

# Autosegmental-metrical approaches to modelling Russian intonation: Evidence and issues



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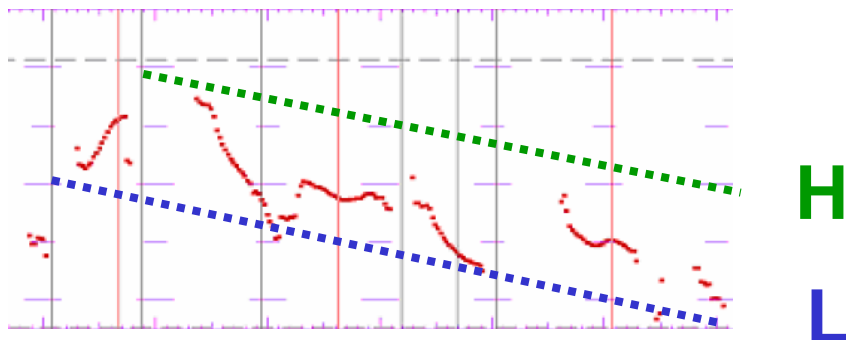
Forschungskolloquium  
Humboldt Universitaet zu Berlin

University of  
**Kent**

# AM-approaches to intonational phonology

## Main posits

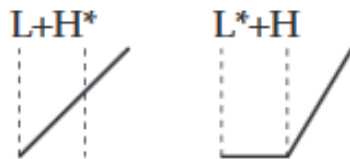
- Phonetic F0-contours are derived from a composition of tones
- Phonological primitives are tones – H, L, (M)
  - Relative units defined with respect to
    - **the speaker's pitch range**: upper part (H) vs. lower part (L) of speaker's voice
    - **local relationships**: locally, H is higher than preceding or following L
    - **phrasal position**: in same position, H is higher than L



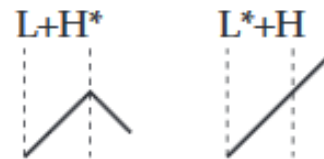
# Association in AM-approaches

- Major pitch events: pitch accents
  - monotonal: L\*, H\*
  - bitonal: H+L\*, L+H\*, H\*+L, L\*+H
  - \*-notation of a tone indicates that the tone has the primary association with the accented syllable
  - trailing/leading tones can have a secondary association
- Tonal association and tonal alignment

a. *English* (after Pierrehumbert 1980)



b. *Spanish* (after Sosa 1999)



From Prieto 2009

# Functions of tones

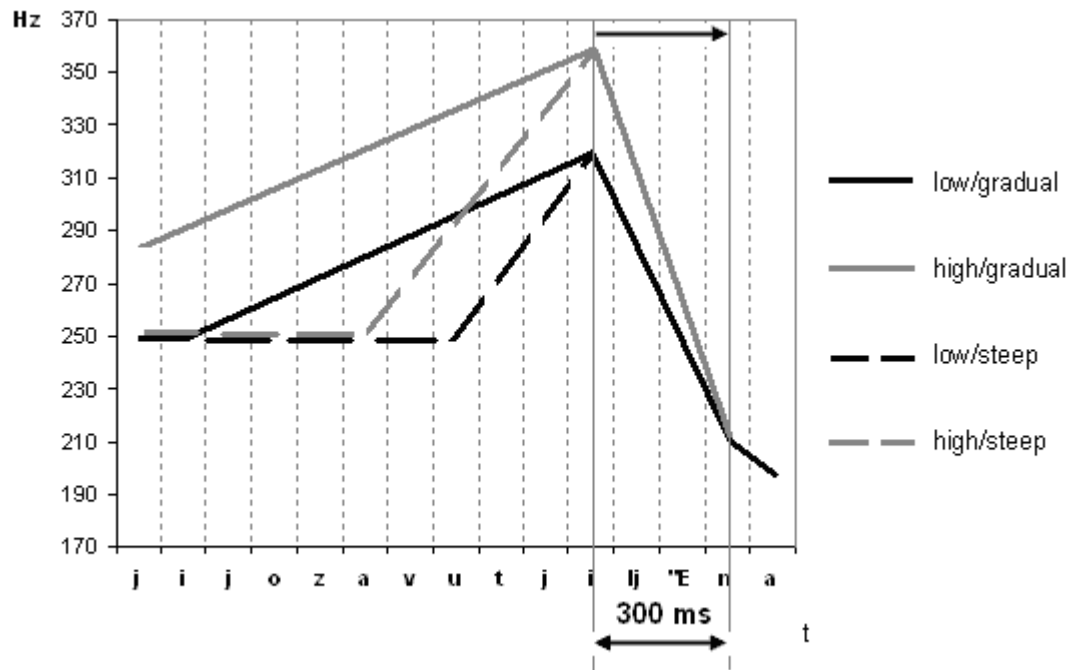
- (1) Delimitative: demarcate a phrase boundary
  - weak boundary: intermediate phrase, *ip* [L- or H-]
  - strong boundary: intonation phrase, *IP* (L% or H%)
- (2) Clarify the focus and information structure
  - Pitch accents are associated with a strong syllable
- (3) Pragmatic meanings of pitch events do not matter
  - L\*-accents indicate that the information is in the common ground and can be derived from the preceding context
  - H\*-accents add new contents to the common ground

