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The ten tonemes of Ticuna, an Amazonian oddity



Special thanks!

Loida Ángel, James Gregorio, **Javier Sánchez**, and all the collaborators in my project (San Martín de Amacayacu, Colombia)

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(Universidad Nacional de Colombia)

Denis Creissels, Antoine Guillaume (DDL, Lyon)

Larry Hyman, Lev Michael, Nicholas Rolle, Amalia Skilton (UC Berkeley)

Amazónicas organizers and reviewers



Main claim

San Martín de Amacayacu Ticuna (Western Amazonia) features:

- **10 tonemes in stressed syllables**
- 5 tonemes in unstressed syllables

N.B.: claim as to *phonological* (NOT just phonetic) items

→ Typologically rare, areally unique

Introduction

Some phonological background

Analysis—Stressed syllables

Analysis—Unstressed syllables

Discussion

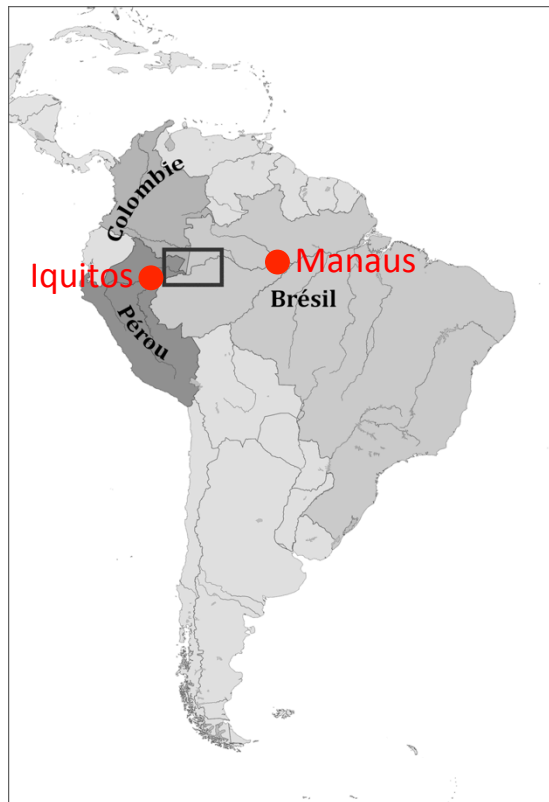
Conclusion

INTRODUCTION

LANGUAGE, LITERATURE, DATA

Language

- ❖ $\approx 50,000$ – $60,000$ speakers (Peru, Colombia, Brasil), vital as a whole (Ethnologue 2018)
- ❖ some dialectal variation (Montes 2004-2005, Santos 2005)
- ❖ San Martín de Amacayacu variety ≈ 550 speakers, heterogeneous (linguistically in particular)
- ❖ Isolate? Yuri-ticuna? (Carvalho 2009, Goulard & Montes 2013, Seifart & Echeverri 2014)



Previous descriptions

- ❖ Doris and Lambert Anderson (SIL, CTic) (N.B.: 1=highest 5=lowest)
- ❖ María Emilia Montes Rodríguez (Los Andes–Paris VIII, mostly SMAT)
(Marília Facó Soares (Museu Nacional/UFRJ, Brazilian varieties) has a somewhat similar analysis; e.g. Soares, 1996)

Previous descriptions

- ❖ Anderson L. (1959): a phonology paper
 - “**five phonemic levels of pitch**”: 1, 2, 3, 4, 5 (p.80)
 - “*presence of [compound?] glides*”: 15, 23, 35, 12, 21, 25, 45... (p.92)
 - “***laryngealization***” is “*phonemic*”; observed with different “*tones and glides*” (→ **orthogonal to pitch**); unclear (p.96-98)

Previous descriptions

- ❖ Anderson D. (1962) and Anderson & Anderson (2017): a language course and a dictionary (phonetics? phonology?)
 - “*cinco niveles de tono*”: 1, 2, 3, 4, 5 (2017:vii)
 - “*cuatro ligaduras*” → “*una sílaba puede tener más de un tono*”: 15, 23, 35, 25 (25 found in one context only) (2017:vii)
 - “*laringaliza*[ción]”: orthogonal to tones? In fact almost only found in syllables with tone 5

Previous descriptions

- ❖ Anderson D. (1962) and Anderson & Anderson (2017): a minimal *phonetic* reading—**9 tones** in single syllables
 - 1, 2, 3, 4, 5
 - 15, 23, 35 (25 is easily shown to be disyllabic)
 - 5_~
- + a handful of marginal “anomalies”

Previous descriptions

- ❖ Montes Rodríguez M. E. (1995): a doctoral dissertation in phonology
 - *“un sistema tonal complejo desde el punto de vista fonético [10 tones] pero relativamente simple fonológicamente hablando”*
(p.75-77)
 - *“Voz laringalizada”* is phonetic (p.69)

Previous descriptions

- ❖ Montes Rodríguez M. E. (1995): a doctoral dissertation in phonology
 - → “*tres tonemas alto, medio y bajo, junto con un sistema de reglas de alofonía*” related to:
 - “*adyacencia de tonos*” (tone sandhi)
 - “*tipos de sílaba*” (e.g. short/long)
 - “*terrazas*”

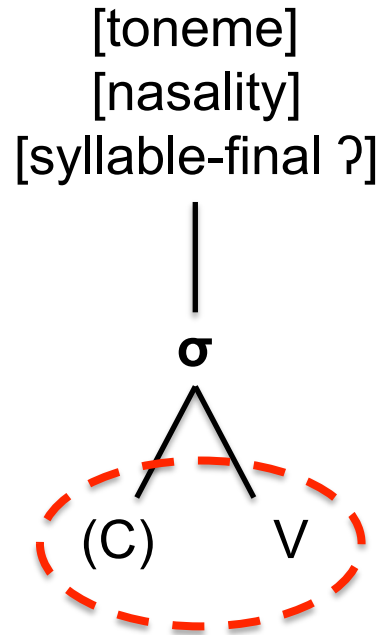
(p.75-77)

Today's data

- ❖ 6 months fieldwork in SMA (PhD, 2015-2017) + work from Leticia
- ❖ most phonological work with Javier Sánchez, some with Loida Ángel and James Gregorio (headset mic Shure Beta 53)
- ❖ extensive transcription of productions by 10 more speakers (+ recordings from 10 more speakers) supports analysis
- ❖ basic methodology: **minimal pairs**; no computerized, statistical analysis

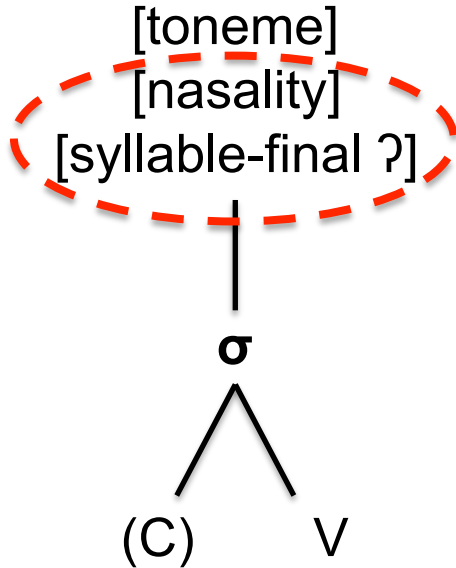
SOME PHONOLOGICAL BACKGROUND

Structure of SMAT syllable



p	t	ṭ̥	k	k ^w ~ᄡ
b	d	ḏ̥	g	w
			ŋ	
i		ɯ		u
	e		o	
aᵛ		a		aᵛ̣

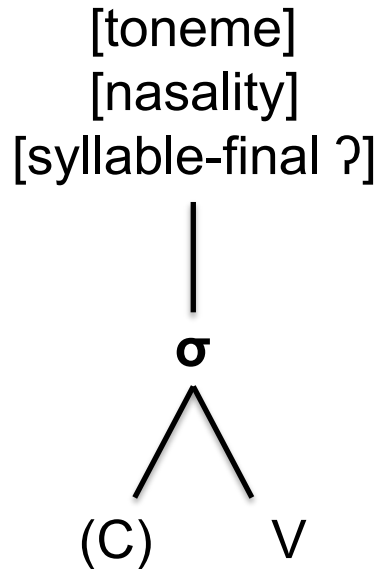
Structure of SMAT syllable



Privative features

Strictly orthogonal to tonemes
(one single incompatibility: toneme 1+?)

