INSTITUTE OF PHONETICS AND SPEECH PROCESSING

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How are the coarticulatory source and effect connected in the development of vowel metaphony?

Stem vowel metaphony and suffix vowel erosion in the Lausberg area (Southern Italy)

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Masterseminar *ExperimentalPhonetik*

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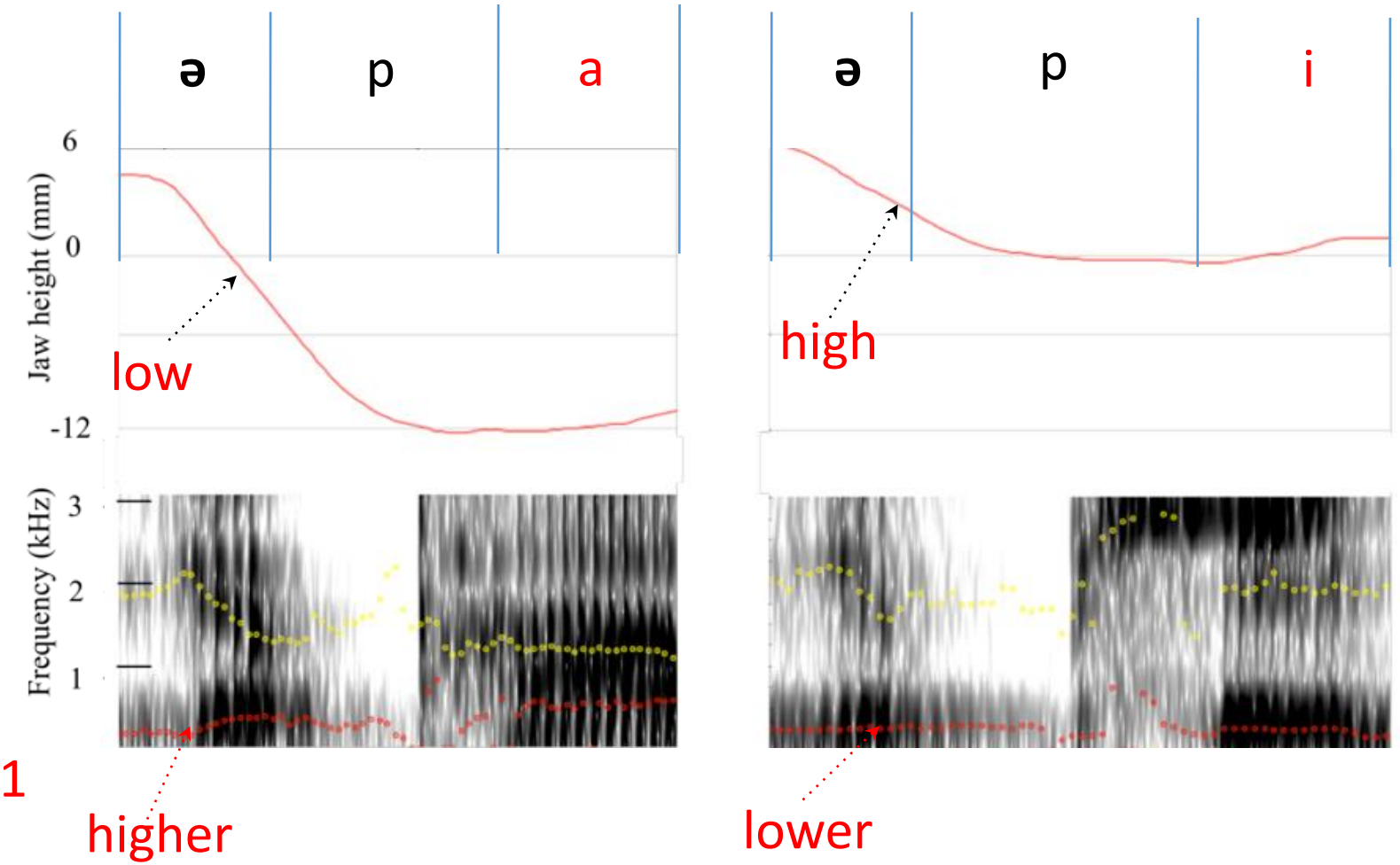
Some preliminary knowledge

V-to-V coarticulation



(Harrington et al. 2013: 244)

From coarticulation to sound change

- A German example of a phonologised V-to-V, **Umlaut**:

Althochdeutsch: <der gast, dia gesti>

Modern German <Gäste> /gɛstə/

Most probably, *Protogermanisch:* */gasti/ !

Target /a/ + Trigger /i/ = a new phoneme /ɛ/!

What happened in Modern German?

- Target: the output (effect) of the sound change became phonemically contrastive, i.e. not an allophone/sub-phoneme but fully phonologised
- Trigger (or source): phonetic erosion via neutralisation to [ə]

The phonologisation paradox

The coarticulatory effect is enhanced as the source wanes

e.g. Umlaut: */gasti/ → /gɛstə/

How is this possible?

Possible explanation: **Cue-trading** between source (trigger) and effect (output from the target)

Further examples:

Vowel nasalization: *main*, /mɛ̃/ < Latin <manus>, 'hand'

Tonogenesis: Eastern vs Western Khmu:

buːc / puːc → pùːc / pûːc 'rice vine / take off clothes'

Our case study

Metaphony in the Lausberg area (Lausberg, 1939)

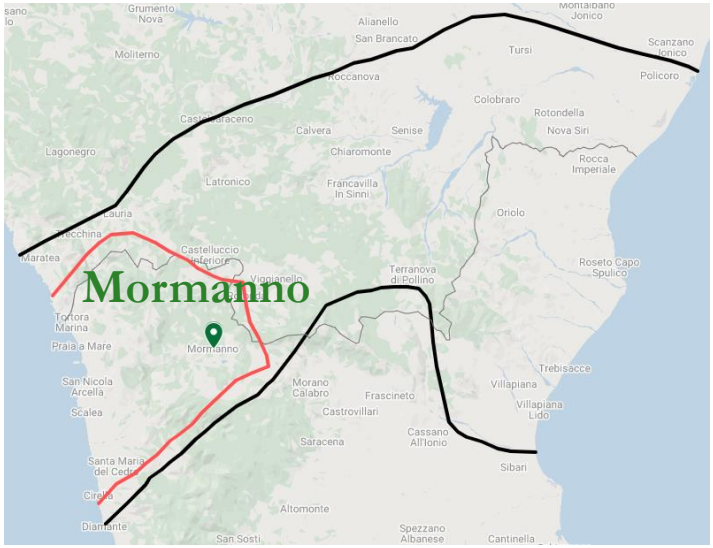
- affects mid stem vowels /e, o/
- triggered by high inflectional suffix vowels /i, u/

e.g. b[ɛ]lla, b[i]llu
vs Italian /bella, bello/

Why the Lausberg area?

