# Tone systems of Dinka dialects

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BEYOND TEXT

# Goals of my research on Dinka tone

- Investigate the parameters of divergence between dialects of Dinka, in terms of:
    - inventory
    - realisation
    - contextual processes
- Consider the relevance of the findings to theory and typology.

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**Part 1**

**Part 2**

# Part 1 / Background

Dinka is:

a Nilo-Saharan language

spoken in Southern Sudan

by approx. 2 million people.

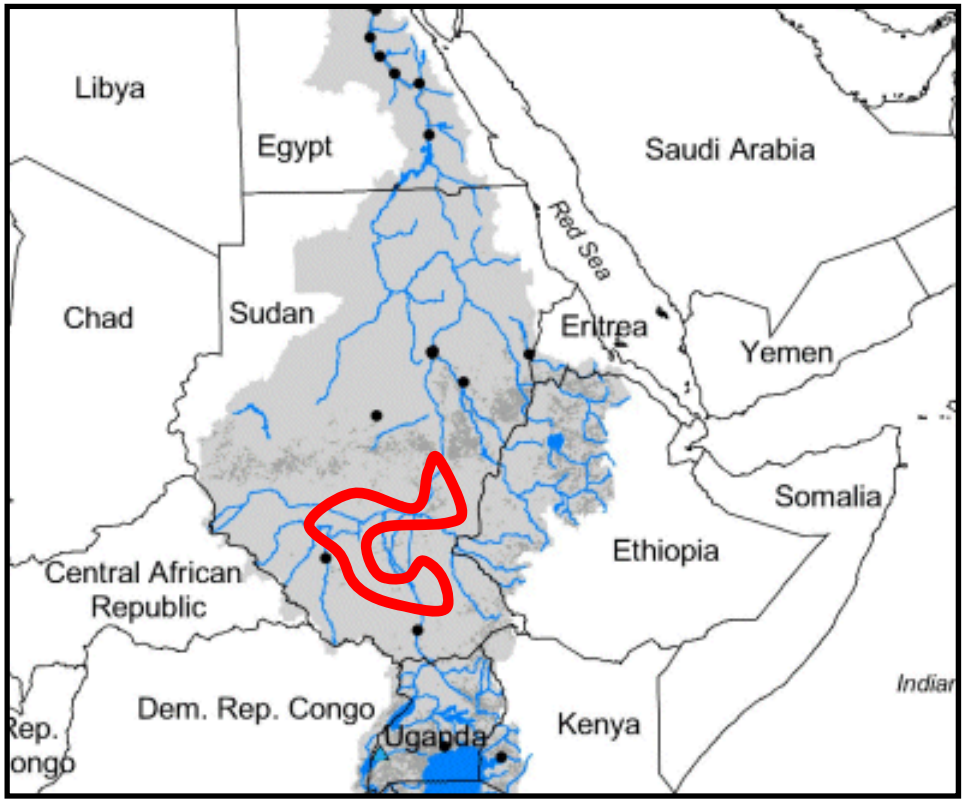
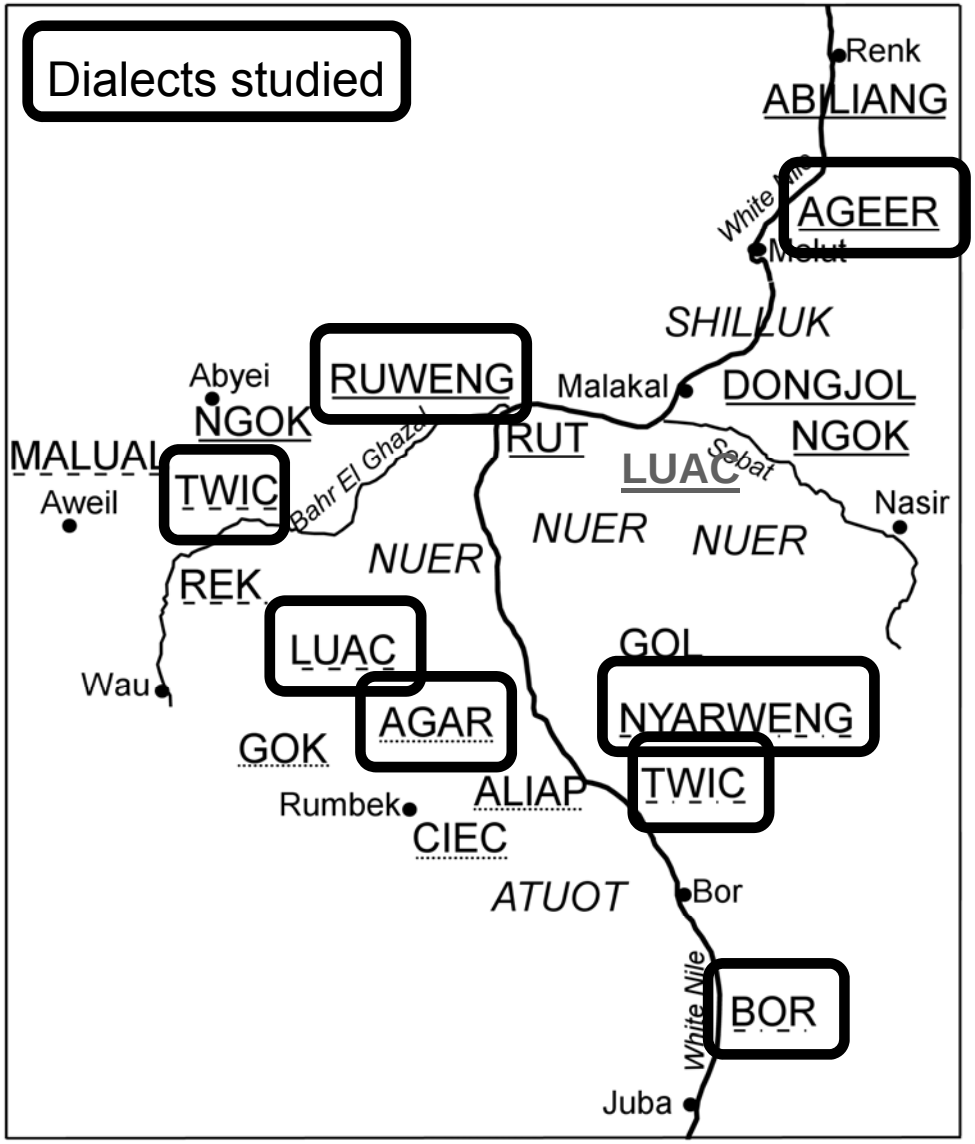



Figure: The Dinka language area, marked on the Nile tributary network.

# Part 1 / Methodology

My investigations on tone in Dinka so far:

- 8 dialects studied;
- 3+ speakers per dialect;
- tonemes in various word patterns and sentence contexts;
- phonological and phonetic analyses



# Part 1 / Vowels, voice quality, length

- Seven vowel phonemes: /i,e,ɛ,a,ɔ,o,u/
- Two phonemic voice qualities (modal vs. breathy):
  - rò̤o̤r ‘forest.SG’
  - rò̤o̤r ‘man.PL’
- Three levels of vowel length (V / VV / VVV):
  - cól ‘mouse.SG’
  - cŏ̤o̤l ‘charcoal.SG’
  - cò̤o̤o̤l ‘charcoal.PL’

# Part 1 / Inventory of tone

- Most dialects have 4 distinctive tone patterns or tonemes: High (H), Falling (HL), Low (L), Rising (LH).