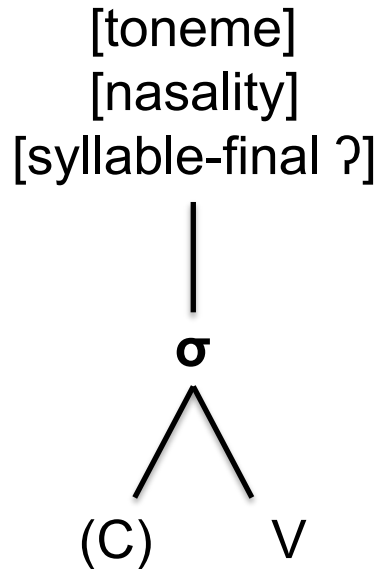
Structure of SMAT syllable



Stress is demarcative (NOT contrastive): automatically on 1st syllable of independent morphemes (=morphosyntactically and phonologically independent: inalienable nouns, verbs, etc.)

→ Often higher intensity; frequent vowel lengthening; exclusive locus of “expressive emphasis”

Structure of SMAT syllable



Stress is demarcative (NOT contrastive): automatically on 1st syllable of independent morphemes (=morphosyntactically and phonologically independent: inalienable nouns, verbs, etc.)

[ku³=**ta**:⁴³-ka¹]

vs

[ku³=ta⁴=**ka**²¹]

2SG.SBJ=**be.big**-liver

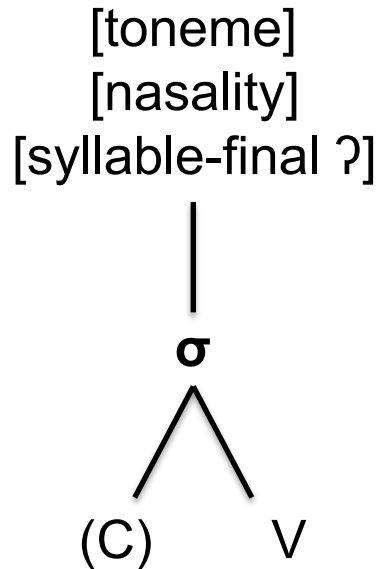


2SG.OBJ=3CLASSI.SBJ-**awake**

'you have a big liver'

'she awoke you'

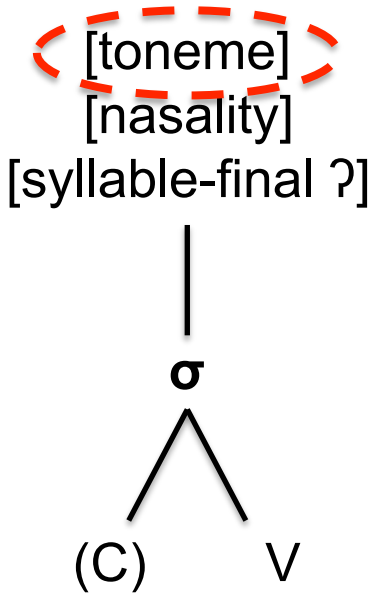
Structure of SMAT syllable



Stress is demarcative (NOT contrastive): automatically on 1st syllable of independent morphemes (=morphosyntactically and phonologically independent: inalienable nouns, verbs, etc.)

Apart from stress, a number of differences between stressed and unstressed syllables (e.g. poorer segments inventory in unstressed syllables)

Structure of SMAT syllable



All syllables bear one (except epenthetic syllables)

Primarily lexical (although also some morpho-syntactically conditioned alternations)

N.B.: domain of tone is the syllable (no spreading across syllables)

→ today's question: **how many values?**

A word on monosyllabicity

- ❖ Monosyllabic morphemes are **extremely common in the lexicon** (especially verbs) → favorable for strict tonal minimal pairs

<i>Ex:</i> /~a ^{toneme} /	[ʔã ²]	‘mosquito’
/pai _̃ ^{toneme} /	[pai _̃ ³¹]	‘(religious) father’ (< port.)
/tu ^{toneme} /	[tu ⁵²]	‘to drag’
/-gw ^{toneme} /	[-gw ⁴]	‘PL’

A word on monosyllabicity

- ❖ Although monosyllabic phonological words are **rare in discourse**: often morphosyntactic complexity within the phonological word (esp. verbs)

Ex: /tɬa^{toneme}=~da^{toneme}=tu^{toneme}=ta^{toneme}/

1SG.SBJ=3CII-V(.OBJ)=to.drag=FUT

'I will drag it'

[tɬa³na^{3'}tu:⁵²ta⁴]