# AM-based descriptions of Russian intonation

- **Mostly case studies** (Igarashi 2002,2005,2006, Makarova 2003, Rathcke 2006a,2006b,2013,2017, Yokoyama 1987,1990,2001)
- **How many H-tone accents are there in Russian?**  
(Igarashi 2002,2005,2006)
  - Igarashi (2002) assumes  $H^*+L$ ,  $H+L^*$  und  $L^*+H$ ,  $L+H^*$
  - Analysing production data, Igarashi (2006) refutes  $H^*+L$  as well as the distinction between  $L^*+H/L+H^*$
  - Igarashi (2006): unclear which tone is associated in  $L+H$  (the location of both pitch targets outside of the accented syllable), an (unprincipled) assumption of  $L+H^*$
- **Are  $L+H^*$  and  $H+L^*$  adequate and sufficient?**
  - Perception data in Rathcke (2006a and 2006b)

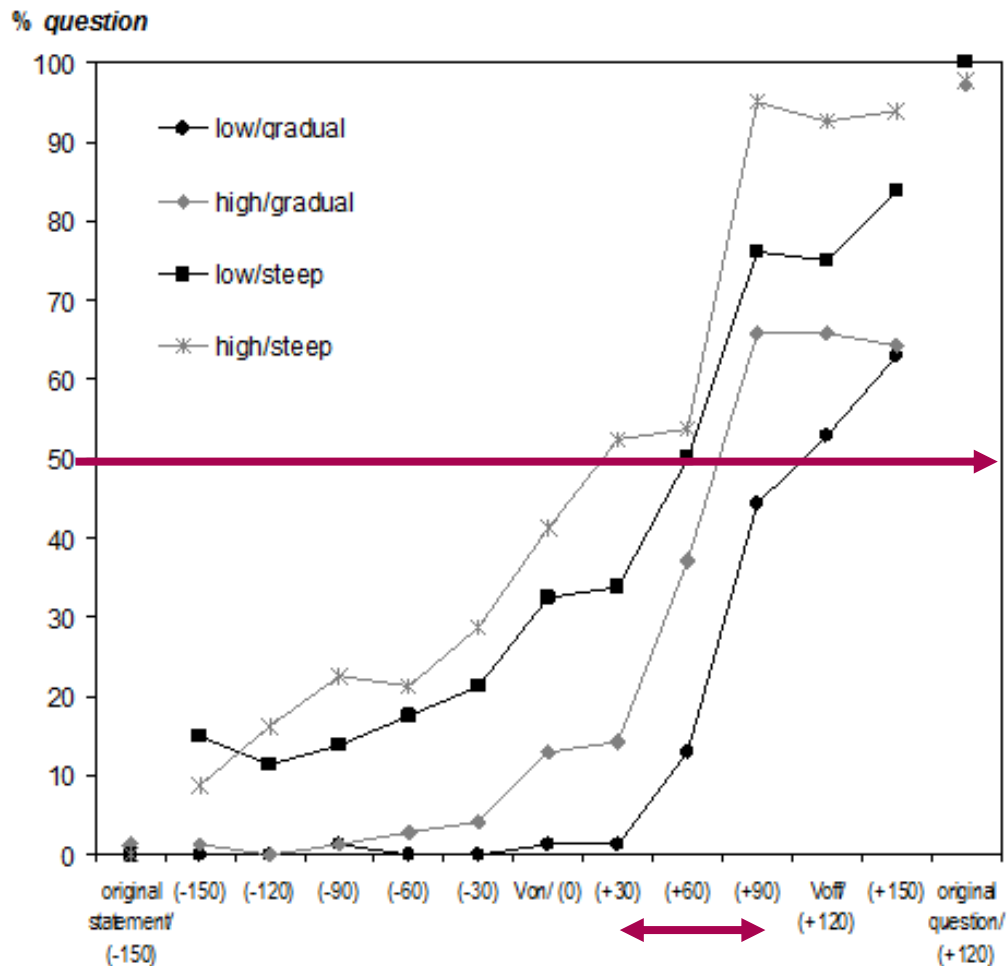
# Rathcke (2006a)

- A perception study of yes/no questions and statements
- Russian sentence 'Её зовут Елена' (Eng. *Her name is Yelena*)
  - 3 manipulations: (1) peak alignment 11 steps from early to late; (2) peak height (high/low) and (3) pitch rise (steep/shallow)



- 38 native listeners of Russian (7 male)
- Age: 20-56
- From various places of RF (based in Kiel)
- Classical CP paradigm (identification & discrimination)

