CROSS-LINGUISTIC EVIDENCE FOR PROSODIC DOMAINS: ARE TONES "DIFFERENT"?

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Exploring Boundaries

UiT The Arctic University of Norway, Tromsø

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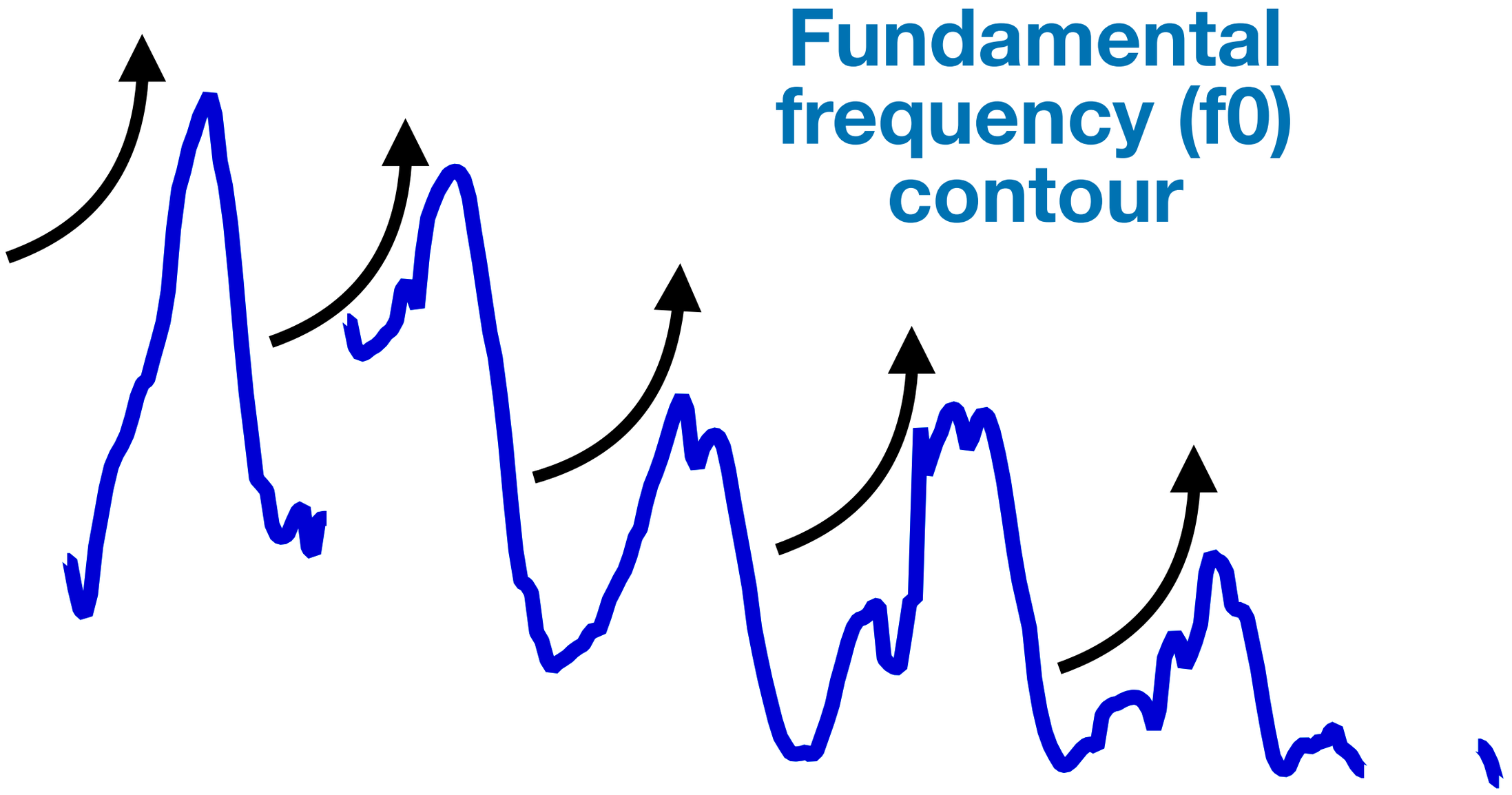
PROSODIC CHUNKS IN BENGALI

rumu nepaler ranir malider namgulo mone rakhte pare ni.

‘Rumu couldn't remember the names of the gardeners of the queen of Nepal.'

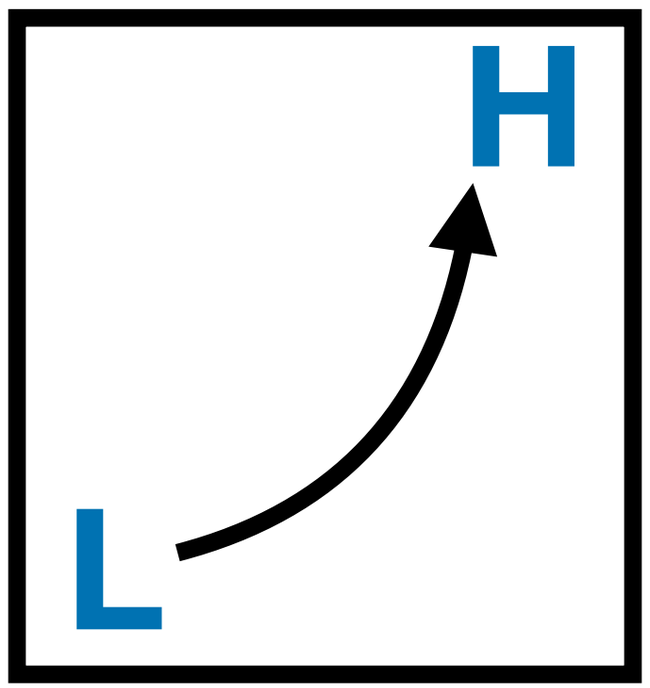
Khan (2008, 2014, et seq.)
https://www.reed.edu/linguistics/khan/B-toBI/

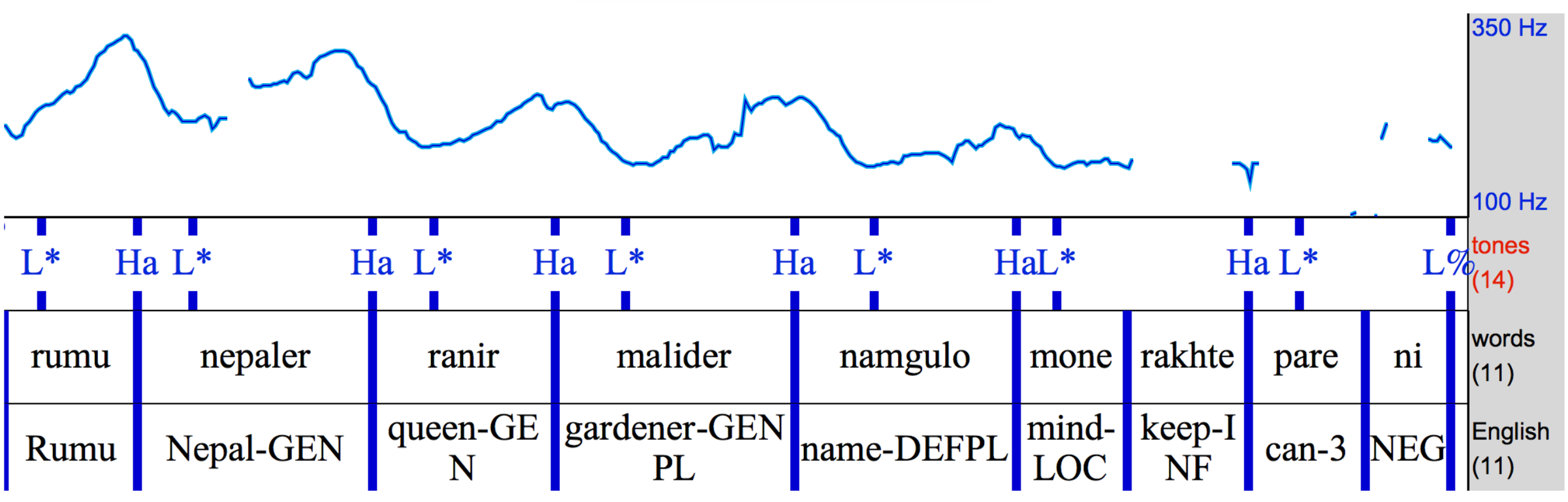
PROSODIC CHUNKS IN BENGALI



https://www.reed.edu/linguistics/khan/B-toBI/tones.html#downtrend

GENERALIZATION: TONES DELIMIT CHUNK

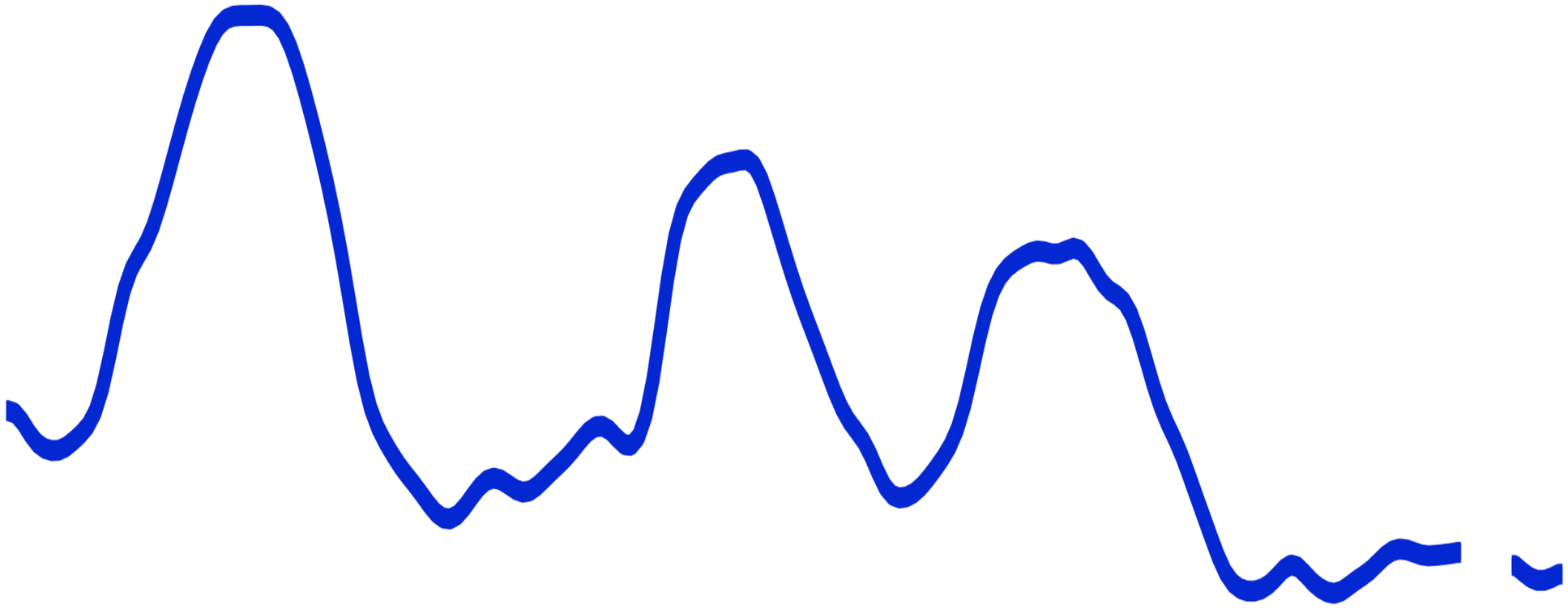




PROSODIC CHUNKS IN SEOUL KOREAN

na - nɨn	**jəŋa -rɨl**	**miwəh-e jo**
1sg -TOP	Younga-ACC	hate -DEC HON

‘I hate Younga.’