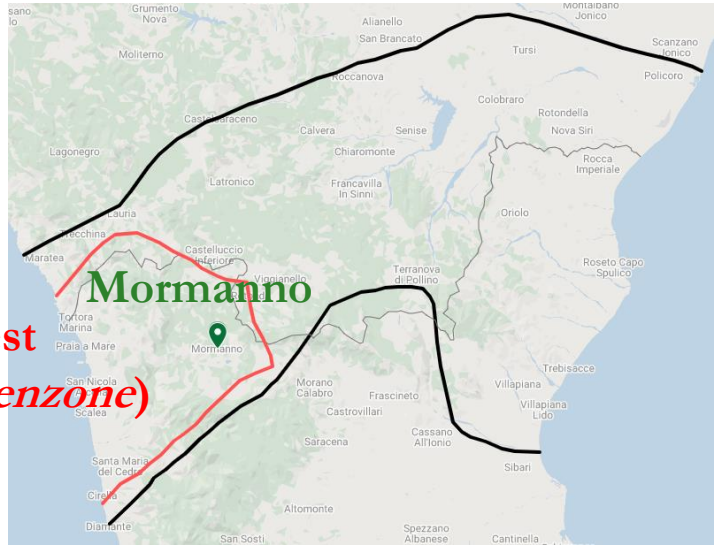
- Coarticulation and sound change in *living* dialects
- Different sound change types coexist in one area

Metaphony in the Lausberg area (Lausberg, 1939)



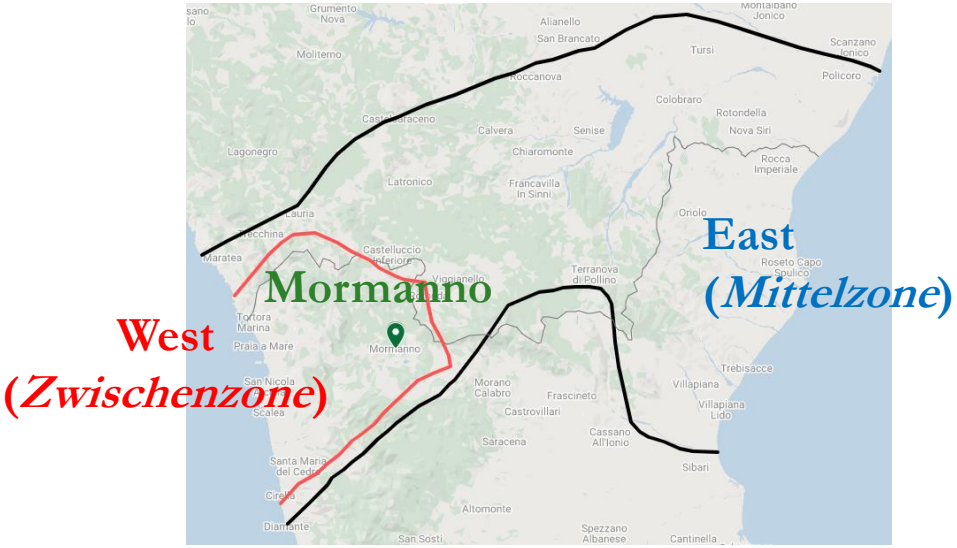
	Mormanno		
[bɛlla]	[bellu]		
[kɔtta]	[kottu]		

Metaphony in the Lausberg area (Lausberg, 1939)



	Mormanno	West	
[bɛlla]	[bellu]	[bjellu, biellu]	
[kɔtta]	[kottu]	[kwottu, kuottu]	

Metaphony in the Lausberg area (Lausberg, 1939)



	Mormanno	West	East
[bɛlla]	[bellu]	[bjellu, biellu]	[billu]
[kɔtta]	[kottu]	[kwottu, kuottu]	[kuttu]

- Suffix vowel erosion: regional variation is unclear.

  [kotta, kuttu], [kottə, kuttə] or [kott, kutt]?

Research questions

1. **Is there a trade-off** of cues between stem and suffix vowels?

2. **Nature of this trade-off**: Is this cue-trading observable *between* different regions, and/or also *within* any speaker or region?

Hypotheses

1. Increasing metaphonic influence in the stem:

MM < West < East

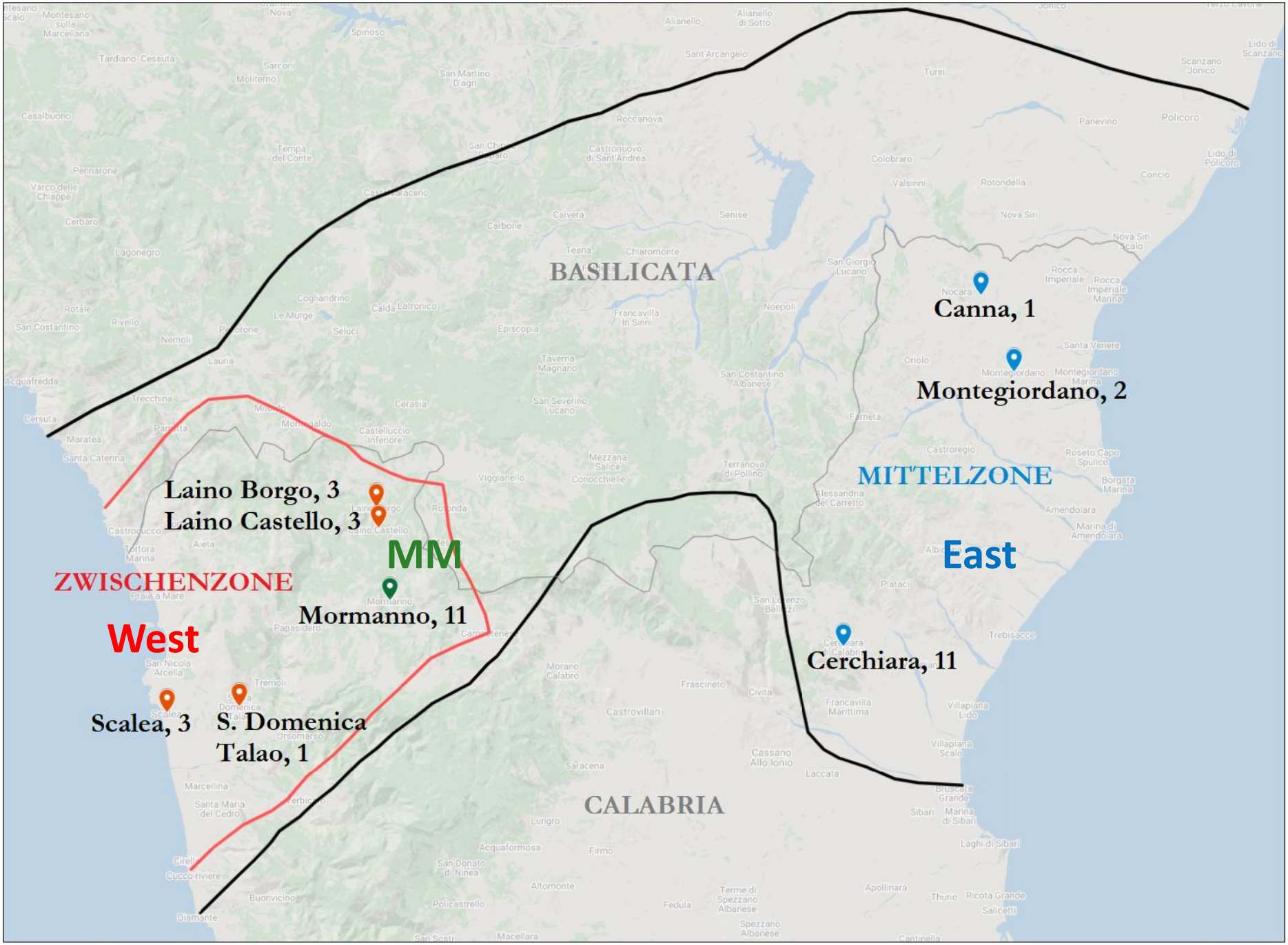
2. Increasing suffix erosion, parallel to metaphony:

MM < West < East

3. Trade-off also *within* regions/individuals

Data elicitation

- Word elicitation through a picture-naming task
- Inflected forms of nouns, adjectives and verbs
- 35 speakers: 18 ♀, 17 ♂, 13 to 91 years old, mean age 48.9


