1. Front vowel shifting in Southern American English

- Static measurements suggest that Southern front tense and lax vowels “swap places,” as in beet-bit, boat-bet. Given their strong acoustic overlap, what maintains their distinctness?
- Dynamic trajectories are shown to diverge in position and shape across tense and lax pairs.

Research questions:
- How distinct are the trajectories of tense vs. lax vowels?
- Which sociolinguistic factors affect vowel trajectory shape?
- Can vowel trajectory modeling give insight into the spread of the Southern Shift?

2. The Digital Archive of Southern Speech

- Audio corpus of semi-spontaneous linguistic atlas interviews (Kretzschmar et al. 2012)
- 64 American speakers native to 8 Gulf States
- Speakers represent a mixture of ethnicities, social classes, education levels, ages
- DASS is being transcribed, aligned, and acoustically analyzed (Olsen et al. 2017)
- Data from 53 speakers is currently available: 26 female (5 African American), 27 male (6 AA)

3. Data and data preparation

- Vowels: 426,682 total tokens aligned and measured with DARLA (Reddy & Stanford 2015)
- Formant values: F1, F2 extracted by DARLA at five time points: 20%, 35%, 50%, 65%, 80%
- Formant values normalized to speaker-specific z-scores (Labov 1971)
- Acoustic filtering: at the 50% F1, F2 values of each token, Mahalanobis distance (Mahalanobis 1936) is calculated, relative to a speaker- and vowel-specific centroid. Tokens with high distance (based on 95% quantile of a χ² distribution) are excluded as outliers
- Tokens analyzed: Stressed front vowels that do not precede nasals or liquids
- Position on vowel diagonal: ZF2 – ZF1 is calculated for each vowel measurement (Dodsworth 2013) and plotted across time. Higher values indicate higher, fronter nuclei (Labov et al. 2013).

4. Generalized Additive Mixed Models

- GAMMs are useful for dynamically variable data (Soskuthy ms.)
- Linear predictors depend linearly on smooth functions (Wood 2017a); models can account for temporal autocorrelation (Baayen et al. 2017), and detect significant differences in smoothed curve shapes

GAMMs fit to vowel data
- Separate model fitted for each vowel (ngay; Wood 2017b)
- Dependent variable: ZF2 – ZF1 (5 values per vowel token)
- Autoregressive error model seeded with ρ from identical ML model

Predictor variables
- Phonological and random factors (not shown in Results table)
- Following consonant place of articulation
- Vowel context within word, indicating syllable structure
- Vowel duration (smooth, and tensor product with Percent)
- Speaker (random smooth)
- Sociolinguistic factors
  - Birth year (relativized: 1886 = 0; 1965 = 79)
  - Ethnicity (reference = Non-Black)
  - Sex (reference = Female)
- Social Class: Upper (reference), Upper Middle, Lower Middle, Lower
- State: AL (reference), AR, FL, GA, LA, MS, TN, TX

5. Estimated trajectories from fitted GAMMs

- Model predictions extracted, plotted (i.e. sadug: van Rij et al. 2017)
- Plots are left blank where no DASS speaker fits that specification
- Other factors set to reference levels
- Effect of birth year indicates intergenerational vowel shifting

6. Results of statistical modeling

- Significance tested via conservative model comparison with dropped factors (compareML; van Rij et al. 2017)
- * indicates factor is significant in model summary alone

7. Conclusions

- Tense and lax front vowels have distinct dynamic trajectories
- T + IH starts higher, fronter than IH
- T has more extreme trajectory, finishes more centrally
- Both vowels reach peak ZF2 – ZF1 near their 50% point
- GAMM trends suggest T lowering, IH raising across generations
- AE is highest and most fronted in its first half
- Over generational time, the shape of AE’s trajectory changes, and its lowest point shifts later in vowel
- Young, African American females have a distinct trajectory suggesting increased raising, and strongest shifting for AE
- Future research will test precisely at what points, and factor levels, trajectories are significantly different

Acknowledgments & References

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