ANALYSIS STRESSED SYLLABLES

Stressed syllables: phonetic sample A



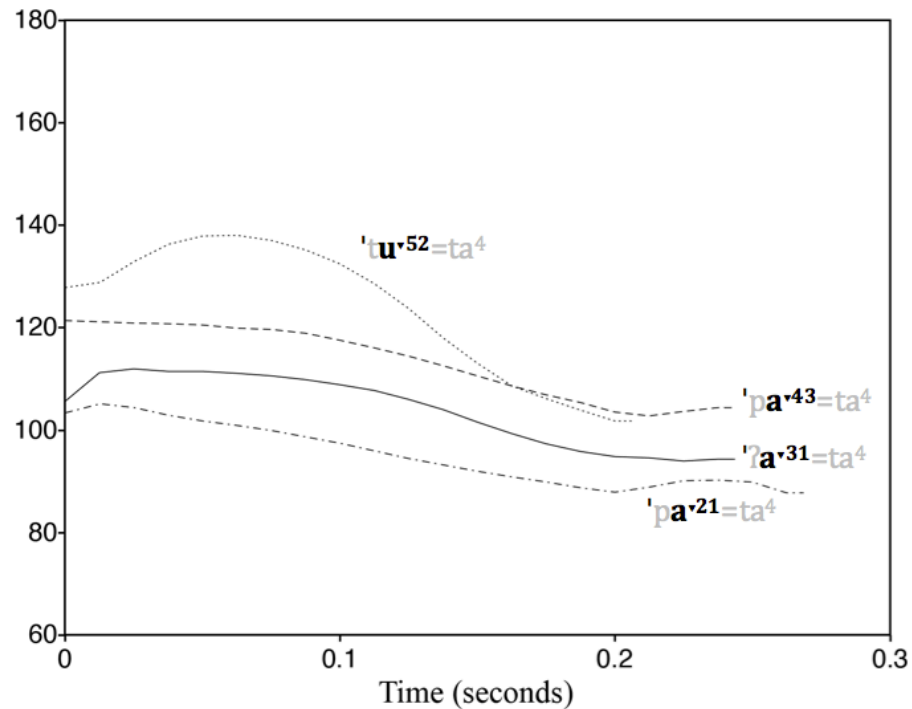
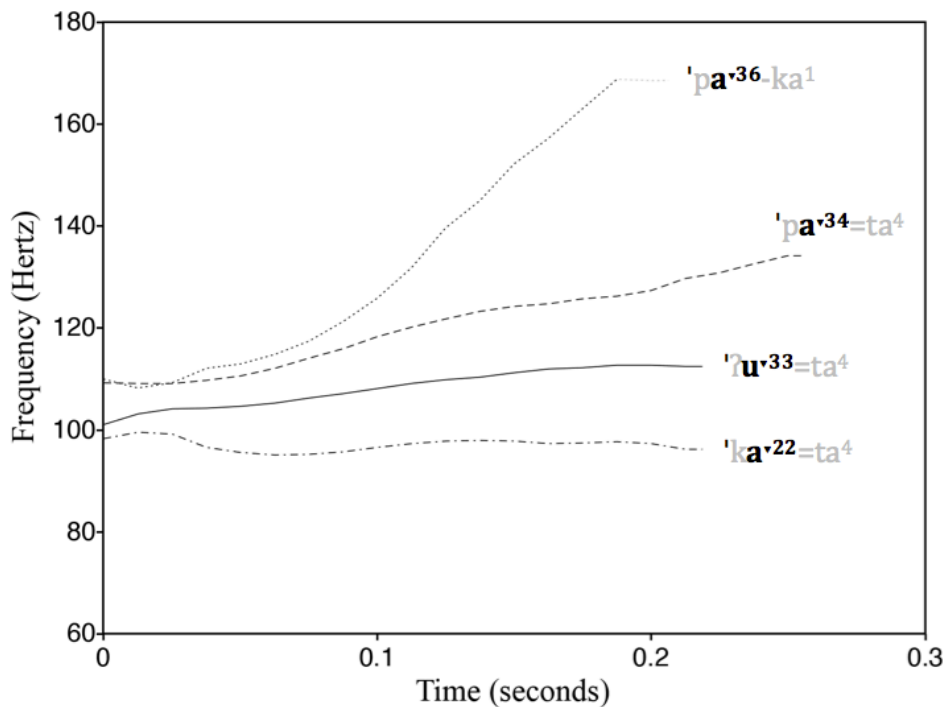
pa: ³⁶	-ka ¹	to.cling-liver	‘to cling at so’s liver’	
tu: ⁵²	=ta ⁴	to.drag=FUT	‘to drag (fut.)’	(ba ₁ ¹⁵ ‘not even’)
pa: ⁴³	=ta ⁴	to.be.dry=FUT	‘to be dry (fut.)’	
pa: ³⁴	=ta ⁴	to.be.nubile=FUT	‘to be nubile (fut.)’	
?u: ³³	=ta ⁴	to.say=FUT	‘to say (fut.)’	(pa ³³ ‘dad!’)
?a: ³¹	=ta ⁴	to.burn=FUT	‘to burn (fut.)’	(pu ³¹ ‘to get used’)
ka: ²²	=ta ⁴	to.stab=FUT	‘to stab (fut.)’	(po ₂ ²² (ra ⁴) ‘power’)
pa: ²¹	=ta ⁴	to.be.tired=FUT	‘to be tired (fut.)’	
pa: ₁	=ta ⁴	to.cling=FUT	‘to cling (fut.)’	

Stressed syllables: phonetic sample A



pa: ³⁶	-ka ¹	to.cling-liver	‘to cling at so’s liver’
tu: ⁵²	=ta ⁴	to.drag=FUT	‘to drag (fut.)’
pa: ⁴³	=ta ⁴	to.be.dry=FUT	‘to be dry (fut.)’
pa: ³⁴	=ta ⁴	to.be.nubile=FUT	‘to be nubile (fut.)’
?u: ³³	=ta ⁴	to.say=FUT	‘to say (fut.)’
?a: ³¹	=ta ⁴	to.burn=FUT	‘to burn (fut.)’
ka: ²²	=ta ⁴	to.stab=FUT	‘to stab (fut.)’
pa: ²¹	=ta ⁴	to.be.tired=FUT	‘to be tired (fut.)’
pa: _~	=ta ⁴	to.cling=FUT	‘to cling (fut.)’

Stressed syllables: phonetic sample A



Stressed syllables: phonetic sample A



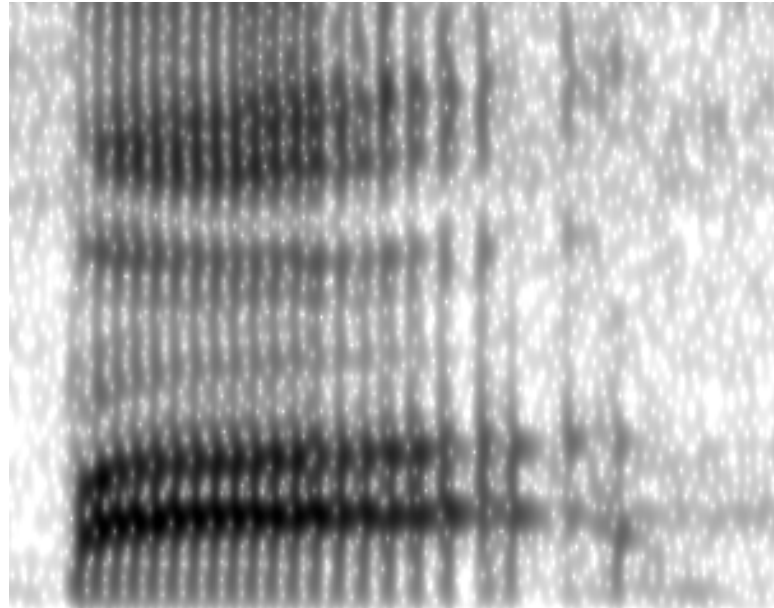
pa: ³⁶	-ka ¹	to.cling-liver	'to cling at so's liver'
tu: ⁵²	=ta ⁴	to.drag=FUT	'to drag (fut.)'
pa: ⁴³	=ta ⁴	to.be.dry=FUT	'to be dry (fut.)'
pa: ³⁴	=ta ⁴	to.be.nubile=FUT	'to be nubile (fut.)'
ʔu: ³³	=ta ⁴	to.say=FUT	'to say (fut.)'
ʔa: ³¹	=ta ⁴	to.burn=FUT	'to burn (fut.)'
ka: ²²	=ta ⁴	to.stab=FUT	'to stab (fut.)'
pa: ²¹	=ta ⁴	to.be.tired=FUT	'to be tired (fut.)'
pa: _~	=ta ⁴	to.cling=FUT	'to cling (fut.)'

Stressed syllables: phonetic sample A



pa: ³⁶	-ka ¹	to.cling-liver	'to cling at so's liver'
tu: ⁵²	=ta ⁴	to.drag=FUT	'to drag (fut.)'
pa: ⁴³	=ta ⁴	to.be.dry=FUT	'to be dry (fut.)'
pa: ³⁴	=ta ⁴	to.be.nubile=FUT	'to be nubile (fut.)'
ʔu: ³³	=ta ⁴	to.say=FUT	'to say (fut.)'
ʔa: ³¹	=ta ⁴	to.burn=FUT	'to burn (fut.)'
ka: ²²	=ta ⁴	to.stab=FUT	'to stab (fut.)'
pa: ²¹	=ta ⁴	to.be.tired=FUT	'to be tired (fut.)'
pa:_~	=ta⁴	to.cling=FUT	'to cling (fut.)'