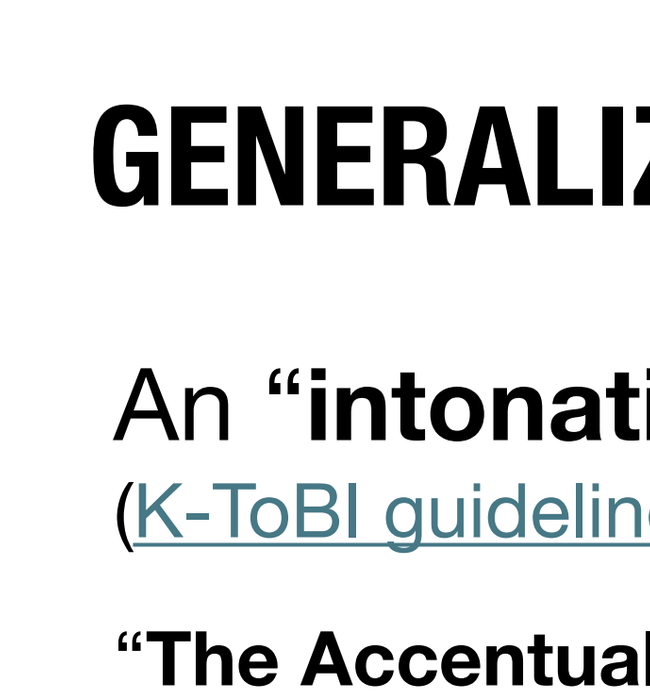


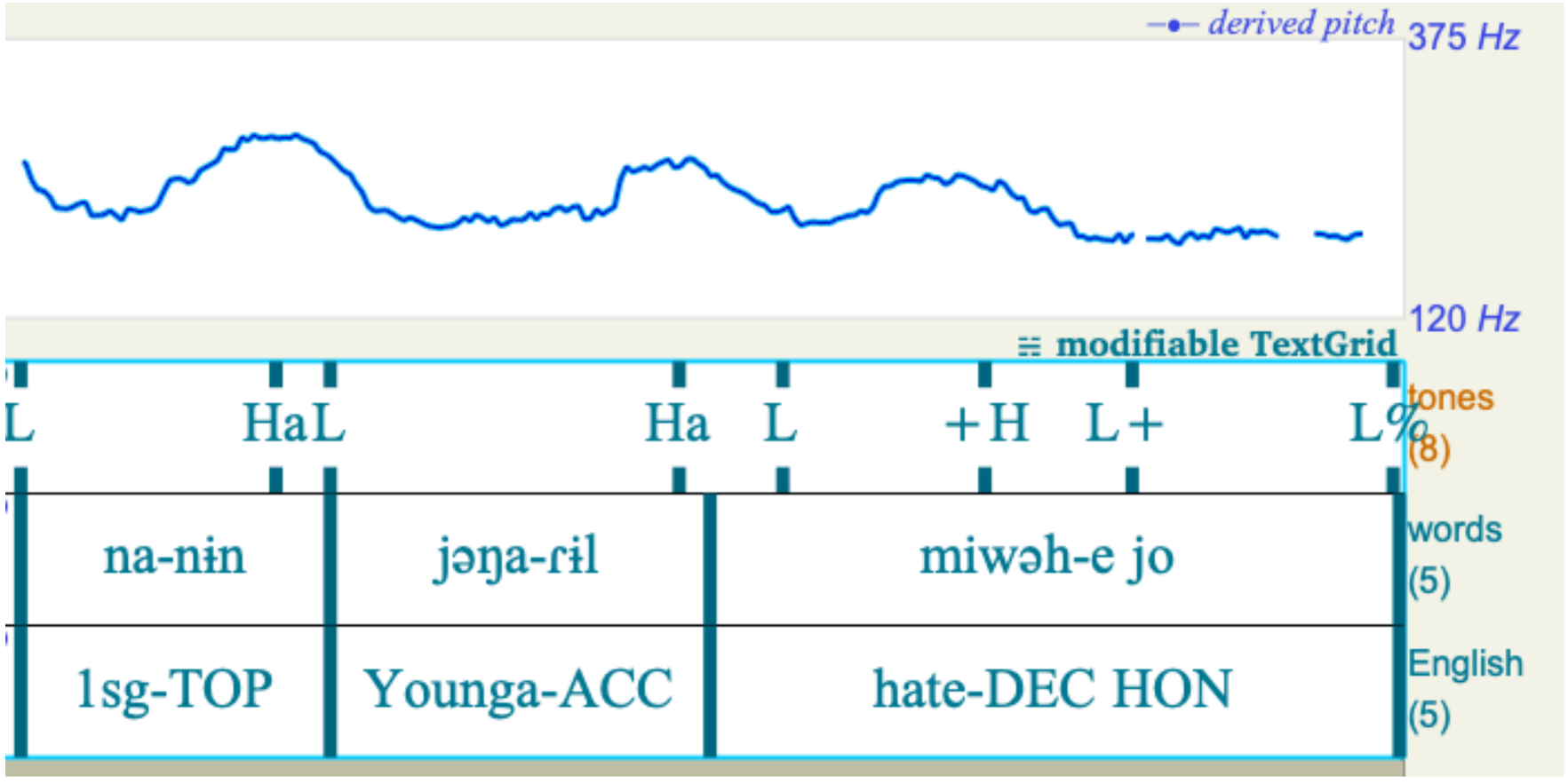
Jun (1993, 2000, et seq.)
https://sunahjun.humspace.ucla.edu/ktobi/K-tobi.html

GENERALIZATION: TONES DELIMIT CHUNK

An “**intonationally defined** prosodic unit”
(K-ToBI guidelines, Jun 2000)

“The Accentual Phrase has a tonal pattern demarcating the beginning and the end of the phrase” (Jun 1993)





THE OBLIGATORY BOUNDARY TONE HYPOTHESIS

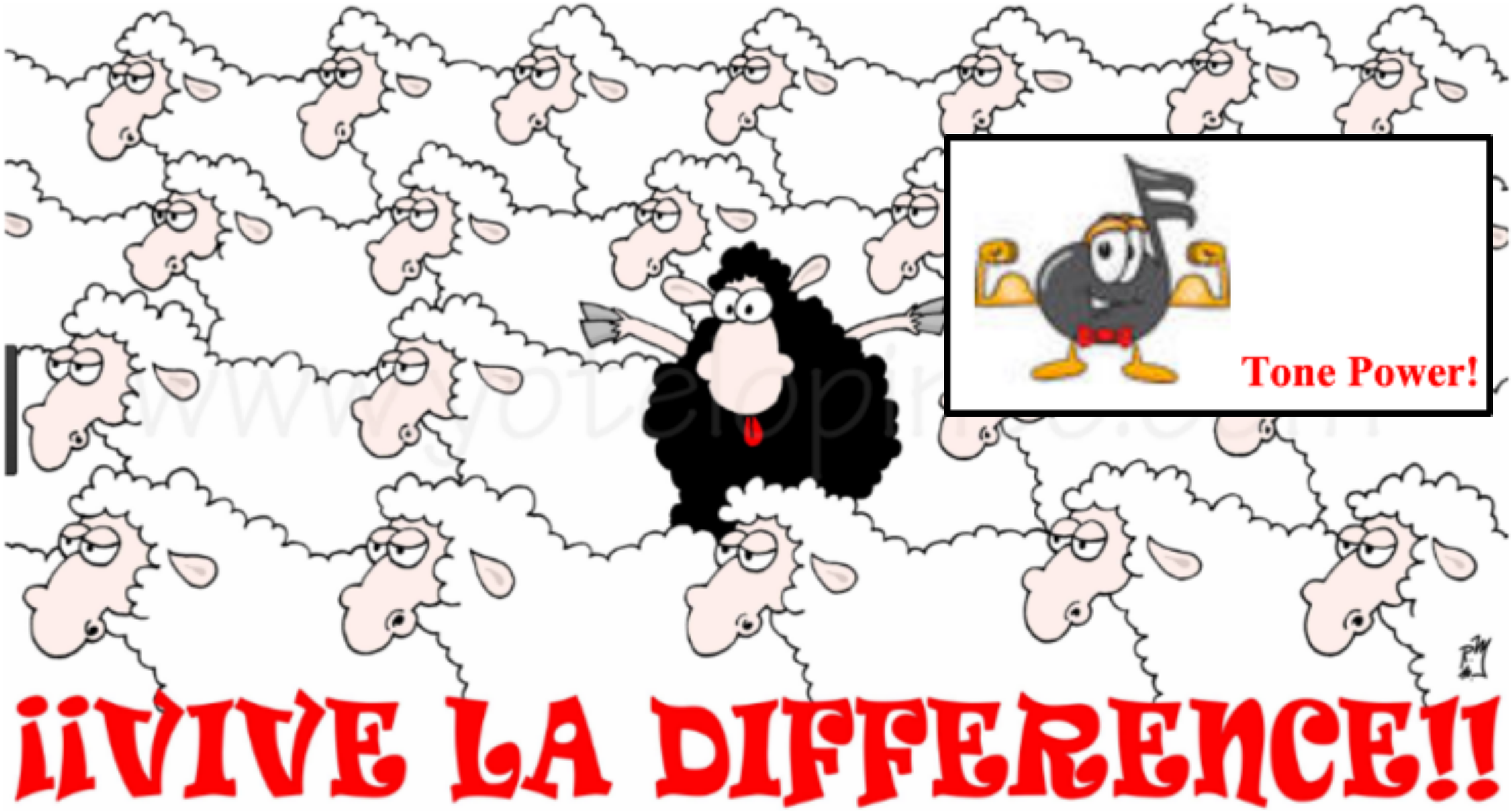
A span of segmental material is a phonological constituent if and only if it is delimited by at least one boundary tone.

Tacit assumption in *practice* of Autosegmental-Metrical (AM) prosodic analyses?

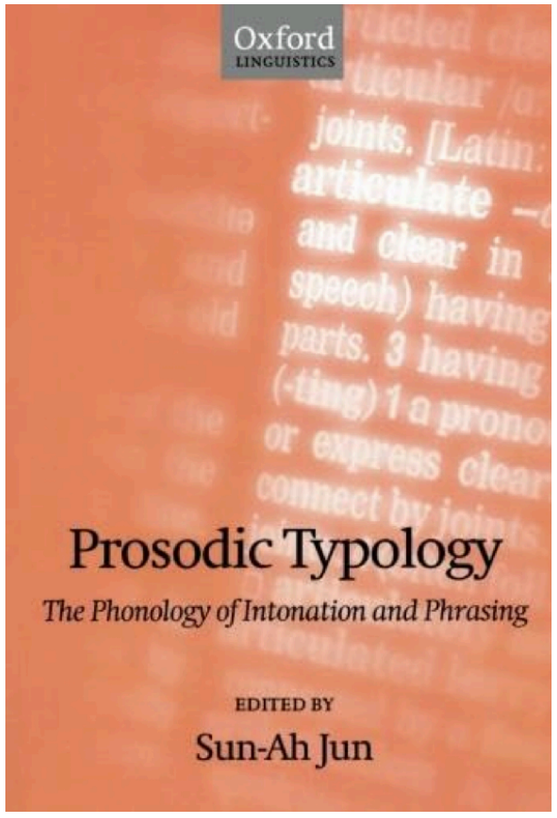
(Yu Speech Prosody 2024 talk, paper)

IS (A BOUNDARY) TONE "DIFFERENT"?

