Lexical Tones in Yucatec Maya: Downstep and Tonal Sandhi

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1. Introduction

To learn more about the nature of tone in Yucatec Maya, we conducted a series of productions experiments. The main goal is to determine the realization of tones. In particular, we intend to investigate the influence of tones on each other analysing assimilatory effects such as downstep or dissimilatory effects such as h-raising.

These facts, then, allow us to determine the interaction of tones in sentences with different kinds of information structure.

2. Data Elicitation

Yucatec Maya is the largest contemporary Mayan language: about 700.000 speakers. It is spoken on the Yucatecan Peninsula (region 39 on the map).
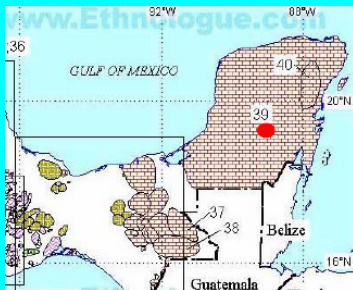
Recordings in August 2006 in Berlin:
Two speakers from the village Yaxley in Quitana Roo (red point on the map).

– Native speakers of Yucatec Maya
– Bilingual in Spanish
– Mainly Yucatec Maya in everyday communication

3. Stimulus Materials

(1)
ich-e kòol-o' ti yàan wáay, áak, páap, láal, yéetel yàalam.
in-DEF milpa-D2 LOC EXIST sorcerer turtle hawk stinging nettle and fawn

"In the corn field, there are a sorcerer, a turtle, a hawk, a stinging nettle, and a fawn."

(2)
t-in w-il-ah ___(noun) ____(adj.) ich-e kòol-o'.
PFV-1.SG 0-see-CMPL in-DEF milpa-D2

"I have seen _____(N) _____(A) in the corn field. "

4. Items

	(1)				(2)	
HHH	wáay	*sorcerer*	áak	*turtle*	máak ch'óop	*human blind*
	páap	*hawk*	yéetel	*and*	máak ts'úut	*human selfish*
	láal	*stinging nettle*				
LLL	mìis	cat	bèes	calf	xìib bòox	*man black*
	nòom	partridge	kàan	snake	xìib ch'èel	*man blond*
	pèek'	dog				
NNN	koh	puma	bah	mole	ts'on nuxib	*hunter old*
	buh	owl	am	spider	ts'on nohoch	*hunter big*
	ek	wasp				

Six further tonal combinations (HL, HN, LH, LN, NH, NL) were tested where these items have been mixed.

5. Measurements and data normalization

• The high or low turning point on the corresponding syllable in Hz
• Data normalization according to Truckenbrodt (2002):

$$F(norm) = \frac{F(Hz) - R2}{R1 - R2}$$

R1 = Mean of first peak of the phrase
R2 = Mean of last valley of the phrase

6. Three syllable types in Yucatec Maya:

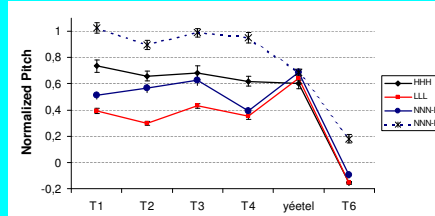Syllables bearing a high tone (H), a low tone (L) and no tone (N)

Fig.1: Comparison of high tone (black), low tone (red) and no tone (blue) sequences in Sentence (1). T1 – T6 are the targets words, yéetel means 'and'.
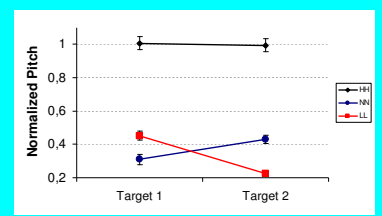
Fig.2: Comparison of high (black), low (red) and no tone target nouns and adjectives in Sentence (2).

7. Tonal assimilation I:

No regressive tonal assimilation –
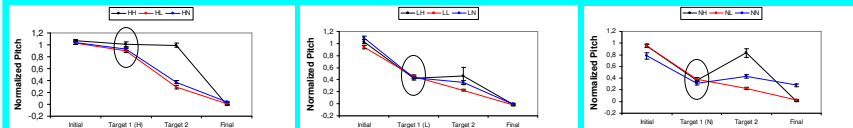The tone of Target 1 remains identical in different tonal contexts.

Fig.3: The influence of a Target 2 tone on a Target 1 high tone (left panel), low tone (middle panel) and no tone (right panel) in Sentence (2).

8. Tonal assimilation II:

Progressive tonal assimilation –
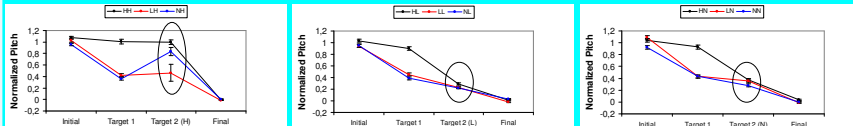In case of H tones, an unclear pattern arises. Low or no tones are identical.

Fig.4: The influence of a Target 1 tone on a Target 2 high tone (left panel), low tone (middle panel) and no tone (right panel) in Sentence (2).

9. Tonal effects – downstep and h-raising:

• In list readings no downstep occurs in Yucatec Maya.
⇒ no tonal assimilation

• High tones in HL or LH sequences are higher than in a HH sequence
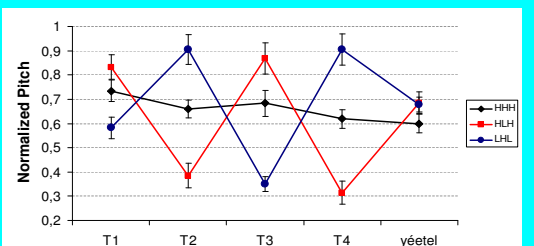⇒ dissimilatory effect, h-raising (cf. Laniran & Clements; Féry & Kügler; Xu)

Fig.5: A comparison between a high tone sequence (black) and high-low tone sequences (red and blue) in Sentence (1). T1 – T6 are the target words and yéetel means 'and'.

10. Conclusions

In terms of F0, Yucatec Maya displays a distinction between two tones, a high and a low tone. Syllables with *no tone* differ from syllable associated with a high or a low tone.

Yucatec Maya shows no tonal assimilations, but a dissimilatory tonal effect – h-raising.

References
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Kügler, F. & Skopeteas, S. (2006) Interaction of lexical tone and information structure in Yucatec Maya. *Proceedings of TAL-2*, 83-88.
Laniran, Y. O. & Clements, G. N. (2003) Downstep and high raising: interacting factors in Yoruba tone production. *Journal of Phonetics* 31: 203 – 250.
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