Realization and representation of plosives in Jutlandic varieties of Danish

Variation in phonetics predicts variation in phonology

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Laboratory Phonology 17 | Social variation on the margins

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Bij ons leer je de wereld kennen

Road map

- Geo-social variation in Denmark

- Corpus of dialect recordings

- Plosive variation in Danish

- Phonetic studies
  - Voice onset time
  - Spectral characteristics / Centre of gravity

- Phonological spirantization

Geo-social variation in Jutland

- ~1900: Widespread regional variation at every major linguistic level

- ~1960: Intensified dialect leveling

- Now: Danish is likely one of the most linguistically homogeneous language communities in the world

- Lexicon and categorical phonology well-described; subphonemic variation less so

- Traditional dialect boundaries represent isogloss bundles

K 0.3
De jyske hoveddialekter

NJy
NVJy
NØJy
MVJy
MØJy
Djurs
SyJy
SønJy
SSlesv
IGS-RÆNSEN
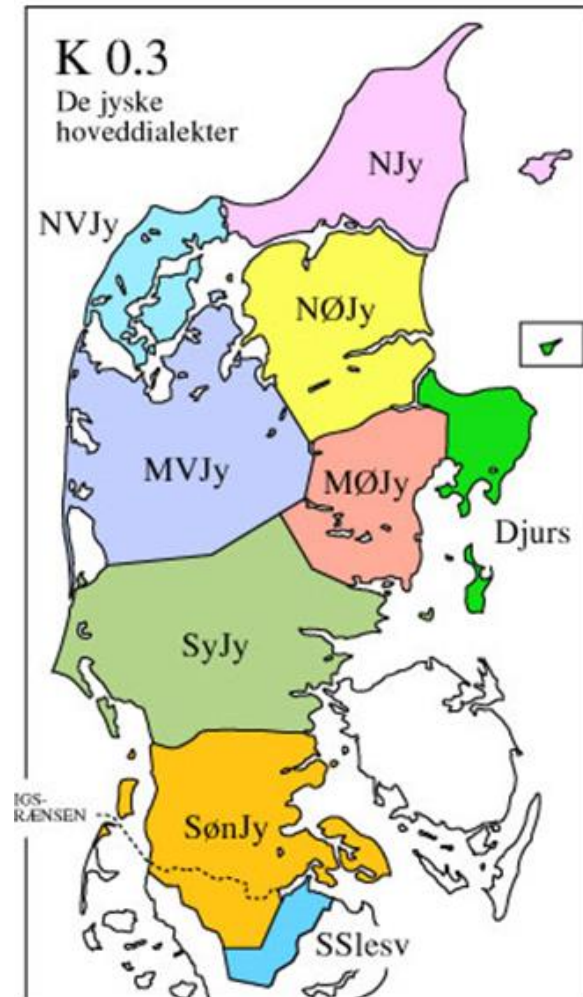
Corpus of dialect recordings

- Large number of dialect recordings from 1971-1976 have been restored in high quality and are freely available online

  - Sociolinguistic interviews

  - NORM (except more women)

