Dialect variation in Hungarian vowel pronunciation: Atlas data compared to acoustic measurements

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Aim of this study

- To test the phonetic reliability of subjectively transcribed atlas data, especially phonetically transcribed vowels
- Comparing vowel qualities deduced from transcribed atlas data ('perceived qualities') to measured formant values
  - Two data sources of vowel quality:
    - Study 1: transcribed dialect data (The Atlas of Hungarian Dialects)
    - Study 2: formant measurements (archived audio recordings of The Atlas of Hungarian Dialects)

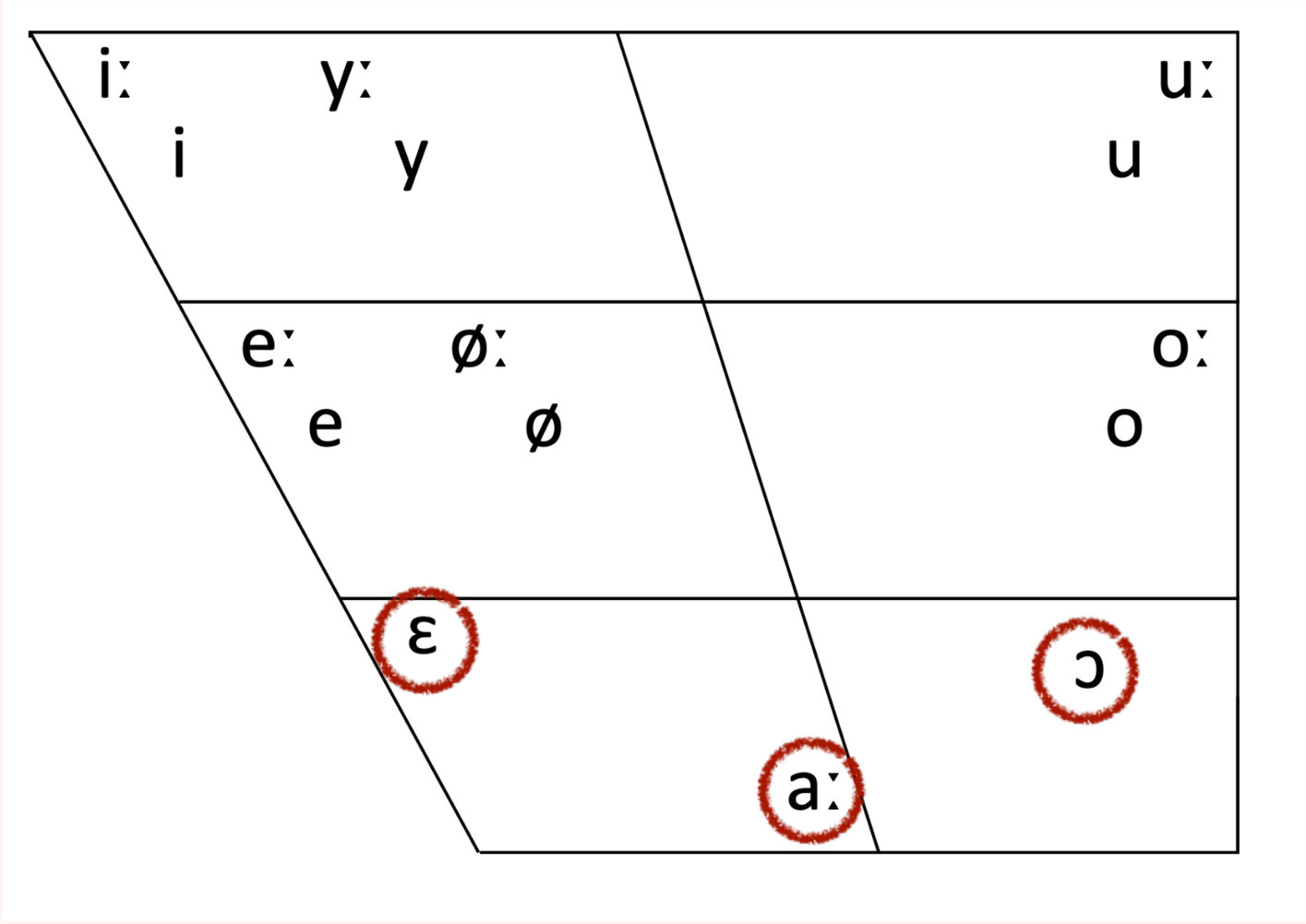
Study 1

Mapping vowel pronunciation from transcribed atlas data

Research material and method

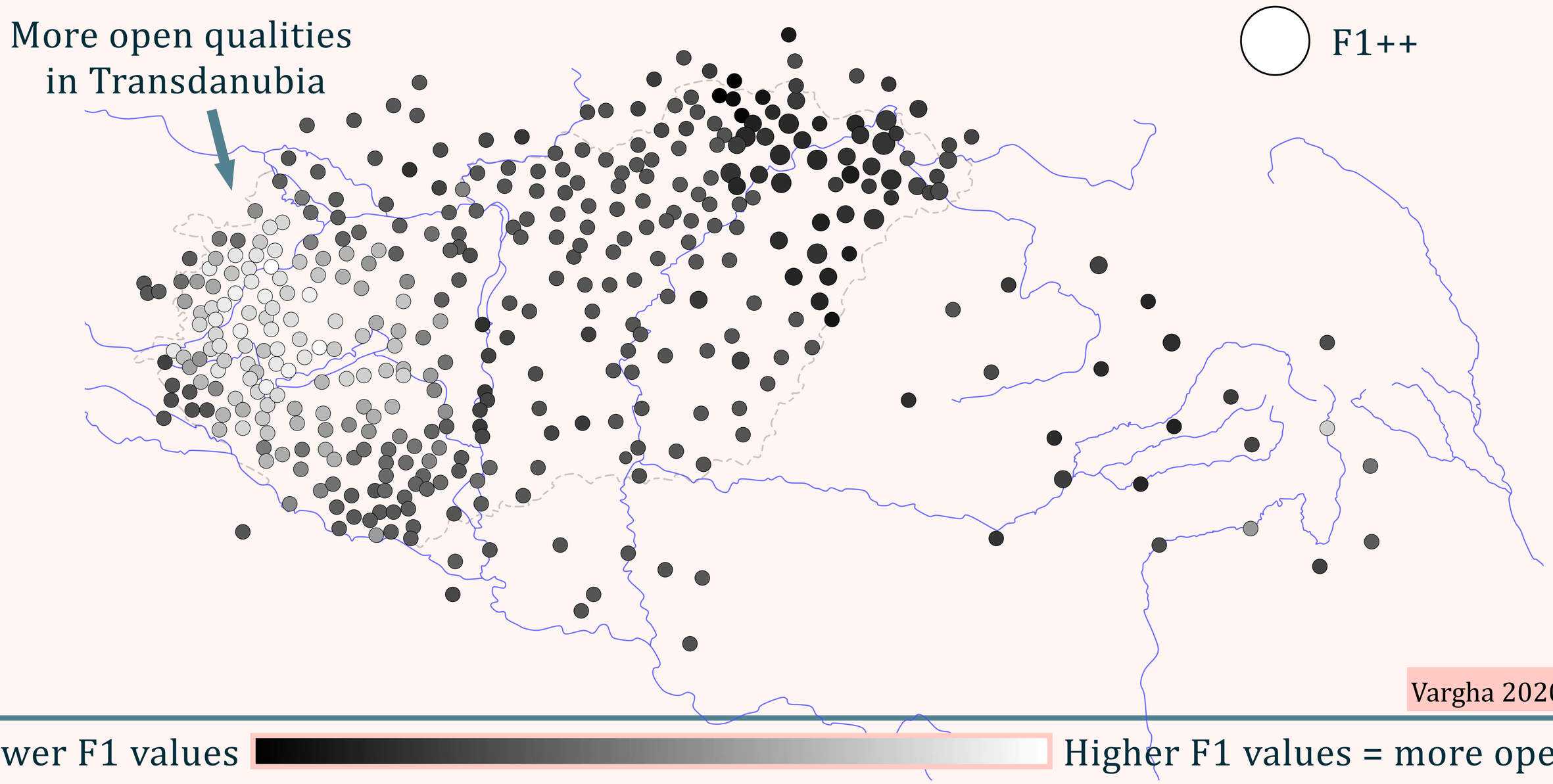
- Computerised maps of The Atlas of Hungarian dialects
  - 395 locations, 565330 data instances
- Making the correspondence between formant values and phonetic symbols
- Attributing normalised formant values for vowel symbols
- Calculating estimated F1 and F2 values for each vowel at every investigation point

Vowel phonemes of Hungarian

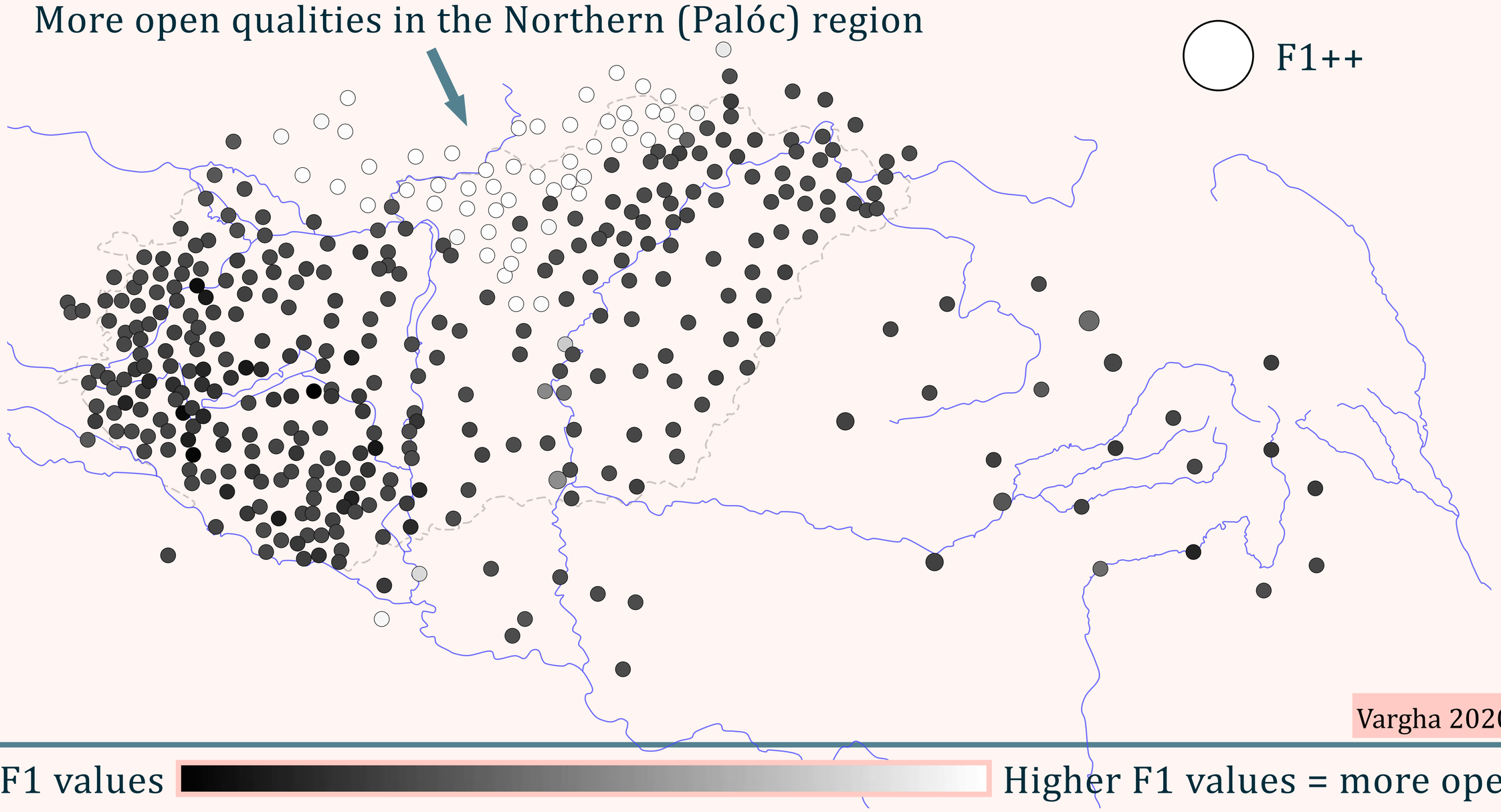


Vowel pronunciations in the focus of the present study:
/ɛ/,/ɔ/, /aː/

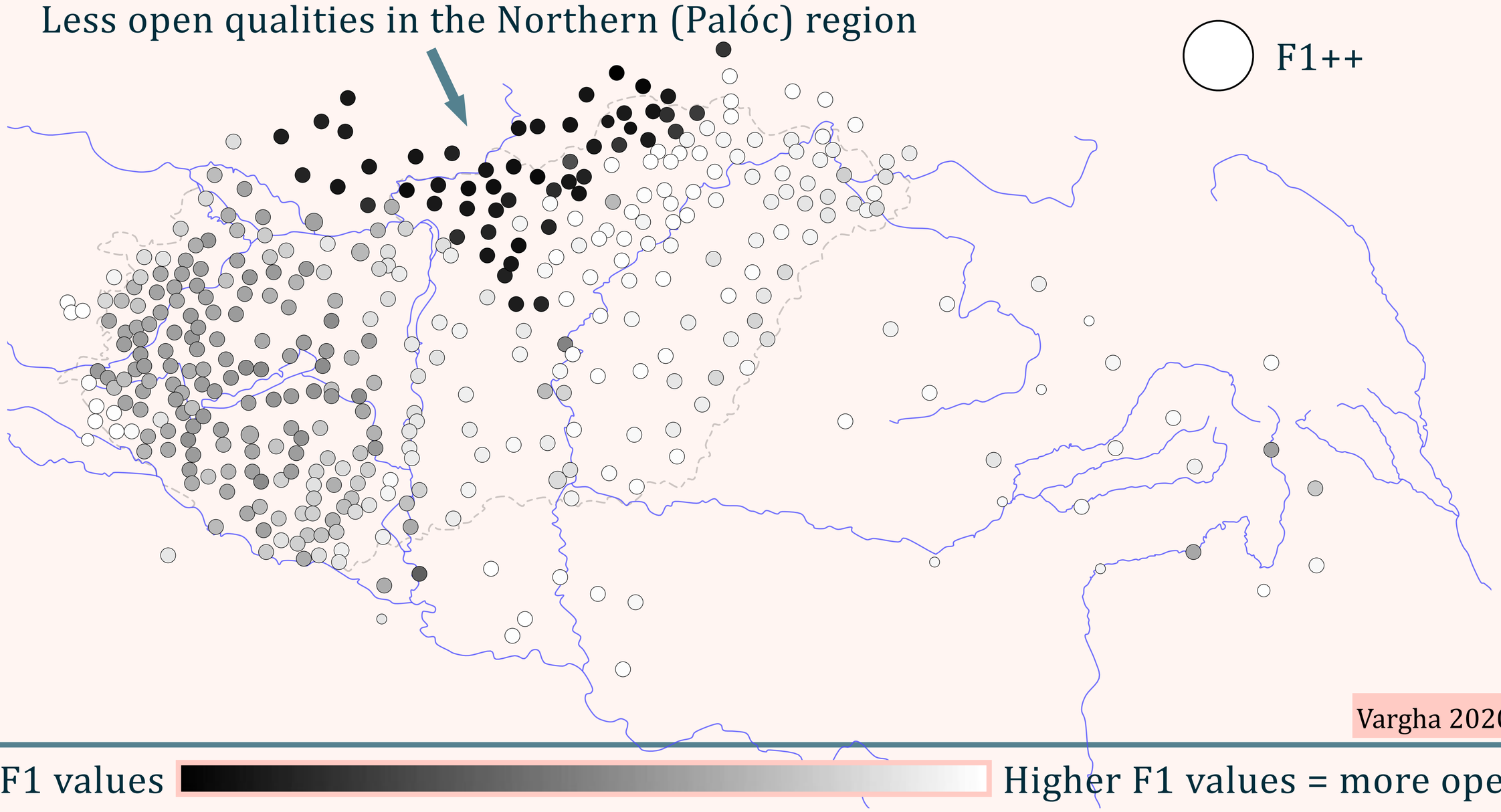
Vowel quality of /ɛ/ as calculated from transcribed symbols



Vowel quality of /ɔ/ as calculated from transcribed symbols



Vowel quality of /aː/ as calculated from transcribed symbols



Study 2

Formant measurements: acoustic study of Hungarian vowel pronunciation

Material and methods

- Research material: Time-aligned transcriptions of selected interview segments from the recordings (1960–1964, 352 locations, 460 hours) made for The Atlas of Hungarian Dialects
- Interviews transcribed and investigated with a dedicated software for doing Hungarian dialect research (Bihalbocs)
- F1 and F2 measurements with Praat using Burg’s method, manually corrected (if needed)

