Word-Level Prosodic Typology

Day 2 (+): Franconian tonal accent

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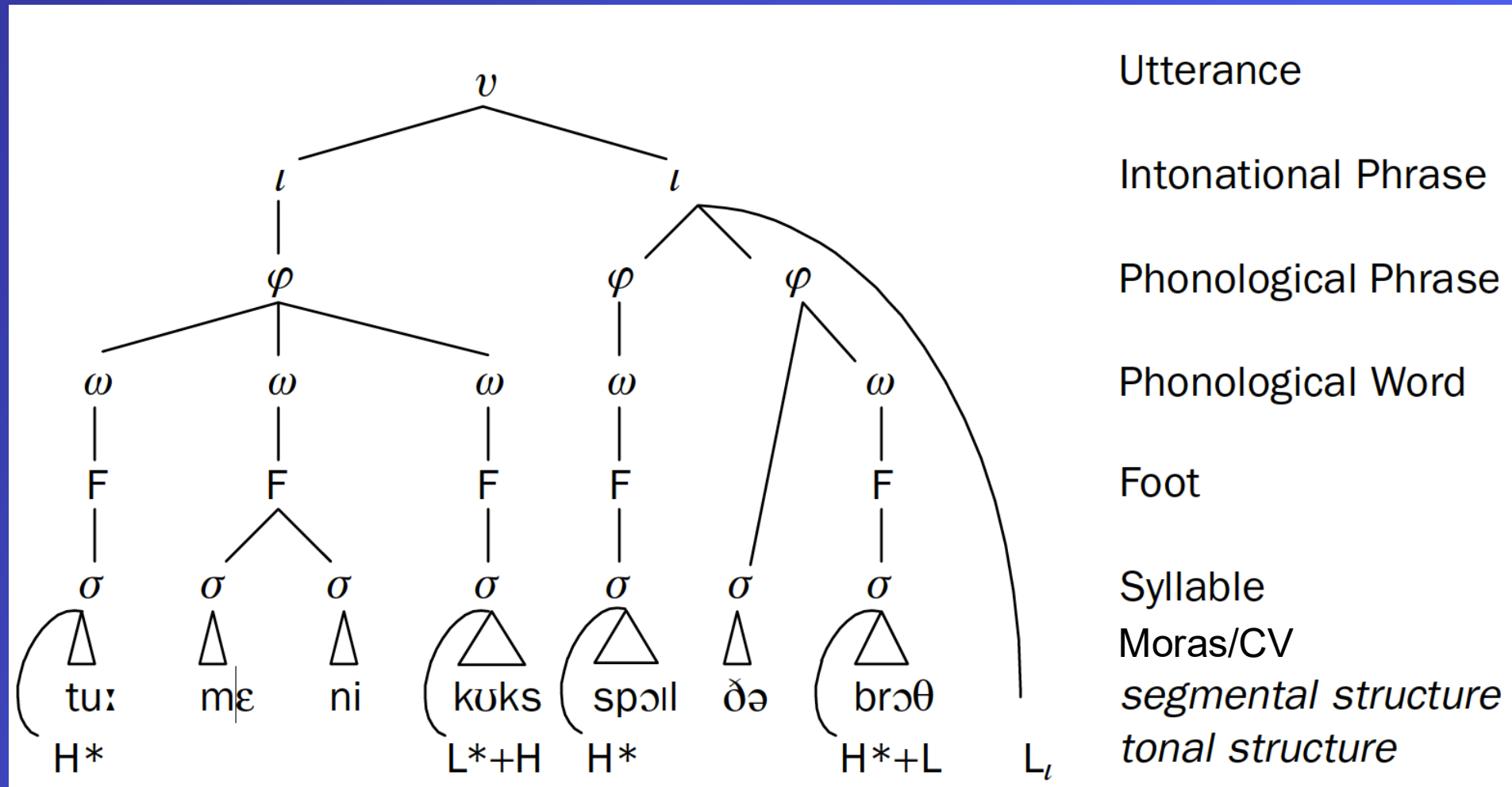
What we will do today

- Some repetition
- Address yesterday's stumbling block: the relationship between stress, tone, and pitch/tone accent
- Discuss different analytical approaches to Franconian tonal accent

Prosodic hierarchy

(Pierrehumbert 1980, taken from Gussenhoven 2004)



A debate in prosodic typology / phonological theory

- “The central goal of phonological typology is to determine how different languages systematize the phonetic substance available to all languages.”

  Hyman (2009:213)

- How does phonetic substance relate to prosody?

A debate on the nature of ‘tonal accent’ (TA)

- Tone accent systems seem to be located ‘somewhere between stress and tone’
- Sometimes regarded as a subgroup of ‘pitch accent systems’ (restricted tone systems)
- TA = oppositions between two (and never more) word accents
- Tone: Accented syllables are primarily distinguished via their tonal melodies
- Stress: the tonal contrast is restricted to stressed syllables – no tone without stress

The crucial question

- Do such ‘intermediate systems’ have have both word stress *and* lexical tone?

or…

- Do the metrical representations of the accents differ, which influences the distribution of intonational tone?

Two traditional positions in the debate

- “Mainstream”: Hyman (2006, 2009, 2011)
  - Stress is a property of syllables

  → No effects of stress below the syllable level

  → Tone accent contrasts must involve lexical tone
- Traditional analysis of tonal accent
  - For Franconian, e.g. Gussenhoven (2000, 2004, 2013), Peters (2006)

Two traditional positions in the debate

- Alternative view: Van der Hulst (2011, 2012, 2014)
  - Units below the syllable (moras) can carry accentual prominence
  - Moras can be marked with diacritic accents / grid marks that indicate the location of prominence
  - This prominence is usually realized as tone / pitch

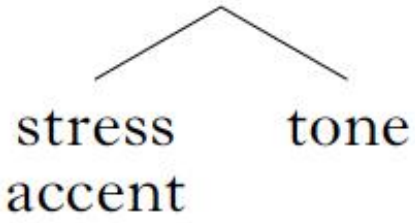
A third view: foot-based opposition (for around 15-20 years)

- Both traditional approaches focus on the tonal correlates of accent but have trouble capturing other correlates (e.g. durational, segmental, distributional factors)
- My work: we need a model that incorporates prosodic boundaries (foot boundaries), unlike van der Hulst's accent marks
- Main claim: Tonal accent and related phenomena can emerge from different types of metrical feet
- Main challenge: violates widely held beliefs about the nature of stress systems

Hyman (2006) on ways to classify prosodic systems

(1) *Classic bi- and trifurcation of prosodic types*

a.



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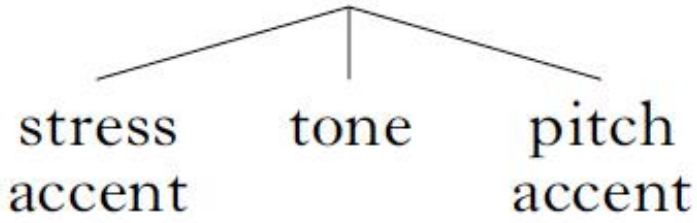

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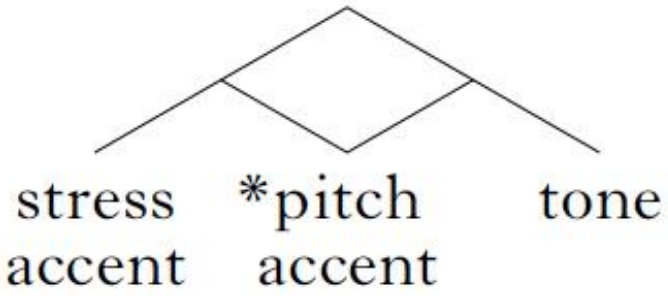
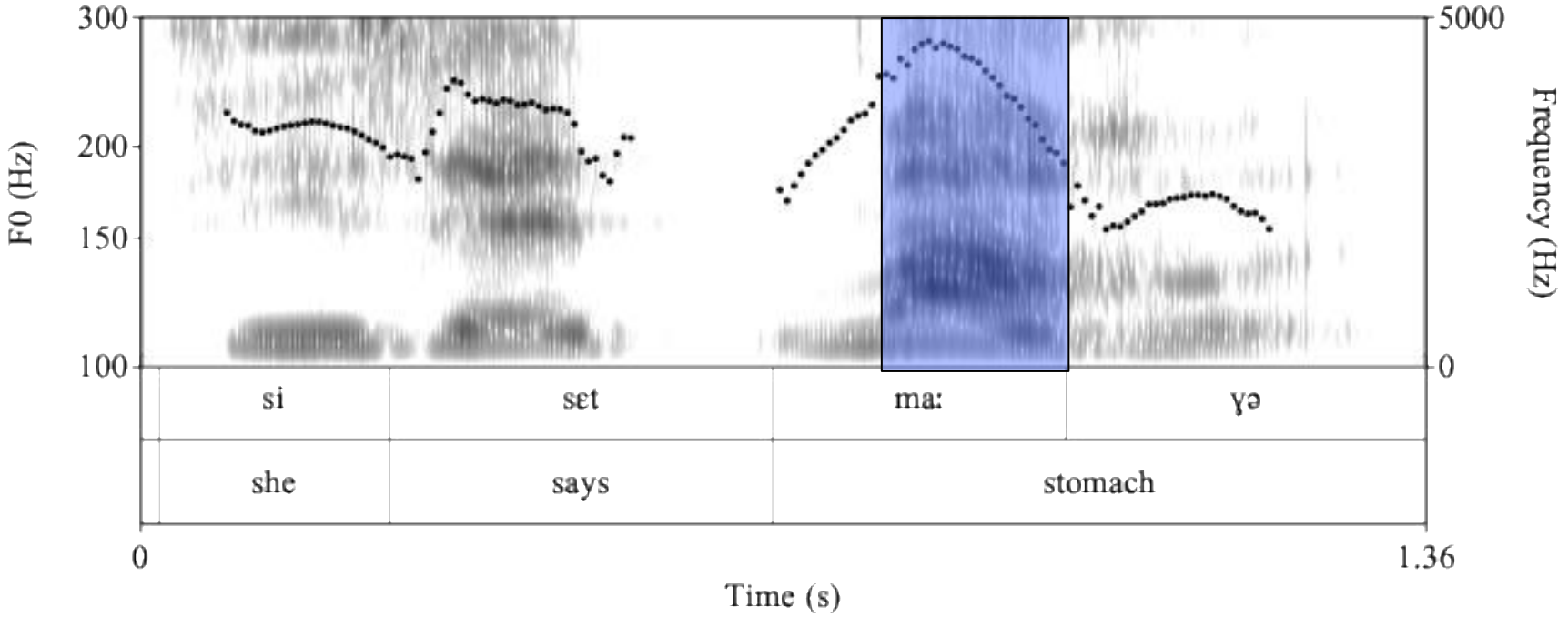


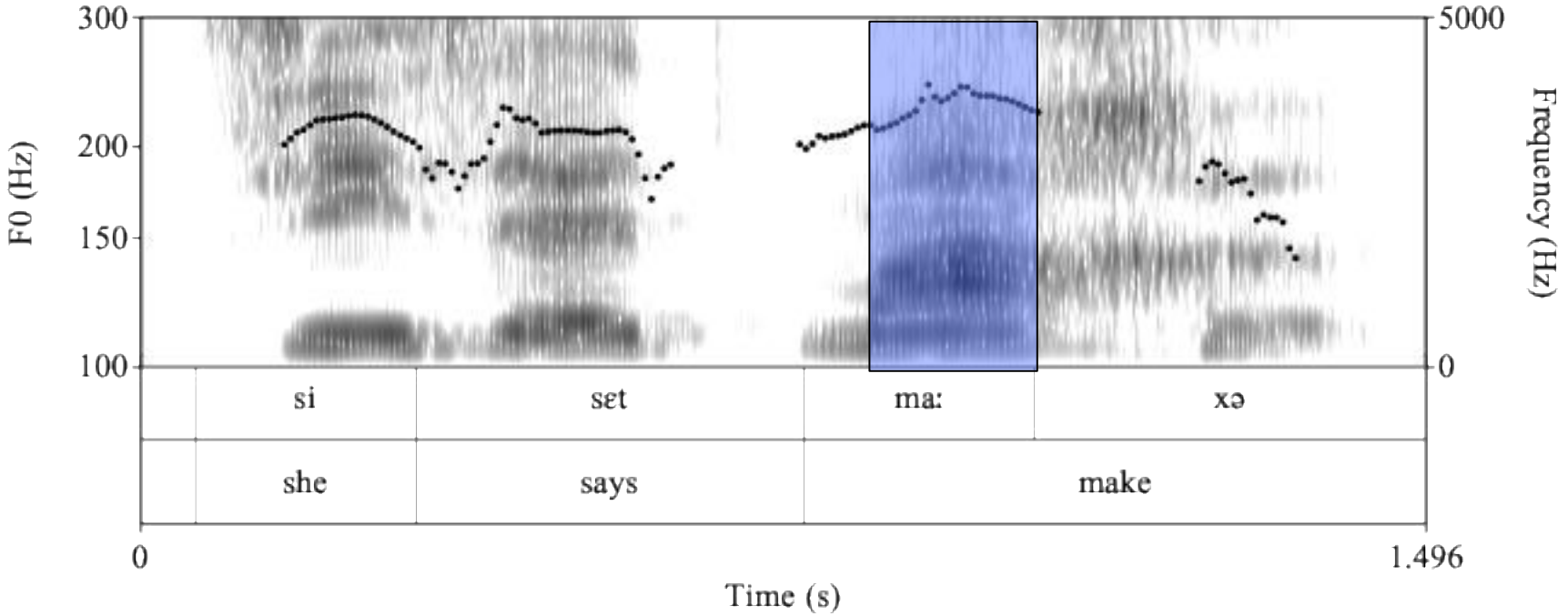
What typological labels could correspond to

- Stress = realized on syllables = foot
- Tone = H or L (or M) tones
- Pitch/tonal accent = ???
  - Maybe a moraic accent = * (e.g., van der Hulst 2012)
  - Moraic accent can do things tone can do and stress can do

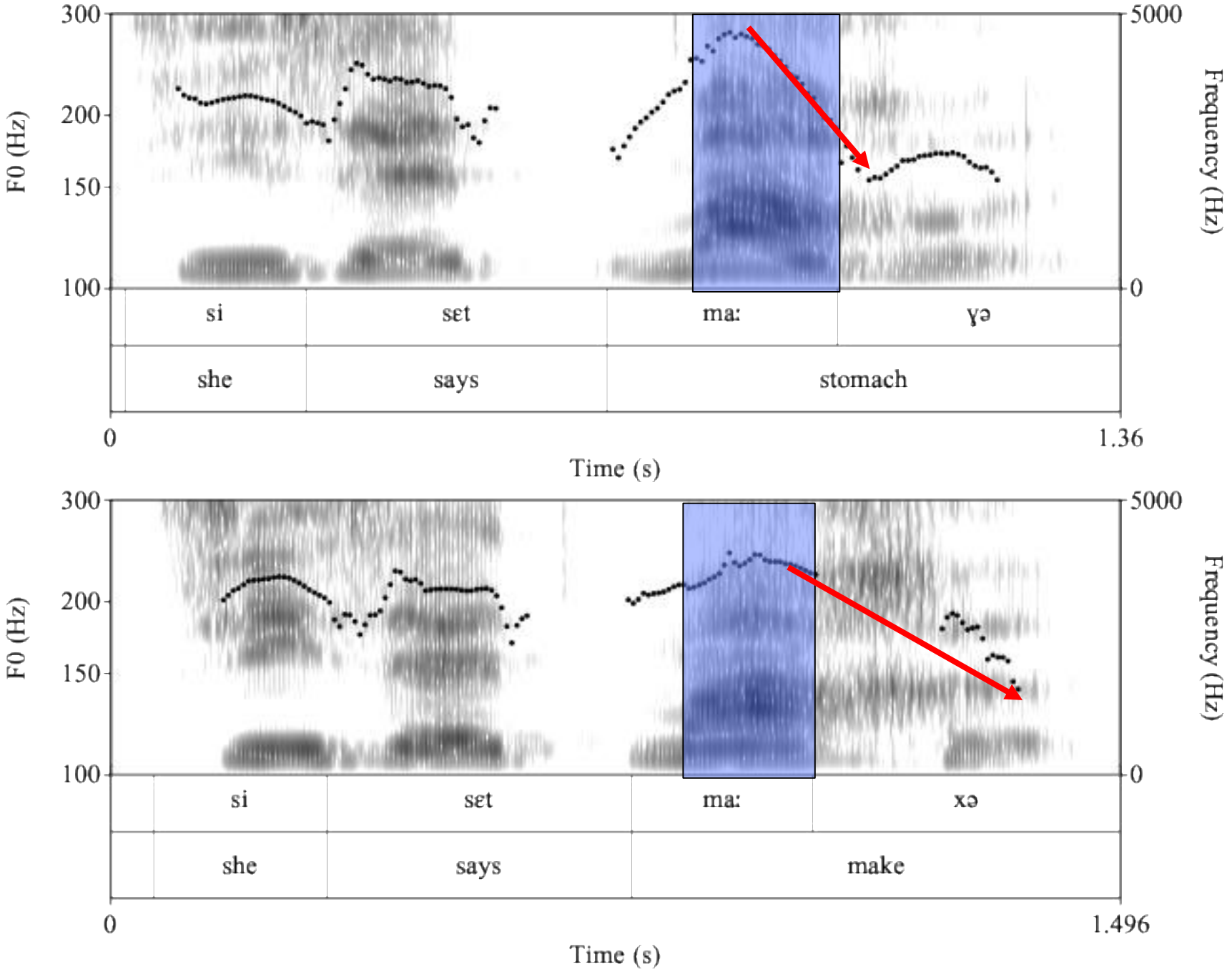
Coming up
to help understand moraic accemt

- Two sound files from a ‘Franconian’ speaker, m, 92 (Holweide, close to Cologne)
- Showing difference between two word melodies, so-called Accent 1 and Accent 2
- Carrier sentence = statement: ‘She says…’
  - [maːɣə] ‘belly’ vs. [maːxə] ‘to make’

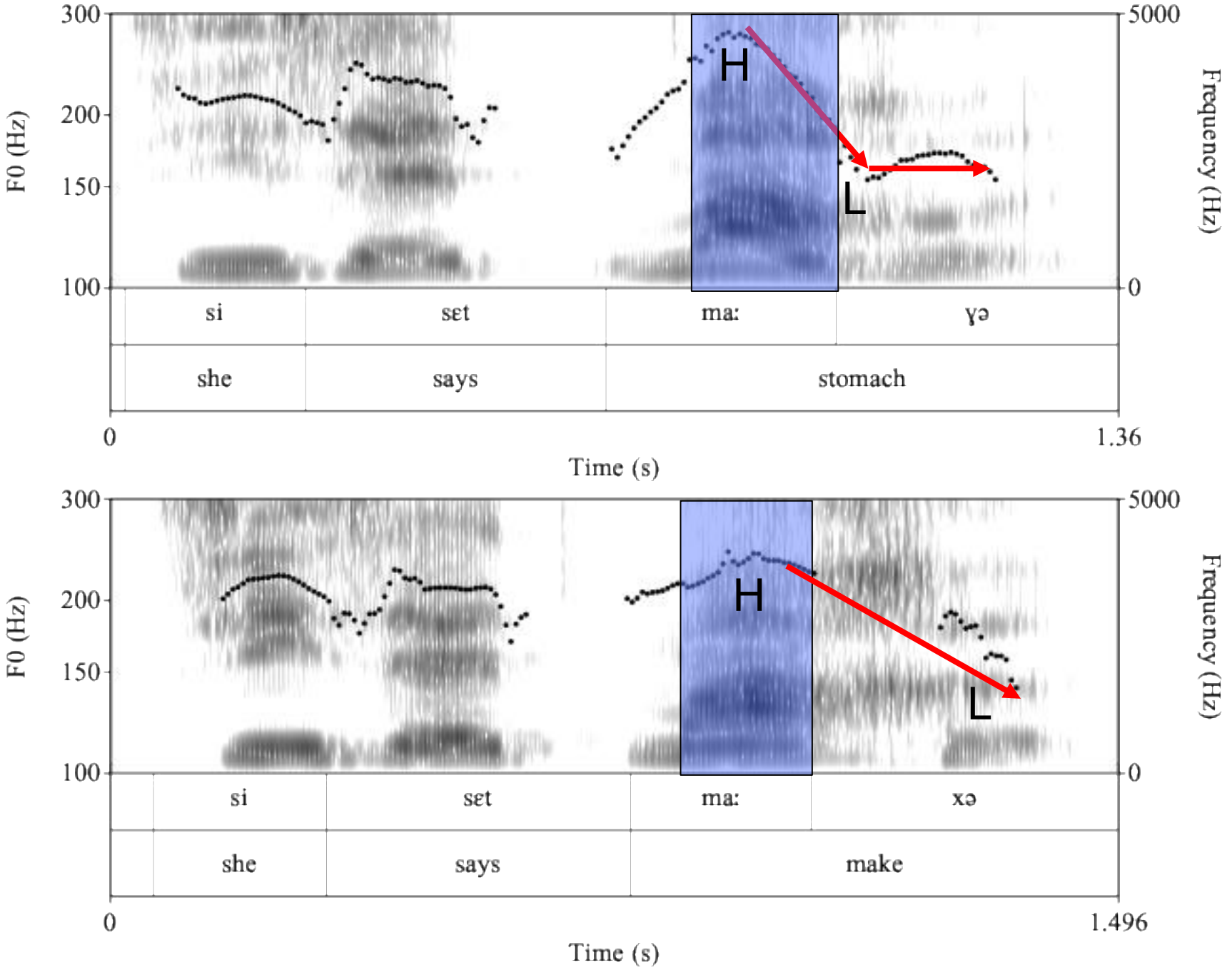




Focus here:
tonal difference



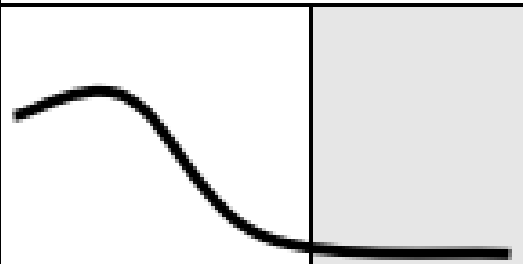
Sentential prominence = falling movement, starting in stressed syllable of most prominent word



Earlier fall (Accent 1)
High (H) to Low (L)

