An Infection Analysis of Across-the-Board Lowering in Jumjum

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Intro

Utterance-final Lowering (p.151)

[**d̪é:ŋ** ↓jɛ́n ʔɔ̂n] ‘cow of the man’

H-tone noun

[**d̪è:ŋ** %] ‘cow’

[**jà:n** jɛ́n ʔɔ̂n] ‘bull of the man’

L-tone noun

[**jà:n** %] ‘bull’

Iterative Utterance-final Lowering (p.153)

[ʔìkɛ̀	**pì:t̪ì**	**mʊ̀k:ìnì** %]	‘He is sowing maize’
ʔìkɛ̀	pí:t̪-í	mʊ́k:í-ní	
3SG	sow:AP-3SG	maize-PL	

[ʔìkɛ̀	**mʌ̀:ɟɔ̀**	**kʊ̀pkɛ̀nɛ̀** %]	‘He opened for Määjo’
ʔìkɛ̀	mʌ́:ɟɔ́	kʊ́p-k-ɛ́n-ɛ́	
3SG	Määjo	open-BEN-PST-3SG>3	

Utterance-initial Utterance-final Lowering (p.153)

[**lɛ̀ŋ**	**ʊ̀làŋ** %]	‘The axe is black’
lɛ́ŋ	ʊ́l-áŋ	
axe:SG	be:black-3SG	

[**tɔ̀ŋ**	**ʊ̀làŋ** %]	‘The spear is black’
tɔ́ŋ	ʊ́l-áŋ	
spear:SG	be:black-3SG	

Null Assumption

Final Lowering realizes a L boundary tone

The Across-the-Board Problem

- **If lowering is due to a L-boundary tone:**
  Why should it spread leftwards
  if Jumjum doesn't have L-spreading elsewhere?

- **If lowering is due to deletion of a final fused H:**
  How can we capture postlexical rule ordering?
  (H-tone coalescence $\rightsquigarrow$ H-deletion)

(cf. Clark 1990 on Igbo)

Proposal in this Talk

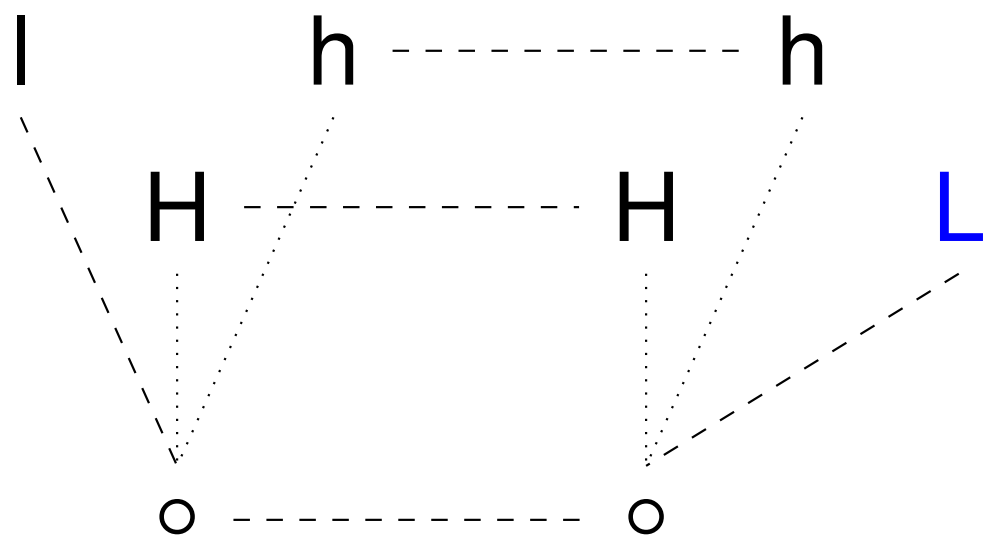
- The lowering boundary tone is a **subtonal** feature – a melody **L** in the feature geometry of Snider (1999) which 'infects' utterance-final H tones

- Opaque interaction of H-fusion and lowering is captured via simultaneous **infection** and coalescence in Containment Theory (Trommer and Zimmermann 2014)

- This also accounts for the opaque interaction of final lowering with other phrase-level processes

(cf. Inkelas and Leben 1990 on Hausa)