  - Born around the turn of the century, mean age ~77 years

- Jutlandic recordings have never been used for scientific study
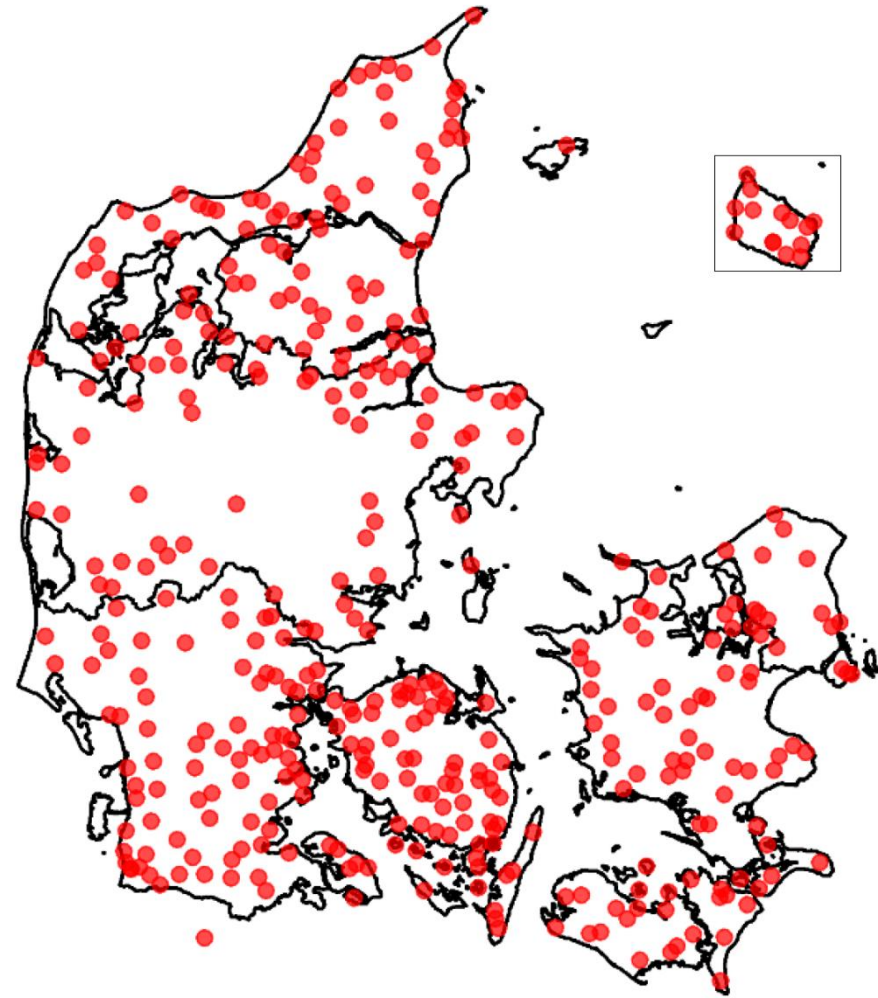
Background: Variation in plosives

- Standard Danish has a voiceless unaspirated ~ aspirated contrast in plosives, and voicing does not play a role in Danish phonology

- Variation in /t/ realization is overt, but not dealt with in the literature

  - Standard Danish has a highly affricated variant, often transcribed as [t^s]

  - Northern Jutlandic varieties use 'the dry t' with no affrication

  - (Often attributed to Northern Jutland, but Brink & Lund (1975) claim that non-affricated /t/ is the norm throughout the Jutland peninsula)

Background: Variation in plosives

- Pilot study found that neither Brink & Lund nor the received knowledge match reality

  - 'Dry t' is found in large parts of Jutland, but affrication is also found in some traditional dialects

  - The distinction is not categorical

  - VOT and burst characteristics are correlated, but not perfectly so

# Background: Variation in plosives

- Eleanor Chodroff & colleagues found covariation in VOT and place cues (=centre of gravity) across laryngeal settings and place of articulation, such that

  - [b~p] covary for speakers, varieties, languages

  - [p~t~k] covary for speakers, varieties, languages

  - etc.

- So although overt variation is found for /t/, similar patterns are likely to exist for other plosives as well

  - Coronal burst characteristics are more salient, so presence/absence of assibilation is more likely to be noticed here!

Hypotheses

- The received knowledge about /t/-variation in Jutland does not give the whole picture

- /t/ is not alone in showing regional variation

- A growing body of literature suggests that underlying representations emerge from the pool of synchronic variation

- As such, patterns of "free variation" in simple onset will to some extent correlate with allophonic patterns and phonological developments in other contexts

Methods: Data for this study

- 213 recordings

  - All Jutlandic recordings of sufficient quality

  - Only one per location

- 70-100 plosives (simple onset) were segmented from each recording

  - VOT extracted

  - Mean COG throughout release extracted for fortis stops /p t k/, but excluded if VOT >10 ms, or mean COG >500 Hz
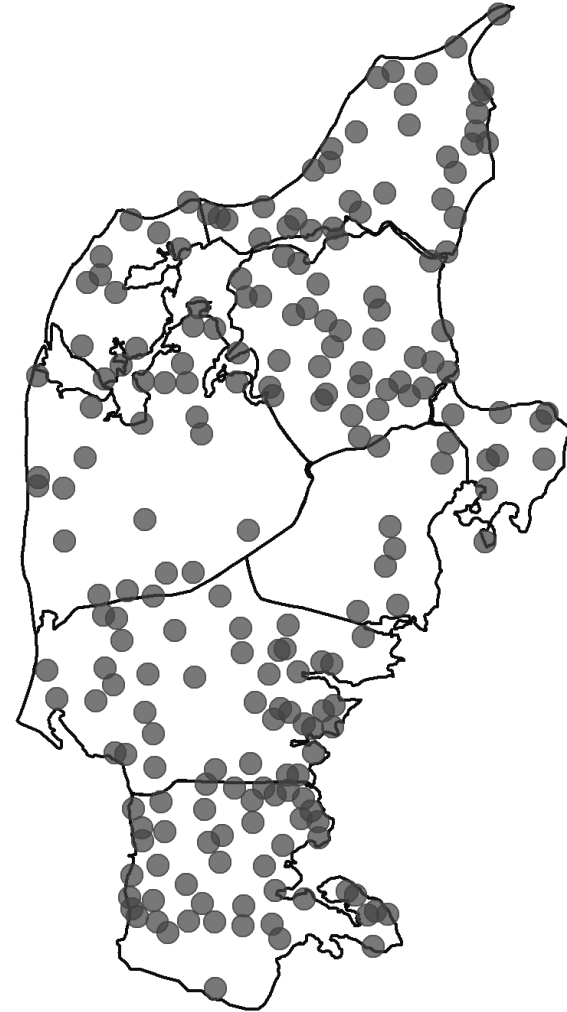
Methods: Data for this study

