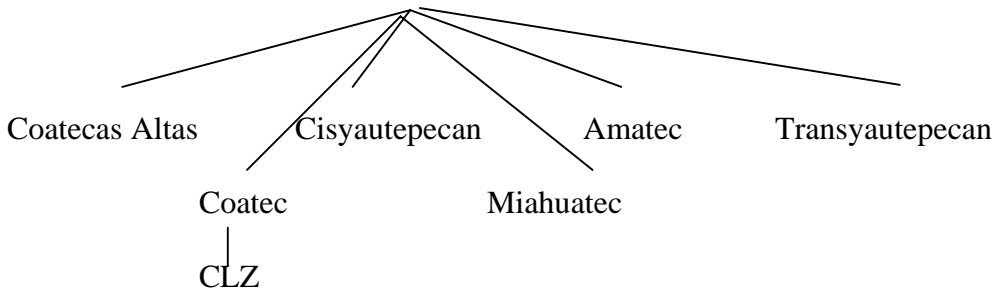


Two kinds of tonal morphology associated with potential aspect marking in Coatlán-Loxicha Zapotec
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1. Introduction

Coatlán-Loxicha Zapotec (CLZ) is one of about 20 Southern Zapotec language spoken in four communities in Southern Oaxaca state in Mexico.

(1) Southern Zapotec as divided by Smith-Stark (2001)



(2) CLZ has five tones:

high (H)	<i>mbé</i>	‘crab’
low (L)	<i>mbè</i>	‘mist’
falling (F)	<i>mbê</i>	‘spider’
rising (R)	<i>mbě</i>	‘turtle’
glottal (7)	<i>mbe⁷</i>	‘moon; butterfly’

The surface tone of a verb root may be changed in two different ways to mark potential.

2. A floating H tonal suffix

2.1 Tonal alternations in CLZ

CLZ has tonal alternations associated with potential aspect marking. This process targets tones that end low, i.e. L and F, and change them to tones that end high, i.e. H and R. The most common patterns are L→R and F→H:

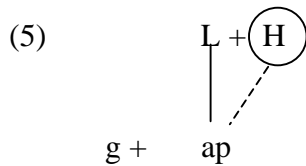
I wish to thank the following people and organizations for their support. The California Indian Languages Center, the Endangered Languages Fund, the Survey of California and Other Indian languages, and the UC Berkeley Humanities Research grant all contributed funds to make my 2002 and 2003 field trips possible, during which time I collected data on upstep in CLZ. Previous data on tone and tonal morphology in CLZ were collected both during independent field trips funded by some of these same sources, and also on the Project for the Documentation of the Languages of Meso-America. In my seven years of studying tone in this language I have benefitted from discussions about tone and Zapotec with several linguists including Terrence Kaufman, Leanne Hinton, George Aaron Broadwell, Larry Hyman, Sharon Inkelas, Mary Paster, Knut Olawsky, and others. About 6/7 of everything I know about this language I know because of my consultant and compadre, Lázaro Díaz Pacheco. I am also very grateful to Henry Azcona for providing child care and moral support during these last few field trips. Any errors or misinterpretations to be found here are my own.

(3)	Root	-àp 'rise'	-yûb 'fall'
	Habitual	ndàp	ndyûb
	Potential	gǎp	yúb

These alternations can be analyzed as the result of a floating high tone that is associated with the potential aspect. Although the segmental portion of the potential aspect marker is a prefix, the tonal portion of the morpheme is always added to the right of the root's underlying tone, and is more simply represented as a suffix, rendering these sequences:

(4) L+H HL+H

The L+H sequence transparently renders a rising tone pattern



The HL+H sequence renders a surface pattern of H, probably by a process of tonal contour simplification (there are no rising-falling or falling-rising tones in the language):

(6) HLH → (HH →) H

2.2 Morphological restrictions on the floating H suffix

In the largest and most regular class of CLZ verbs (cognate with Kaufman's 1989 class A), the floating H tone only marks the potential aspect of intransitive verbs¹. This restriction does not hold in other verb classes or for the few vowel-stems of class A.

(7)	Transitive A verb	Intransitive A verb	Different verb class (D)
Root	-kìt	-yìt	-à
Gloss	'fold'	'bend over'	'eat (something)'
Potential	wkìt	yǐt	wǎ
Habitual	nkìt	ndyìt	ndà
Completive	mkìt	mbyìt	ngwdà

¹ And is in complementary distribution with the floating H tone that marks the first person singular, which only affects transitive verbs of this class.

