The Phonetics and Phonology of Laryngeal Features in Native American Languages

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Contents

CHAPTER 9

Amazonia and the Typology of Tone Systems

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1 Introduction

The purpose of this chapter is to address the following question: How do Amazonian tonal systems fit into the overall scheme of word-prosodic typology? That is, how are they similar to or different from those found elsewhere in the world? For this purpose I draw from a personal database of roughly 600 tone systems geographically distributed as follows:

(1)

Africa	(225)	US, Canada	(49)
Asia	(165)	Mexico	(63)
Pacific	(85)	South America	(54)
Europe	(12)		

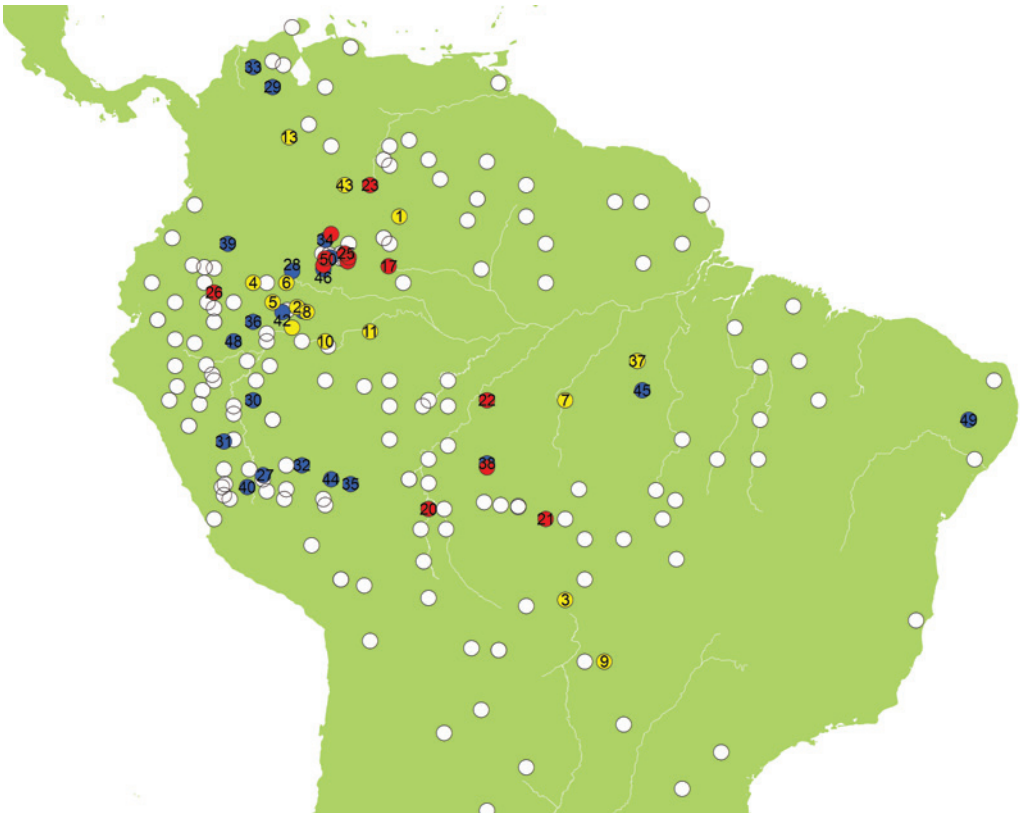
As seen in the following map, most of the South American languages which have been analyzed with tone occur in the Western Amazon.[1]

Based on the literature, the most striking properties concerning Amazonian tone are:

(2) a. uncertainty concerning whether specific languages have tone or should instead be analyzed with "(pitch-) accent", or "stress"
b. limitation to two contrastive tone heights except Ticuna whose variants have been described with 3 or 5 tone heights (Anderson 1959, Montes Rodrigues 1995, Soares 1996)

1 I may have been slightly overgenerous in including a few languages which probably will turn out not to be tonal. In compiling the above during 2006–2010 I have been aided by numerous scholars who shared their writings and insights, provided supplementary materials, and responded to my many questions over email. I am especially grateful to Elsa Gomez-Imbert for her inspirational work and help, as well as Sasha Aikhenvald, José Alvarez, Janet Barnes, Thiago Costa Chacon, Didier Demolin, Pattie Epps, Dan Everett, David Fleck, Jesus Mario Girón Higuita, Oliver Iggesen, Barbara Kroeker, Eugene Loos, Lev Michael, Denny Moore, Knut Olawsky, Ana María Ospina Bozzi, David Payne, Doris Payne, Gessiane Picanço, María Emilia Montes Rodrigues, Filomena Sandalo, Frank Seifart, Kris Stenzel, Luciana Storto, Consuelo Vengoechea, Leo Wetzels. My thanks also to Tammy Stark for preparing the map in Figure 9.1 utilizing the tools in Haspelmath et al. 2008.

 | DOI 10.1163/9789004303218_010



Key to map: blue = /H, ∅/ systems, red = /H, L/, yellow = other tonal system, white = non-tonal