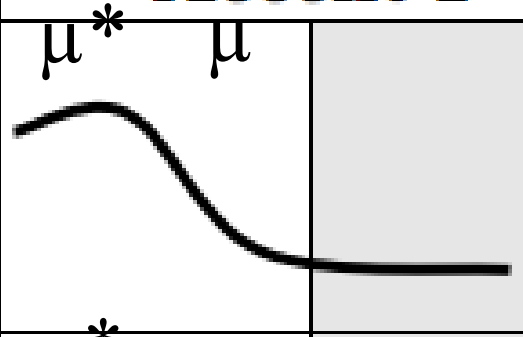
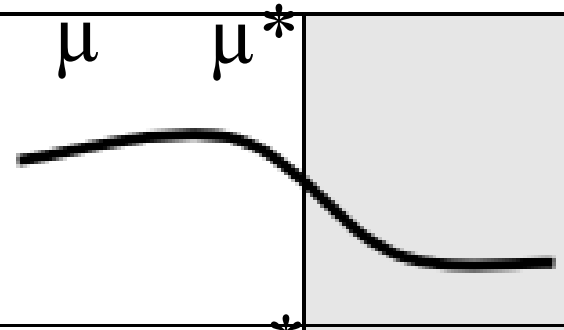
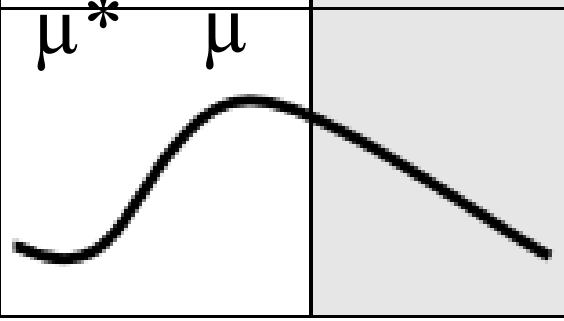
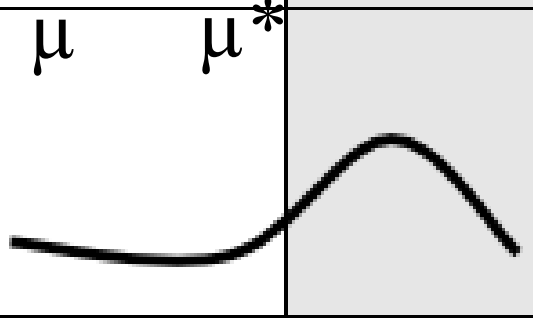
Later fall (Accent 2)
(High Level to Low)

Timing works the same way for rises
(here: stressed plus unstressed syllable)

Context	Accent 1	Accent 2
Declarative, non-final position		
Interrogative, non-final position		

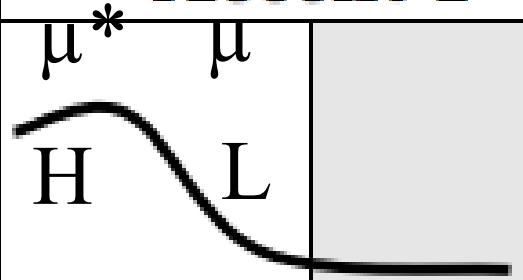
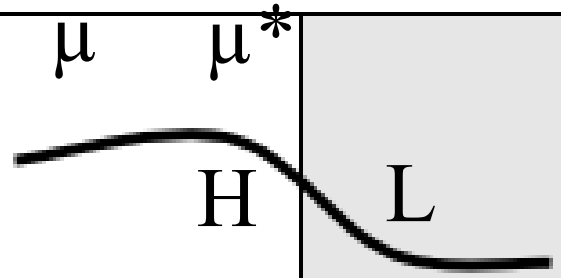
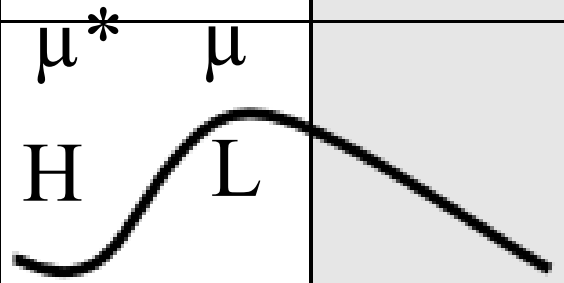
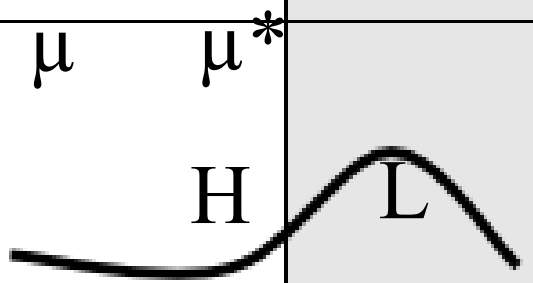
Early Late

Do we want to analyze this as a timing difference, e.g., via stress/accent on moras?
Accent 1 = μ*μ; Accent 2 = μμ*

Context	Accent 1	Accent 2
Declarative, non-final position		
Interrogative, non-final position		

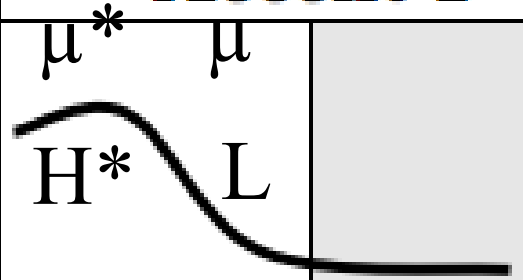
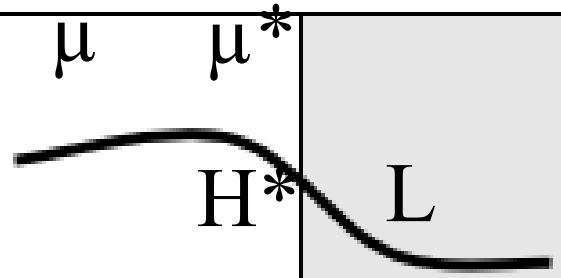
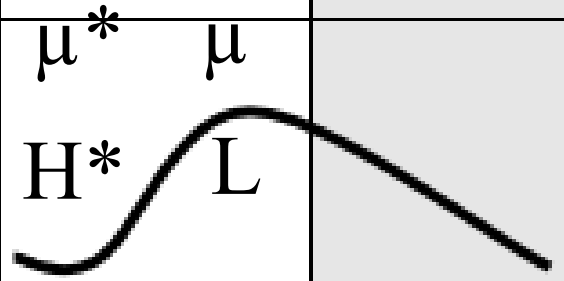
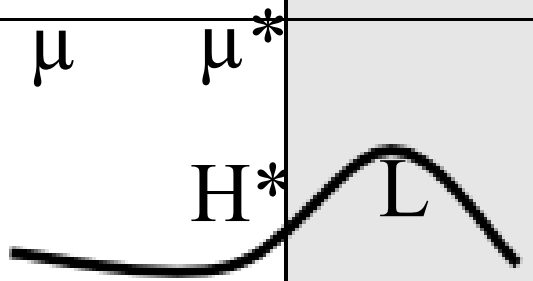
Early Late

If so, how might this work?
Accent 1 = μ*μ; Accent 2 = μμ*

Context	Accent 1	Accent 2
Declarative, non-final position H*L		
Interrogative, non-final position L*H		

Early Late

Could we analyze this as a timing difference?
Accent 1 = μ*μ; Accent 2 = μμ*

Context	Accent 1	Accent 2
Declarative, non-final position H*L		
Interrogative, non-final position L*H		

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But…

- Prosodic typology has assumed for the past few decades that stress = foot = a property of syllables (e.g., Hyman's work)
- Then alignment contrasts within syllables could not be analyzed with moraic stress
- Could we use feet?

Stress and the syllable: an alleged universal

- Part of the widely established research paradigm in theoretical phonology: stress is a property of syllables, not of units below the syllable (Hyman 2006, 2009 for overview)
  - Across syllable difference possible: *MOmo* vs. *moMO*
  - Within syllable difference impossible: *mOu* vs. *moU*
- However… units below the syllable (e.g., moras) are not irrelevant for stress; they can be seen in certain rhythmic patterns in language

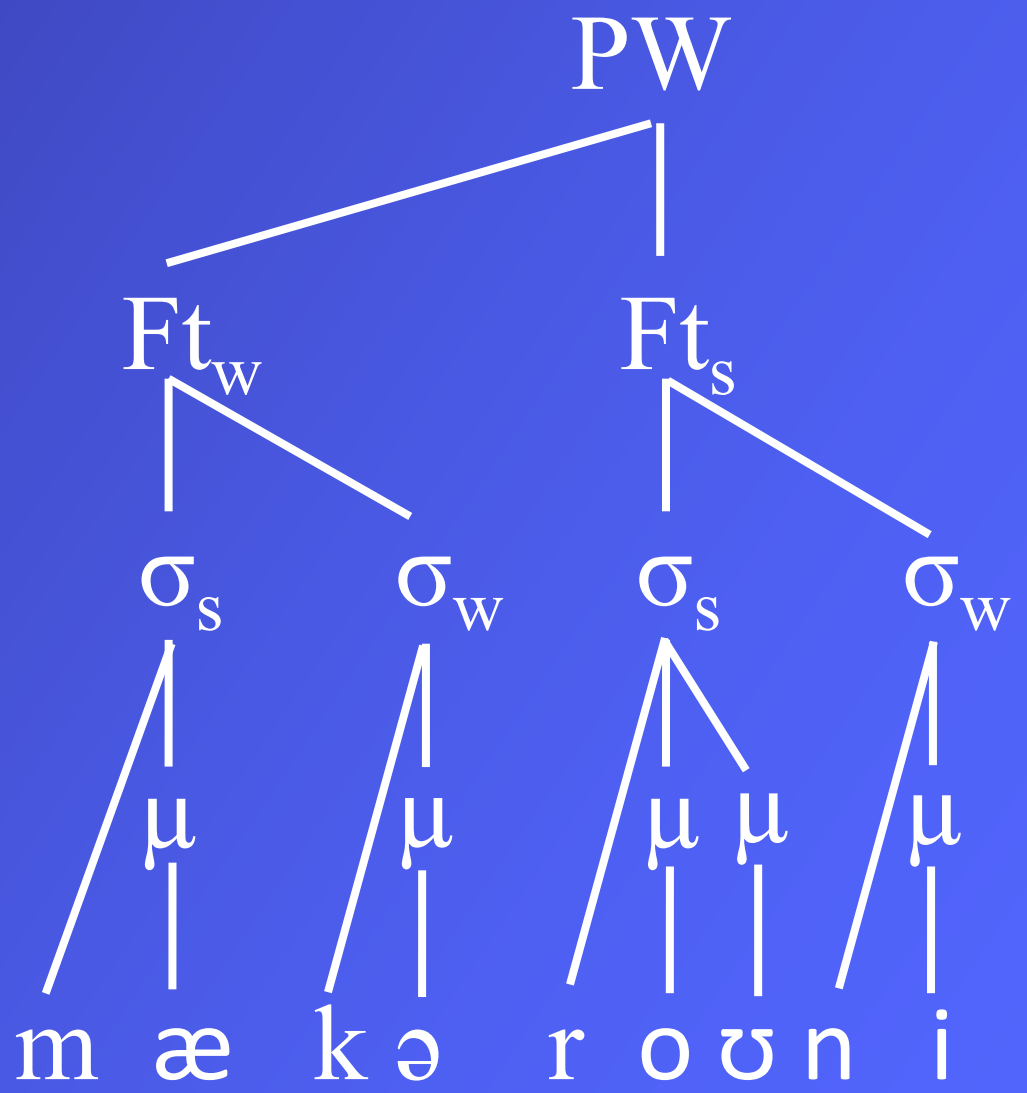
Trochaic metrical structure for *macaroni* (= S W S W)

Phonological Word (PW)

Feet (Ft)

Syllables (σ)

Moras (μ)



What are moras?

- Timing units between the segment and the syllable
- Long vowels = two moras; short vowels = one mora
- Like syllables, moras can play a role in poetry: e.g., Japanese haiku poetry counts moras

Moras and word stress

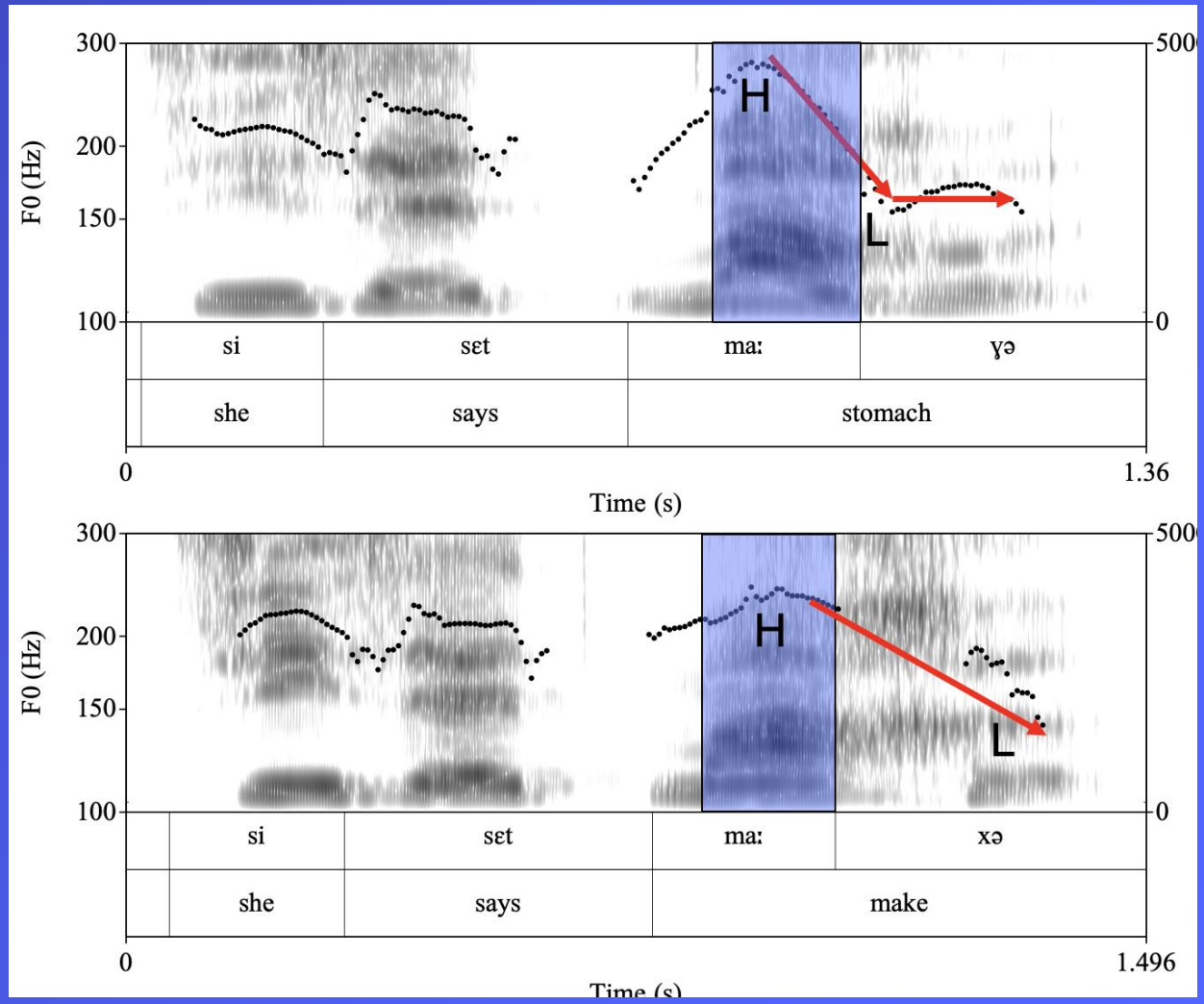
- Like syllables, moras can play a role in foot structure/stress
  - Some languages count two syllables as the preferred foot
  - Others count two moras as the preferred foot
- Relevant here, as per Hayes (1995): syllabic trochees versus moraic trochees
- Stressed syllables in Franconian always have two moras

Stress and the syllable: where we are now

- One claim: stress is a property of syllables, not of units below the syllable
- Another claim: by default, some languages count two syllables as one regular foot, others count two moras
- So… feet can count syllables or moras, but stress-based contrasts can only occur across syllables? Apparently
- But what do we do with tonal accent then?

Tonal accent in mainstream phonological theory

- If stress-/foot-based contrasts within syllables are not permitted, the apparent timing difference we have seen cannot be related to feet/stress
- So… no moraic accents and no feet
- Solution: lexical tone (as found in, say, many African or Asian languages)



Franconian tone accent with lexical tone: Cologne

- Data and analysis
  - Gussenhoven & Peters (2004)
  - Peters (2006)
- The two analyses are largely similar
- We mainly focus on Peters (2006)

Phonetic features of Accent 1 and Accent 2 in Cologne

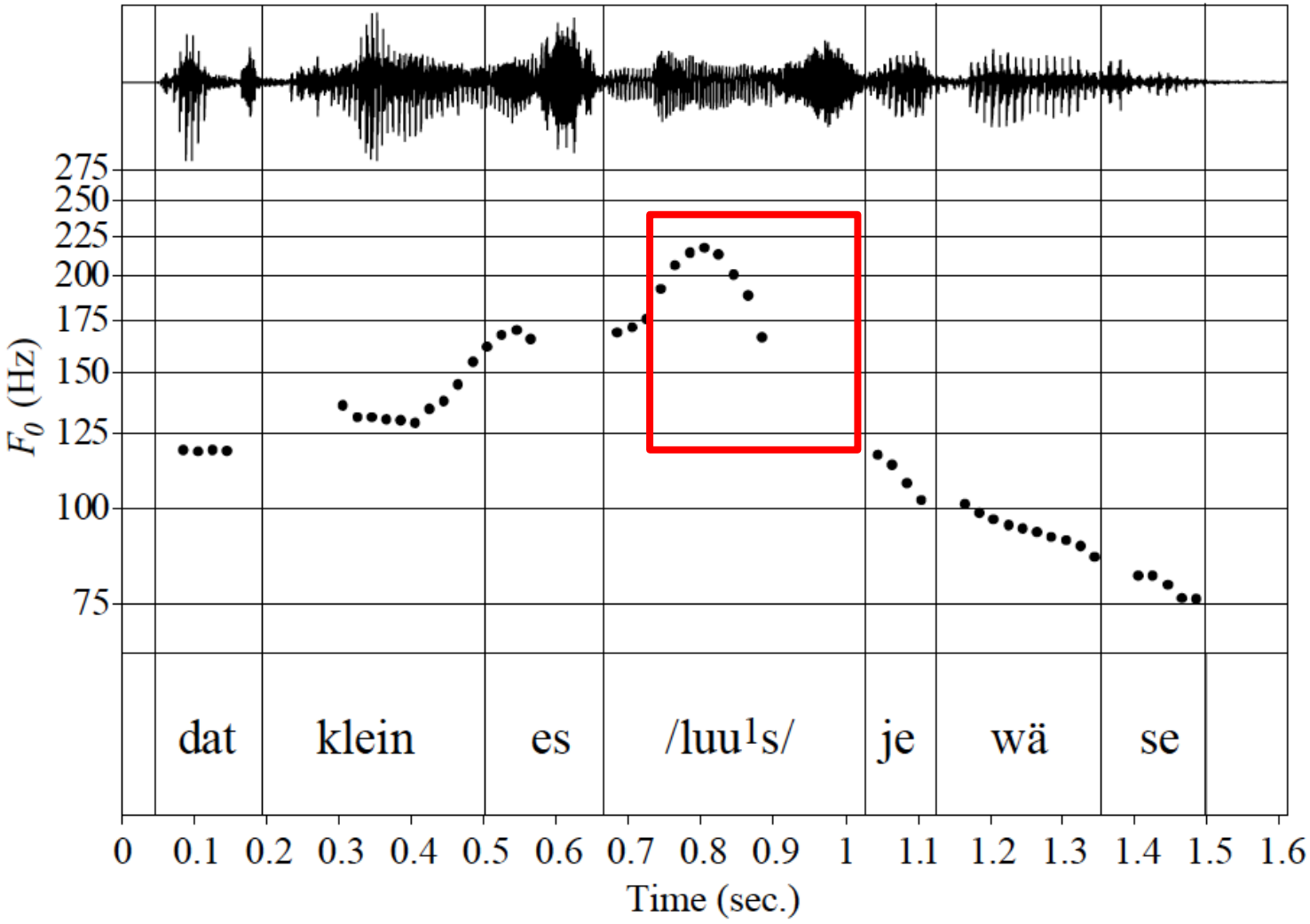
- Method: reading task with tone accent minimal pairs in minimally different carrier sentences (all data from Peters 2006)

/luu^{1}s/	‘clever’	/luu^{2}s/	‘louse’
/kan^{1}/	‘can, bottle’	/kan^{2}/	‘be able’ (SG)
/daa^{1}x /	‘day-DAT’	/daa^{2}x	‘day-NOM’
/huu^{1}s/	‘house-DAT’	/huu^{2}s/	‘house-NOM’
/brau^{1}t/	‘(he/she) brews’	/brau^{2}t/	‘bride’[1]

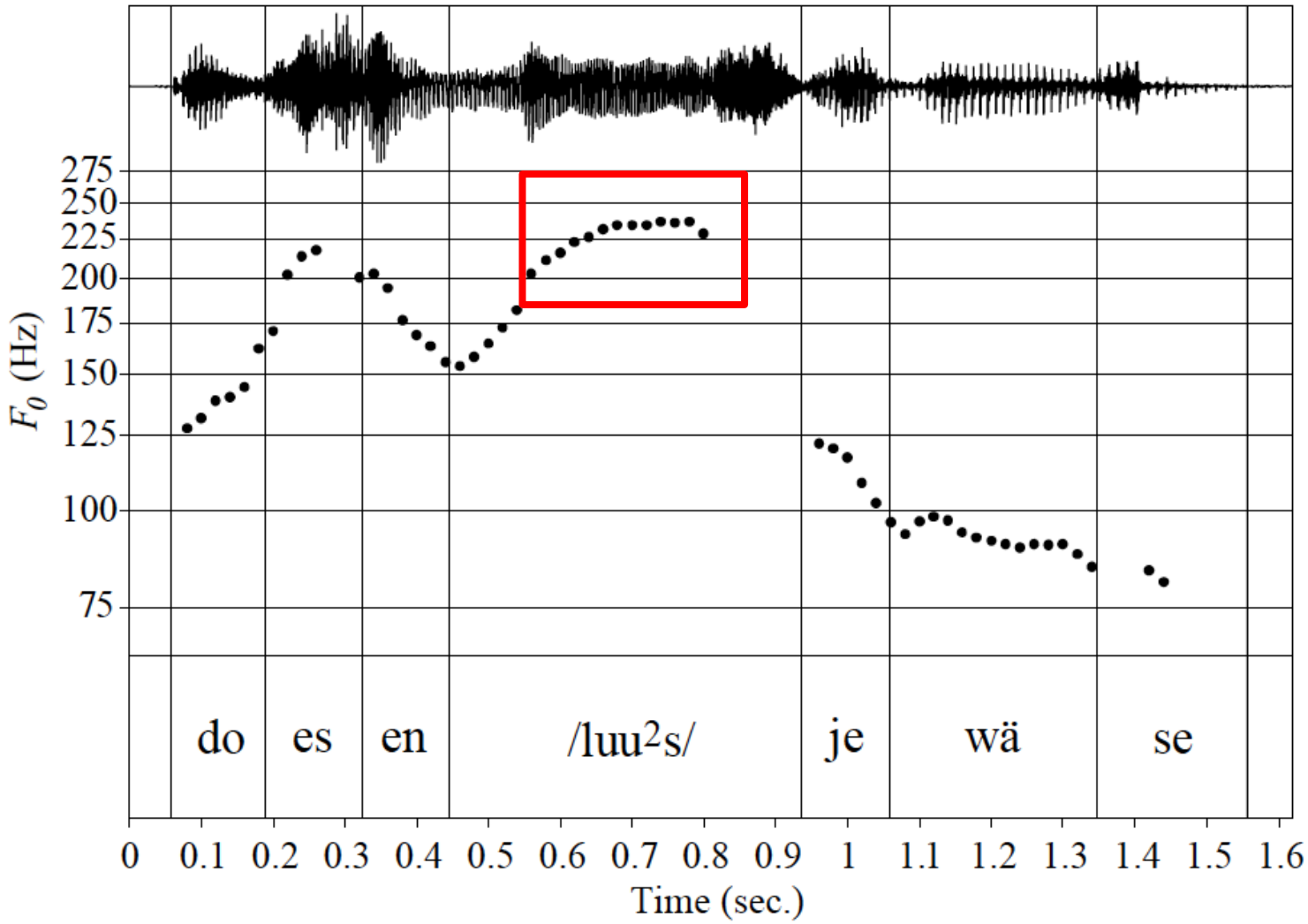
Phonetic features of Accent 1 and Accent 2 in Cologne