# Results of the identification tests



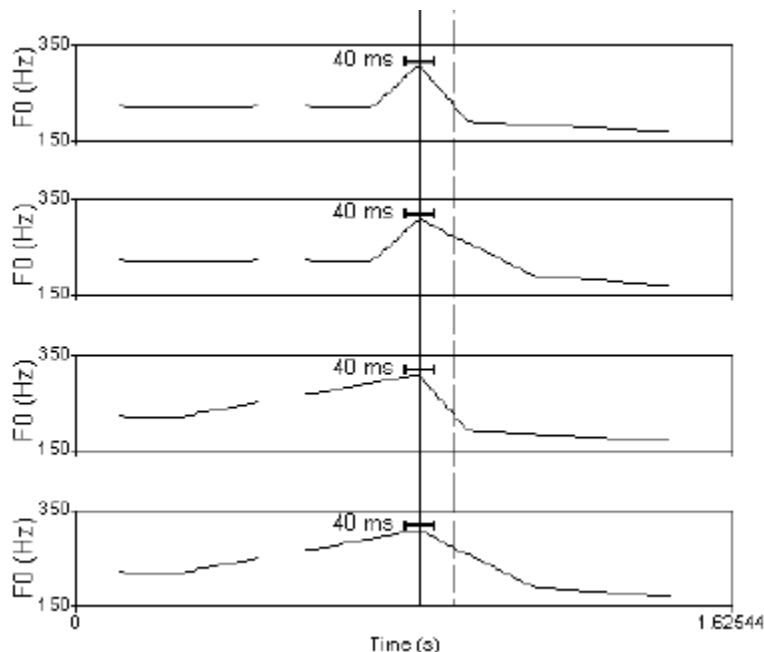
- (1) Later pitch peaks – more question responses ( $p < 0.001$ )
- (2) Earlier shift for contours with a steep rise ( $p < 0.001$ )
- (3) Peak height plays a less important role (n.s.)

Perceptual evidence for Igarashi (2006) proposal:

- H+L\*
- L+H, association unclear, likely L\*+H

# Rathcke (2006b)

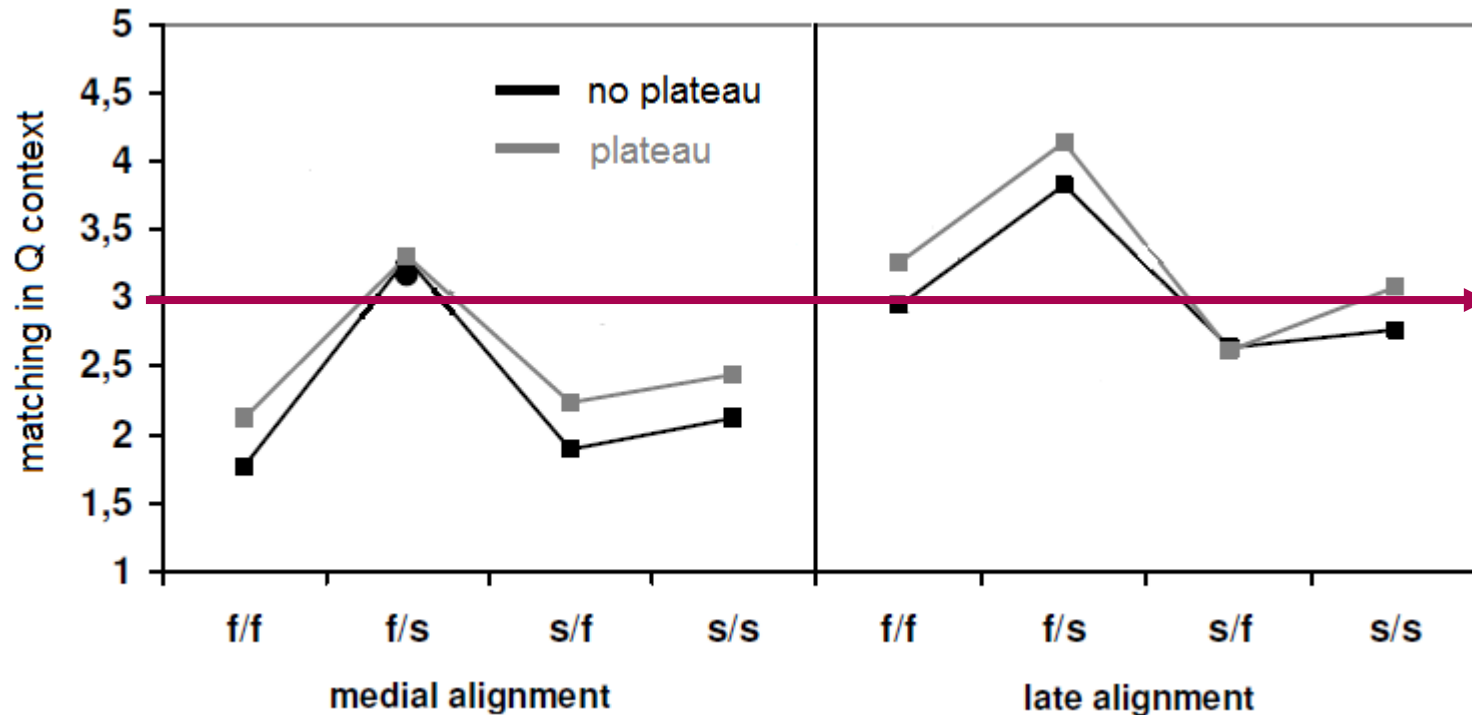
- A perception study of yes/no questions and contrastive statements
- Russian sentence ‘*Она раньше не ела малину*’ (Eng. *She didn’t use to like raspberries*)
  - 3 manipulations: (1) peak shape with 4 combinations of f0 rises and falls (fast/slow); (2) presence of a high plateau and (3) pitch peak alignment (medial – vowel vs. late – lateral)



- 15 native listeners of Russian (6 male)
- Age: 14-15 (school students)
- From Kaliningrad
- Context-matching on a scale from 1 (definitely non-matching) to 5 (definitely matching)



