



5aSC9. An acoustic perspective on legacy data: Vowels in the Digital Archive of Southern Speech

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1. The Digital Archive of Southern Speech

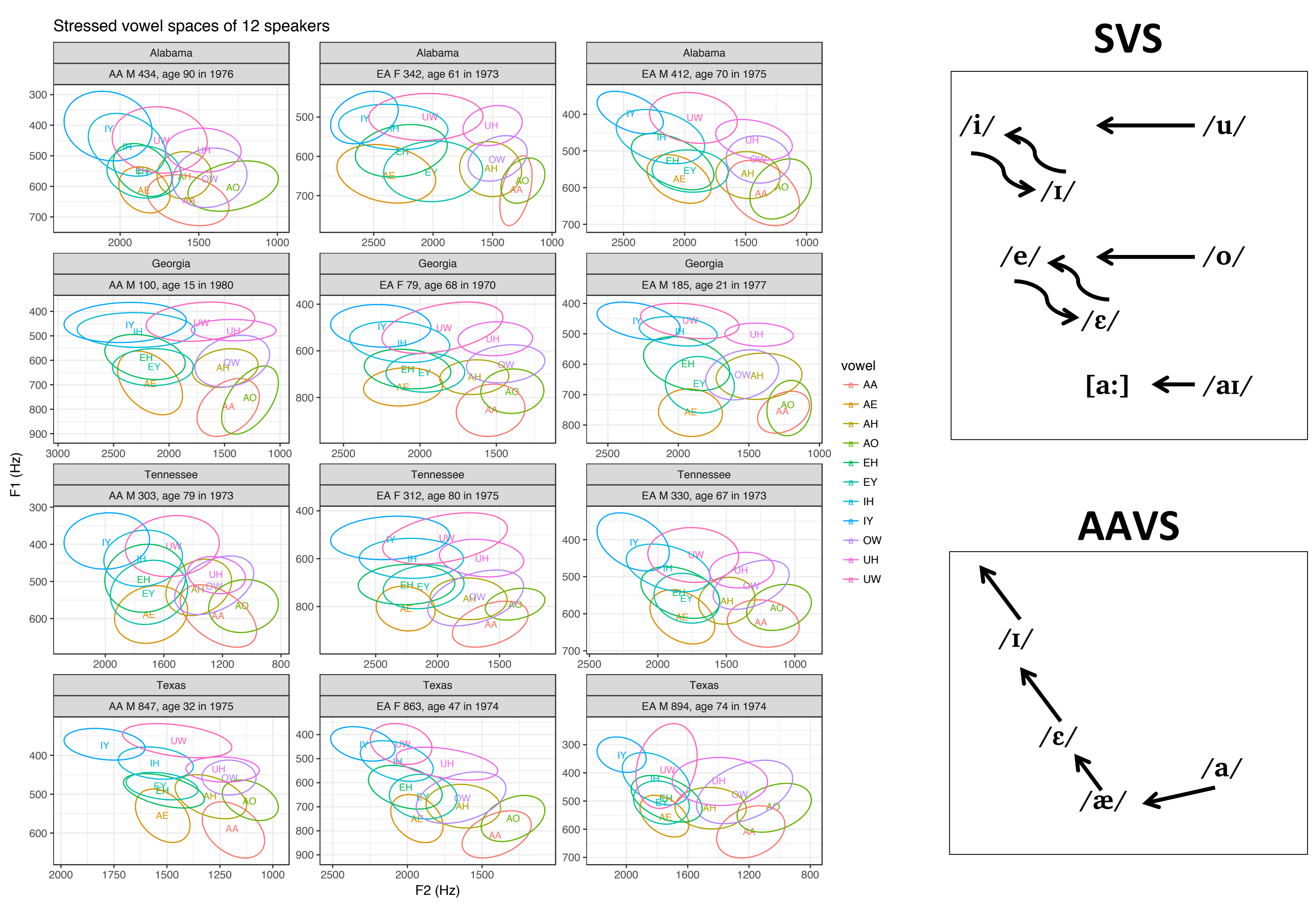
- Corpus
 - Audio corpus of semi-spontaneous linguistic atlas interviews (Kretzschmar et al. 2012)
 - 64 American speakers native to 8 Gulf States
 - 34 men, 30 women, born 1886 – 1965
 - Mixture of ethnicities, social classes, education levels, ages
 - DASS is undergoing transcription, forced alignment, and acoustic analysis (see poster 5aSC8)