Measuring F1 and F2

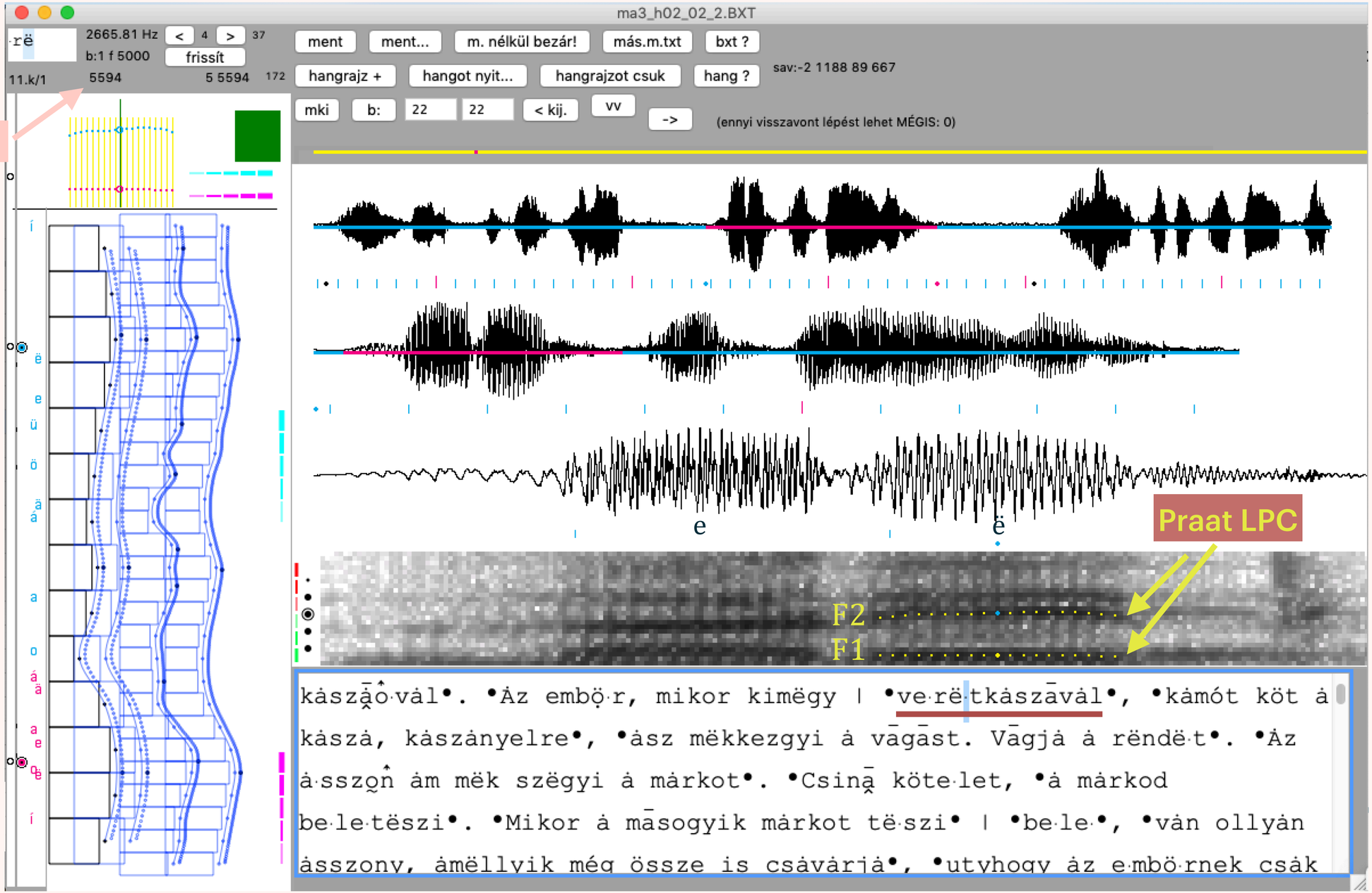
Vowel

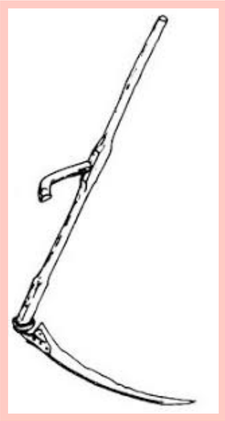
MaxFormant

F2

F1

Measuring formants in our dedicated software, calling Praat via a Praat-script





- markers aligning sound and text
- markers of the measured vowels

Measuring F1 and F2

Vowel

MaxFormant

F2

F1

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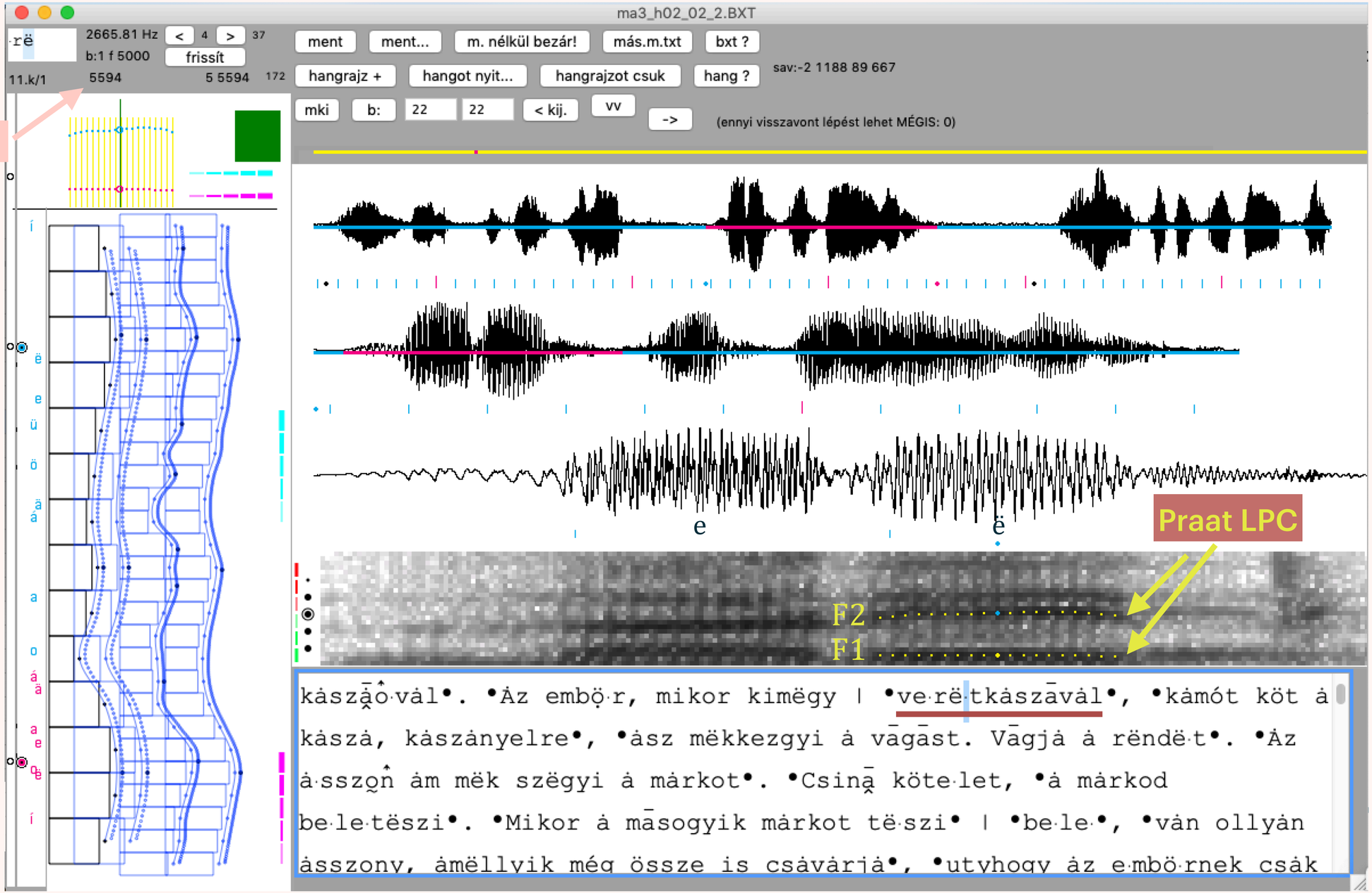
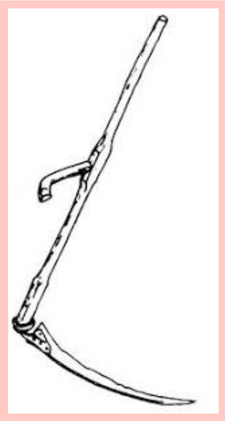
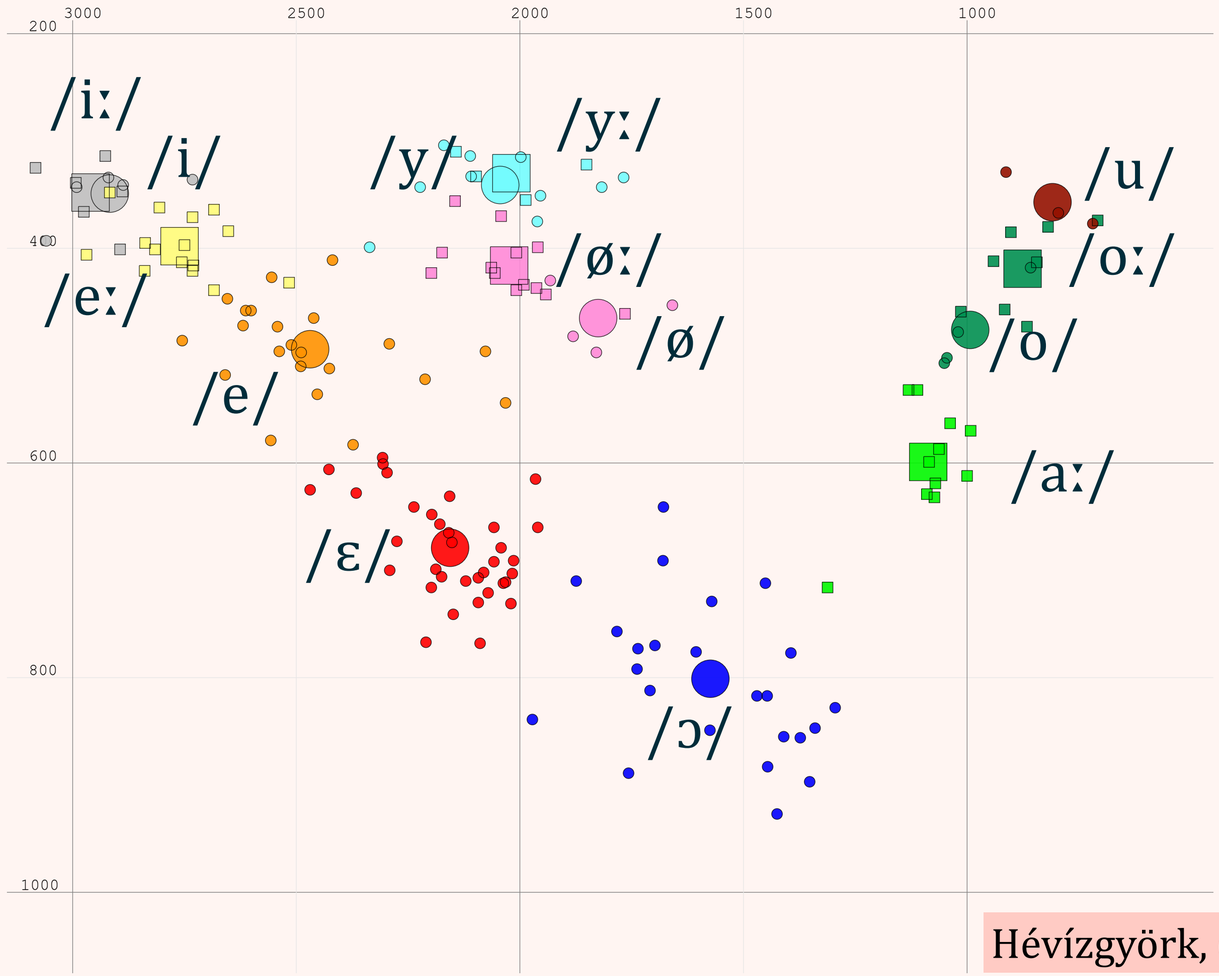