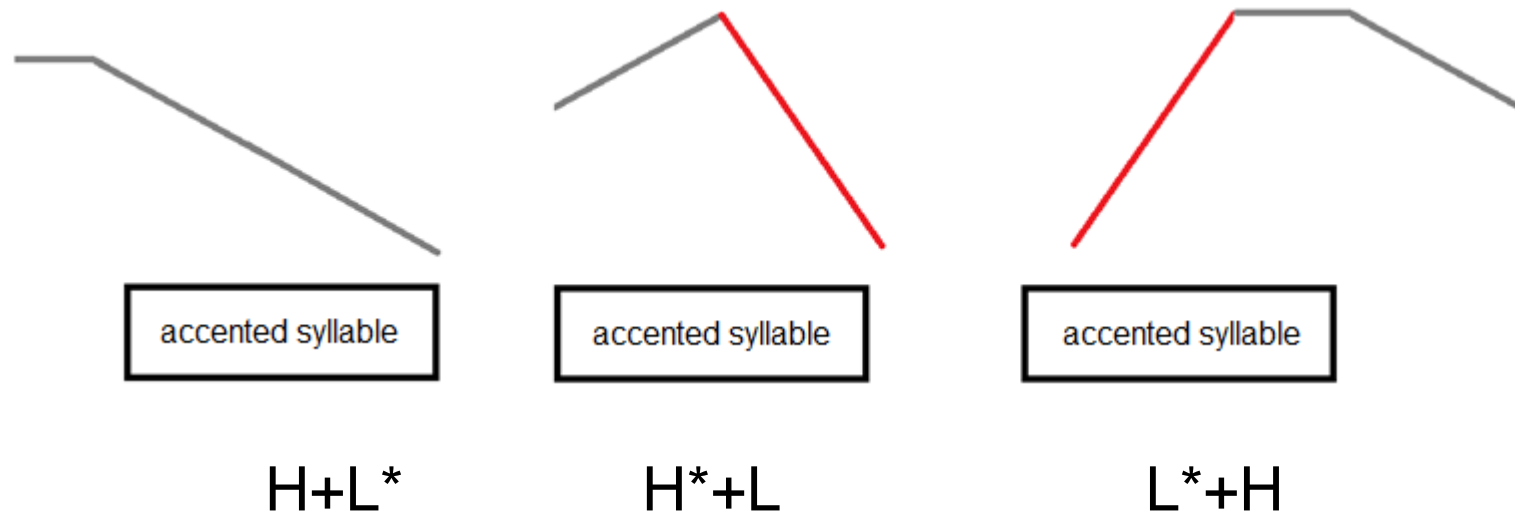
# Results of context-matching tests



All manipulations significant ( $p < 0.001$ ), with a weak effect of a plateau and an equally strong effect of pitch shape and peak alignment

# Implications for tonal analysis

- Best exemplar in neutral statements: slow rise, early H-alignment
- Best exemplar in contrastive statement: slow/fast, medial H-alignment (no plateau)
- Best exemplar in yes/no questions: fast/slow, late alignment (+plateau)



# Other AM-based descriptions of Russian intonation

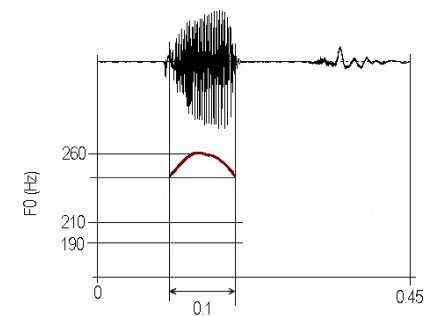
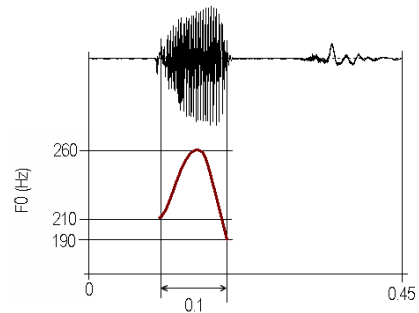
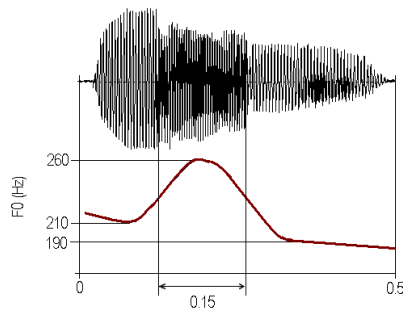
- The most comprehensive description (Odé 2003,2005)
  - Following a less wide-spread AM-account (Gussenhoven 1984, 1988, 1991) and the IPO school of intonation (t Hart, Collier und Cohen, 1990, Odé 1989)
  - Pitch accents integrate/indicate tonal information in the accented syllable and ***all perceptually relevant movements between accents and at phrase boundaries***
  - HL\* for H+L\*
  - H\*L for both H\*+L and L\*+H
  - But also H\*M and H\*H – likely related to tonal modifications due to upcoming phrase boundaries



# Tonal modifications at phrase boundaries

Upcoming phrase boundaries exert time pressure on the realisations of pitch categories (Erickson & Alstermark 1972)

- **Compression:** the f0-velocity is increased, the accent is realised in a shorter time span
- **Truncation:** the f0-velocity is unchanged, f0-targets are cut off in their frequency