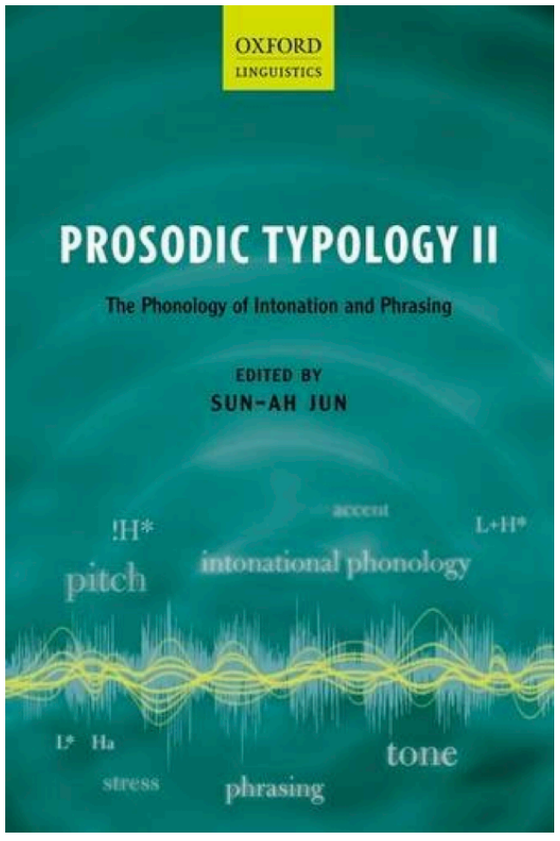
Hyman (2018), Linguistic Society of America presidential address slides



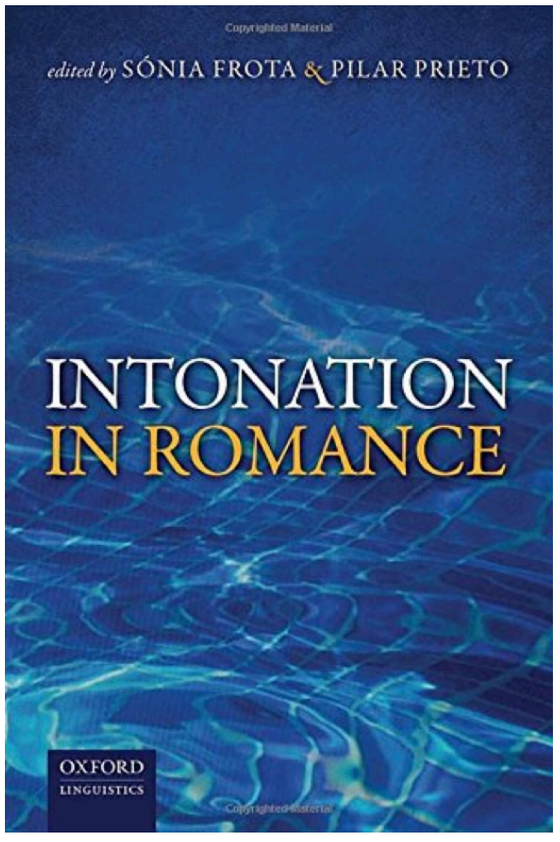
GROWTH OF INTONATIONAL APPROACH: INTONATIONAL PROSODIC HIERARCHY



Jun (2005)



Jun (2014)



Frota & Prieto (2015)

WHITHER CLUSTERING?

Nordic Prosody II, ed. Thorstein Fretheim.
Trondheim: TAPIR, 111–140. 1981

ON PROSODIC STRUCTURE AND ITS RELATION TO SYNTACTIC STRUCTUI

Elisabeth O. Selkirk

Selkirk (1978/1981, p. 136)

> There is thus a whole complex of phonological phenomena which take the intonational phrase as their domain. The intonational phrase is not merely that sequence over which an intonational contour is distributed it is a rhythmic entity as well, and one which has a special status with respect to other segmental and suprasegmental rules. This means of course that where one finds variable phrasing, one expects to encounter the entire host of related phenomena working in tandem: if the corresponding to the subject noun phrase is an I, it will have an intonational melody associated with it, have prepausal lengthening at the end, and so on. By postulating the I as a structural unit, as a category of prosodic structure which defines a particular type of domain, one expects this sort of correspondence of seemingly disparate phenomena. The convergence is, in this sense, explained. It should go without

Nordic Prosody II, ed. Thorstein Fretheim.
Trondheim: TAPIR, 111–140. 1981

- 111 -

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…where one finds variable phrasing, one expects to encounter the entire host of related phenomena working in tandem…

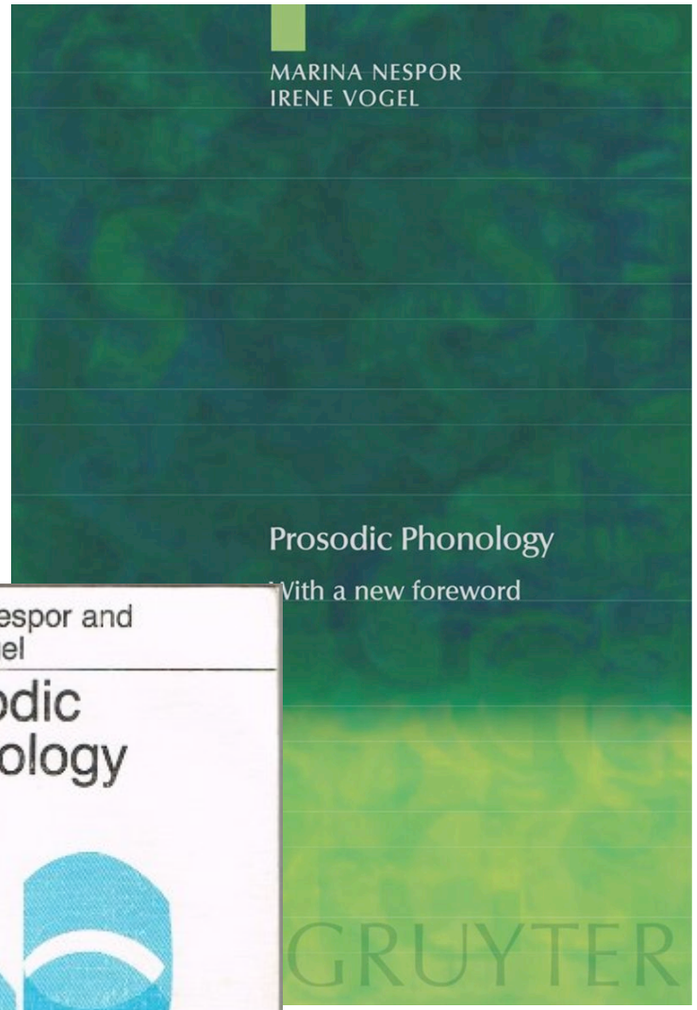
PHONOLOGICAL PATTERNS CLUSTER ABOUT DOMAINS?

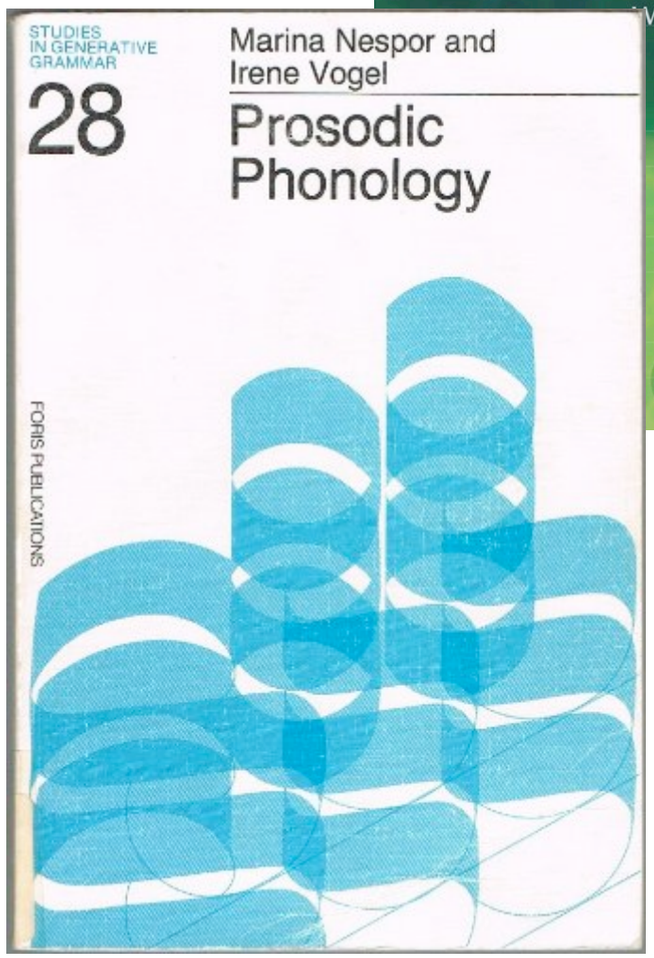
Selkirk (1978/1981, p. 136)

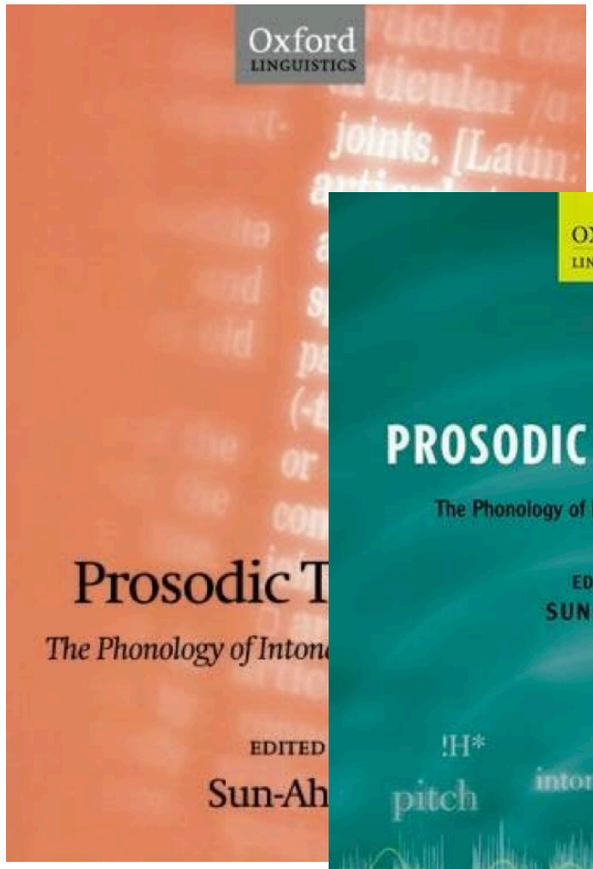
> ***By postulating the [intonational phrase] as a structural unit, as a category of prosodic structure which defines a particular type of domain, one expects this sort of correspondence of seemingly disparate phenomena. The convergence is in this sense, explained.***

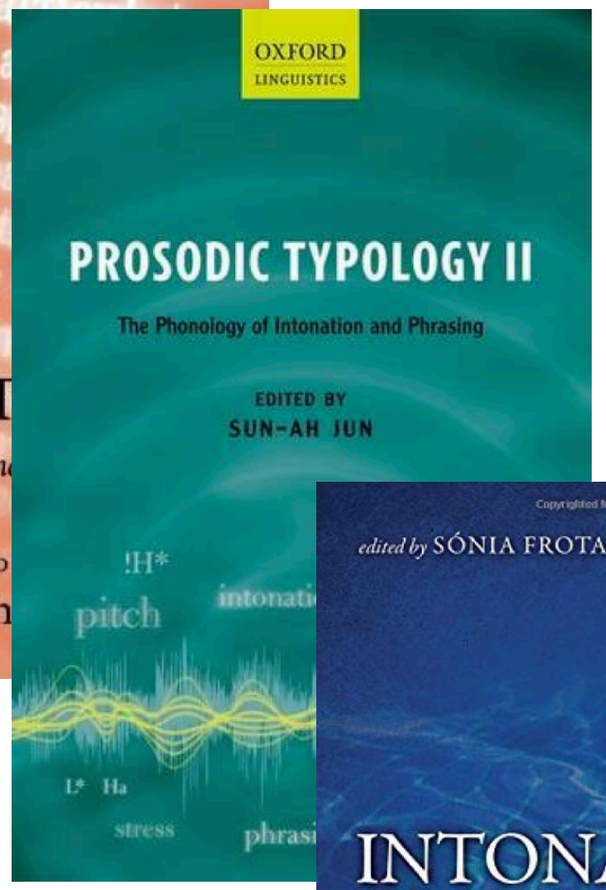
See also Hayes (1988, 1990), Pierrehumbert & Beckman (1988), Inkelas (1989), Raffelsiefen (2005), Bickel et al. (2009), Schiering et al. (2010) i.a.

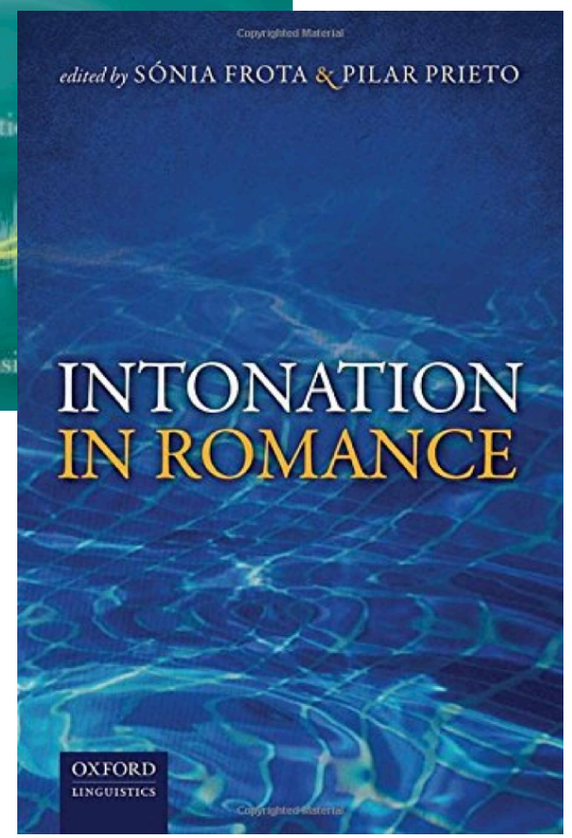
WHITHER CLUSTERING?