BASILICATA
Canna, 1
Montegiordano, 2
MITTELZONE
East
Laino Borgo, 3
Laino Castello, 3
MM
Mormanno, 11
ZWISCHENZONE
West
Scalea, 3
S. Domenica Talao, 1
Cerchiara, 11
CALABRIA

Hypotheses

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Lexical items: examples

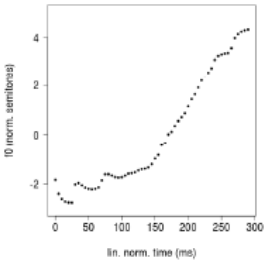
Suffixes	Stem vowels	
	/e/ (n = 2752)	/o/ (n = 2620)
-a	bɛlla	bɔna
-e	vɛrme	nipɔte
-i	d[e-ie-i]nti	f[o-uo-u]rni
-u	l[e-ie-i]ttu	k[o-uo-u]ttu

118 word types (55 lexical stems)

Stem vowel formant processing

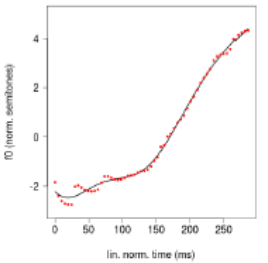
- Time normalisation of F1 and F2
- Lobanov-normalised formant pairs: F1 and F2, /a/, /i/ and /u/ as „corner“ vowels
- Joint analysis of F1 and F2 **along time,** using **FPCA** (Gubian et al. 2015)
- /e/ and /o/ stems analysed separately

Functional Principal Components Analysis (FPCA)



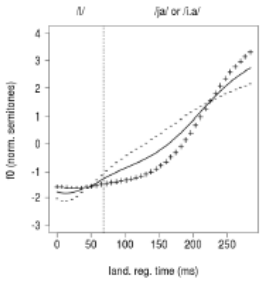
Raw data

The input data is in the form of time sampled contours.



Smoothing

Contours are represented in the form of smooth continuous functions of time. Note: durations are linearly normalized.

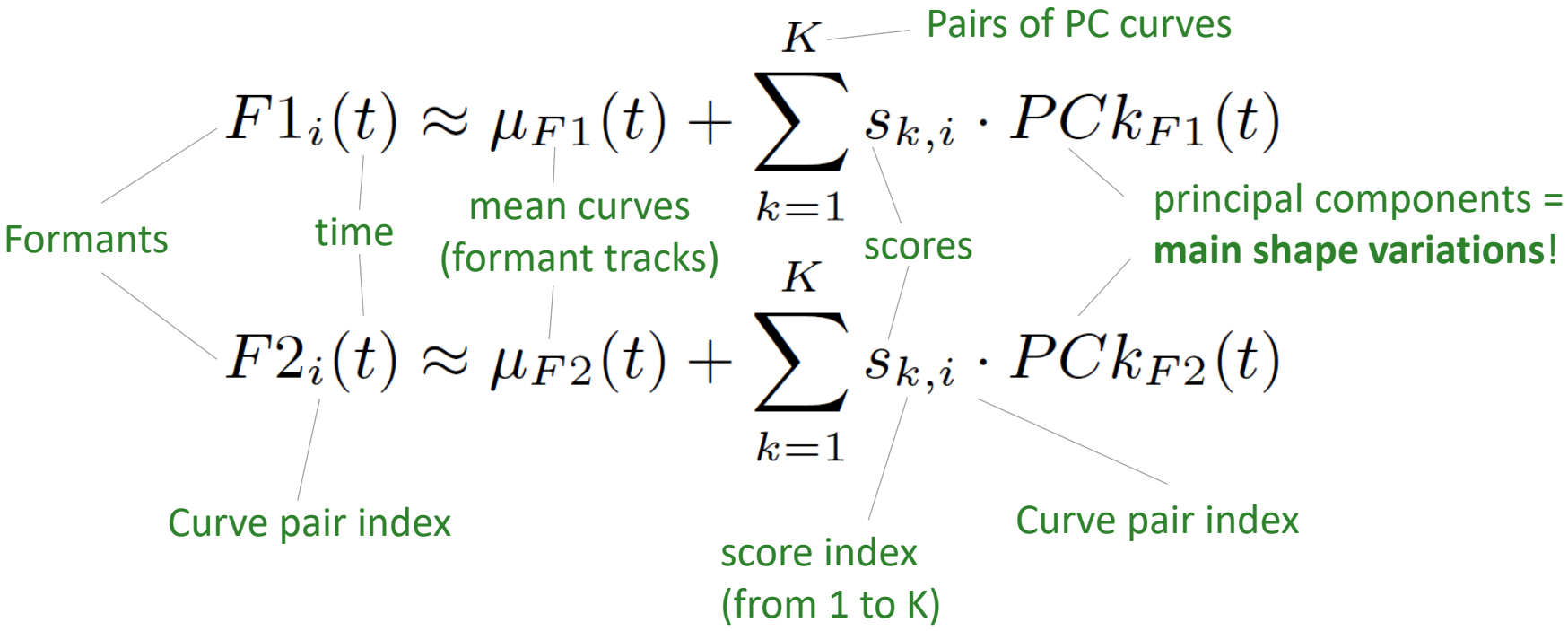


Functional PCA

The main shape variations across the set of contours are extracted. Each contour is parametrised by a set of *PC scores*.

Source: Gubian et al. 2015

Functional Principal Components Analysis



FPCA: shape variations

Functional **P**rincipal **C**omponents **A**nalysis

- Vowel raising / lowering

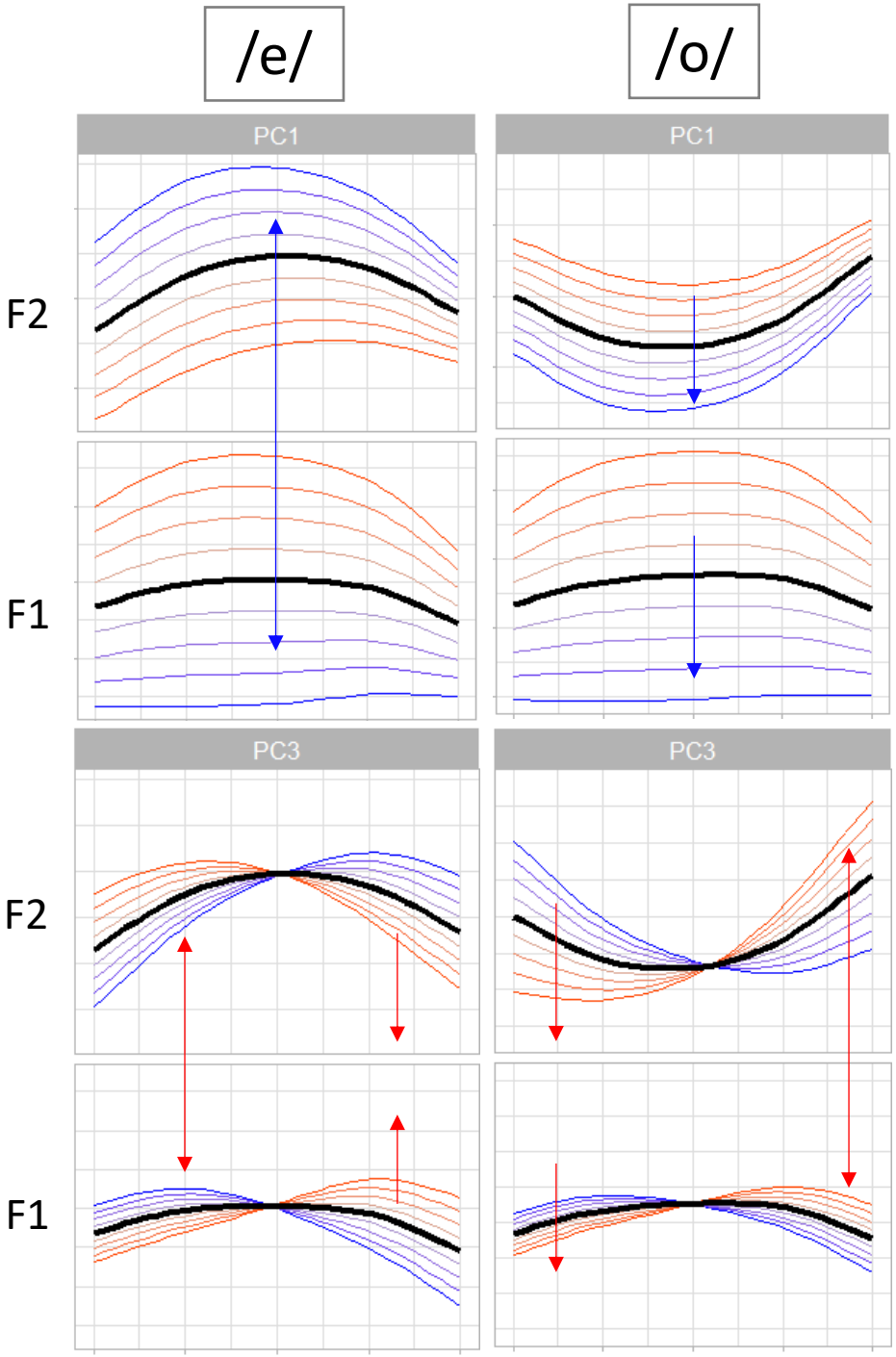
/e/ → [i] /e/ → [ɛ]