Proposal: Simultaneous Infection + Fusion

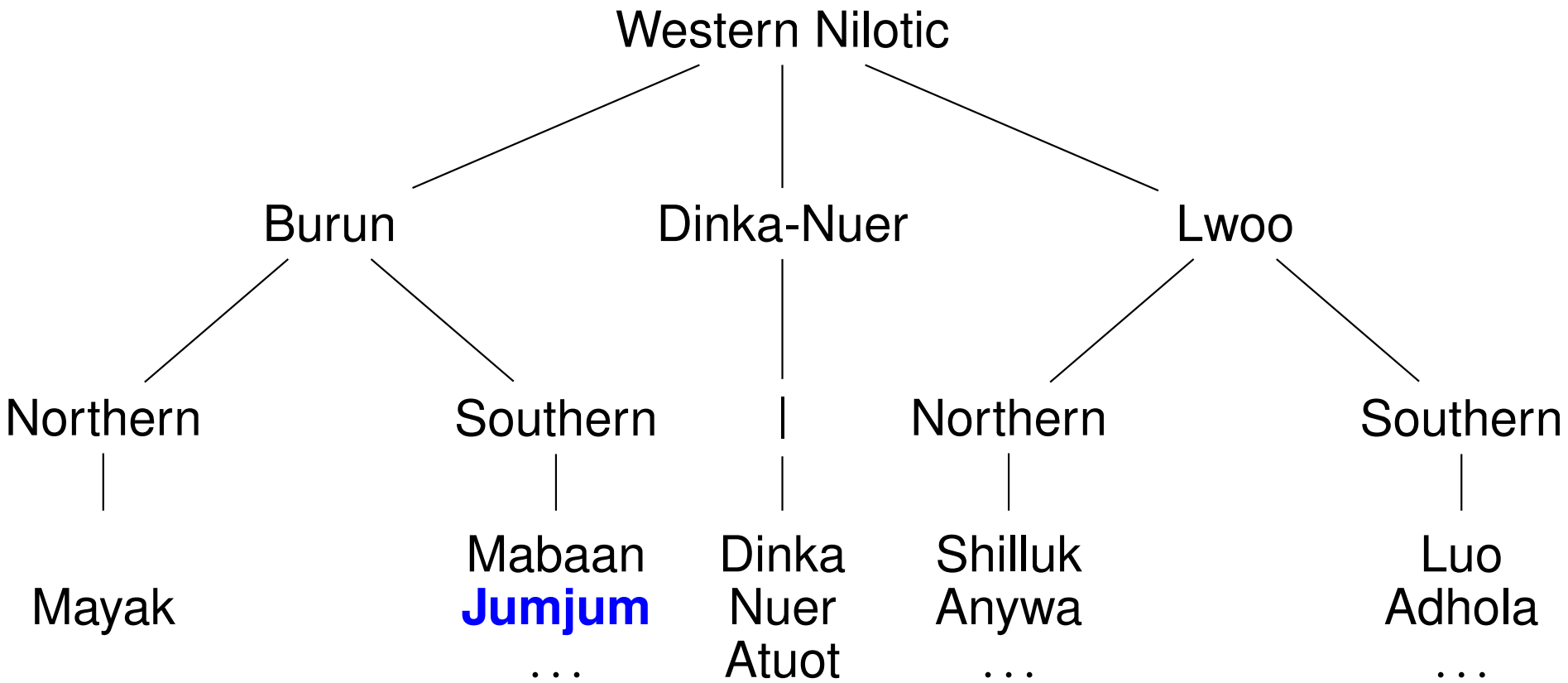


Jumjum

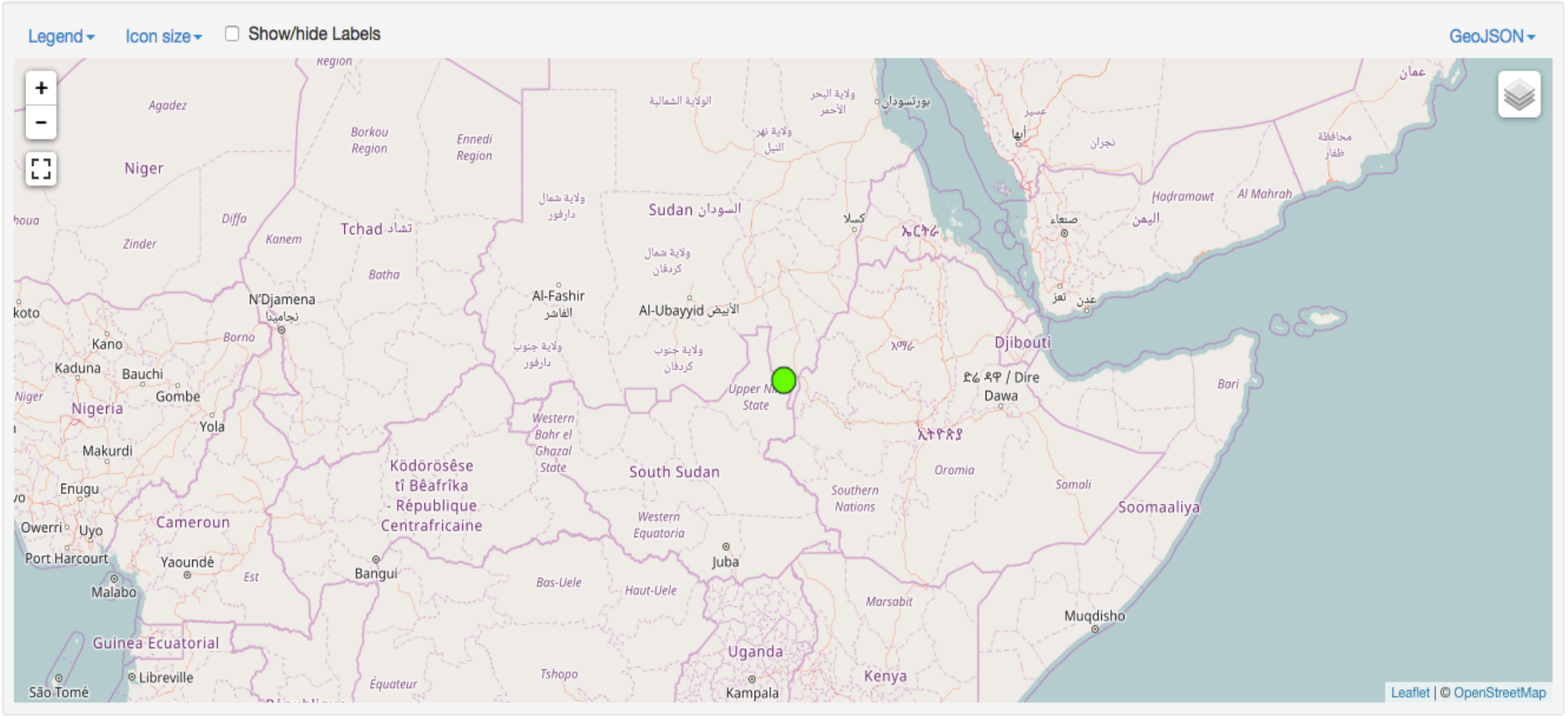
Jumjum

- Western Nilotic language of the Southern Burun branch spoken in the Blue Nile province of South Sudan
- Rich non-concatenative morphology, but also suffixation
- All data in this talk from the detailed paper by Andersen (2004)

Western Nilotic Languages



Jumjum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Zinder
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N'Djamena
Kano
Kaduna
Bauchi
Gombe
Nigeria
Yola
Borno
Makurdi
Enugu
Owerri
Uyo
Port Harcourt
Cameroun
Yaoundé
Malabo
Guinea Ecuatorial
São Tomé
Libreville
Équateur
Ködörösêse tî Bêafrîka - République Centrafricaine
Bangui
Est
Sudan
Al-Fashir
Al-Ubayyid
Western Bahr el Ghazal State
South Sudan
Western Equatoria
Juba
Bas-Uele
Haut-Uele
Tshopo
Uganda
Kampala
Kenya
Marsabit
Djibouti
Dire Dawa
Oromia
Southern Nations
Somali
Soomaaliya
Muqdisho
Bari
Hadramawt
Al Mahrah
صنعاء
عدن
تعز
Leaflet | © OpenStreetMap