THE OBLIGATORY BOUNDARY TONE HYPOTHESIS

If prosodic constituents *defined* on basis of tones:

- Tonal insertion at prosodic boundaries vacuously obligatory (in contrast to segmental sandhi and other patterns)

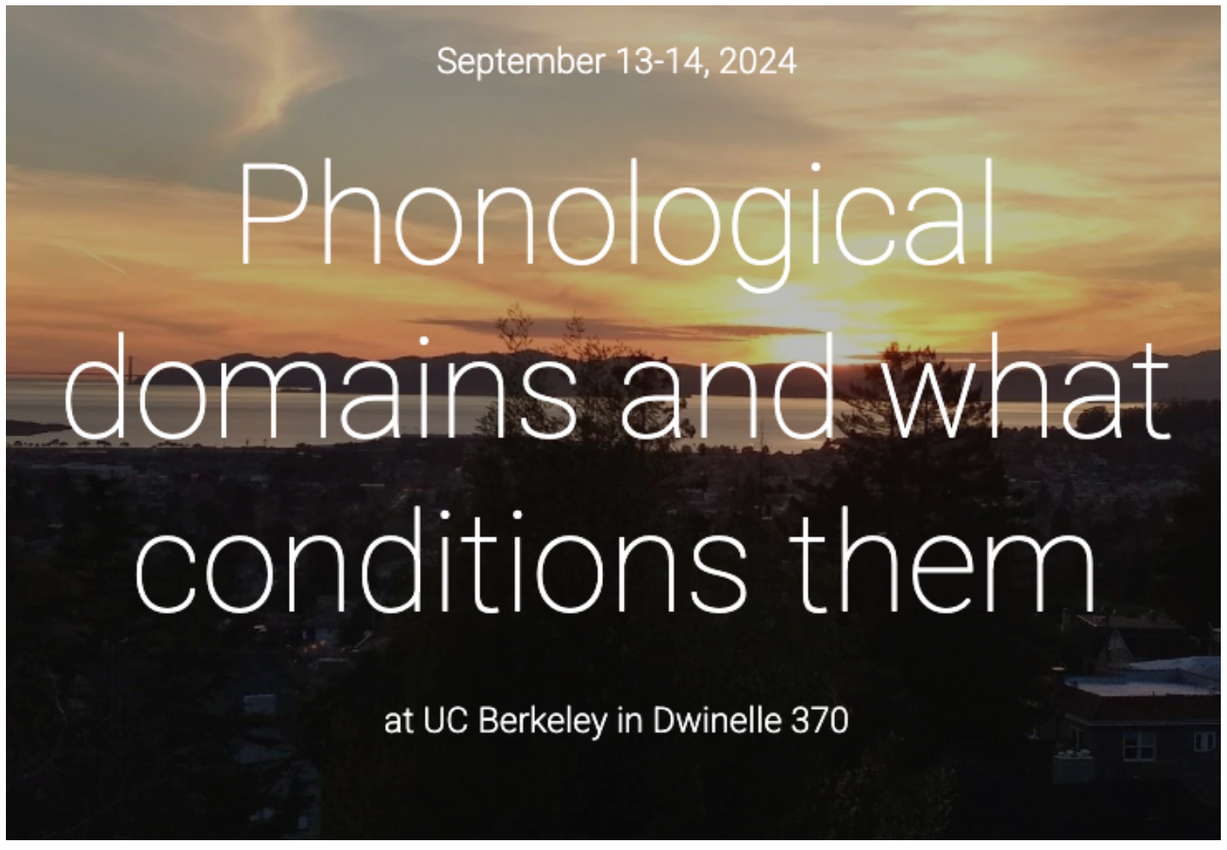
- Less attention to documenting segmental sandhi processes?

NEGLECT OF SEGMENTAL ALLOPHONY?

In those three intonational/prosodic typology volumes:

- About 36 contributions covering over 30 different languages (+multiple varieties thereof)
- Segmental sandhi diagnostics briefly mentioned for smallest break index juncture (within word) for Mainstream American English, Serbo-Croatian
- Some detailed discussion of segmental sandhi for Chickasaw, Greek, Korean, Portuguese, Catalan

SEGMENTAL (AND OTHER TONAL) PHENOMENA ALIVE AND WELL!



- Vowel harmony
- Domain of nasalization
- Tone spreading
- Domain of replacive tone patterns
- Intervocalic voicing, voiced stop lenition
- Glottalization, glottal stop insertion, glottal deletion
- Penult vowel lengthening
- Domain of stress and accent assignment
- Presence of “phrase level” tone

https://sites.google.com/berkeley.edu/phondom/schedule

RELIABILITY OF SEGMENTAL SANDHI?

Hypothesis: ***Segmental allophony hasn't been neglected: tone is a reliable chunk indicator, while segmental sandhi/allophony is not.***

LACK OF RELIABILITY OF GREEK SANDHI

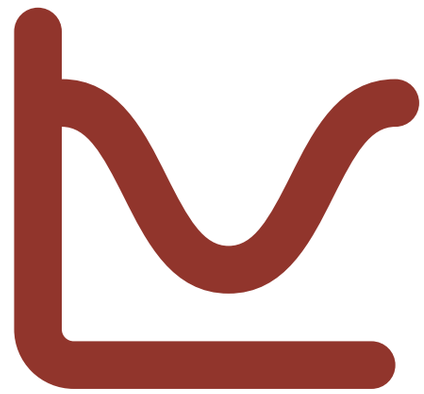
(Arvaniti & Baltazani 2005)

> The examination of our own corpus allows us to make the following observations regarding sandhi. First, several types of sandhi **apply across larger constituents than has previously been suggested**…Second, the application of some rules presented in Kaisse (1985) and Nespor and Vogel (1986) **depends on the lexical items used**… Third, sandhi **does not appear to be obligatory** at any level, as Nespor and Vogel suggest about certain rules; the speaker may choose to apply a particular rule, or she may not. Finally, it appears that at least some of the rules involve **gradient, rather than categorical, changes**.

“PHONETIC” SEGMENTAL SANDHI?

Hypothesis: ***Prosodically-conditioned tonal pattern processes can output tone categories, while segmental sandhi processes directly output phonetic trajectories.***

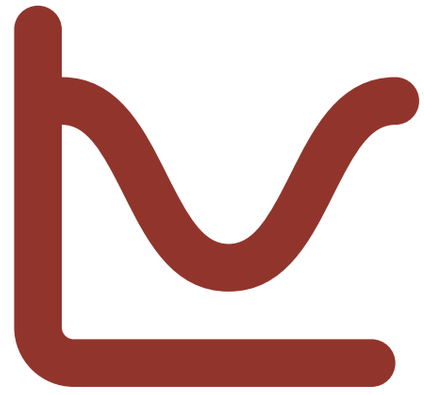
MAPPING STRAIGHT TO TRAJECTORIES



“**Careful examination of specific cases of allophonic variation generally supports** (and never seems to refute) a mode of description of the second type, in which **structured phonological representations are mapped onto classes of phonetic trajectories.**”

Liberman (2018)

MAPPING STRAIGHT TO TRAJECTORIES



We should therefore consider the **null hypothesis**: a theory that entirely eliminates the symbolic treatment of allophonic variation and makes **postlexical representations subject to direct phonetic interpretation, without any intervening symbol manipulation**, whether by rules or by constraints.

Liberman (2018)

PREREQUISITES FOR TESTING HYPOTHESES

- **Identification** of potentially prosodically-conditioned phonological/phonetic patterns
- *Reliability*: Need **independent gold standard for precise domain to be identified**
  - Multiple patterns conditioned on *same* domain
  - Domain identified by morphosyntax
- *Reliability*: Need documentation of **frequency and/or degree of occurrence** across instances, speakers, lexical items, speech style/speech rate, etc.
- *Phonetic trajectories (and gradience)*: **need recordings and acoustic analysis**

TOWARDS TESTING HYPOTHESES

1 **Cross-linguistic database of prosodically-conditioned processes**

2 **Manila Tagalog case study: glottalization**

3 **Seoul Korean case study: lenition/ voicing of Lenis stops**

CROSS-LINGUISTIC DATABASE OF PROSODICALLY-CONDITIONED PATTERNS

Charlotte Kaiser

DATABASES OF SANDHI RULES?

1. ***P-base:*** Mielke (2008); Brohan & Mielke (2014)
Database of 4560 phonological patterns in 537 languages, but scant detail on prosodic domains, e.g., #

2. ***AUTOTYP:*** Bickel, Hildebrandt & Schiering (2009)
70 typologically diverse languages, 382 sub-phrasal patterns fully general across lexicon (across 63 languages), focused on word-level

DATABASE IN PROGRESS…

- Foundational works documenting segmental sandhi rules: Selkirk (1980), Nespor and Vogel (1986), Vogel (1995)…
- Works documenting lenition processes (e.g., Gurevich 2011)
- Intonational literature (e.g., Jun 2005, Jun 2014, Frota and Prieto 2015)
- Syntax-prosody literature (e.g., special *Phonology* issue edited by Selkirk and Lee, 2015)
- Incorporating AUTOTYP information
- Language-specific prosodic overviews (e.g., Myrberg and Riad 2015 on Swedish)
- …
- **…your work!**

INITIAL OBSERVATIONS FROM DATABASE

- **Details about particular kind of prosodic domain not always clear**, e.g., process described as taking place in final or medial position but final/medial in what?
- **Whither clustering?**
  - Most work focuses on just boundary tones, or just segmental sandhi processes
  - Most work focuses on one particular phonological pattern for diagnosing a particular prosodic domain in a particular language rather than a cluster of patterns
- **Not much discussion of optionality/gradience** of patterns, although sometimes mentioned
- Support for proposed prosodically conditioned pattern generally comes from some listed examples/sample pitch tracks; **very rare to have instrumental studies**

PROSODICALLY-CONDITIONED GLOTTALIZATION IN TAGALOG

/V?/ → V: / ____ ...]Phrase

Alessa Farinella

GLOTTAL STOP DELETION IN TAGALOG

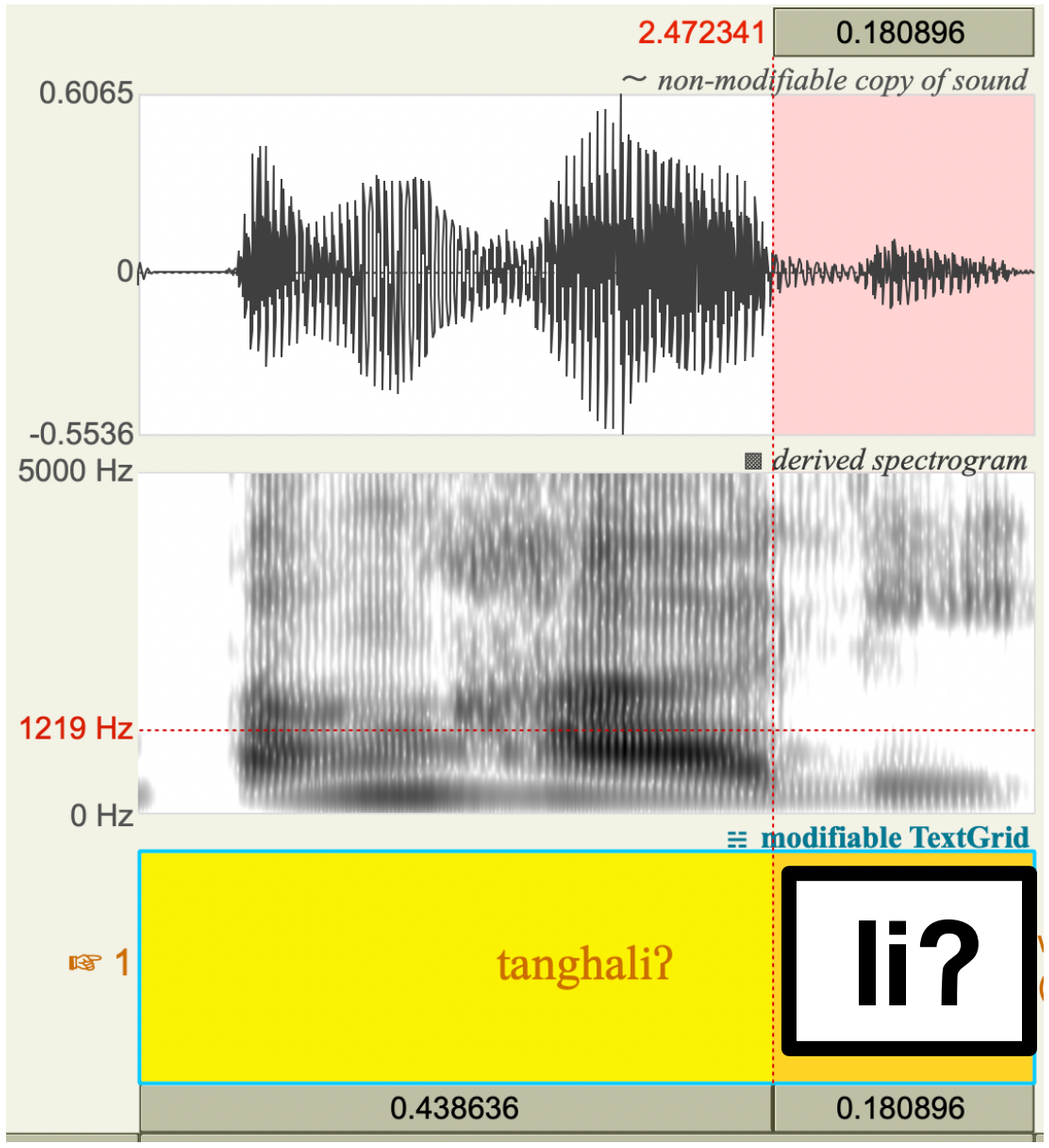
- **"The distinctive glottal stop is usually lost before a following word in the phrase"** (Bloomfield 1972, p. 136)