Phoneme	VOT study	COG study
/b/	2,212	–
/d/	2,369	–
/g/	2,273	–
/p/	1,386	1,128
/t/	5,169	5,037
/k/	4,095	3,866

Methods: Data for this study

- Environmental effects and speaker information that might influence VOT/COG were noted

  - (following) vowel height: high, mid, low

  - (following) vowel backness: back, non-back

  - (following) vowel rounding: +/-

  - Palatal release: +/-

  - Stress: +/-

  - Place of articulation/laryngeal setting: /b d ɡ p t k/

  - Informant gender

Statistical modeling

- The data were fitted to generalized additive mixed models

  - A non-linear regression model used for dynamically varying data

- Speaker/environmental information used as linear predictors

- Random slopes for individual informants by phoneme

- Geographical information (latitude, longitude) included as smooth term (i.e., non-linear predictor)

 - In the COG model, the influence of VOT on COG was also modeled with a smooth term

Results: VOT

- All linear predictors significant at p<.001 level

  - *Except gender*, which has no significant effect on VOT

- The literature suggests an interaction between rounding <> place, and backness <> place

  - No such effect was found

- In both laryngeal settings, evidence was found for labial < alveolar, but not alveolar < velar

- Strong main effect of geography, and specific geographical effects for /p t k/
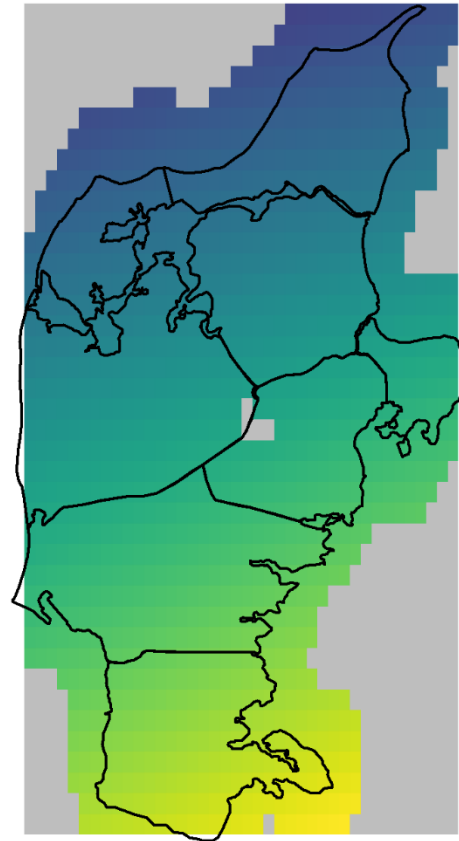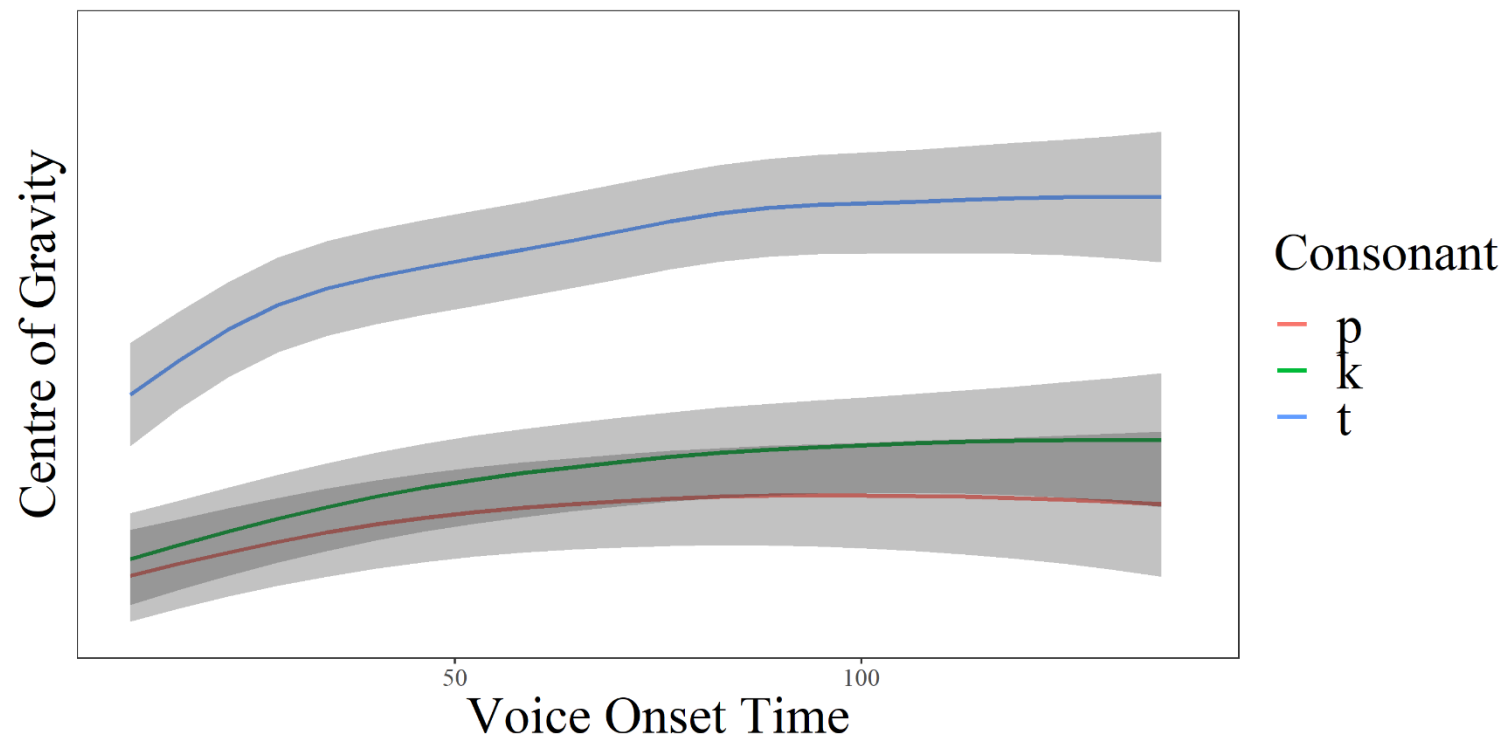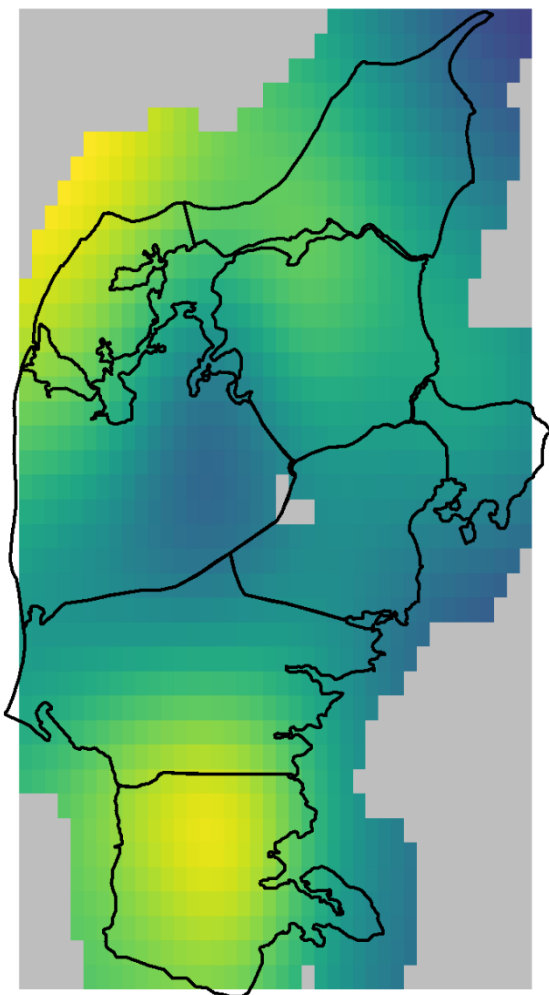
Results: VOT