1	Baniva	H, L, ∅	18	Gavião	H, L	35	Iñapari	H, ∅
2	Bora	L, ∅	19	Hup	H, L	36	Iquito	H, ∅
3	Guató	?	20	Mamainde	H, L	37	Juruna	?
4	Huitoto	?	21	Nambikuára	H, L	38	Karo	H, ∅
5	Miraña	L, ∅	22	Pirahã	H, L	39	Koreguaje	H, ∅ ?
6	Muinane	?	23	Puinave	H, L	40	Nomatsiguenga	H, ∅
7	Munduruku	H, L, ∅	24	Tatuyo	H, L	41	Ocaina	H, ∅
8	Resígaro	?	25	Wanano	H, L	42	Orejón	H, ∅
9	Terena	?	26	Yuhup	H, L	43	Piapoco	H, L, ∅ ?
10	Ticuna	H, M, L	27	Amahuaca	H, ∅	44	Marinahua	H, ∅ ?
11	Ticuna	H, M, L	28	Andoke	H, ∅ ?	45	Suruí	H, ∅ ?
12	Tukano	H, L	29	Macuna	H, L	46	Tanimuca	H, ∅ ?
13	Tunebo	?	30	Capanahua	H, ∅	47	Tuyuca	H, ∅
14	Yagua	H, L, ∅	31	Cacataibo	H, ∅	48	Urarina	H, ∅
15	Barasana	H, L	32	Cashinahua	H, ∅ ?	49	Yatê (Fulnio)	H, ∅ ?
16	Kakua	H, L	33	Chimila	H, ∅	50	Waimaha	H, L
17	Daw	H, L	34	Kubeo	H, ∅			

FIGURE 9.1

c. interactions between tone and metrical structure (stress)
d. the special status of L (low) tone, e.g. marked in Miraña (Weber and Thiesen 2000, Seifart 2005)
e. the interactions of tone with glottalization and syllable structure (e.g. codas)

In the following sections I will address all of the above issues, at times comparing these impressions with tone systems from outside Amazonia. Since I am interesting in typological generalizations, I will first discuss the nature of phonological typology in general (§2), then turn to tone and stress (§3), accent (§4, §5), the typology of two-height tone systems (§6), and the interaction of tone with syllable structure and laryngeal features (§7). I conclude with a brief summary in §8.

2 Phonological Typology

In order to appreciate both the commonalities and diversity observed in Amazonian and other tone systems, we must address the following questions: What is typology? phonological typology? What is a tone? a tone system? How does tone fit into word-prosodic typology? Concerning the first question, there have been two ways of talking about typology. The first is to view typology as the classification of languages:

> . . . a principled way of classifying the languages of the world by the most significant properties which distinguish one from another. (Hagège 1992:7)

The second approach is to characterize typology as the study of linguistic properties ("property-driven typology"):

> Typology, thus, is not so much about the classification of languages as about the distributions of individual traits—units, categories, constructions, rules of all kinds—across the linguistic universe; these distributions, not languages as such, are the primary objects of comparison. (Plank 2001:1399)

Turning to phonological typology, the emphasis in the following statement is clearly to classify languages, rather than taking a phonological property and seeing how it varies across languages:

> . . . it is possible to classify languages according to the phonemes they contain. . . . typology is the study of structural features across languages. Phonological typology involves comparing languages according to the number or type of sounds they contain. (Vajda 2001)

These are the two conceptions of typological work of which Greenberg was in fact well-aware:

> . . . all synchronic typologies have this Janus-like nature in that the same data can be utilized either for a typology of linguistic properties or a typology of individual languages. (Greenberg 1974:14)

In this chapter, as in earlier work, I will assume that the more productive approach is what I term "property-driven typology":

> Rather than seeking to classify or label languages, the central goal of phonological typology is to determine how different languages systematize the phonetic substance available to all languages. (Hyman 2009:213)

As an example, one might ask the question: How do different languages "phonologize" nasality (another property of great interest in Amazonian languages)? Among the possibilities are the following:

(3) a. nasality is contrastive only on consonants, e.g. /b, d/ vs. /m, n/
b. nasality is contrastive only on vowels, e.g. /o, a/ vs. /õ, ã/
c. nasality is contrastive on both consonants and vowels, e.g. /b, d, o, a/ vs. /m, n, õ, ã/
d. nasality is contrastive as a prosody on morphemes, e.g. /bab/^{N} → [mãm]
e. nasality is non-contrastive (allophonic or in free variation), e.g. /b/ → [b] ~ [m]
f. nasality is absent entirely

As can be inferred from the above, assigning a language to one of the above categories may be a matter of interpretation. Phonological typology is not about surface inventories, rather about the analysis of systems, specifically of the relationship between inputs and outputs.

3 Tone and Stress

This last point is especially important in interpreting the analogous question concerning how different languages systematize pitch (f_0): Where do pitch distinctions enter the grammar? At the word level? phrase? utterance? If at the word level, are pitch distinctions a manifestation of tone, stress, and/or "accent"? To answer this last question, let us adopt the following definitions:

(4) Definition of tone (Hyman 2006:229)
A language with tone is one in which an indication of pitch enters into the lexical realization of at least some morphemes.

