

Best practices in sociophonetics: stops

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0. Outline

1. approaches and methods

- auditory
- acoustic
- acoustic profiling

2. issues for development

- methodologies
- what to measure?

1. Approaches and methods

1. Approaches & methods

- how have researchers analysed stops?
- sociolinguists & phonologists:
 - mainly auditory
- phoneticians:
 - mainly acoustic
 - some aerodynamic & articulatory work

1.1 auditory approach

- auditory analysis, common in sociolinguistics
 - usually with a holistic, segmental framework
 - allophonic realisation of phoneme
 - segmental variable rule
 - /-t, -d/ deletion (Tagliamonte & Temple 2005)
 - glottalisation of /t/ (Fabricius 2002)
 - palatalisation of /t d/ (Major 2004)
 - assimilation (Nahkola & Saanilahti 2004)

1.1 auditory approach

- advantages:
 - speed
 - perceptual normalisation across tokens
 - applicable to natural data, large samples
- disadvantages:
 - coarseness
 - imposition of categories on the data
 - lack of control for many influences on realisation
 - e.g. prosodic context, speech rate

1.2 acoustic approach

- dominant approach in phonetic literature
- identification of variation:
 - prosodic context (Cho & McQueen 2005)
 - speech rate/stress (González 2002)
 - assimilation (Snoeren et al in press)
 - epenthesis (Fourakis & Port 1986, Yoo & Blankenship 2003)
 - perception (Mitterer & Ernestus in press)
 - cross-linguistic (Cho & Ladefoged 1999)
 - cross-speaker (Piroth & Janker 2004)

1.2 acoustic approach

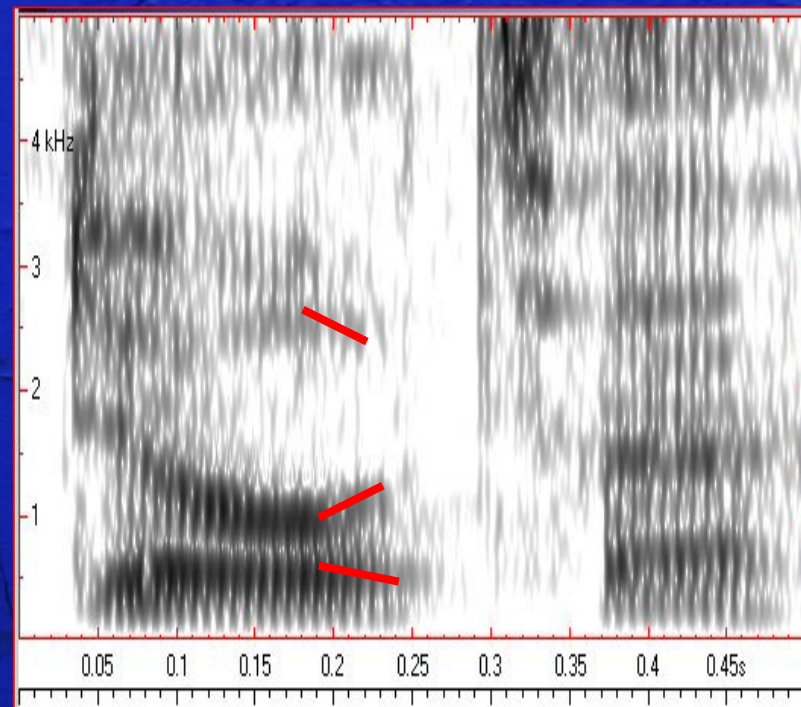
- acoustic studies are not holistic
- examine separate phases of stop production
- thus several methodological strategies & issues

1.2 acoustic approach

- advantages of acoustic approach
 - record fine detail on systematic variation
 - use of controlled data for direct comparison between subjects/contexts etc
- disadvantages
 - use of controlled data! often read, nonsense...
 - small speaker samples
 - time and energy

1.2 acoustic approach

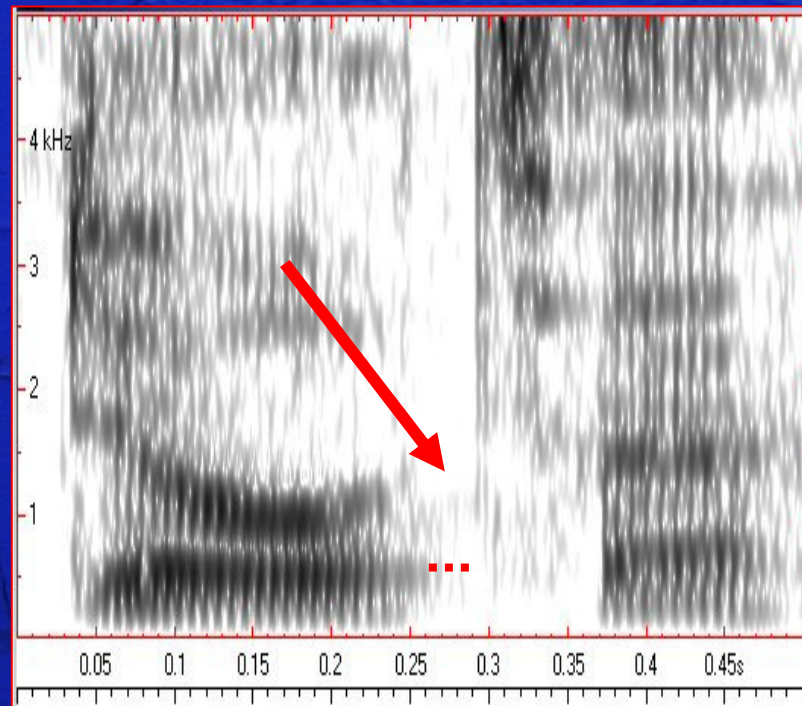
- phases of stop production
 - closing phase: articulators move to exert occlusion