/o/ → [u] /o/ → [ɔ]

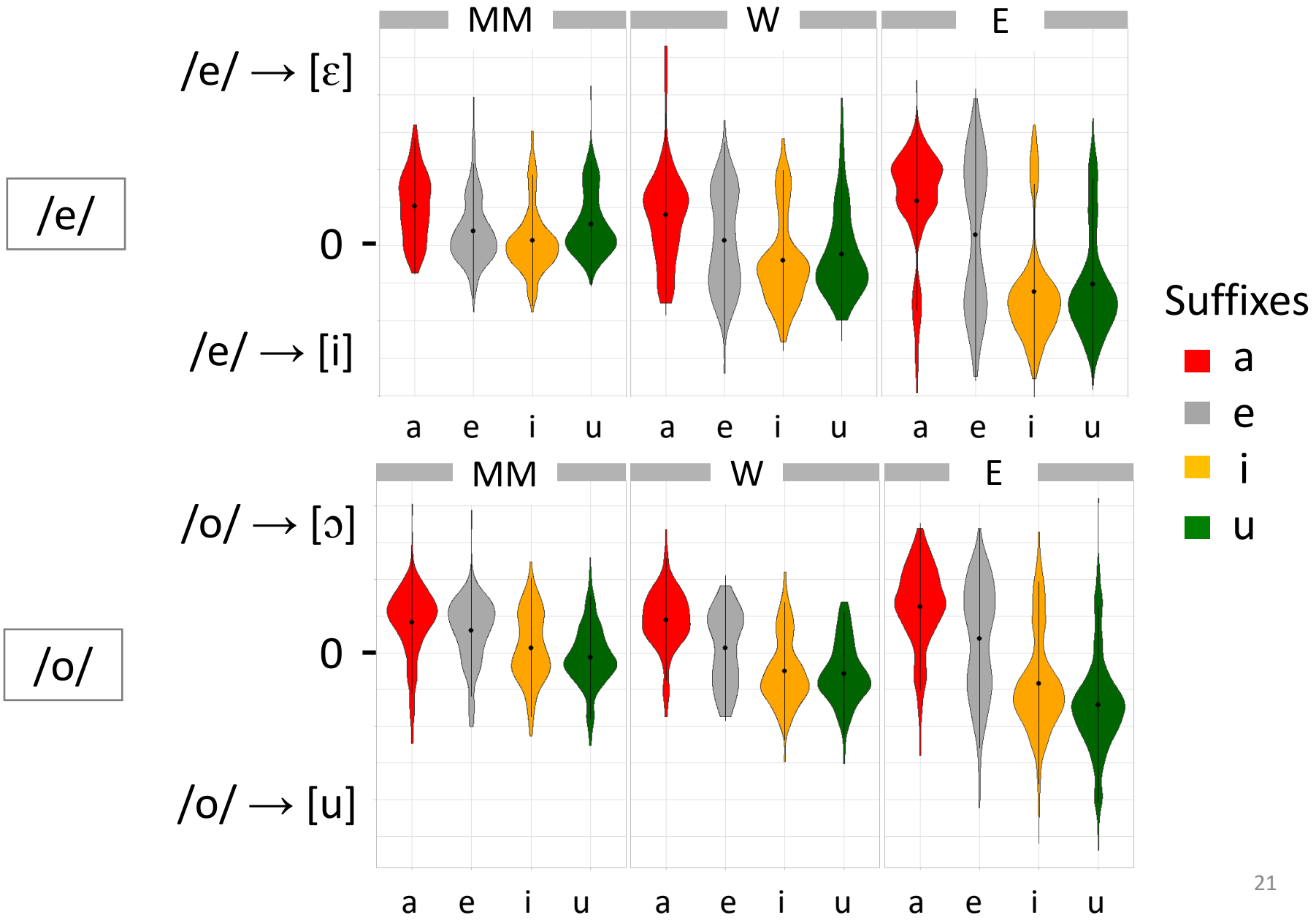
- Diphthongisation

/e/ → [ɛi] /e/ → [iɛ]