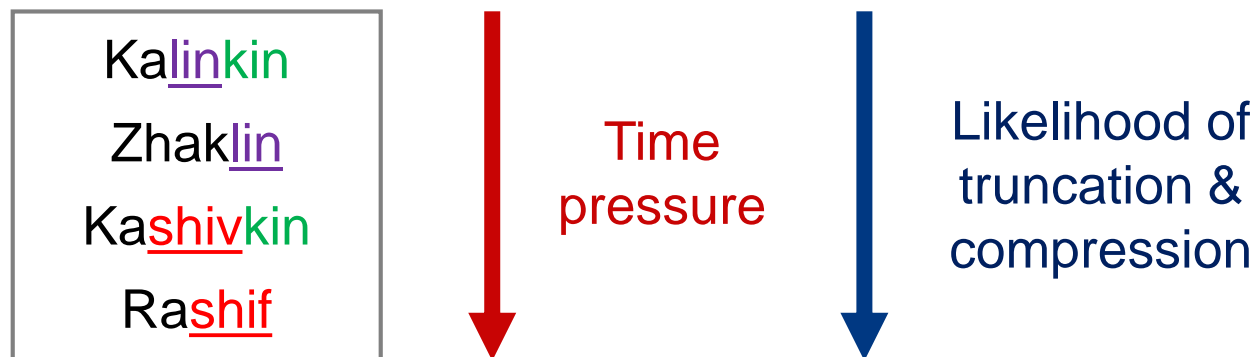


- English: *“a compressing language par excellence”* (Ladd 1996:133; Grabe 1998)
- Truncation far more common: e.g. Hungarian, Palermo Italian (Grice 1995), German (Grabe 1998), Spanish (Ortega-Llebaria 2009)

# Rathcke (2017): truncation in Russian

- Russian is known to be truncating phrase-final falls (Igarashi 2002; Odé 2005) – implications for phonological analyses? all falls truncated?
- Production study with 10 native speakers of Standard Russian (3 male), mean age 31 y.o. (from different cities of RF, in Munich)
  - 3 pitch accents – H+L\*, H\*+L, L\*+H (followed by L%, i.e. final falls)
  - Target words varied in:
    - (1) syllable count (**1** vs. **0** after accented syllable)
    - (2) sonority of accented syllable (vowel surrounded by **sonorants** <lin> vs. **obstruents** <shif>)

Embedded in the sentence “Это был(а)” (It was ...)



after Grabe (1998), with some changes

# Imitation Task

- Auditory presentation  
(headphones)
- Visual presentation  
(card)
- Controlled production  
(microphone)