- Let us look at some selected data…
- First: focus positions

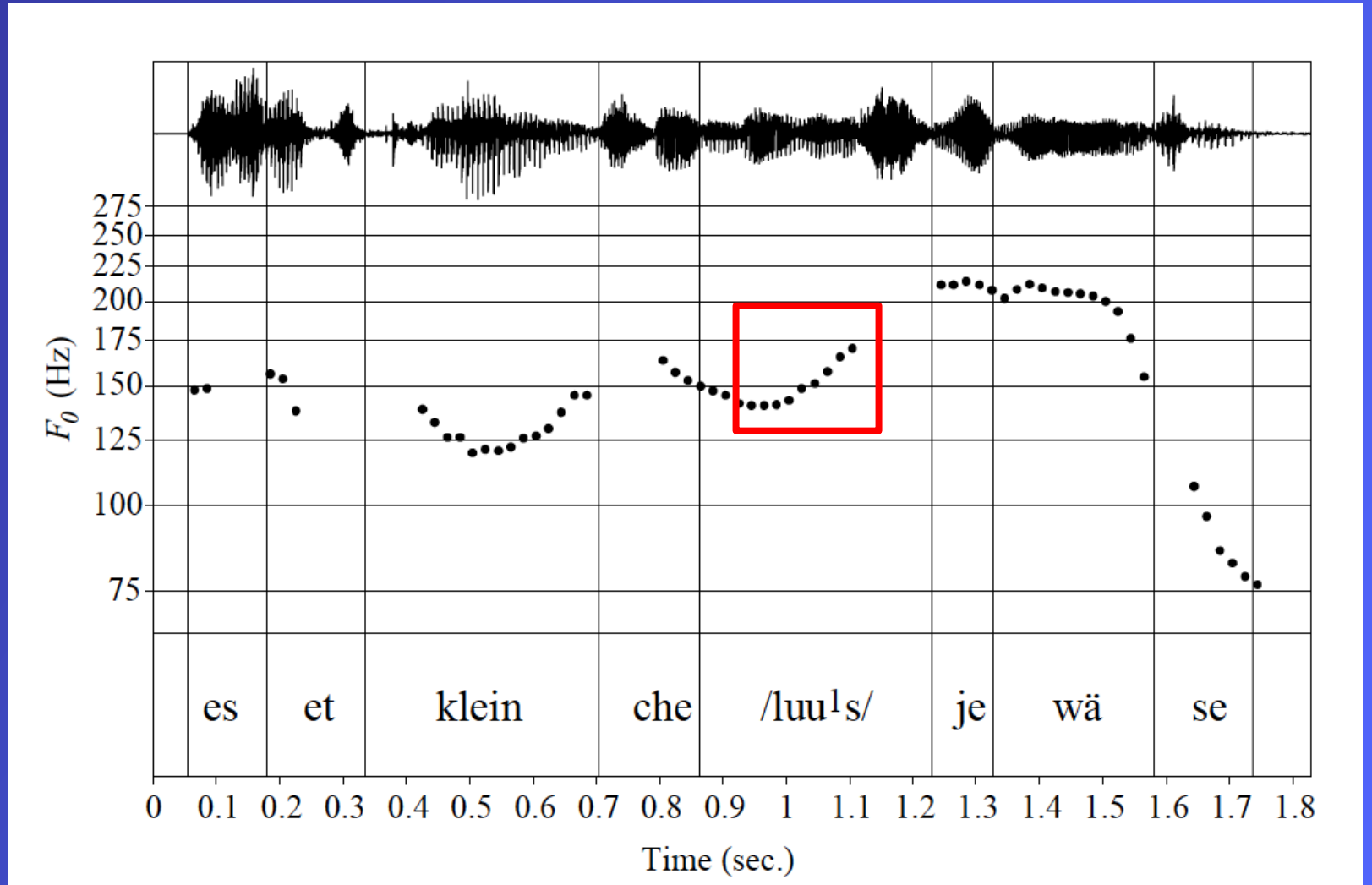
Dec, foc, non-final, Accent 1



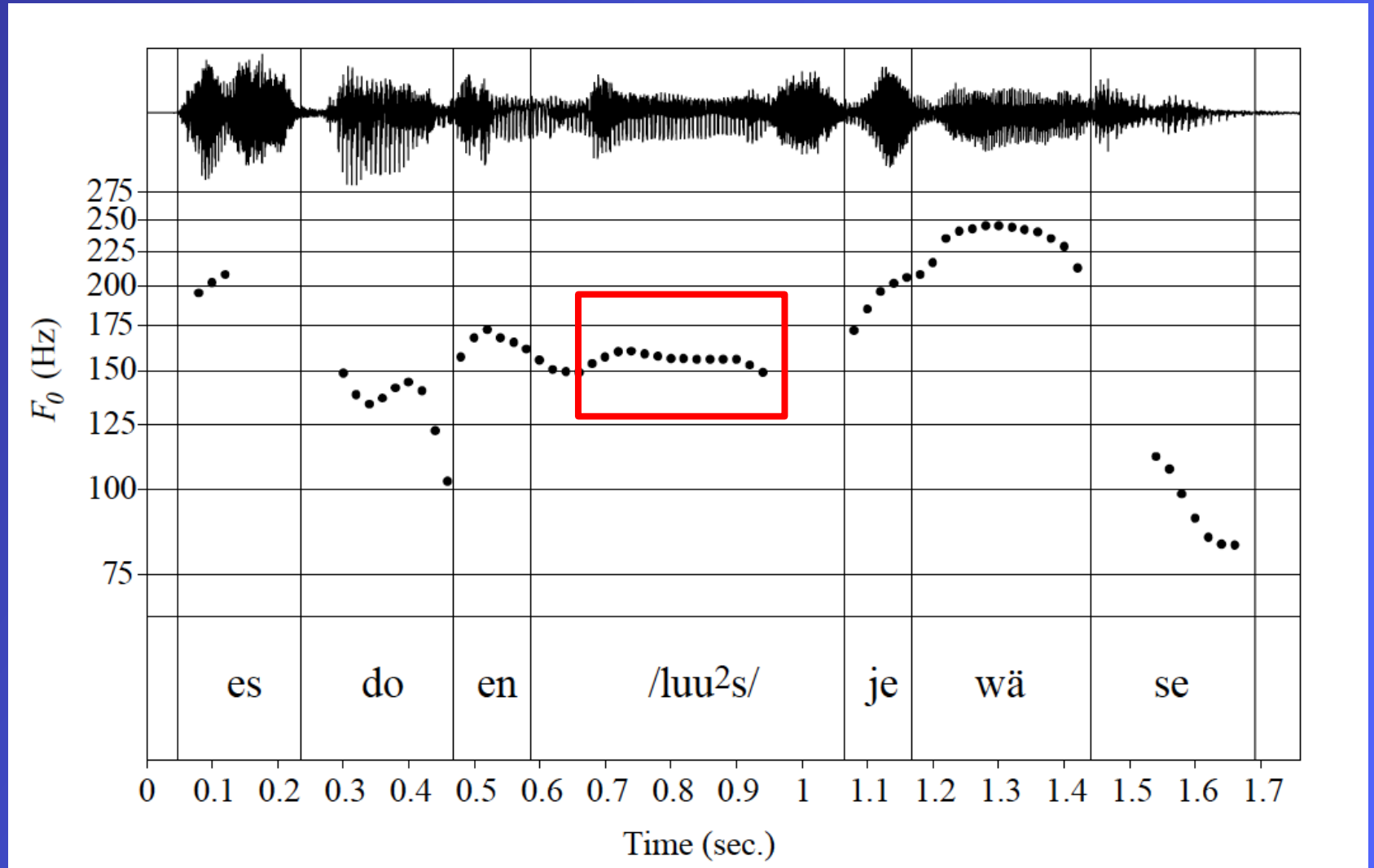
Dec, foc, non-final, Accent 2



Int, foc, non-final, Accent 1



Dec, foc, non-final, Accent 2



Phonetic features of Accent 1 and Accent 2 in Cologne (focus)

- Tone and duration differ between Accent 1 and Accent 2
  - Accent 1 shows earlier tonal movements than Accent 2
  - Accent 2 is longer than Accent 1
  - Phrase-final syllable lengthening much stronger for Accent 2 than for Accent 1

Phonetic features of Accent 1 and Accent 2 in Cologne (post-focus)

- Distinctive phonetic feature duration rather than tone: Accent 2 is longer than Accent 1

Durational differences (focus)

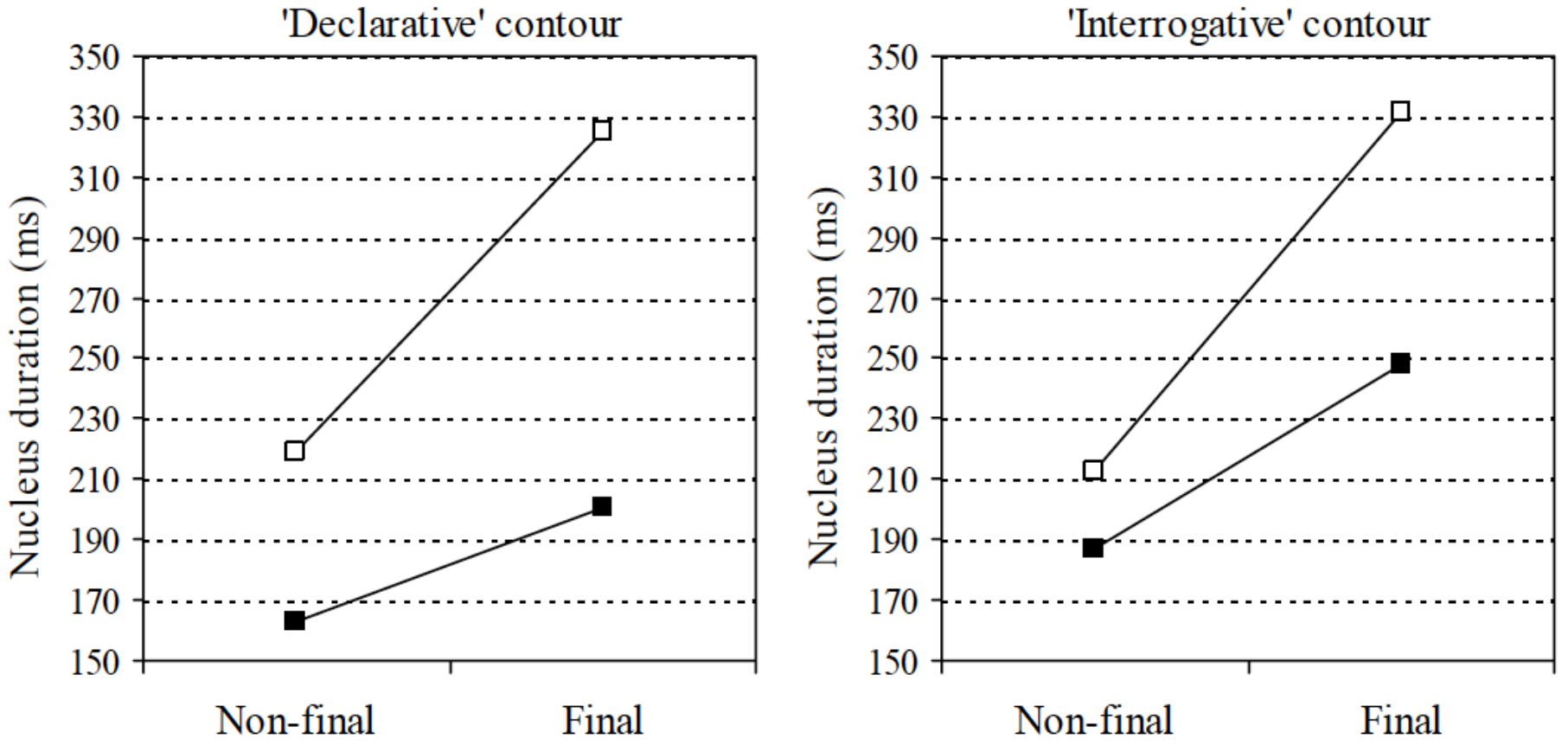


Figure 7. Nucleus duration of the accented syllable in nuclear non-final and final position. Left panel: 'declarative' contour. Right panel: 'interrogative' contour. ■ = Accent 1, □ = Accent 2.

Durational differences (post-focus)

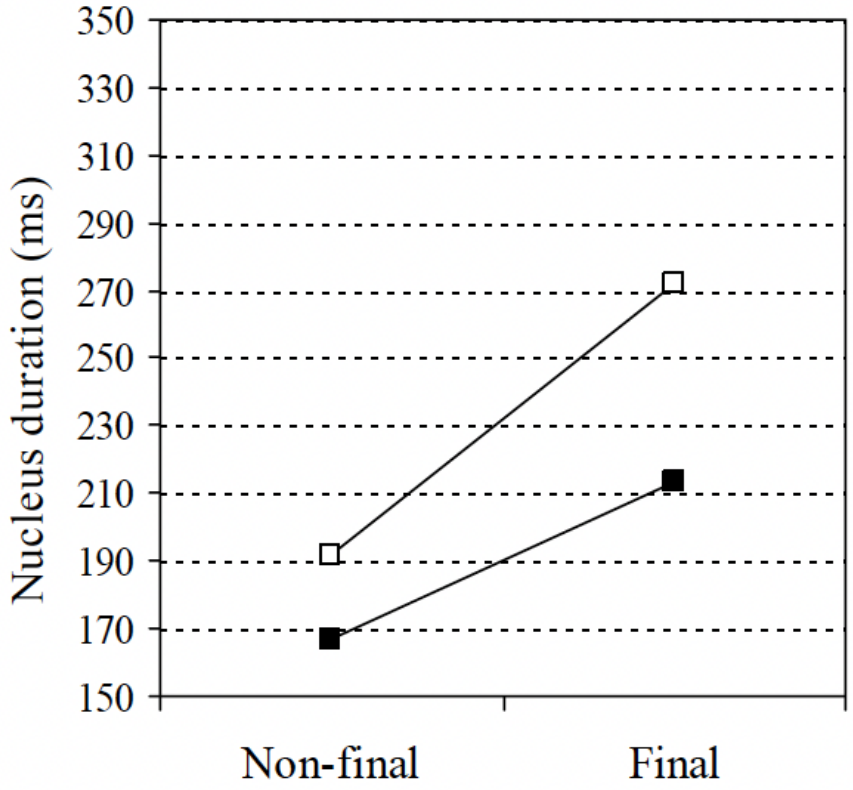


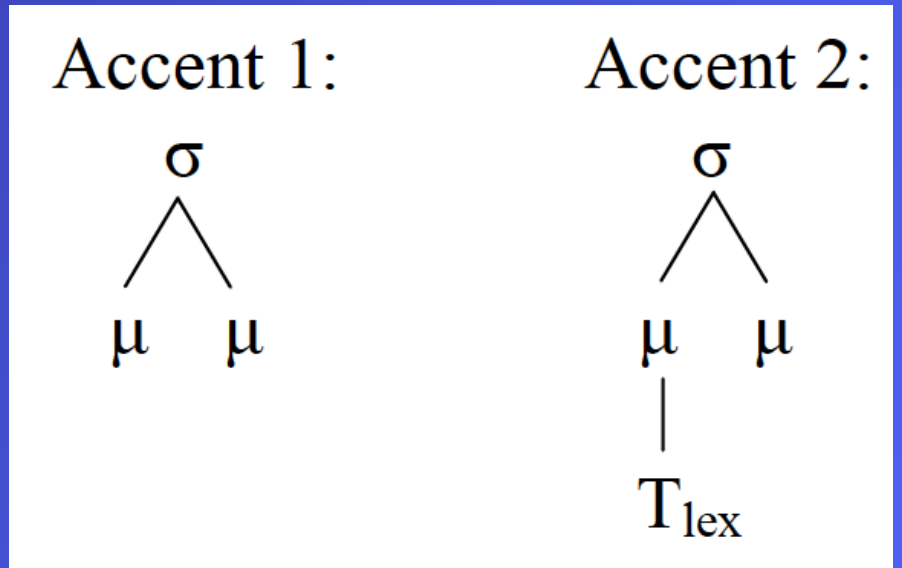
Figure 10. Nucleus duration in postnuclear non-final and final position; ■ = accent 1, □ = accent 2

Phonetic features: summary

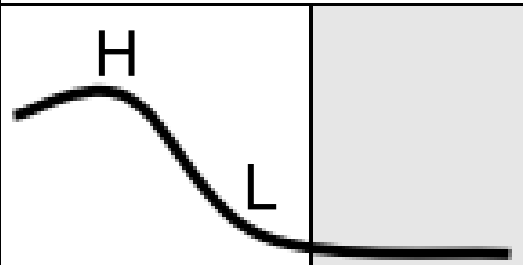
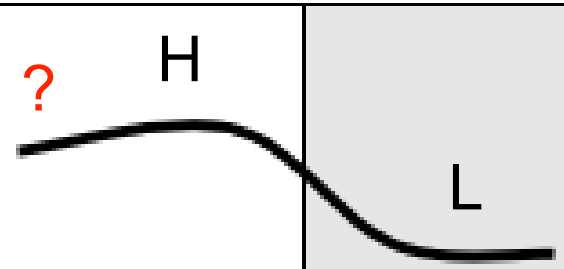
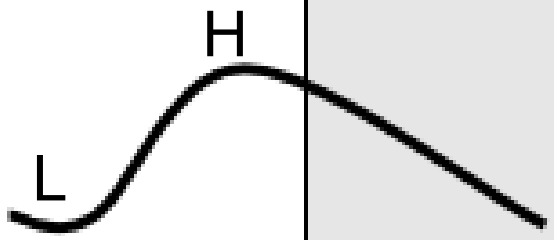
- In the Cologne dialect, it seems to be context-dependent what is the primary phonetic correlate of the accent distinction
- Prominent positions → tone (plus duration)
- Non-prominent positions → duration

A tonal analysis

- Accent 2 has an unspecified lexical tone on its first mora, Accent 1 is lexically toneless
- T_{lex} takes on the value of the following intonational tone

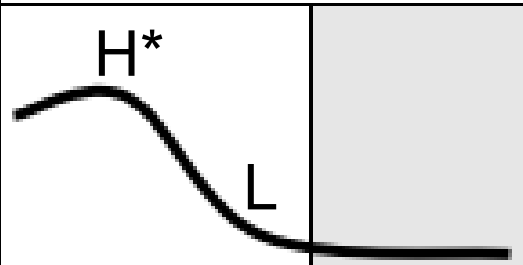
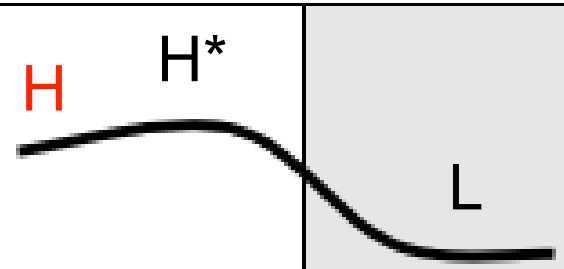
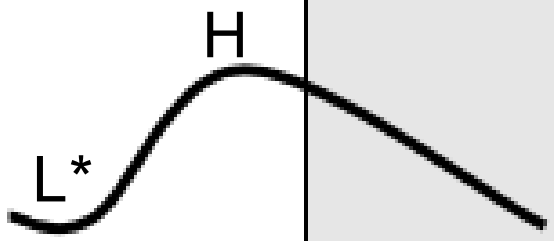
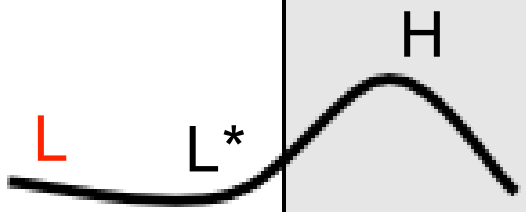


How do lexical tones get their values?

