Cuique suum: vowel reduction in Russian

Pavel Iosad

Universitetet i Tromsø/CASTL
pavel.iosad@uit.no

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Plan

- Outline the traditional picture of Russian vowel reduction

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- Try to tease apart phonetic and phonological aspects of the data
- Argue against purely functional explanations
- Sketch a substance-free account of the patterns

Outline

Overview

- Modern Standard Russian: I take this to be Moscow Russian as spoken by speakers born from around 1940s
- See Comrie et al. (1996) for more discussion
- This called the younger norm; I will also discuss the elder norm (Moscow, mostly upper-class speakers)

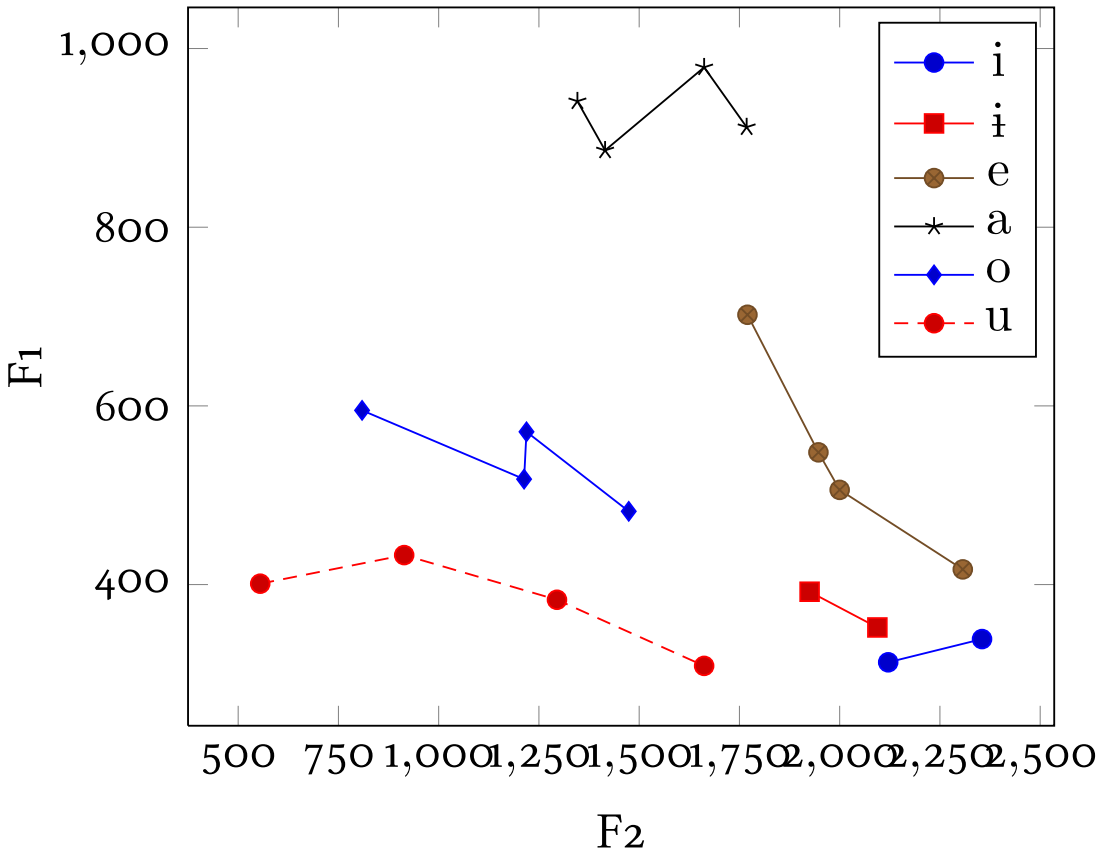
Russian phonology: consonants

Manner	Labial		Dental		Postalveolar		Palatal	Velar	
Voiceless stop	p	pʲ	t	tʲ				k	kʲ
Voiced stop	b	bʲ	d	dʲ				g	gʲ
Voiceless fricative	f	fʲ	s	sʲ	ʂʷ	ʃʲː		x	xʲ
Voiced fricative	v	vʲ	z	zʲ	ʐʷ	[ʒʲː]	j	(ɣ)	
Voiceless affricate			t͡s		(t͡ʃ)	t͡ʃʲ			
Voiced affricate			(d͡z)		(d͡ʒ)	(d͡ʒʲ)			
Nasal	m	mʲ	n	nʲ					
Lateral			l	lʲ					
Rhotic			r	rʲ					

- Parentheses indicate non-contrastive segments due to voicing assimilations

Russian phonology: stressed vowels

Source: Timberlake (2004)



Russian phonology: stressed vowels

- Allophones depend on the palatalization of flanking consonants
- Cf. Padgett (2001) for [ɨ]: it is not a segment, but rather [i] obscured by velarization from the preceding consonant
- Henceforth I assume a five-vowel system.