Stressed syllables: phonetic sample A



| pa | a |



Stressed syllables: phonetic sample B

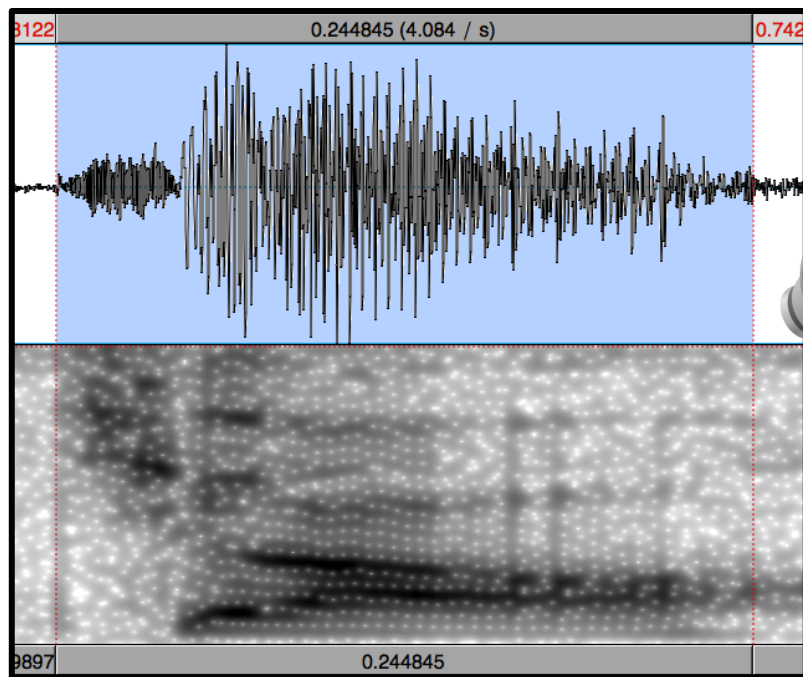


tɛa ³ =nã ³ =	ŋo: ³⁶	-ka ¹	1SG=3=to.bite-liver	'I bite its liver'
tɛa ³ =nã ³ =	tu: ⁵²	=taʔ ¹	1SG=3=to.drag=too	'I drag it too'
tɛa ³ =nã ³ =	mũ: ³⁴	=taʔ ¹	1SG=3=to.encircle=too	'I encircle it too'
tɛa ³ =nã ³ =	mũ: ³³	=taʔ ¹	1SG=3=to.weave=too	'I weave it too'
tɛa ³ =nã ³ =	mũ: ³¹	=taʔ ¹	1SG=3=to.harpoon=too	'I harpoon it too'
tɛa ³ =nã ³ =	mũ: ²²	=taʔ ¹	1SG=3=to.free=too	'I free it too'
tɛa ³ =nã ³ =	ŋa: ²¹	=taʔ ¹	1SG=3=to.scold=too	'I scold it too'
tɛa ³ =nã ³ =	mũ: _~	=taʔ ¹	1SG=3=to.eat=too	'I eat it too'
tɛa ³ =nã ³ =	ʔu: ⁴³	=taʔ ¹	1SG=3=to.boil=too	'I boil it too'

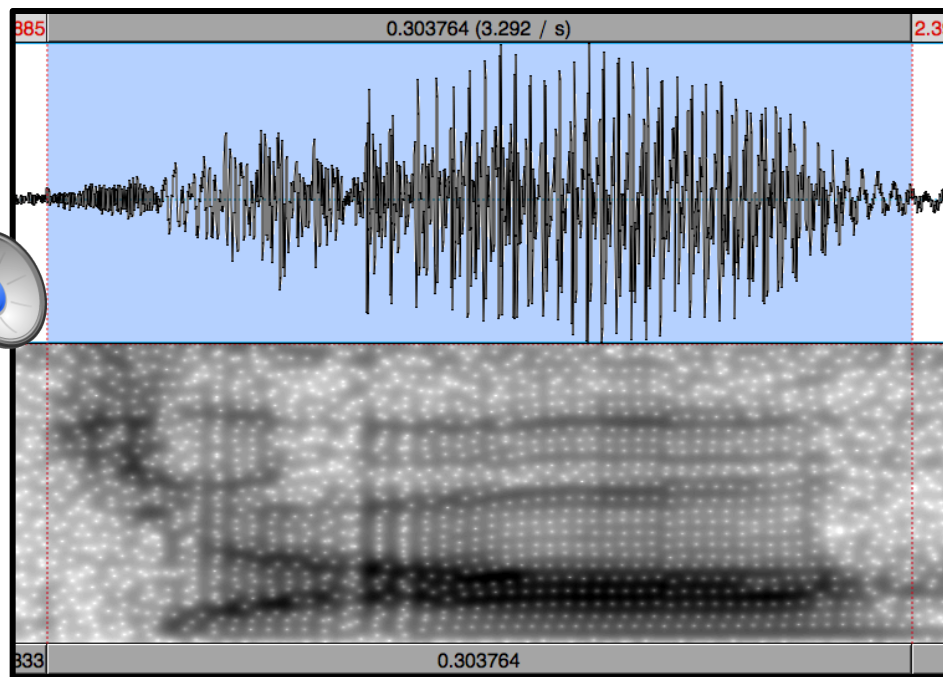
Stressed syllables: σ -initial vs σ -final creaky-voice-ness

- ❖ A number of SMAT speakers display another type of creaky-voiced syllables
- ❖ 1 vs 2 types of creaky-voiced syllables: dialectal distribution?
- ❖ Diachronic hypothesis: 2-types varieties are more conservative (1-type varieties have merged the other type with tone 22)

Stressed syllables: σ -initial vs σ -final creaky-voice-ness



t₆ | o | õ |
'to be white'



t₆ | õ | o |
'to open (a canoa)'

Stressed syllables: phonological analysis

- ❖ These tones and phonation types are (all of them) **tonemes**
 - main phonetic features are essentially maintained across varying contexts (*e.g.* no sandhi, no downdrift, etc.)
 - **systematically contrastive** (in underived monosyllables in particular)
 - **NO case for allophony** between any of them (*e.g.* no segmental or suprasegmental conditioning, no relation to prosody, to word classes, etc.)

Stressed syllables: phonological analysis

- ❖ Pitch-related and phonation-related sets of phonetic properties form a single phonological paradigm: “**tonemes**” (BUT Skilton, pers. com., 2018 on CTic)
 - **complementary distribution:** creaky voice cannot combine with, or overwrite, tonal specifications as if an independent feature
 - pitch is essentially irrelevant in syllables that display creaky voice (although to be further tested with the creaky-to-modal phonation type)
 - creaky voice behaves like any tone in morphotonological processes

Stressed syllables: sets of tonological minimal pairs

Segments	Toneme										
	36	52	34	43	33	31	22	21	t.creaky.voice	i.creaky.voice	
pa			'to be full'	'to be dry'	'dad !'				'to be tired'	'to cling on'	
mã			'to chop up'	'to be sad'	'mum !'		'to sprout'			'to kill'	
mũ			'to be numerous'		'to weave'	'to spear'	'to send'			'to eat (a fruit)'	
ɬɔ				'to plant'		'to fetch'	'to sit'	'other'		'kinkajou'	
ɬu		'to drag'				'to perch'	'to choke'			'tree sp.'	
ɲãĩ	'other'		'to be hot'	'to be spicy'		'tree'		'other'		'to tie'	
tɛi			'to stand'	'to chew'				'tree sp.'		'to be tasty'	
tɔɔ			'to hang'	'to stay'						'to be white'	'to open'
ɲu		'owl sp.'			'to arrive'	'to fall'	'tree sp.'	'to ferment'		'to learn'	
ʔɔ				'to vanish'	'to die (a fire)'	'to be lazy'	'to fruit'			'to be wounded'	

Stressed syllables: conclusion

10 tones = 10 tonemes

36

34

33

22

modal-to-creaky

52

43

31

21

(creaky-to-modal)

(exact labels unimportant)

Stressed syllables: conclusion

Roughly coincides with Andersons (1962, 2017)'s phonetic (?) categories:

36

34

33

22

modal-to-creaky

52

43

31

21

(creaky-to-modal)

Stressed syllables: conclusion

Roughly coincides with Andersons (1962, 2017)'s phonetic (?) categories:

36	→5	52	→51
34	→4	43	→43
33	→3	31	→31
22	→2	21	→1
modal-to-creaky	→1 _~	(creaky-to-modal)	→(∅)

(**N.B.**: Andersons' numbers inverted here!)