2.3 Phonological restrictions on the floating H suffix

Intransitive class A consonant-stems with falling tones only undergo the expected F→H alternation if they are y-initial. This restriction is not found in other classes².

(8)		y-initial	Other C-initial
	Root	-yûb	-kwân
	Gloss	‘fall’	‘become thick’
	Potential	yúb	kwân
	Habitual	ndyûb	nkwân
	Completive	mbyûb	mkwân

Verbs with underlying root tones of high, rising or glottal are typically unaffected by this kind of potential aspect marking.

(9)		high	rising	glottal
	Root	-bí	-kǎn	-to ⁷
	Gloss	‘be distinguished’	‘hit’	‘go out’
	Potential	bí	kǎn	tyo⁷
	Habitual	nbí	ndyǎn	ntyó ⁷
	Completive	mbí	ngwǎn	nhwto ⁷

3. Upstep and register

Verbs not affected by the floating H suffix may instead exhibit an upstepped version of their underlying tone when marked for the potential aspect. Tones whose pitch patterns are normally produced in a lower pitch range or register are now realized in a higher register while maintaining their characteristic pitch pattern of level, falling or rising.

Audio examples---completive and potential forms, recorded in different orders to avoid effects of listing intonation. Potential forms are in bold.

High and rising tones are already realized in the high register range and are not noticeably upstepped when marked for potential aspect.

Low-toned verbs typically have a 30Hz higher pitch in the potential, e.g. 195 vs. 165Hz.

(10)	‘fold it’	wkít	mkít	low tone
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² Nor does it apply to the otherwise phonologically identical tonal morphology involved in marking 1s subjects on transitive class A verbs.

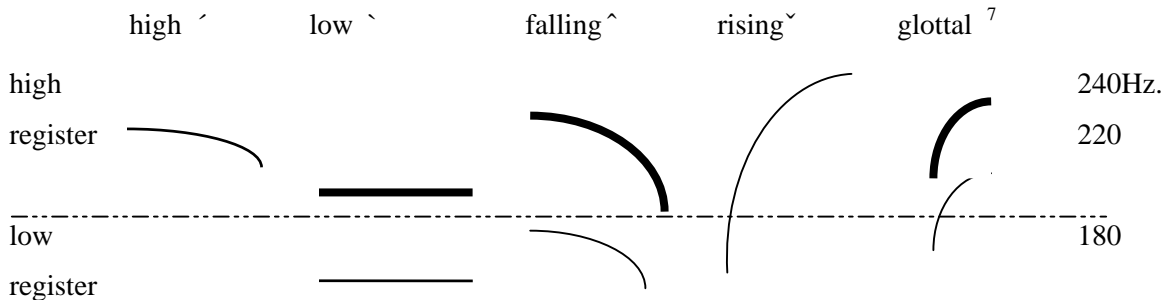
Falling-toned verbs display the most dramatic difference, perhaps because they are contour. A typical pattern is 235>185Hz in the potential and 180>160Hz in other aspects. In other words, falling-toned verbs with potential aspect upstep start 50+Hz higher and fall twice as far as when not in the potential aspect.

- (11) ‘roll it up’ **wdûd** mbdûd **falling tone**
 ‘get rolled up’ **dyûd** mbdyûd
 ‘knock it down’ mtzûb **wtzûb**

Though pitch is more variable with the glottal tone, glottalized vowels are short and the pitch tends to rise, an unsurprising effect of glottalization. When marked for the potential aspect the pitch pattern maintains the same shape but is upstepped approximately 40Hz (e.g. 210>245Hz vs. 170>205Hz).

