Tone and inflection: New facts under new perspectives

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Tone is about melody and meaning, inflection is about grammar, and this book is about a bit of both. The contributions to this volume study possible and sometimes very complex ways in which the melodies of a given language engage in the expression of grammatical meaning. The volume aims to broaden our understanding of the role of tone in the making of grammar. We believe that this is important because it challenges a widespread conception of tone as being a lexical phenomenon only. Such a conception flows from the expectation that any typical tone language should be like Mandarin Chinese or Vietnamese, but these are languages with little or no inflectional morphology. The contributions to this volume challenge this view by showing that there is much more to tone than meets the eye.

In this light, we wonder if tone, more specifically *inflectional tone*, is the last frontier in descriptive and typological linguistics. Evanescent as it may seem at first sight, tone is a hard nut to crack to most of us both in describing a tone language and in disentangling the patterns in which it participates in grammar. Not only does it increase conditions of complexity across languages, but it also makes the fieldwork on such languages challenging, especially for dialect surveys created for comparative purposes.[1] Besides, tone raises issues on the boundaries between phonology and the phonetic implementation of pitch, as we try to reconcile *tonemes*, contours or gliding tones, tone sandhi and tone registers, prosodic heads, triggers, spread and check, plateaus, etc. with phonation or voice quality, downstep and downdrift effects, etc.

Tone remains a puzzling issue for both descriptive and theoretical linguistics. It interacts both with the natural classes of segmental phonology (obstruents vs. sonorants) and with phonation types (voicing, voice quality); it conflicts with other prosodic phenomena such as stress, rhythm and intonation;[2] and it can get intertwined with both the grammar and the lexicon. But it is also impossible to circumvent. In this respect, given that nearly half of the world's languages can be classified as tonal,[3] one wonders to what extent tone is given its fair share in introductory courses in general and theoretical linguistics, as such courses set the foundations for a pool of future linguists.[4]

[1] Compare Josserand (1983) to Dürr (1987): the former, though providing outstanding segmental data on Mixtec dialects (Mixtecan; Oto-Manguean), apparently had no material conditions to afford noting tone throughout the Mixtec dialect area, whereas the only way for the latter to face this challenge was by compiling second-hand data into a general survey (cf. sources in Dürr, 1987: 36–7). One could also mention Kirk (1966), who noted tone in only three of the twelve dialects of his comparative phonological survey of Mazatec (Popolocan, Oto-Manguean), namely: Jalapa de Diaz, Huautla and San Miguel Soyaltepec. He chose the first location because he lived there and could easily check the data; and the other two because he had access to the extensive work carried out by Kenneth and Eunice Pike.

[2] See Peng (2013: 347, 363).

[3] According to Maddieson (2013), 58.2 % of the world languages are non-tonal, whereas 25% can be classified as having a simple tone system, and 16.6% as having a complex one (i.e. roughly 42% of a representative sample of 527 languages classify as tonal).

[4] We admit that tone may seem difficult to grasp. Some of us linguists may even confess being 'tone deaf' to elude having to deal with tonal issues or to stay away from tonal languages. But coming to terms with tone is almost always a question of methodological patience. It requires intensive and demanding training and the discrepancy between underlying and surface tone is often conspicuous or hard to fathom: a mere f0 detection on speech processing programs such as PRAAT is often not enough.

This book makes an attempt at disentangling this intricate web of factors. The way to face this challenge is to follow a clear-cut track. We do so here by sticking to inflectional tone and taking two empirical steps: we first focus on a highly representative area for this issue under study (i.e. the Oto-Manguean languages of Mexico) and then broaden our perspective to additional languages with inflectional tone, thus intending to identify universal trends.

An old course book on African languages by Diedrich Westermann and Ida Ward, published by Oxford University Press for the International Institute of African Languages in 1933, offered the following definition of tone:

> "A tone language is one which makes a particular use of pitch as an element of speech. This special use consists in the employment of pitch for two purposes, *viz*. (1) To indicate meaning (semantic or etymological tones); (2) To show grammatical relationships (grammatical or syntactic ones)".
>
> (Westermann and Ward, 1990: 134, § 402)

This concise definition still largely holds, and can serve as a motif for this volume. All tonal languages use pitch as a component of the lexicon, but our focus is only on those that also use it as a component of inflection. We shall therefore distinguish between two main types of tone: the so-called 'lexical tone' and 'relational tone' (henceforth LT and RT, respectively).

Our primary interest is in RT, but to study RT accurately one has to understand its connections to LT (the opposite is not always true, depending on the type of inflectional system). In our opinion, far too much energy has been spent on describing LT traits in surveys and monographs: tone systems and tone sandhi rules, or tone etymology and tone shifts, especially in relation to segmental features converted into pitch. In contrast, only occasionally, at times even incidentally, are we told about phenomena involving RT: tones as autonomous morphemes, tonal paradigms, prosodic contour agreement and domains, etc. Monographs and cross-linguistic surveys mention these facts, but they either embed the questions in a lexical approach (rather than an inflectional one) or they scatter tonal information in phonotactic or morphosyntactic descriptions of the *spread* and *check* type, which have the fatal consequence of losing what should be our main priority: natural linguistic data. As a result, RT phenomena tend to be described as a by-product of the encounter of the lexicon and the grammar, and the overall picture thus obtained of both the mechanisms of RT and of its rules and constraints ends up as a heavy bundle of entangled phenomena. At times too, the handling of such phenomena becomes muddled with technical meta-language that makes most analyses of tone incomprehensible to outsiders of hardcore phonology.

Could we take an alternative approach to tone, an approach that is overtly inflectional? Can we make an attempt at disentangling the fabric of tone in grammar rather than in the lexicon or in the syntax, and skip phonetic implementation of tone for a moment? In this book we propose we can. In doing so, we gain insights on tone which go beyond traditional approaches.

LT descriptions often rely on diachronic and genetic explanations, such as for example transphonologisation or prosodisation of consonantal features resorting to phonation (see Haudricourt, 1972: 85–316, Gedney 1972, Yip 2002: 33–7, etc.). But what can be said about the fabric and origins of RT? Once we pose this question, many other questions pop up as if opening a Pandora's Box. We mention here a few: Beyond diachrony and tonogenesis, what types of RT can be observed in languages? What triggers RTs? And what do RTs, in turn, trigger in the prosodic chain or in inflectional relations between lexical and functional heads? How autonomous are RTs? To what extent are they organic? Are they as strong as or even more robust than LTs? To what extent are they prone to allotony? What is their relation to default tones and patterns, such as mid tones or the so-called *Obligatory Contour Principle* constraints in the sense of McCarthy's (1986)? How do they contrast with such more 'neutral'

patterns? What else do they bring that LTs or stress cannot do? To what extent can the intricacy of tone patterns be disentangled through default assignation? Are RTs more relevant or more decisive in the overall system than LTs, or are they secondary and expletive devices? How strongly are they anchored to their domains? And to what extent does floating RT differ from anchored RT? What are the consequences of this positional dualism in morphological templates? etc.

Searching for answers to such questions, it becomes apparent that paradoxically, RT and *morphotonology* are the orphans of tone studies.[5] Indeed, advances in the field of morphotonology may well have been jeopardized by the success of the two main phonological approaches to tone: the phonatory transphonologisation approach and the tone sandhi and tone syntax (or *tonotactics*) approach. As the focus of the field has been on the study of the phonetic properties of pitch and their integration into registers or prosodic domains from a phonological standpoint, and as much energy has been invested in distinguishing tone from stress or intonation, it really comes as no surprise that tone studies have hardly afforded the time to delve into the intricacies of RT from an inflectional standpoint. Because of this, we need to revisit RT from a more autonomous standpoint by looking into grammar. This will enhance our understanding of how tone serves as a fundamental actor in the making of inflection in many languages.

This book focuses on some important aspects of RT phenomenology on the basis of a few case studies. A cross-linguistically representative survey of inflectional tone in the world's languages remains an ideal goal and in this book we have taken a step in this direction. Its core section includes a collection of articles on the Oto-Manguean languages, a large and very diverse linguistic family of Mexico with great RT complexity, which inspired Kenneth Pike's (1948) seminal study on tone languages. The volume also includes a set of chapters tackling important issues concerning inflectional tonogenesis found in languages of other geographical areas, namely Asia, Africa and Papua New Guinea.

A focus on RT from the standpoint of inflection opens windows onto new landscapes as it were, some of which we explore in this volume. One of such topics is how tonal inflection may be sensitive to typological variation. In this respect, Palancar (this volume) outlines a preliminary typology of such variation. But we also wonder to what extent tone is sensitive to *autopoiesis*. In other words, how prone is tone to spontaneous emergence and self-organization in the making of grammar? This leads us to the issue of defining structural complexity in language; a central topic in current linguistic theory and typological studies

[5] Take a seminal textbook on morphology such as Matthews (1974) which mentions tone only once (p.133), making reference to 'tonal modification' and 'tonal variation' in Lumasaaba (Bantu, East Africa) and giving an example of an aspectual contrast between near past and perfect. Or take a seminal textbook on tone such as Yip (2002) which devotes only a few pages (pp.105–129) on 'tone morphemes', mentioning Hausa, Chichewa, and a set of five Bantu languages. A more recent course book (Haspelmath and Sims 2010) mentions 'tonal change or stress shift' in Chalcatongo Mixtec (Oto-Manguean) (p.37), and the 'tone modification' of the imperative in Tiv (Benue-Congo) (p.65), while providing a few short drills on Mbay and Hausa (Afroasiatic) (p.55). Spencer (1991) gives more insights into inflectional tone, asserting that "the tone pattern over the whole of the verb [in Chichewa] depends on the tense/aspect" (p.18). This manual devotes four pages to 'tone as morpheme' (pp.163–167) dealing with data from Tiv. Though more extensive, Kenstowicz' (1994) account of tonal phenomena mainly focuses on phonological processes and autosegmental patterns, such as tonal displacement, tonal feet, tonal melody, tonal particle, plateau, tonal polarity, tonal stability and tone-bearing units. The same languages are often quoted from the same stocks, and no comprehensive model comes out of most of the textbooks available to students and scholars. A recent textbook on patterns in phonology (Peng, 2013) displays abundant data and insights on tone in Mande (pp. 320–44) and Yoruba (pp. 345–91). But once more, the survey deals more with LT than with RT. One often has to rely on specific areal surveys to find more substantial data and patterns, as in Goldsmith *et al*. (1995: 444–494) – although modeling of RT as such from both a phonological and morphological standpoint still awaits full coverage. Indeed, the areal strategy is still the best way to search for information on inflectional tone, such as for example through specific studies on the Bantu verb, or through the study of inflectional classes in Oto-Manguean languages, etc.

(Newmeyer and Preston 2014, Miestamo *et al.* 2008). The contributions to this volume provide some possible answers to such questions:

- Integration of formerly free domains. RT can stem from once relatively free domains, such as, for example, the definite determiner in Bamana (Vydrin, this volume) or the light verbs of Mazatec (Léonard and Fulcrand).
- Sound change and *traces*. RT often turns out to be a resilient expression of some former – or underlying– segmental substance, for example resulting from adjustment rules between stems and affixes based on natural class properties (e.g. "level and falling tones appearing in closed syllables with sonorants and obstruent codas, respectively", Jacques, this volume).
- Tonal semiosis, as in Dan (Vydrin, this volume), where the escalation in contrastive levels (or registers) ends up with super high or super low tones – a similar trend can be observed in Chinantec and some other Oto-Manguean languages. This little game may be called *pitch class competition*, giving birth to patterns such as those mentioned by Hyman (this volume) for Iau telic *vs.* atelic verbs. In this case, the spiral of level and contour tones whirls around a value such as telicity or aspect in the logic of a musical scale, rather than resulting from arbitrary assignment.[6]

Integration of free domains, sound change as well as traces and tonal semiosis constitute appealing hunting grounds for the study of RT from the perspective of inflectional morphology. However, these topics provide but a glimpse of the intricate phenomenology of tone.

We hope that the present collection of papers on tone and inflection inspires broader research on RT, giving rise to more studies and making the morphological landscape across languages with tonal inflection easier to explore. Whatever may be the limits of this endeavor, one basic assumption should hold for further research: in order for RT to be integrated into both phonological and morphological theory, it first needs to be disentangled, and to achieve that we should not be afraid of its complexities.

Most contributions to this volume provide first-hand data from recent fieldwork. As RT complexity is often found in endangered languages across the world, these studies show the importance of language documentation for future generations. In this light, not only can this volume contribute to theoretical debates on the interface between tonology and other domains of language through its morphology, but it also may raise issues for further empirical studies within the framework of language documentation (cf. also Gippert *et al.* 2006, Austin and Sallabank 2011). After all, inflectional patterns made up of tones are part of an endangered complexity and, to some extent, of the ecology of language structures at large.

The volume is a collection of eleven selected articles on the relation between tone and inflectional morphology in different languages. The authors are specialists of one or more of the languages under study. The volume is divided into two parts. One part focuses on general questions with a special emphasis on inflectional tonogenesis. The second part includes a selection of papers on the Oto-Manguean languages of Mexico. This is relevant because within Oto-Manguean one finds the most complex morphological systems we know of, and a great part of that complexity is due to tone. We also believe it is important to give these languages more prominence since most materials are in Spanish and they have passed undetected on the radar of typological literature. We will now give a brief overview of the contributions the volume.

[6] Interestingly enough, fine-grained aspectual contrasts in Ok, a Papuan language, might point to the same direction, fostering emerging prosodic differentiation at the stem level.

PART 1.
Tone and inflection: General questions with a focus on inflectional tonogenesis.

In his paper "Morphological tonal assignments in conflict: Who wins?" LARRY HYMAN addresses three significant issues: (a) What is the inventory of morphological "contributors" to verb tone paradigms? (b) What happens if different contributors conflict? And most importantly, (c) what can we learn from this about how tonal morphology works in general? Hyman shows that tone can do everything that segmental (i.e. non-tonal) morphology can do, and he shows that it can even do much more than that, because due to its suprasegmental nature it can extend beyond the syntactic phrase, blurring the distinction between phonology, morphology, and syntax. The analysis is based on Hyman's vast knowledge of African languages, but serving as a bridge from Africa to the New World, it also includes a possible analysis of Macuiltianguis Zapotec, an Oto-Manguean language of the Zapotecan branch.

The article by SEBASTIAN FEDDEN is about the emergence of tone as an inflectional formative in Mian, a Papuan language of the Ok family. Mian is a word-tone language whose lexemes are specified for one out of a set of five tonemes, but tone does little to inflection except for a tiny corner of the grammar that Fedden reveals to us. In Mian, the non-hodiernal past and the imperfective are realized by a homophonous segmental marker. Despite this homophony, many verbs have an aspectual stem distinction that keeps the two grammatical senses apart. For the verbs without the aspectual distinction, a high tone intervenes on the mora of the subject suffix realizing the non-hodiernal past, making the inflected form phonologically distinct from the imperfective. This shows how tone can be recruited for an inflectional purpose. Fedden also shows that this high tone is also found in a set of verbs with aspectual stems. While its occurrence in such forms is redundant from a functional point of view, it is an instance of multiple exponence, which is a property typically associated with complex morphological systems.

In his contribution, GUILLAUME JACQUES studies the nature of the complex stem alternations of the verbal inflection of Khaling, a Sino-Tibetan language of the Kiranti family spoken in Nepal. These alternations involve stems with different tones which occur in paradigms without an apparent functional motivation. Searching for a motivation, Jacques goes beyond a solution that appeals to idiosyncrasies of the verbal lexicon, and, adopting a diachronic perspective, advances a historical account for such tonal alternations showing that the patterns can, at least in most cases, be explained by two series of sound change. Jacques' contribution is a very illustrative example of how a type of tonal inflection that only attends to morphological structure (i.e. no function and thus unmotivated) emerges once the conditions that hold the key to the system are lost.

VALENTIN VYDRIN's article is on two African languages of the Mande group: Bambara (Manding, Western Mande), mainly spoken in Mali, and the Gwɛɛtaa dialect of Dan (Southern Mande, South-Western Mande), spoken in Ivory Coast. The paper is a comparative study of two very different ways in which tone can work as an exponent of grammatical information. Vydrin further suggests a diachronic interpretation for most of the tonal formatives. In Bambara, which has a 2-level tone system, a floating low tone serves to express definiteness on NPs. Vydrin treats this tone as a definite article, which he regards as having an inflectional function. In contrast, the role of tone in the inflection of Dan is more complex, because it has many more functions, including: (i) a replacive extra-low tone on the root of a verb encodes neutral aspect, and on nouns it serves as an isaphet marker in certain types of inalienable possession constructions; (ii) a tone lowering of the root of a verb encodes the

conjoint dependent status of that verb; (iii) an extra-low tone that manifests itself as a syllable-final tonal modulation is used to build infinitival forms; (iv) alterations of the tonal contour of adjective stems indicate cumulative plural; and (v) many of the pronominal predicative markers (auxiliaries) used for the inflection of verbs in Dan contrast just in tone.

PART 2.
Tone and inflection: Insights from the Oto-Manguean languages

As the volume includes six papers on the Oto-Manguean languages of Mexico, ENRIQUE PALANCAR's paper is an introductory chapter to this phylum. This paper also presents a typology of the different situations in which tone is involved in inflection. This typology takes the form of possible situations thought of as occurring between two ends of a continuum. At one end, there is a lexical situation where tone is a phonological property of a given grammatical marker. At the other end, we have the morphosyntactic situation where a given tone serves as an exponent of a specific grammatical category and applying in all cases where that category is required. Between these two ends, there are other cases where the mapping of form and meaning is less clear-cut. Such situations include tone classes and another four cases where tone can be seen as a morphological building block of paradigms. The internal diversity of Oto-Manguean allows for an illustration of at least five of the seven possible types.

ERIC CAMPBELL's contribution provides an accurate description of the role of tone in the inflectional morphology of Zenzontepec Chatino, a conservative Chatino language of Mexico from the Zapotecan branch of Oto-Manguean. The tone bearing unit in Zenzontepec Chatino is the mora, and morae may bear a high tone, a mid tone, or no tone at all (with a default realization of mid-to-low falling pitch). No-tone morae are detected because they are targets of interesting tonal alterations (also see Vydrin, this volume for a similar system in Bambara). Campbell describes the encoding of 2nd person by means of tone and how tonal allomorphy is predictable from the stem's phonological shape. But he also shows tone alterations in the aspect inflection of a subset of the verbal lexicon that are lexically-specified, and Campbell claims that the best way to account for them is by way of inflectional classes.

Continuing with Oto-Manguean languages, JEAN-LÉO LÉONARD and JULIEN FULCRAND's paper is about the internal variation of tonal inflection within the Mazatecan language family of Mexico, another branch of Oto-Manguean spoken in the state of Oaxaca. The authors start by providing a model of the six tone classes in Huautla Mazatec as presented in Pike's (1948) seminal work. They take this model as the basis from which they can estimate the degree of divergence present in a large sample of primary data collected from modern Mazatecan varieties. At a suprasegmental level, the authors propose that Mazatec verb inflection responds to two main processes: downstep, mainly affecting the encoding of the 1st person singular; and the Obligatory Contour Principle, affecting the expression of other persons (except the 3rd person). Léonard and Fulcrand focus on three representative dialects in their sample, and they show in detail how dialectal divergence may occur in a complex system.

YUNI KIM's article is pioneering in both describing and accounting for the tonal patterns of the Amuzgo language of San Pedro Amuzgos. Amuzgo is a branch of Oto-Manguean and the languages of this branch have eight lexical tones. In Amuzgo, person and number inflection is realized by tone, vowel-height, and glottalization alternations on mostly monosyllabic stems. Kim establishes the relationship between observed tones on inflected forms, and the underlying tonal morphemes that can be considered as the inflectional tones proper. She argues that inflectional tones overwrite lexical tones, demonstrating that tonal inflection

patterns cannot be predicted from a lexical item's morphophonological properties, such as its membership to stem-alternation classes. Instead, lexemes must be specified for the tonal inflection pattern that they take. But her analysis does not stop there because accounting for the inflection-class inventory requires factoring out predictable phonological processes. In this respect, Kim argues that glottally conditioned tone lowering creates surface allotones that are predictable for most cases, meaning that the two most frequent surface patterns in the inflection originate from a single underlying default tone. Besides the default, many irreducibly distinct classes remain, making Amuzgan inflection typologically challenging.

CHRISTIAN DICANIO's work is a contribution to building general knowledge of tone from the complex system found in Itunyoso Triqui, an Oto-Manguean language of the Mixtecan branch with nine lexical tones. Providing both a description and an autosegmental analysis of the morphophonology of person clitics in Triqui, this chapter contains a wealth of primary data. Like in many Oto-Manguean languages, person of subject and possessor is marked in Triqui by enclitics associated with a stem that undergoes tonal adjustments. While the segmental structure of enclitics remains stable in Triqui, there is a complex relation between the stem's morphological/phonological structure and the diverse set of tonal and laryngeal changes which co-occur with cliticization. These are addressed by the author, who postulates that certain roots have lexically-specified inflected stem tone allomorphs, while others are organized into two abstract tone classes relating to tone rising.

TIMOTHY FEIST and ENRIQUE L. PALANCAR show that the distribution of tonal inflection in Cuicatec, another Mixtecan language, is complex to a point that one could be tempted to characterize it as chaotic. However, in order to disentangle this tonal complexity in a quest for inflectional structure, the authors propose that one way to deal with the Cuicatec system is to focus on the distribution of the first tonal formative of each pattern (or the first tonal element in the case of contour tones). The proposal operates under the hypothesis that this unit is the historical remnant of the tone of an inflectional prefix which a reduced number of verbs still select, and hence the tone now carries its grammatical function. The authors base this analysis on a sample of 2,480 inflected forms of 620 verbs from the excellent dictionary by Anderson and Roque (1983).

In the paper "Tone and verbal inflection in Yoloxóchitl Mixtec", ENRIQUE L. PALANCAR, JONATHAN D. AMITH and REY CASTILLO GARCÍA study the properties of the tonal inflection of another language of the Mixtecan group, this time of the Mixtec family. Like Triqui, Yoloxóchitl Mixtec has a rich tonal inventory with nine contrastive tones at a lexical level, but the role of tone in the verbal inflection is very different. From a well-informed sample of 554 verbs collected by Amith and Castillo García as part of a larger documentation project on this endangered language, the authors show that Yoloxóchitl Mixtec is a remarkable language within Oto-Manguean because it uses tone as a typical inflectional exponent, i.e. a given tone value is assigned a univocal function. Tonal allomorphy can be accounted for as being conditioned by the morphophonological properties of the verbal stem. The language does not make use of lexically-specified classes involving tone, but the regularity of tone rules contrasts with the existence of other verb classes involving segmental changes in the stem that need to be listed in the lexicon.

Acknowledgements
Like any other collective work, this volume is also the fruit of combined efforts, both personal and institutional. The project for the book started in Paris, at the dawn of the summer of 2013, from a workshop titled "Tons et paradigmes flexionnels: modélisation et parcimonie / Disentangling the inflectional role of tone". Since that event, we have gained more people on

board but have also regrettably lost some, hopefully not forever. We want to thank the commitment of all authors to this work. We are very grateful to Volker Gast, editor of the TiLSM series, for his keen eye in detecting inconsistencies, to his team for all their support and to the external anonymous referee for all the insightful comments and suggestions that have contributed to improving this volume. Institutionally, the edition of the book has been supported by the ESRC/AHRC project ES/I029621/1 "Endangered Complexity: Inflectional classes in Oto-Manguean languages" as well by the project "Meso-American Morpho-Phonology" by the Institut Universitaire de France. This work is also an outcome of the program "Investissements d'Avenir" by the French National Research Agency, ANR 10-LABX-0083, strand 1, PPC2 & strand 7 EM.

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PART 1

Tone and inflection:
General questions with a focus on inflectional tonogenesis

Morphological tonal assignments in conflict: Who wins?

Larry M. Hyman

1. Introduction

The goal of this paper is to address the following questions: (i) What is the inventory of morphological "contributors" to verb tone paradigms? (ii) What happens if the different contributors conflict? (iii) What does this say about how (tonal) morphology works in general? In §2 I present examples showing that tonal morphology can do anything that non-tonal morphology can do. This is followed by an examination of Haya verb stem tonology in §3. In §4 I then present cases that show that the reverse is not true: tonal morphology can do things that non-tonal morphology cannot do. In these cases which involve tonal action across words, the result is that tonal morphology often obscures the compartmentalization of phonology, morphology and syntax. The question of why tone should have such unique properties is addressed in the conclusion in §5.

2. Tonal morphology can do whatever non-tonal morphology can do

As discussed in Hyman (2011: 203), it is sometimes claimed that tone cannot mark certain things. For example, a proposed universal made in the presidential address at the Linguistic Society of America a few years ago was that "No language uses tone to mark case". That this is not true is observed in the following examples from Maasai [Nilotic; Kenya, Tanzania](Tucker & Ole Mpaayei 1955: 177–184; cf. Bennett 1974; Plank 1995: 59–62; Payne 2008):

(1)		Nominative	Accusative		NOM*vs.*ACC tone patterns
	Class I:	èlòkùnyá	èlókúnyá	'head'	L^n-H vs. L-H^n
		èncùmàtá	èncúmátá	'horse'	
	Class II:	èndérònì	èndèrónì	'rat'	H on σ_2 vs. σ_3
		ènkólòpà	ènkòlópà	'centipede'	
	Class III:	òlmérégèsh	òlmérègèsh	'ram'	H on σ_2&σ_3 vs. on σ_2 only
		òlósówùàn	òlósòwùàn	'buffalo'	
	Class IV:	òmótònyî	òmótònyî	'bird'	identical tones—no change
		òsínkìrrî	òsínkìrrî	'fish'	

As seen in the examples and summarized to the right, the first three declension classes show only a tonal difference between their nominative vs. accusative forms. Many other languages could be cited to show that it is not only case that can be exclusively marked by tone. As Hyman & Leben (2000: 588) put it, "tonal morphology... exhibits essentially the same range of morphological properties as in all of segmental morphology". As common linguistic sense tells us, if tone can be a morpheme, it can do everything that a morpheme can do.

Concerning verb tone paradigms, the focus of this paper, we therefore expect that anything that can be marked by a segmental affix or process can also be marked by tone. This includes inflectional marking of subject, object, transitivity, tense, aspect, mood, negation, clause type etc. as well as derivational marking of causative, applicative, reciprocal, passive and other verb forms, as well as processes that derive one word class from another. As an

example, verbs are detransitivized in Kalabari [Ijoid; Nigeria] by assigning a /LH/ melody (Harry & Hyman 2012):

(2)		Transitive			Intransitive		
	a.	kán	H	'tear, demolish'	kàán	LH	'tear, be, demolished'
		kɔ̀n	L	'judge'	kɔ̀ɔ́n	LH	'be judged'
	b.	ányá	H-H	'spread'	ànyá	L-H	'be spread'
		ɗìmà	L-L	'change'	ɗìmá	L-H	'change'
		sá↓kí	H-↓H	'begin'	sàkí	L-H	'begin'
	c.	kíkímà	H-H-L	'hide, cover'	kìkìmá	L-L-H	'be hidden, covered'
		pákìrí	H-L-H	'answer'	pàkìrí	L-L-H	'be answered'
		gbóló↓má	H-H-↓H	'join, mix up'	gbòlòmá	L-L-H	'be joined, mixed up'

The "tone is like everything else" idea would lead us to expect the same degree of uniformity of tonal exponence as in a segmental paradigm. The same tone or tonal melody should be as consistent a spell-out of a given morphosyntactic feature. However, this may not always appear to be the case. Tone has a greater independence ("autosegmentality") and ability to wander (see §4). Any study of a tone system with a reasonably complex tonal morphology must find a way to describe the alternations that take place within the verb system. Verb tone paradigms are often presented in prose, as a table, or more rarely of individual tone assignment rules. I reproduce an example of one such table in (3) vs. a set of rules in (3).

(3) Tone on verb stems in Mambay [Adamawa; Cameroon] (Anonby 2011: 374)

Tonal verb class		Example verb		PERFECTIVE	PRF	PLU-PRF	FUT	OPT	IMPF
1	intr /CVX/	*yáá'*	*'move away'*	H	ºH[L	H	H	H	(LEX)
	intr /CV/	*gé*	*'get lost'*	H	HL*	H	H	H	(LEX)
	tr	*ɓéé*	*'bite'*	H	H	H	H	H	L
2	intr	*sụ̀ụ̀*	*'lie down'*	L	ºH[L	H	H	H	(LEX)
3	intr	*vè*	*'go'*	L	L	L	H	L	(LEX)
4	intr	*hèè*	*'climb'*	L	L	L	L	L	(LEX)
	tr	*gìì*	*'answer'*	L	L*	L*	L	L	L
5	intr/tr	*yàà*	*'finish'*	L	LHL*	LHL*	LH	LH	LH
6	intr/tr	*ʔòògí*	*'drag feet'*	LH	LHL*	LHL*	LH	LH	LH

ºH[L = floating H tone on the left boundary of a L stem; * = replacive melody, i.e., dominates the entire verb word.

(4) Final stem tone assignment rules in Haya [Bantu; Tanzania] (Hyman & Byarushengo 1984: 76)

a. Rules assigning H to the final vowel, independent of tone of radical:

(i) º → H / + V̄] [+NEG: PST-2]
(ii) º → H / + V̄] [+OBJ/NON-SUBJ REL: FUT-2, PRS, PST-1, PST-2]
(iii) º → H / + V̄] [-REL, -NEG:FUT-2, PRS, PST-1, PST-2]
(iv) º → H / + V̄] [IMPERATIVE (-SUBJ MARKER/-OBJ MARKER)]

b. Rules assigning H to the final vowel only if the radical is º (toneless):

(i) º → H / + V̄] [FUT-1]
(ii) º → H / + V̄] [+NEG: PRS.HAB]
(iii) º → H / + V̄] [-NEG, +REL: PST-3, PST.HAB]
(iv) º → H / + V̄] [SUBJUNCTIVE]
(v) º → H / + V̄] [IMPERATIVE (+SUBJ MARKER /+OBJ MARKER)]

c. Miscellaneous

º → H / C V̄]...] [+NEG: PST-2]

Such differences raise the issue of how tones should be assigned within a verb paradigm: (i) by global patterning of partially or fully arbitrary "tonal verb classes", as proposed for Mambay; (ii) by reference to the morphosyntactic features of individual cells, as proposed for Haya; (iii) by some other way? To a large extent it may depend on the situation in the individual language. (I return to Haya in §3.)

What is particularly striking in such systems is that the tone assignments can conflict in a number of ways: (i) by domain (e.g. root vs. stem vs. word); (ii) by function (e.g. lexical vs. derivational vs. inflections); (iii) by morphosyntactic feature (e.g. tense vs. aspect vs. negation). Such potentials hold whether the base is mono- or polysyllabic, contrasting only two tone heights or several. In the latter case consider for example the eight tone patterns on monosyllables in Iau [Indonesian; Papuan], which are lexical on nouns vs. morphological on verbs ($^{\uparrow}$H = super high).

(5)

Tone	Nouns		Verbs		(Bateman 1990: 35–36)
H	bé	'father-in-law'	bá	'came'	*totality of action punctual*
M	bē	'fire'	bā	'has come'	*resultative durative*
H$^{\uparrow}$H	bé$^{\uparrow}$́	'snake'	bá$^{\uparrow}$́	'might come'	*totality of action incompletive*
LM	bè	'path'	bà	'came to get'	*resultative punctual*
HL	bê	'thorn'	bâ	'came to end point'	*telic punctual*
HM	bé̋	'flower'	bá̋	'still not at endpoint'	*telic incompletive*
ML	bè̋	'small eel'	bà̋	'come (process)'	*totality of action durative*
HLM	bê̋	'tree fern'	bâ̋	'sticking, attached to'	*telic durative*

Although the inflectional categories on Iau verbs in (5) lend themselves to a featural, paradigmatic display, the portmanteau tone patterns do not appear to be segmentable. From the summary table in (6) the only generalizations that can be extracted are that telic and incompletive both begin H and resultative ends mid:

(6)

	Telic	Totality of action	Resultative
Punctual	HL	H	LM
Durative	HLM	ML	M
Incompletive	HM	H$^{\uparrow}$H	

In other cases segmenting the tones by morpheme is straightforward, as in Modo [Central Sudanic; Sudan] (Nougayrol 2006):

(7)

		/ata, H/ 'be bitter'		/uba, L/ 'sing'	
1SG, 2SG, 2PL	/H-/	átá H-H	'you are bitter'	úbà H-L	'you sing'
3SG. 1PL, 3PL	/L-/	àtá L-H	'it is bitter'	ùbà L-L	's/he sings'

As seen, verb roots can be H or L which, when conjugated, can acquire a H- vs. L- prefix. While the output consists neatly of the four logical combinations in succession of two tones x two tones (inflection + root) in succession, a consistent exponent can be "subtonal", consisting of less than a full tone. For example, the four combinations of person + tense features also produce a four-way distinction in Gban [Mande; Ivory Coast] (Zheltov 2005: 24):

(8)

	Present		Past		(1 = lowest tone, 4 = highest tone)
	SG	PL	SG	PL	
1st pers.	ĩ^{2}	u^{2}	ĩ^{4}	u^{4}	[+upper]
2nd pers.	ɛɛ^{2}	aa^{2}	ɛɛ^{4}	aa^{4}	
3rd pers.	ɛ^{1}	ɔ^{1}	ɛ^{3}	ɔ^{3}	[-upper]
	[-raised]		[+raised]		

As seen, tone differs consistently between 1st/2nd vs. 3rd person, the latter being one step lower. In addition, all tones are two steps higher in the past than they are in the present. In (8) I have arbitrarily represented the person features as [±upper] and the tense features as [±raised], although they could have been reversed.

In addition to the above concatenativity, tone (and other prosodic features) show the familiar sensitivity to internal morphological structure. Thus consider the "tonal layers" [strata] which Andersen (1992–4: 61) reports for Dinka [Western Nilotic; Sudan], which is monosyllabic, but polymorphemic:

(9) wè̱ec 'kick it hither!' [kick.CENTRIPETAL.2sg]

		voice	*length*	*tone*
inflectional layer	(2SG)	—	—	H
derivational layer	(CP)	[+breathy]	+1	L
root layer	('kick')	—	1	HL

In derivational terms, the root /wêc/ 'kick' acquires breathiness, vowel length, and L tone to become intermediate *wẹ̀ec* when undergoing the centripetal ('hither') derivation. The L is then replaced by H to realize the 2nd person singular subject of the imperative. As Andersen puts it, "The morphological layers are simultaneous but 'vertically' ordered, with the root as the 'deepest' layer, optionally followed by the derivational layer, followed by an inflectional layer." This results in the above "cyclic" effects. (For more on cyclicity in tonal phonology and morphology, see Pulleyblank 1985, 1986.)

In a quite different kind of system, polysyllabic Chichewa [Bantu; Malawi], verb stems can be toneless or can have a single H on either their final or penultimate syllable (Kanerva 1989, Mtenje 1987, among others). With some dialect differences, H tones are assigned as follows (Hyman & Mtenje 1999: 98–99):

(10) a. Final H tone is assigned by
   (i) verb roots with a lexical /H/
   (ii) certain derivational suffixes such as /-its-/ 'intensive', /-ik-/ 'stative', /-uk-/ 'reversive intr.' and (in Nkhotakota dialect) passive /-idw-/
   (iii) the subjunctive final vowel /-é/ (= the only case of a TAM conditioning final H
   (iv) non-reflexive object prefixes (in Nkhotakota dialect).

   b. Penultimate H tone is assigned by
   (i) some affirmative tenses
   (ii) most negative tenses
   (iii) the reflexive prefix /-dzí-/
   (iv) object prefixes in Ntcheu dialect (vs. final H in Nkhotakota)

   c. In the absence of one of the above conditioning factors the stem will be toneless.

As seen, final H is mostly lexical and derivational (with the exceptions of subjunctive *-é* and object prefixes in Nkhotakota dialect), while penultimate H is inflectional, marking TAM, negation, the relative prefix, and object prefixes in Ntcheu dialect.

In cases where the more than one morpheme contributes the same tonal assignment, only one H is realized. Thus, although the following example from Nkhotakota dialect (Sam Mchombo, pers. comm.) has four sponsors of final H tone, only one final H actually materializes (Hyman & Mtenje 1999: 101):

(11) [ti- [[[[pez-] -etsets-] -edw-] -e]] → ti-pez-etsets-edw-é ... 'let's be found a lot'
H H H H
1PL-find-INTENS-PASS-SBJV

In general, in cases of conflict, penultimate H overrides final H—but with one crucial exception: subjunctive final *-é* overrides reflexive/object prefix penultimate, presumably because of scope considerations. While it may seem that all Hs may be assigned by rule, Hyman & Mtenje point to evidence that at least some Hs need to be underlyingly linked to their sponsor—but still follow instructions as to where to go (to the final or penultimate syllable). In (12a), the object prefix /H/ shifts to the penult (Ntecheu dialect). (The remote past tense marker is /-naa-/ to which the H of the subject prefix /tí-/ spreads. The phrase-penultimate vowel lengthens by general rule.)

(12) a. /tí-naa-mú-fotokozer-a/ → tí-naa-fotokozéer-a 'we explained to him'
H_i H_j H_i H_j

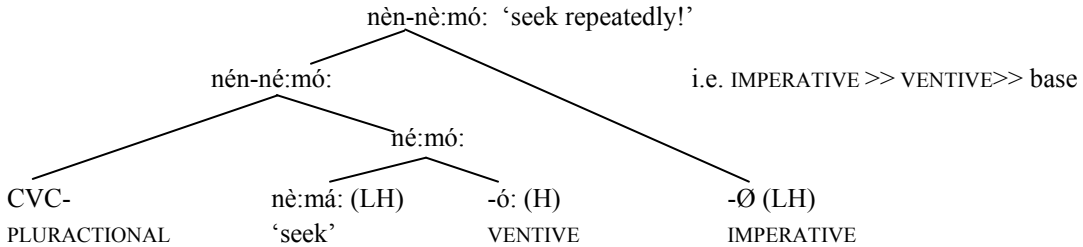
b. /ti-ná-mú-fotokozer-a/ → tí-na-mu-fotokozeer-a 'we explained to him'
H H → Ø H

However, whenever an object prefix is preceded by a H tone morpheme, there is no penultimate H tone. This is seen in (12b), where the general past prefix is /-ná-/. As shown, the /H/ of the /-mú-/ is deleted by what is commonly known as Meeussen's Rule in Bantu: the second of two Hs in succession is deleted. Since it would be odd to have a rule that said "object prefixes assign a H to the penult unless they are preceded by a H", I follow the earlier account with underlying sequences of Hs as in (12b).

Finally, note that there no rules in Chichewa which shift a pre-existing final H to the penult: all penultimate assignment rules insert a /H/ at the same time. For this reason one cannot assume that the penultimate pattern simply applies an instruction to mark off the last syllable as extrametrical. Hyman & Mtenje's (1999: 102) proposal is that final H is assigned at the stem domain, while penultimate H is assigned within a larger "macro-stem" domain. The "later" macro-stem domain thus overrides the earlier stem domain. The major exception is subjunctive *-é*, which is stem-level despite its greater scope.

Other cases in the literature show that the "uppermost" morphological structure wins. Thus, Inkelas (2011: 75) provides the following word tree structure from Hausa [Chadic; Nigeria]:

(13)



As seen, there is an override system of imperative >> ventive >> base not unlike the Dinka example: inflectional tone overrides derivational tone which in turn overrides base tone.

In addition to "layers" (cycles, strata, domains) based on derivational vs. inflectional morphology, paradigmatic conflicts may require a hierarchical ranking of the tonal spell-outs by inflectional features (tense, aspect, mood, negation). A case of this arises in Leggbó [Cross River; Nigeria] (Hyman, Narrog, Paster & Udoh 2002: 407). In the following table, the first indicated tone goes on the root and the second on a suffix (if present). (MCA = main clause affirmative; SRA = subject relative affirmative clause; ORA = object relative affirmative clause; NEG = negative (all clause types); "irrealis" = future/conditional.)

(14) a.

	MCA/ORA		*SRA*		*NEG*	
Root tone:	/L/	/M/	/L/	/M/	/L/	/M/
PERF/PROG	H-M	M-M	L-M	M-M	H-M	M-M
HABITUAL	L-L	M-L	L-L	M-L	H-M	M-M
IRREALIS	L-L	M-L	L-L	M-L	L-L	M-L

(Irrealis assigns L-L / M-L)

b.

	MCA/ORA		*SRA*		*NEG*	
Root tone:	/L/	/M/	/L/	/M/	/L/	/M/
PERF/PROG	H-M	M-M	L-M	M-M	H-M	M-M
HABITUAL	L-L	M-L	L-L	M-L	H-M	M-M
IRREALIS	L-L	M-L				

(other than irrealis, negatives assign H-M / M-M)

c.

	MCA/ORA		*SRA*		*NEG*	
Root tone:	/L/	/M/	/L/	/M/	/L/	/M/
PERF/PROG	H-M	M-M	L-M	M-M	H-M	M-M
HABITUAL	L-L	M-L	L-L	M-L		
IRREALIS	L-L	M-L				

(other than irrealis and negatives, habituals assign L-L / M-L)

d.

	MCA/ORA		*SRA*		*NEG*	
Root tone:	/L/	/M/	/L/	/M/	/L/	/M/
PERF/PROG	H-M	M-M	L-M	M-M	H-M	M-M
HABITUAL	L-L	M-L				
IRREALIS	L-L	M-L				

(unshaded leftover cells require specific tone assignments)

Although Leggbó noun roots lexically contrast H, M and L tone there is only a binary contrast on verb roots: M tone roots vs. roots which alternate between H and L. In (14) I have represented the contrast as one between /L/ and /M/. In looking over such tabular arrays, the strategy is to start with tone assignments that affect an entire row or column. We see first see that no column has the same tonal pattern throughout. However, in (14a) there is one row that is consistent: the irrealis assigns a L tone suffix deriving L-L and M-L patterns independent of clause type or negation. Once we take this predictable assignment out of the equation we see in (14b) that the next generalization is that negation assigns H-M to L roots and M-M to M roots. In (14c) we can now see that the habitual aspect assigns L-L/M-L to cells unclaimed by the irrealis or negation. This leaves a few leftover cells in (14d) where the lexical L vs. M root tones are realized with a M suffix. By following this procedure Hyman et al (2002) were able to establish the following ordered hierarchy, where earlier assignments block later tonal assignments:

(15)

Irrealis	>>	*Negative*	>>	*Habitual*	>>	*Other*
L-L/M-L		H-M/M-M		L-L/M-L		

Hyman & Olawsky (2004: 107) follow the same procedure in analyzing verb tones in Dagbani [Gur; Ghana], shown in the tables in (16). (Incipient = 'about to'; the (LH) in parentheses was inadvertently not elicited, but is extrapolated.)

(16) a.

	MCA		*MCN*		*RCA*		*RCN*	
	PRF	IMPRF	PRF	IMPRF	PRF	IMPRF	PRF	IMPRF
PRS	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
REC.PST	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
GEN.PST	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
INCIPIENT	*lex*	LH	*lex*	LH	*lex*	LH	*lex*	(LH)
FUTURE	H	H	H	H	(H)	(H)	H	H

b.

	MCA		*MCN*		*RCA*		*RCN*	
	PRF	IMPRF	PRF	IMPRF	PRF	IMPRF	PRF	IMPRF
PRS	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
REC.PST	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
GEN.PST	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
INCIPIENT	*lex*	LH	*lex*	LH	*lex*	LH	*lex*	LH
FUTURE	H							

c.

	MCA		*MCN*		*RCA*		*RCN*	
	PRF	IMPRF	PRF	IMPRF	PRF	IMPRF	PRF	IMPRF
PRS		LH	*lex*	LH	*lex*	LH	*lex*	LH
REC.PST	LH		*lex*		*lex*		*lex*	
GEN.PST			*lex*		*lex*		*lex*	
INCIPIENT	*lex*		*lex*		*lex*		*lex*	
FUTURE	H							

d.

	MCA		*MCN*		*RCA*		*RCN*	
	PRF	IMPRF	PRF	IMPRF	PRF	IMPRF	PRF	IMPRF
PRS	LH	LH	*lex*	LH	*lex*	LH	*lex*	LH
REC.PST			*lex*		*lex*		*lex*	
GEN.PST			*lex*		*lex*		*lex*	
INCIPIENT	*lex*		*lex*		*lex*		*lex*	
FUTURE	H							

In 16a) we observe that the future assigns the same H tone to all verbs in all contexts. Once the future is removed, in (16b) we see that the imperfective assigns LH tone to all remaining verbs. In (16c) we assign LH tone to main clause affirmative perfectives—with the exception of the incipient. At this point, in (16d), the remaining perfectives (non-MCA and incipient) receive their lexical H or L tone as a kind of default. (It is interesting to note that the underlying verb root tones are distinguishable only in these contexts.) We can in fact combine (16b,c) to arrive at the following ranking:

(17) *Future* >> *{MCA [-Incip], [Imperfective]}* >> *Lexical (default)*
H LH H vs. L

It can be noted that in both Leggbó and Dagbani, future tense ~ irrealis mood are ranked higher than aspect, as per Bybee's (1985) Relevance Hierarchy. We should think of such disjunctive tone patterns as vying for the same "slot" exactly as Anderson (1986) discussed

some time ago for Georgian prefixes. With this in mind we now return to a more complicated case from Haya, which was briefly displayed in (4).

3. Haya verb stem tonology

Recall the Mambay and Haya cases in (3) and (4), neither of which recognized hierarchies as in Leggbó and Dagbani. In Mambay, Anonby (2011) sets up a table of "tone classes" to summarize the paradigmatic tones across different TAMs, while Hyman & Byarushengo (1984) present a number of morphological rules assigning tones by specific combinations of inflectional features. At the time I considered Haya to be relatively unruly, defying generalization. I now return after three decades to see if we can do better. In what follows I am concerned only with the assignment of H tones within the verb stem (root + suffix(es)), not with the prefixal domain.

As seen in (18), Haya verb stems may have one of four tone patterns with at most one H tone, predictable from whether the root is underlying /H/ or toneless and whether there is a suffixal H or not:

(18)

	root tone	*suffix tone*	*output H*	
a.	/H/	/H/	on final vowel	suffix H is assigned to FV; root H is deleted
b.	/Ø/	/H/	on second mora	suffix H is realized on second mora of stem
c.	/H/	/Ø/	on first mora	root realizes its /H/ on its first mora
d.	/Ø/	/Ø/	none	no stem H

As summarized to the right, a single H may be realized on the final vowel, the second mora, or the first mora, depending on the input tones. In the one case where the root is toneless and there is no suffix H, the verb stem will be toneless. Examples are given in (19), where the tones are indicated as they appear before the application of postlexical tone rules (Hyman & Byarushengo 1984: 60):

(19)

	root	+	*sfx*	*output H*	*underlying*		*output of lexical phonology*	
a.	/H/		/H/	on FV	(ba-) /kom-il-e/ H H	→	(ba-) kom-il-é H	'they tied up' (PST-2)
b.	/Ø/		/H/	on μ_2	(ba-) /jun-il-e/ H	→	(ba-) jun-íl-e H	'they helped' (PST-2)
c.	/H/		/Ø/	on μ_1	(ba-aa-) /kom-il-e/ H H	→	(b-áa-) kóm-il-e H	'they have tied up' (PRF)
d.	/Ø/		/Ø/	Ø	(ba-aa-) /jun-il-e/ H		(b-áa-) jun-il-e	'they have helped' (PRF)

The main clause affirmative forms in (19a,b) are in the yesterday past tense ($Past_2$) which requires a suffixal H, while those in (19c,d) are in the perfect (Perf), which does not assign a H. In fact, such suffix tones are assigned by the morphology in one of three ways: (i) a suffixal H is assigned to the FV, e.g. the $Past_2$ tense in (19a,b); (ii) no suffixal H is assigned, e.g. the Perfect tense-aspect in (19c,d); (iii) a suffixal H is assigned to the FV only if the root is toneless. This is the case in the past habitual (PH) forms in (20).

(20)

	root	+	*sfx*	*output H*	*underlying*		*output of lexical phonology*	
a.	/H/		/-Ø/	on μ_1	(ba-a-) /kom-ag-a/ H	→	(ba-a-) kóm-ag-a H	'they used to tie up' (PH)
b.	/Ø/		/-H/	on μ_2	(ba-a-) /jun-ag-a/ Ø H	→	(ba-) jun-ág-a H	'they used to help' (PH)

In (20a) there is no suffixal H tone, since the root /-kóm-/ 'tie up' has H tone. In (20b), however, there is a suffix H, since /-jun-/ 'help' is toneless. This H is realized on the second mora of the verb stem, as expected. Hyman and Byarushengo refer to this as the "polar H" suffix, since it is present if the root is Ø, but absent if the root is H. One might propose that the H suffix is assigned to all verb forms in such tenses, but that it is subsequently deleted after a H root. The same Meeussen's Rule applying in (12b) in Chichewa is independently required in Haya to delete the second of two Hs are on adjacent moras, so one might first shift the suffixal H to the second mora and then delete it after a H root initial mora. Since the two types of H suffix would still have to be distinguished (those which would shift even after a H root vs. those which don't), I will instead assume that there are two different H assignment rules, one of which is sensitive to whether the root has a H tone or not.

With this established we now can consider which combinations of inflectional features and clause types require which finals. In the following table, H indicates that a suffix H is assigned when the root is either Ø or /H/, while (H) indicates the polar suffix which is assigned only when the root is Ø. Those cells which do not take either suffixal H are indicated by Ø:

(21)

	MCA	*SRA*	*ORA*	*MCN*	*SRN*	*ORN*	*Focus*
PRES HAB	H	Ø	H	(H)	(H)	(H)	---+++
$PAST_1$	Ø	Ø	H	Ø	Ø	Ø	---+++
$PAST_2$	H	Ø	H	H	H	H	---+++
$PAST_3$	Ø	(H)	(H)	Ø	Ø	Ø	+--+++
PAST HAB	(H)	(H)	(H)	Ø	Ø	Ø	---+++
$FUTURE_1$	(H)	(H)	(H)	(H)	(H)	(H)	---+++
$FUTURE_2$	H	Ø	H	Ø	Ø	Ø	---+++
PROGRESSIVE	H	Ø	Ø	Ø	Ø	Ø	+++++
PERFECT	Ø	Ø	Ø	Ø	Ø	Ø	+++++
INCEPTIVE	Ø	Ø	Ø	Ø	Ø	Ø	+++++
PERSISTIVE	Ø	Ø	Ø	Ø	Ø	Ø	+++++
SUBJUNCTIVE	(H)			(H)			+ +
IMPERATIVE	H			(= subjunctive)			+ +

(MCA = main clause affirmative; SRA = subject relative affirmative; ORA = object relative affirmative; MCN = main clause negative; SRN = subject relative negative; ORN = object relative negative.)

As seen, Haya distinguishes three degrees of past tense, and two degrees of future tense. The inceptive is translated as 'to have done X before', while the persistive translates as 'to still do X'. (I address the last Focus column below.) As in the Leggbó and Dagbani cases, I have begun by shading in the rows that have the same tone assignment throughout. As seen, the Future-1 assigns a H suffix tone throughout, despite the fact that the segmental morphology may differ between main vs. relative and affirmative vs. negative clauses. In the following examples it is observed that Future-1 takes the marker /-la-V-/ in the affirmative, but only the empty mora /-V-/ in the negative (-V- is realized by lengthening of the preceding vowel, i.e. [a] in these examples):

(22) a. AFF (ba-la-a-) kom-a vs. (ba-la-a-) /jun-a/ 'they will tie up/help' (FUT-1)
H H

b. NEG (ti-ba-a-) kom-e vs. (ti-ba-a-) /jun-e/ 'they will not tie up/help (FUT-1)
H H

Note that the FVs are also different in the affirmative vs. negative, and yet the polar suffixal H remains constant. In addition, a number of TAMs fail to have a suffix H, which I have also shaded. One other important generalization is that although the segmental morphology can

vary, any given tense has the same negative tones, whether in the MCN, SRN, or ORN. I shall therefore conflate the last three columns as NEG in what follows.

In (23) I reorganize the material in the earlier table by their affirmative tone patterns to reveal that there are in fact three TAM "tone classes", with affirmative TAM residues marked by an asterisk (I will deal with each of these separately below):

(23)

		MCA	*SRA*	*ORA*	*NEG*	*Focus*	*comments:*
1a	$Past_2$	H	Ø	H	H	---+	none of these change their TAM segmental marking in NEG (or affirm)
1b	Present Habitual	H	Ø	H	(H)	---+	
1c	$Future_2$	H	Ø	H	Ø	---+	
1d	$Past_1$	Ø*	Ø	H	Ø	±--+	MCA has different segmental marking
2a	$Future_1$	(H)	(H)	(H)	(H)	---+	(H) throughout, *-la-* prefix only in AFF
2b	Past Habitual	(H)	(H)	(H)	Ø	---+	all have same segmental TAM marking
2c	$Past_3$	Ø*	(H)	(H)	Ø	+--+	MCA has different segmental marking
3a	Perf, Incep, Persist	Ø	Ø	Ø	Ø	++++	all Ø; PRF, INCEP change marking
3b	Progressive	H*	Ø	Ø	Ø	++++	MCA has different segmental marking
	# H =	4	Ø	4	1	= 9	
	# (H) =	2	3	3	2	= 10	The most common = Ø, hence Hyman &
	# Ø =	5	8	4	8	= 25	Byarushengo propose rules assigning Hs

Since there are three possible suffix tone assignments (H, (H), Ø) and three affirmative clause types (MCA, SRC, ORA), there are in principle 3 x3 = nine possible tone assignments. Instead, there are three general affirmative patterns, with the asterisked exceptions to be explained below. (There are nine patterns when we include negatives, not 27.) Class 1 consists of TAMs which have H-Ø-H tonal suffix assignments in the three affirmative columns. Class 2 consists of TAMs which have polar (H) tonal suffix assignments throughout. Class 3 consists of those TAMs which do not receive either type of suffixal H. In other words, we come close to being able to equate class 1 with -H, class 2 with -(H), and class 3 with -Ø. (The class 1 SRA forms present an obvious obstacle.) For reference, I have included comments on the segmental morphology in the last column. Full paradigms of examples are available in Hyman & Byarushengo (1984: 93–101).

I have yet to discuss the focus column, where [+F] refers to TAMs which resist H tone deletion when non-final in their clause, while those which reduce their H tones are marked [-F]. For example in (24a) the present habitual affirmative final H suffix is deleted when a constituent follows in the same clause:

(24) a. PRS HAB Affirmative is [-F] : /ba-jun-á/ → ba-jun-a káto 'they help Kato'
b. All negatives are [+F] : /ti-ba-jun-á/ → ti-ba-jun-á káto 'they don't help Kato'

In the corresponding negative in (24b), however, which is built by prefixing *ti-* to the affirmative, the same final suffix H does not delete. As indicated, all negatives are [+F], whereas affirmative TAMs can be [+F] or [-F], as discussed by Hyman & Watters (1984: 259–262), who argue that the [+F] TAMs are "intrinsically focused". The reason for going into this is that there is further generalization: all tensed affirmative [+F] are Ø except the MCA progressive, which receives a H suffix. Progressive forms are illlustrated in (25).

(25) a. MCA marked by *ni-* : /ni-ba-jun-á/ → ni-ba-jun-á káto 'they are helping Kato'
b. MCN PROG with *-li* : /ti-bá-lí-ku-jun-a/ → ti-bá-li-ku-jun-a káto 'they aren't helping Kato'
NEG-they-COP-INF-help-FV
c. SRA PROG with *-li* : /á-ba-lí-ku-jun-a/ → a-bá-li-ku-jun-a káto 'theywhoare helpingKato'

The reason why the MCA progressive is exceptionally in class 1 is that it is built by adding the focus marker *ni-* to the present habitual (cf. *ni káto* 'it's Kato'). While the progressive is intrinsically [+F] and therefore should have a -Ø final, its H suffixal tone is a carry-over from the present habitual. The two other asterisked exceptions can also be accounted for historically (see below).

What the above analysis suggests is that the tone patterns can be assigned by classes of TAMs, at least as far as the affirmative forms are concerned. The following questions thus naturally arise:

- First, do the affirmative groupings represent natural classes of TAM features? It does not appear so. Class 1 includes the present habitual, the two more recent past tenses ($Past_1$, $Past_2$), and the general future tense ($Future_2$). Class 2 is also incoherent: while past habitual and $Past_3$ go together as distant pasts (they partially share segmental morphology as well), the near future ($Future_1$) doesn't. Finally, however, class 3 has been claimed to be coherent: all are [+F]. (I am limiting my attention to the indicative TAMs, since the imperative and subjunctive, both [+F], take H and (H), respectively.)
- The second question concerns whether one can predict one column from another. The quick answer is: not across the board. In class 1 the MCA and ORA are identical, both receiving suffixal H (vs. SRA Ø). Class 2 affirmatives all take suffixal H, with the MCA $Past_3$ being exception (see below). We have already seen that all class 3 TAMs are Ø except for the MCA progressive explained above.
- A third question is what the significance is of the near future (F1) always receiving a polar (H) suffixal tone? (There is undoubtedly an historical explanation involving the source of the empty -V- mora alluded to above.)

What remains to be explained is why the MCA $Past_1$ and $Past_3$ are exceptional. The $Past_1$ should be H, but is exceptionally Ø. The reason for this is seen in (26).

(26)	a.	y-áa-kóm-a	'he tied up'	[+F]	(= "disjoint" form)
	b.	y-a-kom-a káto	'he tied up Kato'	[-F]	(= "conjoint" form)

As seen, when the verb is phrase-final, the tense marker is *-áa-*. When it is followed by any word within the same clause, as in (26b), not only do the H tones of the tense marker and verb root reduce, but the tense marker is now *-a-*, i.e. short. This is the only tense that does this. The prefixal differences in (26a,b) are in fact a relic of an older system which Meeussen (1959) termed "disjoint" vs. "conjoint" verb forms: *-áa-* was the focused (or disjoint) marker of this tense and *-a-* the unfocused (or conjoint) marker, as they are in the recent past in Kirundi. My hypothesis therefore is that phrase-final $Past_1$ ends Ø rather than H because the form with *-áa-* is in fact [+F]. We of course can't tell this for certain, because the [±F] distinction has an effect only when something follows the verb. The second part of the hypothesis is that the non-final form with *-a-* is not only [-F], as we know from (26b), but also takes a suffixal H in line with other class 1 TAMs, which however automatically deletes. In this way $Past_1$ falls into place.

There is also an historical explanation for why $Past_3$ is [+F] only in the MCA. First, as seen in (27), it is only in the MCA that it is marked with the prefix *-ka-* and the FV *-a*, as in (27a).

(27)	a.	/bá-ka-jun-a/	'they helped'	→	bá-ka-jun-a káto	'they helped Kato' [+F]
	b.	/a-ba-a-jun-íl-e/	'they who helped'	→	a-ba-a-jun-il-e káto	'they who helped Kato' [-F]

In the SRA in (27b) the markers are *-a-* and the final *-il-e*, which also occur in $Past_3$ negative forms. What's significant is that the prefixal and suffixal segmental allomorphy corresponds with [±F]. This is because the *-ka-* prefix has a rather complex history (see Botne 1999 and Nurse 2008 for discussion). In Haya, *-ka-* has an interesting complementary distribution in three different contexts: In MCA, it marks distant past ($Past_3$), as in (27a). In negative clauses it marks the perfect and incipient, contrasting with the affirmative as in (28a,b).

(28)	a.	MCA perfect	:	b-áa-jun-il-e	'they have helped'	[+F]
	b.	MCN perfect	:	ti-bá-ka-jun-il-e	'they haven't helped'	[+F]

Its third function is to mark past consecutive clauses following either a negative or relative clause ('he didn't come *and see* me', 'the man who came *and saw* me'). To account for the exceptional Ø and [+F] of the MCA $Past_3$ form all we need to say is that these were features of its originally function (I would guess perfect, since the perfect tends to be inherently focused in the sense of Hyman & Watters 1984).

As seen, although Haya tonal assignments appear to be somewhat chaotic on first approach, there are some major regularities, which are obscured in a few cases by recent changes in the TAM system. What then can we conclude from this admittedly limited look at three languages? If Leggbó, Dagbani, and Haya are representative—and I can add that other Bantu languages are often like Haya—then I would suggest two generalizations: (i) there is a tendency for negatives to be tonally identical across clause types (MCN, SRN, ORN); (ii) there is a tendency for a future or irrealis to be tonally identical across clause types and negation. However, I would not be surprised to find completely contradictory systems, as TAM systems are relatively unstable and may change in one, but not other clause types, as we saw in the case of Haya $past_3$.

4. Tonal morphology can do more than non-tonal morphology can do

In §1 I suggested that tonal morphology often obscures the compartmentalization of phonology, morphology and syntax. In this final section I would like to demonstrate this, and at the same time show that grammatical tone can do things that non-tone cannot.

The first example comes from Kikuria [Bantu; Tanzania, Kenya], which assigns a H tone to one of the first four moras of the verb stem, depending on the tense (Marlo & Mwita 2009: 2). As seen in (29), once this H is assigned to the underlined mora, the H spreads to the penult:

(29)	a.	μ_1	n-to-o-	[h<u>ó</u>ótóótér-a	'we have reassured'	PAST
	b.	μ_2	n-to-o-	[ho<u>ó</u>tóótér-a	'we have been reassuring'	PAST PROGRESSIVE
	c.	μ_3	n-to-re-	[hoot<u>ó</u>ótér-a	'we will reassure'	FUTURE
	d.	μ_4	to-ra-	[hootoó<u>t</u>ér-a	'we are about to reassure'	INCEPTIVE

The interesting question which arises is: What happens if the verb stem is too short, i.e. doesn't have enough moras for the intended H tone assignment, e.g. to the fourth mora? Marlo and Mwita demonstrate the results as in (30).

(30)	a.	μ_4	to-ra-	[karaaŋg-<u>á</u>	'we are about to fry'	*H tone assignment:*
	b.	μ_4	to-ra-	[sukur-ă	'we are about to rub'	[sukur-a ́
	c.	μ_4	to-ra-	[βun-a^{o}	'we are about to break'	[βun-a μ ́
	d.	μ_4	to-ra-	[ry-a^{o}	'we are about to eat'	[ry-a μ μ ́

In (30a) the verb stem has four moras and the H therefore is assigned to the FV. In (30b), where the stem is one mora short, a rising tone is obtained. When the stem is either two or

three moras short as in (30c,d), there is a level Lº tone, as if the H tone is floating after the verb, keeping the L tone from downgliding, as a prepausal L would normally do. What is extremely interesting is that when the verb is non-final, the mora count continues onto the next word. Marlo & Mwita show this with the toneless noun object ***eɣetɔɔkɛ*** 'banana':

(31)	a.	μ_4	to-ra-	[karaaŋg-á	éɣétɔ́ɔ́kɛ	'we are about to fry a banana'
	b.	μ_4	to-ra-	[sukur-a	éɣétɔ́ɔ́kɛ	'we are about to rub a banana'
	c.	μ_4	to-ra-	[βun-a	eɣétɔ́ɔ́kɛ	'we are about to break a banana'
	d.	μ_4	to-ra-	[ry-a	eɣetɔ́ɔ́kɛ	'we are about to eat a banana'

Again, the H is assigned to the FV in (31), since the verb stem has four moras. The H continues to spread to the penult of the noun object. In (31b) it is assigned to the first mora of the noun and then again spreads to the penult. In (31c) the H is assigned to the second mora of the noun, and then spreads. Finally, in (31d), the H is assigned to the third mora of the noun and spreads just one mora to the penult. Such an array of tone assignments is already quite remarkable (particularly to the fourth mora). However, what is really unusual is that this suffixal H is expected to be stem- or perhaps word-level morphology (although the prefixes are irrelevant), as in other Bantu languages, but is calculated at the phrase level! There seems to be a violation of a basic principle, a violation of what we might think of as canonical morphology (Corbett 2007): Morphs should stay on their own word! Instead, we have something that seems like co-phonologies operating at the phrase level. (For co-phonologies, see Inkelas 2011 and references cited therein.)

A second such violation occurs in the rather restricted tone system of Chimwiini [Bantu; Somalia], which has the following properties (Kisseberth 2009): (i) Tone is only grammatical. There are no tonal contrasts on lexical morphemes, e.g. noun stems or verb roots. (ii) Privative H tone is limited to the last two syllables: final H vs. penultimate H. As an example consider the paradigm in (32).

(32)

		singular		*plural*		
1st pers. } final H:		n- ji:lé	'I ate'	chi-	chi-ji:lé	'we ate'
2nd pers. } final H:		ji:lé	'you (sg) ate'	ni-	ni-ji:lé	'you pl. ate'
3rd pers.	penult H:	jí:le	's/he ate'	wa-	wa-jí:le	'they ate'

As seen, first and second person subjects condition final H tone in the past tense, while third person subjects condition penultimate H tone. As also seen in the above table, the only difference between second and third person singular is tonal. It is clear that tone has a morphological function in the above examples.

But the plot thickens when an object is added, as in (33).

(33)	a.	jile: n̪amá	'you (sg) ate meat'	jile ma-tu:ndá	'you (sg) ate fruit'
	b.	jile: n̪áma	's/he ate meat'	jile ma-tú:nda	's/he ate fruit'

We now see that the final vs. penultimate distinction is realized on the noun object. The tonal morphology is thus phrasal. Kisseberth (2009) also shows that phrasal domains can be nested, depending on information structure, with each right edge receiving the appropriate final or penultimate H:

(34) a. Ø-wa-ʦinḍiḷiḷe w-a:ná] ṉamá] ka: chi-sú] ‘you (sg)cut for the children meat with a knife'
b. Ø-wa-ʦinḍiḷiḷew-á:na] ṉáma] ka: chí-su] ‘s/he cut for the children meat with a knife'

What we have here is a case of tone being able to have long distance effects: If the H had been a lexical property, say, of the verb root, as it can be in Digo (Kisseberth 1984) or Giryama (Volk 2011), we would treat this as pure phonology. Given however that the tonal distinctions are exclusively grammatical, conditioned by specific grammatical morphemes or constructions, we have to address the question of what exactly this is. If tone is a phrasal clitic, it’s quite unlike English possessive *’s*, which serves an appropriate grammatical function at the end of a noun phrase. Should the above tonal distinctions be identified with:

(35) a. morphology? = a property of [1st/2nd pers.] vs. [3rd pers.] subject prefixes
b. phonology? = a property of the phonological phrase—H is semi-demarcative)
c. syntax? = a property of the syntactic configurations which define the P-phrases
c. intonation? = not likely—who ever heard of a 1st/2nd vs. 3rd person intonation?

An anonymous reviewer suggests that the 1st/2nd vs. 3rd person subject tone difference is not “different” from what can be expressed segmentally: “In my opinion, the Chimwiini example on which the demonstration is based calls for a syntactic analysis, and can be satisfactorily analyzed as illustrating an uncommon type of agreement, with the additional complication that the agreement markers are not segments, but morphotonemes.” The problem is that Kisseberth & Abashekh (2011) report several other grammatical morphemes and constructions that also assign a final H tone. As Kisseberth & Abasheikh crucially point out, “The default accent is penult. Final accent occurs only in certain morphological or syntactic structures” (p.1990). One of these is the common conjunction *na* ‘and’ which Kisseberth shows to assign final H tones phrasally, just like first and second person subjects. Thus, in (36) the conjunction *na* assigns a final H on the noun *muun-thu* ‘man’ (Kisseberth & Abasheikh 2011: 1995):

(36) mw-éendo na sifa z-a muu-nthú
behavior and characteristics of man
‘the behavior and characteristics of a man’

It is hardly likely that *na* ‘and’ would condition “an uncommon agreement” on the last word of its phonological phrase.

As seen, both the Kikuria and Chimwiini cases do a good job of obscuring the boundaries between morphemes, words and phrases, and ultimately phonology, morphology, and syntax. Both are effective examples of how tone can function as the glue holding a grammar together. This brings us to the last question: What else can do this other than tone? What can be sponsored by a morpheme in one word but travel at considerable distance to be realized on another? There are more such cases, in fact (see Harry & Hyman 2012 for a preliminary survey). Speakers of languages seem to be better equipped to package and exploit melodies and other syntagmatic properties of pitch at both the word and phrase level than any other phonological property. It seems superfluous at this time, but I can’t help repeating: Tone is different! (Hyman 2011)

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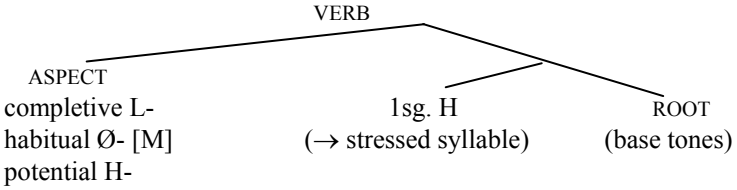
Appendix

Since the Paris 2013 workshop "Tons et paradigmes flexionnels : modélisation et parcimonie / Disentangling the inflectional role of tone" was organized by Jean-Léo Léonard and Enrique Palancar, specialists of Mexican tone systems, I decided to include a few words on an interesting tonal paradigm from Macuiltianguis Zapotec for which Broadwell (2000) presents evidence for the following (partial) structure:



In the following table, two possible input systems are considered: Broadwell's /H, M, L, Ø/ vs. /H, M, Ø/. The stressed syllable is underlined.

Base Tone (Broadwell)	Base Tone (without /M/)	*(underline = stress)*		Completive L-	Habitual Ø-	Potential H-	assignment of grammatical Hs:		
Ø-M	Ø-Ø	1st pers	H	H-M	H-M	H-M	H_1:1sg	H_1:1sg	H_1:1sg
		3rd pers	Ø	L-M	M-M	H-M			H_1:Pot
Ø-M	Ø-Ø	1st pers	H	L-H	M-H	H-M	H_2:1sg	H_2:1sg	H_1:1sg
		3rd pers	Ø	L-M	M-M	H-M			H_1:Pot
Ø-H	Ø-H	1st pers	H	H-H	H-H	H-H	H_1:1sg	H_1:1sg	H_1:1sg
		3rd pers	Ø	L-H	M-H	H-H			H_1:Pot
Ø-H	Ø-H	1st pers	H	L-H	M-H	H-H			H_1:Pot
		3rd pers	Ø	L-H	M-H	H-L			H_1:Pot
Ø-L	Ø-L	1st pers	H	H-L	H-L	H-L	H_1:1sg	H_1:1sg	H_1:1sg
		3rd pers	Ø	L-L	M-L	H-L			H_1:Pot
L-M	L-Ø	1st pers	H	HL-L	HL-L	HL-L	H_1:1sg	H_1:1sg	H_1:1sg
		3rd pers	Ø	L-M	L-M	HL-L			H_1:Pot
L-H	L-H	1st pers	H	HL-L	HL-L	HL-L	H_1:1sg	H_1:1sg	H_1:1sg
		3rd pers	Ø	L-H	L-H	HL-L			H_1:Pot
L-H	L-H	1st pers	H	L-H	L-H	HL-H			H_1:Pot
		3rd pers	Ø	L-H	L-H	HL-H			H_1:Pot
LH	LH	1st pers	H	HL	HL	LH	H_1:1sg	H_1:1sg	
		3rd pers	Ø	LH	LH	LH			
L	L	1st pers	H	HL	HL	HL	H_1:1sg	H_1:1sg	H_1:1sg
		3rd pers	Ø	L	L	L			
H-M	H-Ø	1st pers	H	H-M	H-M	H-M			H_1:1sg
		3rd pers	Ø	H-M	H-M	H-M			H_1:Pot
HL + ^{H}	HL + ^{H}	1st pers	H	HL-^{H}	HL-^{H}	LH-^{H}			
		3rd pers	Ø	HL-^{H}	HL-^{H}	LH-^{H}			

The rules that appear to be needed are as follows:

1. 1sg. H is assigned to the stressed syllable. If the latter is lexically H, the rule is blocked.
2. Aspectual H- or L- is assigned to first syllable, overriding /Ø/. Potential H- forms HL contour with lexical L
3. Phonology: HL-Ø → HL-L (H-L if first vowel is short); ex. of HL-H has V: in both syllables (dùàdíí')
4. Shaded = not predicted by my rules:
   (i) /Ø-H/ 3sg. potential should be H-H (H→ L after H?)
   (ii) /LH/ 1sg. potential should be HL if 1sg. is spelled out first
   (iii) 3rd pers. /L/ potential should be HL. Avoidance of *HLH is general.

Tonogenesis and tonal alternations in Khaling

Guillaume Jacques

1 Introduction

Khaling,[1] like other Kiranti languages, has a very complex templatic verbal morphology (see for instance Bickel et al. 2007 and Jacques 2012). It is unique in the Kiranti subgroup however in having relatively recently innovated a tonal system.[2]

Figure 1: Map of Kiranti languages (from Opgenort 2011)

Tone in Khaling is not only phonemic in that it is used to distinguish between lexical minimal pairs, it also plays a critical role the structure of the verbal inflectional system of the language. Complex patterns of stem

[1] Khaling is spoken by around 15000 speakers in Solukhumbu district, Nepal, see Figure 1.

[2] Tonogenesis and most vowel changes postdate the start of Nepali influence in the eighteenth century, as will be shown in section 4.1.1.

alternations involving vowel, consonant and tonal changes are observed in this language. These alternations are not correlated in isomorphic fashion with any morphosyntactic feature. The distribution of stems[3] (and of tonal alternations) in the Khaling verbal system is influenced by transitivity, person and number of one or two arguments, tense (past vs non-past) in an intricate way. The complete list of conjugation classes, as well as a computational model to automatically generate them is provided in Jacques et al. (2012). The conjugation classes with the greatest number of stems has up to ten of them, while those with the fewest number of stems only have two (but such classes are very limited).

Table 1 illustrates some typical examples of stem alternations. All the forms in the table comprise a stem followed by one unstressed short vowel suffix (which has no tonal contrast). These data show that while in some verb conjugation classes the tone is constant in all stems (for instance, in the case of the verb 'jump' we have level tone, indicated by a macron, in all forms), in most conjugation classes we observe alternations between falling tone (marked with a retroflex accent) and level tone (with a macron, see the conjugation of 'touch') or between falling tone and short vowel syllables where the tonal contrast is neutralized ('go' and 'hit').

Table 1 also illustrates the fact that tonal alternations in Khaling are not completely independent from vowel and final consonant alternations: in the case of the verb 'touch' for instance, we see that the level tone is correlated with the stem final consonants *–j* and *–ʦ*, while the falling tone appears in stems with final *–n*.

Table 1: Examples of tonal alternations in the Khaling verbal system

Infinitive	Non-past 1DI	Non-Past 3PL	Past 3SG	Meaning
bʰoɔ̄j-nɛ	*bʰō:ʦ-i*	*bʰoɔ̂n-nu*	*bʰoɔ̂n-tɛ*	touch (tr)
ʦoɔ̄j-nɛ	*ʦō:ʦ-i*	*ʦoɔ̄j-nu*	*ʦō:s-tɛ*	jump (intr)
kʰoɔ̂n-nɛ	*kʰɵʦ-i*	*kʰoɔ̂n-nu*	*kʰɵs-tɛ*	go (intr)
roɔ̂n-nɛ	*rɵʦ-i*	*rô:t-nu*	*rô:-tɛ*	hit (intr)

In addition, we observe that stem distribution and tonal alternation cannot be accounted for by a single factor. Walther et al. (2014) has shown that stem alternations is Khaling are better accounted for by a morphomic account, rather than in terms of transparent morphosyntactic features.

The apparent chaos of verb stem alternations in general, and the opacity of tonal alternations in particular, can however be partially accounted for by a historical account based on a combined application of the comparative

[3]In the present paper, we use the term 'root' to designate abstract forms from which the entire paradigms can be mechanically generated, and the term 'stem' to refer to the part of the inflected verbs remaining once prefixes and suffixes have been removed, in other words, roots to which morphophonemic changes have been applied.

method and of internal reconstruction. Most of the tonal alternations in Khaling can be straightforwardly explained as the mechanical result of two major sources of tonal contrasts: the transphonologization of stem final consonant contrasts into tonal contrasts, and the creation of falling tones following the loss of some final syllables.

Given the fact that tonal alternations are not completely independent from segmental changes in Khaling, it is necessary to opt for an approach that does not treat tones in isolation from vowel and consonants, and therefore part of the paper will provide the minimal quantity of information on segmental alternations and their origins that are necessary to make sense of the tonal alternations.

First, we describe Khaling synchronic phonology, including segmental inventories, phonotactic rules and tonal contrasts.

Second, we present a simplified picture of stem alternations in Khaling,[4] and propose to reconstruct a stress pattern in pre-Khaling to account for vowel lengthening in some stem types. Although this section does not directly discuss tonal alternations in Khaling, it is a pre-requisite for the complete tonogenesis model elaborated in the following section.

Third, we provide a detailed account of tonogenesis in Khaling. Although a partial discussion of the origin of tones can be found in Michailovsky (1975), the present paper, based on more reliable and complete data, shows that tones in Khaling have more than one origin and describes for the first time the development of falling tones from simplification of disyllables. Some sound laws are demonstrated on the basis of data from nouns rather than verbs, to avoid circularity in the internal reconstruction of the verbal system.

Fourth, we show how the model of tonogenesis proposed in the previous section can account for most tonal alternations in the Khaling verbal system. Pre-Khaling as reconstructed in this model was more similar to other Kiranti languages in having a less elaborate system of stem alternation, and suprasegmentals were restricted to stress shifts.

Fifth, we point out the presence of a residue of forms which cannot be explained as the result of regular sound changes using the laws elaborated in the tonogenesis section. Several potential lines of explanation involving analogical leveling are explored.

2 Synchronic phonology

As shown in Jacques et al. (2012: 1098), Khaling has eighteen vowel phonemes (Table 2) and 27 consonant phonemes (Table 3). The only word-initial clusters allowed are labial or velar stop + *l* and *r*.

[4] For reasons of space, since the present paper is focused on tone, this section is limited to the strict minimum necessary to follow the tonogenesis model. An exhaustive account of alternations can be found in Jacques et al. (2012).

The consonant *ç* only appears as the first element of a word-internal cluster (as in *seçki* 'we kill it'), never word-initially or word-finally. Only unvoiced obstruents and sonorants *–p*, *–t* *–k*, *–m*, *–n*, *–ŋ*, *–r*, *–l*, *–s* and *–j* can occur as codas. Clusters involving two unvoiced stops or affricates (such as *pt*, *kt* etc), as well as geminates (*tt*, *pp*, *kk* and *tsts*), are realized with preaspiration when the preceding vowel is short. The diphthong *oɔ* is treated as a unique phoneme.

Table 2: List of Khaling vowel phonemes

i iː	*ɯ ɯː*			*u uː*
e eː	*ɵ ɵː*			*o oː*
ɛ ɛː			*ʌ*	*oɔ*
		a aː		

Table 3: List of Khaling consonantal phonemes

p	*t*	*ʦ*	*k*	*ʔ*
pʰ	*tʰ*	*ʦʰ*	*kʰ*	
b	*d*	*ʣ*	*g*	
bʰ	*dʰ*	*ʣʰ*	*gʰ*	
m	*n*		*ŋ*	
	s	*ç*		*ɦ*
w	*l*	*r* *j*		

Khaling has a two-way tonal contrast on open syllables with long vowels or closed syllables with a sonorant coda. There is a high level tone (indicated by a macron)[5] and a falling tone (circumflex accent). A marginal contrast between surface low level and high level tone is also attested in a very restricted morphosyntactic environment (see below), but it is irrelevant for the description of verbal flexion and its phonological interpretation is deferred to future research.

The tonal contrast is neutralized on short and / or unstressed vowels. Note that in sonorant-final syllables, vowels are always long, and vowel length is not indicated as it is redundant. Table 4 illustrates possible tonal contrasts on monosyllables.

In polysyllables, only stressed syllables receive tone, and verbs and nouns alike only have one stressed syllable, except in the case of compound verbs, which are not discussed in this paper.

In addition, a contrast between high level tone and a phonetically low tone is attested in the purposive construction with the locative suffix *–bi*

[5]We opt for the macron rather than the acute accent for transcribing the level tone, as the acute accent is used in this paper for indicating stress in (non-tonal) pre-Khaling reconstruction, and we want to avoid confusion.

Table 4: Minimal pairs between level tone and falling tone in monosyllables

Form	Meaning
mɛ̄m	he
mɛ̂m	mother
mɛ̄ː	there
mɛ̂ː	(ideophone) rolling quickly
mɛ	that

followed by a motion verb. Verbs whose root ends in a sonorant consonant *m*, *n*, *ŋ*, *l* or *r* use the infinitive stem with level tone before the suffix *–bi* as in example 1. Root-final *–n* changes to *–j* in this context.

(1) *bʌ̂j ʔu-gʰas kɛ̄m-bi kʰɵs-tɛ*
cow 3SG.POSS-grass chew-LOC go-PST:3SG
'The cow went to chew the grass.'

Verbs with roots ending in obstruents use the nasalized infinitive stem (with final *–n* or *–ŋ* respectively) with falling tone in this construction.

Noun and verb forms with falling tone remain unchanged as in 2: the free noun 'elk' *kɛ̂m* has the same form as when occurring with the locative suffix.

(2) *kɛ̂m-bi kʰɵs-tɛ*
elk-LOC go-PST:3SG
'He went (to hunt) for the elk.'

Monosyllabic nouns with level tone, however, develop a low tone in the purposive construction when suffixed by *-bi*, as *kɛ̄m* 'work'[6] in example 3.

(3) *kɛ̀m-bi kʰɵs-tɛ*
work-LOC go-PST:3SG
'He went for his work.'

This highly restricted, syntactically determined low alternant of the level tone will not be considered further in the present paper, as its synchronic analysis in still unclear (in particular, it remains to be determined whether a similar contrast is found in other grammatical constructions), and it is not necessary to the analysis of the verbal morphology.

In the following, we show the origin of the tonal and length contrasts in Khaling. We point two origins for the falling tone: loss of obstruent codas and syllable reduction.

[6]Borrowed from Nepali *kam*.

3 Vowels and stress in pre-Khaling

In this section, we provide a justification for the reconstructions used in the following sections, in particular for the stress patterns reconstructed for pre-Khaling, which have a direct effect on tonogenesis. Thus, this section mainly discusses vowel alternations from pre-Khaling (an earlier stage of Khaling closer to the common ancestor of Khaling and Dumi) to attested Khaling.

Previous scholarship on comparative proto-Kiranti (van Driem 1990, Michailovsky 1994, Starostin 1994-2000, Opgenort 2005) has focused on the reconstruction of proto-Kiranti initial consonants, but no work has been published on the vowel correspondences between Khaling and other Kiranti languages. In Khaling, as we will see, the evolution of vowels, codas and the development of tonal contrasts are closely related, so that an account of the basic vocalic sound laws is necessary for any further work on the topic.

Internal reconstruction suggests that the complex vowel system of Khaling was innovated from a simpler system, as can be ascertained from the vowel alternations in the verbal system and the complementary distributions between vowels and codas (Michailovsky 1975, Jacques et al. 2012).

As shown in Michailovsky (1975), Jacques et al. (2012) and Michailovsky (2012) using internal reconstruction, in both Khaling and Dumi, no more than five vowels have to be postulated in verbal roots. Complex morphophonological alternations yield all 18 vowels in different contexts. Table 5 illustrates the most important alternations: closed syllable verb stems can be classified into two major categories, weak and strong. Weak stems are found mainly in forms with vowel initial suffixes (the exceptions are shaded in Tables 7, 8 and 9 and discussed in section 5), and strong stems are found with consonant-initial suffixes except in the case of verb stems with final clusters, which always have *t* as second element (see the conjugation of CVCt roots in Table 9 and the discussion in section 3.4).

Table 5: Basic vowel alternations in the Khaling verb

root vowel	open syllable	velar (strong)	velar (weak)	non-velar (strong)	non-velar (weak)
a	*ɛ*	*a*	*ʌ*	*ɛ*	*ɛ*
e	*e*	*e*	*e*	*e*	*e*
i	*e*	*ʌ*	*i*	*ʌ*	*i*
o	*ɵ*	*o*	*ɵ*	*oɔ*	*ɵ*
u	*ʉ*	*u*	*ʉ*	*ʌ*	*ʉ*

Some stem forms (3SG:N.PST→3SG and 3SG:N.PST→3SG) have a lengthened vowel (see Table 6), which we interpret as reflecting radical stress (vs suffixal stress) in pre-Khaling. Reconstructing stress for pre-Khaling has

other important consequences, in particular for the Syllable Reduction Rule (section 4.2).

Table 6: Examples of basic vowel alternations in the Khaling verb

Root	Meaning	weak stem (1DI:N.PST→3SG)	weak stem (lengthened) (3SG:N.PST→3SG)	strong stem 1PI:N.PST→3SG
|*pʰrok*|	untie	*pʰrək-i*	*pʰrō:g-ʉ*	*pʰrok-ki*
|*lom*|	search	*ləm-i*	*lō:m-ʉ*	*loɔ̄m-ki*
|*lop*|	catch	*ləp-i*	*lō:b-ʉ*	*loɔ̄p-ki*

Tables 7, 8 and 9 illustrate the distribution of the stems in the Khaling verbal paradigms. Irregular cases, where a weak stem is found with a consonant-initial suffix, are shaded in grey. In addition to weak and strong stems, we also find lengthened weak stems in the transitive CVC paradigm.

Table 7: Distribution of stems in the intransitive paradigm

S	non-past		past		imperative	
1S	strong-*ŋʌ*	*ŋôŋ-ŋʌ*	weak-*ʌtʌ*	*ŋək-ʌtʌ*		
1DI	weak-*i*	*ŋək-i*	weak-*iti*	*ŋək-iti*		
1DE	weak-*u*	*ŋək-u*	weak-*utu*	*ŋək-utu*		
1PI	strong-*ki*	*ŋok-ki*	strong-*tiki*	*ŋok-tiki*		
1PE	strong-*kʌ*	*ŋok-kʌ*	strong-*tʌkʌ*	*ŋok-tʌkʌ*		
2S	*ʔi*-strong	*ʔi-ŋô:*	*ʔi*-weak-*tɛ*	*ʔi-ŋək-tɛ*	weak-*je*	*ŋək-je*
2D	*ʔi*-weak-*i*	*ʔi-ŋək-i*	*ʔi*-weak-*iti*	*ʔi-ŋək-iti*	weak-*ije*	*ŋək-ije*
2P	*ʔi*-strong-*ni*	*ʔi-ŋô:-ni*	*ʔi*-weak-*tɛnu*	*ʔi-ŋək-tɛnu*	weak-*nuje*	*ŋək-nuje*
3S	strong	*ŋô:*	weak-*tɛ*	*ŋək-tɛ*		
3D	weak-*i*	*ŋək-i*	weak-*iti*	*ŋək-iti*		
3P	strong-*nu*	*ŋô:-nu*	weak-*tɛnu*	*ŋək-tɛnu*		

The vowel alternations in Tables 5 and 6 suggest the existence of three (historical) vowel shifts in Khaling: fronting, lowering and backing. We provide an account of the Khaling vowel shifts on the basis of CVC intransitive and transitive paradigms in addition to some comparative data. Then, we discuss the case of verbs with roots in final clusters (which can only be CVCt) where additional minor sound laws have to be proposed. Finally, we tackle some additional issues concerning the Khaling vowel system in historical perspective.

3.1 Fronting

The non-front vowels **a*, **o* and **u* in pre-Khaling are fronted to *ɛ*, *ɵ* and *ʉ* respectively in open syllables. This shift occurred in open syllable roots, but also in weak stems, where (in pre-Khaling) suffixes are vowel-initial and the coda is resyllabified as the onset of the next syllable.

Table 8: Distribution of stems in the CVC transitive paradigm

A→P	non-past		past		imperative	
1S→3	weak-*u*	*ʔob-u*	weak-*utʌ*	*ʔob-utʌ*		
1DI→3	weak-*i*	*ʔəp-i*	weak-*iti*	*ʔəp-iti*		
1DE→3	weak-*u*	*ʔəp-u*	weak-*utu*	*ʔəp-utu*		
1PI→3	strong-*ki*	*ʔoɔp-ki*	strong-*tiki*	*ʔoɔp-tiki*		
1PE→3	strong-*kʌ*	*ʔoɔp-kʌ*	strong-*tʌkʌ*	*ʔoɔp-tʌkʌ*		
2S→3	*ʔi*-weak.length-*ʉ*	*ʔi-ʔə̄:b-ʉ*	*ʔi*-weak.length-*tɛ*	*ʔi-ʔə̂:p-tɛ*	weak.length-*e*	*ʔə̄:b-e*
2D→3	*ʔi*-weak-*i*	*ʔi-ʔəp-i*	*ʔi*-weak-*iti*	*ʔi-ʔəp-iti*	weak-*ije*	*ʔəp-ije*
2P→3	*ʔi*-strong-*ni*	*ʔi-ʔoɔ̂m-ni*	*ʔi*-weak-*tɛnu*	*ʔi-ʔəp-tɛnu*	weak-*nuje*	*ʔəp-nuje*
3S→3	weak.length-*ʉ*	*ʔə̄:b-ʉ*	weak.length-*tɛ*	*ʔə̂:p-tɛ*		
3D→3	weak.length-*su*	*ʔə̂:p-su*	weak.length-*tɛsu*	*ʔə̂:p-tɛsu*		
3P→3	weak.length-*nu*	*ʔə̂:p-nu*	weak.length-*tɛnu*	*ʔə̂:p-tɛnu*		
1S→2	strong-*nɛ*	*ʔoɔ̂m-nɛ*	strong-*tɛni*	*ʔoɔ̂m-tɛni*		
2/3S→1S	*i*-strong-*ŋʌ*	*ʔi-ʔoɔ̂m-ŋʌ*	*i*-weak-*ʌtʌ*	*ʔi-ʔəp-ʌtʌ*	weak-*ʌje*	*ʔəp-ʌje*
3S→1PI	*i*-strong-*ki*	*ʔi-ʔoɔp-ki*	*i*-strong-*tiki*	*ʔi-ʔoɔp-tiki*	strong-*kʌje*	*ʔoɔp-kʌje*

Table 9: Distribution of stems in the CVCt transitive paradigm

A→P	non-past		past		imperative	
1S→3	strong-*u*	*soɔpt-u*	strong-*tʌ*	*soɔp-tʌ*		
1DI→3	weak-*i*	*səp-i*	weak-*iti*	*səp-iti*		
1DE→3	weak-*u*	*səp-u*	weak-*utu*	*səp-utu*		
1PI→3	strong-*ki*	*soɔp-ki*	strong-*tiki*	*soɔp-tiki*		
1PE→3	strong-*kʌ*	*soɔp-kʌ*	strong-*tʌkʌ*	*soɔp-tʌkʌ*		
2S→3	*ʔi*-strong-*ʉ*	*ʔi-soɔpt-ʉ*	*ʔi*-strong-*tɛ*	*ʔi-soɔp-tɛ*	strong-*e*	*soɔpt-e*
2D→3	*ʔi*-weak-*i*	*ʔi-səp-i*	*ʔi*-weak-*iti*	*ʔi-səp-iti*	weak-*ije*	*səp-ije*
2P→3	*ʔi*-strong-*ni*	*ʔi-soɔ̂m-ni*	*ʔi*-weak-*tɛnu*	*ʔi-səp-tɛnu*	weak-*nuje*	*səp-nuje*
3S→3	strong-*ʉ*	*soɔpt-ʉ*	strong-*tɛ*	*soɔp-tɛ*		
3D→3	strong-*su*	*soɔp-su*	strong-*tɛsu*	*soɔp-tɛsu*		
3P→3	strong-*nu*	*soɔp-nu*	strong-*tɛnu*	*soɔp-tɛnu*		
1S→2	strong-*nɛ*	*soɔ̂m-nɛ*	strong-*tɛni*	*soɔ̂m-tɛni*		
2/3S→1S	*i*-strong-*ŋʌ*	*ʔi-soɔ̂m-ŋʌ*	*i*-weak-*ʌtʌ*	*ʔi-səp-ʌtʌ*	weak-*ʌje*	*səp-ʌje*
3S→1PI	*i*-strong-*ki*	*ʔi-soɔp-ki*	*i*-strong-*tiki*	*ʔi-soɔp-tiki*	strong-*kʌje*	*soɔp-kʌje*

Thus for instance the proto-form **lóm-u* (search-3SG:N.PST→3SG) is resyllabified as **ló.mu* and undergoes the shifts **o* → *ɵ* and **u* → *ʉ* to **ló.mʉ* and the stress on the first syllable causes vowel lengthening to the attested form *lō:mʉ* 'he searches for it'.