(5) Definition of stress (Hyman 2006:231)
A language with stress-accent is one in which there is an indication of word-level metrical structure meeting the following two central criteria:

a. *obligatoriness* : every lexical word has AT LEAST one syllable marked for the highest degree of metrical prominence (primary stress)

b. *culminativity* : every lexical word has AT MOST one syllable marked for the highest degree of metrical prominence

Therefore : every lexical word must have one and only one (primary) stress

From these definitions we note the following crucial differences between tone vs. stress. First, tone is defined as a property of morphemes, while stress is defined as a property of words. Second, tone is (necessarily?) contrastive in underlying representations, while stress need only be present in outputs (being often predictable or "fixed", e.g. on the first or last syllable of the word). Third, the tone-bearing unit (TBU) can be the mora or syllable, while the stress-bearing unit is necessarily the syllable: cases where a long-vowel syllable allows two different prosodic patterns typically involve something other than or in addition to stress, typically tone. Finally, because (primary) stress is both obligatory and culminative, there will be at most as many primary stress patterns as there are syllables, e.g. one pattern on monosyllables, two on bisyllables, and so forth. This contrasts significantly with tone, where the number of patterns increases geometrically with the number of TBUs, as in Andoke (Landaburu 1979:48):

(6) 2σ : L-L L-H H-L H-H
3σ : L-L-L L-L-H L-H-L L-H-H H-L-L H-L-H H-H-L H-H-H

If Andoke allowed monosyllabic words we would expect two patterns H and L, while 16 patterns should be possible on quadrisyllabic words, barring sequential restrictions or tonal contouring.

4 Accent

What, then is "accent"? The term has been used for quite different types of systems (not necessarily in the references below, unless directly quoted):

(7) A language in which stress is realized as high (H) pitch, e.g. Tariana
"Since the stressed syllable is realised with a high pitch, and the difference between many words lies in the positioning of this pitch, Tariana can be considered a pitch-accent language." (Aikhenvald 2003:37)
Also Karitiana (Demolin and Storto 2005:233), Kadiweu (Sandalo 1997, pers. comm.)

(8) A language which has both stress and tone, e.g. Hup
"Only stress-bearing syllables bear contrastive tone. . . ." (Epps 2005:119)

(9) A language where words have an obligatory and culminative H, e.g. Tuyuka
"The phonological word has one and only one accent, which is manifested as a combination of High pitch and intensity. In multi-morpheme words, where more than one morpheme is marked, all but one accent is deleted." (Barnes 1996:31) (cf. below)

(10) A language where words have an obligatory (but not culminative) H, e.g. Iñapari
". . . there is one aspect of Iñapari which clearly distinguishes it from prototypical stress languages, and this is the fact that many words contain more than one high tone. . . . I feel most comfortable categorizing the tonal system of Iñapari as being 'pitch-accent' in nature." (Parker 1999:17–18)

2σ : H-L L-H
3σ : L-H-L L-L-H
4σ : L-H-L-L L-L-H-L L-**H**-**H**-L L-L-L-H
cf. Barasana (Gomez-Imbert 2001:372), Yuhup (Ospina Bozzi 2002:84)

Given the above distributions, if H-L is interpreted as /LH-L/, then all words have either a /LHL/ or /LH/ melody.

(11) A language where words have a culminative (but not obligatory) H, e.g. Ocaina (Agnew and Pike 1957:26), which exhibits the following tone patterns:

2σ	:	H-L	L-L	
3σ	:	H-L-L	L-H-L	L-L-L

To summarize, the two parameters Obligatory(H) and Culminative(H) define four systems:

(12)

	[+ culminative]	[– culminative]
[+ obligatory]	Tuyuka	Iñapari
[– obligatory]	Ocaina	Andoke

The conclusion to be drawn from (12) is that there is no single set of properties that unambiguously defines a pitch-accent system or a pitch-accent prototype (Hyman 2009). This is consistent with the position concerning the goal of typology, which is not to assign languages to types, but to study their properties. About all we can say about the wide range of languages that have been variously characterized as having "pitch accent", "tonal accent" or "melodic accent" is that there are "significant constraints on the pitch patterns for words" (Bybee et al. 1998:277).

A further complication concerns the question of where the obligatory and culminative parameters are satisfied: What level of representation (underlying vs. surface)? What domain (morpheme vs. stem vs. word vs. phrase)? For example, in Puinave, the domain for culminativity is the morpheme: "... at most one syllable per morpheme may be characterized by a H-tone" (Girón Higuita and Wetzels 2007:134). In Chimila, a word can have more than one underlying H, but only one surface H: "... only one surface high tone is permitted per phonological word in Chimila" (Malone 2006:42). Since "... a disyllabic or trisyllabic word can be lexically unspecified for tone ... [or] bear lexical high tone on the accented syllable ... the second syllable ... [or] the first two syllables" (Malone 2006:51), this produces the input patterns in (13).

(13)

2σ	:	∅-∅	H-∅	∅-H	H-H			
3σ	:	∅-∅-∅	H-∅-∅	∅-H-∅	H-H-∅	→	∅-H-∅	[M-H-L]

As indicated, the input /H-H-∅/ undergoes H tone deletion to satisfy word-level culminativity.

A particularly interesting case of obligatory but non-culminative H occurs in Iquito(Michael 2011:62):

> All prosodic words in Iquito bear at least a single H tone, and if a given prosodic word lacks lexically specified high tones (a common occurrence), a high tone is assigned to the syllable bearing primary stress [= the penultimate mora].