daughter

1.2 acoustic approach

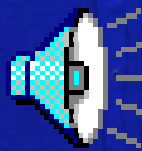
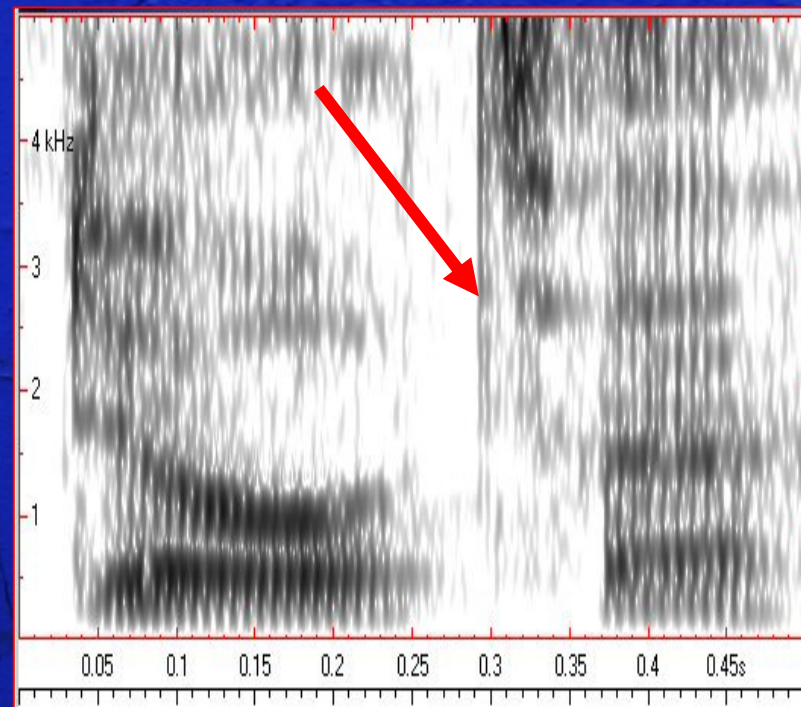
- phases of stop production
 - hold: closure achieved and maintained



daughter

1.2 acoustic approach

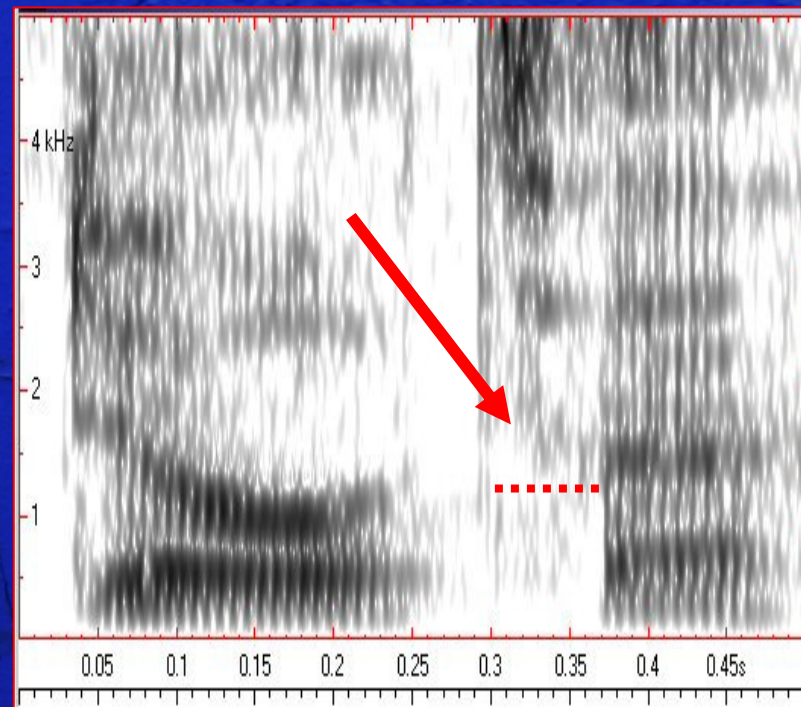
- phases of stop production
 - release: closure removed



daughter

1.2 acoustic approach

- phases of stop production
 - post-release: articulators move for next sound



daughter



1.2 acoustic approach

- example issue: voice onset time (VOT)
 - release + post-release phases
 - important for phonological contrast, e.g. /p - b/
 - see Scobbie (in press), Heselwood & McChrystal (1999)