- (12) ‘put it down’ **wla⁷** mbla⁷ glottal tone

Figure 1: Tones and registers of San Baltazar Loxicha (with upstepped tones in bold)



4. Analysis

4.1 Diachronic origins of morphological upstep in CLZ

Reconstructions of Proto-Zapotec made or adjusted by Swadesh (1947), Fernández de Miranda ([1965] 1995), Suárez (1973), Benton (1988), and Kaufman (1993) all seem to agree that Proto-Zapotec had mostly disyllabic roots, occasionally monosyllabic roots, and had monosyllabic bound morphemes. A typical Proto-Zapotec verb marked for aspect but not person would have had the following syllable shape:

- (13) *CV-CVCV Shape of a typical inflected verb in Proto-Zapotec

CLZ and other Southern Zapotec languages have undergone both pre- and post-tonic vowel deletion historically. The potential aspect prefix consonant /ɣ/ has often been lost as well. The reflex of a verb once shaped like (13) now has the shape in (14):

- (14) (C)-CVC Shape of a typical inflected verb in CLZ

Attempts at reconstructing tone in Proto-Zapotec have been made by Swadesh (1947) and Benton (2003) but there is not yet any consensus. Sierra Juárez Zapotec (SJZ) retains unstressed vowels and has fairly good documentation including tones.

Bartholomew (1983) gives the following prefixes for different classes of SJZ verbs:

- (15) “futuro” (= potential): *gú-*, *w-*, *-í*, *é-*, *gá-*, *g-*, *ts-*, *ch-*, *kká-*, *tá-*
 “presente” (=habitual): *ru-*, *ri-*, *re-*, *rá³-*, *r-*, *kka-*, *rita-*
 “pretérito” (=completive): *be-*, *bi-*, *gu-*, *gut-*, *w-*, *wi-*, *ukkwa-*, *tà-*

All of the SJZ potential aspect prefixes that have vowels have high tone.

The development of upstep in CLZ is like a process of tonogenesis in a language that is already highly tonal.

4.2 History of floating high tones in Zapotec

One expects that floating tones may develop historically through vowel loss. I have not made a thorough historical and comparative study of tone in Southern Zapotec but these correspondences between CLZ and Isthmus Zapotec (IZ) suggest that with vowel loss some tones spread onto surviving syllables:

(16)	IZ (Pickett et al. 1959)	CLZ	
	<i>chònná</i>	<i>chǒn</i>	‘three’
	<i>màní?</i>	<i>mǎn</i>	‘animal’
	<i>ràlé</i>	<i>ndǎl</i>	‘H-be born’

Floating high tones are used morphologically in CLZ to mark both potential aspect and the first person singular. The SJZ literature (Bickmore & Broadwell, 1998; Nellis & Nellis, 1983; Bartholomew, 1983) indicate that that language also has a floating high tone for potential aspect (and 1s. marking).

(17) SJZ verbs from Bartholomew (1983):

	“futuro” (potential)	“presente” (habitual)	gloss
	<i>cù’útsè’</i>	<i>rigú’utsè</i>	‘acomodar’ (adjust)
	<i>quíxá’a</i>	<i>riquíxá’a</i>	‘avisar’ (advise)
	<i>cuánà</i>	<i>ribanà</i>	‘robar’ (steal)
	<i>thínníá</i>	<i>ridínnia</i>	‘aplastar, moler’ (flatten, grind)

³ This is the only non-potential prefix listed with high tone and it occurs in only one of twelve classes listed by Bartholomew.

4.3 Synchronic analysis of potential aspect tonal morphology

The two kinds of tonal morphology seen with potential aspect marking in CLZ, while both involving high pitch, have to result from separate processes because of the following differences:

Upstep

Raises pitch but doesn't change pattern
 Works from left to right (historically)
 Upstepped low is higher low, not H+L=F

Floating high tone

Changes the surface tone (pitch pattern)
 Works from right to left
 L+H=R

Considering how to represent CLZ tones and these two processes of tonal morphology, I have consulted and been influenced by Inkelas and Leben (1990), Snider (1999) and Zhiming (1999), and by Zhiming's citations of Halle and Stevens (1971), Inkelas (1987), and Yip (1980). I have both borrowed and deviated from several of these to come up my own representation of CLZ tone which I now present.

CLZ tonemes and upstepped allotones are minimally defined by three properties: register, the state of the glottis, and length. I represent these as autosegmental-style tiers. I follow Snider (1999) in using *h* and *l* for high and low register respectively.