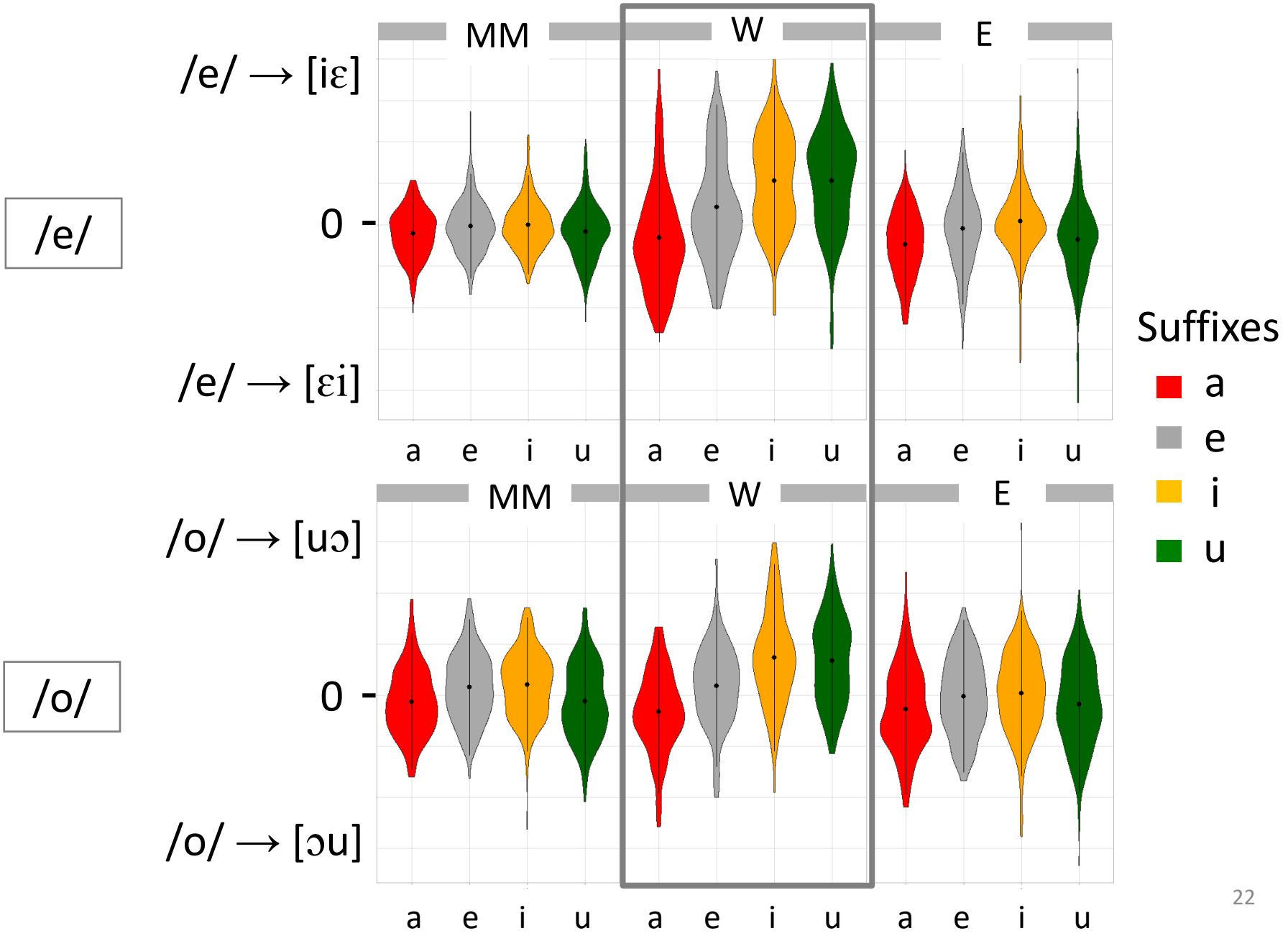
/o/ → [ɔu] /o/ → [uɔ]



Vowel height scores (s_1), by Suffix and Region



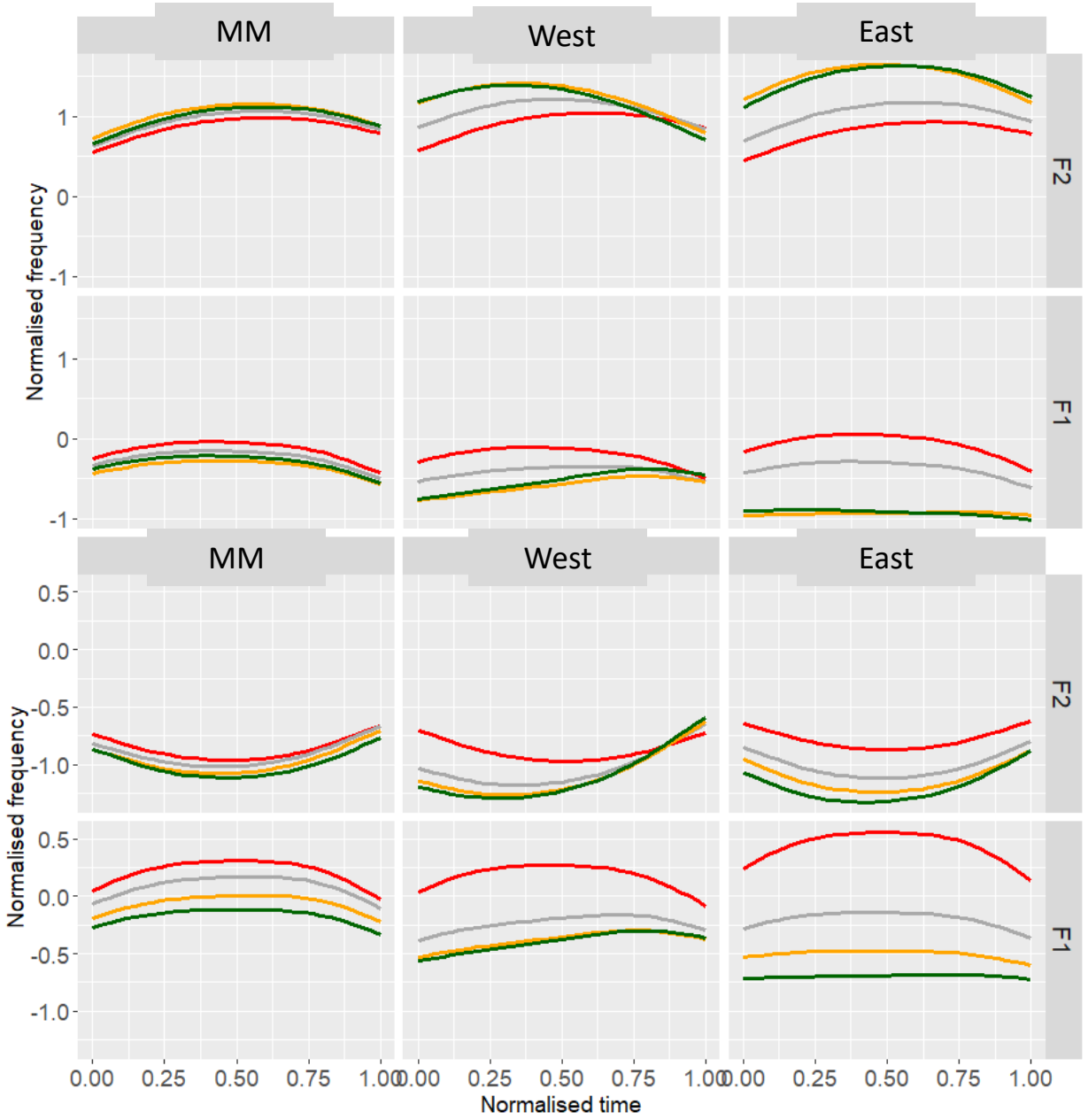
Diphthongisation scores (s_3), by Suffix and Region