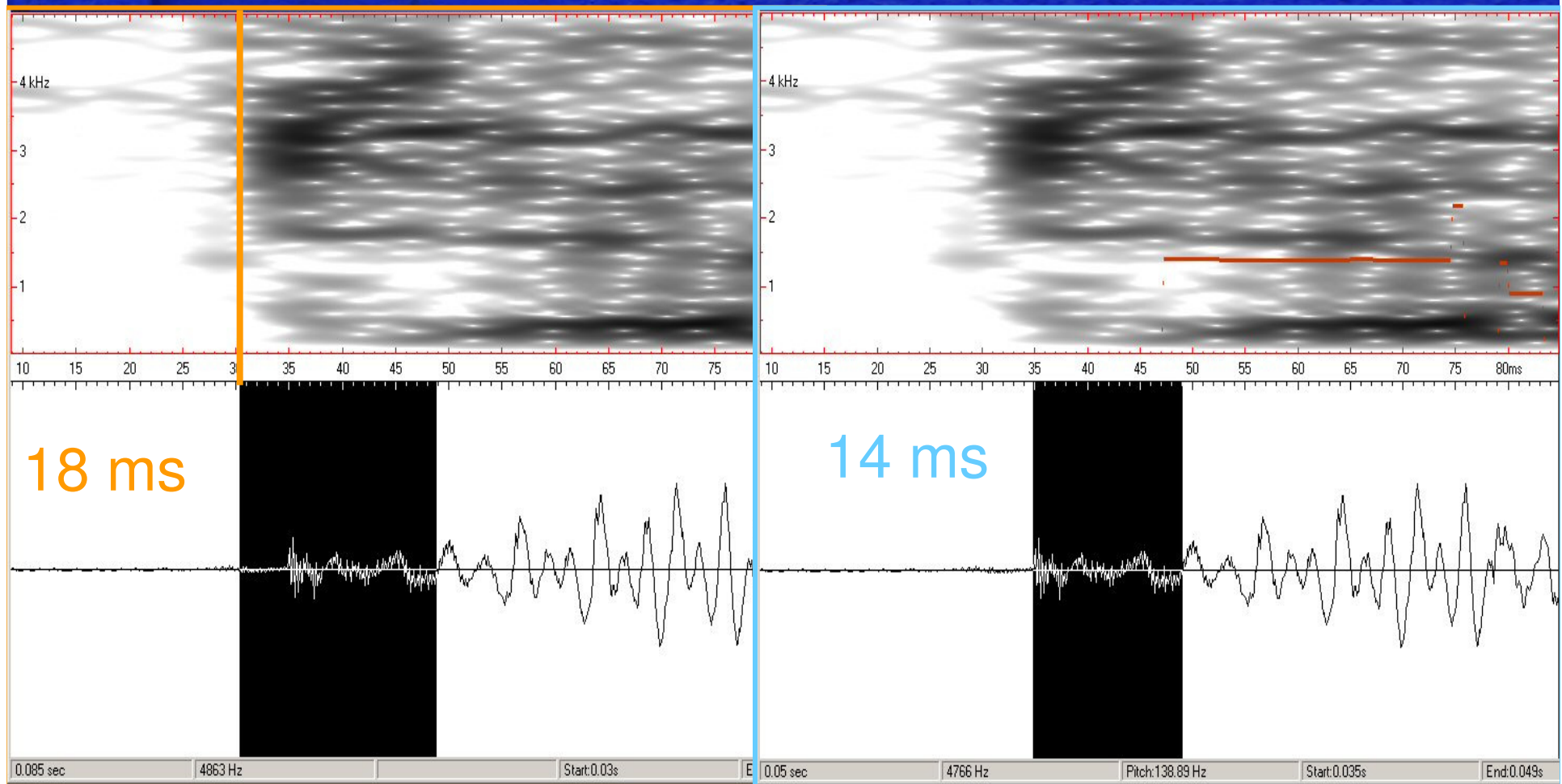
1.2 acoustic approach

- where to measure?
 - classic reference: Lisker & Abramson (1964: 422)

‘the time interval between the burst... and the onset of **quasi-periodicity** that reflects laryngeal vibration’
- Cho & Ladefoged (1999) → 1st **complete** vibration
- Klatt (1975) → onset of **striations in F2**
- further issue in use of waveform vs. spectrogram

