Acoustic analysis of California vowels

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Hypotheses

California shift = Canadian Shift
Canadian Shift, quantitatively (Labov et al. 2006):
- F1 of DRESS greater than 650 Hz
- F2 of LOT less than 1275 Hz
California /ow/ fronting
- F2 of GOAT greater than 1278 Hz

Method

Procedure
- subjects: 13 adult California English speakers from snowball sample
- items: KIT, DRESS, TRAP, LOT, GOAT, FLEECE, FACE, GOOSE
- elicitation: survey (Labov et al. 2006)
- Rainbow passage (Fairbanks 1960)
- headphones w/ ambient noise

Measurement

Formants
- Spectrograms obtained in Praat
- F1, F2 measured at 1st quarter of vowel duration
- between offset and onset of surrounding transitions

Analysis

Overall
- Two-way ANOVA:
  - F1 and F2 differ significantly across 8 vowels
  - F1: F(7, 519) = 355.9, p < 0.0001
  - F2: F(7, 519) = 311.58, p < 0.0001
- Tukey post-hoc test:
  - all vowels differ significantly in both dimensions except:
    - F1 for KIT and FACE
    - F2 for GOOSE and TRAP

Results

The California Shift
relative space:
- KIT DRESS TRAP LOT different in both F1 and F2
absolute space:
- F1 of DRESS greater than 650 Hz
- F2 of TRAP less than 1275 Hz (retracted, for almost all)
- F2 of LOT less than 1275 Hz (retracted, only for some)

/ow/ fronting relative space:
- GOAT frontera (higher F2) than LOT

Summary

Quantitative results
- KIT DRESS TRAP: meet ANAE benchmarks for Canadian Shift, but LOT does not quite

Relative F1, F2 of short vowels
- matches Hagiwara (2005), Ladefoged (2001)
- KIT DRESS TRAP LOT: clearly chain-shifted

F2 of GOAT: centralized nucleus

Background

- LOT-THOUGHT merger (low back merger)
- advanced /uw/ (GOOSE) → [iU]
- conservative /ow/ (GOAT)
- conservative re: Canadian Shift

Innovations

The California Shift:
A pull-chain, parallel to Canadian Shift (Boberg 2008)
- merger of LOT-THOUGHT vowel (i.e. a ; /o/ in ANAE)
- retraction of LOT-THOUGHT to [a].
- retraction of TRAP (i.e. æ, /a/ in ANAE)
- lowering of DRESS (i.e. /e/)

/ow/ fronting
- Central nucleus for GOAT, i.e. /ow/ → [AU]

Previous phonetic research

(Hagiwara 1997, 2005; Ladefoged 2001)
- lowering of KIT, DRESS, TRAP relative to long vowels
- F2: analog of vowel frontness
- F1: inverse analog of height

Symbol key:

Wells ANAE
KIT BRESS TRAP LOT THOUGHT GOAT FLEECE FACE GOOSE
Ih e ae o ah oh ow iy ey uw

References