(18) Registers: *h* *l*

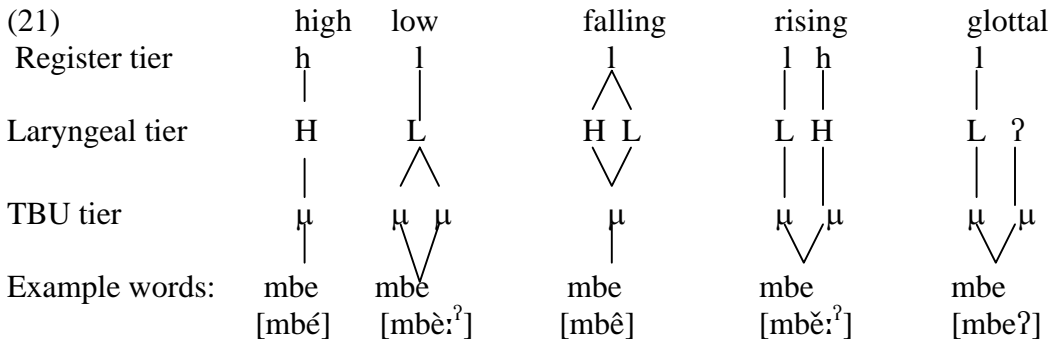
In other Zapotec languages it is probably necessary to indicate glottalization or voice quality on a separate tier from pitch features. However, in CLZ I propose that these two tiers have conflated to one laryngeal tier on which I represent three properties: H for high pitch, L for low pitch, and ? for glottalization.

(19) Laryngeal features: H L ?

As described in Beam de Azcona (1999 and forthcoming), length is an important part of the contrast between different CLZ tones. The mora, which consists minimally of a sonorant, is the TBU. I indicate length by either one or two moras pre-associated with each of these tones.

(20) TBU tier: μ

A disclaimer: certain phonetic details are not spelled out in this formal representation, including the pre-pausal weak glottalization present with low and rising tone, the phonetic fall of the high tone, and the rise in pitch conditioned by the robust glottal stop. The fact that the high point of the rising tone is typically higher than the high point of the high tone is also not predicted by this model but can be explained phonetically elsewhere.



- Note that all CLZ tones which begin in L are bimoraic whereas all CLZ tones which begin in H are monomoraic. Furthermore, only L can dominate two mora slots.
- Note also that there is a maximum of one register ultimately dominating each mora.

Length is not phonemic but is predictable based on tone. In CLZ tone plays out over the sonorous portion of a rime, either V or VS, the final segment of which is lengthened with low or rising tone, and partially glottalized with glottal tone.

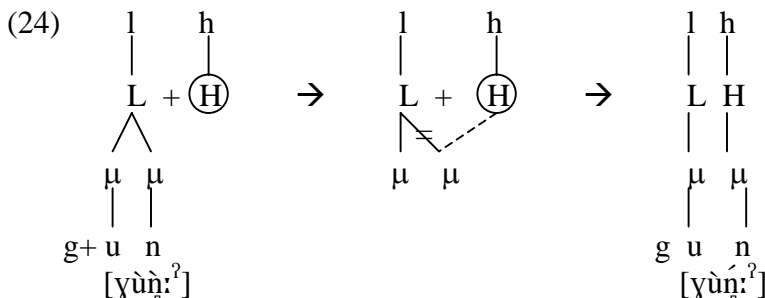
(22)

	high or falling	low or rising	glottal
CVC	Béd ‘Peter’ [βéð [?]]	lîd ‘home’ [li: [?] ð [?]]	yi ⁷ d ‘paper’ [ji [?] θ [?]]
CV	ndô ‘face’ [ndô]	Lă ‘Oaxaca’ [lă: [?]]	yi ⁷ ‘flower’ [ji [?]]
CVS	mbë ⁷ l ‘fish’ [mbæ ⁷ l]	măn ‘animal’ [măn: [?]]	ta ⁷ n [tan [?]]

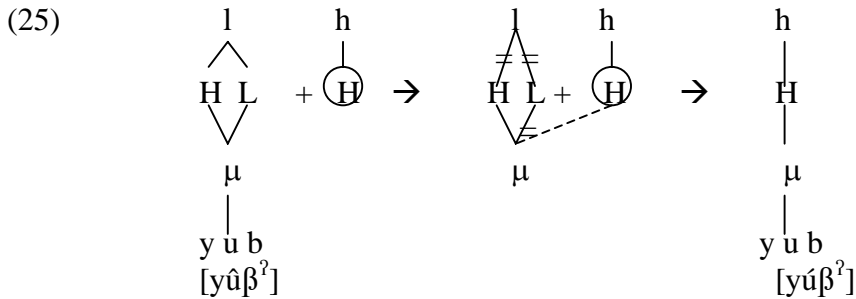
This sonorous sequence can last for one or two moras depending on tone:



The floating high tone is dominated by high register which comes along with the floating high tone when attaching to a TBU (the mora). The low tone is bimoraic and delinks only from the 2nd mora, creating a rising tone.