*Это был Немов?*

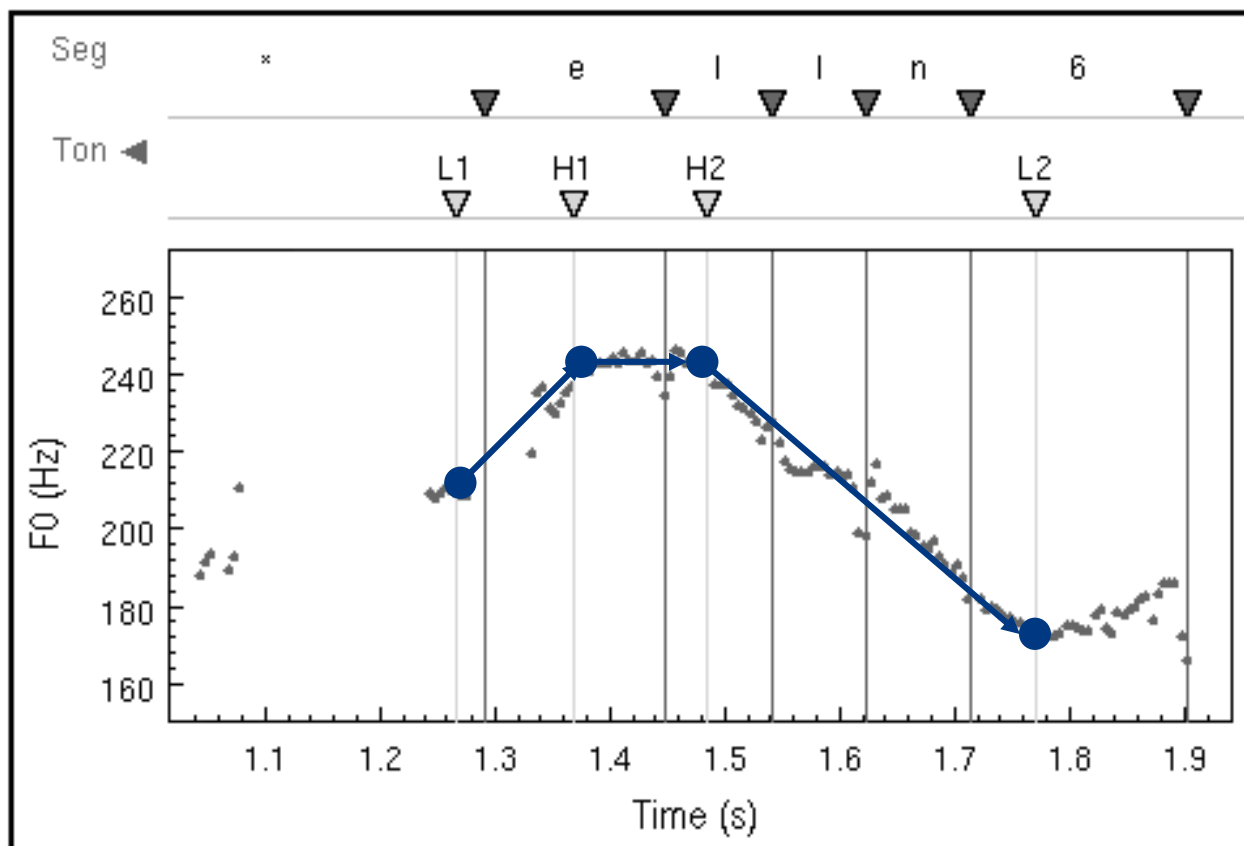
**L\*+H L%**



*Это был Рашиев?*



# Acoustic analyses



## (1) F0-height of L

- in *st*, normalised to mean f0
- truncation: L-undershoot

## (2) F0-velocity of the fall

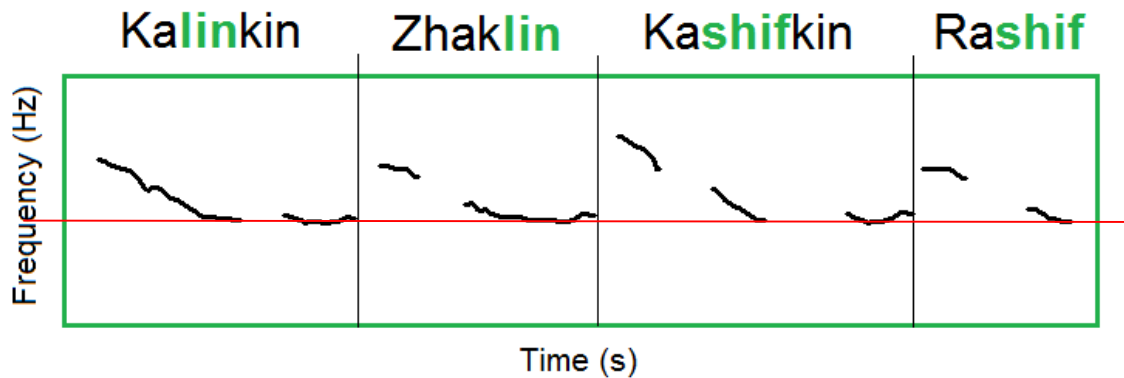
- in *st/sec*
- compression: increase of the f0-velocity

## (3) Alignment (of H\* or L\*)

normalised to the duration of the accented syllable

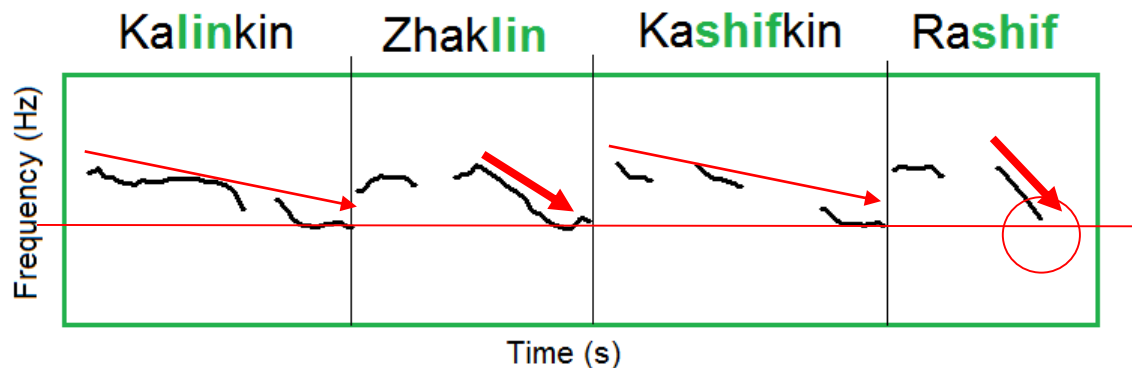
3 repetitions x 4 target words x 2 categories = 24 tokens p. s.

10 native speakers of Standard Russian (3 male), mean age 31 y.o.