This shift does not occur in regular velar final verbs with |a| vocalism such as the transitive verb |*kak*| 'peel', which has a weak stem in *ʌ* (*kʌg-u* 'I peel it') or *a:* (*kā:g-ʉ* 'He peels it') instead of expected *ɛ* and *ɛ:*. Thus, the fronting shift was limited to rounded vowels when occurring before velars.[7]

Only one verb does not fit the pattern in Table 5 : |*jal*| 'strike', which

[7]The intransitive verb |*bʰak*| 'go (honorific)' (Jacques et al. 2012: 1115) presents the stem /*bʰɛ*/ in dual forms (*bʰɛ-ji* go-N.PST:1PI) with irregular loss of the final *k* showing the *a* → *ɛ* shift (**bʰʌk-i* would be expected for the N.PST:1PI). While the reason for the coda loss in this form is unclear, it this verbs confirms the conditioning of the **a* → *ɛ* proposed here.

Table 10: Borrowings from Nepali exhibiting the fronting vowel shift

Nepali	Meaning	Khaling
kam	work	*kɛ̄m*
kʰorsani	chilli	*kʰərsɛ̂j*
buɖʰi	wife	*bʉri*
dudʰ	milk	*dɯ̂ːt*

displays *a* / *ʌ* alternation like roots with velar codas (*jʌl-u* N.PST:1SG→3SG, *jāl-ki* N.PST:1PI→3SG). This exception is due to the fact that this verb was borrowed from Thulung (a neighbouring Kiranti language) after the vowel shift took place.

The fronting shift as defined here is confirmed by the fact that some borrowings from Nepali do present the sound shifts that have been postulated on the exclusive basis of internal reconstruction.

3.2 Lowering

The high vowels **i*, **u* in pre-Khaling are lowered to *ʌ*, and **o* changes to *oɔ* in closed syllables with a non-velar coda. Closed syllables occur in forms with consonant-initial suffixes, where resyllabification is not possible.[8] For instance, in the pre-Khaling form **lom-ki* (search-NPST:1PI→3S), the coda **m* cannot be resyllabified, and since the verb stem remains a closed syllable, its vowel cannot undergo the fronting shift. This form fulfils the conditions for lowering to occur and **o* regularly changes to the diphthong *oɔ* in this context, yielding the attested form *loɔ̄m-ki*.

This sound change predicts that there should not be in Khaling any words with the vowels *i*, *u*, *o* or their fronted equivalents *ʉ* and *ɵ* in closed syllables. Yet, such words are indeed attested, but come from different origins (reduction of polysyllables and borrowings).

3.3 Backing

The only vowel affected by the backing change is *i*. This vowel changes to *ʌ* in closed syllables with a velar coda followed by an obstruent. The pre-Khaling rhymes **–iŋ* and **–ik* change to *-ūː* and *-ûː* respectively when followed by a sonorant. When occurring at the end of a word, **–iŋ* undergoes vowel backing to *–ʌŋ* while **–ik* changes to *-ûː*.

For instance, the pre-Khaling forms **siŋ-na* 'ask, infinitive' and **siŋ-ki* 'ask.N.PST. 1PI→3SG' respectively become *sūː-nɛ* (before a sonorant) and *sʌ̄ŋ-ki* (before an obstruent).

[8] See section 3.4 for the case of CVCt verb roots.

In the southern Khaling dialects, **–iŋ* and **–ik* in the verbal paradigm verbs appear as *–ɑ̄ː* and *–ɑ̂ː* respectively before sonorants. This is however most probably an analogical development unifying the vocalism of all strong stem forms.

3.4 The case of CVCt roots

As all Kiranti languages, Khaling has transitive roots with complex codas, the second element of which is always *t*. Most of these roots are historically analysable as containing the *–t* causative/applicative suffix (see Jacques 2013 for a description of its morphosyntactic functions).

These complex codas affect the application of the sound laws defined above: we find strong stems almost everywhere in the paradigm, even before most vowel-initial clusters, where the final *-t* of the verb root is resyllabified with the suffix. For instance, |*kript*| 'cut' + *–ʉ* 3SG→3 gives *krʌp.t-ʉ* 'He cuts it' with a strong stem (with backing rule).

Weak stems are restricted to inverse forms, as well as first and second dual, and second plural in the past and imperative paradigms. The reason for this cluster simplification is unclear and does not warrant positing a historical sound law of cluster simplification to account for its distribution. The most likely explanation is that this allomorphy is analogical with corresponding simple coda paradigms, especially in the case of inverse forms.

4 Tonogenesis in Khaling

The contrast between level and falling tones has at least two distinct diachronic origins. First, some contrasts originate from the evolution of codas. Second, other tonal contrasts were created by the reduction of disyllables into monosyllables through loss of the final vowel.

In this section, sound laws are demonstrated whenever possible on the basis of data from nouns rather than verbs, and using comparative data from other Kiranti languages. This way of establishing sound laws limits the risk of circular reasoning, which is particularly serious when doing internal reconstruction in a single-language basis.

4.1 Tonal contrasts from codas

The first origin of tonal contrast in Khaling is the evolution (preservation or change) of codas, as discovered by Michailovsky (1975). In pre-Khaling, the eight codas can be reconstructed on the basis of internal reconstruction: three stops **–p*, **–t* and **–k*, three nasals **–m* **–n* and **–ŋ* and two non-nasal sonorant **–r* and **–l*. Of these eight codas, four (**–t*, **–k*, **–n* and **–ŋ*) undergo changes in some contexts.

Obstruent vs sonorant codas develop respectively falling tone and level tone in monosyllables and stress syllables within polysyllabic words.

4.1.1 Obstruents and falling tones

The final stops **–k* and **–t* induce falling tone and change respectively to compensatory lengthening and *–j* in word-final position and before sonorants, as can be assessed by internal reconstruction (Jacques et al. 2012), confirmed with comparative data from Limbu and Dumi (see Table 11, Dumi and Limbu data respectively from van Driem 1993 and Michailovsky 2002). The coda *–k* also induces backing and rounding in the case of the vowels **a* and **i*: pre-Khaling **–ak* and **–ik* become *–ôː* and *–ûː* respectively. It is interesting to note that this sound change should lead us to expect *a* / *ʌ* / *–ôː* in the Khaling system but only *a* / *ʌ* / *–âː* is observed as was shown in the previous section. This suggests that the paradigms of verbs with roots in *–ak* have undergone analogy, and remade the falling tone forms.[9]

Table 11: Examples of falling tones originating from final stops

Pre-Khaling	Limbu	Dumi	Khaling	Meaning
**bit*	*pit*	*bhiʔi*	*bâj*	cow
**met*	*met*	*meːʔe*	*mêj*	wife
**rak*	*yak*		*rôː*	cliff
**pak*	*phak*	*poʔo*	*pôː*	pig
**ʔik*	*ik*		*ʔûː*	field

Before stops, **–k* remains *–k*, while **–t* changes to *ç* before labials and velars.[10]

The coda **-p* remains a stop in Khaling, but can be nasalized to *–m* with falling tone if followed by a nasal-initial suffix as in the infinitive and various verbal forms. Pre-Khaling **-t* followed by a nasal is likewise nasalized to *–n* with falling tone.

4.1.2 Sonorants and level tones

The final sonorants *–m*, *–r*, *–l* are preserved without change and develop level tone in word-final position, as shown in Table 13.

The pre-Khaling coda **–n* changes to *–j* word-finally and before almost all consonants;[11] **–ŋ* is preserved word-finally, between vowels and before

[9] Probably on the basis of forms preserving the *–k*, such as first plural.

[10] The effect of this sound law is still visible in the paradigm of |–t| coda verbs such as |*kʰot*| 'go'. For instance, the first person plural forms (with the velar-initial suffixes *–ki* and *-kʌ*) of these verbs always have |–t| → *–ç* alternation (*kʰoɔç-ki* 'we$_{\text{PE}}$ go').

[11] It is possible that it is preserved before dental stops, but the evidence requires some analysis; this question is discussed in section 5.

Table 12: Examples of falling tones originating from the nasalization of obstruents (infinitive verb forms)

Pre-Khaling	Limbu	Dumi	Khaling	Meaning
**lop-na*		*lop-ni*	*loə̂m-nɛ*	to catch
**rep-na*	*yɛps–*	*repni*	*rêm-nɛ*	to stand
**set-na*	*sɛt–*	*setni*	*sên-nɛ*	to kill

Table 13: Examples of level tones in syllables with sonorant codas

Pre-Khaling	Limbu	Dumi	Khaling	Meaning
**lam*	*lam*	*lam*	*lɛ̄m*	road
**rɒm*	*yam*	*ram*	*roɔ̄m*	body
**lem*		*leːm*	*lēm*	tongue
**ser*		*seːr*	*sēr*	louse
**kʰur*		*kʰir*	*kʰɐ̄r*	hand
**kɒr*		*kar*	*koɔ̄r*	wound
**del*	*tɛn*	*deːl*	*dēl*	village
**tulna*		*tilni*	*tɐ̄lnɛ*	raise (cattle in an enclosed space)

obstruents, but it manifests as compensatory lengthening of the previous vowel before sonorants (inducing the same vowel shift **–aŋ*, **–iŋ* → *–oːˊ*, *–uːˊ* as final **–k*). All closed syllables from syllables with the pre-Khaling coda **–n* and **–ŋ* word-finally have level tone.

Table 14: Examples of level tones in syllables with **–n* and **–ŋ* Pre-Khaling codas

Pre-Khaling	Limbu	Dumi	Khaling	Meaning
**luŋ*	*luŋ*	*lu*	*lūŋ*	stone
**siŋ*	*siŋ*	*si*	*sɐ̄ŋ*	tree
**siŋ-na*		*siŋni*	*sūːnɛ*	ask
**tson-na*		*tsonni*	*tsoɔ̄jnɛ*	hop forward

If the loss of obstruents were the only origin of falling tones, and the sonorant codas the only origin of level tone, we would expect a near-complementary distribution between the two tonal categories: only rhymes with the Khaling codas *–j* and *–m* (and the latter, only word-internally before a nasal) should have a tonal contrast; all other syllables ending in a sonorant should be level tone, and all word-final open syllable long vowels should be falling tone, and only include *–oːˊ*, *–eːˊ* and *–uːˊ*.

Yet, there appear to be no gaps in the distribution of tones in Khaling:

the contrast is present in all long vowel open syllables and in all syllables with sonorant codas. Thus, at least one other origin should be postulated to account for the types of falling and level tone syllables not predicted by the sound laws proposed in this section.

4.2 Falling tones originating from the reduction of disyllables

The reduction of disyllables into monosyllables is another common origin for falling tones. In inherited disyllabic nouns, the vowel and coda of the second syllable are lost in certain conditions (see below), and either the coda of the first syllable or the onset of the second syllable becomes the coda.

Evidence for this syllable reduction mainly comes from comparison with Dumi, where the lost vowel is still present. The very name of the Khaling people, *kʰêl*, illustrates this sound change: the pronunciation **khaliŋ* was borrowed into Nepali before syllable reduction took place, a fact which suggests that it occurred very recently. This sound change is best illustrated by the minimal pair *pʰêr* 'trap, snare' vs *pʰēr* 'near', which corresponds to *phari* 'trap' vs *phar* 'near' in Dumi (data from Rai 2011).

All good examples (see Table 15) involve words with a high vowel in the second syllable. Mid-high and high vowels in the second syllable are immune to this sound change. These examples develop falling tone when the consonant preceding the lost vowel is a sonorant.[12]

In some cases, the second syllable could be of the type *–Ci (as in the time ordinal *nêm* 'in two days') or *–iC (as in *kʰêl* Khaling') but in most cases only an open syllable needs to be reconstructed.

The reduction of disyllables does not always result in a syllable with a final sonorant. When the internal cluster in pre-Khaling only contained obstruents, we obtain closed syllables with obstruent codas without tonal contrasts.

Thus, in *mos* 'bear' from **moksu*, the vowel remains *o* (does not change to *oɔ*) due to the backing effect of the velar coda; the stop is then lost, leaving only an indirect trace, and only the second element *–s* of the cluster remains after loss of the second vowel. Words ending in obstruent codas *–t*, *–k*, *–s* in Khaling all originate from such reduced disyllables (or from loanwords), never from pre-Khaling monosyllables. The geminate stop codas have also been generated by this rule: they originate from aspirated stops or geminated stops that became word-final after the Syllable Reduction Rule.

Reconstructing the pre-Khaling form is impossible on Khaling-internal evidence: comparison with Dumi (and possibly other closely related languages) is necessary to recover the lost vowels and consonants.

[12] A third origin for falling tones results from vowel fusion after the loss of intervocalic **w*. It is found in words like *gʰrêː* 'crab' ← **ŋgrawa* and *tsêː* ← **tsowo*, compare Dumi (Rai 2011) *grawa* 'crab' and *tsuwo* 'heart'.

Table 15: Examples of falling tone or obstruent final monosyllables originating from the simplification of disyllabic nouns

Pre-Khaling	Dumi	Khaling	Meaning
**tsili*	*tsili*	*tsîl*	anger
**nini*	*nini*	*nîn*	aunt (FZ)
**meri*	*miri*	*mêr*	tail
**rali*	*raːli*	*rêl*	centipede
**sali*	*sali* 'nail, talon'	*sêl*	foot
**noru*	*nuɾɨ*	*nêr*	tiger
**nolu*	*nuliɨ*	*nêl*	daytime
**kʰaliŋ*		*kʰêl*	Khaling
**nam-ni*	*naːmniɨ*	*nêm*	in two days
**pipi*	*pipi*	*pip*	grandmother
**moksu*	*moksɨ*	*mos*	bear
**pokʰu*	*pɨkʰɨ*	*pɵk*	dirt

Exceptions to the Syllable Reduction Rules in nouns are extremely rare, and may reflect borrowings, or special contexts where the rule does not apply; this question is left for future investigations.

Table 16: Exceptions to the Syllable Reduction Rule

Pre-Khaling	Limbu	Dumi	Khaling	Meaning
**sendi*	*sendi*	*syendi*	*sēndʉ*, *sēndi*	nail
???		*mupu*	*mupu*	belly

The application of the Syllable Reduction Rule appears to operate differently in verbs. Several verbal suffixes had high vowels in pre-Khaling: the first singular direct *–u*[13], the inclusive and exclusive dual *–i* and *–u* and the third/second transitive *–ʉ*.[14]

The dual inclusive with a suffix *–i* in Dumi and Khaling instead of *–si* or *–su* (from **si + u*) in other Kiranti languages suggests that a cluster reduction rule took place as early as the common ancestor of Khaling and Dumi, as summarized in Table 17:[15] word-internal Proto-Kiranti *stop+s clusters

[13] This ending corresponds to *–uŋ* in other Kiranti languages; pre-Khaling **–uŋ* normally remains *–uŋ* word finally in Japhug (and *–ūː* before sonorants). This irregularity is left for further research.

[14] This suffix regularly reflects pre-Khaling **–u*.

[15] This rule is unrelated to the Syllable Reduction Rule seen above, whose application is entirely different as in *mos* ← **moksú* 'bear'. The Syllable Reduction Rule only applied to secondary clusters in compound nouns, not to the more ancient verbal morphology.

Table 17: Exceptions to the Syllable Reduction Rule

Proto-Kiranti	Limbu	Dumi (past)	Pre-Khaling	Khaling	Meaning
**lop-si*		*lupʰi*	**lopí*	*ləpi*	we_{DI} catch for him
**set-si*	*a-sɛt-su*	*sitsi*	**setsí*	*setsi*	we_{DI} kill him
**kok-si*		*kukʰi*	**kokí*	*kəki*	we_{DI} are able to do it
**lom-si*		*lumi*	**lomí*	*ləmi*	we_{DI} look for him
**lop-u*		*lupʰɨ*	**lóbu*	*lə̄:bʉ*	he catches him
**set-u*	*sɛr-u*	*sidɨ*	**sédu*	*sē:dʉ*	he kills him
**kok-u*		*kukhɨ*	**kógu*	*kə̄:gʉ*	he is able to do it
**lom-u*		*lumɨ*	**lómu*	*lə̄:mʉ*	he looks for him

became intervocalic unvoiced stops in pre-Khaling (and Khaling), while intervocalic unvoiced stops in proto-Kiranti were voiced in Pre-Khaling (but after the split from Dumi and Khaling).

Other word-internal clusters (such as *sonorant+s) were simplified by dropping the **s* without a trace. This rule entails that all word-internal clusters Cs in pre-Khaling (and even more in Khaling) are secondary, and cannot be inherited from proto-Kiranti. It also explains why the dual forms of verbs with *–Ct* roots lost the -t- in dual forms and why the weak stems are found there: it results from an early reduction of the proto-Kiranti *-Cts- cluster into simple *C in pre-Khaling.

For instance the first dual inclusive of the root |*kript*| 'cut' is *kripi* in Khaling. The following stages can be proposed: Proto-Kiranti **kript-si* → **krippi* → pre-Khaling **kripí* → Khaling *kripi*.

In verbal paradigms, the Syllable Reduction Rule only applied to the second syllable of trisyllabic forms, when this second syllable contained a high vowel and was not stressed.

It applies for instance with the 3→3DU and 3→3PL of the transitive paradigm, as illustrated by the data in Table 18.[16]

Table 18: The application of the Syllable Reduction Rule in the verbal system

Pre-Khaling	Khaling	Meaning
**lóbu-nV*	*lê:p-nu*	they catch him
**sédu-nV*	*sê:t-nu*	they kill him
**lómu-nV*	*lêm-nu*	they look for him

On the other hand, it does not apply to first singular and dual forms,

Khaling still has *–Cs–* clusters, but these result from the Syllable Reduction Rule, as we explain below.

[16] The reconstruction of the dual and plural *–su* and *–nu* in pre-Khaling is uncertain; the expected vowel in these suffixes should have been either *i* or *ʉ*.

where the ending was stressed, as shown in Table 19 (except for *–t* and *–n* roots, such as the verb |*set*| 'kill', past dual inclusive *ses-ti*).

Table 19: The Syllable Reduction Rule in forms with stress-bearing endings in pre-Khaling

Pre-Khaling	Khaling	Meaning
**lop-íti*	*ləp-iti*	we_{DI} caught him
**lom-íti*	*ləm-iti*	we_{DI} looked for him
**sets-íti*	*ses-ti*	we_{DI} killed him

5 Tonogenesis and verbal morphology

Most of the tonal alternations observed in the Khaling verbal system (see Jacques et al. 2012) can be accounted for by the two sound changes described above, namely the development of falling vs level tone from obstruents vs sonorants and the Syllable Reduction Rule.

The falling tones originating from obstruents (in verbs with roots in stop codas) occur in two situations (see Table 20).

First, they are found in forms that had nasal-initial suffixes in pre-Khaling, i.e. the infinitive and second plural non-past of all verbs, the first singular third plural non-past of intransitive verbs and the 1SG→2SG and 3→1sg forms of transitive verbs. In these forms, the final obstruents *–p(t)* and *–t(t)* are nasalized to *–m* and *–n* respectively with falling tone. Final *–k(t)* is dropped with compensatory lengthening and falling tone. The first singular suffix *–ŋʌ* works differently from other nasal suffixes: it nasalizes *–p(t)* and *–k(t)* to *–m* and *–ŋ* with falling tone (for *–k(t)* it can also optionally change to compensatory lengthening) , while *–t(t)* changes to *–j* with falling tone before it.

Second, falling tone forms occur in all stems that appear word-finally (first and second person singular or intransitive verbs and 3→2SG of transitive verbs) for verbs with roots in *–t(t)* and *–k(t)*. The coda of verbs in *–p(t)* does not disappear word-finally.

Table 20: Falling tones from lost stops in the Khaling verbal system

Verb root	Meaning	Infinitive	Non-Past 1SG	3SG	1PI
|*ʔɛt*|	say	*ʔên-nɛ*	*ʔêj-ŋʌ*	*ʔêj*	*ʔɛç-ki*
|*kʰot*|	go	*kʰoɔ̂n-nɛ*	*kʰoɔ̂j-ŋʌ*	*kʰoɔ̂j*	*kʰoɔç-ki*
|*pʰuk*|	get up	*pʰûː-nɛ*	*pʰûŋ-ŋʌ* / *pʰûː-ŋʌ*	*pʰûː*	*pʰuk-ki*
|*rep*|	stand	*rêm-nɛ*	*rêm-ŋʌ*	*rêːp*	*rep-ki*

Verbs with sonorant final roots present level tone in the corresponding forms, as illustrated by Table 21.

Table 21: Level tones in sonorant stems in the Khaling verbal system

Verb root	Meaning	Infinitive	Non-Past 1SG	3SG	1PI
|*tsʰom*|	dance	*tsʰoɔ̄m-nɛ*	*tsʰoɔ̄m-ŋʌ*	*tsʰoɔ̄m*	*tsʰoɔ̄m-ki*
|*tson*|	jump	*tsoɔ̄j-nɛ*	*tsoɔ̄j-ŋʌ*	*tsoɔ̄j*	*tsoɔ̄j-ki*
|*kʰoŋ*|	come (from below)	*kʰō:-nɛ*	*kʰō:-ŋʌ*	*kʰōŋ*	*kʰōŋ-ki*

Most of the tonal alternations not explained by the loss of obstruents can be accounted for by the Syllable Reduction Rule. In the verbal system, this does not apply to disyllabic forms, but does occur in tri-syllabic forms (section 4.2): the second syllable of a trisyllabic verb form in pre-Khaling drops if it had a high vowel **i* or **u*.

Table 22 illustrates the application of the Syllable Reduction rule in 3→3PL forms (in comparison with 3SG→3SG forms, where it does not occur).

Table 22: Falling tones from lost syllables in the Khaling verbal system

Verb root	Meaning	Non-Past 3SG	Non-Past 3PL
|*set*|	kill	*sē:d-ʉ* ← **sédu*	*sê:t-nu* ← **sédu-nV*
|*pʰrok*|	untie	*pʰrē:g-ʉ* ← **pʰrógu*	*pʰrê:k-nu* ← **pʰrógu-nV*
|*lom*|	look for	*lē:m-ʉ* ← **lómu*	*lêm-nu* ← **lómu-nV*
|*bʰert*|	cause to fly	*bʰērd-ʉ* ← **bhérdu*	*bhêr-nu* ← **bhérdu-nV*
|*sent*|	see	*sēnd-ʉ* ← **séndu*	*sên-nu* ← **séndu-nV*

The third person plural of intransitive paradigm is *–nu*, and appears to be superficially similar to that of the transitive paradigm. Yet, no falling tone occurs in this form for verbs with roots in sonorant coda. For instance |*bʰer*| 'fly', the intransitive counterpart of |*bʰert*| 'cause to fly' has a third person plural non-past *bʰēr-nu*. This difference is due to the fact that the endings of the transitive and intransitive paradigms were different in pre-Khaling: the former had a compound suffix **–u-nV*[17] while the latter had simple **–nV*. In the third plural of the intransitive paradigm, there was no high vowel between the verb stem and the plural suffix, and hence the Syllable Reduction Rule could not apply to generate a falling tone.

The Syllable Reduction Rule also applies in past tense forms (third and second person direct), as illustrated by Table 23.

In the paradigm of verbs with roots in *–t* coda, the final obstruent drops before the past tense suffix *–tɛ*, resulting in an open syllable long vowel with falling tone, avoiding a long vowel before geminated *tt*. For instance, the

[17] The reconstruction of the vowel in pre-Khaling for the plural suffix *–nu* is still unclear.

Table 23: Falling tones from lost syllables in the Khaling verbal system, Past forms

Verb root	Meaning	Past 3SG
|*set*|	kill	*sêː-tɛ* ← **séduta*
|*pʰrok*|	untie	*pʰrôːk-tɛ* ← **pʰróguta*
|*lom*|	look for	*lôm-tɛ* ← **lómuta*
|*bʰert*|	cause to fly	*bʰêr-tɛ* ← **bhérduta*
|*sent*|	see	*sên-tɛ* ← **sénduta*

following intermediary steps can be posited for the third person past form of the verb 'kill': *sêː-tɛ* ← **sêːttɛ* ← **sēːdʉtɛ* ← **séduta*).

All tonal alternations in the direct transitive paradigm and the inverse non-past paradigm can be accounted for using the rules explained above: SF (stop coda to falling tone), N (nasalization of stop coda), SR (Syllable Reduction Rule), L (lengthening of accented vowel in open syllable). The forms where each of these rules is applied in the transitive paradigm of verb with stop final roots and sonorant final roots are presented in Tables 24 and 25 respectively.

Table 24: Tonal alternations in the transitive paradigm of the verb |*set*| 'kill'

A→P	Non-past	Origin	Past	Origin	Imperative	Origin
1S→3	*sed-u*		*sêː-tʌ*	L+SR		
1DI→3	*sets-i*		*ses-ti*			
1PI→3	*seç-ki*		*seç-tiki*			
2S→3	*ʔi-sēːd-ʉ*	L	*ʔi-sêː-tɛ*	L+SR	*sēːd-e*	L
2D→3	*ʔi-sets-i*		*ʔi-ses-ti*		*sets-ije*	
2P→3	*ʔi-sên-ni*	N	*ʔi-ses-tɛnu*		*ses-nuje*	
3S→3	*sēːd-ʉ*	L	*sêː-tɛ*	L+SR		
3D→3	*sêːs-su*	L+SR	*sêː-tɛsu*	L+SR		
3P→3	*sêːt-nu*	L+SR	*sêː-tɛnu*	L+SR		
1S→2	*sên-nɛ*	N	*sên-tɛni*	N		
2/3S→1S	*ʔi-sêj-ŋʌ*	SF	*ʔi-ses-tʌ*		*sets-ʌje*	
3S→1PI	*ʔi-seç-ki*		*ʔi-seç-tiki*		*seç-kʌje*	

Thus, nearly all tonal alternations in the Khaling verbal system are the result of a mechanical application of sound changes whose existence can be independently proven by applying the comparative method to Kiranti languages.

Table 25: Tonal alternations in the transitive paradigm of the verb |*lom*| 'search'

A→P	Non-past	Origin	Past	Origin	Imperative	Origin
1S→3	*lom-u*		*lomu-tʌ*			
1DI→3	*lɵm-i*		*lɵm-iti*			
1PI→3	*loɔ̄m-ki*		*loɔ̄m-tiki*			
2S→3	*ʔi-lō:m-ʉ*	L	*ʔi-lô̄m-tɛ*	L+SR	*lō:m-e*	L
2D→3	*ʔi-lɵm-i*		*ʔi-lɵm-ti*		*lɵm-ije*	
2P→3	*ʔi-loɔ̄m-ni*		*ʔi-lô̄m-tɛnu*		*lô̄m-nuje*	
3S→3	*lō:m-ʉ*	L	*lô̄m-tɛ*	L+SR		
3D→3	*lô̄m-su*	L+SR	*lô̄m-tɛsu*	L+SR		
3P→3	*lô̄m-nu*	L+SR	*lô̄m-tɛnu*	L+SR		
1S→2	*loɔ̄m-nɛ*		*loɔ̄m-tɛni*			
2/3S→1S	*ʔi-loɔ̄m-ŋʌ*	SF	*ʔi-lɵm-ʌtʌ*		*lɵm-ʌje*	
3S→1PI	*ʔi-loɔ̄m-ki*		*ʔi-loɔ̄m-tiki*		*loɔ̄m-kʌje*	

6 Unexplainable alternations

There remain a residue of forms with falling tones that cannot be accounted for by either scenario, in the past tense of the intransitive paradigm, the inverse transitive paradigm and the direct past tense 2PL→3. We illustrate the problem with data from the intransitive paradigm exclusively.

As presented in Table 26, singular and plural second and third person past and imperative forms have a falling tone in paradigms of verbs with roots in sonorant codas.

Table 26: Distribution of the stems in the intransitive paradigm of the verb |*tsʰom*| 'dance', sonorant final

S	Non-past	Origin	Past	Origin	Imperative	Origin
1S	*tsʰoɔ̄m-ŋʌ*		*tsʰɵm-ʌtʌ*			
1DI	*tsʰɵm-i*		*tsʰɵm-iti*			
1PI	*tsʰoɔ̄m-ki*		*tsʰoɔ̄m-tiki*			
2S	*ʔi-tsʰoɔ̄m*		*ʔi-tsʰô̄m-tɛ*	?	*tsʰô̄m-je*	?
2D	*ʔi-tsʰɵm-i*		*ʔi-tsʰɵm-iti*		*tsʰɵm-ije*	
2P	*ʔi-tsʰoɔ̄m-ni*		*ʔi-tsʰô̄m-tɛnu*	?	*tsʰô̄m-nuje*	?
3S	*tsʰoɔ̄m*		*tsʰô̄m-tɛ*	?		
3D	*tsʰɵm-i*		*tsʰɵm-iti*			
3P	*tsʰoɔ̄m-nu*		*tsʰô̄m-tɛnu*	?		

These forms appear to be superficially identical the corresponding ones of the transitive paradigm. For instance, the third singular of the past

tense *ʦʰôm-tɛ* 'he danced' has the same alternation as that of the transitive verb |*lom*| 'search', *lôm-tɛ* 'he looked for him'. However, this resemblance is misleading. If we observe the intransitive paradigm of verb whose root has a stop coda, as in Table 27, we see that the verb stem has a short vowel in the corresponding forms.

Table 27: Distribution of the stems in the intransitive paradigm of the verb |*ʤʰuk*| 'flee', stop final

S	Non-past	Origin	Past	Origin	Imperative	Origin
1S	*ʤʰûŋ-ŋʌ*	L+N	*ʤʰʉk-ʌtʌ*			
1DI	*ʤʰʉk-i*		*ʤʰʉk-iti*			
1PI	*ʤʰuk-ki*		*ʤʰuk-tiki*			
2S	*ʔi-ʤʰû:*	SF	*ʔi-ʤʰʉk-tɛ*		*ʤʰʉk-je*	
2D	*ʔi-ʤʰʉk-i*		*ʔi-ʤʰʉk-iti*		*ʤʰʉk-ije*	
2P	*ʔi-ʤʰû:-ni*	SF	*ʔi-ʤʰʉk-tɛnu*		*ʤʰʉk-nuje*	
3S	*ʤʰû:*	SF	*ʤʰʉk-tɛ*			
3D	*ʤʰʉk-i*		*ʤʰʉk-iti*			
3P	*ʤʰû:-nu*	SF	*ʤʰʉk-tɛnu*			

The difference between the transitive and intransitive paradigms of verbs with roots in stop coda can be illustrated by the third person past tense of |*pʰrok*| 'untie' and that of |*ʤʰuk*| 'flee'. The former *pʰrô:k-tɛ* 'he untied it' has a long vowel and non-contrastive falling tone, while the latter has a short vowel *ʤʰʉk-tɛ* he fled'.

Hence, it is not possible to reconstruct, for the intransitive past tense, a trisyllabic form with word-initial stress (like *pʰrô:k-tɛ* ← **pʰróguta*). It could be possible to account for the intransitive paradigms in Table 26 and 27 by positing a stress-final pattern in the past tense of intransitive verbs in pre-Khaling, such as *ʦʰôm-tɛ* ← **ʦʰom-itá* and *ʤʰʉk-tɛ* ← **ʤʰuk-itá*. The stress not being placed on the verb stem, vowel lengthening does not occur, and not being placed on the second syllable, the Syllable Reduction Rule can apply and generate the falling tone in verbs with roots in sonorant codas.

However, there is no compelling comparative evidence from any Kiranti language for a high vowel in any of these forms between the verb stem and the suffix. One possible reason for this is that some languages underwent vowel reduction in trisyllables like Khaling. In Dumi, as can be seen in Table 28, all vowels located between the verb stem and the Non-Past[18] *–t* suffix have been lost, even in forms where Khaling has preserved them.[19]

[18]In Dumi, the Past and Non-Past paradigms are reversed in comparison with other Kiranti languages. Thus, the Khaling Past paradigm corresponds to the Dumi Non-Past.

[19]The syllable Reduction Rule that took place in Dumi is of course very different, and independent from, that found in Khaling, since it does not apply to disyllabic nouns.

Table 28: Comparison between Khaling and Dumi (intransitive |*tsʰom*| 'dance' vs transitive |*lom*| 'look for')

S	Khaling Past	Dumi Non-past
1S	*tsʰəm-ʌtʌ*	*tsum-tə*
1DI	*tsʰəm-iti*	*tsum-ti*
1PI	*tsʰoɔ̄m-tiki*	*tsəm-kiti*
2S	*ʔi-tsʰôm-tɛ*	*a-tsum-ta*
2D	*ʔi-tsʰəm-iti*	*a-tsum-ti*
2P	*ʔi-tsʰôm-tɛnu*	*a-tsum-tini*
3S	*tsʰôm-tɛ*	*tsum-ta*
3D	*tsʰəm-iti*	*tsum-ti*
3P	*tsʰôm-tɛnu*	*ham-tsum-ta*
1S	*lom-utʌ*	*lum-tə*
1DI	*ləm-iti*	*lum-ti*
1PI	*loɔ̄m-tiki*	*ləm-kiti*
2S	*ʔi-lôm-tɛ*	*a-lum-ta*
2D	*ʔi-ləm-iti*	*a-lum-ti*
2P	*ʔi-lôm-tɛnu*	*a-lum-tini*
3S	*lôm-tɛ*	*lum-ta*
3D	*ləm-iti*	*lum-ti*
3P	*lôm-tɛnu*	*ham-lum-ta*

Until clear evidence is found in another Kiranti language for reconstructing **–ita* rather than *–*ta* in the second and third singular and plural past forms, the hypothesis laid out in this section must be regarded as tentative.[20]

7 Conclusion

In this paper, we have shown that most tonal alternations in Khaling can be accounted for by two main groups of sound changes: the development of tonal contrast following the loss of codas and the Syllable Reduction Rule.

Some tonal alternations in the intransitive paradigm cannot be explained yet, and future investigation on this topic will have to take into account reflexive paradigms and doubly conjugated verbs. Yet, additional data from

[20]The Past tense suffix probably originates from an independent verb (perhaps the verb 'put', in Khaling |*ta*|). Evidence for this comes from Bantawa (Doornenbal 2009: 165-72), where the cognate past tense suffix *–da–* can still occur as an independent word and receive the second person prefix *ti–*. Thus, this question cannot be satisfactorily answered without an account of the history of doubly conjugated verbs in Khaling and other Kiranti languages. This topic is not discussed in this paper, due to lack of data on most relevant languages.

the languages that are the most closely related to Khaling, in particular Dumi and Koyi, will be necessary to undertake this research.

Notes

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Abbreviations follow the Leipzig glossing rules, except for the following: C consonant V vowel, DI / PI dual / plural inclusive DE / PE dual / plural exclusive.

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Tonal inflection in Mian

Sebastian Fedden

1. Introduction

In the Papuan language Mian (Fedden 2011) two thirds of the verb stems have a distinct aspectual value, either imperfective or perfective, e.g. *wen* 'eat (IPFV)' and *dowə̑n'* 'eat (PFV)', which combine with various TAM suffixes to form the different grammatical TAM categories of the language, but which also restrict the range of possible TAM suffixes. The focus of this chapter are the imperfective aspect (incompatible with perfective stems) and the non-hodiernal past (incompatible with imperfective stems).[1] While these are encoded by two homophonous suffixes (both *-b*), the aspectual stem distinction usually keeps the grammatical senses distinct. This is illustrated for the imperfective in (1) and the non-hodiernal past in (2).[2]

(1) imen=e wen-b-i=be [wɛ̀mbìβɛ̀]
taro=ART eat.IPFV-IPFV-1SG.SBJ=DECL
'I'm eating taro.'

(2) imen=e dowo n-b-i=be [ⁿdòwòmbíβɛ̀]
taro=ART eat.PFV-NHODPST-1SG.SBJ=DECL
'I ate taro before today.'

One third of the verbs are biaspectual, i.e. they have a single form which can either have perfective or imperfective meaning. It is for these verbs that tone, which normally serves the function of differentiating lexical meanings in Mian, plays an inflectional role. A high tone acts as a co-exponent of the non-hodiernal past, hosted on the subject cross-referencing suffix which is always vocalic. Compare examples (3) and (4) for the biaspectual verb *singa* 'pour'.

(3) aai=e singa-b-i=be [sìŋàβìβɛ̀]
water=ART pour-IPFV-1SG.SBJ=DECL
'I'm pouring some water.'

[1] The non-hodiernal past locates an event in the past, but before the day containing the moment of speaking, cf. Latin *hodie* 'today'.

[2] While the non-hodiernal past is a deictic tense, the imperfective is an aspect category which is used for continuous, iterative or habitual situations with present time reference as the default temporal interpretation (Fedden 2011: 287). However, present time reference is merely an implicature that can be cancelled by establishing a different temporal reference point either by the use of a temporal adverbial or by the context, for example the mention of obsolete customs, such as the building of an initiation house in (i), a cultural practice defunct since the early 1960s.

(i) yomin am=o gen-b-io=be [ⁿgɛ̀mbìo̯ββɛ̀]
initiation house=ART build.IPFV-IPFV-3PL.SBJ=DECL
'They were building an initiation house.' [Initiation]

(4) aai[3]=e singa-b-H-i=be [sìŋàβíβɛ̀]
water=ART pour-NHODPST-NHODPST-1SG.SBJ=DECL
'I poured some water before today.'

The verb in example (4) shows multiple realizations of the tense value, namely as a suffix and a tone. This is a case of extended or multiple exponence (Matthews 1974; Caballero and Harris 2012).

Inflectional tone is only employed in a subpart of the verbal paradigm, namely the non-hodiernal past. Its function is to distinguish the non-hodiernal past *-b* from the imperfective, segmentally also *-b* but without high tone, for biaspectual verbs, which do not have distinct stems in the non-hodiernal past and the imperfective. For these the two forms would be homophonous but for the tone. The forms of the biaspectual verb *singa* 'pour' are given in table 1. High tone is indicated by an accent.

Table 1. Non-hodiernal past vs. imperfective forms of the biaspectual verb *singa* 'pour'

SUBJECT	NON-HODIERNAL PAST		IMPERFECTIVE	
1SG	*singabíbe* [sìŋàβíβɛ̀]	'I poured before today'	*singabibe* [sìŋàβìβɛ̀]	'I am pouring'
2SG	*singabéobe* [sìŋàβéo̯βɛ̀]	'you poured before today'	*singabeobe* [sìŋàβèo̯βɛ̀]	'you are pouring'
3SG.M	*singabébe* [sìŋàβéβɛ̀]	'he poured before today'	*singabebe* [sìŋàβèβɛ̀]	'he is pouring'
3SG.F	*singabóbe* [sìŋàβóβɛ̀]	'she poured before today'	*singabobe* [sìŋàβòβɛ̀]	'she is pouring'
1PL	*singabúobe* [sìŋàβúo̯βɛ̀]	'we poured before today'	*singabuobe* [sìŋàβùo̯βɛ̀]	'we are pouring'
2PL	*singabíobe* [sìŋàβío̯βɛ̀]	'you poured before today'	*singabiobe* [sìŋàβìo̯βɛ̀]	'you are pouring'
3PL	*singabíobe* [sìŋàβío̯βɛ̀]	'they poured before today'	*singabiobe* [sìŋàβìo̯βɛ̀]	'they are pouring'

Note that there is complete syncretism between the 2nd and 3rd persons in the plural. Cross-linguistically, this is a common pattern of syncretism (Baerman, Brown and Corbett 2005: 59).

The use of tone as an inflectional exponent creates a situation, where a language with a lexical tone system employs tone also inflectionally, but restricts this to a tiny corner of the grammar, namely to maximise the contrast between two sets of word forms, which would otherwise be identical for a sizeable subset of the verbal vocabulary. The homophony of the non-hodiernal past and imperfective suffixes would lead to segmentally identical forms for 132 biaspectual verbs out of a total of 456 verbs, or 29% (in Fedden, forthcoming), in the

[3] The pharyngealized low vowel /aˤ/ is spelled <aa> in the orthography.

subpart of the paradigm set out in table 1. For the rest of the verbs ambiguity never arises because they have distinct perfective and imperfective stems.

The restriction of inflectional tone to a fraction of the grammar is typologically unusual, but is attested in Sub-Saharan Africa, for example the Mande language Bamana (Vydrin, this volume). In languages which use tone as an inflectional exponent it tends to be employed across a wider range of features. For example, tonal change involved in the marking of tense and aspect is widespread in African languages (Yip 2002: 228). There is extensive use of tonal change in the marking of person and aspect in Oto-Manguean languages, especially Chinantec, Chatino and Mazatec (Yip 2002: 229–231; Léonard, this volume). An example paradigm from Comaltepec Chinantec, which uses tone extensively in person and aspect inflection (together with affixation and vowel length) is given in table 2 from Pace (1990: 26); cited in Yip (2002: 229).

Table 2. The use of inflectional tone in Comaltepec Chinantec

	1SG	1PL	2	3
Progressive	kóː^{L}-R	koː^{M}-Rʔ	kóː^{L}-ʔ	kóː^{L}-r
Intentive	ni^{L}-kóː^{LH}-R	ni^{L}-kó^{H}-Rʔ	ni^{L}-kóː^{H}-ʔ	ni^{L}-kó^{M}-r
Completive	ka^{L}-kóː^{M}-R	ka^{L}-kó^{H}-Rʔ	ka^{L}-koː^{M}-ʔ	ka^{L}-kóː^{L}-r

For an overview of the diverse functions of inflectional tone, with a focus on African languages, see Hyman (this volume). On the wide range of inflectional tone in the Mande language Dan-Gwɛɛtaa, see Vydrin (this volume).

Although the origin of inflectional tone in the Mian non-hodiernal past cannot be reconstructed at this stage, it is likely that it developed through a diachronic process, whereby segmental material was deleted and only a tone remained. During later stages of development the tone contrast was maintained, possibly to avoid homophony between non-hodiernal past and imperfective aspect for biaspectual verbs, which form a sizable subset of verbs. Homophony avoidance has been invoked as a mechanism which inhibits or promotes change within paradigms in order to prevent ambiguities (Crosswhite 1999; Kenstowicz (2005); Rebrus and Törkenczy (2005), or even leads to defectiveness, i.e. empty cells in the paradigm (Baerman 2011). For the views of the critics of homophony avoidance, see for example Lass (1980) and Sampson (2013).

The data presented in this chapter were collected by the author over a period of eleven months of fieldwork in New Guinea. In order to obtain complete paradigms of the categories in question I elicited them with the help of two language consultants.

This chapter has four parts. Section 2 is an introduction to the Mian language and its speakers. Section 3 gives an overview of lexical tone and the word-tone system of the language. Section 4 explores in some details the distribution of inflectional tone in forms of the non-hodiernal past. Section 5 is a conclusion.

2. The Mian language[4]

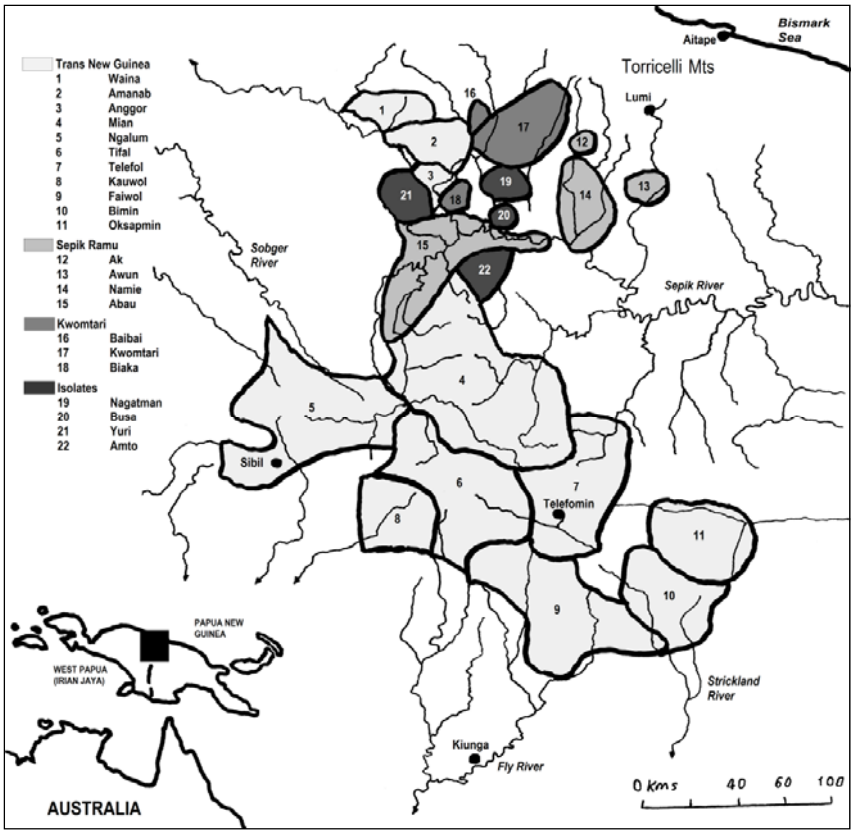
Mian (also known as ‘Mianmin’ or ‘Miyanmin’ in the literature, ISO 639-3 *mpt*) is an Ok language (Healey 1964; Voorhoeve 2005), spoken in Telefomin District of Sandaun Province in Papua New Guinea (see map 1 below) by approximately 1,750 people (Lewis 2009). Mian is part of the Mountain Ok branch, together with Telefol, Tifal, Faiwol, Setaman, Urapmin and Bimin. The Ok languages are named after the widespread word *ok* ‘river, water’ in these

[4] This section draws on Fedden (2011: ch. 1) and Fedden (2012).

languages. They are part of the Trans New Guinea family (Wurm 1982; Pawley 2005; Ross 2005). The language is endangered due to small speaker numbers and the encroachment of Tok Pisin, the PNG-variety of Neo-Melanesian Pidgin. Nowadays almost all speakers are bilingual in Mian and Tok Pisin. Younger speakers have quite good English as well, but in general knowledge of English is not widespread.

Geographically, the Mianmin area is delimited by the August and May Rivers in the west and east, respectively, and the Hindenburg Range in the south, located between the 141st and 142nd degrees of longitude and between the 4th and 5th parallels. The area is mountainous and remote. Contact with Mian speakers was established relatively late during mining investigations in the mid-1930s (Kienzle and Campbell 1938; Campbell 1938: 245).

Two dialect varieties can be distinguished: west Mian (also known as Wagarabai, Skonga or Suganga) in and around Yapsiei, a government and Catholic mission station near the border with Papua (formerly Irian Jaya) with approximately 350 speakers, and east Mian in the villages around Mianmin airstrip, in Gubil, Fiak, and Hotmin with approximately 1,400 speakers. The two Mian dialects are mutually intelligible. While the western dialect is contiguous to several other Ok languages to the west and to the non-related Sepik language Abau upstream from Yapsiei, the eastern dialect is in contact with the closely related Ok languages Telefol to the east and south and Tifal to the southwest. Some men above 50 years of age speak or at least understand Telefol.



Map 1. The Ok languages of Papua New Guinea

Mian has 13 consonantal phonemes /b, g, t, k, m, n, ŋ, f, s, h, l, w, j/ and twelve vowel and diphthong phonemes /a, aˤ (i.e. pharyngealized), ɛ, i, o, u; ai, aˤi, ɛi, au, aˤu, ou/. Voiced stops are pre-nasalized. The language has word-tone. The properties of the tone system will be described in more detail below.

The language is head-marking (Nichols 1996) with almost no nominal morphology. Verbal morphology is mainly suffixal. The language has a complex tense system with five distinctions in the past: near past, hesternal past,[5] non-hodiernal past, remote past, and general past. In addition, verb forms only inflected as realis mostly have past time reference. Serial verb and clause chaining constructions are common in discourse. Unmarked constituent orders is SV and AOV.

Approximately two thirds of the verbs are either perfective (PFV) or imperfective (IPFV), while the rest is biaspectual. The aspectual stem distinction is an important feature of the language and differentiates among other things forms of the non-hodiernal past and the imperfective for at least two thirds of the verbal vocabulary because the former requires the perfective stem while the latter requires the imperfective stem. Whenever a Mian verb stem is cited here its aspect value is provided in brackets if a given stem is unequivocally perfective or imperfective, such as *dowon'* 'eat (PFV)' and *wen* 'eat (IPFV)' or *went* 'hear (PFV)' and *wentê* 'hear (IPFV)'. For biaspectual verbs the gloss is given without any specification of aspect, e.g. *singa* 'pour'. Before dealing with inflectional tone I briefly summarize how tone works in the Mian lexicon.

3. Lexical tone

Mian is a word-tone language. Each lexeme is specified for one out of a set of five tonal melodies, which is assigned to the word as a whole. In a typology of tone systems based on the domain of tonal contrast, Donohue (1997: 373) distinguishes word-tone systems, which use the whole word as the relevant tone assignment domain, found for example in Mende (a Mande language of West Africa), Shanghai (Sino-Tibetan), and Swedish and Norwegian (both Indo-European), from syllable-tone systems, in which each syllable is allowed to bear a distinctive tone independent of the other syllables in the word, as for example in Mandarin, Cantonese (both Sino-Tibetan), Vietnamese (Mon-Khmer), Igbo (a Kwa language of West Africa), and Chuave (Papuan, spoken in Chimbu Province in Papua New Guinea).

In a word-tone language, a limited number of lexically specified tone patterns accounts for the tonal surface specifications of entire mono- and polysyllabic words. Mian has the following five tonal melodies (a typical inventory for a Papuan word-tone language): high (H), low (L), rising (LH), peaking (LHL), and falling (HL). Each stem is lexically specified for exactly one for these five tonal melodies. Affixes are typically toneless and receive their tone specification by spreading of tones from the stem to the affixes.

In terms of frequency, for nouns and adjectives the following holds: L and LH are common. H is less common and rare in polysyllabic words. LHL and HL are rare on monosyllabic and disyllabic words. For verbs the following holds: L and LHL are common. HL is less common. H and LH are unattested. In the orthography the five tonal melodies are written as follows: *mén* 'child' (H), *měn* 'string bag' (LH), *kla* 'properly' (LHL), and *fê* 'carrion' (HL). Low tone is unmarked, e.g. *fu* 'cook' (L). Tables 3 and 4 give an overview of distinctive Mian tonal melodies in mono- and disyllabic words, respectively.

[5] Cf. Latin *hesternus* 'yesterday's'.

Table 3. Monosyllabic tonal minimal pairs

Tonal melody	Phonemic	Phonetic	Orthographic	Meaning
H	/an^{H}/	[án]	án	‘arrow; bow’
H	/mɛn^{H}/	[mén]	mén	‘child’
LH	/a^{ʕ}m^{LH}/	[ă^{ʕ}m]	ăam	‘pandanus species’
LH	/mɛn^{LH}/	[mĕn]	mĕn	‘string bag’
LHL	/a^{ʕ}m^{LHL}/	[ă̂^{ʕ}m]	ă̂am	‘older sister’
HL	/fɛ^{HL}/	[fɛ̂]	fê	‘carrion’
HL	/o^{HL}/	[ô]	ô	‘take (PFV verb stem)’
L	/am^{L}/	[àm]	am	‘house’
L	/o^{L}/	[ò]	o	‘say (IPFV verb stem)’

Table 4. Disyllabic tonal minimal pairs

Tonal melody	Phonemic	Phonetic	Orthographic	Meaning
H	/sɛku^{H}/	[sék^{h}ú]	séku	‘bush knife’
LH	/afɛt^{LH}/	[àfɛ̌t^{h}]	afĕt	‘cleared of taboo’
LH	/usan^{LH}/	[ùsăn]	usăn	‘vomit (n.)’
LHL	/ibal^{LHL}/	[ìβâl]	ibâl	‘paper wasp’
LHL	/walo^{LHL}/	[wàlô]	walô	‘multiply (PFV verb stem)’
HL	/usan^{HL}/	[úsân]	usân	‘tail’
HL	/walo^{HL}/	[wálô]	walô	‘cut off (PFV verb stem)’
L	/afɛt^{L}/	[àfɛ̀t^{h}]	afet	‘different’
L	/ibal^{L}/	[ìβàl]	ibal	‘dust’
L	/walo^{L}/	[wàlò]	walo	‘buy (PFV verb stem)’

Words which have the L tonal melody have low pitch throughout, e.g. *am* ‘house’ and *ibal* ‘dust’. Words which have the H tonal melody have high pitch throughout, e.g. *án* ‘arrow; bow’ and *séku* ‘bush knife’. The LH melody creates a rising pitch on the final stem syllable, while all preceding syllables (in polysyllabic words) are low, e.g. *mĕn* ‘string bag’ and *afĕt* ‘cleared of taboo’. The LHL melody produces a peaking pitch on the final stem syllable, while all preceding syllables (in polysyllabic words) are low, e.g. *klâ* ‘properly’ and *ibâl* ‘paper wasp’. Finally, the HL melody creates falling pitch on the final syllable, whereas all preceding syllables (in polysyllabic words) are high, e.g. *fê* ‘carrion’ and *usân* ‘tail’. For more information about the mechanisms of how tonal melodies are associated with the segments, see Fedden 2006; 2011: 46–83).

4. Tone as an inflectional exponent

The Mian verb has a wide range of inflectional categories for which the language could employ tone but does not. The following template of the Mian verb shows the inflectional categories in the language, including the morphosyntactic features person, number and gender, and the morphosemantic features tense, aspect and mood (in table 5).[6]

[6] Given the complexity of the Mian verb system, to keep matters manageable I exclude forms with a prefixal verbal classifier (Fedden 2011: ch. 5), forms in (tight) serialization with an auxiliary (Fedden 2011: 303–311), and forms containing object suffixes, which cross-reference recipients and beneficiaries (Fedden 2011: 269–271, 273–278). None of these forms are relevant to the issue at hand.

Table 5. Inflectional categories of the Mian verb ordered relative to the stem

(OBJ)[7]	Stem	TAM	SBJ[8]	(TNS)
na- '1SG.OBJ'	Σ	*-s* 'RPST'	*-i* '1SG.SBJ'	*-so* 'HPST'
ka- '2SG.OBJ'		*-nab* 'NPST'	*-eo~-eb* '2SG.SBJ'	*-bio* 'GPST'
a- '3SG.M.OBJ'		*-m* 'INCH'	*-e* '3SG.M.SBJ'	
wa- '3SG.F.OBJ'		*-n~-Ø* 'REAL'[9]	*-o* '3SG.F.SBJ'	
y(a)-~i- 'PL.OBJ'[10]		*-amab* 'IRR'	*-uo~-ob* '1PL.SBJ'	
		-b$^{(+H)}$ 'NHODPST'[11]	*-io~-ib* '2/3PL.SBJ'	
		-b/-l 'IPFV'		

All inflectional categories are realized by affixal morphology, the non-hodiernal past being the only inflectional category in which tone plays a role as an inflectional exponent. All finite verbs cross-reference their subject. A very small subset of the verbal vocabulary is lexically specified to also cross-reference the object with a prefix; hence the object prefix appears in brackets. The stem itself is followed by an obligatory slot which accommodates a whole range of tense, aspect, or mood (TAM) suffixes (Fedden 2011: 283). The tense slot after the subject suffix, on the other hand, can be empty. The tense suffixes *-so* 'hesternal past' and *-bio* 'general past', both in the post-subject slot, require the realis suffix *-n~-Ø* in the TAM slot, which precedes the subject suffix.

There are two alternative imperfective suffixes, *-b* and *-l*. Their semantics is identical. While *-b* is available for the inflection of all imperfective or biaspectual stems, *-l* is much more restricted and only available for a subset of these. While 152 verbs in the Mian corpus (Fedden, forthcoming) allow inflection for imperfective with *-b*, 18 of these (Fedden 2011: 319), or barely 12%, alternatively allow inflection for imperfective with *-l*.

Stem aspect is an important grammatical category in Mian because it has ramifications for further inflectional possibilities of a verb. Stem aspect determines whether a verb stem can be inflected for a given TAM category. Inflection with the non-hodiernal past suffix requires the verb stem to be either biaspectual or unequivocally perfective, whereas inflection with the imperfective suffix requires the verb stem to be either biaspectual or unequivocally imperfective. Biaspectual verbs do not show any inflectional restrictions.

The Mian stem aspect system is typologically noteworthy because of the wide range of morphological processes employed in aspect marking (Fedden, forthcoming). The means of aspect marking in Mian are both diverse and unpredictable. Some aspect pairs involve suppletive aspectual stems, e.g. *baa* 'say (PFV)' vs. *o* 'say (IPFV)'. Apart from suppletion, aspectual stems can be distinguished through one of nine different suffixes, e.g. *deilaˇ*

[7] There are only seven verbs which cross-reference their object with a prefix, namely *-tẽm'* 'see (PFV)', *-temẽ'* 'see (IPFV)', *-lô* 'hit, kill (PFV)', *-nã̆* 'hit, kill (PFV)', *-e* 'hit, kill (IPFV)', *-ntamã̆* 'bite (PFV)', and *-fũ'* 'grab (PFV)', all of which – with the notable exception of 'see' – are high on the transitivity scale (Hopper and Thompson 1980)

[8] The allomorphy in the subject suffix depends on the context. If an illocutionary clitic beginning in /b/ follows, e.g. declarative *=be*, the first allomorph is chosen, for example in the non-hodiernal past form *singa-b$^{(+H)}$-eo=be* 'you poured before today'. In all other cases the second allomorph is chosen, for example when a tense suffix is following, e.g. in the hesternal past form *singa-n-eb-so=be* 'you poured yesterday', under negation *singa-b-eb=ba=be* 'you are not pouring', or in adverbial clauses, e.g. *singa-n-eb kesoa* 'because you pour'.

[9] Realis verb forms show phonologically conditioned allomorphy. The suffix *-n* is chosen, if the verb stem ends in a vowel, which most do. For the minority of verbs which end in a consonant *-Ø* is used.

[10] The plural object prefix shows some idiosyncratic allomorphy. All verbs take *ya-*, except *-nâ'* 'hit, kill (PFV)', which takes *-i*, and *-e* 'hit, kill (IPFV)', which takes *y-*.

[11] In the remainder of this chapter, I cite the non-hodiernal past suffix as *-b$^{(+H)}$*, to clearly differentiate it from the imperfective suffix *-b*.

'remove hair (PFV)' vs. *dei* 'remove hair (IPFV)' or a stem change in the form of various apophony patterns, e.g. *ifa* 'serve food (PFV)' vs. *ifu* 'serve food (IPFV)'. Some verbs are monoaspectual, in that they lack a corresponding perfective or imperfective stem, e.g. *kaan* 'die (PFV)', which only has a perfective stem or *ei* 'fly (IPFV)', which only has an imperfective stem.

While the few word-class changing derivational affixes in the language are never associated with a tonal alternation the role tonal changes play in the perfective-imperfective stem derivations is minimal at best. For a small number of perfective-imperfective aspect pairs,[12] there is a tone change, in addition to either affixation or apophony, but it is hard to discern any patterns. Table 6 is an exhaustive list, grouped according to whether the tone is associated with the stem or is an affixal matter.

Table 6. Aspect pairs involving a tone change in addition to affixation or apophony

	PFV	IPFV	Gloss
Tone on stem	*dâ* [ⁿdâ]	*da-ka* [ⁿdàkʰà]	'break off'
	diki-la [ⁿdìkʰìlà]	*dîk* [ⁿdìk]	'do garden work'
	halbu-a [hàlbwà]	*halbû'* [hàlbû]	'fold'
	obtanâ [ɔpt̄ʰànâ]	*obtunu* [ɔpt̄ʰùnù]	'light (with fire)'
Tone on affix	*beta-lâ'* [ᵐbètʰèlâ]	*beta* [ᵐbètʰà]	'open'
	dei-lâ' [ⁿdɛ̀ilâ]	*dei* [ⁿdɛ̀i]	'remove hair'
	un [ùn]	*un-ê* [ùnê]	'go'
	went [wɛ̀nt]	*went-ê* [wɛ̀ntʰɛ̂]	'hear'

There is possibly a suffix *-ɛ̌* with peaking tone (LHL), which marks imperfective aspect, as for example in *wentɛ̌* 'hear (IPFV)' and *unɛ̌* 'go (IPFV)'. However, it is not the case that this tone is associated with imperfective aspect in general, since we also find *deilâ'* 'remove hair (PFV)' and *betalâ'* 'open (PFV)', where the same tone occurs in the perfective form. To conclude, there are not many cases which show a tone alternation to begin with, and for the ones that do, tone does not consistently mark either perfective or imperfective aspect.

In terms of distinguishability of non-hodiernal past and imperfective forms there are three types, which are summarized in table 7 below. Most verbs are either mono-aspectual, that is they lack the opposite stem, e.g. *kaan* 'die (PFV)', or they are part of an aspect pair with two distinct stems, e.g. *baa* 'say (PFV)' vs. *o* 'say (IPFV)'. Inflectional tone is consistently found in biaspectual verbs. Each of these three types is explained below.

[12] Namely, for a total of 16 out of 456 verbs in Fedden (forthcoming), i.e. barely 3%, forming 8 perfective-imperfective aspect pairs.

Table 7. Forms of the non-hodiernal past vs. the imperfective

	Stems		Non-hodiernal past	Imperfective
	PFV	IPFV		
Monoaspectual	*kaan*	—	*kaambebe* ‘he died’ [kʰàˀmbɛ̀βɛ̀]	—
	—	*ei*	—	*eibebe* ‘he’s flying’ [ɛ̀iβɛ̀βɛ̀]
Aspect pairs	*baa*	*o*	*baabibe* ‘I said’ [ᵐbàˀβìβɛ̀]	*obibe* ‘I’m saying’ [ɔ̀βìβɛ̀]
	ifa	*ifu*	*ifabibe* ‘I served’ [ìfàβìβɛ̀]	*ifubibe* ‘I’m serving’ [ìfùβìβɛ̀]
	deilâ’	*dei*	*deilâ’bibe* ‘I removed hair’ [ⁿdɛ̀ilâβìβɛ̀]	*deibibe* ‘I’m removing hair’ [ⁿdɛ̀iβìβɛ̀]
Inflectional tone	*singa*		*singabíbe* ‘I poured’ [sìŋàβíβɛ̀]	*singabibe* ‘I’m pouring’ [sìŋàβìβɛ̀]

Monoaspectual verbs may be perfective-only, i.e. lacking an imperfective stem. Consequently, there is no imperfective form, e.g. *kaan* ‘die (PFV)’ has the form *kaambebe* ‘he died before today’ in (5), which can only be a form of the non-hodiernal past. On the other hand, *eibebe* ‘he’s flying’ in (6), a form of the monoaspectual imperfective-only verb *ei* ‘fly (IPFV)’, can only be imperfective.

(5) kaan-b-e=be [kʰàˀmbɛ̀βɛ̀]
die.PFV-NHODPST-3SG.M.SBJ=DECL
‘He died before today.’ / *‘He is dying.’

(6) wan=e ei-b-e=be [ɛ̀iβɛ̀βɛ̀]
bird=ART fly.IPFV-IPFV-3SG.M.SBJ=DECL
‘The bird is flying.’ / *‘The bird flew before today.’

All aspect pairs have distinct perfective and imperfective stems, where the contrast is obvious, e.g. *baa* ‘say (PFV)’ forms *baabibe* ‘I said before today’ in (7), while *o* ‘say (IPFV)’ forms *obibe* ‘I’m saying’ in (8).

(7) baa-b-i=be [ᵐbàˀβìβɛ̀]
say.PFV-NHODPST-1SG.SBJ=DECL
‘I said before today.’

(8) o-b-i=be [ɔ̀βìβɛ̀]
say.IPFV-IPFV-1SG.SBJ=DECL
‘I’m saying.’

Biaspectual verbs like *singa* ‘pour’ can be inflected for non-hodiernal past or imperfective. Here, the inflectional high tone effectively differentiates non-hodiernal past from imperfective forms, e.g. *singa* ‘pour’ forms both *singabíbe* ‘I poured before today’ in (9) and *singabibe* ‘I am pouring’ in (10).

(9) singa-b-H-i=be [sìŋàβíβɛ̀]
pour-NHODPST-NHODPST-1SG.SBJ=DECL
'I poured before today.'

(10) singa-b-i=be [sìŋàβìβɛ̀]
pour-IPFV-1SG.SBJ=DECL
'I'm pouring.'

The distribution of the inflectional high tone in non-hodiernal past forms of such verbs, where homophony is never an issue, is more difficult to characterize. It seems that for many of these a form with high tone and a form without a high tone exist side by side, making them instances of optional multiple exponence in Caballero and Harris's (2012: 182–183) typology. So there are *baabibe* and *baabíbe*, both 'I said before today', with the pronunciations [ᵐbàˁβìβɛ̀] and [ᵐbàˁβíβɛ̀], respectively. While future systematic elicitation may help establish the extent of high tone occurrence in these forms, I also found substantial variation between speakers.

The origin of the inflectional tone in the non-hodiernal past cannot be reconstructed at this stage. We know that at least two other Mountain Ok languages have similar forms to what we find in Mian. Both Telefol (Healey 1964: 73) and Tifal (Boush 1975: 22) have an imperfective suffix *-b*. In addition, Telefol has a past perfective suffix *-b* and Tifal has a hesternal past suffix *-b*, both of which are likely cognates of the Mian form for the non-hodiernal past. However, we lack information on tone in these two past tense categories in Telefol and Tifal. The inflectional tone in the Mian non-hodiernal past likely developed through a process of grammaticalization, whereby segmental material was deleted and only a tone remained. During later stages of development the tone contrast was presumably maintained to avoid homophony between non-hodiernal past and imperfective aspect, but the contrast was consistently retained only in circumstances where the stem aspect system failed to disambiguate the forms.

5. Conclusion

Mian is first and foremost a lexical tone language. The main function of tone is to distinguish lexical meanings. The lexical tone system could have run parallel to a system of inflectional morphology perfectly well, which would have exclusively involved affixal morphology. Mian has a wide range of inflectional categories which are exclusively expressed by affixes. Yet tone serves to maximise the contrast between two sets of inflectional word forms, resulting in multiple exponence in the non-hodiernal past of biaspectual verbs, involving a suffix and high tone, and optional multiple exponence in the non-hodiernal past of all other verbs.

The restriction of tone as an inflectional exponent to such a tiny area of the grammar is typologically unusual. Looking at languages which use prosody in inflection, for example many African and Oto-Manguean languages, we typically find tone to be employed widely and not to be limited to a single category.

I propose that homophony avoidance is responsible for the synchronic situation in Mian. The language has exploited and continues to exploit a tone contrast that presumably has arisen spontaneously as a result of a grammaticalization process, in order to keep apart two TAM categories, which otherwise would be homophonous for a sizeable subset of the verbal vocabulary.

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Abbreviations
ART - article, DECL - declarative, IPFV - imperfective, M - masculine, NHODPST - non-hodiernal past, NPST - near past, OBJ - object, PFV - perfective, PL - plural, REAL - realis, RPST - remote past, SBJ - subject, SG - singular, TAM - tense/aspect/mood.

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Tonal inflection in Mande languages: The cases of Bamana and Dan-Gwɛɛtaa

Valentin Vydrin

1. Introduction

Mande is a mid-range language family (its time depth ranges between 5000 and 6000 years) presumably belonging to the Niger-Congo macrofamily. It comprises more than 70 languages. Practically all Mande languages are tonal, therefore the Proto-Mande language most probably was tonal too. Tonal systems of the modern Mande languages are very diverse in the number of tones, in the complexity of rules conditioning the passage of tones from the underlying level to the surface, in the role grammatical tone and a number of tonal morphemes; for a survey (although outdated in some points) see (Vydrine 2004).

It would be too ambitious and too bulky to display here the tone inflections in all the Mande languages (or even those whose tonal systems are sufficiently well studied to date), so, I will limit myself by presenting tonal systems and tonal inflections in two languages of the family, Bamana (Bambara) and Dan (the Gwɛɛtaa dialect), belonging to different branches of the Mande family (35% of cognates in M. Swadesh's 100-wordlist, which corresponds to more than 4000 years of independent existence). This presentation has a secondary task to show how different are these tonal systems, and therefore how risky it may be to refer to Mande tonal systems in general.

Bamana (also Bambara, Bamanankan, ISO 639-3 bam) is mainly spoken in the Republic of Mali by about 4,000,000 L1 speakers and up to 8,000,000 L2 speakers. Legally one of 13 "national languages" of Mali, Bamana is the major language of this country. It serves as lingua-franca everywhere, except for the North-Eastern part of the country. The official language of Mali is French, while "national languages" share among them mainly the oral sphere. However, it is also taught at a number of primary schools, there are several periodicals and an emergent literature in Bamana.

The Bamana language is represented by numerous local dialects displaying considerable divergences in what concerns the surface-level tonal and segmental realizations.[1] These divergences may result in serious difficulties in mutual intelligibility (or its lacking) among speakers of different dialects, despite the fact that their grammars and vocabularies are similar. However, mutual understanding is ensured by the existence of a pandialectal koine, Standard Bamana stemming from the dialect of Bamako (the capital of Mali). The Bamana data analyzed in this paper belongs to Standard Bamana.

Dan (also Yakuba, Gio, ISO 639-3 dnj) counts about 1,600,000 speakers mainly in Côte d'Ivoire and Liberia; there are also compact areas of Dan in Guinea.[2] It belongs to the Southern Mande group where it remains the biggest language, with relation to the number of speakers. Dan displays a considerable dialectal variation, which is typical of the languages of the forest zone: distant dialects may have up to 10% (or slightly more) of divergent vocabulary in the Swadesh's 100 wordlist (Vydrin 2009a) and be mutually unintelligible. At least two Dan language norms are being established in Côte d'Ivoire: the Western Dan, based on the Blo dialect, and the Eastern Dan, based on the Gwɛɛtaa dialect. In this paper, I

[1] See http://www-01.sil.org/SILESR/2000/2000-003/Manding/Bamana.htm.
[2] Cf. http://www-01.sil.org/SILESR/2000/2000-003/Dan-Tura-Mano_map.htm.

concentrate on the analysis of the Eastern variety spoken in the Goueta sousprefecture of the Tonkpi Province of Côte d'Ivoire.

In section 2, I analyze the Bamana tonal system. Its main features are: two levels with a downdrift and downstep; low tone is the marked one; the tonal compactness rule regulates a merger of adjacent tonal domains within syntactic groups of certain types; a floating low tone plays a role of a definite/referential article.

In section 3, Dan Gwɛɛtaa tones are analyzed. This language has 5 level tones; context changes of tones are quasi-nonexistent; there are numerous grammatical tonal modifications; in the majority of cases, it is the extralow which appears as a grammatical tone; an interpretation of extralow as a default tone can be suggested.

2. The tonal inflection in Bamana

Bamana, with its two level tones, belongs to the languages with a minimal tonal inventory (cf. Hulst (2012) who suggests to analyze all two-level languages in terms of accent, rather than tone). Unlike the majority of two-level languages, in Bamana it is not the high, but the low tone that is marked. Bamana has a rather high rate of lexical minimal pairs distinguished only by tones: in a dictionary numbering 11,423 entries, 697 pairs have been found, i.e. 1393 words, or about 12.2% of the vocabulary, among these, there is an overwhelming majority of the most frequent words of the language, in particular many auxiliary words. Bamana is an isolating language with an extremely scanty segmental inflectional morphology, which prevents it from combining segmental and tonal elements of inflectional paradigms, for such paradigms are simply missing. Unlike many other Mande languages (including Dan, see below), Bamana has no tonal inflectional markers erasing lexical tones, — unless we consider as tonal inflection the tonal compactness (see 2.1; this solution seems to me unnecessary). The only tonal inflection available is the article (reference/definiteness marker) represented by a floating. The purpose of this division is to describe the tonal system of Bamana and the role of the tonal inflection.

2.1. Basics of tonal phonology in Bamana

The tonal system of Bamana (and those of some closely related Manding varieties, very similar to Bamana) was subject of numerous publications, beginning with (Welmers 1949) and (Bird 1966). It was hotly debated since 1970s (Courtenay 1974, Creissels 1988, Creissels and Grégoire 1993, Creissels 2009, Dumestre 1987), and by now, it is more or less clear how this system works.[3] In what follows, I will display its main features, which is necessary for the understanding of the Bamana tonal inflection.

As mentioned above, Bamana has a two-level tonal system. At the surface level, there is a great variability of pitches which is due to the phenomenon of downdrift and contextual tonal modifications described below.

[3] There is also a formalist tradition of the study of Bamana tone represented mainly by American authors (Leben 2003, Weidmann and Rose 2006, Green 2010) intended to place the Bamana data into the framework of particular theories. In this paper, I am not going to discuss the formalist approaches to the Bamana tone.

2.1.1. Tonally dominant and tonally recessive syllables, tonal domain

Syllables in Bamana fall into tonally dominant and tonally recessive.[4] A tonally dominant syllable has a low or (by default) a high tone associated with it. A tonally recessive syllable inherits its tone from the preceding syllable; its surface tone can be also conditioned by the right context. A sequence consisting of a dominant syllable and the recessive syllables to its right (within a word or a tonally compact group), represents a tonal domain.[5]

(1) |dù̲lokoto| → *dùlòkòtò* 'produce blisters'
|mé̲leke| → *méléké* 'envelope'

Any word-initial syllable in a content word is dominant. All suffixes consist of recessive syllables. In most lexemes, it is the initial syllable only that is dominant, the others are recessive, so that the tonal domain coincides with the word. There are however some words that have non-initial dominant syllables. Such lexemes, which include more than one tonal domain, constitute 'minor tonal classes.' Among these, there are:

– prefixed and compound verbs:

(2) |lá|sè̲gin| → *lásègìn* 'return'
|kù̲nna|tì̲gɛ| → *kùnnátìgɛ̀* 'relieve of shame'
|mà̲|fá̲ra| → *màfárá* 'separate'
|dá̲la|té̲liya| → *dálátéliyá* 'force to speak quickly'

– certain nouns (less than 10% of the vocabulary):

(3) |jà̲n|kà̲mu| → *jǎnkàmù* 'black scorpion'
|fó̲gon|fò̲gon| → *fógónfògòn* 'lung'
|bì̲la|kò̲ro| → *bìlákòrò* 'uncircumcised boy'
|tá̲|sà̲len| → *tásàlèn* 'kattle for ablutions'

2.1.2. Low tone markedness.

Contrary to the general trend of tonal languages, it is the low tone that is marked in Bamana (Creissels and Grégoire 1993, Creissels 2009).[6] As it is said above, the low tone associated with a dominant syllable spreads to the right up to the end of its domain (most often, to the end of the word, if there is no other low tone dominant syllable on its way):

(4) |gɛ̀lɛnya| → *gèlènyà* 'grow difficult'

[4] Cf. Eric Campbell's paper on Zenzontepec Chatino (this volume) where tone bearing units similar (although not identical!) to the Bamana "tonally recessive" ones are analysed as "no tone morae". A crucial difference between the Zenzontepec Chatino "no tone morae" and the Bamana "tonally recessive syllables" lies in the fact that the former carries a default low tone in a "neutral" context which is ousted by the marked mid and high tones in certain contexts according to the predefined set of rules, while in Bamana, the "recessive syllables" have no tone of their own, their tonality always depends completely on the left or right context. Alternatively, the "recessive syllables" in Bamana could be termed as "no tone syllables" too.

[5] The vowels of tonally dominant syllables are underlined. A vertical bar subdivides a word into domains. The acute accent designates a high tone, and the grave accent stands for a low tone.

[6] Both publications deal with the Kita Maninka, however, the analysis is relevant for Bamana as well. I am not going to reproduce here Creissel's argumentation in favour of the low tone markedness.

A low tone spread to the right is curbed if it encounters another low tone associated with a syllable. In this case, a buffer high tone is necessarily inserted between the two low tones. The buffer high tone is associated with the final segment of the first low tone domain: its final mora (if the domain is equal to one syllable), its final syllable (if the domain includes more than one syllable), its final foot (if the domain includes two feet or more).

In (5a), the first domain consists of only one syllable *ma*, and the buffer high tone is assigned to the second mora of the first syllable, so that the syllable acquires a rising tone. In (5b), the first domain covers two syllables, *kun-na,* and the buffer high tone is assigned to its final syllable. If a dominant syllable is not assigned a low ton, it acquires, by default, a high tone which spreads to all the subsequent recessive syllables of the domain, whatever may be the tone of the following domain (in 5c-d, this process can be also regarded as an insertion of a buffer high tone at the end of the high-tone domain, the result is the same).

(5) a. |mà|dòn| → *mădòn* 'approach'
b. |kùnna|sìri| → *kùnnásìrì* 'be ashamed'
c. |bólo|bán| → *bólóbán* 'get ruined'
d. |bólo|kò| → *bólókò* 'pass initiation'

It can be therefore said that in Bamana, two adjacent low tone domains are separated by a high tone.[7]

2.1.3. Tonal compactness

Certain types of syntactic constructions are subject to the rule of 'tonal compactness'. In a tonally compact construction, all the domains, except the initial one, are eliminated, and the initial domain extends up to the right boundary of the construction. If the resulting domain carries the low tone and is followed by another low-tone element, its final component is assigned a high tone.[8] The following constructions are tonally compact:

– the attributive construction, "noun + simple adjective":[9]

(6) |mìsi| 'cow' + |bìlen| 'red' + ` ART → *mìsì bílén-`* 'red cow'
|só| 'house' + |bìlen| 'red' + ` ART → *só bílén-`* 'red house'

The entire sequence represents one tonal domain, so that its final dissyllabic segment, *bilen,* followed by a floating low tone of the article (see below), is assigned a buffer high tone (if the tonal compactness rule were not applied, the tonal contours would be **mìsí bìlén-`, \*só bìlén-`*);

– the determinative construction, "dependent noun + head noun":

(7) a. |mùso| 'woman' + |sèn| 'foot/leg' + ` ART → *mùsò sén-`* 'feminine foot/leg'

[7] There are in fact some exceptions: the infinitive marker *kà* and the 3SG pronoun *à* always appear with low tone, without any rising, even when followed by another low-tone word.

[8] Tonal compactness in Manding resembles, at least externally, the tonal transformation in Shanghai, as described in (Yip 2007: 242).

[9] More precisely, focalized adjectives derived from qualitative verbs by the means of the suffix *-man* also form tonally compact groups with their head nouns: |*só*| 'hous' + |*fin-man*| 'black' → *só finmán* 'the house (which is) black'. Adjectives derived with other suffixes behave as tonally autonomous.

b. |kámalen| ‘young man’ + |sèn| ‘foot/leg’ + ` ART → *kámálén sén-`* ‘young man foot/leg’

Note that without the tonal compactness rule, the tonal contour would be **mùsó sěn-`, *kámálén sěn-`*.

– the preverbial construction, “preverbal adverb + verb”:

(8) |sɛ̀bɛkɔrɔ| ‘seriously’, |dɔ́gɔya| ‘humiliate’

à	*yé*	*à*	*mùsó-`*	*sèbɛ̀kɔ̀rɔ̀*	*dɔ̀gɔ̀yà*
3SG	PFV.TR	3SG	woman-ART	seriously	humiliate

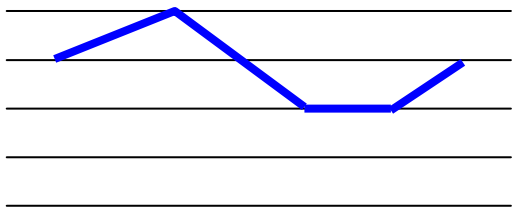
‘He seriously humiliated his wife.’ (rather than **… sèbɛ̀kɔ̀rɔ̀ dɔ́gɔ́yá*)

2.1.4. Downdrift

The downdrift in Bamana follows a typical model: the range of rising in the sequence “Low – High” is roughly a half of the range of lowering in the sequence “High – Low”. As a result, a high tone at the end of a sentence may be realized at the same level as a sentence-initial low tone, or even below that level:[10]

(9)

À	*tɛ́*	*sìgì*	*só*	‘He does not stay at home.’
3SG	IPFV.NEG	sit	home	



2.2. Tonal inflection in Bamana: The floating low tone as the definite/referential article

The only tonal inflection in Bamana is a definite (or referential) article. It is realized primarily on the tonal domain following the NP with which the article is associated: if the following domain carries a high tone, this high tone becomes downstepped. This phenomenon is usually described by postulating that the definite/referential NP is followed by a floating low tone, which interacts with the tone of the following domain.

It should be also noted that the floating low tone is suffixed to a noun or to an attribute (in other words, to the rightmost element of a noun phrase of the structure N + Atr).[11] Despite

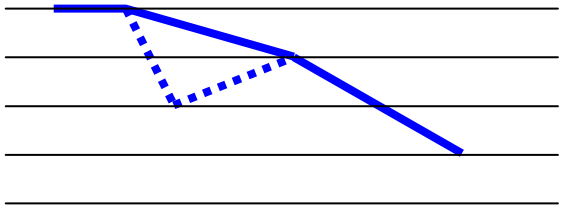
[10] This is the way the Bamana downdrift is most often represented in grammars. In fact, the reality is more complicated: as a rule, the phrase-initial low tone is realized very low, and the subsequent high tone rises very high; then follows a sharp drop. As a result, the first high tone in a sentence becomes very proeminent, while all subsequent tonal fluctuations are considerably less significant in amplitude. However, for the purposes of this paper, these peculiarities (most probably, of intonative nature) are of no crucial importance, and we can abstract ourselves from these details.

[11] In some theoretical approaches, the term “article” is applied only to syntactic words, and not to affixes. However, other approaches are possible as well, where affixes can be regarded as articles too. There is a long tradition of treating inflectional affixes as articles in such languages as Swedish, Rumanian, Bulgarian, Literary Arabic, and many others. In Manding languages, the tonal (in Bamana, Maninka, Jula) or segmental (in Mandinka, Xasonka, Marka-Dafing) grammatical morpheme of definiteness is most often referred to as “article”, although sometimes, descriptive definitions are used (e.g., “marqueur de détermination nominale” ,

the fact that it has no segmental support, it represents a tonal domain of its own. See example (10), where the high tone of *té* goes down a notch in relation to the high tone of *jégé*.[12]

(10)

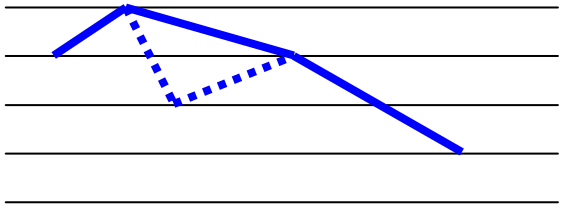
Jégé-`	*té*	*yàn*	'The fish is not here.'
fish-ART	NEG.be	here	



If the domain preceding the tonal article is low-tonal, a buffer high tone is necessarily inserted at its end, just before the floating low tone (following the rule of "low tone markedness"), see (11).

(11)

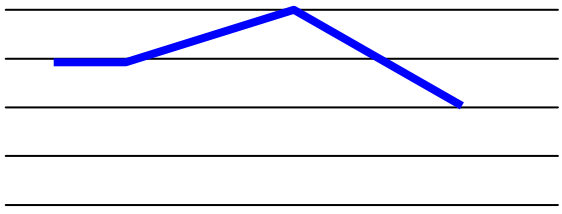
Mùsó-`	*té*	*yàn*	'The woman is not here.'
woman-ART	NEG.be	here	



In the absence of a floating low tone, the tonal contour of the phrase is very distinctly different, cf. (12).

(12)

Mùsò	*té*	*yàn*	'There is no woman/there are no women here.'
woman	NEG.be	here	



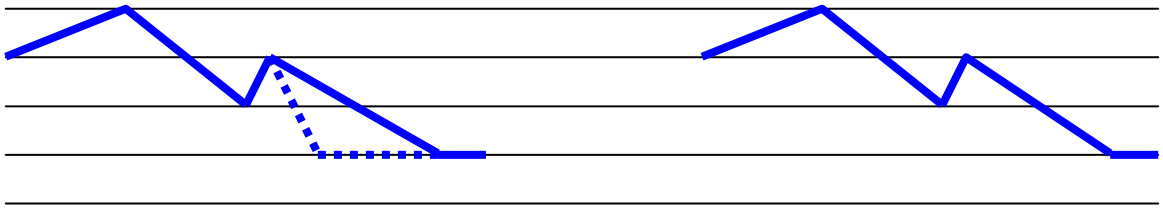
The floating low tone is neutralized if the following word begins with a low tone. In this context, presence of absence of the tonal article cannot be observed at the surface level. Therefore, sentences (13.a), where *fàli* 'donkey' carries an article, and (13.b), where it has no article, are homonymous:

Creissels and Sambou 2013:17). In this paper, I will keep the term "article", in line with the predominant Mandeist tradition.

[12] The dotted line shows an underlying contour of the floating low tone.

(13.a)

À	*má*	*fàlí-`*	*bùgɔ̀*
3SG	PFV.NEG	donkey-ART	hit



'He didn't hit the donkey.'

(13.b)

À	*má*	*fàlí*	*bùgɔ̀*
3SG	PFV.NEG	donkey	hit

'He didn't hit donkeys / a donkey.'

In the texts, nouns appear most frequently with the article. Here are some contexts where forms with and without the article can be differentiated:

– under negation (11 and 12; 13a and 13b) or under question;
– a determinative (14.a) and a possessive inalienable (14.b) noun constructions:

(14.a)

mùsò	*sén-`*
woman	foot/leg-ART

'a/the feminine foot/leg'

(14.b)

mùsó-`	*sɛ̌n-`*
woman-ART	foot/leg-ART

'a/the woman's foot/leg.'

– evidential opposition of a non-firsthand (non-visual) information (15.a) vs. firsthand (visual) information (15.b) in the progressive:

(15) a.

Ń	*dɔ́gɔ́kɛ́-`*	*bɛ́*	*kàlàn-nà*	*Fránsí*
1SG	younger.brother-ART	COP	learn-NONVIS	France

'My younger brother makes his studies in France.' (and I'm in Mali)

b.

Ń	*dɔ́gɔ́kɛ́-`*	*bɛ́*	*kàlán-`*	*ná*
1SG	younger.brother-ART	COP	learning-ART	PP

'My younger brother is studying.' (and here is he with a book)

In the construction of non-firsthand information (15.a), the verb appears with the suffix *-la* (the *-na* form is used when the preceding vowel is nasal) which is tonally recessive (it inherits its tone from the verb). The firsthand information construction 15.b) is technically non-verbal: the verb is nominalized and appears with the tonal article, it is followed by the locative postposition *ná* which carries a downstepped high tone.[13]

ORIGIN: the tonal article in Bamana comes back to the segmental article **-ò*. This form is still attested in numerous varieties spoken on the geographic periphery of the Manding area: Mandinka, Xasonka, Worodugukan, Marka-Dafin, some Kagoro dialects. Some traces of the segmental article *-ò* can be found even in some eastern dialects of Bamana, e.g., the dialect of Bore (Давыдов 2011). In its turn, **-ò* comes back to an anaphoric pronoun / remote demonstrative determinant **ò ~ *wò* (its reflex in modern Bamana is *ò*).

[13] This construction seems to be the only one in Bamana where this *-la*-form can be used. However, in closely related Manding varieties, such as Maninka of Kita (Creissels 2009), Mandinka (Creissels and Sambou 2013: 125-131), Standard Maninka of Guinea, an analogous form is much more current and appears in various contexts; it can be interpreted in those varieties as an infinitive. The suffix *-la* goes back to the locative postposition *-lá,* the same as in the "visual construction" (21b). Therefore, the difference between both constructions is not fortuitous; in fact, they represent one and the same construction at different stages of grammaticalization.

3. **The tonal inflection in Dan-Gweɛtaa**

The tonal system of Dan-Gweɛtaa is radically different from that of Bamana: a great number of contrastive tones; almost non-existent contextual modifications of tones; no differentiation into dominant and recessive syllables; a considerable number of inflectional tonal morphemes in all major segments of grammar: verb, noun, auxiliaries.

3.1. Basics of tonal phonology in Dan

Dan-Gweɛtaa has five level tones (*á̋* extra-high – *á* high – *ā* mid – *à* low – *à̏* extra-low) and three modulated tones (all are falling: *ä̋* extra-high-falling – *â* high-falling – *ā̂* mid-falling). In the tonological studies, existence of true five-level tonal systems are often treated with certain distrust,[14] therefore, I am illustrating the tone contrasts in table 1.

Table 1. Minimal series demonstrating contrast of five level tones in Dan-Gweɛtaa

Extra-High		*dɛ̋* ‘leaves’		*gbą̋* ‘foot, leg’	*káą́* ‘scabies’	*yá̋* ‘yams (sp.)’
High		*dɛ́* ‘other’	*gɔ́* ‘miss sb.’		*káá* 2PL NEG, PRESTV	*yá* 1PL.EXCL PRF
Mid	*dɩ̄* ‘taste’		*gɔ̄* ‘venerable’	*gbą̄* ‘wing’	*kāā* 2PL PROSP	*yā* ‘here’
Low		*dɛ̀* ‘how many’	*gɔ̀* ‘husband’	*gbą̀* ‘ceiling’	*kàà* ‘scratch’	*yà ~ yà̏* 3SG of PRF
Extra-Low	*dɩ̏* ‘disappointment’	*dɛ̏* ‘call’	*gɔ̏* ‘grass shed’	*gbą̏* ‘go in’ (sharp object)	*kàà̏* ‘reed’	*yà̏* ‘sit down’
High-Falling				*gbą̂* ‘uproar’		*yâ* ‘badly’
Mid-Falling	*dɩ̄̂* ‘hunger’					

Modulated lexical tones, especially Extrahigh-Falling (*tīītiɖɛ̏* ‘extremely black’, *zīīziɖɛ̏* ‘extremely ancient’) and Mid-Falling are rare. Because of their rarity, the phonological status of lexical modulated tones (single tones or combinations of level tones) is difficult to be determined. An argument in favour of a bi-tonemic interpretation of the modulated tones is the fact that falling tones in Dan-Gweɛtaa also result from combination with an extralow tonal suffix which serves as the infinitive marker (see 3.2).

The domain of a tone is the syllable. Another important rhythmic unit in Dan is the metric foot (cf. in particular (Vydrin 2010a)): there are numerous restrictions on combinations of tones within this unit (see 3.1.2). There are in Dan light feet (V, CV), heavy feet (CVV, CVŋ, CVVV, CVVŋ, ClVŋ, ClVV) and extraheavy feet (CVVV, CVVŋ). Contextual changes of tones are very few (and they will not be discussed in this paper).

[14] Cf. for example in (Yip 2007: 231): “it is possible to contrast up to four <...> and probably five <...> different level tones”.