Reconstructed formants from FPCA

/e/

/o/



Suffixes

- a
- e
- i
- u

Hypotheses

1. Increasing metaphonic influence in the stem:

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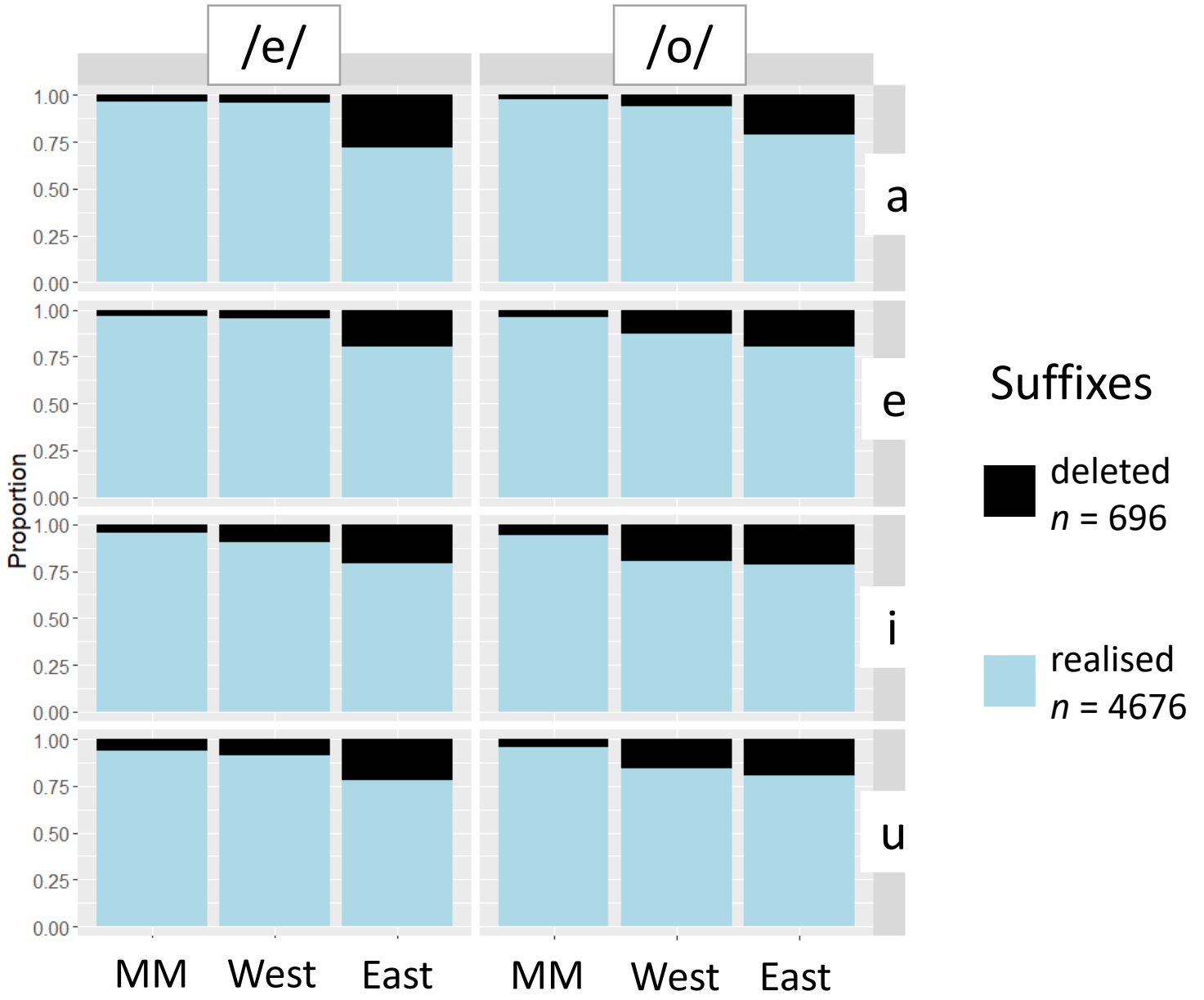
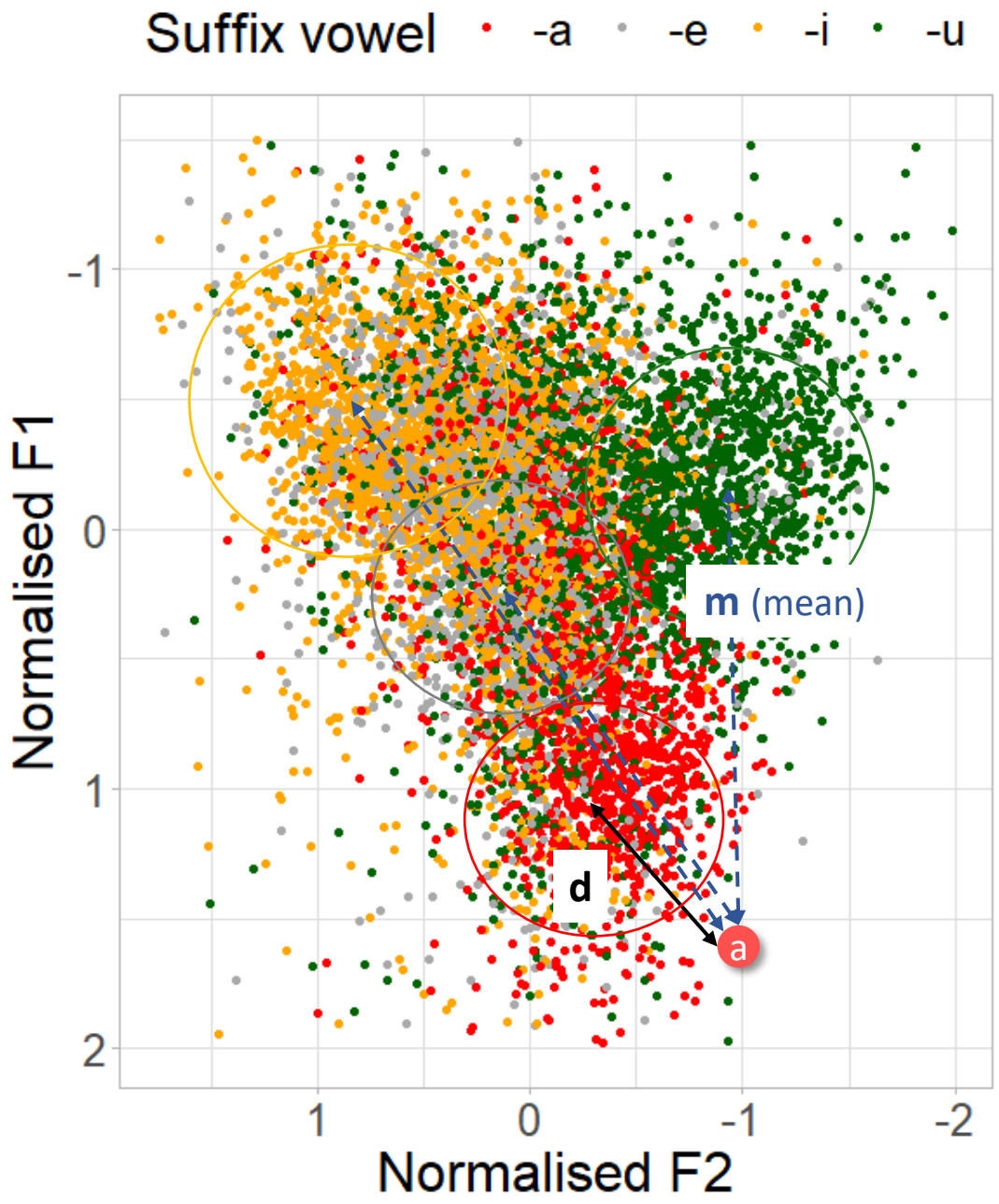
3. Trade-off also *within* regions