Main effect
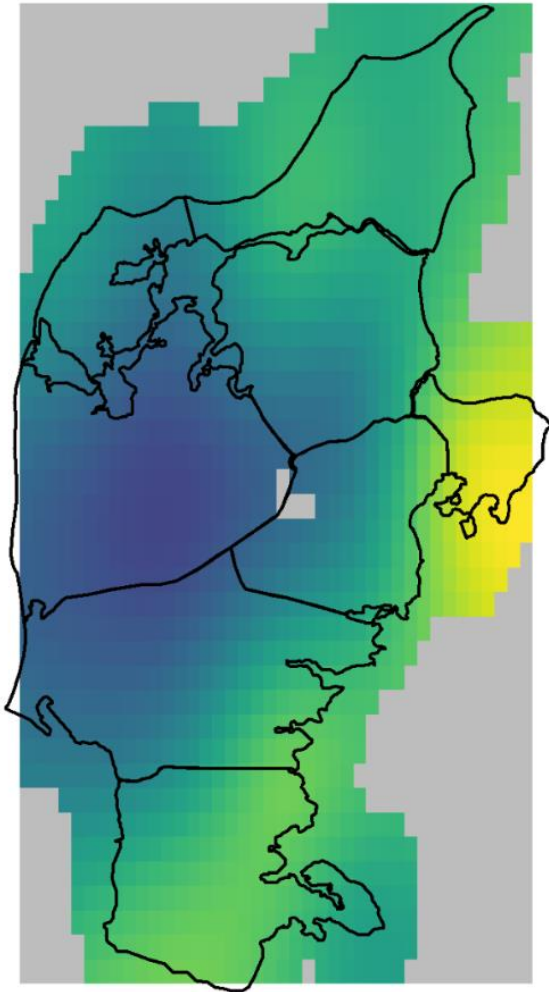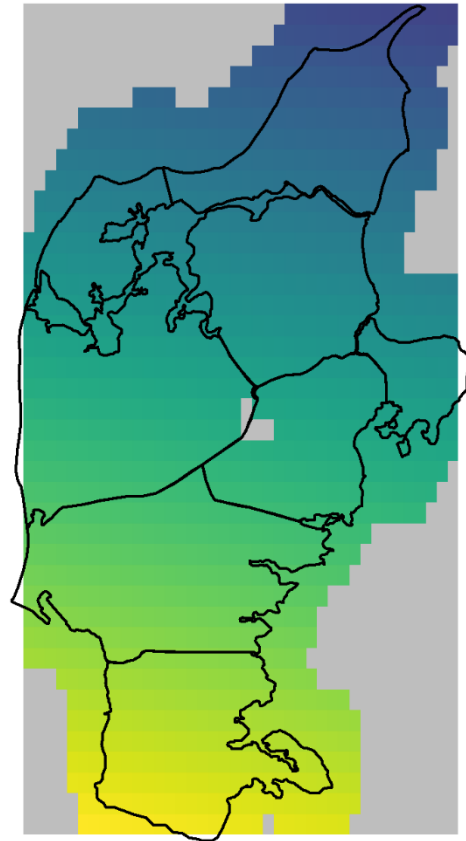
/p/ /t/ /k/

Results: COG

- All linear predictors significant at p<.001 level
- Strong main effect of geography
  - No specific geographic effects for /p t k/
- Significant non-linear relationship between VOT and COG
  - Strong main effect
 - Only phoneme-specific effect is for /t/

Results: VOT

Main effect, COG

Phonological patterns: hypotheses

- On the basis of these results, we can form hypotheses about phonetics predicting phonology

- We focus on lenition, mostly in the form of (probabilistic) spirantization

    - Often found in weak prosodic positions:
      coda, unstressed onset

- Since occlusions are generally tighter for fortis plosives /p t k/, lenis plosives /b d g/ are expected to more readily spirantize through gestural weakening

Main effect only, VOT Main effect, COG
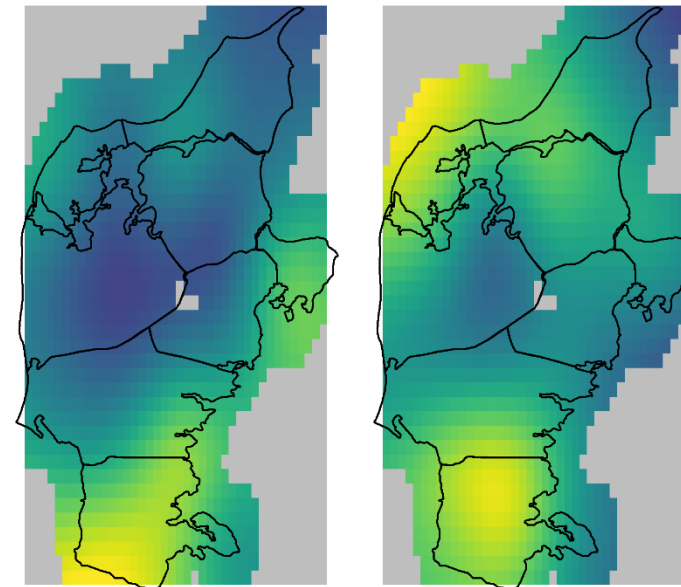
Hypotheses (VOT)

