

# Tonal alignment constraints and the nature of evaluation

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## 1 Introduction<sup>1</sup>

Macuilianguis Zapotec (hereafter MacZ) is spoken in the town of Macuilianguis, in the state of Oaxaca, Mexico. It is an Otomanguean language of the Zapotecan family, which has great internal diversification, comprising forty or more different languages.

MacZ has not been previously described. The closest language with a description is Sierra Juárez Zapotec (SJZ), which is spoken in a town about twenty miles from Macuilianguis. The primary sources on SJZ are Marks (1976) and Nellis and Nellis (1983). SJZ tonal data are discussed in Bickmore and Broadwell (1998).

MacZ vowel length is contrastive. Verb stems are in general one or two syllables long. Longer verb stems are generally morphologically complex. For a monosyllabic stem, the allowable patterns are VV and CVV. For bisyllabic stems, the allowable patterns are VVCV, CVCVV, CVVCVV, CVVCV, CVCV/, CV/CV, and CVC<sub>1</sub>C<sub>1</sub>V(/).

The primary data we are concerned with in this talk is shown in (1) below:

- 1) a. bè-xàttā'-nà-nà  
com-iron-3s-3s  
  
'He ironed it.'
- b. bè-xáttā'-yà'-nà  
com-iron-1s-3s  
  
'I ironed it.'

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<sup>1</sup> In the orthography used here, symbols have their standard phonetic values, with the following exceptions. <c> = /k/, /x/ = /š/, <yh> = /ž/, <th> = /θ/, <ch> = /č/, <'> = /ʔ/, and doubled vowels are long. Underlining shows stress.

We use the following abbreviations in our glosses: cs = causative, com = completive aspect, hab = habitual aspect, neg = negative, pot = potential aspect, 1s = 1<sup>st</sup> person singular, 3s = 3<sup>rd</sup> person singular, 3p = 3<sup>rd</sup> person plural.

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- c. àbí bé-xàttā'-yà'-nà  
neg com-iron-1s-3s  
  
'I didn't iron it.'
- d. \*àbí bé-xáttā'-yà'-nà  
neg com-iron-1s-3s  
  
'I didn't iron it.'

Claims:

- The 1<sup>st</sup> person singular suffix is associated with a floating H tone.
- H tone on the initial syllable of the verb stem in (1b) is due to constraints favoring the realization of a floating tone on a stressed syllable.
- In (1c), the H tone on the initial syllable corresponds to *both* the floating H of the 1<sup>st</sup> person and the H tone of the preceding word.
- This suggests that EVAL has a derivation blind status which can “mistake” the tone of one morpheme for that of another.
- Candidates like (1d), with H tones on both the initial syllable and the stressed syllable, are ruled out due to the Obligatory Contour Principle.

## 2 Some tonal rules of MacZ

For ease of presentation, we'll begin discussing tonal processes in MacZ from a rule-based perspective before moving on to a constraint-based account.

### 2.1 Rightward spreading to a toneless vowel

Consider the following forms, which show that there is a process which spreads a tone rightward to a following toneless syllable:

- 2) a. Bè-xàttā'-nà-nà. 'He ironed it.'  
com-iron-3sg-3sg
- b. Rū-xāttā'-nà-nà 'He is ironing it.'  
hab-iron-3sg-3sg
- c. Gú-xáttā'-nà-nà. 'He will iron it.'  
pot-iron-3sg-3sg

In these examples, the completive, habitual, and aspectual prefixes bear H, M, and L tone

respectively. /-xatta’-/ is a verb stem with a toneless initial syllable and a M tone on the second syllable.

We could describe this process with a rule of the following sort:

3)     T  
       |  
       μ μ

## 2.2 Rightward H spread

There is a similar but distinct process that spreads H tone rightward. This differs from the preceding rule in that it spreads a H to syllables that have a linked tone, creating a contour.

- 4)     a.     Bè-tùùbí-ná-nà  
              com-roll:up-3sg-3sg  
              ‘He rolled it up.’
- b.     Gú-tùùbí-nà-nà.<sup>2</sup>  
              pot-roll:up-3sg-3sg  
              ‘He will roll it up.’

We can state this rule in as follows:

5)     H  
       |  
       μ μ

## 2.3 Contour realignment

Consider again the following forms, this time focussing on the second syllable of the verb stem. Here we can see that when the stem-initial syllable becomes a contour as a result of H spreading, the L portion of the contour spreads onto the following syllable, deleting its H tone.

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<sup>2</sup> This form also shows the effects of Contour realignment, described below.

- 6) a. Bè-tùù**bí**-ná-nà  
com-roll:up-3sg-3sg  
‘He rolled it up.’
- b. Gú-tùù**bì**-ná-nà.  
pot-roll:up-3sg-3sg  
‘He will roll it up.’