Suffix vowel deletion



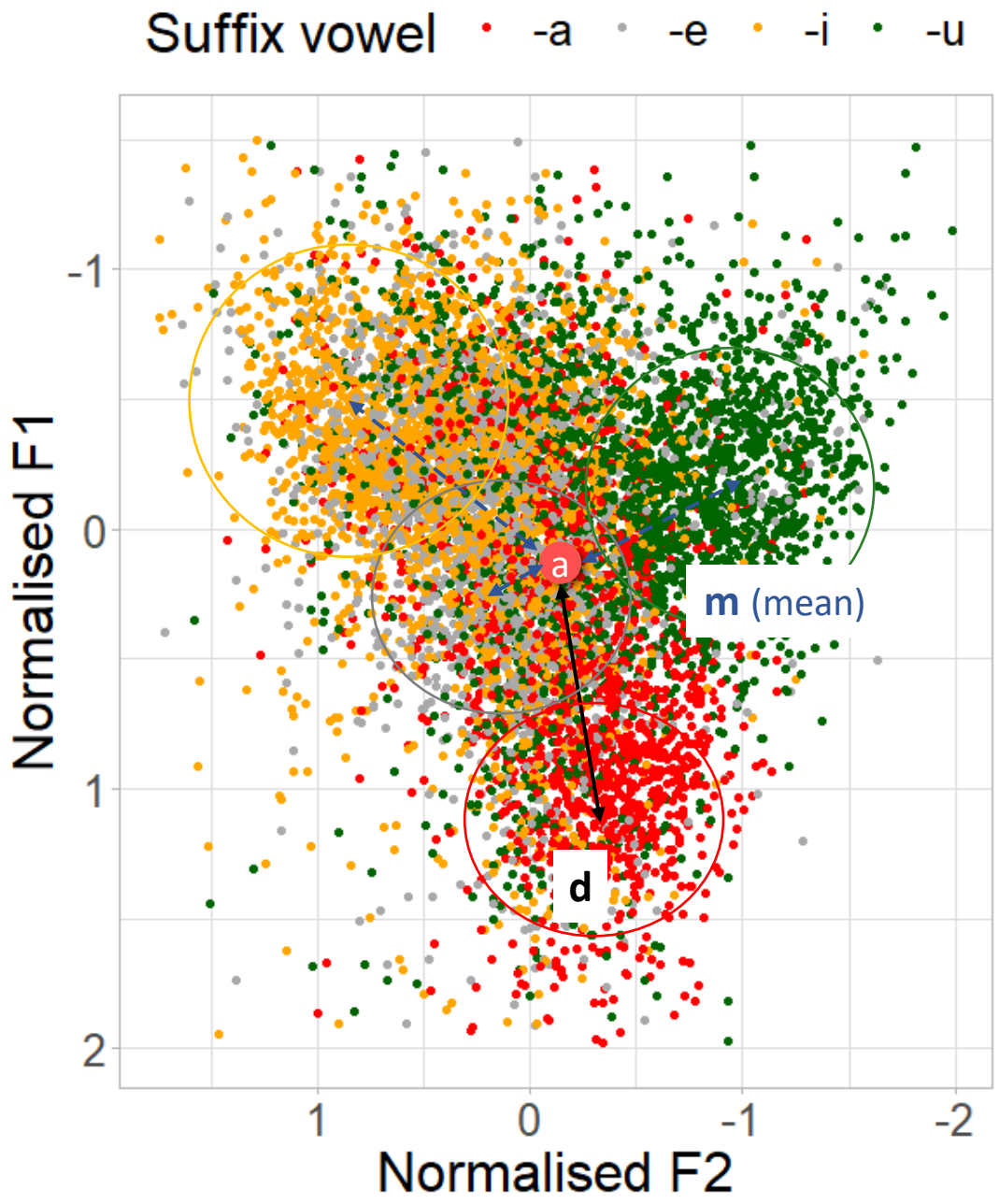


Centralisation *(c)* index

based on Euclidean distances in the Lobanov-normalised F1 × F2 space

$c = \log (d / m)$

☝ ***c* < 0**: less vowel reduction



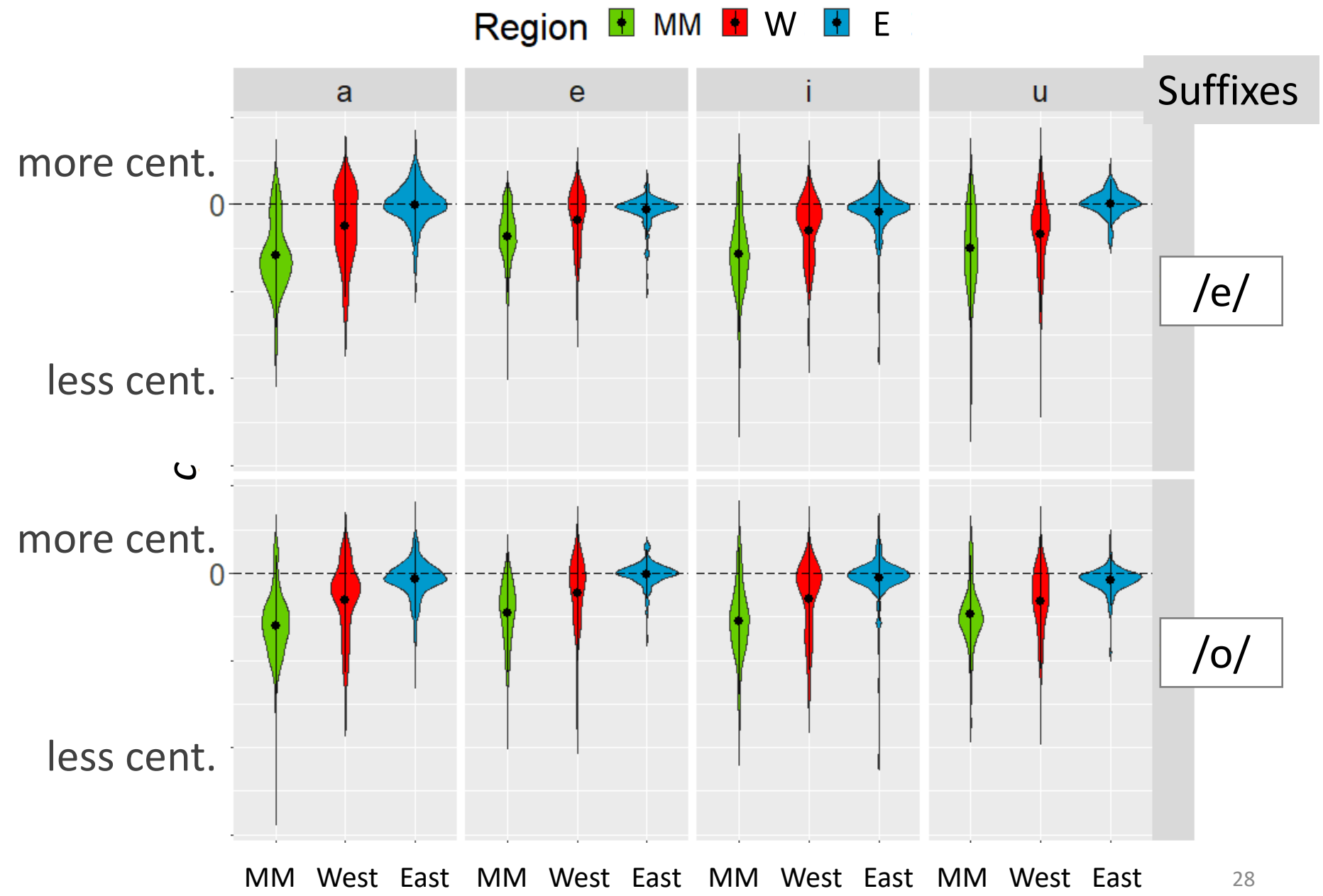
Centralisation *(c)* index

based on Euclidean distances in the Lobanov-normalised F1 × F2 space

$$c = \log (d / m)$$

- ***c* < 0**: less vowel reduction
- ***c* ≈ 0**: suffix vowel likely reduced to [ə]

Results: suffix centralisation



Hypotheses

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Within-individual cue-trading between suffix and stem?

Within any region, do speakers who centralise the suffix more also produce more marked metaphony?