More Phrase-Level Processes

More Phrase-Level Processes

- H-Tone Spreading
- H-Tone Spreading + Final Lowering
- Falling Tone Simplification

H-Tone Spreading (p.154)

[ʔìkɛ̀	kʌ̀t**tʌ́**	**ˈdí:k**	jà:kɔ̀]
ʔìkɛ̀	kʌ̀t-t-ʌ́	dì:k	já:-k-ɔ́
3SG	steal-AP-PST-3	goat:PL	PRO-PL-1PL

'He stole our goats'

[ʔá**mí**	**ˈkʌ́**	gʊ̂ŋ]
ʔám-í	kʌ̀	gʊ̂ŋ
eat-PST3>3SG	PREP	dog:SG

'It has been eaten by the dog'

H-Tone Spreading + Final Lowering (p.155)

[ʔìkà	bí	**t̪ʊ́ ↓wû**]	‘I shall die’
ʔìkà	bí	t̪ʊ́wù	
1SG	FUT	die-1SG	

[**tí ↓ŋâl**]	‘sand’

[**tí ↓ŋál**	jɛ̀k	ʔɔ̂:n]	‘the man’s sand’
tíŋàl	jɛ̀-k	ʔɔ̂:n	
sand	PRO-PL:AG	man:SG	

Fall Simplification (p.156)

[kʌ̂ɲ] ‘hunger’

[**kʌ́ɲ**	jɛ̀n	ʔɔ̂:n]	‘the man’s hunger’
kʌ̂ɲ	jɛ̀-n	ʔɔ̂:n	
hunger	PRO-SG:AG	man:SG	

[ʔìkɔ̂:n] ‘we’

[ʔìk**ɔ́:n**	↓**ʔʌ́**mɔ̂n]
ʔìkɔ̂:n	ʔʌ́m-ɔ̀n
1PLEX	eat:AP-1PLEX

‘We will eat’

Monosyllabic Nouns (p.151)

	Underlying	**Framed**	**Isolation**		
/L/	/jà:n/	[jà:n jɛ̀n ʔɔ̂n]	[jà:n]	[L]	‘bull’
/H/	/d̪é:ŋ/	[d̪é:ŋ ↓jén ʔɔ̂n]	[d̪è:ŋ]	[L]	‘cow’
/HL/	/t̪ɔ̂:n/	[t̪ɔ́:n jɛ̀n ʔɔ̂n]	[t̪ɔ̂:n]	[HL]	‘cock’

Disyllabic Nouns (p.151)

	Underlying	**Framed**	**Isolation**		
/LL/	/bɛ̀:lgʌ̀/	[bɛ̀:lgʌ̀ jɛ̀k ʔô̰n]	[bɛ̀:lgʌ̀]	[LL]	‘canes’
/HH/	/t̪ʊ́d̪gʊ́/	[t̪ʊ́d̪gʊ́ ˓jɛ́k ʔô̰n]	[t̪ʊ̀d̪gʊ̀]	[LL]	‘cocks’
/LH/	/d̪ìŋ:ʌ́/	[d̪ìŋ:ʌ́ ˓jɛ́n ʔô̰n]	[d̪ìŋ:ʌ̀]	[LL]	‘pestle’
/HL/	/wíllʌ̀/	[wíl˓lʌ́ jɛ̀n ʔô̰n]	[wíl˓lʌ̂]	[HH͡L]	‘guests’
/H͡LL/	/kû:rà/	[kú:rà jɛ̀n ʔô̰n]	[kú:rà]	[HL]	‘ball’
/H͡LH/	/mɛ̂rkʌ́/	[mɛ́r˓kʌ́ ˓jɛ́k ʔô̰n]	[mɛ́rkʌ̀]	[HL]	‘children’

Opacity

Final Lowering Counterbleeds Fusion (p.153)

[**lɛ̀ŋ**	**ʊ̀làŋ** %]	‘The axe is black’
lɛ́ŋ	ʊ́l-áŋ	
axe:SG	be:black-3SG	

[***lɛ́ŋ** **ʊ̀làŋ** %]

Underlying Final L-Tones don't spread (p.153)

[ʔìkì	**d̪ʌ̀:mʌ̀**	**lɛ̀n**]	'You are looking at an axe'
ʔìkì	d̪ʌ́:m-ʌ́	lɛ́n	
2SG	look:at:AP-2SG	axe	

[ʔìkì	d̪ʌ́:mʌ́	**kìŋ***]	'You are looking at a bee'
ʔìkì	d̪ʌ́:m-ʌ́	**kìŋ**	
2SG	look:at:AP-2SG	bee	

*[ʔìkì	**d̪ʌ̀:mʌ̀**	**kìŋ**]

("Non-derived Environment Blocking")

Fall Simplification Counterfeeds H-Spreading (p.156)

[**ʔɔ́:n**	bì:c:àn	já:n	tɔ̀rd̪ɛ̀]
ʔɔ̂:n	bì:c:àn	jâ:n	tɔ̀r-d̪-ɛ́
man:SG	rootSG:AG	tree:SG	pull-M-3SG>3

‘The man is pulling the tree’s root.’

*[**ʔɔ́:n** **↓bí:**c:àn já:n tɔ̀rd̪ɛ̀]

Non-Iterativity of H-Tone Spreading

[ʔìkɛ̀	bʊ̀**gɛ́**	**ꜜkɛ́**	**t̪í rꜜkɛ́**	wɛ̀nɔ̀k]
ʔìkɛ̀	bʊ̀g-g-ɛ́	kɛ̀	t̪í r kɛ̀	wɛ̀nɔ̀k
3SG	arm-PL-3SG	COM	leg-PL-3SG	swell-M:3

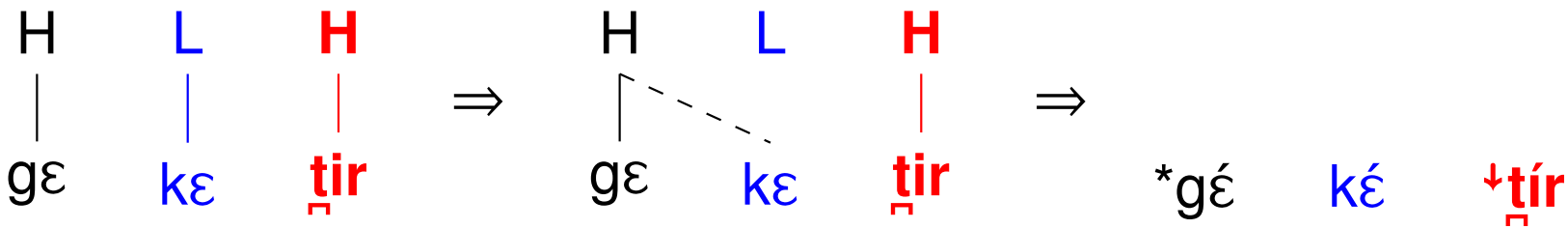
‘His arms and legs swell’