- markers aligning sound and text
- markers of the measured vowels

Normalisation (rescaling) of Hz values

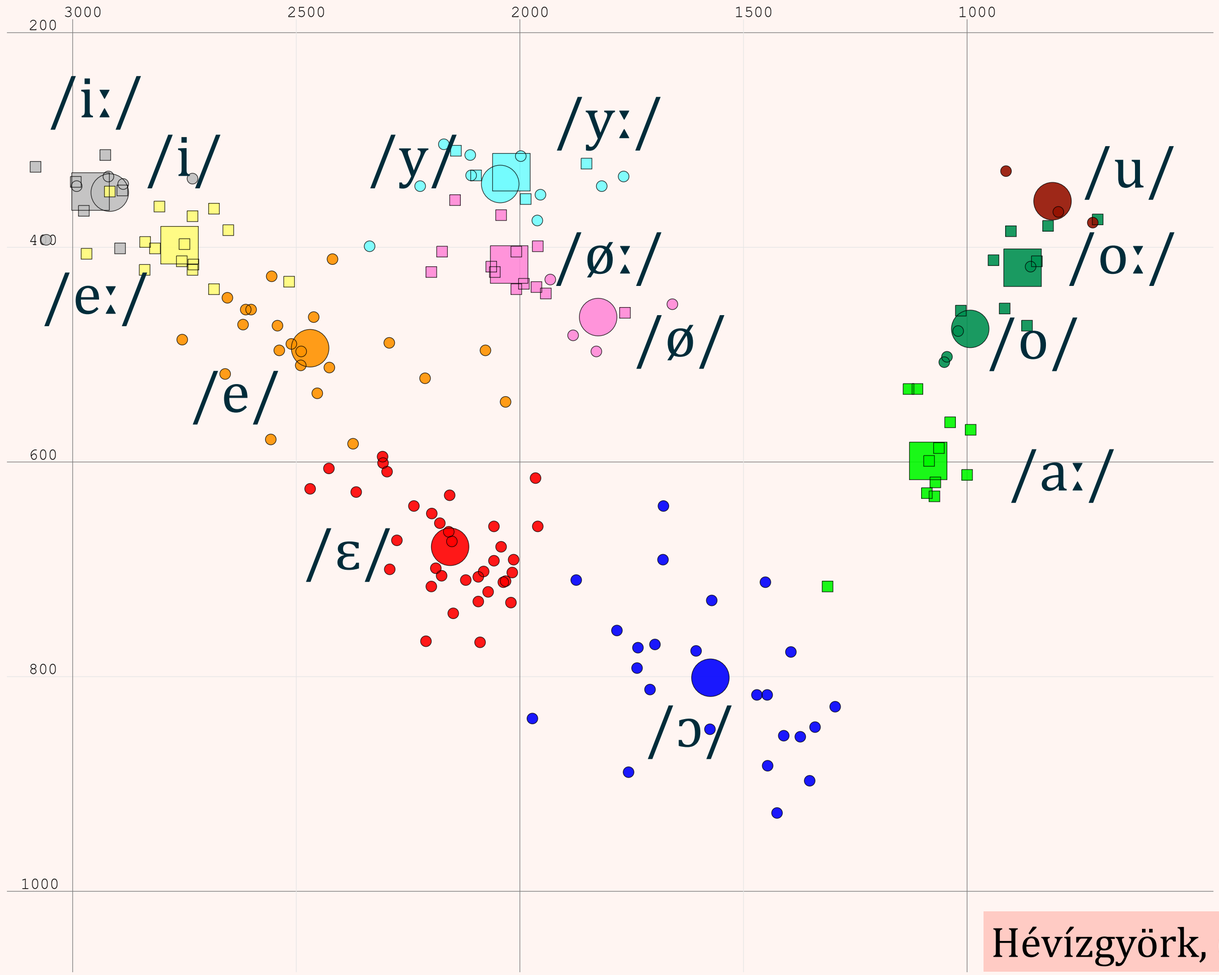
Row formant values



Hévízgyörk, 68 years old woman

Normalisation (rescaling) of Hz values

Row formant values

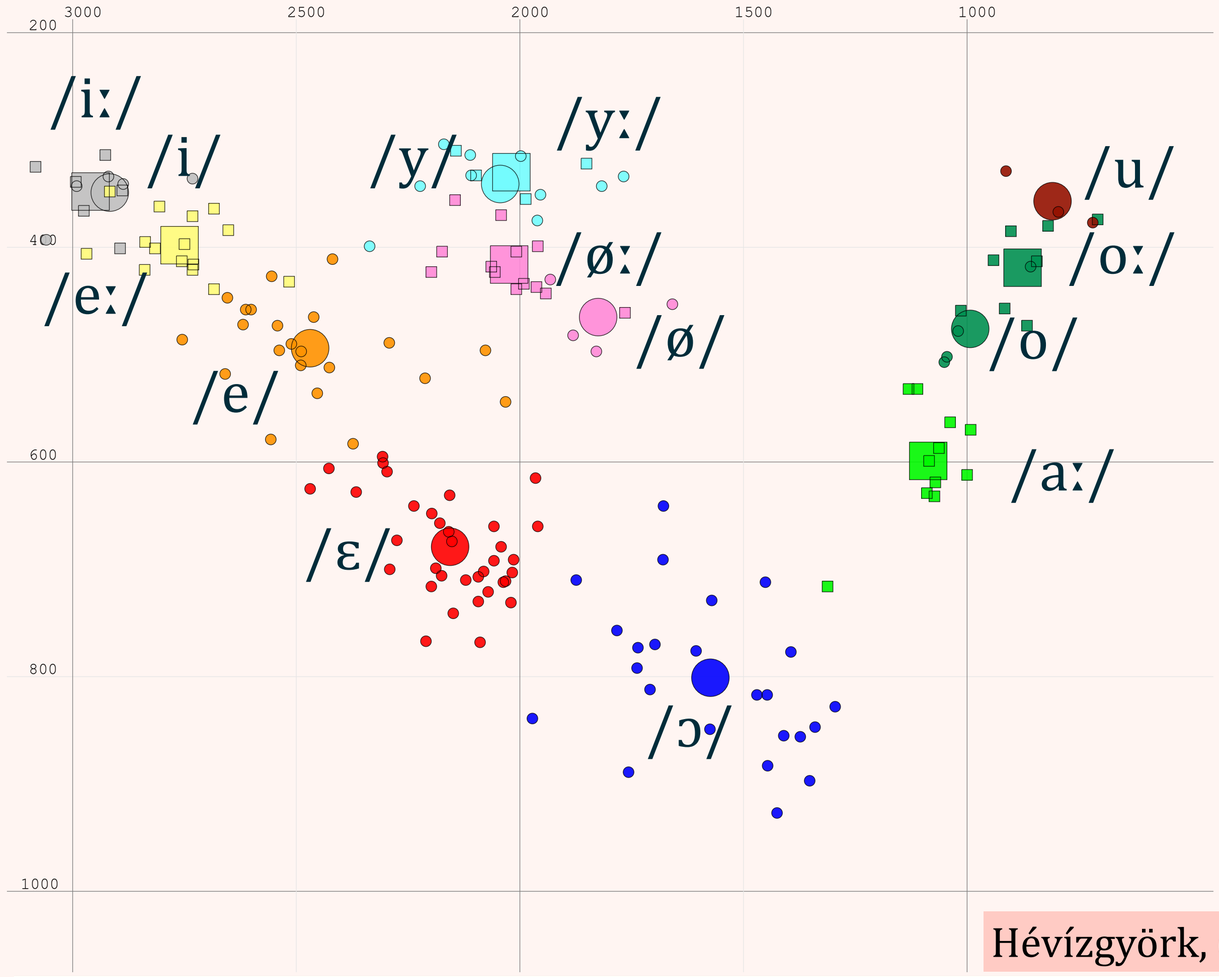


Hévízgyörk, 68 years old woman

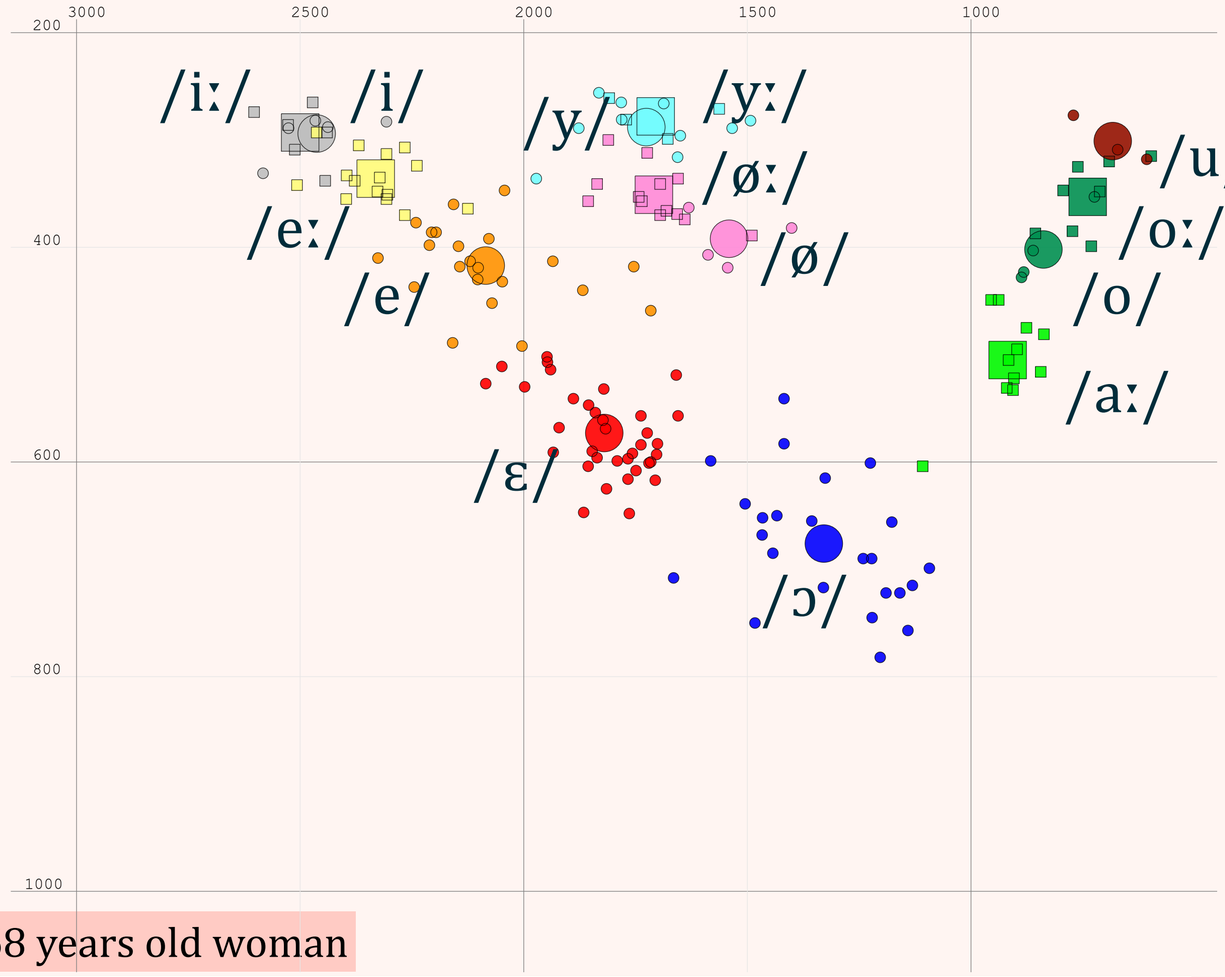
Normalisation: F1[i:] = F1min F2[i:] = F2max FxNorm = ((Fx-F1min) * 100) / (F2max - F1min)

Normalisation (rescaling) of Hz values

Row formant values



Formant values rescaled to match standard male pronunciation of /iː/ (reference values: Gósy 2004)



Hévízgyörk, 68 years old woman

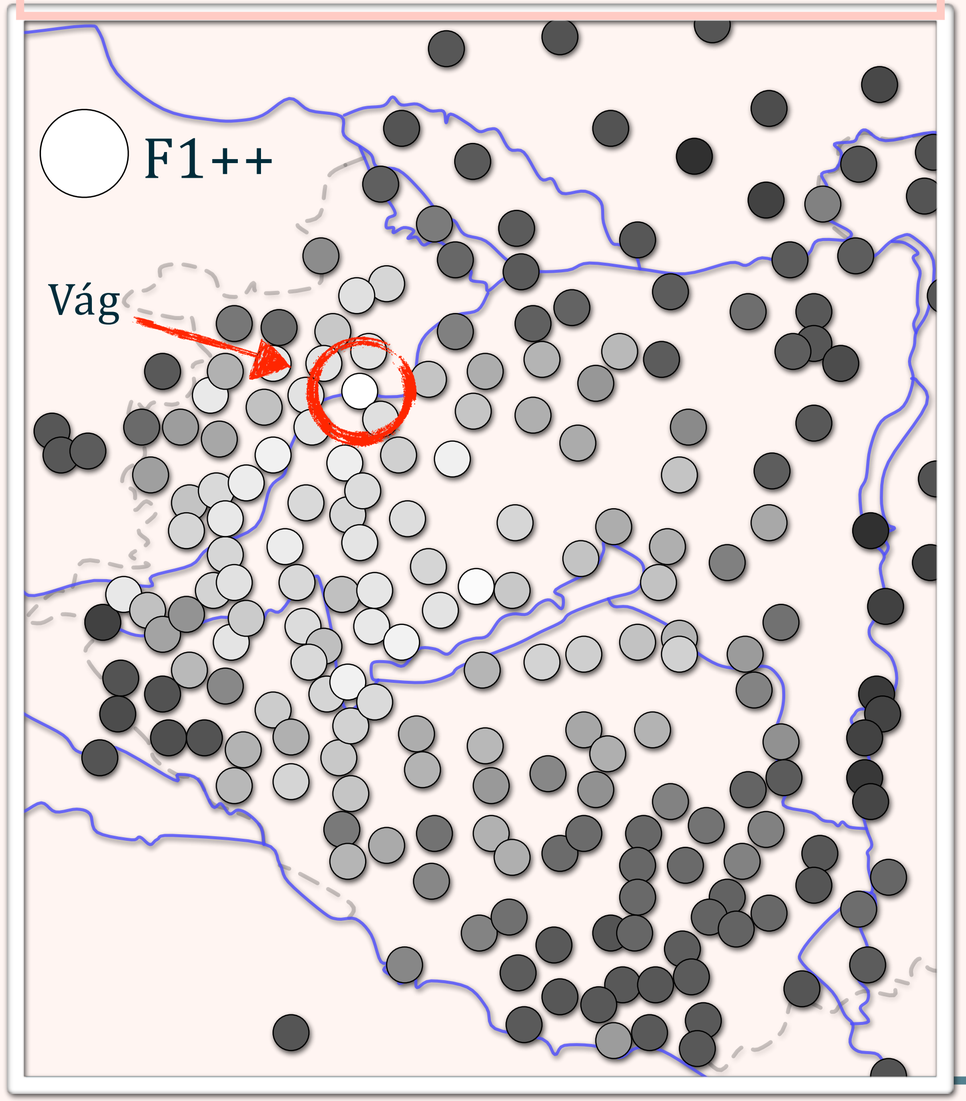
Normalisation: F1[i:] = F1min F2[i:] = F2max FxNorm = ((Fx-F1min) * 100) / (F2max - F1min)

Comparative study

Transcribed vowel qualities vs. formant measurements

F1 and F2 values at Vág (Transdanubia)

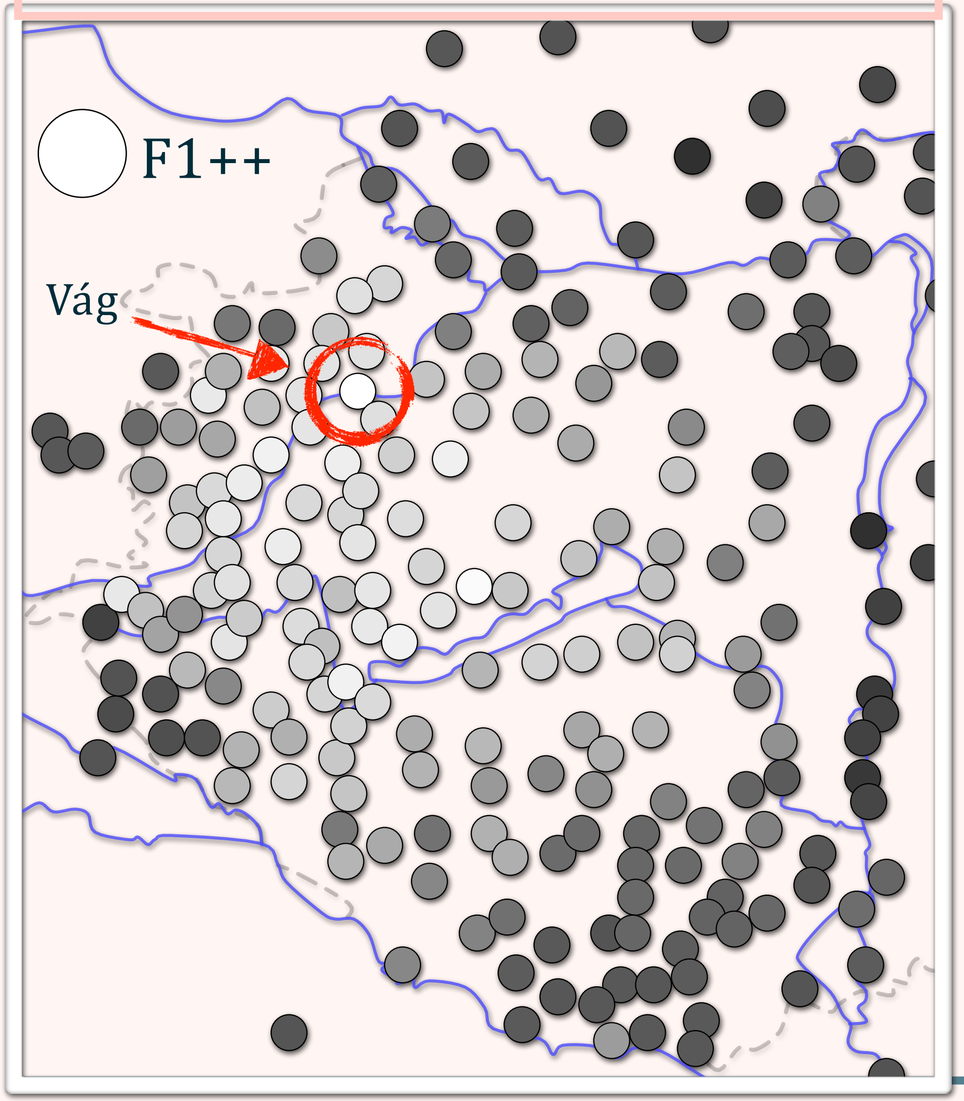
/ɛ/ F1 calculated from transcribed atlas data



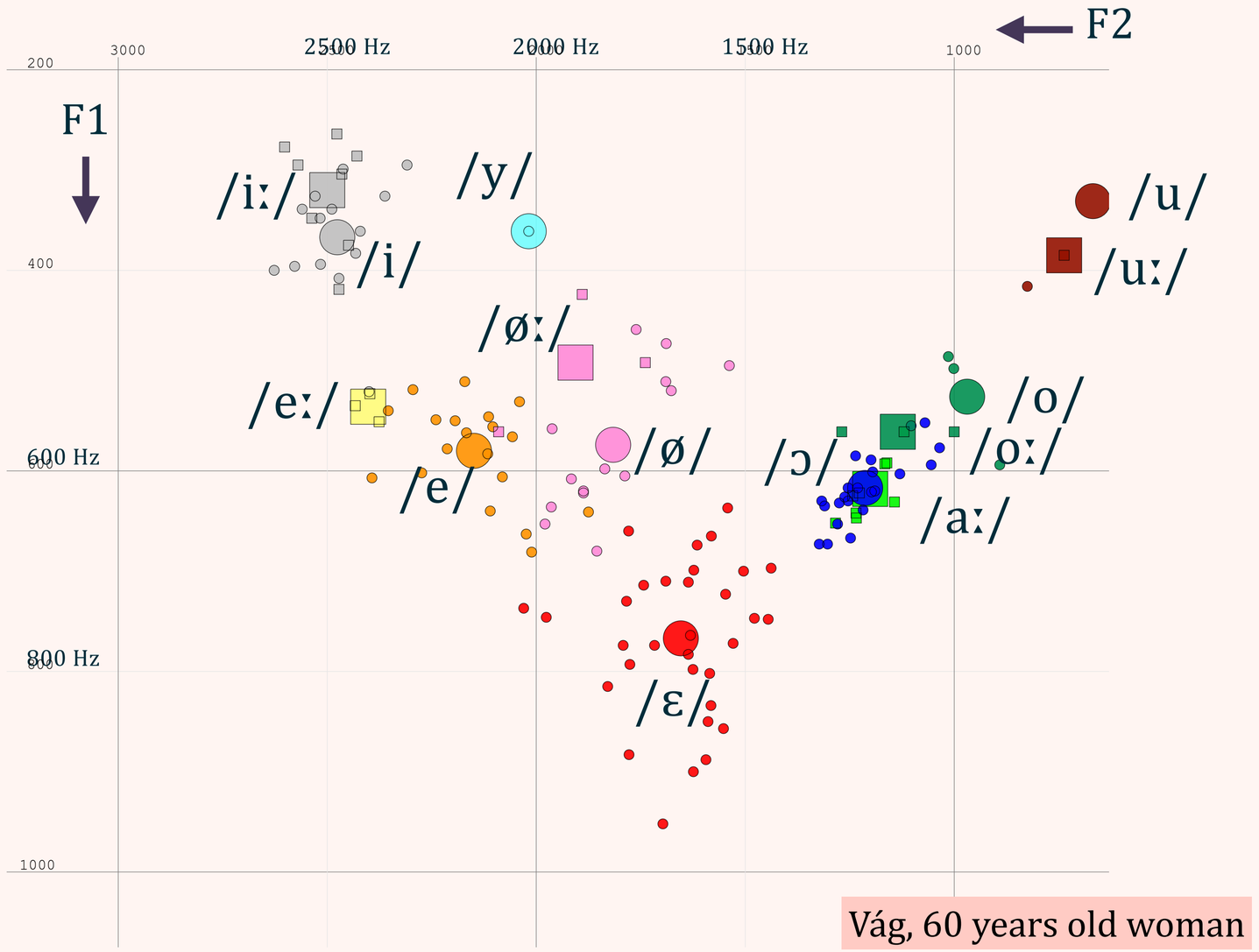
Study 1

F1 and F2 values at Vág (Transdanubia)

/ɛ/ F1 calculated from transcribed atlas data



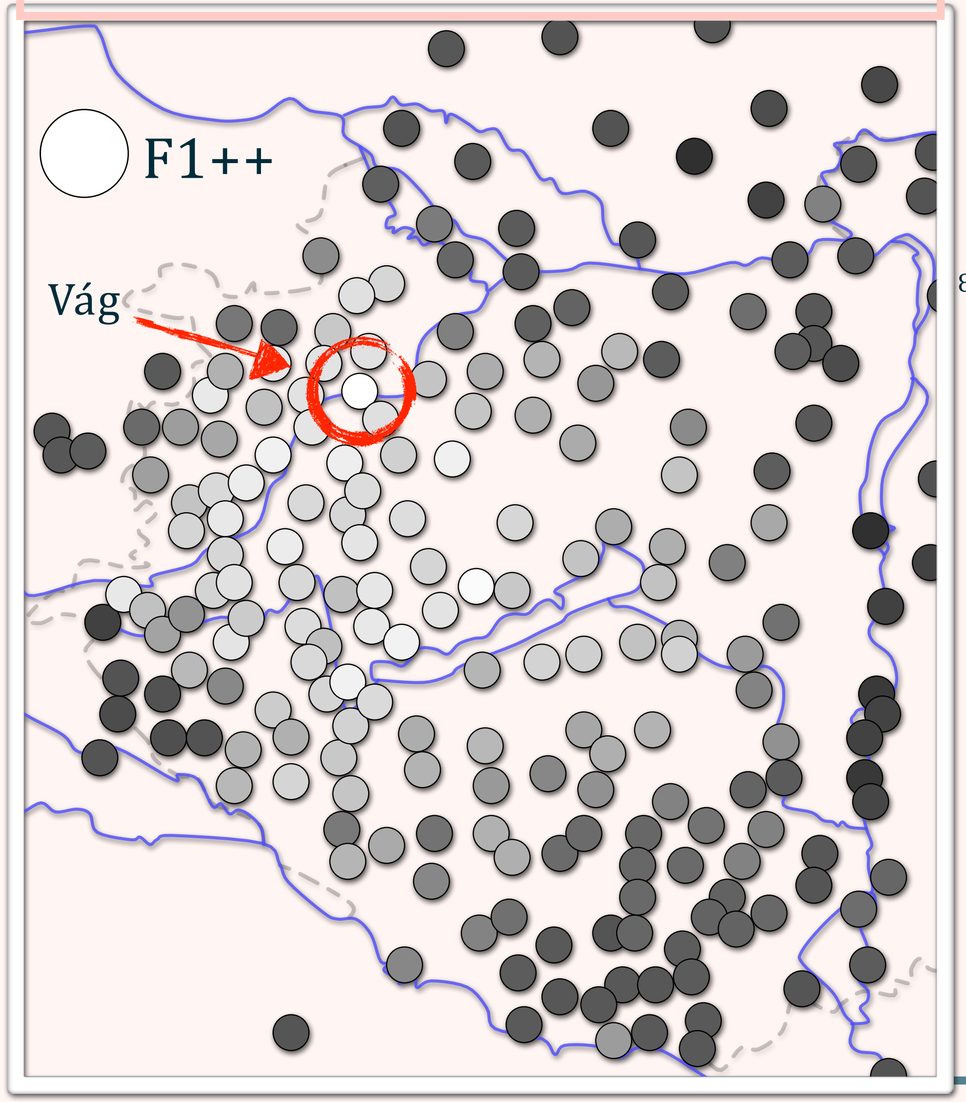
Study 1

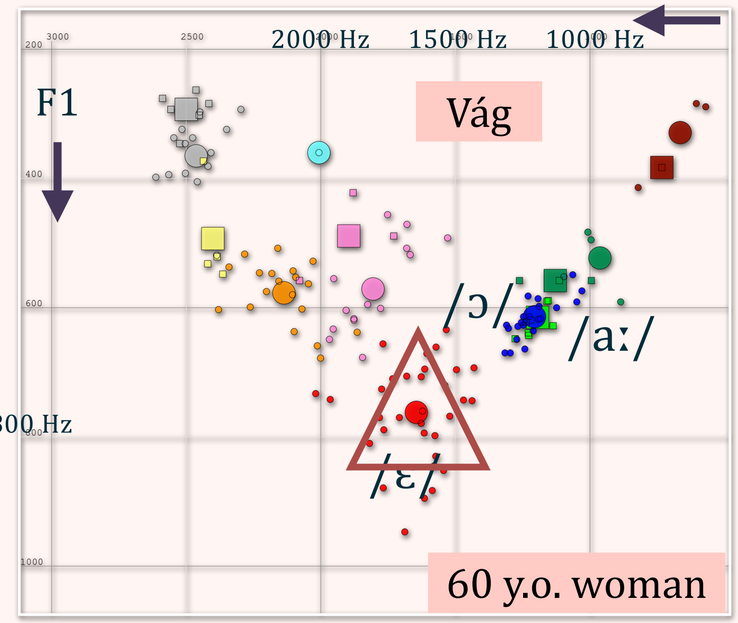


Study 2

F1 of /ɛ/ at three locations at Transdanubia

/ɛ/ F1 calculated from transcribed atlas data





Study 1

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F1 of /ɛ/ at three locations at Transdanubia