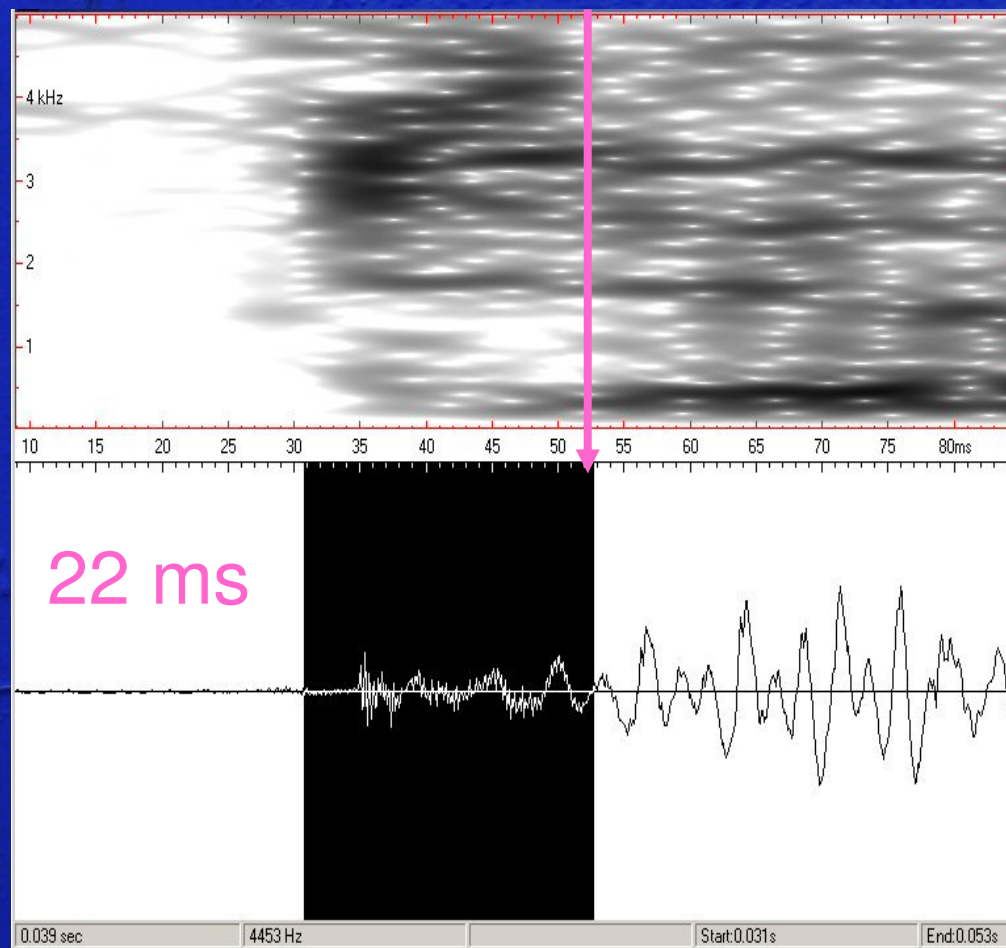
Lisker & Abramson strategy:

- [d] of *daughter*
- burst identified on **spectrogram** or **waveform**?



Klatt (1975) strategy:

- measure burst to **onset of striations in F2 or F3**



- in all cases measure to **zero crossing**: waveform meets horizontal

1.2 acoustic approach

- thus variability in measurement strategy

- Ladefoged (2003: 142):

‘it is often difficult to describe exactly when a given phenomenon - the release of a stop or the start of vocal fold vibration - occurs. The acoustic record can be read in different ways and choices have to be made... what matters... is to devise a plan, write it down, and keep to it.’