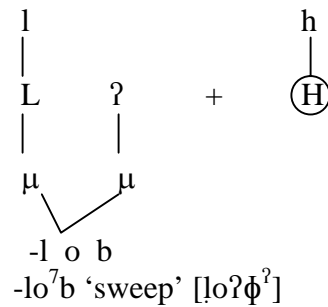
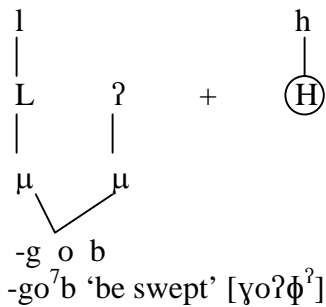


There can only be one register per mora in this language. Since the falling tone is a monomoraic tone, the low register must also delink.



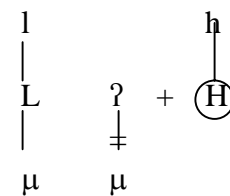
Glottal tone blocks the spread of the floating high, preventing this kind of potential aspect marking. Interestingly, with some types of 1s. marking there is deglottalization in both CLZ and Lachixío Zapotec (Sicoli, 1997)---apparently an older process in Zapotec.

(26) Glottal root with potential aspect Glottal root with first person singular



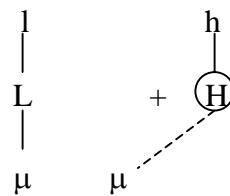
Deglottalization

N/A

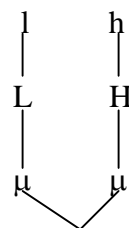
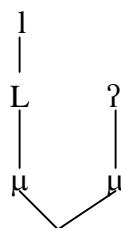


\textcircled{H} docking

Blocked by ?

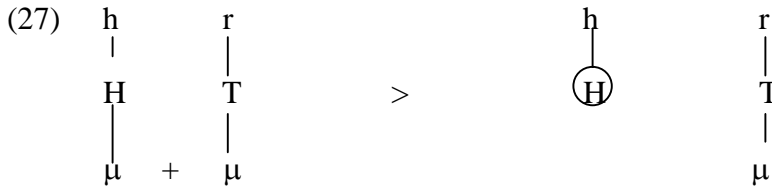


End result

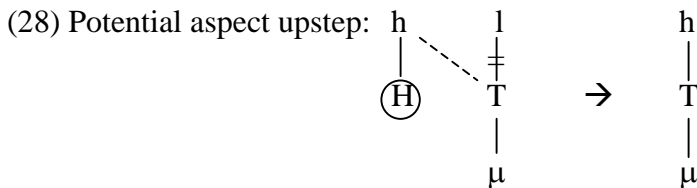


g o b [ɣoʔɸ¹] l o b [lõβ¹]

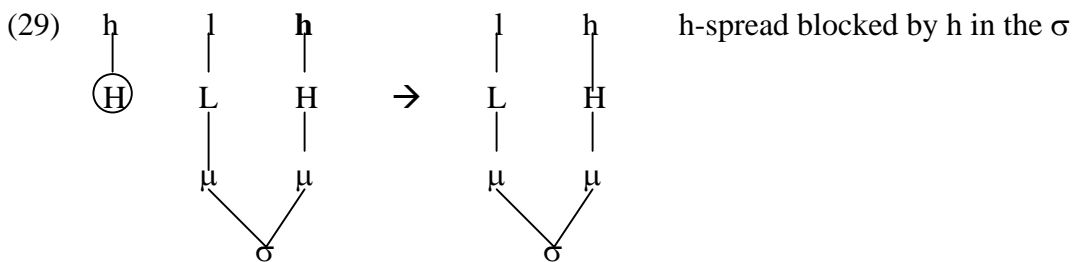
I suggested that upstep resulted diachronically from the loss of a prefix vowel. The high-toned potential prefix would have created a floating high tone with high register on the left, as shown here.