- If VOT is low, the laryngeal distinction is probably partially maintained through prevoicing, which may be phonological

  - We have not measured prevoicing, but impresionistically, this indeed seems to be the case

  - If /b d ɡ/ spirantize, voicing is expected to be retained (→ [v ð̞ ɣ])

- If VOT is high, we have no reason to suspect phonological voicing

  - If /b d ɡ/ spirantize, we expect [f s x]

Main effect only, VOT   Main effect, COG
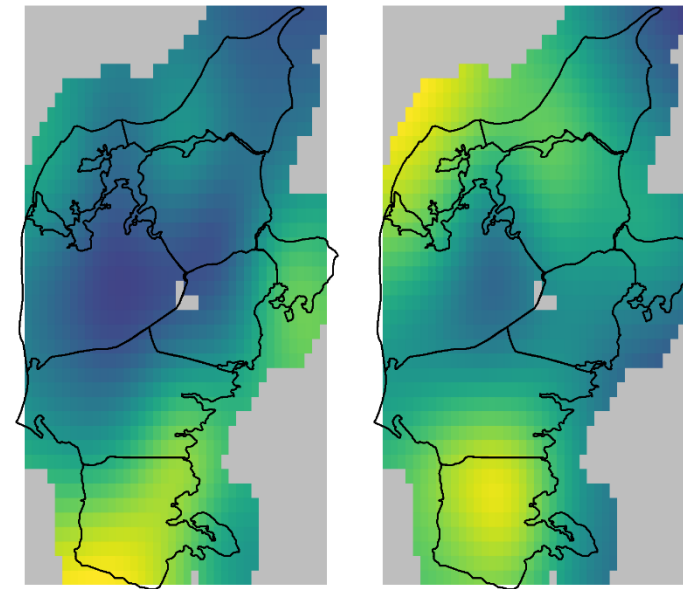
Hypotheses (COG)

- If COG is high, /p t k/ have very salient place cues during release

  - These resemble homorganic fricatives

  - This increases likelihood of reanalysis as fricatives through cue reranking

  - Or just dropping occlusion in certain environments

- If COG is low, /p t k/ should be less likely to spirantize

Main effect only, VOT Main effect, COG
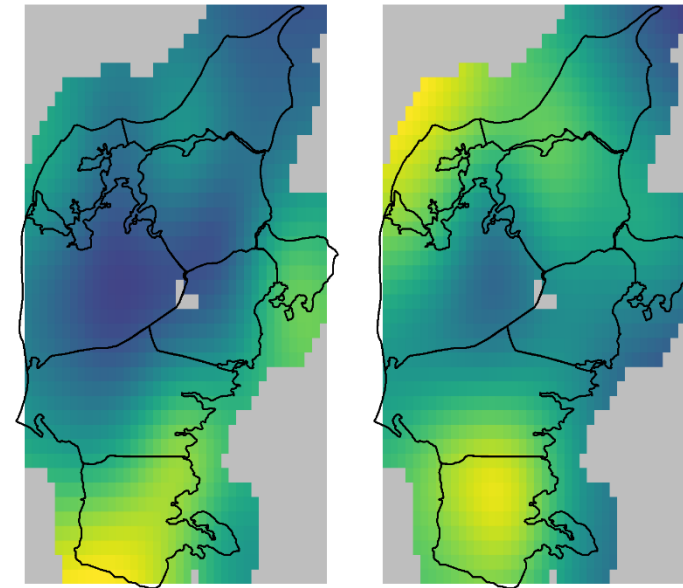
Phonological patterns: hypotheses

	VOT	COG
low	/b d g/ → [v ð̞ ɣ]	/p t k/ stable
high	/b d g/ → [f s x]	/p t k/ → [f s x]