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- E.g. Luanyjang (Luac) – Remijsen & Ladd (2008):

| H | HL | L | LH |
|---|---|---|---|
| bạ́ɲ<br>chief.SG | gê̤em<br>cheek.SG | ɟṳ̀r<br>stranger.SG | cǒ̤ok<br>foot.SG |
| léeŋ<br>drum.SG | tîiim<br>tree.PL | nòoon<br>grass.SG | pǎal<br>knife.SG |

# Part 2 / Dispersion Theory

- Main difference in realisation among the 4-toneme dialects: relative height of the LH:

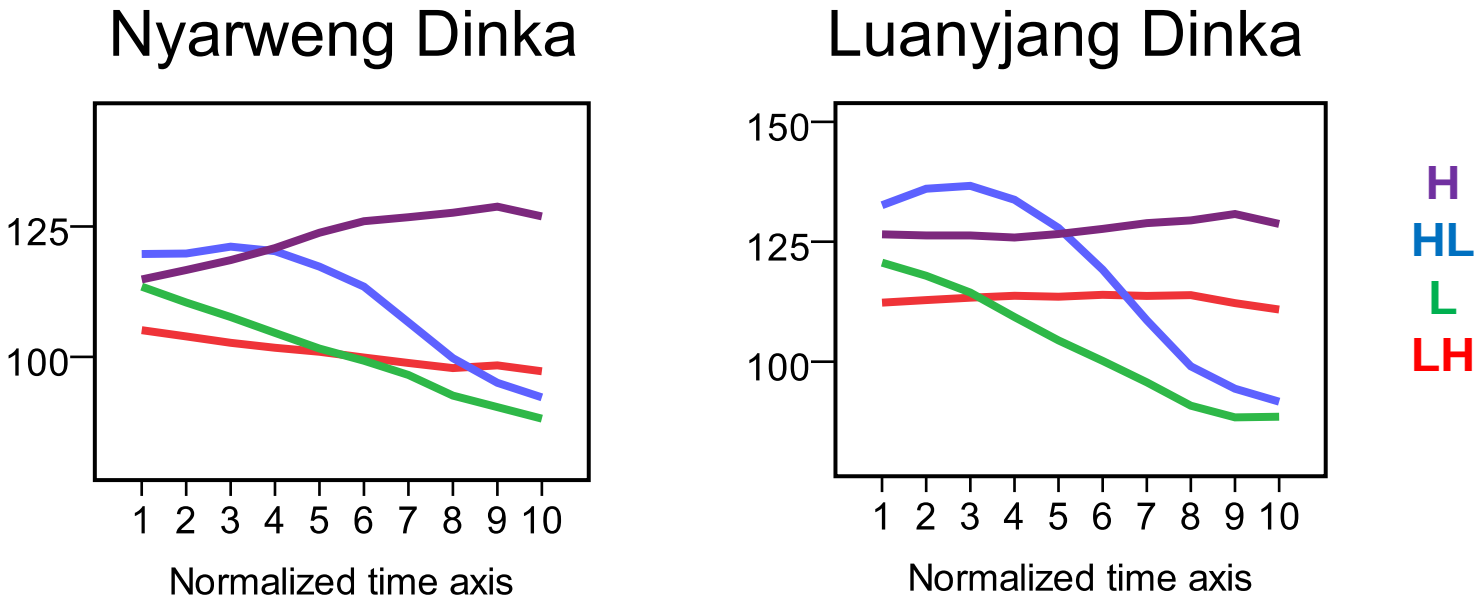



Figure: Averaged f0 traces of the tonemes in Nyarweng and Luanyjang, on the voiced part of the rhyme. Each trace represents 2 or 3 lexical items by 3 speakers in isolation.

# Part 1 / Word structure

- The great majority of Dinka words consists of closed monosyllables, e.g.:

| | |
|---|---|
| bîŋ | mjɛ̀ɛɛr |
| cup.SG | giraffe.PL |

- Native polysyllabic words invariably begin with /a-/, and end in a closed syllable, e.g.:

| | |
|---|---|
| aŋáaar | ado̱ok |
| buffalo.SG | gourd.PL |

- Only the final syllable carries tone phonologically.

# Part 1 / Tonal crowding

**Tonal crowding**

- Contour tones ⟹ >1 tone target per TBU;

- TBU = σ
- 1-syllable words
- V vs. VV vs. VVV

⟹ Limited amount of segmental material for tonal realisation (cf. Xu 2004)

# Part 1 / Tonal crowding

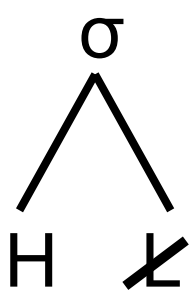
**Phonological ‘solution’ to tonal crowding:**

- In some dialects, tone sandhi reduces the number of tone targets in particular contexts.

Bor Dinka:

- HL -> H becomes in all non-final contexts.

- Rule – HL simplification:



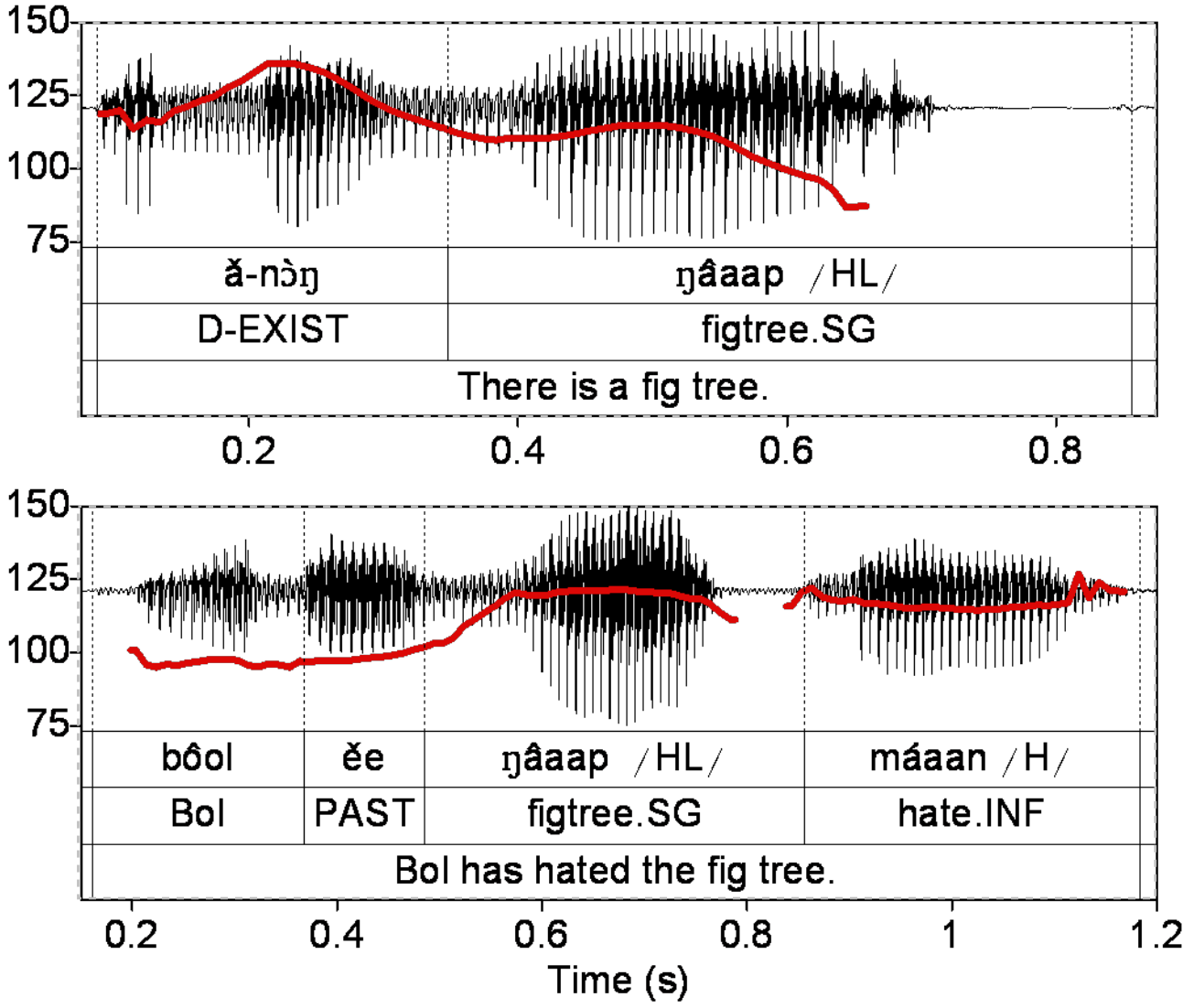




Figure: An illustration of HL Simplification in the Bor dialect of Dinka.

# Part 1 / Tonal crowding

**Phonetic ‘solution’ to tonal crowding:**

- Nyarweng Dinka: no phonological mechanisms; just articulatory undershoot when segmental material is limited.