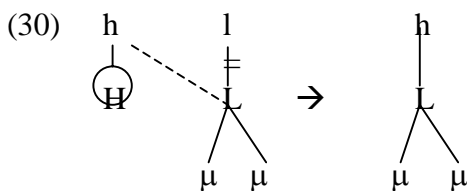
Considering both morphological floating tones and the tones formerly associated with now-lost non-tonic vowels, like those shown in (16), we have only seen cases of tones (i.e. laryngeal features) docking to the left. It seems that floating tones do not spread rightward in this language. However, register does spread to the right, as shown in (28).



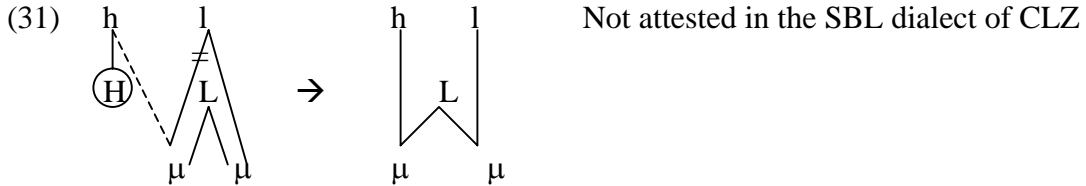
For the high tone this process would be without effect since the register is already high. One might imagine the potential aspect high register spreading onto the first mora of a rising tone and delinking the low register, creating a rising tone that started higher. However, this is not what happens. High register anywhere in a syllable, including the second mora, blocks the spread of high register.



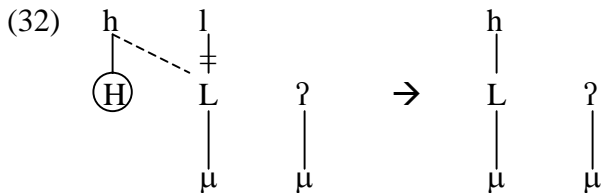
Low tone is upstepped by a simple linking of high register and delinking of low register.



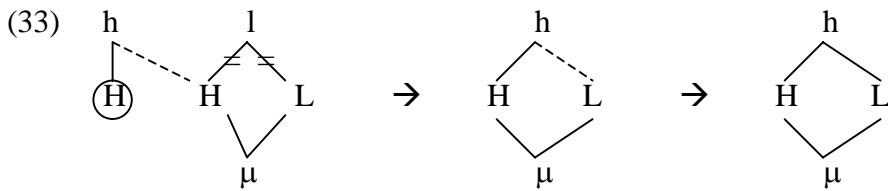
A representation in which register was linked directly to the mora rather than the laryneal feature (tone) would produce a non-occurring pitch pattern in which there was a fall from low in the high register to low in the low register.



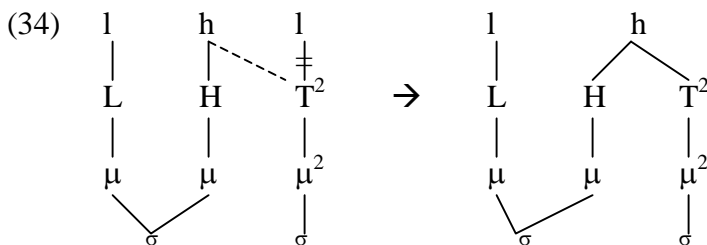
The glottal tone behaves similarly to the low tone since it consists of a low tone followed by glottalization.



The falling tone has low register associated with two pitch features (H and L) which play out over one mora. Since only one register can dominate each mora, the low register delinks when the high register spreads.



Besides when marked for potential aspect, words with low, falling, and glottal tones are upstepped when following a word with rising tone. High-toned words do not cause upstep so this is a specific rule that only takes place where there is a rising tone:



5. Findings summarized

In CLZ...

- Pitch patterns can be played out in at least two possible registers.
- Pitch patterns contrast with glottalization, yielding 5 contrastive “tones”
- Both changes in tone and changes in register can be exploited morphologically.
- Register can spread to dominate the tone to its right, but only moves to the left if it is carried there by a tone it dominates.
- Laryngeal features or tones only associate with moras to the left. They cannot associate with moras on the right.
- ? blocks $\textcircled{\text{H}}$ docking
- While up to two laryngeal features can be associated with one mora, there can only be one register per mora
- While the mora is the TBU, h spreading is blocked if there is already a high register in the syllable (even if in a different mora than the target).

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