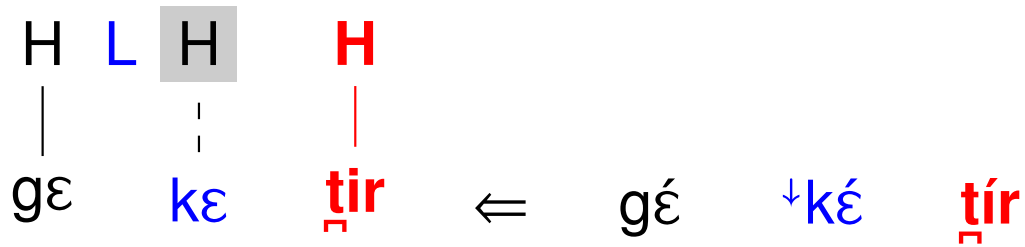
[**ʔáŋ**	**ꜜbát̪**tà	ʔà	ʔɔ̀t̪ɔ̀n]
ʔáŋ	bàt̪:à	ʔà	ʔɔ́t̪-ɔ́n
and	not	be:3	sleep-PTC

‘But he is not sleeping’

*[**ʔáŋ** **ꜜbát̪ꜜt̪á** **ꜜʔá** **ꜜʔɔ́ꜜt̪ɔ̂n**]

Downstep Displacement





Theoretical Assumptions

Theoretical Assumptions

- Autosegmental Containment & Generalized Markedness Constraints

  (Trommer and Zimmermann 2014)

- Tonal Feature Geometry (Snider 1999)

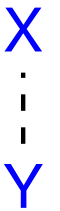
- The Lateral Theory of Coalescence (Trommer 2016)

Containment & Generalized Markedness Constraints

- **Autosegmental Containment:** (extending Prince & Smolensky 1993)
  Underlying material
  is never literally deleted, but retained in the output,
  (but may be marked as phonetically invisible).

- **Constraint Cloning:** (cf. Cloning in Correspondence Theory, McCarthy & Prince 1995)
  All markedness constraints are assumed to exist in two versions,
  one referring only to phonetically visible material,
  and one to all material in a given structure.

Representation of Association Lines (Trommer and Zimmermann 2014)

Morphological association lines		Epenthetic association lines
phonetically visible:	phonetically invisible:	phonetically visible:
		

Axiom of Phonetic Visibility (Trommer and Zimmermann 2014)

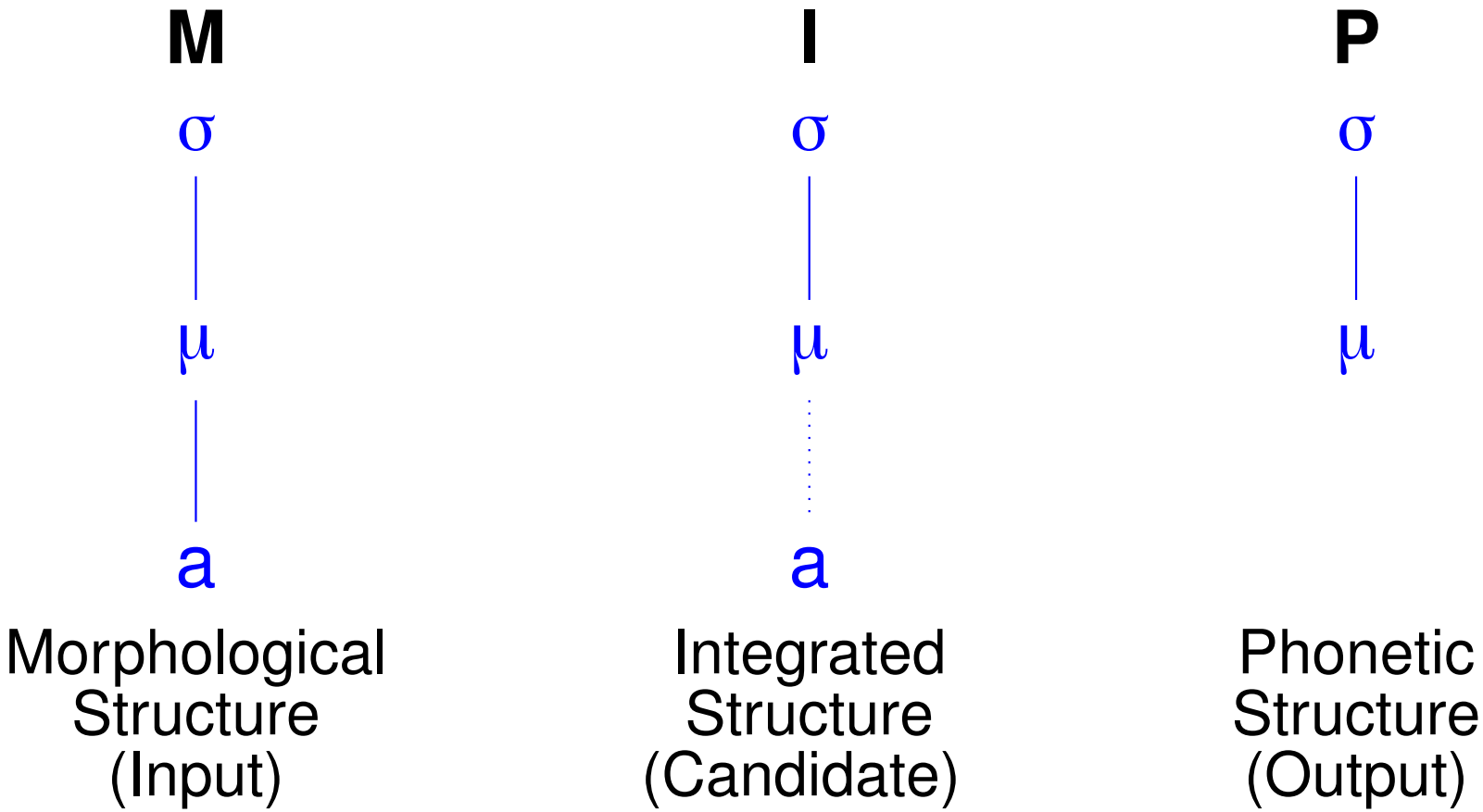
A phonological node is visible to phonetics