Types and contexts of reduction

- It is traditional to distinguish between moderate and radical reduction
- Moderate reduction: more contrasts preserved, more peripheral vowels:
  - All immediately pretonic syllables
  - All onsetless syllables
  - Variable (mostly speech rate/style): phrase-final open syllables
  - Not all sources: /o/a/ before unstressed /o/a/ in hiatus
- Radical reduction: fewer contrasts preserved, schwa-like vowels:
  - All other unstressed syllables
- Main point of talk: the difference between moderate and radical reduction is phonetic, not phonological, but the difference between vowels in stressed and unstressed syllables is phonological

Phonetic realization: C_, moderate reduction

- /o/ and /a/ neutralize to…
  - Traditional (many Russian sources, Jones & Ward, 1969): [ʌ]
  - Newer Russian sources, Barnes (2006); Padgett & Tabain (2005): [ɐ]
  - Actually (Kasatkina, 2005): [ɐ] in Moscow; [ʌ] in many other places where the local dialect does not have vowel reduction (notably St Petersburg, Ukraine)

(1)

a.	[ˈkot]	[kɐˈta]
	‘cat (nom. sg.)’	‘cat (gen. sg.)’
b.	[ˈdavnʲɪj]	[dɐˈvno]
	‘ancient (masc. nom. sg.)’	‘long ago’

Phonetic realization: C_, moderate reduction

- The vowel /e/ is rare after non-palatalized consonants in the native lexicon
  - Except [ʂʷ], [ʐʷ] and [t͡s], but these are a special case to be discussed below
- The vowel [ɨ] is realized as a laxer vowel
- Where it occurs, in borrowings, it neutralizes with [ɨ]

(2) [fɐˈnetʲɪkə] [fənɨtʲit͡ʃʲəskʲɪj]
'phonetics' 'phonetic'

- The vowel /u/ does not neutralize, but the realization is laxer.

Phonetic realization: C^j_, moderate reduction

- The high vowels /i/, /u/ have a laxer realization ([ɪ], [ʊ])
- All non-high vowels are neutralized with /i/:

(3)

a. [ˈnʲos] [nʲɪˈsla]
‘carry (masc. sg. past)’ ‘carry (fem. sg. past’

b. [ˈpʲatʲ] [pʲɪˈtʲi]
‘five (nom.)’ ‘five (gen.)’

c. [rɐzʲˈdʲel] [rəzʲdʲɪˈlʲil]
‘divide (nom. sg.’) ‘divided (masc. sg. past)’

Phonetic realization: Š_, moderate reduction

- The (phonetically) non-palatalized postalveolars [ʂʷ], [ʐʷ], and the coronal [t͡s] present a special case
- The mid vowels /e/, /o/ are (normally) realized as [ɨ], i. e. as if [ʂʷ], [ʐʷ], [t͡s] were palatalized:

(4)

a.	[ˈt͡sennəj]	[t͡sɨˈna]
	‘valuable (masc. nom. sg.)’	‘price (nom. sg.)’
b.	[ˈʐʷon]	[ʐʷɨˈna]
	‘wife (gen. pl.)’	‘wife (nom. sg.)

- The low vowel /a/ varies between [ɐ] and [ɨ] (across speakers and lexical items):

(5)

[lɐˈʂʷatkə]	[ləʂʷɨˈdʲej] or [ləʂʷɐˈdʲej]
‘small horse (nom. sg.)’	‘horse (gen. pl.)’

Phonetic realization: radical reduction

- After (phonetically) non-palatalized consonants: all vowels except /u/ neutralize to [ə]
- After palatalized consonants all vowels except /u/ neutralize to a [ɪ]-like segment

(6)

a.	(i)	[sat]	[sədɐˈvot]
		‘garden (nom. sg.)’	‘gardener (nom. sg.)’
	(ii)	[pʲatʲ]	[pʲɪtɐˈt͡ʃok]
		‘five’	‘five-ruble coin (dim.)’
b.	(i)	[dom]	[dəmɐˈvoj]
		‘house (nom. sg.)’	‘house sprite (nom. sg.)’
	(ii)	[lʲot]	[lʲɪdʲɪˈnoj]
		‘ice (nom. sg.)’	‘icy (masc. nom. sg.)’
c.	(i)	[ʂʷesʲtʲ]	[ʂʷəzʲdʲɪˈsʲat]
		‘six’	‘sixty’
	(ii)	[lʲes]	[lʲɪsɐˈvot]
		‘forest (nom. sg.)’	‘forester’

Elder norm: non-high vowels

- In the elder norm, non-high vowels never neutralize with /i/. This is normally transcribed in Russian sources as [i^{e}] or [ɨ^{e}]
- After palatalized consonants