Stressed syllables: conclusion

Virtually coincides with Amalia Skilton's (UC Berkeley) independent phonological analysis for CTic (pers. com., 2018) except for the 2 units with creaky-voice

ANALYSIS

UNSTRESSED SYLLABLES

Unstressed syllables: phonetic sample

pe ^{33?}	-wa ⁵		'at	you (pl.)'	
pe ^{33?}	-te ⁴	'your (pl.)	husband'		
pe ³³	-mã ³	'your (pl.)	path'		
pe ³³	-ga ¹	'your (pl.)	rib'		
teau ²¹	-pa _~	'my	skirt'		

Unstressed syllables: phonological analysis

- ❖ AGAIN: these tones and phonation type are (all of them) **tonemes**
 - main phonetic features are essentially maintained across varying contexts
 - systematically **contrastive**
 - **NO case for allophony** between any of them

Unstressed syllables: sets of tonological minimal pairs

❖ Fewer minimal pairs than in stressed syllables

Segments	Toneme				
	5	4	3	1	creaky
nã		3CLASSII-IV.SBJ=	3CLASSII-V=	PRED.CLASSna ¹ =	
ta		3CLASSI.SBJ=	1PL.SBJ=		-VICIOUS.HABIT?
pe	2PL.BEN=		2PL.SBJ=		-bait
?ũ	-BEN	-NMLZ.CIV	-ACC	-TRANSFORMATIVE	
i	PROG=		PRED.CLASSi ³ =	PRED.CLASSi ¹ =	

Unstressed syllables: conclusion

5 tones = 5 tonemes

5

4

3

1

creaky

Unstressed syllables: conclusion

Narrowly coincides with Andersons (1962, 2017)'s phonetic (?) categories:

5

4

3

1

creaky

Unstressed syllables: conclusion

Narrowly coincides with Andersons (1962, 2017)'s phonetic (?) categories:

5	→5
4	→4
3	→3
1	→1
creaky	→1 _~

(N.B.: Andersons' numbers inverted here!)

Unstressed syllables: conclusion

Narrowly coincides with Skilton's phonological analysis for CTic (pers. com., 2018) except for the one unit with creaky voice

BUT

Andersons (1962, 2017) have one more tone: 2

Skilton (pers. com., 2018) has one more toneme: 2

→ NOT in SMAT (?)

DISCUSSION

Stressed syllables: attempt at a perceptual experiment

- ❖ 2016, 5 speakers (♂/♀, 15-40 y/o), 42 words from sets of minimal pairs: words are played one by one several times, speakers are asked to write down meaning
- ❖ Surprisingly low success at task (43-50% → not random but does not support analysis)

Stressed syllables: attempt at a perceptual experiment

- ❖ BUT experiment very far from optimal (unnatural and rare monosyllabic items, recordings' quality, room's acoustics, etc.) → results at best hard to interpret
- ❖ Inventory is too large → ambiguity without a tonal context, methodology is irrelevant for its purpose
- ❖ Future work: same task with a tonal frame (e.g. $t\text{a}^3=n\tilde{\text{a}}^3=m\tilde{\text{u}}:\text{xx}=t\text{a}^?1$) and better conditions would most certainly yield near-perfect scores

Distributional assymetry of tonemes

❖ Lexical (NOT textual) frequency

- 52 and Creaky-to-Modal: relatively rare (only a few cases in underived monosyllables in particular)
- 36: frequent but exceptional in underived monosyll. (one/two cases?)
- these are mostly secondary (as a result of tonological alternations)

Distributional assymetry of tonemes

❖ One (marginal) combinational gap

[syllable-final ?] + toneme 1 not found in unstressed syllables

Typological perspective

❖ Uncommonly rich toneme inventory cross-linguistically

- a handful of (South) East Asian languages reach strictly speaking 9-fold (or more?) inventories:
 - Kam (Tai-Kadai) (Tang, 2008:87; Yang & Edmondson, 2008:514)
 - some Hmongic languages (?)

Typological perspective

❖ Uncommonly rich toneme inventory cross-linguistically

- most striking typological parallels (in both richness and configuration of inventory): some **Oto-Manguéan** subgroups (under some analyses)
 - Palantla Chinantec (Merrifield & Edmondson, 1999)
 - Xochistlahuaca Amuzgo (Bauernschmidt, 1965:473-474)
 - ...

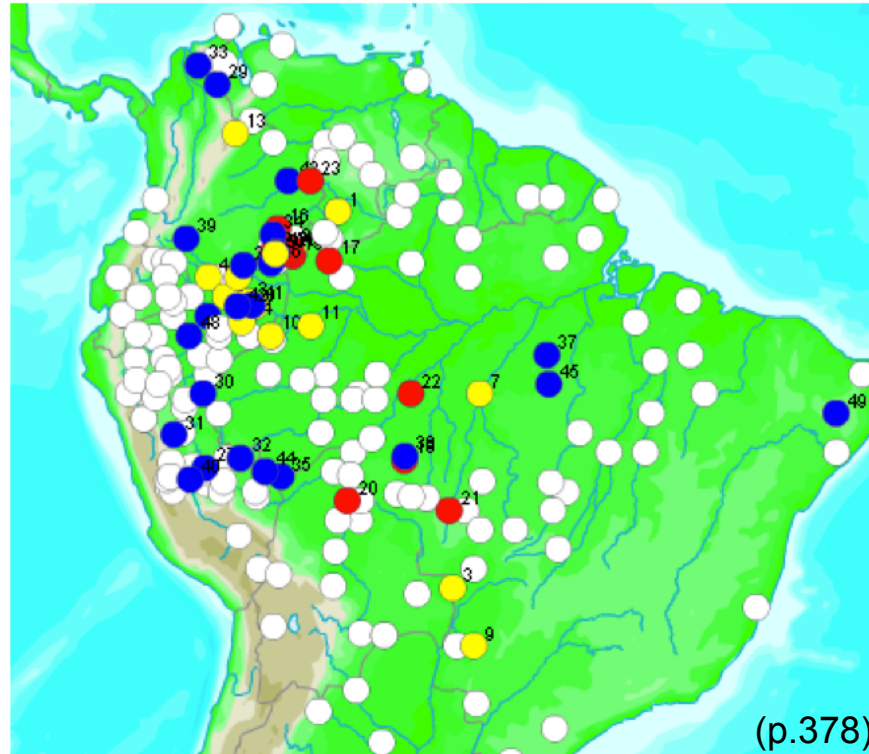
→ future work: detailed comparison

Areal perspective

❖ **Hyman (2010)**: typology of tonal systems in Amazonia (=South America in this case), 50 languages surveyed

“most of the South American languages which have been analyzed with tone occur in the Western Amazon” (p.377)

Areal perspective



● \geq two-way contrast

Areal perspective

❖ **Hyman (2010)**: typology of tonal systems in Amazonia (=South America in effect), 50 languages surveyed

“most of the South American languages which have been analyzed with tone occur in the Western Amazon” (p.377)

→ areal consistency

Areal perspective

- ❖ BUT richest inventories known: “three”-way inventories

H vs L vs Ø	Yagua, Mundurukú, Baniva, Piapoco (?)
H vs M vs L	Ticuna (according to Montes, 1995)

→ Ticuna’s toneme inventory is not only peculiar for the (even Western) Amazon region, but *highly* peculiar

- ❖ How to make sense of this areal uniqueness?