3.2. Is there a neutral tone in Dan-Gwɛɛtaa?

In tonological studies, one can find statements as the following one: "In a three-tone language, neutralization of tonal contrasts by tone deletion will be to M" (Odden 1996: 21). Let us see if the same trend is valid in a five-level language. In Dan-Gwɛɛtaa, there seems to be no clear cases of tonal neutralization. However, the following facts can be considered in this relation:

1) In heavy feet, there are rather strict restrictions on tonal combinations:

– all combinations of identical initial and final tones are allowed (cf. the *kaa* series in the table 1);
– all combinations with the final extralow tone are possible: *flɛ́ɛ̀* 'kernel of a nut', *fa̰à̰* 'hat', *dɔ̃ɔ̃ŋ̀* 'citrus fruit', *kɛ̀ɛ̀* 'after' (the latter pattern, Low-Extralow, is relatively rare);
– combinations "mid-high" and "mid-extrahigh" are allowed, although both are much less frequent than those with final extralow tone: *sa̰a̰ŋ́* 'star', *yɛ̄ɛ́* 'cotton'.

Other tonal combinations are extremely rare (Low-Extrahigh: *wɛ̀ɛ́-dɛ̄* 'a round dance'; Mid-Low: *sūà* 'falsehood'; etc.). The combinations of tones in the feet are represented in the Table 2.

Table 2. Combinations of tones in the feet in Dan-Gwɛɛtaa.

1 \ 2	EL	L	M	H	EH
EH	+	--	--	--	+
H	+	--	--	+	--
M	+	(rare)	+	+	+
L	+	+	--	--	(rare)
EL	+	--	--	--	--

The three modulated tones in Dan-Gwɛɛtaa (mentioned in 3.1.1) reproduce the most frequent tonal patters of the heavy feet; all end in extralow tone. An extraheavy feet, as a rule, cannot carry more than two different tones (e.g., *gbíɔ̃̀ɔ̃̀* 'pregnancy', *dūɔ̃̀ɔ̃̀* 'younger maternal uncle').[15] Their tonal patterns are the same as those of the heavy feet.

2) Among the tonal morphemes described below, the most grammaticalized ones (and, at the same time, those whose origins are the most difficult to trace back) are those of the neutral aspect, the conjoint form of the verb, the infinitive, the nominalization, and the izaphet. Of these, three are represented by the extralow tone, and one (the tonal modification of the conjoint form) is represented by a tonal lowering (to the extralow or low, rarely to the mid tone), which can also be interpreted as a result of amalgamation of the tone of the stem with an extralow-tone morpheme.

With all necessary reservations, one can suggest the interpretation of the extralow tone in Dan Gwɛɛtaa as a default one. If so, one could speak of oppositions of the lexical tones (in their diversity) to the uniforme (extralow) grammatical tones, and that of the diverse foot-initial tones (a strong position) to the final tone (either the same as the initial, or extralow).

[15] The only exception seems to be a Manding borrowing *gbàúù̀* 'kitchen' (from Jula *gbà-búgú*`).

3.3. Tone as an exponent of inflection[16]

3.3.1 Infinitive

The infinitive is marked by a syllable-final tonal modulation of the verbal stem.[17] Cf. (16a), where the verb *dɑ̃* 'save' is used in the construction of perfect with its lexical tone, and (16b) where it appears in the infinitive form. In both tomograms in figures 1 and 2, the verb *dɑ̃* is indicated with cursors; the tonal drop at the end of the verb is clearly visible in (16b)):

(16.a) *Bɛ́* *ɤ́* *dɤ́,* *yɤ̀* *ɤ̄* *dɛ̀* *dɑ̃*
human\EMPH REL.3SG.JNT be 3SG.OPT REFL.SG self save
'Every man for himself!' (Sauve qui peut!)

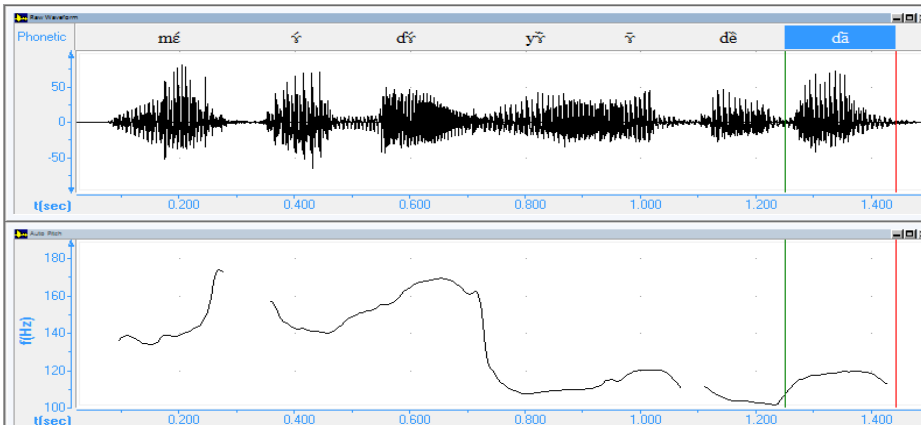


Figure 1. Tomogram of example 16.a

(16.b) *Ká* *wǫ́* *sʌ̀* *kʌ̄* *Zlə̀ə̀* *dɔ̀* *kā* ***dɑ̃-'***
2PL.PRF matter good do God go\NEUT 2PL.NSBJ **save-INF**
'If you do good deeds, God will save you.'

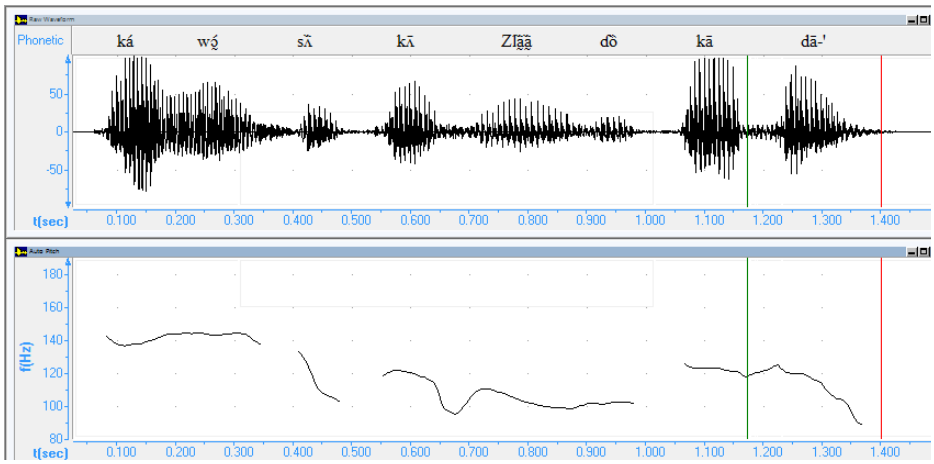


Figure 2. Tomogram of example 16.b

[16] Tone also serves in Dan-Gwɛɛtaa to express degrees of intensity of adjectives (often in combination with plurality), e.g.: *dɤ̋ɤ̋dɤ̀ɤ̀* 'round' — *dɤ̋ɤ̋dɤ̋ɤ̋* 'very round' (pl.). However, formation of the intensive forms belongs rather to the derivation than to inflection, so, it will not be analyzed here.
[17] Designated here by an apostrpohe.

ORIGIN: The infinitive marker seems to come back to the same **6ə̃̀* or **6ə̀* postposition as the neutral aspect marker (see below); it represents another cycle of grammaticalization of this postposition (Vydrin 2012).

3.3.2. Inflections of pronominal predicative markers (or auxiliaries)

The basic word order in a verbal phrase is (S) AUX – (DO) – V, where S is a subject (optional), AUX is an auxiliary word whose root expresses person and number, and the inflection expresses TAM and polarity; DO is a direct object which is obligatory in the transitive constructions and impossible in intransitive ones; V is a verbal predicate. The inflections within AUXs are very often expressed either by tones only, or simultaneously by tonal and segmental modifications of the stems, cf. table 3.[18]

Table 3. Pronominal predicative makers in Dan-Gwɛɛtaa.

	Singular				Dual		Plural			
	1	2	3	Log.	INCL	1.EXCL	1.INCL	2	3	Log.
Existential	*ā*	*ī/ūū*	*yɤ̀/yɤ̀*	*ɤ̄*	*kō*	*yī*	*kwā*	*kā*	*wɔ̀*	*wō*
Conjoint	*á*	*í/úú*	*Ø/ɤ́/yɤ́*	*ɤ́*	*kó*	*yí*	*kwá*	*ká*	*wó*	*wó*
Optative	*á*	*í/úú*	*Ø/yɤ̀*	*ɤ́*	*kó*	*yí*	*kwá*	*ká*	*wɔ̀*	*wɔ́*
Perfect	*6ą́*	*6á*	*yà/yə̀*	*yá*	*kó*	*yá*	*kwá*	*ká*	*wà/wə̀*	*wá*
Prohibitive	*6ą́*	*6á*	*yá*	–	*kó*	*yá*	*kwá*	*ká*	*wá*	–
Prospective	*6ą̄ą̄*	*6ii*	*yɤ̄ɤ̄*	–	*kōō*	*yii*	*kwāā*	*kāā*	*wōō*	–
Presumptive	*6ą̀ą̀*	*6āə̀*	*yāə̀*	–	*kōɔ̀*	*yāə̀*	*kwāə̀*	*kāə̀*	*wāə̀*	–
Neg. Imperfective	*6ą́ą́*	*6áá*	*yáá*	–	*kóó*	*yáá*	*kwáá*	*káá*	*wáá*	–
Neg. Perfective	*6i̱í̱*	*6íí*	*yíí*	–	*kóó*	*yíí*	*kwíí*	*kíí*	*wíí*	–
Imperative	–	*Ø/6ɤ̀*	–	–	*kɔ̀*	–	*kwə̀*	*kə̀*	–	–

Existential, optative and conjoint sets differ only in tones; the same is true for the sets of the perfect and prohibitive, presumptive and negative imperfective. Diachronically, these sets result from fusion of subject pronouns with auxiliaries.

3.3.3. Neutral aspect marker on the verb

In modern Dan-Gwɛɛtaa, the neutral aspect is marked on the verbal root (which usually coincides with a metric foot) by an extra-low tone (replacing the lexical tones).[19] Cf. (17a), where the verb *wɛ́* 'speak' appears with its lexical tone, and (17b) where it is used in the construction of neutral aspect:

(17.a) *Yà* *wɛ́* *ɤ̄* *yu̱ú̱dɤ̄*
3SG.PRF speak REFL.SG nose.LOC
'He has snuffled.'

(17.b) *Yɤ̀* *wɛ̀* *ɤ̄* *yu̱ú̱dɤ̄*
3SG.EXIST speak\NEUT REFL.SG nose.LOC
'He snuffles.'

[18] For reasons of space, I cannot delve here into detailed description of grammatical semantics and functions of the predicative pronominal markers.
[19] For the details on the neutral aspect in Dan-Gw□□taa see (Vydrin 2010b).

ORIGIN: The neutral aspect extra-low tone morpheme comes back to a locative postposition **bə̀̃* or **bə̀* which first grammaticalized into an imperfective marker (via the stage of an infinitive or supin marker). In more detail, see (Vydrin 2012).

3.3.4. Conjoint status marker

The "conjoint" (dependent) status of the verbal construction is marked by the tone lowering of the root morpheme (a metric foot) of a verb; the conjoint form of a verb is necessarily preceded by a predicative marker of the conjoint set (see above). This marker appears in dependent clauses, after a focalized NP (18b), in consecutive constructions, and in some other contexts. Cf. (18a), where the verb appears with its lexical tone:

(28.a) *Gwʌ̀ yà* ***glūūūŋ̄***
stone 3SG.PRF roll
'The/a stone has rolled.'

(28.b) *Gwʌ̀ də̀ʌ̀ ɤ́* ***glùùùŋ̀***
stone FOC REL.3SG.COJNT roll\COJNT
'It is a stone that is rolling.'

The pattern of the lowering depends on the lexical tone of the verb and on the metric foot structure. There is no single rule for all the verbs; there are rather several classes of verbs, each of them follows a rule of its own, e.g. in (19), (altogether, 13 models of tonal change are available).

(19) *dĭ̋ʌ̋ʌ́* → *dĭ̀ʌ̄ʌ̄* 'mash (fruit)'
bə̀ʌ́ŋ́ → *bə̀ʌ̀ŋ̀* 'swallow'
gí̋ə̋ → *gì̀ə̀* 'grow overripe'
dɔ̄ŋ̄ → *dɔ̀ŋ̀* 'count'
kplǣæ̀ → *kplæ̀æ̀* 'grow thin', etc.

ORIGIN: The tonal lowering (the marker of the conjoint status marker) may originate in a segmental suffix whose form cannot be reconstructed at the present state of our knowledge.

3.3.5. Tone as an exponent of the izaphet marker[20]

In certain types of inalienable possessive nominal constructions, the extra-low tone (replacing lexical tones) on the root morpheme of a noun is used as the izaphet marker. Cf. ungrammatical **dū wɔ́* and an NP with a different meaning *gɤ̀ɤ̀ dǔ́* 'trunk of iroko tree.'

(20) *dū wɔ̀̃*
magic matter\IZF
'sorcery' (*wɔ́* → *wɔ̀̃*)

(21) *gɤ̀ɤ̀ dùù*
iroko tree\IZF
'iroko tree' (*dúú* → *dùù*)

[20] Izaphet is a head marking in nominal constructions.

Application or non-application of this tonal inflection is influenced by several factors which look rather as tendencies than as rules (in fact, they are not yet utterly clear):

– words with generic meanings are more inclined to carry the izaphet marker: *ɓɛ̰̄* 'human being', *dɛ̄* 'woman', *bʉ́ʉ́* 'wilderness', *ɓláà* 'farm, field', *dīāŋ̄* 'talk, speech', *dʉ́ʉ́* 'tree' etc. have the izaphet form (respectively *ɓɛ̰̀, dɛ̀, bʉ̀ʉ̀, ɓlàà, dīàŋ̀, dʉ̀ʉ̀*), while many other nouns with more specific meanings do not;

– if the two nouns in the construction are in the PART – WHOLE relation, the izaphet marking is absent (22a, 23a). If the relation can be described as "the first noun equals the second one", the izaphet marker is present (22b, 23b):

(22) a. *bāā dʉ́ʉ́* 'cassava stem',
b. *bāā dʉ̀ʉ̀* 'cassava plant' (*dʉ́ʉ́* 'tree')

(23) a. *bīɤ̄ sɔ̰́* 'elephant tusk' (*sɔ̰́* 'tooth, tusk'; **bīɤ̄ sɔ̰̀* would be ungrammatical)
b. *bīɤ̄ wʉ̀ʉ̀* 'elephant's carcass', 'elephant's body' (*wʉ̄ʉ̄* 'meat');

– application or non-application of the izaphet tonal morpheme may depend on rhythmic factors, such as position of the construction in the sentence.

Most probably, the izaphet (extra-)low-tone morpheme should be reconstructed already for the Proto-South-Mande level: similar tonal morphemes are attested in other varieties of Dan (Макеева 2012), in Mano and Guro. Related phenomena are also found in some Southwestern Mande languages and in Susu (Green, Anderson and Obeng 2013), which can be viewed as an argument in favour of even more ancient origin of this tonal inflection.

3.3.6. Nominalization

When a verb is nominalized together with its indirect object or cicumstant (which keeps its post-verbal position), the lexical tone of the verb is substituted by an extralow tone which can be regarded as a nominalization marker:

(24) *yí* ***tɔ̀*** *ká* *ɓīʌ́gā*
water draw\NMLZ with creeper
'rope for drawing water' (cf. *tɔ́* 'draw (water)')

(25) *N̄* *tɔ́ɔ́ŋ̀-dʌ̄* *yʊ̄* *yɤ̀* ***dɔ̰̀ŋ̀*** *síʔāā-sʉ̀ʉ̀* *ká*
1SG.NSUBJ namesake-father nose 3SG.EXIST STICK\NMLZ land.sub-ger with
'My friend has a flat nose' (lit. "My friend's nose is stuck to the earth", cf. *dɔ̰̀ŋ̀* 'stick').

ORIGIN: This tonal infection can be probably reconstructed for the proto-language of the Mano-Dan-Tura subgroup: at least in one other language of the subgroup, Mano, a low-tone morpheme is available whose semantics and usage is exactly the same as the nominalization tonal morpheme in Dan-Gwɛɛtaa (Khachaturyan 2014).

3.3.7. Case in locative nouns

There is a subclass of nouns, the so-called locative nouns, which have developed a declension system comprising six cases: common, locative, inessive, subessive, adessive, comitative. The declension patterns are highly irregular. Most nouns have only two cases (usually, the common and the locative case). Not a single locative noun has all six case forms. Different cases are formed by using a whole number of formal means: suffixes, final vowel copying, vowel modification, tonal modifications. The latter case is illustrated by examples (26–29), where cases are expressed by tones: mid or extrahigh for the comitative case (26, 28), extralow for the subessive case (27, 29).

(26) *Yà* *gwą̄nʌ́* *zʌ̄* ***gę̄ę̄ę̄***
3SG.PRF cat hit foot/leg.COM
'He has kicked a cat.'

(27) *Yà* *dɔ̄* *ɤ̄* ***gę̏ę̏ę̏***
3SG.PRF stand REFL.SG foot/leg.SUB
'He has got up.'

(28) *Yɤ̏* *zụ̏* *kpę́ŋ́-dɤ̄* *n̄* *yą́ą́*
3SG.EXIST reach\NEUT ouside-LOC 1SG.NSUBJ eye.COM
'He has got out in my presence.'

(29) *Sūʌ́ʌ́* *yà* *dɔ̄-'* *yą̏ą̏*
sty 3SG.PRF put-3SG.NSUBJ eye.SUB
'He has got a sty on his eye.'

The locative nouns are not very numerous: in my Dan-Gwɛɛtaa dictionary (version from June 2014 containing 2775 lexemes), there were 53 of them (without toponyms). There are five locative nouns that differentiate case forms by tones only, see table 4.

Table 4. Locative nouns with case forms differentiated only by tones

COMMON	LOCATIVE	INESSIVE	SUBESSIVE	ADESSIVE	COMITATIVE
gɛ̄ŋ̀dɛ̀	gɛ̄ŋdɤ̄		gɛ̏ɛ̏		gɛ̄ɛ̄
'foot, leg'	'at the feet'		'on the feet'		'with/by the feet'
yą̄		yą́ą́ŋ́	yą̏ą̏		yą́ą́
'eye'		'in the eyes'	'on the eye'		'before the eyes of'
kó		kőő	kwʌ́ʌ̀		kwʌ́ʌ́
'each other'		'in each other'	'together'		'together'
kɔ̀			kwɛ̀ŋ̀, kwɛ̀ɛ̀	kɔ̀ɔ̀	kɔ̄ɔ̄
'hand'			'in the hands of'	'on the hands of'	'with a hand'
zɪ̄ą̄ą̄				zɪ̏ą̏ą̏ ~ zɪ̄ą̄ą̄ tà	
'road'				'at the road, on the road'	

ORIGIN: The declination of "locative nouns" in Dan-Gwɛɛtaa stems from a fusion of noun stems with postpositions. The tonal contrasts among the case forms reflect the original lexical tones of the postpositions. So, the non-low tone of the comitative case can be explained through the high tone of the comitative postposition *ká,* and the extralow tone of the

subessive case is inherited from the subessive postposition *bà*. For more details, see (Vydrin 2011).

4. Concluding remarks

Although both languages belong to one mid-range family, the tonal systems of Bamana and Dan-Gwɛɛtaa seem totally different, cf. table 5.

Table 5. Comparison of characteristics of the tonal systems of Bamana and Dan-Gwɛɛtaa

	Bamana	Dan-Gwɛɛtaa
Number of tones	2	5 (+ 3 modulated)
Downdrift & downstep	+	–
Contextual changes of tones	very much	minimal
Max. size of tonal domain	Unlimited (a tonally compact unit)	syllable
Number of tonal inflections	1	numerous
Character of realizations of tonal inflections	downstep & contextual modifications to the right	substitution of the lexical tone

There are two factors that can explain this divergence. The first one is just the time distance: as is proved by the history of better documented languages (especially those of East Asia), 4000 years (and even less) of independent evolution is quite enough to let tonal systems transform radically. The second factor is the areal influence: among all South Mande languages, Dan seems to be the most influenced by Kru languages whose typical characteristics are the polytony and multiple grammatical tones (Bearth and Link 1980; Vydrin 2009b). Bamana (and other languages of the Manding group), to the contrary, has a long history of contacts with non-tonal languages (Pulaar-Fulfulde, Wolof) or two-tone languages which tend to evolve towards accent-like systems. This environment was less conductive to the complication of its tonal system and grows of the functional load of tones. However, this tendency by itself does not exclude retention or emergence of tonal inflections: Bamana rather represents an extreme case, a language where the presence of tonal inflections is minimized, while in other two-level tonal languages of the Mande family it may be more prominent.

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Abbreviations: ART – definite/referential article (floating low tone); CMM – common case; COM – comitative case; COP – copula; EMPH – tonal marker of the emphatic definite form; EXCL – excusive; EXI – existential pronominal predicative markers; FOC – focalization particle; H – high tone; INCL – inclusive; INF – infinitive tonal inflection; intens. – intensive; IPFV – imperfective; IZF – izaphet tonal inflection; JNT – conjoint pronominal predicative markers; conjoint tonal inflection; L – low tone; LOC – locative case; M – mid tone; NEG – negative; NEUT – neutal aspect tonal inflection; NMLZ – nominalization; NONVIS – non-visual (non-firsthand); NP – noun phrase; NSBJ – non-subjective pronominal set; PFV – Perfective; PL – plural; PP – postposition; PRESTV – presentative; PRF – perfect;

PRH – prohibitive; PROSP – prospective; REFL – reflexive pronoun; REL – relativization marker; SG – singular; SUB – subessive case; supint. – superintensive; TR – transitive

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PART 2

Tone and inflection:
Insights from the Oto-Manguean languages

A typology of tone and inflection: A view from the Oto-Manguean languages of Mexico

Enrique L. Palancar

1. Introduction

Tone is well-known for playing a role in the makeup of inflection, but the literature has not yet produced a comprehensive typology of the relation between tone and inflection from a morphological perspective. There are various reasons for this. On the one hand, the interest in the morphological side (i.e. the form) of inflection has lain outside the general spotlight of linguistic typology, which, except for the Surrey Morphology Group, has been mainly concerned with trying to make sense of linguistic structure in functional terms. I show here that in most situations where tone is involved in inflection it is difficult, if not impossible, to give it a clear-cut morphosyntactic function.

On the other hand, our understanding of how tone works is relatively recent and the emphasis of its study has been on its phonological nature and on how it contributes to the creation and maintenance of lexical meaning. This understanding has been made possible thanks to the substantial body of knowledge generated through the laborious work of many field linguists describing tonal languages with complex inflection. In this respect, the contribution to the field has mainly come from the languages of Africa. We know less of languages from other areas, especially of those from the Americas because it has taken the field more time to gather the basic relevant information. This is somewhat ironic because Pike's 1948 seminal work on tone was precisely inspired by the Oto-Manguean languages; a large phylum of tonal languages spoken in Mexico.

In this light, I outline here a typology of the ways we find tone involved in the realization of inflectional categories. For this, I take a morphological perspective on tone. This also means that I have consciously avoided using jargon from the discipline of phonology since its technicalities often hinder the understanding of a broader readership. This also means that the emphasis is not on what a given tone sounds like or how it stands, works or should be characterized with respect to other suprasegmental units in the system, but rather on what tone is used for in the formal makeup of inflection and on how it is used for that purpose.

In this respect, because inflection is the part of syntax that is relevant to the morphology, the emphasis will be on the mapping between linguistic form and grammatical meaning. To understand the role of tone in this context, we could imagine a continuum of two ideal systems. At the one end, tones have no role in inflection. They are regarded as a lexical property of an inflected stem or of a grammatical affix. At this end, tones are bits of the lexical phonology. This type of tone is presented in §2. At the other end, tones are treated as discrete suprasegmental affixes (commonly called 'auto-segments') working as genuine exponents of morphosyntactic feature values. Such type of inflectional tone is briefly presented in §3. Languages vary considerably along this logical continuum and the present study is an attempt to pinpoint the most relevant types that can be observed focusing on morphological tone which is a type of inflectional tone used as a building block of the grammar of a language for the construction of forms in inflectional paradigms. In this respect, in §4 I introduce the four main subtypes of morphological tone. Besides morphological tone, we can also find tonal allomorphy organized in inflectional classes. This type is presented in §5.

To illustrate this typology I mainly focus on the Oto-Manguean languages of Mexico (although not exclusively). There are various reasons for this. Within Oto-Manguean, one finds the most complex morphological systems we know of (only comparable to some found among the Nilotic languages of Africa, notably Dinka and Nuer) and a great part of that complexity is due to tone. Also their internal diversity displays a great wealth of possible types. I also concentrate on verbal inflection, not only because verbs are by far the word class in these languages where the morphology is more complex, but also because we know less about the nominal inflection, whose study would no doubt have some bearing on the present proposal.

1.1. The Oto-Manguean languages of Mexico

Oto-Manguean (also 'Otomanguean') is a linguistic phylum of Amerindian languages spoken in Central and Southern Mexico.[1] Oto-Manguean is typologically unique in the Americas because it is the only phylum where all its languages are tonal.

The 2005 census by the INALI[2] states there are 1,769,971 speakers of Oto-Manguean languages, of which 218,679 are monolingual. Oto-Manguean consists of the eight different linguistic groups in Figure 1, which for the present purposes I treat as branches of the phylum.[3]

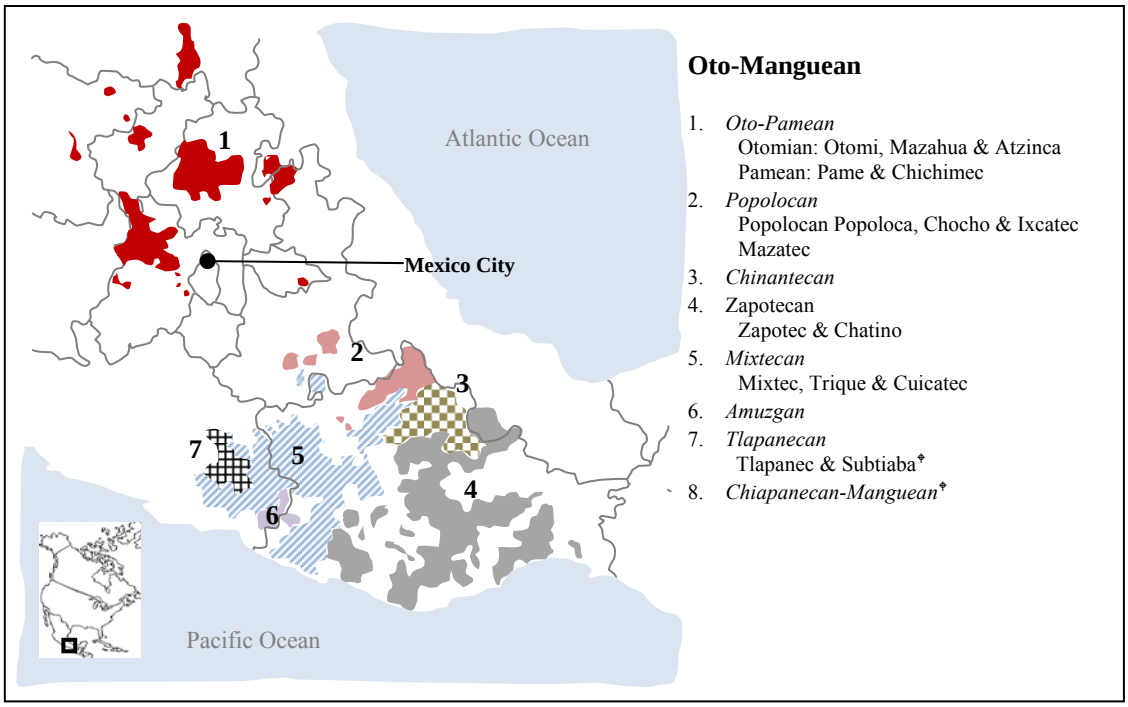

Figure 1. The Oto-Manguean languages of Mexico.

[1] The three Oto-Manguean languages once spoken outside the current territory of Mexico are Subtiaba† (Nicaragua) (Tlapanecan), Monimbo† (Nicaragua) and Chorotega† (Costa Rica) (Manguean).

[2] National Institute for Indigenous Languages.

[3] The traditional taxonomy found in Campbell (1997), which is in turn based on unpublished materials by Terrence Kaufman, proposes four major branches organized into two large subgroups: (i) Western Oto-Manguean consisting of Oto-Pamean-Chinantecan and Tlapanecan-Manguean; and (ii) Eastern Oto-Manguean formed of Amuzgo-Mixtecan and Popolocan-Zapotecan. I prefer to take here a flat approach to the phylum since this taxonomy has not yet been discussed at length. Coincidentally, Cecil H. Brown and Eric Holman supplied to me in a personal communication a MDS plot using data available at the Automated Similarity Judgment Program database (http://asjp.clld.org/). This plot shows that the superordinate groups of the traditional taxonomy lack a centered core and Western Oto-Manguean has no integration.

While there is agreement among scholars as to which languages are Oto-Manguean and which are not, there is currently no established consensus regarding the number of languages involved. This is because Oto-Manguean generally involves important diasystems or dialectal continua within each of its different branches, making it difficult to define categorically where a given dialect finishes and a different language starts. Figures vary from source to source: while the Ethnologue and the Glottolog propose 176 and 179 different languages, respectively, the INALI proposes 220 giving more weight to sociolinguisitic factors (in much the same vein as Danish and Norwegian Bokmål or Serbian and Croatian are treated as different languages).

All Oto-Manguean languages are tonal. But the tonal systems within the phylum vary enormously; from languages with an inventory of two tones (e.g. Chichimec and Pame from the Oto-Pamean branch) to languages with an inventory of ten or more tones (e.g. the Eastern Chatino languages of the Zapotecan branch). Apart from tone, the internal diversity of the phylum makes it difficult to come up with an inventory of features that is shared by all languages. There is an overwhelming tendency towards open syllables, especially at root level. Languages often have nasal vowels, complex phonation and voice quality. All languages are head-marking. Nouns do not inflect for case, although they may receive classifiers and their possession inflection can be at times challenging. In some branches, the animacy value or the discourse status of a noun is also relevant for the inflection. Oto-Manguean languages lack non-finite forms such as infinitives, and this has consequences for the syntax of clause chaining. In general, inflectional morphology is very intricate. This is partly due to the interaction of multiple systems acting independently of each other, resulting in cross-classification: e.g. a verb may simultaneously belong to various inflectional classes: one for its endings, another for its stem changes and a third for its tonal changes. This situation produces in turn the great deal of irregularity in verbal paradigms that is characteristic of some branches (Levy 1987). At the level of word order syntax, all branches can be characterized as verb initial (also a Mesoamerican feature according to Campbell *et al.* 1986); only recently some have become predominantly SV. Oto-Manguean languages are largely fusional; they do not have noun incorporation except for the basic type. Their derivational morphology is largely unproductive. New words are often borrowed and often lie outside the scope of the more morphological aspects of the inflection.

2. Tone as a phonological property of grammatical markers

Inflectional information is often, although not exclusively, conveyed by affixes. In many tone languages with relatively complex inflectional morphology, tone may be simply a property of the lexical phonology of the inflectional affixes, just as it is associated with the phonology of other words with lexical content.

For example, Otomi languages (Oto-Pamean) have three tones, but only two are relevant for our purposes: high (represented with an acute accent) and low (not represented). A contrast based on the high *vs.* the low tone operates as a useful mechanism to keep grammatical markers phonologically distinctive, which would otherwise be segmentally homophonous. This is illustrated in (1) from the variety of Northern Otomi spoken in San Ildefonso Tultepec in the state of Querétaro. Here the tonal contrast of high vs. low that serves to create minimal pairs for lexical words (e.g. ’*bó̱ts’e* (H) ‘religious offering’ vs. ’*bo̱ts’e* (L)

'basket, ribcage'; *dó'yo* (H) 'bone' *vs. do'yo* (L) 'hotplate to heat tortillas', etc.) is exploited in inflectional clitics *dá* vs. *dà* or *gí* vs. *gì*.[4]

(1)		Tone /H/	Tone /L/
	a.	d**á**=ts<u>o</u>t'e	d**a**=z<u>o</u>t'e
		1.CPL=arrive.there	3.IRR=SS/arrive.there
		'I arrived there.'	'S/he'll arrive there.'
	b.	g**í**=ts<u>o</u>t'e	g**ì**=ts<u>o</u>t'e
		2.INCPL=arrive.there	2.IRR=arrive.there
		'You arrive there.'	'You'll arrive there.'

The Otomi case is commonly found across languages, and it is the most common source for inflectional tonogenesis. In this respect, Palancar *et al.* (this volume) and Feist and Palancar (this volume) show cases in Mixtecan languages where a given grammatical prefix consisting of segments and tone loses its segmental part and all that remains of it is its tone, which then becomes the exponent of the grammatical information. Such tones need to be linked to a segment in the stem, and often invade its lexical phonology giving rise over time to complex tonal patterns (such as for example the tonal classes in §5).[5]

3. Morphosyntactic tone

Tones can do things other than sit inert in the phonology. In Otomi languages, a third person possessor is encoded by a floating high tone. This happens without exception every time the information is required by the syntax. The high tone lands on the mora immediately preceding the possessed noun.[6] The landing site may be a determiner as in (2a) or a preposition as in (2b) (in the examples, the singular enclitic *=r* does not bear tone).[7] The Otomi case also serves as an illustration that within the same inflectional system one may also find different situations at the same time.

(2)		Possessed		Non-possessed	
	a.	n**ó**=r	bötsi	n**o**=r	bötsi
		<3.POSS>DEF.SG=SG	child	DEF.SG=SG	child
		'His/her/their child.'		'The child.'	
	b.	k**á**=r	méxá	k**a**=r	méxá
		<3.POSS>on=SG	table	on=SG	table
		'On his/her/their table.'		'On the table.'	

[4] The third tone is a raising tone that is not found in inflectional formatives, but only found in lexical roots. This contour tone emerged from the monosyllabification of historical disyllabic stems bearing the melody /L-H/. This is a well-known source of lexical tonogenesis.

[5] Inflectional tonogenesis can also arise in unpredictable ways, see for example Fedden (this volume) for a very interesting case study of how a particular tone value in Mian, a Papuan language with a rich tonal system, serves an inflectional function in a very restricted context.

[6] If the mora on which the floating tone lands has high tone (for independent reasons it is not possible that it has rising tone), the word is pronounced with a rising tone that starts very high.

[7] Abbreviations: ANT anterior; AOR aorist; CPL completive; DEF definite; FIN final vowel; FUT future; HAB habitual; IMM immediate; IMPER imperative; IMPF imperfect; INCPL incompletive; INF infinitive; IRR irrealis; NEG negative; POSS possessive; POT potential; PROG progressive; PROSP prospective; PRS present; PST past; SUB subject; REC recent; SEQ sequential; SS secondary stem.

The tone inventory of Otomi languages used for situations like this is restricted to a binary contrast of high vs. low. A more interesting case is found in Yoloxóchitl Mixtec, a language with more tones.

Yoloxóchitl Mixtec (Mixtecan) has nine basic tones in lexical contrasts (cf. Vietnamese has six according to the common view): four level tones (written with superscript numbers from /1/ for the low tone through /4/ for the high tone); three rising tones (13, 14, 24) and two falling tones (32, 42) (DiCanio *et al.* 2012). Out of these nine tones, at least three are fully exploited in the inflection. Table 1 illustrates the forms of different verbs for the irrealis, the negative irrealis and the completive. For this language, the tones in the irrealis can be taken as basic; that is, as provided by the lexicon (see Palancar *et al.*, this volume).

Table 1. Tone and verbal inflection in Yoloxóchitl Mixtec.

IRR	NEG. IRR	CPL		
nu^{3}mi^{3}	nu$^{\mathbf{14}}$mi^{3}	nu$^{\mathbf{13}}$mi^{3}	‘hug’	(tr)
ku^{3}u^{3}	ku$^{\mathbf{14}}$u^{3}	ku$^{\mathbf{13}}$u^{3}	‘happen’	(intr)
nda^{3}kin^{2}	nda$^{\mathbf{14}}$kin^{2}	nda$^{\mathbf{13}}$kin^{2}	‘sharpen’	(tr)
ku^{3}ya^{3}tin^{3}	ku$^{\mathbf{14}}$ya^{3}tin^{3}	ku$^{\mathbf{13}}$ya^{3}tin^{3}	‘get closer’	(intr)
ndu^{3}toʔ^{3}ni^{3}	ndu$^{\mathbf{14}}$toʔ^{3}ni^{3}	ndu$^{\mathbf{13}}$toʔ^{3}ni^{3}	‘open eyes’	(intr)
nda^{3}xiʔ^{3}i^{4}	nda$^{\mathbf{14}}$xiʔ^{3}i^{4}	nda$^{\mathbf{13}}$xiʔ^{3}i^{4}	‘open’	(tr)
cha^{3}ka^{3}nduʔ^{4}u^{4}	cha$^{\mathbf{14}}$ka^{3}nduʔ^{4}u^{4}	cha$^{\mathbf{13}}$ka^{3}nduʔ^{4}u^{4}	‘lay down’	(tr)

In table 1, we have verbs with different melodies in the base form: /3-2/, /3-3/, /3-3-3/, /3-3-4/ and /3-3-4-4/. If this form is compared with the tonal melodies of the other two forms, we observe there is a tone change affecting the first mora, i.e. instead of /3/, we find /14/ in the negative irrealis and /13/ in the completive. The mapping of form (i.e., a specific tone value) and grammatical meaning (i.e., a specific inflectional value) is constant and there are no exceptions. This remarkable systematicity leaves us with an inflectional system operating with flawless morphosyntactic rules that involve tone. In such a system, tone could be said to work as a regular suprasegmental affix: the affix being suppletive for the negative irrealis (i.e. /14/ replaces /3/ on the first mora of the stem), or additive for the completive (i.e. /1/ is inserted before the lexical /3/ on the first mora of the stem producing a raising tone /13/.

This regularity makes Yoloxóchitl Mixtec an ideal language for syntactic approaches to inflection that do not particularly appreciate the ‘messy bits’ of the morphology. But those bits exist, nonetheless; they sometimes mess about the mapping of form and meaning in the inflectional realization or they serve as mere building blocks in the formation of grammatical structure. Tone plays a fundamental part in those messy bits. In the following section, I outline the main types of purely morphological tone.

4. Morphological tone: Tone linked to stems as a building block of paradigms

To introduce morphological tone, let us first depart from a situation where tones are just an inherent property of the phonology of the stem, just as they may be of affixes (as in the Otomi case presented in §2). In such a situation, stems surface with tones associated with them by the lexicon, just as they have specific vowels or consonants.[8] In an inflectional system involving verbs, tone may sit inert on verbal stems. This may happen to all verbs, to only

[8] It is more convenient here to talk about stems rather than roots because the stem is the fundamental formal unit that represents the lexeme in an inflected form. Also, while some stems consist of a root only, some consist of other material besides the root.

some or to just a handful of them. A particularly interesting case to start with is Tswana, a Bantu language spoken mainly in South Africa.

Tswana has two tones: high and low. The tones are lexically associated both with stems and with affixes. Stems can have inherent high tone or be toneless. If toneless, they are subject to complex prosodic rules at the word level (Creissels *et al.* 1997). Take for example the verb *tɬʰalʊχaɲ-* 'understand' which is a toneless stem that surfaces as /HLL/ in (3) as a result of a regular spreading rule by means of which the high tone of the preceding potential prefix *ka*^{H}- spreads on to the first syllable of the stem; the other two syllables receive low tone by a prosodic default.

(3) ba^{H}-ka^{H}-tɬʰa$^{\mathbf{H}}$lʊ$^{\mathbf{L}}$χa$^{\mathbf{L}}$ɲ-a^{L}
3.SUB-POT-understand-FIN
'They can understand.'

The issue at hand here is what Creissels (2006:10) treats as 'grammatical high tone'. In contrast to (3), in (4) the same toneless stem now surfaces as /LHH/ in the negative of the same mood. Here the high tones in the stem cannot be explained as the result of any prosodic rule, i.e. we might have expected the structure to have been /LLL/.

(4) ba^{H}-ka^{H}-sɪ^{L}-tɬʰa^{L}lʊ$^{\mathbf{H}}$χa$^{\mathbf{H}}$ɲ-ɪ^{L}
3.SUB-POT-NEG-understand-FIN
'They cannot understand.'

Creissels concludes that the distribution of the high tone in (4) is purely morphological in nature (in the sense of Aronoff 1994), arguing that it does not respond to any semantically coherent bundle of morphosyntactic features values.

Verbal inflection in Tswana is rich. A verb can inflect for a large number of morphosyntactic values, including mood (indicative, circumstantial, subjunctive, imperative, potential, etc.), tense-aspect (present, future, perfect, etc.), polarity (positive *vs.* negative), disjunction (conjunct *vs.* disjunct), as well as non-finite forms such as the infinitive, the relative and the sequential. In this context, the grammatical high tone of Tswana is found in all negative forms, so in principle, one could take it to be an exponent of negation alongside other segmental ones (namely the prefix sɪ^{L}-), but it is also found in other forms that have little to do with negation, such as the positive indicative perfect conjunct, the positive circumstantial perfect, the imperative and the sequential. This heterogeneity of meanings indicates a lack of morphosyntactic function, but it does not mean it lacks a grammatical function altogether.

In our view, the grammatical tone of Tswana serves as a building block in inflected forms in paradigms. It works, as it were, like thematic vowels in languages like Latin or like stress patterns in Greek or Russian. We treat this type of tone as 'morphological tone'.

A very similar morphological tone system, but with a more complex distribution that requires an intricate morphophonological apparatus is found in Kabiyè, a Gur language of Togo that belongs to the North-Volta Congo subgroup of the Volta-Congo branch of Atlantic-Congo.

4.1 Morphological tone conditioned by phonological shape

Like Tswana, Kabiyè also has two tones: high (marked by an acute accent) and low (not represented). Verbs in Kabiyè have a rich array of inflectional possibilities, but to illustrate the point we will only concentrate on six basic forms built by suffixation (including zero

suffixes, i.e. bare stems): imperfective present, imperfective past, past, aorist, infinitive and imperative (with a bare stem). There are verbs with inert tone across the paradigm, i.e. stem tone does not change, like for example *kpéɤu* 'forgive' in table 2.

Table 2. The Kabiyè verb *kpéɤu* 'forgive' has a stem with invariable tone.

	'forgive'	tone
IMPF.PRS	-kpéɤ-u	H
IMPF.PST	-kpéɤ-aɤ	H
PST	-kpéɤ-a	H
AOR	-kpéɤ	H
INF	kpéɤ-u	H
IMPER	kpéɤ	H

But not all verbs in Kabiyè are like *kpéɤu*. For our analysis, we rely on the sample of 800 verbs in Roberts (2013). Out of them, only 165 behave like this; the rest have tonal alternations involving stems that receive a low tone in certain cells of the paradigm. What is interesting is that not all such verbs alternate in the same way.

All verbs considered, including the ones that do not alternate, display five patterns of tonal behavior. Table 3 shows two such patterns. Shading highlights stems that receive a low tone. Besides tone, stems may be also display other segmental changes that are independent of tone alternations.

Table 3. Two verbs in Kabiyè showing different patterns of tone alternations.

	'sweep'	tone	segm.	'cut'	tone	segm.
IMPF.PRS	-ház-ɪɤ	H	haz	-cɛ́k-ɪ	H	cɛk
IMPF.PST	-haz-aɤ́	L	haz	-cɛk-aɤ́	L	cɛk
PST	-haz-áa	L	haz	-cɛb-á	L	cɛb
AOR	-ház-ɪ	H	haz	-cɛ́	H	cɛ
INF	haz-ʊ́ʊ	L	haz	cɛ́b-ʊ	H	cɛb
IMPER	haz-ɪ	L	haz	cɛ	L	cɛ

Here we are interested in two important questions: (i) regarding the form: for the inflection of a given verb, can we predict when the stem will have a high or a low tone? and if so, how can we predict it? and (ii) regarding the function: what is the relation of tone to grammatical function in such a system? Let us address the first question.

The study of inflectional morphology is a quest to find grammatical structure and analyses are just possible paths to it. The standard procedure with tone is to take a given form as base, whose tone is considered lexical (i.e. stable and memorized), from which other forms are derived through morphophonological rules. This means that tone allomorphy may be predicted if one finds the key to the system that can make generalizations. Kabiyè is a good example of this.

Roberts (2013) divides Kabiyè verbs into 23 different conjugation models attending to other aspects of inflection, but not tone.[9] The exemplar verbs for each one of Roberts' conjugations are given in table 4 together with an indication of their population size in his sample. To facilitate understanding, the forms in the table have been arranged in a slightly

[9] Roberts (2013) includes four other paradigms for another ten verbs with motion components and complex stems which we exclude here.

different way to the way they appear in tables 2 and 3. Shading applies to cells with low tone stems. The different patterns of tonal behavior are indicated by roman numerals.

Table 4. Distribution of high vs. low tone in stems in Kabiyè verbal paradigms.

		IMPF.PRS	AOR	IMPER	INF	IMPF.PST	PST		#	Conj
I	a.	-haz-ɪɤ	-haz-ɪ	haz-ɪ	haz-ʊʊ	-haz-aɤ	-haz-aa	'sweep'	92	9
	b.	-sul-uu	-sul-i	sul-i	sul-uu	-sul-aɤ	-sul-aa	'cover up'	52	10
	c.	-keles-iɤ	-keles-i	keles-i	keles-uu	-keles-aɤ	-keles-aa	'rinse'	48	17
	d.	-lulus-uu	-lulus-i	lulus-i	lulus-uu	-lulus-aɤ	-lulus-aa	'pour'	32	18
II	e.	-paɤ	-paa	paa	pa-ʊ	-paɤ-aɤ	-pa(w) -a	'dance'	36	13
	f.	-yo-u	-yoo	yoo	yo-u	-yow-aɤ	-yow-a	'quarrel'	19	14
	g.	-ɖɔng	-ɖɔ	ɖɔ	ɖɔm	-ɖɔng-aɤ	-ɖɔm-a	'walk'	31	16
	h.	-sʊk-ɪ	-sʊʊ	sʊʊ	sʊʊ-ʊ	-sʊk-aɤ	-sʊw-aa	'load'	9	12
	i	-cɛk-ɪ	-cɛ	cɛ	cɛb-ʊ	-cɛk-aɤ	-cɛb-a	'cut'	28	15
	j.	-cak-ɪ	-caɤ	caɤ	caɤ-ʊ	-cak-aɤ	-caɤ-a	'sit'	12	11
III	k.	-kpeɤ-u	-kpeɤ	kpeɤ	kpeɤ-u	-kpeɤ-aɤ	-kpeɤ-a	'forgive'	2	21
	l.	-kat-ɪɤ	-kat-ɪ	kat-ɪ	kat-ʊʊ	-kat-aɤ	-kat-aa	'meet'	111	19
	m.	-ɖɔk-ʊʊ	-ɖɔk-ɪ	ɖɔk-ɪ	ɖɔk-ʊʊ	-ɖɔk-aɤ	-ɖɔk-aa	'hold'	52	20
IV	n.	-haɤ	-ha	ha	ha-ʊ	-haɤ-aɤ	-ha(w)-a	'give'	17	5
	o.	-lu-u	-lu	lu	lu-u	-luw-aɤ	-luw-a	'take out'	17	6
V	p.	-tʊk-ʊʊ	-tʊʊ	tʊʊ	tʊʊ-ʊ	-tʊk-aɤ	-tʊ-aa	'decrease'	5	4
	q.	-kpak-iɤ	-kpaɤ	kpaɤ	kpaɤ-u	-kpak-aɤ	-kpaɤ-a	'take'	10	3
VI	r.	-cɛl-iɤ	-cɛl-i	cɛl-i	cɛl-uu	-cɛl-aɤ	-cɛl-aa	'give back'	70	1
	s.	-kot-uu	-kot-i	kot-i	kot-uu	-kot-aɤ	-kot-aa	'fold'	28	2
	t.	-kuud-uu	-kuud-i	kuud-i	kuud-uu	-kuud-aɤ	-kuud-aa	'twist'	7	8
	u.	-weles-iɤ	-weles-i	weles-i	weles-uu	-weles-aɤ	-weles-aa	'listen'	31	7
	v.	-cɪkɪl-ɪɤ	-cɪkɪl-ɪ	cɪkɪl-ɪ	cɪkɪl-ʊʊ	-cɪkɪl-aɤ	-cɪkɪl-aa	'tickle'	66	22
	w.	-hulut-uu	-hulut-i	hulut-i	hulut-uu	-hulut-aɤ	-hulut-aa	'shout (ritual)'	25	23

We observe that a high tone is always used for the imperfective present and the aorist, and this can be easily spelled out as a rule. The question is when we can predict low tone. For the building of the tonal structure of remaining forms, we propose that the stem of the imperative is informative, i.e. a principal part (Finkel and Stump 2007). In this we follow Roberts, but we reach different conclusions.

If a verb has a low tone in the stem used for the imperative form, then it will have low tone in all other forms (pattern I), except when the imperative stem is monosyllabic, in which case the infinitive will have high tone (pattern II). When the verb has high tone in the imperative, things become more complex as conditions get more specific. With many options, one commonly resorts to the existence of a default rule that applies elsewhere. The default for a verb with a high tone in the imperative is to also have high tone for all other forms, i.e. the invariable pattern III grouping verbs (k-m). In this, it behaves like the default of low tone. Exceptions can be explained by appealing to phonological properties of the stem, but the rules need to be stored somewhere under the control of the morphology. First, if the segmental stem is of the type /CVɤ-/ or /CVw-/ as in (n-o), then the past has low tone, despite all other forms having high tone (pattern IV). If the imperative has the shape /(H-)H+H/ (+ indicates the mora of the suffix *-i/ɪ*), then the shape for the infinitive, the imperfective past, and the past will be

/(L-)L+H/ making pattern VI as in (r-u). But if the shape is /H-H+L/, for those same forms, the shape will be /L-H+L/ as in (v-w). Finally, verbs in (p-q) have two segmental stems in alternation (CVV- vs. CVk-); for such verbs with a high tone imperative, the stem for the past tenses always carries low tone (pattern V).

This analysis could perhaps be rephrased in a more sophisticated way, but it illustrates a situation where the distribution of tonal changes in paradigms can be accounted for as attending to other aspects of the form without having to appeal to the lexicon.

Having established the rules behind the making of forms in the paradigm, we are left with the second question: what is the function of tone in Kabiyè? Our view is that we are facing a similar type of morphological tone as seen in Tswana. In other words, tone in Kabiyè does not have a morphosyntactic function. Neither low nor high tone is used as an inflectional exponent for any given inflectional category. The fact that high tone is always used for the stem of the imperfective present and the aorist could cause one to ponder whether there is a grammatical connection between high tone and such values. If we were to accept such a view, we would then be confronted with two further issues: (i) what is the grammatical connection between those two tenses which would enable us to make sense, in functional terms, of the fact that the same form (i.e., high tone) encodes both; but most significantly (ii) why do other stems have high tone for other cells of the paradigm?

While morphological tone in Kabiyè and Tswana serves the same purpose, it works in typologically different ways in each language. In Tswana, the rules of high tone assignment apply to all verbs and are aimed at the same cells of the paradigm.[10] In Kabiyè, however, the assignment of a low tone to a stem can vary from verb to verb and the cells involved also vary. This assignment depends on the application of a complex set of abstract rules linked to properties of the phonological shape of the lexical stem. Verbs which have lexical stems with the identical key property will behave in the same way, otherwise they won't.

4.2. Morphological tone conditioned by inflectional class

We have seen two situations where tone has a purely morphological role in the inflection. In the first situation, found in Tswana, it serves as a building block that applies to all verbs and to the same paradigmatic cells. The second situation, found in Kabiyè, is a possible deviation from the first one. Inflectional tone does not involve all verbs, and does not apply to the same cells. A second deviation is found in Acazulco Otomi, where we see that the application of morphological tone is conditioned by inflectional class membership of the verb.

Acazulco Otomi (Oto-Pamean) also has two tones involved in inflection: high (represented with an acute accent) and low (not represented). Hernández Green (2015a, 2015b, forthcoming), proposes that verbs in Acazulco Otomi fall into three main inflectional classes, defined by the specific set of inflectional proclitic markers they select.[11] Table 5 illustrates the basic paradigms of the three classes.[12] Class I verbs have two different paradigms depending on whether they are transitive or intransitive. Shading indicates slabs in the paradigm where the lexical tone of the stem is altered, in this case changed to a low tone.

[10] When the stem already has an inherent high tone, grammatical high tone is not observable.

[11] There is an additional fourth class including patientive verbs which we will not further discuss here because it is mainly based on class III.

[12] Apart from the basic paradigm, Hernández Green (2015a, 2015b) shows that verbs also have two other paradigms called deictic and of adjunct registration.

Table 5. The three main verbal inflectional classes of Acazulco Otomi.

			Class I (tr) *nǘ* 'see'	Class I (intr) *mǐ́hï* 'sit'	Class II *ʔŏ̌hö* 'sleep'	Class III *ʔŭ́ni* 'give'
Realis	CPL	1st	dí nǘ=ga	dí mǐ́h=ka	dídí ʔŏ̌h=ka	dí ʔŭ́n=ga
		2nd	gí nü	gí mǐ́h=a	gídí ʔŏ̌h=a	gí ʔŭ́ni
		3rd	bi nǘ	bi mǐ́h=a	bi ʔŏ̌h=a	bi ʔŭ́ni
	INCPL	1st	drá nǘ=ga	drá mǐ́h=ka	drá ʔŏ̌h=ka	drádí ʔŭ́n=ga
		2nd	grá nǘ	grá mǐ́h=a	grá ʔŏ̌h=a	grádí ʔŭ́ni
		3rd	ra nǘ	ra mǐ́h=a	ra ʔŏ̌h=a	radi ʔŭ́ni
	HAB	1st	dádí nǘ=ga	dán mïh=ka	dán ʔöh=ka	dádí ʔŭ́n=ga
		2nd	gádí nü	gán mïh=a	gán ʔöh=a	gádí ʔŭ́ni
		3rd	an nü	an mïh=a	an ʔöh=a	adi ʔŭ́ni
	PROSP	1st	xtá nǘ=ga	xtá mǐ́h=ka	xtá ʔŏ̌h=ka	xtá ʔŭ́n=ga
		2nd	xtágí nü	xtágí mǐ́h=a	xtágí ʔŏ̌h=a	xtágí ʔŭ́ni
		3rd	xta nǘ	xta mǐ́h=a	xtagi ʔŏ̌h=a	xtagi ʔŭ́ni
Irrealis	CPL	1st	gụ nǘ=ga	gụ mǐ́h=ka	gidi ʔŏ̌h=ka	gidi ʔŭ́n=ga
		2nd	gi nǘ	gi mǐ́h=a	gidi ʔŏ̌h=a	gidi ʔŭ́ni
		3rd	da nǘ	da mǐ́h=a	di ʔŏ̌h=a	di ʔŭ́ni
	INCPL	1st	gra nǘ=ga	gra mǐ́h=ka	gra ʔŏ̌h=ka	gradi ʔŭ́n=ga
		2nd	gra nǘ	gra mǐ́h=a	gra ʔŏ̌h=a	gradi ʔŭ́ni
		3rd	dra nǘ	dra mǐ́h=a	dra ʔŏ̌h=a	dradi ʔŭ́ni
	HAB	1st	gadi nǘ=ga	gan mïhka	gan ʔöh=ka	gadi ʔŭ́n=ga
		2nd	gadi nü	gan mïh=a	gan ʔöh=a	gadi ʔŭ́ni
		3rd	dan nü	dan mïh=a	dan ʔöh=a	dadi ʔŭ́ni

Three things make morphological tone in Acazulco Otomi remarkable typologically:

To begin with, it has an unusual realization. The stem receives a low tone as a default, but it may also receive a high tone under specific circumstances: (i) when the stem is not monosyllabic but consists of a root plus a stem formative (indicated with the + sign) and has no further suffixation; (ii) when the verb is a V+N compound; and (iii) when the stem bears the human antipassive suffix *-te*, the enclitic *='mbé* for plural exclusive, the delimitative *=thoho* 'just' or the counterfactual *=möhö*. These are illustrated in (5) as (a), (b) and (c), respectively.

(5)		INCPL.REALIS				HAB.REALIS	
	a.	*ra=zo+ni*	'S/he's weeping'	/L/ > **/H/**		*an=zó+ni*	'S/he weeps'
	b.	*ra=tü-the*	'S/he's thirsty' (die-water)	/L/ > **/H/**		*an=tǘ-the*	'S/he's often thirsty'
	c.	*ra=tsah-te*	'It's biting (people)' (e.g. a dog)	/L/ > **/H/**		*an=tsáh-te*	'It bites (people)' (e.g. a dog)

If a verb has a lexical tone which is identical to that of the output of the rules, we cannot observe the effects of morphological tone.

(6)		INCPL.REALIS				HAB.REALIS	
	a.	*ra=tsa*	'It's biting it'	/L/	> **/L/**	*àn=tsà*	'it bites it'
	b.	*ra=hɨ́+xi*	's/he's whistling'	/H/	> **/H/**	*an=hɨ́+xi*	's/he whistles'
	c.	*ra=nüh-te*	's/he's seeing (people)'	/H/	> **/H/**	*an=nüh-te*	's/he sees (people)'

The distribution of this grammatical tone in Acazulco Otomi is morphological. Like in Kabiyè and Tswana, different cells in the paradigm that have little in common in functional terms require the same tone. However, the conditioning is different. Unlike in Tswana, but like in Kabiyè, morphological tone on Acazulco Otomi is not found in all verbs. But while in Kabiyè, its distribution is linked to the morphophonology, in Acazulco Otomi it is linked to the inflectional class of the verb. This means that it is a property of the paradigm of a certain class of verbs, which in itself is defined by the lexicon. Once speakers know to which inflectional class a given verb belongs, then it is predictable whether that verb will receive morphological tone or not, and if it does, which specific cells will be affected.

4.3. Morphological tone linked to the lexicon.

A final type of morphological tone is characterized by a distribution bearing all the typical idiosyncrasies of the lexicon. This is found in Chichimec (Oto-Pamean). As shown in table 6, in Chichimec there are verbs like *-pór* 'remove' and *-ʔor* 'appear' which retain their lexical tone throughout the paradigm.[13]

Table 6. The Chichimec verbs *-pór* 'remove' and *-ʔor* 'appear'

	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL
PRS	*tu-pór*	*su-pór*	*u-pór*	*e-pór*	L-H	L-H	L-H	L-H
FUT	*gu-pór*	*ki-pór*	*ga-pór*	*ga-pór*	L-H	L-H	L-H	L-H
ANT.PST	*tu-pór*	*su-pór*	*u-pór*	*e-pór*	L-H	L-H	L-H	L-H
REC.PST	*ku-pór*	*ki-pór*	*ku-pór*	*ku-pór*	L-H	L-H	L-H	L-H
IMM.PST	*u-pór*	*i-pór*	*zu-pór*	*zu-pór*	L-H	L-H	L-H	L-H
POT	*nu-pór*	*mi-pór*	*mu-pór*	*mi-pór*	L-H	L-H	L-H	L-H
SEQ	*ra-pór*	*gi-pór*	*ru-pór*	*ru-pór*	L-H	L-H	L-H	L-H
PRS	*tú-ʔor*	*sú-ʔor*	*ú-ʔor*	*é-ʔor*	H-L	H-L	H-L	H-L
FUT	*gú-ʔor*	*kí-ʔor*	*gá-ʔor*	*gá-ʔor*	H-L	H-L	H-L	H-L
ANT.PST	*tú-ʔor*	*sú-ʔor*	*ú-ʔor*	*é-ʔor*	H-L	H-L	H-L	H-L
REC.PST	*kú-ʔor*	*kí-ʔor*	*kú-ʔor*	*kú-ʔor*	H-L	H-L	H-L	H-L
IMM.PST	*ú-ʔor*	*í-ʔor*	*zú-ʔor*	*zú-ʔor*	H-L	H-L	H-L	H-L
POT	*nú-ʔor*	*mí-ʔor*	*mú-ʔor*	*mí-ʔor*	H-L	H-L	H-L	H-L
SEQ	*rá-ʔor*	*gí-ʔor*	*rú-ʔor*	*rú-ʔor*	H-L	H-L	H-L	H-L

Table 6 further shows that verbs in Chichimec inflect by means of prefixes for the person of subject (third person has an additional number distinction) and for various TAM values, namely, present, future, anterior past, recent past, immediate past, potential and sequential (a sort of neutral grammatical tense used in the dependent clause in clause combining contexts). These prefixes do not carry lexical tone. In this they are different from the grammatical markers of Tswana or the Otomi clitics in (2). The tone they receive is provided by the word's

[13] Chichimec data come from Angulo (1933).

prosodic phonology and it is manifested by inverting the lexical tone of the stem. The inverse happens in Tswana.

However, unlike the verbs in table 6, most verbs in Chichimec have more than one stem: the majority have only two, while some have up to five. When this happens, the verbs organize these different stems into specific patterns (i.e. the distribution is not entirely chaotic). Following Palancar and Avelino (in preparation) there are at least 14 such patterns. One of those patterns is illustrated by the verbs *-tsá* 'do' in table 7. As the tone value of affixes appears to be predictable, we shall only be concerned with the stems. To aid visualization of the patterns, each different stem has been assigned a different capital letter and a different type of shading.

Table 7. The stem pattern of the Chichimec verb *-tsá* 'do'

	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL
PRS	*-tsá*	*-ʃá*	*-tsá*	*-tʃá*	A	D	A	B	H	H	H	H
FUT	*-tsá*	*-ʃá*	*-tsá*	*-tʃá*	A	D	A	B	H	H	H	H
ANT.PST	*-tsá*	*-ʃá*	*-tsá*	*-tʃá*	A	D	A	B	H	H	H	H
REC.PST	*-tsá*	*-ʃá*	*-tsá*	*-tʃá*	A	D	A	B	H	H	H	H
IMM.PST	*-tsá*	*-ʃá*	*-tsá*	*-tʃá*	A	D	A	B	H	H	H	H
POT	*-tsá*	*-ʃá*	*-tsá*	*-tʃá*	A	D	A	B	H	H	H	H
SEQ	*-tsá*	*-ʃá*	*-tsá*	*-tʃá*	A	D	A	B	H	H	H	H

The verb *-tsá* 'do' requires three stems, annotated here for convenience as 'A', 'B' and 'D'. The A-stem could be taken as a lexical default, while the B-stem and the D-stem are used for a specific person value, e.g. the D-stem is used for the second person. Now take the verb *-sá* 'win' in table 8. This verb lacks a segmentally different D-stem, but we observe a contrast in tone for the same cells in which we have the D-stem of *-tsá* 'do'.

Table 8. The stem pattern of the Chichimec verb *-sá* 'win'

	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL
PRS	*-sá*	*-sa*	*-sá*	*-tʃá*	A	A	A	B	H	L	H	H
FUT	*-sá*	*-sa*	*-sá*	*-tʃá*	A	A	A	B	H	L	H	H
ANT.PST	*-sá*	*-sa*	*-sá*	*-tʃá*	A	A	A	B	H	L	H	H
REC.PST	*-sá*	*-sa*	*-sá*	*-tʃá*	A	A	A	B	H	L	H	H
IMM.PST	*-sá*	*-sa*	*-sá*	*-tʃá*	A	A	A	B	H	L	H	H
POT	*-sá*	*-sa*	*-sá*	*-tʃá*	A	A	A	B	H	L	H	H
SEQ	*-sá*	*-sa*	*-sá*	*-tʃá*	A	A	A	B	H	L	H	H

For such a case, one could in principle posit that the verb *-sá* 'win' follows the same stem alternation pattern as *-tsá* 'do', and that the low tone is just a phonological property of the D-stem of *-sá* to distinguish it from its A-stem (i.e., the stems would otherwise be segmentally homophonous). If this view is correct, tone would bear no inflectional function here; instead being a lexical property of stems. Similarly, if we pursue this analysis, we would have to conclude that the D-stem of the verb *-tsá* 'do' just happens to have the same lexical tone as the A-stem.

A more complex pattern of stem alternations is given in table 9. Here things start getting more interesting since we observe a high tone in the potential form of the verbs *-ɲi* 'want' and *-hun* 'throw'.

Table 9. The stem pattern of the Chichimec verbs *-ʔa* ‘bury’, *-ʔi* ‘want’ and *-hun* ‘throw’

	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL
PRS	*-ʔa*	*-ʔa*	*-ʔa*	*-rʔa*	A	A	A	B	L	L	L	L
FUT	*-ʔa*	*-ta*	*-nda*	*-rʔa*	A	D	C	B	L	L	L	L
ANT.PST	*-ʔa*	*-ta*	*-nda*	*-rʔa*	A	D	C	B	L	L	L	L
REC.PST	*-ʔa*	*-ta*	*-nda*	*-rʔa*	A	D	C	B	L	L	L	L
IMM.PST	*-ʔa*	*-ta*	*-ʔa*	*-rʔa*	A	D	A	B	L	L	L	L
POT	*-ʔa*	*-ta*	*-ʔa*	*-rʔa*	A	D	A	B	L	L	L	L
SEQ	*-ʔa*	*-ta*	*-ʔa*	*-rʔa*	A	D	A	B	L	L	L	L
PRS	*-ʔi*	*-ʔi*	*-ʔi*	*-rʔi*	A	A	A	B	L	L	L	H
FUT	*-ʔi*	*-tí*	*-ndí*	*-rʔi*	A	D	C	B	L	H	H	H
ANT.PST	*-ʔi*	*-tí*	*-ndí*	*-rʔi*	A	D	C	B	L	H	H	H
REC.PST	*-ʔi*	*-tí*	*-ndí*	*-rʔi*	A	D	C	B	L	H	H	H
IMM.PST	*-ʔi*	*-tí*	*-ʔi*	*-rʔi*	A	D	A	B	L	H	L	H
POT	*-ʔi*	*-tí*	*-ʔi*	*-rʔi*	A	D	A	B	H	H	H	H
SEQ	*-ʔi*	*-tí*	*-ʔi*	*-rʔi*	A	D	A	B	L	H	H	H
PRS	*-hun*	*-hun*	*-hun*	*-hún*	A	A	A	B?	L	L	L	H
FUT	*-hun*	*-nhín*	*-nhin*	*-hún*	A	D	C	B?	L	H	L	H
ANT.PST	*-hun*	*-nhín*	*-nhin*	*-hún*	A	D	C	B?	L	H	L	H
REC.PST	*-hun*	*-nhín*	*-nhin*	*-hún*	A	D	C	B?	L	H	L	H
IMM.PST	*-hun*	*-nhín*	*-hun*	*-hún*	A	D	A	B?	L	H	L	H
POT	*-hún*	*-nhín*	*-hún*	*-hún*	A	D	A	B?	H	H	H	H
SEQ	*-hun*	*-nhín*	*-hun*	*-hún*	A	D	A	B?	L	H	L	H

Verbs like *-ʔi* ‘want’ and *-hun* ‘throw’ could be said to have the same pattern as *-ʔa* ‘bury’, only that their B-stem and D-stem would have a high tone.[14] But the high tone in the A-stem of the verbs *-ʔi* and *-hun* for the potential of the first person and the third person singular and dual is surprising. One does not expect a different tone here because at the segmental level there is no comparable stem change in other verbs for the same cells. We could take this to be an incipient inflectional use of tone, in this case to mark the potential mood, but its further idiosyncrasies would perhaps let us down.

For example, in other verbs, instead of a high tone we find a low tone, like in the verb *-mę́* ‘defend’ in table 10. As the A-stem has a high tone, one could think of a mechanism of tonal inversion. Notice that a low tone also applies to the second person, suggesting that we are facing a verb with a stem pattern somehow similar to that of table 8, but with a D-stem like in table 9.

[14] We could assume that the B-stem of *-hun* ‘throw’ in built by a tone contrast like the D-stem of *-sá* ‘win’ in table 8.

Table 10. The stem pattern of the Chichimec verb *-mę́* ‘defend’

	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL
PRS	*-mę́*	*-mę̀*	*-mę́*	*-mhę́*	A	A	A	B	H	H	H	H
FUT	*-mę́*	*-mę̀*	*-mę́*	*-mhę́*	A	D?	A	B	H	L	H	H
ANT.PST	*-mę́*	*-mę̀*	*-mę*	*-mhę́*	A	D?	A	B	H	L	H	H
REC.PST	*-mę́*	*-mę̀*	*-mę́*	*-mhę́*	A	D?	A	B	H	L	H	H
IMM.PST	*-mę́*	*-mę̀*	*-mę́*	*-mhę́*	A	D?	A	B	H	L	H	H
POT	*-mę̀*	*-mę̀*	*-mę̀*	*-mhę́*	A	D?	A	B	L	L	L	H
SEQ	*-mę*	*-mę*	*-mę*	*-mhę́*	A	D?	A	B	H	L	H	H

To complicate things further, the verb *-tsá* ‘hurt’ in table 11 shows yet another pattern. Here the potential is encoded throughout all persons by a low tone.[15] But most importantly, this pattern is not exclusive to the potential as it also applies to the forms of the present and the recent past.

Table 11. The stem pattern of the Chichimec verb *-tsa* ‘hurt’

	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL	1st	2nd	3SG/DU	3PL
PRS	*-tsa*	*-ʃa*	*-tsa*	*-tʃa*	A	D	A	B	L	L	L	L
FUT	*-tsá*	*-ʃa*	*-za*	*-tʃa*	A	D	C	B	H	L	H	H
ANT.PST	*-tsá*	*-ʃa*	*-zá*	*-tʃa*	A	D	C	B	H	L	H	H
REC.PST	*-tsa*	*-ʃa*	*-za*	*-tʃa*	A	D	C	B	L	L	L	L
IMM.PST	*-tsá*	*-ʃa*	*-tsá*	*-tʃa*	A	D	A	B	H	L	H	H
POT	*-tsa*	*-ʃa*	*-tsa*	*-tʃa*	A	D	A	B	L	L	L	L
SEQ	*-tsá*	*-ʃa*	*-tsá*	*-tʃa*	A	D	A	B	H	L	H	H

The tonal patterns increase in numbers as we go from one verb to the next. Our understanding of Chichimec verbs is based on the behavior of only 168 verbs from Angulo (1933) and thus remains limited. Of these, only 31 display some sort of tonal perturbations, but only a handful are of the sort described for the verbs in tables 9-11. This suggests that morphological tone in Chichimec remains tightly and intricately linked to the lexicon. The Chichimec case reminds us of the stem tonal stem patterns in Khaling whose distribution Jacques (this volume) accounts for appealing to the rules of a historical sound change. However, for Chichimec the key to the system appears to have been lost. This means that there is no indication from the morphophonology or the morphology as to what verbs have morphological tone and which do not. Similarly, once we know that a given verb has tone perturbations, we are not in a position to predict in what cells this will happen. Speakers need to store this information as part of the lexical entry.

In the following sections, I present a final type of inflectional tone which is different from all others presented so far. In this type, there is a great degree of tonal allomorphy in the realization of morphosyntactic values. The optimal way to account for this type of allomorphy is by means of inflectional classes defined by tone. To show this type, let us start with Tlatepuzco Chinantec, another Oto-Manguean language.

[15] Whether the verbs *-ɲi* ‘want’ and *-hun* ‘throw’ in table 9 have the potential encoded in the same way as *-mę́* ‘defend’ is unclear when it comes to the cells for the second person and for the third person singular and dual.

5. Tonal classes: Inflectional classes made by tone.

Tlatepuzco Chinantec has six tones involved in lexical contrasts (cf. Mandarin Chinese has only four): three level tones and two rising contours (low-mid /12/ and low-high /13/). Out of these six tones, five are involved in verbal inflection in rather intricate ways. Verbs in Chinantec inflect for TAM by means of prefixes (including zero suffixes or bare stems). These prefixes, in turn, are associated with stems inflected for aspect/mood by tone, e.g. the past prefix *ca*^{1}- and the hodiernal past prefix *na*^{2}- are always affixed to the completive stem. The same tonally inflected stems also indicate distinctions involving the person of the subject. The relevant person values for the inflection are first person singular and dual, second person and third person (see for example Merrifield 1968, Pace 1990, Foris 2000, etc.).

The sources propose that the paradigm of a verb can be reconstructed from three principal stems: the completive, the incompletive and the irrealis stem. In table 12, we obeserve the inflected stems of six different verbs (a-f).[16]

Table 12. The twelve inflected stems of six verbs in Tlatepuzco Chinantec.

			1SG		1PL		2		3	
CPL.STEM	a.	'bend'	húʔ^{1}	1	húʔ^{13}	13	húʔ^{1}	1	húʔ^{2}	2
	b.	'gnaw'	tsǿʔ^{1}	1	tsǿʔ^{13}	13	tsǿʔ^{1}	1	tsǿʔ^{1}	1
	c.	'bring'	quián^{1}	1	quián^{13}	13	quián^{12}	12	quián^{2}	2
	d.	'call'	tǿʔ^{1}	1	tǿʔ^{13}	13	tǿʔ^{12}	12	tǿʔ^{1}	1
	e.	'cut'	tiu^{1}	1	tiu^{3}	3	tiu^{32}	32	tiu^{1}	1
	f.	'scare'	ʔán^{2}	2	ʔán^{13}	13	ʔán^{1}	1	ʔán^{2}	2
INCPL.STEM	a.	'bend'	húʔ^{12}	12	húʔ^{12}	12	húʔ^{12}	12	húʔ^{2}	2
	b.	'gnaw'	tsǿʔ^{12}	12	tsǿʔ^{12}	12	tsǿʔ^{12}	12	tsǿʔ^{12}	12
	c.	'bring'	quián^{12}	12	quián^{12}	12	quián^{12}	12	quián^{2}	2
	d.	'call'	tǿʔ^{12}	12	tǿʔ^{12}	12	tǿʔ^{12}	12	tǿʔ^{2}	2
	e.	'cut'	tiu^{12}	12	tiu^{2}	2	tiu^{2}	2	tiu^{12}	12
	f.	'scare'	ʔán^{2}	2	ʔán^{12}	12	ʔán	2	ʔán^{2}	2
IRR.STEM	a.	'bend'	húʔ^{13}	13	húʔ^{13}	13	húʔ^{13}	13	húʔ^{2}	2
	b.	'gnaw'	tsǿʔ^{13}	13	tsǿʔ^{13}	13	tsǿʔ^{13}	13	tsǿʔ^{1}	1
	c.	'bring'	quián	13	quián^{13}	13	quián^{13}	13	quián^{2}	2
	d.	'call'	tǿʔ^{13}	13	tǿʔ^{13}	13	tǿʔ^{13}	13	tǿʔ^{2}	2
	e.	'cut'	tiu^{13}	13	tiu^{3}	3	tiú^{3}	3	tiu^{1}	1
	f.	'scare'	ʔán^{3}	3	ʔán^{13}	13	ʔán^{3}	3	ʔán^{2}	2

A glance at the distribution of tones in the inflected forms in table 12 suffices to show that tone in Tlatepuzco Chinantec verbal inflection does not work in the same predictable ways as it does in languages like Yoloxóchitl Mixtec in §3. In Chinantec there is no evident consistent mapping between form and meaning. For example, for the encoding of the first person singular (the first column in table 12), one could say that tone values /1/, /12/ and /13/ encode the bundles {1SG, CPL}, {1SG, INCPL} and {1SG, IRR}, respectively. While this would already have to exclude the pattern in the verb in (f), to complete this picture one would also have to

[16] The data of Tlatepuzco Chinantec come from Merrifield and Anderson (2007).

account for the many other instances where exactly the same tone values are found in other cells of the paradigm to encode other, very different grammatical information, as indicated by the shading. This suggests that the distribution of tone values is, if anything, morphological.

This type of tonal inflection provides further challenges for a theory of tone, because contrary to morphosyntactic tone, identifying a form of a verb in Chinantec that may serve as a lexical base from which the tone values of other forms can be derived is, in our humble opinion, a futile task (for a similar position, but stated differently, see Finkel and Stump, 2009). However, *qui quaerit invenit*... and Baerman and Palancar (2014) propose that there is still some structure beyond the apparent chaos.

In this regard, Baerman and Palancar (2014) propose that one way to start finding some paradigmatic structure can be accomplished by first isolating third person forms from other person forms. If we then concentrate on the forms involving other persons, we start to see some patterns emerging. For example, one possible analysis of the data in table 12 is that the verbs in (a-d) follow the same pattern: incompletive is marked by /12/ and irrealis by /13/ without person distinctions. But the verbs then fall into two inflectional classes attending to how they mark the completive, all encode first person singular and plural by /1/ and /13/, respectively, whereas for the second person, verbs in (a-b) use /1/ while the verbs in (c-d) use /2/. Verbs in (e) and (f) would have to be accounted for as being deviant or irregular. All such verbs would then have to be further analyzed as belonging to other independent classes attending to the ways they encode the third person. In reality, things become more complex when we move from a handful of verbs to hundreds of them. As a result of this, a typical Chinantecan language is often analyzed as consisting of 70 or more such classes (see Palancar 2014).

A very similar system to Chinantec is found in Yaitepec Chatino, an Eastern Chatino language of the Zapotecan branch with ten contrastive tones.[17] Verbs in Yaitepec Chatino inflect for four aspect-mood values: completive, potential, habitual and progressive (also called 'continuous' or 'continuative'). Verbs have different stems for each value, and tone plays a major role in the marking of aspect-mood distinctions as well as distinctions of person of subject. Examples of three different paradigms are given in table 13.

Table 13. The Yaitepec Chatino verbs *xnu* 'leave behind', *swi* 'choose' and *jwi* 'kill'

	xnu 'leave behind'			*swi* 'choose'			*jwi* 'kill'		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
CPL	nwxnu^{21}	nwxnu^{31}	nwxnu^{1}	nwswi^{3}	nwswi^{31}	nwswi^{1}	yjwi^{3}	yjwi^{2}	yjwi^{12}
POT	xnu^{21}	xnu^{31}	xnu^{1}	swi^{3}	swi^{31}	swi^{43}	kjwi^{3}	kjwi^{31}	kjwi^{24}
HAB	nxnu^{21}	nxnu^{31}	nxnu^{1}	nswi^{3}	nswi^{31}	nswi^{43}	ntyjwi^{3}	ntyjwi^{31}	ntyjwi^{24}
PROG	nxnu^{21}	nxnu^{31}	nxnu^{1}	nswi^{2}	nswi^{31}	nswi^{1}	ntjwi^{2}	ntjwi^{2}	ntjwi^{2}

The verb *xnu* 'leave behind' has contrastive tone for person, but not for aspect-mood. The verb *swi* 'choose' has invariant tone for the second person. The forms for potential and habitual receive the same tone; a pattern followed by many verbs, but not all. The verb *jwi* 'kill' is similar to *swi* 'choose' in many respects, but we have different tones involved in the marking of second person. The dataset in Rasch (2015) includes 324 inflected verbs and they could be said to instantiate almost 90 different tonal paradigms. A handful of such paradigms have an alternative tone in one or more cells, for example the transitive verb *xkwi* 'boil'

[17] According to Rasch (2015), there are three level tones: /1/ High with a slight rising; /2/ High, but slightly lower than /1/; /3/ Mid; and seven contours: /31/ Mid-rising; /21/ High-rising, rising more recognizably than /1/; /14/ High and sharply falling, starting at /1/ and continuing to fall; /12/ and /23/ High and falling; /24/ High and sharply falling; and /43/ Low and rising.

inflects like *xnu* ‘leave behind’, but as it can also have a tone /31/ for first person completive, it is treated as belonging to a different class. If we discard such cases, and a handful of inanimate verbs that cannot be inflected in all persons for semantic reasons, we are left with the 75 paradigms given in table 14 in the Appendix.[18]

All ten lexical tones are also found at least once in the 75 different paradigms. A correlation of tone value and person is given in table 15 (no relevant correlations are found involving aspect-mood). The figures indicate the number of times a given tone is found in a given cell across the paradigms of the classes.

Table 15. Tone values used in the tonal classes of Yaitepec Chatino per person value.

Tones	1st	2nd	3rd	Total	1st	2nd	3rd	Total
/1/	19	47	25	91	21%	52%	27%	100%
/2/	28	48	10	86	32%	57%	11%	100%
/3/	29	0	35	64	45%	0%	55%	100%
/12/	22	0	38	60	36%	0%	64%	100%
/14/	0	0	3	3	0%	0%	100%	100%
/21/	41	0	24	65	63%	0%	37%	100%
/23/	5	0	15	20	25%	0%	75%	100%
/24/	0	0	55	55	0%	0%	100%	100%
/31/	7	130	14	151	4%	87%	9%	100%
/43/	74	0	6	80	93%	0%	7%	100%

Yaitepec Chatino is a mixed system regarding the mapping of a specific form to a specific morphosyntactic value. There are, for example, tones which are associated with a specific person: tone /24/ only occurs in third person forms; tone /43/ could be treated as an exponent of first person; and we could practically say the same about tone /31/ but for second person. Other tones are used for more than one person so a clear mapping between form and meaning breaks down here. Also, while all ten tones are found in third person forms and most of them in first person forms, only three of them are used to encode second person. This suggests that the marking of second person attends to other sorts of rules. We can explore this possibility further.

For example, in complex systems like Yaitepec Chatino, it often happens that tone assignment for a specific value may be more predictable for some areas of the paradigm than for other areas. This is the view taken by implicative approaches to inflectional morphology in works such as Bonami and Boyé (2007), Montermini and Bonami (2013), and Bonami and Luís (2014), which are inspired by Morin (1987). Such works explore the degree of predictability that exists among the cells of a given paradigm. As for Yaitepec Chatino, it is possible to find instances where the tone of the second person can be predicted from the marking of the third person (the same cannot be said of the marking for the first person, which

[18] The most complex tonal system in Oto-Manguean, and possibly in the world's languages, is found in Tlapanec (Tlapanecan). In his grammar of the Tlapanec language of Malinaltepec, Suárez (1983) provides information about the tones in the inflectional paradigms of about 160 verbs. Out of these, 135 fall into at least 18 different tonal classes, but 24 of them have more complex tonal paradigms. Such verbs are the type of transitive verbs that express actions that may involve two persons in an actor-undergoer sort of relation (e.g., 1>2, 1pl>2, 2>3, etc.). Each of these types of interrelation constitutes a cell in the paradigm of these verbs. There are 30 cells in total and tone plays a fundamental role in the making of such paradigms. These 24 verbs, which were selected at random by Suárez to register tone, already display 20 different tonal classes!

is far more chaotic, i.e. unpredictable). This is shown in table 16, where we compare the correlations between the tone used for the {3, CPL} with the one used for the {2, CPL}.

Table 16. Tone correlations between 3.CPL and 2.CPL in Yaitepec Chatino

{3, CPL}	{2, CPL}				{2, CPL}		
Tones	/1/	/2/	/31/		/1/	/2/	/31/
/1/	0	0	17	17	–	–	100%
/3/	0	0	8	8	–	–	100%
/21/	0	0	2	2	–	–	100%
/24/	0	0	1	1	–	–	100%
/14/	0	0	1	1	–	–	100%
/31/	10	0	0	10	100%	–	–
/23/	8	1	0	9	88%	12%	–
/12/	3	18	1	22	14%	82%	4%
/2/	0	3	2	5	–	60%	40%

At least six tones (1, 3, 21, 24, 14 and 31) when found in the third person completive render a predictability value of 100% with regard to the tone value we will find in the second person completive. This actually happens regardless of aspect-mood, because the same correlation is found in the potential and the progressive (although not shown in the table). But beyond those tones, certainty of outcomes cannot be guaranteed. The next best correlation is /23/, which will most likely render /1/ for second person, followed by /12/, etc. This suggests that for a substantial part of the 75 patterns, the assignment of tone to the second person is subject to a morphophonological operation. But in situations like this, when some tone value is predictable from another tone value, one still needs to appeal to the morphology, because the specific tone value we are to find for the second person is not in itself given by the phonology. In other words, there is nothing inherently phonological that would make a tone /31/ become /1/ or vice versa. Yaitepec Chatino evolved from an ancestor system which might have been very similar to conservative Zenzontepec Chatino as described in Campbell (this volume) where the tonal marking for second person is to a large extent still predictable.

Whether speakers of Chinantec or Yaitepec Chatino learn their paradigms in the way we analyze them or whether they learn them on a cell-to-cell basis as if each form were an independent word remains an open question, which we must leave to the experts of child language acquisition. For the moment, the structure in inflectional classes appears to be the most convenient way to deal with such systems.

6. Final remarks

I have outlined here a typology of the different situations where tone is involved in inflection taking a morphological perspective. I have illustrated most of the types using Oto-Manguean languages, as the internal linguistic diversity of this phylum from the Americas displays almost all types. From the lexical end of the continuum, where grammatical affixes receive their own lexical tone, to the morphosyntactic end, where tone works as a regular exponent of a given grammatical category, there are at least five other types; each one with its own logic.

We are at the dawn of understanding how complex systems work. But to do better we need help. We need full paradigms in grammars of tonal languages, not just rules, abstract representations or examples of how a given form bearing tone is used in a natural context. This is a cordial invitation to descriptive linguists to enrich the field with new data on inflection. It matters. It matters in a time when most languages with complex morphology are

dying. By doing so, we will be paying tribute both to the languages and to the field of linguistics, because in a hundred years from now, when all of us are gone, it will only be our data that shall remain for future linguists to continue increasing our understanding of our human languages.

Acknowledgements
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APPENDIX

Table 14. Tonal paradigms in Yaitepec Chatino.

		CPL			POT			HAB			PROG		
		1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Class 1	1,1,1A	21	31	1	21	31	1	21	31	1	21	31	1
Class 2	1,1,1C	3	31	1	3	31	1	3	31	1	2	31	1
Class 3	1,1,1D	43	31	1	43	31	1	43	31	1	43	31	1
Class 4	1,1,1E	21	31	1	3	31	1	3	31	1	21	31	1
Class 5	1,21,1A	3	31	1	3	31	21	2	31	21	2	31	1
Class 6	1,21,1B	21	31	1	21	31	21	21	31	21	21	31	1
Class 7	1,21,1E	1	31	1	21	31	21	21	31	21	1	31	1
Class 8	1,21,1H	21	31	1	21	31	21	21	31	21	1	31	1
Class 9	1,21,1I	21	31	1	21	31	21	21	31	21	2	31	1
Class 10	1,21,1J	21	31	1	21	31	21	21	31	21	43	31	1
Class 11	1,21,2A	3	31	1	3	31	21	3	31	21	21	31	2
Class 12	1,3,12A	43	2	12	3	31	3	3	31	3	43	2	12
Class 13	1,3,2B	21	31	1	3	31	3	3	31	3	2	31	2
Class 14	1,43,1A	3	31	1	3	31	43	3	31	43	2	31	1
Class 15	1,43,1B	3	31	1	3	31	43	3	31	43	1	31	1
Class 16	1,43,1C	43	31	1	43	31	43	43	31	43	43	31	1
Class 17	12,12,12A	12	2	12	12	2	12	12	2	12	12	2	12
Class 18	12,12,12B	12	1	12	12	2	12	12	2	12	12	2	12
Class 19	12,12,12C	43	1	12	43	1	12	43	1	12	43	1	12
Class 20	12,12,12D	43	2	12	43	2	12	43	2	12	43	1	12
Class 21	12,12,12E	12	1	12	12	1	12	12	1	12	12	1	12
Class 22	12,12,2A	43	2	12	43	2	12	43	2	12	43	2	2
Class 23	12,12,2B	12	2	12	12	2	12	12	2	12	12	2	2
Class 24	12,12,2C	12	2	12	12	2	12	12	2	12	2	2	2
Class 25	12,24,12B	43	2	12	43	31	24	43	31	24	43	2	12
Class 26	12,24,14A	12	2	12	43	31	24	43	31	24	12	2	14
Class 27	12,24,14B	1	2	12	43	31	24	43	31	24	1	2	14
Class 28	12,24,24A	2	2	12	43	31	24	43	31	24	43	31	24
Class 29	12,24,2A	43	2	12	43	31	24	43	31	24	43	2	2
Class 30	12,24,2B	3	2	12	3	31	24	3	31	24	2	2	2
Class 31	12,24,2C	1	2	12	21	31	24	21	31	24	1	2	2
Class 32	12,24,2D	12	2	12	43	31	24	43	31	24	2	2	2
Class 33	12,24,2E	3	31	12	43	31	24	43	31	24	2	31	2
Class 34	12,24,3A	2	2	12	43	31	24	21	31	3	43	31	3
Class 35	12,3,2A	12	2	12	3	31	3	2	31	3	2	31	2
Class 36	12,3,2B	12	2	12	3	31	3	3	31	3	2	2	2
Class 37	12,3,2C	43	2	12	3	31	3	3	31	3	2	31	2
Class 38	14,14,14A	43	31	14	43	31	14	43	31	14	43	31	14

Class 39	2,2,2A	2	31	2	2	31	2	2	31	2	2	31	2
Class 40	2,2,2B	2	2	2	2	2	2	2	2	2	2	2	2
Class 41	2,24,14A	2	2	2	43	31	24	43	31	24	43	2	14
Class 42	2,24,14B	1	31	2	43	31	24	43	31	24	43	31	14
Class 43	2,3,14A	2	2	2	43	31	3	43	31	24	2	2	14
Class 44	21,21,1A	21	31	21	21	31	21	21	31	21	21	31	1
Class 45	21,21,21A	21	31	21	21	31	21	21	31	21	21	31	21
Class 46	23,23,12A	23	1	23	23	1	23	23	1	23	12	1	12
Class 47	23,23,12D	43	1	23	43	1	23	43	1	23	43	1	12
Class 48	23,23,23A	43	1	23	43	1	23	43	1	23	43	1	23
Class 49	23,24,12A	43	1	23	43	31	24	43	31	24	43	1	12
Class 50	23,24,12B	23	1	23	43	31	24	43	31	24	12	1	12
Class 51	23,24,12C	1	1	23	21	31	24	21	31	24	1	1	12
Class 52	23,24,12D	1	1	23	43	31	24	21	31	24	1	1	12
Class 53	23,24,23A	23	2	23	43	31	24	43	31	24	43	2	23
Class 54	23,24,24A	23	1	23	43	31	24	43	31	24	43	31	24
Class 55	24,24,14A	43	31	24	43	31	24	43	31	24	43	31	14
Class 56	3,2,2A	2	31	3	3	31	2	3	31	3	2	31	2
Class 57	3,3,2A	3	31	3	3	31	3	3	31	3	2	31	2
Class 58	3,3,2B	1	31	3	21	31	3	21	31	3	1	31	2
Class 59	3,3,2C	21	31	3	21	31	3	21	31	3	21	31	2
Class 60	3,3,2D	3	31	3	3	31	3	3	31	3	2	2	2
Class 61	3,3,2E	1	31	3	43	31	3	43	31	3	43	31	2
Class 62	3,3,2F	3	31	3	3	31	3	3	31	3	3	31	2
Class 63	3,3,3A	21	31	3	21	31	3	21	31	3	21	31	3
Class 64	3/,24,12A	31	1	31	43	31	24	43	31	24	12	1	12
Class 65	3/,24,12C	43	1	31	43	31	24	43	31	24	43	1	12
Class 66	3/,24,24A	1	1	31	21	31	24	21	31	24	21	31	24
Class 67	3/,24,3/A	43	1	31	43	31	24	43	31	24	43	1	31
Class 68	3/,24,3/B	1	1	31	21	31	24	21	31	24	1	1	31
Class 69	3/,24,3/C	21	1	31	21	31	24	21	31	24	21	1	31
Class 70	3/,24,3/D	31	1	31	43	31	24	43	31	24	31	1	31
Class 71	3/,24,3/E	43	1	31	43	31	24	43	31	24	31	1	31
Class 72	3/,3/,3/A	31	1	31	31	1	31	31	1	31	31	1	31
Class 73	3/,3/,3/B	43	1	31	43	1	31	43	1	31	43	1	31
Class 74	1,21,1A	21	31	1	3	31	21	21	31	21	21	31	1
Class 75	1,21,1B	3	31	1	21	31	21	21	31	21	2	31	1

Tone and inflection in Zenzontepec Chatino

Eric Campbell

1. Introduction

Tone plays a crucial role in person inflection as well as aspect/mood inflection in Zenzontepec Chatino (ISO 693-6: czn), a Zapotecan language of the deep and diverse Oto-Manguean linguistic stock of Mesoamerica. However, the role of tone in person inflection differs in almost every respect from its role in aspect/mood inflection. First of all, tone in person inflection is entirely predictable from the tone of the uninflected stem, while tone patterns associated with aspect/mood inflection are largely unpredictable, and ultimately, lexically specified. Secondly, tone is always the sole exponent of second person singular pronominal inflection, while it is at most only part of the realization of aspect/mood inflection. That is, when aspect/mood inflection involves tone, there is always some segmental material that accompanies it. The purpose of this chapter is to describe these facts and offer an account of why tone behaves so differently in the two types of Zenzontepec Chatino inflectional morphology.