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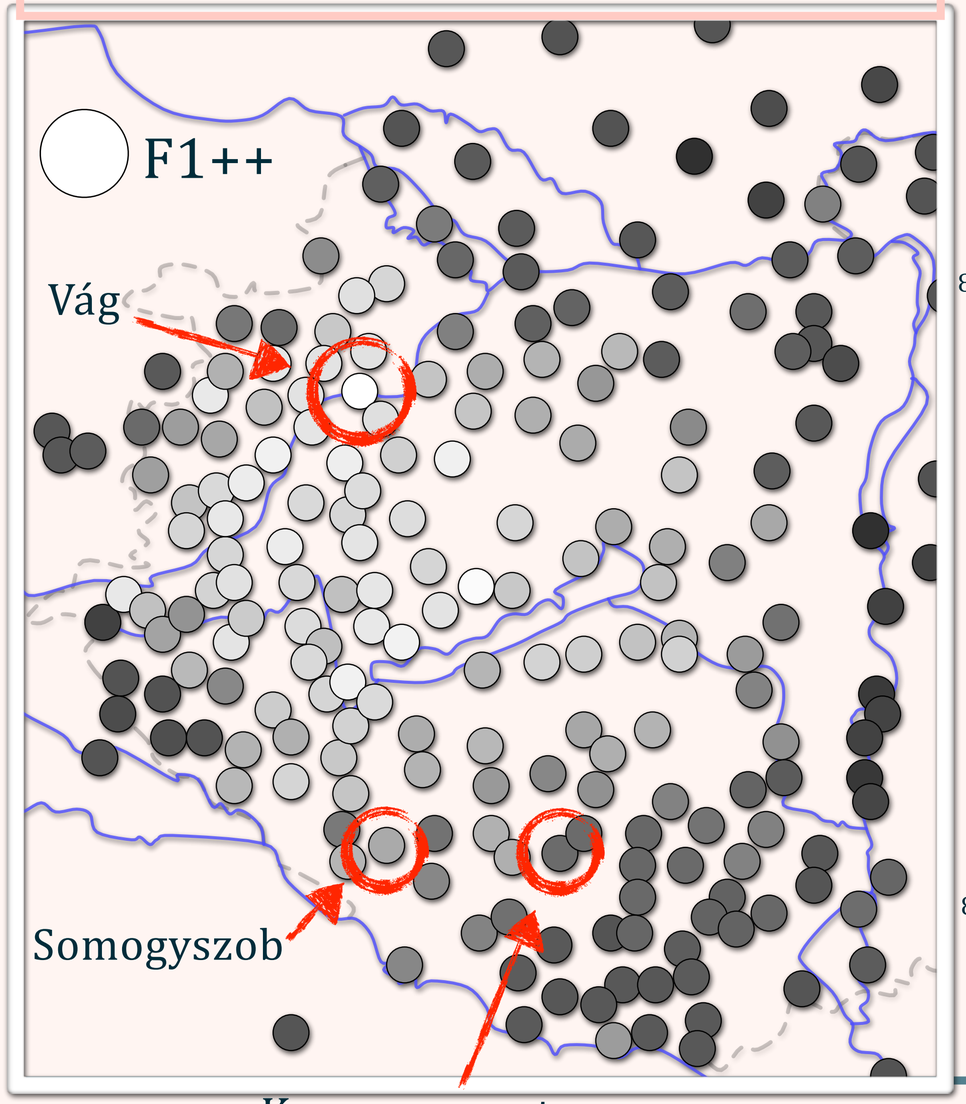
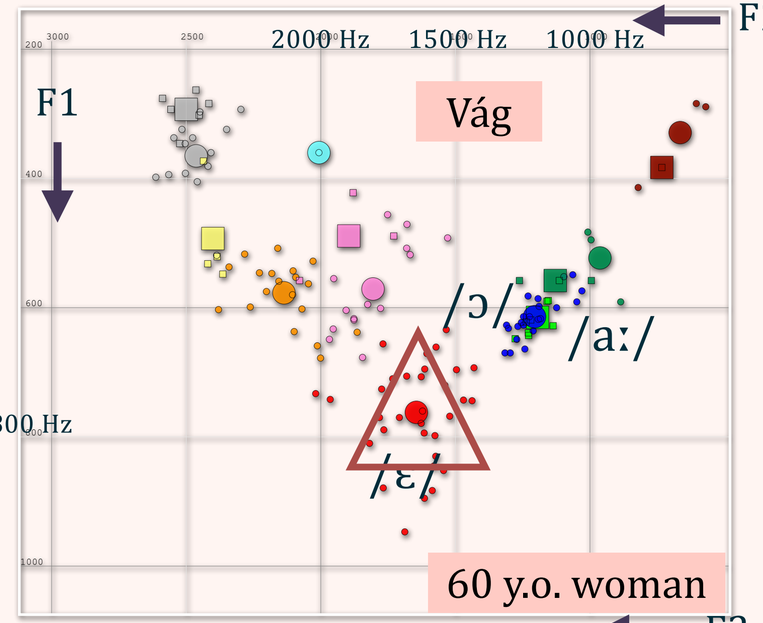
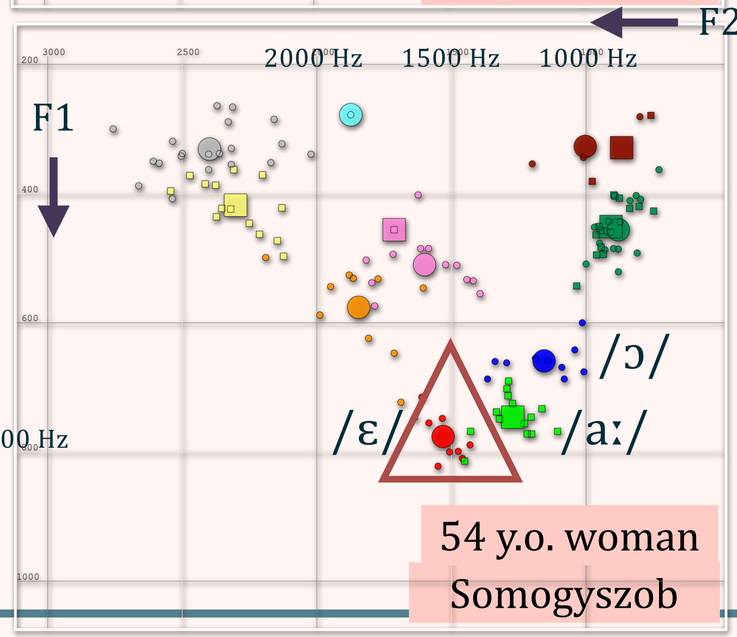
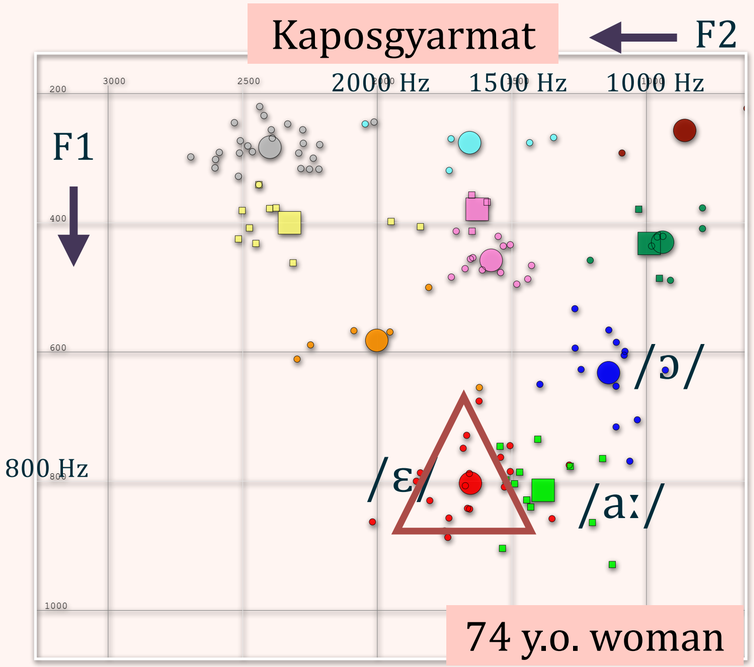


Study 1

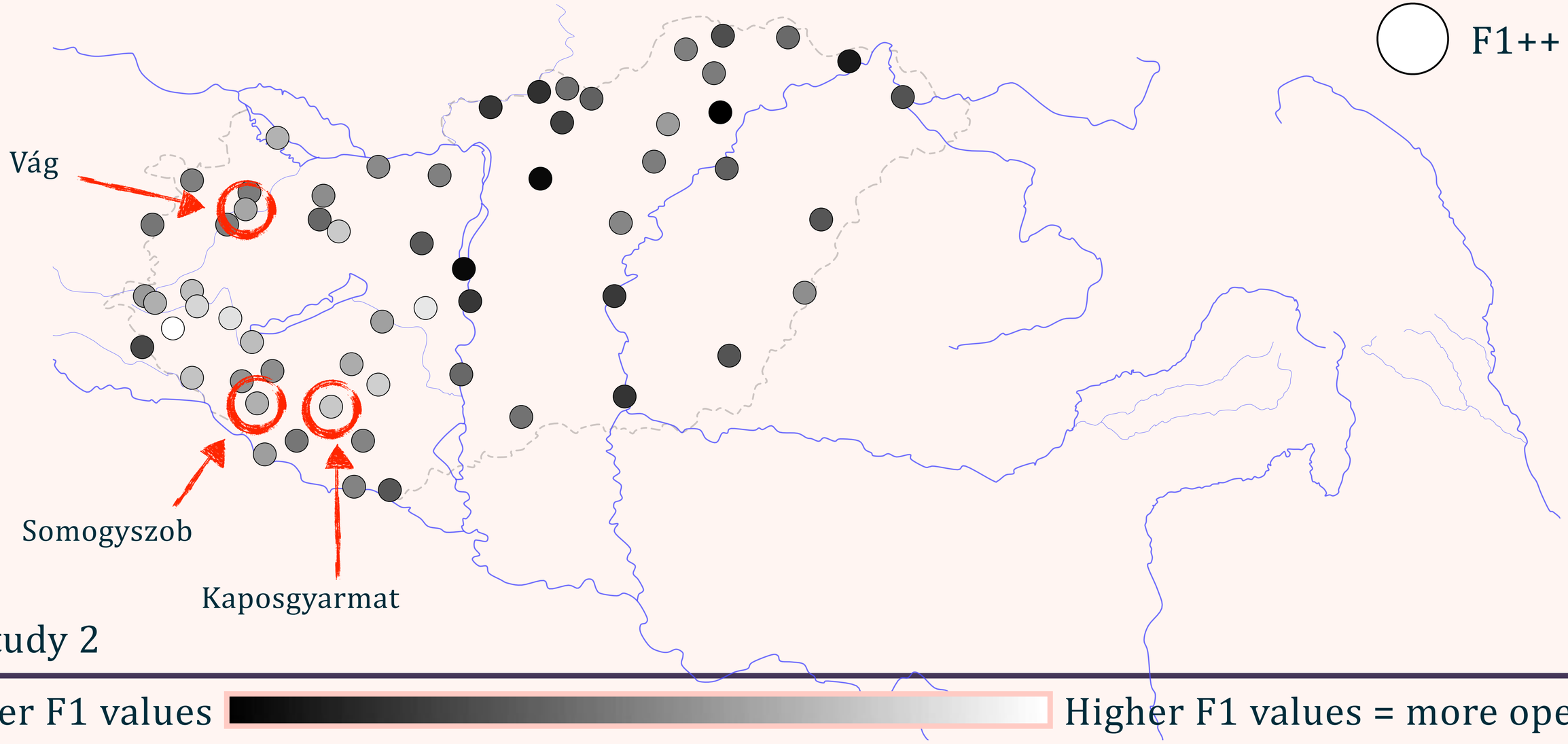






Study 2

Map of measured F1 values of/ɛ/



Study 2

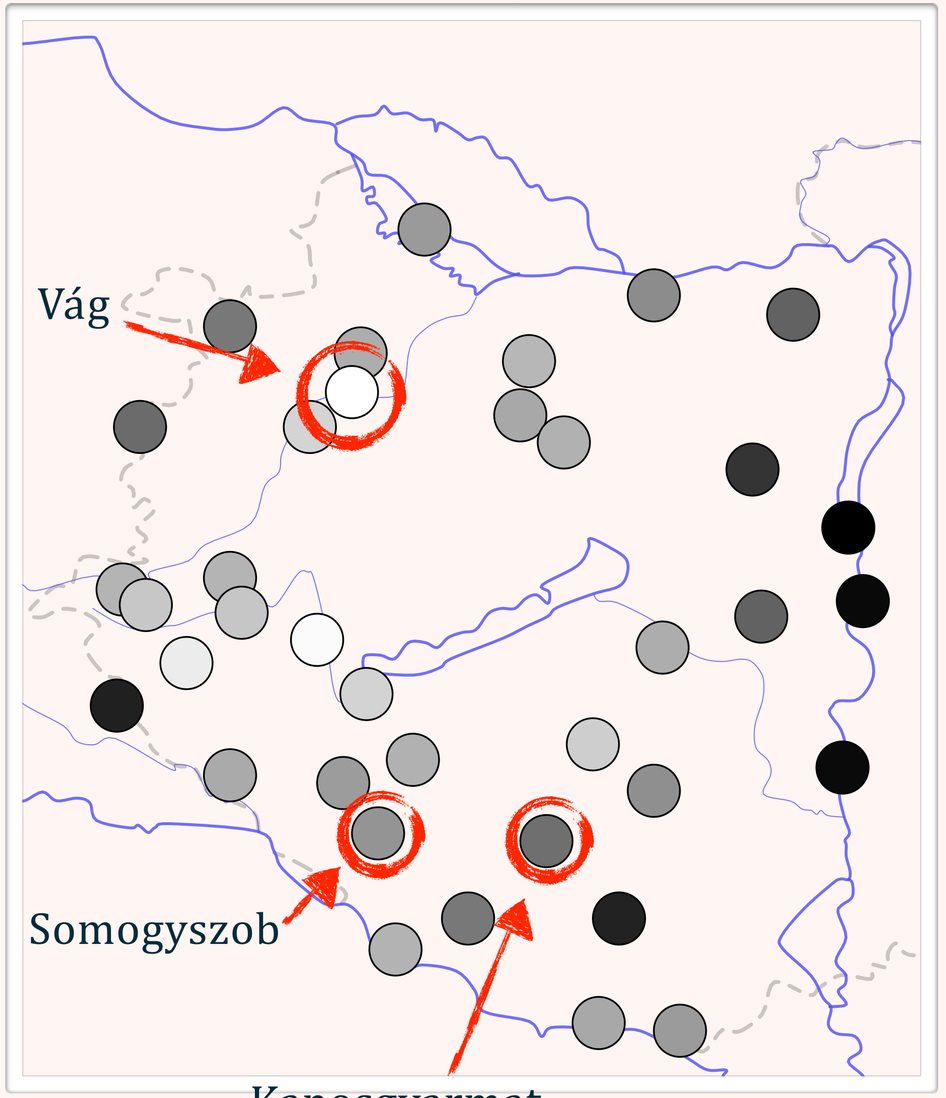
Lower F1 values — Higher F1 values = more open