Bor Dinka:

ŋâaap
figtree.SG

Nyarweng Dinka:

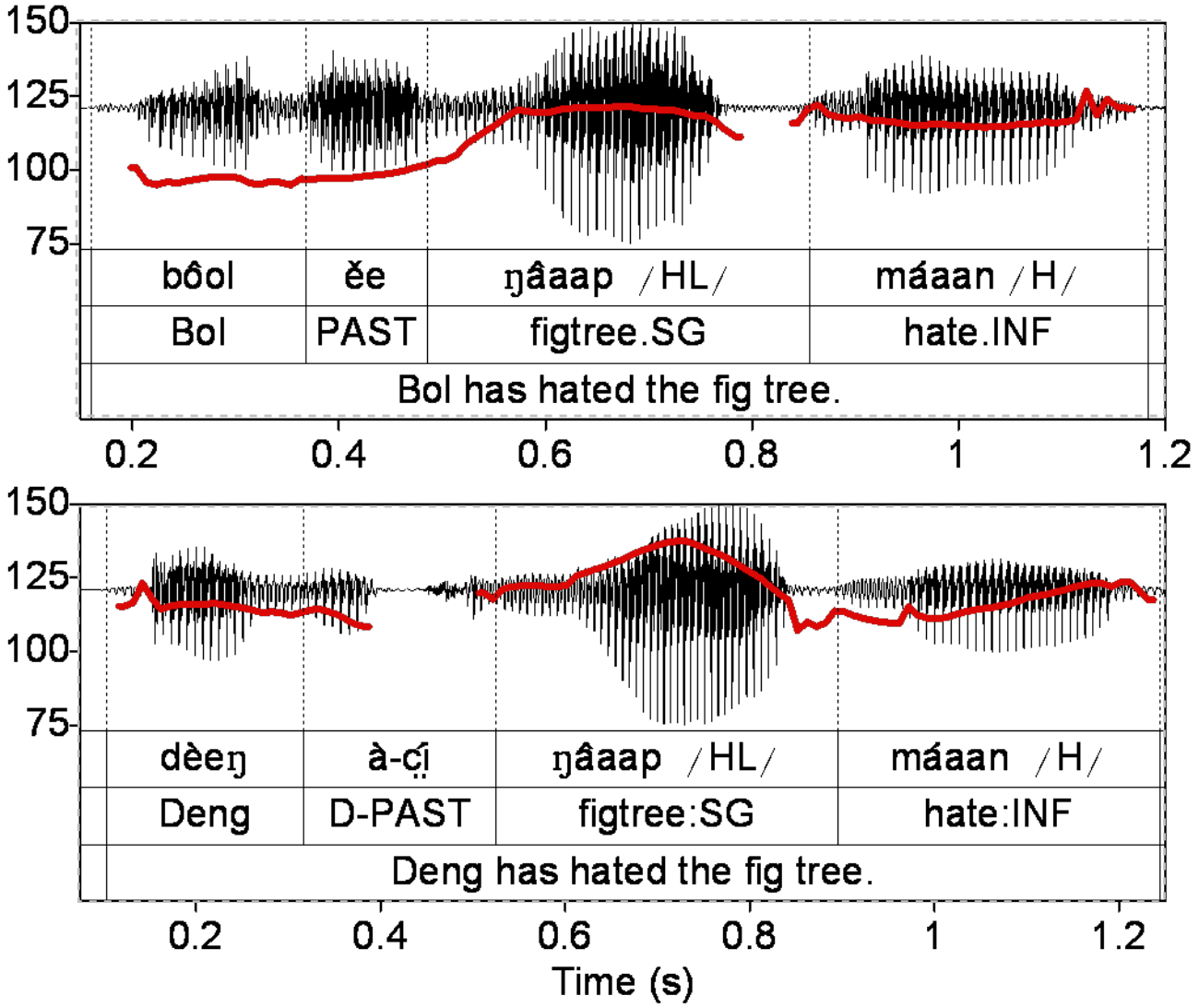



Figure: Illustration of HL Simplification in Bor vs. its absence in Nyarweng.

Nyarweng:
HL on CVVVC

Nyarweng:
HL on CVC

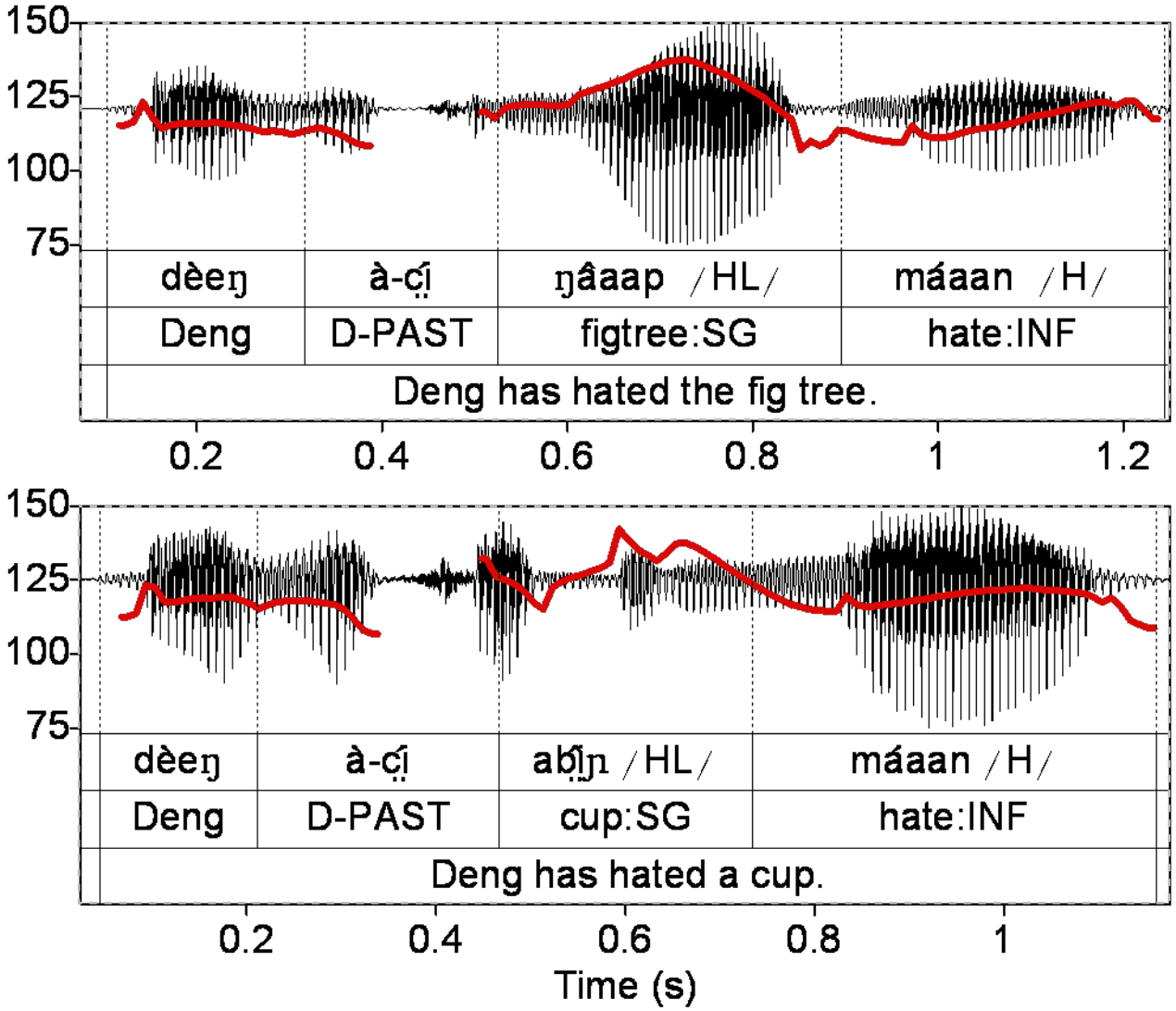



Figure: The effect of vowel length on the phonetic realisation of the HL contour tone in Nyarweng.

# Part 1 / Tone sandhi

- Another dialect, Luanyjang, gets rid of HL contours by means of a different phonological process: Dissimilatory Lowering.
- This process sheds light on the nature of the contour tones.