- Research questions
 - Vowels and vowel shifting in DASS
 - How do geography, age, gender, socioeconomic status, etc. impact the vowel space?
 - Do European Americans show the Southern Vowel Shift (Labov et al. 2006)?
 - Do African Americans show the African American Vowel Shift (Thomas 2007)?

- Data & data preparation
 - Data from 41 speakers is currently available: 20 female (3 African American), 21 male (5 AA)
 - Vowel tokens: 317,702 tokens aligned & extracted by DARLA (Reddy & Stanford 2015a, 2015b)
 - Formant value extraction methods
 - Single-point F1, F2 extracted by DARLA according to vowel-specific heuristics (cf. Rosenfelder et al. 2011's "best" measurement)
 - Time-course F1, F2 extracted by DARLA at 20%, 35%, 50%, 65%, 80% of vowel duration
 - Acoustic F1, F2 filtering
 - Single-point data: each token's Mahalanobis distance (Mahalanobis 1936) was calculated relative to a speaker- and vowel-specific centroid; tokens with high distance from centroid (based on the 95% quantile of a χ^2 distribution) were excluded as outliers
 - Time-course data: speaker- and vowel-specific quantiles were calculated at the 50% measurement of each token. Tokens were excluded as outliers if their midpoint F1 or F2 exceeded the 99% quantile, or was less than the 1% quantile.