Difference between F1 /ɛ/ and F1 /aː/

Study 1

Transdanubia

Study 2



F1 /aː/ is higher

F1 /ɛ/ is higher

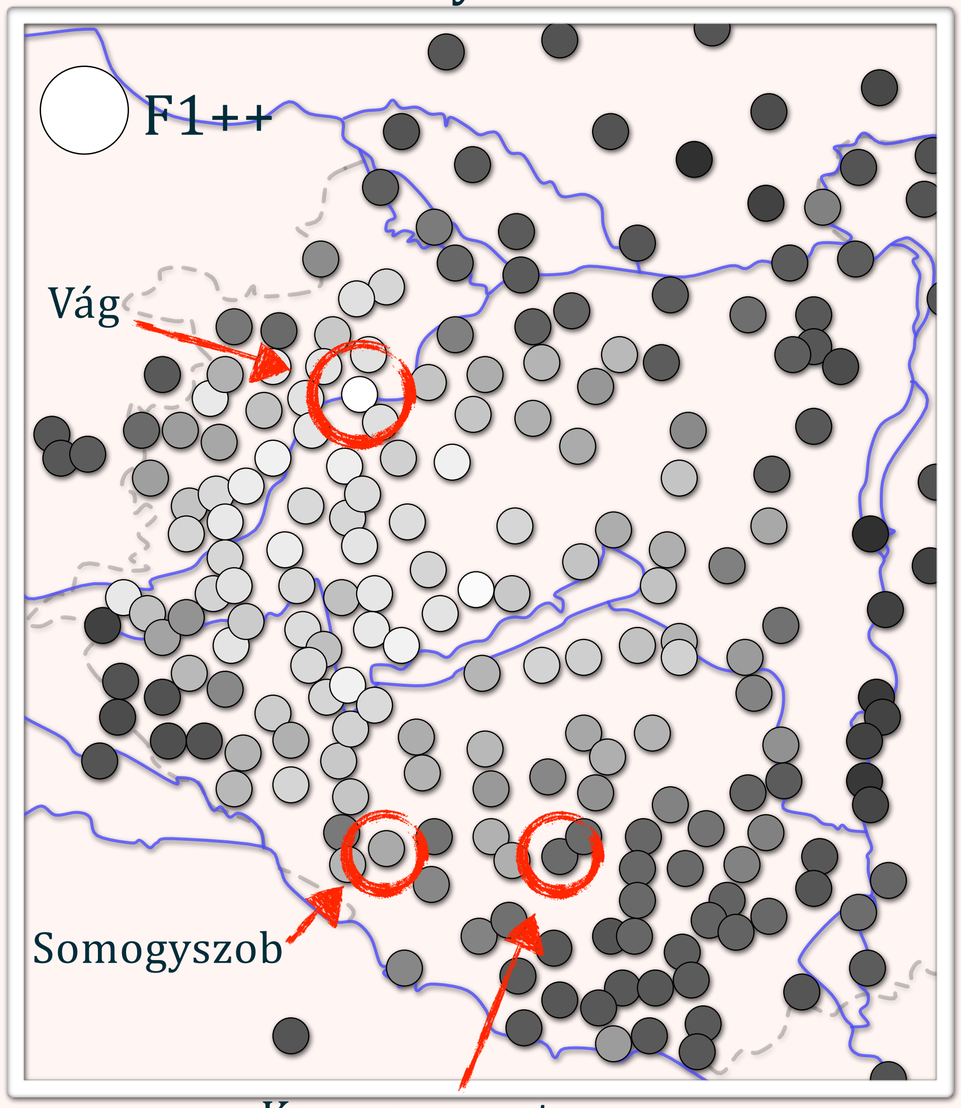
F1 /ɛ/ calculated from transcribed atlas data