# Part 1 / Tone sandhi

| | |
|---|---|
| H L H > H L H<br><br>**nòoon** ‘grass.SG’ | **Acôol à-cį́ nòoon máaan**<br>Achol D-PAST grass.SG hate.INF<br>‘Achol hated grass.’ |
| H H H > H L L<br><br>**aɲáaar** ‘buffalo.SG’ | **Acôol à-cį́ aɲáaar máaan**<br>Achol D-PAST buffalo.SG hate.INF<br>‘Achol hated a buffalo.’ |

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| H HL H > H L H<br><br>**tîiim** ‘tree.PL’ | **Acôol à-cį́ tîiim máaan**<br>Achol D-PAST tree.PL hate.INF<br>‘Achol hated trees.’ |
| H LH H > H LH L<br><br>**păal** ‘knife.SG’ | **Acôol à-cį́ păal máaan**<br>Achol D-PAST knife.SG hate.INF<br>‘Achol hated a knife.’ |

# Part 2 / Tone sandhi

- Summary of Dissimilatory Lowering in Luanyjang:

| Underlying | Observed |
|---|---|
| H L H | H L H |
| H H H | H L L |
| H HL H | H L H |
| H LH H | H LH L |

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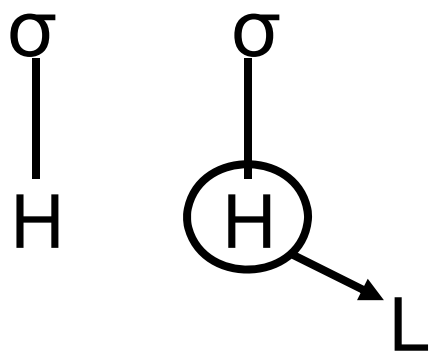
- Rule:



# Part 1 / Conclusions

- Four tonemes: High, Low, Rise (LH), Fall (HL);
- No interaction with three-level vowel length at the level of the inventory: the TBU is the syllable;
- Most but not all dialects have sandhi rules that reduce tonal crowding.

# Part 2: Tone in Dinka dialects from the perspective of Dispersion Theory

# Part 2 / Introduction

- Dispersion Theory (Liljencrants & Lindblom 1972, Becker-Kristal 2010):

  - vowel categories are good to the extent that they are perceptually distinct from one another;

  - vowel categories are adaptive: they maximise perceptual distance.

# Part 2 / Dispersion Theory in vowel systems

- Dispersion Theory is well-supported for vowel systems. Illustration from Becker-Kristal (2010):

Five-vowel systems

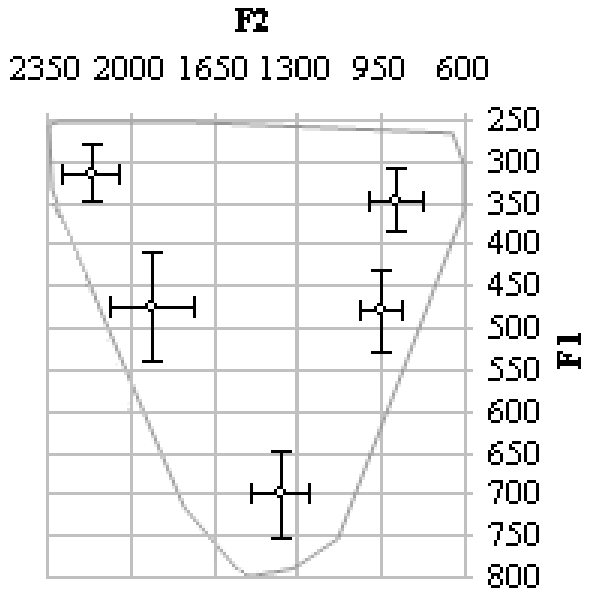



Figure: descriptive stats on F1xF2 values in 5-vowel systems (41 languages).

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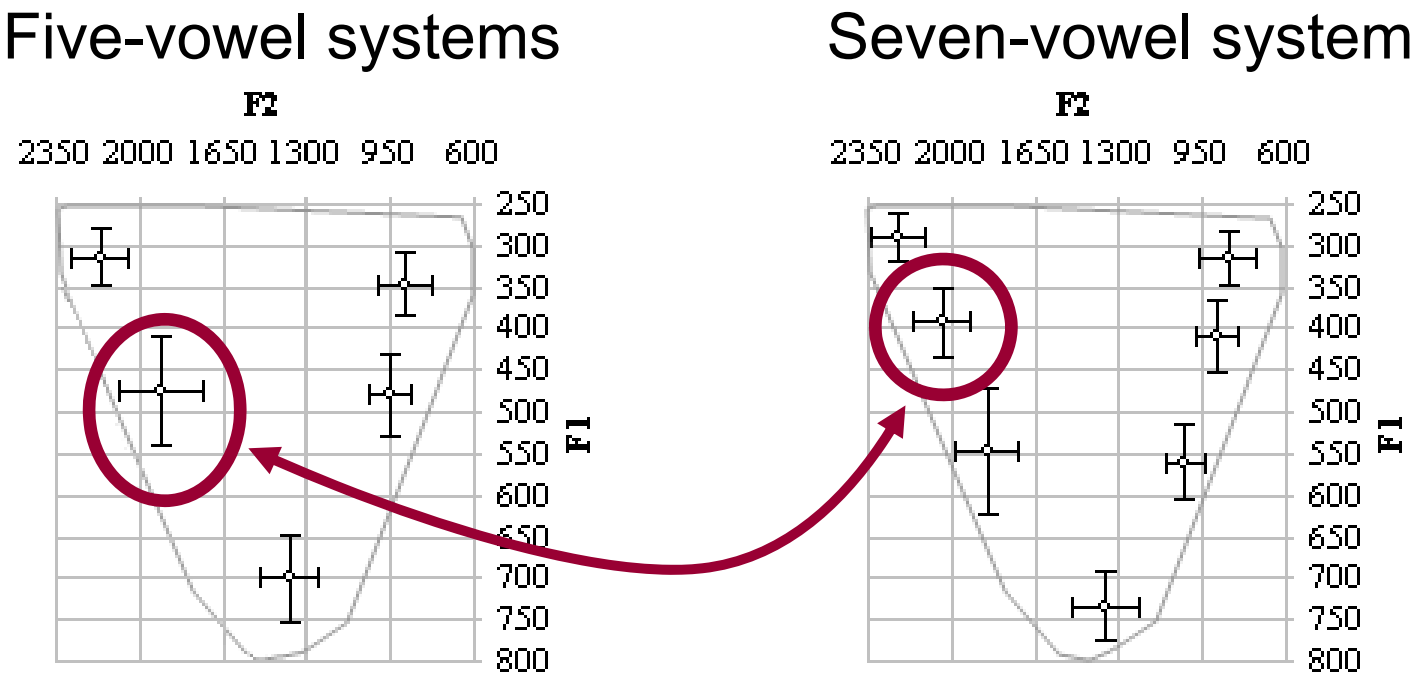



Figure: descriptive stats on F1xF2 values in 5-vowel systems (41 languages) vs. 7-vowel systems (32 languages).

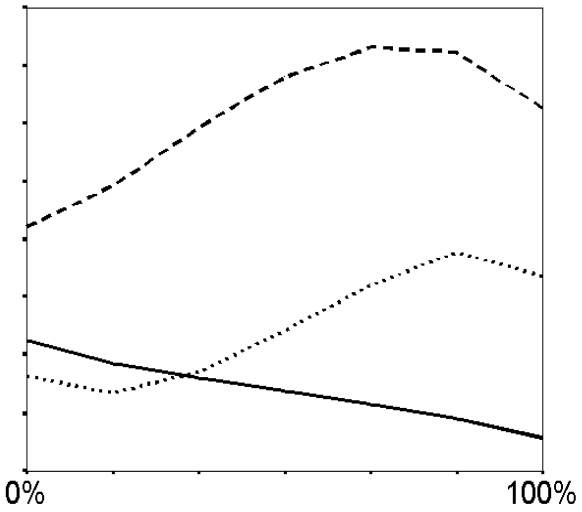
# Part 2 / Dispersion Theory in tone systems

- The detailed phonetic realisation of vowel categories has implications for their phonological representation.
- My argument: Dispersion Theory can also benefit the study of tone – it can inform the evaluation of competing analyses.