Oto-Manguean languages offer some striking examples of inflectional complexity (Wichmann 2006; Palancar 2012). These languages tend to be strongly head-marking, with person and TAM inflection occurring on or adjacent to the verb. The stock consists of eight family-level groupings (Kaufman 1987; 2006), and languages from most of the member families share a common pattern in which person inflection follows the verb and TAM inflection precedes it. This structure is found in varieties of Mazatec (Mazatecan family, Jamieson 1982), Chinantec (Chinantecan family, Westley & Merrifield 1990), Mixtec (Mixtecan family, Macaulay 1996), Zapotec (Zapotecan family, López & Newburg 2005), and Me'phaa (Tlapanec-Subtiaba group, Wichmann 2010). Languages of the Oto-Pamean family of Oto-Manguean do not share this pattern, as they typically have both TAM and (subject)person inflection preceding the verb, often fused together (see e.g. Palancar 2009: 175 for Otomi and Martínez Ortega 2012 for Ocuilteco). Zenzontepec Chatino behaves like most other Oto-Manguean languages, having postverbal person inflection and preverbal aspect/mood inflection.

The reason for the divergent behavior of tone in person inflection versus aspect/mood inflection in Zenzontepec Chatino lies in the different prosodic statuses of their respective positions on the verb. Person inflection (other than 2SG) is realized by enclitics, which make up separate phonological words from their hosts and do not affect the tone of their hosts. The purely tonal 2SG person inflection is realized by replacing the tone of the final phonological word of the host, a tonal effect from the same direction where the enclitics occur. Aspect/mood inflection, on the other hand, typically involves some segmental prefixal material, modifying the stem from the opposite direction. Prefixes, even if syllabic, fall within the same phonological word as their stem. Any tonal effects from the TAM prefixes are now opaque and part of the lexical information encoded in verbs, since the tone patterns are not predictable from the prefixes or the phonological shape of the stems.

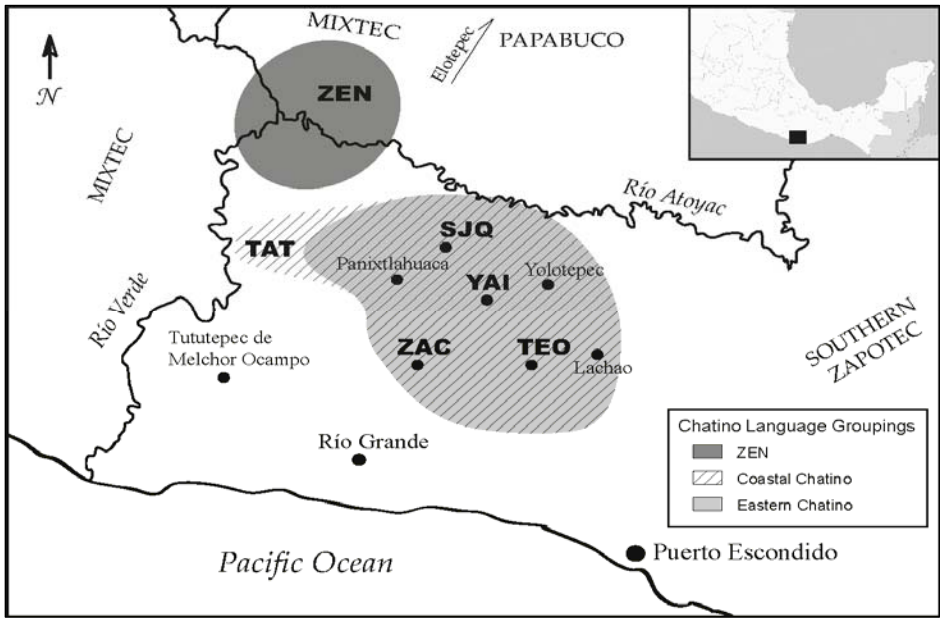
The rest of this chapter is organized as follows. First, some background information on Zenzontepec Chatino is provided in §2, and then an overview of its tone system is given in §3. The structure of verbs and the relevant prosodic domains are discussed in §4. Person inflection is treated in §5, aspect/mood inflection in §6, and finally, a summary and conclusions are in §7.

2. Language background

Chatino refers to a group of languages spoken in rural southwestern Oaxaca State, Mexico. It consists of at least three languages: Zenzontepec, Tataltepec, and Eastern Chatino (Boas 1913; Campbell 2013a), with the last being spoken in some 15 villages (Cruz 2011; Cruz & Woodbury 2014) between which there are varying degrees of mutual intelligibility, from quite high to very low. Tataltepec and the Eastern Chatino group together make up a higher-level grouping, Coastal Chatino (Campbell 2013a). The location and subgrouping of some of the Chatino languages is shown in Map 1. Chatino is sister to Zapotec and together they make up the Zapotecan language family of Oto-Manguean (Boas 1913; Kaufman 1987).

Zenzontepec Chatino is the most geographically removed from the rest, and it is the most linguistically divergent. There are an estimated 8,000 speakers of the language, but at most only one quarter of them are monolinguals. This would make it sound as if the language were quite vital, but there are also an estimated 8,000 monolingual Spanish speakers in the community, and the shift to Spanish is accelerating.

Zenzontepec Chatino is a head-marking and head-initial language, with VSO basic constituent order, a distinction between alienable and inalienable noun possession, and complex inflectional verb classes. It shares many of the other traits characteristic of the Mesoamerican linguistic area (Campbell et al. 1986), such as a vigesimal numeral system, relational nouns, a lack of plural marking on nouns, and a distinction between inclusive versus exclusive first person plural pronouns. While some varieties of Chatino have five tones (e.g. Zacatepec Eastern Chatino, Woodbury 2012) and as many as twelve (e.g. San Juan Quiahije Chatino, see Cruz 2011 and Woodbury 2012), Zenzontepec Chatino has only two tones. The nature, distribution, and behavior of Zenzontepec Chatino tone is outlined in the next section.



Map1. Chatino languages (from Campbell 2013a)

3. Overview of Zenzontepec Chatino tone

In order to understand the role that tone plays in inflection in Zenzontepec Chatino, one must first understand the basic tonal phonology. Therefore, this section provides a brief description of the Zenzontepec Chatino tone system. First, the tonal inventory is presented in §3.1, then the distribution of tones (§3.2), and finally, the main phonological processes that involve tone (§3.3).

3.1. Tone inventory

In Zenzontepec Chatino the tone-bearing unit (TBU) is the mora, and a mora may bear a high tone (/H/, <*v́*>), a mora tone (/M/, <*v̄*>), or no tone (Ø, <*v*>). Monomoraic words, though fairly uncommon inlexical word classes, illustrate the three-way tonal contrast (1).[1]

(1)	/H/ ≠ /M/	*jly**á***	'lunch'	*jly**ā***	'morning'
	/H/ ≠ Ø	*jny**á***	'work'	*jny**a***	'griddle'
	/M/ ≠ Ø	*jn**ē***	'money'	*jn**e***	'finger of'

Figure 1 (adapted from Woodbury 2012) shows averaged pitch tracks for the three tonal specifications on monomoraic forms for one male speaker at about 50 years of age. Each track is based on between seven and nine total tokens of four or five words. For each token the f_0 value is measured in Hertz (y-axis) at eleven equidistant points (x-axis) over the duration of the vowel.[2] The H and M tones both have slight rises and relatively high (for this speaker) final pitch targets. The default realization of the toneless category is a relaxed, mid-to-low falling pitch.

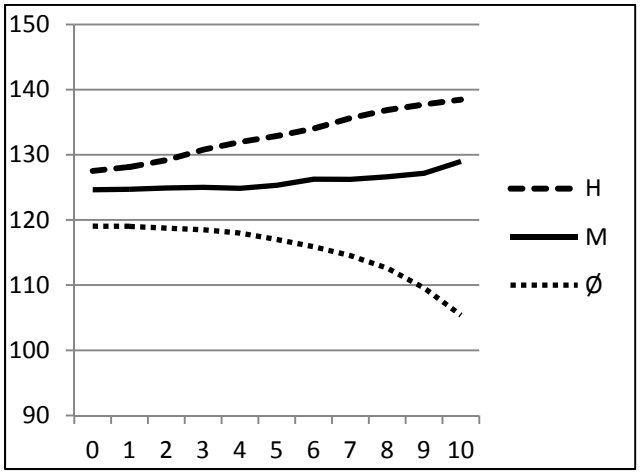


Figure 1. Avg.f_0 (Hz) of tones on monomoraic words (Woodbury 2012)

[1] The orthography used here differs from the IPA as follows: *kw* = [k^{w}], *tz* = [ʦ], *r* = [ɾ], *ty* = [t^{j}], *ly* = [l^{j}], *ny* = [n^{j}], *ch* = [ʧ], *x* = [ʃ], y = [j], ky = [k^{j}], j = [h], Ỵ = nasalized vowel, VV = long vowel, V̄ = mid tone, V́ = high tone.

[2] Thanks to John Kingston for sharing his PRAAT script for averging f_0 tracks, and thanks to Tony Woodbury for sharing the chart.

The lowest pitch category is considered tonally unspecified for four reasons.[3] First, and perhaps most importantly, the lowest tone does not trigger any phonological processes (§3.3), while /H/ and /M/ are phonologically active (see Myers 1998; Hyman 2012: 3). Second, H tone spreads through any following moras that bear no tone (§3.3.1), reflecting the fact that there really is nothing there. Third, it is the most common, by a significant margin.[4]Fourth, and finally, its relaxed falling pitch trajectory is due to the lack of any tone target. It is mere declination, which is the default intonational pattern in Zenzontepec Chatino, as it is in many other languages (Cohen & 't Hart 1967; Ladd 1984; Connell & Ladd 1990). Underlyingly toneless TBUs are well known in African tone languages (Stevick 1969; Myers 1998; Hyman 2001) and other American tone languages (McDonough 1999; Daly & Hyman 2007), and they are even attested in Asian tone languages (Chen 2000; Evans 2009).

Considering the details above, the Zenzontepec Chatino tone system would nearly fit what Hyman (2009, 2012) calls a three-height, privative tone system. However, it is unusual in that the toneless category is not M but rather the lowest one. Neither Yip (2002: 26) nor Hyman (2012: 3) admit the possibility that a three-height privative system may have an unspecified category other than M, though neither of them overtly excludes the possibility. Maddieson's(1978: 341) third tone universal, however, states that "Phonetically central tones are unmarked[.]Extreme tones are highly marked." Zenzontepec Chatino thus offers an exception to the typology of tone systems. Paster (2003) argues that Leggbo (an Upper Cross Niger-Congo language) has a tone system of /H/ vs. /M/ vs. Ø, which is equivalent to the Zenzontepec Chatino inventory, but that is the only other case of such a system that I know of in the literature.[5]

3.2. The restricted distribution of tones

The distribution of tones in Zenzontepec Chatino is best stated with reference to a prosodic constituent of one to three moras that includes a root and any prefixal formatives attached to it. Other phonotactic patterns and phonological processes in the language refer to, or operate within, this same domain (Campbell 2014). Therefore, this domain is considered the phonological word (Nespor & Vogel 1986; Dixon & Aikhenvald 2002). Crucially for tone distribution, and for the role of tone in inflection, enclitics and separate stems within compounds each make up separate phonological words (see §4).

Most uninflected words in the language are bimoraic, but some few are monomoraic and a few others are trimoraic. Given the three-way mora-borne tonal contrast, there are nine logically possible tone combinations on bimoraic phonological words. However, only five of the nine possibilities occur on basic stems not inflected for person: ØØ, ØM, MH, HM, and HØ. These are the five basic tone patterns, listed in order from most to least frequent (2).

(2)	a.	ØØ	*koǫ*	'tuber'	*chaja*	'tortilla'
			jaaʔ	'sleeping mat'	*tisǫʔ*	'tasty'
	b.	ØM	*keē*	'flower'	*kixę̄ʔ*	'herbaceous plant'
			jwiī	'whistle'	*nyatę̄*	'person'

[3] Full exemplification and argumentation for the tone analysis are not included here but can be consulted in Campbell (2014).

[4] To give an idea of how common tonelessness is, about 62% of vocabulary from the 100-word Swadesh and Leipzig-Jakarta (Tadmor 2009: 69─71) lists is toneless (Campbell 2014).

[5] Preliminary comparative work suggests that proto-Chatino low tone (*L) was lost (in some contexts) in Zenzontepec Chatino, merging with the toneless category (Campbell & Woodbury 2010), perhaps giving rise to this unusual tone system.

c.	MH	*nkāą́*	‘coconut’	*lūtí*	‘vine’
		nkwīíʔ	‘ring’	*yāná*	‘corn cob’
d.	HM	*yúū*	‘cliff’	*kíʔyū*	‘man (adj.)’
		léē	‘strong’	*líjyā*	‘sugar cane’
e.	HØ	*tíi*	‘ten’	*súkwa*	‘forty’
		tyáą	‘throat’	*nkwítzą*	‘child’

Of the other possible bimoraic tone combinations, ØH and MM also occur, but they function exclusively as 2SG pronominal inflection, and they are the sole exponents of that category (§5.2). The two remaining imaginable bimoraic tone patterns, MØ and HH, never occur within a single phonological word.

In trimoraic phonological words, the basic tone patterns align to the end of the word, and the tone of the initial (antepenultimate) mora is predictable from the basic tone pattern of the final two moras and the grammatical class of the root or stem. When the penultimate mora is toneless, the antepenultimate mora is likewise toneless, as with the ØØ (3a) and ØM (3b) basic tone patterns, and also the 2SG ØH pattern (§5.2). For words whose final two moras have the MH pattern, the antepenultimate mora is toneless if the root is a noun, but it will have M tone if the root is verbal (3c). A somewhat opposite pattern is found on words with the HM basic tone pattern: when the stem is a noun, the antepenultimate mora has M; when the stem is a verb, the antepenultimate mora is toneless (3d). Finally, trimoraic phonological words with the HØ basic tone pattern always have M on their antepenultimate mora (3e).Antepenultimate moras never bear /H/.

(3)	a.	**Ø**ØØ	*kw**i**seeʔ*	‘raccoon’	
		ØØØ	*nk**a**y-aku*	‘ate’	
	b.	**Ø**ØM	*kw**i**natę̄*	‘mosquito’	
		ØØM	*k-**u**-saāʔ*	‘will tear’ (tr.)	
	c.	**Ø**MH	*kw**i**līxí*	‘butterfly’	(noun root)
		MMH	*nt**ē**-tētzá*	‘is distributing’	(verb root)
	d.	**M**HM	*x**ī**-nkwéē*	‘jaw of’	(noun stem)
		ØHM	*nk**a**-xáʔā*	‘shouted’	(verb stem)
	e.	**M**HØ	*k**ū**-náʔa*	‘female’	
		MHØ	*nt**ē**-tákwi*	‘is flying’	

The patterns just described illustrate that the distribution of tones is quite restricted in Zenzontepec Chatino (see Hyman 2011for similar cases in other languages). Furthermore, tone distribution is increasingly restricted the further from the end of the word one goes. This fits with other phonotactic patterns in the language, since contrastive vowel length and vowel nasalization occur only in final syllables, and the vowel /o/ only rarely occurs outside of final syllables. The lack of HH as a basic tone pattern calls to mind the Obligatory Contour Principle (Leben 1973), but it is also explainable by H tone culminativity since a phonological word never has more than one underlying H tone.

3.3. Phonological processes involving tone

To complete this sketch of the Zenzontepec Chatino tone system before delving more directly into the role of tone in inflection, there are three main tonal phonological processes that must be understood: H tone spreading, M and H downstep, and M tone substitution. Each of these processes is illustrated below with textual examples and representations in autosegmental phonology (Goldsmith 1976).

3.3.1. High tone spreading.

High tone spreads through any following toneless moras until another tone (M or H) occurs, or otherwise until the end of the intonational phrase is reached. Spreading is blind to phonological word boundaries, occurring both within and across multiple words. The example in (4) contains only two tones, the M tone on the particle *tī* and the H tone on the first mora of *nyáʔa* 'mother', which spreads through the remaining seven moras in the clause, since they are toneless (4).

(4) a. *nch-aa tī nyáʔa na jneʔe luwe=VʔV*
PRG-go TPLZ mother DEF scorpion small.PL=DEM
'The mother of the small scorpions went away.'
[MMG.raton0:32]

b. *nchaa tī nyáʔa na jneʔe luweeʔ*
M H

High tone spreading of some form or another is common in African languages (Hyman and Schuh 1974; Odden 1995), and within Oto-Manguean it is attested in varieties of Mazatec (Jamieson 1977) and Mixtec (Daly and Hyman 2007). The Mazatec case reported by Jamieson (1977) shows a long distance spreading similar to that found in Zenzontepec Chatino. Zacatepec Chatino, a conservative variety of the Eastern Chatino subgroup, ha slong distance H tone spreading (Woodbury 2012) that is cognate to that of Zenzontepec Chatino.

3.3.2. *Downstep*

When a spreading high tone comes into contact with another tone, either H or M, that second tone is downstepped. Though a downstepped ↓H tone may be realized at a mid-level pitch, it is still phonologically /H/, and not /M/, because it will spread just like any other H tone (5).

(5) a. *ta tāká tzaka nkwítzą*
already exist one child
'There already was a child.' [DSF.santa.maria2 3:16]

b. *ta tāká tzaka nkwítzą*
M H ↓H

A M tone downstepped by a spreading H tone (6)will have a low pitch realization. However, it remains phonologically /M/, and not Ø, as it will trigger mid tone substitution (§3.3.3) in the appropriate context.

(6) a. *tatīyá telā n-tya ʔą=niʔ* *tzǫʔ kwayū*
every night HAB-go.around=3RSP back horse
'She went around on horseback every night.' [TCR.nikolasa 3:53]

b. *tātīyá telā n-tya ʔą=niʔ* *tzǫʔ kwayū*
M M H ↓M M

3.3.3. Mid tone substitution

An underlying /M/ tone on a monomoraic enclitic will be replaced by /H/ if and only if its host bears only a single M tone on its final mora. This can be viewed as a dissimilatory process. The mid-toned 3PL enclitic *=ūʔ* occurs twice in the example in (7). In the first instance its M tone is downstepped by the immediately preceding H tone. In the second instance its M tone is substituted with/H/ since its host bears only a final-mora M tone. The new tone is truly a phonologically /H/ tone, as evidenced by its spreading through the final, toneless word *yaą* 'sweat bath'.

(7) a. *lēʔ nk-yala=rīké=ūʔ* *nka-jnyā=**úʔ*** *yaą*
then CPL-fill=chest=3PL CPL-make=**3PL** sweat.bath
'They made a plan and built a sweat bath.' [TCR.ni7.rosa 2:24]

a. *lēʔ nk-yala=rīké=**ūʔ*** *nka-jnyā=**úʔ*** *yaą*
M MH↓M M **M** **H**

4. The verbal template and prosodic domains

It was stated above in §3.2 that the distribution of tones is best captured by referring to a constituent of one to three moras, and that this constituent is the phonological word. There are five basic bimoraic tone patterns that occur on uninflected phonological words, and the corresponding trimoraic patterns are predictable from those (§3.2). In order to understand how tone works in inflection, it is crucial to understand the prosodic status of the positions of different types of inflection. This is best done by examining the structure of verbs, which are where the majority of the morphology is found in Zenzontepec Chatino.

Verbs may be fairly morphologically and prosodically complex once they are fully elaborated, and they may contain several phonological words. The verbal template is given in figure 2. The Verbal Core makes up a single phonological word (ω) and consists of the head verbal root and three prefixal positions (adapted from Campbell in press, following in spirit Kaufman's 1987 work on comparative Oto-Manguean morphology). If the verb has an auxiliary, the auxiliary and its own aspect/mood prefix precede the Verbal Core, forming a

compound with it, but making up a separate phonological word from the Core. A verbal lexeme may itself be a compound with the head verb root in the Verbal Core and the incorporated stem (or stems) following it. Any such stems are separate phonological words. One or multiple adverbial enclitics may follow the simple or compound verb stem, and finally, a pronominal subject enclitic, if present, occurs last. Each enclitic is also a separate phonological word.

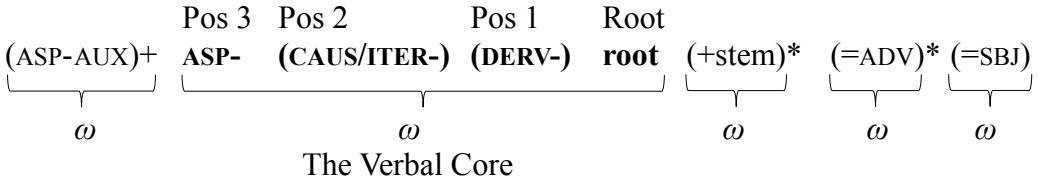


Figure 2. ZEN verbal template (from Campbell in press)

The two types of inflection in Zenzontepec Chatino are pronominal person inflection (§5), which occurs on stems of various grammatical classes, and aspect/mood inflection (§6), which is restricted to verbs. With person enclitics that have some segmental makeup, the behavior of tone follows the tonal phonology outlined in (§3). Inflection for 2SG person is purely tonal, and it occurs only on the final phonological word of the full stem, which may be the head root/stem, the final stem in a compound, or an adverbial enclitic. The segmental part of aspect/mood inflection, on the other hand, is prefixal and occurs in Position 3 of the Verbal Core, which is part of the same phonological word as the root and any derivational formatives(Pos 2 and Pos 1) associated with it. This difference in prosodic status of the positions of person versus aspect/mood inflection has significant ramifications for the behavior of tone in Zenzontepec Chatino inflection.

5. Person inflection

Zenzontepec Chatino has a single set of dependent pronouns, and they can serve any function that a pronominal NP can serve. The dependent pronouns for all person/number categories, except for 2SG, are enclitics (§5.1), and 2SG pronominal inflection (§5.2) alone is realized exclusively by tone change on the basic (3rd person) stem.

5.1. Dependent pronouns

The pronominal inflectional enclitics are listed in table 1. First person plural has a distinction between exclusive and inclusive, and the third person singular category is elaborated with several sub-categories: nonspecific, masculine, feminine, and respectful. Any third person pronoun, singular or plural, may have no overt coding if its referent is highly topical. As represented in the verbal template shown in figure 2, dependent pronouns always occur at the very end of any form that they inflect, which may be a verb, a noun in an inalienable possession construction, or an adjective or quantifier used predicatively.

Table1. Dependent pronouns of Zenzontepec Chatino

		SG	PL
1st	EXCL	*=ą̄ʔ*	*=ya*
	INCL	—	*=na* / *=ą*
2nd		TONE	*=wą*
3rd	(any)	Ø	Ø / *=ūʔ*
	NSPC	*=ūʔ*	
	M	*=yu*	
	F	*=chūʔ*	
	RSP	*=niʔ*	

Three of the pronominal enclitics (*=ą̄ʔ*, *=ūʔ*, *=chūʔ*) are monomoraic with M tone, and therefore undergo M tone substitution (§3.3.3) if their host bears only M tone on its final mora. Mid tone substitution, however, is a post-lexical phonological process, and none of the tones in its input or output are ever the sole exponent of any inflectional category. Second person singular inflection, on the other hand, is always and only realized by tone change on the basic (i.e. third person) stem.

5.2. Tone in 2SG pronominal inflection

Second person singular pronominal inflection is purely tonal, and in that respect it is different from pronominal inflection of other person/number categories. Pronominal 2SG inflection is realized strictly by two specialized tone patterns, and the rules for 2SG inflection are quite simple. First, if the final phonological word of the basic stem has only M tone on its final mora, then the 2SG stem is formed by substituting that M tone with H tone. This applies to monomoraic, bimoraic, and trimoraic phonological words alike. A few examples that consist of a single phonological word of various sizes, with only final M tone, are listed in(8), with basic stems on the left hand side and 2SG-inflected forms on the right.

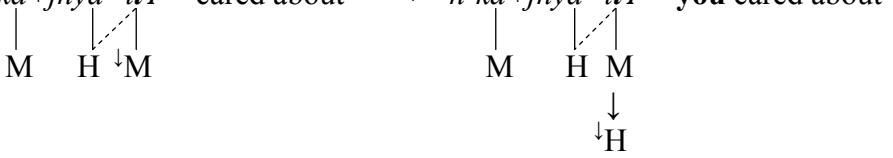
(8)	*jly**ū***	‘is big’	M	→	H	*jly**ú***	‘**you** are big’
	*ya**ā**ʔ*	‘hand of’	ØM	→	ØH	*ya**á**ʔ*	‘**your** hand’
	*nch-ujw**ī**ʔ*	‘is selling’	ØM	→	ØH	*nch-ujw**í**ʔ*	‘**you** are selling’
	*teʔy**ū***	‘naked’	ØM	→	ØH	*teʔy**ú***	‘**you** are naked’
	*xi-kiy**ā**ʔ*	‘pay of’	ØØM	→	ØØH	*xi-kiy**á**ʔ*	‘**your** pay’
	*nt-u-sa**ā**ʔ*	‘tears (tr.)’	ØØM	→	ØØH	*nt-u-sa**á**ʔ*	‘**you** tear (tr.)’

Some uninflected and 2SG-inflected pairs of complex lexemes that consist of multiple phonological words, but whose final phonological word has only a single final M tone, are in (9). The final phonological word may be an unbound stem, the final stem of a compound, or an enclitic.

(9) *jne jly**ū*** ‘thumb of’ → *jne jly**ú*** ‘**your** thumb’
*nka-ʔni+tzoʔ**ō*** ‘repaired it’ → *nka-ʔni+tzoʔ**ó*** ‘**you** repaired it’
*tyána+san**ā*** ‘will investigate’ → *tyána+san**á*** ‘**you**’ll investigate’
*ch-uʔu=tzoʔ**ō*** ‘will live well’ → *ch-uʔu=tzoʔ**ó*** ‘**you** will live well’

The example in (10) shows a case of 2SG inflection with tone substitution in an autosegmental representation. The process operates just as M tone substitution (§3.3.3) does, except there is no segmental pronominal enclitic and the tone substitution occurs right on the stem.[6]

(10) *n-kā+jnyá=tīʔ* ‘cared about’ → *n-kā+jnyá=tíʔ* ‘**you** cared about’



The second rule of 2SG inflection is the following: If a basic (i.e. 3rd person) stem has any tone pattern other than a single M tone on its final mora, then its 2SG inflected form will have M tone on all moras of its final phonological word. Examples of uninflected and 2SG-inflected monomoraic, bimoraic, and trimoraic stems consisting of a single phonological word are listed in (11), grouped according to their basic tone patterns: (Ø)Ø, (M)H, HM, HØ.

(11) a. *jne* ‘finger of’ Ø → M *jnē* ‘your finger’
tyuuʔ ‘will cough’ ØØ → MM *tyūūʔ* ‘you’ll cough’
yane ‘neck of’ ØØ → MM *yānē* ‘your neck’
kilituʔ ‘navel of’ (Ø)ØØ → (M)MM *kīlītūʔ* ‘your navel’

b. *jlyá* ‘is fast’ H → M *jlyā* ‘you are fast’
k-ōó ‘will grind’ MH → MM *k-ōō* ‘you’ll grind’
sūtẹ́ʔ ‘knee of’ MH → MM *sūtẹ̄ʔ* ‘your knee’
nkā-tūsúʔ ‘grabbed’ (M)MH → (M)MM *nkā-tūsūʔ* ‘you grabbed’

c. *nk-y-ánō* ‘stayed’ HM → MM *nk-y-ānō* ‘you stayed’
xī-nkwéē ‘jaw of’ (M)HM → (M)MM *xī-nkwēē* ‘your jaw’

d. *nyáʔa* ‘mother of’ HØ → MM *nyāʔā* ‘your mother’
ntē-tákwi ‘is flying’ (M)HX → (M)MM *ntē-tākwī* ‘you’re flying’

Again, for complex lexemes or stems made up of more than one phonological word, the 2SG tone pattern occurs strictly on the final phonological word (12).

(12) *nyáʔk**u**l**a*** ‘grandma of’ → *nyáʔk**ū**l**ā*** ‘your grandma’
tāká=kāʔá ‘lives too’ → *tāká=kāʔā* ‘you live too’
ʔne+tii=rīké ‘can guess’ → *ʔne+tii=rīkē* ‘you can guess’
y-akwiʔ+kíʔyū ‘bragged’ → *y-akwiʔ+kīʔyū* ‘you bragged’
nt-e+k-ū-líji ‘loses (tr.)’ → *nt-e+k-ū-lījī* ‘you lose (tr.)’

[6] This fact of course suggests that at some point in time there was a 2SG enclitic with M tone, but its segmental features were lost. The loss of segmental features likely occurred at some pre-proto-Chatino stage, since no attested Chatino variety conserves any of the segments.

It is possible to view this type of 2SG tonal inflection as involving delinking of whatever tones are associated with the final phonological word of the host and addition of a purely M tone (moraless) enclitic, whose M tone then spreads to the beginning of that domain (13).

(13) *lákwi?* 'oneself' → *lākwī?* 'yourself'
H H M

Like the 2SG tonal marking, the non-2SG person/number enclitics, which are all at least partly segmental, only attach to the final phonological word of their host. Therefore, as regards their distribution and function, the 2SG inflectional tone patterns are much the same as the other person/number enclitics. The crucial difference is that while the phonological makeup of the other person/number categories is either (i) strictly segmental or (ii) both segmental and tonal, the substance of 2SG inflection is strictly tonal. Since the exponent of a discourse participant pronoun, with its high frequency of use, is purely tonal, tone can be said to have a high functional load in Zenzontepec Chatino. However, some of that load is perhaps lightened by the fact that the tone patterns of second person singular inflection are unique to that function and therefore stand out as such.

6. Aspect/mood inflection

Aspect/mood inflection involves two largely independent layers of complexity: (i) segmental prefixation (§6.1), which may be fusional, and (ii) alternation in a stem's basic tone pattern across different aspect/mood categories (§6.2). The role that tone plays in aspect/mood inflection is quite different from the role of tone in 2SG pronominal inflection, a fact that is due to the difference in prosodic status of the positions of the two types of inflection (§4). Though aspect/mood inflection involves tone, the tone of the inflected form is not predictable from the tone of the uninflected stem asit is in 2SGperson inflection. Also, although aspect/mood categories may have many allomorphs, no allomorph of any category is purely tonal, whereas 2SG person inflection is always purely tonal.

6.1. Prefixal aspect/mood inflection

The four primary aspect/mood categories that Zenzontepec Chatino verbs inflect for are Potential Mood (POT), Habitual Aspect (HAB), Progressive Aspect (PRG), and Completive Aspect (CPL). Most verbs can be grouped into one of seven prefix-based inflectional classes according to which allomorphs of the four primary aspect/mood prefixes they select. Table shows the prefix classes of Zenzontepec Chatino (Campbell 2011), modeled on Kaufman's (1987) analysis of Zapotec verb classes. The notation (*t* → *ty*) means that a stem-initial /t/ becomes palatalized [tʲ].

Table 2. ZEN Aspect prefix (sub-)classes (Campbell 2011)

	POT	HAB	PRG	CPL
Ac/A2	*ki-*	*nti-*	*nte-*	*nka-*
A2	*ki-*	*nti-*	*nte-*	*nkwi-*
Bc	*ki-*	*nti-*	*nte-*	*nku-*
Bt	(*t* →*ty*)	*n-* (*t* →*ty*)	*nte-*	*nku-*
By	(*y* →*ch*)	*n-* (*y* →*ch*)	*nte-*	*nk-*
Ca	*k-*	*nti-*	*nch-*	*nku-*
C2	*k-*	*nti-*	*nch-* ~ *ntey-*	*y-* ~ *nkay-*

In some cases the phonological shape and/or lexical semantics of a verb may provide clues about which prefix-class it will belong to, but the prefix-class of many verbs cannot be reliably predicted on such grounds. A summary of the phonological and/or semantic characteristics that tend to associate with each prefix-based verb class is given in (14)(from Campbell in press, see also Campbell 2011).

(14) Sub-class Ac/Au unergative or transitive verbs (Ac),derived *u-* causative verbs (Au)
Sub-class A2 transitive and all *i* or *e* initial verbs (tr. or itr.)
Sub-class Bc unaccusative verbs
Sub-class Bt motion and posture verbs
Sub-class By *y-* initial verbs, many being derived unaccusative
Sub-class Ca unaccusative, *a-* initial
Sub-class C2 unergative or transitive, begin in *a-*, *o-*, or *u-*

Table 3shows the aspectual paradigms of one verb from each of the seven prefix-classes. Each of these verbs is toneless in all four of its inflected forms, so the lack of tone cannot be correlated with any particular prefix or prefix-class.

*Table 3.*Aspectual paradigmsfor toneless verbs of each prefix-class

		Stem	POT	HAB	PRG	CPL
Ac	'laugh'	*-xiti*	*ki-xiti*	*nti-xiti*	*nte-xiti*	*nka-xiti*
A2	'choose'	*-xikạ*	*ki-xikạ*	*nti-xikạ*	*nte-xikạ*	*nkwi-xikạ*
Bc	'get toasted'	*-kiʔi*	*ki-kiʔi*	*nti-kiʔi*	*nte-kiʔi*	*nku-kiʔi*
Bt	'go around'	*-taʔạ*	*tyaʔạ*	*n-tyaʔạ*	*nte-taʔạ*	*nku-taʔạ*
By	'get burned'	*-y-atiʔ*	*ch-atiʔ*	*n-ch-atiʔ*	*nte-y-atiʔ*	*nk-y-atiʔ*
Ca	'be born'	*-ala*	*k-ala*	*nti-(a)la*	*nch-ala*	*nku-(a)la*
C2	'hold'	*-alaʔ*	*k-alaʔ*	*nti-(a)laʔ*	*nch-alaʔ*	*y-alaʔ*

6.2. Tone alternations in aspect/mood inflection

Unlike the verbs in Table 3, the tone pattern of many verbs varies depending on which aspect/mood category they are inflected for. Table 4 shows eight prefix sub-class Bc verbs inflected for the four primary aspect/mood categories. Even though each verb in the table shares the same set of prefixes, each verb has a different cross-aspect tone pattern. This demonstrates that cross-aspect tonal alternations are independent of any prefixal part of

aspect/mood inflection. Therefore, just as verbs can be classified according to which allomorphs of the aspect/mood prefixes they select, they can also be placed into inflectional classes according to the tonal dimension of their aspect/mood inflection.

Table 4.Prefix sub-class Bc verbs with varying tone patterns across aspects

	POT	HAB	PRG	CPL	tone pattern
'get angry'	*ki-nyaxę̀ʔ*	*nti-nyaxę̀ʔ*	*nte-nyaxę̀ʔ*	*nku-nyaxę̀ʔ*	ØØ invariant
'get counted'	*ki-lakwā*	*nti-lakwā*	*nte-lakwā*	*nku-lakwā*	ØM invariant
'fall over'	*ki-sāą́*	*nti-sāą́*	*nte-sāą́*	*nku-sāą́*	MH invariant
'sink (itr.)'	*ki-líti ʔ*	*nti-líti ʔ*	*nte-líti ʔ*	*nku-líti ʔ*	HØ invariant
'get beaten'	*ki-ka ʔne*	*nti-ka ʔne*	*nte-ká ʔnē*	*nku-ká ʔnē*	ØØPOT/HAB; HM PRG/CPL
'get snapped'	*ki-kitę̄ʔ*	*nti-kitę̄ʔ*	*nte-kītę́ʔ*	*nku-kītę́ʔ*	ØMPOT/HAB; MH PRG/CPL
'come off'	*ki-su*	*nti-su*	*nte-sū*	*nku-sū*	ØØPOT/HAB; ØM PRG/CPL
'get crushed'	*ki-tita*	*nti-tita*	*nte-tita*	*nku-titā*	ØØPOT/HAB/PRG; ØM CPL

Just as the aspect-prefix classes cannot be used to predict the tone pattern across a verb's aspectual forms, the phonological shape of the stem itself does not help predict a verb's tone pattern either. The two verbs 'be hanging' and 'fly' in Table 5 illustrate this well. The segmental makeup of the two stems (and their prefixes) is identical, and the verbs' only formal difference is in their tone patterns. The verb 'be hanging' is toneless in the Potential Mood and Habitual Aspect, but it has the HM basic tone pattern in the Progressive and Completive Aspects. In contrast, the verb 'fly' has invariant HØ tone across all aspect/mood forms.

Table 5. Segmentally identical verbs with different tone across aspects

		Stem	POT	HAB	PRG	CPL
'be hanging'	Bt	*-tákwī*	*tyakwi*	*n-tyakwi*	*nte-tákwī*	*nku-tákwī*
'fly'	Bt	*-tákwi*	*tyákwi*	*n-tyákwi*	*nte-tákwi*	*nku-tákwi*

Another pair of verbs that are segmentally identical in all of their inflected forms and only differ in their tone alternation patterns across aspects is given in Table 6. The verb *-una* 'hear' is toneless in all four aspects, while the verb *-ūná* 'cry' has the ØM basic tone pattern in the Potential Mood and Habitual Aspect and the MH basic tone pattern in the Progressive and Completive Aspects.

Table 6. Prefix-class C2 verbs with different tone across aspects

		Stem	POT	HAB	PRG	CPL
'hear'	C2	*-una*	*k-una*	*nt(i)-una*	*nch-una*	*y-una*
'cry'	C2	*-ūná*	*k-unā*	*nt(i)-unā*	*nch-ūná*	*y-ūná*

There are9cross-aspect tone alternation (or lack thereof) patterns that occur in the language, and they are listed in Table 7, along with the percentage of non-compound verbs in the

lexicon on which they occur. Of the 375 basic verbs so far documented, 71.2% of them have invariant tone (or invariant tonelessness) across aspects.

Table 7. Summary of tone pattern alternation across aspects

Tone alternation pattern across aspects		% of non-compound verbs in lexicon		
Invariant (same tone in all aspects)		71.2%		94.3%
ØØPOT/HAB	HM PRG/CPL	10.9%	23.1%	
ØM POT/HAB	MH PRG/CPL	8.5%		
ØØPOT/HAB	ØM PRG/CPL	2.1%		
MH POT/HAB	ØM PRG/CPL	1.6%		
ØM POT/HAB/PRG	MH CPL	1.9%	5.7%	
MH POT/HAB/CPL	ØM PRG	1.9%		
ØØPOT/HAB/PRG	HM CPL	1.4%		
ØØPOT/HAB/PRG	ØM CPL	0.5%		

Another 23.1% of non-compound verbs follow a pattern in which the Potential Mood and Habitual Aspect forms have the same basic tone pattern and the Progressive and Completive Aspect forms share a different tone pattern. In the remaining 5.7% of non-compound verbs, the tone is also always the same in the Potential and Habitual forms, but tone varies between the Progressive and Completive Aspects. The majority of these are verbs in which the Progressive Aspect form is built on the Potential Mood form, and that is why only the tone on the Completive Aspect form is different. The few verbs that have a unique tone solely in the Progressive Aspect may reflect an earlier pattern in which the Progressive Aspect prefix bore M tone, as it still does today in Zacatepec Eastern Chatino (Villard & Woodbury 2012).

Given the above patterns, some generalizations can be made. First of all, the tone in the Potential and Habitual is always identical, without exception, and the tone is almost always identical between the Progressive and Completive Aspects (94.3% of the time). Second, even though tone is ultimately not predictable across the various aspect/mood inflected forms of a verb, knowing the tone in one or two aspect forms can narrow down the possibilities of which tones may occur in the other forms. For example, if a verb has no tone in the Completive Aspect, then it will be toneless in all other aspects. Also, if a verb has ØM tone in the Potential Mood and Habitual Aspect, it can only have either ØM or MH tone in the Progressive and Completive Aspects. If a verb has either the HM or HØ tone pattern in the Potential and Habitual forms, then its tone must be invariant across all forms, and if a verb has HM tone in the Completive Aspect, then all other forms must have either no tone or the same HM tone pattern.[7]

7. Discussion and conclusions

The system of TAM inflection in Zenzontepec Chatino is quite complex because there are two orthogonal layers, the prefixal system and the tone alternation system, simultaneously at play. Excluding verbs with irregular prefixes that would make up singleton inflectional classes, the seven prefix classes and nine tone alternation classes combine to yield 63

[7] This is not an exhaustive list of the cross-aspect tone predictive possibilities that can be drawn for the summary in Table 7.

possibilities. Of these possibilities, 31 are actually populated (Campbell 2013b), so the language can be said to have at least that many inflectional classes.

Since there is considerable allomorphy in all of the aspect/mood inflectional categories and the selection of allomorphs is often not predictable based on the phonological shape or lexical semantics of a verb, aspect/mood inflection in Zenzontepec Chatino is morphomic, i.e. purely morphological (Aronoff 1994: 25), at least for some verbs. Interestingly, the same is true for other Chatino languages (Villard 2010; Sullivant 2011) and Zapotec languages of several primary subgroups within Zapotec (Bartholomew 1983; Kaufman 1987; Smith Stark 2002; Beam 2004). Therefore, the inflectional class system is old and relatively stable despite being an example of apparently spurious complexity.

Person inflection, on the other hand, is completely regular in Zenzontepec Chatino. Even in 2SG inflection, with its two allomorphs that are purely tonal, the selection of one of the allomorphs is predictable from the tone of the uninflected stem. Therefore, person inflection does not contribute to the complexity of the inflectional classes.

Aspect/mood inflection precedes the verb stem and always falls into the same phonological word as the stem, while person inflection is realized by enclitics that follow the verb, and if segmental, make up a separate phonological word from it. The different positions of the two types of inflection, and the differing prosodic statuses of those positions, are the reason why the role of tone is quite distinct in each type of inflectional morphology in Zenzontepec Chatino.

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Abbreviations

CPL	Completive Aspect	POT	PotentialMood
DEF	definite	PRG	Progressive Aspect
DEM	demonstrative	RSP	respectful
HAB	Habitual Aspect	TPLZ	topicalizer
itr.	Intransitive	tr.	transitive
NSPC	non-specific		

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Tonal inflection and dialectal variation in Mazatec

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1. Introduction

In this paper, we study tonal inflection in the context of dialectal variation. We concentrate on Mazatec, a much diversified dialect network of Mexico from the Popolocan group of Oto-Manguean. We revisit here the seminal proposal in Pike (1948: 95-165) about the role of tone in the verbal inflection of Mazatec by studying and evaluating its relevance with respect to present-day dialectal variation based on three key dialects of Mazatec: a subdialect of the central Highlands close to the Huautla dialect described by Pike; the dialect of San Miguel Soyaltepec from the Lowlands, and the peripheral and very innovative dialect of San Francisco Huehuetlán. Our study is based on first-hand data collected in intensive fieldwork since 2010 as an important outcome for the creation of a linguistic atlas of Mazatec as part of the 'ALMaz' project.[1]

In section 1, we present the main dialect divisions and current spelling conventions for Mazatec. In section 2, we introduce the reader to three competing descriptive models of inflectional and tonal classes in Mazatec: Pike (1948), Jamieson (1982) and our own (ALMaz). In section 3, we describe each of the three dialects, on the basis of salient lexical root tone or inflectional class paradigms. Each case study discusses competing degrees or options for increasing complexity or, on the contrary, 'simplexity' (i.e. parsimony and regularity). We conclude with some remarks on the need for more dialect studies on Mazatec, a language mostly described through a few cases studies, which could hardly grasp the intricacy of typological variation induced by geolinguistic and sociolinguistic factors. Our basic assumption is that in Mazatec, as a dialect network, an inflectional tone system emerged out of preverbal stem formation, but became demotivated, through competing morphological processes of 'complexification' of suppletive preverbs and root allomorphs in stems. Tone patterns became simplex, whereas preverb classes and stem allomorphy became more and more complex. This trend is also supported by the fact that agreement marking in Mazatec, either subject or object agreement, tends to be enclitic instead of affixal or merely desinential. As a result, tone inflection still plays a central role in some dialects, especially in the central or in the northwestern Highlands (Huautla, San Mateo, San Antonio), but its relevance tends to become dimmer as time unfolds. This complex dynamics of competing and interacting segmental (concatenative) and suprasegmental (tonal) resources in the building of the grammar and the lexicon is exemplified by the three dialects at stake. Should dialect areas sum up to seven (see figure 1 below), patterns of intrication of tonal *vs.* morphological complexity probably go beyond twenty-five, according to fieldwork observations made within the framework of the ALMaz. This paper provides but a glimpse of this complexity, though it advocates underlying 'simplexity' in the making up of tone inflectional systems in particular.

[1]The ALMaz project (*Atlas Lingüístico Mazateco*) is a dialectal database fed with Kirk's data (1966) and a wide range of first-hand data recorded through fieldwork in over 25 localities since 2010. It also includes Regino's (1993) phonological data sets and Pike's (1948) inflectional paradigms. The questionaire has more than 1,800 items. For more information see Léonard (2010, 2012); Léonard *et al.* (2012); and Léonard and Kihm (2012, 2014).

1.1. Mazatec as a 'diasystem'

Mazatec is one of the most diversified dialect networks of the Popolocan language group of Eastern Oto-Manguean. It displays a very high degree of dialectal diversity (see Kirk 1966) producing a large 'diasystem' (see Weinreich 1954). Alternatively, one could also speak of Mazatec languages rather than Mazatec dialects.

The Mazatec diasystem has traditionally been divided into two main zones: the Highlands and the Lowlands, but phonological areas differ sharply from morphological areas, and strong differences in lexical stem formation choices involved in the building up of verb inflection justify further divisions. We propose at least the five areas in figure 1:[2] (i) the area of the central Highlands (CH), with the Huautla dialect as a powerful norm, federating Santa Maria Asunción and San Miguel Huautepec; (ii) the Lowlands (Lw), with further subdivisions; (iii) the valley (Cuicatlán Canyon, CC) including the western dialect of Mazatlán Villa de Flores and the Chiquihuitlán dialect of the East described and documented in Jamieson (1988, 1996); (iv) the northwest area (NW), including the dialects of San Francisco Huehuetlán, San Jerónimo Tecoatl and San Antonio and the so-called Pueblan Mazatec; and (v) the midlands (ML), which could be further subdivided between the San Pedro Ixcatlán dialect, with a strong drive towards the Lowland dialect of San Miguel Soyaltepec, and the Jalapa de Diaz dialect, which federates dialects of the "Piemont" (Ayautla) and the area of the Santo Domingo river. In this paper, we mainly focus on a comparison of the tonal inflection of three main dialects, as given in map 1.

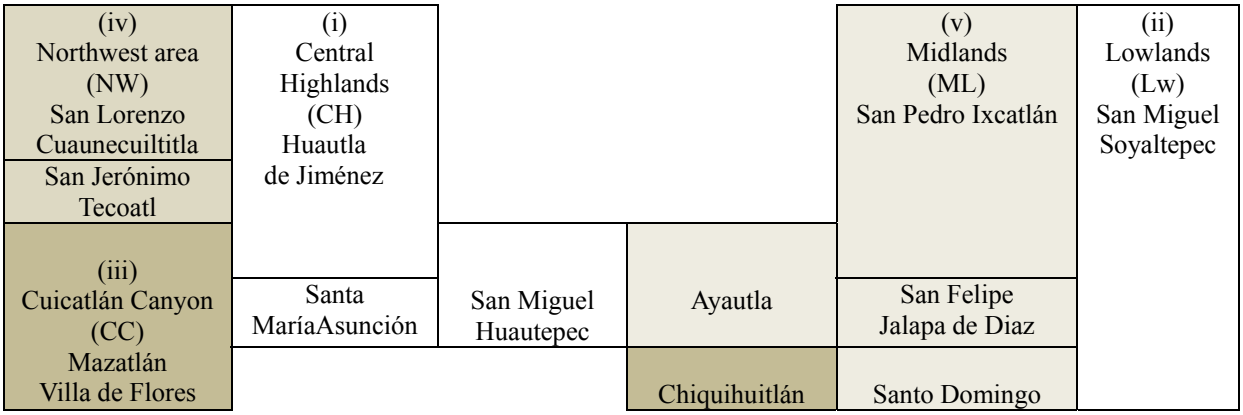
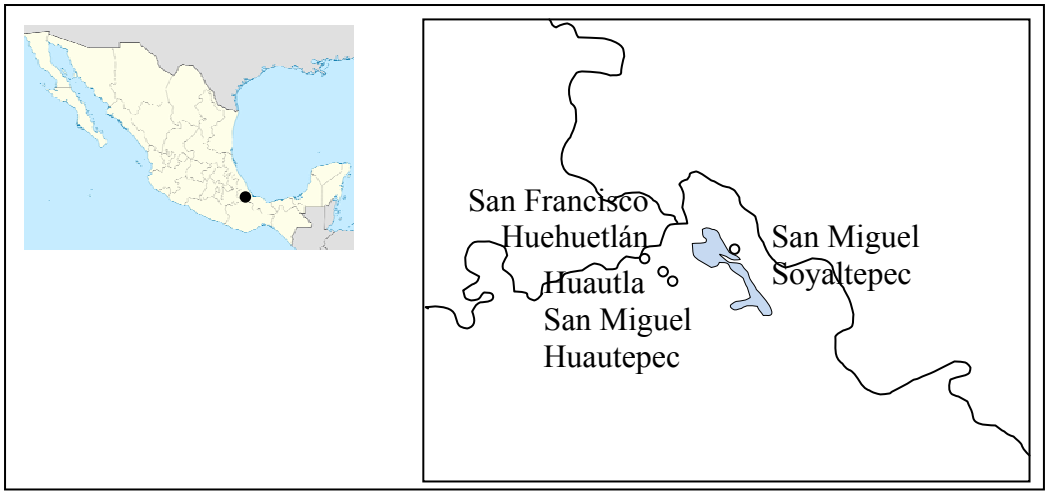


Fig. 1. Mazatec main dialect divisions (Léonard *et al.* 2014).

[2] This figure is the result of a cladistic initiated by Jean Léo Léonard with Antonella Gaillard-Corvaglia and Pierre Darlu based on Kirk's (1966) cognate sets for 12 Mazatec varieties, later published in Léonard *et al*. 2014. Details on isoglosses are given in Léonard *et al.* (2012). See also Gudschinsky (1958a).



Map 1. The three Mazatec dialects of the study

1.2. Phonology and spelling conventions

The basic consonant inventory of Mazatec is given in table 1 together with the so-called ALFALEIM orthography based on Regino (1993) and Cerqueda García (2001).[3] As literacy in Mazatec is on the rise, and as there is some demand for printed data in current spelling conventions, we preferentially use the ALFALEIM convention.[4]

Table 1. Mazatec primary contoïds.

	Labial	Coronal			Dorsal	Glottal
		Dental	Palatal	Retroflex		
Stops		t <*t*>			k <*k*>	ʔ<*’*>
Affricates		ts <*ts*>	tʃ<*ch*>	tʂ<*z*>		
Fricatives		s <*s*>	ʃ<*x*>			/h/<*j*>
Resonants nasals	m <*m*>	n <*n*>	ɲ<*ñ*>			
Lateral		l <*l*>				
Approx/Glides	w <*b*>[5]		j <*y*>			

The vowel system is penta-vocalic, though back high and mid vowels /u, o/ have complex patterns of complementary distribution and neutralization. Nuclei can be oral, nasal, creaky and breathy. Nasality is represented by a <*n*> in the spelling (e.g. <*in,en,an, un/on*>). The apostrophe <*’* > represents creakiness in nuclei and ejectivity in onsets, whereas <j> represents breathiness. Nuclei can be interrupted (V’V) or reaspirated (VhV), increasing

[3] ALFALEIM stands for ‘Alfabeto para la Lengua Indígena Mazateca’.
[4] In the ALFALEIM, /hw/ is represented as <*f*>.
[5] A strong trend to betacism (*w>v, b*) has been spreading swiftly through the diasystem in the late decades. In Kirk’s comparative data from 1966 the bilabial approximant is still abundantly documented for many dialects, especially in the lowlands and in the periphery of the Highlands (we also noted [w] instead of [b] in Pueblan Mazatec). It seems the phenomenon has irradiated from centers as Huautla and Jalapa, and it is gaining stronghold nowadays nearly everywhere in younger speaker’s sociolects. Pike and Pike (1947) and Pike (1948) still record an intermediate allophone of the fricative type <v> in Huautla, i.e. a bilabial spirant [β], whereas most speakers now have plain [b]. In order not to puzzle the reader with erratic allophones, we have unified data in this paper using <*b*> as the only grapheme for underlying /w/.

conditions for creakiness (V̰) and breathiness (V̤) (see Kirk *et al.* 1993, Silverman *et al.* 1995, Silverman 1997). Nuclei are always short (vowel gemination in the spelling is only an orthographic artefact to annotate tonal contours, but there are no long vowels in Mazatec).

Mazatec has both level and contour tones. Some dialects have three level tones (Jalapa de Diaz) while others have up to four (Huautla, San Miguel Soyaltepec). The ALFALEIM convention for writing tones is the following:

- High (/H/) represented with an acute accent (*í*)
- Mid-high (/h/) represented with a grave (*ì*)
- Mid (/M/) which is not represented (*i*)
- Low (/L/) represented with an underlining (i̲)

Contour tones (HM, HB, hM, hB, MB, BM, Bh, Mh, hH, BhB, BhM, cf. Pike, 1967: 313) do not significantly increase duration in nuclei, as already noted by Pike & Pike (1947).

2. Competing models for verb morphology in Mazatec

Verb inflection in Mazatec is notoriously complex, and one has to handle it somehow. To achieve this, two main models have been proposed in the literature so far. The pioneering one is by Pike (1948), who regards Mazatec verbs as being composed of a co-verb and a lexical root. For example, the form *b'éxá* 'send' is analyzed as consisting of the bound light verb *b'é-*, to which the meaning 'put down' is assigned, and the nominal root *xá* 'work'. The second model is found in Jamieson (1982) and is exploited further in Léonard and Kihm (2010, 2014). In the latter model, Mazatec verbs are made up of complex stems, composed of a stem formative which for the most part has no or little semantic specifications and a lexical root, hence *b'é+xá*'send'. Both models have their pros and cons, but in general one could say that the strength of one becomes the weakness of the other, and vice versa. Pike's model envisions a Mazatec verbal lexicon that is entirely compositional in structure: the light verb serves as a specifier to convey dynamicity and specifications about position and direction, whereas the lexical root provides the lexical content. The roots in question are seen as polyvalent, i.e. they may be further analyzed as belonging to the class of N, ADJ, PRED, etc. The lot is transformed into a verb by lexical collocation. But it has consequences for the lexicon, as almost all verbs in the lexicon are thus seen as derived. In a way, Pike's views of verb formation mechanisms in Huautla Mazatec is strongly supported by the lexicon- For example, the verb *(t)si'i(n)* '*mak*e' is used as the causative prefix *(t)si-*. However, it is sometimes difficult to predict the meaning of the composition from its parts, and sometimes the parts are completely opaque. Besides, some of Pike's light verbs surface as highly irregular and suppletive in the verb paradigm. And it is precisely the need to handle the idiosyncracies of their inflectional behavior that makes Jamieson's model more attractive, as they are handled in terms of inflectional classes. In her model, verb inflection is seen as a joint effort of the morphological properties of the stem formatives (the light verbs in Pike's model) – inflected for the 1st person singular and for the incompletive by means of tone – and the properties associated with the root. For convenience of exposition, we use Pike's terminology when referring to the compositional parts of the stem of a verbal lexeme, and will thus use labels such as 'preverb' and 'root' to refer to such units.

Pike's model is also pioneering in handling the role of tone in Mazatec inflection. In his model, the lexical root is the unit that *gives the tune* at word level, providing the *stem tone*. He bases his analysis of Mazatec on the Highlands dialect of Huautla, which has six tone classes defined by the tone of the root (R-T class, henceforth): one for each level tone (/H/, /h/, /M/,

/L/) and two contours (LM and Lh). These classes are illustrated in table 2. We will see later how much these lexemes may vary affixally and prosodically.

Table 2. Pike's (1948) R-T classes (PV stands for 'preverb').

Root tone class		Verb	Gloss	Composite elements		Composition
Class 1	/H/	*b'éxá*	'send'	*b'é-xá*	PV+N	'put down' + 'work'
		b'én'ión	'tie'	*b'é-n'ión*	PV+ADJ	'put down' + 'strong'
		síská	'play'	*sí-ská*	PV+PRED	'do' + 'be foolish
Class 2	/h/	*sítsjò*	'grill'	*sí-tsjò*	PV+ ADJ	'do' + 'crisp'
		bántjè	'plant'	*bá-ntjè*	PV+N	'place' + 'corn-hip'
Class 3	/M/	*b'é'ma*	'hide'	*b'é-'ma*	PV+N	'put down' + 'secret'
		b'éts'oa	'ask for'	*b'é-ts'oa*	PV+N	'put down' + 'mouth'
Class 4	/L/	*b'éntjao*	'ventilate'	*b'é-ntjao*	PV+N	'put down' + 'wind'
		síkao	'touch'	*sí-kao*	PV+ADP	'do' + 'with'
Class 5	LM	*b'éñai*	'bury'	*b'é-ñai*	PV+?	'put down' + '?'[6]
		b'ésee	'whistle'	*b'é-see*	PV+N	'put down' + 'song'
Class 6	Lh	*bántià*	'open way'	*bá-ntià*	PV+N	'place' + 'path'

Verbs in Mazatec can be classified into different morphophonological classes, according to the phonological shape of their preverbs and their behaviour. For this purpose consider table 3.[7]

Table 3. Preverbs and morphophonological classes for Huautla Mazatec.

Class			Preverb	Semantics	Person split
Labial onsets	I	A	*b'é-*	COLLOCATIVE	No Split
		B	*ba-*		
		C-1	*bi-*	DYNAMIC	
	II	C-2	*ba- / bi-*		Split
		C-3	*bá- / fa-*		
	III		*b'a- / ch'a-*	COLLOCATIVE	
Coronal onsets	IV		*sí- / ni-*	CAUSATIVE	
	V		*tsò- / mi-*	ALLOCUTION	
Dorsal onsets	VI		*kjo- / chjo-*	MOVEMENT	
Open set	VII		*see / jnta*	KERNEL PROCESS	

To sumarize table 3 in a few words, Huautla Mazatec and many Highlands varieties divide verbal stems into three major morphophonological classes (indicated in roman numbers): one with labial onsets (I, II, III), one with coronal onsets (IV, V), and another with dorsal onsets (VI). Subdivisions are due to semantic correlates: *collocative*, such as 'put', 'get', 'carry' and 'hold'; *dynamic*, with directionals, such as 'go', 'pass', etc. *causative* 'make', 'give', 'come to do something'. Classes II-VII have a stem split conditioned by person. The first stem is used for the 3rd person and the 1st person singular; the second one for all other persons.At times

[6]Though Pike does not give a gloss here, we may assume *ñai* can be interpreted as 'lay', derived from *jña,* or *jna* 'stay', i.e. as a semantically *positional* root.

[7]The classification in table 3 results from the ALMaz and has strongly benefitted from the advices of two Mazatec linguists (Juan Casimiro Nava and Javier García Martínez, both from Huautla) and from several Mazatec Grammar Workshops organized with the CMPIO alliance of bilingual school teachers in 2010-2013 (see Léonard, Gragnic and Avilés Janiré Gonzalez, 2013).

we refer to this split schematically as '+3/1SG' vs. '-3/1SG', the latter indicating all other persons but 3rd person and 1st person singular. The split serves to encode information about the person of the subject in an indirect way, but information about person of subject is also encoded in Mazatec by means of suffixes at root level. With suffixes, the juncture between the root final vowel and the person suffix gives rise to a number of complex adjustments whose outcomes vary across all Mazatec dialects. A summary of the outcomes found in Pike's data of Huautla Mazatec is given in table 4.

Table 4. Nuclei juncture shift in Pike's data of Huautla Mazatec

NEUTRAL	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL	
	Base form	*-a*	*-i*	*-o*	*-i*	(*-à*)	
e > a	*b'éjt**é***	*b'e̲ejtée*	*b'èjt**á**-i*	*b'èjt**á**-o*	*b'èjt**á̲i***	*b'èjté*	'wrap'
	*b'**é***	*b'e̲e*	*b'**à**-i*	*b'**à**-o*	*b'**à̲i***	*b'è*	'put'
ai > a/e	*b'éñ**a̲i***	*b'e̲eña̲i*	*b'èñ**a̲**-i*	*b'èñ**a̲**-o*	*b'èña̲i*	*b'èñ**e̲**-è*	'burry'
ao > oa/o	*b'éntj**a̲o***	*b'e̲entj**o̲**-a̲*	*b'èntj**o̲a̲**-i*	*b'èntj**o̲a̲**-o*	*b'èntj**o̲a̲i***	*b'èntj**o̲**-à*	'fan'

Besides segmental morphology, tone also plays a major role in Mazatec verbal inflection. For this purpose, consider the partial paradigm of the class 1 verb *b'éxá* 'send' in Table 5, which is a reanalysis of Pike's (1948) notation of Huautla Mazatec.

Table 5. Analysis of Pike's paradigm for *b'éxá* 'send' in Huautla Mazatec.

	PRESERVATION OF STRUCTURES		PREVERB DOWNSTEP (e.g. 1SG)		OCP & ENCLITIC FUSION	
	3 (base form)		1SG		1PL.INCL	
NEUTRAL	*b'éxá*	b'é-xá	*b'e̲exáa*	b'e̲e-xá=a	*b'èxá*	b'è-xá(=à)
CPL	*tsak'éxá*	tsak=(b) 'éxá	*tsak'e̲exáa*	tsak=(b)'e̲exá=a	*tsak'èxá*	tsak=(b)'èxá(=à)
INCPL	*k'o̲èxá*	k= (b)'èxá	*k'o̲exáa*	k=(b)'exá=a	*k'oéxá*	k=(b)'éxá(=à)

Let us start with the neutral aspect. We take the form for the 3rd person (SG/PL) *b'éxá* < |*w'éxá*| as lexical, i.e. it is the default or the lemmatic form. The form for the 1st person singular *b'e̲exáa* has two contours: one on the preverb (*b'e̲e-*), the other on the lexical root (*xáa*). Here, the preverb is indeed conjugated with a 1SG allotone: the LM contour. The HM contour in the root (*xáa*) results from the incorporation of a homorganic low vowel /a/, preserving a tonal trace of its suffixation, i.e. a conditioned reflex of the enclitization *=an* (the bound person index for 1st person singular). The completive prefixes *tsaka-* > *tsak-* have a predictable pattern: they copy the stem of the neutral aspect (including tone patterns), except for the labial onset, which undergoes deletion before the prefix.

In the incompletive forms, we can observe the outcome of a process dubbed *vocalization* by Bull (1984), which affects the labial onset: INCPL *k=w'èxá* > *k=u'èxá* >*k'o̲èxá*.[8] On the prosodic level, the initial slot of the stem receives a Lh contour: *k'o̲èxá*. The tone for the other forms also changes: LM for 1st person singular (*k'o̲exáa*) and MH for the 1st plural inclusive (*k'oéxá*).

As is indicated in table 5, for the tonal making of inflected forms we propose three main processes:

(i) **Lexical anchorage** (or preservation of structures): the tone for the form of the 3rd person is anchored as the lexical tone.

[8]Interestingly, this deletion does not occur with the prior completive marker *ka=*: PRIOR CPL 3 *ka=b'éxá*'(s)he just sent'. The marker *tsak-* is a chain made of *tsa-* and *ka=; tsa-* being a well identified completive prefix in other Mazatec dialects.

(ii) **Preverb downstepping**: the marking for the 1st person singular is made by downstep on the preverb (/H/> LM) and also on all persons in the incompletive[9].

(iii) **Obligatory Contour Principle** (OCP): Following McCarthy (1986), OCP states that languages tend to prefer contrastive rather than tautological chains, prefering /L-H/ or /H-L/ strings to /H-H/ or /L-L/ plateaus. In this case, forms like *b'èxá*, with a /h-H/ pattern, actually results from lexical/H/ tone of the preverb, which is no longer controlled by the default paradigm, i.e. the lexically anchored pattern as mentioned previously in (i), so that any intermediary level tone can be used (/h/ or /M/). Indeed, there is no discrete difference between forms such as *b'èxá-* or *b'exá-* in the ALMaz data[10].

So far the basics of what we can learn from Pike's description of verbal inflection. But Pike's data have an important flaw: he avoided dealing with variation. For the sake of ergonomic description of the data made available to him, mainly by his sister Eunice, Kenneth Pike unified paradigms to make regularity come through. In other words, he did not take variation into account, so that the annotation of the contour tones and other tone contrasts presented in table 3 should be regarded as a theoretical construct, made regular in order to make it understandable. Pike was describing the Huautla dialect from an idiolect, and at the same time, he does not provide the reader with information as to who collected the data, with whom, what kind of speaker, from where, of what age and what gender. Although we are well aware that such were questions which were not relevant in the 1950s, in many Huautla idiolects that we have recorded since 2010 we have observed a great degree of flexibility as to the necessity of applying contrastive patterns to the synchronic equivalent forms to those in table 2.

Table 6 includes novel data provided by Clementina Cerqueda García in September 2011, an educated language consultant form Huautla aged 53 at the time. The data can be compared with Pike's, contrasting forms are given in shading. Tone values were attributed according to a set of phonological principles, but the final decision was taken according to f0 values observed on PRAAT (Boersma and Weenink 2014). This idiolect makes the tone stem contrasts smoother: it opposes two stems only:the default stem *b'èxá-* (/h-H/) and the contour stem *b'e̲exá-*(LM-/H/). The two sets of data are the same in the incompletive, i.e. they are both based on the default stem *k'oéxá-*. In the completive, the contour is weak: e.g 1SG.CPL *tsak'**e**xáa* in the ALMaz data vs. *tsak'e̲exáa* in Pike's. In several cells, the preverb high tone is neutralized into a mid tone: *b'exái*, instead of Pike's *b'èxái*.

Table 6. Comparing tone class 1 verb *b'éxá* 'send' in Pike's and ALMaz.

		3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NEUTRAL	Pike's	*b'éxá*	*b'e̲exáa*	*b'èxái*	*b'èxáo*	*b'èxái̲*	*b'èxá*
	ALMaz	*b'èxá*		*b'exái*		*b'exáijin̲*	*b'exá*

[9] We do not use here the term "downstep" as a lowering floating tone, nor as a kind of downdrift (Yip 2002) in the final domain of a word or a phrase. Instead, we do use it as a lowered high tone (/H/ > /h/, /M/), or as a lowered contour (/H/ > LM, Hh…), in the preverbal domain. About the various meanings of this term in the literature, see Rialland (1997).

[10] For a presentation of the ALMaz project (*Atlas Lingüístico Mazateco*) and results, see Léonard (2010), Léonard & al. (2012, 2014), Léonard & Kihm (2014). In short, the ALMaz is a dialectal database fed with Kirk's Ph. D. data (1966) and a wide range of first-hand data recorded through fieldwork in over 25 localities, since 2010, on the basis of Kirk's cognate sets (*op.cit.*), Regino's phonological data sets (Regino 1993), and Pike's inflectional paradigms (Pike 1948). The question list has more than 1,800 items, and most of the inflectional data elicited with this questionnaire is being published in occasional papers, as Léonard (2012=; Léonard & Kihm (2012, 2014).

CPL	Pike's	*tsak'éxá*	*tsak'eexáa*	*tsak'èxái*	*tsak'èxáo*	*tsak'èxái*	*tsak'èxá*
	ALMaz	*tsak'èxá*	*tsak'exáa*		*tsak'exáo*	*tsak'èxáijin*	*tsak'èxá*
INCPL	Pike's	*k'oèxá*	*k'oexáa*	*k'oéxái*	*k'oéxáo*	*k'oéxái*	*k'oéxá*
	ALMaz					*k'oéxáijin*	

The tonal triplet made up by the tones in the three forms {3}, {1sg} and {1pl.incl} can be used to compare tone inflectional contrasts at stem level in the Highlands varieties. This is shown in table 7. Although the LM-HM contrast for 1st person singular undergoes idiolectal variation, merging with the /M-H/ pattern, as in San Miguel Huautepec, Pike's situation still holds for conservative speakers of the Huautla dialect, but neither the lemmatic tone seen in the form for the 3rd person (Pike's *b'éxá vs.* ALMaz *b'èxá*), nor the tones for the 1st person inclusive (Pike's *b'èxá* vs. ALMaz *b'exá*) hold synchronically. Therefore, one could say that the only tonal contrast resorting to person marking is LM-HM, but only in conservative dialects, whereas in emerging varieties, stem contrasts are reduced to a neutralized /M-H/ pattern (*b'exá*).

Table 7. Tone inflectional triplets for the central Highlands area

NEUTRAL	Pike's	ALMaz			Pike's	ALMaz	
	Huautla		SMH		Huautla		SMH
3	*b'éxá*	*b'èxá*	*b'èxá*		/H-H/	/h-M/	
1SG	*b'eexáa*	*b'eexáa*	*b'exá*	=	LM-HM		
1PL.INCL	*b'èxá*	*b'exá*	*b'exá*		/h-H/	/M-H/	

The conclusion we draw from this comparison is that the only contrast that really matters is the one involving the realization of the 1st person singular (and the incompletive) with the contour /LM/. All other cells in the paradigm amount to a default tone string for the preverb while the root tone stays stable. As a matter of fact, Huautla Mazatec has a disjunctive distribution of tone resources in the two stem domains: preverb *vs.* root. Whereas roots display a much wider array of tones (the six classes in table 2), table 3 above already shows that preverbs in the central Highlands can either have a high tone (*b'é-*, *bá-*, *sí-*) or a mid tone (*ba-*, *bi-*, *ba-/bi-*, *fa-*, *b'a-/ch'a-, kjo-*), exceptionally a mid-high tone (*tsò-*). In contrast, in Valley and Lowlands varieties there are also low tones. In general, preverbal tone does not entirely match the tone contrasts found in light verbs (i.e., free forms allomorphs), suggesting that the combination of preverb and root works at a more lexical level. Besides, only three preverbs are sensitive to the tonal marking of person involving the person triplet indicated in table 7, the rest remain invariant as for tone.

This is indicated in table 8, which provides a matrix basis of the ALMaz data, the preverbal tone (PV-T), the R-T class number according to Pike distributed in the heuristic triplet opposing AGRS 3, 1SG and 1PL.INCL. The '**&**' symbol after the PV-T in table 8 (e.g. I-A *b'é-X* => PV-T /H&/: NTR 3 *b'**é**xá* '(s)he sends'*vs.* 1SG *b'**ee**xáa*) points at preverbs involved in inflectional tone marking. Whereas other preverbs without this index do not alternate a preverbal level tone with a contour according to AGRS (1SG) and aspect (INCPL) [11].

[11]This is a good instance of this structural compromise, as we assume here incidentally that the preverb classes of Mazatec represents a mixed system, which partly preserves inherited Proto-Popotocan (Gudshinsky, 1958b: 57) or Proto-Zapoteco-Popolocan TAM prefixes (**wa- >ba-*, **wi- >bi-* as TAM/Person markers), even if K. Pike interprets these two prefixes as potentially light verbs (see *collocative* or *displacive* and *dynamic* semantic correlates for IC B and C1 in table 3 above, which can be posited *a posteriori*), but mainly reinterpreted the whole set of prefixes as motion and station light verbs – but this topic would lead us too far, as our goal here is merely synchronic.

Table 8. Classification of preverbs according to tone sensitivity in Pike's Huatla Mazatec.

PV	PV-T	R-T class			NEUTRAL	CPL	INCPL	
b'é-	/H&/	1(/H/)	I.A	3	*b'éxá*	*tsak'éxá*	*k'o̲èxá*	'send'
				1SG	*b'e̲exáa*	*tsak'e̲exáa*	*k'o̲exáa*	
				1PL.INCL	*k'o̲èxá*	*tsak'èxá*	*k'oéxá*	
bá-/fa-	/H&:M/	3 (/M/)	II.C3	3	*bájtsa*	*tsakájtsa*	*ko̲àjtsa*	'put to cook'
				1SG	*ba̲ajtsàa*	*tsaka̲ajtsàa*	*ko̲àjtsàa*	
				1PL.INCL	*fajtsaà*	*tsakjajtsaà*	*kjoájtsaà*	
sí-/nì-	/H&:h/	5 (/h/)	IV	3	*sítsjò*	*kisi̲itsjò*	*si̲itsjò*	'toast'
				1SG	*si̲itsjòa*	*kisi̲itsjòa*	*si̲itsjòa*	
				1PL.INCL	*nìtsjoà*	*kinìtsjoà*	*si̲tsjoà*	
ba-	/M/	3 (/H/)	I.B	3	*bané*	*tsakané*	*ko̲anè*	'wash'
				1SG	*banée*	*tsakane̲e*	*ko̲ane̲e*	
				1PL.INCL	*banè*	*tsakanè*	*ko̲anè*	
bi-	/M/	3 (/LM/)	I.C1	3	*biya̲a*	*tsakiya̲a*	*koiyá*	'die'
				1SG	*biya̲a*	*tsakiya̲a*	*koiyáa*	
				1PL.INCL	*biya̲à*	*tsakiyaà*	*koiyá*	
ba-/bi-	/M/	1 (/M/)	II.C2	3	*bate*	*tsakate*	*ko̲ate*	'break'
				1SG	*bate*	*tsakate*	*ko̲ate*	
				1PL.INCL	*bichà*	*tsakichà*	*koichá*	
b'a-/ch'a-	/H&/	2 (/H/)	III	3	*b'akjá*	*tsak'akjá*	*k'oa̲kjá*	'wear'
				1SG	*b'akjáa*	*tsak'akjáa*	*k'oa̲kjáa*	
				1PL.INCL	*ch'àkjá*	*kich'àkjá*	*ch'a̲kjá*	
tsjoa-	/M/	5 (/LM/)	V	3	*tsjoake̲e*	*tsjoake̲*	*tsjoachaà*	'love'
				1SG	*koantsjoake̲e*	*koantsjoake̲*	*koantsjoachaà*	
				1PL.INCL	*ko̲antsjoake̲e*	*ko̲antsjoake̲*	*ko̲antsjoachaà*	

From the perspective of the theory of linguistic change, it seems that most of the phenomena we will observe in the following can be explained as follows: the inflectional tone triplet (LEX. ANCH. *vs.* PV Downstep *vs.* OCP default) emerged from competing tone patterns in some preverbs (PV-T&) and in the root (√T), as a result of the process of stem formation predicted by Pike in his model, later modelled by Jamieson (1982, 1996) in terms of stem classes. Later on, this process of lexemization of PV+√ strings, in which the PV-T inflectional patterns, already irregular (see table 8, in which some PVs bear contrastive tones) became more and more residual, hence, more and more neutralized. As AGRS endings in Mazatec tend to be enclitic, although a trend towards suffixation and fusion with the root does exist in the Highlands in particular, inflectional tone, already residual in PV ended up being redundant. Instead, two powerful segmental processes competed with inflectional tone patterns: conflation, through suppletive PV and roots on the one hand, and PV string complexification on the other hand. As a result, tone patterns became more and more routinely concatenative and demarcative, rather than oppositive or contrastive. Routine phonology overcame discrete tone morphophonology: OCP strings or plateaus won, at word level. These trends towards neutralization of inflectional tones have probably been rampant for a long time, undergoing intense sociolinguistic variation, as we could observe during the last four years of fieldwork, with over one hundred speakers.

3. Empirical survey: Evidence from three dialects

3.1. The Central Highlands Mazatec of San Miguel Huautepec.

San Miguel Huautepec (henceforth, SMH) is a Central Highlands variety. An exemplar paradigm of a R-T class 1 verb in SMH is given table 9 with the verb *b'èxá* 'send'.

Table 9. The verb *b'èxá* 'send' in SMH

	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NEUTRAL	*b'èxá*	*b'exá*	*b'èxái*[12]	*b'èxó(i)*	*b'exài*	*b'exá*
CPL	*tsak'èxá*	*tsak'exá*	*tsak'èxái*	*tsak'èxói*	*tsak'exái*	*tsak'èxá*
INCPL	*kuèxá*	*kuexá*	*kuéxái*	*kuéxói*	*kuéxái*	*kuéxá*

In this variety, there are two contrastive tonal patterns involving the preverb, mainly exploited for the marking of 1st person singular in the triplet. The tone of the root remains invariant. This is indicated in table 10.

Table 10. Tone inflectional triplets in SMH

	preverb	Root		preverb	Root
3	/h/	/H/		OCP	Lexical
1SG	/M/			Neutral	
OTHER	/h//M/			OCP	

According to the ALMaz, the basic triplet for tone inflection in this variety reads as follows: NTR 3 (*b'èxá* in free variation with *b'éxá*), 1SG *b'exá*, 1PL.INCL *b'exá*, allotonic with *b'èxá-*, instead of Pike's NTR 3 *b'éxá*, 1SG *b'eexá*, 1PL.INCL *b'èxá*. As the last two tonal strings (1SG *b'exá* and 1PL.INCL *b'exá*)are equivalent in SMH, from the standpoint of acceptable variation, we end up with a system that reduces complexity, i.e. a system in which the 1SGcontour predicted by Pike is only residual, ending up in a mere mid tone (/M/). As other paradigms also tend to neutralize preverbal tone, and as all incompletive forms have no low tone (/L/) (NTR 3 *kuèxá*, 1SG *kuexá*, 2SG *kuéxái*, 1PL.INCL *kuéxá*, etc.), we could say that the Pike's1SG & incompletive contour is partly resilient in this subdialect of the central Highlands.

Applying OCP to this process resorts to a mere form of neutralization of the level tone *vs.* the contour tone opposition for 3 and 1SG marking in the preverb (i.e. Pike's NTR 3 *b'éxá* (/H-H/) *vs.b'èxá-* (/h-H/) in SMH. Levelling the marking of 1SG from 1SG *b'eexá* (LM-/H/) to *b'exá* in SMH (compared with 1PL.INCL *b'exá*) is not a trifle process: it introduces a range of potential variation in inflectional tone contrasts not only in huautla Mazatec, but in most dialects, which contrasts with the apparently discrete and regular patterns proposed by Pike.

In table 11, incompletive preverbal tone rather raises than incurve into a LM contour, as Pike would have predicted for Huautla: INCPL 3 *kuèñón*, 1SG *kueñòá*, 1PL.INCL *kuèñòá*, with a mid-high level tone (/h/) on the preverb. Instead, in the same R-T class, for another PV class with a high tone preverb (IV *síská* 'play'), the tone of the preverb points to neutralization: INCPL3 *síská*, 1SG *sìská*, 2SG *niskái*, 1PL.INCL *niská.* These data point out to a reduction of tone contrasts, as the forms for NTR 3 *síská* and 1SG *sìská* are isomorphous with the INCPL.

[12] With an allophonic trend towards vowel fusion: *ai* > *e*, with few or no morphological consequences (i.e. *allophony* proper, without *allomorphy*) – a typical case of free variation.

Table 11. The verbs *bèñón* 'braid, tie up' *síská* 'play' in SMH

	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NEUTRAL	*bèñón*	*beñòá*[13]	*beñòí*	*beñón*	*beñóin*	*bèñòá*
CPL	*tsak'èñón*	*tsak'èñòá*	*tsak'èñòí*	*tsak'èñón*	*tsak'eñóin*	*tsak'eñòá*
INCPL	*kuèñón*	*kueñòá*	*kuèñòí*	*kuèñón*	*kuèñóin*	*kuèñòá*
NEUTRAL	*síská*	*sìská*	*nìskái*	*nìskó*	*nìskái*	*níská*
CPL	*kisìská*	*kisìská*	*kinìskái*	*kinìskó(i)*	*kinìskái*	*kinìská*
INCPL	*síská*	*sìská*	*niskái*	*niskó*	*niskái*	*niská*

The *ni*-marked stem of most verbs of PV class IV has a mid high tone (/h/) in the NTR on the preverb anda mid tone (/M/) in all INCPL. The mid-high tone can be taken to be the result of OCP (NTR 2SG *nìskái*, 2PL *nìskó*, 1PL.EXCL *nìskái*). In the NTR1PL.INCL *níská*, the high tone on the root associated to a floating mid-high tone for the *-à* suffix assimilates the tone of the preverb.

Table 12. Comparing *b'éma* 'hide' in Pike's data of Huautla with *b'ènama* from SMH.

		3	1SG	2SG	1PL.INCL	2PL
NEUTRAL	Pike's	b'éma	b'ee'màa	b'è'mai	b'è'maà	b'è'mao
	ALMaz SMH	*b'ènama*	*b'ènamaa*	*b'enamai*	*beyomà*	*beyomo*
CPL	Pike's	tsak'éma	tsak'eemàa	tsak'èmai	task'è'maà	tsak'èmao
	ALMaz SMH	*tsakenama*	*tsakàtenama*	*tsakenamai*	*tsakeyomà*	*tsakeyomò*
INCPL	Pike's	k'oè'ma	k'oe'màa	k'oé'mai	ko'é'maà	k'oémao
	ALMaz SMH	*kuénòma*	*kuàtenama*	*kuenamai*	*kueyomà*	*kueyomò*

The two verbs contrast in various respects. Segmentally, SMH has the stative affix *na-* before the root *'ma* and a stem with various allomorphs: *nama-*, *yomV,* and *nòma-*.[14] Allomorphy is also found in the aspect markers (CPL *tsak-* vs. *tsakàte-* and INCPL *kué-vs.kuà-*). On the tonal level, tone contrasts have been levelled down by means of the OCP and the emergence of a mid tone plateau nearly everywhere in the matrix.

The three basic principles mentioned above should be kept in mind, in our comments of table 5, i.e. Pike's model for inflectional tone in Huautla Mazatec. This model predicts (i) lexical tone anchorage for the lemmatic form (AGRS 3);(ii) downstep involving the AGRS 1SG and all persons in the incompletive; (iii) defective patterns of the PV-T-Root^{T} patterns elsewhere, the exponent α in the PV$^{\alpha}$ slot standing for a neutralized preverbal tone, whereas the T exponent in Root^{T} stands for robustness of the root tone – which also provides the tone class. Pike's data point to a further principle, inherent to the first one: lexical root tone undergoes only superficial alteration in the Huautla dialect. We will see further that this parameter does not hold in our data, especially in the Lowland dialects.

[13] With *allophonic* gliding, and a trend to fronting of the mid back nucleus: *beñòá* > [beñüá].

[14] The *-na-*/*-yo-* allomorphs point to a a positional *jña* root, probably grammaticalized into a stative infix. Nevertheless, the *-no-* allomorph instead could resort to a |*-nu-*| stative preverb. Moreover, a good deal of analogical reanalyzis may also have taken place here to explain stem allomorphy for this lexeme.

Table 13. The verbs *bèñii* ‘bury’ and *b'èse* ‘whistle’ in SMH

	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NEUTRAL	*bèñii*	*beñoa*	*beñoi*	*beñon*	*beñoi*	*beñoa*
CPL	*tsakèñi*	*tsakeñoa*	*tsakeñi*	*tsakeñon*	*tsakeñi*	*tsakeña*
INCPL	*kueñi*	*kueña*	*kuèñoi*	*kuèñon*	*kuéñi*	*kuèña*

NEUTRAL	*b'èse*	*b'èse*	*b'esai*	*b'eso*	*b'esai*	*b'esee*
CPL	*tsakèse*	*tsakese*	*tsakesai*	*tsakeso*	*tsakesai*	*tsakesee*
INCPL	*kuese*	*kuese*	*kuésai*	*kuéso*	*kuèsai*	*kuésee*

The paradigms of the next two verbs are the more interesting as they represent the complex root tone class 5 (see table 2). The lexemes are *b’éñai* ‘bury’ and *b'ésee* ‘whistle’ in Huautla vs. *bèñii* and *b'èse* in SMH. Forms are highly variable, as far as basic components are concerned: (i) there is no clear hint at preservation of the contour in the lemmatic forms (*bèñii* has a R-T contour MM, while *b'èse* has not, and comes out as a /M/ tone root); (ii) the NTR1SG&INCPLdownstep is missing, in both sets of data: *beñoa* ‘I bury’, *kueña* ‘I’ll/used to bury’; *b'èse* ‘I sing’, *kuese* ‘I’ll/used to whistle’, instead of the *b’eeñai/k’oeñee* and *b’eesee/k’oesee* forms reported by Pike; (iii) overall tone neutralization seems to be the key parameter here, instead of a mere OCP in defective paradigms. Both paradigms, though, show that the preverbal lexical high tone is partly resilient, as it is expressed by a mid-high tone (*bèñii* ‘(s)he buries’, *kata=b'èñi* ‘let’s bury’; *b'èse* ‘(s)he whistles’, *kata=b'èse* ‘let’s whistle) and also CPL 3 *tsak=èñi/tsak=èse*.All this points to a general neutralization not only of the R-T class, but also of any inflectional tone constraint. One of the most complex of Pike'sR-T class is levelled down to a nearly toneless class (or at least prosodically neutral), with only residual hints of preverbal tone anchoring.

The next and last set of paradigms from SMH belong to PV class VII. All items are light verbs convertible in PV class preverbs: *fì* ‘go’, *fa'a* ‘pass’, *b'a* ‘carry, take away’. The three sets belong to the neutral R-T class, i.e. root tone mid, in which one can expect minimal tone marking or tone contrast, except in the incompletive, where K. Pike observed the downstep pattern.

Table 14. The verbs *fì* ‘go’, *fa'a* ‘pass’ and *b'a* ‘carry’in SMH

	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NEUTRAL	*fì*	*tifia*	*timii*	*timankión*	*timankin*	*timankià*
CPL	*ki*	*kia*	*kiin*	*tsankiòn*	*tsankin*	*tsankià*
INCPL	*kuei*	*kjioá*	*kuín*	*kuankíon*	*kuankin*	*kuankià*

NEUTRAL	*fa'a*	*fa'a/fà'a*	*b'itjai*	*b'itjao*	*b'itjai*	*b'itjaa*
CPL	*ja'a*	*jà'a*	*jitjai*	*kitjao*	*kitjai*	*kitjoa*
INCPL	*kua'a*	*kua'a*	*kuitjài/kuitjái*	*kuitjào*	*kuitjài*	*kuitjà*

NEUTRAL	*b'a*	*ya*	*kichai*	*kichao*	*kichai*	*kichà*
CPL	*tsaka*	*tsaka*	*kichai*	*kichao*	*kichai*	*kichà*
INCPL	*kua*	*kua*	*chai*	*chao*	*chai*	*chaà*

Here, the general trend is what could be called *downstep reversion*, as we already saw with the previous paradigm: NTR *fi* ‘go’ *vs.* INCPL1SG *kjioá*, 2SG *kuín*, 2PL *kuankíon*, 1PL.EXCL *kuankìn* 1PL.INCL *kuankià*, whereas Pike had INCPL 3 *kjoai*, 1SG *kjóia*, 2SG *kjóin*, 2PL *koankíon*,

1PL.EXCL *koankíin*, 1PL.INCL *koankián*. Stem allomorphy is therefore distributed as follows: 'go' *fi*, *mi, ki, mankì*; 'pass' *fa'a, (j)a'a*, *b'itja*; and 'carry' *b'a, ya, cha*. The only role played by inflectional tone here is limited to downstep reversion by tone rising (/h/ or /H/ instead of a LM or Lh contour). In other words, in spite of its residuality, tone is still part of the game, nested in a paradigm which seem to preserve prosodic markedness conditions: the incompletive.

We can now make a few conclusions about tone inflectional patterns in the SMH dialect. Although it is a subdialect of the Central Highlands dialectal area, whose leading urban center is Huautla, the data still point at some important discrepancies. The general impression is that the SMH dialect tends to neutralize many contrasts observed by Pike for Huautla dialect some 60 years ago. For example the loss of the R-T class 5 (from an LM root to MM) merging with the R-T class 3 and the levelling of the NTR1SG downstep. Some of the neutralization processes may be due to sociolinguistic (especially sociolectal) factors, as our informant was (slightly) under forty years old. We will now turn to the Lowlands dialect.

3.2. Lowlands Mazatec: the Mazatec of San Miguel Soyaltepec

San Miguel Soyaltepec (henceforth SMS) within the district of Tuxtepec is as conspicuous a dialect in the Lowlands as is the Huautla dialect in the Highlands. Nevertheless, one expects variable diatopic and sociolinguistic patterns, especially after the whole region was drowned after the building of the dam of Miguel Alemán in the 1950's. The population were displaced and reaccommodated into new villages around the artificial lake, or they were forced to move to the neighboring state of Veracruz. Our data come from elicitations in August 2013 with a most reliable speaker in his early forties, a bilingual teacher living in the village of Corral de Piedra, not far from the new urban center of Temascal, in the municipality of SMS.

Tables 15 show data for R-T class 1, with the verb *b'éxá* 'send', which we have already seen for the two Highlands dialects (Huautla and SMH).

Table 15. The verb *b'éxá* 'send' in the Lowlands of SMS

	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NEUTRAL	*béxá*	*béxà*	*béxè*	*bèxànò*	*béxánì*	*bèxàñà*
CPL	*yéxá*	*yéxà*	*kíkéxáè*	*kíkèxánò*	*kíkèxánè*	*yèxàyà*
				yèxánó	*yèxánè*	
INCPL	*béxá*	*bàkéxá*	*bákèxálè*	*bákèxánò*	*bàkèxànè*	*bàkèxànà*

The striking fact here is that root tone inflection prevails instead of preverbal tone downstep: while Huautla has *b'eexáa* 'I send', SMS has *b'éxà*, with a slightly lowered high tone (/H/>/h/). This points at a domain realignment of tone lowering, which is a basic characteristic of NTR 1Sg and incompletive downstep. A further condition is likely to weaken the status of downstep marking as an inflectional tone marking strategy: the prefixal strings for the incompletive: INCPL 3 *béxá* (syncretic with NTR 3), 1SG *bàkéxá*, 2SG *bákèxálè*, 2PL *bákèxánò*, 1PL.EXCL *bàkèxànè*, 1PL.INCL *bàkèxànà*, instead of Huautla INCPL 3 *k'oèxá*, 1SG *k'oexáa*, 2SG *k'oéxái*, 2PL *k'oéxáo*, 1PL.EXCL *k'oéxái*, 1PL.INCL *k'oéxá*. For the incompletive, SMS has *bàk=*for all forms except the 3rd person, withthe deletion of the labial onset of the preverb: INCPL1SG *bàk=éxá*, 2SG *bák=èxá=* (*=lè* here is an applicative 3 person pronoun), etc.

The next dataset shows that Pike's R-T class 2 merges with R-T class 1: compare SMS *títsjó*'toast' with HU *sítsjò*, with a/H/ tone on the root (*tsjó*) instead of the expected mid-high tone (*tsjò*).