- **"When such words occur in the middle of a phrase, the glottal stop does not occur, but there is compensatory lengthening of the word-final syllable.** (Schachter & Otanes 1972, p. 16)

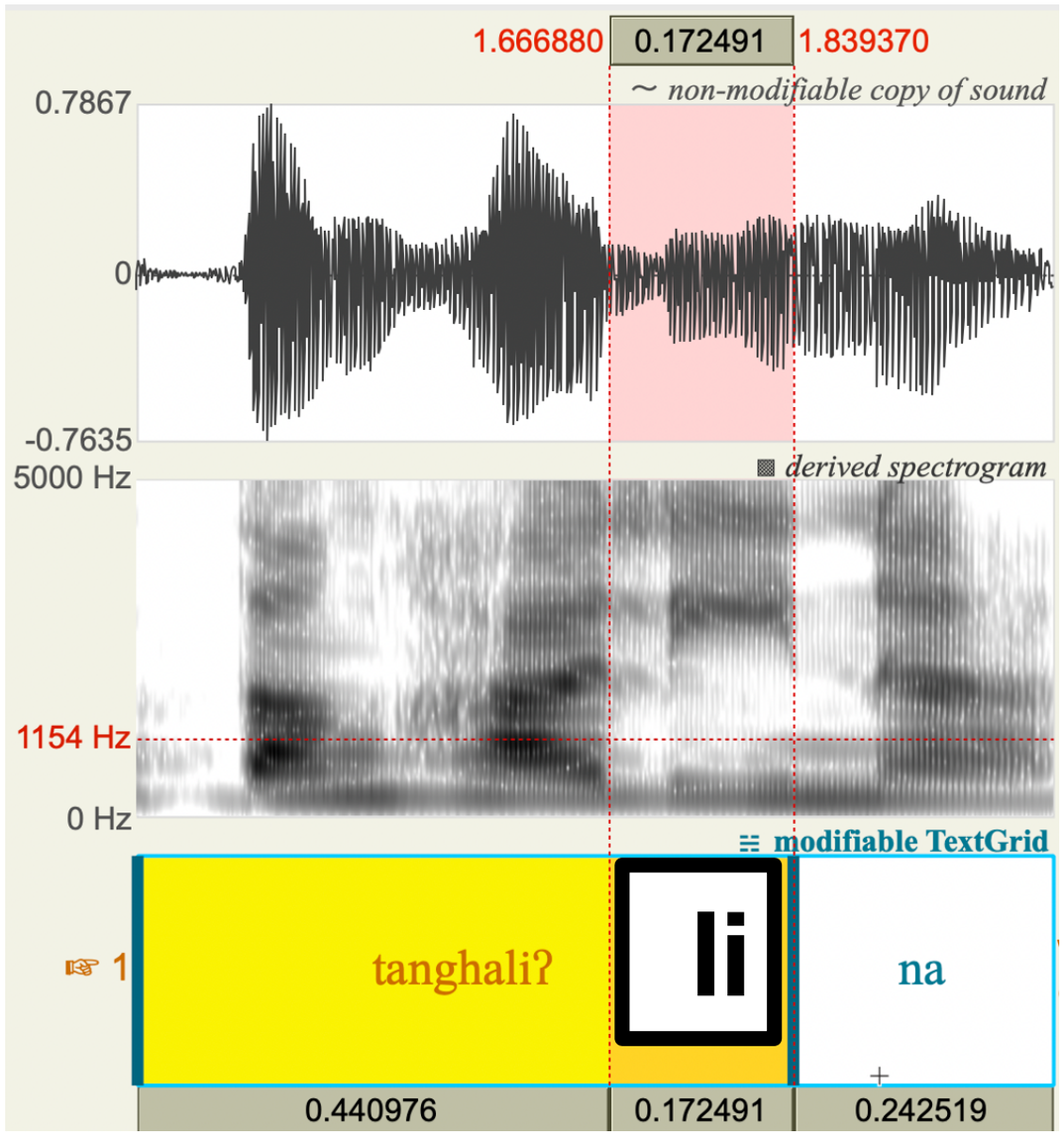
- **"When the glottal stop is final in the prosodic phrase… deletion is optional**. The **conservative** dialects preserve the glottal stop in this position while the **non-conservative** dialects tend to delete it." (Kaufman 2007, p. 42)

EXAMPLE OF V? VS. V: FOR /taŋhali?/

Utterance-final li?



Utterance-medial li:



https://www.tagalog.com/dictionary/example_sentence.php?dictionary_example_id=1613

https://www.tagalog.com/dictionary/example_sentence.php?dictionary_example_id=10058

SAMPLE EXPERIMENTAL STIMULI: CAREFULLY PLACED GLOTTAL STOPS

- ʔ at end of verb: Niilut**o<u>ʔ</u>** ng nanay ang pancit
- ʔ at end of subject: Kinagat ng pus**a<u>ʔ</u>** si Juan
- ʔ at end of object: Hinuli ng kuting ang tut**a<u>ʔ</u>**, pero hindi ko alam kung bakit

Reliability*: Prosodically-conditioned process only has a chance of even applying *<u>if the target and context of rule are present (cf. boundary tones, pre-boundary lengthening,…)</u>

SAMPLES OF GLOTTAL STOPS IN MANILA TAGALOG

Expected: medial vs. final position (followed by pause)

hito:	hito?

tuta:	pusa?

guro?	guro?

***Reliability/Trajectory*: How easy is it to decide whether V: or V? by listening alone?**

PROSODICALLY-CONDITIONED LENITION IN SEOUL KOREAN SPONTANEOUS SPEECH

Seung Suk (Josh) Lee

TWO CHUNKINGS IN SEOUL KOREAN

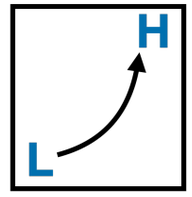
/koŋ.sa.ka.ta.maŋ.ha.ta/

‘(Someone) is very busy with various public and private matters’

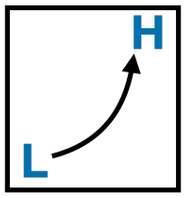
‘(Things) are messed up while going to a construction site’

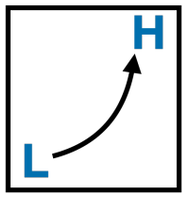
Clipart from
www.irasutoya.com/

PROS. BOUNDARY TONES (SEOUL KOREAN)



L H L
koŋ.sa.ka ta.maŋ.ha.ta





L H L H L
koŋ.sa ka.ta maŋ.ha.ta

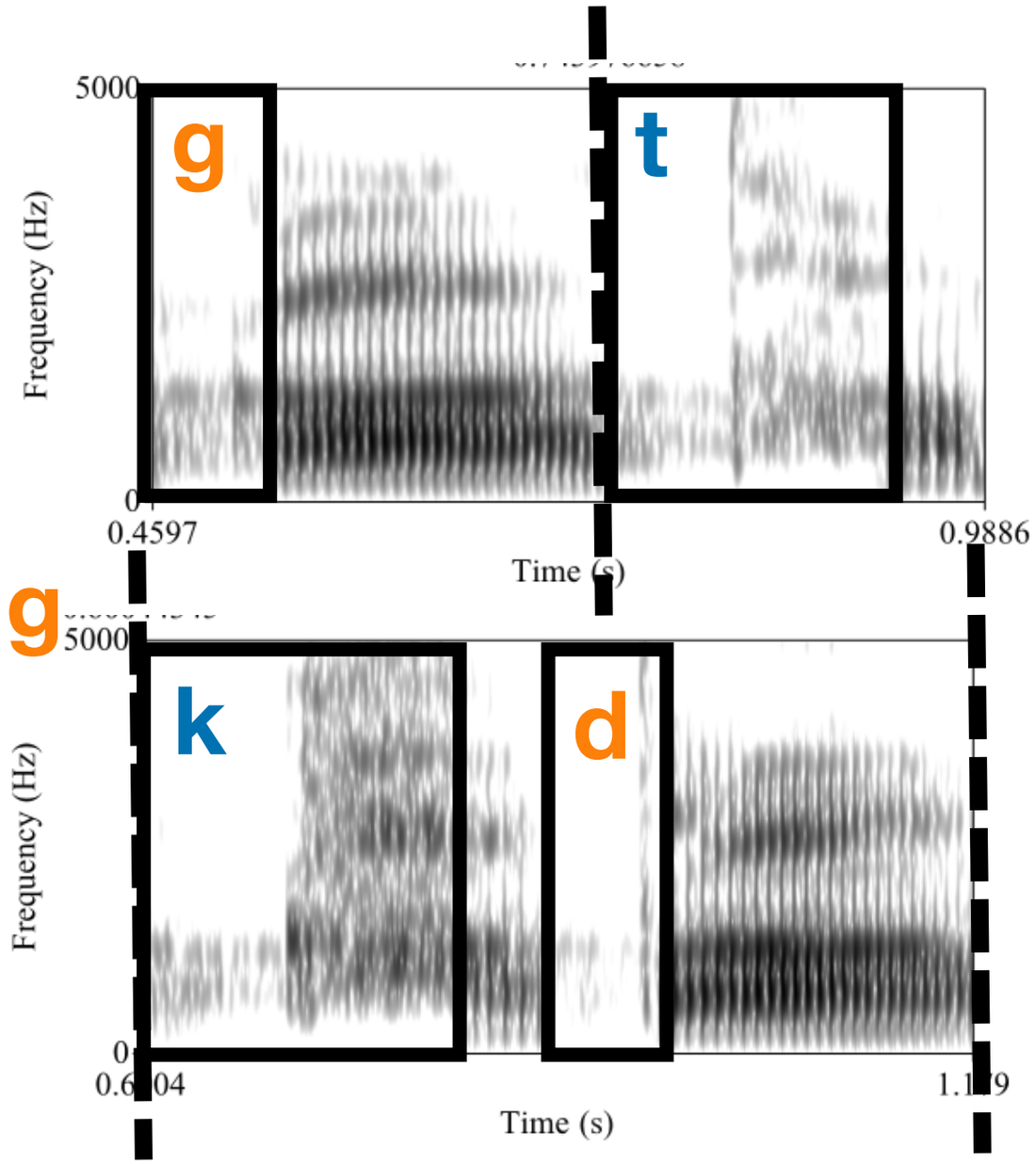
LENIS STOP VOICING (SEOUL KOREAN)