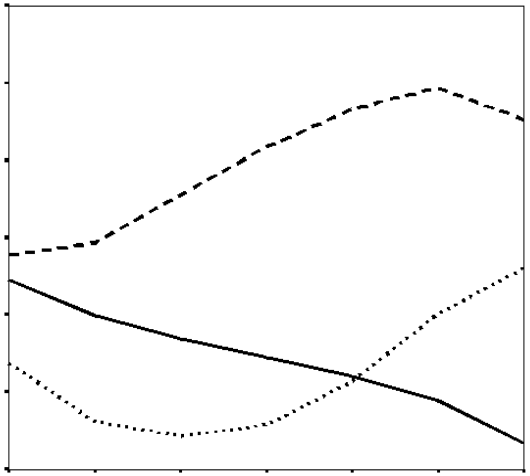
# Part 2 / Dispersion Theory in tone systems

- Consider the realisation of the Fall toneme (full line) in three dialects of Ma'ya (Remijsen 2001):

Laganyan dialect




Salawati dialect



Misol dialect

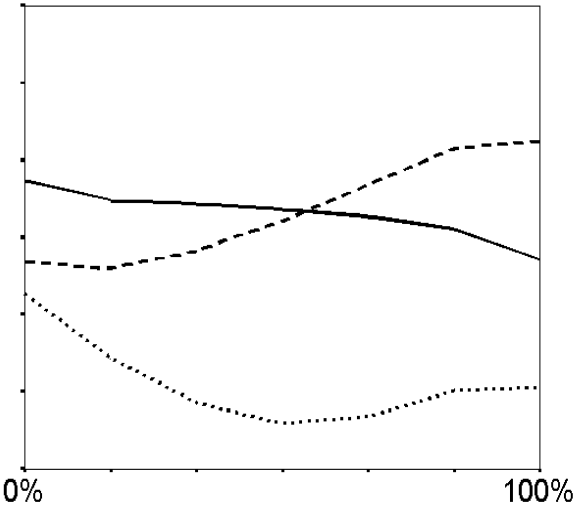



Figure: Averaged F0 traces (8 spks/dialect) of the 3 tonemes of Ma'ya in utterance-final context, in 3 dialects.

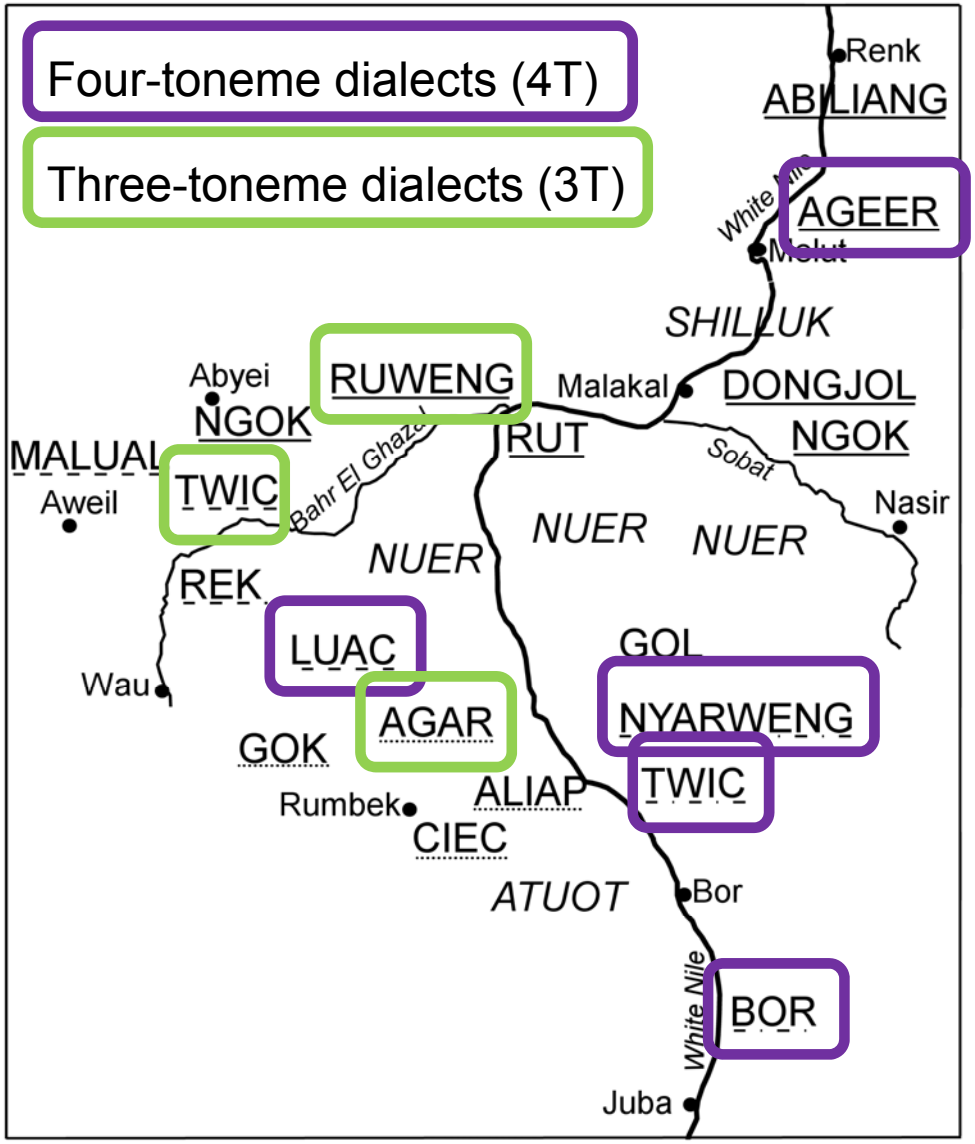
# Part 2 / Three- vs. four toneme systems

- Three dialects of Dinka have only 3 tonemes:

  - Western Twic

  - Ruweng

  - Agar (Andersen 1987)



# Part 2 / Twic (3T)

- H (purple) vs. LH (red) is neutralised in Twic (3T): its H toneme is at the top end of the tonal space.

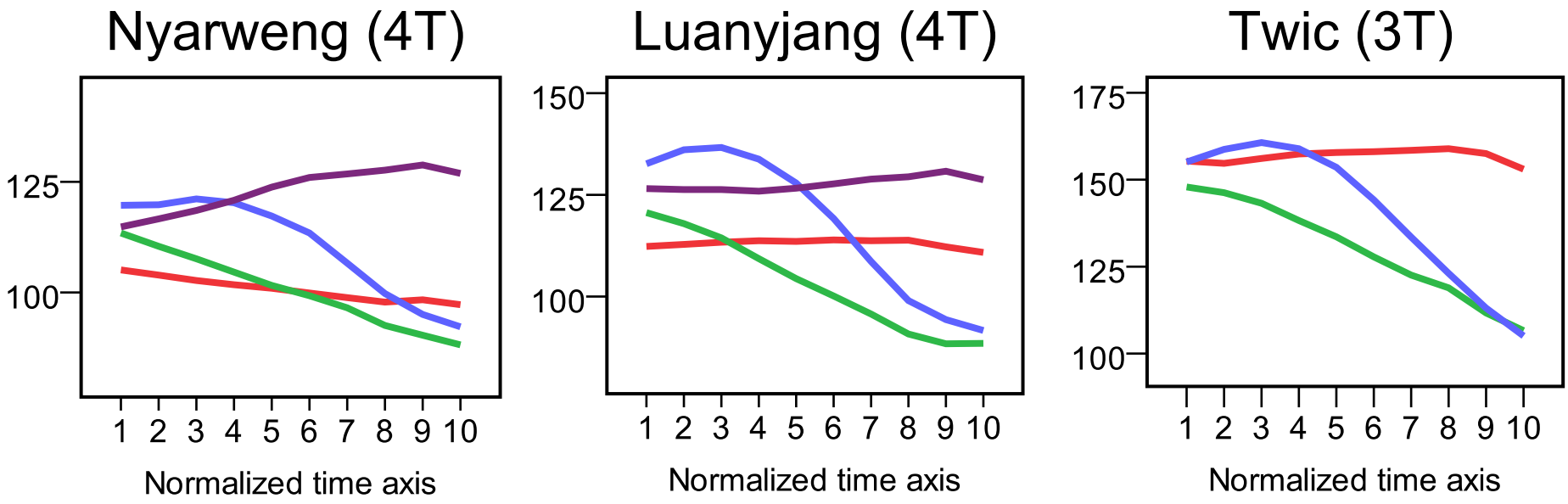
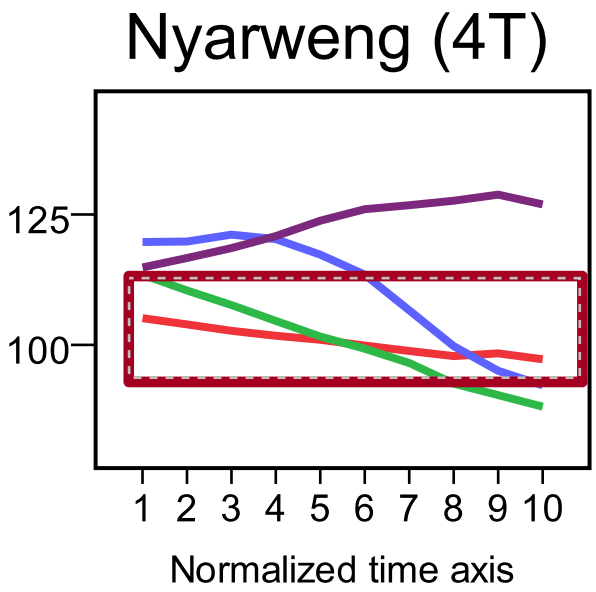
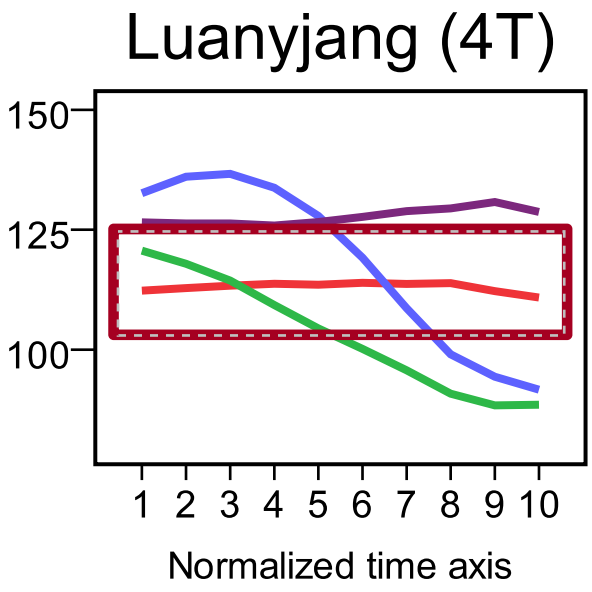