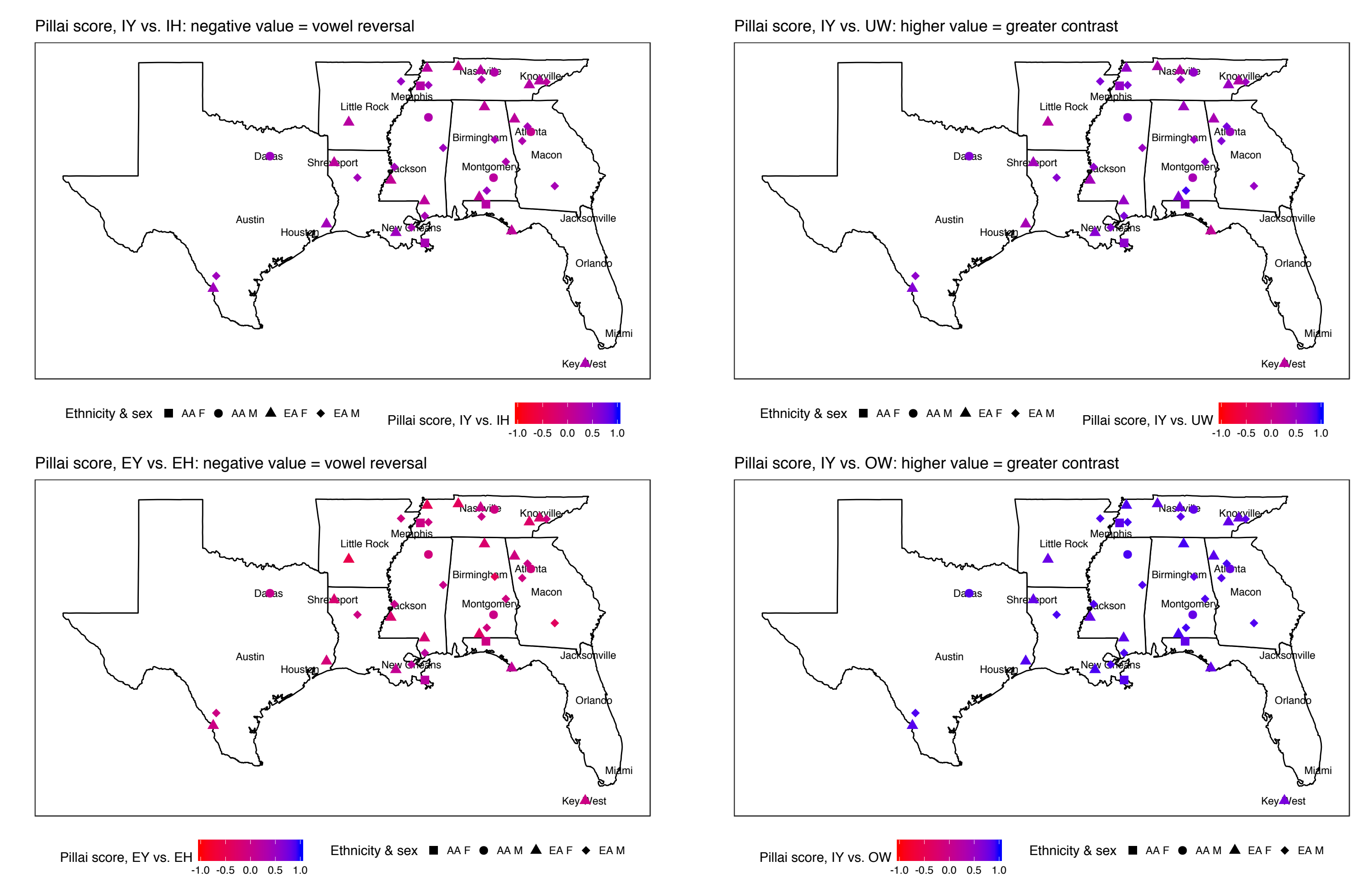
2. Mapping the vowel space

- Data: Mahalanobis-filtered, single-point F1, F2 measurements used for vowel plots
- Plots show means and 1-SD ellipses for stressed vowels (pre-sonorant nuclei excluded)
- Sample of individuals from 3 states show vowel spaces across sexes & ethnicities
 - EA speakers (cf. SVS) may show more front-vowel overlap, back-vowel fronting
 - AA speakers (cf. AAVS) may show front-lax vowel raising, /a/-fronting