This implies a rule like the following:

- 7) Contour realignment

$$\begin{array}{ccc} T_1 & T_2 & T_3 \\ \sigma_1 & & \sigma_2 \end{array}$$

### 3 Tonal changes associated with the first person

#### 3.1 The regular cases

Adding the first person singular suffix results in an additional H tone appearing on the stressed syllable of the verb stem. This results in

- i.) a simple H if the stressed syllable is toneless,
- ii.) a HL fall if the stressed syllable is L, or
- iii.) an unchanged H if the stressed syllable is H or M.

- 8) a. bè-xàttā'-yà'-nà      ‘I ironed it.’  
com-iron-1s-3s
- b. bè-xàttā'-nà-nà      ‘He ironed it.’  
com-iron-3s-3s

In these examples, we see that the first person singular form shows an additional H on the initial syllable. However, the first person singular may also result in an additional H on other syllables as well.

If a bisyllabic verb stem has stress on its second syllable, that syllable attracts the 1<sup>st</sup> person H. /-dechu-/ ‘to fold’ is a stem with a toneless initial syllable and a M tone on the second syllable. Despite the toneless, initial syllable, the 1<sup>st</sup> person form shows a H on the stressed second syllable.

- 9) a. bè-dèchū-nā-nà                    ‘He folded it.’  
com-fold-3s-3s
- b. bè-dèchú-yá’-nà.                    ‘I folded it.’  
com-fold-1s-3s

/-dechu-/ contrasts minimally with /-xàttā’-/ in the location of stress. Stress is final for /-dechu-/, but initial for /-xàttā’-/.

### 3.2 Exceptions to High to Root Docking

Certain preverbal elements (including at least *àbí(dí)* ‘not’, *tùtèbá* ‘often’, *ànú(dí)* ‘nobody, nothing’, *nùyá* ‘someone’, and *nàyá* ‘yesterday’) that end in a H tone spread this H onto the initial syllable of the following verb. We will take the negative *àbí* as typical of this class:

- 10) a. bè-xàttā’-nà-nà                    ‘He ironed it.’  
com-iron-3s-3s
- b. àbí bè-xàttā’-nà-nà                    ‘He did not iron it.’  
neg com-iron-3s-3s

Of particular interest is the fact that when there is H spreading from a preverbal element, the additional H associated with the first person singular fails to appear:

- 11) a. bè-xàttā’-yà’-nà                    ‘I ironed it.’  
com-iron-1s-3s

- b. àbí bé-xàttā'-yà'-nà  
neg com-iron-1s-3s  
  
'I didn't iron it.'

However, the first person H does appear when there is a syllable intervening between the initial syllable and the verb stem:

- 12) a. bè-di-bíìsi-yà'-nà  
com-caus-dry-1s-3s  
  
'I dried it.'
- b. àbí bé-di-bíìsi-yà'-nà  
neg com-caus-dry-1s-3s  
  
'I didn't dry it.'

#### 4 A constraint-based account

We will assume that the 1<sup>st</sup> person suffix is associated with the following input:

- 13) H L  
|  
ya'

We will initially assume the following three constraints:

- 14) ALIGN (T, L, Morph, L) = ALIGN(MorphL)  
Align the left edge of a tonal melody with the left edge of the morpheme associated with it.
- 15) \*Closed Contour =\*Con  
  
Contour tones are not allowed on closed syllables.
- 16) Associate Float = AssocF  
A floating tone must be associated with a tone-bearing unit.  
(Cf. \*Float, Meyers 1997).

Consider the following range of candidates. Candidates that have both tones of the 1<sup>st</sup> person linked to the /-ya'/ syllable violate \*Con. Deleting the floating H leads to a violation of AssocF. The optimal candidate is one that places the H of the 1<sup>st</sup> person on the toneless initial syllable of the verb stem:

17)

	L M HL L	*Con	AssocF	Align(MorphL)
	be - xatta' - ya' - na			
a.	L H M L L be - xatta' - ya' - na			*
b.	L M HL L be - xatta' - ya' - na	*!	*	*
c.	L M L L be - xatta' - ya' - na		*!	

In this example, there is a toneless, stressed initial syllable in the verb stem, and the 1<sup>st</sup> person H ends up there.

However, when the verb has stress on the second syllable, the floating H is attracted to that syllable. /-dechu-/ has the following underlying representation:

18) M

de chu

Recall the following forms:

- 19) a. bè-dèchū-nā-nà 'He folded it.'  
com-fold-3s-3s
- b. bè-dèchú-yá'-nà. 'I folded it.'  
com-fold-1s-3s

We propose to capture the fact that the floating tone is attracted to the stressed syllable with the following constraint:

20) Associate Float to Stress

Associate the left edge of a floating tone with the stressed syllable.