Context	Accent 1	Accent 2
Declarative, non-final position		
Interrogative, non-final position		

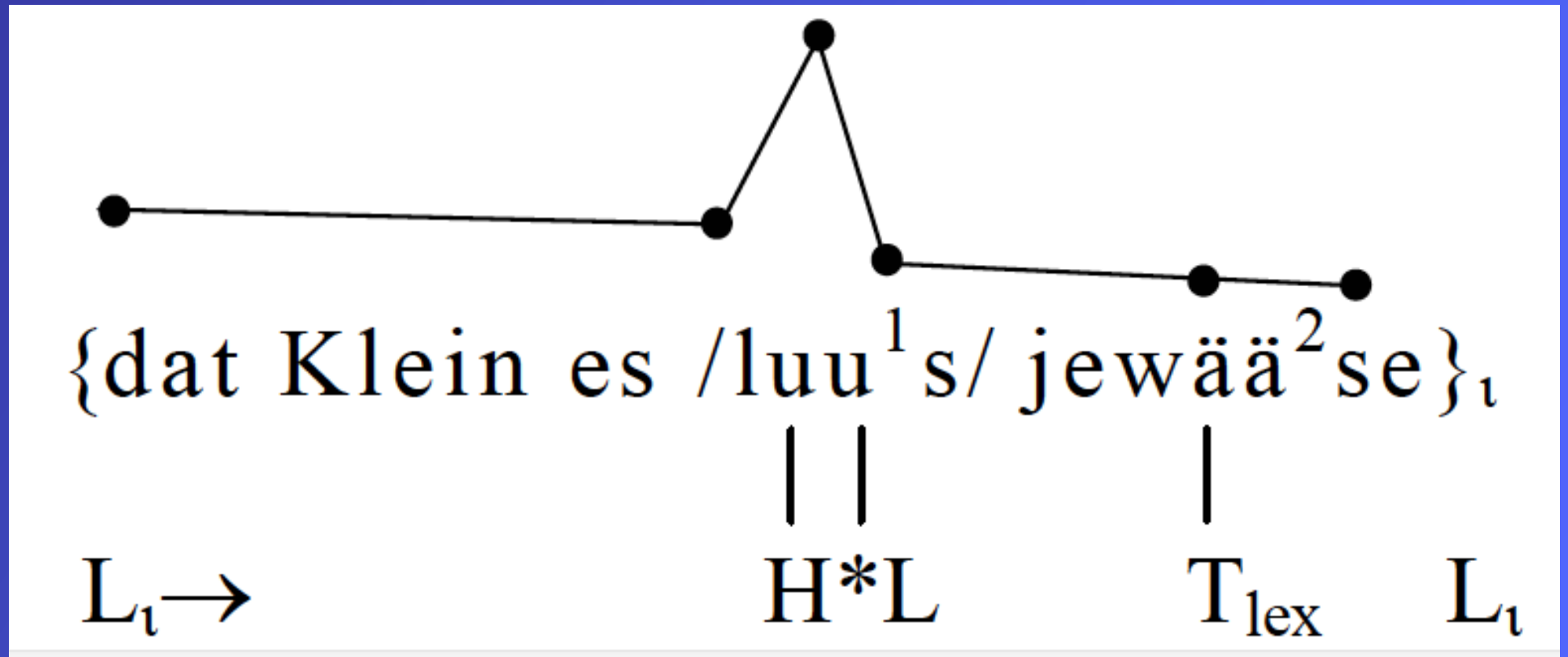
Early Late

‘Invisible’ lexical tone delays timing of fall/rise

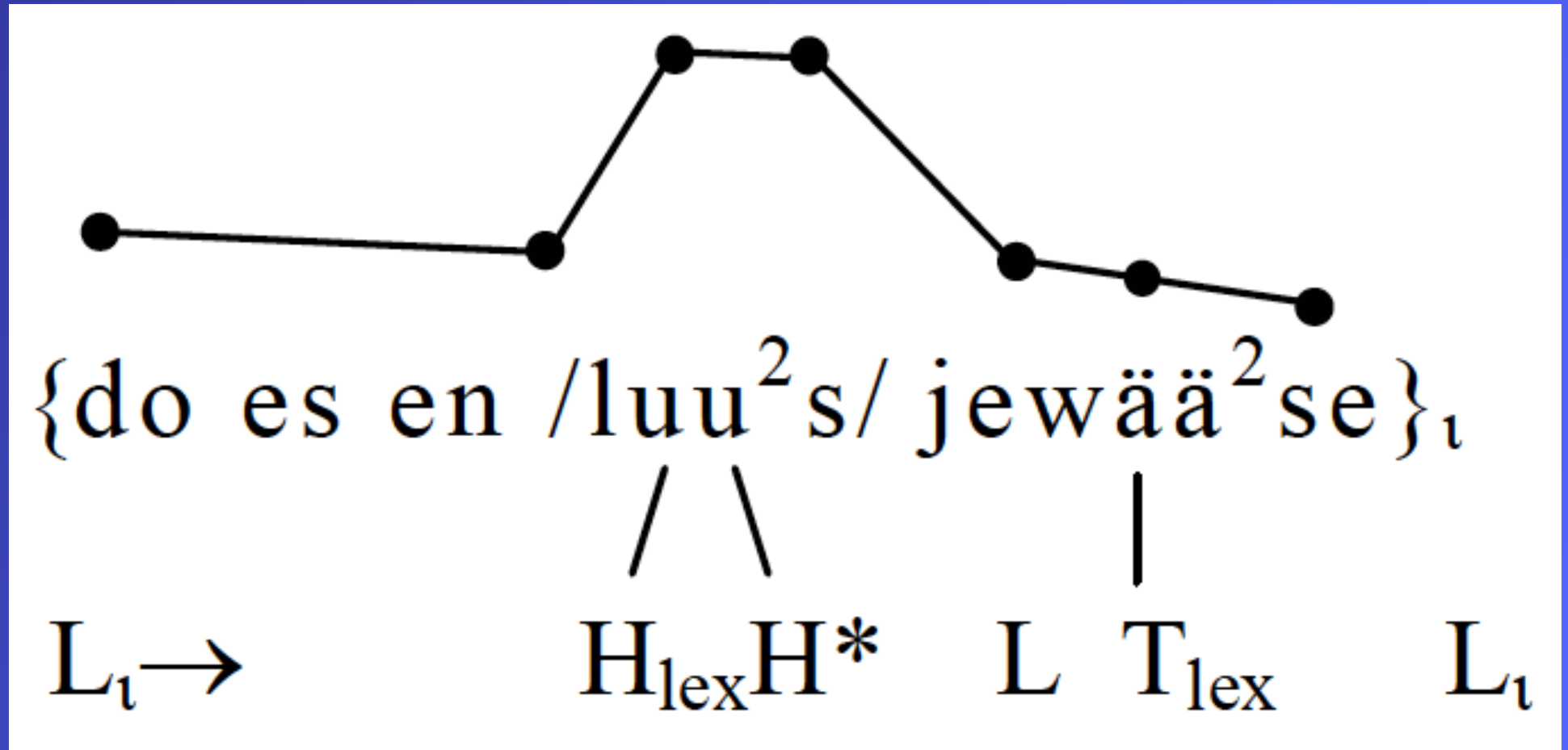
Context		Accent 1	Accent 2
Declarative, non-final position	H*L		
Interrogative, non-final position	L*H		

Early Late

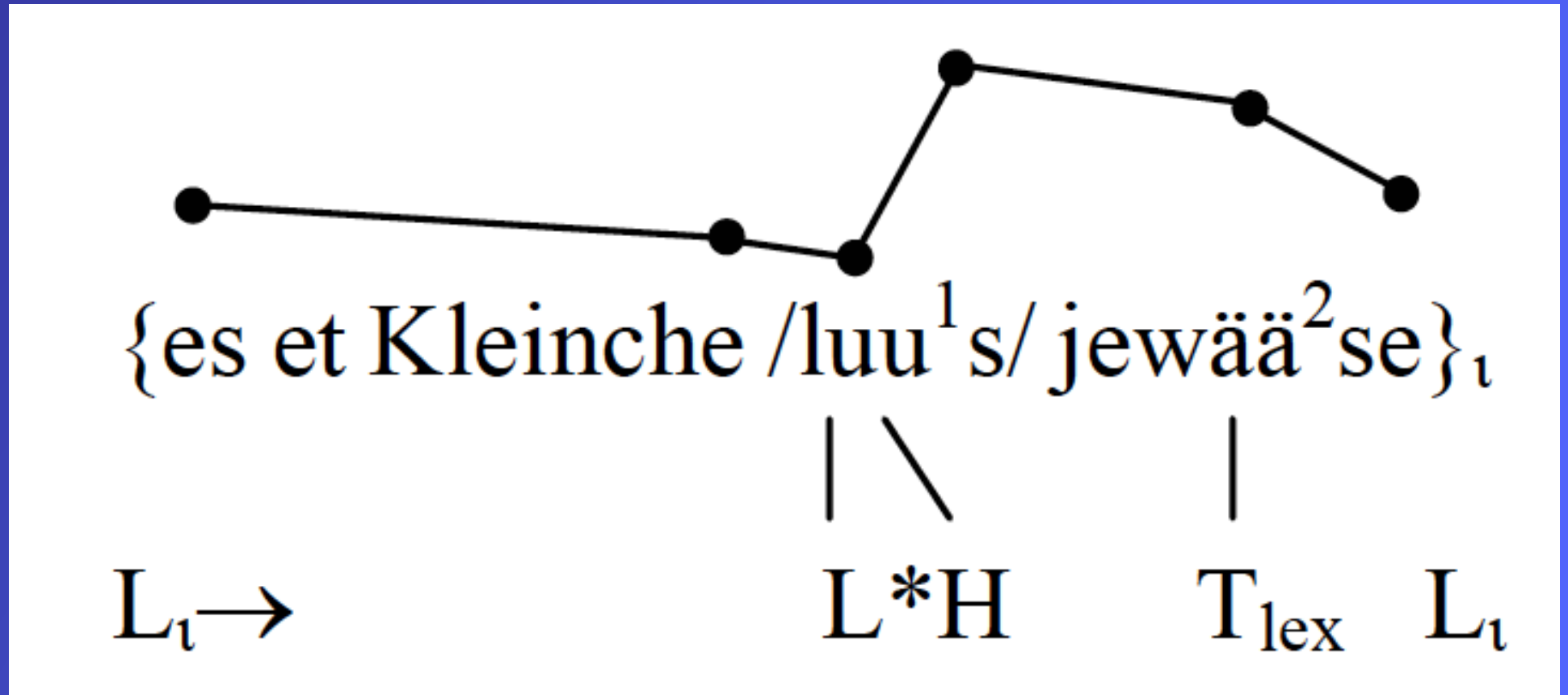
Dec, Focus, non-final, Accent 1



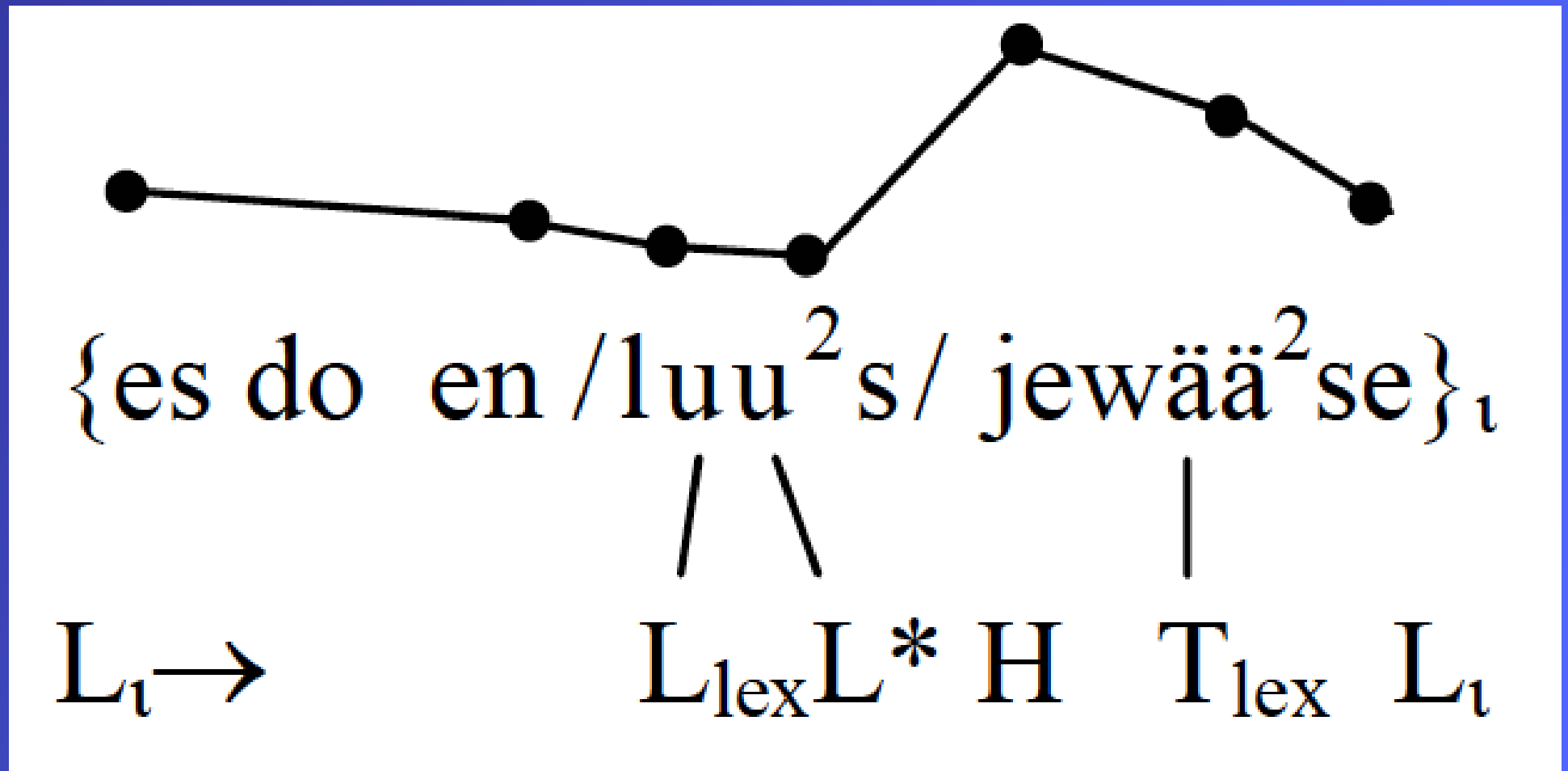
Dec, Focus, non-final, Accent 2



Int, Focus, non-final, Accent 1



Int, focus, non-final, Accent 2



A tonal analysis: summary (tonal mapping)

- The unspecified lexical tone docks onto the first mora of Accent 2
- It blocks the association of the starred tone, which has to go to the second mora
- The lexical tone adopts the value of the following starred tone:
  - T_{lex} H* → H_{lex} H*
  - T_{lex} L* → L_{lex} L*

A tonal analysis: summary (durational effects)

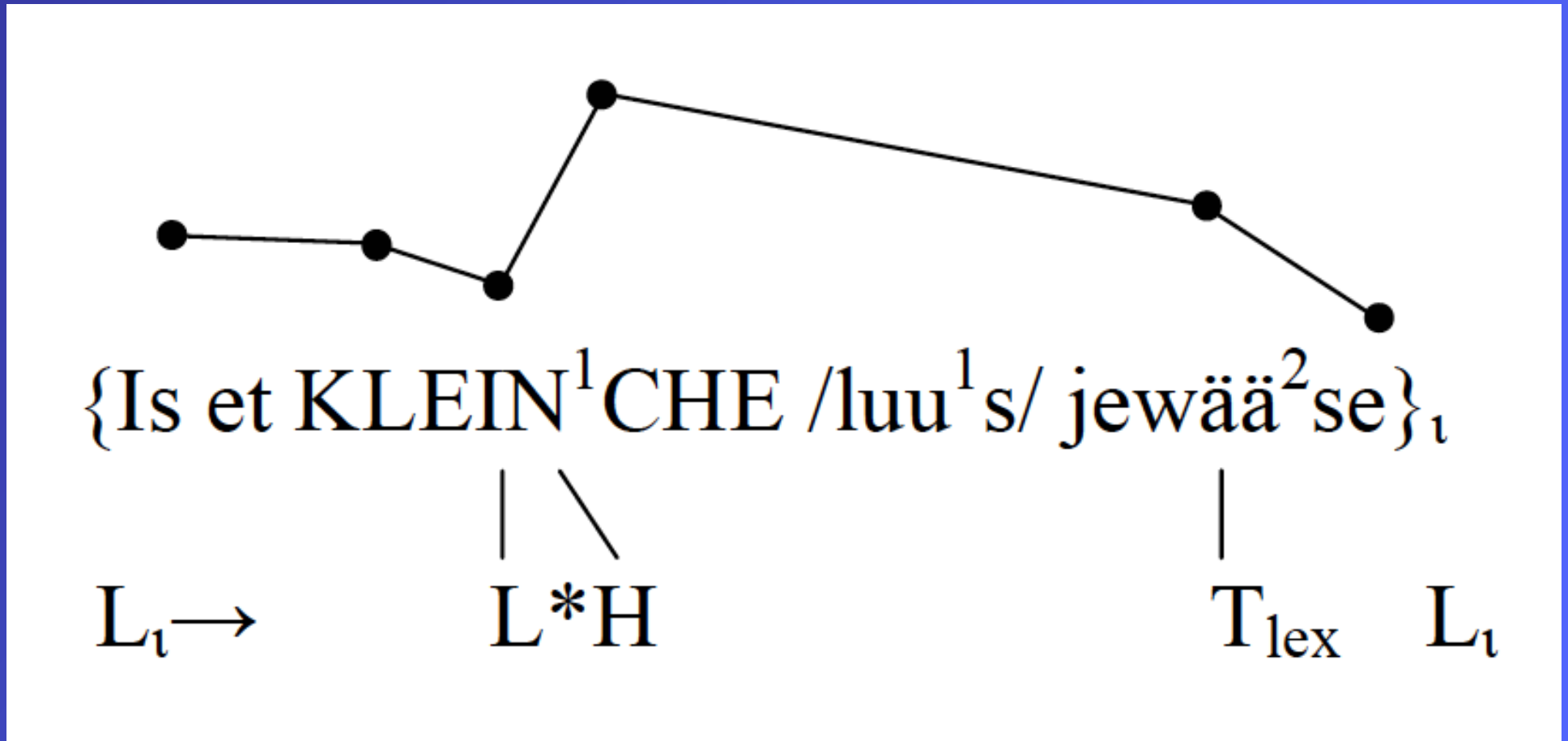
- The lexical tones leads to lengthening of the syllable carrying that tone
- In syllables without a pitch accent, the difference between Accent 1 and Accent 2 is durational

→ Accent 2 undergoes tonal lengthening but remains tonally invisible as no intonational tone is in the same syllable

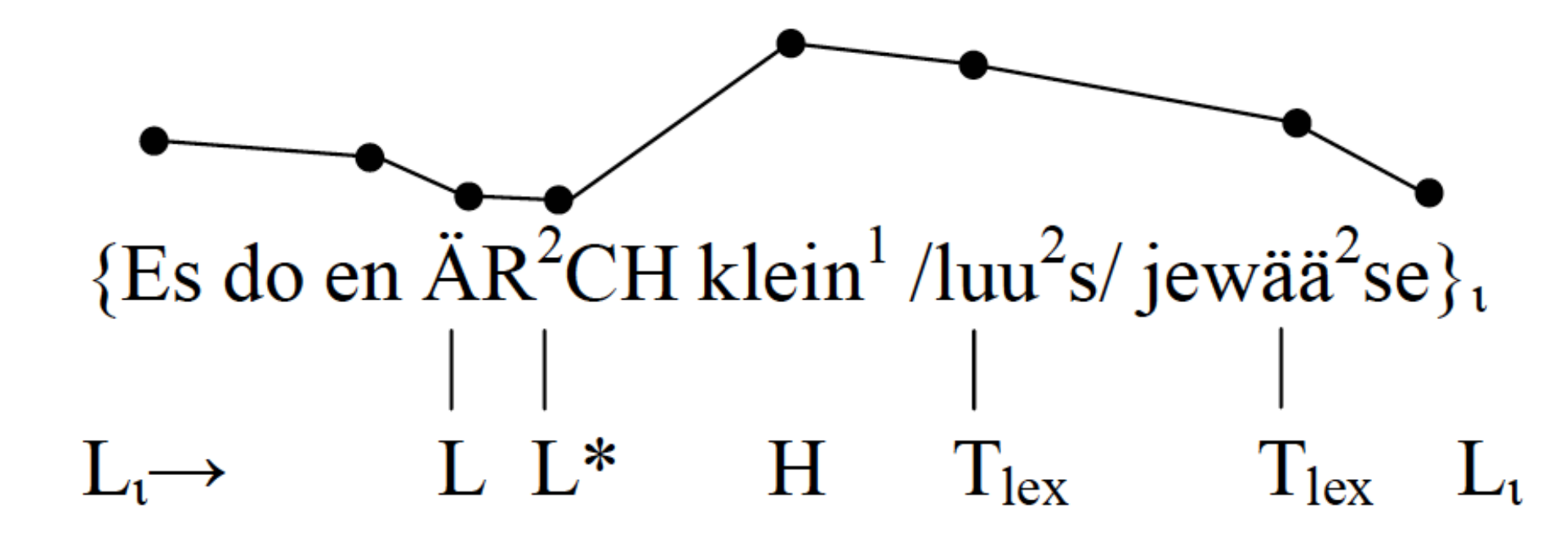
Peters (2006: 21)

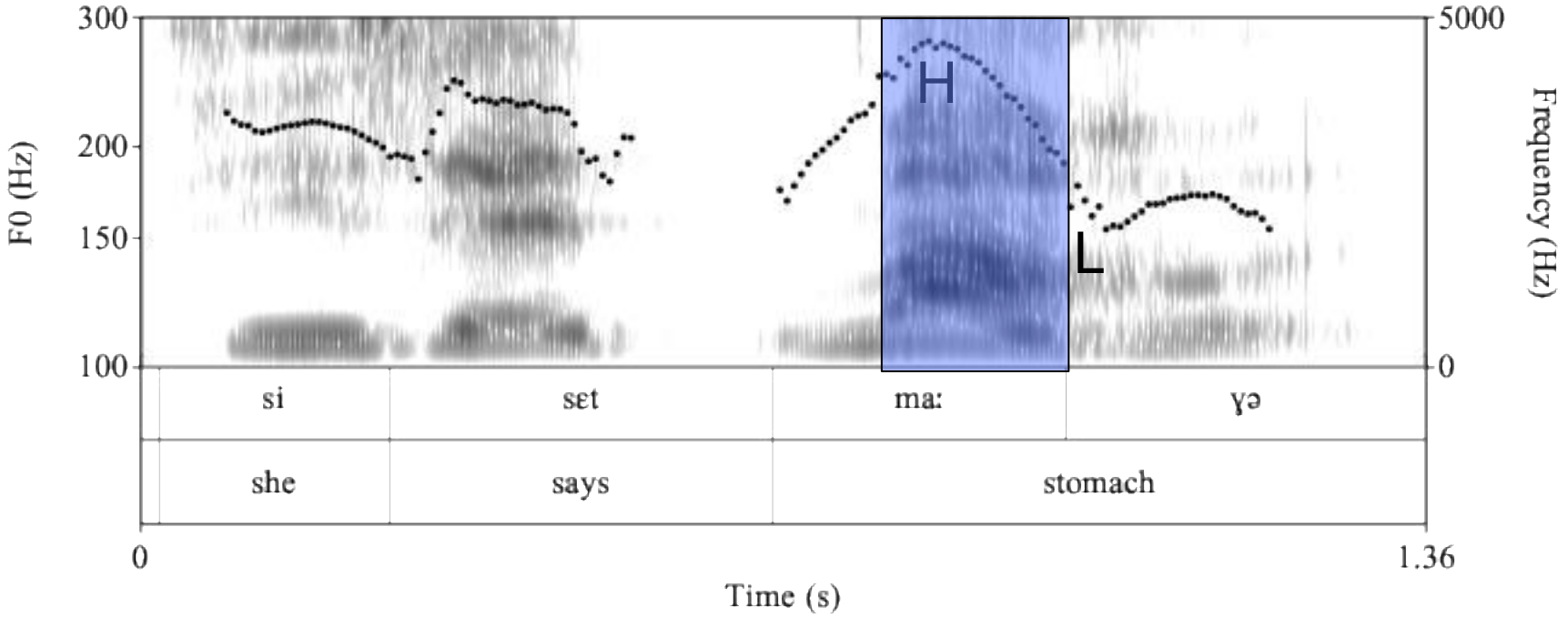
- “We interpret this fact as a tonal lengthening due to the lexical tone on accent 2 words, which remains unspecified in terms of “high” or “low”, as no tone on the same syllable is available to provide a tonal feature. The lexical tone, represented as T_{lex}, can be interpreted as an empty tonal node whose phonetic implementation consists in a lengthening of the syllable with which it is associated.”