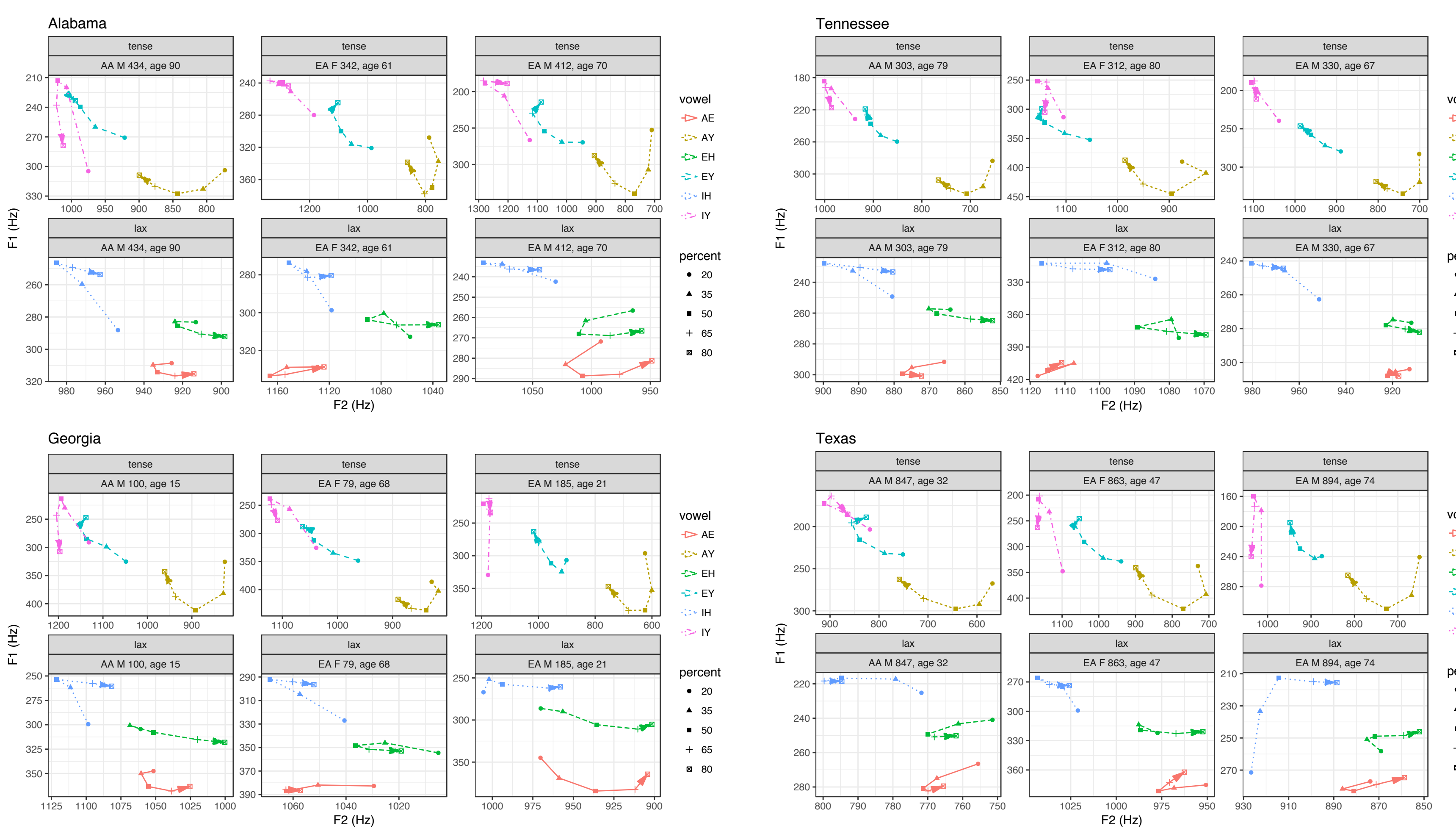
3. Pillai scores quantify vowel overlap

- Single-point F1, F2 values of vowel pairs input to MANOVA, providing a Pillai score
- High scores indicate distinctness, while low scores suggest overlap or vowel merger (Hall-Lew 2010, Hay et al. 2006). Scores range from -1 (vowel height reversal) to 1.
- Trends are consistent with chronology and strength of Southern Shifting features
 - Front vowels: 2-sided t-test shows /i/ / are more distinct than /e/ / ($p < 0.001$)
 - Back vowels: /u/ undergoes greater fronting (towards /i/) than /oo/ ($p < 0.001$)
 - AA speakers have higher /e/ / Pillai scores than EA speakers ($p < 0.05$)
 - Men have higher Pillai scores for all pairs ($p > 0.05$)