if and only if

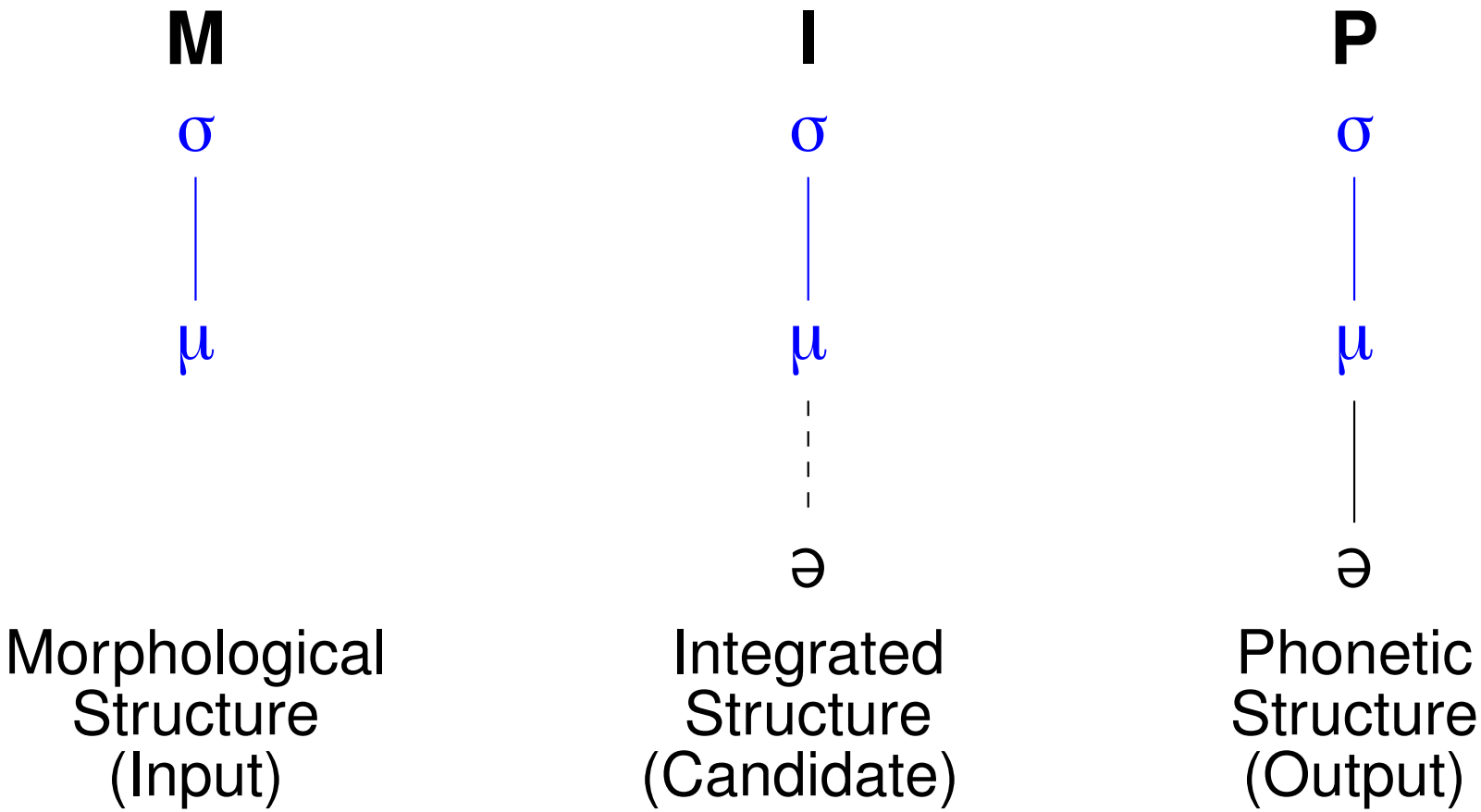
it is dominated by the designated ancestor node of the structure

through an uninterrupted path of phonetic association lines

Deletion


M
σ
μ
a
Morphological Structure (Input)
I
σ
μ
a
Integrated Structure (Candidate)
P
σ
μ
Phonetic Structure (Output)

Epenthesis


M
σ
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P
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ə
Morphological Structure (Input)
Integrated Structure (Candidate)
Phonetic Structure (Output)

Generalized Markedness (the Cloning Hypothesis)

Every markedness constraint exists in 2 incarnations:

The **general clone** refers to all structure in I

The **phonetic clone** refers only to structure in P

(cf. Cloning in Correspondence Theory, McCarthy & Prince 1995)

Generalized Markedness

OCP Assign $*$ to every pair of adjacent H-tones in **P**

OCP Assign $*$ to every pair of adjacent H-tones in **I**

	OCP	OCP
a. mat wi ni H L H		
b. mat wi ni H L H	*	
c. dep ke re H H	*	*

Central Consequence

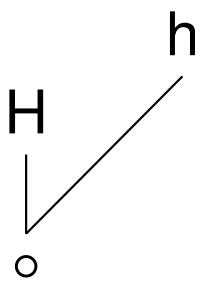
In contrast to Correspondence Theory

phonetically ‘deleted’ material can still have (opaque)

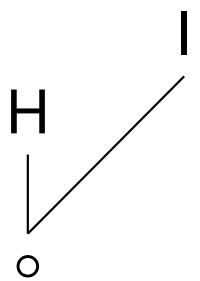
phonological effects in phonological surface representations

Tone in Register Tier Theory (Snider 1999)