Table 16. The verb *títsjó* ‘toast’ in the Lowlands of SMS compared to *sítsjò* in HU

		3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
SMS	NEUTRAL	*títsjó*	*tìtsjóa*	*nìtsjuíji*	*nítsjónò*	*nítsjúne*	*nìtsjúñà*
	CPL	*tísítsjó*	*kítítsjóa*	*kínítsjuíji*	*kìnìtsjónò*	*kìnètjuóne*	*kìnìtsjúyà*
	INCPL	*t(s)ítsjó*	*títsjóa*	*nítsjuíji*	*nítsjónò*	*nítsjúne*	*nìtsjúñà*
		3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
HU	NEUTRAL	*sítsjò*	*si̲itsjòa*	*nìtsjòi*	*nìtsjòo*	*nìtsjòi̲*	*nìtsjoà*
	CPL	*kisi̲itsjò*	*kisi̲itsjòa*	*kinìtsjòi*	*kinìtsjòo*	*kinìtsjòi̲*	*kinìtsjoà*
	INCPL	*si̲itsjò*	*si̲itsjòa*	*si̲tsjòi*	*si̲tsjòo*	*si̲tsjòi̲*	*si̲tsjoà*

Table 17 highlights SMS *vs.*HU discrepancies as far as inflectional tones are concerned. Every form is checked by an index, such as LXA = Lexical Anchoring, DS = Downstep, OCP = Obligatory Contour Principle. As a result, the SMS set appears as a system where tone is far less discrete than in the HU system described by Pike – and far less than the system described by Eunice Pike in an important paper about SMS tone allomorphy (Pike, 1956).

Table 17. R-T class 2 (/h/), PV class IV: *sítsjò*‘toast’, indexing HU *vs.* SMS discrepancies.

			3		1SG		1PL.INCL
NEUTRAL	SMS	LXA	*títsjó*	OCP	*tìtsjóa*		*nìtsjúñà*
	HU		*sítsjò*	DS	*si̲itsjòa*		*nìtsjoà*
CPL	SMS	LXA	*tísítsjó*	LXA	*kítítsjóa*	OCP	*kìnìtsjúyà*
	HU	DS	*kisi̲itsjò*	DS	*kisi̲itsjòa*		*kinìtsjoà*
INCPL	SMS	LXA	*títsjó*	LXA	*títsjóa*		*nìtsjúñà*
	HU	DS	*si̲itsjò*	DS	*si̲itsjòa*	DS	*si̲tsjoà*

Eunice Pike reports on a wide array of contours and tone contrasts differing between the two dialects, as in table 17. We add two lines of morphological analysis, which enhance the role of desinential inflectional tone marking in the SMS dialect, according to Eunice Pike's data. Processes read as follows: “Desinential DownStep” (DES.DS) *chinii̲* ‘you eat’, “Desinential Rising” (DES.RISING) *tsjuaná* ‘gives me’, “Desinential Contour” (DES.CONTOUR) *tsjua̲naà* ‘I give him’. These processes are far more marked morphologically than it may seem at first sight, as indeed, 2SG *-i* in the Mazatec diasystem has an intrinsic mid tone (/M/) instead of a low tone (/L/), and so does the 1SG *=na* oblique enclitic. The *tsjua̲naà*<= |*tsjua̲=na.à*| form has a 3 impersonal contour tone standing for a kind of prosodic enclisis hosted by the 1SG *=na* oblique enclitic. As we’ll see with the next datasets, it seems these intricacies have been either levelled out since the 50's by linguistic change, or Eunice Pike's informant(s) were from a specific dialect, much different from those we had the opportunity to work with in 2013. We do not see much traces of such a state of affairs – a drift towards desinential tone complexity.

Table 17. Some tone inflectional contrasts in SMS *vs.* HU, according to Eunice Pike (1956: 58)

	NTR2SG 'you eat'	INCPL2SG 'you'll eat'	NTR3>1SG 'gives me'	NTR1>3SG 'I give him'	NTR2SG 'you deceive'	INCPL2SG 'you'll deceive
SMS	*chinii*	*chini*	*tsjuaná*	*tsjuaanaà*	*ch'ànachei*	*ch'anachei*
analysis	|*chi.ne+i*|	|*chi.ne+i*|	|*tsjua=ná*|	|*tsjuaa=na.à*|	|*ch'à.na.che+i*|	|*ch'a.na.che+i*|
HU	*chjinai*	*chjinai*	*tsjoána*	*tsjoale*	*ch'ànachai*	*ch'anachai*
analysis	|*chji.ne+i*|	|*chji.ne+i*|	|*tsjoá=na*|	|*tsjoa=le*|	|*ch'à.na.cha+i*|	|*ch'a.na.cha+i*|
SMS	DES. DS	-	DES. RISING	DES. CONTOUR	-	-

The next dataset in table 18 comes from R-T class 3 – the most neutral because /M/ is the lexical tone. In SMH, the subdialect from the central Highlands, we saw that these conditions of lexical /M/ tone fostered general neutralization. The label PV class II-C.2' stands for a modified PV class II-C.2, as compared to the category defined in table 3 above, for the central Highlands dialect. As to R-T class, in our SMS data, on the contrary, a tone shift of the type R-T class 3 > R-T class 2 seems to take place, as shown in the lemmatic form *bèñámà*. This lexeme *bèñámà* is originally a compound associating the collocative or displacive preverb *b'é-* to two roots: |*bè-jñá.mà*|, with a positional |*jñá*| as first root of a complex root string *jñá-mà* has a /h/ tone on the root vowel, instead of a /H/ tone. The preverb *b'é-* has also a /h/ tone (*b'è-*), instead of a/H/ tone. Data in table 18 show two trends: on the one hand, OCP chains, around the final root tone, anchored as /h/ in SMS instead of /M/ in HU, as in NTR 3 *bèñámà* (/h-H-h/), 1PL.EXCL *bìyómàne*; on the other hand, plateauing as in CPL 3 *tsànkà'mà* (/h-h-h/), 1SG *tsànkàmàa*, INCPL3 *bàkànkà'mà* <= |*bàkà=nkà.'mà*|, etc. terracing around a lexically anchored /h/ root tone from left to right is a process which recalls neutralization too, as much as an OCP would do. It still resorts to the levelling out of inflectional tone contrasts. Instead of the preverbal downstep for AGRS 1SG, in all aspects, we find a /hM/ contour (NTR1SG *bèñàmàa*, CPL1SG *tsànkàmàa*, due to what could be considered as an enclisis, rather than a desinential suffixing strategy of all AGRS pronominal enclitics, except for 2SG which, in this dialect, tends to be rather of the desinential type (i.e. the suffixing type, with strong trends to merge phonologically with the stem vowel). However, the contour /hM/ is hosted here by the final root, instead of occurring in the preverbal domain.

Table 18. R-T class 3 >R-T class 2, PV class II-C.2': *b'èñámà* 'hide'

	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NTR	*bèñámà*	*bèñàmàa*	*mìnìmè*	*bìyòmànòn*	*bìyómàne*	*bìyómàñà*
					mìyàmàne	*mìyàmàñà*
CPL	*tsànkà'mà*	*tsànkàmàa*	*íyúmàè*	*ìkìyúmànòn*	*ìkìyúmàne*	*ìkìyùmàyàn*
INCPL	*bàkànkà'mà*	*bàkànkàmàyan*	*bàkìnìmàn*	*bàkìyòmànòn*	*bàkìyòmàne*	*bàkìyòmàyàn*

The SMS R-T class4 paradigm (HU *bèxkia*) stands as *b'èxkíà*'read' in SMS. This class shift, which shows up in table 19 confirms the general trend for a R-T class raising shift in the main Lowlands dialect, as Pike's R-T class 4, anchoring a low tone (/L/) in roots does not merge with R-T class 2 (the /h/ class), but gets more complex, creating a specific R-T class of the contour type Hh: HU *b'exkia* (with a/L/ tone in the root) *vs.* SMS *bèxkíà* (with a Hh tone in the nucleus). This taxonomic complexification is strongly compensated by two simplex processes we already pointed out: OCP chains (as in NTR 3 *bèxkíà,* 2SG *bèxkíè*) or overall plateauing at the R-T class level, here through /h/ tone spreading, reminding the /H/ spreading

process mentioned in Campbell (this volume) (INCPL 3*bàkèxkià*, 1SG*bàkèxkià(a),* 2SG *bàkèxkièjè*, etc.).

Table 19. R-T class 4, PV class I-A: *b'èxkíà* 'read' in SMS.

	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NTR	*bèxkíà*	*bèxkìàja* *bèxkìàja*	*bèxkíè*	*bèxkìànòn*	*bèxkíàne*	*bèxkìàyàn*
CPL	*yèxkìà*	*yèxkìà(a)*	*kìkèxkìè*	*kìkèxkìànòn*	*kìkèxkìàne*	*kìkèxkìayan*
INCPL	*bàkèxkìà*	*bàkèxkìàa*	*bàkèxkìèjè*	*bàkèxkìànòn*	*bàkèxkìàne*	*bàkèxkìàyàn*

Table 20 shows how cautious one should be before stating any generalization about paradigms in the Mazatec diasystem, before having all the data at hand. The *bàjen* paradigm does not point to a R-T class 4 > R-T class 2 saltative merger, but rather to a R-T class 4 > R-T class 3 gradual merger. Anyhow, this process does confirm indeed the trend to R-T class raising in SMS, as compared to the Huautla R-T class system – supposedly closer to the proto-R-T class system, according to Kirk (1966), if we indulge to refer to diachronic conjectures. As both SMS and HU dialect agree on PV class, and as this dataset nicely highlights discrepancies between the main Lowlands dialect and the main central Highlands dialect, we give paradigms for both in table 20 (HU forms appear in smaller fonts, below the row of SMS).

Table 20. R-T class 4, PV class III: *b'àjen* 'cut down (tree)' in SMS and 'pick' in Pike's HU.

		3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NTR	SMS	*bàjen*	*bàjen*	*chàje*	*ch'àjànòn*	*ch'àjane*	*ch'àjayan*
	HU	*b'aj<u>e</u>n*	*b'aj<u>e</u>n*	*ch'àj<u>a</u>in*	*ch'àj<u>a</u>o*	*ch'àj<u>a</u>in*	*ch'àj<u>e</u>èn*
CPL	SMS	*ts'àjen*	*ts'àjen*	*kìch'àje*	*kìch'àjanòn*	*kìch'àjane*	*kìch'àjayan*
	HU	*tsak'aj<u>e</u>n*	*tsak'aj<u>e</u>n*	*kich'àj<u>a</u>in*	*kich'àj<u>a</u>on*	*kich'àj<u>a</u>in*	*kich'àj<u>e</u>èn*
INCPL	SMS	*bàk'àjen*	*bàk'àjen*	*bàch'àjeje*	*bàch'àjanòn*	*bàch'àjane*	*bàch'àjayan*
	HU	*k'<u>oa</u>j<u>e</u>n*	*k'oaj<u>e</u>n*	*ch'<u>a</u>j<u>a</u>in*	*ch'<u>a</u>j<u>a</u>on*	*ch'<u>a</u>j<u>a</u>in*	*ch'<u>a</u>j<u>e</u>èn*

As the paradigm in table 20 is not of the type of preverb class that has two alternative tone preverbs, as presented in table 18, no 1SG and incompletive preverbal downstep is to be expected. In both dialects, the preverb belongs to PV class III (see table 3), which is conflative (+3/1SG HU *b'a-* SMS *b'à-* here *bà-* vs.-3/1SG *ch'à-*). Both sets of paradigms point at a *ch'à-* conflative preverb of AGRS -3/1SG, with a mid-high tone (/h/), and as *b'à-* with a/h/ tone in SMS matches *b'a-* with a mid tone (/M/) in Huautla, we have here an interesting case of a PV-T of the /h/ type, whereas the only types reported for in table 8 were /H(&)/ and /M/. Here as in the previous set in table 19, /h/ tone spreading erases any other tone contrasts. The/h/ tone strings stop at the root (INCPL 3/1SG *bàk'àjen*) or in the prerhizomic syllable (CPL/INCPL2PL *kìch'àjanòn*). AGRS 3 and 1SG are syncretic (NTR *bàjen*, CPL *ts'àjen*, INCPL *bàk'àjen*), as in HU too (*b'aj<u>e</u>n*). However, in SMS for this paradigm, inflectional contrasts rely more on segmental and affixal or clitic strategies than in HU, as the 2SG forms clearly show: NTR2SG SMS *chàje*, HU *ch'àj<u>a</u>in*, with a /h/ tone for the NTR form, in HU *vs.* INCPL 2SG SMS *bàch'àjeje*, HU *ch'<u>a</u>j<u>a</u>in*, with a /L/ tone on the preverb in HU, whereas SMS contrast these cells with discrete proclitics (CPL *kì=* and INCPL *bà=*) and with allomorphic enclitic AGRS marking (INCPL2PL *bàch'àjeje* <= *bà=ch'à.je=ji*).

The following datasets in tables 21-22 provide more instances of these different strategies for inflectional marking between the two major dialects of the Highlands and Lowlands[15]. Both sets resort to R-T class 5 (LM) and PV-T& (*b'é-* preverb, with a lexical high tone) from PV class I-A, so that structural complexity turns out to be particularly challenging here.

Table 21. R-T class 5, PV class I-A: *b'éñàí*: bury' in SMS *vs.b'éñai*in Pike's HU

		3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NTR	SMS	*béñàé*	*bèñàja*	*bèñàjéje*	*bèñàjénòn*	*bèñàjéne*	*bèñàjèyàn*
	HU	*b'éñai*	*b'eeñai*	*b'èñai*	*b'èñao*	*b'èñai*	*b'èñeè*
CPL	SMS	*yèñàjé*	*yéñàjéja*	*kìkèñàjéje*	*kìkèñàjànòn*	*kìkéñàjáne*	*(k)ìkèñàjàyàn*
	HU	*tsak'éñai*	*tsak'eeñee*	*tsak'èñai*	*tsak'èñao*	*tsak'èñai*	*tsak'èñeè*
INCPL	SMS	*bàkéñàjén*	*bàkéñàjéyan*	*bàkéñàjèje*	*bákéyàjánòn*	*bàkéñàjáne*	*bàkèñàjàyàn*
	HU	*k'oèñai*	*k'oeñee*	*k'oéñai*	*k'oéñao*	*k'oéñai*	*k'oéñeè*

First, Huautla R-T class 5 splits into two subclasses in SMS: HU R-T class LM > SMS R-T class hH (*b'éñàí*) and R-T class /H/(*bèsé*), pointing at trends towards *R-T class polymorphism*. Second, the 1SG and Incompletive downstep, which is a rather strong feature in Huautla (especially in K. Pike's data), does not seem play any significant role in SMS. Third, /h/ spreading, as a variety of /H/ spreading, prevails in the SMS dialect, erasing any tone contrast of the Huautla type, including lexical anchorage of the basic form and OCP trends, except in a few cells, more or less at random). Fourth, SMS resorts to more concatenative processes than HU. Nevertheless, some interesting contrasts do emerge in the SMS variety: NTR 3 *béñàé*<= *b'é.ñàí*, 1SG *bèñàa*, with a /hM/ contour, in free variation with *bèñàja*, with a rearticulated vowel of the /VhV/ type (or "reaspirated vowel"). This free contrast suggests that some kind of negociation is at stake in the system, between a moraïc and suprasegmental approach, as in the NTR1SG *bèñàa* form (hM contour), and a segmental reflex of the VhV type *bèñàja <= bè.ñàjV=a*, which resorts more to a lenis/fortis alternation of the nucleus (with V as the lenis nucleus, as opposed to VhV as the strong one), supported by stem-suffix vowel homorganicity, than to proper concatenation of the *=an* AGRS 1SG marker. The same trend can be seen in the NTR1PL.EXCL *bè(jè)sàne* form, where the preverb can optionally be realized as a strong allomorph, with reaspirated vowel: *bèjèsàne <= |bèjV.sè=jni|*, as a Root Nucleus Adjustment constraint lowers the nucleus in the root (*-e > -a*). In other words, some contrastive constraint is still active in the NTR 3 *vs.*1SG opposition in this Lowlands variety, realized as a stem contour at root level, instead of nesting in the preverbal slot – a rhizomic contrast instead of a preverbal one.

Table 22. R-T class 5, PV class I-A: *b'èsé*: 'whistle' in SMS *vs.b'ésee* in Pike's HU

		3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NTR	SMS	*bèsé*	*bèsà(a)*	*bèsá(j)e*	*bèsànòn*	*bè(jè)sàne*	*bèsànà*
	HU	*b'ésee*	*b'eesee*	*b'èsai*	*b'èsao*	*b'èsai*	*b'èseè*
CPL	SMS	*yèsá*	*yèsá(j)a*	*kìkèsáje*	*(k)ìkèsànòn*	*(k)ìkesàne*	*(k)ìkèsànà*
	HU	*tsak'ésee*	*tsak'eesee*	*tsak'èsai*	*tsak'èsao*	*tsak'èsai*	*tsak'èseè*
INCPL	SMS	*bàk'esà*	*bàk'esá(j)a*	*bàkesèje*	*bàkesànòn*	*bàkèsàne*	*bàkesàyan*

[15] Undoubtebly, Jalapa de Diaz would be the third major dialect, representative of another important area: the Midlands, or "Piemont", which embraces the Santo Domingo valley, in the South. But we will not analyze this dialect. As a three level tones dialect, the midland variety is inherently more simplex, as tone inflection is concerned.

HU	*k'o̲èse̲e*	*k'o̲ese̲e*	*k'oésa̲i*	*k'oésa̲o*	*k'oésai*	*k'oése̲e*

The next datasets show verbs from PV class VII: these lexemes are monosyllabic in AGRS 3, and generally follow the conflation pattern predicted by Jamieson (1982)[16]. Some of these items are considered as light verbs involved in preverbation, according to Pike's model (e.g. |*tsí'ín*|, in table 24 below –SMS *tsiin* 'do, mak'*vs.*Pike's HU *s'ín*). The same trend towards a simplification of the three basic contrastive inflectional tone patterns (Lexical Anchoring, Preverb Downstep & OCP) can be observed for R-T class 1 (table 18.1): NTR AGRS 3*bé*, 1SG *bèa*, 2SG *mà*. Though, even in this paradigm, a mid-high (/h/) plateau takes the lead, instead of OCP in the NTR and incompletive set: NTR 2PL *mànkìnòn*, 1PL.EXCL *mànkìne*, 1PL.INCL *mànkìyàn*. Instead, OCP emerges in the CPL default paradigms (i.e. -3/1SG): AGRS 3 *kìjí*, 2PL *tsànkénòn*, 1PL.EXCL *tsànkíne*, 1PL.INCL *tsànkíyàn*. This seems to be more a trend than a strong constraint, as this plateau *vs.* OCP tonal correlation at lexeme level fluctuates for R-T class 2 and 6' verbs as shown in table 24 below. We may say that these two phenomena are two sides of the same coin, i.e. two expressions of the default paradigm, described as OCP proper or OCP only in Pike's data.

Table 23. R-T class 1, PV class VII: bé<= |wai| 'go'

	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NEUTRAL	*fué*	*fuèa*	*mà*	*mànkìnòn*	*mànkìne*	*mànkìyàn*
CPL	*kìjí*	*kíya(j)a*	*k'ìn*	*tsànkénòn*	*tsànkíne*	*tsànkíyàn*
INCPL	*fué*	*fuèa*	*mà*	*mànkìnòn*	*mànkìne*	*mànkìyàn*

Moreover, suppletive alternations in PV class VII make inflectional tone contrasts quite unnecessary: in table 23stems read as NTR AGRS 3 *fué*, 2SG *mà*, 2PL&1PL.EXCL *mànkìnV-*, 1PL.INCL *mànkìyV-*, etc. <= | *mà.nkì.nVyV*|, with a POT.DIR$_{DOWN}$.DERIV template. The CPL set has even finer grained patterns, with a vowel contrast *tsànkínV-/ tsànkénV*, which shows up too in the 2PL jussive *tànkénó(n)*. In other words, inflectional tone here is overcome by suppletive and derivative patterns. Once more, the balance favors morphology over prosody in implementing inflectional contrasts.

The same trend can be observed for "irregular" verbs from PV class VII: *bà(j)à* 'put' and **tsìi̲n* 'do, make' in table 24. Inflectional tone turns out to be even more at loss: for R-T class 2 (/h/)*bà(j)à*, except for the INCPL 3 *bàkéjà*, the plateau option overcomes any other pattern. Instead, for a verb we could classify as R-T class 6', with a /hL/ contour in the lemmatic form (NTR AGRS 3 *tsìi̲n*'do'), the complex pattern the lexical anchorage of such a contour tone implies, seems to induce more fluctuation as to default strategies: once more, plateau and OCP patterns compete, pointing at the emergence of interactive – more than properly contrastive – paradigms. Nevertheless, plateau and OCP scrambling seems to come out, rather than truly asymmetric patterns. Here too, morphology takes the lead, with discrete forms of suppletion: NTR 3 *tsìi̲n*, 2SG *nì(j)íi* (with a postlexical optional "reaspirated nucleus", induced by desinential 2SG *=ji* enclisis), 2PL *ñánòn*, and intricate patterns shaped by local morphophonological constraints in CPL for the default suppletive forms: 2SG *kìníin,* 2PL *kìyìànò* <= |*kìñìànò*|, i.e. *-ñánV-* stems. A weakened nasal onset provides even more alternative sets in the INCPL: 1SG *bàtsììña* vs.1PL.EXCL *bàyáne* <= |*bà=ñá.na=ji̲n*|, with a derived root *ñá.nV*.

[16] See Jamieson (1988) and (1996) for more information. Jamieson's (1996) Chiquihuitlán dictionary is especially interesting as far as inflectional class taxonomy is concerned, as the author had to point at an inflectional type for every verbal entry in her sample. The Chiquihuitlán dialect is more similar to Lowlands dialects than to Central Highland varieties.

Table 24. R-T class 2, PV class VII: *bà(j)à*‘put’ and R-T class 6’, PV class VII ‘*tsìin* ‘do’

	3	1SG	2SG	2PL	1PL.EXCL	1PL.INCL
NEUTRAL	*bà(j)à*	*bà(j)àa*	*bènì*	*bàntònò(n)*	*bàntòne*	*bàñàyàn*
CPL	*yè(j)á*	*yèàña*	*kíkèné*	*kìkèñànòn*	*kìkèñàne*	*kìkèñàyàn*
INCPL	*bà(j)à*	*bà(j)àñan*	*bàkènè*	*bàkèyànòn*	*bàkèyàne*	*bàkèyàyàn*
	bàkéjà	*bàkèjàyan*				
NEUTRAL	*tsìin*	*tsìya*	*nì(j)íi*	*ñánòn*	*ñà(j)áne*	*ñà(j)àyàn*
CPL	*kìtsìin*	*kìtsìiña*	*kìníin*	*kìyìànò*	*kìñáne*	*kìñày*
INCPL	*bàtsì(in)*	*bàtsìiña*	*bànìi*	*bàñàanò(n)*	*bàyáne*	*bàyàyan*

3.3. Pueblan Mazatec: the Mazatec of San Francisco Huehuetlán

The last variety we study is the Mazatec of San Francisco Huehuetlán (henceforth SFH) (also called ‘Pueblan Mazatec’ or *án xo’boo*[17], as many of these varieties are spoken in the state of Puebla, in the Sierra Negra. The Mazatec of SFH provides very interesting data being a peripherical subdialect from the Highlands which, though, clearly points at strong patterns of morphological continuity with the Midlands (Jalapa de Diaz) and the Lowlands (SMS).

SFH is a good example of a dialect that sums up most of the morphological and prosodic patterns observed up to now: as many Highlands dialects, it tends to convert the preverbal inflectional tone contrasts AGRS 3 *vs.*1SG*vs.* other persons into routine strategies aiming at forms of neutralization (see recurrent high tone on the first syllable in most NTR forms in table 25 below: NTR1SG *t**á**ba’nióon*, 2SG *t**é**ba’níi(n)*, etc.); as Lowlands dialects usually do, ittends to grind the lexical root into stem allomorphs (NTR3SG *ba**’ín***<= |*b’e.’niún*| “(s)he braids”), 1SG *tába**’nió**on*; CPL3SG *ya’**ún***,1SG*ya’**nión***; INCPL2SG *ta’íin*, 1PL *kuà**’(n)uj**in*). As Midland dialects (e.g. Jalapa de Diaz) are likely to do, it also tends to develop preverbal strings (NTR3SG*ba’ínvs.* 2SG ***téba**’níi(n)*, 1PL***tátsuba**’nìin*, 3PL ***ínyoba**’ín*, etc.).

A further set of processes concern the endings: ending licensing, i.e. AGRS index interact with the phonological material of the root, as NTR1SG *tába’nióon* <= *tába’niún=an*, with a HM contour *tába’ni**óo**n*, resulting from the contact with the nucleus of the 1SG enclitic ending (whereas in CPL1SG *ya’nión*, suffixal fusion happens instead of enclisis, so that the AGRS ending is still responsible for the opening of the root nucleus, but with no tone contour HM, and a single level tone /H/). Root may be governed by the ending to such an extreme point that it shrinks to a single nucleus – a combination of several of the above mentioned processes –, ending up in a weak root, as in AGRS 3: NTR3SG *ba’ín*, CPL3PL *ya’ín* <= |*ye.’niún*|, INCPL3PL *kuà’ín* <= |*ku=bè.’niún*|. The relevant processes are indicated as follows:

i) Root Onset Deletion: NTR3SG *ba’ín* <= |*b’e.’**n**iún*| ‘(s)he braids’
ii) Root Nucleus Compression: NTR3SG *ba’ín* <= |*b’e.’ni**ú**n*| ‘(s)he braids’
NB: We’ll conflate both processes into Root Compression (√_CPRS)
iii) Preverbal string (PV STRING)
iv) Ending licensing (END_LIC)
v) Weak Root (WEAK √).

[17] On the intricacies of the settlement patterns which have led to this situation of structural mixity and to further complexification, see Léonard (2013).

Table 25. R-T class 1, PV class I-A: *ba'ín*'braid', postlexical forms and morphophonological constraints in SFH

	3 SG	1 SG	2 SG	2 PL	1 PL	3 PL
NEUTRAL	*ba'ín*	*tába'nióon*	*téba'níi(n)*	*tá'níon*	*tátsuba'nìin*	*ínyoba'ín*
CPL	*ya'ún*	*ya'nión*	*kika'ún*	*kika'niójon*	*kika'nújin*	*ya'ín*
INCPL	*kuà'ín*	*kuà'nióon*	*ta'íin*	*kuà' níojon*	*kuà'(n)ujin*	*kuà'ín*
	√_CPRS	PV STRING END_LIC	√_CPRS END_LIC WEAK RT PV STRING	END_LIC	√_CPRS PV STRING END_LIC	√_CPRS PV STRING WEAK RT

In order to make these processes more explicit, table 26 provides lexical forms. We may notice that, unlike in other dialects observed so far, the SFH variety has lost the value {1PL.INCL}, and has discrete inflection cells for {3PL}.

Table 26. R-T class 1, PV class I-A: *ba'ín*'braid'in SFH, postlexical *vs*.lexical representations

	3 SG	1 SG	2 SG	2 PL	1 PL	3 PL
	POSTLEXICAL FORMS					
ROOT	***Níún***	***nión***	***(n)íún***	***nión***	***nù***	***Níún***
NEUTRAL	*ba'ín*	*ba'**nió**on*	*ba'**ní**i(n)*	*tá'**no**n*	*tsuba'**nì**in*	*ínyoba'ín*
CPL	*ya'ún*	*ya'**nió**n*	*kika'ún*	*kika'**nió**jon*	*kika'**nú**jin*	*ya'ín*
INCPL	*kuà'ín*	*kuà'**nió**on*	*ta'íin*	*kuà' **nío**jon*	*kuà'**(n)u**jin*	*kuà'ín*
	LEXICAL FORMS					
ROOT	***-ín-***	***nión***	***-ní- / -V^{H}n-***	***-no- / nión***	***-nìn- / -nún-***	***-ín-***
NEUTRAL	*be.'iún*	*té.be.'nión=an*	*tí.be'níún-i*	*té.' nión=jon*	*té.tsu.be.'nù=in*	*ín.ya.be'ín*
CPL	*ye'iún*	*ye'nión=an*	*ki.k=e'níún-i*	*ki.k=e'nión=jon*	*ki.k=e' nù=jin*	*ye'ín*
INCPL	*kuè'iún*	*k.uè.'nión=an*	*te.'níún-i*	*k.uè' níon=jon*	*k.uè' nù=jin*	*k.uè'ín*

Another R-T class 1 paradigm for SFH is provided by the *sínxó* stem (Table 27), interpretable as |*ts'ínxá*| at lexical level. With the exception of root allomorphy processes, we find most of the already mentioned phenomena of complexification (prolific preverbal strings, ending fusion and contours, etc.). In the previous example, unlike what we already observed in Huautla, the PV-T did not belong to the /H&/ subclass, so that we could not detect inflectional tone contrasts in the preverb domain, as expected, according to Pike's model. Instead, the *sínxó* stem, from PV class IV, should be exemplar for this scope. Though, in this case too, powerful segmental concatenative processes, such as PV STRING complexification seem to have erased any suprasegmental contrast: *sínxó*/*(n)iòxV^{H}* seems to be the pivotal allomorphic set around which clitics and affixes work out secondary stem aggregates, whereas only two prosodic patterns emerge: a /H-H/ tonal chain at primary stem level (*sínxó*), according to the lexical anchoring constraint, and a /h-H/ tonal chain as a default primary stem (*(n)iòxV^{H}*). The INCPL2SG *tiki'anxe* form is all the more interesting, as it comes up as the only exception to this well redistributed and regular dualism (LEX.ANCH *vs.* /h-H/ OCP), which can easily be explained as a secondary tonal chain, out of an intricate set of processes resorting to more than √_CPRS, i.e. straightforwardly to stem compression: *tiki'anxe* <= |*ti=kui.ba=n**iò**xé*|. Then, the /h-H/ OCP releases a /L-M/ chain at stem level (/h-H/>/L-M/), as a kind of marked or over-marked OCP.

Table 27.R-T class 1, PV class IV *sínxó*'works' in SFH (postlexical forms)

	3 SG	1 SG	2 SG	2 PL	1 PL	3 PL
NEUTRAL	*tinósínxó*	*tasínxóo*	*tenioxé* *tantènioxé*	*tatseniòxón*	*tatseniòxéen*	*ndiosínxó*
CPL	*kisínxó*	*kisínxóo*	*kiniòxé*	*kiniòxón*	*kiniòxéen*	*kisínxó*
INCPL	*bisínxó*	*bisínxòo*	*tiki'anxe*	*tetiò(n)xón*	*tetiò(n)xéen*	*bisínxó*

The next dataset in tables 28-29 confirms the invariability of tone strings in stems in this dialect, with but superficial details (either /M-h/: *sitsjù* in NTR & INCPL 3, or /H-H/ *sìtsjù* as the default tone stem), and seriously questions the regular dualism observed in R-T class 1, as patterns are now far more unpredictable. Interestingly enough, the mid-high tone (/h/) of the root lowers the previous preverb high tone (PV-T: /H/ > /M/before /h/), resulting in a weakening of lexical anchoring of a PV-T that K. Pike classified as /H&/ (see table 8 above). For NTR1SG, Ending licensing (END_LIC) shows up as the only prosodic discrete process: *sitsjùu* (with a /hM/ contour on the root) *vs.*NTR3SG *sitsjù* (R-T class 2, with /h/ anchored on the root). Again, tone economy levels all tone chains at word level, either with a /M-h/ chain (the basic *sitsjù* stem, CPL2SG *kinatsjùi*, and all the default forms in-NTR paradigms), or with a /h-h/ plateau (NTR2SG *tàtsjùi*, 1PL *sàtsjùjin*; CPL3SG *kisìtsjù*, INCPL3PL *sìtsjù*).

In table 28 we added data from San José Buenavista (SJB), a subdialect from the San Antonio Eloxochitlán area – an important dialect from the northwestern Highlands. Both its morphological and prosodic patterns resemble much more the central Highlands dialect (Huautla) than SFH or any subdialect from the Mazateco poblano area – except, perhaps, the San Pedro Ocopetatillo variety. In SJB, lexical anchoring of the R-T class tone, the /H&/PV-T downstep (here, preverb/H/>/h/ in NTR&CPL1SG: *sìtsjòo*) and anticonflative TAMV prefixing (i.e. no preverb suppletive alternation in -3/-1SG, e.g. INCPL2PL ***sì****tsjojñonvs.*NTR2PL ***nì****tsjojñon*), and the OCP default/h/ tone for PV-T/H&/ do work as basic patterns. The /H&/PV-T downstep is even more evident in the INCPL: 3 *siitsjò*, 1SG *sìitsjòo*, 2SG *sìitsjii*. The line LEXICAL, SFH in table 29 encodes most processes enumerated above (set 3 of constraints & processes), through morphological segmentation, in order to make easier the comparison with the SJB dialect[18]. The striking thing with the SFH dialect is the intricacy of preverbal allomorphs: the suppletive form of the causative has |*tè*-| and |*sè*-|or|*se*-| in the NTR & INCPL, whereas it has |*ne*-| in the CPL: NTR2SG *tàtsjùi*<= |*tè.tsjù-i*|, 2PL *tàtsjùjun* <= |*tè.tsjù=jun*| *vs.*1PL *sàtsjùjin*<= |*sè.tsjù=jin*|, etc.; CPL2SG *kinatsjùi*, 2PL *kinatsjujùn*, *vs.*1PL. *kinatsjùjin*. In such a system, concatenative and stem selection constraints (in other words, preverbal subcategorization) are so discrete and complex, that tone inflection becomes marginal. The comparison with a San Antonio Eloxochitlán subdialect, SJB, which has preserved the fine-grained inflectional tone pattern triplet of the Huautla type, as described by K. Pike, tells a lot about the drastic choice made by the SFH subdialect of Mazateco poblano.

[18] In the case of the Mazateco poblano dialect, specifically, phonological change as compared to the rest of the Mazatec diasystem are so impressive that we indulge in making of *lexical representations* a kind of etymological rewriting, for the sake of interdialectal comparison. Otherwise, the reader could be misled by the opacity of data, if not handled from a comparative standpoint.

Table 28. R-T class 2, PV class IV: *sitsjù* 'toast' in SFH *vs. sítsjòo* in SJB

			3 SG	1 SG	2 SG	2 PL	1 PL	3 PL
NTR	SFH	POSTLEX	*sitsjù*	*sitsjùu*	*tàtsjùi*	*tàtsjùjun*	*sàtsjùjin*	*sitsjù*
		LEX	si.tsjù	si.tsjù.u	tè.tsjù-i	tè.tsjù=jun	sè.tsjù=jin	si.tsjù
	SJB		*sítsjòo*	*sìtsjòo*	*nìtsjìi*	*nìtsjojñon*	*nìtsjòjin*	*sítsjòo*
CPL	SFH	POSTLEX	*kisìtsjù*	*kisìtsjùu*	*kinatsjùi*	*kinatsjujùn*	*kinatsjùjin*	*kisìtsjù*
		LEX	ki=sì.tsjù	ki=sì.tsjù.u	ki=ne.tsjù-i	ki=ne.tsju=jùn	ki=ne.tsjù=jin	ki=sì.tsjù
	SJB		*sìtsjòo*	*sìtsjòo*	*nìtsjìi*	*nìtsjojñon*	*nìtsjòjin*	*sìtsjòo*
INCPL	SFH	POSTLEX	*kotositsjù*	*sìtsjùu*	*tatsjùi*	*tatsjùun*	*satsjùin*	*sìtsjù*
		LEX	ka.ta=si.tsjù	sì.tsjù.u	te.tsjù-i	te.tsjù.un	se.tsjù-in	sì.tsjù
	SJB		*siitsjò*	*sìitsjòo*	*sìitsjii*	*sìtsjojñon*	*sìtsjòjin*	*siitsjò*

SFH paradigms in table 29 are even more baffling, as postlexical rules predict the surface primary stem *ba̲'atjà* in the NTR3SG resorts to a |*be̲'etjè*| lexical representation, i.e. to a subclass of phonologically strong preverb of PV class I-A, according to table 3 (here encoded as I-A'): |*be̲'etjè*| instead of |*b'étjè*|. The PV-T too classifies differently as the usual I-A class *b'é-* (PV-T /H&/), as |*be̲'e*|, i.e. as a LM reflex. As Pueblan Mazatec is still among the less documented dialects of Mazatec, we'll leave this detail aside, but still, it points to a type of variation we had not encountered so far in our survey: the PV-T class split, within some categories of preverbs.

Table 29. R-T class 2, PV classI-A':*ba̲'atjà*'plant' inSFH. (postlexical forms)

	3 SG	1 SG	2 SG	2 PL	1 PL	3 PL
NEUTRAL	*kinoba̲'atjà*	*ba̲'atja̲*	*teba̲'itja̲*	*tatsuba̲'atja̲*	*tatsube̲'etji̲n*	*yoba̲'atjà*
CPL	*yàtja̲*	*yàtja̲a*	*kikatje̲*	*kikatja̲ja*	*kikatjeji̲n*	*yàtja̲*
INCPL	*kotikatja*	*bíkatjà*	*tikátje̲*	*tonkikátja*	*(tonkikátjejin)*	*kotikatja*

The interesting point with tone patterns in table 29 is that a contrast involving AGRS 3 *vs.*1SG appears: NTR3SG *kinoba̲'atj**à*** vs.1SG *ba̲'atj**a̲***, opposing a lexically anchored/h/ tone of R-T class 2 and a/L/ tone ending for 1SG *ba̲'atj**a̲***, and a CPL3SG *yàtja̲* with a /L/ tone to a 1SG *yàtj**a̲a*** with a LM contour. In the INCMPL 3SG *kotikatj**a***, with a /M/ tone, contrasts with 1SG *bíkatj**à***, with a /h/ tone. Nevertheless, in the triplet NTR3SG *kinoba̲'atjà*, 1SG *ba̲'atja̲*, 3PL *yoba̲'atjà*, complex preverbation plays a stronger role in opposing the forms than tone could ever do by itself. In last resort, contrastive primary stems *ba̲'atjà / ba̲'atja̲*, differing slightly by the final tone, can be considered as mere allomorphs competing within a free variation field, as the INCPL allomorphic stems (3SG *kotikatja*<= |*ka.ti.k(u)=b'é.tjè*|, 1SG *bíkatjà*).[19]

4. Conclusion

In this paper we have shown that inflectional tone patterns in Mazatec differ considerably in the Mazatec dialect network. Roughly, two types were taken into account: on the one hand,

[19] The *bíkatj**à*** form 'I'll/used to plant' might be analyzed further as |*kuí.k(u)=b'etjè*|, as a labialization process *kui-* >*bi-* is endemic in the northwestern highlands: elders in San Lucas Zoquiapam do realize such forms in the incompletive. Although Mazatec often baffles linguists with irregularities and suppletive alternations, for PV as much as for roots, interdialectal comparison often allows to trace fine-grained processes in many cells of the paradigms. What makes Mazatec inflectional morphology baffling is endemicity not only at diatopic level, but also at cell level in inflectional systems observed in synchrony, in every single dialect. A process which could be called *micro-paradigm embedding*, as in the case of INCPL1SG *bíkatjà*.

the Central Highlands type, which opposes lexical tones according to preverb tone and root tone class properties (the Lexical Anchoring parameter), the 1SG&INCPL downstep and the default pattern elsewhere involving the Obligatory Contour Principlein McCarthy's (1986), as described in tables 5 and 8; on the other hand, an array of neutralizing parameters of all these constraints. The former has a strong hold in Huautla and in the Northwestern region, around San Antonio Eloxochitlán, whereas the later is widely spread, even in the outskirts of Huautla (e.g. it is rampant even in our SMH data), and it seems to be dominant in the Lowlands, as our SMS data suggest. In this type, both *plateau* and OCP patterns are competing, sometimes apparently at random, sometimes according to clear-cut dichotomies between TAM paradigms.

This study is the pioneer in accounting for this simple pattern of variation, as few Mazatec dialects have been described so far – most of what we know about preverb class and tone inflection in Mazatec focuses on mainly three dialects: Huautla (Pike, 1948), Chiquihuitlán Mazatec (Jamieson, 1982), San Jeronimo Tecoatl Mazatec (Bull, 1983, 1984) and, except Jamieson's comprehensive work on Chiquihuitlán (1988, 1996), we still have fragments. Moreover, dialects seem to have undergone considerable structural changes since SIL linguists described a few dialects (i.e, Kenneth Pike, Eunice Pike, Carole Jamieson, B. Bull, P. L. Kirk, G. Cowam and S. Gudschinsky). Although their work is an admirable piece of scholarship, it still need to be updated with new data and many other dialects, as the more we dive into dialect variation in Mazatec, the more we figure out new preverb class systems, new preverb tones and root tone classes. Paradoxically, one may say that Mazatec still badly needs more documentation, in spite of outstanding scholarship on several dialects. Moreover, as a language with still impressive vitality, social stratification and complex patterns of socioeconomic interactions between subregions distributed over at least five ecosystems (Highlands, midlands, Lowlands, the Cuicatlán Canyon and the Sierra Negra región in Puebla), it needs sociolinguistic studies on variation.

This paper has attempted to point at a few tracks on those hills and valleys where tone inflection and morphological complexity meet in intricate patterns of subsystem embedding. Complexity does not arise from bits and chunks holding together, but rather from sets of elementary constraints and parameters combined according to an economy of structural discreteness. Mazatec diasystem is particularly exemplar in this respect, and deserves more attention.

Abbreviations

ADJ: adjective; AGRS: agreement subject; CAUS: causative; CPL: completive aspect; cV & PR: co-verbation and polyvalent root (model); DERIV: derivative; DIR: directional; Excl: exclusive; Imper: imperative; /H/: high tone; /h/: mid-high tone; PV class: inflectional class; Incl: inclusive; INCPL: incompletive aspect; /L/: low tone;/M/: mid tone; MP: morphophonological; N: noun; NTR: neuter aspect; Pl: plural; POT: potential; PRED: predicate; preverb: preverb; PV-T: preverbal tone; R-T class: root tone class; Sg: singular; SOC: sociative root (= 'with'); T: tone; V: underspecified vowel; V'V, VhV: rearticulated vowels;*vs.*: *versus.*

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Appendix

Collaborators for the ALMaz data used in this paper:

- HU: Clementina Elodia Cerqueda García, school teacher, aged 53in 2011. Always lived in Huautla. Data recorded by Léonard in 2011-13.
- SFH: Benancio Villanueva González, aged 37 years in 2012, school teacher. Always lived in SFH, sección 2. Data recorded by Léonard and de Jesús (CMPIO).
- SJB: Leonardo Aventanio Bautista, aged 41 in 2011, from the *agencia* of San José Buenavista, school teacher in a Bachillerato Integral Comunitario, author of an outstanding booklet for the teaching of Mazatec (variety of San Antonio Eloxochitlán). Data recorded by Léonard.
- SMH: Jorge Carrera, San Miguel Huautepec, school teacher, aged 35 in 2013. Six years of studies in Huautla (high school). Data recorded by Calderón and Léonard.
- SMS: Juan Mauro Vicente, Corral de Piedra, SMS, school teacher, aged 51 in 2013. Parents from the former village of Playa Lagarto (now drowned by the Miguel Alemán dam). Lived three years in Temascal, close from his native village, and five years in Oaxaca, to study in the UPN. Wife from Valle nacional, monolingual in Spanish. Data recorded by Calderón, Nakamoto and Léonard.

Tonal overwriting and inflectional exponence in Amuzgo

Yuni Kim

1 Introduction

Amuzgo, an Eastern Oto-Manguean language with close affinities to Mixtecan (Campbell 1997: 158), is spoken in the Costa Chica region of Guerrero and Oaxaca States in southern Mexico. This paper deals with the Amuzgo variety of San Pedro Amuzgos, Oaxaca (see map 1), which has about 4000 speakers and has previously been studied by Smith-Stark and Tapia García (1984, 2002), Tapia García (1999), Stewart & Stewart (2000), and Buck (2000). The data come from these sources, plus a manuscript by Tapia García (n.d.) containing the full inflectional paradigms of about 1000 words. The data have been partially checked by the author on-site in San Pedro Amuzgos, with Tapia García himself and other native speakers.

Map 1. San Pedro Amuzgos, Oaxaca, Mexico.

In Amuzgo, person inflection in transitive verbs (plus a subset of intransitives) is realized in several ways simultaneously: aside from inflectional affixes, there are stem alternations in tone, vowel height, and/or glottalization.[1] Because each type of stem alternation has multiple possible surface patterns, the intersection and overlaying of these systems on top of each other results in numerous combinations of exponence strategies attested for each cell in the paradigm. The goal of this paper is to describe Amuzgo's tonal morphology and disentangle its role in the inflectional system. We focus on person marking in singular paradigms, where the interplay of lexical and morphological tone with other inflectional structure is especially complex.

Amuzgo tonal inflection is of theoretical interest because there is no fixed relationship between the tonal exponents of inflection and the morphosyntactic features they realize, contra the fairly common assumption that inflectional markers either have unique featural content or are defaults of some kind (see e.g. Müller 2007: 16–17). Instead, in Amuzgo a

1 A subset of intransitive verbs inflect for person with a special set of enclitics (see Buck 2000: 376), with no stem alternations at all.

limited set of tones is used and reused in different paradigm cells, and the set of inflectional classes quite closely approaches the set of logically possible configurations of these exponents in the paradigm. More concretely, I demonstrate that the sets of inflectional tones for 1st and 2nd person singular forms are coextensive and identical: there are five different tones that are attested as exponents of 1st person, and the same five tones are also the ones attested as 2nd person exponents. Tonal inflectional classes are defined by combinations of 1st and 2nd person tones. In this regard Amuzgo is reminiscent of Western Nilotic languages such as Nuer (see Baerman 2012), whose inflectional classes also exploit the combinatorial possibilities of a small set of elements.

The principal function of tone in the inflectional system is thus not to mark person features as such, but rather to enable lexical retrieval in the light of other person markers. Listeners can infer person categories from affixes, vowel height alternations, and glottalization alternations. However, the lexical identity of the word is obscured, because crucial information about lexical tone is not available: many stems are segmentally homophonous, and lexical tones are completely overwritten by inflectional tones. In order to recover the lexeme behind an inflected verb form, a listener must rely on inflection-class knowledge – in other words, knowledge of which lexical item carries a particular inflectional tone in the specific paradigm cell indicated by the less ambiguous exponents of person features. At least from the listener's perspective, tonal inflection in Amuzgo is a type of inflectional morphology that carries purely morphological information (cf. Aronoff 1994), to the unusually complete exclusion of morphosyntactic information encoded directly as such.

Because this paper is the first attempt in the literature to describe the tonal patterns of Amuzgo person inflection, the bulk of the argumentation is devoted to establishing the relationship between observed tones on inflected forms and the underlying tonal morphemes that can be considered as the inflectional tones proper. Previous published information on this subject consists only of raw data in the 30 or so sample verb tables in Buck (2000). With the aim of providing both an overview and an analysis, the structure of the paper is as follows: §2 gives background information on Amuzgo tone and situates person-marking phenomena within the overall inflectional system. In §3, I analyze the formal morphological and phonological properties of tonal inflection. Phonologically, I argue that inflectional tones overwrite lexical tones, as opposed to concatenating or fusing with them. I show that inflectional tones cannot be predicted from lexical tones, nor do they have any apparent phonological interactions with them. Morphologically, I demonstrate that the tonal inflection patterns cannot be predicted from a lexical item's other morphophonological properties, such as its membership to other stem-alternation classes; instead, lexemes must be specified for which tonal inflection pattern they take.

Having established the existence of tonal-overwriting inflection as an independent morphological phenomenon, in §4 we are in a position to ask how many underlyingly distinct tonal inflectional classes Amuzgo has. Because surface distinctions in tone can arise from interactions between the underlying inflectional tones and their phonological context, an analysis of the morphological inflection-class inventory requires that we factor out predictable phonological processes. I argue that a phonological process of glottally conditioned tone lowering creates predictably distributed surface allotones in some cases; this means that the two most frequent surface patterns originate from a single default underlying one. Nevertheless, despite the prevalence of the default pattern, many irreducibly distinct inflectional classes remain.

In §5 I discuss the role of tonal inflection within the overall structure of inflectional exponence, considering its consequences for further research on Amuzgo morphology as well

as for morphological theory in general. In particular, Amuzgo offers a challenge for theoretical proposals that constrain the possible number of inflectional classes in a language based on its inventory of exponents, such as the No-Blur Principle (Carstairs-McCarthy 1994, Cameron-Faulkner and Carstairs McCarthy 2000) and Inflection Class Economy Theorem (Müller 2007).

2 Amuzgo tones and inflectional categories

Amuzgo has eight lexically contrastive tones, described in detail by Smith-Stark and Tapia García (1984) and also recognized by Buck (2000). Table 1 shows the number-based tone labels used by Smith-Stark & Tapia García (1984) alongside a translation of the Spanish labels in Buck (2000), where H corresponds to *alto* 'high', M to *medio* 'medium', and L to *bajo* 'low'. Two-tone sequences reflect compound tone names; for example *bajo-bajo* is rendered as LL. In the bottom row of table 1, the eight contrastive tones are illustrated with an 8-way minimal octuplet.

Table 1. Tones of Amuzgo (San Pedro Amuzgos)

SSTG (1984)	/5/	/3/	/34/	/1/	/12/	/35/	/53/	/31/
Buck (2000)	H	M	MM	L	LL	MH	HM	HL
Minimal octuplet	nɛ̰^{5} 'dust'	nɛ̰^{3} 'cheap'	nɛ̰^{34} 'jump.CPL.3SG'	nɛ̰^{1} '*zacate*'	nɛ̰^{12} 'wilderness'	nɛ̰^{35} 'ripe'	nɛ̰^{53} 'sell.CPL.3SG'	nɛ̰^{31} 'already'

Both systems are descriptive phonetic labels rather than claims about phonological representation, and they are parallel apart from some minor differences in phonetic detail (comparing e.g. the 31 and HL labels for the same tonal category). Kim's (2011) study of a young speaker suggests intergenerational variation in the phonetic realizations of categories 1 (L), 53 (HM), and 31 (HL), but I will use Smith-Stark & Tapia García's (1984) tone numbers to refer to the tones, which is the system also used in Tapia García's (n.d.) verb tables.

The possibilities for further reduction are unclear. Although Bauernschmidt (1965) successfully reduced the 11 surface tones of Xochistlahuaca (Guerrero) Amuzgo to 6 underlying ones by arguing for an independent syllable-based parameter of ballisticity, Smith-Stark and Tapia García (1984) do not find corresponding evidence for the Oaxacan variety of San Pedro Amuzgos. Although Buck's (2000: 372) description splits the 8 tones into "controlled" and "ballistic" ones in a way that implies 5 underlying tones, Kim (2011) uncovers a phonological process that applies to controlled but not ballistic members of the putatively same tonal category, raising problems for the unification of their representations on the tonal tier.[2] We are not aware of any evidence for phonologically contrastive vowel length, either, despite a cline of durational differences between tone categories (see Kim 2011); we therefore do not follow the Buck (2000) and Stewart & Stewart (2000) convention of transcribing single versus double vowels.

As mentioned, tone is one of several elements exploited in Amuzgo for purposes of inflectional marking. Others include glottalization and vowel height, plus systems of prefixes, initial consonant mutations (related diachronically if not synchronically to prefixation), and suppletive stem allomorphy. To contextualize the role of tone in the inflectional system, I give

2 This process is a tone-sandhi alternation found in a younger speaker's speech, presumably a recent innovation. Older speakers do not produce this sandhi, and it does not figure in the present data.

a sample paradigm in table 2, illustrating some exponence strategies used in realizing different inflectional categories.

Amuzgo distinguishes singular versus plural number; four basic TAM categories (completive, incompletive, potential, and irrealis); and 1st, 2nd and 3rd person, plus 1st person inclusive and exclusive. In the following paragraphs I will describe number, TAM, and person marking, in this order.

Table 2. Inflectional paradigm of *kʷheʔ*^{35} 'arrive (here)' (Tapia García n.d.: 610)[3]

	Completive	Incompletive	Potential[4]	Irrealis
1SG	tʲhɛ^{1}	ma^{3}-kʷhɛ^{1}	n^{5}-nkʷhɛ^{1}	kʷhɛ^{1}
2SG	tʲheʔ^{1}	ma^{3}-kʷheʔ^{1}	n^{5}-nkʷheʔ^{1}	kʷheʔ^{1}
3SG	tʲheʔ^{35}	ʔ^{5}-kʷheʔ^{35}	n^{5}-nkʷheʔ^{35}	kʷheʔ^{35}
1PL.INCL	skɛ^{34}	ko^{3}-tskɛ^{34}	n^{5}-tskɛ^{34}	ki^{3}-tskɛ^{34}
1PL.EXCL	skɛ^{31}	ko^{3}-tskɛ^{31}	n^{5}-tskɛ^{31}	ki^{3}-tskɛ^{31}
2PL[5]	ske^{3} oʔ^{3}	ko^{3}-tske^{3} oʔ^{3}	n^{5}-ntske^{3} oʔ^{3}	ki^{3}-tske^{3} oʔ^{3}
3PL	ske^{3}	ko^{3}-tske^{3}	n^{5}-ntske^{3}	ki^{3}-tske^{3}

Despite the size of the paradigm in table 2, one characteristic we can note at a very general level is that singular and plural forms are built on different stems. The morphophonological relationship between singular and plural stems for any given lexical item does not appear to be systematically predictable, and in fact the singular and plural stems for the verb in table 2 appear to be suppletive, not related by any synchronic phonological processes. Various recurring processes are found, however. According to Buck (2000: 425ff.), plural stems can be derived from singular stems via prefixation of *t-* or *tʲ-* (1.a-b); instantiate initial-consonant mutation or deletion patterns associated with *t-* or *tʲ-* prefixation (1.c-d); involve no change (1.e); move a final glottal stop to prevocalic position (3f); lower a high vowel to high-mid (1.g); or be suppletive, not being derivable from singular stems by any regular phonological operation (1.h). More possible patterns are evident in Tapia García (n.d.).

3 Although sources on San Pedro Amuzgos Amuzgo use terms that translate to 'past', 'present', 'future', and 'subjunctive', here I use labels that facilitate comparison with other Eastern Oto-Manguean languages. However, the Amuzgo tense-aspect-mood system has not been investigated in depth.

4 The transcriptions here are phonemic; the singular forms are realized with initial velar nasals as a result of assimilation to the following velar plosive.

5 The 2pl. enclitic/suffix is included here at least partly to disambiguate 2pl. and 3pl. forms (Tapia García, p.c.), although the 3SG enclitic *hu*^{5} and 3pl. *ho*^{5}, listed in the Buck (2000) paradigms, are absent in Tapia García (n.d.). Since the obligatoriness and syntactic distribution of these morphs is not clear to me, I will not discuss them further, but I note that they are an additional exponent of person and number.

(1) Singular versus plural present-tense stems[6]

	SINGULAR	PLURAL	
a.	kẽʔ^{34}	t-kẽʔ^{12}	‘summon’
b.	ʔue^{1}	tʲ-ʔue^{3}	‘grind’
c.	mã^{1}	t-õã^{3}	‘wash’
d.	ke^{3}	tʲ-e^{3}	‘break’
e.	ntʃhe^{3}	ntʃhe^{3}	‘push’
f.	ntʃõʔ^{34}	ntʃʔõ^{12}	‘blink’
g.	ndʲi^{35}	ndʲe^{1}	‘hear’
h.	tso^{5}	nda^{1}	‘sleep’

Segmental stem changes are not the only possible exponents of plurality. In table 2, the prefixes *ko*^{3}-and *ki*^{3}- appear in plural but not singular forms of the present and the subjunctive, respectively. We also observe that singular and plural stems can differ in tone.

The morphological marking of tense, aspect and mood (similarly to number marking) relies on prefixation and/or its diachronic morphophonological heirs, namely mutations and deletions of features in initial consonants. In the paradigm in table 2 there are changes at the left-hand side of the stem, ranging from prefixes specific to certain TAM categories, such as *ma*^{3}- in the present, to changes in initial consonants, namely stem-initial *k*^{w}- in the present and subjunctive singular versus arguably monosegmental *nk*^{w}- in future forms; and the apparent replacement of initial consonants, where initial *t*-^{j}- in the past singular forms is accompanied by deletion of *k*^{w}- or *nk*^{w}-.

We refer to the tables in Buck (2000: 439) for an extensive classification of initial consonant mutations associated with TAM inflection. Additional aspectual prefixes, not shown here, can also be added to one of the four basic stems to create complex TAM forms such as the past habitual and future habitual forms listed in Tapia García (n.d.). Notably for our purposes here, tone appears to have no role whatsoever in TAM inflection: the paradigm in table 2 is entirely representative in that tone remains constant across the four forms in each row. Especially important to observe, given that this is an Oto-Manguean language, is that the stability of the stem tone across TAM categories indicates that the Incompletive *ma*^{3}- and Irrealis *n*^{5}- prefixes do not trigger any tone sandhi; this is constant across all the data.

In contrast, tone is most active in person marking, which also arguably possesses the most complex combination of exponence strategies. Aside from affixation, person marking involves tone, a system of glottal alternations, and vowel lowering. Regarding affixes, across all TAM categories we find a 2SG suffix -*ʔ* (which, however, is not unambiguously evident in the data in table 2, since the singular stem already ends in glottal stop; see §3 and §4 for further analysis). In the present tense only, different prefixes group 1SG and 2SG (*ma*^{3}-) together to the exclusion of the 3SG (*ʔ*^{5}-).

Several stem alternations are evident in the 1st person forms in Table (2). Glottal alternations target 1st person forms: the final glottal stop present in the 2SG and 3SG forms is absent from the 1SG form. Similarly, vowel-height alternations can also be seen: all first-person forms (1SG, 1PL.INCL and 1PL.EXCL) feature a low-mid vowel [ɛ] as opposed to the high-mid [e] present in other forms. This first-person vowel lowering is without exception in the case of high-mid vowels across all verbs, and lexically conditioned in verbs containing

6 In both the singular and the plural, I take third-person forms (minus affixes) as stems, since they are the loci of unpredictability and maximal contrast. The 3SG is the only cell in the paradigm where any of the 8 tones cna be found, and all plural tones can be predicted on the basis of the 3pl. tone.

high vowels. For this particular verb, 2nd person non-concatenative changes are limited to tone. While the 3SG forms have tone 35 (rising), both 1st and 2nd person forms alter the tone to 1 (low).

Following this initial look at exponence strategies in Amuzgo inflection, we now turn to a closer examination of the patterns and morphological mechanisms behind various elements of the system, seeking ultimately to characterize the morphological role of tone.

3 Phonological and morphological structure of tonal inflection

The description of tonal inflection presents two basic analytical problems. First, what is the morphophonological process or operation by which inflectional tones are associated to stems? Second, where in the lexicon or in the grammar do these inflectional tones originate – as integral elements of memorized stem allomorphs, in lexically arbitrary tonal inflectional classes along the lines of Aronoff (1994), or in regular rules that predictably match verbs with inflectional exponents according to the verb's phonological or morphosyntactic properties? In order to argue for the second possibility – that of inflectional classes – this section will argue that neither memorized stem allomorphs nor feature-based rules are appropriate analyses for the generalizations found in the data.

Tonal inflection in singular paradigms displays a wide variety of options. For example, table 3 gives the 1SG, 2SG, and 3SG forms of some verbs of phonotactic shape CV. The first row shows that they all have tone /3/ in the 3rd person. However, in 1st and 2nd person singular forms they diverge. In the 1st person, the verbs in (a-b) have tone /53/, while (c) has tone /3/. In the 2nd person, (a-c) both have tone /3/, while (b) is the odd one out with tone /53/. While the same two tones are used here, namely /53/ and /3/, neither is unique to either 1st or 2nd person, and they recombine into three different patterns of 1st-2nd tonal inflection: the /53/-/3/ pattern in (a), as opposed to /53/-/53/ in (b), as distinct still from /3/-/3/ in (c).

Table 3. Incompletive singular paradigms for some verbs with 3SG tone /3/

	(a) 'sing'	(b) 'enter'	(c) 'eavesdrop'
3SG	ʔ^{5}-ta^{3}	ʔ^{5}-βa^{3}	ʔ^{5}-nda^{3}
1SG	ma^{3}-ta^{53}	ma^{3}-βa^{53}	ma^{3}-nda^{3}
2SG	ma^{3}-ta-ʔ^{3}	ma^{3}-βa-ʔ^{53}	ma^{3}-nda-ʔ^{3}

Table 4 gives the full set of possibilities found in a sample of 133 words culled from Tapia García (n.d.), comprising the majority of paradigms in the list that meet a set of basic criteria for the present study: they are verbal, participate in inflection via stem alternations (as opposed to the enclitics referred to in fn. 1), and are based on monosyllabic stems. Words not meeting these criteria were excluded from the dataset in order to avoid potential effects of tone sandhi or non-verbal inflectional mechanisms.[7] Table 4 can be read in the same way as the data in table 3: for words with each of the 3SG tones in the top row (the number of verbs in

7 For a subset of nouns and property-concept words, possessive or other person-number inflection is very similar to the system described in §2; there is even apparent compatibility with TAM markers. There are also particle verbs consisting of verb plus e.g. directional particle, where it is the particle (rather than the verb root) that shows stem alternations in person inflection, again in a way similar to §2. Although it may turn out that the inflectional paradigms under discussion here are used in a uniform way across word classes, I have erred on the side of caution and attempted to control for non-arbitrary morphological factors.

the sample with that tone being shown below that), all of the attested 1SG stem tones are listed, followed by all of the attested 2SG stem tones.

Table 4. Attested inflectional tones in singular paradigms

3SG	/5/	/53/	/31/	/35/	/34/	/3/	/12/	/1/
1SG	/53/ /3/ /1/	/53/	/53/ /3/	/53/ /3/ /12/ /1/	/53/ /3/	/53/ /31/ /3/ /1/	/53/ /12/	/53/ /31/ /3/ /12/
2SG	/53/ /31/ /3/ /1/	/53/ /31/	/31/	/53/ /31/ /1/	/53/ /31/	/53/ /31/ /3/ /12/ /1/	/31/ /12/	/53/ /31/ /3/ /1/
N =	*n=12*	*n=5*	*n=3*	*n=35*	*n=12*	*n=32*	*n=5*	*n=29*

Only five of the eight tones – /53/, /31/, /12/, /1/, and /3/ – are found in the 1SG and 2SG, whereas all eight are attested in 3SG forms; we assume that the 3SG tone is the lexical tone. While accidental gaps cannot be ruled out in a sample of this size, particularly for less frequent categories, it is already apparent from table 4 that inflectional tones are not predictable based on 3rd person (lexical) tone. Each of the inflectional tones – for example tone /53/ – is compatible with a wide range of lexical tones, meaning that in at least some forms, lexical tone has left no apparent trace of its identity; and simultaneously, there is no inflectional tone from which a lexical tone can be accurately recovered. These are the hallmarks of tonal overwriting.

Just as the unpredictability of inflectional tones from lexical tones points to a certain phonological analysis of the operations involved, we now show that a lack of robust implicational relationships between tonal inflectional patterns and other stem alternations points to the independent status of tonal inflectional classes in the morphology.

The most prominent type of stem alternations are those involving glottalization. Some examples are shown in table 5.

*Table 5.*Illustrations of stem alternations involving glottalization

INCPL	(a) ‘arrive’	(b) ‘break’
1SG	ma^{3}-$k^{w}hɛ^{1}$	ma^{3}-$tʔã^{53}$
2SG	ma^{3}-$k^{w}heʔ^{1}$	ma^{3}-$tãʔ^{31}$
3SG	$ʔ^{5}$-$k^{w}heʔ^{35}$	$ʔ^{5}$-$tãʔ^{31}$

In (a), a final glottal stop is present in both the 2SG and 3SG forms, but absent from the 1sg form. In contrast, while the paradigm in (b) also shows final glottal stops in the 2SG and 3SG, glottalization is still present in the 1SG form, but appears in a different configuration with respect to the vowel.

Buck (2000: 378ff.) and Stewart & Stewart (2000) assign verbs to five classes (A, B, C,

D, and E) according to the presence and behavior of glottalization in their person-marking paradigms. Classes A and B cover verbs whose third-person forms end in vowels, e.g. shapes CV and CʔV. The remaining three classes (C, D, and E) divide up verbs whose third-person forms end in glottal stop, e.g. of shape CVʔ.[8] Table 6 provides a schematic overview of the SIL glottalization classes. Where there is a stem alternation, the minority stem shape is boldfaced. We can see that the alternation in (a) in table 5 falls into class E, while the alternation in (b) is representative of the class C category.

Table 6. Glottalization classes.

3SG stem	1SG stem	2SG stem	SIL	My proposal
-V	-V	-V	A	Non-alternating
-Vʔ	-Vʔ	-Vʔ	D	Non-alternating
-Vʔ	**-ʔV**	-Vʔ	C	1st person glottal metathesis
-Vʔ	**-V**	-Vʔ	E	1st person glottal deletion
-ʔV	-ʔV	**-V**	B	Irregular

With respect to glottalization alternations in stems, I propose to reanalyze the SIL classification in such a way that three groups of verbs are recognized: non-alternating, those with 1st person glottal metathesis, and those with 1st person glottal deletion. This schema is simpler than the SIL classification because I have merged the two non-alternating categories (A and D), which do not represent morphologically distinct patterns, and eliminated Class B, which turns out to have only two members after inspection of Stewart and Stewart (2000) and Tapia García (n.d.), and can thus be considered lexically idiosyncratic.

In table 6, we see that stem alternations only occur in verbs whose 3SG forms end in a glottal stop. Vowel-final verbs, once we eliminate irregular cases, never show glottalization alternations. Class A, illustrated by the present-tense forms in table 7, is defined as comprising the verbs of this latter type. Of the 86 vowel-final verbs in the dataset, 84 – i.e. virtually all of them – are non-alternating, falling into Class A. (Suppletive verbs, where alternations in individual features like glottalization cannot be meaningfully observed, are not counted here.)

Table 7. Vowel-final Class A in Buck (2000) and Stewart & Stewart (2000)

	CV ‘burn’		CʔV ‘catch’	
	(a) INCPL	(b) CPL	(c) INCPL	(d) CPL
1SG	ma^{3}-$tskɔ^{3}$	$skɔ^{3}$	ma^{3}-$vʔa^{53}$	$tʔa^{53}$
2SG	ma^{3}-tsko-$ʔ^{3}$	sko-$ʔ^{3}$	ma^{3}-vʔa-$ʔ^{3}$	tʔa-$ʔ^{3}$
3SG	$ʔ^{5}$-$tsko^{3}$	sko^{3}	$ʔ^{5}$-$vʔa^{3}$	$tʔa^{3}$

Meanwhile, of the 41 glottal-final (and non-suppletive) verbs in the dataset, 15 (or 37% of them) are non-alternating (“Class D”). These include both CVʔ and CʔVʔ shapes, i.e. both those with plain vowels and those with pre-glottalized (or laryngealized) vowels; more specifically, all of the CʔVʔ verbs in the dataset are non-alternating. Some examples of non-alternating, glottal-final singular present-tense paradigms are shown in table 8. Interestingly,

8 A sixth class (F) is reserved as the dictionary-entry label for the subset of intransitive verbs (regardless of phonotactic shape) that inflect with a separate paradigm of enclitics and are outside the system in §2.

Tapia García (n.d.) transcribes echo vowels in all first-person forms of verbs in this category. The role of this echo vowel is not known, nor has its distribution been studied; Buck (2000) does not include or mention it.[9]

Table 8. Glottal-final Non-alternating verbs (Class D)

INCPL	(a) 'take out'	(b) 'bring a gift'	(c) 'clean'
1SG	ma^{3}-$k^{w}hiʔ^{53}$-i^{3}	ma^{3}-$ndɔʔ^{53}$-$ɔ^{3}$	ma^{3}-$βɛʔ^{53}$-$ɛ^{3}$
2SG	ma^{3}-$k^{w}hiʔ^{1}$	ma^{3}-$ndoʔ^{31}$	ma^{3}-$βeʔ^{31}$
3SG	$ʔ^{5}$-$kwhiʔ^{3}$	$ʔ^{5}$-$ndoʔ^{3}$	$ʔ^{5}$-$βeʔ^{1}$

A slightly more common pattern for glottal-stop-final verbs in the dataset is the 1st person Glottal Metathesis alternation ("Class C"). Examples are shown in table 9. Overall, 51% of glottal-final verbs (21 of 41) belong to this category. All of them have the shape CVʔ in the 2nd and 3rd person; it perhaps stands to reason that a CʔVʔ verb would not be able to laryngealize an already-laryngealized vowel. The comparisons of different TAM forms for the same verb in table 9 illustrate that the presence and location of glottalization in stems remains constant in each person category, across all TAM forms.

Table 9. Glottal Metathesis stem alternations

	'break'		
	(a) CPL	(b) INCPL	(c) IRR
1SG	$tʔã^{53}$	ma^{3}-$tʔã^{53}$	n^{5}-$tʔã^{53}$
2SG	$tãʔ^{31}$	ma^{3}-$tãʔ^{31}$	n^{5}-$tãʔ^{31}$
3SG	$tãʔ^{31}$	$ʔ^{5}$-$tãʔ^{31}$	n^{5}-$tãʔ^{31}$

It is important to note that "metathesis" is a descriptive cover term referring to alternations in the phonetic and linear position of glottalization, since we do not have phonological arguments for the exact representational difference between pre- and post-vocalic glottalization. However, it is useful to keep in mind that prevocalic glottal stops in CʔV sequences refer to phonologically laryngealized vowels. Phonetically, the sequences written as CʔV are realized with creak and/or glottal stop in the first part of the vowel, giving a CVʔV-like, interrupted-vowel type impression. Much as in other Oto-Manguean languages (Silverman 1997), there is a very short (if any) modal phase, followed by creak, followed by a longer modal phase on which tone is realized. Silverman (1997) has convincingly argued that the sequential phasing of nonmodal phonation and tone, found throughout the language family, is an optimal strategy for the phonetic realization of both features on the same vowel. Similarly, orthographic ChV indicates phonologically breathy-voiced vowels. Here again, the sequencing of breathy and modal phases in the transcription reflects the phonetics, but there is no evidence that these are phonologically distinct segments.

Finally, only a handful of glottal-final verbs – 4 of 41 (or about 10%) – show the 1st

9 The discovery of the morphological source and identity of these echo vowels may well change the characterization of these verbs as glottally non-alternating. The main point that this is a distinct alternation pattern from the other two possibilities found in glottal-final verbs still stands, however.

person Glottal Deletion pattern illustrated in table 10, where a CVʔ stem alternates with a 1st person CV stem. Although this alternation seems relatively uncommon in verbs, it appears in the possessive paradigms of at least 7 nouns in Tapia García (n.d.), out of a closed set of kinship, body-part, and other closely-possessed nouns that inflect with §2-like stem changes, indicating that it should probably be considered as a genuine (if minority) class of alternations rather than as a cluster of coincidentally idiosyncratic cases. In both nouns and verbs, the roots belonging to this class are CVʔ; no words with laryngealized vowels (CʔVʔ) are attested with this pattern.

Table 10. Glottal Deletion stem alternations (Class E)

INCPL	(a) 'arrive'	(b) 'receive (gift)'
1SG	ma^{3}-k^{w}hɛ^{1}	ma^{3}-nda^{3}
2SG	ma^{3}-k^{w}heʔ^{1}	ma^{3}-ndaʔ^{31}
3SG	ʔ^{5}-k^{w}heʔ^{35}	ʔ^{5}-ndaʔ^{34}

We can now ask whether tonal inflection patterns are in any way parasitic on the three-way distinction in glottalization-based stem allomorphy patterns. The question is relevant for glottal-final verbs, since, as seen in (8), vowel-final verbs are virtually all non-alternating. Table 11 shows the seven different tonal-inflection patterns for 1SG-2SG forms that are attested with verbs ending in a glottal stop. However, the tonal inflection pattern is not predictable based on glottalization class: most tonal patterns are attested with verbs of more than one glottalization type, and the low number of Glottal Deletion verbs in the sample means that some of the gaps in that row could be accidental. We can conclude that glottalization alternations and tonal alternations in person marking are best seen as orthogonal and cross-classifying systems.

Table 11. Tonal-inflection pattern and glottalization alternations

1SG	/53/	/3/	/31/	/53/	/53/	/3/	/1/	/12/
2SG	/31/	/31/	/31/	/1/	/53/	/1/	/1/	/1/
Non-alternating	*n=10*	*n=2*	-	*n=2*	-	*n=1*	-	-
Metathesis	*n=12*	*n=2*	*n=1*	*n=4*	*n=1*	*n=1*	-	*n=1*
Deletion	-	*n=1*	-	-	-	-	*n=2*	*n=1*

To the extent that inflectional tones are not predictable based on any morphophonological property of verbs, they must on some level be idiosyncratically specified. A basic analysis might conceive of inflectional tones as memorized properties of the individual allomorphs that are designated to fill particular cells. More abstractly, though, data from irregular verb paradigms suggest that whole tonal inflectional patterns (i.e. 1SG-2SG combinations) could be specified at the level of the lexeme. In some irregular verb paradigms, the tonal pattern remains the same across TAM categories despite stem suppletion.

Table 12. Suppletive paradigms

a.	'go'	Completive	Incompletive	Potential	Irrealis
	1SG	$t^{jh}ɛ^{1}$	$hɔ^{1}$	n^{5}-$nk^{h}ɔ^{1}$	$k^{h}ɔ^{1}$
	2SG	$t^{h}aʔ^{53}$	$β^{h}aʔ^{53}$	n^{5}-$nk^{h}aʔ^{53}$	$k^{h}aʔ^{53}$
	3SG	$t^{h}a^{1}$	$β^{h}a^{5}$	n^{5}-$nk^{h}a^{5}$	$k^{h}a^{5}$
b.	'break'				
	1SG	$tʔiɔ^{53}$	ma^{3}-$kʔiɔ^{53}$	n^{5}-$nkɛ^{53}$	$kɛ^{53}$
	2SG	$tʔioʔ^{3}$	ma^{3}-$keʔ^{3}$	n^{5}-$nkeʔ^{3}$	$keʔ^{3}$
	3SG	$tʔio^{1}$	$ʔ^{5}$-$kʔio^{1}$	n^{5}-nke^{3}	ke^{3}

In (a) in table 12, the 1SG past tense form $t^{jh}ɛ^{1}$ 'I went' is built on a different root than the other 1SG forms (homophonous with the 1SG past 'I arrived' in table 2 above), yet the 1st person tone remains consistent across TAM categories. Neither does the different 3SG tone in the past tense make a difference to the tonal pattern. Similarly, the paradigm for 'to break' in (b) shows consistent inflectional tones across TAM categories, despite the fact that the paradigm is made up of forms based on two different roots, which furthermore appear to have different lexical tones (tone 1 in the past and present, which are built on $kʔo^{1}$; and tone 3 in the future and subjunctive, built on ke^{3}). Under a scenario where tones are properties of individual allomorphs, the consistency of inflectional tones across suppletive allomorphs would be coincidental, rather than as the logical consequence of an inflectional-class specification militating over all TAM paradigms of the same lexeme.

In sum, the 1st and 2nd person tones of the Amuzgo singular paradigms bear no reliably predictable relationship with either lexical tone or stem allomorphy patterns. This is true both in cases of stem allomorphs that could plausibly be derived by semi-productive but morpholexically specific phonological operations such as Metathesis or Deletion, as well as in cases that are more clearly suppletive. The examples in table 12 provide some evidence that inflectional classes may be abstract and lexically diacritic (see e.g. Aronoff 1994), rather than epiphenomena arising from lexical listing of tonally specified stem allomorphs. In terms of implementation, the inflectional tones completely replace lexical tone, being compatible with a wide variety of lexical tones while at the same time not undergoing any apparent phonological changes that are conditioned by the lexical tones.

To contextualize the continued focus on singular paradigms, I note that plural inflectional tones – unlike the singular ones – are fully predictable. The rules for plural tones are illustrated in table 13, based on Buck (2000: 386). Both total overwriting and lexical-tone manipulation are evident. While the 2pl. and 3pl. forms always carry the same tone, which may be considered the lexical tone and can be any of the 8 phonologically contrastive ones, the 1st person exclusive always takes tone /31/, which simply displaces the lexical tone without being affected by it. This can be analyzed as a /31/ tonal morpheme, carrying 1st person exclusive features, which overwrites lexical tone.

Table 13. Inflectional tones in plural paradigms

1PL.INCL	/5/	/53/	/31/	/35/	/34/	**/34/**	/12/	**/12/**
1PL.EXCL	/31/	/31/	/31/	/31/	/31/	/31/	/31/	/31/
2PL	/5/	/53/	/31/	/35/	/34/	/3/	/12/	/1/
3PL	/5/	/53/	/31/	/35/	/34/	/3/	/12/	/1/

For six of the eight lexical tones, the tone for 1st person inclusive forms remains unchanged. The other two – /3/ and /1/ – are changed /34/ and /12/, respectively. The fact that the mid tone stays in the mid range, and the low one in the low range, plus the fact that they undergo a similar kind of transformation (i.e. addition of a slight rising contour), points to both lexical tones being operated on by the same process. While Buck (2000: 386) suggests that this process is one of converting ballistic tones to controlled ones, I will refrain from speculating on the representational parameters involved, pending further investigation of the tonal phonology. It is also not clear whether the rule for 1st person inclusive operates on all forms, but for principled reasons applies vacuously to most tonal categories, or whether the process is specifically restricted to lexical tones /3/ and /1/. Either way, the inflectional tones in plural paradigms are completely predictable based on a combination of 1st-exclusive overwriting and lexical tone, and there is only one set of patterns: no inflectional-class distinction need be invoked.

4 From surface patterns to inflectional classes

In this section I take a closer look at the inventory of tonal person-marking patterns found in the singular paradigms of the 133 morphologically simplex verbs in our sample. The main issue of this section is to establish how many morphological patterns of tonal inflection are found in Amuzgo singular paradigms. The surface-distinct patterns discussed in §3 may not reflect morphologically distinct patterns, since varying surface forms could be produced by interactions between lexical or morphological tones, as Williams (2005) proposes for nominal inflection in the Xochistlahuaca (Guerrero) variety of Amuzgo. Although we saw in §2 that there are no sandhi processes evident between lexical and inflectional tones, here I show that there is a tone-altering interaction between morphological tones and a different phonological property of stems, namely final glottal stops.

Key observations include the emergence of very common patterns alongside much rarer ones, and the complementary distribution of patterns which appear either only on stems ending in a glottal stop, or not ending in a glottal stop, but not both. Positing a process of glottally-conditioned tone lowering allows us to unify some of the surface-distinct apparent inflectional classes into a smaller number of morphologically genuine ones. The formulation of this process points to certain phonological representations for Amuzgo tones, which have previously been studied primarily from a phonetic point of view (Smith-Stark & Tapia García 1984, Kim 2011; though see Bauernschmidt 1965 and Williams 2005 on the Amuzgo variety of Xochistlahuaca, Guerrero).

In the previous section, table 11 illustrated the seven different combinations of 1SG-2SG inflectional tones that are found on glottal-final verbs. When vowel-final verbs are included, the number of patterns rises to 15. Table 14 shows all the attested combinations of 1SG and 2SG tones, along with the numbers of vowel-final and glottal-final verbs displaying each pattern. Provisional class labels are given to facilitate the subsequent discussion.

Table 14. Surface patterns of tonal inflection

	Patterns on V-final verbs								Patterns on ʔ-final verbs/Both						
Class	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1SG	/53/	/53/	/53/	/31/	/3/	/12/	/1/	/1/	/53/	/53/	/3/	/12/	/31/	/3/	/1/
2SG	/53/	/3/	/12/	/1/	/3/	/12/	/53/	/3/	**/31/**	**/1/**	**/31/**	**/1/**	**/31/**	**/1/**	**/1/**
V#	*43*	*21*	*1*	*8*	*2*	*2*	*4*	*1*	-	*1*	*1*	-	-	*2*	-
ʔ#	*1*	-	-	-	-	-	-	-	*22*	*6*	*5*	*2*	*1*	*2*	*2*

Crucial to observe here is that all five inflectional tones can appear in either 1st or 2nd person. Difference between patterns consist of varying distributions of this common pool of elements between the two cells. In the sample, 15 of the 25 logically possible combinations are attested.

Another feature of table 14 is that there are salient asymmetries in the number of verbs displaying each tonal inflection pattern. Amuzgo has three patterns that clearly predominate over the others in terms of members: Class A /53/-/53/ (on 44 verbs), Class B /53/-/3/ (on 21 verbs), and Class I /53/-/31/ (on 22 verbs). None of the other patterns is shown by more than 8 verbs in the sample. This is unlike the Western Nilotic language Dinka, which despite being similar in that it recombines a small set of exponents to create different inflectional classes, is argued by Ladd, Remijsen & Manyang (2009) to lack any default or regular inflectional pattern.

A third striking pattern that emerges is that most tonal inflection patterns are exclusive or nearly exclusive either to vowel-final verbs or glottal-final verbs; just a few patterns are attested on both. Once the vowel-final patterns are isolated, we see a generalization in the 2SG tones: glottal-final verbs can only ever take a tone ending in /1/ (low falling or low level) for this person category. These two facts can be connected. The complementary distribution of tonal inflection patterns with respect to phonological environment suggests a phonological process deriving surface-distinct patterns from common underlying forms. A restriction on 2SG tones for glottal-final verbs suggests that this phonological process may be a tone-lowering one that is responsible for the consistent output of tones ending at a low level.

The morphophonological structure of the 2SG forms of glottal-final verbs provides a context whose uniqueness accounts for why a phonological process would apply in these forms to the exclusion of others. While they give the auditory impression of ending in a single glottal stop, there are two possible sources for it: either the lexical final glottal stop of the verb, or the 2SG suffix *-ʔ*.

Table 15. Ambiguous morphological affiliation of final [ʔ] in 2SG of CVʔ verbs

INCPL	(a) ‘enter’	(b) ‘summon’
1SG	ma^{3}-va^{53}	ma^{3}-$kʔ\tilde{ɛ}^{53}$
2SG	ma^{3}-va-$ʔ^{53}$	ma^{3}-$k\tilde{e}ʔ^{31}$ OR ma^{3}-$k\tilde{e}$-$ʔ^{31}$
3SG	$ʔ^{5}$-va^{3}	$ʔ^{5}$-$k\tilde{e}ʔ^{34}$

In the 2SG forms of vowel-final verbs like in (16a) we see the suffix unambiguously, but in (16b) it is unclear where to draw the morpheme boundaries, i.e. which of the competing

glottal stops has surfaced, or if there is even a way in which the single glottal stop somehow corresponds simultaneously to the underlying material or both stems and affixes. It is not within the scope of this paper to fully resolve the segmentation ambiguity, so I will call this a "double glottalization" context while remaining agnostic about the morphophonological representation of the actual output.

My proposal is that the two largest tonal-inflection patterns, Class A /53/-/53/ and Class I /53/-/31/, reduce to a single underlying one, /53/-/53/, once we posit a process of mid-to-low tone lowering (3 → 1) in the double-glottalization context. I have abstractly indicated this context as CVʔʔ in (3). This unified inflectional class is now by far the largest of the tone patterns, accounting for about 50% of the verbs in the dataset, and can be considered the default.

(3) Tone Lowering
  a. /3/ --> [1] / CVʔʔ
  b. /(5)3/ --> [(5)1] / CVʔʔ

The formulation of the rule as in (3.a), targeting only the second element in the underlying /53/ contour, is motivated in two ways. First, a process of /3/ → /1/ tone lowering in glottalization contexts also appears on prefix allomorphs that alternate (for poorly understood reasons) between CV and CVʔ shapes.

Table 16. Tone Lowering in Prefixes: 3 --> 1 alternation

	'walk'		'float'	
	(a) CPL.SG	(b) INCPL.SG	(c) CPL.SG	(d) CPL.PL
1st	**tʲeʔ^{1}**-ka^{1}	**βaʔ^{1}**-ka^{1}	ma^{3}-ntʲʰa^{53}	**maʔ^{1}**-ntʲʰa^{12}
2nd	ta^{3}-ka-ʔ^{1}	βa^{3}-ka-ʔ^{1}	ma^{3}-ntʲʰa-ʔ^{3}	**maʔ^{1}**-ntʲʰa^{1}-oʔ^{3}
3rd	**taʔ^{1}**-ka^{5}	βa^{5}-ka^{5}	ma^{3}-ntʲʰa^{3}	**maʔ^{1}**-ntʲʰa^{1}

In (a) and (b) in table 16, we see that the glottal-final prefix allomorphs *tʲeʔ^{1}-*, *taʔ^{1}-*, and *βaʔ^{1}* all have tone 1, while the vowel-final ones *ta^{3}-* and *βa-* have tone 3 or 5. Another set of prefix alternations is evident when comparing singular (c) and plural (d) forms of the verb 'to float', which is one of a set of verbs showing this same alternation. The prefix on singular forms is *ma^{3}-*, with tone 3 on a CV syllable, but the plural allomorph is *maʔ^{1}-*, with a lowered tone 1 on a CVʔ syllable. While these phonological environments are not completely parallel to the putative CVʔʔ context, the similarity suggests that further analysis of Amuzgo morphophonological structure may be able to unify the two processes.

The other motivation for the formulation of Tone Lowering as in (3.a) is to enable Tone Lowering, whose trigger is at the right edge of the syllable, to operate locally and affect the final half of the contour, to the extent that there is no need for a phonologically global lowering of the entire tone. In fact, there is some independent evidence from tone in Spanish loanwords that the correct phonological representation of tone /31/ is HL, rather than ML as implied by the tone numbers.

Table 17. Tone in Spanish loans

	Oxytone			Paroxytone	
a.	su^{31}	'blue' (<*azul*)	d.	ka^{5}le^{1}	'mayor' (<*alcalde*)
b.	a^{3}bri^{31}	'April' (<*abril*)	e.	ba^{3}rre^{5}ta^{1}	'crowbar' (<*barreta*)
c.	ta^{3}ria^{31}	'homework'(< *tarea*)	f.	ska^{3}le^{5}ra^{1}	'ladder' (<*escalera*)

The majority of loanwords with final stress (a-c) have tone /31/ on the stressed syllable, whereas paroxytones (d-f) have a /5-1/ tone pattern spread across the two final syllables. These patterns can be unified if we revise the representation of tone /31/ to /51/: we now have an identical melody consisting of 5 (H) and 1 (L), which are simply associated differently to words of different prosodic shapes.

Therefore, if Tone Lowering affects only the second half of the contour to change /53/ to [51], as illustrated in (3b), then the pared-down rule gives us a more correct output representation – in addition to potentially being more generally applicable to morphophonological phenomena outside the 2SG forms of glottal-final verbs, such as the prefixes in table 16. It is nevertheless important to note the morphological specificity of tonal lowering, since tones /1/ and /51/ do freely occur on vowel-final (e.g. CV) syllables elsewhere, just as tones /3/ and /53/ freely occur on glottal-final (e.g. CVʔ) syllables. On the other hand, the postulation of Tone Lowering creates an ambiguity in classes K /3/-/51/ and M /51/-/51/, found on stems ending in a glottal stop, where the second-person form surfaces with tone /51/. In the absence of morphological alternations, we do not know whether this tone /51/ reflects an underlying, unchanged /51/, or whether it has been produced by Tone Lowering from underlying /53/.

The Tone Lowering process in Table 16, and its success in enabling the identification of a default /53/-/53/ inflectional class that encompasses surface classes A and I, raises the possibility of further collapsing surface tonal-inflection patterns according to their complementary distribution on vowel-final and glottal-final syllables. From table (12), another pair of candidates that reduce to a single category is Class B /53/-/3/, a frequent pattern limited to V-final verbs, and Class J /53/-/1/, a pattern attested on six ʔ-final verbs in the dataset and one V-final verb. If the V-final verb is dealt with separately, perhaps as a lexical exception and not a true member of the same inflectional class, Tone Lowering gets us the complementary distribution for free.

The paradigms in table 18 show V-final and ʔ-final examples of verbs in the inflectional class that has underlying tones /53/-/3/. In the 2SG form of 'eat', Tone Lowering applies to turn underlying /3/ into surface tone /1/.

Table 18. Proposed /53/-/3/ class: V-final and ʔ-final examples

INCPL	(a) 'sing'	(b) 'eat'
1SG	ma^{3}-ta^{53}	ma^{3}-k^{w}ʔa^{53}
2SG	ma^{3}-ta-ʔ^{3}	ma^{3}-**k^{w}a(ʔ-)ʔ^{1}** /3/ --> [1]
3SG	ʔ^{5}-ta^{3}	ʔ^{5}-k^{w}aʔ^{3}

Beyond this, it is not clear how many more surface patterns can be unified, or indeed if it is desirable to consider infrequent patterns as morphologically semiproductive rather than irregular. The infrequent Class H /1/-/3/, found on a single V-final verb (plus in a suppletive paradigm, not counted, where the lexically final segment cannot be assessed), can in principle

be merged with Class O /1/-/1/, found on two glottal-final verbs, with no extra stipulation. It is also possible that Tone Lowering should be extended to /12/, converting it into tone /1/ by lowering the second half of the contour, despite the fact that this tone does not rise phonetically to a mid level. This would achieve a further reduction of the V-final Class F pattern /12/-/12/ and ʔ-final Class L pattern /12/-/1/ into underlying /12/-/12/. More evidence, including an expansion of the scope of analysis to morphologically derived verbs, may shed light on these particular patterns and on the extent to which they are systematically restricted to V-final and ʔ-final contexts beyond the controlled, morphologically homogeneous sample inspected for the current study.

Already, though, four of the most frequent tonal inflectional patterns have been reduced to two main inflectional classes that cover the majority of verbs in the dataset. A revision of the tonal-pattern chart in terms of inflectional classes (and corrected tonal representations) is presented in table 19. The unified classes as proposed in this section have been boldfaced.

Table 19. Inflectional tone classes.

Class	**A/I**	**B/J**	C	D	E	**F/L**	G	**H/O**	K	M	N
1SG	**53**	**53**	53	51	3	**12**	1	**1**	3	51	3
2SG	**53**	**3**	12	1	3	**12**	53	**3**	51	51	1
V#	*n=43*	*n=21*	*n=1*	*n=8*	*n=2*	*n=2*	*n=4*	*n=1*	*n=1*	*-*	*n=2*
ʔ#	*n=22*[10]	*n=6*	*-*	*-*	*-*	*n=2*	*-*	*n=2*	*n=5*	*n=1*	*n=2*

Overall, the resulting picture is mixed: while the majority of verbs now belong to one of the major inflectional classes, there remains a residue of smaller classes whose internal structure and relationships are less apparent. Further analysis may be able to unify more surface patterns into underlying inflectional classes, and evidence may be found for considering some of the infrequent patterns to be irregular. For now, there is a stubborn array of tonal inflectional patterns that create an inflectional-class system with nontrivial degrees of complexity and arbitrariness alongside the order and predictability of the default pattern(s).

5 Conclusion

We have seen that the tonal inflectional classes of Amuzgo exploit the combinatorial possibilities of a small set of elements, similarly to the Western Nilotic language Nuer (as analyzed by Baerman 2012). Such languages appear to contradict principles in the theoretical morphology literature that posit restrictions on the number of inflectional classes that can exist within an inflectional system, given the markers that are available. For example, the Paradigm Economy Principle (Carstairs 1987), given in (4), states that the number of inflectional classes for a paradigm cannot exceed the greatest number of possible exponents for a single cell.

(4) Paradigm Economy Principle (Carstairs 1987: 51)

10 This number does not include the exceptional glottal-final verb having a 2SG form with [53], since the logic of Tone Lowering would require this verb to be irregular, i.e. outside the inflectional-class system. Similar logic applies in the V# cell of the next category.