L H L
koŋ.sa.ga ta.maŋ.ha.ta

L H L H L
koŋ.sa ka.da maŋ.ha.ta

See Jun (1993, p. 77) and refs therein

LENIS STOP VOICING (SEOUL KOREAN)



OPPORTUNITIES TO SIGNAL PRESENCE/ ABSENCE OF PROSODIC BOUNDARIES

- Out of 231,625 total prosodic words in Seoul Korean **spontaneous** speech corpus, 39.1% start with Lenis
- Phonetic trajectory difference expected for *some* kind of segment almost 100% of the time

Segment	Percent	AP Initial: expected	AP Medial: expected
lenis	39%	Voiceless	Voiced/Lenited
vowel	25%	Formant space larger	Formant space smaller
fricative	13%	/h/ not deleted	Optional /h/ deletion
nasal	13%	Denasalized	Nasal
fortis	5.6%	Vowel longer	Vowel shorter
aspirated	4%	VOT longer	VOT shorter
liquid			

Domain-initial strengthening literature

LENIS STOP VOICING (SEOUL KOREAN)

[-cont, -asp, -tense] [+voice] / ($_{\varphi}$ … [+voice] ___ [+voice] …)$_{\varphi}$

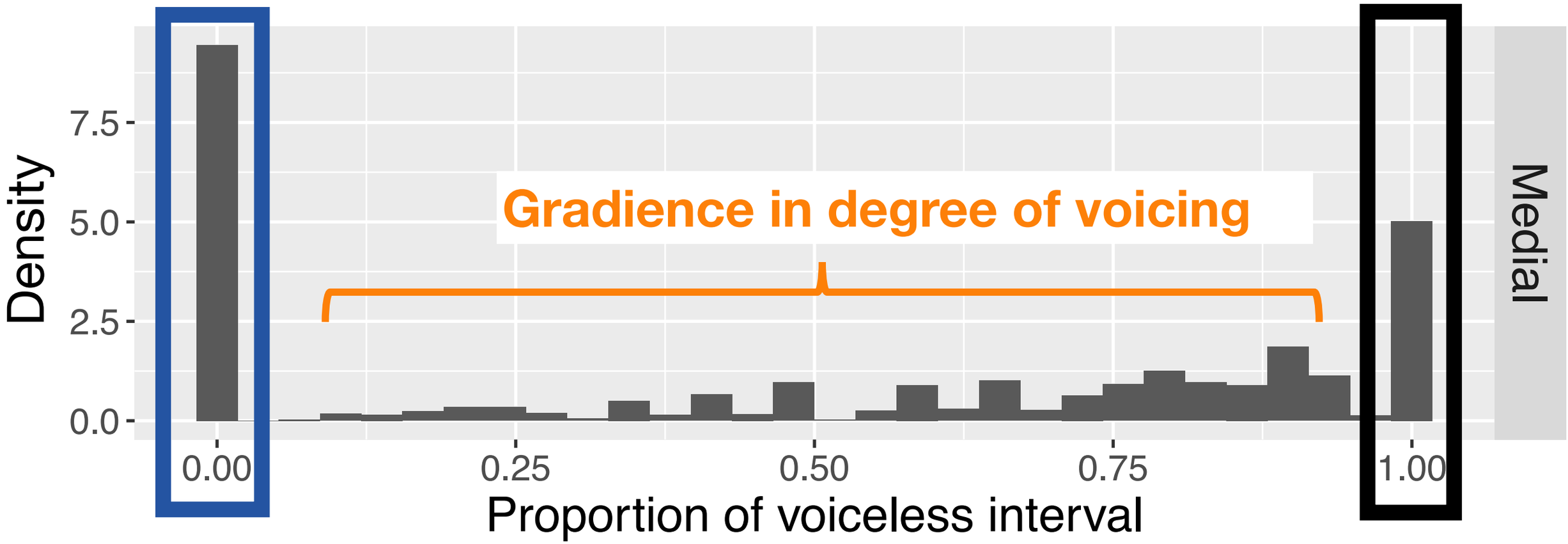
Adapted from Jun (1993, p. 78, (3)))

A Lenis stop becomes voiced intervocalically within a phonological phrase (or accentual phrase)

Described as optional and gradient in literature (see Jun 1993, 1994) => lack of "reliability"?

LENIS STOP VOICING OPTIONAL, GRADIENT

Lee (2024)



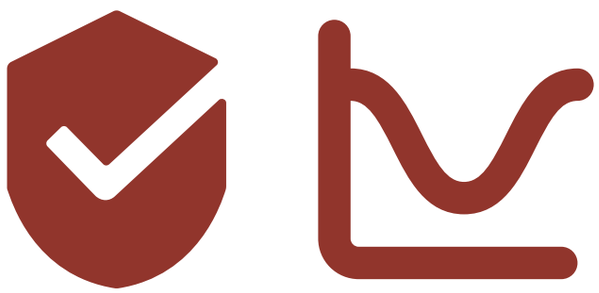
Fully voiced as expected

But also fully voiceless!

…BUT LENIS ALWAYS RELIABLY REDUCED

Lenis obstruents reliably reduced in medial position relative to initial position (shorter, bigger intensity drop)

Lee (2024)



- 70% of chunk-medial voiceless tokens follow partially or fully devoiced vowel (cf. “continuity lenition”, Katz 2016)
- **Remaining (“exceptionally”) voiceless ones still more reduced relative to chunk-initial position**
- We wouldn’t have come to this conclusion if the other correlates (duration & degree of reduction) hadn’t been acoustically investigated!

CONCLUSION

1 ***Are (boundary) tones different from other prosodically-conditioned patterns?***

Potential differences: reliability, "categorical" vs. mapping to phonetic trajectories.

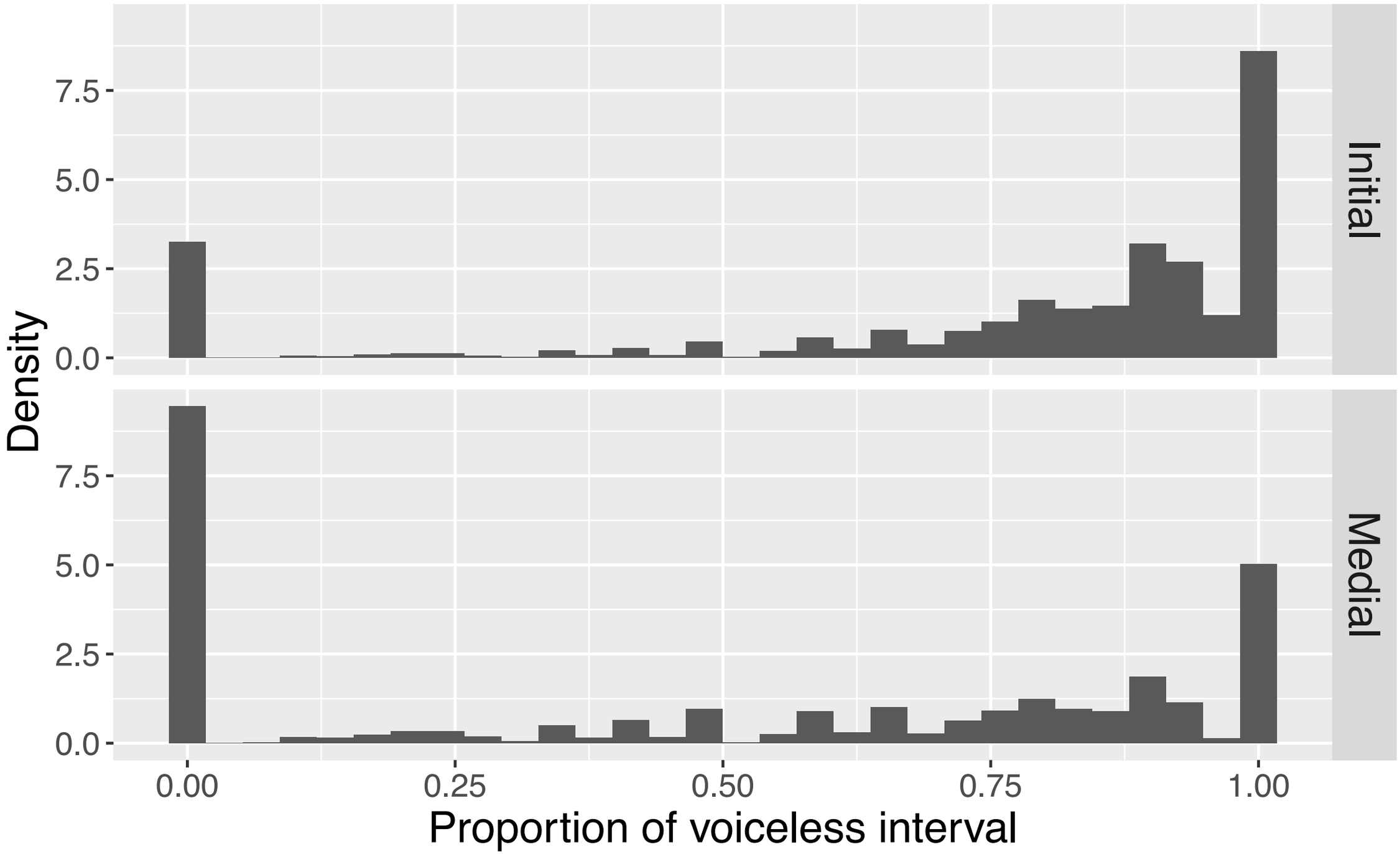
2 ***Are (boundary) tones different from other prosodically-conditioned patterns?***

Maybe…but we need more documentation and analysis to really assess this…we'd love to have your help (insights, documentation, recordings,…)!

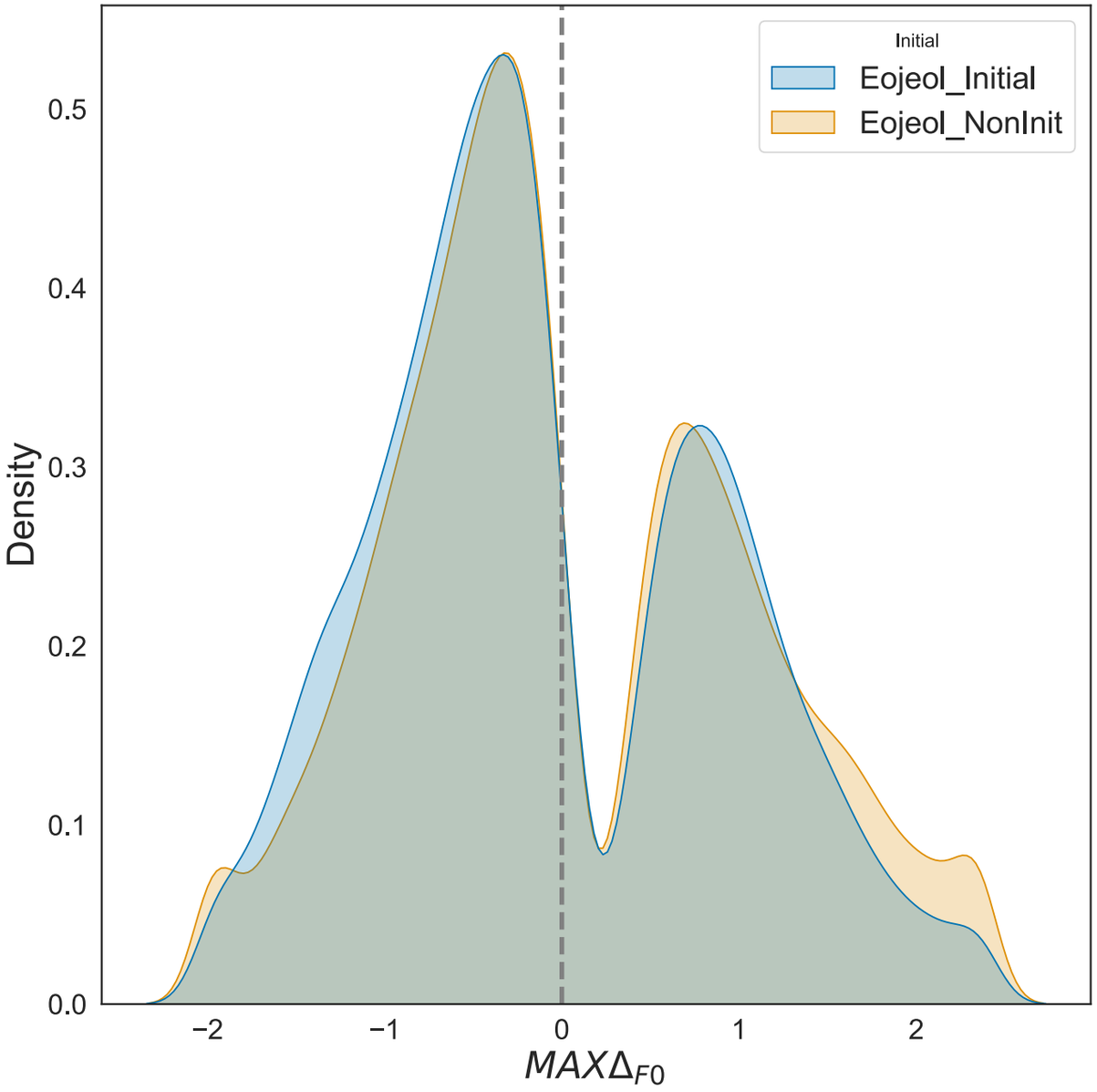
¡¡VIVE LA DIFFERENCE!!