The examples in (14) show a minimal pair between two nouns, one with an initial /H/, the other underlyingly toneless:

(14)					*-ya 'plural'*	*kí- 'my'*
a. lexical initial H	/túuku/	túuku	'tumpline'	túuku-ya	kítúuku
b. default penult H	/tuuku/	tuúku	'ear'	tuukú-ya	kí-tuuku

When the toneless plural suffix *-ya* is added, there is no change in the initial H of 'tumpline'. When it is added to toneless 'ear', however, the H shifts to remain in penultimate position. When the H tone prefix *kí-* 'my' is added to 'tumpline', the result is two H tones in sequence. When added to toneless 'ear', the H of the prefix blocks the assignment of the default penultimate H.

The examples in (15) show a further interesting condition on default H tone:

(15)				
a.	/pirusu/	→	(pi)(rúsu)	'electric eel'
b.	/pirusu-ka/	→	(piru)(súka)	'electric eels'
c.	/kí-pirusu/	→	(kípi)(rusu)	'my electric eel'
d.	/kí-pirusu-ka/	→	kí(piru)(súka)	'my electric eels'
e.	/kí-pirusu-ka-hata/	→	kí(piru)(suka)(háta)	'with my electric eels'

In (15) parentheses notation has been used to parse the CVs right-to-left into moraic trochees. As seen, default penultimate H is assigned to the toneless inputs in (15a,b), but not in (15c), where it is blocked by the H of the *kí-* prefix. The fact that *kí-* fails to block the default H in (15d,e), shows that the penultimate H will be assigned if there is no lexical /H/ in the last four moras. Another way to look at this is that a default penultimate H will be assigned to the last foot if neither it nor the preceding foot contains a lexical H. It is thus within the last four moras (two feet or "colon") that H is obligatory (but not culminative). A number of Amazonian tone systems have left- or right-edge "windows" of various sorts.

In the discussion thus far we have been concerned with distinguishing "pitch-accent" from tone. One alternative is to view (5) not as a definition of stress, but rather as a characterization of a stress prototype. Under such a view the obligatory and/or culminative H tones of Tuyuka, Iñapari, Ocaina, Chimila and Iquito might be characterized as accent in the sense of non-prototypical stress. There is however good reason to think that at least some cases of such H tones are not stress. One argument is that H tone can do things that stress cannot. Consider Urarina. In this language words in isolation generally have a single final H, but belong to one of the following four tone classes (Olawsky 2006):

(16)

class	*tone pattern determined by A–D class of the phrase-initial word*
A	first word = L; H is assigned to initial syllable of following word
B	first word = L; H is assigned to 3rd syllable of following word
C	first word = L; H is assigned to last syllable of final word of phrase
D	first word keeps its final H tone when a word follows, all the rest = L

As seen in the sentences in (17), the overall pattern is determined by the A–D class of the phrase-initial word:

(17)

A	raaná	'peccary (sp.)'	→	raana rɯ́.a.kaa	'he has carried peccary'
B	obaná	'peccary (sp.)'	→	obana rɯ.a.káa	'he has carried peccary'
C	reemaé	'dog'	→	reemae rɯ.a.kaá	'he has carried dog'
D	makusajarí	'pepper'	→	makusajarí rɯ.a.kaa	'he has carried the pepper'

Although H appears to be both obligatory and culminative at the phrase level in Urarina, the properties described in (16) and illustrated in (17) are unheard of in stress systems: There is no language where stress classes A–D condition a different stress placement on the another word of a phrase. On the other hand, similar systems to Urarina are found in languages where H is not necessarily culminative (Hyman 2011). Anyone wishing to analyze the H tone of Urarina as an accent would thus have to explain why it is only when there is a unique tonal exponent, i.e. [H], that such long distance effects are observed. Since other quite different long distance effects are observed in tone systems from other parts of the world, we are on firm ground in insisting that Urarina should be analyzed with a phonological /H/ tone—not with a stress-like accent.

5 Accent as an Interpretive Concept

Although definitions of tone and stress were given in (4) and (5), we have seen that it is hard to give a non-arbitrary definition of pitch accent. In this connection it is significant to take note of the following observation: While some languages must be analyzed with tone and others with stress, no language MUST be analyzed as "pitch accent". A tonal interpretation is always possible. One would be hard-pressed to analyze the three (five?) levels of Ticuna without tone (Anderson 1959, Montes-Rodrigo 1995) or the complex metrical system of Nanti without stress (Crowhurst and Michael 2005). Where is the comparable system that requires a third category of pitch accent? I have argued here and elsewhere that pitch accent is an incoherent notion. However, researchers still insist on it, often expressing the feeling that it is somehow intermediate between tone and stress. It is important to recognize that "pitch accent" is an interpretive concept. As Gussenhoven (2004:42) puts it:

> "Accent" . . . is an analytical notion and cannot be measured. [It is] thus different from stress, which is typically an observable phenomenon, and different also from tone, whose existence is equally measurable. . . .