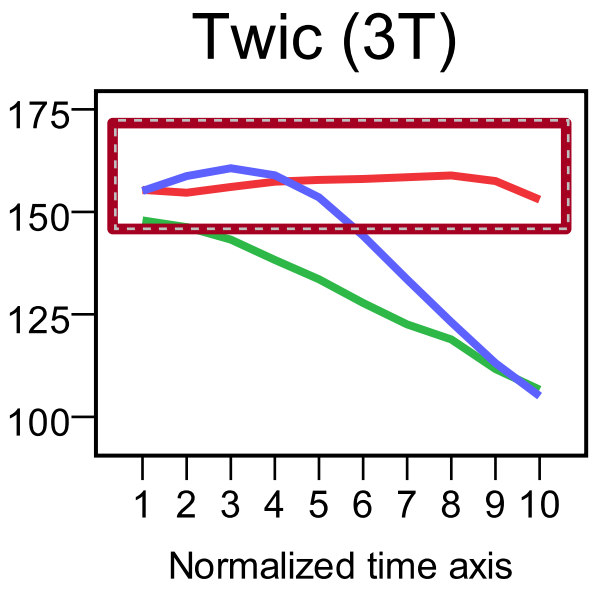

Figure: Averaged f0 traces of the tonemes of the Nyarweng, Luanyjang and Twic. Each trace represents 2 or 3 lexical items by 3 speakers in isolation.

# Part 2 / Twic

- Sound example – **pǎal** ‘knife.SG’ by 2 speakers of each of these three dialects:



# Part 2 / Agar and Ruweng

- In Ruweng (3T) and Agar (3T), however, the ‘High’ is not at the top. Contrary to Dispersion Theory.

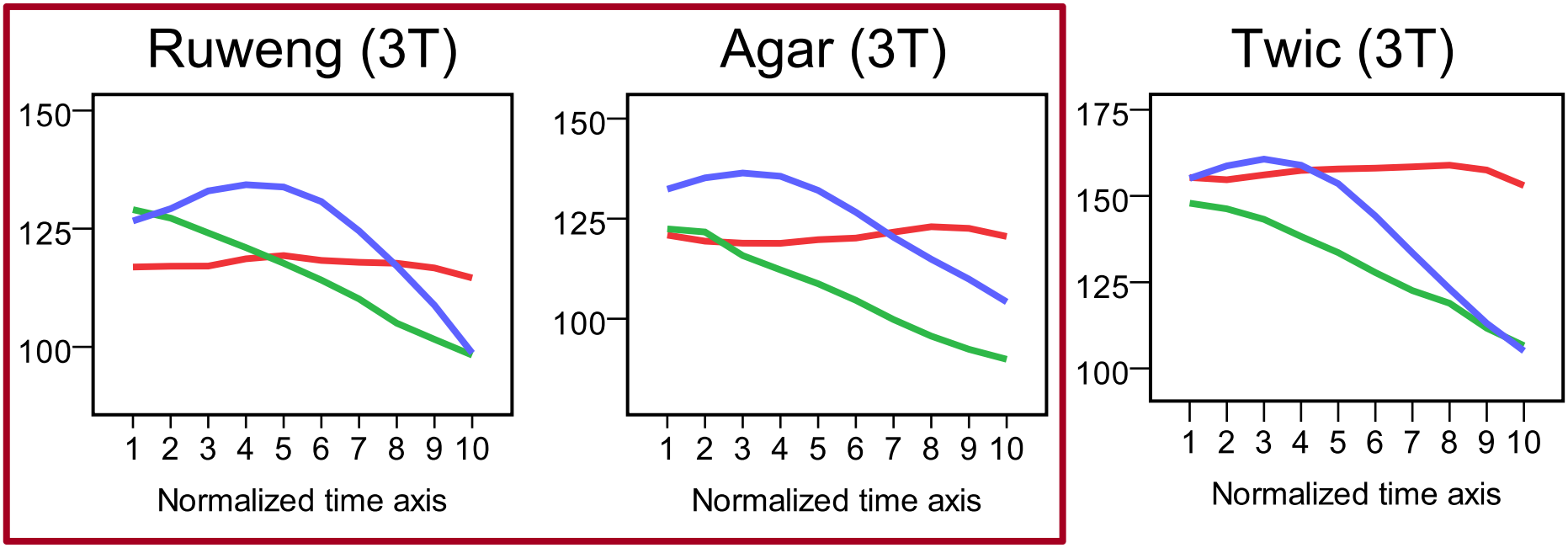



Figure: Averaged f0 traces of the tonemes of Ruweng, Agar and Twic. Each trace represents 2 or 3 lexical items by 3 speakers in isolation.

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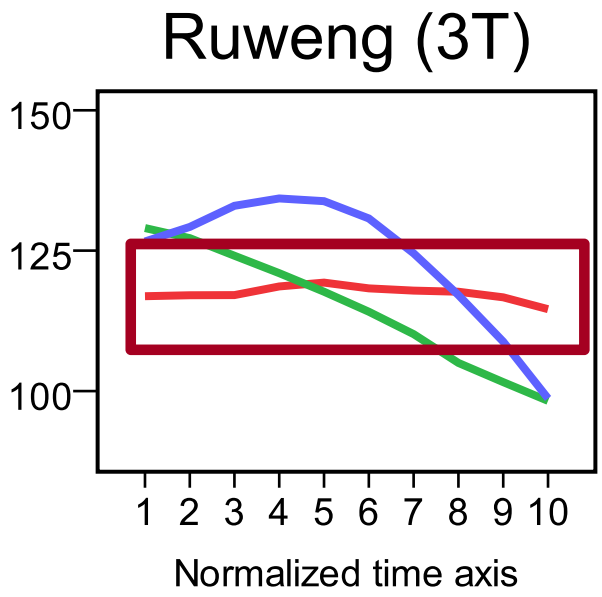