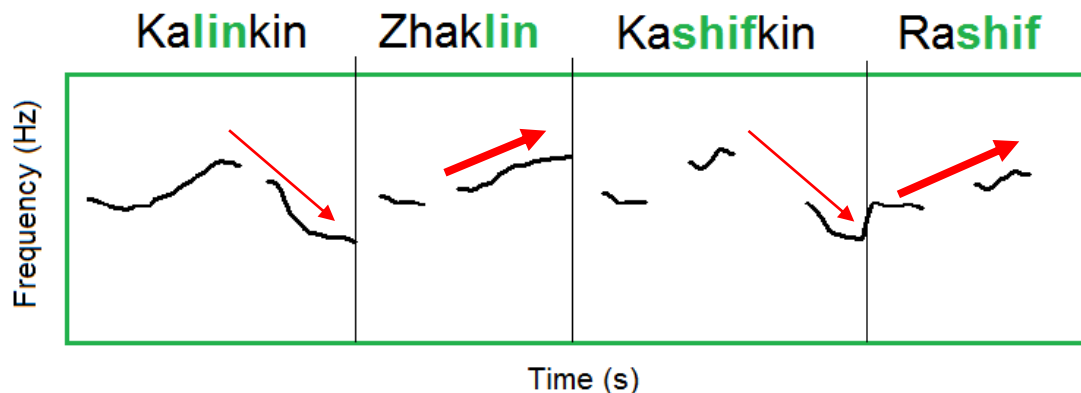
### H+L\* L%

- no truncation
- no compression
- some realignment



### H\*+L L%

- some truncation (1-4 st)
- some compression
- some realignment



### L\*+H L%

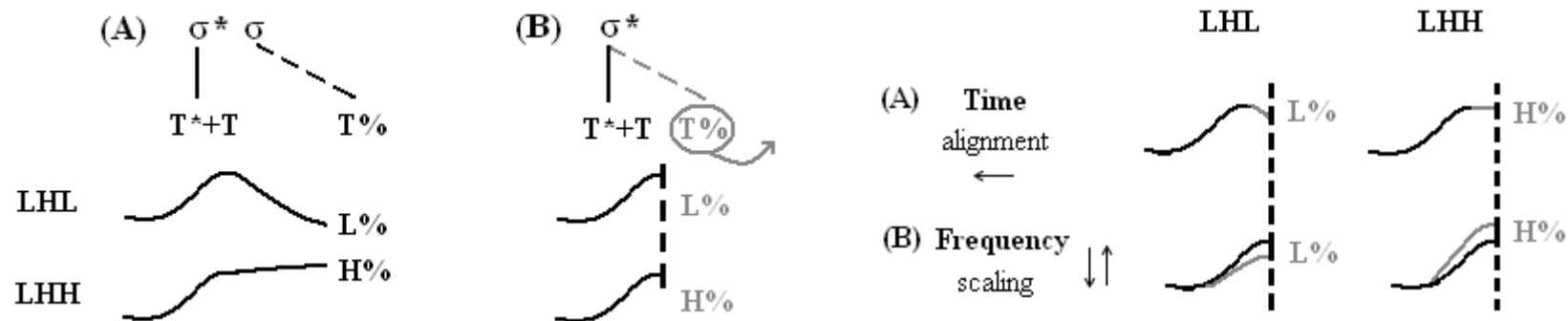
- categorical truncation
- no compression
- some realignment



# Role of truncation in phonology

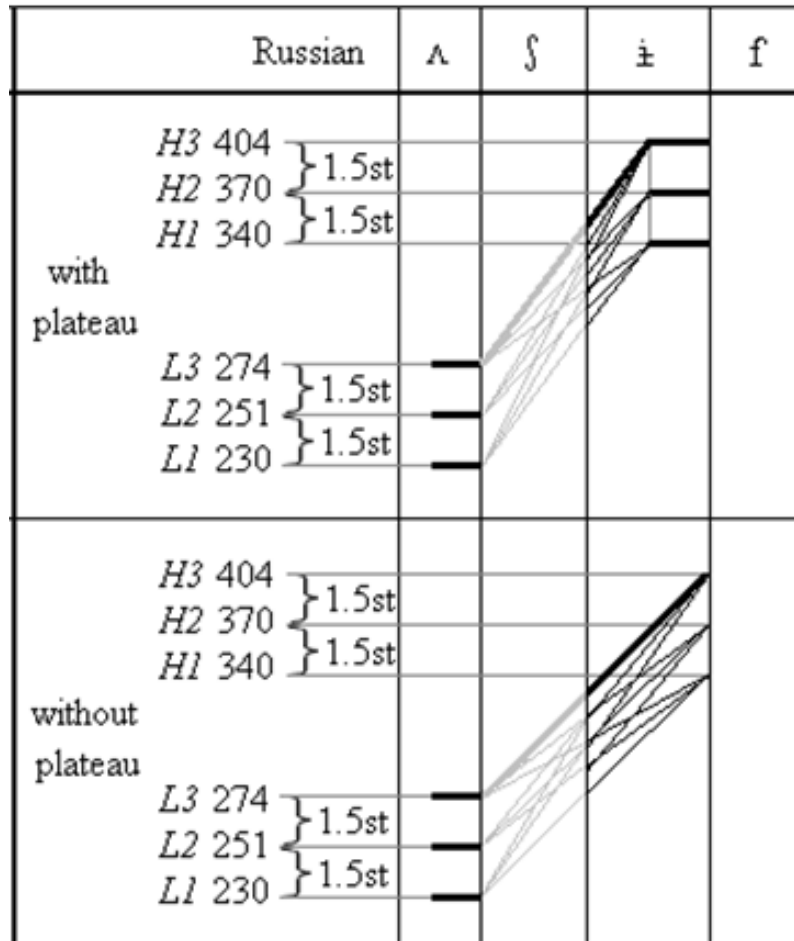
Truncation is not a unified phenomenon :

- **L\*+H L%** in Russian is truncated through a complete loss of the secondarily associated L% (categorical truncation)
- **H\*+L L%** in Russian is slightly truncated (gradual truncation)
  - Some of these cases are likely to have been identified as H\*H and H\*M, respectively in Odé (2003,2005)
  - Further support for the perceptually argued analysis of H\*+L (here: preservation of a trailing tone, truncation of L%)