Even limiting ourselves to Eastern Tukanoan, linguists have analyzed the same or similar phenomena with stress, tone, and/or accent:

> . . . typological classification of ET [Eastern Tukanoan] languages as 'tone' or 'pitch-accent' languages is still somewhat a matter of debate. (Stenzel 2007:345)

Consider the following HL patterns of Barasana, which Gomez (2001:377–8) and Gomez and Kenstowicz (2000) analyze as tonal:

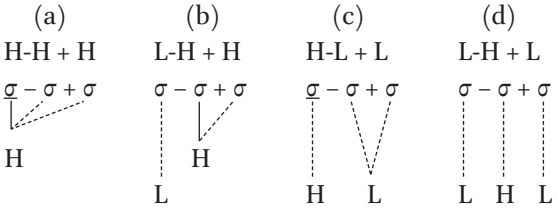
(18)	*roots*	μμ	+ μ	+ μμ^{HL}	+ μμ^{HL} + μ	+ μ + μμ^{HL} + μ
a.	/H/	HH	HH-H	HH-HL	HH-HL-L	HH-H-HL-L
b.	/LH/	LH	LH-H	LH-HL	LH-HL-L	LH-H-HL-L
c.	/HL/	HL	HL-L	HL-LL	HL-LL-L	HL-L-LL-L
d.	/LHL/	LH(L)	LH-L	LH-LL	LH-LL-L	LH-L-LL-L

In Barasana, roots are bimoraic, while suffixes can be mono- or bimoraic. Roots may be /H/ or /HL/, either of which can be preceded by a contrastive, initial L. In the case of /LHL/, the second L will float if there is no TBU for it to link to. Although a H feature is obligatory in a Barasana word, the above patterns show

that it is not culminative. After a /H/ or /LH/ root, a monomoraic suffix will be realized H and a bimoraic suffix HL. After a /HL/ or /LHL/ root, both monomoraic and bimoraic suffixes are realized L. The tonal realizations of forms with two suffixes are shown in the last two columns of (18). The generalization is that /H/ and /LH/ roots continue their H to the right, while /HL/ and /LHL/ roots require following TBUs to be L. In other words, once there is a L TBU, the word may not go back up to H. While one might be tempted to see this as some form of accentual reduction, it is common for tone systems to prohibit a *HLH sequence (cf. Cahill 2007), for which Yip (2002:137) proposes the constraint *TROUGH. A strictly tonal account is both possible and unproblematic.

More recently, Chacon (2012) presents a quite different interpretation of the similar system of closely related Kubeo. In his analysis, every word must be stressed (p. 111). There also are two kinds of stress: Unpredictable, lexical stress is initial; default "rhythmic" stress is on the second syllable (p. 116). In addition, a word may or may not have a lexical /H/. Lexical /H/ spreads to the right (p. 135), while default H goes to the stressed syllable and does not spread. This produces the same four patterns of root + monosyllabic suffix as in Barasana:

(19)



Initial lexical stress is underlined in (19a,c), while I have indicated Chacon's lexical /H/ tones as prelinked in (19a,b). As seen, the prelinked Hs spread to the right, while the default Hs in (19c,d) do not. As Chacon (2010:26) observes, "... L tones at the left edge of words ... only occur when stress is located in the second syllable". As a result, Kubeo trisyllabic words show the same four tone patterns as Barasana: H-H-H, L-H-H, H-L-L and L-H-L. Although Chacon presents a rather subtle argument concerning a monosyllabic form, the main lesson to be drawn from (18) and (19) is how the same system can be analyzed in quite different ways. As nothing is involved but H and L tones, the onus is on Chacon to demonstrate that the language has the stress contrast that he posits.

Turning to another Tukanoan language, Tuyuka has some of the same distinctions, but notably no H tone spreading. Barnes (1996) analyzes the underlying distinctions as "accent". In her account morphemes may have a prelinked + A, an unlinked A, or no accent, where accent = a potential H tone.

Crucially, a surface word can only have one surviving accent (= H tone), which Barnes calls "word stress". In effect, each word has one and only one surface H tone, which is both obligatory and culminative. Which "accent" will survive as the one output H is determined by the following ordered statements: (i) If there is a + A in the word, the first + A will be realized H; otherwise: (ii) if there is an A in the word, the first A will be realized H; otherwise: (iii) if there is no + A or A in the word, the second syllable will receive a default H. The table in (20) shows how the nine logical combinations of stem and suffix + A, A and ∅ are realized (cf. Barnes 1996:41):

(20)

		suffix: + A	*suffix:* A	*suffix:* ∅	
	+ A	σ́ – σ + σ	σ́ – σ + σ	σ́ – σ + σ	(stem + A "wins")
stem:	A	σ – σ + σ́	σ – σ́ + σ	σ – σ́ + σ	(stem A wins unless suffix = + A)
	∅	σ – σ + σ́	σ – σ + σ́	σ – σ́ + σ	(suffix + A or A wins)

Like Chacon's stress distinction, we observe that + A = morpheme-initial H, while A = second syllable H. Among other possibilities, a strictly tonal reanalysis of Tukuya might therefore reinterpret + A as /H/ and A as /LH/. In this case, two tone rules would be needed, as in (21).

(21) a. LH → L / __ H
b. H → L / H (X) __

The rule in (21a) would simplify the /LH/ of Barnes' A to L when followed by the /H/ of Barnes' + A. This is an example of the common tone absorption rule found in numerous languages (LH-H → L-H; HL-L → H-L). The rule in (21b) deletes the H of either /H/ or /LH/ when there is an earlier H in the word, thereby accounting for the culminative property of H tone in the language. While (21b) might seem "accentual" to some, such "reduction" rules are found also in unambigous tone systems (Hyman 2009).

6 Types of Two-Height Tone Systems

Instead of focusing on the tone, stress, or accent interpretations, the point here is that we should refer directly to the properties of H, for example as in (22).