- but also beware small differences even if sig.₁₈

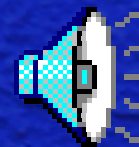
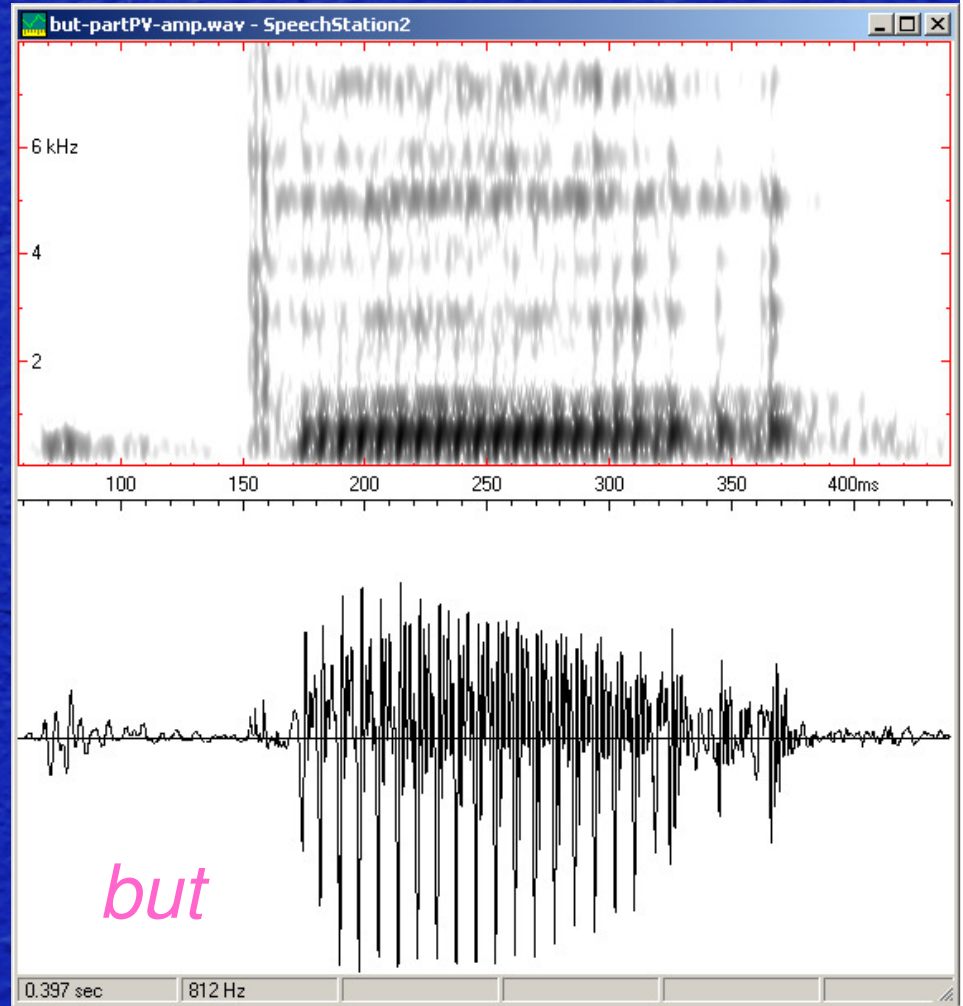
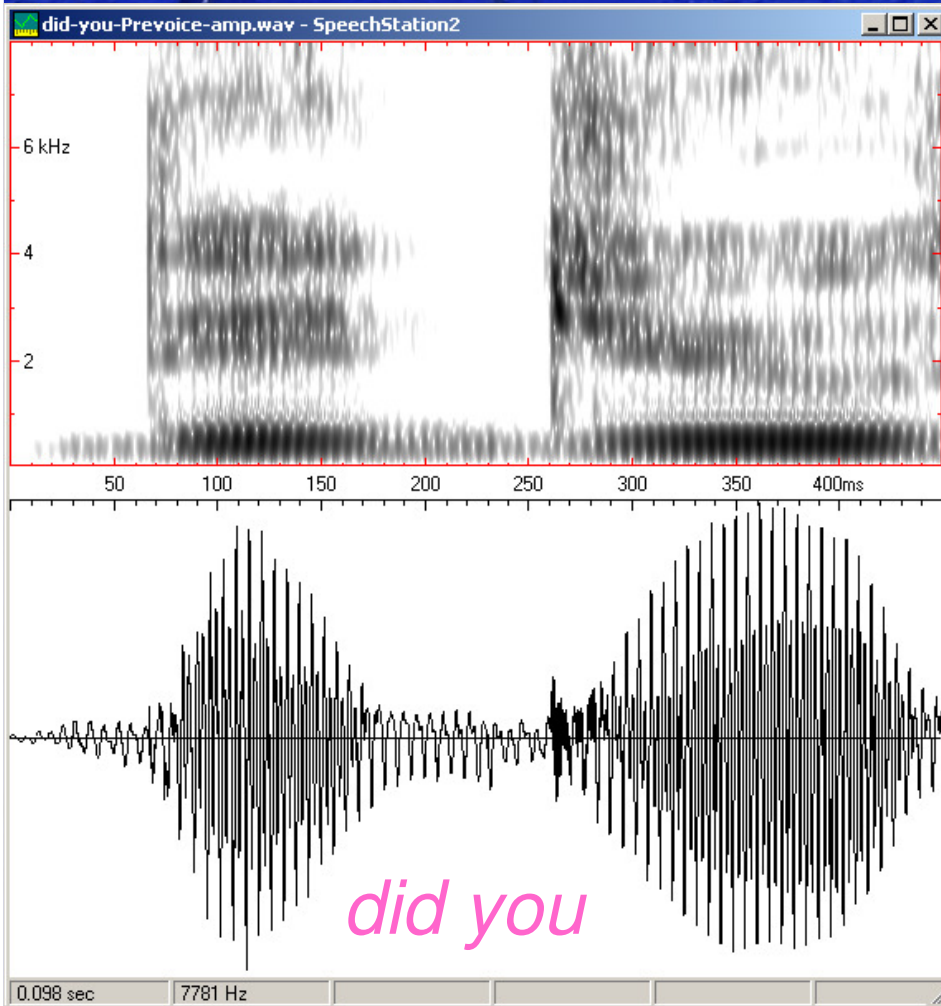
1.2 acoustic approach

- other factors to consider with VOT
 - multiple bursts esp. with velars
 - Cho & Ladefoged 1999 take **last** transient as start of VOT
 - systematic effects on VOT etc of:
 - vowel length & quality in adjacent syllables
 - place of articulation
 - extent of contact area
 - speed of articulator movement
 - prosodic context
 - use of pre-voicing **and** short lag VOT for /bdg/
 - need to measure two separate phonetic categories