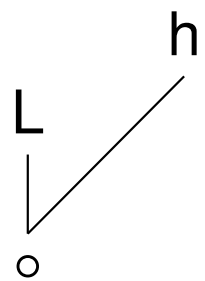
High



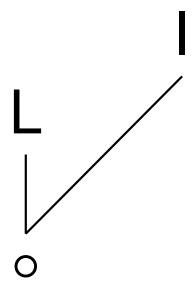
Mid$_1$

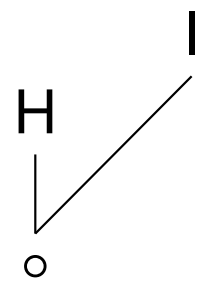


Mid$_2$



Low



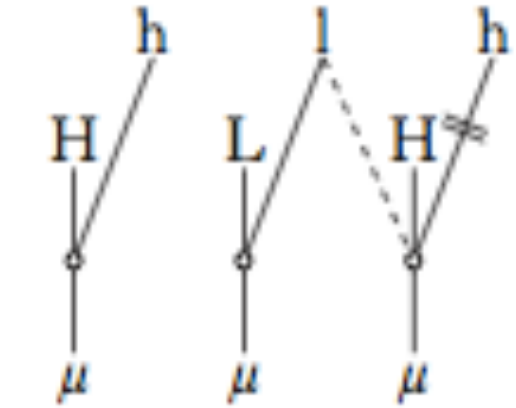


Downstepped High

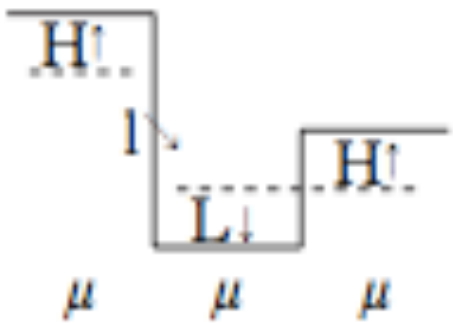
Representation of Downstep in Snider (1999)

Downstepped High (automatic)

a. *structural representation*

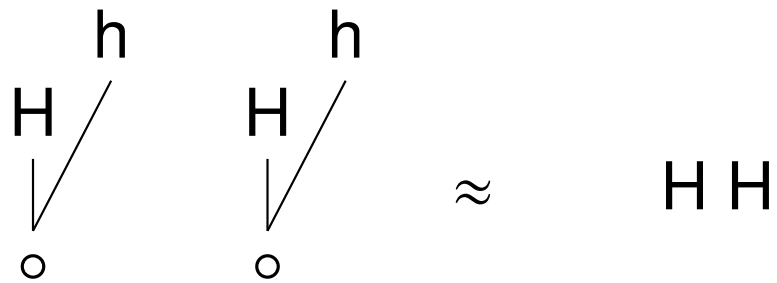


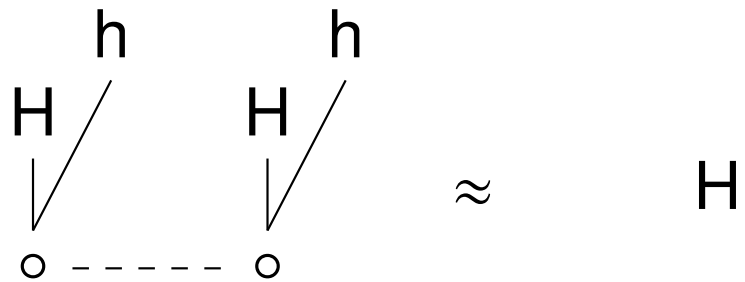
b. *phonetic representation*



The Lateral Theory of Coalescence (Trommer 2016)

Phonology **Phonetics**





The Lateral Theory of Coalescence (Trommer 2016)

Two laterally associated nodes are evaluated as identical

by phonological constraints on phonetic representations (**P**)

and by phonetic spellout

Analysis

Constraints on H-Spread and Downstep

H▷ Assign ∗ to every syllable intervening between the rightmost anchor of a H-melody tone and the closest right Utterance edge in **I**

*H⁚ Assign ∗ to every epenthetic association line of a H-melody tone which is right-adjacent to another epenthetic association line of the same H-melody tone in **I**

MAX I Assign ∗ to every I register tone which is in **M** but not in **P**

Constraints on Ⓛ- Association and Coalescence

L
↓
∘

Assign ∗ to every melody L
which is not associated to a tonal root node in **I**

*L∘{h,H}

Assign ∗ to every tonal root node which is associated
to a L-melody node and a t the same time
to a h-register or H-melody node in **P**

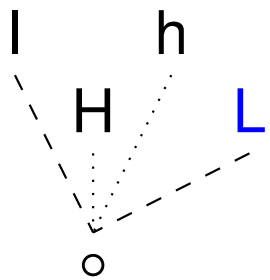
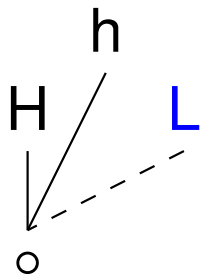
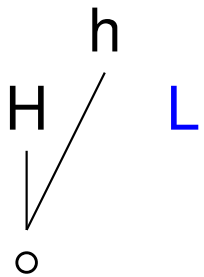
OCP_H

Assign ∗ to every pair of adjacent
H-melody, h-register, and ∘-nodes
which form part of a H-tone
(i.e. of a ∘ associated to h and H) in **I**

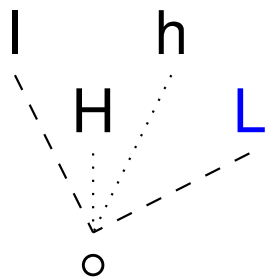
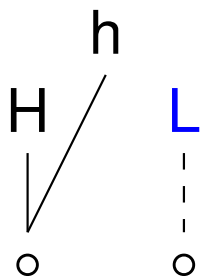
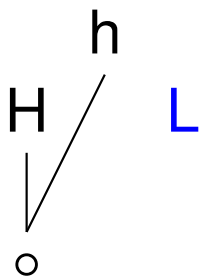
Constraints on Contour Tones

*$\underline{\hat{\text{o}}\sigma}$ Assign $*$ to every HL contour which is not PWord-final in **P**