(22)

	obligatory	*culminative*
Barasana, Kubeo	+	–
Tuyuka	+	+

Of course, there are other properties of H tones that should also be considered in a full typology. Despite the relatively few languages that have been subjected to accentual interpretations, a much larger class of two-height tone systems can be established as strictly tonal. However, the underlying system can be privative /H/ vs. ∅ or /L/ vs. ∅, equipollent /H/ vs. /L/, or both: /H/ vs. /L/ vs. ∅. The following recapitulated from the above map represents the analysis of the indicated languages, based on my reading of the literature:

(23) a. /H, L/ : Barasana, Kakua, Daw, Gavião, Hup, Mamainde, S. Nambikuara, Pirahã, Puinave, Tatuyo, Wanano, Yuhup

b. /H, ∅/ : (i) Amahuaca, Capanahua, Chimila, Iquito, Karo, Nomatsiguena, Ocaina, Piapoco, Urarina, Iñapari, Cashibo-Cacataibo, Tuyuka; (ii) Andoke?, Casinahua?, Koreguaje?, Kubeo?, Marinahua?, Suruí?, Tanimuca?, Yatê?

c. /L, ∅/ : Miraña (default tone = H)

d. /H, L, ∅/ : Baniva, Munduruku, Yagua, Maijiki (Orejon)

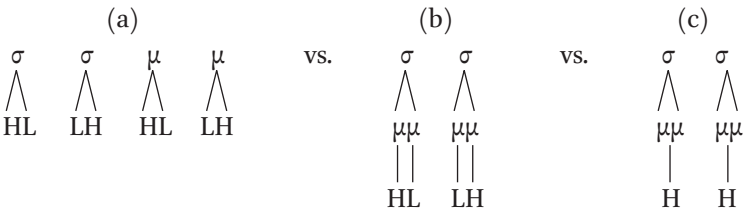
e. / ? / : Waimaha, Guató, Muinane, Resígaro, Terêna, Tukano, Tunebo, Huitoto (Minica)

In determining the correct representation, the tone features H or L are recognized only if they are "phonologically activated" in the sense of Clements (2001:2):

> . . . features are specified in a given language only to the extent that they are needed in order to express generalizations about the phonological system.

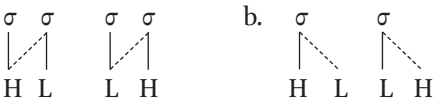
There are several potential criteria for establishing that H or L is phonologically activated (cf. Hyman 2001). The first concerns the representation of contour tones. As seen in (24a), if a HL or LH contour occurs on a single TBU, whether syllable or mora, both features are judged to be needed. If, on the other hand, the contour is realized over two TBUs, i.e. two moras, further evidence will be needed to determine if both features are required, as in (24b), or whether one of the two moras receives its tone by default, as in (24c). This is the case in Barasana and Kubeo, where these contours occur only in bimoraic syllables.

(24)



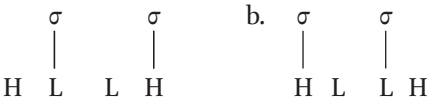
Note that the same potential evidence is available whether the contours occur in underlying representations or are derived by tone spreading rules (/H-L/ → H-HL, /L-H/ → L-LH), as in (25a), or by assigning an unlinked tone to a TBU which has the opposite tone, as in (25b).

(25)



A second potential criterion for phonological activation is when H or L occurs as an unlinked or "floating" tone, as in (26).

(26)



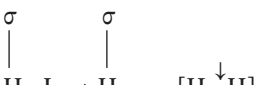
As indicated, a floating tone can either precede or follow a linked tone. A floating tone can also occur between linked tones (cf. (27b) below). In addition, there can be more than one floating tone in a row. Some languages have extensive systems of tonal morphemes, e.g. Yuhup H 'concomitant', L 'non-concomitant', LH 'imperative' (Ospina Bozzi 2002:86). Where both H and L occur as floating tones, there is strong evidence that both features are activated.

Further evidence for /H, L/ comes from cases where contour simplification or underlying floating L produces a H + downstepped $^{\downarrow}$H sequence, as in (27a) and (27b), respectively:

(27) a.

Gavião (Moore 1999:301)

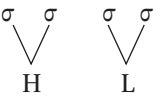
b.

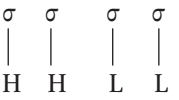


Tatuyo (Gomez-Imbert 1980:2–3)

In other cases floating tones are appropriate to motivate or block particular phonological rules.

The final criterion we will consider concerns cases where H or L must be referred to in stating certain distributional constraints or rules. For example, any time there is a need to cite the Obligatory Contour Principle (OCP) to rule out successive identical tones, the H or L feature is required. While multiply linked tones are permitted, as in (28a), the OCP prohibits successive identical linked features, as in (28b).

(28) a. 

b. 

Although not all of the authors explicitly invoke the OCP, there is evidence of such effects in the following languages:

(29) a. *HH : Amahuaca (Russell and Russell 1959), Iñapari (Parker 1999:26–7), Nomatsiguena (Payne 1997:5), Yagua (Payne and Payne 1989:431)

b. *LL : Miraña (Weber and Thiesen 2000:3, Seifart 2005:40), Gaviäo (Denny 1999),

c. both : Munduruku (Picanço 2005:313)

While OCP constraints are expected to hold especially at the morpheme level, the OCP is applied at different domains and responded to differently by different languages.