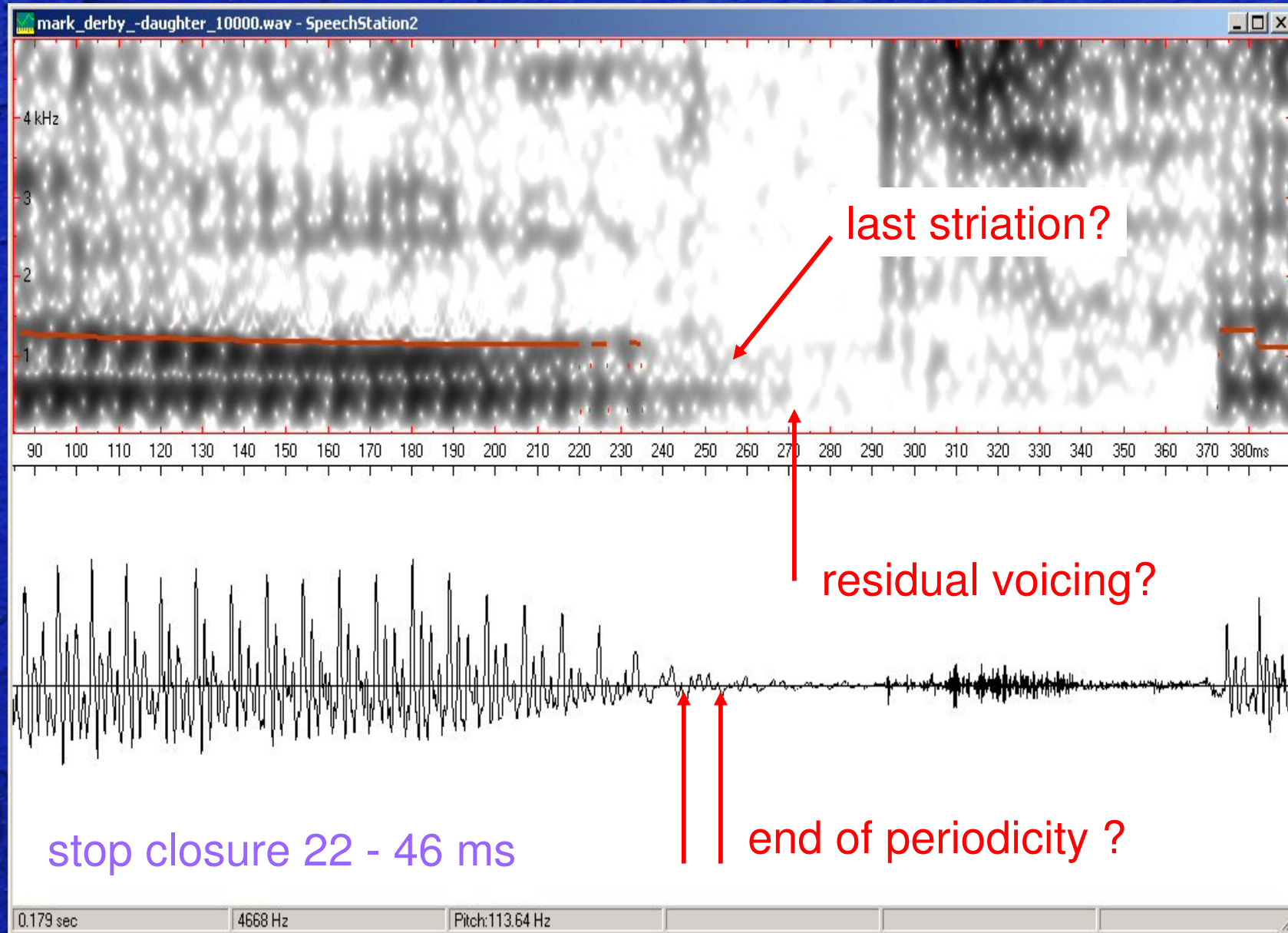
1.2 acoustic approach

- similar measurement issues in identification of:
 - duration of pre-voicing during stop closure
 - continuous pre-voicing before burst?
 - voicing then some voiceless portion before burst?
 - duration of stop closure period: where is the end of [V] prior to stop closure?
 - offset of F2 (Cho & McQueen 2005)

pre-voicing



where is the end of [V] ?