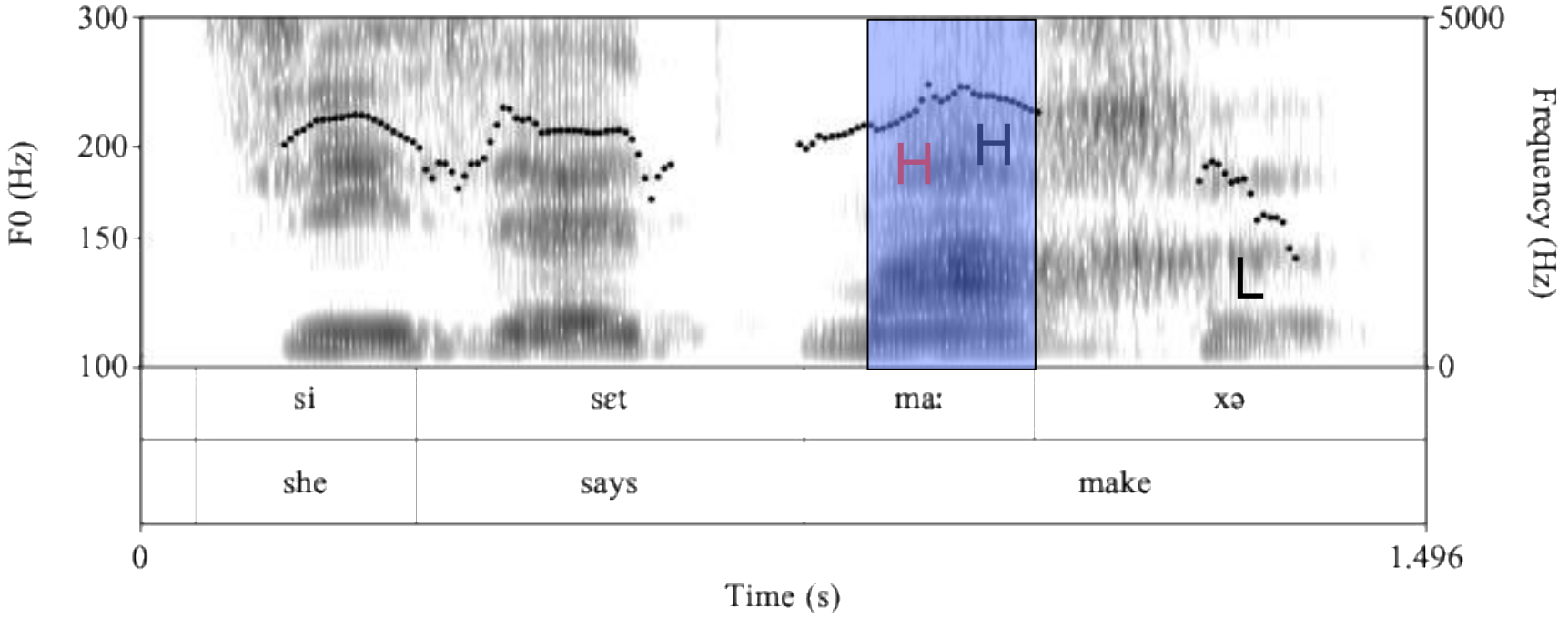
Int, post-focus, non-final, Accent 1



Int, post-focus, non-final, Accent 2



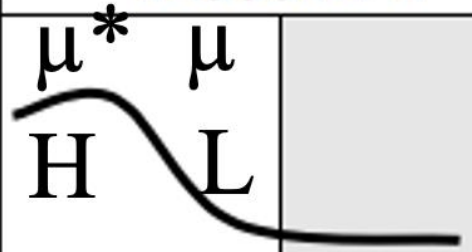
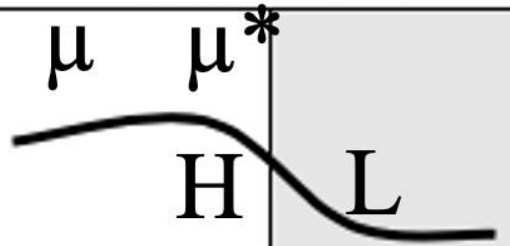
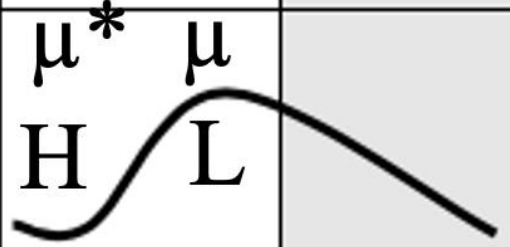
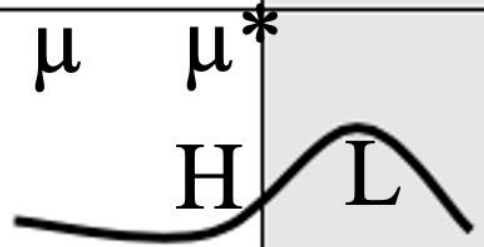




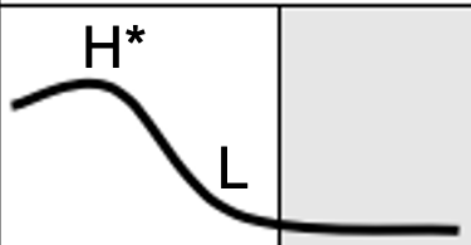
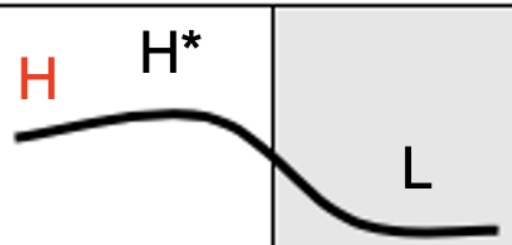
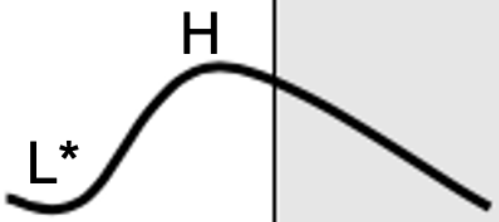
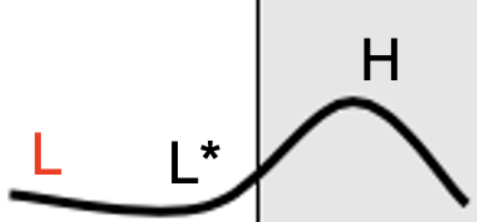
Tonal analysis for Cologne:
extra lexical tone on Accent 2

The tonal approach

- How would you evaluate the analysis?
- How does it compare to the mora stress analysis?

Context		Accent 1	Accent 2
Declarative, non-final position	H*L		
Interrogative, non-final position	L*H		

Mora stress/accent

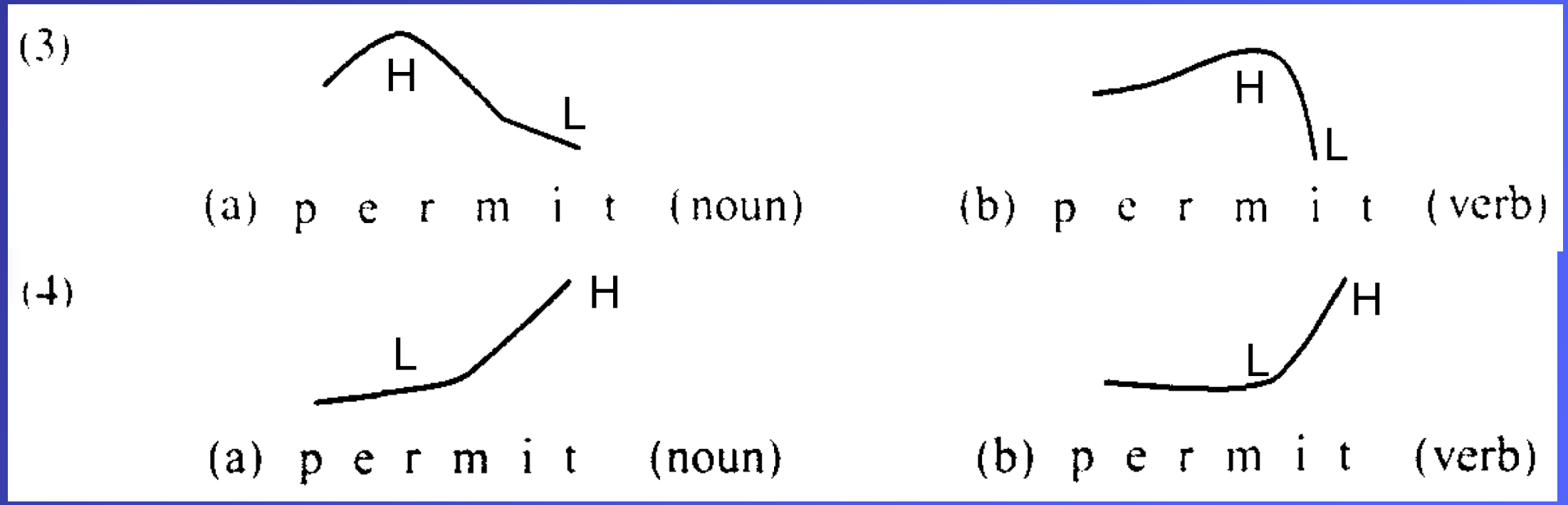
Context		Accent 1	Accent 2
Declarative, non-final position	H*L		
Interrogative, non-final position	L*H		

Lexical tone

Some of my conceptual concerns regarding lexical tone

- Using lexical tone is fine, I guess, if there really *can't* be stress-related contrasts within syllables
- But…
  - the invisible lexical tone makes the timing difference look coincidental – is that all there is to say?
  - no other tone language has been described that changes a lexical tone because of an intonational tone – isn't that a bit strange?
  - contours not that different from what German/Dutch/English generally sound like (next slide)

Syllable-based intonational timing differences in English statements and yes-no questions (Ladd 2008)



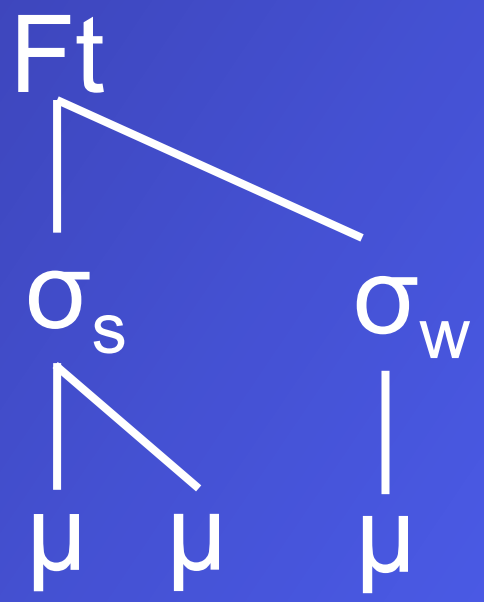
- Not *that* different from the Franconian contours, right? Is that mere coincidence?

My claims (to be defended)

- The similarities between Dutch/English/German and the Cologne-type ‘Franconian’ contours are not coincidental
- Franconian has a similar but more ‘fine-grained’ metrical system than Dutch/English/German
- Basic contrast: Accent 1 counts strong and weak syllables (syllabic trochee), Accent 2 counts strong and weak moras (moraic trochee)

Some abstract structures (slightly simplified)

Accent 1
counts syllables



Accent 2
counts moras

How stress/foot structure is expressed across languages

- A few prototypical correlates of feet
  - Realization of intonational contours (as we have seen)
  - Consonantal patterns
  - Durational patterns
  - Vocalic patterns
- Each of these types exists in at least some Franconian dialects

→ In line with a foot-based analysis, but less expected with tone

Some examples from Franconian

- Tonal patterns (as seen above, more later)
- Consonantal patterns
- Durational patterns
- Vocalic patterns (skipped for this week)

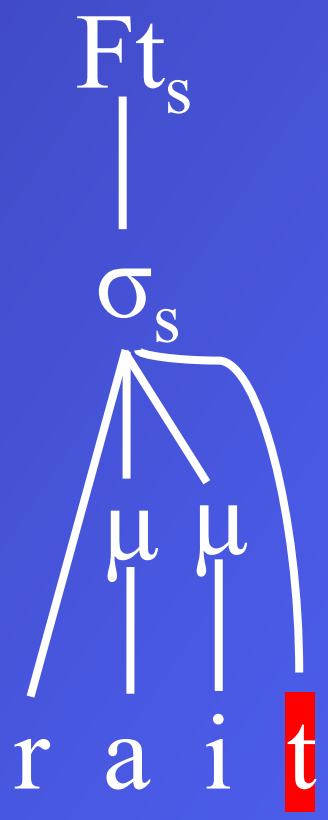
Some examples from Franconian

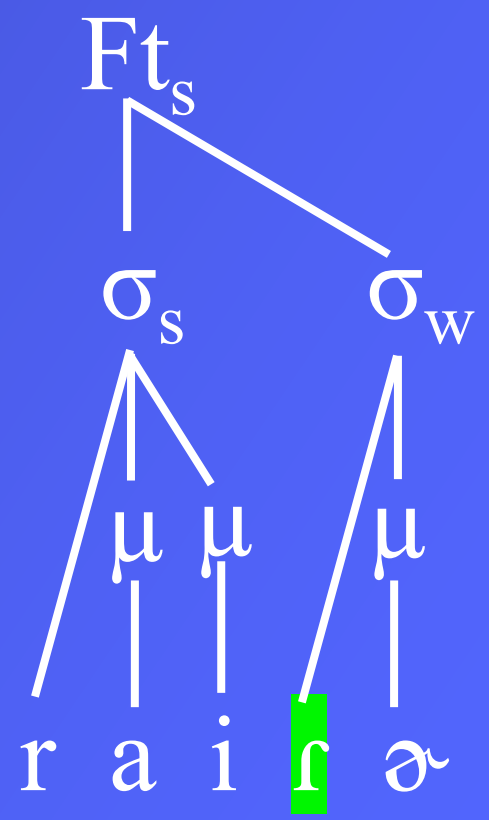
- Tonal patterns
- Consonantal patterns
- Durational patterns

A generalization on consonants and foot structure

(e.g. Honeybone 2008, 2012 for overview)

- Stronger consonants preferred at the edge of feet or outside of feet
- Weaker consonants preferred in the middle of feet
- English ‘write’ vs. ‘writer’





Consonants and feet in Franconian dialects (Köhnlein & Cameron 2024)

Some Franconian dialects show synchronic interactions of accent and the voicing quality of word-medial consonants:

1. Disyllabic words with medial voiced (weaker) consonants always receive Accent 1

Examples: *Always* [iː^{1}zən] ‘iron’, [drøː^{1}mən] 'to dream'

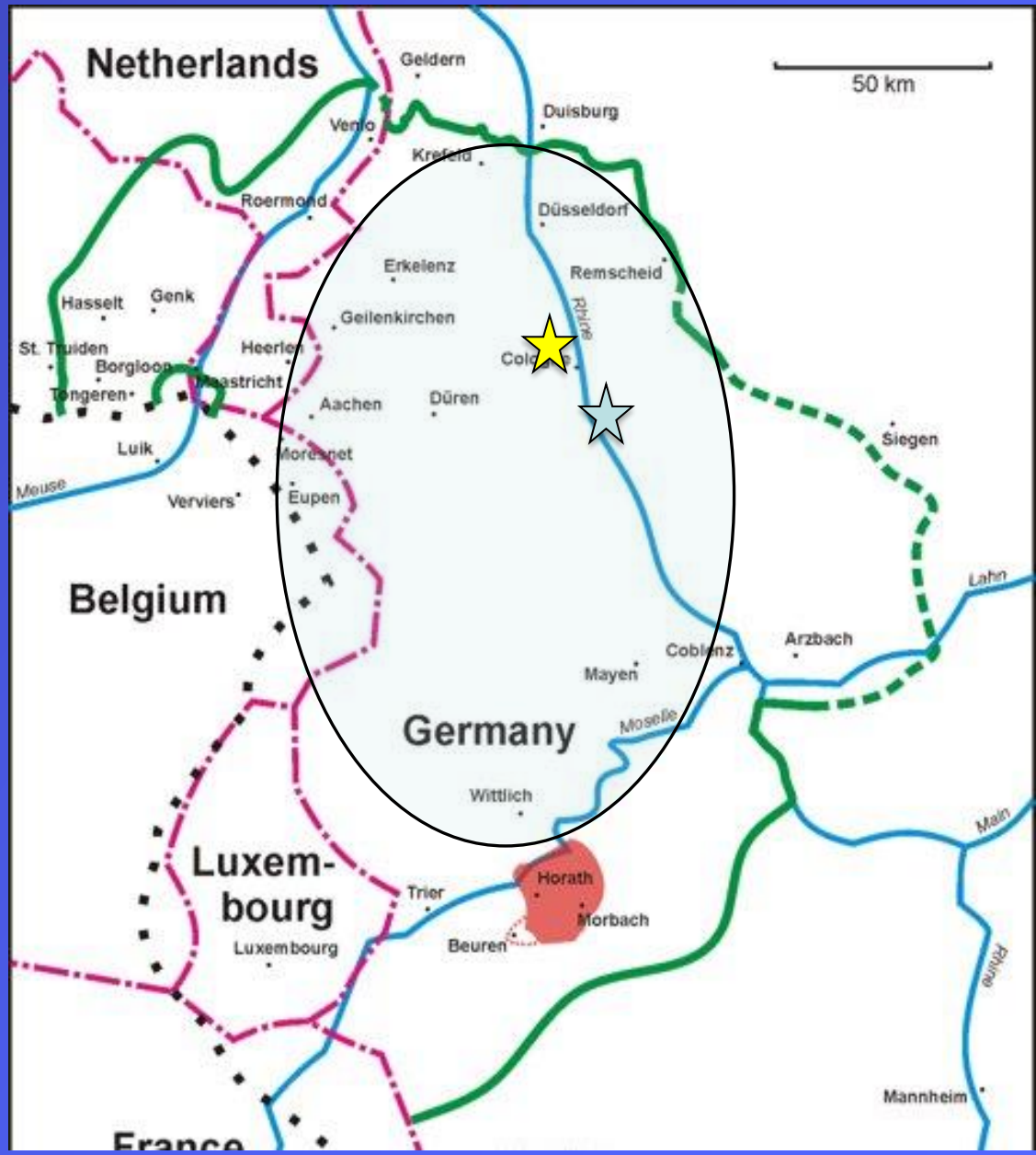
2. Disyllabic words with medial voiceless (stronger) consonants typically receive Accent 2, though some words receive Accent 1 (ask if you want)

Examples: *Typically* [riː^{2}sən] ‘to tear’

Data

- Disyllabic words from two grammars (longest basic words in the language)
- Müller (1900) – Aegidienberg ☆
- Münch (1904) – Cologne ★
- *Consonant Voicing → Accent* stated explicitly by both Müller (1900: 3) and Münch (1904: § 20, 21)

- (Some morphologically conditioned exceptions)



End of Day 2

Data – Cologne as an example

Voiced medial C: Accent 1

- [maː^{1}ɣə] ‘stomach’
- [oː^{1}ɣə] ‘eye’
- [lɔː^{1}ɣə] ‘sites’
- [luː^{1}zə] ‘to delouse’
- [freː^{1}zə] ‘to freeze’

Voiceless medial C: Accent 2

[maː^{2}xə] ‘stomach’

[stri^{2}ːfə] ‘stripes’

[loː^{2}fə] ‘to run'

[riː^{2}sə] ‘to tear’

[ʃliː^{2}sə] ‘to split’

Data – Aegidienberg as an example

Voiced medial C: Accent 1

- [iː^{1}zən] 'iron'
- [ʃuː^{1}vən] 'shove'
- [jaː^{1}ɣən] 'to hunt'
- [vɔː^{1}dər] 'words'

Voiceless medial C: Accent 2

[riː^{2}sən] 'to tear'

[ʃuː^{2}fəl] 'shovel'

[klaː^{2}fən] 'to gossip'

[laː^{2}xən] 'to laugh'

Data – Words with word-medial ‘sonorants’ always have Accent 1

Accent 1 Cologne

- [leː¹jə] 'to lie, tell a falsehood'
- [drøː¹mə] 'to dream'
- [meː¹nə] 'to mean’
- [knaː¹lə] 'to bang, crack'

Accent 1 Aegidienberg

[leː¹jən] 'to lay'

[drøː¹mən] 'to dream'

[lyː¹nən] 'to pay'

[fyː¹rən] 'to lead'

Generalizations – Restated

1. Disyllabic words with medial voiced (weak) consonants always receive Accent 1.

Always [iː^{1}zən] ‘iron’

2. Disyllabic words with medial voiceless (strong) consonants typically receive Accent 2

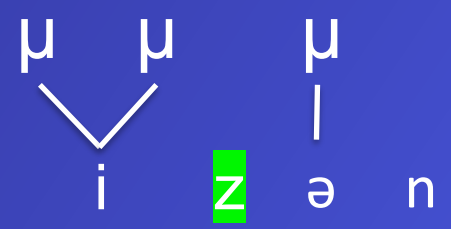
Typically [riː^{2}sən] ‘to tear’

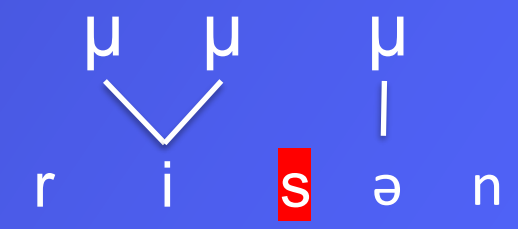
Analytical Claim by Köhnlein & Cameron – basic Ingredients

- Relevant dialects: Voicing/strength of word-medial C influences foot structure = ‘bottom-up process’

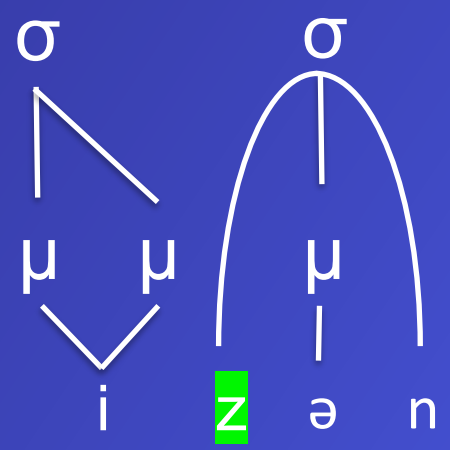
- Note: this goes counter to other traditional assumptions where only top-down is recognized; e.g., Blumenfeld (2006), Rasin (2016)