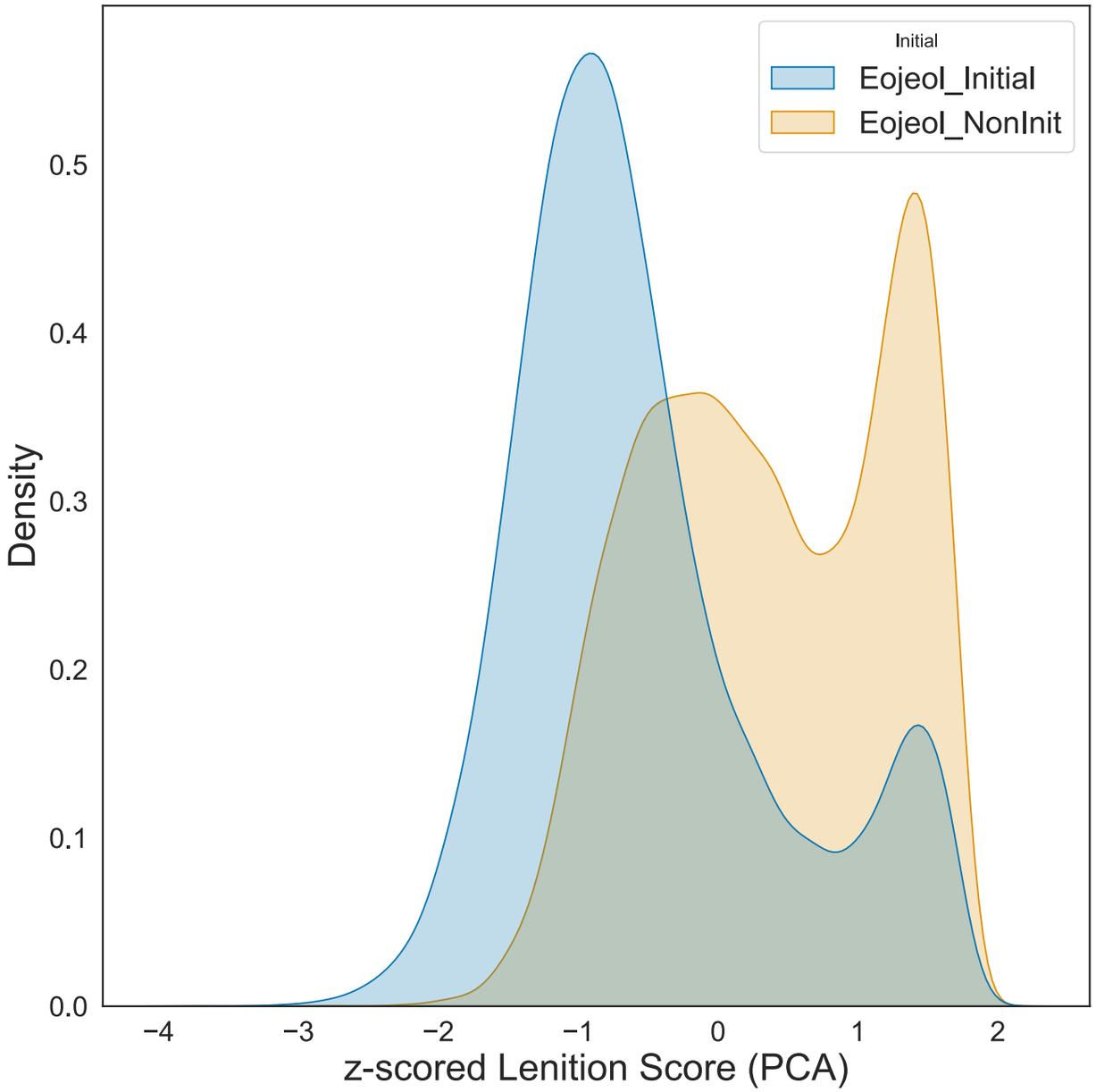
APPENDIX

LENIS STOP VOICING OPTIONAL, GRADIENT



F0 VS. SEGMENTAL LENITION CUES

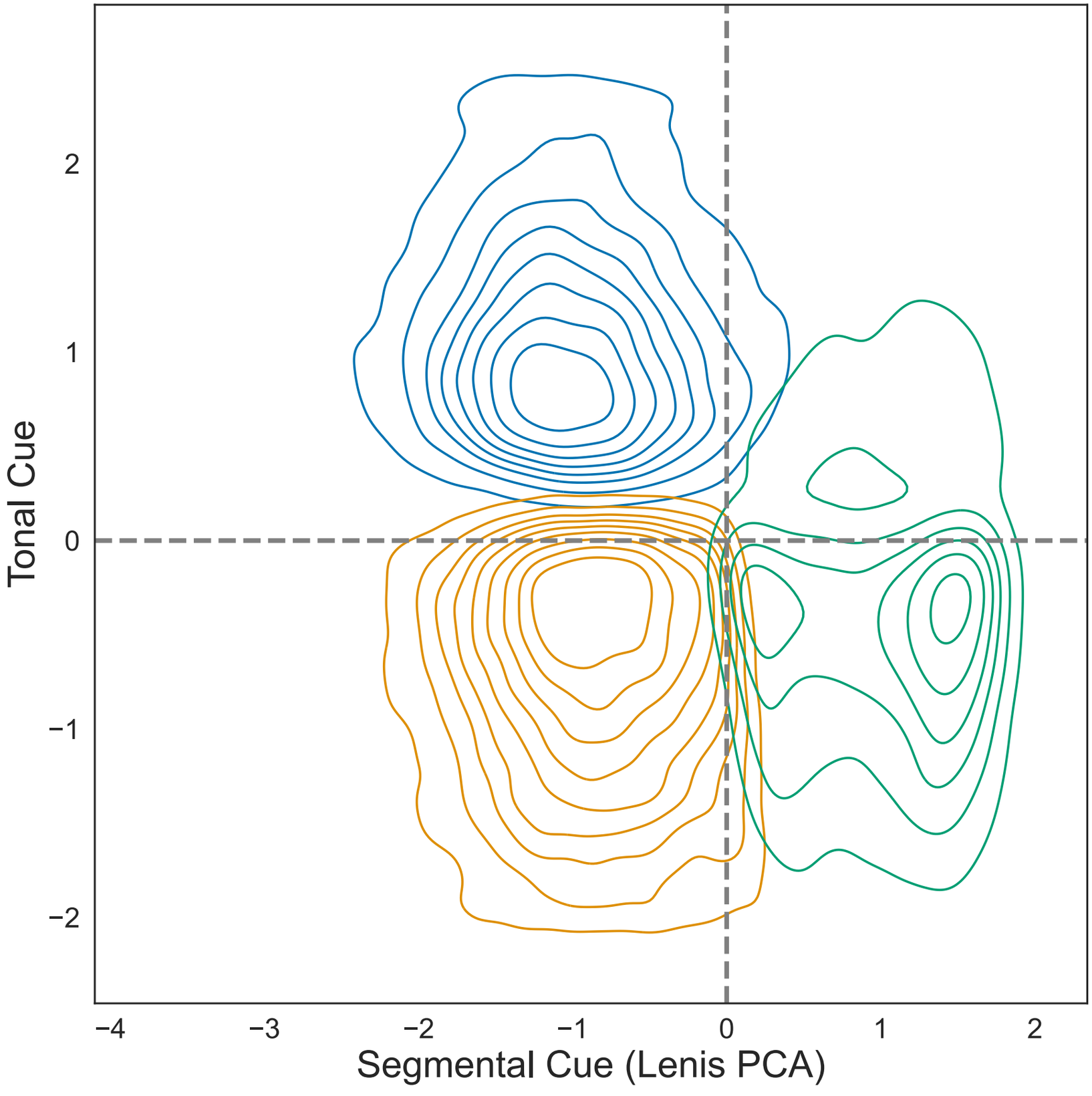




F0 change: overlapping!

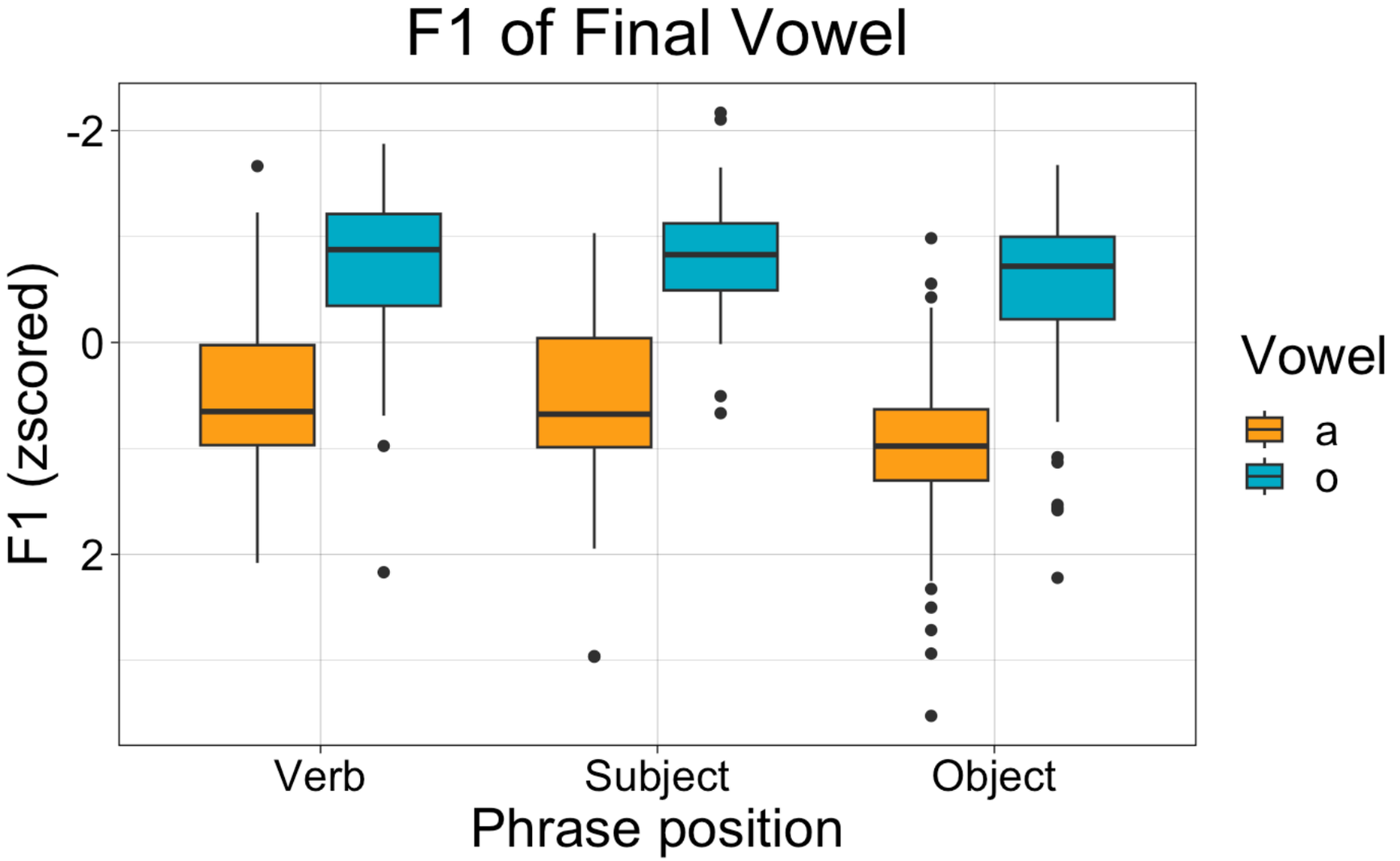
Lenition: separation

2D F0 AND SEGMENTAL LENITION CUES



VOWEL LOWERING IN MANILA TAGALOG

- No difference in F1 between vowels in verbs, subjects, and objects
- In fact, more lowering for [a]!