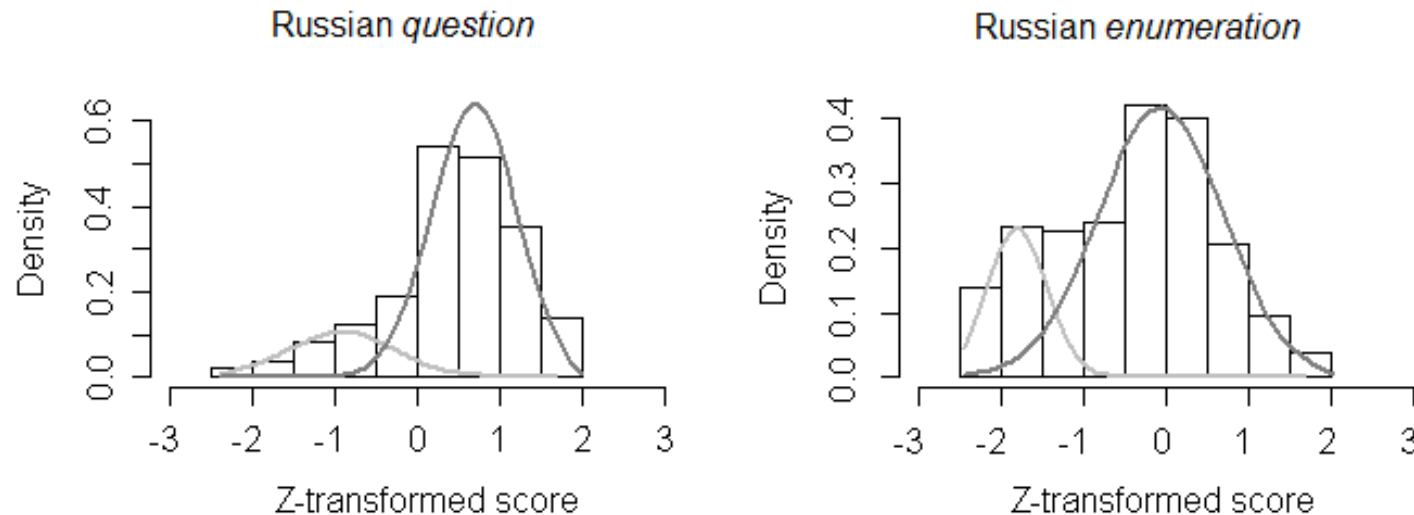
After Grice 1995

# Rathcke (2013): a perception study of truncation



- Russian sentence “Эмо Павуѳ” (*This is Rashif*)
- a set of 18 stimuli:  
3 L-values x 3 H-values x 2 f0-trajectories
- Task: matching contextual fit on the scale from -4 to +4 in two contexts:
  - (1) yes-no question (L\*+H L%): ‘*Is that Rashif? Do you happen to know it?*’
  - (2) List (L\*+H H%): ‘*There are Rashif, Tamara and Anthony.*’
- 22 listeners (aged 22-49)
- 9-point scale responses z-score transformed to account for individual biases

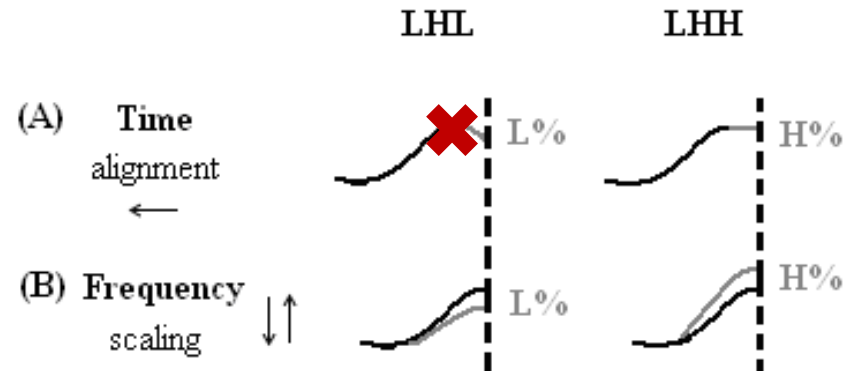
# Discriminating between truncated H% and L%



- Bias toward accepting all contours in both contexts
- Neutralisation of truncated L% and H% is quite advanced, though not complete
  - An overall bias towards the identification of L% (questions) is surprising: if neutralisation is advanced, we would rather predict a bias towards LHH since truncation mainly “deforms” the surface form L%

# Acoustic differences between truncated H% and L%

- Best exemplar for **L\*+H L%**
  - high H of +H
  - presence of a high plateau
- Best exemplar for **L\*+H H%**
  - low H of +H
  - Simple rise



- These results do not support the idea that the phonetics of truncation can be explained by the phonological composition of tonal strings
- Rather, the phonetics of truncation seems to reflect the meaning carried by the tonal strings
  - Overall up-scaling of the tune that expresses a question (Ohala 1984, Gussenhoven 2000)

# Conclusions and outlook

(1) Our understanding of Russian intonation (in terms of AM-modelling) is still rather fragmentary.

- Baseline for the study of some research questions is missing and has to be established as control conditions

(2) Modifications of pitch patterns under time pressure are language- and accent-specific

- Poor understanding of phonetic adjustment strategies might lead to incorrect assumptions about the structure of tonal representations

(3) A growing body of research shows that it is impossible to avoid pragmatic meanings when studying intonation (e.g. Niebuhr and Ward 2018)

- Consistent effects on phonetic realisations of pitch accents, if phonetics guides the discussion of pitch accent structure (Pierrehumbert 1980, Pierrehumbert & Beckman 1988, Ladd 1996)

Thank you!

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