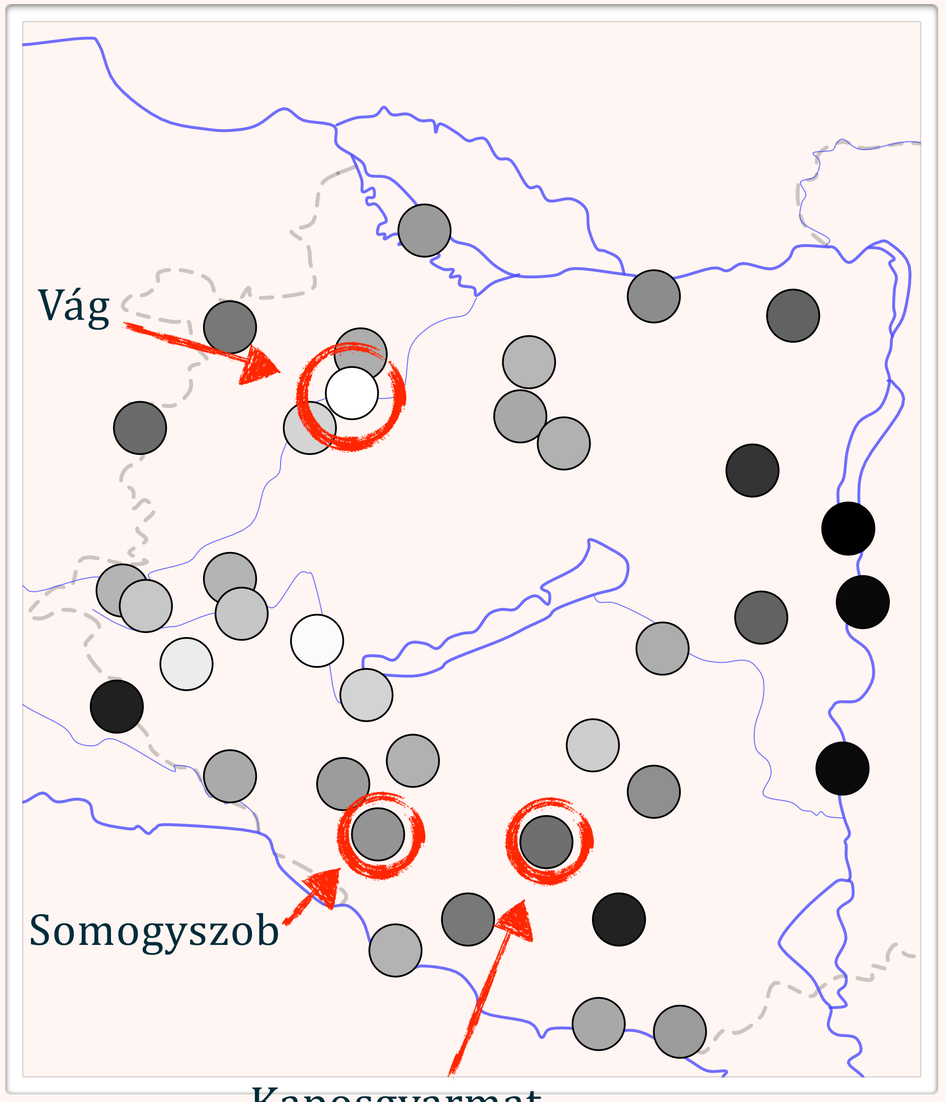
Difference between F1 /ɛ/ and F1 /aː/

Study 1

Transdanubia

Study 2

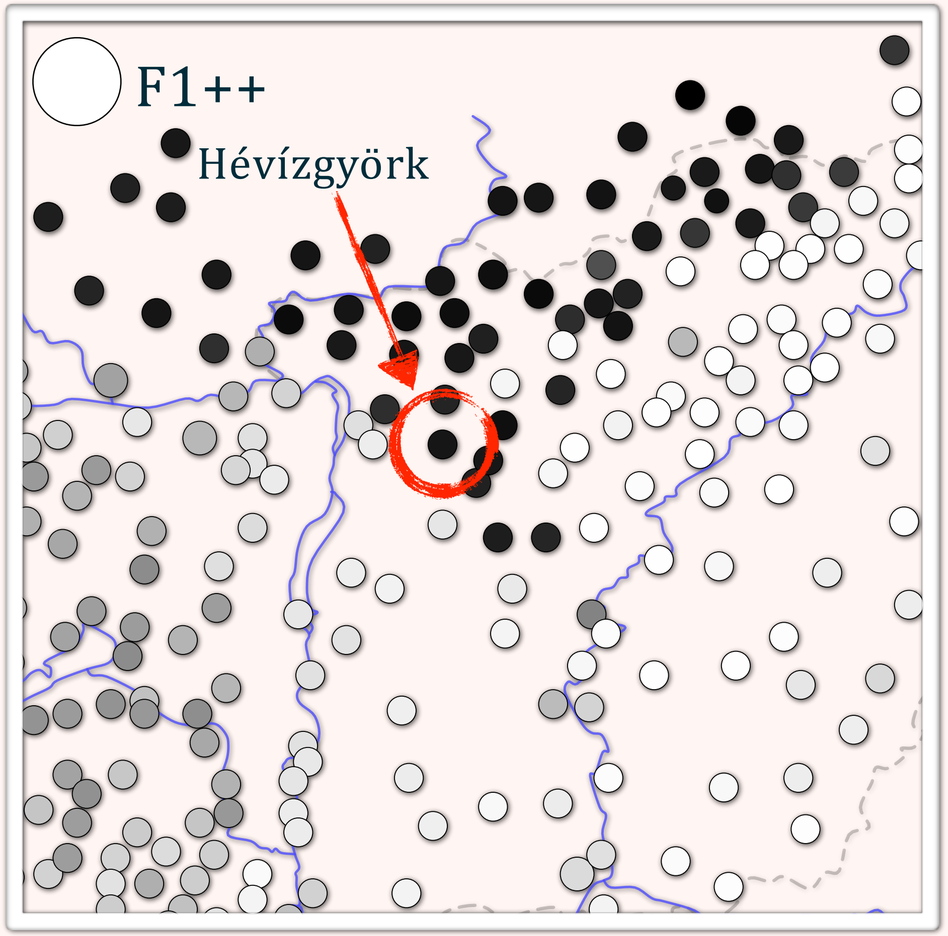




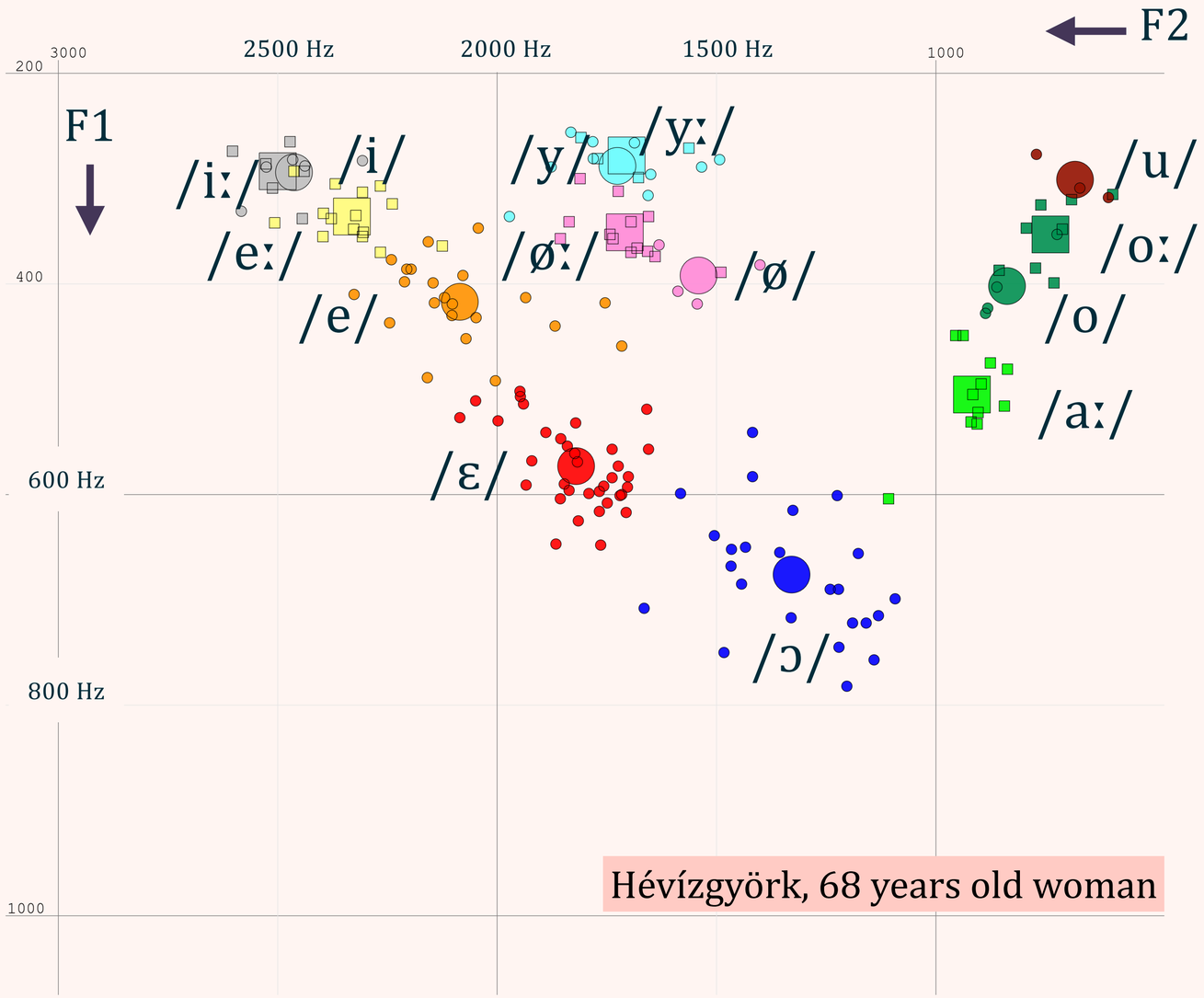
Lower F1 — Higher F1

F1 /aː/ is higher — F1 /ɛ/ is higher

“Typical” northern (Paló́c) vowel qualities



/aː/ F1 calculated from transcribed atlas data

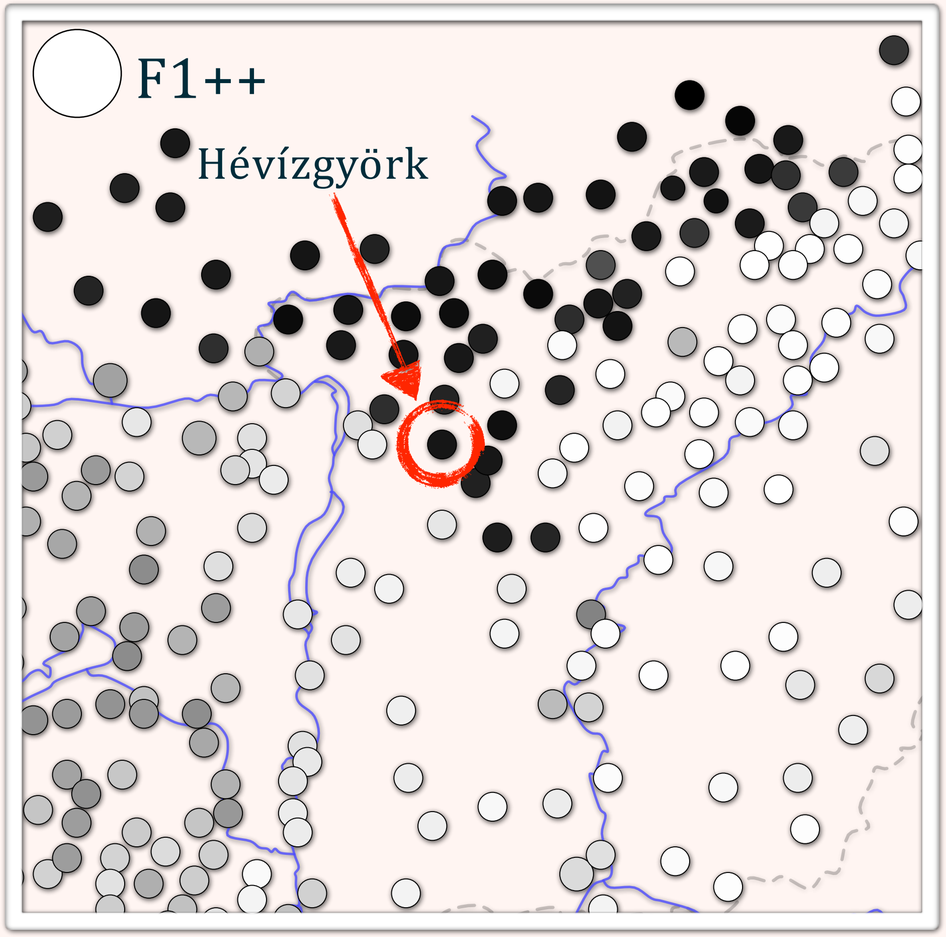


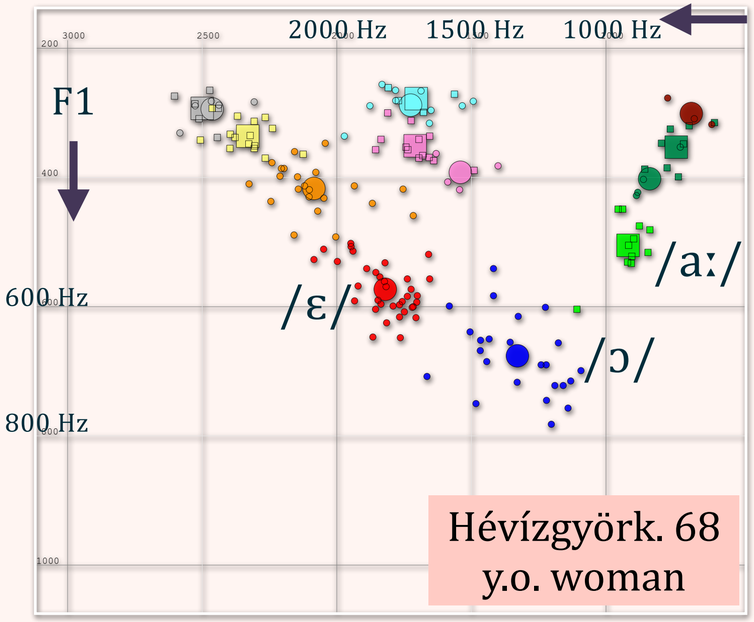
Study 1

Study 2

Variation in the pronunciation of /aː/ in northern (Paloc) dialects

/aː/ F1 calculated from transcribed atlas data



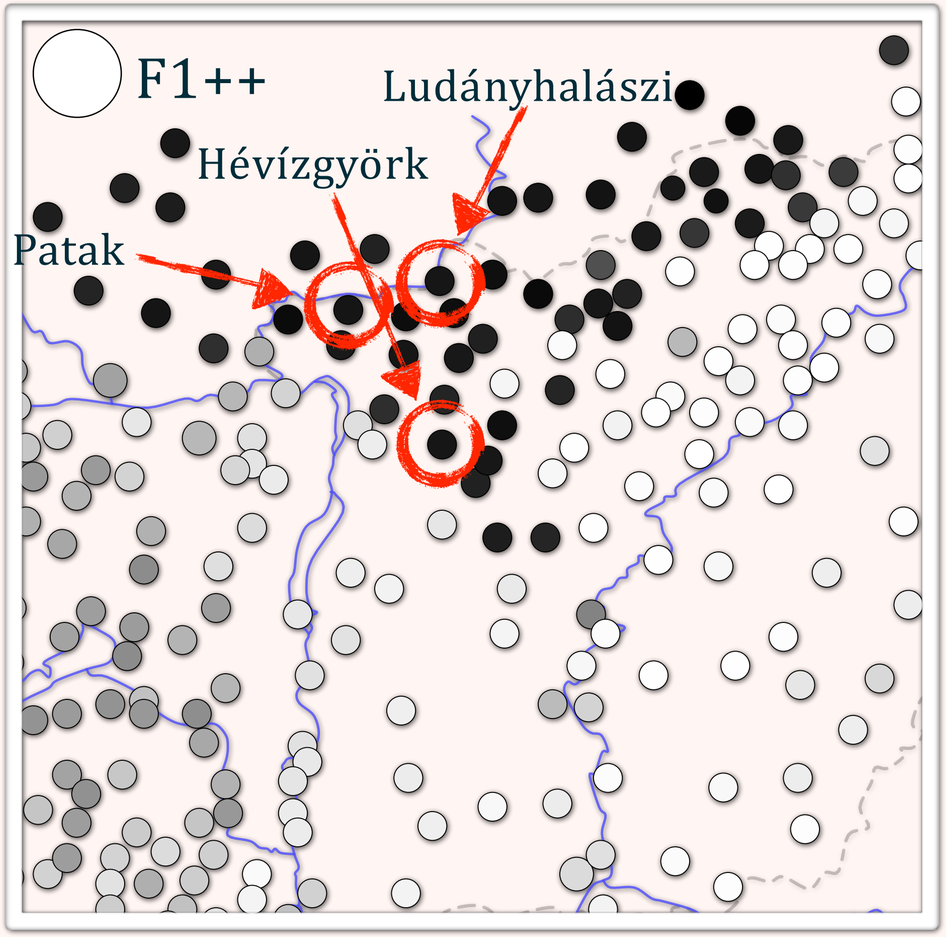


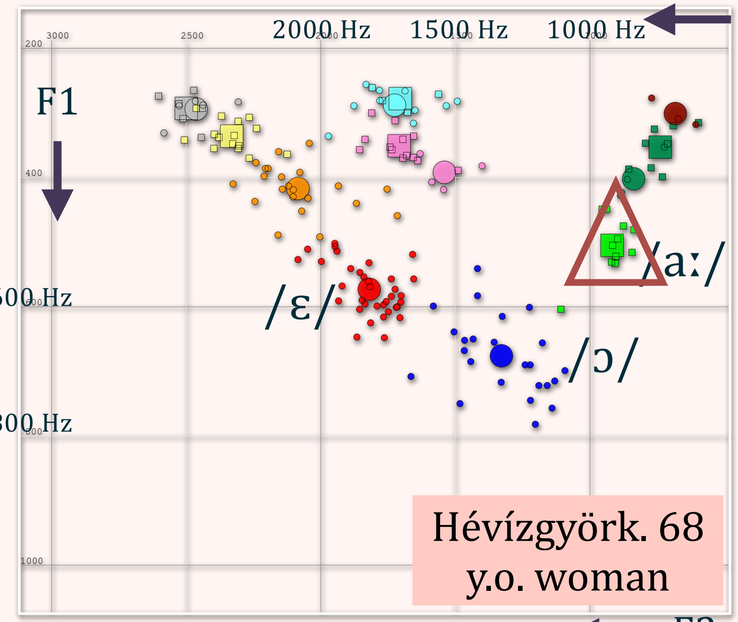
Study 1

Study 2

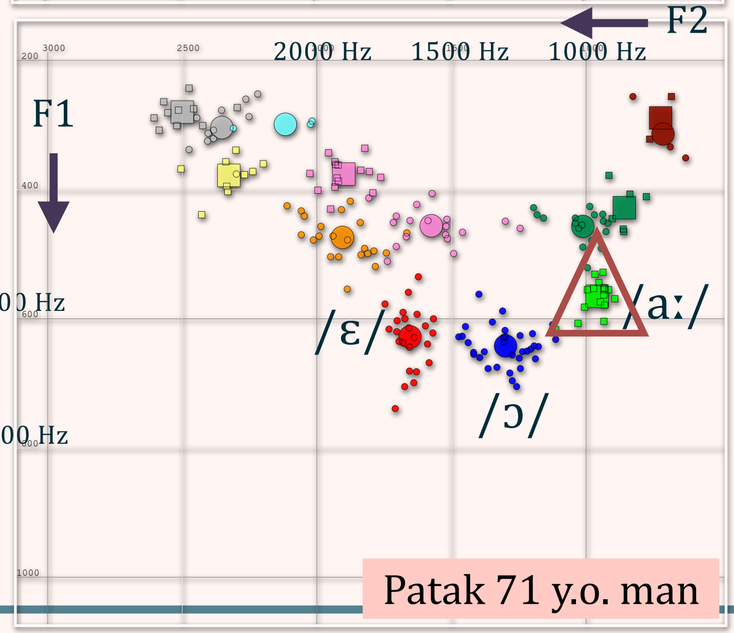
Variation in the pronunciation of /aː/ in northern (Palóc) dialects