CONCLUSION

SMAT toneme inventory

Toneme inventory			
in stressed syllables		in unstressed syllables	
36	pitch	5	pitch
52	—	4	—
34	—	3	—
43	—	1	—
33	—	creaky voice	phonation
31	—		
22	—		
21	—		
terminal creaky voice	phonation		
initial creaky voice	—		

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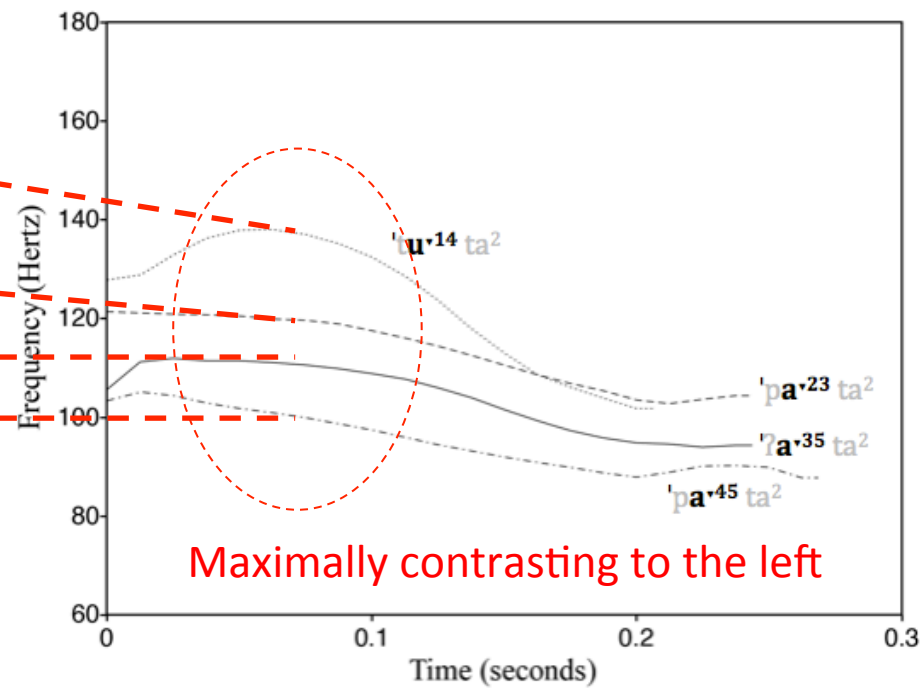
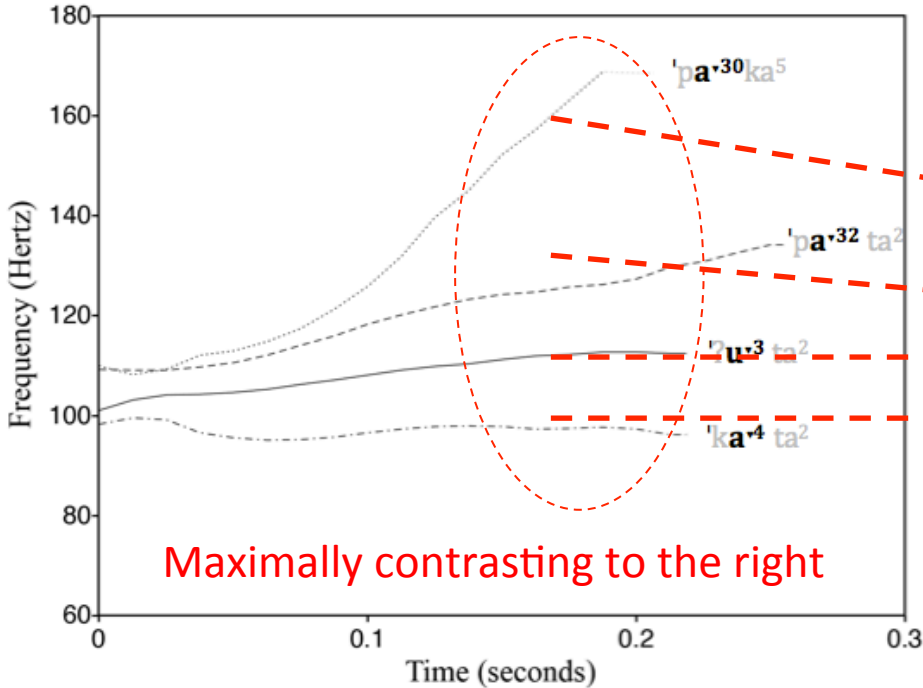
mō'è'ũchì

An analysis of what underlies the surface contrastive tones

Tonemes whose distinctive feature is pitch: stressed syllables (→ no creaky voice)