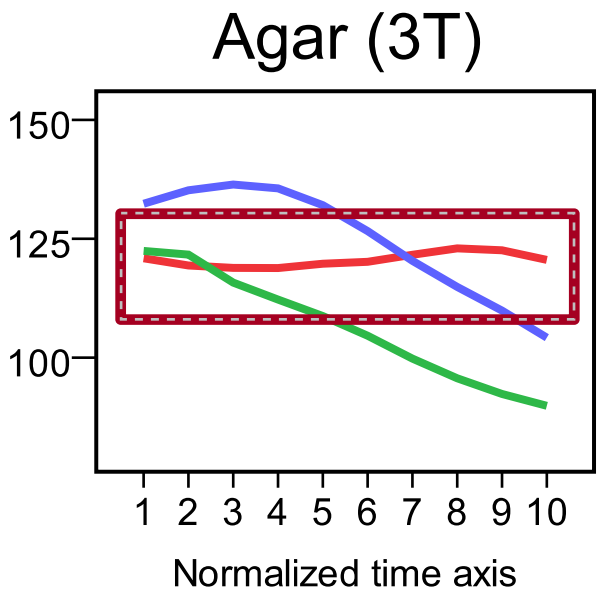


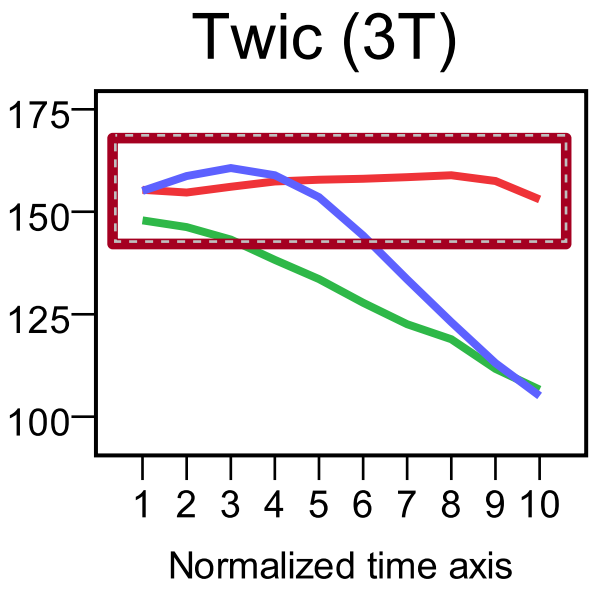

# Part 2 / Agar and Ruweng

- In Ruweng (3T) and Agar (3T), *H and *HL have neutralised: both are falling in final position and high elsewhere.
- Example – a *H infinitive verb:

| | |
|---|---|
| Nyarweng (4T) | **Dèeŋ à-cį́ nòoon máaan**<br>Deng D-PAST grass.SG hate.INF<br>'Deng hated grass.' |
| Ruweng (3T) | **Dèeŋ à-cį́ nòoon mâaan**<br>Deng D-PAST grass.SG hate.INF<br>'Deng hated grass.' |

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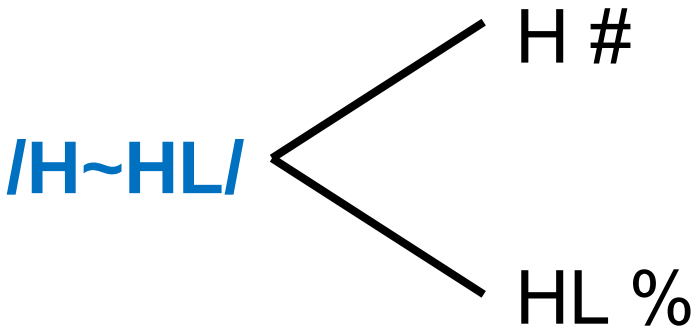
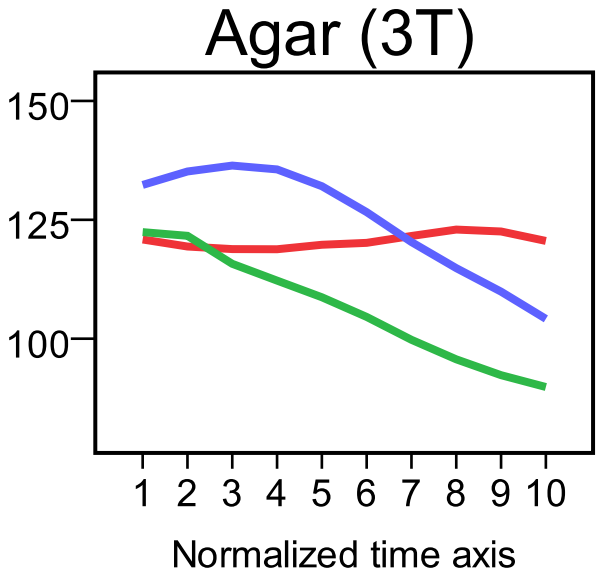
| | *L | *LH | *H | *HL |
|---|---|---|---|---|
| 4-toneme dialects | ● | ● | ● | ● |
| Agar, Ruweng | ● | ● | ● | |

# Part 2 / Agar and Ruweng

- What is the most appropriate phonological representation of the toneme?



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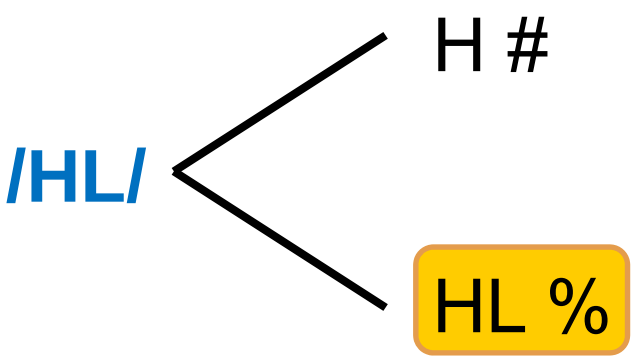
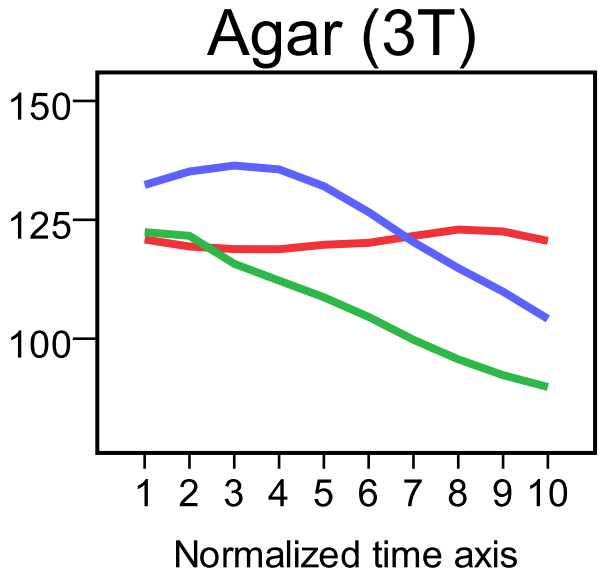
- Andersen (1987) on Agar:



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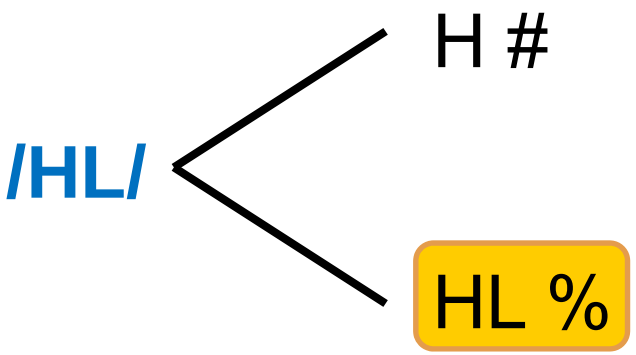
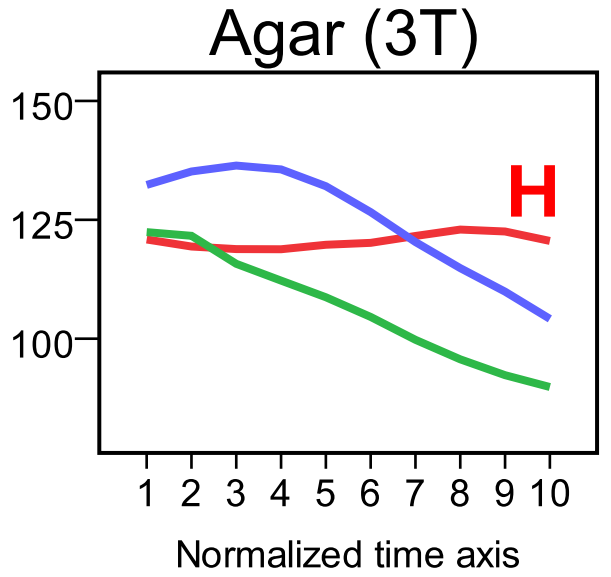
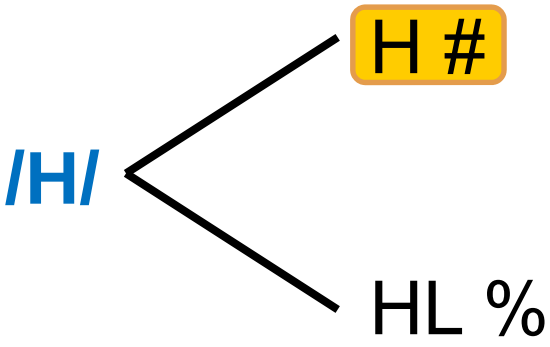