Finally, it should be noted that a language may not have the same underlying and surface systems. A two-height system may start out as privative, e.g. /H, ∅/, but become equipollent [H, L] in the course of the derivation, as may be the case in Iñapari:

> . . . I carried out an instrumental study of Iñapari pitch contours [where L tone is inserted by default]. One of my findings was that low tones do in fact correspond to a true phonological target. . . . In other words, it is not the case that only high tones are phonologically specified and that the pitch values of all other moras are simply filled in by phonetic interpolation. (Parker 1999:20)

It is also possible for a two-height system to have three heights [H, M, L] on the surface. Thus, in Andoke a third tone height is derived as follows (Landaburu 1979:49):

(30) a. /H-L-L/ → H-M-L (L raising between H and L) (Landaburu 1979:49)
b. L-L // → L-M // (L raising before pause)

In Karo, /L/ is realized M in a stress syllable according to Gabas (1999:44). While these examples involve the raising of /L/ to M, a M tone can also result from the lowering of /H/. Thus, in Koreguaje, "When three high tones occur on contiguous syllables, if the first or the last high- tone syllable occurs contiguous to a low-tone syllable, it will usually be lowered to a mid" (Gralow 1985:6). In Muinane /H/ and /L/ appear to merge as M in final position (Consuelo Vengoechea, pers. comm.). Finally, a M tone may also result from the simplification of a contour tone, e.g. LH in Kakua (Cathart 1979:26–7)

(31) a. when the first syllable ends in a voiceless consonant:
/ LH + L/ → MH-L
/~bŏpdà/ → [mő~pnà~] 'se pudre' (˜ = nasalization)

b. when the first syllable ends in a voiced consonant:
/ LH + L/ → M-H
//ăbbèh/ → [/ābᵐbéh] 'subir'

The question that these languages raise is whether they should be typologized as having a two-height or three-height tone system. Pirahã shows that we should not typologize on the basis of surface contrasts. According to Everett (p.c.), Pirahã has the following rules:

(32) a. H → M / { #, L } __ L (# = word boundary)
"A H tone between two Ls or at the beginning of a word followed by a L is lowered to M."

b. L → M / H __ { H, # }
"A L tone between two H tones or followed by a H tone word finally is M."

As a result of these rules, /H-L/ words are realized [M-M], creating a three-height surface contrast:

(33)

	Underlying	*Surface*				
a.	/H-H/	H-H	/tígí/	→	tígí	'small parrot'
b.	/H-L/	M-M	/xábì/	→	xābī	'to stay'
c.	/L-L/	L-L	/pìgì/	→	pìgì	'swift'
d.	/L-H/	L-H	/sàbí/	→	sàbí	'mean', wild'

In attempting to typologize the Pirahã tone system, I suggest that it is more impressive that bisyllabic words can be "reduced" to a two-way contrast between /H/ and /L/ than by the fact that a third M level has become surface-contrastive. Still, the most complete approach would be one where tone systems are simultaneously typologized by their underlying and surface tonal inventories, including cases where a third height is totally predictable on the surface.

7 Syllable Structure and Laryngeal Features

In several Amazonian languages, tone is sensitive to laryngeal features, specifically coda voicing and glottalization. These features may restrict contrasts and/or affect the realization of a tone or tone rule. For example, in Daw, a CVC syllable which ends in a voiced consonant can contrast /LH/ vs. /HL/, whereas a syllable ending in a voiceless consonant can only be /LH/ (Martins 2005:50–1). As seen in (34) this restriction is sometimes reflected in morphological alternations:

(34)

	intransitive		*transitive*	
a.	cɔ́m	'bathe (self)'	cɔ̂m	'bathe (s.o.)'
b.	jú?	'be hot'	jǔ?	'heat'

While HL is said to function as a transitivizer in Daw, as in (34a), it must be realized LH when the coda consonant is voiceless, as in (34b). In related Hup, /H/ is realized H when the coda consonant is voiceless, but HL when it is voiced (Epps 2005):

(35)

a.	/čúk/	→	[čúk˚]	'tool handle'
b.	/čúg/	→	[čûgᵑ]	'hummingbird'
c.	/jˀá/	→	[čə̂:]	'black'

(35c) shows that /H/ is also realized HL on a /CV/ syllable which automatically lengthens its vowel in final position.

While coda voicing can affect tone, as above, I know of no Amazonian case where voiced obstruent onsets have an effect on the tonology. Instead, South American languages seem more sensitive to coda properties, including their presence vs. absence. As seen in (36), tone is dependent on the presence of a coda in Capanahua (as it may be in other Panoan languages) (Loos 1969:188):

(36) a. /mapop/ → maˈpop → maˈpóp → maˈpó 'clay'
b. /mapo/ → ˈmapo → ˈmápo → ˈmápó 'head'

As seen, stress is assigned to the second syllable in (36a), since that syllable is closed, but to the first syllable in (36b), since the second syllable is open. After stress is assigned, the stressed syllable receives a H tone, which spreads to the second syllable in (36b). When the final /p/ is lost, this produces a surface contrast between L-H and H-H. Interestingly, Loos (1969:194) goes on to claim that words with an underlying final glottal stop do not attract stress and H tone, "either because the glottal deletion rule precedes [H tone assignment], or because the glottal does not function as syllable closure". In fact, there is reason to believe that glottal stop affiliates with L both in Capanahua and elsewhere in Amazonia. Thus the (unstressed) second H of a H-H CVCV word becomes L if it is followed by ʔV in the same word (Loos 1969:196). Thus compare *šóbó* 'house' with *šóbòʔò* 'in the house'.