- The high-low dichotomy is a (useful) simplification

- This gives four logical possibilities

  - We explore reduction patterns in the speech of four representative speakers, supplemented by findings from the dialectological literature
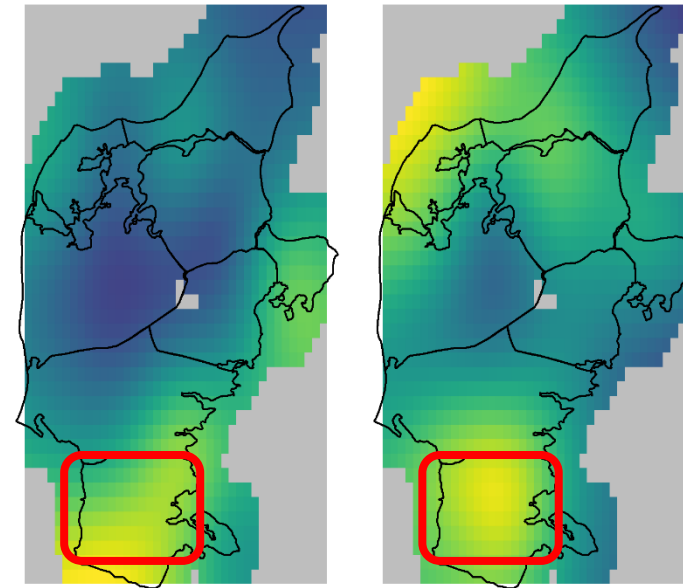
Main effect only, VOT   Main effect, COG
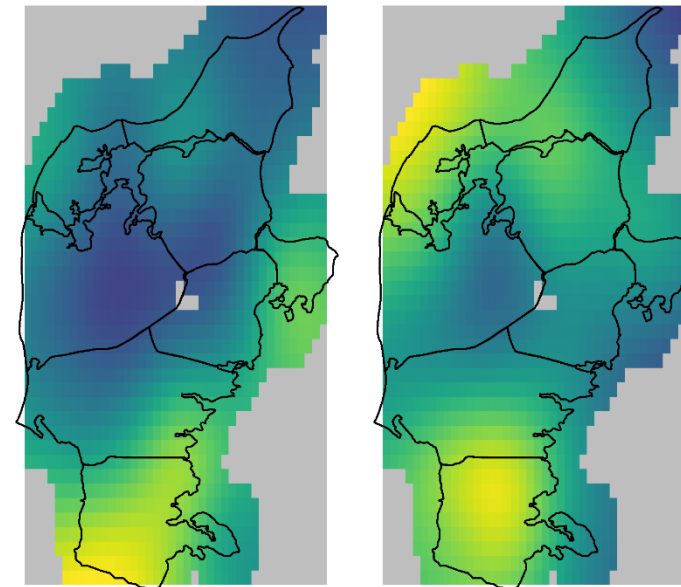
Toftlund: high VOT, high COG

- Laryngeal neutralization for velars
  - Categorically: /g k/ → [x] in coda
  - Same pattern also found non-categorically in onset
- /b/ generally remains voiceless when spirantized
  - /b/ → [f] frequent in coda
- This is in line with our hypotheses

Main effect only, VOT **Main effect, COG**

Ørsted: high VOT, low COG

- Somewhat ambiguous patterns – both phonetically and phonologically

- No laryngeal neutralization

- Fortis plosives and /g/ are rather stable

- /b/ → [f] frequent in coda

- /d/ categorically weakens to a glide in some positions

  - Which is unexpected!

- Partially in line with our hypotheses

Main effect only, VOT   Main effect, COG
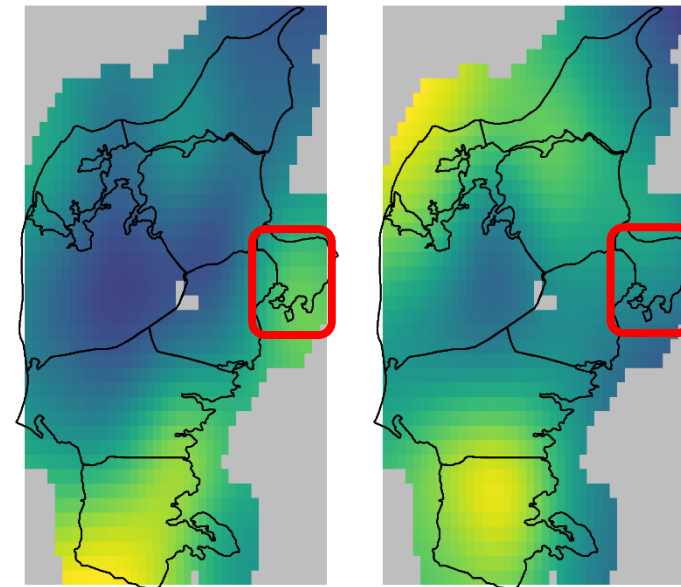
No: low VOT, high COG