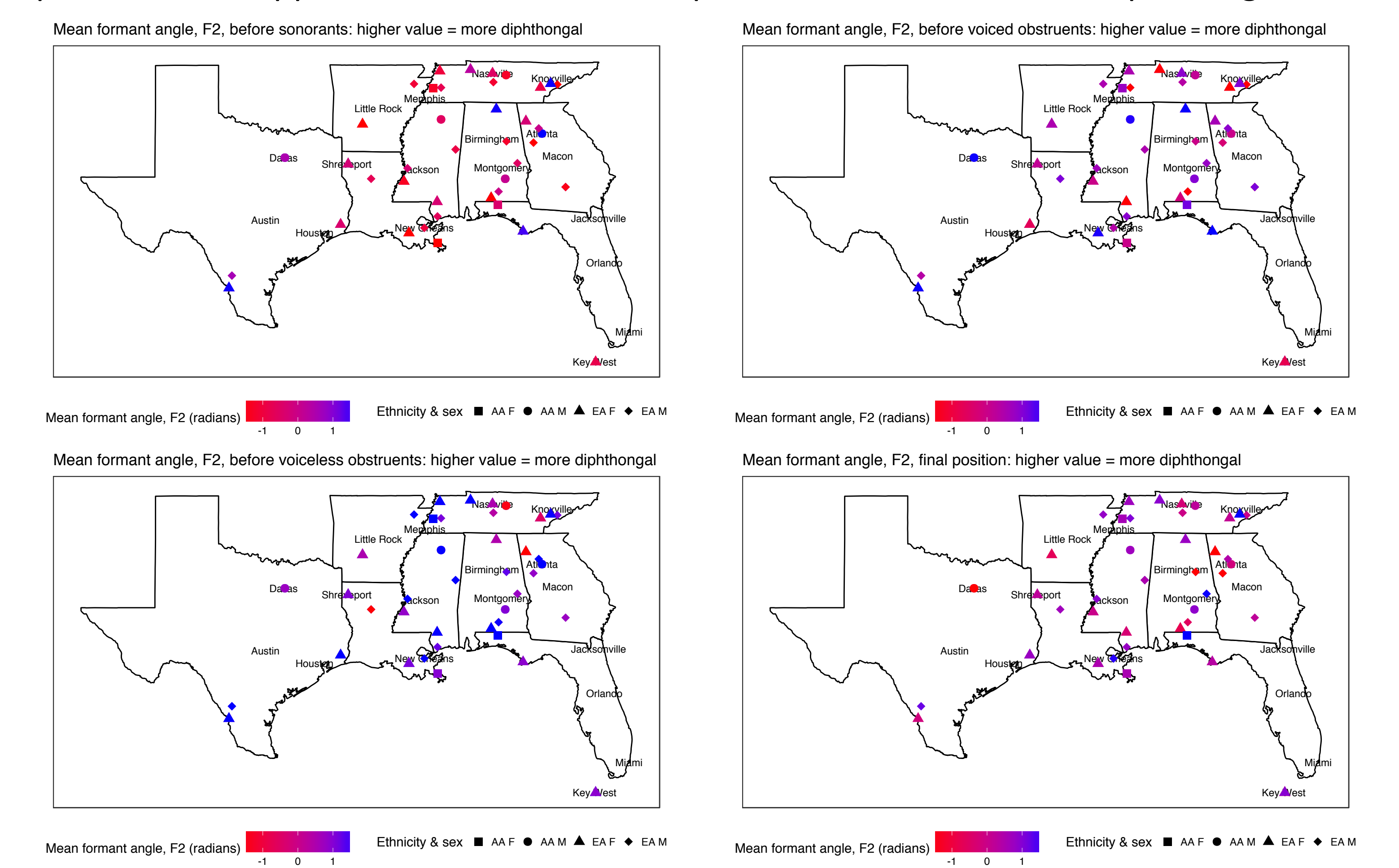
4. Front vowel trajectories

- Vowel formant dynamics reveal dialectal (Fox & Jacewicz 2009), phonological differences
- Time-course F1, F2 plotted for 3 tense vowels /i/ e/ a/, and 3 lax vowels /ɪ/ ɛ/ æ/
 - Stressed vowels only; trajectories represent speaker means
 - Tense vowels plotted are all pre-voiceless, because of conditioned /a/ monophthongization
- Tense vowels move toward a high-front vowel; lax vowels centralize
- Future work will use sociolinguistic variables to model trajectory shape



5. Realization of /a/

- Monophthongization of /a/ to [a:] is common in Southern speech. What occurs in DASS?
 - Formant angle of F2 calculated between 20%, 80% time points (Fox & Jacewicz 2009)
- Results confirm phonological patterns of glide weakening (cf. Labov et al. 2006):
 - lowest formant angles ([a:]) before sonorants, highest ([aɪ]) before voiceless obstruents
 - Pairwise t-test with Bonferroni correction confirms that angles differ significantly across plots ($p < 0.01$) except for pre-voiced vs. final contexts ($p > 0.05$)
- Monophthongization is (a) variably implemented, (b) variable by speaker and region
- Speakers from Appalachia have most widespread, unconditioned monophthongization



6. Conclusions

- Single-point data reveal both high variability and vowel shifting in naturalistic speech
 - /ɛ/ has higher nucleus than /e/ for some speakers, consistent with SVS and AAVS
- Time-course data reveal trajectory direction differences between tense & lax vowels
- Formant angles confirm conditioned weakening of /a/ → [a:], with speaker variation
- As transcription and alignment continue, the data set will grow to 64 speakers
- Use our QR code to interact with this growing dataset in your web browser!

References & Acknowledgments

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