/aː/ F1 calculated from transcribed atlas data

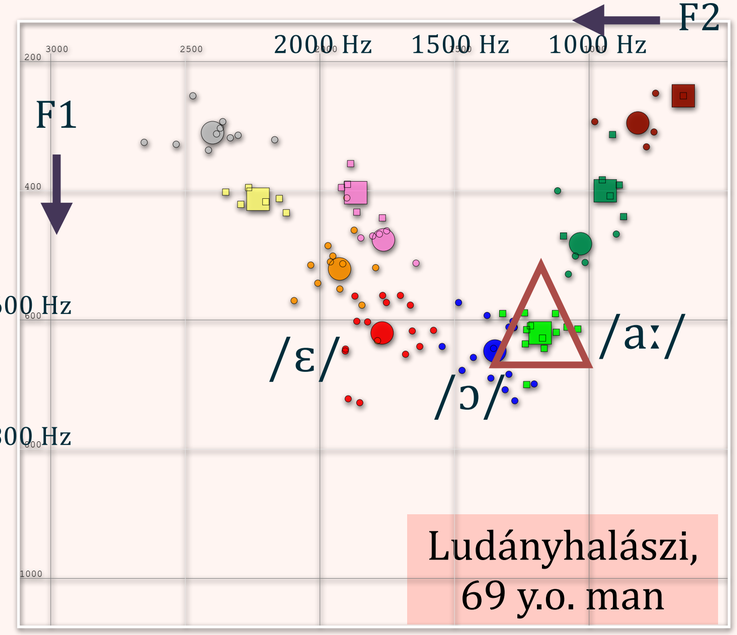




Hévízgyörk. 68 y.o. woman



Patak 71 y.o. man



Ludányhalászi, 69 y.o. man

Study 1

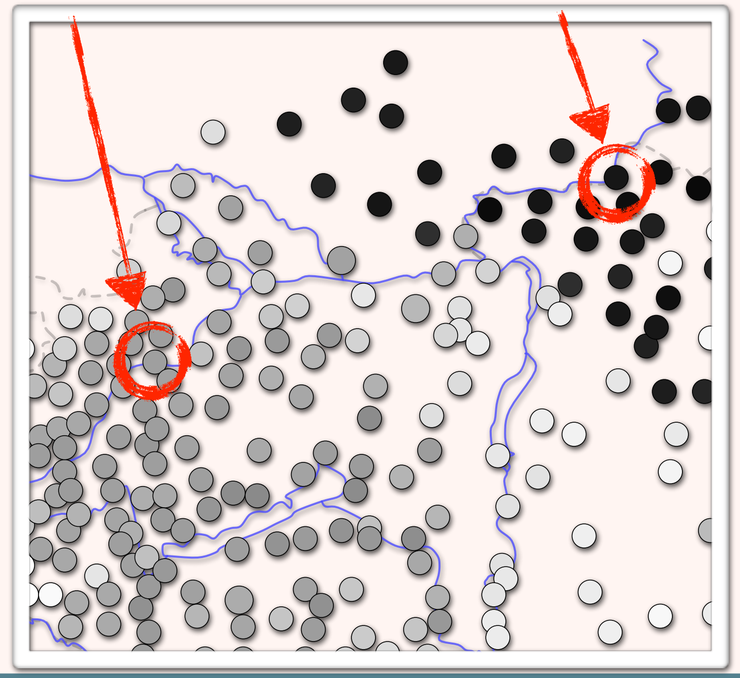
Study 2

Striking difference in transcribed data, but similar formant values

F1 /aː/ calculated from transcribed atlas data

Vág

Ludányhalászi



Study 2

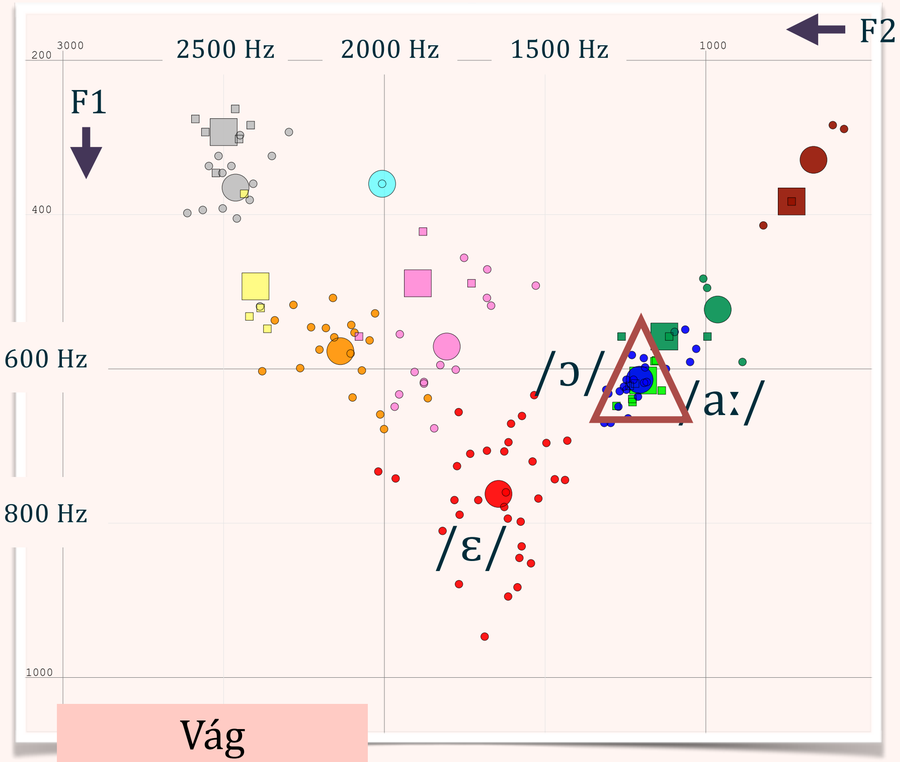
F1++

Study 1

Study 2

Striking difference in transcribed data, but similar formant values

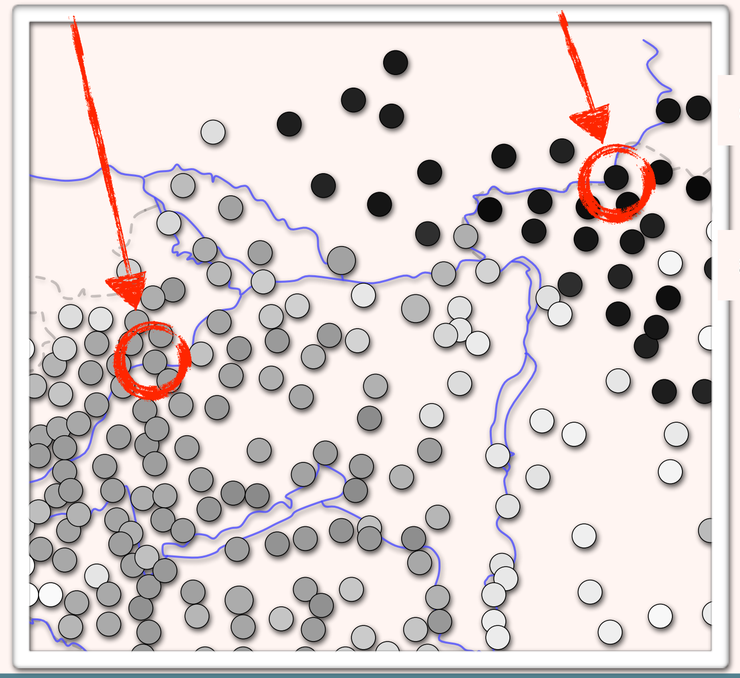
Transdanubia



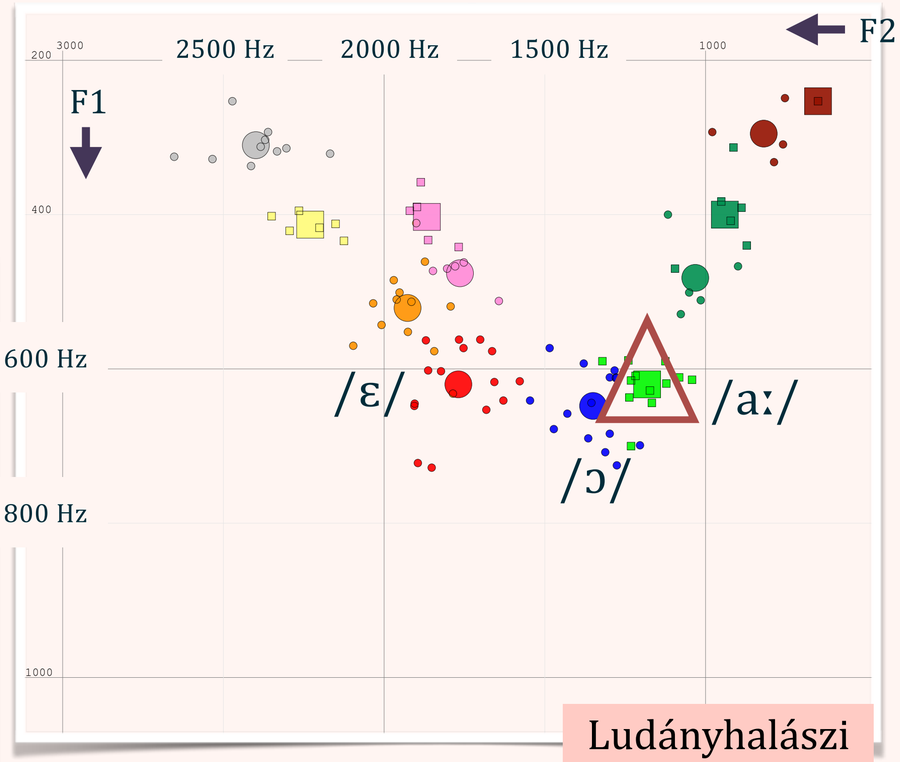
Vág

F1 /aː/ calculated from transcribed atlas data

Vág Ludányhalászi



Central north



Ludányhalászi

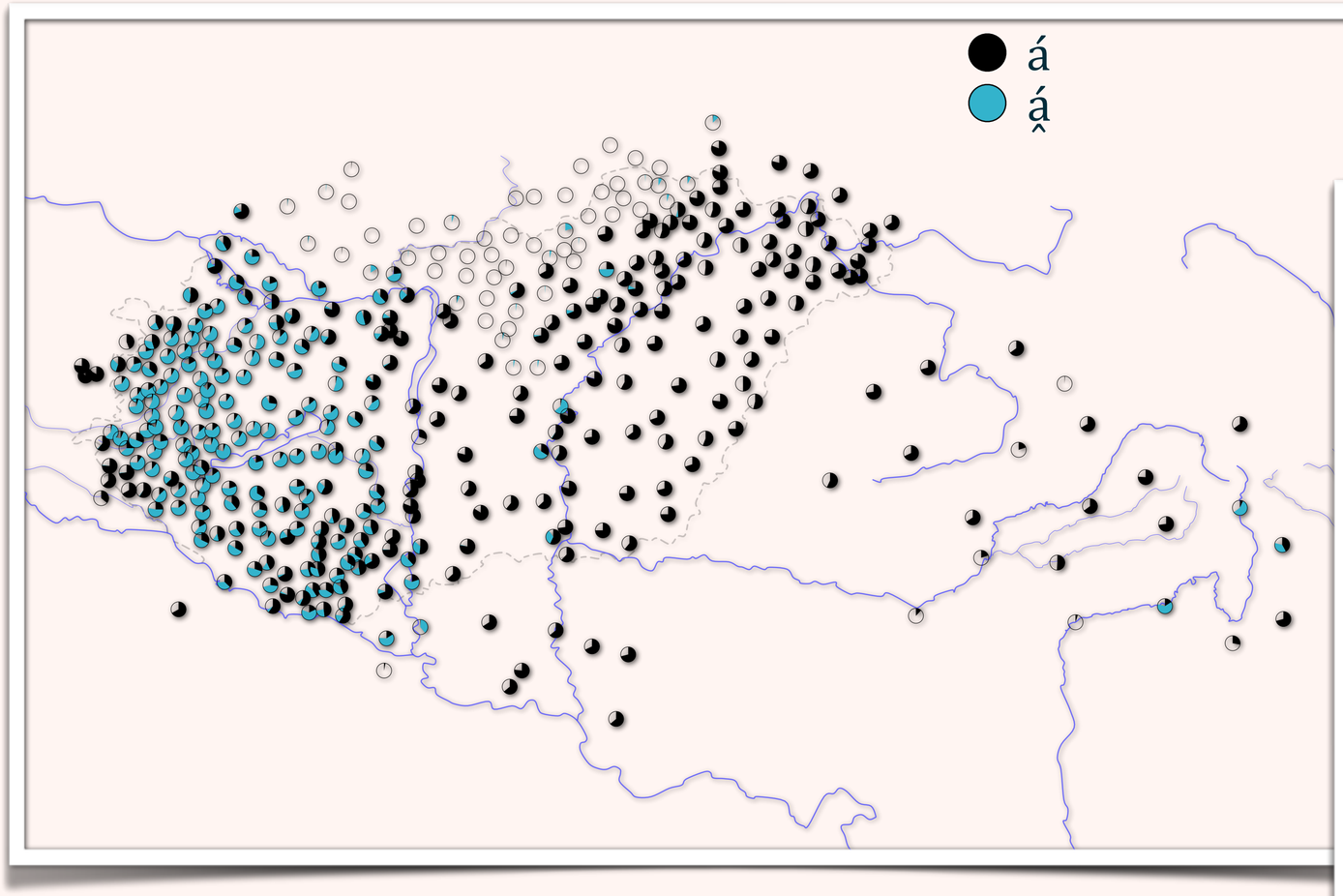
Study 2

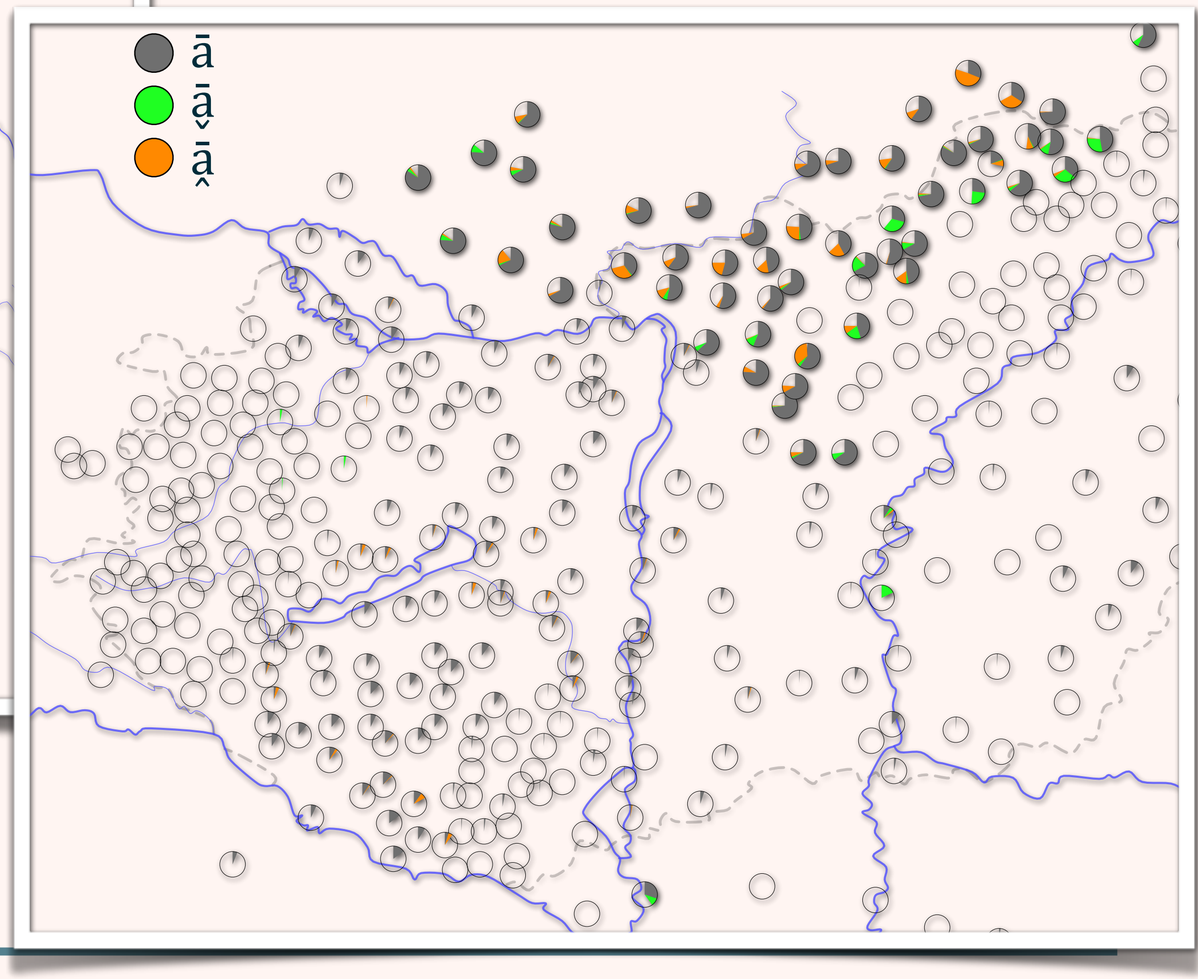
F1++

Study 1

Study 2

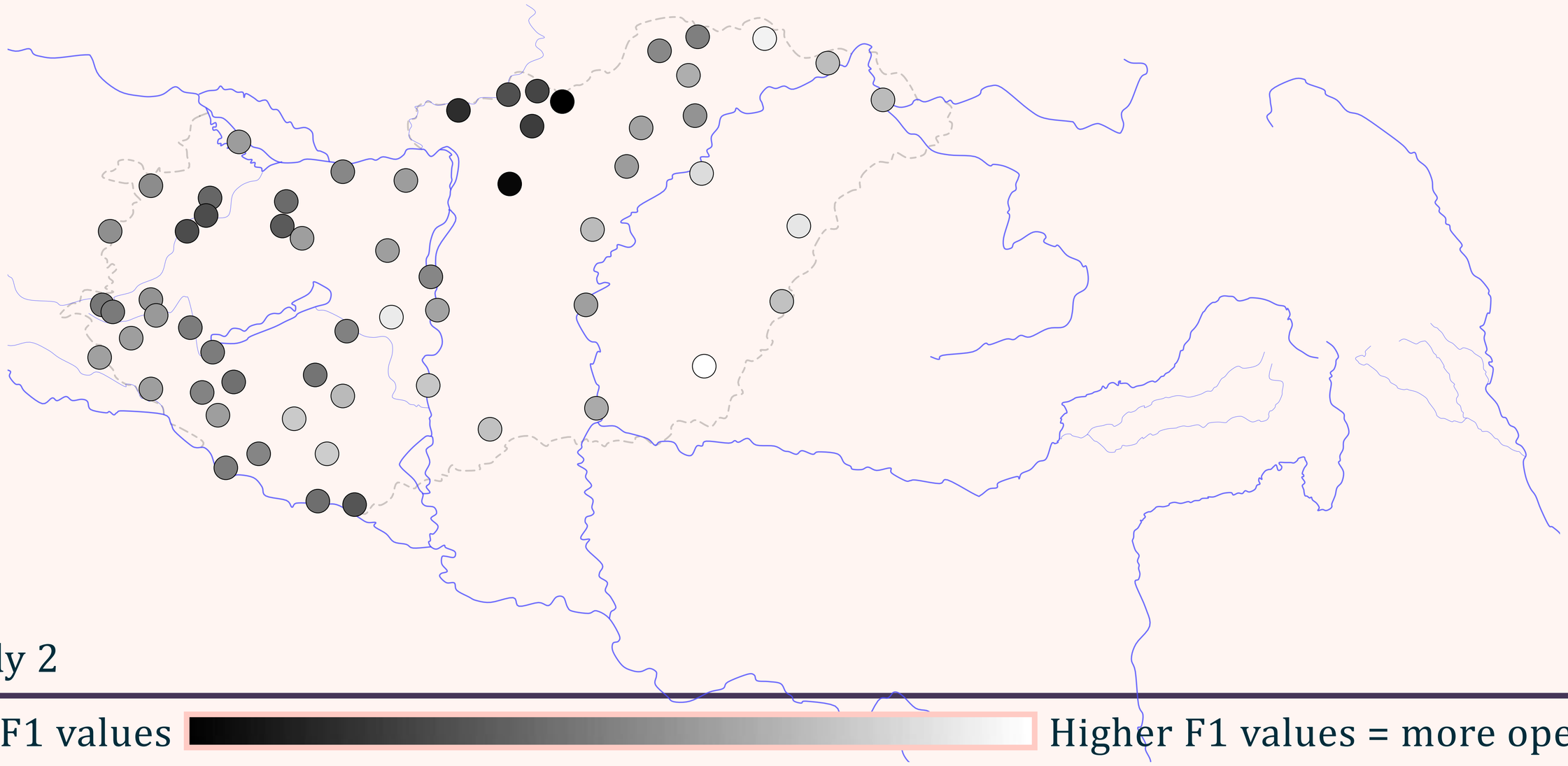
Transcibed vowel qualities of /aː/ in The Atlas of Hungarian Dialects





Study 1

F1 values of /aː/

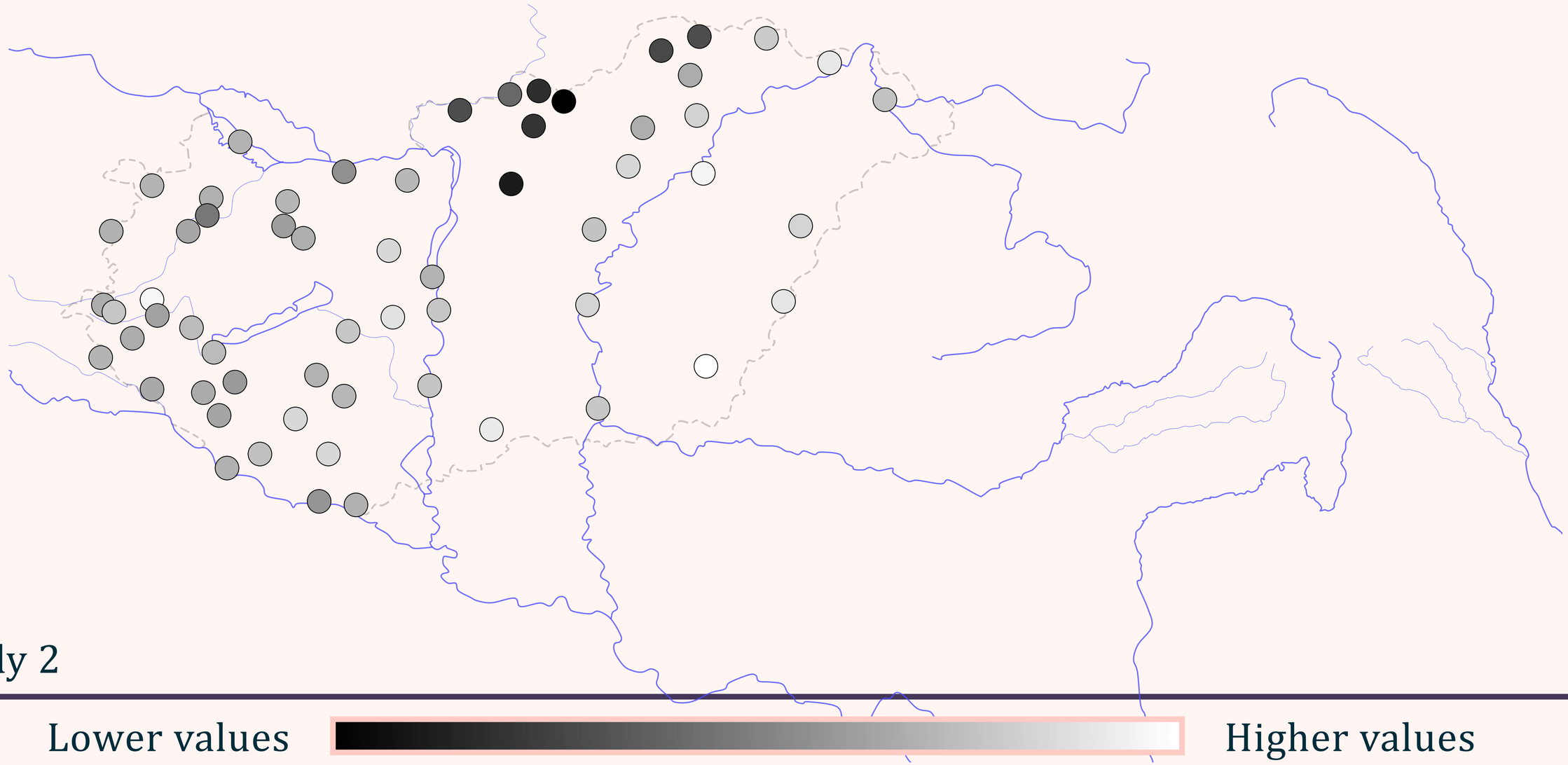


Study 2

Lower F1 values

Higher F1 values = more open

Difference between F1/aː/ and F1/ɔ/



Study 2

Lower values

Higher values

Conclusion

- By comparing Study 1 and Study 2, vowel qualities deduced from transcribed atlas data don't always seem to reflect vowel qualities per se, but rather relative qualities.
  - Example: transcribed quality of /ɛ/ reflects the relationship between the quality of /ɛ/ and that of /aː/
- The transcribed quality of /aː/ and /ɔ/ in the northern region (Palóc region) is rather schematic: atlas data can only reveal the nature of the inverse relationship between /aː/ and /ɔ/ compared to other dialects.
- Formant measurements reveal the real similarities between northern and western pronunciation of /aː/ (while the transcriptions are different).
- Formant measurements can potentially contribute to the better understanding of transcribed vowel qualities.

THANK YOU FOR YOUR ATTENTION!

NATIONAL RESEARCH, DEVELOPMENT AND INNOVATION OFFICE
HUNGARY

PROJECT FINANCED FROM THE NRDI FUND

General aims of our project on Hungarian vowel pronunciation

Acoustic and dialectometric study of Hungarian dialects, NKFIH, FK 138396

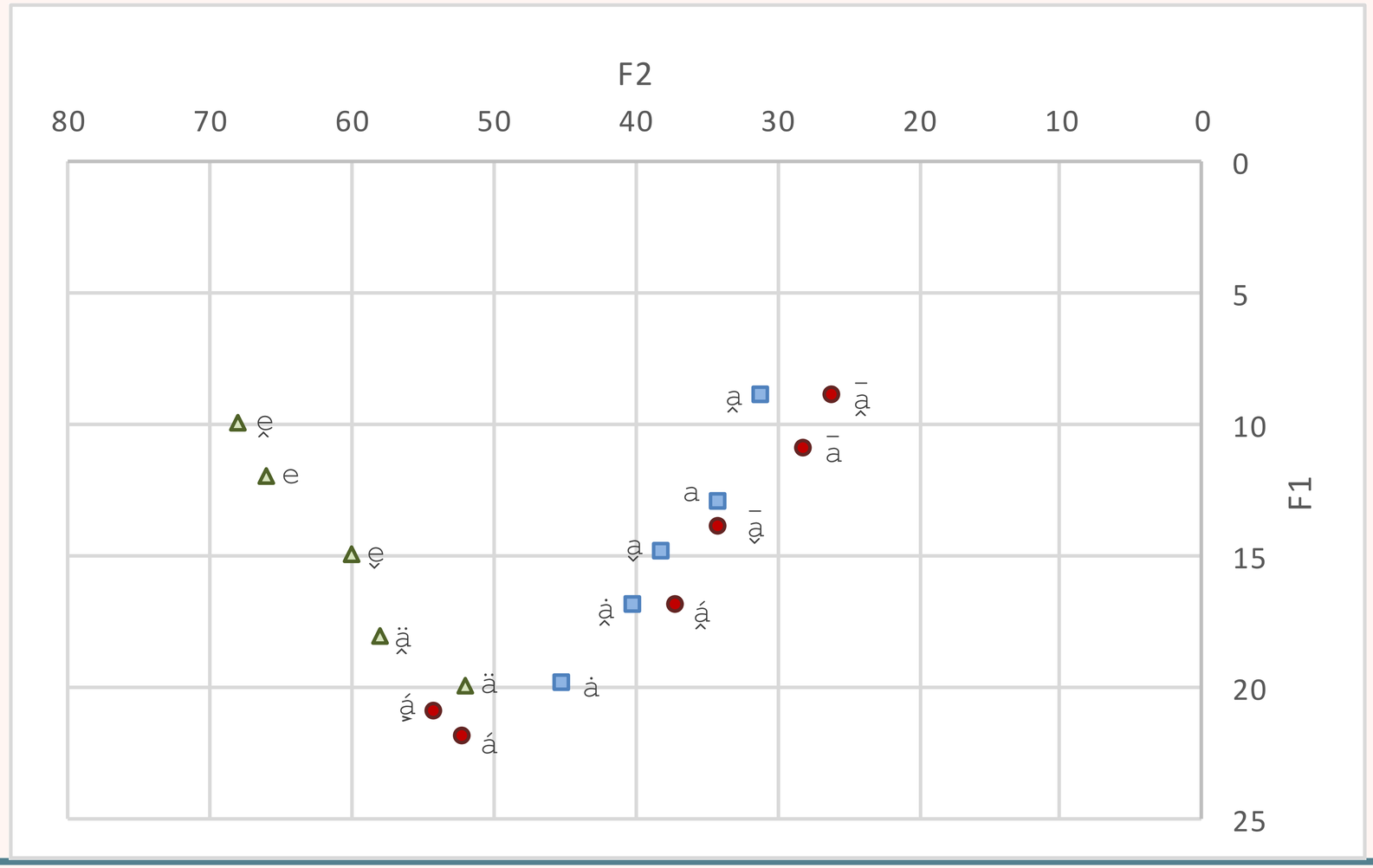
- To determine typical vowel pronunciation patterns of different dialects
- To identify differences and similarities not captured by transcribed atlas data
- To analyse the related nature of the pronunciation of different vowels

Attributing normalised formant values for vowel symbols

/ɛ/

/ɔ/

/aː/



F1min = 0 F2max = 100

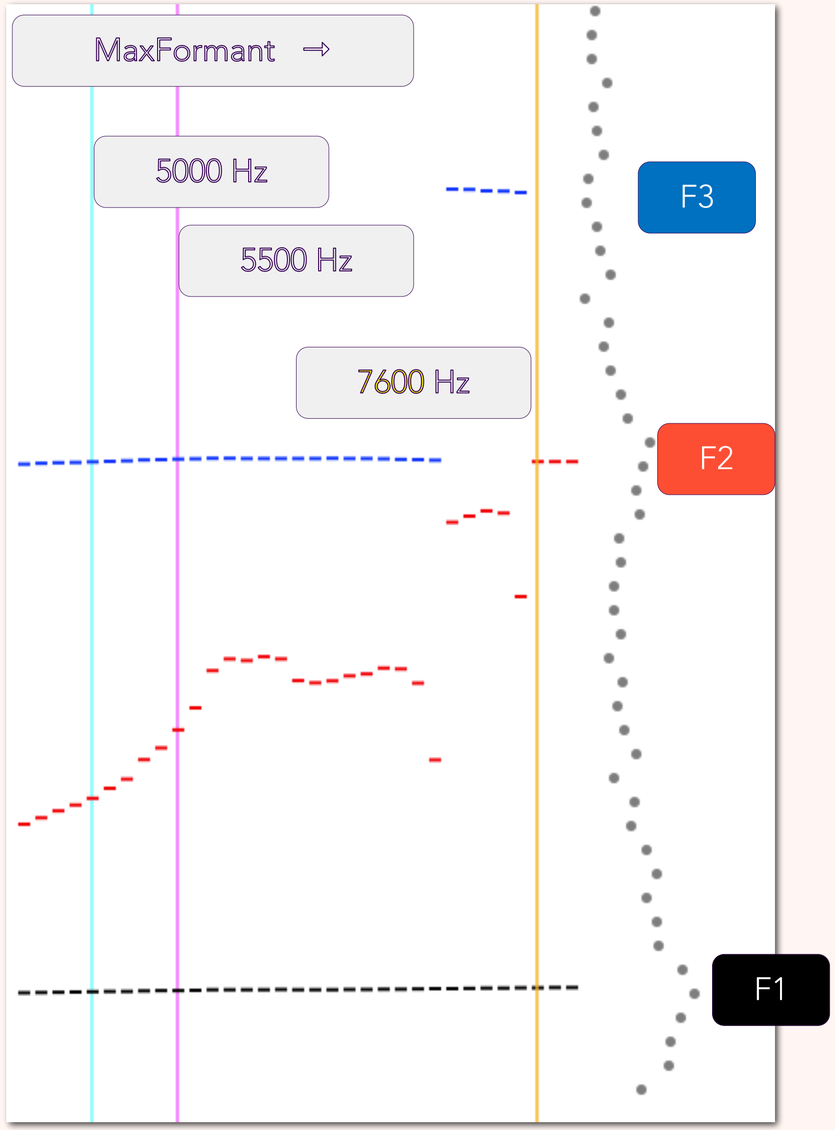
Vargha 2020

Example for the calculation of the typical quality of /ɛ/ (at Vörs, Transdanubia)