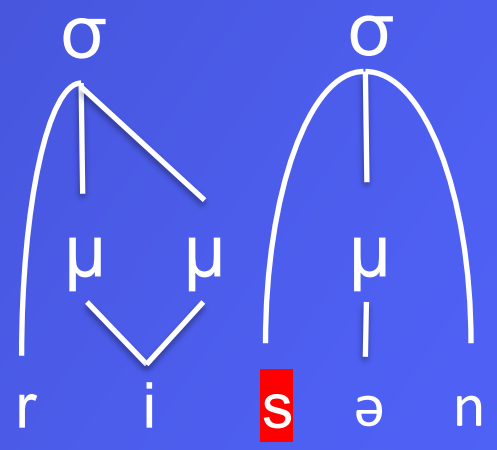
Analytical Claim : Consonant → Foot



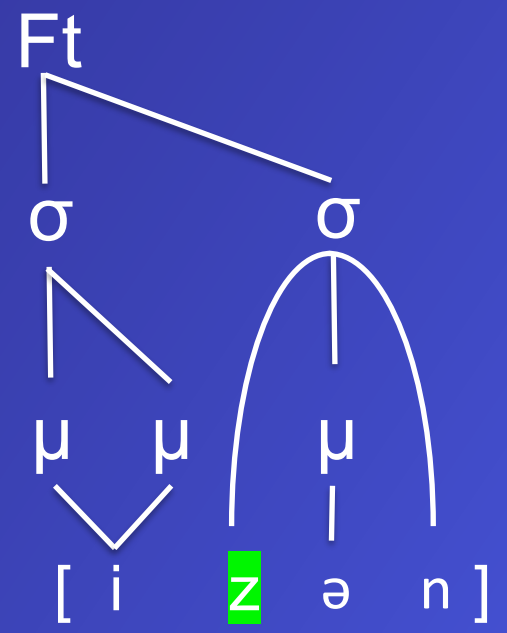


Analytical Claim : Consonant → Foot

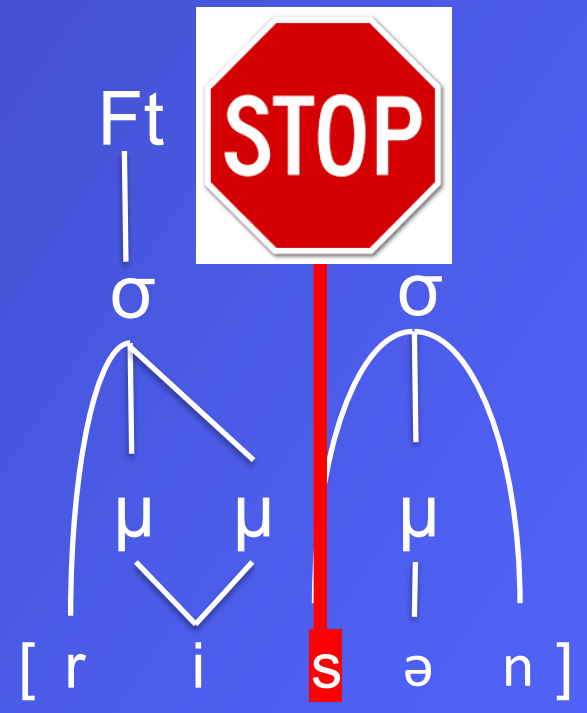




Analytical Claim : Consonant → Foot

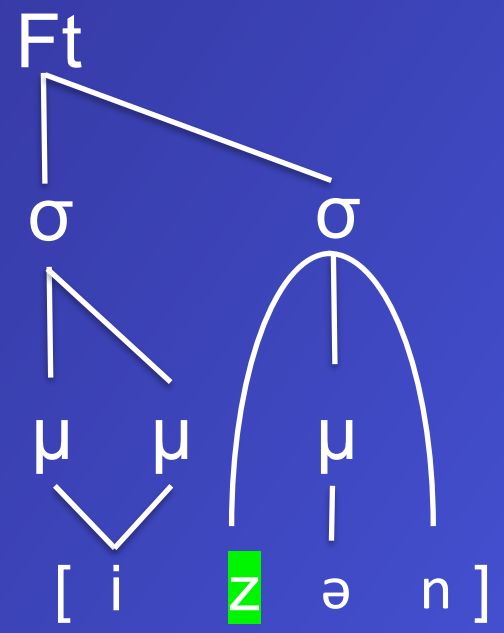


Accent 1

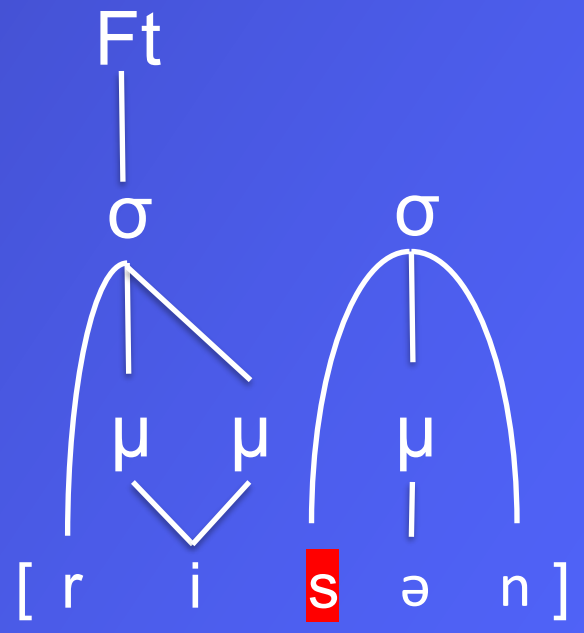


Accent 2

Analytical Claim : Consonant → Foot



Accent 1



Accent 2

Some examples from Franconian

- Tonal patterns
- Consonantal patterns (check = analyzed with feet)
- Durational patterns

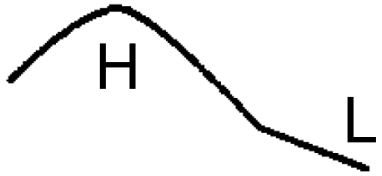
Tonal contrasts in a foot-based approach

- Basic idea: Predictable intonational tones map differently onto the feet for Accent 1 and Accent 2

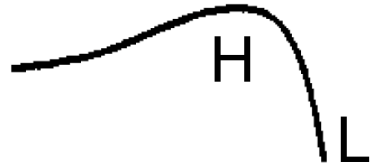
(Köhnlein 2011 et passim, Hermans 2012, Kehrein 2018, Van Oostendorp 2018, Köhnlein & Cameron 2024)

Common pattern in stress systems (typically across syllables)

(3)



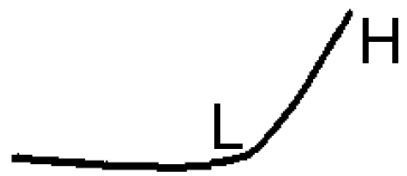
(a) p e r m i t (noun)



(b) p e r m i t (verb)

(4)

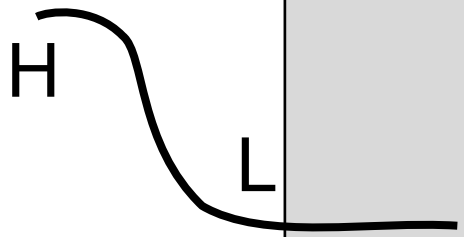
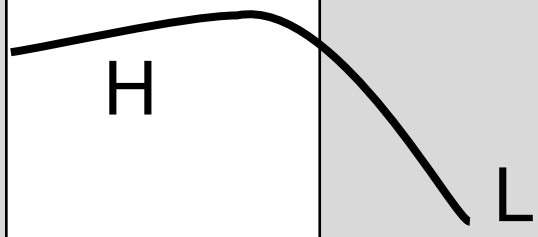
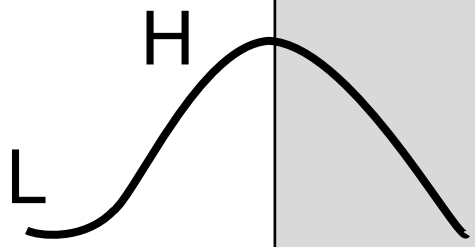
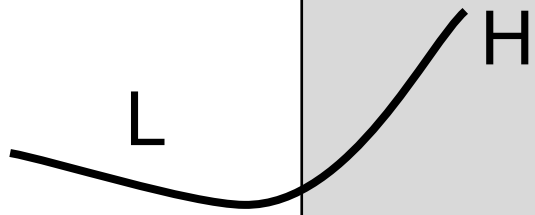
(a) p e r m i t (noun)



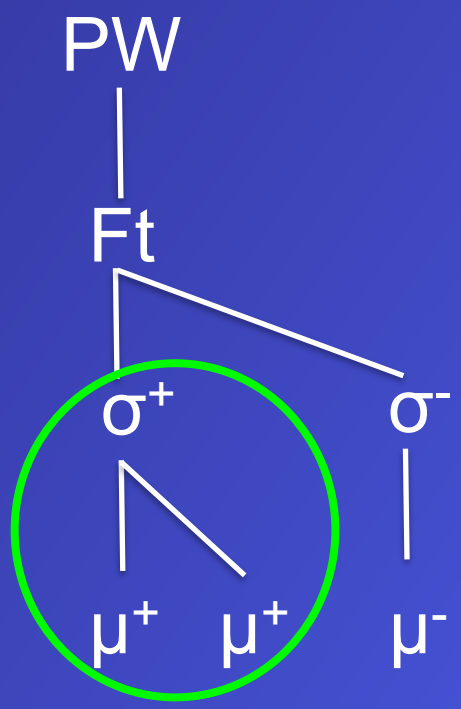
(b) p e r m i t (verb)

- Left: stressed and unstressed syllable get a tone
- Right: stressed final syllable gets both tones

Tonal Contours Plus Tones

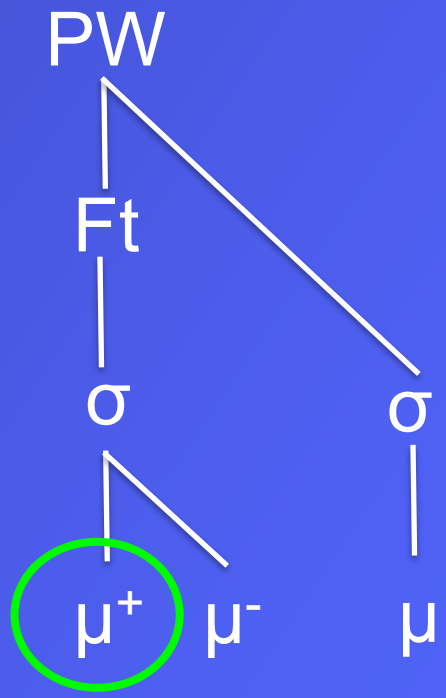
	Cologne (Peters 2006)			
	Accent 1		Accent 2	
	σ	σ	σ	σ
Declarative HL				
Interrogative LH				

Foot Structures and Head Domains



Accent 1

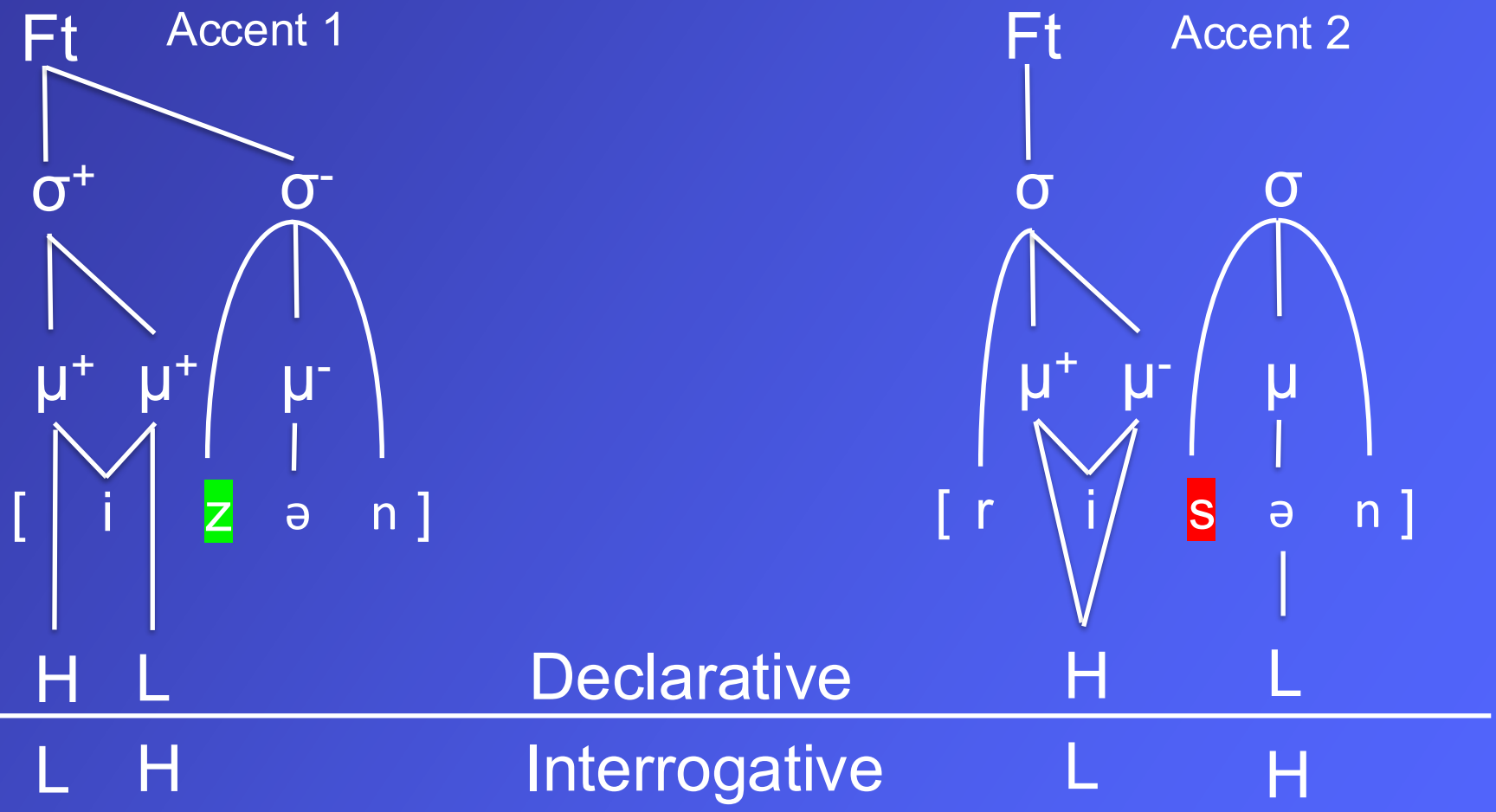
‘Syllabic’ Trochee



Accent 2

‘Moraic’ Trochee

Tones Licensed by ‘Strong’ Moras Only



Some examples from Franconian

- Tonal patterns (check = analyzed with feet)
- Consonantal patterns (check = analyzed with feet)
- Durational patterns
- Vocalic patterns (skipped for today)

Duration in Franconian

- In various dialects, durational contrasts enhance the tonal opposition between Accent 1 and Accent 2
- Accent 2 is significantly longer than Accent 1 (Peters 2006 for Cologne)
- Analysis in a foot-based approach
  - Duration as a correlate of foot structure is expected under a foot-based approach
  - A foot has a certain phonetic duration that is divided between its members (e.g., Prince 1980, Odden 1997 for Estonian)

Some relevant data from Aachen

(work with Phuong Dang, dialect comparison with Tianyi Ni)

- **Participants:**
  - 8 native speakers (5 male, 3 female, age range: 58 – 80, mean age: 72.5)
- **Materials:**
  - 4 near-minimal pairs of disyllabic words
  - (6 potential minimal pairs of monosyllabic words)

Methods

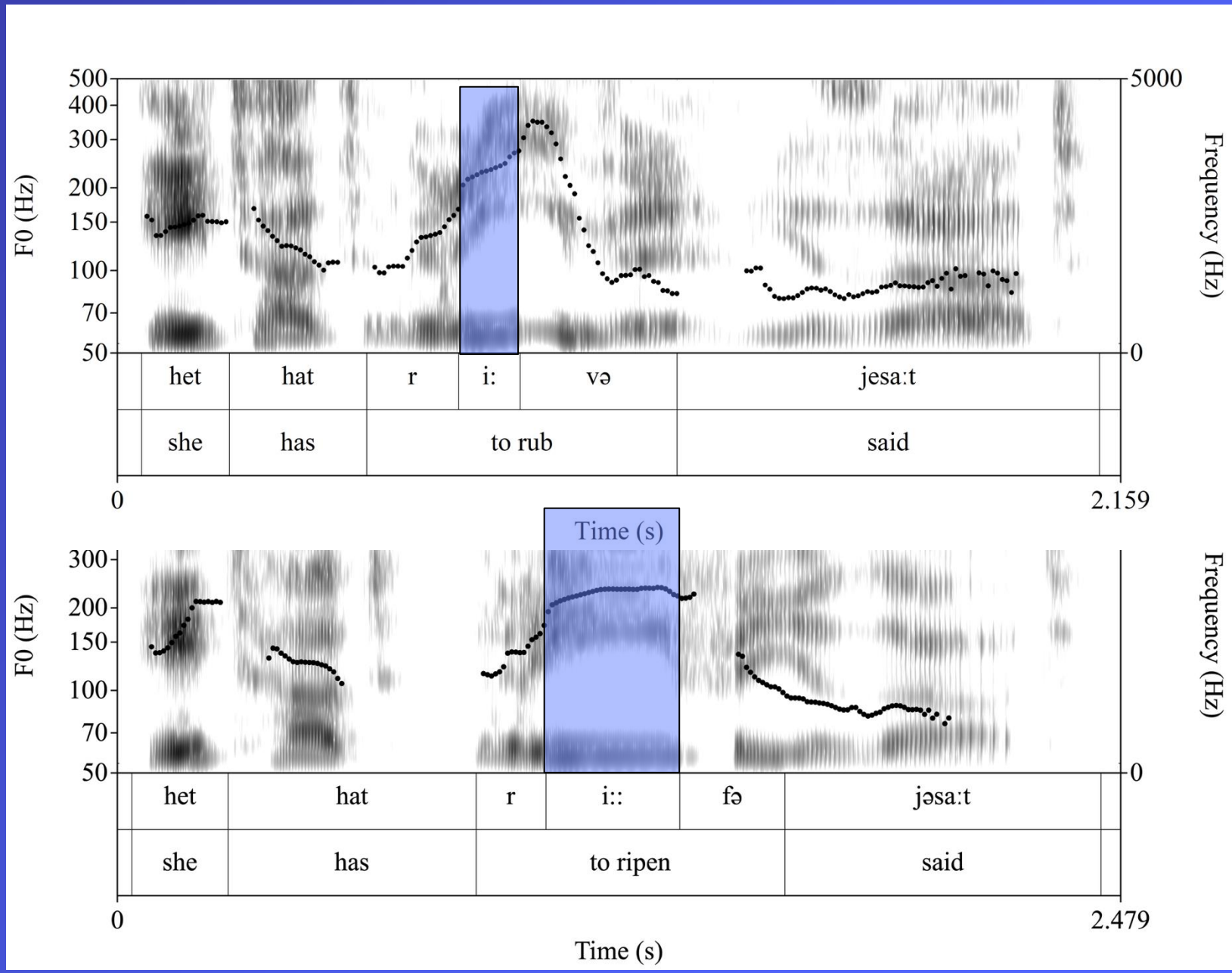
- **Carrier sentences**
  - 4 carrier sentences varying in sentence types (declarative vs. interrogative) and sentence positions (final vs. non-final)
- **Data collection**
  - Participants read the list of monosyllabic and disyllabic words embedded in four carrier sentences twice
- **Statistical analysis**
  - Mixed-effects linear regression (DV: vowel duration, IV: positions & following consonant voicing, random effects for subjects and items)

Example from Aachen (tone correlate not that clear)

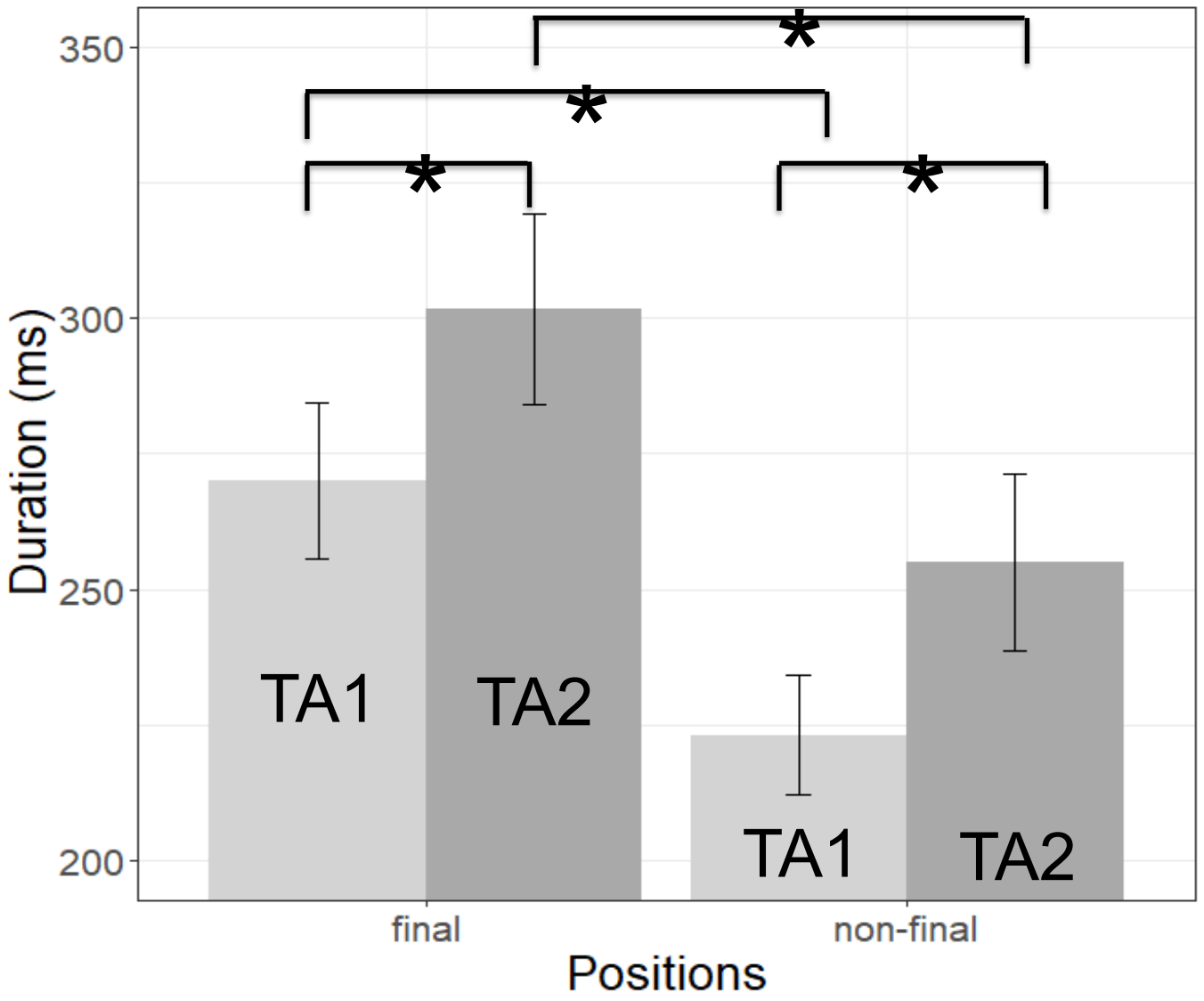
[riː^{1}və] ‘to rub’

Speaker: m, 59, recorded himself

[riːː^{2}fə] ‘to ripen’