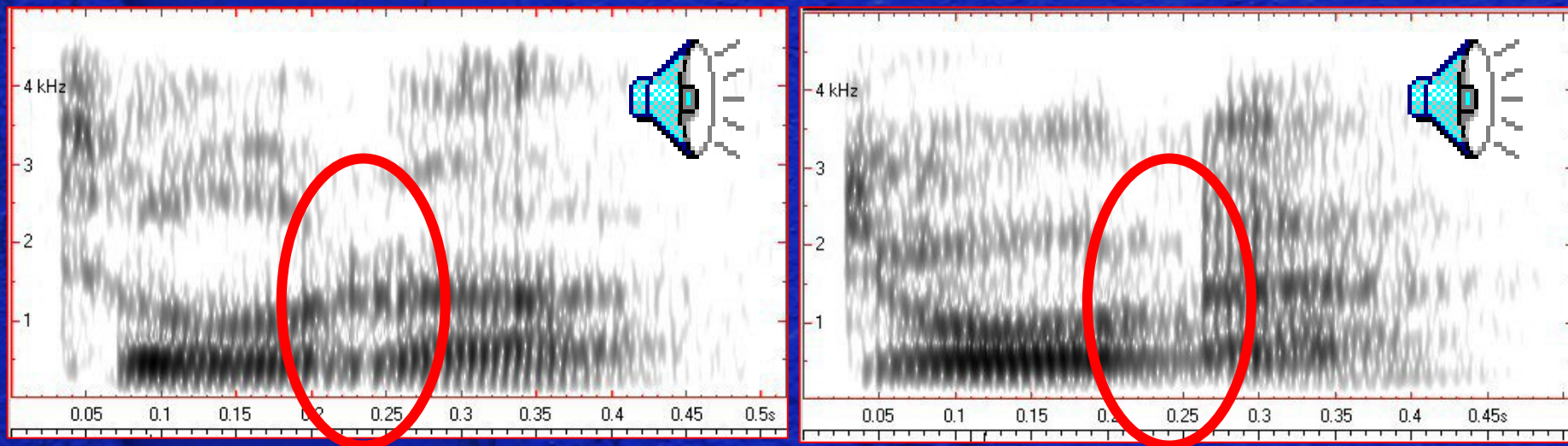


1.3 acoustic profiling

- intermediate approach (Docherty & Foulkes 2005)
- construct profile of acoustic properties
 - i.e. record presence/absence of components
 - quantitative measurement where possible but not essential
 - permits assessment of **distribution of key components** independently or in combination

1.3 acoustic profiling

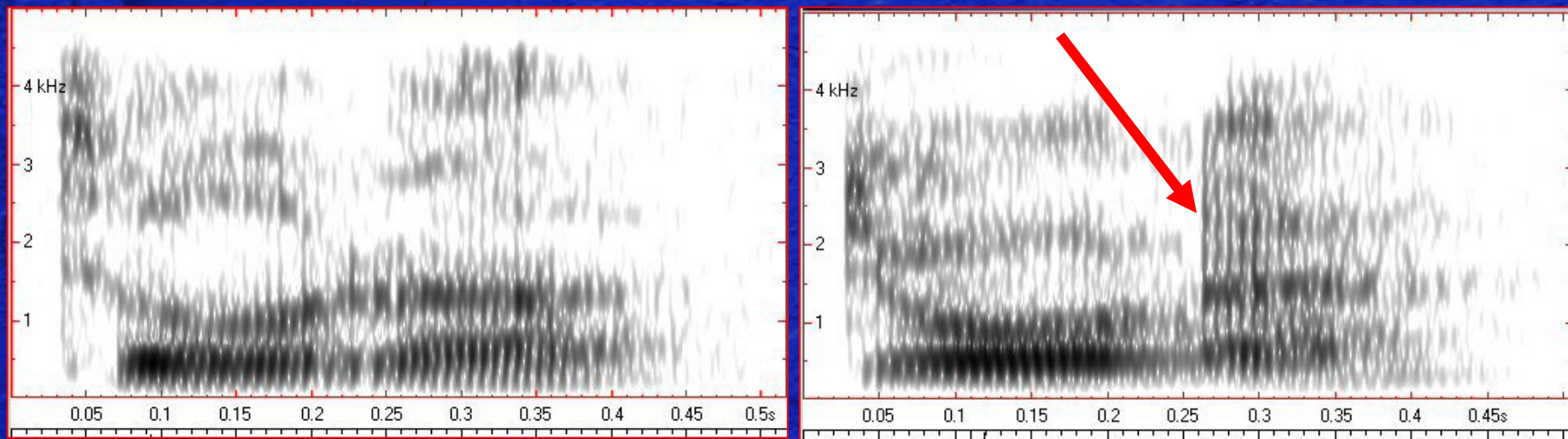
- Newcastle medial /-t-/
 - very few silent stop gaps
 - lots of creaky voicing - glottal constriction



daughter

1.3 acoustic profiling

- Newcastle medial /-t-/
 - differences in presence/absence of transient



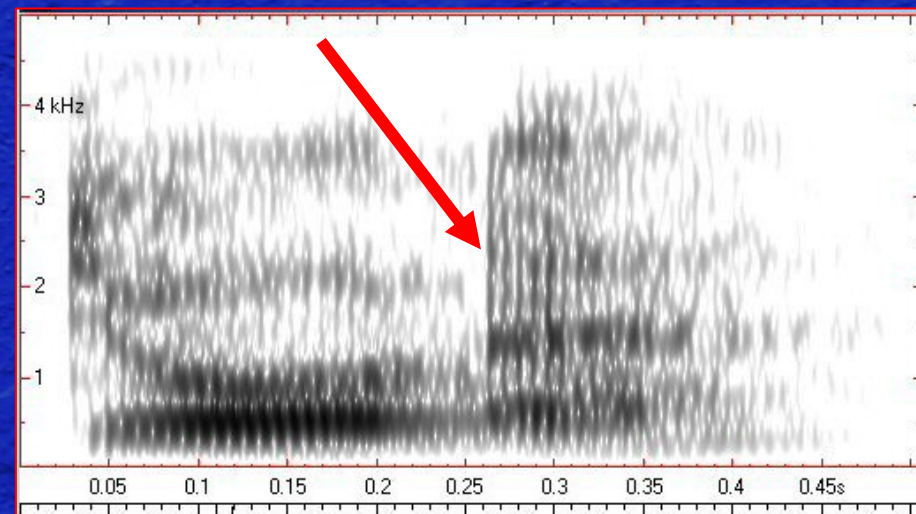
daughter

1.3 acoustic profiling

- Newcastle medial /-t-/
 - differences in presence/absence of transient
 - transients sig. more common for **older males**