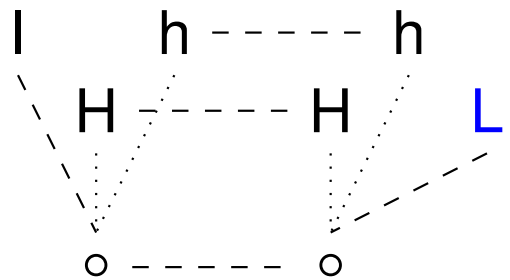
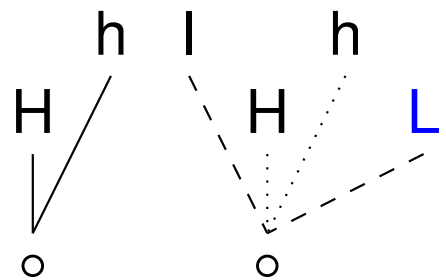
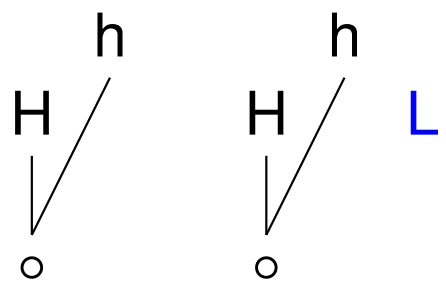
Simple Utterance-Final Lowering: dé꞉ŋ+L → dè꞉ŋ

Input: = c.	L ↓ ○	OCP_H	*L○{h,H}	DEP ○	FAITH
☞ a. 					****
b. 			*!*		*
c. 	*!				

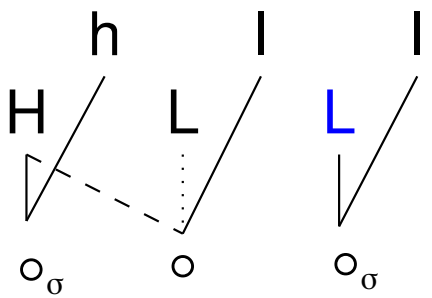
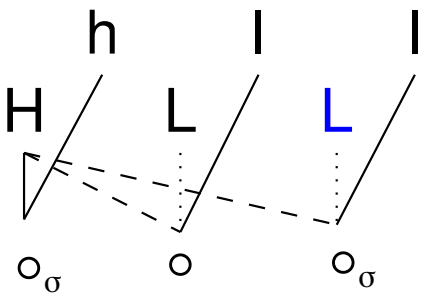
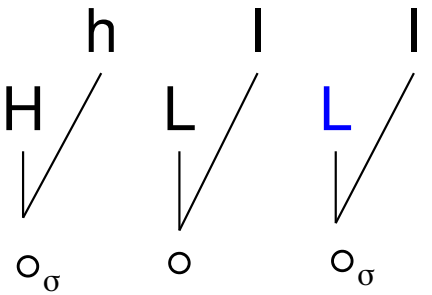
Simple Utterance-Final Lowering: dé꞉ŋ+L → dè꞉ŋ

Input: = c.	L ↓ ○	OCP_H	*L○{h,H}	DEP ○	FAITH
☞ a. 					****
b. 				*!	*
c. 	*!				

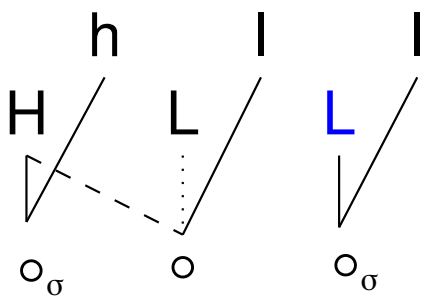
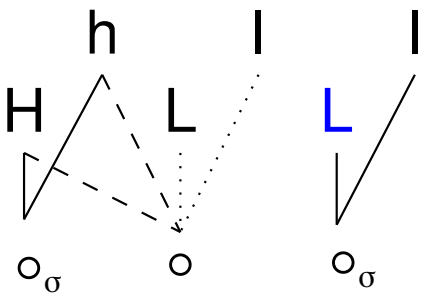
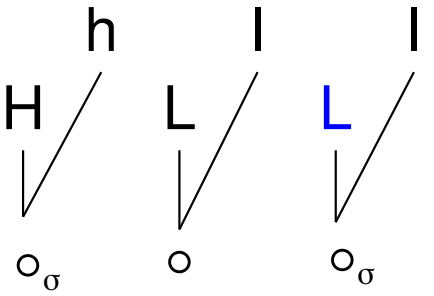
Iterative Utterance-Final Lowering: ʊ́lán̩+L → ʊ̀làn̩

Input: = c.	L ↓ ○	OCP_H	*L○{h,H}	DEP ○	FAITH
☞ a. 					*7
b. 		*!*			*4
c. 	*!				

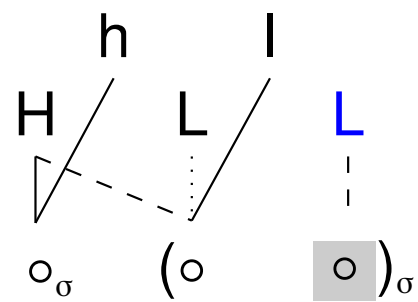
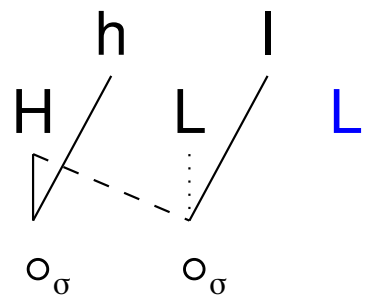
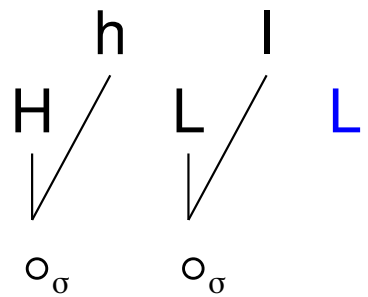
H-Spread ⇝ Downstep: wíllà jèn → wíl↓lá jèn

Input: = c.	*H⁚⁚	*L∘{h,H}	H▷	Dep ∘	Faith
☞ a. 			*		**
b. 	*!				****
c. 			**!		