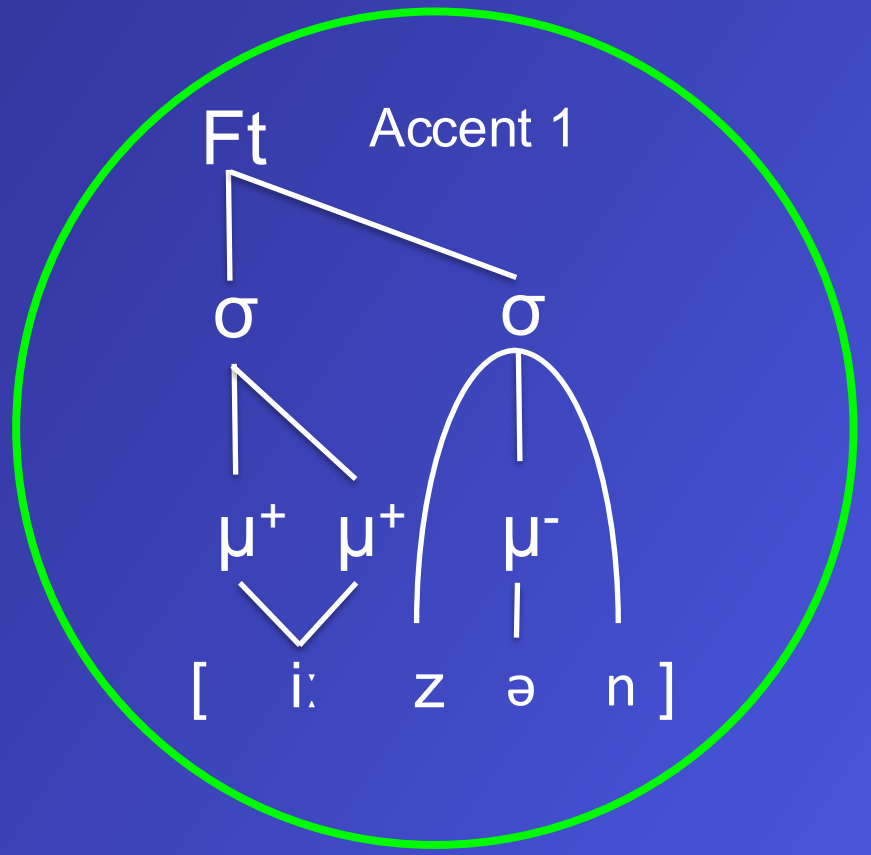
Stressed vowel duration in Aachen disyllabic words



TA1 = Accent 1 before voiced C

TA2 = Accent 2 before voiceless C

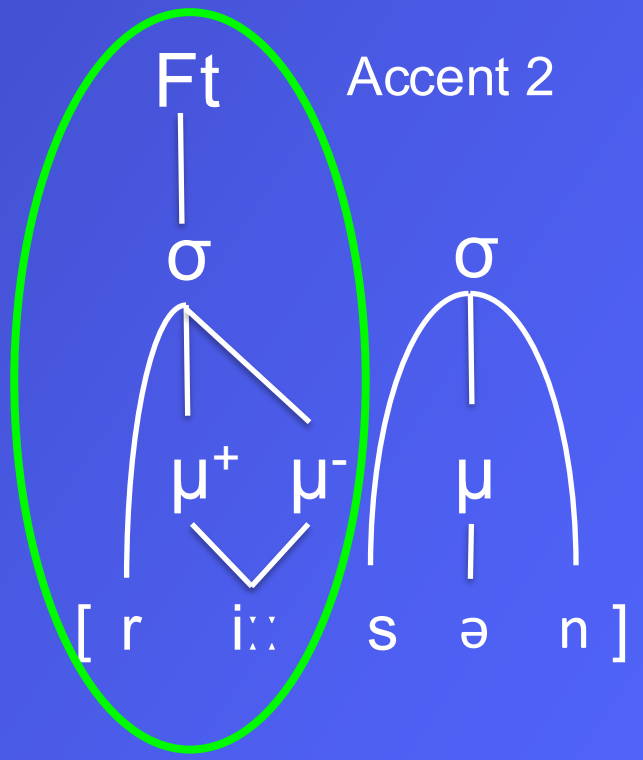
Durational correlates: Accent 1



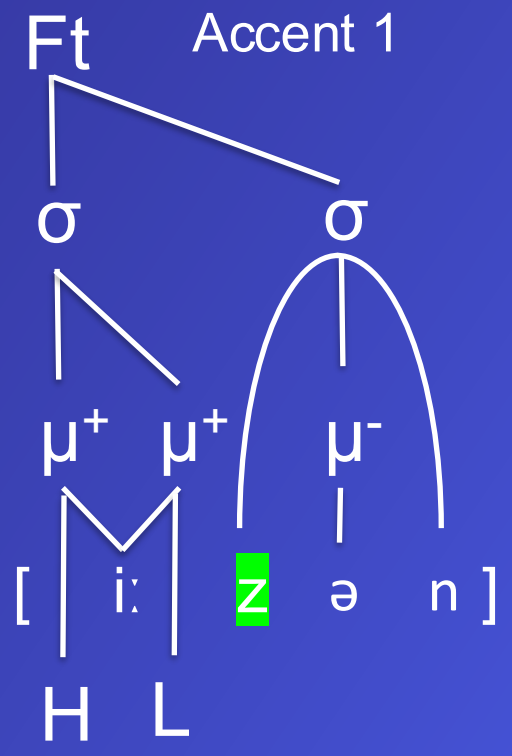
- Stressed syllable + unstressed syllable is the foot
- Duration of the foot only partially expressed in the stressed syllable: Syllable is long

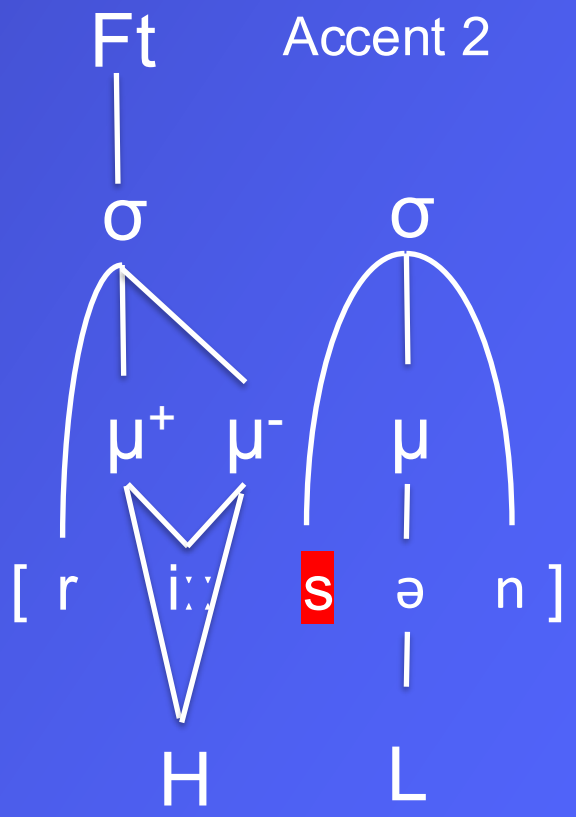
Durational correlates: Accent 2

- Stressed syllable is the whole foot
- Duration of the whole foot expressed in the stressed syllable: Syllable is overlong
- Ni, Rocker & Köhnlein 2025 for a different mechanism in Low German to express similar structures



Everything put together

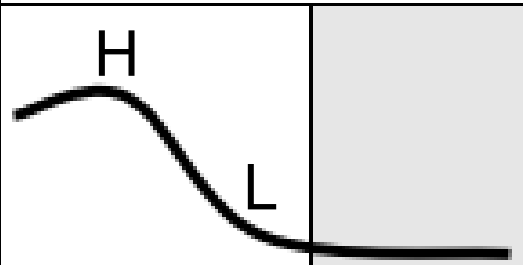
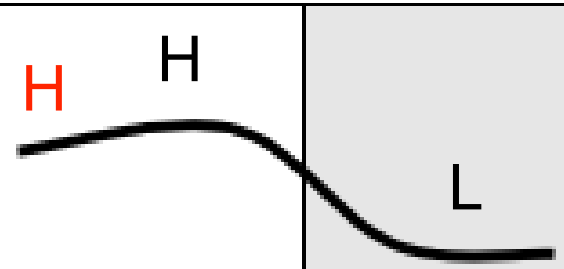
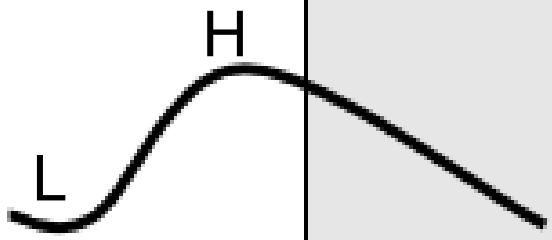




Foot-based approach =
unified analysis of various co-occuring phenomena

- Tonal patterns (check; analyzed with feet)
- Consonantal patterns (check; analyzed with feet)
- Durational patterns (check; analyzed with feet)

So why not lexical tone?

Context	Accent 1	Accent 2
Declarative, non-final position		
Interrogative, non-final position		

Early Late

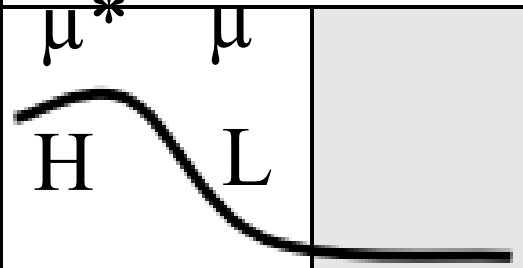
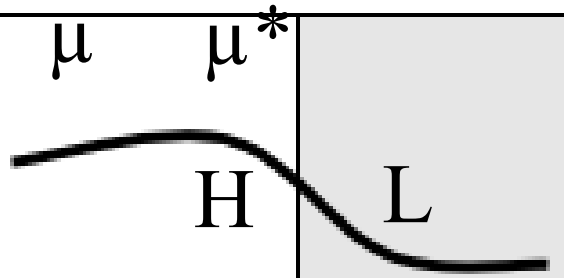
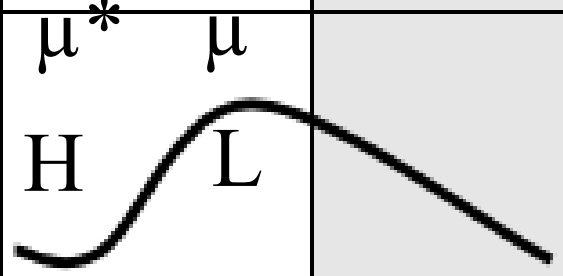
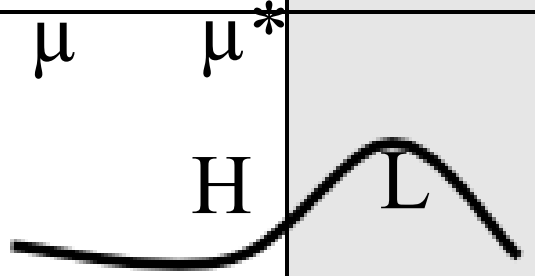
Some reasons, referencing my initial concerns

- The ‘invisible’ lexical tone makes the timing difference look coincidental – follows from foot approach
- No other tone language has been described that changes a lexical tone because of an intonational tone – not needed in foot approach
- Franconian contours not that different from what German/Dutch/English generally sound like – is that mere coincidence? No, at least not under the foot approach; they are closely related metrical systems

Some more reasons

- It doesn’t need to assume an arbitrary lengthening rule → lengthening follows from invoking foot structure\
- Interactions with word-medial consonant voicing not straightforward

So why not ‘moraic stress’?

Context	Accent 1	Accent 2
Declarative, non-final position H*L		
Interrogative, non-final position L*H		

Early Late

Some reasons

- Can model the tonal patterns, but…
- Doesn’t have much to say about interactions with voicing in the following syllable or Accent-2 lengthening

→ I’d say: advantage for the foot

So what does this all mean?

- If on the right track, this analysis suggests that the long prevalent assumption ‘stress = feet = syllables’ is too simplistic

→ There exist rhythmic/timing contrasts below the syllable level

→ Not ne necessarily two types of stress, but different domains are possible (in line with the assumption that feet can count syllables or moras)

- Approach emerges from a detailed study of an individual language via unifying several phenomena using the same machinery

However

Accent 2 = monosyllabic Ft
Accent 1 = disyllabic Ft

- But what about these words? How do they get Accent 1?

/luu^{1}s/	‘clever’	/luu^{2}s/	‘louse’
/kan^{1}/	‘can, bottle’	/kan^{2}/	‘be able’ (SG)
/daa^{1}x /	‘day-DAT’	/daa^{2}x	‘day-NOM’
/huu^{1}s/	‘house-DAT’	/huu^{2}s/	‘house-NOM’
/brau^{1}t/	‘(he/she) brews’	/brau^{2}t/	‘bride’[1]

Four types of words

- ‘Disyllabic’ TA 1: [daʊ^{1}və] ‘pigeon-pl.’
- ‘Disyllabic’ TA 2: [dau^{2}və] ‘baptism-pl.’
- ‘Monosyllabic’ TA 1: [dauf^{1}] ‘pigeon-sg.’
- ‘Monosyllabic’ TA 2: [dauf^{2}] ‘baptism-sg.’

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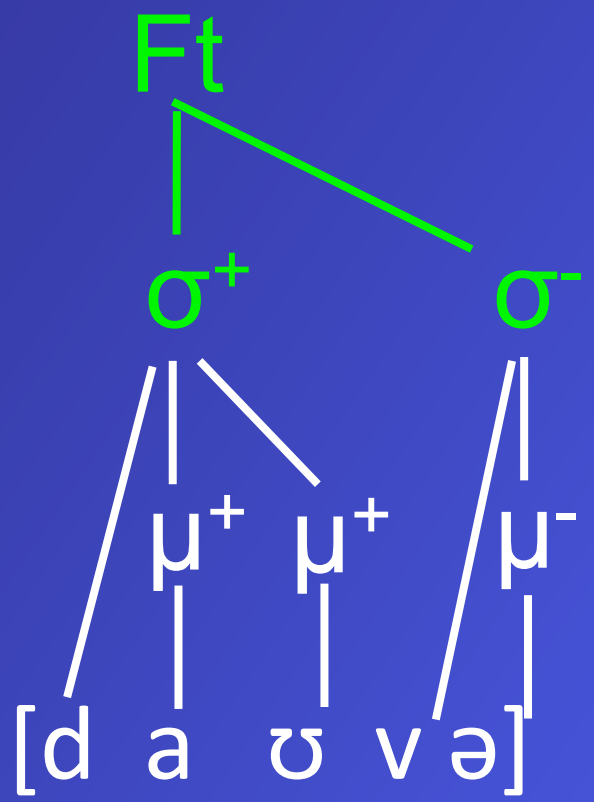
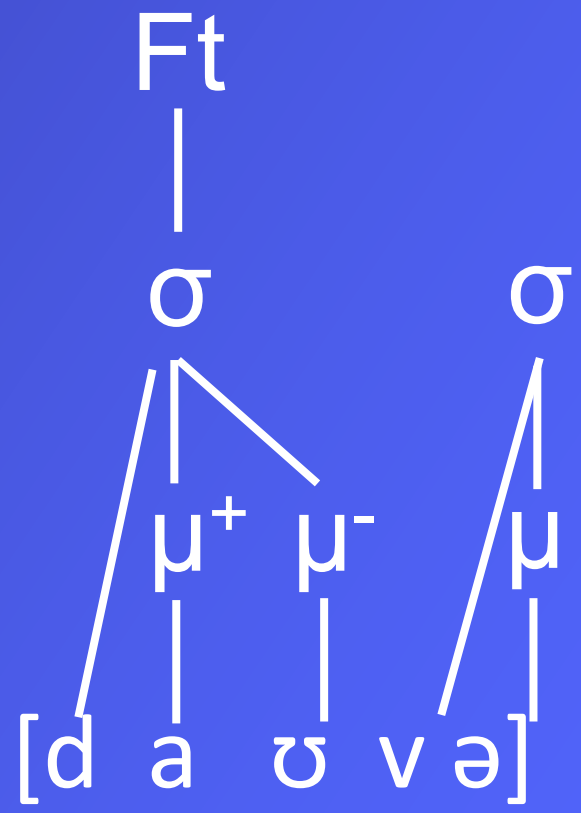
Accent 1



Accent 2



Faith (Ft-Hd) >> *UnevenTrochee

Four types of words

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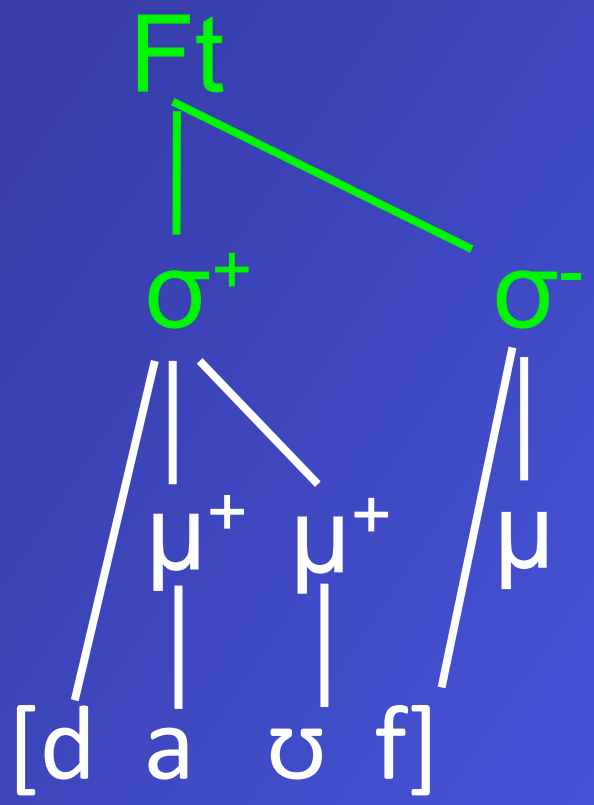
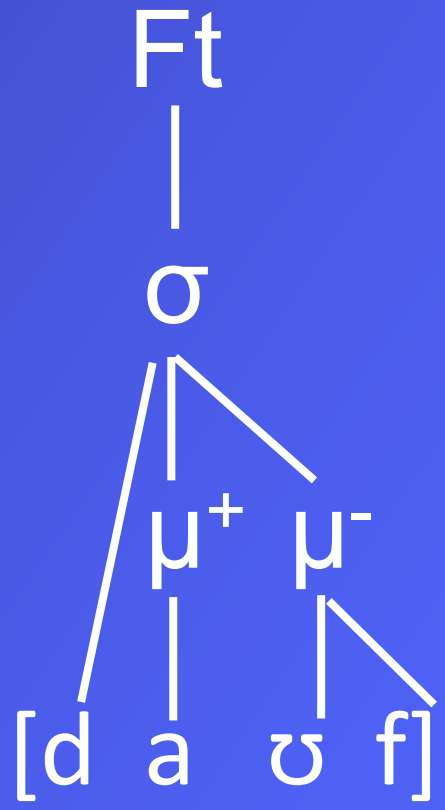
Accent 1



Accent 2



‘Monosyllabic’ Accent 1: Bisyllabic foot with an empty-headed second syllable

Empty-headed syllables

- Essentially syllables with an empty nucleus
- Have been proposed in various phonological frameworks (either obligatory or optional)
  - Kaye (1990), Kiparsky (1991), Harris (1994), Van Oostendorp (1995), Lowenstamm (1996), Harris & Gussmann (2002), Scheer (2004), among many others

How could we make an analysis like this stronger?

- Claims imply that one foot per language might be insufficient to understand the metrical structure across the world's languages
- Permits foot-related tonal contrasts within syllables
- Assumes that Franconian consonant-final words *can* end in an empty-head syllable

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Parallels in Estonian

(based on Köhnlein& Cameron 2024)

- Estonian is well known for its three-way durational opposition (Q1, Q2, Q3)

Quantity contrast in Estonian		
a. [sada] 'hundred'	[sa:da] 'send, imperative	[sa::da] 'to receive'
b. [lina] 'flax'	[lin:a] 'town, gen-sg'	[lin::a] 'town, part-sg'

- Over time, the durational contrast between Q2 and Q3 has been accompanied by a pitch contrast (Lehiste 2003 for summary)
- Similar to Cologne, just that the longer accent has falling tone, and the shorter one level tone

Consonant Gradation

- Consonant Gradation: morphophonemic alternations
- Five paradigms, most comparable cases to Franconian shown below
- Q2 = weak grade; Q3 = strong grade

	'sad'	*Grade*
Nom. Sg.	kur:p (Q3)	*strong*
Gen. Sg.	kurva (Q2)	*weak*
Part. Sg.	kur:pa (Q3)	*strong*
Nom. Pl.	kurvat (Q2)	*weak*
Gen. Pl.	kur:pate (Q3)	*strong*
Part. Pl.	kur:pi (Q3)	*strong*

	'pole'	Grade
Nom. Sg.	teivas (Q2)	*weak*
Gen. Sg.	tei:pa (Q3)	*strong*
Part. Sg.	teivast (Q2)	*weak*
Nom. Pl.	tei:pat (Q3)	*strong*
Gen. Pl.	teivaste (Q2)	*weak*
Part. Pl.	tei:pait (Q3)	*strong*

Theoretical approaches

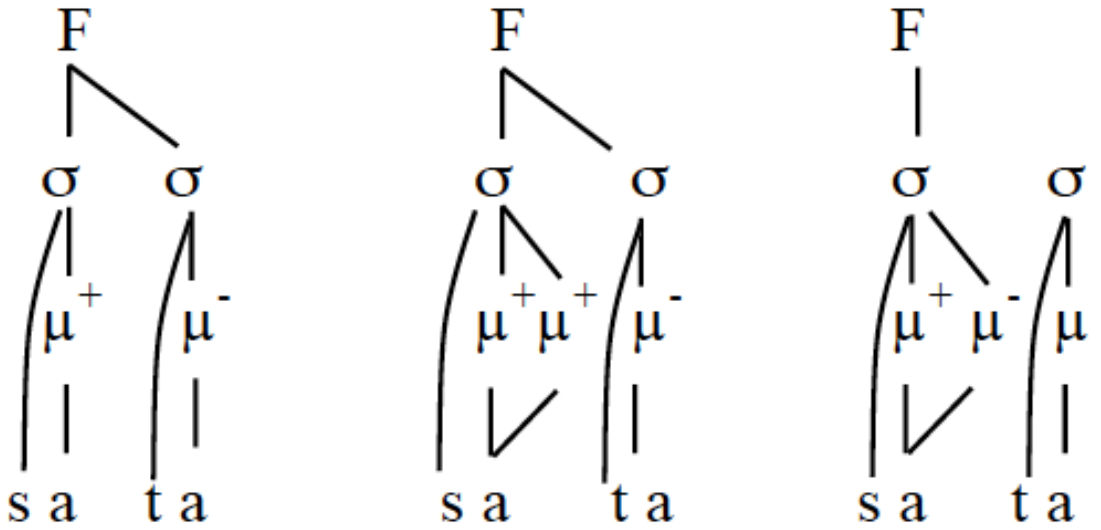
- Vast amount of theoretical literature
- **Ternary analysis**: three degrees of vowel length (e.g. Hayes 1995, Bye 1997, Pöchtrager 2006)
- **Binary analysis I**: one or two V-slots, one or two moras (e.g. Ehala 2003, Spahr 2013, 2014)
- **Binary analysis II**: one vs. two moras, monosyllabic vs. disyllabic trochees (e.g. Prince 1980, Odden 1997, Prillop 2020 – we follow this line of work)