> "When in a given language L more than one inflectional realization is available for some bundle or bundles of non-lexically-determined morphosyntactic properties associated with some part of speech N, the number of macro-paradigms for N is no greater than the number of distinct 'rival' macroinflections available for that bundle which is most generously endowed with such rival realizations."

In Amuzgo there are five possible inflectional tones for 1SG forms, and a minimum of four for 2SG forms (due to the surface neutralization of /53/ and /51/). The Paradigm Economy Principle predicts that there should be no more than five distinct paradigms, a prediction that is falsified by the 11 inflectional classes listed in table 19. Although deeper analysis of these surface patterns may be possible, the task of eliminating six classes would not appear to be a trivial one.

The subsequent and related No Blur Principle (Carstairs-McCarthy 1994, Cameron-Faulkner & Carstairs-McCarthy 2000) proposes that at most one allomorph – for our purposes here, at most one inflectional tone – can fail to predict the rest of the paradigm.

(5) No-Blur Principle (Carstairs-McCarthy 1994: 742)

> "Within any set of competing inflectional realizations for the same paradigmatic cell, no more than one can fail to identify inflection class unambiguously."

In the case of Amuzgo, four of the five 1SG tones should correspond unambiguously to specific 2SG tones. Nevertheless, even the reduced table 19 does not conform to this hypothesis. Among the 1SG tones, only tone /12/ unambiguously tells us the 2SG tone, which is also tone /12/; the other four all have multiple possibilities for what the 2SG tone can be. Looking at the 2SG cell makes matters worse: all of the 2nd person tones are attested with multiple 1st person tones.

As a final example, the Inflection Class Economy Theorem of Müller (2007) is given in (6).

(6) Inflection Class Economy Theorem (Müller 2007: 164):

> "Given a set of *n* inflection markers, there can be at most 2^{n-1} inflection classes, independently of the number of grammatical categories that the markers have to distribute over."

A maximum of 2^{n-1} classes where n=5, as it does in Amuzgo, yields a limit of 16 classes for the five markers. Amuzgo does fall within this, according to the data and analysis presented here. However, the theorem is based on what Müller (2007: 16) calls the Syncretism Principle: "For each marker, there is a unique specification of morphosyntactic features." The Amuzgo data clearly do not bear out this assumption. It may be that the number of inflectional classes has been limited by the fact that the paradigms under discussion have involved an extremely limited number of cells – just two – while the data are, in other ways, not in line with the spirit of the theory.

The Syncretism Principle captures the fundamental incompatibility between Amuzgo inflection and the well-known proposals in (4-6): the idea that inflectional elements are direct exponents of morphosyntactic features – direct in the sense that morphosyntactic features should be recoverable from the inflectional element alone, without necessary reference to

other exponents of the same category or other properties of the word. Even in cases of syncretism, it is usually the case that the choice of exponent at least narrows down the range of morphosyntactic features that could possibly be interpreted from it. In Amuzgo this is only true in a probabilistic or statistical sense. After undoing the effects of phonology, recovery of an underlying /53/ inflectional tone may influence the listener decide between 1st and 2nd person based on frequency bias, but in principle the tone itself cannot tell us which of the cells in this two-cell paradigm a form is located in.

The listener can only infer person category from other, more direct clues such as the 2SG suffix *-ʔ* or the fact that a 1st person stem can never have a high-mid vowel (which would always lower to low-mid). Similar ambiguities obtain with each of the other inflectional tones. What is the role of tonal inflection in Amuzgo, then, if tonal morphs have no restrictions on the morphosyntactic features they can carry? The tonal-overwriting mechanism also means that inflectional tones obliterate, rather than preserve, information about lexical tones; so overall they appear to carry neither lexical nor grammatical information.

Instead, tonal exponents are only meaningful in *relation* to the other components of the inflectional system. The inflectional role of tone in Amuzgo, and probably elsewhere in Oto-Manguean, seems to be to carry purely morphological information – i.e. about inflectional class – that indirectly enables the listener to recover the intended lexical item through knowledge about the indexation of verbs to specific inflectional classes.

Table 20. Tonal inflection and lexical recovery

INCPL	(a) 'inhale'	(b) 'vomit'	(c) 'break'
1SG	ma^{3}-tã^{53}	ma^{3}-tã^{53}	ma^{3}-tʔã^{53}
2SG	ma^{3}-tã-ʔ^{53}	ma^{3}-tã-ʔ^{3}	ma^{3}-tã(ʔ-)ʔ^{51}
3SG	ʔ^{5}-tã^{34}	ʔ^{5}-tã^{3}	ʔ^{5}-tãʔ^{51}

In the 2SG form *ma^{3}-tã-ʔ^{53}*in table 20, the inflectional tone /53/ by itself does not disambiguate the person category. But taking into account the relationship between the inflectional tone and the final glottal stop, the form is identifiable as 2SG. It carries the 2SG glottal suffix, and we know that this glottal stop is not a lexical one because the tone has surfaced as /53/ rather than undergoing Tone Lowering. If it had undergone Tone Lowering to /51/, the word would be interpretable as the 2SG form of 'break' in (c). The fact that this word has tone /53/ in the 2nd person, in turn, means that it can only be 'inhale' - since 'inhale' is the verb with root segmental content *tã* that belongs to an inflectional class that takes /53/ in the 2nd person. Meanwhile, similar logic applies to 'vomit' in (b): although the 1SG form is actually homophonous with the 1SG of 'inhale', it is the conjunction of tone /3/ and final glottal stop that help to identify it as the 2SG of this particular lexical item – despite the fact that the tone itself carries neither lexical nor morphosyntactic information, but rather functions in a highly paradigmatic way to ultimately be effective in conveying both.

In sum, it has been necessary to disentangle the various areas where tone operates within Amuzgo morphophonology – tone from other stem alternations, lexical from inflectional tones, underlying tones from surface ones – to arrive at an object of morphological analysis, which has been an apparent system of tonal inflectional classes that is independent from other inflectional stem alternations. It is independent, however, only in the sense of being arbitrarily specified. Precisely because of its abstract morphological status, the function and interpretation of Amuzgo tone relies so heavily on interaction with other

exponents that it challenges the typological picture of what a possible system of inflectional morphology can look like.

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Abstract and concrete tonal classes in Itunyoso Triqui person morphology

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1 Introduction

Otomanguean languages possess some of the most complex tonal inventories among the languages of the world. According to the *World Atlas of Linguistic Structures*, approximately 41.8% of the world's languages (220/527) are tonal (Maddieson, 2011). Of these, 60% (132/220) have only 1-2 lexical tone contrasts and 40% have three or more tonal contrasts (88/220). Among the tone languages with large inventories, languages with between 3-6 tonal contrasts are relatively common, e.g. Thai (5), Mandarin (4), Vietnamese (6), Cantonese (6), Yoruba (3). Languages with greater than six tones are rare, but many are Otomanguean. For instance, in Yoloxóchitl Mixtec, up to 8 tones may occur on a single mora and 20 tonal melodies on a bimoraic monosyllabic word (DiCanio et al., 2014). Quiahije Chatino has 14 tones (Cruz, 2011), Tlacoatzintepec Chinantec has 7 (Thalin, 1980), and Chiquihuitlan Mazatec has 17 (Jamieson, 1977). In addition to such bewildering complexity in inventory size, Otomanguean languages also contain complex morphological processes where tone plays an integral role; a feature largely absent from many East and Southeast Asian tonal languages.

One domain where tone features heavily in Otomanguean morphology is the application of personal enclitics or suffixes to lexical stems. Personal clitics vary dramatically within sub-families, e.g. across Mixtec variants, and across the Otomanguean stock. At one extreme, tonal changes induced by certain personal suffixes/clitics may distinguish between a variety of inflectional paradigms, as in certain Chinantec languages (Chinantecan) (Foris, 1994; Pace, 1990) or in Ixcatec (Popolocan) (Fernández de Miranda, 1961). In these languages, the tonal changes associated with person are not phonologically-conditioned, but must be lexically-specified.[1] At the other extreme, tonal changes induced by personal clitics/suffixes may be entirely phonologically or morphologically-conditioned, as in Yoloxóchitl Mixtec (Amith & Castillo García, no date, Castillo García, 2007), Jicaltepec Mixtec (Bradley, 1970), and Isthmus Zapotec (Pickett et al., 2001). In these languages, the tonal changes associated with person are predictable based on non-arbitrary properties of the stem.

The tonal alternations associated with personal clitics in the Triqui languages (Mixtecan) lie somewhere between these two extremes: not arbitrarily affiliated with stems within a particular paradigm, but also not easily phonologically-predictable. The current paper provides the first description and analysis of clitic morphophonology in Itunyoso Triqui. Itunyoso Triqui [itun'joso 'triki], (ISO 639-3, trq) is spoken in the town of San Martín

[1] Though see Jamieson (1988) for a Mazatec variety in which verbal paradigms are predictable based on vowel qualities in stems.

Itunyoso, Mexico. Like many other Otomanguean languages, it has a large tonal inventory (9 lexical tones) which interacts in nuanced ways with the clitic morphology. I show that personal clitic morphology is *phonologically*-conditioned for stems with most tones but, for words carrying tone /3/, it is also sensitive to an abstract distinction between a class which includes stem tone-raising and a class which does not. There are two distinct tonal processes affecting the application of clitics: stem-formation rules and clitic-conditioned tone spreading/deletion. Such processes are sensitive not only to the set of possible tone-glottal co-occurrence restrictions in the language, but also to general principles of tone-mora association/reassociation as described in autosegmental-metrical phonology (Goldsmith, 1990). In the remainder of this section, I provide an introduction to Itunyoso Triqui (IT, henceforth) clitic morphology and a background on Triqui tonal phonology.

All data in this paper comes from original fieldwork done by the author on the San Martín Itunyoso variant of Triqui between 2004 - 2014. During this time a database of 356 nominal/verbal paradigms was compiled. The phonology and phonetics of segments and tone are discussed in depth in DiCanio (2008) (but see (DiCanio (2010)) for a brief overview). Segmental and tonal transcriptions in this paper follow the conventions used in these publications with three exceptions: First, "y" is used in place of phonological /j/. Second, geminates are represented using doubled consonants instead of a length diacritic, e.g. "tt" instead of /t:/. Third, tone /35/ is represented as tone /45/ in this text, an analysis which better reflects its phonetic realization and corresponds with the morphophonological alternations here. Except for this tonal transcription difference, tonal marking follows conventions used in DiCanio (2008, 2010, 2012a,b) and Hollenbach (1984), where /5/ is high and /1/ is low.

1.1 Background: IT morphology

In many Otomanguean languages, affixes are prefixal and only clitics may occur at the right edge of the word (Suárez, 1983). This particular morphological structuring also occurs in all Triqui variants (c.f. Hollenbach (1984); Longacre (1959)). While words of any part of speech may contain a personal enclitic, alienable nouns may be preceded by a single possessive prefix and verbs may be preceded by non-productive causative or iterative prefixes; and a productive aspectual prefix. Owing to the nature of clitics in the language though, they can freely attach to words of most parts of speech. General, verbal, and nominal morphological tamplates are shown below, followed by example sentences in (1) - (8).

General template: STEM=(NUM)+(CLITIC)
Nominal template: (POSS)–NOUN=(NUM)+(CLITIC)
Verbal template: (CAUS)–(ASP)–VERB=(SUBJECT.CLITIC)=(OBJECT.CLITIC)

(1) ya^{3}ʔyoh^{3} tʃi^{4}ʔyãh^{4} tʃu^{3}βe^{3}
daily bark dog
'The dog barks daily.'

(2) na^{3}ʔmã^{4} βeʔ^{3}
sink house
'The house is sinking.'

(3) k^{w}eh^{3}=ɾeʔ^{1} ɾi^{3}ã^{32} tʃi^{3}ŋga^{4}
PERF.jump=2S face fence
'You jumped over the fence.'

(4) na^{3}βi^{43} si^{3}-sũh^{2} a^{3}k^{w}a^{4}ni^{43}
finish.1S POSS-work.1S now
'I am finishing my work now.'

(5) k-a^{2}ʔniʔ^{1}=ɾeʔ^{1} ββe^{4} tʃah^{3}
POT-cut=2S hair head.1S
'You will cut my hair.'

(6) na^{2}-ki^{3}-ʔyah^{3} saʔ^{1}=sih^{3} yã^{3}ʔã^{32}
CAUS-PERF-make good=3SM light
'He is fixing the light.'

(7) ri^{1}kih^{1} kkaʔ^{3} ɾi^{3}ã^{32}=ɾeʔ^{1}
POT.give.1S candle face=2S
'I will give you a candle.'

(8) tʃa^{2}kah^{1}=ɾeʔ^{1}=ũh^{3}
marry=2S=3SF
'You are marrying her.'

While nouns and verbs may be inflected for person by a person enclitic, they may differ in their inflection.[2] Aspectual prefixes are not obligatory on verbs and those lacking them carry a progressive/habitual reading, as in examples (1) and (2). Perfective and potential aspect are marked by a prefix, but are distinguished from each other only by tone. For the perfective, consonant-initial verbs receive a /kV^{3}-/ prefix, e.g. /ki^{3}-ta^{2}nih^{3}=sih^{3}/ 'he lowered', while vowel-initial verbs receive a /k-/ prefix with no tonal changes on the initial syllable of the stem, e.g. /k-a^{4}ko^{43}=sih^{3}/ 'he cried'. For the potential, consonant-initial verbs receive a /kV^{2}-/ prefix, e.g. /ki^{2}-ta^{2}nih^{3}=sih^{3}/ 'he will lower', while vowel-initial verbs receive a /k-/ prefix which changes the initial syllable of the verb stem to tone /2/, e.g. /k-a^{2}ko^{43}=sih^{3}/ 'he will cry'. Examples (5) – (7) show aspectual prefixes on verbs. In example (8), we observe two enclitics applying to a Triqui verb, marking subject and object.

Nouns may be inflected only with a possessive prefix which varies by the semantic class of nouns on which it applies. Inalienable nouns take no prefix, e.g. /ya^{32}/ 'tongue' > /ya^{32}=sih^{3}/ 'his tongue', while for animate nouns, personal clitics attach to a pre-nominal classifier, e.g. /tʃu^{3}tʃe^{32}/ 'chicken', /tã^{4}=ũh^{3} tʃu^{3}tʃe^{32}/, owner=3SF chicken, 'her chicken.' Certain alienable nouns take an irregular prefix or undergo an onset consonant mutation, e.g. ya^{3}ʔah^{3} 'chile pepper' > /ta^{3}ʔah^{3}=sih^{3}/ 'his chile pepper.' However, most alienable nouns take a /si^{3}-/ prefix. Bare, uninflected nouns are shown in examples (1 - 3) and (5 - 7). Inflected nouns are shown in examples (4), (5), and (7).

1.1.1 The problem with enclitics

Most of the person-number distinctions marked with enclitics in IT do not condition any stem tone changes. Table 1 provides the person enclitics in the language. There are only 8 morphologically distinct clitic forms in IT: 1S, 2S, 3S.Masc, 3S.Fem, 3S.ANIM, 1DU, 1.EXCL, and 1.INCL. With the exception of the 1st person forms, all non-singular person

[2] A full account of aspectual and possessive allomorphy is provided in DiCanio (no date).

marking results from combining a numeral morpheme with one of the clitics. Thus, the 2*nd* and 3*rd* person dual forms are marked with the morpheme /nu^{2}k$^{\text{w}}$e^2/ and the 2*nd* and 3*rd* person plural forms are marked with the morpheme /a^{3}niʔ^2/. There is reason to analyze these forms as synthetic. Different quantifiers may precede person clitics, including words like /ta^{2}ɾãʔ^3/ 'all', e.g. /ta^{2}ɾãʔ^3=tʃuh^3/ 'all of them (ANIM)'. The dual and plural morphemes condition segmental allomorphy with the 2*nd* person enclitic /=ɾeʔ^1/, which appears here as /=he^{4}ɾeʔ^1/ and /=ih^{4}ɾeʔ^1/, respectively. The only clitics which condition stem tonal changes are the 1S, 2S, and the 1DU.[3]

Table 1: Itunyoso Triqui enclitics

	Number		
Person	Singular	Dual	Plural
1*st*	=h ⇌ *deletion*	=ʔ	=neʔ^4 (inclusive) =ũh^4 (exclusive)
2*nd*	=ɾeʔ^1	=nu^{2}k$^{\text{w}}$e^{2}he^{4}ɾeʔ^1	=a^{3}niʔ^2=ih^{5}ɾeʔ^1
3*rd* Masculine	=sih^3	=nu^{2}k$^{\text{w}}$e^{2}sih^3	=a^{3}niʔ^2=sih^3
3*rd* Feminine	=ũh^3	=nu^{2}k$^{\text{w}}$e^{2}ũh^3	=a^{3}niʔ^2=ũh^3
3*rd* Animal	=tʃuh^3	=nu^{2}k$^{\text{w}}$e^{2}tʃuh^3	=a^{3}niʔ^2=tʃuh^3

When one examines the tone-altering clitics on words of differing phonological and tonal shapes, it is difficult to observe clear patterns. Observe the data from possessed nouns in Table 2. While some tendencies are apparent here, most of the possessed forms are distinct. The stem tone on the bare root is *usually* identical to the stem tone preceding the 3SM clitic, but distinct for the forms in (e) and (g). The 1S forms show various tonal patterns on stems, only some of which match the bare stem tone. Of these, certain forms involve the addition of /-h/ (c–g), while others delete it (a–b). The 2S clitic /=ɾeʔ^1/ conditions either no change of stem tone (in (a), (e–g)), stem tone-raising to /4/ (in (c)), or stem tone lowering to /1/ (in (b) and (d)). The 1DU clitic /ʔ/ conditions either no stem tone change (in (d), (e), and (g)), or a stem tone change to /4/. Lest one consider that these alternations are predictable from the bare stem tone, consider that each of the pairs (c–d) and (e-f) have identical tonal patterns in bare stems, but show entirely distinct 1S, 2S, and 1DU forms. None of these forms are idiosyncratic; there are many examples of each type.

At first glance, these data might suggest that each IT word belongs to a particular paradigm, much like one observes in the Chinantecan and Popolocan branches of Otomanguean. Though, a deeper investigation reveals that many of the patterns, especially for certain bare stem tones, follow from predictable phonological constraints/processes and stem-formation rules in the language. Once such processes are considered, the seeming arbitrariness of

[3]There is a process underway, however, of merging a reduced version of the 2P form with the stem, e.g. /ɾa^{3}ʔa^3=a^{3}ni^2=ih^{5}reʔ^1/ ~ /ɾa^{3}ʔaː^{35}hreʔ^1/ '*your (PL) hand(s)*.' Note that in this context, the plural morpheme, /a^{3}ni^2/, is redundantly omitted in favor of marking person with tone and coda aspiration.

Table 2: Stem-level tone changes with person marking in Itunyoso Triqui.

Bare stem	Gloss	1S	2S	3SM	1DU
(a) yo^{3}ʔoh^{45}	'land'	to^{3}ʔo^{32}	to^{3}ʔoh^{45}=ɾeʔ^{1}	to^{3}ʔoh^{45}=sih^{3}	to^{3}ʔoʔ^{4}
(b) si^{4}tuh^{3}	'bellybutton'	si^{4}tu^{43}	si^{4}tuh^{1}=ɾeʔ^{1}	si^{4}tuh^{3}=sih^{3}	si^{4}tuʔ^{4}
(c) ɾi^{3}ki^{3}	'stomach'	ɾi^{3}kih^{45}	ɾi^{3}ki^{4}=ɾeʔ^{1}	ɾi^{3}ki^{3}=sih^{3}	ɾi^{3}kiʔ^{4}
(d) tu^{3}neʔ^{3}	'tail'	tu^{3}neh^{3}	tu^{3}neʔ^{1}=ɾeʔ^{1}	tu^{3}neʔ^{3}=sih^{3}	tu^{3}neʔ^{3}
(e) sũ^{32}	'work'	si^{3}-sũh^{2}	si^{3}-sũ^{2}=ɾeʔ^{2}	si^{3}-sũ^{2}=sih^{3}	si^{3}-sũʔ^{2}
(f) yã^{32}	'salt'	tãh^{3}	tã^{32}=ɾeʔ^{1}	tã^{32}=sih^{3}	tũʔ^{3}
(g) ɾu^{3}si^{1}	'stick'	si^{3}-ɾu^{1}sih^{1}	si^{3}-ɾu^{1}si^{1}=ɾeʔ^{1}	si^{3}-ɾu^{1}si^{1}=sih^{3}	si^{3}-ɾu^{1}siʔ^{1}

tonal alternations on the stem mostly disappears. Phonological constraints on tonal association in IT are examined in the following section.

1.2 Background: IT tonal phonology

There are nine contrastive surface tones in IT, though their distribution is sensitive to both the syllable on which the tone falls in the word and the presence/absence of a glottal consonant in the stem-final syllable's coda (the only codas in the language). Stem-final syllables are accentually prominent in IT. Prominence is indicated by a greater number of segmental contrasts which occur in final syllables as well as a larger inventory of possible tones (DiCanio, 2008). These syllables are also phonetically lengthened (DiCanio, 2010). Table 3 shows the surface tonal contrasts in IT on monosyllables with different final rimes.

Table 3: Surface tonal contrasts on different rime types in monosyllables

	Open syllable		Coda /h/		Coda /ʔ/	
Tone	Word	Gloss	Word	Gloss	Word	Gloss
/4/	yũ^{4}	'earthquake'	yãh^{4}	'dirt'	niʔ^{4}	'see.1DU'
/3/	yũ^{3}	'palm leaf'	yãh^{3}	'paper'	tsiʔ^{3}	'pulque'
/2/	ũ^{2}	'nine'	tah^{2}	'delicious'	ttʃiʔ^{2}	'ten'
/1/	yũ^{1}	'loose'	kãh^{1}	'naked'	tsiʔ^{1}	'sweet'
/45/			toh^{45}	'forehead'		
/13/	yo^{13}	'fast (adj.)'	toh^{13}	'a little'		
/43/	ɾa^{43}	'to want'	nnãh^{43}	'mother!'		
/32/	ɾã^{32}	'durable'	nnãh^{32}	'cigarette'		
/31/	ɾã^{31}	'lightning'				

In Table 3, we observe that, with the exception of tone /31/, all of the tones may surface on syllables with a coda /h/ and contour tones never surface on syllables with a coda /ʔ/. In addition to these patterns, tone /4/ only surfaces on the a syllable with a coda /ʔ/ when it

Table 4: Tones on disyllabic words (from DiCanio (2008))

σ_2	/4/	/3/	/2/	/1/	/43/	/32/
σ_1 /4/	ku^{4}tu^4 ‘owl’	ta^{4}ko^3 ‘to dry (tr.)’	X	X	sna^{4}ŋga^{43} ‘day of the dead’	X
/3/	ka^{3}to^4 ‘shirt’	ta^{3}kã^3 ‘hill’	tʃi^{3}nũ^2 ‘bat’	ku^{3}ʈʂu^1 ‘rotten’	ka^{3}sti^{43} ‘oil’	ti^{3}ni^{32} ‘nopal cactus’
/2/	X	ya^{2}ko^3 ‘poor’	ru^{2}ku^2 ‘behind’	X	X	ka^{2}mi^{32} ‘car’
/1/	X	ta^{1}mã^3 ‘bug’	X	ku^{1}nu^1 ‘deep’	X	X

co-occurs with the 1DU clitic /ʔ/. Otherwise, only three level tones occur preceding a coda /ʔ/. Most of the distributional patterns observed here in monosyllabic words also occur in polysyllabic words. While monosyllabic roots comprise approximately 21% of the IT lexicon, polysyllabic roots comprise approximately 79% of the lexicon (71% disyllabic, 8% trisyllabic).

The influence of prominence on tone distribution is clearly seen in polysyllabic words, shown in Table 4. We observe that contour tones only surface in final syllables and the tonal contrasts in non-final syllables are limited. Tones /4/ and /43/ may only be preceded by tones /3/ or /4/. Meanwhile, tones/2/ and /32/ may only be preceded by tones /2/ or /3/. Tone /3/ may be preceded by any of the level tones and tone /1/ only by tones /3/ or /1/. Note that tone /31/ does not occur in polysyllabic words. Each of these patterns holds regardless of whether there is a coda /h/ or /ʔ/ on the final syllable.

Table 5 shows the tonal patterns which surface on disyllabic words with a final glottal consonant. With the exception of tone /45/, no contour tone may surface on a closed syllable in a polysyllabic word. Note that tone /1.3/ does not surface on words with a coda /ʔ/. Importantly, what both Tables 4 and 5 show is that tones /4/, /43/, and /45/ never co-occur with tones /2/, /1/, /32/, and /13/ on uninflected IT words.

This distributional gap and the structural symmetry of the IT tonal system is captured by dividing the system into distinct registers (DiCanio, 2008).[4] The register distinction is shown in Table 6, following the featural system in Yip (1993, 2002). Tone /31/ is excluded from the register system on phonological grounds (see DiCanio (2008:153–156)).

Viewed in terms of register, the IT tonal system is symmetrical. There are two level tones in each register, as well as a falling and a rising tone. This distinction also helps explain the tones which surface in non-final syllables in IT. With two exceptions, non-final syllables on uninflected IT words must agree in register with the final syllable tone. These exceptions to this principle are underlying tones specified on a non-final syllable, described below.

[4]Hollenbach (1984) also divides Copala Triqui tone into two registers.

Table 5: Disyllabic words with a final syllable codas

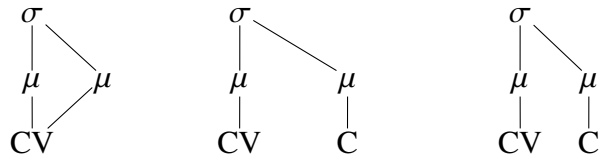
	Coda /h/		Coda /ʔ/	
4.4	ski^{4}tih^{4}	‘ground nest’	tu^{4}ʔβiʔ^{4}	‘our aunt (incl)’
4.3	tʃa^{4}tʃih^{3}	‘tarantula’	a^{4}kĩʔ^{3}	‘to break, snap’
3.45	ta^{3}kĩh^{45}	‘nose’		
3.4	ti^{3}kih^{4}	‘to shove in’	to^{3}ʔoʔ^{4}	‘our lip (incl)’
3.3	ka^{3}tʃih^{3}	‘cotton’	ka^{3}kĩʔ^{3}	‘problem’
3.2	tʃa^{3}tʃih^{2}	‘sheep’	tʃu^{3}tʃuʔ^{2}	‘potato’
3.1	k^{w}e^{3}ʔnih^{1}	‘Wednesday’	ka^{3}tʃũʔ^{1}	‘shadow’
2.3	tʃu^{2}k^{w}ih^{3}	‘name’	ta^{2}ɾeʔ^{3}	‘to erase’
2.2	tʃa^{2}tʃih^{2}	‘space’	nu^{2}k^{w}eʔ^{2}	‘both’
1.3	nu^{1}k^{w}ah^{3}	‘hard, strong’		
1.1	ni^{1}tʃih^{1}	‘to freeze’	ni^{1}tʃũʔ^{1}	‘near’

Table 6: Tonal Register in Itunyoso Triqui (from DiCanio, 2008)

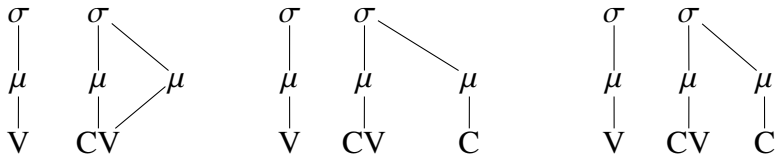
Tone Feature		Level Tone	Falling Tone	Rising Tone
+Upper	+High	/4/	/43/	/45h/
	−High	/3/		
−Upper	+High	/2/	/32/	/13/
	−High	/1/		

1.2.1 The autosegmental representation of Itunyoso Triqui words

Following DiCanio (2008), stem-final syllables in IT are bimoraic. The final syllable may contain either a moraic coda consonant, /ʔ, h/, or a long vowel. Representations of this analysis are shown in (9) for monosyllabic words and (10) for disyllabic words. Note that the preglottalized prenasalized stop in the latter example is a single, laryngeally-complex segment (c.f. DiCanio (2008)).



(9) ‘squash’ ‘spicy pozole’ ‘sandal’

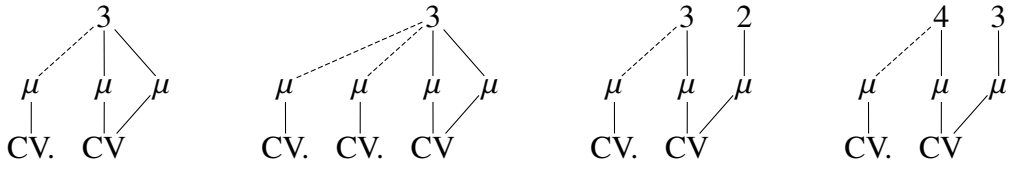


(10) ‘is born (3S)’ ‘is laughing (3S)’ ‘is sore (3S)’

All stem-final syllables in IT are heavy, while non-final syllables are obligatorily light. Many languages demonstrate this strong connection between syllable weight and stress, known as the *weight to stress* principle (Hayes, 1981). The representations above reflect such a connection. However, evidence from the asymmetries in the distribution of consonant and vowel types bolsters this argument. Many of the consonant and vowel types in IT are licensed only within word-final syllables. Final prominence is not simply a feature of Itunyoso Triqui words, but is also found in Copala and Chicahuaxtla Triqui (Hollenbach, 1977, 1984).[5]

Tones are represented in IT words in autosegmental-metrical (AS) terms (Goldsmith, 1990). Tone numbers are used here as shorthand for tonal feature specification and contour tones are analyzed as sequences of level tones. For most IT words, only one level or one contour tone is specified on the final syllable of a word. Preceding syllables on polysyllabic words receive a surface tonal specification through a leftward tonal association convention. These principles produce the following tonal represenations, shown in (11), for the words /tʃu3ku3/ ‘animal’, /tʃi3ko3yo3/ ‘tadpole’, /ɾu3ne32/ ‘bean’, and /ɾu4ne43/ ‘avocado.’

[5] Yip (2002:234) also examines the Copala Triqui system in terms of prominence.

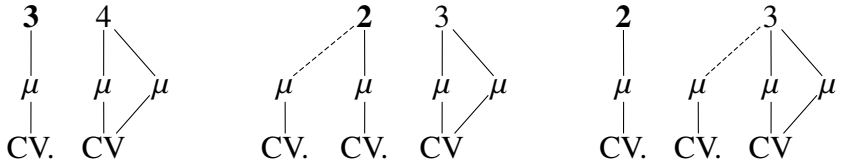


(11) tʃu. ku tʃi. ko. yo ɾu. ne ɾu. ne

In (11), we observe level tones associated with disyllabic and trisyllabic words containing level and contour tones. Tonal alignment in IT proceeds from right to left. The rightmost tone level is associated with right edge of the word first (the location of prominence) and then all preceding tones are affiliated with preceding moras. Many IT words lack an underlying tone on non-final syllables and this right-to-left association maintains the same register for all syllables in the word. This leftward association from the final syllable parallels other phonological processes in IT, such as nasal spreading and mid-vowel licensing, both of which proceed leftward from the final syllable in the root (DiCanio, 2008). The rule is formulated in (A) below.

(A) *Leftward association convention*: Assign a tone or tone contour, right to left, starting on the rightmost mora (TBU) of the word and then associate the leftmost tone in the word to all preceding moras within the word.

Non-final syllables may also carry a contrastive, underlying tone /2/ or /3/, shown in (12) for words /ka^{3}to^4/ 'shirt', /tu^{2}k^{w}a^{2}na^3/ 'swallow', /tʃi^{2}ɾa^{3}kĩ^3/ 'cockroach', and /ti^{2}kyũ^{32}/ 'to study.' Note that this contrastive tone may occur in the penult or in the antepenult, as (10b) and (10c) demonstrate.



(12) ka. to tu. k^{w}a. na tʃi. ɾa. kĩ

On trisyllabic words, both the penult and antepenult may have a contrastive tone. For the penult, these tones include /4, 3, 2/. Tone /1/ only occurs on non-final syllables as a result of leftward tonal association. For the antepenult, only level tones /3, 2/ may occur. While tone /3/ may co-occur with any tone, each of these underlying tones must agree in register with the tone on the final syllable, i.e. tone /2/ never co-occurs on the same stem with tone /4/. The presence of contrastive tones on non-final syllables blocks the leftward association convention in (A).

Implicit in this representation in (11) and (12 is the notion that only a single tone may be associated with a mora. Contours are only possible on final syllables because they are bimoraic. Furthermore, this principle accounts for tonal association on words with glottal coda consonants (see below). An additional constraint in IT requires that every tone be associated with a mora; no floating tones are permitted on the word. These two rules are stated in (B) and (C) below.

(B) *Moraic tonal specification*: A mora may be associated with only a single tone.

(C) *No floating tones*: Every tone must be associated with a mora.

1.2.1.1 Coda glottal consonants as TBUs The tonal patterns surfacing on words with final syllable coda glottal consonants are distinct from those on open syllables. While no contour tone may precede a coda /ʔ/, the distribution of tone is sensitive to word size for words ending in a coda /h/. In polysyllabic words, final falling tones never surface preceding a coda /h/. However, in monosyllabic syllables with a coda /h/, any contour tone may surface, except for tone /31/ which never surfaces on a closed syllable. Tones in monosyllabic words with coda consonants are represented in (13) below for words /sĩʔ^{3}/ 'child', /kkĩh^{3}/ 'masa', /nnãh^{32}/ 'cigarrette', /nnãh^{43}/ 'mother!', /sĩh^{45}/ 'man', and /yah^{13}/ 'dust.'

(13)

3		3		3	2	4	3	4	5	1	3
μ	μ	μ	μ	μ	μ	μ	μ	μ	μ	μ	μ
CV	C	CCV	C	CCV	C	CCV	C	CV	C	CV	C
sĩ	ʔ	kkĩ	h	nnã	h	nnã	h	sĩ	h	ya	h

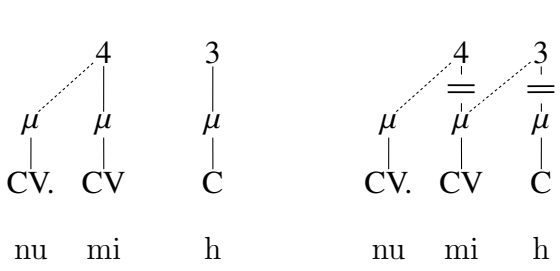
Note that there is a phonetic difference between the two IT codas. Whereas /h/ is typically voiced, [ɦ], glottal stops /ʔ/ are produced with at least some glottal closure (DiCanio, 2012a). The voicing in the former permits pitch information to be carried along with breathy phonation. The tonal patterns here are captured by permitting tone to be associated to an /h/ coda mora, but not a /ʔ/ coda mora.

However, this pattern only holds on syllables with a coda /h/ in *monosyllabic* words. With the exception of tone /45/, no contour may surface on a syllable with a coda in polysyllabic words. Observe the words in Table 5. While we observe tones /43/, /32/, and /13/ followed by a coda /h/ in (13), no falling tone may surface on a syllable with a coda here, i.e. *3.32h, *2.32h, *4.43h, *3.43h, *1.13h. This distributional restriction can be captured with a constraint specifying that a modal vowel is the preferred tone-bearing unit. Whereas the individual levels composing a contour tone may associate with a laryngeal coda, this is avoided if tones are able to associate leftward on the word. Since leftward tonal association is not possible on monosyllabic words (and IT lacks tone sandhi) contours surface on monosyllables with a coda /h/. The principle accounting for the general ranking of TBU types is given in (D) below.

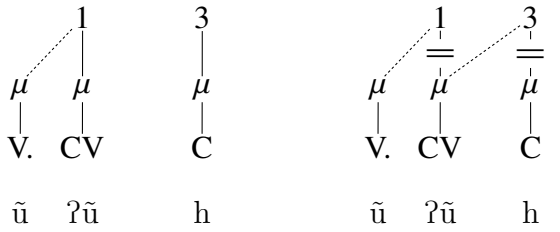
(D) *Preferred TBU ranking*: the syllable nucleus (vowel) is the preferred TBU for tonal assignment, followed by a coda /h/; i.e. V » /h/ [ɦ].

Both the leftward association convention and the preferred TBU ranking are general principles which interact with a stronger tendency in IT for tones to be maintained on lexical roots (an identity constraint in Optimality-theoretic terms (Prince and Smolensky, 1993)). On monosyllabic words, the constraint against floating tones results in tonal association to a lower ranked TBU, as contour tones are allowed to surface on a closed syllable. In polysyllabic words, the initial level composing a contour tone is associated leftward to avoid association of the final tone with a laryngeal coda. This process accounts for both the distribution of tones on polysyllabic words across the IT lexicon and processes specific to the 1S clitic, described in the following section. It is schematized in (14) for /nu^{4}mih^{3}/ 'to tie, knot' and (15) for /ũ^{1}ʔũh^{3}/ 'five (pron.)'.

(14)

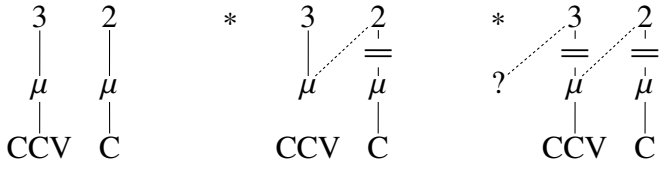


(15)



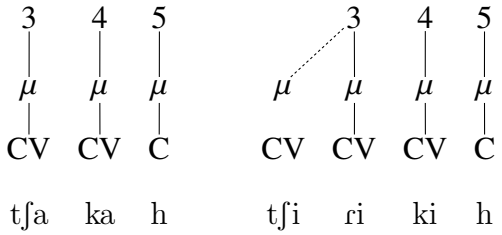
In each of these examples, the final tone /3/ is not associated with the coda consonant. Since no tone may delete in IT (Rule C), this process causes spreading of the final tone leftward. This causes delinking of tones on preceding moras. Though both (14) and (15) show leftward association before the TBU preference condition, no ordering is assumed here. Both orders are possible.

When monosyllabic words are considered, the preferred TBU for the final tone of a contour is obligatorily the coda, as shown in (16a) for the word /nnãh^{32}/ 'cigarrette'. Reassociation of the final tone to the preceding mora is not possible since it would produce a violation of Rule (B), as in (16b), where a single mora is associated with more than a single tone. A possible repair strategy for this reassociation is shown in (16c), where the preceding tone is delinked. However, this would result in tonal stranding, violating rule (C). Rules (B) and (C) are never violated in IT.



(16) (a) nnã h (b) nnã h (c) nnã h

The alignment of tone /45/ is one exception to this preferred TBU ranking. It never dissociates on polysyllabic words nor on words with a coda /h/. However, note that this is the only tone that *obligatorily* occurs on stem-final rimes with a coda /h/. This particular difference in distribution is at odds with the more typical pattern both in Triqui and cross-linguistically for open syllables to be the preferred position for contour tones (DiCanio, 2008; Zhang, 2004). All other contour tones in Triqui occur on both open syllables and /Vh/ rimes. When tone /45/ surfaces on a polysyllabic word, it is always preceded by a phonologically specified tone /3/ on non-final syllables.[6] The representation of polysyllabic words with tone /45/ in the stem-final syllable is given in (17a) and (17b).



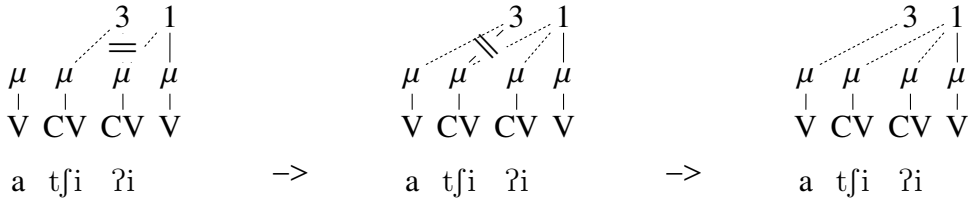
(17) a. 'pig' b. 'grasshopper'

The establishment of these constraints on tonal association provides a framework for the analysis of the tonal processes associated with Itunyoso Triqui enclitics.

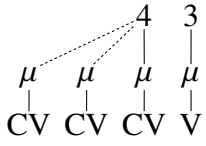
1.2.1.2 Tone /31/ and alignment So far, we have excluded one of the contour tones from our analysis. Unlike the other contours, tone /31/ never surfaces on a syllable with a coda /h/. This is not the only odd behavior specific to this tone though. Whereas other contour tones (/43/, /32/, /13/, /45/) surface on final open syllables, tone /31/ does not. Moreover, there is a clear distinction in alignment between tone levels. For tone /31/, tone level /3/ obligatorily surfaces on the leftmost syllable in the word where every syllable to the right surfaces as tone level /1/, shown in (18) for the word /a^{3}tʃi^{1}ʔi^{1}/ 'to begin'. In other words, there are no tonal patterns of the shape */3.31/ on disyllables nor */3.3.1/ or */3.3.31/ on trisyllables. By contrast, for tone /43/, the contour surfaces on the rightmost syllable where every syllable to the left receives tone level /4/ via leftward spreading. An example of this is shown in (19) for the word /ɾu^{4}k^{w}i^{4}ʔi^{43}/ 'peach'.

[6]Tone /3/ behaves as a default tone on words with multiple tonal specifications, c.f. DiCanio (2008).

(18)



(19)



The representation in (18) shows a process of leftward spreading of tone /1/, as described in DiCanio (2008). This is a general phonological property of tone /1/ when it is assigned on the final mora of IT words. This process is iterative but does not violate principle (C). This low tone spreading is schematized in the rule below:

(E) *Low tone spreading*: A low /1/ tone associated to the rightmost mora must spread leftward iteratively to the leftmost edge of the phonological word.

Importantly, this rule interacts with a constraint barring unlinked tones on the left edge of the phonological word. In OT terms, such a constraint barring floating tones is crucially ranked more highly than the low tone spreading rule.

2 Stem tonal allomorphy and clitic-application

Throughout this paper, we have been assuming the existence of bare stem forms for nouns and verbs in Itunyoso Triqui. Insofar as we assume that such a form is isomorphic with words in isolation, the stem shape is obvious in the case of alienable nouns. The phonological shape of stems is less apparent when we consider certain verbs or inalienable nouns. Some inalienably-possessed nouns, like kinship terms, have an obligatory enclitic and certain verb roots are obligatorily marked for aspect.[7] While these patterns suggest the absence of a bare form, note that most enclitics do not condition segmental or tonal changes on the word. Only the 1^{st} person singular, the 2^{nd} person singular, and the 1^{st} person dual cause changes in the phonological structure of the stem. Other clitics do not condition stem-level changes. Thus, for most words, it is convenient to consider the unmodified stem, with no phonological alternations, as something akin to a regular stem allomorph for the word. For verbs, this stem also happens to be the form used with all full NP subjects.

Yet, for a subset of nouns (no verbs) in the IT lexicon (29/356 words in the database), *all* cliticized words share a distinct stem tonal allomorph unrelated to the bare noun's tone.

[7]There is no infinitive verb form. All verbs in an infinitival clause are marked for aspect.

The stem tones in these nouns is always tone /2/ and all words which undergo this stem alternation carry tone /32/ or /4/ in the bare noun form. Yet, the presence of these tones in the bare noun is not a predictor of whether an alternate stem tone will be used; this must be lexically-specified. Observe the paradigms given in Table 7 below for bare nouns with tone /32/.

Table 7: Stem-level tonal changes with bare root tone /32/

Bare noun	(a) $\text{ku}^{3}\text{ɾu}^{32}$	(b) $\text{ni}^{3}\text{tĩ}^{32}$	(c) $\text{ɾi}^{3}\tilde{\text{a}}^{32}$	(d) $\text{tʃi}^{3}\text{lu}^{32}$
Gloss	'granary'	'chayote'	'face'	'knife'
1S	$\text{si}^{3}\text{-ku}^{2}\text{ɾuh}^{2}$	$\text{si}^{3}\text{-ni}^{2}\text{tĩh}^{2}$	$\text{ɾi}^{3}\tilde{\text{a}}\text{h}^{3}$	$\text{si}^{3}\text{-tʃi}^{3}\text{luh}^{3}$
2S	$\text{si}^{3}\text{-ku}^{2}\text{ɾu}^{2}\text{=ɾeʔ}^{1}$	$\text{si}^{3}\text{-ni}^{2}\text{tĩ}^{4}\text{=ɾeʔ}^{1}$	$\text{ɾi}^{3}\tilde{\text{a}}^{1}\text{=ɾeʔ}^{1}$	$\text{si}^{3}\text{-tʃi}^{3}\text{lu}^{1}\text{=ɾeʔ}^{1}$
3S.Masc	$\text{si}^{3}\text{-ku}^{2}\text{ɾu}^{2}\text{=sih}^{3}$	$\text{si}^{3}\text{-ni}^{2}\text{tĩ}^{2}\text{=sih}^{3}$	$\text{ɾi}^{3}\tilde{\text{a}}^{2}\text{=sih}^{3}$	$\text{si}^{3}\text{-tʃi}^{3}\text{lu}^{2}\text{=sih}^{3}$
1DU	$\text{si}^{3}\text{-ku}^{2}\text{ɾuʔ}^{2}$	$\text{si}^{3}\text{-ni}^{2}\text{tĩʔ}^{4}$	$\text{ɾi}^{3}\tilde{\text{u}}\text{ʔ}^{3}$	$\text{si}^{3}\text{-tʃi}^{3}\text{luʔ}^{3}$

In the paradigms shown in Table 7, the 3S.Masc form reflects the stem form found in the remainder of the paradigm, e.g. with the 3S.Fem, 3S.ANIM, 2P, and 3P forms. As mentioned, for most words, only the 1S, 2S, and 1DU clitics condition tonal changes on the stem. Yet, we observe an alternate 3S.Masc form in this table. Examples (a) and (b) show a tonal change for all inflected stems where the penultimate syllable in both words no longer carries tone /3/, but /2/. The 3S.Masc stem, which normally does not show any clitic-induced tonal changes undergoes changes here. (The tonal changes on the stem-final syllable for the 2S and 1P.DU forms for 'chayote' are the result of separate processes, described later.) However, not all noun stems with tone /32/ are affected by this rule. Examples (c) and (d) show that the penultimate tone /3/ is maintained; only the stem-final syllable is influenced by the addition of the clitic.

Bare nouns with tone /4/ also may undergo this stem change to tone /2/, as shown in Table 20 below. The words (a) and (b) show the stem alternation whereas the words in (c) and (d) show the more common pattern where the stem tone is unaffected.

Table 8: Stem-level tonal changes with bare root tone /4/

Bare noun	(a) $\text{ko}^{3}\text{no}^{4}\text{ʔo}^{4}$	(b) $\text{snã}^{4}\text{ʔãh}^{4}$	(c) $\text{ka}^{3}\text{to}^{4}$	(d) stĩ^{4}
Gloss	'medicine'	'language'	'shirt'	'fingernail'
1S	$\text{si}^{3}\text{-ko}^{2}\text{no}^{2}\text{ʔoh}^{2}$	$\text{si}^{3}\text{-snã}^{2}\text{ʔã}^{2}$	$\text{si}^{3}\text{-ka}^{3}\text{toh}^{45}$	stĩh^{45}
2S	$\text{si}^{3}\text{-ko}^{2}\text{no}^{2}\text{ʔo}^{2}\text{=ɾeʔ}^{2}$	$\text{si}^{3}\text{-snã}^{2}\text{ʔãh}^{2}\text{=ɾeʔ}^{1}$	$\text{si}^{3}\text{-ka}^{3}\text{to}^{4}\text{=ɾeʔ}^{1}$	$\text{stĩ}^{4}\text{=ɾeʔ}^{1}$
3S.Masc	$\text{si}^{3}\text{-ko}^{2}\text{no}^{2}\text{ʔo}^{2}\text{=sih}^{3}$	$\text{si}^{3}\text{-snã}^{2}\text{ʔãh}^{2}\text{=sih}^{3}$	$\text{si}^{3}\text{-ka}^{3}\text{to}^{4}\text{=sih}^{3}$	$\text{stĩ}^{4}\text{=sih}^{3}$
1DU	$\text{si}^{3}\text{-ko}^{2}\text{no}^{2}\text{ʔoʔ}^{2}$	$\text{si}^{3}\text{-snũ}^{2}\text{ʔũʔ}^{2}$	$\text{si}^{3}\text{-ka}^{3}\text{toʔ}^{4}$	stĩʔ^{4}

These irregular stem allomorphs must be lexically-specified. Note that this is not dissimilar from other stem allomorphy in IT. For instance, the word /a^{4}sih^{3}/ 'clothing' takes an alternate stem form when possessed /si^{3}-kã^{3}ʔãh^{45}/ 'my clothing', as does /βeʔ^{3}/ 'house' > /tu^{3}k^{w}ah^{45}/ 'my house'. Whereas these stems are segmentally distinct from their bare roots, the examples in Tables 7 and 20 are only tonally distinct. With these exceptions specified as such, it is possible to discuss most of the tonal morphophonology on IT words as either a strictly local process influencing the adjacent, final stem syllable, or as a result of the regular phonological rules/constraints outlined in §1.2.1.

One such regular rule is the process of low tone spreading for words with tone /31/. As described in the previous section, this tone surfaces as a contour tone on monosyllabic words, but always dissociates on polysyllabic words, e.g. /3.1/, /3.1.1/. When a possessive prefix /si^{3}-/ precedes words with tone /31/, low tone spreading results in the absorption of tone level /3/ into the prefix. Some representative examples are given in Table 9.

Table 9: Phonological changes with tone /31/

Bare noun	(a) ɾu^{3}si^{1}	(b) si^{3}siʔ^{1}	(c) tʃa^{3}koʔ^{1}	(d) tʃa^{31}
Gloss	'stick'	'sweets/candy'	'daughter-in-law'	'head'
1S	si^{3}-ɾu^{1}sih^{1}	si^{3}-si^{1}sih^{1}	tʃa^{3}koh^{1}	tʃah^{3}
2S	si^{3}-ɾu^{1}si^{1}=ɾeʔ^{1}	si^{3}-si^{1}siʔ^{1}=ɾeʔ^{1}	tʃa^{3}koʔ^{1}=ɾeʔ^{1}	tʃa^{31}=ɾeʔ^{1}
3S.Masc	si^{3}-ɾu^{1}si^{1}=sih^{3}	si^{3}-si^{1}siʔ^{1}-sih^{3}	tʃa^{3}koʔ^{1}=sih^{3}	tʃa^{31}=sih^{3}
1DU	si^{3}-ɾu^{1}siʔ^{1}	si^{3}-si^{1}siʔ^{3}	tʃa^{3}koʔ^{1}	tʃoʔ^{4}

3 First person singular cliticization

Once one accounts for the phonological constraints on tonal association/spreading as well as irregular stem tonal allomorphs, the tonal patterns associated with clitic marking in IT more easily reveal themselves. The following sections describe the segmental and tonal processes associated with 1S clitic marking. Distinct tonal processes occur for each of the 1S allomorphs. The /=h/ allomorph involves the insertion of a tone /45/ to the right edge of the stem when the stem contains an upper register tone. This process instigates leftward tonal spreading on the stem. When the stem does not contain an upper register tone, no tonal insertion takes place and, instead, the tone in the final mora is lost. The allomorph which involves the deletion of a coda /h/ involves the insertion of tone /3/ to the final mora when the stem contains a +Upper, +High tone, but insertion of tone /2/ to the final mora when the stem contains a +Upper, -High tone. This process is described below.

3.1 Toggling

The tonal phonology associated with the 1S clitic is by far the most complex within IT morphology. Two phonological processes are used to mark the 1S clitic: /h/-toggling and tonal alternations. A morphological toggle, or reversal, refers to a process where "a morphological opposition seems to reverse its function across environments" (Baerman, 2007). In order to explain this process, recall that there are three possible rime types which occur in final syllables: /V:/, /Vh/, and /Vʔ/. Final syllables are either open with a long vowel or closed by a glottal consonant with a shorter vowel. Non-final syllables are all open with short vowels. For all IT words, the 1S enclitic is marked by affixing a coda /h/ on a final open syllable rime and shortening the modal vowel, or by deleting a coda /h/ from a /Vh/ rime (with compensatory lengthening the vowel). This process is often accompanied by tonal changes on the final syllable of the stem. Examples of toggling are shown in Table 10.[8]

In the toggling data, /h/ is deleted and added, depending on its presence or absence in the bare stem. In examples (a-e), note that the bare or 3S stem form does not contain a stem-final /h/, but this is present in the 1S inflected forms on the right. In examples (f-j), the bare/3S stem forms contain a stem-final /h/, but this is absent in the 1S inflected form on the right. This segmental alternation is regular in IT, however the tonal changes which accompany it are rather more complex. For examples (a - c), 1S forms with a stem-final /h/ are accompanied by tone /45/, but the forms in (d) and (e) are accompanied by distinct tones. Similarly, for examples (f-j), 1S forms with a stem-final open syllable are accompanied by four distinct surface tones (/43, 32, 3, 2/).

Table 10: /h/-toggling of 1*st* person singular in Itunyoso Triqui

Bare/3S stem	Gloss	Inflected stem	Gloss
(a) $a^3tʃi^3$	'peel'	$a^3tʃih^{45}$	'I peel'
(b) $so^3ʔo^3$	'be deaf'	$so^3ʔoh^{45}$	'I am deaf'
(c) nne^3	'plough'	si^3-neh^{45}	'my plough'
(d) $ku^3ɾu^{32}$	'granary'	si^3-$ku^2ɾuh^2$	'my granary'
(e) yo^{32}	'sugarcane'	toh^3	'my sugarcane'
(f) $a^4tʃih^3$	'grow (intr.)'	$a^4tʃi^{43}$	'I grow'
(g) $ŋgah^3$	'be lying'	$ŋga^{43}$	'I am lying'
(h) $nneh^3$	'dream'	si^3-ne^{32}	'my dream'
(i) ka^2kih^3	'nail'	si^3-ka^2ki^2	'my nail'
(j) $na^2ɾãh^3$	'to close (tr.)'	$na^2ɾã^3$	'I close'

With few lexical exceptions, all nouns and verbs undergo toggling and it is a productive process. Following Baerman's criteria for morphological reversals, a reversal occurs

[8]Monosyllabic words with an initial geminate undergo degemination when prefixed, c.f. DiCanio (2009).

when an alternation exists between two morphological exponents such that the values are switched in two different contexts. The /h/ toggling pattern clearly fits this criterion. This pattern does not match Baerman's second criterion, however; the paradigms observed in each context are not mirror images of each other. Words with /Vʔ/ rimes undergo an alternation changing /Vʔ/ to /Vh/. There is no pattern where the opposite alternation occurs.[9] In fact, there are two ways in which the 1S enclitic can affect words with a final /Vʔ/ rime. Most words undergo a replacement of the glottal coda, e.g. /Vʔ/ > /Vh/. Examples of this are shown in part (a) of Table 11.

Table 11: Regular (a) and irregular (b) 1S marking on /Vʔ/ rime stems

	Bare stem	Gloss	Inflected stem	Gloss
(a)	na^{3}tʃãʔ^3	'turn'	na^{3}tʃãh^{45}	'I turn'
	ʔnaʔ^3	'come'	ʔnah^3	'I am coming'
	ka^{3}siʔ^3	'honey'	si^3-ka^{3}sih^{45}	'my honey'
	kkãʔ^3	'corn dough'	si^3-kãh^3	'my corn dough'
(b)	kĩʔ^3	'smell (intr.)'	kĩ^{3}ʔĩh^{45}	'I smell'
	na^{2}ɾãʔ^3	'pick up (mass N.)'	na^{2}ɾã^{3}ʔãh^{45}	'I pick up'
	ka^{3}tʃũʔ^1	'shadow'	si^3-ka^{1}ʃũ^{1}ʔũh^1	'my shadow'

Certain words with /Vʔ/ rimes do not undergo a replacement of the glottal coda. Instead, a /V+h/ sequence is appended to the stem with no change to the stem's phonological shape, as shown in part (b) of Table 11. The vowel in this sequence is always an exact copy of the final vowel in the stem. The words which undergo this pattern are lexically-specified. Words of various sizes and with different final rime vowels may receive the reduplicated /-Vh/ clitic allomorph.

There are some substantial differences in clitic morphology between Triqui variants. The general process of /h/-toggling does not occur in Copala Triqui (Hollenbach, 1984:334). Instead, /-h/ is appended to all stems as one exponent of the 1S clitic (the other exponent being different tonal alternations). Like Itunyoso Triqui, certain stems with final /Vʔ/ rimes receive a reduplicative /Vh/ allomorph. In Chicahuaxtla Triqui, an /h/ toggling process similar to the one found in Itunyoso Triqui occurs for the 1S and the 3S.Fem clitics (Longacre, 1959; Good, 1979), but with a different set of tonal alternations. These three segmental allomorphs of the 1S in IT are summarized in Table 12.

Regardless of which allomorph of the 1S clitic is applied to IT words, the final syllable remains bimoraic. Thus, when /-h/ is appended as a clitic, it occupies the final mora of the syllable and the modal portion of the vowel is shortened. When /-h/ is deleted, the vowel lengthens. This process is formalized in the autosegmental representations in (20) for the word /a^{3}tʃi^3/ 'to peel' and in (21) for the word /a^{4}tʃih^3/ 'to grow.' In (20) we observe an

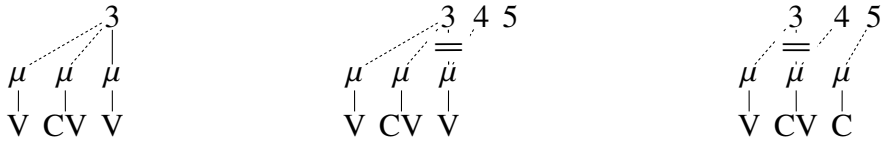
[9] Yet, certain subtypes, discussed in §3.2, may satisfy both criteria.

Table 12: 1S segmental allomorphy

Stem-final rime	Allomorph assigned
Vː	-/h/ inserted
Vh	-/h/ deleted
Vʔ	-/h/ inserted (regular)
	-/Vh/ vowel reduplication (irregular)

initial stage where leftward tonal association has resulted in the association of a single tone, /3/, across the word. The addition of the 1S clitic results in the insertion of /h/ and a contour tone on the right of the stem. This tone, via the constraint against floating tones, associates leftward on to the stem, delinking the stem on the preceding mora. In (21), we observe what superficially looks like the opposite process. Since the /-h/ coda is no longer present, tonal well-formedness conditions require that the rightmost mora receive tone /3/ and that preceding tones associate rightward, which results in a final contour tone on the long vowel. A contour is not possible in syllables with a coda /h/ as a tone would be associated to a coda glottal consonant and this would violate principle (D).

(20)



(21)

3.2 Tonal Alternations specific to the 1st person singular enclitic

The set of tonal alternations associated with the 1S enclitic are quite complex. I present the most frequent patterns first and discuss the exceptions in §**??**. It is possible to identify four *types* of tonal processes: tonal alternations occurring with /h/ deletion, tonal alternations occurring with /h/ addition, tone /4/ stem allotony, and irregular tonal changes. Many tonal changes are phonologically predictable based on the tonal/glottal features present in the final syllable of the stem.

3.2.1 *Tonal Alternations associated with /h/ deletion*

Many words which undergo /h/ deletion possess a falling tone /43/ on the stem-final syllable. This tone occurs only when /h/ is deleted from the final stem and only on words whose stem-final syllable carries an upper register tone, e.g. /4h/ and /45h/. Stems with a final tone /3h/ undergo an alternation with tone /32/ instead. Examples of these alternations are given in Table 13.

Table 13: /h/ deletion resulting in stem-final falling tones

Tone	Bare stem	Gloss	Inflected stem	Gloss
/45/	kuh^{45}	'bone'	$\mathrm{si}^{3}\text{-}\mathrm{ku}^{43}$	'my bone'
	$\mathrm{si}^{3}\mathrm{nuh}^{45}$	'crazy'	$\mathrm{si}^{3}\mathrm{nu}^{43}$	'I am crazy'
/4/	$\beta\tilde{\mathrm{a}}\mathrm{h}^{4}$	'dig'	$\beta\tilde{\mathrm{a}}^{43}$	'I dig'
	$\mathrm{a}^{3}\mathrm{rah}^{4}$	'sing'	$\mathrm{a}^{3}\mathrm{ra}^{43}$	'I sing'
/3/	nneh^{3}	'dream'	$\mathrm{si}^{3}\text{-}\mathrm{ne}^{32}$	'my dream'
	$\mathrm{ya}^{3}\mathrm{ʔah}^{3}$	'chile pepper'	$\mathrm{ta}^{3}\mathrm{ʔa}^{32}$	'my chile pepper'

The tonal alternations shown here illustrate a frequent pattern among upper register tones. This process is completely regular for tone /45/ with no exceptions, but does not apply to all stems with a final tone /4/ or /3/. By contrast, lower register tones do not undergo a process of lowering when /h/ deletion occurs. Tone on lower register words remains unaltered. The patterns found on words with lower register tones (/32/, /2/, /1/, /13/) are completely regular with no exceptions. Some representative examples are shown in Table 14.[10]

Table 14: Absence of tonal alternation with /h/ deletion in lower register

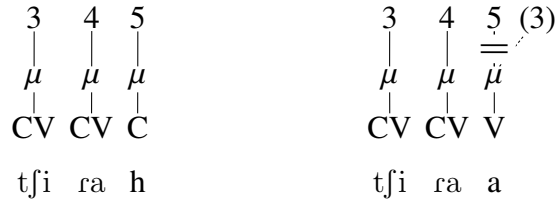
Tone	Bare stem	Gloss	Inflected stem	Gloss
/32/	$\mathrm{kk}^{\mathrm{w}}\mathrm{eh}^{32}$	'edible green'	$\mathrm{si}^{3}\text{-}\mathrm{k}^{\mathrm{w}}\mathrm{e}^{32}$	'my edible green'
	yyah^{32}	'flower'	tta^{32}	'my flower'
/2/	koh^{2}	'separate corn kernels'	ko^{2}	'I separate corn kernels'
	$\mathrm{ku}^{2}\mathrm{k}^{\mathrm{w}}\mathrm{ah}^{2}$	'tepache jug'	$\mathrm{si}^{3}\text{-}\mathrm{ku}^{2}\mathrm{k}^{\mathrm{w}}\mathrm{a}^{2}$	'my tepache jug'
/1/	$\beta\mathrm{a}^{3}\ \tilde{\mathrm{kah}}^{1}$	'be naked'	$\beta\mathrm{a}^{3}\ \tilde{\mathrm{ka}}^{1}$	'I am naked'
	$\mathrm{na}^{1}\mathrm{ʔah}^{1}$	'shame'	$\mathrm{si}^{3}\text{-}\mathrm{na}^{1}\mathrm{ʔa}^{1}$	'my shame'
/13/	yah^{13}	'powder'	tah^{13}	'my powder'

From an autosegmental perspective, tonal lowering with the 1S clitic can be generalized as a process which not only deletes the coda /h/, but any tone associated with this coda as

[10]While tone /13/ surfaces on /Vh/ stems, the tone is quite rare (only 12 words attested). Stems with this tone are mostly adverbs and discourse particles, neither of which usually receive a personal enclitic. For this reason, only one example of this tone is given here.

well. For stems with tones /4h/ and /45h/, a floating tone /3/ delinks the preceding mora's tone and associates it with the final mora. For stems with tone /3h/, the floating tone is /2/. This process is shown in (22).

(22)



(23)

From an autosegmental perspective, the tonal alternations for the 1S enclitic affecting final stem tones /4h/ and /45h/ are the result of the same exact process. In (22), the elimination of the final /h/ results in the erasure of tone level /5/. A floating tone /3/ then associates to the right edge of the word. In (23), the elimination of the final /h/ does not result in any tonal loss since the final mora has no tonal affiliation. A similar type of process applies to stems with tone /3h/ with a floating tone /2/, as shown in (24).

(24)

In sum, for those stems with a coda /h/ in the final syllable, the 1S enclitic is marked by the deletion of both the coda consonant from the stem and any tone associated with this mora. A floating tone /3/ attaches to the right edge of stems with a preceding tone /4/ whereas a floating tone /2/ attaches to the right edge of stems with a preceding tone /3/. These tones are associated with the stem-final (vocalic) mora.

3.2.2 *Tonal Alternations associated with /h/ insertion*

The tonal alternations associated with /h/ insertion are more complex than those associated with /h/ deletion. Like the tonal alternations occurring with /h/ deletion, lower register tones /2/, /1/, and /13/ do not undergo tonal changes. Most of the tonal alternations are restricted to upper register tones. Recall that seven tones surface in stem-final open syllables (/4, 3, 2, 1, 43, 32, 31/) and three on /Vʔ/ rimes (/3, 2, 1/). Stems with tone /4/ and *most* stems with tone /3/ undergo an alternation to tone /45/ when /h/ is added to the stem. This process of tonal raising with /h/ insertion mirrors the process of final moraic tonal deletion discussed in the previous section. However, the morphotonal exponents for individual stem tones are not identical. For instance, when /h/ is deleted, tone /3/ > /32/ and tone /4/ > /43/. Yet, when /h/ is inserted, the stem tones neutralize to /45h/. Examples of this process are shown in Table 15.

Table 15: Tone raising with stem tones /3/ and /4/

Tone	Bare stem	Gloss	Inflected stem	Gloss
/4/	$\mathrm{st\tilde{i}}^{4}$	'fingernail'	$\mathrm{st\tilde{i}h}^{45}$	'my fingernail'
	$\mathrm{ʈʂi}^{3}\mathrm{ʔi}^{4}$	'excrete'	$\mathrm{ʈʂi}^{3}\mathrm{ʔih}^{45}$	'I excrete'
/3/	$\mathrm{y\tilde{u}}^{3}$	'palm leaf'	$\mathrm{t\tilde{u}h}^{45}$	'my palm leaf'
	$\mathrm{ni}^{3}\mathrm{k\tilde{i}ʔ}^{3}$	'stand'	$\mathrm{ni}^{3}\mathrm{k\tilde{i}h}^{45}$	'I am standing'

As a mirror image of the /4/ > /43/ tonal change with /h/ deletion, stems with tone /43/ undergo a change to tone /4/ when /h/ is added. Like /h/-toggling, the tonal patterns are a type of morphological reversal. This process is regular in Itunyoso Triqui and it affects loanwords. All monosyllabic stems and most disyllabic stems with tone /43/ in a final syllable undergo this toggling (just 2/27 exceptions). Examples of are shown in Table 16.

Table 16: Tone /43/ ⇌ /4h/ toggle

Bare stem	Gloss	Inflected stem	Gloss
/h/-insertion			
$\mathrm{ru}^{4}\mathrm{ne}^{43}$	'avocado'	si^{3}-$\mathrm{ru}^{4}\mathrm{neh}^{4}$	'my avocado'
$\mathrm{le}^{4}\mathrm{tu}^{43}$	'bother'	$\mathrm{le}^{4}\mathrm{tuh}^{4}$	'I bother'
$\mathrm{ʃ\tilde{u}}^{43}$	'take off'	$\mathrm{ʃ\tilde{u}h}^{4}$	'I take off'
/h/-deletion			
$\mathrm{tʃi}^{4}\mathrm{ɾoh}^{4}$	'pants'	$\mathrm{tʃi}^{4}\mathrm{ɾo}^{43}$	'my pants'
$\mathrm{a}^{4}\mathrm{ɾah}^{4}$	'construct'	$\mathrm{a}^{4}\mathrm{ɾa}^{43}$	'I construct'
sih^{4}	'arrive'	si^{43}	'I arrive'

The alternation affecting each of these upper register tones (/4, 43, 3/) is captured by the autosegmental insertion of a floating /45/ tone with a coda /h/ at the right edge of the stem. For instance, the example in (25) shows the delinking of stem-final tone /3/ and the leftward association of tone /45/ onto the final syllable for the word 'to know'. By contrast, the final tone /3/ on the stem is deleted with /h/ insertion in the example in (26) but no additional tone is associated with the final mora.

(25) 'to know' –> 'I know'

(26) 'chest' –> 'my chest'

Level tones /2/ and /1/ do not undergo tonal raising when /h/ is inserted. This parallels the pattern in §3.2.1 where no floating tones attach to the low register tones. However, the absence of tonal raising is also found for certain lexical stems with tone /3/. Within the corpus, 106/356 roots contain a stem-final tone /3/ without a coda /h/. 76 of the 106 undergo the raising pattern shown in Table (15), while 19 undergo no tonal alternation, 6 are irregular, and 5 take an alternate stem tone /4/ (see §3.2.3). Examples of the lack of a tonal alternation are shown in Table 17. Note that lower register stems with a /Vʔ/ rime do not change tone even when they receive the reduplicative allomorph, /Vh/, as illustrated by the word 'return (tr.)' in the data set.

Table 17: Absence of tonal changes with /h/ addition

Tone	Bare stem	Gloss	Inflected stem	Gloss
/3/	$ka^{2}ɾĩ^{3}$	'wheel'	si^{3}-$ka^{2}ɾĩh^{3}$	'my wheel'
	$si^{3}keʔ^{3}$	'mud'	si^{3}-$si^{2}keh^{3}$	'my mud'
/2/	$a^{3}ɾũ^{2}$	'smoke'	$a^{3}ɾũh^{2}$	'I smoke'
	$na^{2}ʔniʔ^{2}$	'wash (dishes)'	$na^{2}ʔnih^{2}$	'I wash (dishes)'
/1/	$tʃa^{1}kã^{1}$	'be tall'	$tʃa^{1}kãh^{1}$	'I am tall'
	$na^{1}koʔ^{1}$	'return (tr.)'	$na^{1}ko^{1}ʔoh^{1}$	'I return'

For words containing tonal melodies /32/ and /31/, there are two possible tonal realizations of the 1S clitic when /h/ is inserted. For those tone /32/ nouns which undergo a stem change to tone /2/ (see Table 7 in §2), no surface tonal alternation takes place. In derivational terms, the change of tone on the stem blocks further tonal rules from applying. The remainder of words with these tones undergo a change to tone level /3/ when /h/ is added to the stem. The alternation occurs in both monosyllabic and disyllabic stems with tone /32/, but only occurs on monosyllabic stems with tone /31/. Examples of this process are given in Table 18.

Table 18: Contour tone neutralization to tone /3/ in association with /h/ addition

Tone	Bare stem	Gloss	Inflected stem	Gloss
/32/	$ka^{3}ʔnga^{32}$	'be born (PERF)'	$ka^{3}ʔngah^{3}$	'I was born'
	$yã^{3}ʔã^{32}$	'light'	$tã^{3}ʔãh^{3}$	'my light'
/31/	mmi^{31}	'bridge'	$tu^{3}mih^{3}$	'my bridge'
	nne^{31}	'meat'	si^{3}-neh^{3}	'my meat'

The general pattern here is captured in autosegmental terms by the replacement of the final mora of the stem with a coda /h/ and the erasure of the stem-final mora, in a process identical to that for tone /43/, shown in (26). The AS representations for words with tones /32/ and /31/ are shown in (27) and (28). In both cases, the insertion of a coda /h/ for the 1S allomorph delinks the tone associated with the final mora.

(27)

(28)

For tonal melody /31/, the tonal rule associated with the 1S enclitic involves the deletion of tone /1/ at the right edge of the stem. This pattern would seem to interact with the more general low tone spreading rule (rule E), described in §1.2.1.2. Low tone spreading

involves the reassociation of tone /1/ to the penultimate mora on the final syllable and to other preceding moras on the word as long as no tone is deleted. If /h/ insertion involves the delinking of only the final mora of the stem, then low tone spreading predicts that it will fail to produce any surface tonal changes on polysyllabic words carrying this tone melody. In other words, a disyllabic stem like /tʃi^{3}ʔii^{1}/ 'disease, illness', would be produced with the same tones on the stem-final syllable when /h/ is inserted, e.g. /si^{3}=tʃi^{1}ʔih^{1}/ 'my disease, illness.'

However, the deletion of the final moraic tone does not, in fact, conflict with the low tone spreading rule. Note that this rule appears to apply almost entirely to monosyllabic words with a tone /31/ melody in IT. On such words, tone /1/ is *only* associated with the final mora. Tone /1/ is entirely deleted with the final mora. With few exceptions (3/17 polysyllables), the surface tonal melody on polysyllabic words carrying /31/ does not change. The attested 1S form for 'disease' is, in fact, /si^{3}=tʃi^{1}ʔih^{1}/, where the final syllable retains tone /1/. Thus, on the surface, words with a /31/ melody show distinct patterns when inflected with the 1S clitic, but this is only a phonological consequence of differences in tonal association related to word size. When low tone spreading takes place in polysyllabic words, tone /1/ is not lost on the stem since it can spread leftward. A consequence of this pattern is that, in derivational terms, low tone spreading must precede tonal rules associated with cliticization.

In sum, there are three major types of tonal alternations for the 1S allomorph which inserts a coda /h/ to the right edge of the stem. For bare/3S stems containing tone /4/ or /3/, the 1S allomorph attaches a /45/ tonal melody at the right edge. Constraints preventing floating tones and requiring only one tone per mora produce a leftward association of these tones and a delinking (or absorption in the case of tone /4/) of tones on the final syllable of the stem. For bare/3S stems containing a falling tone (/43/, /32/, /31/), the 1S allomorph deletes any tone associated with the final mora. For bare/3S stems containing tones /1/, /2/, and, in some cases, /3/, the 1S allomorph does not involve any tonal alternations.[11]

3.2.3 *Tone /4/ Stem Allotony*

In §2, we discussed certain words which undergo a tonal stem alternation when cliticized. These stem allomorphs are lexically-specified and comprise the base form onto which clitic-specific processes apply. However, there are also words for which the entire base carries tone /4/. Unlike the stem-changes discussed above, this stem tonal change also influences any possessive prefix that applies to the root. Some examples of this process are given in Table 19.

Unlike the stem tonal alternations where tone /32/ and /4/ neutralize to tone /2/, this stem tonal allomorphy occurs with the 1S clitic and, as we shall see, with the 1DU clitic as well. When other clitics apply to these words, the stem tone on the word remains identical

[11]Tonal melody /13/ has been left out here, but this tone usually surfaces, like tone /45/, on a /Vh/ rime. Thus, all cliticized cases, when they occur, involve /h/ deletion, not insertion. Furthermore, as most stems with tonal melody /13/ are discourse particles, enclitics are rarely attached to them.

Table 19: Tone /4/ stem allomorphy in association with /h/ addition

Tone	Bare stem	Gloss	Inflected stem	Gloss
/3/	$\text{nne}ʔ^{3}$	'straw rope'	$\text{tu}^{4}\text{-neh}^{4}$	'my straw rope'
			$\text{tu}^{3}\text{-ne}ʔ^{3}\text{=sih}^{3}$	'his straw rope'
/2/	$\text{u}^{3}\text{tu}^{2}$	'scratch'	$\text{u}^{4}\text{tuh}^{4}$	'I scratch'
			$\text{u}^{3}\text{tu}^{2}\text{=sih}^{3}$	'he scratches'
	$\text{tʃu}^{3}ʔ\text{nu}^{2}$	'huipil'	$\text{tʃu}^{4}ʔ\text{nuh}^{4}$	'my huipil'
			$\text{tʃu}^{3}ʔ\text{nu}^{2}\text{=ũh}^{3}$	'her huipil'
/32/	kka^{32}	'corn tassle'	$\text{si}^{4}\text{-kah}^{4}$	'my corn tassle'
			$\text{si}^{3}\text{-ka}^{2}\text{=sih}^{3}$	'his corn tassle'
	ββe^{32}	'maguey cactus'	$\text{tu}^{4}\text{-βeh}^{4}$	'my maguey cactus'
			$\text{tu}^{3}\text{-βe}^{2}\text{=ũh}^{3}$	'her maguey cactus'
/31/	nne^{31}	'meat'	$\text{si}^{4}\text{-neh}^{4}$	'my meat'
			$\text{si}^{3}\text{-ne}^{2}\text{=sih}^{3}$	'his meat'
	$\text{to}^{3}\text{ko}ʔ^{1}$	'hang (tr.)'	$\text{to}^{4}\text{koh}^{4}$	'I hang'
			$\text{to}^{3}\text{ko}ʔ^{2}\text{=sih}^{3}$	'he hangs'

to the bare/3S form. In the examples 'my straw rope' and 'my corn tassle', we observe a tonal change not only on the lexical root, but on the possessive prefix as well. This tonal change applies both the phonologically-conditioned possessive prefix allomorph /tu-/ and to the regular possessive prefix allomorph /si^{3}-/. This stem tonal allomorph is not restricted to roots where 1S formation involves /h/-insertion, but also occurs with /h/-insertion. Only roots with tone /3/ undergo this pattern, shown below in Table 20.

Table 20: Tone /4/ stem allomorphy in association with /h/ deletion

Bare stem	Gloss	Inflected stem	Gloss
tʃuh^{3}	'pot'	$\text{si}^{3}\text{-tʃu}^{43}$	'my pot'
		$\text{si}^{3}\text{-tʃuh}^{3}\text{=sih}^{3}$	'his pot'
$\text{ni}^{3}ʔ\text{yah}^{3}$	'salsa'	$\text{si}^{3}\text{-ni}^{3}ʔ\text{ya}^{43}$	'my salsa'
		$\text{si}^{3}\text{-ni}^{3}ʔ\text{yah}^{3}\text{=sih}^{3}$	'his salsa'
ŋgah^{3}	'be lying'	ŋga^{43}	'I am lying'
		$\text{ŋgah}^{3}\text{=sih}^{3}$	'he is lying'

The inflected forms in Table 20 appear on the surface to resemble those 1S forms for stems with tone /4h/ or /45h/. Recall that such forms underwent an alternation of /45h, 4h/ > /43/ with the 1S clitic. Yet, when we examine the tone on the 3S.Masc forms, the stem is not raised.

3.2.4 Summary of stem selection and 1S morphology

There are four possible stem types that serve as the base for the application of 1S clitic morphophonology in Itunyoso Triqui. These stem types are the bare noun form, the 3S stem (for verbs and inalienably-possessed nouns), a tone /2/ stem, and a tone /4/ stem. The irregular tonal stems serve as the base for 1S glottal consonant toggling, but no additional tonal changes apply to these stems to indicate the 1S clitic. For regular stems, the directionality of the toggling process (/V꞉, Vʔ/ –> /Vh/, /Vʔ/ –> /VʔVh/, or /Vh/ –> /V꞉/) determines the type of tonal alternation that will apply. Table 21 summarizes the exponents of the 1S clitic by rime type and tone.

Table 21: The application of 1S morphophonology

Final syllable rime	**Final syllable tone**	**Inflected final rime**
V꞉	/3, 4/	Vh^{45}
V꞉	/43, 32, 31/	Vh + final mora tone deletion
V꞉	/2, 1/	Vh
Vʔ	/3ʔ/	Vh^{45}
Vʔ	/1ʔ , 2ʔ , 3ʔ/	Vh
Vʔ	/3ʔ/	VʔVh^{45} (redup.)
Vʔ	/1ʔ , 2ʔ/	VʔVh (redup.)
Vh	/45h, 4h/	V꞉^{43}
Vh	/3h/	V꞉^{32}
Vh	/2h, 1h, 32h, 13h/	V꞉

The presence of both alternate stem types for cliticized IT words and a plethora of possible tone-rime combinations in final syllables renders the set of morphotonal alternations with the 1S clitic superficially opaque. However, a small set of tonal rules, described in §1.2, as well as the autosegmental rules for tonal association permit clearer generalizations to be made regarding IT cliticization. First, no tones are inserted when the 1S clitic is attached to a stem with a lower register tone. In these cases, the /h/-toggling process simply involves the insertion/deletion of the coda glottal consonant.

Second, disregarding irregular /Vʔ/ roots for which a reduplicated form occurs, e.g. /ka^{3}ɣaʔ^{3} > ka^{3}ɣaʔ^{3}ah^{45}/ ‘bottle > my bottle’, for stems which undergo /h/ insertion, only high register level tones involve the association of a floating /45/ tonal melody. Stems with falling tones involve the deletion of the tone on the stem-final mora. Third, for stems which undergo /h/ deletion, only high register tones receive a floating tone (/3/ or /2/) attached to the right edge of the stem, producing final contours /43/ and /32/. None of the other tones (low register) undergo regular alternations here. These major rules governing 1S cliticization are given below.

1S /h/ insertion rule: Replace the rightmost mora of the stem with /h/. If the rightmost associated tone on the base is [+Upper] and level, insert tone /45/ at the right edge.

If not, delete any tone associated with the rightmost mora.

1S /h/ deletion rule: Delete both /h/ and the tone from the rightmost mora of the stem. If the rightmost associated tone on the base is [+Upper, +High], insert tone /3/ at the right edge. If the rightmost associated tone on the base is [+Upper, -High], insert tone /2/ at the right edge. If the rightmost associated tone is [-Upper], do not associate any additional tone.

The strength of the rules above is that it is unnecessary to specify how floating tones will associate on IT words. The existing rules on tonal well-formedness account for this. However, one pattern in Table 21 remains unexplained: while most words with tone /3/ undergo tonal alternations (to /45/), other words with this tone do not. Just what predicts this pattern is made clearer by considering the remainder of the clitic morphology, which we turn to next.

4 Second person marking

Whereas the morphophonological alternations associated with the 1S clitic are particularly complex, both segmentally and tonally, the morphology of the 2S and 1DU clitics is rather simpler. The 2S enclitic morpheme in Itunyoso Triqui is /=ɾeʔ[1]/. The clitic is associated with three tonal alternations on the stem onto which it attaches: it may condition low tone spreading on the preceding syllable, tone raising on the preceding syllable (to tone /4/), or no tonal changes on the stem. The process of low-tone spreading is unique to Itunyoso Triqui. Chicahuaxtla Triqui has a similar process of tone-raising conditioned by the 2^{nd} person enclitic, but no process of low-tone spreading (Longacre, 1959). The same is true for Copala Triqui (Hollenbach, 1984).

4.1 The Low Tone Spreading 2S allomorph

For the 2S allomorph which conditions low tone spreading, the low tone on the enclitic spreads just one syllable to the left, changing the final stem syllable tone to /1/. Note that the 2S morpheme is the only clitic in IT to contain tone /1/. Thus, this process can be seen as another instance of a more general rule of low tone spreading (LTS) described above. 2S LTS occurs for all stems carrying a falling tonal melody, e.g. /32, 3.2, 3.2.2, 3.3.2, 43, 4.3, 4.43, etc./ and on (mostly) upper register level tones which contain a stem-final coda, e.g. /3ʔ, 3h, 4ʔ/.[12] Words with tonal melody /31/ obligatorily undergo low tone spreading, as per the general LTS rule, so they are excluded here. As most Spanish loanwords take tonal melody /43/, this rule applies to these loanwords as well. Examples of the low tone spreading process are given in Table 22.

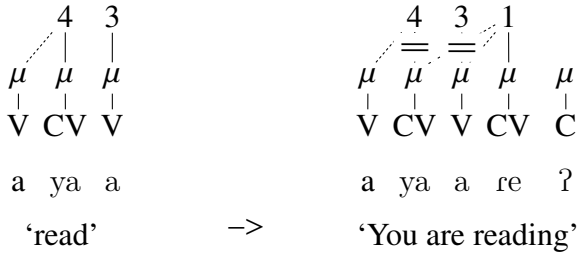
[12]Tone /4/ only surfaces on a /Vʔ/ rime with the 1DU clitic; in an inflected context.

Table 22: Low tone spreading with 2S clitic

Tone	Bare stem	Gloss	Inflected stem	Gloss
/43/	$a^{4}ya^{43}$	'read'	$a^{4}ya^{1}{=}ɾeʔ^{1}$	'you read'
	$tʃa^{4}βi^{43}$	'key'	si^{3}-$tʃa^{4}βi^{1}{=}ɾeʔ^{1}$	'your key'
/32/	$ya^{3}ʔa^{32}$	'cord'	$ta^{3}ʔa^{1}{=}ɾeʔ^{1}$	'your cord'
	kka^{32}	'corn tassle'	si^{3}-$ka^{1}{=}ɾeʔ^{1}$	'your corn tassle'
/4.3/	$si^{4}tuh^{3}$	'navel'	$si^{4}tuh^{1}{=}ɾeʔ^{1}$	'your navel'
	$a^{4}tʃih^{3}$	'believe'	$a^{4}tʃih^{1}{=}ɾeʔ^{1}$	'you believe'
/3.2/	$a^{3}ɾũ^{2}$	'scratch'	$a^{3}ɾũ^{1}{=}ɾeʔ^{1}$	'you scratch'
	$a^{3}ʔβi^{2}$	'grind (in mortar)'	$a^{3}ʔβi^{1}{=}ɾeʔ^{1}$	'you grind'
/4/	$ɾa^{4}ʔyãh^{4}$	'be in a hurry'	$ɾa^{4}ʔyãh^{1}{=}ɾeʔ^{1}$	'you are in a hurry'
	$yã^{4}ʔãh^{4}$	'guitar'	$tã^{4}ʔãh^{1}{=}ɾeʔ^{1}$	'your guitar'
/3/	$ni^{3}ʔyah^{3}$	'see'	$ni^{3}ʔyah^{1}{=}ɾeʔ^{1}$	'you see'
	$nneh^{3}$	'dream'	si^{3}-$neh^{1}{=}ɾeʔ^{1}$	'your dream'
/2/	$tʃa^{2}kah^{2}$	'get married'	$tʃa^{2}kah^{1}{=}ɾeʔ^{1}$	'you got married'
	$ttʃeʔ^{2}$	'be short'	$ttʃeʔ^{1}{=}ɾeʔ^{1}$	'you are short'

Table 22 shows stems with tone /2/ which also undergo LTS with the 2S clitic allomorph. These two words are the only examples of stems with tone /2/ which undergo this process. Most words with tone /2/ do not undergo any tonal alternation with the 2S clitic. This process is represented in autosegmental terms in (29) for /$a^{4}ya^{43}$/ 'read.'

(29)



The tonal spreading with the 2S allomorph in (29) is slightly different from the general LTS process described earlier. In the latter, no tone may be deleted from the stem. In the former, any tone associated with the final *syllable* of the stem is delinked and erased. Those tones affiliated with any non-final syllable, are unaffected.

4.2 The tone raising 2S allomorph

A smaller set of words in Itunyoso Triqui undergo a process of tone raising with the 2S enclitic. For this allomorph, the final syllable of the stem raises to tone /4/. While the process of low tone spreading applies to stems with varying underlying tonal patterns, tonal raising applies, without exception, only to stems with an underlying level tone /3/. Examples of tone raising stems with the 2S enclitic are given in Table 23.

Table 23: Tone Raising Stems with 2S enclitic

Bare stem	Gloss	Inflected stem	Gloss
ɾa^{3}ʔa^{3}	'hand'	ɾa^{3}ʔa^{4}=ɾeʔ^{1}	'your hand'
u^{3}nu^{3}	'hear, understand'	u^{3}nu^{4}=ɾeʔ^{1}	'you hear'
si^{3}kiʔ^{3}	'chewing gum'	si^{3}-si^{3}kiʔ^{4}=ɾeʔ^{1}	'your chewing gum'
ya^{3}ʔah^{3}	'chile pepper'	ta^{3}ʔah^{4}=ɾeʔ^{1}	'your chile pepper'

The phonological behavior of this process parallels that of the LTS rule. In both cases, the tones associated with the final syllable of the stem are replaced by a tone specified by the clitic allomorph. Yet, there is a difference in representation. In this particular case, tone /4/ is hypothesized to be a floating tone attached to the left edge of the clitic. It is this tone which attaches at the right edge of the stem.

For the most part, words which undergo low tone spreading with the 2S clitic have distinct stem tones from words which undergo stem tonal raising. However, comparing the data in Table 23 to that in 22, we observe that words with a tone /3/ melody may undergo either process. What accounts for the difference between these words? This distinction between different stems with tone /3/ is better understood once we consider those stems which fail to undergo any tonal alternation with the 2S clitic.

4.3 The neutral 2S allomorph

Many Itunyoso Triqui roots do not undergo tonal alternations with the 2S enclitic. Non-alternating stems vary in their underlying tonal melodies, which consist of /2/, /3/, /43/, and /32/. There is a surface tonal neutralization between stems which undergo tone raising and stems with an underlying tone /4/, as well as a neutralization between stems which undergo low tone spreading and stems with an underlying tone /1/. For the purposes of classification, I will leave aside these words. However, it is notable that stems with melodies /4/ and /45/ fail to undergo low tone spreading and stems with tones /1/ and /2/ fail to undergo tonal raising. Examples of non-alternating stems with the 2S enclitic are shown in Table 24.

Table 24: Non-alternating stems with 2S enclitic

Tone	Bare stem	Gloss	Inflected stem	Gloss
/43/	tʃa^{43}	'eat'	tʃa^{43}=ɾeʔ^{1}	'you eat'
/32/	na^{2}nu^{32}	'get dressed'	na^{2}nu^{32}=ɾeʔ^{1}	'you get dressed'
/3/	ya^{2}ʔnã^{3}	'mask'	ta^{2}ʔnã^{3}=ɾeʔ^{1}	'your mask'
/2/	ku^{2}k^{w}ah^{2}	'tepache jug'	si^{3}-ku^{2}k^{w}ah^{2}=ɾeʔ^{1}	'your tepache jug'

Leaving aside stems with a tone /3/ and /2/ melody, it appears that stems with tonal melody /32/ may either undergo LTS or no tonal alternation. However, upon closer inspec-

tion, there is an important distinction among these different stems. The stems with tone /32/ which undergo LTS are those which do not involve a melodic stem change to tone /2/, whereas those stems which involve a melodic change from /32 > 2/ do not undergo any tonal alternation. In other words, the process of stem /2/ selection prevents any further changes to the tonal shape of the word. This stands in contrast with those words which involve a stem change to tone /4/ for only the 1S or 1DU clitics, described in §3.2.3.

Yet, not all of the roots which carry tone /32/ and fail to undergo a tonal alternation with the 2S clitic also undergo a stem-/2/ alternation. The word /$\mathrm{t\int a^{43}}$/ 'eat' in Table 24 does not undergo a stem alternation but fails to undergo tonal alternations. Why do words of this shape fail to undergo low tone spreading? The explanation relies on the same principles that constrain the general low tone spreading in IT; the avoidance of tonal deletion due to word size. Monosyllabic words like /$\mathrm{kka^{32}}$/ 'corn tassle' undergo low tone spreading, e.g. /$\mathrm{si^3}$-$\mathrm{ka^1}$=$\mathrm{re\text{?}^1}$/ 'your corn tassle' because a prefix is present on the inflected form. For verbs or inalienably-possessed nouns where a prefix is not present, low tone spreading may not result in the deletion of the tonal content on the final (only) stem syllable. (Recall that the 2S LTS process affects the tones associated on the entire final syllable, not just the final mora.) The same constraint barring tonal deletion from the general process of iterative LTS for tone /1/ bars LTS from deleting tones on inflected monosyllabic words for the 2S clitic.

4.4 Paradigmatic uniformity and clitic boundaries

So far, we have no explanation for why stems with tonal melodies /3/ and /2/ appear to receive the low tone spreading 2S clitic allomorph, the tone-raising allomorph, or the neutral allomorph. If the stem tone is not a predictor of the tonal changes which these stems undergo with the 2S clitic, what is? Recall in Table 21 that certain roots containing tone /3/ undergo both final syllable tone raising to /45/ with /h/-insertion, while other roots containing tone /3/ do not undergo any tone raising. When we compare these alternations with those affecting the 2S clitic, a pattern emerges: all of the lexical stems which undergo tone raising with the 2S enclitic also undergo tone raising to tone /45/ with the 1S enclitic (see Table 15) if the stem involves /h/-insertion. Words which do not undergo tone raising with the 1S enclitic either undergo no tonal changes or low tone spreading with the 2S enclitic.