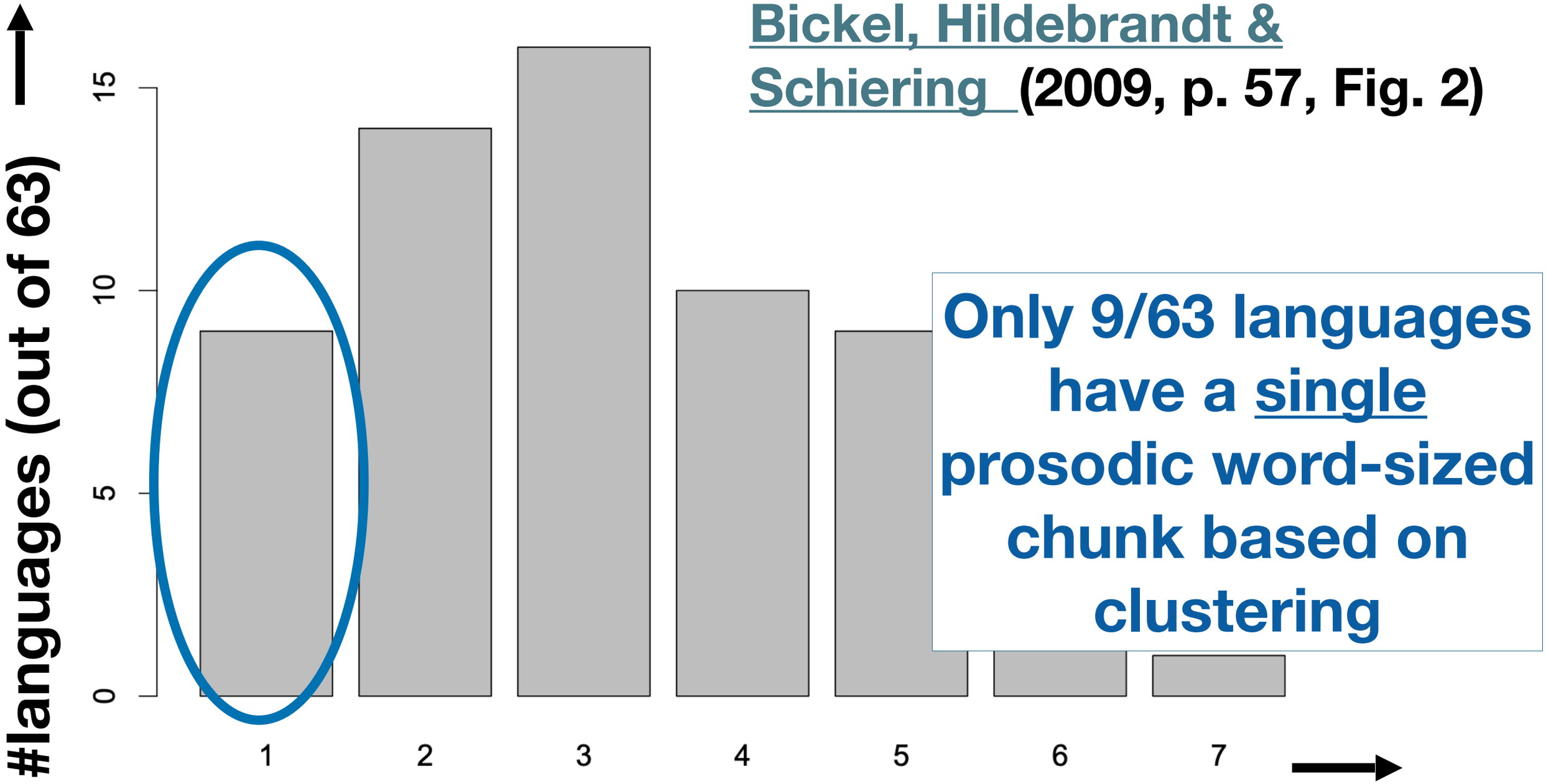


GROWTH OF INTONATIONAL APPROACH: INTONATIONAL PROSODIC HIERARCHY

- "**Intonational approach**" (discussion in Jun 1998, Frota 2000): intonation gets privileged status in defining prosodic constituents, i.e. "**tone-first**"
  - *Pierrehumbert (1980), Beckman (1986), Beckman & Pierrehumbert (1986), Pierrehumbert & Beckman (1988)…*

- Sometimes organization of tonal chunks proposed to be separate from other chunks (e.g., Hyman, Katamba and Walusimbi 1987, Gussenhoven 1992, Gussenhoven 1990, Gussenhoven and Rietveld 1992)

CHUNK INFERENCE ⇒ CHUNK PROLIFERATION



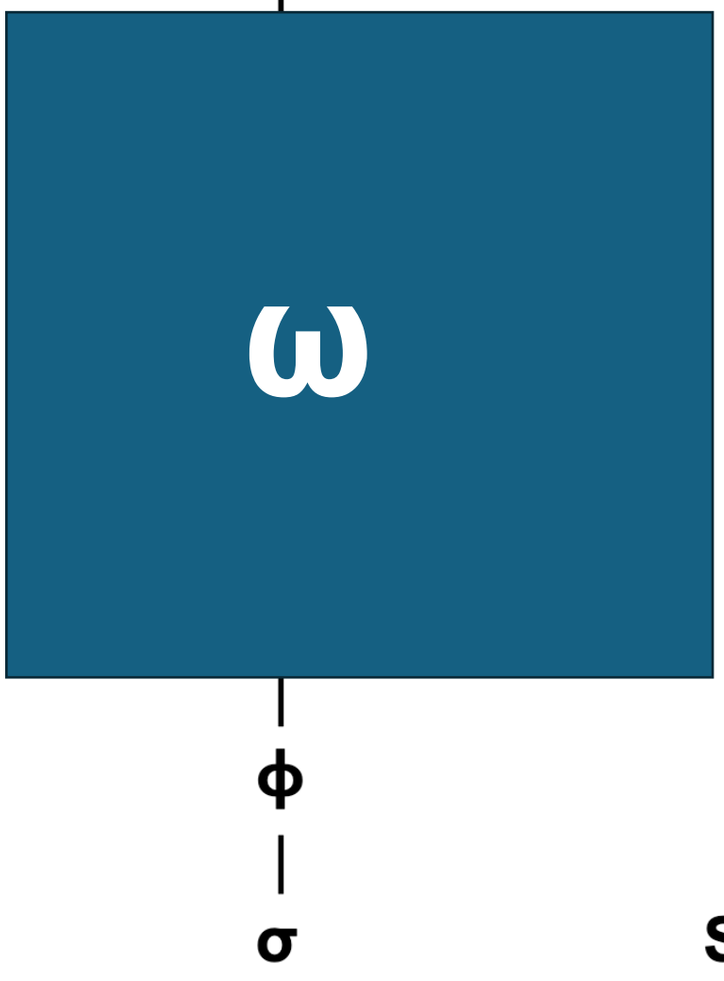
Bickel, Hildebrandt & Schiering (2009, p. 57, Fig. 2)

Only 9/63 languages have a single prosodic word-sized chunk based on clustering

CHUNK INFERENCE ⇒ CHUNK PROLIFERATION

Slide from Bickel et al. (2007)

The facts on the ground: Limbu (Kiranti, Sino-Tibetan)



Phrase: voicing assimilation, e.g. /p/ → [b]

*pe:kma*ʔ ***b****o:ŋ* 'it's time to go'

Foot: trochaic rhythm (secondary stress)

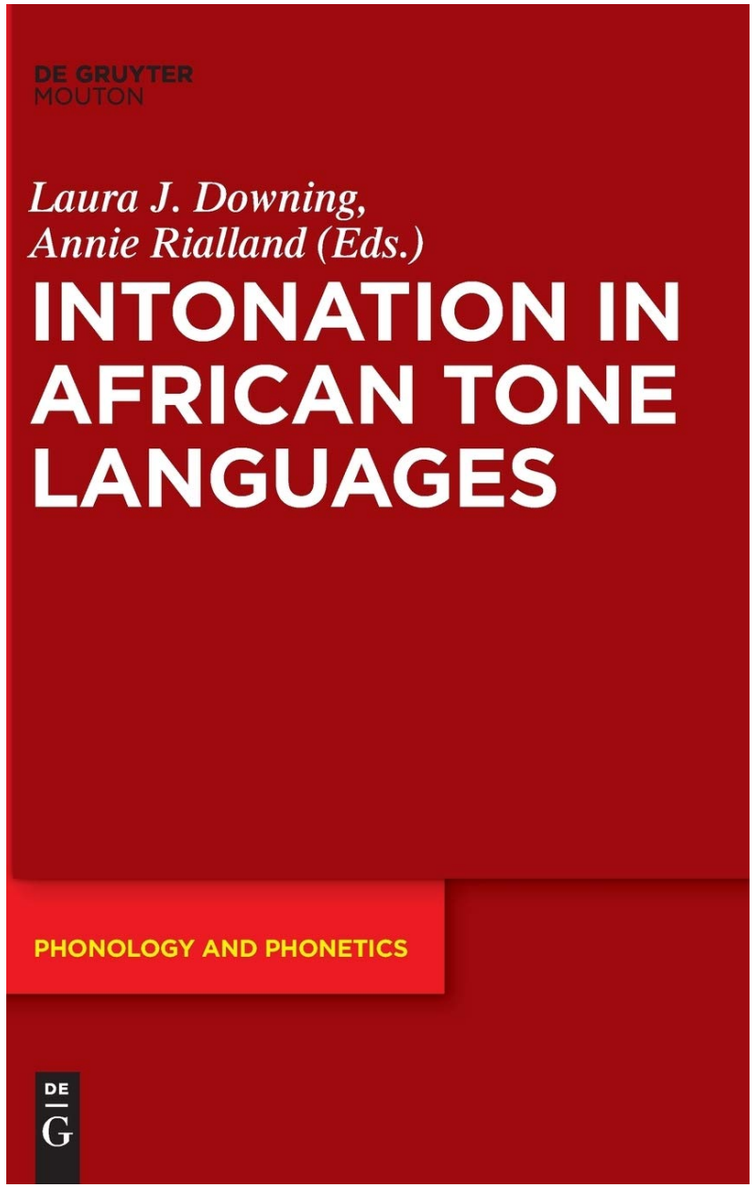
ʔ*a*ˈʔ*oŋ* ˌ*ŋe:* 'my brother in law!'

Syllable: C(G)V(C)

BOUNDARY TONES JUST ONE COMPONENT OF GRAMMAR: NOT STATIC!

(6) Languages distinguishing Phonological Phrase and Intonation Phrase

Language (Source)	Phonological Phrase domain	process	Intonation Phrase domain	process
Bàsàá (Hamlaoui and Makasso 2019)	(V O) (O)	High tone spread	{(S){V O O}}	Falling Tone Simplification
Bemba (Kula and Bickmore 2015, Kula and Hamann 2017)	(V O) (O)	High tone spread	{{S} {V O O}}	Intonation boundary tones: L% following subject; Final Lowering at the end of the sentence
Chimwiini (Kisseberth 2017)	(V O) (O)	High tone assignment, shortening	{V O O}	High tone "agreement"
Kimatuumbi (Odden 1987, 1990, 1996; Truckenbrodt 1995, 1999)	(V O) (O)	vowel shortening	{{S} {V O O}}	Phrasal Tone Insertion (PTI) on non-final Intonation Phrase
Tsonga (Kisseberth 1994, Selkirk 2011)	(V O) (O)	High tone spread	{{S} {V O O}}	Penult lengthening
Tumbuka (Downing 2017)	(V O) (O)	High tone assignment, penult lengthening	{S V O O}	Final Lowering



Downing (2021) https://osf.io/8vung/download

ELFNER (2015): VARIATION IN BOUNDARY TONES IN CONNEMARA IRISH

(23) Barplot illustrating number of tokens by speaker for the realization of phrase accents on the leftmost noun in a branching non-final subject