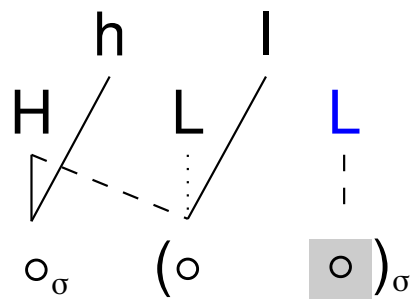
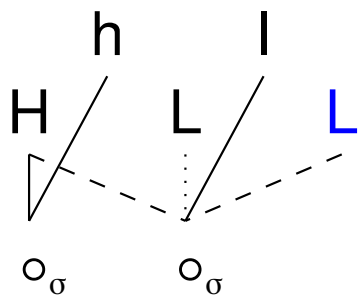
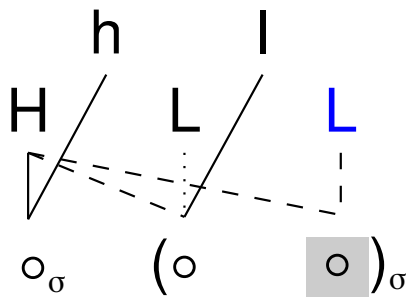
H-Spread ⇝ Downstep: wíllà jèn → wíl↓lá jèn

Input: = c.	*H⁝⁝	*L∘{h,H}	H▷	DEP ∘	FAITH
☞ a. 		*			**
b. 			*		***!
c. 			**!		

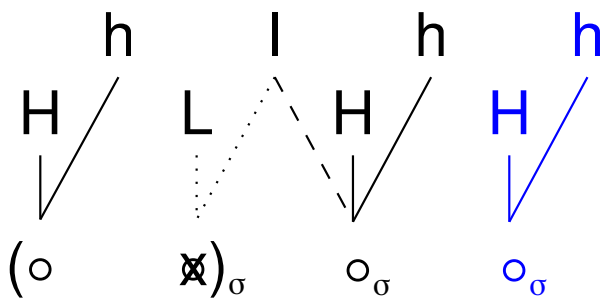
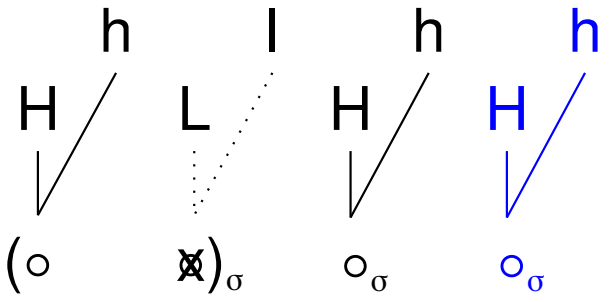
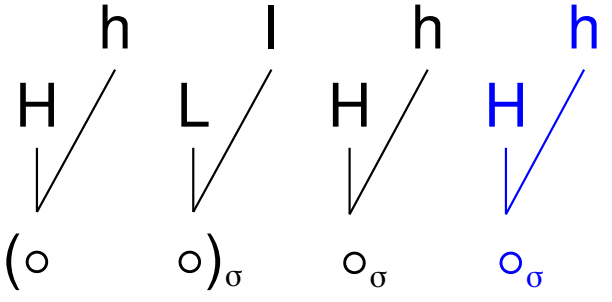
H-Spread + Boundary-L: wílà+L → wí$^{\downarrow}$lâ

Input: = c.	L ↓ ○	*H⁝	*L○{h,H}	H▷	DEP ○	FAITH
☞ a. 					*	**
b. 	*!					*
c. 	*!			*		

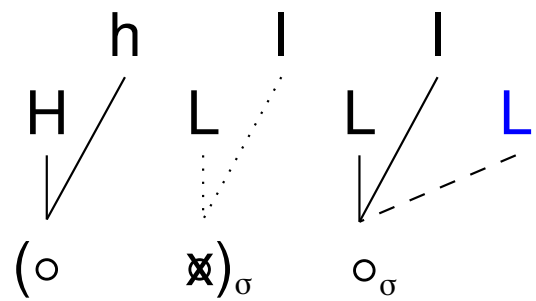
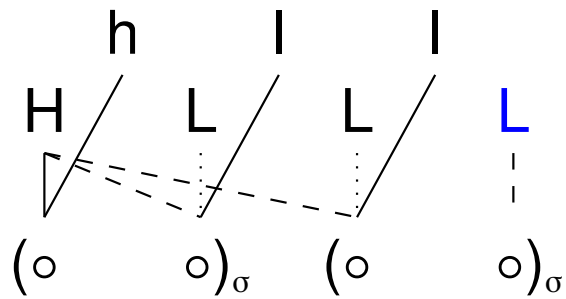
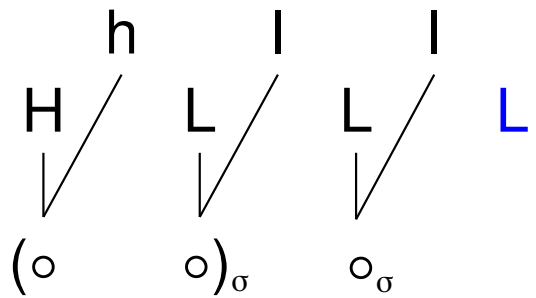
H-Spread + Boundary-L: wílà+L → wí↓lâ

Input: = ↺	L ↓ ○	*H⁝	*L○{h,H}	H▷	DEP ○	FAITH
☞ a. 					*	***
b. 			*!			***
c. 		*!	*!			****

F-Simplification ⇝ Downstep: mêrká+jék → mér↓ká+jék

Input: = c.	MAX I	L ↓ ○	*$\underline{\hat{\sigma}\sigma}$	H▷	DEP ○	FAITH
☞ a. 				*		****
b. 	*!					***
c. 			*!	*		

Fall Simplification ↛ H-Spreading: kûːrà+L → kúːrà

Input: = c.	*H⁝⁝	L ↓ ○	*σ̂σ	H▷	DEP ○	FAITH
☞ a.  (○ ~~○~~)σ ○σ				*		**
b.  (○ ○)σ (○ ○)σ	*!				*	***
c.  (○ ○)σ ○σ		*!	*!	*		

Summary – Solved Problems

- **Downstep *before* not *after* target of H-spreading:**
  Survival of register-I ← Feature Geometry

- **Boundary-L spreads, other Ls don't:**
  L doesn't spread but infects fused H's ← Feature Geometry

- **Final Lowering counterbleeds Fusion:**
  Generalized OCP fuses also lowered H's ← Containment

- **Non-Iterativity of H-Spreading &**
  Fall Simplification counterfeeds H-Spreading:
  *H⁝ ← Containment

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Overview