One way to capture both the non-predictability of the tonal raising process for tone /3/ and its uniformity within the 1S and 2S clitic morphology is to posit two abstract tonal categories for stems containing tone /3/. Certain lexical stems in Itunyoso Triqui which contain a tone /3/ melody are specified as *tone-raising*, while others are not tone-raising. Yet, if this binary abstract tonal classification is created, how do we distinguish those tone /3/ and tone /2/ stems which involve LTS with the 2S clitic allomorph from those which involve no tonal changes at all?

Another way to resolve this is to argue that there are two types of *clitic boundaries* within Itunyoso Triqui. There are those clitics that have a substantive influence on the phonology of the final syllable of the stem and those which do not. The former case might be analyzed as word-internal cliticization and the latter, word-external cliticization. Such a

distinction is not purely stipulative. There is evidence for two types of clitic boundaries in the application of personal clitics in Copala Triqui (Hollenbach, 1984). In this work, Hollenbach distinguishes the phonological behavior of 1S, 2S, and 1DU clitics (word-internal morphology) from the other clitics which do not influence the phonology of the stem (word-external morphology). The distinction here in Itunyoso Triqui is that this split divides the same morpheme; there are word-internal 2S clitic allophones which influence stem tone and word-external 2S clitics which do not. Among the word-internal clitics, there are those roots which are specified as tone-raising and those which are not. A consequence of this distinction is that there are not three tonal allomorphs of the 2S clitic in IT, but only two: a lexically-specified form with tone-raising and another without tone raising. The distinction between stems which undergo low tone spreading and those which do not lies in the type of morphological boundary at the right edge of the stem.

Based on the complex tonal alternations, there may be good phonological evidence for treating *word-internal* clitics as suffixal and *word-external* clitics as true clitics. However, clitics which condition complex tonal alternations apply equally to all parts of speech in Itunyoso Triqui and regularly attach to the right edge of a verb+adverb domain; e.g. /ka^{3}-tʃi^{4}nih^{4}/, PERF-get.drunk.1S, 'I got drunk.' vs. /ka^{3}-tʃi^{4}ni^{43} ỹũh^{45}/ PERF-get.drunk again.1S, 'I got drunk again.' In the first example, the 3S stem tone on the verb is /43/ and this tone undergoes the regular changes with /h/-insertion. In the second, the 1S clitic is attached to the post-verbal adverb and the stem tone (/4/) here undergoes different, but regular tonal changes to tone /45/ with /h/-insertion. Clitics typically attach on syntactic domains larger than the morphological word (Spencer, 1991) and IT clitics do not differ in terms of their morphological attachment sites, only in terms of their phonological properties. Insofar as these phonological effects alone are sufficient to distinguish affixes from clitics in IT morphology, then there is evidence a difference in stem boundary type.

5 First person dual marking

The 1DU enclitic, =/ʔ/, conditions two phonological processes on Itunyoso Triqui words. There is a segmental alternation and a tonal alternation which affects words with stem tone /3/. The segmental alternation affects words where the final syllable of the stem has a central vowel: /a/ or /ã/. These vowels are rounded before the 1DU clitic to /o/ and /ũ/, respectively. In stems with identical vowels separated by an intervocalic glottal stop, e.g. /V$_1$ʔV$_1$/, both vowels undergo this alternation. Stems ending in a non-central vowel do not undergo any alternation. The vowel alternation is completely regular and affects loanwords as well, e.g. /me^{4}sa^{43}/ 'table' > /me^{4}soʔ^{4}/ 'our (excl) table'. Examples are shown in Table 25.

One consequence of this process is its unique interaction with a phonological constraint in IT regarding labial consonants. Rounded vowels are not permitted in the same syllable as labial consonants in any Triqui variant (DiCanio, 2008; Longacre, 1957; Silverman, 2002); i.e. none the consonants /p, β, ββ, m, mm, k^{w}, kk^{w}, ʔβ, ʔm/ may co-occur with the vowels

Table 25: Vowel alternations with 1DU clitic

Bare stem	Gloss	Inflected stem	Gloss
$\text{sã}^3\text{ʔãh}^2$	'money'	$\text{si}^3\text{-sũ}^2\text{ʔũʔ}^2$	'our money'
$\text{na}^2\text{ɾãh}^3$	'close (tr.)'	$\text{na}^2\text{ɾũʔ}^3$	'we close'
$\text{ɾa}^3\text{ʔa}^3$	'hand'	$\text{ɾo}^3\text{ʔoʔ}^4$	'our hand'

/u, ũ, o/. When the 1DU applies to a word containing a labial onset consonant followed by /a/ or /ã/, the labial consonant is lost. For instance, the word $/\text{tu}^3\text{ʔβa}^3/$ 'lips' is $/\text{to}^3\text{ʔoʔ}^4/$ when inflected with the 1DU clitic.

Certain lexical stems undergo a process of tone raising to tone /4/ before the 1DU enclitic. In uninflected lexical stems, tone /4/ never surfaces on a /Vʔ/ rime. In this way, tone /4/ is purely a grammatical tone on /Vʔ/ rimes, conditioned by enclitic morphology. All of the words which undergo this alternation possess a tone /3/ on the final syllable of the root or 3S stem. A majority of these words undergo tonal raising (to /45/) with the 1S clitic and to tone /4/ in the 2S clitic (49/61 paradigms). The remaining 11 exceptions do not satisfy the phonological conditions for tonal raising; the stem either contains a coda /h/ and /h/-deletion occurs with the 1S clitic, or the stem possesses a falling melody like /4.3/ and will undergo low tone spreading with the 2S clitic. Examples of tone raising are given in Table 26. Examples with lower register tone and no tonal raising are given in Table 27.

Table 26: Tone raising with the 1DU enclitic

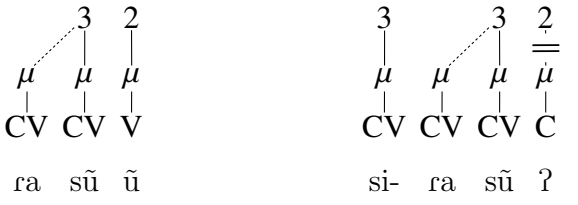
Tone	Bare stem	Gloss	Inflected stem	Gloss
/3/	$\text{a}^3\text{ʔnãʔ}^3$	'be sick'	$\text{a}^3\text{ʔnuʔ}^4$	'we are sick'
	$\text{tʃa}^3\text{tã}^3$	'pineapple'	$\text{si}^3\text{-tʃa}^3\text{tũʔ}^4$	'our pineapple'
	nni^3	'mother'	nniʔ^4	'our mother'

While there is no tone raising shown for the words in Table 27, there are surface tonal changes on stems. All stems which contain a contour tone in the final syllable undergo contour simplification to a level tone. Recall that no contour tones may surface preceding a glottal stop in Itunyoso Triqui. For each of the contour tones listed above, we can posit a general phonological rule for the 1DU which replaces the final mora on the stem with a /ʔ/ and delinks (and erases) the tone associated with it. This rule is identical in its behavior to /h/ insertion rule for the 1S clitic except for the fact that a /ʔ/ is inserted here instead. An AS representation of the rule is given in (30) for an example with tone /32/.

Table 27: Absence of tone raising with the 1DU enclitic

Tone	Bare/3S stem	Gloss	Inflected stem	Gloss
/4/	tʃi^{4}ɾoh^{4}	‘pants’	tʃi^{4}ɾoʔ^{4}	‘our pants’
	yo^{4}	‘basket’	toʔ^{4}	‘our basket’
/3/	kkãʔ^{3}	‘corn flour’	si^{3}-kũʔ^{3}	‘our corn flour’
	kĩʔ^{3}	‘smell (intr.)’	kĩʔ^{3}	‘we smell’
/2/	sã^{3}ʔãh^{2}	‘money’	si^{3}-sũ^{2}ʔũʔ^{2}	‘our money’
	ttʃeʔ^{2}	‘be short’	ttʃeʔ^{2}	‘we are short’
/1/	tʃi^{3}ʔi^{1}	‘illness’	si^{3}-tʃi^{1}ʔiʔ^{1}	‘our illness’
	ka^{1}tĩ^{1}	‘be skinny’	ka^{1}tĩʔ^{1}	‘we are skinny’
/43/	ɾu^{4}ne^{43}	‘avocado’	si^{3}-ɾu^{4}neʔ^{4}	‘our avocado’
	ya^{4}ku^{43}	‘garlic’	si^{3}-ya^{4}kuʔ^{4}	‘our garlic’
/32/	ko^{3}ʔo^{32}	‘drink’	ko^{3}ʔoʔ^{3}	‘we drink’
	na^{2}ʔneh^{3} ɾi^{3}ã^{32}	‘dream (V.)’	na^{2}ʔneh^{3} ɾi^{3}ũʔ^{3}	‘we dream’
/31/	mmi^{31}	‘bridge’	tu^{3}miʔ^{3}	‘our bridge’
	nna^{31}	‘farm’	tʃi^{3}-noʔ^{3}	‘our farm’
/45/	ta^{3}kĩh^{45}	‘nose’	ta^{3}kĩʔ^{4}	‘our nose’
	yo^{3}ʔoh^{45}	‘land’	to^{3}ʔoʔ^{4}	‘our land’

(30)



6 Discussion & Conclusions

Itunyoso Triqui clitic morphology is characterized by lexically-specified paradigms, suppletive tonal stem allomorphy, and a large number of phonologically predictable segmental and tonal alternations. Most of the phonological processes triggered by clitics are phonologically-conditioned. For the clitics conditioning phonological changes on the stem (1S, 2S, 1DU), the stem tonal register predicts whether it will undergo tonal alternations. No tonal raising occurs on words which contain lower register tones (/2/, /1/, /13/, /32/, /31/ (derived /1/)). The only tonal alternations which surface on words with lower register tones result from either final moraic deletion of tone /32/ (–> 3h for 1S, –> 3ʔ for 1DU) or from low tone spreading with the 2S clitic. These are both phonologically-predictable from the tonal type (contour, falling melody). For a subset of words with tonal melody /32/, an alternate tonal stem /2/ is used.

The remaining phonological conditions determining tonal changes on the stem are those related to the presence of either a final contour tone and the final rime type. Final contour tones undergo regular patterns of final mora deletion when the clitic contains a glottal consonant, e.g. /T_1T_2 –> T_1+(h/ʔ)/. Falling tonal melodies regularly undergo low tone spreading with the 2S clitic. Finally, the presence/absence of /h/ as a final stem coda determines the set of tonal alternations a stem may undergo.

A set of phonological well-formedness conditions, couched within an autosegmental-metrical framework, account for all regular clitic-induced phonology in IT. First, the various processes of contour levelling (43 > 4+(h, ʔ), 32 > 3+(h, ʔ), 31 > 3+(h, ʔ), 45 > 4+(ʔ)) which occur with cliticization are generalized by assuming that the attachment of a glottal consonant to the final mora of the syllable results in tonal erasure. Second, the process of tonal raising with /h/ insertion for upper register tones (/3/ (+tone raising), /4/, /43/) is also derived via the general principle of leftward tonal spreading. Third, the lack of tonal alternations on unprefixed monosyllabic roots (and other processes) are captured by assuming both a strong constraint against tonal deletion on the left edge of the lexical stem and a strong constraint specifying that a mora may only be associated to a single tone. Seen this way, it is not necessary to specify such alternations as lexeme or paradigm-specific. Were one to specify a set of all possible alternations entirely paradigmatically, one would lose the much broader phonological generalizations regarding tonal structure in the language.

However, there are also two ways in which clitic morphology in IT is not phonologically-predictable. First, certain roots undergo stem tonal alternations prior to cliticization. These tonal stems are largely suppletive in the same way as suppletive *segmental* stem allomorphs are in the language, e.g. /βeʔ^3/ 'house' > /tʃu^{3}k$^{\mathrm{w}}$ah^{45}/ 'my house'. That is, the same suppletive stem allomorph appears before all clitics. Second, all roots with a tone /3/ melody must be specified as either tone-raising or non-tone-raising. Those within the first category undergo final syllable stem tone-raising with the 2S and 1DU clitics and with the 1S clitic if and only if they do not contain a stem-final /h/ (and therefore undergo /h/-insertion). Thus, even those roots lacking a tonal conditioning environment for tonal raising must contain the appropriate rime type for it to be produced. Paradigms for tone-raising and non-raising roots with tone /3/ are shown in Table 28.

Table 28: Raising and Non-raising tone /3/ stems in Itunyoso Triqui

	Raising stems		Non-raising stems	
Bare noun	(a) ya^{3}tãʔ^3	(b) nĩ^{3}ʔĩ^3	(c) tu^{3}neʔ^3	(d) ttãʔ^3
Gloss	'foam'	'to know'	'tail'	'corncob'
1S	si^3-ya^{3}tãh^{45}	nĩ^{3}ʔĩh^{45}	tu^{4}neh^4	si^4-tãh^4
2S	si^3-ya^{3}tãʔ^4=ɾeʔ^1	nĩ^{3}ʔĩ^4=ɾeʔ^1	tu^{3}neʔ^1=ɾeʔ^1	si^3-tãʔ^1=ɾeʔ^1
3S.Masc	si^3-ya^{3}tãʔ^3=sih^3	nĩ^{3}ʔĩ^3=sih^3	tu^{3}neʔ^3=sih^3	si^3-tãʔ^3=sih^3
1DU	si^3-ya^{3}tũʔ^4	nĩ^{3}ʔĩʔ^4	tu^{4}neʔ^4	si^4-tũʔ^4

Paradigms (a) and (b) show stems for which an abstract tonal specification (raising) results in tone-raising in the final syllable of the stem with the 1S, 2S, and 1DU clitics. Paradigms (c) and (d) do not undergo any of these alternations and are specified as non-raising stems (though both take stem tone /4/ with the 1S and 1DU forms). While the remainder of the tonal melodies in the language undergo regular tonal alternations or non-alternations, it is only words with tone /3/ that necessitate this abstract classification.

The phonological characteristics of the stem and the set of phonological well-formedness conditions described in §1.2 account for the clitic-specific morphology in IT. Resultingly, one can conclude that clitic morphology is not primarily paradigmatic in nature in IT. However, the phonological patterns are opaque from the surface phonological representations which blend together suppletive tonal stem allomorphy with regular phonological constraints. Most of the suppletive stem tonal allomorphy is not triggered by specific clitics, but by person-marking as a general inflectional process. Once one accounts for these processes, the conditioning phonological environments for tonal alternations emerge. The major exception to these regularities is the ambiguous status of tone /3/, which must be specified at an abstract level as tone-raising or non-raising.

Clitic morphology varies substantially among the different Triqui variants, especially with respect to tonal alternations. However, a few shared patterns are striking. First, for most Triqui variants, bare stems with tone /3/ or with sequences containing tone /3/ will undergo processes of tone-raising with the 1S, 2S, and 1DU enclitics. The fact that tone-raising occurs with all of these enclitics for a specific tonal class suggests that tone /3/ functioned as a neutral tone at a historical stage in Triqui. Neutral tones are prone to tonal alternations because they are phonologically unspecified for tone. Adjacent floating tones on clitics are more often realized on stems with neutral tones, creating a surface-level tonal alternation on the stem's tone.

Second, for all Triqui variants, there is a tendency for lower tones to resist processes of tonal raising. The same resistance of lower register tones to tonal alternations in Itunyoso Triqui is found in Chicahuaxtla Triqui with the 1S and 1DU clitics. In Copala Triqui, tones /2/ and /1/ do not participate in any clitic-conditioned tonal alternations. While Hollenbach (1984) does not connect register to tonal alternations in Triqui morphology, she does discuss argue that tones /2/ and /1/ belong to a lower tonal register in featural terms. As I have argued here, such a distinction is useful in explaining morphological toggling and tonal alternations in Itunyoso Triqui. It may be useful in explaining these patterns in Chicahuaxtla Triqui as well.

Otomanguean languages present unique challenges to work on inflectional systems. Complex tonal systems and alternations result in surface phonological patterns which appear phonologically capricious. The clitic morphology of Itunyoso Triqui is neither neatly phonologically-predictable nor strictly paradigmatic, but reflects a combined system where many stem-specific alternations must be taken into account prior to an examination of the phonological alternations. As a result, an in-depth understanding of the general phonological conditions for tonal well-formedness is crucial to revealing systemic regularities in morphological tonal alternations. The separation of processes of inflectional stem-formation

and clitic-induced morphology is particularly crucial in this regard. After such a distinction is made for the IT data, principled exceptions of tonal alternations remain. These can be captured by positing a distinction between abstract tone-raising roots and those which do not induce raising.

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Tracing the emergence of inflectional tone in Cuicatec

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1. Introduction

In this paper, we study a number of relevant aspects of the aspectual inflection of Cuicatec, an Oto-Manguean language of Mexico. We show that the inflection of Cuicatec, which involves tone, displays a great degree of morphological complexity as a result of the following factors:

(a) Verbs can be said to fall into a large number of inflectional classes according to the affix patterns they select for their aspectual inflection.
(b) The same verbs fall into other inflectional classes according to the tone pattern they select for the same purpose.
(c) Affixal morphology and tonal morphology operate as two independent systems of inflection, but they show areas of interconnection. Some of these areas are traces of lexical tones associated with prefixes which we claim were then reanalyzed as inflectional formatives.
(d) Similarly, the inherent structural intricacies of the system are such that they give way to other alternative analyses, but whatever analysis is taken at the end, the complexity is still not greatly reduced.
(e) Whichever analysis is adopted as a means of explaining the inflectional system, it invariably only accounts for a portion of the inflection system, leving behind a plethora of 'loose ends' and exceptions.

Cuicatec belongs to the Mixtecan branch of Oto-Manguean, together with the Mixtec languages and Triqui. Our analysis of Cuicatec verb inflection is pioneering, as no previous analysis exists. The literature is rich on the Mixtec family and Triqui. But even in Mixtec the interest in the analysis has not been on inflection but on the phonology of tone, starting in Pike's (1948) seminal book leading to a vast literature; recent relevant work including Daily and Hyman (2007), DiCanio, Amith and García Castillo (2014), McKendry (2013) and DiCanio (2012a, 2012b). Besides tone, studies with emphasis on the grammar focus on aspects of the morphosyntax (e.g. Bradley and Hollenbach 1988, 1990, 1991, 1992). The only exception is Macaulay's (1996) grammar of Chalcatongo Mixtec, which includes a few sections on the morphological properties of inflection. See also Palancar, Amith and García Castillo (this volume) for a first analysis of the verb inflection of Yoloxóchitl Mixtec. Our analysis of Cuicatec inflection is based on secondary data: we have compiled a sample of 2,480 inflected forms of 620 verbs from the excellent dictionary by Anderson and Roque (1983).

As a language, Cuicatec (c. 8,600 speakers) can be subdivided into two main varieties – Tepeuxila Cuicatec and Teutila Cuicatec – with a high degree of mutual intelligibility exisiting between them. The variety registered in Anderson and Roque (1983) is from Santa María Pápalo, a socio-linguistically significant dialect of Tepeuxila Cuicatec (Ethnologue 2013). The language is spoken in the northwest of the state of Oaxaca in south-central Mexico, as shown in Map 1.

Map 1. Location of Santa María Pápalo, Oaxaca State, Mexico.

In section 2, we give a brief summary of a number of pertinent points relating to the phonology of Cuicatec, which are necessary to understand the following sections, and in section 3, we provide an overview of the verbal inflection system. Section 4 is concerned with the aspectual/modal prefixes, as it will become clear that these are relevant in understanding the emergence of inflectional tone.

Following the necessary background information provided in Sections 2–4, Section 5 introduces the notion of tone as an inflectional exponent. In Section 6, we investigate the tonal patterns observed in four different groups of verbs (based on the shape of their prefixes) and finally, in Section 7, we summarize our findings and propose a hypothesis to explain the synchronic complexity observed in Cuicatec verbal inflection.

2. Overview of Cuicatec phonology[1]

2.1. Tone

All syllables in Cuicatec are tone bearing and predominantly CV- in shape. Tones may be either level or contour. Level tones display a four-way contrast between high, high-mid, low-mid and low, marked with superscript numerals from 1 (high) to 4 (low).

A subset of the possible combinations of the four level tones gives rise to at least five contour tones. These contour tones are mostly observed on monosyllabic words, but are rare on native disyllabic words; this suggests that monosyllabic words are, in fact, bimoraic and can therefore either display a long level tone or a contour tone, but unfortunately vowel length is not marked in the orthography.

Table 1 presents nouns showing the main tone patterns on both monosyllables and disyllables. We have intentionally not shown verb forms in this table since this paper proposes that tone plays an important role in the inflection of Cuicatec verbs and the purpose of Table 1 is to illustrate the possible lexical tones.

[1] Orthography: when *n* is syllable-final, this indicates nasalisation of the preceding vowel (or the preceding two vowels where they are separated by *h* or *ʔ*). Also note that we have made a number of small adjustments to the orthography used in Anderson and Roque (1983) for the sake of clarity: (1) we represent laryngealization with an IPA glottal symbol, (2) we represent *c* with *k*, and (3) where *u* indicates labialization of the preceding consonant, we represent this with a superscript *w*.

Table 1. Cuicatec nouns displaying different lexical tone patterns

Monosyllables (level tones)					
1	high	H	l^{ʔ}in^{1}	/l^{ʔ}ĩ^{1}/	boy
2	high-mid	M1	nd^{ʔ}a^{2}	/^{n}d^{ʔ}ɒ^{2}/	worm
3	low-mid	M2	g^{w}an^{3}	/g^{w}ã^{3}/	between
4	low	L	ka^{4}	/ka^{4}/	clothes
Monosyllables (contour tones)					
14	descending	H>L	den^{14}	/dẽ^{14}/	a little of
24	descending	M1>L	yan^{24}	/jã^{24}/	village
32	raising	M2>M1	min^{32}	/mĩ^{32}/	there
43	raising	L>M2	ku^{43}	/ku^{43}/	metal
243	descend./raising	M1>L>M2	yen^{243}	/jẽ^{243}/	foam
Disyllables					
1-2			d^{ʔ}i^{1}v^{ʔ}a^{2}	/d^{ʔ}i^{1}.v^{ʔ}a^{2}/	sparrow hawk
1-4			l^{ʔ}a^{1}nda^{4}	/l^{ʔ}a^{1}.^{n}da^{4}/	flabby
2-1			le^{2}ngue^{1}	/le^{2}.^{n}ge^{1}/	lame
2-2			yu^{2}ni^{2}	/ju^{2}.ni^{2}/	path
2-4			sa^{2ʔ}an^{4}	/sa^{2}.^{ʔ}ã^{4}/	man
3-2			k^{w}a^{3}ku^{2}	/k^{w}a^{3}.ku^{2}/	straight
3-3			ka^{3}ka^{3}	/ka^{3}.ka^{3}/	paper
4-3			d^{ʔ}u^{4}ni^{3}	/d^{ʔ}u^{4}.ni^{3}/	brains
4-4			nda^{4}cha^{4}	/^{n}da^{4}.tʃa^{4}/	seven
2-24			ga^{2}nar^{24}	/ga^{2}.nar^{24}/	win

As we will show in Section 6, in verbal inflected forms, we often find some other tonal combinations which result from the adding of an inflectional tone 2 or 4 on a syllable that carries lexical tone. From such combinations we obtain additional tone patterns such as: 42, 23, 232 and 242. We are, however, unable to determine if such combinations should be analyzed as two adjacent level tones (our preference) or as specific contour tones found only in inflection.

2.2. Laryngealized vowels

Vowels in Cuicatec may be laryngealized. Anderson and Roque refer to two degrees of laryngealization – 'lightly interrupted vowels' and 'abruptly interrupted vowels'. They treat 'lightly interrupted vowels' as a phonation effect on the vowel, which they represent with an apostrophe before the affected vowel and which we represent with a superscript glottal symbol (e.g. **ch^{ʔ}i^{4}ka^{3}**).

On the other hand, they treat 'abruptly interrupted vowels' as being consonantal in nature and occurring between two vowels and therefore **nde$^{3ʔe^{3}}$** 'dance' (POT) would be seen as being disyllabic **nde^{3}-^{ʔ}e^{3}**. Nevertheless, we have diverged from their analysis and instead treat **V^{ʔ}V** as a complex nucleus consisting of a single, bimoraic, glottalized vowel. We have done this for the following three reasons:

1. complex, glottalized, nuclei are a well-known phenomenon in Oto-Manguean languages (Suárez 1983: 33) and it is therefore less likely that these are glottal-initial syllables as the authors state;
2. in all examples in the data, the vowel preceding the 'abrupt interruption' is identical in quality to the vowel which follows. Were the glottal stop a true consonant and the

onset of a new syllable, we might expect the quality of both vowels to differ in at least some examples;

3. the authors state that nasalization and the phonation associated with 'lightly interrupted vowels' always 'spreads' over an 'abrupt interruption' and affects both vowels. This could be seen as evidence that both vowels in fact belong to the same nucleus, and therefore the explanation of 'spreading' is superfluous.

3. Overview of Cuicatec verbal inflection

Verbs in Cuicatec inflect for aspect and mood and for person and number of the subject. Table 2 gives the Progressive forms of the verb *ca^{3}ta^{3}* 'sing'. As this partial paradigm shows, the pronominal system displays a number of grammatical distinctions, including clusivity (1PL), familiarity (2SG and 3rd person), gender (3rd person) and animacy (3rd person). Person and number are realised both syntactically, by means of independent pronouns, as well as morphologically by means of pronominal enclitics and inflection. Person/number inflection may involve tone (1SG), suffixes (2SG.FAM and 1PL.INCL) or the bare stem (all non-shaded forms in Table 2).

Table 2. Progressive forms of the verb *ca^{3}ta^{3}* 'sing'

		INDEPENDENT PRO.	VERB	DEPENDENT PRO.
1st person	1SG	u^{1}=ne^{1}	yi^{3}-ta^{1}	
	1PL.EXCL	nd^{ʔ}u^{1}s'un^{43}=ne^{1}	yi^{3}-ta^{3}	=n^{ʔ}un^{14}
	1PL.INCL	s^{ʔ}un^{1}=ne^{1}	yi^{3}-t-o^{31}	
2nd person	2SG.FAMILIAR	di^{2}=ne^{1}	yi^{3}-t-e^{2}	
	2SG.FORMAL	nd^{ʔ}i^{4}=ne^{1}	yi^{3}-ta^{3}	=ni^{4}
	2PL	nd^{ʔ}ist^{ʔ}i^{4}=ne^{1}	yi^{3}-ta^{3}	=ni^{4}
3rd person	3.M.FAMILIAR	sa^{2ʔ}an^{4}=ne^{1}	yi^{3}-ta^{3}	=san^{2}
	3.F.FAMILIAR	ta^{1ʔ}an^{4}=ne^{1}	yi^{3}-ta^{3}	=tan^{1}
	3.FORMAL	^{ʔ}i^{4}yan^{4}=ne^{1}	yi^{3}-ta^{3}	=yan^{1}
	3.ANIMAL	i^{3}ti^{3}=ne^{1}	yi^{3}-ta^{3}	=ti^{4}
	3.INANIMATE	–	yi^{3}-ta^{3}	

Unfortunately, despite the interesting complexity person and number marking bring to verbal inflection in Cuicatec, the dictionary does not provide sufficient data to enable us to reconstruct all the forms of a paradigm and, therefore, the remainder of this paper is concered only with aspectual inflection.

All verbs have four aspectual forms – the Potential (POT), Progressive (PROG), Completive (CPL) and Perfect (PRF). A fifth form, the Habitual, is only given for a small subset of verbs and we will therefore leave it out of this paper. The forms used in the dictionary correspond to the bare stems. Examples of the four aspectual forms of five verbs are presented below in Table 3.

Table 3. Examples of the four aspectual forms of five verbs

	POT	PROG	CPL	PRF	
(1)	ka^{2}ta^{4}	yi^{2}ta^{4}	chi^{2}ta^{4}	ndi^{2}ta^{4}	'get ill'
(2)	cu^{4}chi^{4}ka^{3}	yi^{4}chi^{4}ka^{3}	ka^{4}chi^{4}ka^{3}	nchi^{4}ka^{1}	'stroll'
(3)	k^{ʔ}a^{2}ka^{2}	^{ʔ}i^{2}ka^{2}	ch^{ʔ}i^{4}ka^{3}	nd^{ʔ}i^{2}ka^{2}	'clap'
(4)	ndu^{3}vi^{2}	yi^{3}ndu^{3}vi^{2}	ndu^{4}vi^{4}	nnu^{2}vi^{1}	'praise'
(5)	n^{w}a^{24}	yi^{2}n^{w}a^{24}	n^{w}a^{24}	n^{w}a^{24}	'recover'

In this paper we make reference to verbal stems and aspectual prefixes and, thus, it is important to define what we mean by a stem and a prefix. In our analysis, we treat a stem as any part of an inflected form which is segmentally invariant across all cells of the paradigm.

We use the word *invariant* somewhat loosely, however, as we allow for phonological changes to affect the stem. Table 4 shows the verb forms of Table 3, but this time indicating our segmentation of the prefix and the stem. In example (3), the initial vowel of the stem in the POT is /ʔa/, while in all other forms it is /ʔi/. We treat this as a phonological change triggered by the addition of the potential prefix *ka-*. Likewise, in example (4), the stems of all forms except the perfect begin with *nd-*, while the perfect begins with *n-*, which we treat as a sound change triggered by the addition of the perfect prefix *n-*.

Table 4. Repetition of Table 3, showing the segmentation of prefixes and stems

	POT	PROG	CPL	PRF	
(1)	ka^{2}–**ta^{4}**	yi^{2}–**ta^{4}**	chi^{2}–**ta^{4}**	ndi^{2}–**ta^{4}**	'get ill'
(2)	ku^{4}–**chi^{4}ka^{3}**	yi^{4}–**chi^{4}ka^{3}**	ka^{4}–**chi^{4}ka^{3}**	n–**chi^{4}ka^{1}**	'stroll'
(3)	k–**ʔa^{2}ka^{2}**	**Ø–ʔi^{2}ka^{2}**	ch–**ʔi^{4}ka^{3}**	nd–**ʔi^{2}ka^{2}**	'clap'
(4)	**Ø–ndu^{3}vi^{2}**	yi^{3}–**ndu^{3}vi^{2}**	**Ø–ndu^{4}vi^{4}**	n–**nu^{2}vi^{1}**	'praise'
(5)	**Ø–n^{w}a^{24}**	yi^{2}–**n^{w}a^{24}**	**Ø–n^{w}a^{24}**	**Ø–n^{w}a^{24}**	'recover'

Also note, in this regard, that by *invariant* we are not considering tone, thus segmentally-invariant stems may nevertheless display tonal changes.

With these points in mind, any part of a verb form which does not appear in all forms is treated as external to the stem and thus as an exponent of inflection. As the examples in Table 4 illustrate, inflectional prefixes may appear in all four forms (1, 2), in three forms (3), in two forms (4) or in only one form (5).

As Table 4 shows, a verb can either be composed of (i) an inflectional stem alone (e.g. POT form of (4)), (ii) an inflectional stem and a non-syllabic prefix, in which case the number of tones will remain unaltered (e.g. PRF form of (2)), or (iii) an inflectional stem and a syllabic prefix (e.g. PROG form of (5)), in which case the number of tones will be greater than any other form in that verb's paradigm which either do not have a prefix or whose prefix is non-syllabic.

4. Prefix series

In the previous section we showed that verbs select different affixes for building their four aspectual forms. Verbs can be arranged into inflectional classes according to the prefixes they select. We will refer to the set of prefixes selected by a verb as a 'prefix series'.

The data used for this paper consists of a sample of 534 verbs. The most common prefix series is represented by 181 of these verbs (~34%), and we treat these verbs as belonging to *prefix series 1*. Verbs belonging to prefix series 1 do not take a prefix in the POT or CPL, while they take the prefix YI- in the PROG and N- in the PRF, as represented in Table 5.

Table 5. Prefix series 1

	POT	PROG	CPL	PRF
Prefix series 1	Ø	YI	Ø	N

The prefixes here are given in uppercase letters to indicate that they are the underlying prefixes, since prefixes in Cuicatec may be subject to allomorphy. When this type of morphological variance can be accounted for by morphophonology, we treat the prefix series as a macro-series that may be made up of more than one micro-series. By way of example, prefix series 3 is presented in Table 6. Here, the underlying prefixes (KU, YI, CHI and NDI), are given in uppercase letters, with the morphophonologically-motivated micro-series listed below with an example verb.

Table 6. Examples of verbs belonging to the four micro-series of prefix series 3

	POT	PROG	CPL	PRF	
3	KU	YI	CHI	NDI	
a	**ku**^{3}-ndu^{2}ku^{4}	**yi**^{3}-ndu^{2}ku^{4}	**chi**^{4}-ndu^{2}ku^{4}	**ndi-**^{2}ndu^{2}ku^{4}	'accompany'
b	**k^{w}-**^{ʔ}a^{4}nen^{1}	Ø-^{ʔ}a^{4}nen^{1}	**ch-**^{ʔ}a^{4}nen^{1}	**nd-**^{ʔ}a^{4}nen^{1}	'shave'
c	**k-**^{ʔ}**u**^{3}chi^{3}	Ø-^{ʔ}i^{3}chi^{3}	**ch-**^{ʔ}i^{4}chi^{3}	**nd-**^{ʔ}i^{2}chi^{3}	'bury'
d	**k^{w}-**a^{3}ku^{2}	**g-**a^{3}ku^{2}	**ch-**a^{4}ku^{4}	**nd-**a^{2}ku^{3}	'cry'

We will now take each micro-series in turn and explain why we take them to represent the same prefix series. Series 3a displays the archetypal forms of prefix series 3 in that all four forms display the fully realised prefixes.

Series 3b displays reduced, non-syllabic prefixes in all forms except the PROG. This phonological reduction can easily be accounted for when we note that the same pattern is repeated on all verbs where the stem begins with a laryngealized vowel. With regard to the absence of a prefix in the PROG form, again, this holds for all stems beginning with a laryngealized vowel and thus we are able to say that *Ø-* is an allomorph of *yi-*, with which it is in complementary distribution.

Series 3c is identical in most respects to series 3b, except that the vowel of the prefix *ku-* replaces the initial vowel of the stem. While this behaviour is typical of verbs beginning with a laryngealised /ʔi/, there are exceptions to this, thus we are unable to treat this as an automatic phonological change. Nevertheless, it is clear that it is the phonological shape of the prefix that is affecting the stem and therefore it can still be considered a micro-series of prefix series 3.

Series 3d follows the same principles as Series 3b, except that verbs belonging to this micro-series have a vowel-initial stem, rather than beginning with a laryngealized vowel. The PROG prefix in vowel-initial verbs is realised as *g-*, which is in complementary distribution with *yi-* and *Ø-*.

Having explained the methodology behind our division of Cuicatec verbs into different prefix series, in Table 7 we present the 14 different inflectional classes we identify, according to the prefix series they select. We indicate the number of verbs which belong to each series in the final column. Note that some series are instantiated by a single verb.

Table 7. Example verbs from the 14 inflectional prefix series

	POT	PROG	CPL	PRF	
1	Ø	YI	Ø	N	(181)
	na⁴nde⁴	**yi**⁴-na⁴nde⁴	na⁴nde⁴	**n**-na²nde⁴	'converse'
2	Ø	YI	Ø	Ø	(138)
	nti³vi²	**yi**³nti³vi²	nti⁴vi⁴	nti²³vi²	'turn on'
3	KU	YI	CHI	NDI	(52)
a	**ku**³-ndu²ku⁴	**yi**³-ndu²ku⁴	**chi**⁴-ndu²ku⁴	**ndi**-²ndu²ku⁴	'accompany'
b	**k**ʷ-ʔa⁴nen¹	ʔa⁴nen¹	**ch**-ʔa⁴nen¹	**nd**-ʔa⁴nen¹	'shave'
c	**k**-ʔ**u**³chi³	ʔi³chi³	**ch**-ʔi⁴chi³	**nd**-ʔi²chi³	'bury'
d	**k**ʷ-a³ku²	**g**-a³ku²	**ch**-a⁴ku⁴	**nd**-a²ku³	'cry'
4	KU	YI	CHI	N	(37)
a	**ku**³-nda³va³	**yi**³-nda³va³	**chi**⁴-nda³va³	**n**-na²³va³	'fall over'
b	**k**ʷ-ʔe³nu³	ʔe³nu³	**ch**-ʔe⁴nu³	**n**-ʔe²nu³	'occur'
c	**k**-ʔ**u**²ne²	ʔi²ne²	**ch**-ʔi⁴ne⁴	**n**-ʔi²ne²	'grind'
d	**k**ʷ-e²nu²	**g**-e²nu² (²)	**ch**-e⁴nu⁴	**n**-e²nu²	'spy'
5	KU	YI	CHI	NI	(8)
	ku²-ne²	**yi**²-ne²	**chi**⁴-ne⁴	**ni**²-ne²	'ripen'
6	KU	YI	CHI	NU	(8)
	ku⁴-ndʔi¹⁴	**yi⁴**-ndʔi¹⁴	**chi⁴**-ndʔi¹⁴	**nu²**-ndʔi¹⁴	'cover'
7	KA	YI	CHI	NDI	(26)
a	**ka**³-kʔa²ca²	**yi**³-kʔa²ka²	**chi**⁴-kʔa⁴ka³	**ndi**²-kʔa²ka²	'drive'
b	**k**-ʔ**a**³ka³	ʔi³ka³	**ch**-ʔi⁴ka³	**nd**ʔ-i²ka³	'cut'
c	**k**-a⁴tu⁴	**g**-a³tu³	**ch**-a⁴tu³	**nd**-a³tu³	'fracture'
8	KA	YI	CHI	N	(25)
a	**ka**⁴-ndʔi⁴chi⁴	**yi**⁴-ndʔi⁴chi⁴	**chi**⁴-ndʔi⁴chi⁴	**n**-nʔi²chi¹	'see'
b	**k**-ʔ**a**³nga¹⁴	ʔi³nga¹⁴	**ch**-ʔi⁴nga¹⁴	**n**-ʔi²nga¹⁴	'spill'
c	**k**-**a**²nu⁴	**g**-e²nu⁴ (²)	**ch**-e²nu⁴	**n**-e²nu⁴	'run'
9	KA	YI	CHI	NI	(5)
	ka²-n̲dʔi⁴ya⁴	**yi**²-n̲dʔi⁴ya⁴	**chi**²-n̲dʔi⁴ya⁴	**ni**²-n̲dʔi⁴ya⁴	'frighten'
10	KA	YI	CHI	Ø	(3)
	ka⁴-nne⁴	**yi**⁴-nne⁴	**chi**⁴-nne⁴	nne²⁴	'speak'
11	KU	YI	KA	NDI	(7)
a	**k**ʷ-a¹tʔun⁴	**g**-a¹tʔun⁴	**k**-a¹tʔun⁴	**nd**-a¹tʔun⁴	'swallow'
b	**k**ʷ-ʔa⁴	ʔa⁴	**k**-ʔa⁴	**nd**-ʔa⁴	'call'
12	KU	YI	KA	N	(19)
a	**ku**⁴-chi⁴ka³	**yi**⁴-chi⁴ka³	**ka**⁴-chi⁴ka³	**n**-chi⁴ka¹	'stroll'
b	**k**ʷ-ʔan²	ʔan²	**k**-ʔan⁴	**n**-ʔan²	'accept'
c	**k**ʷ-an⁴	**g**-an⁴	**k**-an⁴	**n**-an⁴	'scratch'
13	KA	YI	{POT}	N+{POT}	(15)
a	**k**-u³vi³	**g**-u³vi³	**k**-u⁴vi³	**n**-ku²³vi³	'appear'
b	**k**-ʔa²nnu⁴³	ʔa²nnu⁴³	**k**-ʔa²nnu⁴³	**n**-kʔa²nnu⁴³	'fold'
14	{CPL}	YI	CHI	N+{CPL}	(9)
	ch-o²nda̲¹⁴	**g**-o²nda̲¹⁴	**ch**-o⁴nda̲¹⁴	**n**-cho²nda̲¹⁴	'exceed'

It is worth highlighting here that the different prefix series mainly emerge from the combination of a few alternant markers as exponents of a given value. For example, the prefixes *Ø-*, *ka-*, and *ku-* in the POT, with their respective realizations, combine with other

[2] In the original source, this form is given as *gue²nu²*, following the conventions of Spanish orthography, where *gu-* before /i/ or /e/ represent [g].

alternant markers realizing other values, such as *Ø-, chi-, ka-* and *ku-* in the CPL. There is also a degree of syncretism in prefixes series, such as ø- for POT and CPL.

Note that, in prefix series 13 and 14, the notations {POT}, {CPL} and {PRF} indicate that the inflected forms given within the braces serve as the inflectional stem of the given form, i.e. as Priscianic stems. Thus, the stem of the verb *'appear'* is vowel-initial *-uvi*, and the PROG therefore takes the allomorph *g-*, resulting in *guvi*. The POT form takes the reduced form of the prefix *ka-*, resulting in *k-uvi*. The form of the CPL, however, is (segmentally) identical to the POT, and the PRF form is, likewise, formed from the POT, but in the latter case adding the PRF prefix *n-*.

5. Introduction to inflectional tone – where should we look for it?

Having explained the basics of the segmental exponents of inflection, we are now in a position to turn to role that tone plays in Cuicatec verbal inflection. While identifying inflectional prefixes is a straightforward process of finding those parts of verb forms that were not present in all paradigm forms, analysing the tonal patterns of Cuicatec verbs is far from simple, for a number of reasons, which we will now go through one by one.

Firstly, every syllable in a Cuicatec word carries a tone, or a series of tones. Given the huge variance in tonal patterns across Cuicatec verb forms, we believe it is highly unlikely that every tone plays a role in conveying inflectional information; therefore, it is necessary to distinguish between inherent lexical tones and those tones which are exponents of inflection.

In attempting to address this issue, let us consider where, if anywhere, inflectional tone might present itself on a verb form. Since Cuicatec verb stems are overwhelmingly bisyllabic there are three obvious positions to consider: (i) the inflectional prefix, (ii) the first syllable of the stem and (iii) the second syllable of the stem.

It is clearly plausible to think that aspectual prefixes might bear inflectional tone since they are, by their very nature, involved in the inflection of the verb. However, this raises the question of what happens when the prefix is either non-syllabic or absent. The first syllable of the stem is also a potential candidate as a host for inflectional tone, but then how should we treat forms that do have a tone-bearing prefix? Of the three positions in a verb form which we are considering as potential hosts for inflectional tone, we consider the second syllable of the stem to be the least likely. The reason for this is because the second syllable of the stem is associated with person marking, as we have already encountered in Section 2. In this paper we therefore consider both the tones of any prefix, together with the first tone of the stem.

Secondly, given the fact that aspectual prefixes may, on the one hand, be syllabic and thus tone-bearing, while on the other hand they may be non-syllabic or absent and thus unable to bear tone, it is important to establish which tone in a given verb form corresponds to the same tone in the corresponding form of another verb. To illustrate the importance of establishing the relevant tone, consider the examples presented below in Table 8 (prefixes are indicated in bold typeface).

Table 8. Illustration of the tone patterns which arise from both prefixes and stems

	POT	PROG	CPL	PRF	
(1)	**ku**^{3}di^{2}	**yi**^{3}di^{2}	**chi**^{4}di^{3}	**ndi**^{2}di^{3}	'fondle'
PREFIX	3	3	4	2	
STEM	2	2	3	3	
(2)	**ku**^{4}di^{3}nu^{3}	**yi**^{4}di^{3}nu^{3}	**chi**^{4}di^{3}nu^{3}	**n̲**di^{23}nu^{3}	'be encouraged'
PREFIX	4	4	4	–	
STEM	3	3	3	23	
(3)	nte^{2}	**yi**^{3}nte^{2}	nte^{4}	nte^{2}	'restore'
PREFIX	–	3	–	–	
STEM	2	2	4	2	
(4)	**k-**ʔa^{2}ka^{2}	ʔi^{2}ka^{2}	**ch-**ʔi^{4}ka^{3}	**nd-**ʔi^{2}ka^{2}	'clap'
PREFIX	–	–	–	–	
STEM	2	2	4	2	

In example (1), we can either consider the tones of the prefix, giving a pattern 3~3~4~2, or those of the stem, giving us a tone pattern across the four forms of 2~2~3~3. In example (2), although all four forms have a prefix, three of these are syllabic and carry a tone, whereas the fourth is non-syllabic, so we can either consider the tones of the first syllable of each stem, giving 3~3~3~23, or alternatively simply consider the first tone of each inflected form, which corresponds to the prefix in three of these forms and to the first syllable of the stem in the PRF form, which would give the pattern 4~4~4~23. Example (3) shows a similar issue, but here only the PROG form has a prefix, and the two alternative patterns are 2~2~4~2 or 2~3~4~2. In example (4), the prefix is non-syllabic in all forms in which it is present leaving only the stem to carry tone and giving a pattern of 2~2~4~2.

In order to address the second issue, where there is no prefix present, or the prefix is non-syllabic, we represent this with '0', allowing us to align the prefix "slot" and the first syllable of the stem "slot" of all verbs with each other. This is illustrated in Table 9.

Table 9. Illustration of how tone patterns are encoded

	POT	PROG	CPL	PRF	
Verb form	cu^{3}di^{2}	yi^{3}di^{2}	chi^{4}di^{3}	ndi^{2}di^{3}	'fondle'
Prefix (3a)	cu-	yi-	chi-	ndi-	
Tone pattern	3~2	3~2	4~3	2~3	
Verb form	cu^{4}di^{3}nu^{3}	yi^{4}di^{3}nu^{3}	chi^{4}di^{3}nu^{3}	n̲di^{23}nu^{3}	'be encouraged'
Prefix (4a)	cu-	yi-	chi-	n-	
Tone pattern	4~3	4~3	4~3	**0**~23	
Verb form	nte^{2}	yi^{3}nte^{2}	nte^{4}	nte^{2}	'restore'
Prefix (2)	Ø-	yi-	Ø-	Ø-	
Tone pattern	**0**~2	3~2	**0**~4	**0**~2	
Verb form	c-ʔa^{2}ca^{2}	ʔi^{2}ca^{2}	ch-ʔi^{4}ca^{3}	nd-ʔi^{2}ca^{2}	'clap'
Prefix (7b)	c-	Ø-	ch-	nd-	
Tone pattern	**0**~2	**0**~2	**0**~4	**0**~2	

Thirdly, it is possible that there are word-internal prosodic changes that render otherwise transparent patterns opaque. Tones may spread from one syllable to another within the same word, in much the same way as vowel-harmony, or a given word may block the application of an inflectional tone. Unfortunately, it is not possible to answer all these questions with the limited data we have access to, but it is important to bear these possibilities in mind while analyzing tonal inflection.

6. Tonal patterns

As no previous analysis of Cuicatec verbal inflection exists, it is unclear if inflectional prefixes and tone interact with each other. We thus look at the behavior of tone within the context of the aspectual prefixes. In doing so, we attempt to ascertain, firstly, if tone is conveying any inflectional information and, secondly, if there is any correlation between inflectional prefixes and tonal patterns.

The second issue raised in section 5 concerned the fact that aspectual prefixes may be realized in one of three phonological 'shapes' – i.e. as syllabic, non-syllabic or zero prefixes. We also showed in section 4 that a single (macro) prefix series can consist of micro-series which exhibit different prefix shapes, dependent on the phonological shape of the verb stem. Thus, in order to analyze the behavior of tones within the context of the aspectual prefixes, we begin by assigning each micro-series to one of four groups based on the phonological shapes of their prefixes. The characteristics of the four groups are outlined below in Table 10. Tables showing the prefix series which belong in each group will also be given in the relevant sections.

Table 10. Prefix shapes of verbs belonging to Groups 1–4

	POT	PROG	CPL	PRF	#	%
Group 1	–	CV-	–	C- / –	319	59.7
Group 2	C-	C-	C-	C-	143	26.8
Group 3	CV-	CV-	CV-	CV-	42	7.9
Group 4	CV-	CV-	CV-	C-	30	5.6
					534	100.0

We take each group of verbs in turn, starting with Group 1. The reason for choosing to begin with verbs belonging to Group 1, as opposed to Group 3, for example, which might appear a more obvious starting point given the presence of syllabic prefixes in all forms, is due to the fact that Group 1 contains the largest number of verbs (319 or ~60%) and therefore any patterns we observe in this set of data are more likely to be statistically significant.

Groups 2–4 are instantiated by significantly fewer verbs and these are thus dealt with following our analysis of Group 1 verbs. Group 2 consists of verbs with a non-syllabic prefix in all forms (including verb forms with the Ø- allomorph in the PROG); Group 3 consists of verbs with a syllabic prefix in all forms; and Group 4 consists of verbs with a syllabic prefix in the POT, PROG and CPL, and a non-syllabic prefix in the PRF.

6.1. Tonal patterns of Group 1

As explained in the preceding section, Group 1 verbs display the prefix shapes presented in Table 11. Only two micro-prefix series (Series 1 and 2) follow this pattern, although they account for a large proportion of Cuicatec verbs (319 verbs or ~60%). In this section, and

those which follow, a schematic representation of the micro-prefix series which belong to each group will be presented (example verbs for each micro-series are presented in section 4).

Table 11. Schematic representation of micro-prefix series belonging to Group 1

	POT	PROG	CPL	PRF	#
Group 1	**–**	**CV-**	**–**	**C- / –**	319
Series 1	Ø–	yi–	Ø–	n–	
Series 2	Ø–	yi–	Ø–	Ø–	

The 319 verbs which belong to Group 1 display a large number of tonal patterns, which are presented in Table 12. These are arranged according to a number of observed patterns. Since only the PROG form has a prefix, in Group 1 we compare the tone of the first syllable of the stem across all four forms. In the following paragraphs we outline the patterns which we observe.

The first pattern which emerges from the data is that in all but fourteen verbs, out of a possible 319, the tone of the first syllable of the POT stem is identical to the corresponding tone of the PROG. Looking across all four paradigm forms we can also see that a small number of verbs are invariable with regards to the first tone of the stem (labeled as 'Invariable' in Table 12), but since this only applies to 29 verbs it is by no means the norm.

Turning our attention to the CPL, we see that 249 forms out of a possible 319 bear either tone 4, or begin with a tone 4. In the PRF, 299 forms either bear tone 2 or begin with tone 2. Verbs which follow both these patterns are listed in Table 12 as belonging to one of the A sets.

Looking more closely at those forms that *begin* with a tone 4 or tone 2, we can see that in most cases the following tone(s) mirror(s) the tones seen in the POT/PROG. From these observations we deduce that the CPL is primarily associated with tone 4 and the PRF is primarily associated with tone 2. We also deduce that this tone can either replace the tone of the POT/PROG (which we refer to as 'replacive tone', e.g. 0~**2** in POT → 0~**4** in CPL) or be added to the tone of the POT/PROG (which we refer to as ADDITIVE TONE, e.g. 0~**3** in POT → 0~**43** in CPL)[3].

Also worth noting here is that a single verb may exhibit both replacive and additive tone in its paradigm. In Table 12, verbs which only display replacive tone are listed as set A1, verbs which display both replacive and additive tone are set A2 and those which only display additive tone are listed as set A3.

The fact that the tones of the POT and PROG are the same in almost all verbs, coupled with the fact that these tones are sometimes retained in the CPL and PRF (in cases of additive tone) allows us to further deduce that the POT/PROG tone is an inherent lexical tone of the verb.

[3] In those cases where tone 4 (CPL) or tone 2 (PRF) is not followed by an exact copy of the POT/PROG tone, a simple explanation for why this does not happen is usually easy to find. For example, when a tone 4 appears before the POT/PROG tone 43, this is not represented as 443, since the internal moraic structure of syllables is not reflected in tone marking in Cuicatec, thus a bimoraic syllable bearing tone 4, although phonetically it might be better represented with 44, is instead represented only with 4. Thus, a tone 4 associated with the CPL, when added to tone 43 of the POT/PROG, would be represented as 43. We are, however, unable to be completely certain that verb entries in the dictionary displaying tone 43 in the POT/PROG and 43 in the CPL are, in fact, realized phonetically as 443 in the CPL, but we deduce this from the following two observations. Firstly, the fact that tone 4 and tone 2 are so common in the CPL and PRF forms, respectively, leads us to believe that despite being rendered opaque in some cases, there is nevertheless an additional tone 4 or 2 present. Secondly, in those verbs where the addition of a tone 4 in the CPL is only assumed, rather than given, the corresponding PRF forms do display the expected additional tone 2 (see A3 in Table 12).

The final observations to be made about the data in Table 12 is that 35 verbs (or just over ten percent of Group 1 verbs) adhere to the observations above, except that the tone of the CPL is 3; these are listed in the rows marked B1 and B2 (B1 showing only those verbs displaying replacive tone, B2 showing those verbs which involve additive tone). In a similar fashion, another small subset of verbs display tone 1 in the PRF, but adhere to the above observations in all other respects; these are labeled as set C. Finally, 14 verbs are irregular with respect to at least one of the above observations and are listed as 'Other'.

*Table 12***.** The tonal patterns of verbs belonging to Group 1

		POT	PROG	CPL	PRF	Count
A	A1	0~**2**	3~**2**	0~**4**	0~**2**	56
		0~**4**	4~**4**	0~**4**	0~**2**	54
		0~**3**	3~**3**	0~**4**	0~**2**	18
		0~**2**	2~**2**	0~**4**	0~**2**	2
	A2	0~**4**	4~**4**	0~**4**	0~**24**	52
		0~**3**	3~**3**	0~**4**	0~**23**	25
		0~**32**	3~**32**	0~**4**	0~**232**	1
		0~**43**	4~**43**	0~**4**	0~**243**	1
	A3	0~**43**	4~**43**	0~**43**	0~**243**	10
		0~**3**	3~**3**	0~**43**	0~**23**	9
		0~**32**	3~**32**	0~**43**	0~**232**	2
		0~**42**	4~**42**	0~**42**	0~**242**	1
B	B1	0~**3**	3~**3**	0~**3**	0~**2**	5
		0~**2**	3~**2**	0~**3**	0~**2**	4
	B2	0~**3**	3~**3**	0~**3**	0~**23**	22
		0~**3**	4~**3**	0~**3**	0~**23**	4
C		0~**3**	3~**3**	0~**4**	0~**1**	5
		0~**32**	3~**32**	0~**4**	0~**1**	3
		0~**2**	3~**2**	0~**4**	0~**1**	2
Invariable		0~**2**	2~**2**	0~**2**	0~**2**	8
		0~**24**	2~**24**	0~**24**	0~**24**	8
		0~**1**	3~**1**	0~**1**	0~**1**	7
		0~**2**	3~**2**	0~**2**	0~**2**	3
		0~**3**	4~**3**	0~**3**	0~**3**	1
		0~**14**	3~**14**	0~**14**	0~**14**	1
		0~**24**	3~**24**	0~**24**	0~**24**	1
Other		0~**2**	3~**2**	0~43	0~**2**	2
		0~**2**	3~**2**	0~**4**	0~24	1
		0~2	4~3	0~**3**	0~23	1
		0~2	3~3	0~2	0~2	1
		0~**3**	3~**3**	0~**4**	0~24	1
		0~**3**	4~**3**	0~**3**	0~24	1
		0~23	3~3	0~**3**	0~23	1
		0~24	3~34	0~34	0~24	1
		0~**3**	3~**3**	0~**43**	0~12	1
		0~2	3~3	0~**4**	0~**2**	1
		0~3	3~2	0~**4**	0~**2**	1
		0~4	3~3	0~**4**	0~**2**	1
		0~2	3~3	0~**3**	0~**2**	1
					Total	319

In Table 12 shows all surface tone patterns of Group 1 verbs. However, taking into account lexical tone, we would no longer want to consider a verb with lexical tone 2 any differently to a verb with a lexical tone 3, for example, if they pattern in the same way with regards their

inflection. We are therefore able to simplify Table 12 in Table 13 (disregarding the 14 verbs listed under 'Other').

Table 13. The tonal patterns of verbs belonging to Group 1

		POT	PROG	CPL	PRF	Count
A	A1	0~lex	3~lex	0~**4**	0~**2**	74
		0~lex	4~lex	0~**4**	0~**2**	54
		0~lex	2~lex	0~**4**	0~**2**	2
	A2	0~lex	4~lex	0~**4**	0~**2**/lex	53
		0~lex	3~lex	0~**4**	0~**2**/lex	26
	A3	0~lex	4~lex	0~**4**/lex	0~**2**/lex	11
		0~lex	3~lex	0~**4**/lex	0~**2**/lex	11
B	B1	0~lex	3~lex	0~**3**	0~**2**	9
	B2	0~lex	3~lex	0~**3**	0~**2**/lex	22
		0~lex	4~lex	0~**3**	0~**2**/lex	4
C		0~lex	3~lex	0~**4**	0~**1**	10
Invariable		0~lex	2~lex	0~lex	0~lex	16
		0~lex	3~lex	0~lex	0~lex	12
		0~lex	4~lex	0~lex	0~lex	1
					Total	305

By disregarding the tone of the prefix in the PROG this table can be further simplified to provide the summary presented in Table 14. The motivation for a verb displaying either replacive or additive tone requires further investigation and, therefore, both these sub-types have been conflated in Table 14.

Table 14. Summary of patterns observed in Table 13

	POT	PROG	CPL	PRF	Count	Percent
A	LEX	LEX	4	2	231	72.4%
B	LEX	LEX	3	2	35	11.0%
C	LEX	LEX	4	1	10	3.1%
Invariable	LEX	LEX	LEX	LEX	29	9.1%
Other	X	X	X	X	14	4.4%
				Total	319	100%

Table 14 shows that the general observations made about the tonal patterns in Group 1 hold true for 72% of verbs (Pattern A). The patterns which differ only in the marking of either the CPL or PRF (Patterns B and C) hold true for a further 14% of verbs, invariable verbs account for around 9% of verbs, leaving less than 5% of verbs which appear to be irregular.

For clarity, we end Section 6.1 with a list of the observations made with respect to Group 1 verbs:

1) Tone 4 is an exponent of inflection in the CPL.
2) Tone 2 is an exponent of inflection in the PRF.
3) The tones in the POT and PROG forms are lexical tones.
4) Inflectional tones can either replace, or be added to, lexical tones.

We will now turn our attention to seeing if the same generalizations can be made about verbs which belong to Groups 2–4.

6.2. Tonal patterns of Group 2

In Group 2 we consider verbs that either have a non-syllabic prefix or a zero-prefix in all forms. There are 143 verbs which follow this structural pattern, belonging to the 17 micro-prefix series presented in Table 15.

Table 15. Schematic representation of micro-prefix series belonging to Group 2

	POT	PROG	CPL	PRF	#
Group 2	**C-**	**C-**	**C-**	**C-**	143
Series 3b	k^w–	Ø–	ch–	nd–	
Series 3c	k– (+u)	Ø–	ch–	nd–	
Series 3d	k^w–	g–	ch–	nd–	
Series 4b	k^w–	Ø–	ch–	n–	
Series 4c	k– (+u)	Ø–	ch–	n–	
Series 4d	k^w–	g–	ch–	n–	
Series 7b	k– (+a)	Ø–	ch–	nd–	
Series 7c	k–	g–	ch–	nd–	
Series 8b	k– (+a)	Ø–	ch–	n–	
Series 8c	k– (+a)	g–	ch–	n–	
Series 11a	k^w–	g–	k–	nd–	
Series 11b	k^w–	Ø–	k–	nd–	
Series 12b	k^w–	Ø–	k–	n–	
Series 12c	k^w–	g–	k–	n–	
Series 13a	k–	g–	k–	n+k–	
Series 13b	k–	Ø–	k–	n+k–	
Series 14	ch–	g–	ch–	n+ch–	

Table 16. The tonal patterns of verbs with a non-syllabic prefix in all forms

		POT	PROG	CPL	PRF	Count
A	A1	0~lex	0~lex	0~**4**	0~**2**	42
	A2	0~lex	0~lex	0~**4**	0~**2**/lex	9
	A3	0~lex	0~lex	0~**4**/lex	0~**2**/lex	3
	A4	0~lex	0~lex	0~**4**/lex	0~**2**	4
B	B1	0~lex	0~lex	0~**3**	0~**2**	15
	B2	0~lex	0~lex	0~**3**	0~**2**/lex	3
Invariable		0~4	0~4	0~**4**	0~**4**	57
Other		0~3	0~3	0~**4**	0~3	2
		0~3	0~3	0~1	0~**2**	1
		0~2	0~2	0~**3**	0~**2**3	1
		0~34	0~34	0~**34**	0~**2**4	1
		0~2	0~3	0~**4**	0~**2**	1
		0~3	0~1	0~**4**	0~**2**	1
		0~4	0~3	0~4	0~3	1
		0~4	0~3	0~43	0~2	2
					Total	143

Table 16 presents the tone patterns found organized and labeled in a similar way as in the preceding section. That is, A1 verbs which have a replacive tone 4 and 2 in the CPL and PRF, respectively; A2 verbs differ from A1 in that the tone is additive PRF; A3 verbs show additive tone in both the CPL and PRF, B1 and B2 verbs are divided in the same manner except that the tone in the CPL is 3, and C verbs have tone 1 in the PRF. Again, we have represented those tones we believe to be lexical as LEX, allowing us to reduce the number of apparent patterns. In this table it was necessary to add a new pattern, not seen in Group 1 verbs, namely Pattern A4. These verbs display an additive tone in the CPL, but a replacive tone in the PRF. A summary of the patterns in Table 16 is presented below in Table 17.

Table 17. Summary of patterns observed in Table 16

	POT	PROG	CPL	PRF	Count	Percent
A	LEX	LEX	4	2	58	40.5%
B	LEX	LEX	3	2	18	12.6%
C	LEX	LEX	4	1	0	0.0%
Invariable	LEX	LEX	LEX	LEX	57	39.9%
Other	X	X	X	X	10	7.0%
				Total	143	100%

In general, Group 2 verbs do not adhere quite as well to our observations as we might have predicted, with only 40% of verbs following Pattern A. However, the most striking difference observed here is the significant number of verbs which are invariable with respect to tone alternations, amounting to almost 40% of this sample.

A simple explanation for this large number of invariable verbs, which would not be a valid argument for the previous two groups under analysis, is the fact that all paradigm forms of Group 2 verbs require an aspectual prefix. Since there is already a four-way distinction at the segmental level, one could hypothesize that the large number of invariable verbs with respect to tone is due to tone no longer being required to play a role in differentiating between different inflectional forms.

Thus, by taking Pattern A and invariable verbs together we are able account for 80% of our sample of Group 2 verbs. Let us now consider Groups 3 and 4.

6.3. Tonal patterns of Group 3

In Group 3 we consider verbs that have a syllabic prefix in all forms. There are only 42 verbs which follow this structural pattern, belonging to the five prefix series presented in Table 18.

Table 18. Schematic representation of micro-prefix series belonging to Group 3

	POT	PROG	CPL	PRF	#
Group 3	**CV-**	**CV-**	**CV-**	**CV-**	42
Series 3a	ku–	yi–	chi–	ndi–	
Series 5a	ku–	yi–	chi–	ni–	
Series 6	ku–	yi–	chi–	nu–	
Series 7a	ka–	yi–	chi–	ndi–	
Series 9	ka–	yi–	chi–	ni–	

The first thing we notice when looking at the tone patterns of these 42 verbs is that, in all but six of them, the tone of the first syllable of the stem is invariable across all four forms, which provides even stronger evidence than before for this being the lexical tone of the verb.

Nevertheless, tone 4 and 2 are still associated with the CPL and PRF, respectively, but these tones now appear on the prefixes. Note the adjusted notation used in presenting the patterns below in Table 19, where tone 4 (CPL) and tone 2 (PRF) appear in the prefix slot.

Table 19. The tonal patterns of verbs with a syllabic prefix in all forms

	POT	PROG	CPL	PRF	Count
A	3~lex	3~lex	**4**~lex	**2**~lex	11
	4~lex	4~lex	**4**~lex	**2**~lex	8
B	3~lex	3~lex	**3**~lex	**2**~lex	3
Invariable	2~lex	2~lex	2~lex	2~lex	3
	4~lex	4~lex	4~lex	4~lex	2
Other	2~2	2~2	4~4	2~2	5
	3~2	3~2	4~4	2~2	2
	2~4	3~4	2~4	2~4	1
	3~2	3~2	4~3	2~3	1
	3~2	3~2	4~43	2~2	1
	3~2	3~2	4~43	3~2	1
	4~2	4~2	4~2	4~4	1
	4~4	3~3	4~3	2~2	3
				Total	42

Previously, we claimed that tone 4 and tone 2 are inflectionally associated with the CPL and PRF, respectively. Having seen that these tones are associated with prefixes in those forms which have syllabic prefixes, we would make a further claim that they are *lexically* associated with the respective aspectual prefixes. When the prefix is syllabic, the tone would thus naturally appear on the prefix. However, when the prefix is reduced to a non-syllabic form, or not present, the *lexical* tone of the underlying or historic prefix shifts over to the first syllable of the stem.

This further claim fits well with other behavior we have seen in Cuicatec verbal inflection and, indeed, provides a neat explanation for at least two phenomena. Firstly, the presence of additive tone and replacive tone could be indicative of a system in flux, whereby additive tone is the first step in a process of prefix loss, leading eventually to replacive tone.

Secondly, there are no instances of additive tone seen on the prefixes of the verbs represented in Table 19, suggesting that the tone of the prefix is its inherent lexical tone and additive tone only occurs when the stem hosts the residual tone of a reduced or lost aspectual prefix.

Taking these new observations into account, we now present the distribution of tone patterns of Group 3 verbs in Table 20. Note the amended notation under the CPL and PRF columns for patterns A, B and C to account for the fact the stem tone is a lexical tone in these verbs.

Table 20. Summary of patterns observed in Table 19

	POT	PROG	CPL	PRF	Count	Percent
A	LEX	LEX	4-LEX	2-LEX	19	45.3%
B	LEX	LEX	3-LEX	2-LEX	3	7.1%
C	LEX	LEX	4-LEX	1-LEX	0	0.0%
Invariable	LEX	LEX	LEX	LEX	5	11.9%
Other	X	X	X	X	15	35.7%
				Total	42	100%

The new definition of pattern A in these verbs accounts for 45% of verbs. Although this is almost half of all verbs in Group 3, it is nonetheless significantly less than the percentage of verbs which pattern A accounted for in Groups 1 and 2. The main reason for this lower percentage is due to the large number of verbs which do not adhere to any pattern and might instead be seen as irregular. But again, it goes without saying that in paradigms that are maximally distinctive at the segmental level, the reliance on tone for marking paradigmatic distinctions becomes unnecessary, which might perhaps explain the greater number of verbs in this group which display some other minor pattern.

6.4. Tonal patterns of Group 4

In Group 4 we consider verbs that have a syllabic prefix in all forms, except the PRF. There are 30 verbs which follow this structural pattern, belonging to the four prefix series presented in Table 21. The tonal patterns observed in these verbs are given in Table 22.

Table 21. Schematic representation of micro-prefix series belonging to Group 4

	POT	PROG	CPL	PRF	#
Group 4	**CV-**	**CV-**	**CV-**	**C-**	30
Series 4a	ku–	yi–	chi–	n–	
Series 8a	ka–	yi–	chi–	n–	
Series 10	ka–	yi–	chi–	Ø–	
Series 12a	ku–	yi–	ka–	n–	

Table 22. The tonal patterns of verbs with a syllabic prefix in the POT, PROG, PRF

		POT	PROG	CPL	PRF	Count
A	A1	4~lex	4~lex	**4**~lex	0~**2**	2
	A2	3~lex	3~lex	**4**~lex	0~**2**/lex	4
		4~lex	4~lex	**4**~lex	0~**2**/lex	7
C	C1	4~lex	4~lex	**4**~lex	0~**1**	3
	C2	4~lex	4~lex	**4**~lex	0~**1**/lex	2
		3~lex	3~lex	**4**~lex	0~**1**/lex	2
Invariable		4~lex	4~lex	4~lex	0~lex	3
Other		4~2	4~2	4~2	0~4	1
		4~3	4~3	4~3	0~4	1
		4~43	4~43	4~43	0~41	2
		4~4	4~4	4~14	0~4	1
		2~2	2~2	2~24	0~24	1
		4~24	4~14	4~14	0~14	1
					Total	30

Despite being such a small group of verbs, the tone patterns provide real support for the hypotheses already discussed. In this group of verbs, tone 4 in the CPL is again associated with the aspectual prefix, in all but one verb. The PRF, however, either has a non-syllabic prefix or no prefix in these verbs, and it is therefore no surprise that these verbs adopt the strategy already seen in Groups 1–3 in which tone 2 appears on the first syllable of the stem. Again, this may either involve replacing the lexical tone (A1) or being added to it (A2), corroborating our hypothesis yet further. We also see instances of verbs taking tone 1 in the

PRF (C1, C2), which we have also seen previously. Table 23 summarizes the distribution of patterns in Group 4 verbs.

Table 23. Summary of patterns observed in Table 22

	POT	PROG	CPL	PRF	Count	Percent
A	LEX	LEX	4-LEX	2	13	43.4%
B	LEX	LEX	3-LEX	2	0	0.0%
C	LEX	LEX	4-LEX	1	7	23.3%
Invariable	LEX	LEX	LEX	LEX	3	10.0%
Other	X	X	X	X	7	23.3%
				Total	30	100%

Here we see that pattern A accounts for 43% of Group 4 verbs, a similar figure to that seen with Group 3 verbs. In this case, however, pattern C accounts for a further 23% of verbs, bringing the total of verbs accounted for by patterns A–C to 66%. Again, there is also a relatively high proportion of irregular verbs.

7. Conclusion

As it will have become apparent, Cuicatec verbal inflection is complex. This is due, first and foremost, to the significant number of prefix series and tonal patterns that exist. These two systems cross-cut each other and, in doing so, the number of unique inflectional classes is multiplied. However, it is also due to the fact that the two systems of prefixes and tone are so intertwined with each other that one cannot be divorced from the other, but instead both must be looked at together if one is to disentangle, at least to a degree, the tonal inflection of Cuicatec.

Indeed, a number of noteworthy observations made in this paper may never have come to light had we looked at the tonal patterns of Cuicatec verbs in isolation, without paying heed to the segmental realization of the verb forms. For example, our observations about tone 4 being an inflectional tone used to mark the CPL, and tone 2 to mark the PRF, became clear when we looked at verbs which do not have a syllabic prefix in these forms, while the notion that these tones are lexically associated with a syllabic prefix only became apparent when looking at Group 3 verbs in isolation.

In summary, then, we present the following as our hypothesis regarding the synchronic role of tone in Cuicatec verbal inflection:

- Tone 4 is lexically associated with the CPL prefix (or tone 3 in a subset of verbs).
- Tone 2 is lexically associated with the PRF prefix (or tone 1 in a subset of verbs).
- When a non-syllabic prefix is present in CPL/PRF, these tones are hosted by the first syllable of the verbal stem. As a result, the prefix and tone are co-exponents of inflection.
- If no prefix is present in CPL/PRF, the tone associated with these forms is still hosted by the first syllable of the verbal stem, but in these cases tone is the sole exponent of inflection.

Taking this hypothesis, together with the possible explanation for the co-existence of replacive and additive tone which we alluded to earlier, we arrive at the following hypothesis regarding the possible diachronic development of verbal inflection in Cuicatec:

Stage 1. Verbal aspect is marked by means of syllabic prefixes, which carry lexical tone.
Stage 2. Prefixes become phonologically reduced to non-syllabic prefixes, and the lexical tone of the aspectual prefix shifts onto the stem (additive tone).
Stage 3. Additive tone is later reanalyzed as replacive.
Stage 4. The tone now appearing on the stem is reanalysed as an exponent of inflection.
Stage 5. Aspectual prefixes are lost due to the presence of dual exponents of inflection.
Stage 6. Verbal aspect is marked solely by tone.

This hypothesis illustrates how a language may go from marking aspect solely by means of prefixes to marking it solely by tone. As we have seen, Cuicatec uses both prefixes and tone in its verbal inflection and, thus, we would suggest that Cuicatec is currently in the process of moving towards Stage 6. Furthermore, it would appear that certain verbs are further along in this sequence of events than others, which in turn provides an explanation for the high degree of internal complexity which we observe in Cuicatec.

On the contrary, we should be clear that we have no issues with accepting that the human mind is capable of handling incredibly complex inflectional systems, such as those seen in the Oto-Manguean languages, and it is of course possible for a language to have multiple exponents of inflection acting as systems which are orthogonal to each other, like in Cuicatec. Nevertheless, is it encouraging to see that, even within such complexity, there are often patterns to be found when one searches long enough and hard enough. These patterns, in turn, might lead one to a possible explanation for the origin of the complexity and, if they do, all the better.

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Verbal inflection in Yoloxóchitl Mixtec

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1. Introduction

Mixtec is a language family that together with Cuicatec and Triqui forms the Mixtecan branch of Oto-Manguean, a large and very diverse phylum of languages spoken in Mexico. In Mixtec languages tone carries a significant functional load both in inflection and in derivation. For example, verbs in Mixtec languages have at least three main inflected forms: two aspects: incompletive (also called 'habitual', 'continuative', or even 'present') and completive (also called 'past') and one mood: irrealis (also called 'potential', or even 'future'). It is particularly common for tone alone to distinguish the irrealis and the incompletive, though tone alone may also mark the completive. Some Mixtec languages use tone productively to mark negation, as in Metlatonoc (Overholt 1961:620) and Xochapa (Stark, Johnson, and Guzmán, 2006:120). As for derivation, though no longer a productive process, tone may also be manifested in transitivity alternations as in Xochapa (Stark, Johnson, and Guzmán, 2006:118) and San Juan Colorado (Stark, Johnson, and Lorenzo 1986:168).[1] Similarly, tone is also involved in denominal adjective derivation in Chalcatongo Mixtec in what has been called the 'adjectival high' by Hinton et al. (1991) and which Macaulay (1996:64–65) considers "somewhat productive".[2] Yoloxóchitl Mixtec manifests all the preceding uses of tone: a low tone alone is an alternate way to mark the completive, a rising tone (/14/) is used to mark negation, a contrast between /1/ and /3/ tones distinguishes pairs of intransitive and transitive verbs, and a high tone marks not only in denominal adjectives but also attributive nouns and stative or resultative verbs. [3]

Despite what we consider interesting tonal and segmental alternations in marking verbal aspect and mood, there have been few studies dedicated to this characteristic of Mixtec and even fewer based on a large lexical database and corpus. In this article, we broach this topic in relation to verbal inflection in Yoloxóchitl Mixtec, a Mixtec language spoken in a small cluster of villages located approximately three-and-a-half hours by car south of Acapulco along the Pacific Coast of the state of Guerrero (see map 1). We base our analysis on a large sample of 554 verbs from primary data collected by Amith and Castillo García.

[1] Note that for Yosondúa Mixtec a segmental morpheme (*x*- or *s*-) marks the transitive of intransitive/transitive pairs (Beaty de Farris et al. 2002:164). A similar segmental difference, along with tonal alternations, marks transitivity in San Juan Colorado Mixtec (Stark, Johnson, and Lorenzo 1986:167–8).

[2] Tonal variation accompanied by a final glottal stop is used to derive stative verbs in Ayutla (Hills 1990:198–9).

[3] It is not altogether unlikely that there is some historical link between the use of high tone in the production of adjectives and its function in verbal morphology to mark the incompletive aspect as well as to form stative forms (see McKendry 2013:32–34, and Macaulay 1996:65 and *passim.*).

Map 1. Location of Yoloxóchitl Mixtec in Mexico.

Yoloxóchitl Mixtec (henceforth YM) is charactized by its high number of tonal contrasts (nine basic tones and over twenty-three lexical tonal melodies on bimoraic stems [see (1) and fn. 9]) and, not unexpectedly, the almost complete absence of tonal sandhi.[4] Nevertheless, the tone of some enclitics may be conditioned by either the phonological environment (i.e., a stem-final tone affects the tone of a following enclitic) or by the syntactic environment (i.e., certain enclitics manifest a lower tone in phrase medial as opposed to phrase final position). As in other Mixtec languages, tone in YM carries a high functional load: tonal contrasts not only mark the aforementioned aspect and mood distinctions but person marking as well. After a stem final mid-high (/3/) or high (/4/), a tone /2/ encodes the first person (i.e., the subject of a predicate or the possessor of a noun). This tone is in complementary distribution with *=yu*^{1}, used to mark first person after stems that end in tone /2/ or /1/ (see §4.1). YM tone is also involved in a set of other lexico-semantic changes. One, the 'adjectival high', is reported elsewhere (in YM, for example, *yu*^{1}*u*^{4} 'stone' > *yu*^{4}*u*^{4} 'solid', *xaʔ*^{3}*an*^{2} 'fat' > *xaʔ*^{14}*an*^{2} 'greasy', and *ñuʔ*^{3}*u*^{4} 'earth' > *ñuʔ*^{4}*u*^{4} 'earth colored'). The function of other, somewhat irregular, tonal variations is not so easily defined and requires further study although many such variations seem related to the adjectivization function already mentioned. These additional tone-marked distinctions include:

- Marking of a noun as an attributive, a function particularly common in plant and animal names: *tio*^{1}*ko*^{4} 'ant' > *tio*^{14}*ko*^{3} in the compound *i*^{3}*ta*^{2} ('flower') + *tio*^{14}*ko*^{3} '*Montanoa grandifolia* DC', a plant of the Asteraceae family known for its pungent 'ant-like' smell, and *tio*^{4}*ko*^{4} in the compound *ña*^{1}*ña*^{4} + *tio*^{4}*ko*^{4} ('ant eater'); *tiʔ*^{1}*ĩ* ^{4} 'skunk' > *tiʔ*^{4}*ĩ*^{4} in the compound *yu*^{3}*ba*^{2} ('edible green') + *tiʔ*^{4}*ĩ*^{4} '*Solanum nigrescens* M. Martens & Galeotti', an edible plant of the Solanaceae family; *yu*^{3}*ku*^{4} 'hill' > *yu*^{1}*ku*^{4} in the compound *ki*^{3}*ni*^{2} ('pig') + *yu*^{1}*ku*^{4} 'wild boar'; and finally *i*^{3}*su*^{2} 'deer' >

[4] One of the rare examples of possible sandhi is the sequence *kuʔun*^{1} ('go' [IRR]) + verb with initial tone /3/, which shows a lowering of the initial tone of the verb: *kuʔũ* ^{1} + *ku*^{3}*chi*^{3} ('bathe') → *kuʔũ* ^{1} *ku*^{1}*chi*^{3} ('go to bathe'). Interestingly, the Mixtec of Cuanacaxtitlan, a closely related neighboring village about 5 km southeast of Yoloxóchitl, manifests sandhi in some cases. For example, Christian DiCanio observed that at least in some cases word-final high tones (/4/) spread to low (/1/) initial tones on following words. Thus *ku*^{1}*mi*^{4} ('four') followed by *ka*^{1}*ta*^{1} ('sugar press [trapiche]') is realized as *ku*^{1}*mi*^{4} *ka*^{1}*ta*^{1} in Yoloxóchitl but *ku*^{1}*mi*^{4} *ka*^{4}*ta*^{1} in Cuanacaxtitlan. The extent of this tone spreading (i.e., whether all word-final high tones spread to a low initial tone on a following word or whether this phenomenon may be lexically determined) still needs to be investigated.

i^4su^4 in the compound ko^1o^4 (‘snake’) + i^4su^4 ‘boa’ (‘deer snake’ is a common Mesoamerican calque).[5]

- Irregular adjectival/nominal marking: $la?^4la^1$ ‘worn-out (bags, hammocks)’ > $la?^{14}la^1$ ‘worn-out clothes’.
- Marking of scale: $bi^1xĩ^3$ ‘cold’ ~ $bi^1xĩ^1$ ‘lukewarm’.
- Marking of the characterization of time periods: sa^1bi^4 ‘rain’ > sa^4bi^4 ‘rainy season’.
- Different modification functions: $ti^1ka^1yu^1$ ‘jet’ as a modifier used only with nda^4a^4 ‘black’' to indicate ‘jet black’ and in $ti^4ka^1yu^1$ ‘carbonized’ (as in a heavily burnt tortilla).

Despite the rich and unexplored occurrence of tonal alternations in derivational morphology, in this paper we limit our study of tone to the marking of mood and aspect on verbs, a marking that manifests a fairly high degree of morphological regularity. That is, specific tones are consistently associated to specific aspect/mood values. Section 2 presents a brief overview of YM. The following section begins with a summary presentation of YM segmental and autosegmental phonology. It continues with a discussion of the role of tone in YM inflectional and derivational morphology and patterns of tonal allophony that are dependent on phonological and morphosyntactic factors. Section 4 presents patterns of tonal variation related to verbal inflection in the irrealis, incompletive, completive and negative irrealis. We examine both tonal marking and segmental alternations. This study ends, section 5, by comparing YM verbal inflection to that found in closely related Xochapan Mixtec (state of Guerrero) and that of the more distantly related San Juan Colorado Mixtec (state of Oaxaca). As a result of this comparison we suggest the possibility of a regional pattern of verbal inflection through tone that typifies Guerrero Mixtec.

2. Yoloxóchitl Mixtec

Mixtec is here considered to be a language *family*, part of a larger unit, Oto-Manguean, that Suárez [1983:26] considers to be a ‘hyper-family’ or a ‘stock’. Mixtecan languages (spoken in Oaxaca [156 municipalities], Guerrero [13 municipalities], and Puebla [10 municipalities]) are highly varied internally, the result of approximately 2,000 years of diversification. Estimates of the number of Mixtec languages vary (*Ethnologue* lists 53, Smith Stark [1995] mentions 45; Suárez (1983) estimates about 29 distinct languages; Bradley and Hollenbach [1988:1] suggest “perhaps twenty mutually unintelligible languages”). Likewise, the criteria utilized for such determinations also vary: mutual intelligibility is favored by SIL and *Ethnologue*; others (e.g., Josserand, 1983) compare lexicon and morphology in establishing isoglosses.

Following Josserand (1983), Mixtec languages are now commonly organized into five branches, represented in figure 1. Recognition of this internal diversity is not recent. The first grammarian of Mixtec, Fray Francisco de Alvarado, already remarked on the internal diversity of the family in his grammar of 1593.

[5] For calques, see Campbell, Kaufman, and Smith-Stark (1986) and Smith-Stark (1982, 1994)

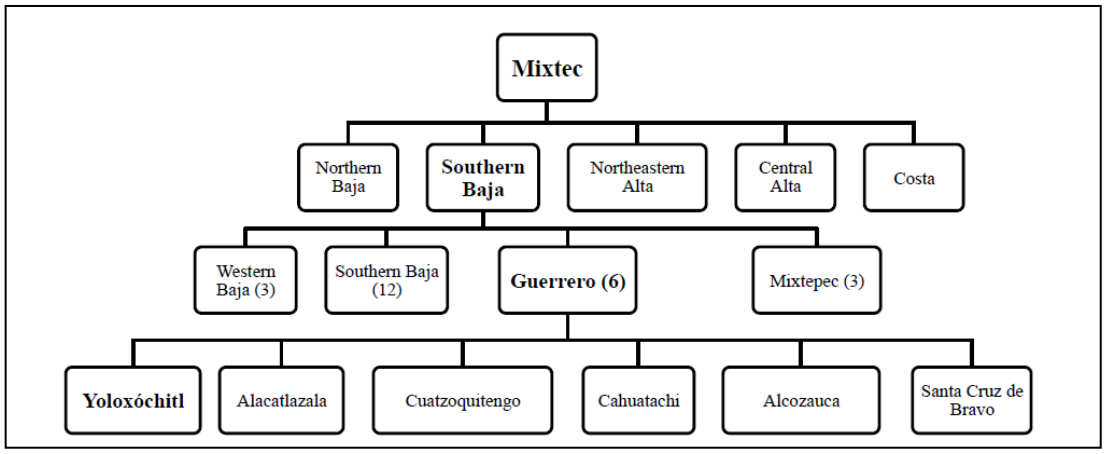

Figure 1. Mixtec family based on Josserand (1983), from DiCanio et al. (2014).

Both YM and Xochapan Mixtec (which, along with San Juan Colorado Mixec, we discuss in the conclusion) are treated by Josserand (1983) as belonging to the Guerrero subgroup, which comprises six main varieties; Xochapan Mixtec is classified under the Alcozauca variety. Castillo García (2007), a native speaker of YM, reports reasonably good mutual intelligibility across the Guerrero subgroup, but the degree of intelligibility drops considerably when one compares YM with neighboring Mixtec varieties of the Southern Baja group such as Ayutla Mixtec. San Juan Colorado Mixtec is more distant and would probably show a low level of mutual intelligibility with YM although Castillo Garcia does not provide any qualitative judgements on the degree of intelligibility.

Yoloxóchitl Mixtec is spoken in four villages along the Pacific Coast of southern Guerrero, Mexico. The greatest linguistic vitality is found in the villages of Yoloxóchitl (pop. approx. 3,000) and Arroyo Cumiapa (pop. approx. 1,500), about 6.5 miles to the northeast of Yoloxóchitl. In both of these villages almost all speakers are highly fluent. Yoloxóchitl Mixtec is also spoken, though rapidly disappearing, in Cuanacaxtitlan (pop. approx. 4,000) and Buenavista and its surrounding farms (pop. approx. 5,000). In both these latter areas language loss, shift to Spanish and very high relexification is virtually complete among the younger generation. It is fair to say that in both Cuanacaxtitlan and Buenavista the 'tipping point' has been reached and the language has passed from one side to the other of what Fishman (1991) calls "the continental divide", that is, the point at which intergenerational transmission of language ceases and maintenance becomes an often fruitless endeavour.

3. Basics of the segmental and tonal phonology of Yoloxóchitl Mixtec

YM has 17 consonant segments and five cardinal vowels (DiCanio et al. 2014). We consider both nasalization and laryngealization to be autosegmental features. With few exceptions (apparently the result of recent compounding) nasalization is restricted to the stem-final mora; laryngealization occurs only on the penultimate mora. Thus when a laryngealized stem combines with a following bimoraic stem, laryngealization is lost in the now non-penultimate position: *xaʔ^{l}a^{4}* 'foot' + *kuʔ^{l}u^{1}* 'area (be it urban or distant from a village) overgrown with weeds' becomes *xa^{14}kuʔ^{l}u^{1}* 'distant (from an inhabited area) woods'. There are other co-occurrence restrictions: a laryngealized vowel can only precede a stem-final consonant if it is voiced; a nasalized vowel can only follow a stem-final consonant if it is voiceless. Given these restrictions there are no CVCV words in YM with both a laryngealized and nasal vowel

although there are CVV and CVʔV stems with both features: *iʔ^{3}in^{3}* ‘scratch’ (transitive verb).[6]

The five cardinal vowels also manifest interesting distributional patterns. With virtually no exception the two vowels of CVV stems are identical, a pattern that suggests either vowel lengthening to fulfil phonotactic constraints on minimal word formation or a rigorous process of vowel harmonization. Regardless of the stem syllable structure, however, stem nasal vowels are limited (with one exception) to /ã/, /ĩ/, and /ũ/.[7] The occurrence of nasal /ẽ/ and /õ/ in enclitics is probably the result of phonologically motivated vowel quality shift from underlying /ã/ and /ũ/, respectively.

YM has nine basic tones that can occur on a single mora: four level tones (written as superscript numbers from /1/ for the low tone through /4/ for the high tone); three rising tones (/13/, /14/, and /24/) and two falling tones (/32/ and /42/).[8] Again there are significant distributional gaps. Tone /2/ is never found on the initial mora; /32/ and /42/ are only word final and occur in the absence of any contrast with /31/ and /41/, both of which are absent in YM tonal phonology. Even though it does bear significant functional weight as a 1st-person enclitic after stems that end in final /4/ or /3/, it is highly likely that the low middle /2/ is innovative. Finally, of the 89 occurrences of final mora rising tones found in the lexicon (/13/, /14/, and /24/) all but two occur after a previous high (/4/) tone.[9]

Monomoraic words are rare. They are limited to some 40 in total and are almost exclusively function words such as modals, clausal markers and adverbs. The vast majority of content words in YM are bimoraic, either mono- or disyllabic, though longer trimoraic words are not uncommon. There are 23 tonal melodies on bimoraic lexical stems. As expected, some tonal melodies are more frequent than others. Indeed, two of the twenty-three melodies on bimoraic stems (3−13 and 3−14; see fn. 9) are limited to one word each. The remaining melodies are exemplified in the nouns and adjectives in (1). However, if morphological tone were to be taken into account (e.g., verbal inflection for aspect and mood, negation, and 1st-person marking), the number of realized patterns on bimoraic stems would increase considerably. For example, including inflectional morphology, the sequence /na^{T}ma^{T}/ alone manifests 21 tonal contrasts. These are different from the 21 lexical melodies as the verb paradigm includes tonally marked morphemes (e.g., negation and first person).

(1)	/1-1/	bi^{1}ka^{1}	‘comb’	/4-3/	iʔ^{4}in^{3}	‘mute’
	/1-3/	ta^{1}a^{3}	‘man’	/4-4/	sa^{4}bi^{4}	‘rainy season’
	/1-4/	xi^{1}i^{4}	‘grandfather’	/4-13/	che^{4}e^{13}	‘big’
	/1-32/	xa^{1}ko^{32}	‘opossum’	/4-14/	na^{4}ni^{14}	‘long (PL)’
	/1-42/	ta^{1}kwi^{42}	‘water’	/4-24/	ya^{4}a^{24}	‘tongue’
	/3-2/	ñu^{3}u^{2}	‘village’	/13-2/	tiʔ^{13}bi^{2}	‘lightning bug’
	/3-3/	taʔ^{3}ni^{3}	‘animal breast’	/14-1/	naʔ^{14}a^{1}	‘demoniac’
	/3-4/	bi^{3}ko^{4}	‘feast’	/14-2/	ma^{14}ñu^{2}	‘central place’

[6] Although we consider laryngealization an autosegmental feature, we still represent this phonation type with <ʔ>. Likewise, following convention we write nasal vowels with a following <*n*>, although an orthography using forms with a tilde might be preferable.

[7] The only stem occurrence of /ẽ/ is in the noun *le^{3}en^{4}* ‘genital liquid’ (male or female).

[8] There is one function word and two adverbs, all monomoraic, with /143/. Two plant names have similarly complex tones: *piʔ^{1}la^{4}xi^{132}* ‘*Jaltomata darycana*’ and *ku^{4}tu^{1}pi^{342}* ‘*Plumbago scandens*’. In this latter case the name is onomatopoeic for the sound the flowers make when blown through by playing children.

[9] The melody /3-13/ is only attested in the passive-oriented verb *kiaʔ^{3}bi^{13}* ‘be sold’, while /3-14/ occurs only in the quantifier *i^{3}nda^{14}* 'one'.

/3-42/	ñu^{3}u^{42}	‘night’	/14-3/	nu^{14}u^{3}	‘face’
/4-1/	ya?^{4}a^{1}	‘darkish, brown’	/14-4/	ye?^{14}e^{4}	‘door’
/4-2/	xa?^{4}a^{2}	‘lime-soaked maize (*nixtamal*)’			

Some melodies are common across all syllable types (/1-1/, /1-3/, /1-4/, /3-2/, /3-3/, /3-4/, /4-2/ and /4-4/) and at least six patterns are much more common in disyllabic than in monosyllabic bimoraic words (/1-32/, /4-1/, /4-3/, /13-2/, /14-2/, /14-3/). Finally, in addition to /3-13/ and /3-14/, which occur in one word each, seven patterns are extremely rare in the lexicon (/1-42/, /3-13/, /3-14/, /3-42/, /4-13/, /4-14/, /14-1/). Moreover, the distribution of tones is asymmetrical. While the first mora allows for only five possibilities (/1/, /3/, /4/, /13/, /14/), the second mora, which is lengthened, allows for nine (/1/, /2/, /3/, /4/, /13/, /14/, /24/, /32/, /42/) although two, /13/ and /14/, are relatively rare). Note that /31/ is never found in lexical or inflected words, either in a bimoraic melody /3-1/ or on a single mora /31/.