- No laryngeal neutralization
- /k/ very frequently spirantizes to [x~χ]
  - /p/ → [f] is found, albeit infrequently
- /b d g/ retain voicing when spirantizing
  - /g/ very frequently weakens to [ɣ~ʝ~j]
  - This is categorical in some function words
- This is in line with our hypotheses

Main effect only, VOT **Main effect, COG**
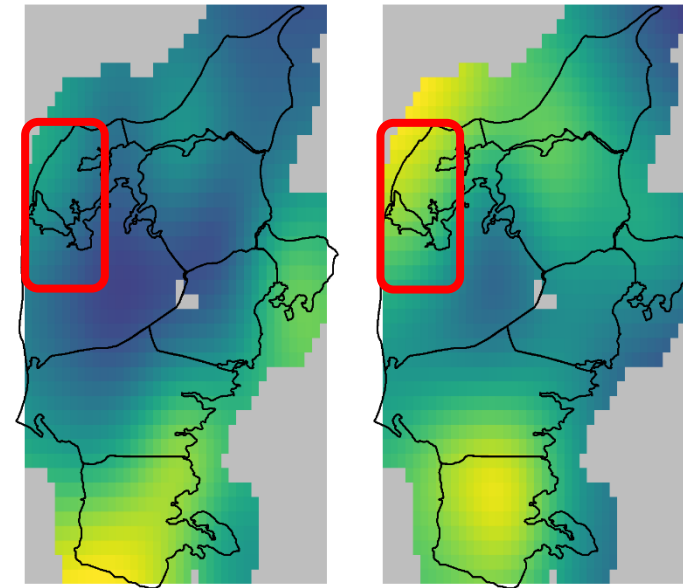
Junget: low VOT, low COG

- No laryngeal neutralization

- Spirantization of fortis plosives limited to /k/

  - Although frequent for /k/

- /g/ – and to some extent /b/ – often alternate with voiced fricatives

- /d g/ assimilate with adjacent nasals

  - This would argue for phonological voicing

- Mostly in line with our hypotheses

  - We did *not* predict spirantization of fortis plosives, which is also relatively marginal here

Main effect only, VOT   Main effect, COG
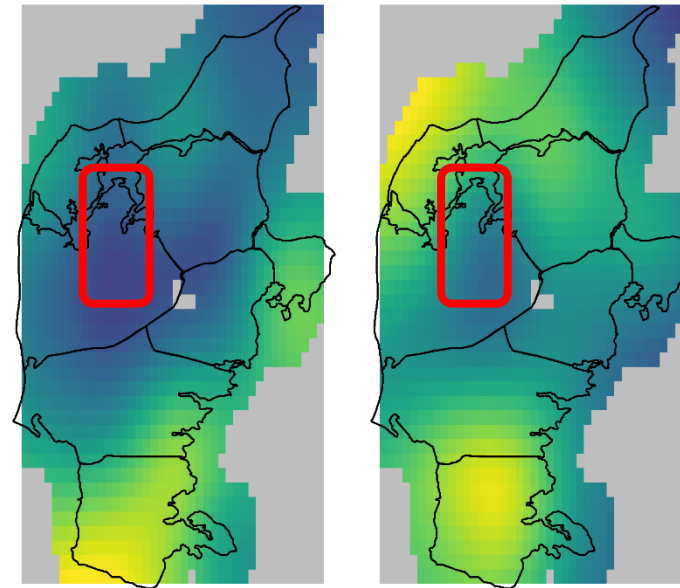
Phonological representation

- Low ~ high VOT = presence ~ absence of phonological voicing in /b d g/

  - This feature is relatively stable in lenition processes

- Low ~ high COG = absence ~ presence of place features during release of /p t k/

  - Can help account for relative stability of plosives, but difficult to capture at a segmental level

  - A possible solution may be found with the quantized, subsegmental representational framework of Q theory (e.g. Shih & Inkelas 2019)

Conclusions and summary

- On the basis of a large corpus of interview data, we found complex dynamic patterns of variation in the realization of plosives

  - This variation is not limited to /t/, but applies to all fortis plosives

- The phonetic variation in fortis plosives predicts phonological patterns for all plosives

  - These patterns suggest differences in phonological representation in the varieties

  - This is supported by patterns of lenition seen in the data

Tak for jeres opmærksomhed!

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