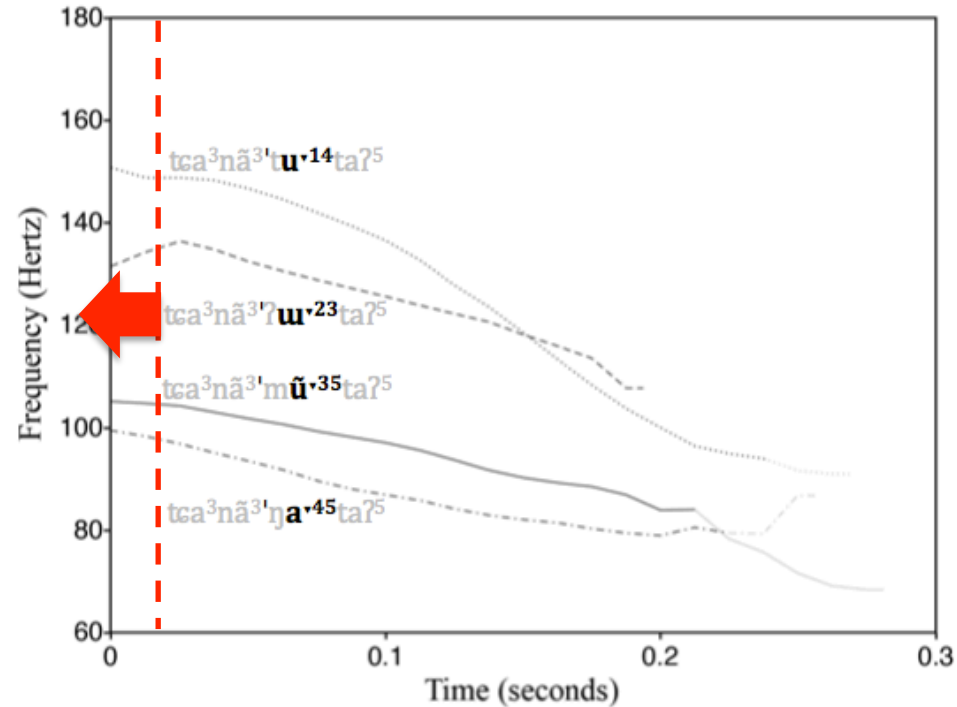
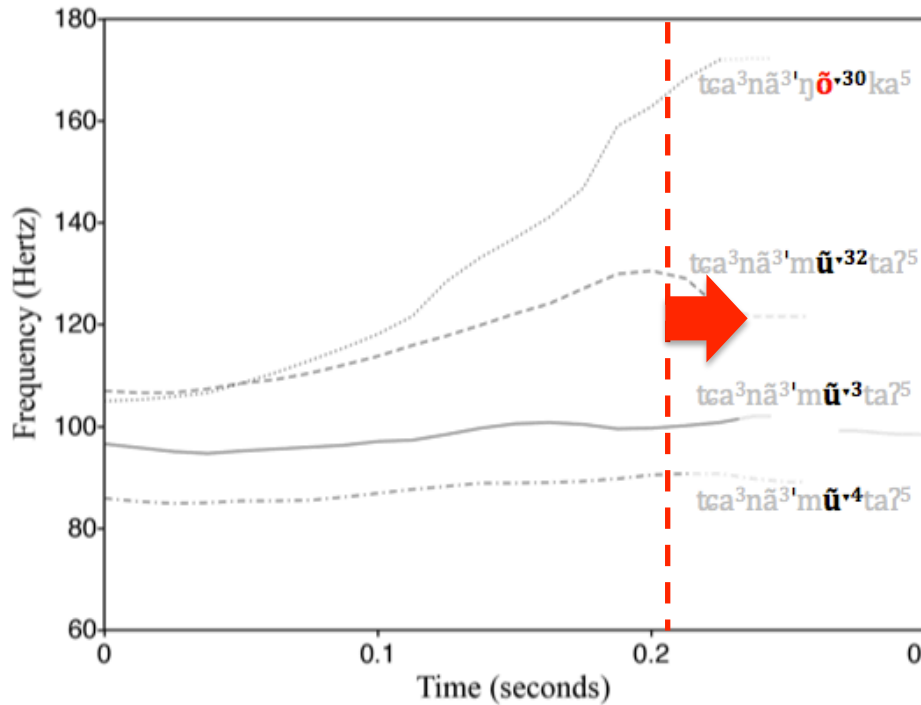
4 level/rising

4 falling



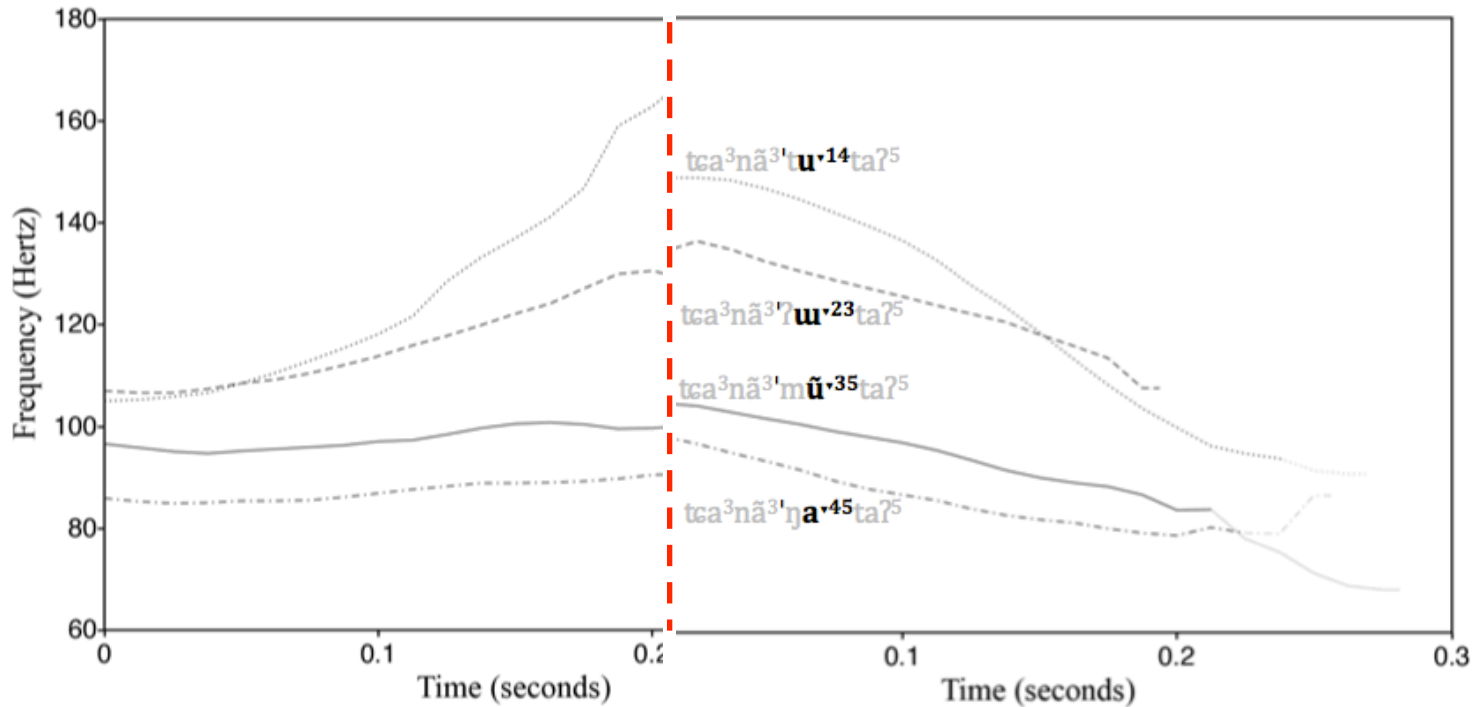
WARNING: in these diagrams, 5=lowest; 0=highest!

Tonemes whose distinctive feature is pitch: stressed syllables (→ no creaky voice)



WARNING: in these diagrams, 5=lowest; 0=highest!