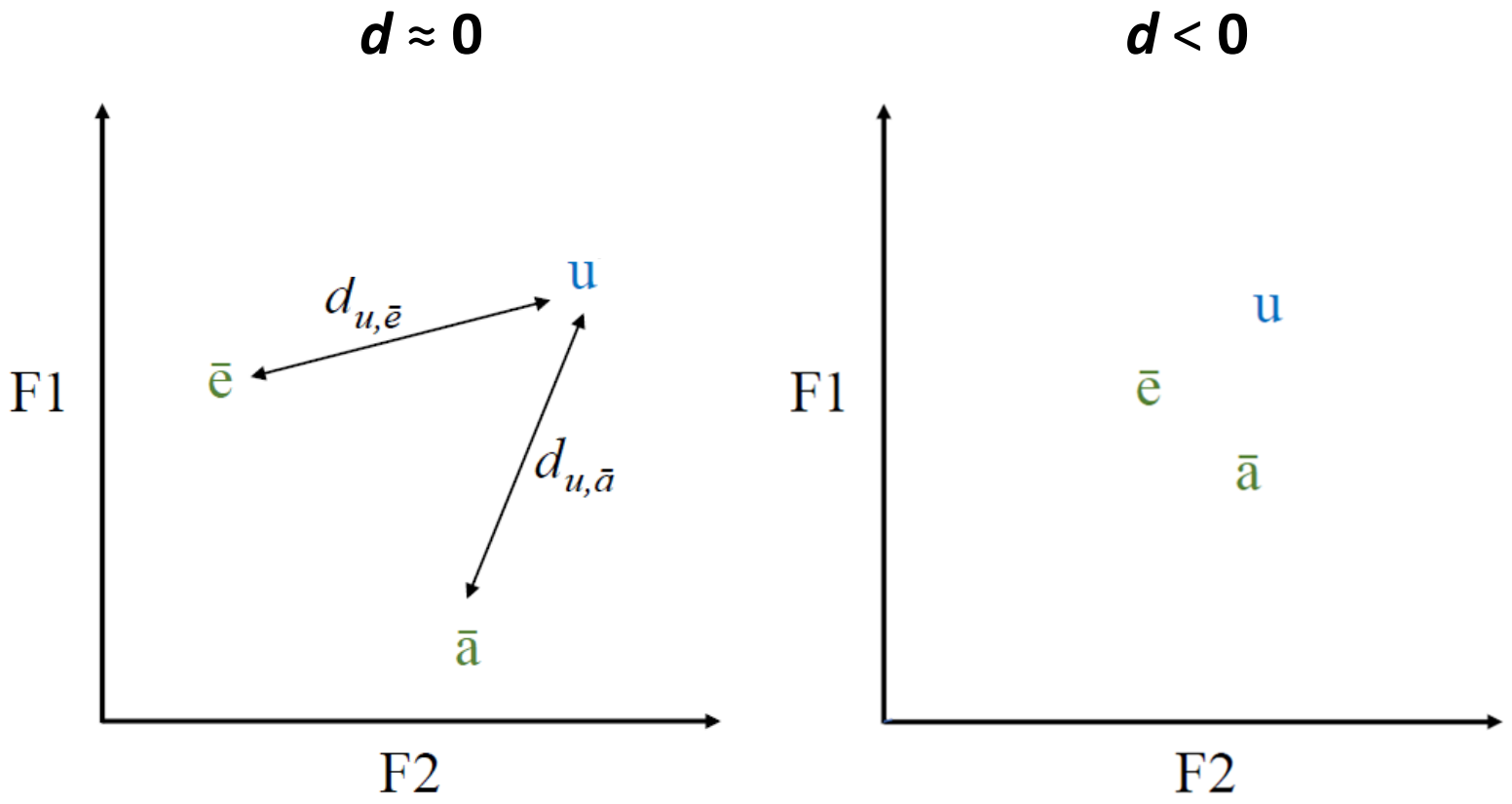
Calculated by speaker, lexical stem, for ≠ suffix contexts:

d_{stem} : log. of Euclidean distances in the acoustic space

e.g. d_{stem} of /b**o**ni/ to /bona, bone/ (High vs Mid vs Low)

d_{suffix} : log. of Euclidean distances in the F1 x F2 space

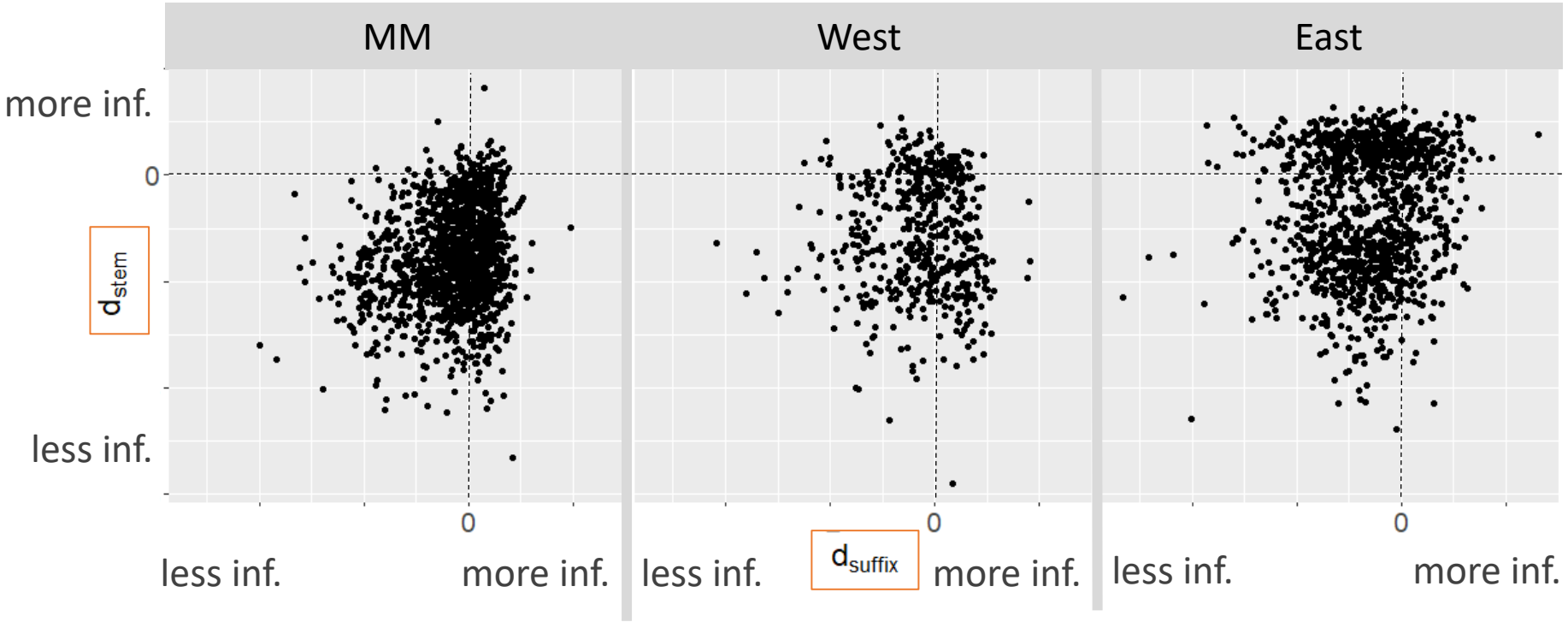
e.g. d_{suffix} of /bonu/ to /bona, bone/ (High vs Mid vs Low)



Is d_{stem} *inversely* related to d_{suffix} ?

Correlation between d_{stem} and d_{suffix}

- ***d* < 0**: less acoustic informativity
- ***d* ≈ 0**: more acoustic informativity



Relationship between the two was **non-significant**

To summarise...

MM < West < East

metaphonic influence ⟷ suffix erosion

- Trading of phonetic *and* morphological cues between stem and suffix.
- Trade-off takes place *between*, **not** *within* regions
- Each region possibly represents a stage in the progression of metaphony towards phonologisation

Danke ☺

Fragen? Kommentare?