In a number of Amazonian languages, tone has significant interactions with glottal stops and glottalization, which generally prefer or otherwise cooccur with L tone. A notable case is Tukano, which contrasts /H/, /LH/ and /L/ tones, assigned by morpheme (Ramirez 1997:26):

(37) a. /were/ → [ʊɛɾ́ɛ́] 'warn'
H
b. /bara/ → [ᵐbàɾ̌ă] 'love-charms'
LH
c. /yawi/ → [yàwì] 'pie'
L

In the above examples, /H/ and /L/ link to both moras of the bimoraic stem, while /LH/ is realized as a L on the first mora and a LH on the second. The above realizations of /H/ and /LH/ as H-H and L-LH are obtained when both the first vowel and the second consonant are (plain) voiced. If either the first vowel is glottalized (') or the second consonant is voiceless, in which case the preceding vowel is partially devoiced, the respective realizations are L-H and L-MH:

(38) a. /tu'ku/ → [tùu̯kú] 'fruit (sp.)'
H
b. /tu'ku/ → [tùu̯kǔ] 'angular'
LH
c. /peta/ → [pèe̯tá] 'door'
H
d. /peta/ → [pèe̯tǎ] 'tucandera'
LH

While it is not obvious how to interpret the effect of devoicing, glottalization clearly has a tone-lowering effect on the first mora. Morphophonemic alternations involving /LH/ are also sensitive to the L tone effect of glottalization. In Tukano most suffixes are "atonal" (Ramirez 1997:70) and are realized L after a /H/ or /L/ root. However, by a process of "deslocamento" (Ramirez 1997:73), a /LH/ root passes its rising contour onto the suffix, as in (39b, c).

(39) a. /apo/ → àpǒ [àa̯pɔ̄́]
LH
'to repair'
b. /apo-bĩ/ → apo-bǐ̃ [àa̯pɔmǐ̃]
LH
'he repairs'
c. /apo-ti-bĩ/ → apo-tǐ-bĩ [àa̯pɔtǐmı̀̃]
LH
'he doesn't repair'
d. /apo-kã'-bĩ/ → apǒ-ka'-bĩ [àa̯pɔ̌kɐ̃̀ɐ̃mı̀̃]
LH
'he repairs indeed'

However, as seen in (39d), a glottalized suffix will block tonal dislocation, i.e. it won't let the H of the LH contour pass through it. The following examples show that dislocation takes place not by syllable but by morpheme:

(40) a. /da'da/ + /bãsi/ → da'da bãsǐ 'to know how to work'
LH
b. /da'da/ + /sĩ'di/ → da'dă sĩ'di 'to want to work'
LH

While the /LH/ dislocates onto the second mora of /bãsi/ in (39a), it cannot shift across the glottalized first syllable of /da'da/.

The above is just one of several tone systems which show an affiliation between glottalization and L tone. An intriguing case is Munduruku, which contrasts /H/ and /L/ with toneless (∅) TBUs (Picanço 2005). In this language although ∅ is often realized with default L pitch, only underlying /L/ conditions

a H on the following TBU. In addition, glottalization occurs only with /L/ and only when the following H is realized. Returning to Tukanoan, Máíjiki (Orejón) L tone corresponds to the loss of **ʔ*, while H tone corresponds to the loss of **h* (Farmer 2010:10). Thus compare Farmer's following correspondences between Máíjɨki, Koreguaje and Tukano:

(41)		*Máíjɨki*	*Koreguaje*	*Tukano*	
	a.	má	maa	maha	'macaw (sp.)'
		mɨ́ĩ́	bũĩ	muhí	'roofing leaf'
		ó	o	ohó	'plantain'
	b.	mà	maʔa	maʔá	'path'
		wè	wɨʔe	wiʔí	'house'
		dzì	dʒɨʔɨ	jɨʔɨ́	'I'

8 Summary

The above represents a brief overview of what I have gleaned from the literature on Amazonian tone systems. The data and analyses I have presented justify the observations presented in (2). Setting aside the derived surface M of Pirahã in (33), only Ticuna contrasts more than two tone heights. In addition, there are often correlations between tone, metrical stress, syllable structure and glottalization. Some care was taken to distinguish tone from the vaguer notion of "accent", which one is tempted to adopt when /H/ is obligatory, culminative, or of low tonal density. The main question I would pose to specialists of these languages is whether tone is recent, as perhaps suggested by Máíjɨki, or whether it has been around for some time and has undergone simplification. The metrical connection in Iquito might suggest recent tonogenesis, as in Iroquoian, or restructured, long-standing tone, as in Comorian Bantu. The interactions with laryngeal features, while present, do not seem as extensive as in SE Asia, where tone is relatively recent, or in Oto-Manguean, where tone has been around for some time. Of course it is possible that tone is ancient in some families, but has been introduced more recently in others. Unfortunately this is something which I cannot resolve, but which I hope will receive attention by the growing number of researchers who have been drawn to Amazonian linguistics in recent years. As I hope to have made clear, there is a lot of exciting tone in Amazonia, whether one's interest is synchronic or diachronic. I would like to conclude by again thanking those mentioned in footnote 1, and anyone else I may have inadvertently overlooked, for their inspiring work, and for the guidance they have provided me in my first exploration into South America.

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