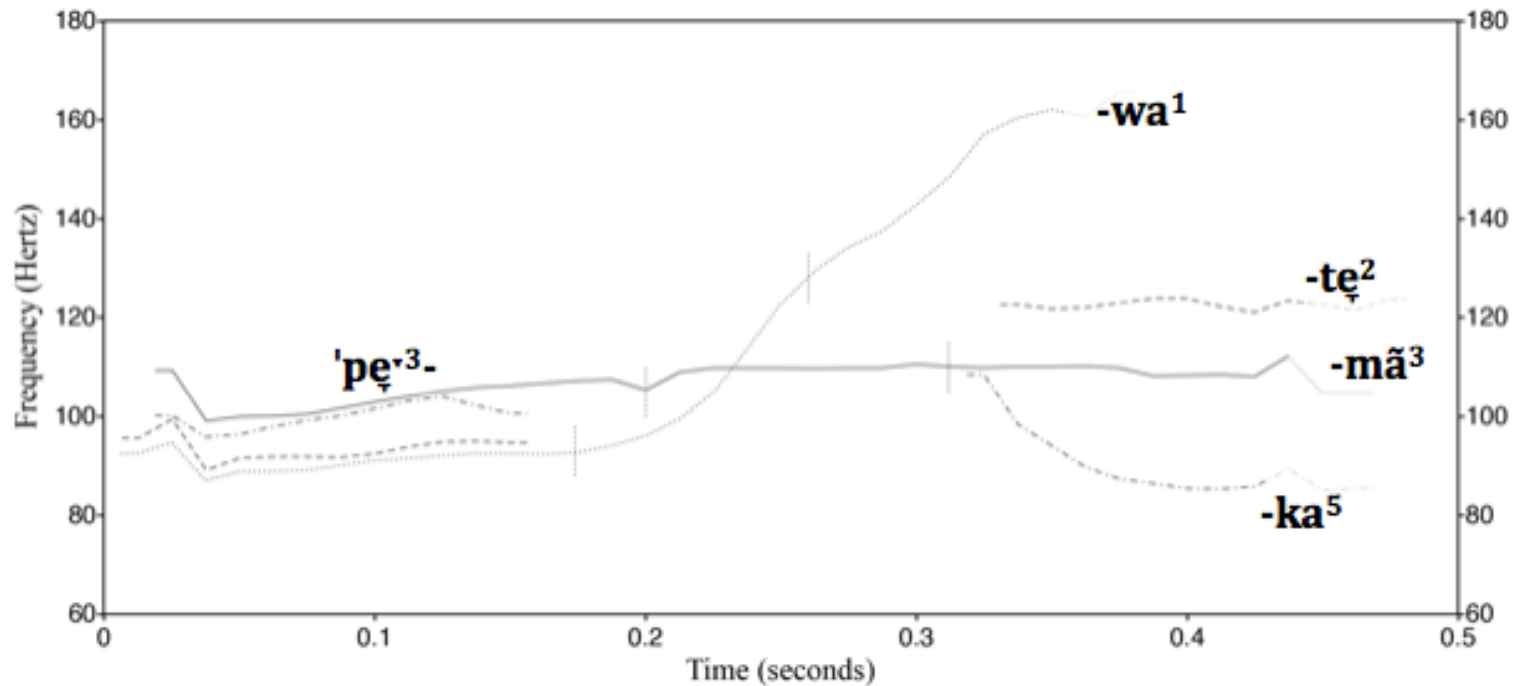
Tonemes whose distinctive feature is pitch: stressed syllables (→ no creaky voice)



WARNING: in these diagrams, 5=lowest; 0=highest!

Tonemes whose distinctive feature is pitch: UNstressed syllables (→ no creaky voice)

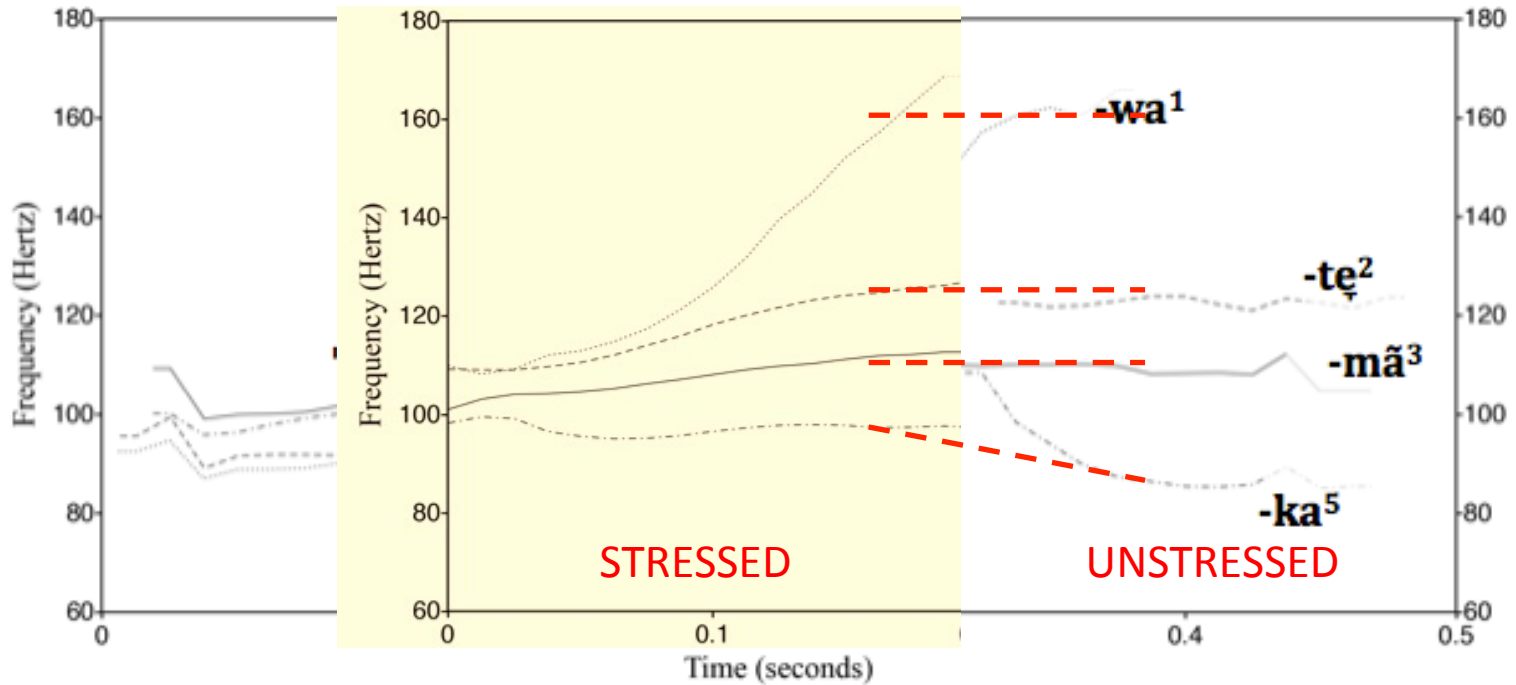
4 level(-ish)



WARNING: in these diagrams, 5=lowest; 0=highest!

Tonemes whose distinctive feature is pitch: UNstressed syllables
 (→ no creaky voice)

4 level(-ish)



WARNING: in these diagrams, 5=lowest; 0=highest!

Hypothesis

Underlyingly:

- **5 distinctive articulatory targets:**
 - Pitch (default modal voice):
LOW
MID
HIGH
EXTRA.HIGH
 - Phonation (pitch mostly irrelevant): CREAKY.VOICE
- **Unstressed syllables** have only **1 “alignment”** for these targets
 - 5 contrasts (slightly problematic, see 2 tonemes linked to unstressed syllables w/ glottal stop)
- **Stressed syllables** have **2 “alignments”**: target “aligns” to the left or to the right
 - 10 contrasts on the surface

Remaining issues

What does “alignment to the left/right” mean?

- *moraic interpretation*: 2 moras in stressed syllables; 5 tonemes; toneme links to one mora
- *Q-theoretic-like interpretation*: vocalic segments are subdivided in at least two phases *in stressed syllables*; 10 tonemes; tonemes are defined by two orthogonal features (height and phase alignment)
- *“ballistic/controlled accents” interpretation*: two types of stress (cf. SIL tradition for Oto-Manguean languages)

Remaining issues

If true, why apparently **no detectable effect of this underlying system in the morphotonology?**

In particular, this analysis apparently fails to make sense of the morphophonological “tone circle” (see later)

Unstressed syllables: phonetic sample

ku: ⁴³	-ga¹	‘your (sg.)	rib’
tɛaυ̃ ²¹	-ga¹	‘my	rib’
pe ³³	-ga¹	‘your (pl.)	rib’
ku: ⁴³	-nē³	‘your (sg.)	son’
tɛaυ̃ ²¹	-nē³	‘my	son’
pe ³³	-nē³	‘your (pl.)	son’
ku: ⁴³	-te⁴	‘your (sg.)	husband’
tɛaυ̃ ²¹	-te⁴	‘my	husband’
pe ³³	-te⁴	‘your (pl.)	husband’