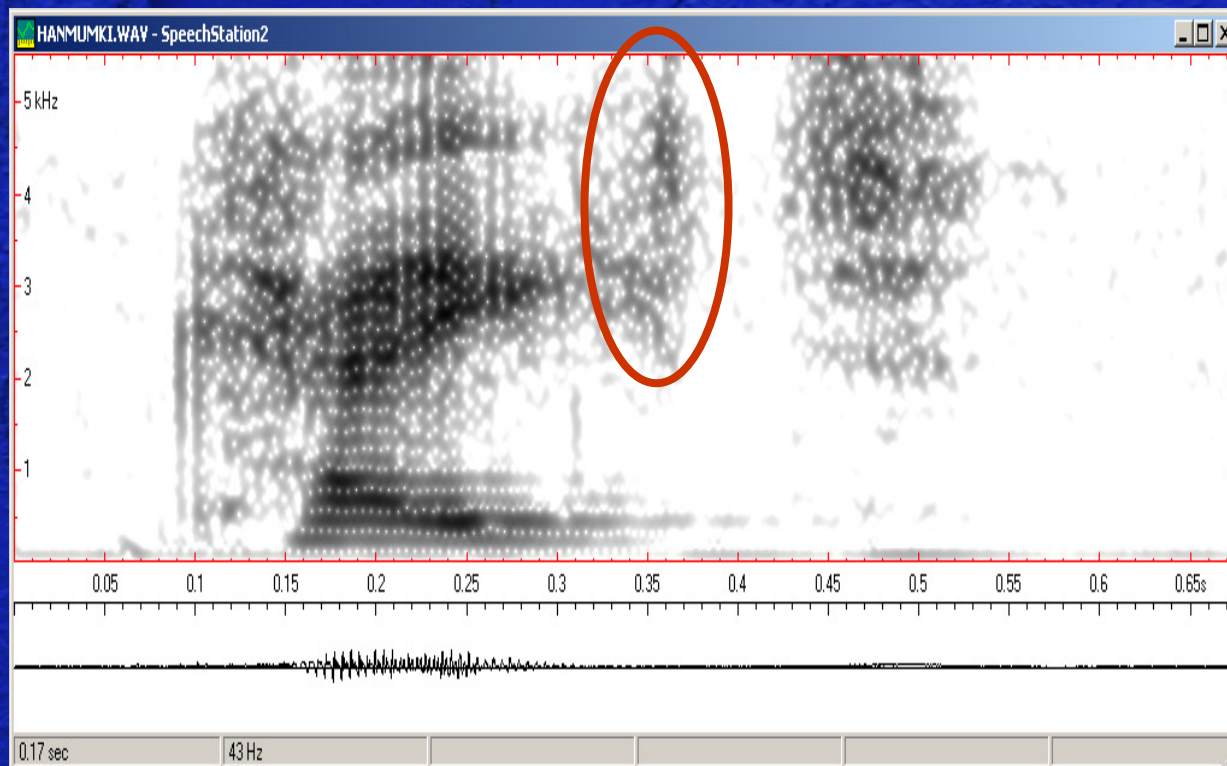
older males > 40%

other groups 11-23%

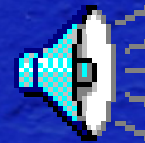


1.3 acoustic profiling

- **pre-aspiration** of [-t] (Docherty et al in press)



kite



innovative variant
young women

2. Other methodologies & issues for discussion

2.1 other methodologies

- other methods being applied to larger, heterogeneous speaker samples and to analyse variation
 - mostly according to language, context, rate etc
- examples
 - EPG (Kerswill & Wright 1990)
 - ultrasound (Davidson 2005)
 - airflow & pressure (Cho et al 2002)

2.1 other methodologies

- other methods being applied to larger, heterogeneous speaker samples and to analyse variation
 - mostly according to language, context, rate etc
- still unclear how applicable these methods are to natural data & what problems/issues might arise in analysis, interpreting data etc

2.2 what to measure?

- VOT has been analysed in many studies
- but other phases have barely been touched by sociolinguists (maybe with good reason?)
 - burst energy & centre of gravity (Cho & McQueen 2005)
 - spectral slope (amplitude of H1-F2: measure of abruptness in vocal fold closure; Cho et al 2002)
 - phonation quality at release (amp. of H1-H2 as measure of breathiness; Cho et al 2002, Ladefoged 2003)

2.2 what to measure?

- even with tried and tested approaches we need to be circumspect as to what to analyse
- e.g. secondary cues in analysis of stops
(Klatt 1975, Cho & Ladefoged 1999, Jessen & Roux 2002, Cho et al 2002 etc)
 - preceding vowel length
 - f0
 - formant transition rate
 - energy in following vowel

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