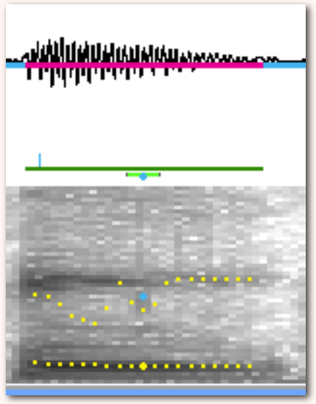
Symbol	F1	F2	occurrences
e̬	15	60	492
e	12	66	160
a̬	18	58	46
è	12	66	8
è̬	15	60	3
/ɛ/	**14,48**	**61,29**	709

pondered average of occurrences

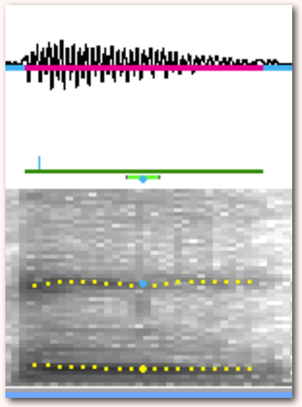
Setting the ideal formant ceiling for each speaker and computing the formant ceiling for each vowel relative to [iː]



kössígházáná

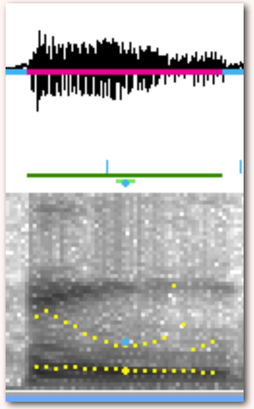


PRAAT standard settings

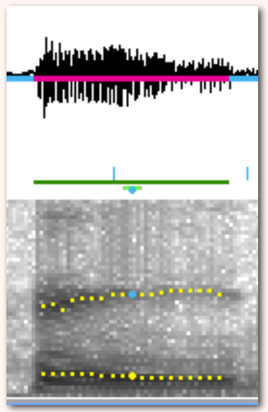


maxFormant_i:
7600 Hz

félit

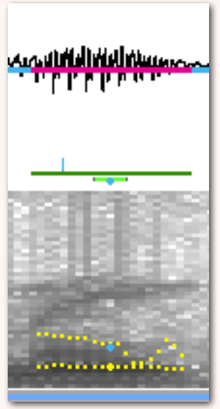


PRAAT standard settings

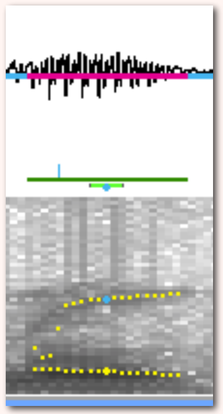


maxFormant_i:
7600 Hz

mëg



PRAAT standard settings

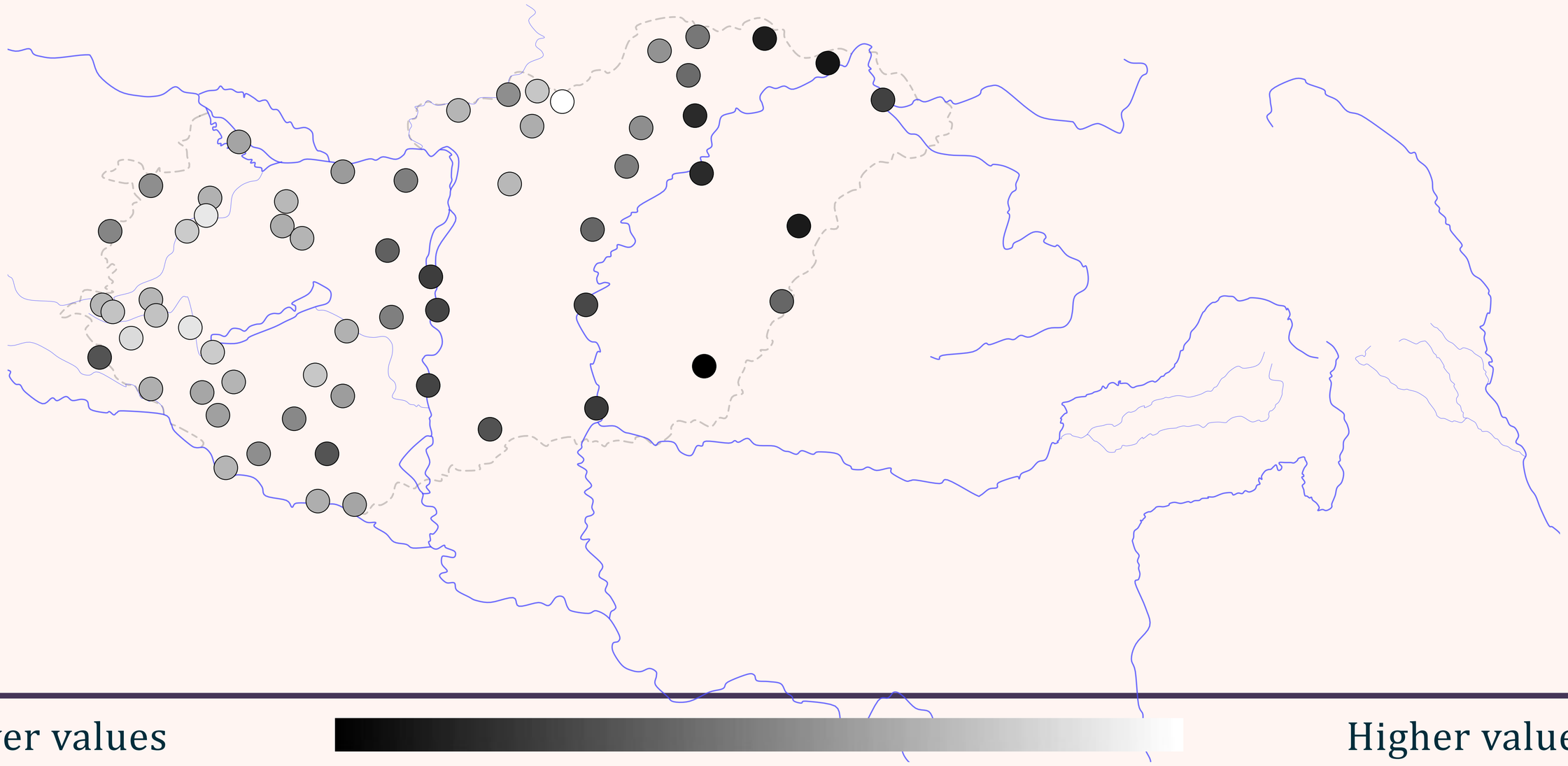


maxFormant_i:
7600 Hz

Döbrököz (Transdanubia), 73 years old woman

cf. Escudero et al. 2009

Difference between F1 /ɛ/ and F1 /aː/

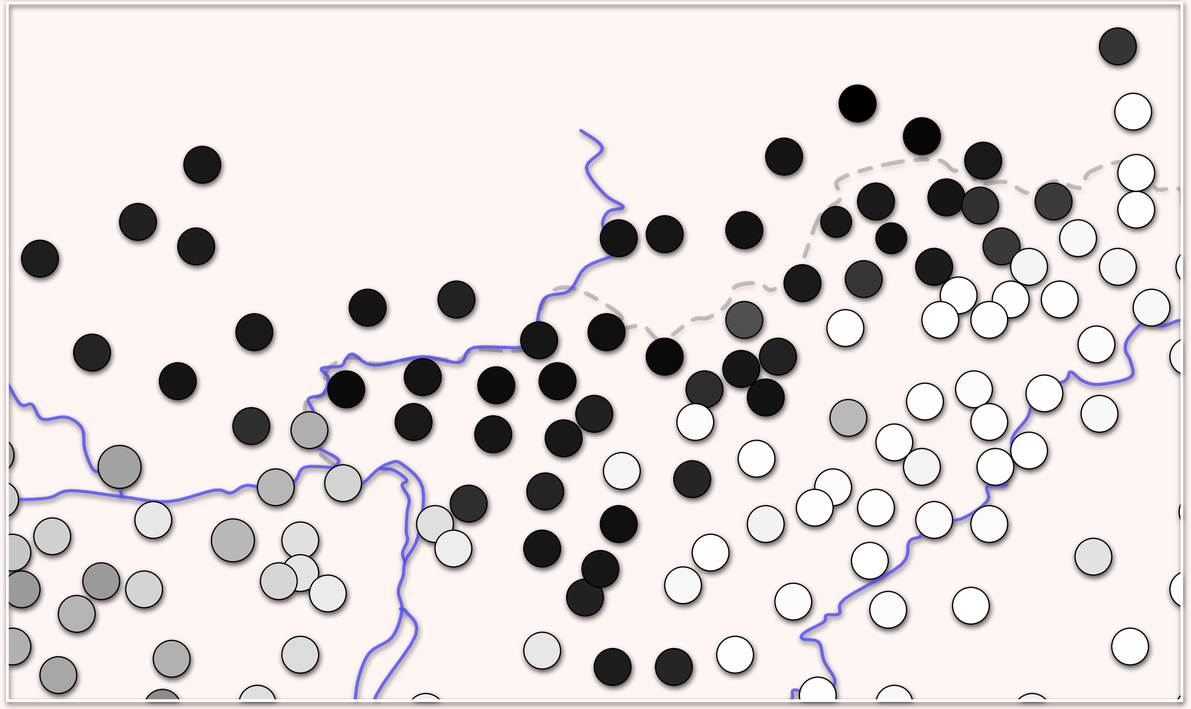


Lower values

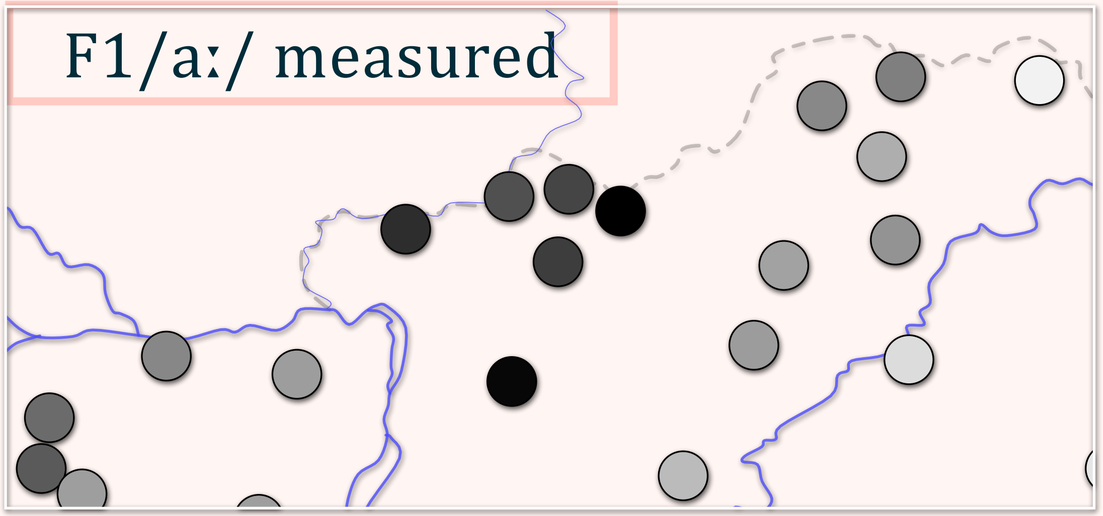
Higher values

Transcribed vowel qualities compared to formant measurements (Palócföld)

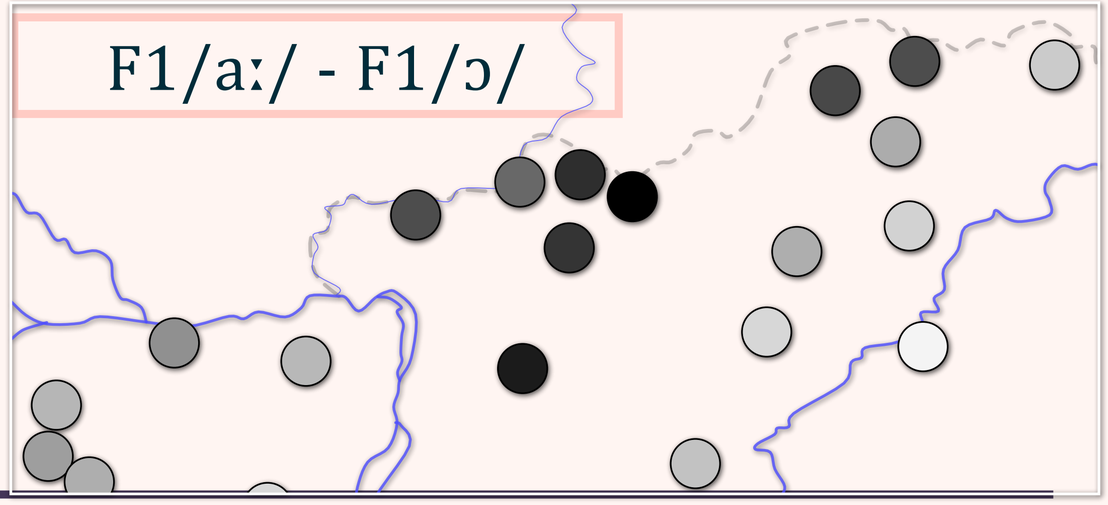
F1/aː/ calculated from transcribed atlas data



F1/aː/ measured

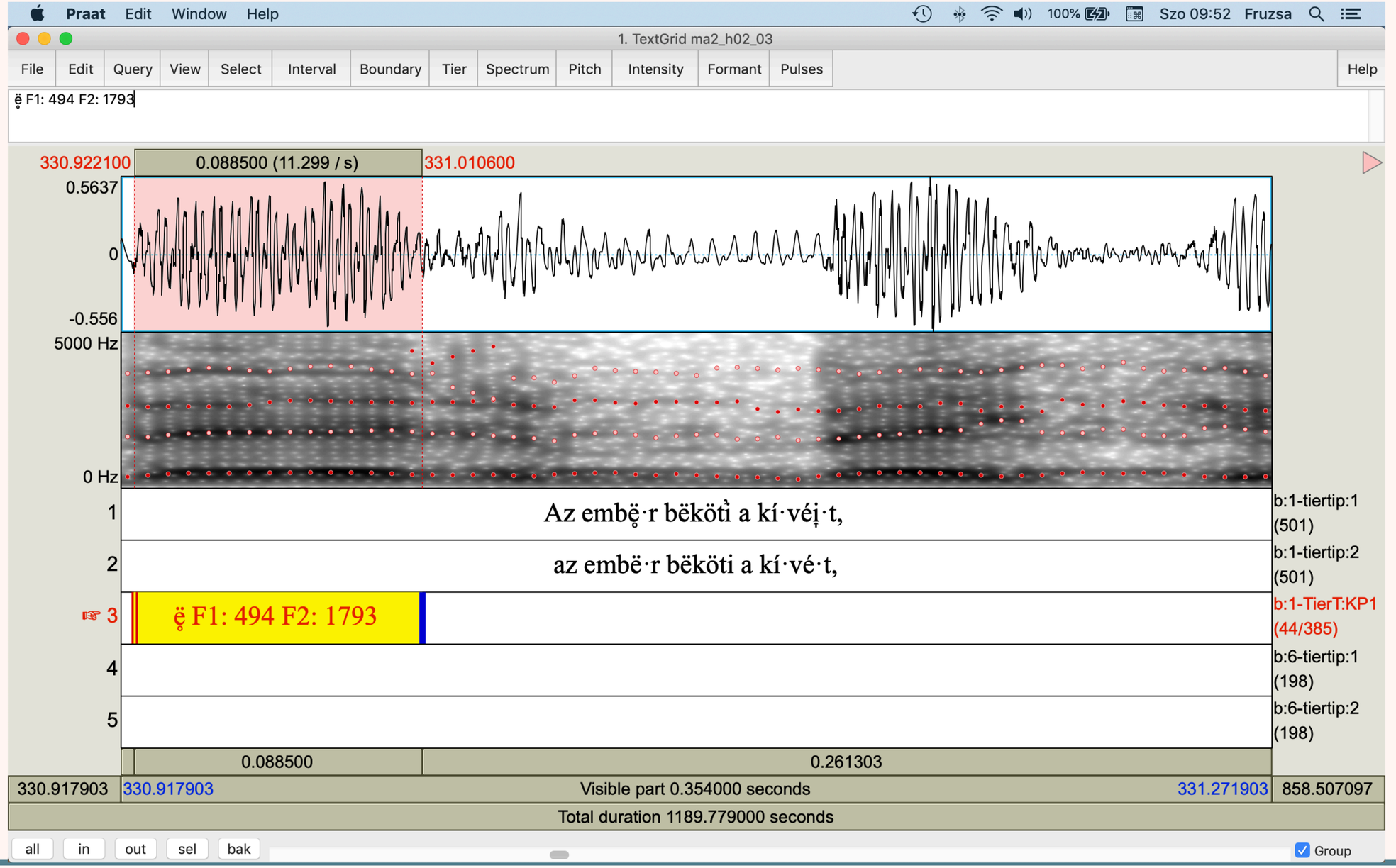


F1/aː/ - F1/ɔ/



Lower values

Higher values


Praat Edit Window Help
100% Szo 09:52 Fruzsa
1. TextGrid ma2_h02_03
File Edit Query View Select Interval Boundary Tier Spectrum Pitch Intensity Formant Pulses Help
ę F1: 494 F2: 1793
330.922100
0.088500 (11.299 / s)
331.010600
0.5637
0
-0.556
5000 Hz
0 Hz
1
Az embę·r bëköti a kí·véį·t,
2
az embë·r bëköti a kí·vé·t,
3
ę F1: 494 F2: 1793
4
5
b:1-tiertip:1 (501)
b:1-tiertip:2 (501)
b:1-TierT:KP1 (44/385)
b:6-tiertip:1 (198)
b:6-tiertip:2 (198)
0.088500
0.261303
330.917903
330.917903
Visible part 0.354000 seconds
331.271903
858.507097
Total duration 1189.779000 seconds
all in out sel bak
Group