We also draw on two other constraints:

21) Max-IO

An element in the input must correspond to an element in the output.

22) \*ShortH

A H tone may not be associated only with a light syllable.

The constraint \*ShortH will favor candidates where H tones appear in either heavy syllables (CVV or CVC) or two light syllables (CVCV).

The following tableau shows the situation with a verb that has stress on the second syllable.

	L M H L L	*Con	*Short H	Assoc F	Assoc FS	Align (MorphL)	Max-IO
	be - de <u>ch</u> u - ya' - na						
a.	L H L					*	*
	be - de <u>ch</u> u - ya' - na						
b.	L H M L L		*!		*	*	
	be - de <u>ch</u> u - ya' - na						
c.	L H M L L				*!	*	
	be - de <u>ch</u> u - ya' - na						
d.	L M L L			*!	*	*	*
	be - de <u>ch</u> u - ya' - na						

The necessity of AssocFS is seen in this tableau. Without this constraint, we would incorrectly predict candidate (b) to be the output because it has one less violation of Max-IO.

Now consider the situation when a word like *àbí* precedes the verb stem. We will assume that the following additional constraint comes into play:

23) Obligatory Contour Principle (H)

Two adjacent H tones are prohibited.

24)

	L H <sub>1</sub> L M H <sub>2</sub> L L	OCP(H)	*Con	AssocF	AssocFS	Align (MorphL)	MaxIO
	abi be - x <u>atta</u> ' - ya' - na						
a.	L H <sub>1,2</sub> L M L L ☞ abi be - x <u>atta</u> ' - ya' - na				*	*	
b.	L H <sub>1</sub> H <sub>2</sub> M L L abi be - x <u>atta</u> ' - ya' - na	*!				*	*

We will assume that the H found on the initial syllable of the verb is evaluated as the H relevant to the constraint AssocF.

Next we move to a discussion of the following forms:

25) a. bè-di-bìsi-yà'-nà  
com-caus-dry-1s-3s

'I dried it.'

b. àbí bé-di-bìsi-yà'-nà  
neg com-caus-dry-1s-3s

'I didn't dry it.'

The verb /-di-biisi/ has the following input:

26)        L M  
              | |  
              di- bi*ī* si

/-di-/ is a toneless causative prefix used with certain verbs (generally corresponding to the transitive member of a causative/inchoative alternation.)

To account for the deletion of the M on the final syllable of the verb stem in the forms in (25), we suggest the following constraint:

27)        \*HLM

A verb stem may not contain the tonal melody HLM

28)

	L    LMH L L	OCP(H)	*HLM	AssocF	AssocFS	Align MorphL	Max-IO
	be-di-bi <i>ī</i> si- ya'-na						
a.	L    HL    L L be-di-bi <i>ī</i> si- ya'-na					*	*
b.	L    HLM   L L be-di-bi <i>ī</i> si- ya'-na		*!			*	
c.	L        LM   L L be-di-bi <i>ī</i> si- ya'-na			*!		*	*
d.	L   H   LM   L L be-di-bi <i>ī</i> si- ya'-na				*!	*	

29)

	LH <sub>1</sub> L    LM H <sub>2</sub> L L	OCP(H)	SprCon	SprH	Assoc F	AssocFS	Align MorphL	Max- IO
	abi be-di-biisi- ya'-na							
a.	LH <sub>1</sub> L H <sub>2</sub> L L L ☞ abi be-di-biisi- ya'-na						*	*
b.	LH <sub>1,2</sub> L LM L L abi be-di-biisi- ya'-na					*!	*	
c.	LH <sub>1</sub> H <sub>2</sub> L L L abi be-di-biisi- ya'-na	*!					*	*

EVAL has a “derivation-blind” character when it comes to the constraint AssocF. It does not know what the source of a H tone on the verb stem is, and “mistakes” the H that is spread from the negative for the floating H of the 1<sup>st</sup> person.

Our data are similar to those discussed in Yip (1995) and Russell (1997), who discuss cases of haplology such as that found between the English plural and possessive. In their analyses, a single word-final /z/ in English is evaluated as satisfying the alignment constraints associated with two different morphemes.

Russell (1997) suggests that the input and winning candidate for an English form like *cats'* (*tails*) is as follows:

Input                    [[[[cat] z<sub>1</sub>] z<sub>2</sub>]

Winning candidate    [[cat] z<sub>1,2</sub>]

Since it is possible for a single instance of a phonological unit to satisfy more than one morphological constraint, cases where two distinct instances occur are now less than optimal, since they violate the Obligatory Contour Principle.

## 5 References

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