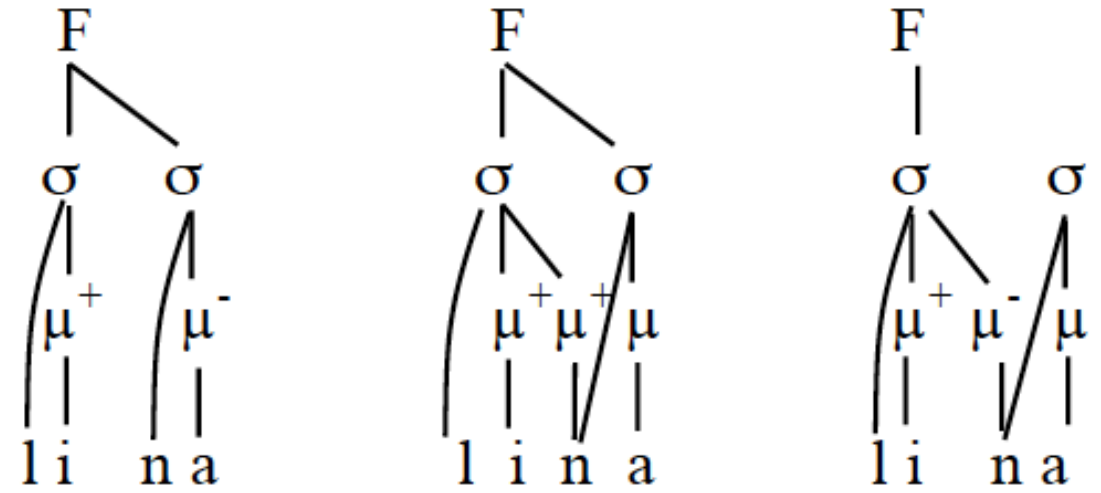
Foot-based approach (duration): Prince (1980), moraic version Odden (1997)

- Bimoraic syllables contrast in foot structure
- Durational differences express the difference in metrical structure on the surface
- Monosyllabic foot longer than first syllable of disyllabic foot (this is what we adopted for Cologne)

Surface representations for three degrees of overlength in Estonian

Q1 Q2 Q3

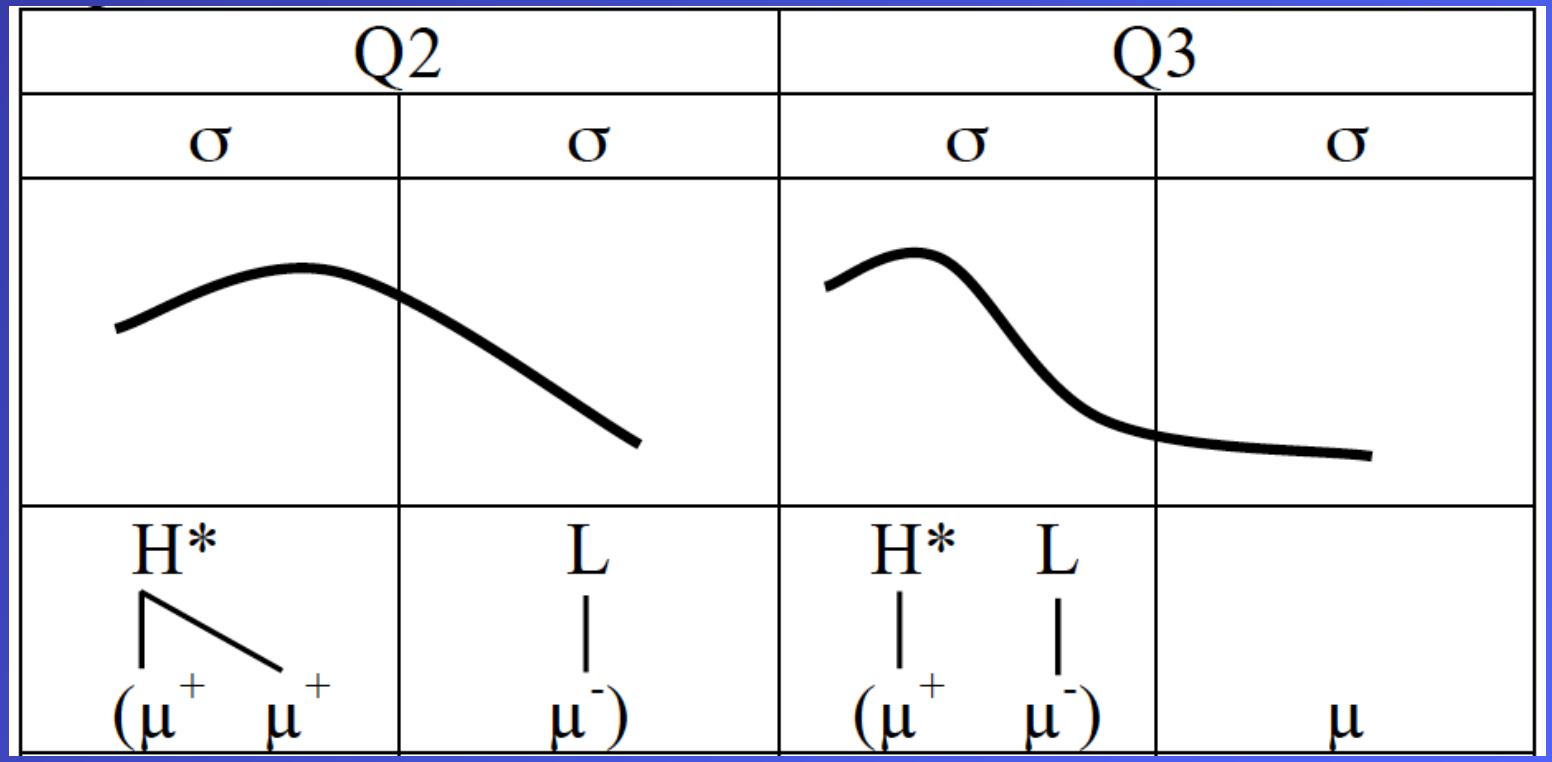




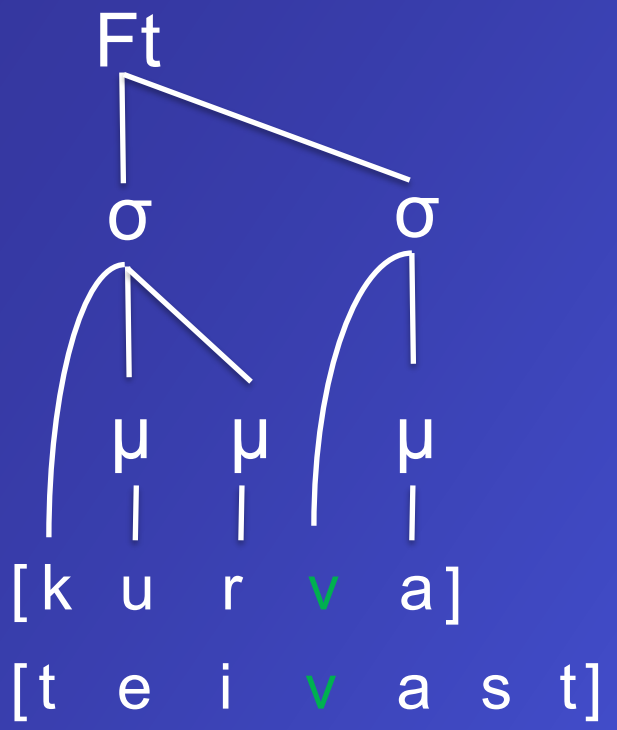
Foot-based approach (tone)

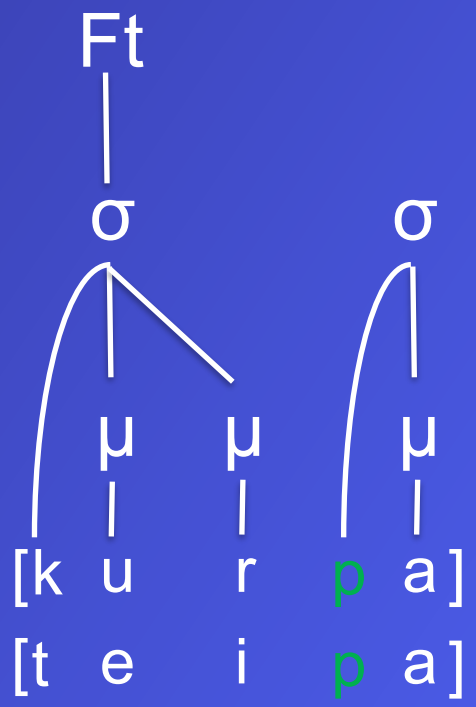
- Q3 = HL, Q2 = H
- Grammar: In Estonian, every mora can license tones, but strong moras avoid low tone (Constraint: *Hd/L, de Lacy 2002)
- Comparable to the analysis of Arzbach Franconian in Köhnlein (2011, 2016)

Effects of *Hd/L in Estonian (contours adapted from Lehiste 1997)



Foot-based Approach (Gradation)





	'sad'	'pole'
Gen. Sg.	kurva	tei:pa
Part. Sg.	kur:pa	teivast

Summary Estonian

- Word-medial C voicing correlates with Tonal Accent in certain Franconian dialects (as well as with Estonian quantity)
- Additional correlates
  - Tone
  - Duration
- Unified analysis possible if we assume that…
  - Accent 1 / Q2 is a disyllabic foot, and Accent 2 / Q3 a monosyllabic foot
  - Consonantal strength can influence footing (at least in Franconian)

The general ‘metrical approach’ to tonal accent is an emerging framework

- For other work on Franconian, see e.g. Hermans (2012), Kehrein (2017), Van Oostendorp (2017)
- For Norwegian and Swedish, see Móren-Duóllja (2013), Iosad (2015), Kaldhol & Köhnlein (2021)
- For Scottish-Gaelic, see Iosad (2013), Morrison (2019)
- For Uspanteko, see Köhnlein (2018), Köhnlein & Zhu (2019)

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Top-down interactions with consonant quality I: exceptions to final devoicing

- Some dialects of Franconian did not apply final devoicing in apocopated Accent 1 words (at least) until the 20th century
- Two sources of evidence
  - Described in dialect grammars (Dupont 1910–11; Dupont et al. 2014; Leenen 1915)
  - Results from ‘Willems questionnaire’ (1885), as discussed in Goossens (1978)

Example: Bree dialect (Dupont et al. 2014)

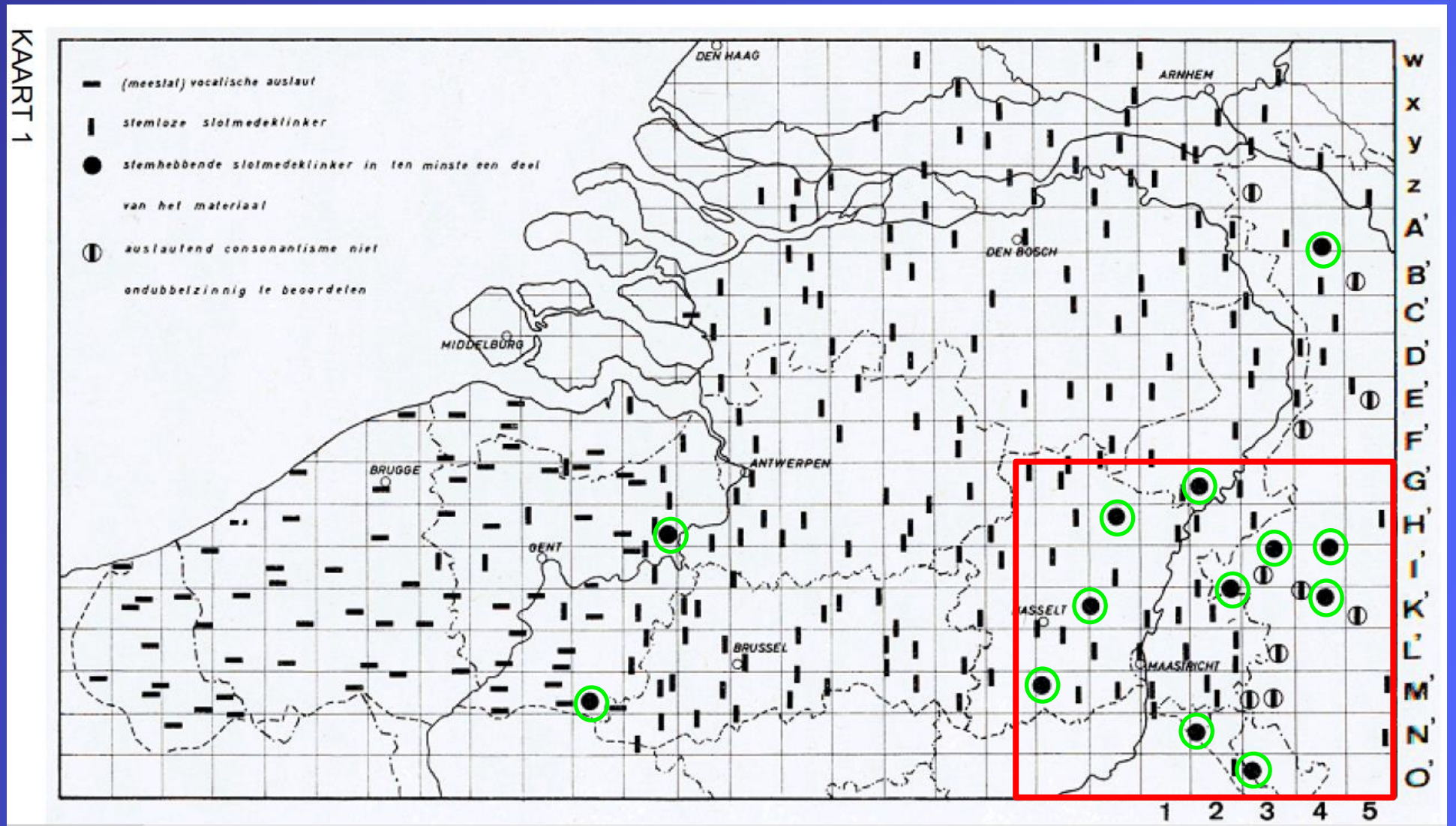
- /bliiv/ ‘stay (stem)’

→ [bliif^{2}] ‘stay!’ vs. [bliiv^{1}] ‘(I) stay’

- /glaaz/ ‘glass’

→ [glaas^{2}] ‘glass’ vs. [glaaz^{1}] ‘glasses’

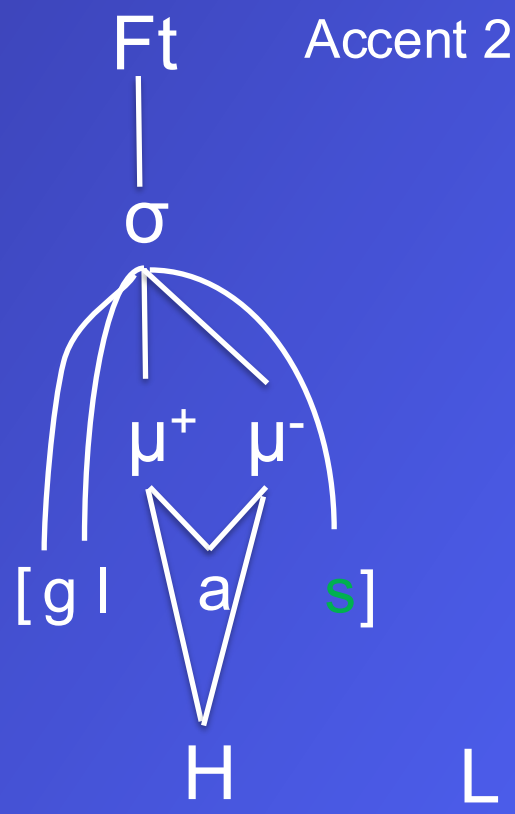
Map from Goossens (1978)
Green = No FD in apocopated forms,
Red = Accent area (roughly)



How to account for this?

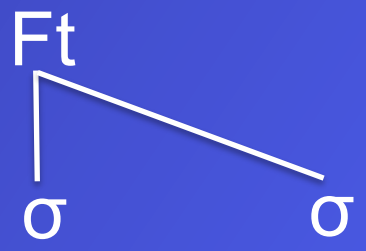
- The non-application of final devoicing appears to indicate that the Accent-1-final consonant is not ‘really’ word-final
- One possible analysis: ‘empty-headed syllables’ = syllables without a nucleus

Bree: /gla$_{\mu\mu}$z/ → [gla:s^{2}]



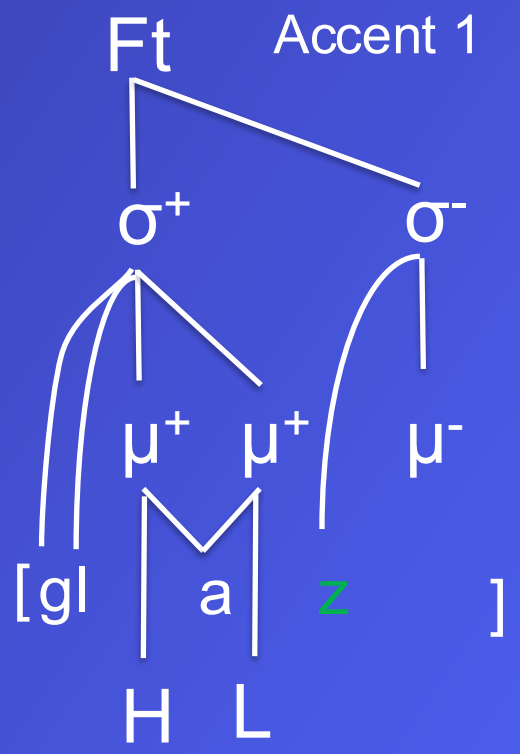
Plural morpheme = syllabic trochee: /gla$_{\mu\mu}$z/ + (σ_s.σ_w)

Generalised Non-linear Affixation (cf. Bermúdez-Otero 2012)

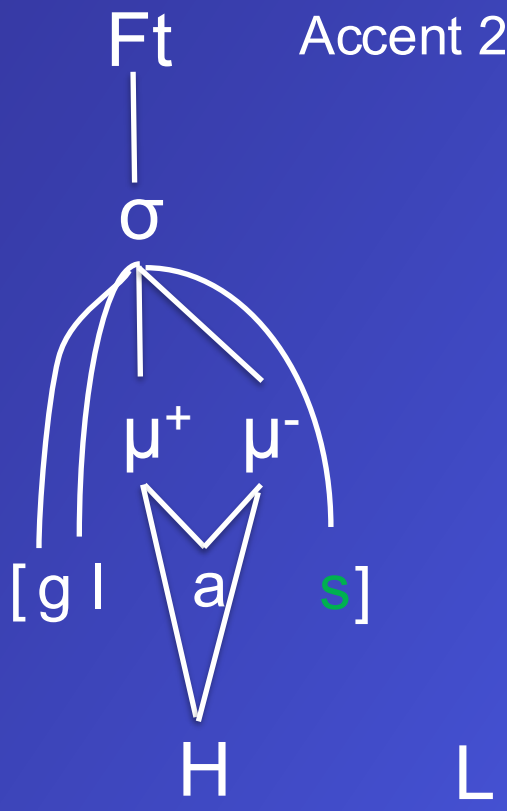
/gla$_{\mu\mu}$z/ + 

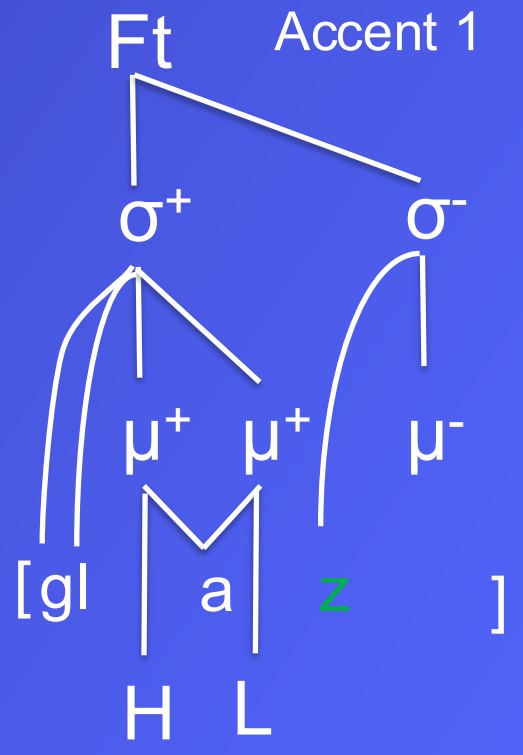
Plural morpheme = syllabic trochee

/gla$_{\mu\mu}$z/ + (σ_s.σ_w) → [gla:.z^1]



[glaaz[1]] ‘glasses’ vs. [glaas[2]] ‘glass’





Top-down interactions with consonant quality II: word-final deletion (coalescence) under Accent 1

- Many German dialects delete word-final plosives in certain contexts (usually plurals, sometimes also datives)
- Phonotactic contexts differ across dialects, but always include /nd/ (obstruent has to be phonologically voiced / lenis)
- All dialects with word-final consonant deletion also delete word-medially (Schirmunski 2010 (1962): 479)
  - [hʊnt] ‘dog’ vs. [hʊn] ‘dogs’
  - [kɪnt] ‘child’ vs. [kɪnɜ] ‘children’

Example from tonal accent: Horath (Reuter 1989)

Nom. Sg.	**Dat. Sg.**	**Nom. Pl**	
hont^{2}	hon^{1}	hɛn^{1}	‘dog’
bant^{2}	ban^{1}	bɛn^{1}	‘ribbon’
kent^{2}	ken^{1}	kenər^{2}	‘child’
lant^{2}	lan^{1}	lɛnər^{2}	‘country’

More cases (taken from Kohnlein 2018)

Word-final and word-medial consonant deletion in Horath Franconian

	nominative singular	*dative singular*	*plural*	
a.	kamp^{2}	kam^{1}	kɛm^{1}	‘comb’
	bant^{2}	ban^{1}	bɛn^{1}	‘ribbon’
	hont^{2}	hon^{1}	hen^{1}	‘dog’
	ʃaŋk^{2}	ʃaŋ^{1}	ʃɛŋ^{1}	‘cupboard’
	gaŋk^{2}	gaŋ^{1}	gɛŋ^{1}	‘walk’
	haŋk^{2}	haŋ^{1}	hɛŋ^{1}	‘slope’
b.	kent^{2}	ken^{1}	kenər^{2}	‘child’
	rent^{2}	ren^{1}	renər^{2}	‘cattle’
	lant^{2}	lan^{1}	lɛnər^{2}	‘country’
	bilt^{2}	bil^{1}	bilər^{2}	‘picture’
	valt^{2}	val^{1}	vɛlər^{2}	‘forest’
	rant^{2}	ran^{1}	rɛnər^{2}	‘edge’
	ʃilt^{2}	ʃil^{1}	ʃilər^{2}	‘sign’
	velt^{2}	vel^{1}	velər^{2}	‘game (animal)’

Analysis: Deletion in onset of unstressed syllable (Köhnlein 2018

UR	**Nom. Sg.**	**Dat. Sg.**	**Nom. Pl**
	Ø	$(\sigma_s.\sigma_w)$	$(\sigma_s.\sigma_w)$ OR /ər/ (plus umlaut)
/hond/	hont^2	hon.n^1	hɛn.n^1
/band/	bant^2	ban.n^1	bɛn.n^1
/kend/	kent^2	ken.n^1	ken.nər^2
/land/	lant^2	lan.n^1	lɛn.nər^2