As the object of our study is the role of tone in the making of the verbal inflection of YM, in the next section we concentrate on verbs.

3.1. Sample and the tonal structure of verbs

Our analysis of the verbal inflection of YM is based on a sample of 554 verbs taken from a large lexical database presently comprising 2,192 lexical entries. This database was compiled by Jonathan D. Amith and Rey Castillo García as a principal outcome for the documentation project “Corpus and lexicon development: Endangered genres of discourse and domains of cultural knowledge in Tu?^{1}un^{3} i^{4}sa^{1}bi^{14} (‘the Mixtec language’) of Yoloxóchitl, Guerrero” (see also Amith and Castillo García, n.d. 1 and n.d. 2).[10]

The sample of 554 YM verbs used in this study is balanced in regard to moraic structure and transitivity. The sample contains an almost equal number of bimoraic and trimoraic verbs in almost equal proportion regarding transitivity (2), (‘intr’ stands for ‘intransitive’; ‘tr’ for ‘transitive’ and ‘ditransitive’).

(2)

	intr	tr/dtr	Total
Bimoraic	183	99	282
Trimoraic	182	90	272
Total	365	189	554

Many trimoraic words in YM are formed by compounding or by derivation (the latter may involve productive mechanisms or archaic ones, the latter resulting in what are now frozen forms). This has consequences for the distribution of the tonal patterns in such trimoraic words as they are associated with the patterns found on the bimoraic words on which they are based. For example, a denominal verb formed by adding a particular prefix to a nominal stem will have a tonal pattern properly of nouns over its final two morae. A detailed analysis of the relation between tonal melodies in bimoraic and trimoraic words, however, would require a

[10] A note on the structure of the dictionary is in order. Primary verbal entries are found under the irrealis form, but the total number of entries also includes approximately 120 ‘place-holders’ or cross-references. For example, when a verb has an irrealis form which stands in a suppletive relation to the incompletive, the incompletive form is given an entry but this entry is without semantic content. The entry is simply a pointer to the main verb entry, in the irrealis mood. Additionally, dictionary entries have also been established for iterative verbal formations using the prefix *nda^{3}*- when the semantics of the iterative are not transparent.

level of effort that is beyond the scope of the present article. The focus below is on bimoraic verbs.

3.1.1. Bimoraic verbs

The lexicon of YM has no monomoraic verbs so that like nouns and adjectives a verb with a bimoraic stem instantiates the basic lexical template for a verbal lexeme.[11] There are 282 bimoraic verbs in our sample. Some examples appear in (3), inflected in the irrealis.

(3)	a.	ka^{3}a^{4}	(intr)	'slip'
		tu^{3}tu^{4}	(intr)	'whistle'
		ka^{3}xi^{4}	(tr)	'eat' 'bite' or 'bite into' (foods such as fruit, popcorn, *pozole* and sometimes meat, chicken or cheese)[12]
		sa^{3}ta^{4}	(tr)	'buy'
	b.	ke^{1}yu^{4}	(intr)	'swim'
	c.	chi^{3}kun^{2}	(tr)	'hang'

The verbs in (3) have different tonal melodies: /3-4/ in (3a), /1-4/ in (3b) and /3-2/ in (3c), respectively. With few exceptions, the tonal melody of the irrealis represents lexical tone, i.e., the tonal melody representative of the basic lexical form.

Throughout the YM verbal lexicon, contrastive tonal melodies also correlate with lexical contrast. For example, the pairs in (4) differ only in tone, their segments being identical. The contrasts may involve differences in the first mora as in (4a), differences in the second mora, as in (4b) or differences in both morae, as in (4c).

(4)	a.	ka^{1}ku^{3}	/1-3/	(intr)	'escape'	~	ka^{3}ku^{3}	/3-3/	(intr)	'be born'
		ke^{1}ta^{3}	/1-3/	(intr)	'get in' (SG sub.)	~	ke^{3}ta^{3}	/3-3/	(intr)	'get out' (SG sub.)
		ki^{1}ni^{4}	/1-4/	(intr)	'be balanced'	~	ki^{3}ni^{4}	/3-4/	(tr)	'shoot'
	b.	ka^{3}ba^{3}	/3-3/	(intr)	'lie to sleep'	~	ka^{3}ba^{4}	/3-4/	(tr)	'turn around'
		ka^{3}si^{2}	/3-2/	(tr)	'take a shortcut'	~	ka^{3}si^{4}	/3-4/	(intr)	'get goose bumps'
		ka^{1}an^{1}	/1-1/	(intr)	'get drilled'	~	ka^{1}an^{3}	/1-3/	(intr)	'get used'
	c.	kaʔ^{1}a^{1}	/1-1/	(intr)	'drown'	~	kaʔ^{3}a^{3}	/3-3/	(intr)	'emit a sound'
		ka^{1}sun^{1}	/1-1/	(intr)	'creak'	~	ka^{3}sun^{2}	/3-2/	(intr)	'get fried'
		ti^{3}bi^{2}	/3-2/	(intr)	'blow out air'	~	ti^{14}bi^{3}	/14-3/	(intr)	'rot'

Minimal triplets also exist, and they emerge as a combination of the contrasts in (4) in unpredictable ways. For example, the triplets in (5) each show different patterns of contrast.

(5)	a.	kwi^{1}i^{4}	/1-4/	(intr)	'fight'
		kwi^{3}i^{4}	/3-4/	(tr)	'peel'
		kwi^{3}i^{3}	/3-3/	(intr)	'be able'
	b.	kwi^{1}so^{1}	/1-1/	(intr)	'boil'

[11] Our sample includes bimoraic and trimoraic verbs, but excludes several quadrimoraic verbs present in the dictionary (e.g. *ta^{3}xi^{3}kwaʔ^{4}a^{4}* 'keep', *ka^{3}sa^{3}chiu^{4}un^{4}* 'work', among others). Such quadrimoraic verbs, nevertheless, follow the same principles as bimoraic and trimoraic verbs.

[12] *Ka^{3}xi^{4}* contrasts with *ku^{3}xi^{3}* used for eating meals, mole, tortillas and most other foods. The eating of meat can be expressed by either verb in patterns, if any, that are not yet fully understood.

	kwi^{1}so^{3}	/1-3/	(intr)	‘be pricked’
	kwi^{3}so^{3}	/3-3/	(tr)	‘load’
c.	ta^{1}ni^{1}	/1-1/	(intr)	‘be spoilt’
	ta^{14}ni^{3}	/14-3/	(intr)	‘bruise’
	ta^{3}ni^{3}	/3-3/	(intr)	‘be carried away by water’
d.	tu^{3}u^{3}	/3-3/	(tr)	‘sting’
	tu^{1}u^{3}	/1-3/	(intr)	‘appear’
	tu^{3}u^{4}	/3-4/	(intr)	‘roll’

The irrealis forms of the 282 bimoraic verbs in our sample display a total of 12 different tonal melodies, given in table 1. Lexical verb stems, therefore, manifest only 12 of the 23 documented tonal possibilities for bimoraic stems. This absence is reflective of the fact, discussed in continuation, that high tone in the first mora of verbs is ‘reserved’ to mark the incompletive aspect.[13] Among the absent patterns, /13-2/ is not uncommon in the overall lexicon. The tonal pattern /3-13/, however, is found only in one verb, *kia?^{3}bi^{13}* ('be sold'), but in no other bimoraic lexical stem. In bimoraic words, /14-1/ is found in one verb, *chu?^{14}ma^{1}* ('be incensed') two nouns and one adjective; /14-4/ is quite common although found in only one verb, *xio?^{14}o^{4}* ('become ill from desiring food').

Table 1. Tonal melodies in lexical stems of bimoraic verbs (irrealis forms only).

		μ2						
		/1/	/2/	/3/	/4/	/13/	/32/	
μ1	/1/	46	—	34	26	—	4	110
	/3/	0	25	85	45	1	0	156
	/4/	0	0	0	0	0	0	0
	/13/	0	0	0	0	0	0	0
	/14/	1	7	7	1	0	0	16
		47	32	126	72	1	4	282

In table 1, ‘0’ indicates tonal melodies that are attested elsewhere in the lexicon but are not found in bimoraic verbs; ‘—’ indicates tonal melodies that are not attested anywhere in the lexicon. As a general rule, there are no bimoraic verbs in the irrealis with a lexical high tone /4/ on the first mora (μ1)[14] as this tone is the inflectional exponent of the incompletive (see §5.2). A further analysis, table 2, reveals that by default bimoraic verbs have tones /1/ or /3/ (only a few have /14/) on μ1. There is a greater range of tone values for the second mora (μ2), although 45 percent of the total number of verbs (126 of 282) have tone /3/ on μ2. Many verbs also have harmonized melodies: 46 (16.3 %) have /1-1/ and 85 (30.0 %) have /3-3/. That is, close to 50 percent of bimoraic irrealis verbs have harmonized tone.

The distribution of tonal melodies in lexical entries displays an interesting correlation with transitivity. Consider for this purpose the data in table 2, where we have given the transitivity status of bimoraic verbs.

[13] Indeed, seven of the eleven absent melodies have an initial /4/ tone.
[14] One stative manifests the melody /4-14/, which is limited to four words, all disyllabic.

Table 2. Lexical tonal melody and transitivity in bimoraic verbs.

			μ2 /1/	/2/	/3/	/4/	/13/	/14/	/32/	intr	tr
μ1	/1/	intr	38	0	30	24	0	0	4	96	
		tr	8	0	4	2	0	0	--		14
	/3/	intr	0	11	54	13	1	0	0	79	
		tr	0	14	31	32	0	0	0		77
	/14/	intr	1	3	3	1	0	0	0	8	
		tr	0	4	4	0	0	0	0		8
										183	99

We see from table 2 that almost 90 percent (96 out of 110) of bimoraic verbs with tone /1/ on μ1 are intransitive. Verbs with /1/ on the first mora constitute half of the intransitive bimoraic verbs (96 out of 183) but only 15 percent of the transitives (14 out of 99). This reveals a strong correlation between phonology and transitivity: a verb bearing lexical melodies such as /1-1/, /1-3/, /1-4/ or /1-32/ is expected to be intransitive. In contrast, a tone /3/ or /14/ on μ1 is uninformative about transitivity.

The correlation of tonal melody and transitivity is partly exploited in the lexicon through the existence of a set of valence pairs that contrast only in tone. In such patterns, the intransitive verb often depicts an inchoative state of affairs, a sort of passive meaning. That is, the semantics of the intransitives suggest an implicit and unexpressed agent. This indicates that, at least historically, the direction of derivation might have been intransitivization. This is consistent with the fact that tone /1/ is closely associated with intransitivity (+ 90%) while tone /3/ is uninformative in this regard.[15]

There are various patterns involved in such intransitive/transitive pairs, given in (6), all in the irrealis form. In all of them, the intransitive verb has tone /1/ on μ1 and the transitive verb tone /3/. In patterns (6a) and (6b), the tone on μ2 remains constant, which would seem to indicate that the transitivity alternation, at least historically, was motivated by a tonal change on the first mora alone, a pattern to be expected given the position of morphological tone in general. In (6c) and (6d) the tone on the second mora of the transitive shifts as well, but in (6c) this is clearly due to a phonotactic constraint on /3-1/ melodies, which occur nowhere in YM. The upward shift to tone to tone /4/ on the final mora is irregular and unexplained (6d). It might reflect some underlying tonal difference between the two sets: (6c) regular from a phonotactic constraint and (6d) irregular transitive patterns from /1-1/ intransitives.[16]

[15] The agent can be syntactically expressed but only in a juxtaposed clause with the meaning 'X did it'. Such constructions are used when the patient is topic. Note the following:

(i) a. ni^{1}-ku^{1}un^{4} yaʔ^{3}a^{4} [i^{13}xa^{3} Juan]
CPL-be.ground chilli CPL.do John
'The chilli (old information) was ground by John.'

b. ni^{1}-koʔ^{1}ni^{4} ji^{1}ndi^{1}ki^{4} [i^{13}xa^{3} Juan]
CPL-be.milked cow CPL.do John
'The cow (old information) was milked by John.'

[16] Other alternations between /1/ ~ /3/, are possibly related to the alternation that marks transitivity: *ke^{1}ta^{3}* 'enter' (SG subj.) and *ke^{3}ta^{3}* 'exit' (SG subj.) and, despite the segmental difference, *nde^{1}e^{3}* 'enter' (PL subj.) and *ke^{3}e^{3}* 'exit' (PL subj.).

(6)	a.	ku^{1}un^{4}	/1-4/	(intr)	‘be ground’	~	ku^{3}un^{4}	/3-4/	(tr)	‘grind chilli for sauce’
		koʔ^{1}ni^{4}	/1-4/	(intr)	‘be milked’	~	koʔ^{3}ni^{4}	/3-4/	(tr)	‘milk’
		kwi^{1}i^{4}	/1-4/	(intr)	‘peel off’	~	kwi^{3}i^{4}	/3-4/	(tr)	‘peel’
		nda^{1}ta^{4}	/1-4/	(intr)	‘get split in two’	~	nda^{3}ta^{4}	/3-4/	(tr)	‘split in two’
		taʔ^{1}bi^{4}	/1-4/	(intr)	‘get broken’	~	taʔ^{3}bi^{4}	/3-4/	(tr)	‘break’
		ta^{1}xi^{4}	/1-4/	(intr)	‘be fired from work’	~	ta^{3}xi^{4}	/3-4/	(tr)	‘fire from work’
		tu^{1}xi^{4}	/1-4/	(intr)	‘be crushed’	~	tu^{3}xi^{4}	/3-4/	(tr)	‘crush’
	b.	na^{1}ma^{3}	/1-3/	(intr)	‘get changed’	~	na^{3}ma^{3}	/3-3/	(tr)	‘change’
	c.	ka^{1}an^{1}	/1-1/	(intr)	‘get drilled’	~	ka^{3}an^{2}	/3-2/	(tr)	‘drill’
		tu^{1}un^{1}	/1-1/	(intr)	‘get turned on’[17]	~	tu^{3}un^{2}	/3-2/	(tr)	‘turn on’
	d.	ka^{1}ba^{1}	/1-1/	(intr)	‘turn around’	~	ka^{3}ba^{4}	/3-4/	(tr)	‘turn around’
		kaʔ^{1}yu^{1}	/1-1/	(intr)	‘be written’	~	kaʔ^{3}yu^{4}	/3-4/	(tr)	‘write’

3.1.2. Trimoraic verbs

Apart from bimoraic verbs, a significant number of YM verbs are trimoraic. There are 272 such verbs in our sample, displaying a total of 22 different tonal melodies, illustrated in table 3.

Table 3. Tone melodies in trimoraic verbs.

Melody	#	intr	tr	Example		
/1-1-3/	1	1	0	ku^{1}ndaʔ^{1}a^{3}	(intr)	‘move away’
/1-1-4/	1	1	0	ku^{1}nuʔ^{1}u^{4}	(intr)	‘get back home’
/1-4-4/	1	1	0	ki^{1}tuʔ^{4}un^{4}	(intr)	‘be pulled out (part of a whole)’
/1-4-2/	1	1	0	tu^{1}xuʔ^{4}u^{2}	(intr)	‘get harmed’
/3-1-1/	20	16	4	nda^{3}kwi^{1}kun^{1}	(intr)	‘sprout, spring’
/3-1-3/	21	19	2	ka^{3}kiʔ^{1}i^{3}	(intr)	‘trip’
/3-1-32/	1	1	1	ku^{3}bi^{1}xi^{32}	(intr)	‘grow white hair’
/3-1-4/	12	11	1	ku^{3}ma^{1}ni^{4}	(intr)	‘lack’
/3-2-2/	8	3	5	ndo^{3}ko^{2}o^{2}	(intr)	‘get up of bed’
/3-3-2/	34	23	11	nda^{3}yeʔ^{3}e^{2}	(intr)	‘shine’
/3-3-3/	57	35	22	ku^{3}ndi^{3}xi^{3}	(intr)	‘get dressed’
/3-3-4/	43	24	19	nda^{3}ke^{3}e^{4}	(intr)	‘become stretched’
/3-3-42/	2	2	0	ku^{3}ñu^{3}u^{42}	(intr)	‘get dark (at night)’
/3-4-1/	5	4	1	ndu^{3}ka^{4}chi^{1}	(intr)	‘become equal’
/3-4-13/	1	1	0	xi^{3}ka^{4}ba^{13}	(intr)	‘get turned around’
/3-4-2/	7	4	3	ko^{3}seʔ^{4}e^{2}	(intr)	‘hide oneself’
/3-4-24/	11	10	1	xu^{3}ku^{4}tu^{24}	(intr)	‘roll’
/3-4-3/	18	10	8	ku^{3}bi^{4}ka^{3}	(intr)	‘get rich’
/3-4-4/	22	12	10	ta^{3}xaʔ^{4}a^{4}	(intr)	‘dance’
/3-14-2/	2	1	1	ku^{3}to^{14}o^{2}	(intr)	‘fancy or crave’
/3-14-3/	2	1	1	ku^{3}nu^{14}u^{3}	(intr)	‘examine in detail’
/14-1-1/	2	1	1	xo^{14}kwi^{1}in^{1}	(intr)	‘turn around to see’
Total	272	182	90			

[17] Said of an electric device.

As with bimoraic verbs, trimoraic verbs may also have tones /1/, /3/ or /14/ on μ1, but tones /1/ and /14/ are very rare (found only in 6 verbs). Thus trimoraic melodies almost always start with tone /3/. This would not be unexpected if, historically, trimoraic verbs were formed from a derivational morpheme prefixed to a bimoraic verbal stem. Most derivational verbal prefixes do indeed carry a mid tone /3/ (the completive marker *ni*^{1}- being an inflectional morpheme). Thus the tonal pattern on μ1 of trimoraic verbs is correlated to the tones of derivational morphemes. This consistency of tone marking on the first mora of trimoraic verbs means that the functional lexicosemantic contrast lies on μ2 and μ3. In many ways the melodies of the final two morae of trimoraic verbs are similar to the melodies of bimoraic verbs, except for those cases with a high tone /4/ or a low-mid tone /2/ on the middle mora. Instances of tone /4/ occur most often in deadjectival verbs. A mid-mora /2/ occurs only after initial-mora /3/. Compare table 4 with table 1. Relevant contrasts have been highlighted.

Table 4. Tonal melodies of last two morae in lexical stems of trimoraic verbs.

		μ3 /1/	/2/	/3/	/4/	/13/	/14/	/24/	/32/	/42/	
μ2	/1/	22	0	22	13	0	0	0	1	0	58
	/2/	0	8	0	0	0	0	0	0	0	8
	/3/	0	34	57	43	0	0	0	0	2	136
	/4/	5	8	18	23	1	0	11	0	0	66
	/13/	0	0	0	0	0	0	0	0	0	--
	/14/	0	2	2	0	0	0	0	0	0	4
	/24/	0	0	0	0	0	0	0	0	0	--
	/32/	0	0	0	0	0	0	0	0	0	--
	/42/	0	0	0	0	0	0	0	0	0	--
Total		27	52	99	79	1	--	11	1	2	272

Minimal pairs involving trimoraic verbs also occur. Like those of bimoraic verbs, the contrasts may involve differences in the tone linked to μ2, as in (7a), or to μ3, as in (7b). Triplets of minimal pairs involve a combination of such possibilities (7c).

(7)	a.	ku^{3}nda^{1}a^{4}	/3-1-4/	(intr)	'grow hoarse'	~	ku^{3}nda^{4}a^{4}	/3-4-4/	(intr)	'darken'
	b.	ko^{3}nde^{3}e^{3}	/3-3-3/	(intr)	'sit' (PL sub.)	~	ko^{3}nde^{3}e^{4}	/3-3-4/	(intr)	'endure'
		ka^{3}ti^{1}in^{1}	/3-1-1/	(intr)	'resound, throb'	~	ka^{3}ti^{1}in^{3}	/3-1-3/	(intr)	'pile up'
	c	ku^{3}naʔ^{1}a^{1}	/3-1-1/	(intr)	'be free, not be busy'					
		ku^{3}naʔ^{3}a^{2}	/3-3-2/	(intr)	'get founded'					
		ku^{3}naʔ^{3}a^{4}	/3-3-4/	(intr)	'take a long time'					

As with bimoraic verbs, a given trimoraic verb often forms part of a transitivity pair. In all such pairs, the intransitive verb has a low tone and the transitive one a mid-high tone, the same pattern found in the bimoraic transitivity alternations. While the members of the pair may realize the contrastive tone on μ1 as in (8a), it is more common that the tonal contrast is realized on μ2 (8b). This is another indication that the stem of trimoraic verbs consists of a bimoraic root —in reality a historical bimoraic stem—plus an initial stem formative that we will mark with the plus sign (+). In (8b) the initial stem formative is the iterative *nda*^{3}-, which

easily explains why the contrast is realized on μ2 (and occasionally on μ3 as well: *nda*^{3}+sa^{1}ka^{1} vs. *nda*^{3}+*sa*^{3}*ka*^{4}). Thus the intransitive/transitive alternation is marked on μ1 of the bimoraic stems to which the iterative is prefixed.

(8)	a.	ki^{1}+tuʔ^{4}un^{4}	/1-4-4/	(intr)	'be pulled off'	~	ki^{3}+tuʔ^{4}un^{4}	/3-4-4/	(tr)	'pull off'
	b.	nda^{3}+ka^{1}ya^{1}	/3-1-1/	(intr)	'gather up'	~	nda^{3}+ka^{3}ya^{2}	/3-3-2/	(tr)	'gather up'
		nda^{3}+sa^{1}ka^{1}	/3-1-1/	(intr)	'get mixed up'	~	nda^{3}+sa^{3}ka^{4}	/3-3-4/	(tr)	'mix up'
		nda^{3}+tu^{1}u^{4}	/3-1-4/	(intr)	'get wrapped up'	~	nda^{3}+tu^{3}u^{4}	/3-3-4/	(tr)	'wrap up'
		nda^{3+}ka^{1}ya^{1}	/3-1-1/	(intr)	'come together (e.g., individuals in a meeting')'	~	nda^{3}+ka^{3}ya^{2}	/3-3-2/	(tr)	'reunite'

The intransitive/transitive pairs may also involve equipollent verbs that contrast not in tone but in the segments of the stem formatives, as in (9). In such pairs, the intransitive verb has the stem formative *ku*^{3}*/ko*^{3}+ while the transitive varies: the examples in (9) illustrate *ka*^{3}+, *chi*^{3}+ and *ta*^{3}+ as the transitive formatives.

(9)	a.	ku^{3}+ta^{3}ni^{3}	/3-3-3/	(intr)	'hang down'	~	ka^{3}+ta^{3}ni^{3}	/3-3-3/	(tr)	'hang'
		ku^{3}+ndi^{3}chi^{2}	/3-3-2/	(intr)	'get up' (SG sub.)'	~	ka^{3}+ndi^{3}chi^{2}	/3-3-2/	(tr)	'place up (SG obj.)'
	b.	ku^{3}+nduʔ^{4}u^{4}	/3-4-4/	(intr)	'sit down' (SG sub.)'	~	chi^{3}+nduʔ^{4}u^{4}	/3-4-4/	(tr)	'put down (SG obj.)'
	c.	ko^{3}+seʔ^{4}e^{2}	/3-4-2/	(intr)	'hide oneself'	~	ta^{3}+seʔ^{4}e^{2}	/3-4-2/	(tr)	'hide'

Other pairs such as those in (10) involve trimoraic verbs derived from suppletive bimoraic stems in which the transitivity alternation is marked on the segmental contrast of both the middle syllable (the initial consonant of the base bimoraic stem) and on the stem formative (10a). Another pattern is seen in (11), in which in addition to the suppletive stem, the transitivity alternation is linked to a prefix. This prefix may be associated with the intransitive (11a) or transitive (11b), a situation probably related to the detransitivizing (11a) or the transitivizing (11b) semantics of the formative.

(10)	a.	ndu^{3}+ndi^{3}kun^{2}	/3-3-2/	(intr)	'regenerate'	~	nda^{3}+chi^{3}kun^{2}	/3-3-2/	(tr)	'regenerate'
	b.	nda^{3}+taʔ^{1}nu^{1}	/3-1-1/	(intr)	'get bent'	~	nda^{3}+kaʔ^{1}nu^{1}	/3-1-1/	(tr)	'bend'
(11)	a.	ku^{3}+ndi^{3}kun^{2}	/3-3-2/	(intr)	'get hung up'	~	chi^{3}kun^{2}	/3-2/	(tr)	'hang up'
	b.	nu^{1}na^{4}	/1-4/	(intr)	'become open'	~	ndu^{3}+ku^{3}na^{4}	/3-3-4/	(tr)	'open'

Although the base verb of (11b) is suppletive at the segmental level (/n/~/k/), the tonal alternation is reminiscent of that found in (6) in which /1/ is associated with the intransitive and /3/ with the transitive. Thus while the valence of the second verb in (11b) might be accounted for by the tone /3/, it is also possible that *ndu*^{3}- performs some sort of transitivizing function, such as that typical of a causative. Such seemingly causative morphemes are illustrated by the verbs in (12). In no case, however, are either *cha*^{3}+ or *xi*^{3}+ productive, as is the commonly used causative marker *sa*^{4}-, discussed below.

(12)	a.	ka^{3}ba^3	/3-2/	(intr)	‘lie down’	~	cha^3+ka^{3}ba^3	/3-3-2/	(tr)	‘lie down’
		kwi^{3}in^3	/3-3/	(intr)	‘hang up’ (PL sub.)	~	cha^3+kwi^{3}in^3	/3-3-3/	(tr)	‘hang up’ (PL sub.)
	b.	kwaʔ^{3}a^3	/3-3/	(intr)	‘be made’	~	xi^3+kwaʔ^{4}a^4	/3-4-4/	(tr)	‘be made’

Stem formatives such as *ndu^3+*, *cha^3+* or *xi^3+* are not productive and are restricted to a small number of lexical forms. In some cases the historical derivation is apparent: *chi^3+ kuʔ^{3}ba^2* ‘measure’ is undoubtedly related to *kuʔ^{3}ba^2* ‘measure (noun)’. In other cases the trimoraic verbs are lexically basic; that is, the final two morae do not correspond to any discernible lexical item presently found in YM. Thus the nouns *ku^{1}nduʔ^{1}u^4* ‘bush’ and *ti^{1}nduʔ^{4}u^4* ‘lit firewood’ seem to suggest a stem,**nduʔ^{1}u^4* or **nduʔ^{4}u^4*, that is non-existent in YM at the present time. These cases may be contrasted to clearly productive derivational processes in which both elements are identifiable: *ku^3+bi^{1}xi^{32}* ‘get white hair' from *bi^{1}xi^{32}* 'white hair' and the inchoative marker *ku^3-*.

In contrast to the causative-like semantics of some stem formatives, such as those just discussed, YM has a genuine productive causative prefix, *sa^4-*, that can be prefixed to both bimoraic and trimoraic verbs (see 13). In some cases the semantic relation between the causative form and a base verb is not clear (13c) as, in this case, the only possible base verb, *kwaʔ^{3}a^3*, is used only in a ritual context with a meaning to the effect of ‘be benefited by’ not clearly related to the meaning, 'study', of the causative. In most cases, however, the semantics of the causative derivation is clear.

(13)	a.	kaʔ^{1}a^1	(intr)	‘drown’	>	sa^4-kaʔ^{1}a^1	(tr)	‘drown [sb.]’
		kaʔ^{1}an^1	(intr)	‘talk’	>	sa^4-kaʔ^{1}an^1	(tr)	‘make talk’
		kiʔ^{1}bi^3	(intr)	‘get in’	>	sa^4-ka^{1}ku^3	(tr)	‘force in’
		na^{3}ñu^3	(intr)	‘get fat’	>	sa^4-na^{3}ñu^3	(tr)	‘fatten’
		chi^{3}chin^4	(intr)	‘suckle’	>	sa^4-chi^{3}chin^4	(tr)	‘breast feed’
	b.	nda^3+i^{3}chi^2	(intr)	‘dry up’	>	sa^4-nda^{3}i^{3}chi^2	(tr)	‘dry’
		nda^3+ka^{3}a^4	(intr)	‘trip’	>	sa^4-nda^3-ka^{3}a^4	(tr)	‘trip [sb.] up’
		nda^3+kaʔ^{3}an^4	(intr)	‘remember’	>	sa^4-nda^3-kaʔ^{3}an^4	(tr)	‘remind’
		tu^1+xuʔ^{4}u^2	(intr)	‘get hurt’	>	sa^4-tu^{1}xuʔ^{4}u^2	(tr)	‘harm’
		ku^1+ndaʔ^{1}a^3	(intr)	‘move up’	>	sa^4-ku^{1}ndaʔ^{1}a^3	(tr)	‘remove’
	c.					sa^4+kwaʔ^{3}a^3	(intr)	‘study’

In our analysis of tonal patterns in verbal aspect marking we have excluded any verbs bearing the prefix *sa^4-*. This responds to the high frequency and productivity of this causative marker. We have also excluded in our sample about a dozen quadrimoraic verbs, such as those in (14).

(14)	cha^3+ka^3+nduʔ^{4}u^4	(tr)	‘lay down’
	ka^3+sa^3+chiu^{4}un^4	(intr)	‘work’
	ka^3+si^3+kweʔ^{3}e^2	(intr)	‘get upset’
	ku^3+ta^3+nde^{3}e^3	(intr)	‘bend down’
	ku^3+ti^3+saʔ^{4}ma^3	(intr)	‘coagulate’
	nda^3+ka^1+tuʔ^{4}un^4	(tr)	‘ask’
	nda^3+ki^3+nde^{3}e^4	(intr)	‘rest’
	nda^3+xi^3+koʔ^{4}ni^3	(tr)	‘turn around’
	ta^3+xi^3+kwaʔ^{4}a^4	(tr)	‘keep’

4. Tone and verbal inflection in Yoloxóchitl Mixtec

The previous sections presented both the wealth and diversity of tonal contrasts in YM as well as its significant functional role. This role includes verbal inflection, the topic of this present section. Tone is not only used for the marking of first-person singular subject but, most importantly, for marking aspect, mood and polarity values, an encoding of grammatical function that is remarkably systematic. We start with a brief description on how tone marks person and then move to the encoding of aspect, mood and polarity.

4.1. Tone and the marking of person

In YM, the subject of verbs and possessor of nouns is encoded by means of enclitics. For the first person, there are four allomorphs, three segmental (*=yu*^{1}, *=e*^{1} and *=i*^{1}) and one tonal (=^{2}). The distribution of these allomorphs is phonologically conditioned. Enclitics *=e*^{1} and *=i*^{1} are the most restricted, both optionally occur instead of *=yu*^{1} after stems with a tone /1/ on the final mora, the former after stems ending in /a/ or /o/, the latter after stems ending in /u/. For all other cases, enclitic *=yu*^{1} occurs after stems with a final /1/ or /2/ and =^{2} after stems with a final /3/ or /4/.

Tone /2/ is affixed to a stem ending in /3/ or /4/ to mark first person, e.g. *ki*^{1}*ta*^{3} 'enter' > *ki*^{1}*ta*^{3}*=*^{2} 'I enter'; *ka*^{1}*xan*^{4} 'sneeze' > *ka*^{1}*xan*^{4}**=**^{2} 'I sneeze'; or *ka*^{3}*ta*^{4} 'feel itchy' > *ka*^{3}*ta*$^{4=2}$ 'I feel itchy'.[18] Depending on the tonal melody of the stem, the stem-final tone may be elided before the enclitic, creating a surface form contrasting in person, e.g. *ku*^{3}*xa*^{3} 'mature' > *ku*^{3}*xa*$^{(3)}$*=*^{2} > *ku*^{3}*xa*^{2} 'I mature' or *ndoʔ*^{4}*o*^{4} 'suffer' > *ndoʔ*^{4}*o*$^{(4)}$*=*^{2} > *ndoʔ*^{4}*o*^{2} 'I suffer'. The general pattern suggests maintenance of stem-final tone when the tonal melody over the final two stem morae is rising (i.e., /1-3/, /1-4/ and /3-4/). Elision of stem-final tone occurs when the tonal melody on the bimoraic stem is level or falling (i.e., /3-3/, /4-3/ and /4-4/).[19] Additionally, syllable structure plays a significant role. The final tone /4/ in a stem with /4-4/ is elided, as expected, if the syllable structure is CVV or CVʔV but maintained in disyllabic roots (e.g., *nda*^{4}*ta*^{4}*=*^{2} 'I split (something) in two').[20]

4.2. Tone and the marking of aspect/mood

Verbs in YM inflect for incompletive and completive aspect and for irrealis mood. There is also an inflectional form for the negative of verbs in this mood and, conditionally, in the two aspects. The language has two alternative forms for the completive, which for convenience we call CPL-1 and CPL-2. Two other occasional verb forms, stative and progressive, will not be studied here as they are relatively rare and in many cases irregular in form. Table 5 offers paradigms of four representative verbs.

[18] Note that in neighboring Cuanacaxtitlan the use of tone, =2, as a first person enclitic does not occur as an allomorph of =yu^{1} adding further evidence that Yoloxóchitl /2/ is inovative.

[19] Note that if the tonal melody is /1-1/ then the enclitic *=yu*^{2} is used to mark the first person.

[20] A search through over one hundred hours of transcribed natural speech recordings reveals that other factors may affect the behaviour (maintenance or elision) of stem-final tones before the 1st person enclitic: natural vs. elicited speech, rapidity of utterance, speaker idiosyncracies, and free variation.

Table 5. The verbal paradigm of four exemplary verbs in YM.

	'hang' (tr)	'drag' (tr)	'break' (tr)	'boil' (intr)
IRR	chi^{3}kun^{2}	ku^{3}+ñu^{3}u^{3}	taʔ^{3}bi^{4}	kwi^{1}so^{1}
NEG.IRR	chi^{14}kun^{2}	ku^{14}+ñu^{3}u^{3}	taʔ^{14}bi^{4}	kwi^{14}so^{1}
CPL-1	ni^{1}-chi^{3}kun^{2}	ni^{1}-ju^{3}+ñu^{3}u^{3}	ni^{1}-taʔ^{3}bi^{4}	ni^{1}-si^{1}so^{1}
CPL-2	chi^{13}kun^{2}	ju^{13}+ñu^{3}u^{3}	taʔ^{13}bi^{4}	si^{1}so^{1}
INCPL	chi^{4}kun^{2}	ju^{4}+ñu^{3}u^{3}	taʔ^{4}bi^{4}	si^{4}so^{1}
STAT	ndi^{4}kun^{2}	---	taʔ^{4}bi^{4}	---
PROG	chi^{4}+ndi^{3}kun^{2}	ñu^{4}u^{4}	---	---

Tone plays a fundamental role in marking aspect/mood in YM verbs. The completive CPL-1, with the prefix *ni^{1}*-, is the only inflected form built by segmental affixation. We take the segments and tonal melody of the CPL-1 stem as representing the basic lemma of the verb. In most cases the tonal melody of the irrealis matches that of CPL-1 although in a few cases (§4.3.3) it is distinct. The following section explores the role of tonal variation in marking aspect and mood.

4.2.1. Inflectional tone for the CPL-2

The two alternative completive forms (CPL-1 and CPL-2) appear to be in free variation.[21] While the form for the CPL-1 is built by prefixing *ni^{1}*- to the base stem, CPL-2 is realized simply by adding a low tone /1/ to the lexical tone on μ1 of the base. The inflectional tone /1/ of CPL-2 has a lexical origin: the prefix *ni^{1}*-. When the base has tone /3/ on μ1, (55% of bimoraic verbs [156 out of 282] and 98% of trimoraic ones [266 out of 272]), the result is an ascending tone /13/ for the CPL-2, as in (14a) and (14b).

(14)		CPL-1	CPL-2		
	a.	ni^{1}-chi^{3}chin^{4}	chi**^{13}**chin^{4}	(intr)	'suckle'
		ni^{1}-kaʔ^{3}an^{4}	kaʔ**^{13}**an^{4}	(tr)	'believe'
	b.	ni^{1}-chi^{3}+ndaʔ^{3}a^{4}	chi**^{13}**+ndaʔ^{3}a^{4}	(tr)	'push
		ni^{1}-ku^{3}+i^{3}ni^{2}	ku**^{13}**+i^{3}ni^{2}	(tr)	'love'

The same rule applies to causative verbs with the prefix *sa^{4}*-, but for such verbs the CPL-2 that results is homophonous with the negative irrealis, which also bears the inflectional tone /14/ (15).

(15)	CPL-1	CPL-2	NEG.IRR		
	ni^{1}-sa^{4}-naʔ^{1}a^{1}	sa**^{14}**-naʔ^{1}a^{1}	sa**^{14}**-naʔ^{1}a^{1}	(tr)	'teach'
	ni-sa^{4}-ka^{3}sun^{2}	sa**^{14}**-ka^{3}sun^{2}	sa**^{14}**-ka^{3}sun^{2}	(tr)	'fry'

Completive tone /1/ may be present, though not overtly manifested, on stems with lexical tones /1/ or /14/ on μ1. As a result, the tonal melodies of the CPL-2 and the irrealis of verbs with /1/ or /14/ on μ1 are homophonous (16). Nevertheless, a significant number of verbs have irrealis forms whose segments are distinct from those of the lexical stem (the stem of the CPL-2) (see §4.3). In cases of lexical tones /1/ or /14/ on μ1, this segmental variation

[21] This could be taken as a canonical instance of overabundance (Thornton 2011).

maintains the formal distinction between the irrealis and CPL-2 despite the fact that the tonal melodies for the two forms are identical.

(16)	CPL-1	CPL-2	IRR		
	ni^{1}-ka^{1}ba^{1}	ka$^{\mathbf{1}}$ba^{1}	ka$^{\mathbf{1}}$ba^{1}	(intr)	‘turn’
	ni^{1}-tu^{1}+xuʔ^{4}u^{2}	tu$^{\mathbf{1}}$+xuʔ^{14}u^{2}	tu$^{\mathbf{1}}$+xuʔ^{4}u^{2}	(intr)	‘get hurt’
	ni^{1}-xi^{14}ta^{3}	xi$^{\mathbf{14}}$ta^{3}	xi$^{\mathbf{14}}$ta^{3}	(tr)	‘pull’
	ni^{1}-si^{14}+kwe^{1}kun^{1}	si$^{\mathbf{14}}$+kwe^{1}kun^{1}	si$^{\mathbf{14}}$+kwe^{1}kun^{1}	(tr)	‘spread a disease to (sb)’

4.2.2. Inflectional tone for the incompletive.

In the default situation, the form for the incompletive aspect is built by overwriting the lexical tone on μ1 with high tone /4/. In (17) instances of CPL-1 are given alongside the incompletive to provide a reference for lexical tone of the stem.

(17)		CPL-1	INCPL		
	a.	ni^{1}-chi^{3}chin^{4}	chi$^{\mathbf{4}}$chin^{4}	(intr)	‘suckle’
		ni^{1}-kaʔ^{3}an^{4}	kaʔ$^{\mathbf{4}}$an^{4}	(tr)	‘believe’
		ni^{1}-ku^{3}+i^{3}ni^{2}	ku$^{\mathbf{4}}$+i^{3}ni^{2}	(tr)	‘love’
		ni^{1}-ka^{3}+xi^{4}ta^{3}	ka$^{\mathbf{4}}$+xi^{4}ta^{3}	(tr)	‘grind’
	b.	ni^{1}-kaʔ^{1}an^{1}	kaʔ$^{\mathbf{4}}$an^{1}	(intr)	‘talk’
		ni^{1}-ndaʔ^{1}yu^{1}	ndaʔ$^{\mathbf{4}}$yu^{1}	(intr)	‘confess’
		ni^{1}-tu^{1}+xuʔ^{4}u^{2}	tu$^{\mathbf{4}}$+xuʔ^{4}u^{2}	(tr)	‘get hurt’

As causatives already have a tone /4/ on μ1, which is lexically associated with the prefix *sa*^{4}-, the incompletive is indistinguishable in surface form from the irrealis (18).

(18)	IRR	INCPL		
	sa^{4}-ndo^{3}to^{3}	sa$^{\mathbf{4}}$-ndo^{3}to^{3}	(tr)	‘wake up’
	sa^{4}-ndu^{1}xin^{1}	sa$^{\mathbf{4}}$-ndu^{1}xin^{1}	(tr)	‘bury’

With level tones in a bimoraic stem, the formation of the incompletive is quite regular, although in some cases there is a pattern split depending on the syllabic structure of the verbal stem. This is demonstrated by the examples in table 6. Note that there are no YM words with /3-1/ tones.

Table 6. Tone allomorphy for the incompletive.

Syllable structure		LEX		INCPL	CPL-1	INCPL	
a	disyllabic	/1-1/	>	/4-1/	ni^{1}-ki^{1}xin^{1}	ki^{4}xin^{1}	‘fall asleep’
	monosyllabic				ni^{1}-tu^{1}un^{1}	tu^{4}un^{1}	‘catch fire, light up‘
b	disyllabic	/1-3/	>	/4-13/	ni^{1}-ka^{1}ku^{3}	ka^{4}ku^{13}	‘escape’
	monosyllabic				ni^{1}-ka^{1}an^{3}	ka^{4}an^{13}	‘get accustomed’
c	disyllabic	/1-4/	>	/4-14/	ni^{1}-ka^{1}xan^{4}	ka^{4}xan^{14}	‘sneeze’
	monosyllabic				ni^{1}-ku^{1}un^{4}	ku^{4}un^{14}	‘for chilli to be ground into sauce’
d.1	disyllabic	/3-3/	>	/4-3/	ni^{1}-ka^{3}ba^{3}	ka^{4}ba^{3}	‘lie down to sleep’
					ni^{1}-nda^{3}ba^{3}	nda^{4}ba^{3}	‘fall’
d.2	monosyllabic	/3-3/	>	/4-4/	ni^{1}-chi^{3}i^{3}	chi^{4}i^{4}	‘get wet’
					ni^{1}-kaʔ^{3}a^{3}	kaʔ^{4}a^{4}	‘emit a sound’
					ni^{1}-ku^{3}u^{3}	ku^{4}u^{4}	‘occur, happen’
					ni^{1}-chiʔ^{3}i^{3}	chiʔ^{4}i^{4}	‘harvest’ (tr)
e.1	disyllabic	/3-4/	>	/4-4/	ni^{1}-ku^{3}chi^{4}	ku^{4}chi^{4}	‘feel sad’[22]
					ni^{1}-ka^{3}ba^{4}	ka^{4}ba^{4}	‘turn’ (tr.)
e.2	monosyllabic	/3-4/	>	/4-24/	ni^{1}-ka^{3}a^{4}	ka^{4}a^{24}	‘slip’
					ni^{1}-ku^{3}un^{4}	ku^{4}un^{24}	‘grind [chilli] for sauce′

The preceding examples reveal interesting, though regular, patterns. If the lexical tone has /1/ on μ1 then /4/ is assigned to μ1 and the lexical tone /1/ on μ1 is assigned to μ2. This can be seen most clearly in (b) and (c) whose outcomes result in a rising tone /13/ or /14/ on μ2. When the lexical tone of μ2 is also /1/, it remains unchanged in the incompletive (a).

If the lexical tone of μ1 is /3/ then a split pattern develops depending on the syllabic structure of the stem. With disyllabic stems, the incompletive is formed by simply assigning /4/ to μ1; there is no change in the lexical tone of μ2 (d.1/e.1). If the stem is monosyllabic (CVV or CVʔV), then for lexical melodies /3-3/ the incompletive is /4-4/, an outcome that can be accounted for by positing a single lexical tone /3/ that spreads to both morae in the lexical base. The same spreading would occur when the single lexical tone is overwritten by inflectional tone /4/. If the lexical tonal melody is /3-4/ for disyllabic verbs the tone of μ1 is simply raised to /4/. In monosyllables, however, the mid tone /3/ on μ1 is pushed to μ2 and lowered to /2/ in the context of surrounding high tones (a rising /34/ tone is not found in YM) resulting in a /4-24/ tonal melody.

A final interesting incompletive formation involves the few irrealis stems that have a lexical tone /14/ on μ1 (for a complete list, see table 7 below). Such stems require the incompletive prefix *i^{4}-* if the verb is bimoraic, as shown in (19a) and table 7.[23] But with trimoraic verbs, tone /4/ overwrites the lexical tone, as shown in (19b). Like other inflectional tones, tone /4/ for the incompletive is the reflex of a segmental form, in this case the archaic incompletive prefix *i^{4}-,* only observable nowadays in this restricted prosodic context of initial /14/ in lexical stems.

[22] In collocation with the noun *i^{3}ni^{2}* ‘heart’.

[23] One verb has a suppletive incompletive form that begins with /i/: LEX.STEM *jo^{3}nde^{3}e^{3}* ‘sit down’ (PL subj.) > INCPL *i^{4}nde^{4}e^{4}* .Three other bimoraic verbs have an initial /i/ in their lexical stems, none of which have an initial /14/ tone: LEX.STEM *i^{3}ʔin^{3}* ‘scratch’ (INCPL *iʔ^{4}in^{3}*); LEX.STEM *i^{1}chi^{1}* ‘dry up (something alive, such as a plant)’ (INCPL *i^{4}chi^{1}*); LEX.STEM *i^{3}xa^{3}* ‘do’ (INCPL *i^{4}xa^{3}*).

(19)		CPL-1	INCPL		
	a.	ni^{1}-ki^{14}tu^{3}	i^{4}-ki^{14}tu^{3}	(intr)	‘dawn’
		ni^{1}-ta^{14}ni^{3}	i^{4}-ta^{14}ni^{3}	(intr)	‘get bruised’ (fruit)
		ni^{1}-ti^{14}bi^{3}	i^{4}-ti^{14}bi^{3}	(intr)	‘rotten’
		ni^{1}-chu^{14}tu^{2}	i^{4}-chu^{14}tu^{2}	(tr)	‘kiss’
	b.	ni^{1}-xo^{14}+kwi^{1}in^{1}	xo$^{\mathbf{4}}$+kwi^{1}in^{1}	(intr)	‘turn around to look’
		ni^{1}-si^{14}+kwe^{1}kun^{1}	si$^{\mathbf{4}}$+kwe^{1}kun^{1}	(tr)	‘spread a disease to (someone)’

This incompletive prefix *i*^{4}- in YM provides an example of the retention of a historical form of a bound prefix to mark the continuative, a morpheme discussed by McKendry (2013:80):[24]

> The imperfective prefix provides an example of the process whereby CV segments are lost, but the tones remain as floating tones. In most varieties the difference between the irrealis and the imperfective forms of verbs is the presence of a High tone in the imperfective. Hollenbach (2001) posits that this floating High tone is all that remains of a verbal morpheme which up to colonial times had CV segments.

McKendry (2013:80) goes on to say that the historical prefix form is *yo*, attested in Alvarado (1962 [1593]) as in the following example:

(20) **yo**-sasi=ndi
IPFV-eat=I
‘I'm eating.’

Finally, there are at least two verbs in our sample that have an irregular tonal outcome in the incompletive (21a). Another irregular verb (21b) has the unexpected historical incompletive marked *i*^{4}- despite lacking the initial /14/ lexical tonal melody that otherwise motivates the use of this prefix.

(21)		CPL-1	INCPL	Expected		
	a.	ni^{1}-ka?^{1}an^{1}	ka?^{4}an^{2}	*ka?^{4}an^{1}	(intr)	‘talk’
		ni^{1}-sa^{1}a^{4}	sa^{4}a^{24}	*sa^{4}a^{14}	(intr)	‘get upset’[25]
	b.	ni^{1}-jo^{3}nde^{3}e^{3}	(i^{4}-)nde^{4}e^{4}	*jo^{4}nde^{3}e^{3}	(intr)	‘sit down’ (PL sub.)

[24] The same incompletive prefix is also found Juxtlahuaca Mixtec (Ramírez and Beatham, 2012:4), e.g. *í-ndú'ú=ra* ‘he's sitting down.’ We are indebted to Lucien Carroll for bringing McKendry's observation and the Juxtlahuaca examples to our attention.

[25] There are eight monosyllabic verbs (seven intransitives and one transitive) that have /1-4/ lexical tone. All but *sa*^{1}*a*^{4} (‘get upset’) form the incompletive with /4-14/, as expected (see examples in table 8). However, there are two verbs *sa*^{1}*a*^{4} (‘get heated up’ [e.g., a boiled liquid] and ‘get upset’) that are homophonous in the irrealis though distinct in the incompletive: *sa*^{4}*a*^{14} ‘get heated up’ [a liquid] and *sa*^{4}*a*^{24} ‘get upset’. The two verbs would seem to be related as distinct senses of the same lemma. Whether the irregular incompletive tonal melody of one sense (*sa*^{4}*a*^{24} ‘get upset’) can be ascribed to a disambiguating function is, however, unclear.

4.2.3. Inflectional tone for the negative: Irrealis, incompletive, completive

Negation in YM can be marked inflectionally by means of tone on verbs in the irrealis, completive, and, less commonly, the incompletive. In cases in which negation cannot be marked by tone a negative adverb is used. With the incompletive, at times both tonal and syntactic marking of negation can occur with the same verb stem (table 8, below).

Negation of the irrealis and completive through tone is shown in (22) and (23). For the irrealis, negation is realized by overwriting the lexical tone on μ1, be it /1/ or /3/, by an ascending tone /14/. This occurs regardless of whether the verb has a bimoraic stem as in (22a) or a trimoraic one, as in (22b), or even if the verb is a causative derived verb with the prefix *sa*^{4}-, as in (22c).

(22)		IRR	NEG.IRR		
	a.	cho?^{3}ma^{4}	cho$^{\mathbf{14}}$ma^{4}	(tr)	‘squash’
		ka?^{1}an^{1}	ka?$^{\mathbf{14}}$an^{1}	(intr)	‘talk’
	b.	ka^{3}+xi^{4}ta^{3}	ka$^{\mathbf{14}}$+xi^{4}ta^{3}	(tr)	‘grind’
		tu^{1}+xu?^{4}u^{2}	tu$^{\mathbf{14}}$+xu?^{14}u^{2}	(tr)	‘get hurt’
	c.	sa^{4}-na?^{1}a^{1}	sa$^{\mathbf{14}}$-na?^{1}a^{1}	(tr)	‘teach’
		sa^{4}-ka^{3}sun^{2}	sa$^{\mathbf{14}}$-ka^{3}sun^{2}	(tr)	‘fry’

Note that despite the fact that in causative constructions with *sa*^{4}- the irrealis and incompletive are formally indistinct, negation through a rising tone is limited to the irrealis (23) whereas the negative of the incompletive is marked by the adverb *ba*^{143}.

(23)	IRR	NEG.IRR	INCPL	NEG.INCPL		
	sa^{4}-chi^{3}i^{3}	sa^{14}-chi^{3}i^{3}	sa^{4}-chi^{3}i^{3}	ba^{143} sa^{4}-chi^{3}i^{3}	(intr)	‘make wet’

In the causative, then, the irrealis and incompletive utilize distinct strategies to mark the negative: tonal inflection for the irrealis, a syntactic structure for the incompletive. This distinction suggests that despite the examples in tables 7 and 8, the prototypical markers of negation are tonal for the irrealis and segmental for the incompletive.

Negation of completive aspect only occurs with CPL-1 form, in which the completive aspect is marked by the prefix *ni*^{1}-. The tonally marked CPL-2 form cannot be negated, either through tone or by a preceding lexical element. For CPL-1 negation is realized in one of two ways. The most common (1385 of a total of 1574 corpus occurrences; 88 percent) is with *ni*^{14}-, applying the /14/ tonal marker of negation to the prefix. An alternative form is syntactic, using the element *ba*^{143} (189 cases in the corpus; 12 percent). After *ba*^{143} the tone of the completive prefix *ni*^{1}- is raised to *ni*^{4}-.

(24)	CPL-1	NEG.CPL-1 WITH TONAL MARKING	NEG.CPL-1 WITH SYNTACTIC MARKING AND RAISED TONE ON *NI*^{1}-		
	ni^{1}-na ʔ^{1}ma^{1}	ni^{14}-na ʔ^{1}ma^{1}	ba^{143} ni^{4}-na ʔ^{1}ma^{1}	(intr)	‘confess’
	ni^{1}-su^{3}ma^{3}	ni^{14}-su^{3}ma^{3}	ba^{143} ni^{4}-su^{3}ma^{3}	(intr)	‘go backwards’
	ni^{1}-ka^{3}chi^{2}	ni^{14}-ka^{3}chi^{2}	ba^{143} ni^{4}-ka^{3}chi^{2}	(tr)	'say'

For irrealis stem verbs with lexical tone /14/ on μ1, however, negation is marked syntactically by means of the negative adverb *kwa*^{14}, as shown in table 7. Note in table 7 that six verbs

with initial /14/ have an alternate form. The alternative irrealis forms *xi^{4}ko^{2}, xi^{4}ta^{3}*, *ya^{4}kun^{2}*, and *yuʔ^{3}bi^{2}* apparently can occur only after the negative marker *kwa^{14}* (i.e., the affirmative irrealis must have tone /14/ on μ1). However, two irregular forms, *chaʔ^{4}bi^{3}* and *chu^{4}tu^{2}*, can be used in the affirmative, that is, even if not preceded by the negative marker *kwa^{14}*. As pointed out in (19.a) above, the verbs in table 7 are those whose incompletive form is marked by the prefix *i^{4}-*. It is to facilitate the visualization of this pattern that we include their incompletive forms here.[26]

Table 7. The negative of irrealis stems with /14/ on μ1.

IRR	NEG.IRR	Alternative IRR	INCPL	
ki^{14}tu^{3} / ni^{1}ki^{4}tu^{3}	kwa^{14} ki^{14}tu^{3}	----	i^{4}-nki^{14}tu^{3}	‘dawn’
chuʔ^{14}ma^{1}	kwa^{14} chuʔ^{14}ma^{1}	----	i^{4}-chuʔ^{1}ma^{1}	‘be incensed’
ta^{14}ni^{3}	kwa^{14} ta^{14}ni^{3}	----	i^{4}-ta^{14}ni^{3}	‘get bruised’ (fruit)
ti^{14}bi^{3}	kwa^{14} ti^{14}bi^{3}	----	i^{4}-ti^{14}bi^{3}	‘get broken’ (a machine)
xa^{14}bi^{2}	kwa^{14} xa^{14}bi^{2}	----	i^{4}-xa^{14}bi^{2}	‘get tired’
xa^{14}ni^{2}	kwa^{14} xa^{14}ni^{2}	----	i^{4}-xa^{14}ni^{2}	‘dream’
xa^{14}ta^{2}	kwa^{14} xa^{14}ta^{2}	----	i^{4}-xa^{14}ta^{2}	‘shave’ (sb's head)
xi^{14}nda^{2}	kwa^{14} xi^{14}nda^{2}	----	i^{4}-xi^{14}nda^{2}	‘carve’
xiʔ^{14}ni^{3}	kwa^{14} xiʔ^{14}ni^{3}	----	i^{4}-xiʔ^{14}ni^{3}	‘rub’
xiʔ^{14}ñu^{3}	kwa^{14} xiʔ^{14}ñu^{3}	----	i^{4}-xiʔ^{14}ñu^{3}	‘patch up’
xioʔ^{14}o^{4}	kwa^{14} xioʔ^{14}o^{4}	----	i^{4}-xioʔ^{14}o^{4}	‘become sick from wanting a food’
chaʔ^{14}bi^{3}/chaʔ^{4}bi^{3}	kwa^{14} chaʔ^{14}bi^{3} kwa^{14} chaʔ^{4}bi^{3}	chaʔ^{4}bi^{3}	i^{4}-chaʔ^{14}bi^{3} i^{4}-chaʔ^{4}bi^{3} chaʔ^{4}bi^{3}	‘pay’
chu^{14}tu^{2}/chu^{4}tu^{2}	kwa^{14} chu^{14}tu^{2} kwa^{14} chu^{4}tu^{2}	chu^{4}tu^{2}	i^{4}-chu^{14}tu^{2}	‘kiss’
xi^{14}ko^{3}	kwa^{14} xi^{14}ko^{3} kwa^{14} xi^{4}ko^{3}	xi^{4}ko^{3}	i^{4}-xi^{14}ko^{3}	‘sell’
xi^{14}ta^{3}	kwa^{14} xi^{14}ta^{3} kwa^{14} xi^{4}ta^{3}	xi^{4}ta^{3}	i^{4}-xi^{14}ta^{3} i^{4}-xi^{4}ta^{3}	‘pull’
ya^{14}kun^{2}	kwa^{14} ya^{14}kun^{2} kwa^{14} ya^{4}kun^{2}	ya^{4}kun^{2}	i^{4}-ya^{14}kun^{2} i^{4}-ya^{4}kun^{2}	‘massage’
yuʔ^{14}bi^{2}	kwa^{14} yuʔ^{14}bi^{2} kwa^{14} yuʔ^{3}bi^{2}	yuʔ^{3}bi^{2}	i^{4}-yuʔ^{14}bi^{2}	‘get scared’

The negative adverb *kwa^{14}* in YM is used only before the irrealis. Comparative evidence from other Mixtec languages strongly suggests that this marker is the reflex of a historical irrealis marker that is still observable in other varieties as an optional or contextually conditioned marker, with various degrees of phonological independence: *kwa^{1}* in San Juan Colorado (Stark Campbell et al. 1986:163) (see also table 13 below), *ku* in Jamiltepec (Johnson 1988:102), *kūn* in Ocotepec (Alexander 1988:251), or the prefixes *kw-* or *kV-* in Coatzospan (Small 1990:398). Both the independent word and the fused prefix are undoubtedly related to the segmental alternations discussed in §4.3 and go back to the historical prefixes **ka-* and

[26] Note the verb *i^{4}-nki^{14}tu^{3}*, which is based on the contracted trimoraic stem *ni^{1}ki^{4}tu^{3}*, an alternate of bimoraic stem *ki^{14}tu^{3}* ‘dawn’. This suggests that an initial /14/ tone in bimoraic stems such as the ones in table 7 might be historically related to a conflation of two independent level tones /1/ and /4/ realized over the first two morae of historically prior trimoraic verbs.

**ku-* reconstructed by Kaufman (cited in Macaulay 1996:48) as the allomorphs for the irrealis in Proto-Mixtec.

The other principle independent negative marker in YM is *ba*^{143}, which is most commonly used to negate a verb in the incompletive, as in (25).[27]

(25) ba^{143} kaʔ^{4}an^{2}=yu^{1}
NEG INCPL.SPEAK=1SG
'I do not speak.'

A few incompletive verbs, however, can also accept tonal marking (/14/) of negation. The verbs that have been identified as accepting tonal as well as segmental marking of negation all have an incompletive stem that is segmentally different from that of the irrealis (for more details on segmental alternations in verb stems, see the following section). Table 8 offers data on the frequency of this alternative marking for four verbal lemmas of this type based on Amith and Castillo García's large corpus of YM texts.[28] Notice that the first and fourth verbs have alternative stems for the incompletive at a lexical level with no difference in meaning. The use of the negative form of the incompletive varies greatly depending on the lexical item. For example, for the verb *ku*^{3}*ni*^{3} 'know', tonal marking of the negative incompletive is found 1,394 times, whereas the syntactic alternative by means of *ba*^{143} is only found in only 22 cases. Both options, inflectional vs. the syntactic negation, are used with equal frequency for the verb *kwi*^{3}*in*^{3} 'accept', but for the verbs *kwa*ʔ^{1}*a*^{3} 'permit' or *ko*^{3}*to*^{3} 'see', the tonal encoding is less favoured.

Table 8. Incompletive verbs with negation marked by tone /14/.

IRR	INCPL	Corpus occurrences of affirmative INCPL	NEG.INCPL	Corpus occurrences of tonal NEG.INCPL	*ba*^{143}
ku^{3}ni^{3} 'know'	ji^{4}ni^{2}	3,483	ji^{14}ni^{2}	1,394	22
	xi^{4}ni^{2}	298	xi^{14}ni^{2}	261	
	ji^{4}ni^{3}	119	ji^{14}ni^{3}	3	
	xi^{4}ni^{3}	45	xi^{14}ni^{3}	1	
kwi^{3}in^{3} 'accept'	xi^{4}in^{4}	81	xi^{14}in^{4}	59	60
kwaʔ^{1}a^{3} 'permit'	xaʔ^{4}a^{13}	175	xaʔ^{14}a^{13}	24	86
ko^{3}to^{3} 'see'	xi^{4}to^{3}	146	xi^{14}to^{3}	2	6
	ji^{4}to^{3}	419	ji^{14}to^{3}	1	11

In this section we have examined the use of tone in YM as an inflectional exponent of aspect, mood and polarity. Inflectional tones in this system work as prosodic affixes with a remarkable consistency in the form-meaning mapping of inflection. Before we compare the behaviour of tone in YM to that found in other Mixtec languages, in the next section we

[27] Notice that both *ba*^{143} and the negative irrealis marker *kwa*^{14} have the same tone /14/ characteristic of other negative forms in YM.

[28] These four verbs are not the only ones that accept tonal marking of negation in the incompletive. They are simply those for which such tonal marking is most frequently found in the corpus. Although not documented in the corpus, according to the judgement of Castillo García other verbs also accept tonal marking of negation in the incompletive: *ka*^{3}*xi*^{4} IRR, *xa*^{4}*xi*^{24} INCPL, *xa*^{14}*xi*^{24} NEG INCPL 'eat', 'bite into'; and *xi*ʔ^{4}*in*^{13} INCPL, xiʔ^{14}*in*^{13} NEG INCPL 'leak' (a house roof) (this verb does not have an irrealis form).

introduce other relevant aspects of the inflectional morphology of YM that involve segmental alternations on the stem.

4.3. Stem alternation patterns in verbal morphology

In addition to tone, segmental stem alternations also play an important role in YM verbal inflection. Most verbs, here called "invariant verbs", maintain segments constant throughout their paradigms, as for example the verbs *ku^{3}kiʔ^{4}bi^{3}* 'be a nuisance' and *xi^{3}kwiʔ^{4}na^{4}* 'steal' in table 9. Other verbs, here called "variant verbs", may have two segmentally distinct stems: *ku^{3}kaʔ^{3}an^{3}* 'be ashamed', for example, has one stem for the irrealis mood (and for the negative irrealis) and another for the incompletive and completive aspects The same stem formatives (e.g., **ku-* in table 10) may be found with either invariant or variant verbs. This type of segmental variation is very common in YM and in Mixtec languages in general. But it is still poorly understood and further study is needed to understand any possible conditioning factors.

Table 9. Invariant and variant verbs in YM.

	Invariant verbs (intr) 'be a nuisance'	(tr) 'steal'	Variant verbs (intr) 'be ashamed'
IRR	ku^{3}+kiʔ^{4}bi^{3}	xi^{3}+kwiʔ^{4}na^{4}	ku^{3}+ka'^{3}an^{3}
NEG.IRR	ku^{14}+kiʔ^{4}bi^{3}	xi^{14}+ kwiʔ^{4}na^{4}	ku^{14}+ka'^{3}an^{3}
CPL-1	ni^{1}- ku^{3}+kiʔ^{4}bi^{3}	ni^{1}- xi^{3}+kwiʔ^{4}na^{4}	ni^{1}- xi^{3}+ka'^{3}an^{3}
CPL-2	ku^{13}+kiʔ^{4}bi^{3}	xi^{13}+kwiʔ^{4}na^{4}	xi^{13}+ka'^{3}an^{3}
INCPL	ku^{4}+kiʔ^{4}bi^{3}	xi^{4}+kwiʔ^{4}na^{4}	xi^{4}+ka'^{3}an^{3}

Most YM verbs are invariant: 89 percent of our sample verbs are of this type (495 of 554).[29] The remaining 109 are variant. Such verbs appear to be remnants of an older system in which the stem formatives involved in the building of the irrealis stem were once irrealis markers of some sort. Macaulay (1996:48) makes this point and cites a manuscript by Terrence Kaufman in which he reconstructs the proto-Mixtec prefixes **xi-* (durative), **ka-* (irrealis), and **ku-* (also irrealis) as evidence for the historical basis of the *xi-/ku-* alternation noted in many Mixtec languages. These same archaic stem formatives are evident in YM. At some point this situation became morphologically opaque, giving rise to the invariant~variant verb patterns now in evidence. For some verbs, the irrealis stem generalized to the entire paradigm (e.g., *ku^{3}kiʔ^{4}bi^{3}* 'be a nuisance') whereas for other verbs it was the stem bearing Kaufman's 'durative' **xi-* that generalized (e.g., *xi^{3}kwiʔ^{4}na^{4}* 'steal').

Note that in the case of *invariant verbs* with lexical tone /1/ or /14/ on μ1, the irrealis and CPL-2 forms are indistinct (table 10, first column, rows 1 and 3). This homophony is avoided, however, with *variant verbs* as in these cases the irrealis stem is not identical to the lexical stem of the incompletive and completive (table 10, second column):

[29] As pointed out above, our sample does not include any causative verb with the prefix *sa^{4}-*.

Table 10. Homophony between irrealis and CPL-2.

	Invariant (tr) 'sew'	Variant (tr) 'ask for'	Initial /14/ (intr) 'dream'
IRR	ki^{1}ku^{3}	ka^{1}kan^{1}	xa^{14}ni^{2}
CPL-2	ki^{1}ku^{3}	xi^{1}kan^{1}	xa^{14}ni^{2}
INCPL	ki^{4}ku^{13}	xi^{4}kan^{1}	i^{4}-xa^{14}ni^{2}

Of the 109 variant verbs in our sample, 101 (93%) fall into two inflectional classes attending to the proposed stem formative of the irrealis: *ku*+ (82 cases) or *ka*+ (19 cases). The remaining eight verbs are irregular to some degree and are treated separately. The distribution of the classes in our sample is given in (26).

(26)

		ku+	*ka*+	TOTAL
Bimoraic	intr	29	3	
	tr	13	10	
Trimoraic	intr	35	6	
	tr	5	0	
TOTAL		82	19	101

The following sections analyze the patterns of variation manifested in the 109 variant verbs of our sample.

4.3.1. The ku+ stem class

Eighty-two verbs in the sample have a stem change to initial *ku*+ in the irrealis, e.g. *chi*+*chi* /1-3/ 'mature, ripen' > IRR.STEM *ku*+*chi*. We refer to this variable segmental portion of the stems as the stem formative (indicated by the plus sign +). The unstressed /u/ in the formative *ku*+ surfaces as [o] in conditions that are not entirely clear; there may be some free variation involved. Note also that *ku*+ is labialized to [kw][30] when associated to a non-back initial stem vowel (e.g. *ch*+*achi* /3-3/ 'be torn apart' > IRR.STEM *ku*+*achi* [k^{w}achi]). Representative examples of the *ku*+ stem class are given in (27). Verbs with variable lexical stems are illustrated in (27b). In a few cases the irrealis is built by adding *ku*+ to a verb lacking a stem formative in the lexical form (27c).

(27) The ku+ class

	LEX.STEM	IRR.STEM	TONE		
a.	cha+achi	ku+achi	/3-3/	(intr)	'be torn apart'
	chi+chi	ku+chi	/1-3/	(intr)	'mature, ripen'
	ja+nuʔu	ku+nuʔu	/1-1-4/	(intr)	'go back to one's place'[31]
	ji+ni	ku+ni	/3-2/	(tr)	'see'
	jo+ndaa	ko+ndaa	/3-2-2/	(tr)	'look after'
	ju+ndaʔa	ku+ndaʔa	/1-1-3/	(intr)	'remove oneself (from place)'
	ju+eta	ku+eta	/3-3/	(intr)	'be measured'
	ki+xin	ku+sun	/1-1/	(intr)	'sleep'

[30] Labialization and palatalization commonly occur before enclitics: /Cu/, and sometimes /Co/, is labialized before non-back vowels and /Ci/ is palatalized before non-front vowels.

[31] Alternative stem: *kwa^{1}nuʔ^{1}u^{4}*.

	si+iso	ku+iso	/1-1/	(intr)	‘come to a boil’
	xa+aʔa	ku+aʔa	/1-3/	(dtr)	‘give’
	xi+iin	ku+iin	/1-1/	(intr)	‘copulate’
	xi+iko	ku+iko	/3-4/	(tr)	‘carry’
	xi+kaʔan	ku+kaʔan	/3-3-3/	(intr)	‘be ashamed’
	xu+xa	ku+xa	/3-3/	(intr)	‘become an adult’
b.	xi+to/ji+to	ko+to	/3-3/	(intr)	‘look’
	ju+ndeta/ndu+ndeta	ku+ndeta	/3-3-3/	(intr)	‘stand up’ (PL sub.)
c.	ndoʔo	ko+ndoʔo	/3-3/	(intr)	‘be the victim of disfortune’
	nani/ju+nani	ku+nani	/(3-)3-2/	(intr)	‘become resolved [a problem]’

4.3.2. The ka+ stem class

Nineteen verbs have an initial *ka+* sequence for the irrealis that is not present in the lexical stem (incompletive). For example, *xa+ta* /3-3/ ‘dig out’ is *ka+ta* in the irrealis. As the tone melody is independent from segmental changes, we have disassociated the segments from the tonal structure. Representative examples of *ka+* stem class verbs are given in (28).

(28) The ka+ class

	LEX.STEM	IRR.STEM			
a.	sa+si	ka+si	/3-2/	(tr)	‘look after cattle’
	xa+ʔnu	ka+ʔnu	/1-1/	(tr)	‘split in two’
	xi+kan	ka+kan	/1-1/	(tr)	‘ask for’
	ja+nduʔu	ka+nduʔu	/3-4-4/	(intr)	‘lie down’
b.	xa+ta/ja+ta	ka+ta	/3-3/	(intr)	‘dig out’
	xa+kwiin/ju+kwiin	ka+kwiin	/3-1-3/	(intr)	‘be left hanging’
	xi+ta/ji+ta	ka+ta	/3-3/	(intr)	‘sing’

As previously noted, we treat the segmental stem of the completive (CPL-1) as the lexical stem. It has a wider distribution in the aspect paradigm, being found in the incompletive as well as the completive. Additionally, its form is more diverse and unpredictable. A number of verbs may have alternative lexical stems, almost invariably manifesting a *x/j*-type of alternation in the historical prefix, such as the one illustrated by the verbs in (28b).

In general, there is little in the lexical stem that indicates with certainty that the verb is a member of the variant class although the phonology of the stem does provide some clues. For example, no invariant verb has a lexical stem with an onset /j/, so verbs such as ju^3+nda^3tu^3 ‘wait’, ju^3+ndi^3xi^3 ‘dress’, ja^3+ndu^4u^4 ‘lie down’ and ja^3ta^2 ‘graze’ can be assumed to be variant, with a different onset segment in the irrealis. Furthermore, in most cases verbs beginning with *ju-* belong to the *ku+* class, and with *ja-* to the *ka+* class. The initial sequences of irrealis stems are less revealing: irrealis stems with /ka/ or /ku/ onsets may or may not be variant: 224 regular verbs in the sample have irrealis stems with /ka/ or /ku/ onsets and only 101 of these (43%) are variant. Of the 123 remaining invariant verbs, 59 have a /ka/ onset and 64 a /ku/ onset.[32]

[32] Like the verbs of the *ku+* class, most of the invariant verbs with an onset in /ku/ are intransitive (50 out of 59). The transitivity profile of verbs having /ka/ is much more mixed.

4.3.3. Irregular verbs

Finally, eight verbs in the sample of a total of 109 variant verbs are irregular, although most of them could be alternatively analyzed as members of the *ku+* class. The verbs listed in (29) have suppletive irrealis stems that at times also bear tonal melodies that are distinct from those of the lexical stem.

(29)

	LEX. STEM	IRR		
a.	i+^{3}xa^{3}	a+^{3}sa^{3}	(tr)	'do'[33]
	ju^{3}+na^{3}ni^{2}	na^{3}ni^{2}	(intr)	'be able to reach out to grab (something)'
	xi+ʔ^{3}i^{3}	ko+ ʔ^{3}o^{3}	(tr)	'drink'
	xa+ʔ^{1}an^{1}	ku+ʔ^{1}un^{1}	(intr)	'go'
b.	xi+^{1}xi^{1}	ko+^{3}ko^{3}	(intr)	'get burnt'
	xi+^{1}yo^{3}	ko+^{3}o^{3}	(tr)	'be (existential)'
	xi+ʔ^{1}i^{1}	ku+^{3}u^{2}	(intr)	'die'
	xi+^{1}ka^{3}	ka+^{3}ka^{3}	(intr)	'walk'

To this point we have presented and analyzed tonal and segmental variation in the marking of inflection in YM verb. In the following section, we conclude this article by comparing YM verbal inflection with patterns found in two other languages within the Mixtec family for which comparable data exists.

5. Conclusion: Yoloxóchitl verbal inflection in a Mixtec context

This paper has discussed tonal and segmental variation in the inflection of verbs in YM. We have shown that in this language tones work as fully fledged inflectional exponents. That is, YM manifests a system of verbal inflection whereby a given tone X is assigned a certain morphosyntactic value Y. The system has little tonal allomorphy overall, and when we find it, especially in the building of the incompletive, the different tonal structures can be accounted for as conditioned by morphophonological properties of the stems. In other words, one does not need to appeal to information encoded in the lexicon to account for the selection of tonal alternants.

We conclude this article by placing the inflectional system of YM within the context of Mixtec languages in general in order to suggest how representative the YM system is considering Mixtec as a language family. The answer is not straightforward. By comparing the YM system to that found in Xochapan Mixtec, we show that both systems share characteristics that we suggest are features of the Guerrero subgroup of Mixtec languages. A very brief excursion into another more distantly related Mixtec language for which sizeable lexical samples exist, such as San Juan Colorado Mixtec, reveals that outside the Guerrero subgroup of Mixtec languages the inflectional system appears to be very different. At this stage, however, we can only suggest possible patterns of tonal and segmental morphology to explore in analyzing Mixtec dialectology.

Xochapan Mixtec (henceforth XM) is a member of the Guerrero subgroup and thus closely related to YM, also a Guerrero Mixtec language. Xochapan Mixtec is spoken by approximately 8,000 people in Xochapa, a village in the municipality of Alcozauca about 60 kilometers north-northeast of Yoloxóchitl. In general, XM bears a strong resemblance to YM

[33] The verb has an alternative pair *ki+xa* /3-3/ 'do' > IRR.STEM *ku+sa* in the *ku+* class.

though differing in some interesting ways. The dictionary of XM by Stark, Johnson, and González de Guzmán (2006) includes 111 verbs with bimoraic lexical stems. For each the authors give three inflected forms: the irrealis (called 'future'), the completive (called 'past') and the incompletive (called 'present'). Xochapa has four level tones. To facilitate comparison we have converted the orthography of the original, which uses accents, to that we employ for YM: 1 (low) to 4 (high), and two contour tones, one rising and one falling.

In XM, the completive may be encoded in either of two ways, the distribution of which is in complementary distribution. Verbs that have a tone /3/ on μ1 in their lexical representation (i.e., irrealis), receive a tone /2/ in the completive, as in (30a). Verbs with a lexical tone /1/ on μ1 (mostly, but not exclusively, associated with intransitive verbs as in YM; see examples below), receive the prefix *ndi*^{1}-, cognate of YM *ni*^{1}- used in the CPL-1 (30b). Among the bimoraic examples in (30), there are also instances of variant verbs of the two classes *ku*+ and *ka*+, again cognate with YM.

(30)		IRR	CPL		
	a.	cha?^{3}bi^{3}	cha?^{2}bi^{2}	(tr)	'pay'
		ka^{3}a^{3}	ka^{2}a^{2}	(intr)	'bathe (at sweat lodge)'
		ku^{3}un^{3}	ku^{2}un^{2}	(intr)	'produce'
		ku+^{3}tu^{4}	chu+^{2}tu^{4}	(intr)	'get filled'
		ka+^{3}kin^{3}	xa+^{2}kin^{2}	(tr)	'place'
		ka+?^{3}mi^{3}	xa+?^{2}mi^{2}	(tr)	'burn'
	b.	ka^{1}nda^{1}	ndi^{1}-ka^{1}nda^{1}	(intr)	'move, tremble'
		ku^{1}ni^{1}	ndi^{1}-ku^{1}ni^{1}	(tr)	'want'
		ka?^{1}an^{1}	ndi^{1}-ka?^{1}an^{1}	(intr)	'talk'
		nda?^{1}i^{1}	ndi^{1}-nda?^{1}i^{1}	(intr)	'shout', 'bark', 'scold'

In contrast to XM, in which the two markings available for the completive appear in complementary distribution, in YM there are two alternative completive forms: CPL-1 and CPL-2. As we have pointed out above, for invariant verbs the form of CPL-2 with lexical tones /1/ or /14/ on μ1 is homophonous with that of the irrealis. A topic for future research, therefore, is whether in YM simple tonal marking of the completive is more common when a contrast with the irrealis is maintained. This constrast would be maintained when (1) the stem-initial tone of the irrealis is /3/, or (2) there is a segmental distinction between the lexical (completive) and irrealis stem (see §4.3.3).

The XM sample also includes 13 verbs with the prefixes *ku*^{3}- for the irrealis and *xi*^{1}- for the completive. Some illustrative examples are given in (31). These verbs form their own inflectional class whose membership appears to be lexically determined.

(31)	IRR	CPL	INCPL		
	ku^{3}-nda^{3}a^{3}	xi^{1}-nda^{2}a^{2}	nda^{4}a^{3}	(tr)	'look after'
	ku^{3}-na^{3}ni^{4}	xi^{1}-na^{2}ni^{4}	na^{4}ni^{4}	(intr)	'be called'
	ku^{3}-nda^{3}tu^{3}	xi^{1}-nda^{2}tu^{2}	nda^{4}tu^{4}	(tr)	'wait'
	ku^{3}-ndi^{3}chi^{3}	xi^{1}-ndi^{2}chi^{2}	ndi^{4}chi^{3}	(intr)	'stand' (SG sub.)

For the verbs in (31), notice that when the lexical stem has tone /3/ in the initial mora, the completive has /2/ (e.g. 'look after' (IRR) *ku*^{3}*-nda*^{3}*a*^{3} vs. (CPL) of *xi*^{1}*-nda*^{2}*a*^{2}). This may result from tone sandhi rules, pointing to a harmonization of tone /3/ to the low tone of the prefix *xi*^{1}-, but could also be taken as the bridging context from which the possible reanalysis of tone /2/ as a marker of completive in XM resulted in the forms given in (30a). Similarly, the

stem formative *ku*+ that we find in the irrealis of verbs of the *ku*+ class is undoubtedly the historical reflex of the stem formative of that class. As we have pointed out, the irrealis stem of many verbs was historically levelled to the entire paradigm, producing a large number of invariant verbs that now have a stem with a velar onset /k/ in all forms.[34]

For the incompletive, when the tonal melody of the base is /1-1/ as in (32a), inflectional tone /4/ overwrites lexical tone /1/ on μ1, just as it does with initial lexical tone /3/, as shown in (32b-c). However, when the melody of the base is /1-3/ or /1-4/, as in (32d-e), the inflectional tone of the incompletive is added onto, but does not replace, the lexical tone /1/ of μ1, resulting into a falling tone on μ1 that given the lack of pitch specification in the source we write simply as falling (v^F) though most likely the contours are /41-3/ and /41-4/.

(32)

		IRREAL	INCPL	CPL	Transitivity	Gloss
a.	/1-1/	ka^{1}nda^{1}	ka^{4}nda^{1}	ndi^{1}-ka^{1}nda^{1}	(intr)	‘move, tremble’
		ku^{1}ni^{1}	ku^{4}ni^{1}	ndi^{1}-ku^{1}ni^{1}	(tr)	‘want’
		kaʔ^{1}an^{1}	kaʔ^{4}an^{1}	ndi^{1}-kaʔ^{1}an^{1}	(intr)	‘talk’
		ndaʔ^{1}i^{1}	ndaʔ^{4}i^{1}	ndi^{1}-ndaʔ^{1}i^{1}	(intr)	‘shout, bark, scold’
b.	/3-3/	ka^{3}ku^{3}	ka^{4}ku^{4}	ka^{2}ku^{2}	(intr)	‘be born’
		ka^{3}chi^{3}	ka^{4}chi^{3}	ka^{2}chi^{2}	(tr)	‘say’
		chi^{3}i^{3}	chi^{4}i^{4}	chi^{2}i^{2}	(intr)	‘get wet’
		ndaʔ^{3}a^{3}	ndaʔ^{4}a^{3}	ndaʔ^{2}a^{2}	(intr)	‘get better, recuperate’
c.	/3-4/	ko^{3}ko^{4}	ko^{4}ko^{4}	ko^{2}ko^{4}	(tr)	‘swallow, gulp down’
		sa^{3}ta^{4}	sa^{4}ta^{4}	sa^{2}ta^{4}	(tr)	‘buy’
		ta^{3}an^{4}	ta^{4}an^{4}	ta^{2}an^{4}	(tr)	‘put in, insert’ (PL.OBJ)
d.	/1-3/	ka^{1}ku^{3}	ka$^{F(41)}$ku^{3}	ndi^{1}-ka^{1}ku^{3}	(intr)	‘escape’
		ndi^{1}ko^{3}	ndi$^{F(41)}$ko^{3}	ndi^{1}-ndi^{1}ko^{3}	(intr)	‘cool down’
		ndo^{1}o^{3}	ndo$^{F(41)}$o^{3}	ndi^{1}-ndo^{1}o^{3}	(intr)	‘stay’
		kaʔ^{1}un^{3}	kaʔ$^{F(41)}$un^{3}	ndi^{1}-kaʔ^{1}un^{3}	(intr)	‘burn’
e.	/1-4/	chi^{1}ʔyo^{4}	chiʔ$^{F(41)}$yo^{4}	ndi^{1}-chi^{1}ʔyo^{4}	(intr)	‘boil’
		nu^{1}na^{4}	nu$^{F(41)}$na^{4}	ndi^{1}-nu^{1}na^{4}	(intr)	‘open’
		sa^{1}a^{4}	sa$^{F(41)}$a^{4}	ndi^{1}-sa^{1}a^{4}	(intr)	‘get warm’

A summary comparison of the realization of the incompletive in Yoloxóchitl Mixtec and Xochapa Mixtec is given in table 11 with data of 106 verbs in XM.[35] The number of occurrences of each tonal melody pattern is given in the final column.

[34] In Cuicatec, the historical reflex of an irrealis prefix *ku*^{3}- can still be observed (see Feist and Palancar, this volume).

[35] Not included in the table of 106 verbs are five somewhat irregular verbs that are not easily categorized. Three add *ku*^{3}- to an incompletive form with a tonal melody of /4-4/; one adds *ku*^{3}- to an incompletive form with a tonal melody of /3-4/. The final irregular verb is ‘go’.

Table 11. Comparative of the realization of the incompletive in bimoraic verbs of YM and XM

		YM	XM	Occurrences
/1-1/	disyllabic	$CV^{1}CV^{1} > CV^{4}CV^{1}$	$CV^{1}CV^{1} > CV^{4}CV^{1}$	11
	monosyllabic	$CV^{1}V^{1} > CV^{4}V^{1}$	$CV^{1}V^{1} > CV^{4}V^{1}$	4
/3-3/	disyllabic	$CV^{3}CV^{3} > CV^{4}CV^{3}$	$CV^{3}CV^{3} > CV^{4}CV^{3}$	11
			$CV^{3}CV^{3} > CV^{4}CV^{4}$	25
	monosyllabic	$CV^{3}V^{3} > CV^{4}V^{4}$	$CV^{3}V^{3} > CV^{4}V^{3}$	3
			$CV^{3}V^{3} > CV^{4}V^{4}$	15
/1-3/	disyllabic	$CV^{1}CV^{3} > CV^{4}CV^{13}$	$CV^{1}CV^{3} > CV^{F}CV^{3}$	7
	monosyllabic	$CV^{1}V^{3} > CV^{4}V^{13}$	$CV^{1}CV^{3} > CV^{F}V^{3}$	6
/1-4/	disyllabic	$CV^{1}CV^{4} > CV^{4}CV^{14}$	$CV^{1}CV^{4} > CV^{F}CV^{4}$	2
	monosyllabic	$CV^{1}V^{4} > CV^{4}V^{14}$	$CV^{1}CV^{4} > CV^{F}V^{4}$	1
/3-4/	disyllabic	$CV^{3}CV^{4} > CV^{4}CV^{4}$	$CV^{3}CV^{4} > CV^{4}CV^{4}$	20
	monosyllabic	$CV^{3}V^{4} > CV^{4}V^{24}$	$CV^{3}V^{4} > CV^{4}V^{4}$	1

For the incompletive form of verbs with lexical melody /1-1/, both YM and XM keep the lexical tone on μ2, but with /3-3/ YM shows a split pattern based on syllable structure (i.e., the inflectional pattern is predictable from stem morphophonology), whereas the split in XM is encoded in the lexicon (i.e., there are no apparent morphological or phonological conditioning elements). For verbs with melodies /1-3/ and /1-4/, XM adds the high tone of the incompletive to the lexical low tone on μ1, resulting in a falling tone, but maintains the lexical tone of μ2. In YM, in contrast, the high tone /4/ of the incompletive replaces the lexical tone /1/ on μ1which is aligned then to μ2, resulting in a rising tone on μ2. It is worth noting that YM never manifests falling tone on the first mora; the rightward shift of lexical tone /1/ might, therefore, reflect this phonotactic constraint. Finally, for verbs with melody /3-4/, XM preserves lexical tone on μ2 in all cases, whereas syllabic structure is again very relevant for YM, where we find a split between /4-4/ on disyllabic stems and /4-24/ (from underlying /4-34/) on monosyllabic stems.

The tonal inflection of both XM and YM is in general very similar. We take this systemic similarity to point to a common feature of the Guerrero subgroup. But a glimpse into the inflection of San Juan Colorado Mixtec, another Mixtec language for which a published dictionary provides ample comparative data on verb morphology, suggests that Mixtec languages may also show tonal allomorphy not predictable by morphophonology.

San Juan Colorado Mixtec (henceforth SJCM) is spoken in the district of Jamiltepec, state of Oaxaca, by approximately 6,000 people. SJCM pertains to the Costa branch of Mixtec (see fig. 1) and it is thus only distantly related to the Southern Baja branch containing the Guerrero subgroup. To provide comparative data, we rely on a sample of 179 verbs from the dictionary by Stark *et al.* (1986) that has the following two properties: (a) the verbs have bimoraic stems in all three forms; and (b) the irrealis and the completive have the same tonal melody although the irrealis is formed by preceding the irrealis stem with the modal marker *kwa*^{1}.[36] This means that the incompletive form is the only form marked by tone, and it is precisely in the tonal patterns found in incompletive that the inflection of SJCM differs from both YM and XM.

Based exclusively on the data available in Stark *et al.* (1986), the incompletive form in SJCM displays a tonal allomorphy whose conditioning appears to be lexical. This means that the morphology of the incompletive is best analyzed by grouping SJCM verbs according to

[36] The appearance of this mood marker is undoubtedly the cognate of the negative irrealis marker *kwa*^{14} used with YM verbs whose irrealis form has /14/ on μ1. This point was discussed in section 4.2.3.

the tonal melodies manifested in the incompletive. Such an organization results in in the four inflectional classes described in table 12.

Table 12. Tonal classes for the incompletive in SJCM.

CLASS		LEX	IRR	CPL	INCPL			
I	17	/1-1/	kwa^{1} ka^{1}an^{1}	ka^{1}an^{1}	/3-3/	ka^{3}an^{3}	(tr)	'bite'
	31	/1-2/	kwa^{1} kaʔ^{1}yɨ^{2}	kaʔ^{1}yɨ^{2}		kaʔ^{3}yɨ^{3}	(tr)	'paint'
	1	/3-2/	kwa^{1} ko^{1}kon^{2}	ko^{1}kon^{2}		ko^{3}kon^{3}	(tr)	'swallow'
96	47	/2-2/	kwa^{1} nu^{2}ña^{2}	nu^{2}ña^{2}		nu^{3}ña^{3}	(tr)	'open'
II	5	/1-1/	kwa^{1} ndɨ^{1}yɨ^{1}	ndɨ^{1}yɨ^{1}	/3-2/	ndɨ^{3}yɨ^{2}	(intr)	'scorch'
	4	/1-2/	kwa^{1} tsi^{1}yo^{2}	tsi^{1}yo^{2}		tsi^{3}yo^{2}	(intr)	'have diarrhoea'
29	20	/2-2/	kwa^{1} ki^{2}ku^{2}	ki^{2}ku^{2}		ki^{3}ku^{2}	(tr)	'sew'
III	4	/1-1/	kwa^{1} nda^{1}tsi^{1}	nda^{1}tsi^{1}	/3-1/	nda^{3}tsi^{1}	(intr)	'become loose'
	1	/1-2/	kwa^{1} na^{1}ñi^{2}	na^{1}ñi^{2}		na^{3}ñi^{1}	(tr)	'hit'
6	1	/2-1/	kwa^{1} kaʔ^{2}yɨ^{1}	kaʔ^{2}yɨ^{1}		kaʔ^{3}yɨ^{1}	(intr)	'use make-up'
IV	20	/1-1/	kwa^{1} kaʔ^{1}an^{1}	kaʔ^{1}an^{1}	/2-3/	kaʔ^{2}an^{3}	(tr)	'talk'
	3	/1-2/	kwa^{1} ja^{1}ta^{2}	ja^{1}ta^{2}		ja^{2}ta^{3}	(tr)	'buy'
	21	/2-1/	kwa^{1} ndaʔ^{2}ba^{1}	ndaʔ^{2}ba^{1}		ndaaʔ^{2}ba^{3}	(tr)	'switch off'
48	4	/2-2/	kwa^{1} naʔ^{2}ma^{2}	naʔ^{2}ma^{2}		naʔ^{2}ma^{3}	(tr)	'confess'

Verbs in classes I to III have a high tone /3/ on μ1 of the incompletive. Again, this marking strategy is reminiscent of the use of a high tone /4/ in both YM and XM for the same function. What is different about SJCM is that there are many verbs (class IV, approximately 27 percent of the total number of verbs analyzed) that mark the incompletive with a mid tone /2/. Additionally, taking simply the surface forms of verbs in isolation, there is no apparent motivation for the tonal changes manifested on the second mora of the verbs analyzed. Even if the default rule were to raise the lexical tone to tone /3/ in all morae, the patterns manifested in classes II and III would still require an explanation.

Tonal allomorphy involving the marking of the incompletive is also found in YM, as we saw in table 6 above, but in YM the outcome of tonal variance (except for the verb noted in fn. 23) is predictable from a combination of tonal melody and syllabic structure. Nevertheless, from an Oto-Manguean perspective, the tonal classes of SCJM are not typologically odd. Similar lexically conditioned patterns are also found in many languages of this stock including Cuicatec (Feist and Palancar, this volume), Triqui (DiCanio, this volume), Mazatec (Léonard and Fulcrand, this volume), Amuzgo (Kim, this volume) and Chatino (Campbell, this volume). It remains possible that a more refined phonological analysis carried out on SJCM verbs with novel data might reveal tonal structures or the influence of floating tones that have escaped our understanding. This paper is a cordial invitation to carry out such research in this fascinating area of the grammar of Mixtec. Documenting these languages by way of well-informed lexical databases is a priority before it is too late.

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