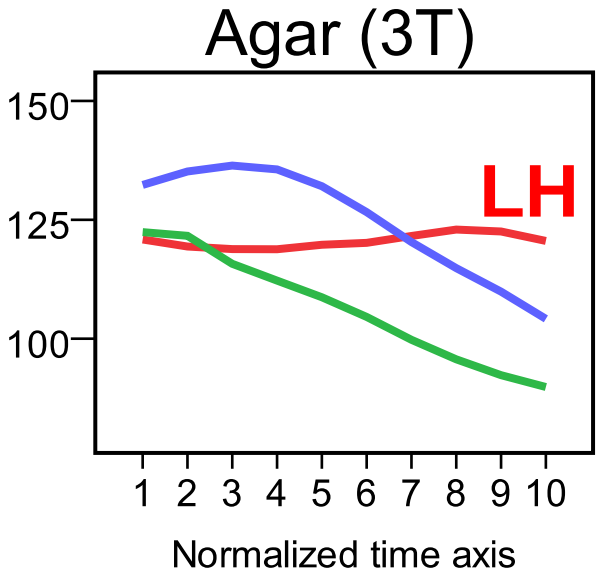




**Contrary to Dispersion Theory: the 'H' (red line) does not shift upwards to maximise perceptual distance**

# Part 2 / Agar and Ruweng

- What is the most appropriate underlying representation?
- Reanalysis proposed here:



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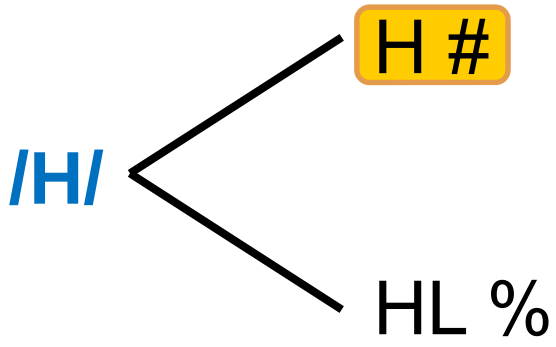


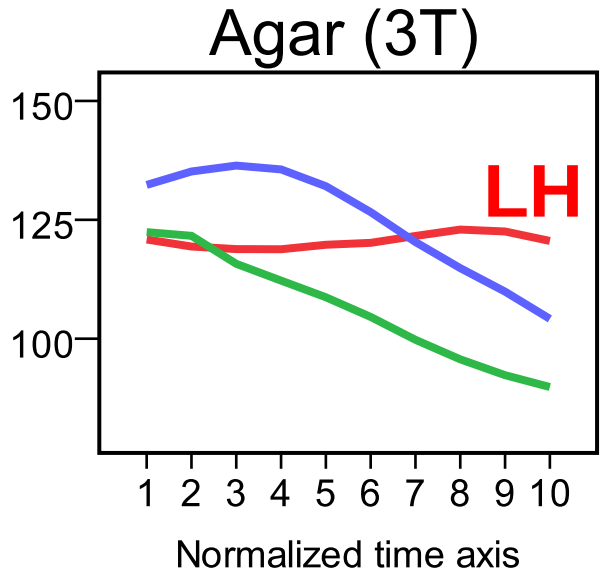


**In line with Dispersion Theory: the H (blue line) is at the top of the tonal space**

# Part 2 / Agar and Ruweng

- There is additional support for the reanalysis from Dissimilatory  Lowering in the Ruweng dialect – remember Luanyjang:

# Part 2 / Agar and Ruweng

- Dissimilatory Lowering in Luanyjang (4T):

| | |
|---|---|
| H L H > H L H<br><br>**nòoon** ‘grass.SG’ | **Acôol à-cį́ nòoon máaan**<br>Achol D-PAST grass.SG hate.INF<br>‘Achol hated grass.’ |
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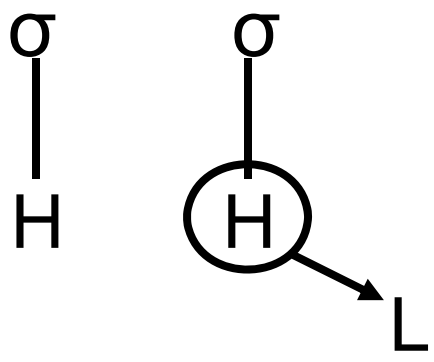
# Part 2 / Agar and Ruweng

- Summary of Dissimilatory Lowering in Luanyjang Dinka (4T):

| Underlying | Observed |
|---|---|
| H L H | H L H |
| H H H | H L L |
| H LH H | H LH L |
| H HL H | H L H |

- Rule:



# Part 2 / Agar and Ruweng

- Dissimilatory Lowering in Ruweng Dinka (3T) – transcription following Andersen (1987) on Agar:

| | |
|---|---|
| H L HL > H L HL<br><br>**nòoon** ‘grass’ | **Acôol à-cį́ nòoon mâaan**<br>Achol D-PAST grass.SG hate.INF<br>‘Achol hated grass.’ |
| H HL HL > H L L<br><br>**aɲâaar** ‘buffalo.SG’ | **Acôol à-cį́ aɲâaar mâaan**<br>Achol D-PAST buffalo.SG hate.INF<br>‘Achol hated a buffalo.’ |
| H H HL > H LH L<br><br>**páal** ‘knife.SG’ | **Acôol à-cį́ páal mâaan**<br>Achol D-PAST knife.SG hate.INF<br>‘Achol hated a knife.’ |

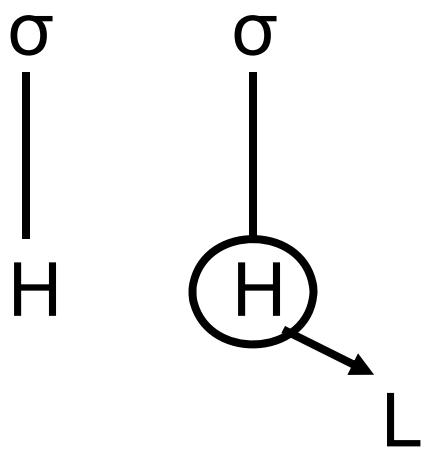
# Part 2 / Agar and Ruweng

- Summary of Dissimilatory Lowering in the Ruweng dialect (3T):

| Application of Andersen (1987) to Ruweng | | | This reanalysis: | |
|---|---|---|---|---|
| Underlying | Observed | | Underlying | Observed |
| H HL HL | H L L | | H H H | H L L |
| H H HL | H H L | | H LH H | H LH L |

# Part 2 / Agar and Ruweng

- The reanalysis proposed here allows for a better generalisation of Dissimilatory Lowering in Ruweng.
- Rule – same as in Luanyjang (4T):



# Part 2 / Agar and Ruweng

- Three lines of evidence support the same analysis, i.e., that H underlies H~HL in Ruweng:

  - Dispersion Theory

  - cognates from 4T dialects

  - Dissimilatory Lowering

- They suggest that the surface realisation found in citation and sentence-finally (HL) is not the phonological representation.

# Part 2 / Agar and Ruweng

- In Agar, the other 3T dialect, however, there is no Dissimilatory Lowering, and Andersen (1987) is solely based on data from this dialect.
- Here the positioning of the tonemes in the tonal space provides the only dialect-internal argument for the interpretation that the underlying representation of /HL~H/ is H, rather than HL.

# Part 2 / Conclusion

- The phonetic realisation of tonal categories reflects their phonological nature, just as is the case for vowels;
- The predictions of Dispersion Theory re. the phonetic realisation of sound categories can contribute to the phonological analysis of tone systems.

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# Acknowledgements


- John Penn de Ngong, Peter Malek Ayuel, Caguor Adong Manyang, Simon Kuengbuny Pal, Akol Kongoor Reech, Simon Yak Deng for assistance in making the recordings.
- The speakers who took part in the elicitation sessions.
- Torben Andersen, Larry Hyman, Bob Ladd, Peter Ladefoged, Tatiana Reid, and Alice Turk, for thought-provoking discussions on Dinka tone over the years.
- SIL Sudan (director: Elizabeth Newport) and the Institute of African & Asian Studies at University of Khartoum (director: Al-Amin Abu-Manga), both for sponsorship of and support during data collection in Sudan.
- The Arts & Humanities Research Council and The British Academy, for research funding under several grants.

# Part 1 / The grammatical function of tone

- Like the other suprasegmental distinctions, tone is heavily involved in the morphosyntax – e.g.:

**adwə̀ɔk ă-mèl**
gourd.SG AGR-soil.2SG
You make the gourd dirty.

**adwə̀ɔk ă-mêl**
gourd.SG AGR-soil.PASS
The gourd is being made dirty.