(7)

a. [ˈnʲos] [nʲiᵉˈsla]
‘carry (masc. sg. past)’ ‘carry (fem. sg. past’

b. [ˈpʲatʲ] [pʲiᵉˈtʲi]
‘five (nom.)’ ‘five (gen.)’

c. [rɐzʲˈdʲel [rəzʲdʲiᵉˈlʲil]
‘divide (nom. sg.’) ‘divided (masc. sg. past)’

- After postalveolars

(8)

a. [ˈt͡sennəj] [t͡sɨᵉˈna]
‘valuable (masc. nom. sg.)’ ‘price (nom. sg.)’

b. [ˈzˠon] [zˠɨᵉˈna]
‘wife (gen. pl.)’ ‘wife (nom. sg.)

Elder norm: postalveolars

- In the elder norm, /a/ after postalveolars is neutralized with the mid vowels (as [ɨ^{e}]):

(9)

[ˈʂ^{w}ar]	[ʂ^{w}ɨ^{e}ˈrɨ]
‘ball (nom. sg.)’	‘ball (nom. pl.)’

- In other words, the postalveolars behave exactly like surface-palatalized consonants

Outline

Phonetics or phonology?

- I am going to argue the following:
  - There is no phonological distinction between "moderate" and "radical" reduction
  - That distinction is due to differing durations imposed by language-specific phonetics
  - Phonologically, Russian only distinguishes between a 5-vowel system in stressed syllables and a 2-/3-vowel system in unstressed syllables
- In particular, I am going to argue against approaches which interpret surface [ə] as a phonological /ə/:
  - All reduction is phonetic: cf. Padgett & Tabain (2005) (NB! they do not make exactly this claim)
  - Reduction is phonological, driven by functional considerations encoded into the phonology: Crosswhite (2001)
- I argue, with Barnes (2007), that the facts of moderate reduction are irrelevant to the phonology.

Radical reduction: hyperarticulation

- Barnes (2007): hyperarticulation experiment with unstressed /a/ and /o/
- F1 is extremely well correlated with syllable duration, irrespective of position w. r. t. stress
- The first pretonic syllable can also have a clear [a] in a specific intonational construction where the pretonic syllable bears a H tone and can be prolonged for this reason (Kasatkina, 2005; Bethin, 2006)
- There is no specific phonological representation for [ɐ] and [ə], they instantiate /a/ within the constraints imposed by short duration

Radical reduction: [ə] ≠ /ə/

- The vowel /u/ is claimed not to neutralize, yet it can be realized as [ə], especially in fast speech (Likhtman, 1999)
- Do we want this to be a phonological fact? If not, surface [ə] is not always a phonological /ə/ (or whatever the other vowels neutralize to)
- The "schwa" is extremely prone to coarticulation pressure from flanking consonants and following vowels (Paufošima, 1980):

(10) a. [pʊdʊkʊˈmʲentəm]
'according to documents (dat. pl.)'
instead of [pədəkʊˈmʲentəm]

b. [rəˠzlʲɪˈt͡ʃʲajʊt͡sːa] instead of [rəzlʲɪˈt͡ʃʲajʊt͡sːa]
'they differ'

Improvements on the traditional accounts

- Some degree of phonetic laxing/vowel space contraction due to decreased length well-attested:
- No phonological segments with strange restrictions on distribution
- Phrase-final variability between moderate and radical reduction boils down to well known variable lengthening (e. g. Fougeron & Keating, 1997)
- No special “speech-rate phonology”: all the schwa-type sounds are other vowels with heavy undershoot

Moderate reduction: phonology after all

- But all reduction cannot be due to phonetic vowel space contraction
- The following neutralizations are real (for the younger norm):
  - Following non-palatalized consonants:
    - /a/, /o/ → /a/
    - /e/, /i/ → /i/
  - Following palatalized consonants:
    - /a/, /e/, /o/, /i/ → /i/
- How do we know?

Evidence for reduction

- Hyperarticulation: even when given the possibility of increased length, speakers still neutralize
- Reduction feeds into other processes:
  - In Russian, surface [ji] is normally realized as [i] (cf. Kasatkin, 2009)
  - Russian has two main verbal classes, one with an /-it/ suffix in the 3sg present, and one with /-ot/
  - When unstressed, both come out as [-it] and feed into the /ji/ simplification

	‘give to drink’	‘dig’
Underlying	/poj-it/	/roj-ot/
Surface	[ˈpoɪt]	[ˈroɪt]

- Some sort of feeding from reduction is inevitable

Evidence for reduction

- The postalveolars (and [t͡s]) behave (at least to some extent) like palatalized consonants and thus we expect them to share some feature
- It cannot be a phonetic feature:
  - It cannot be an articulatory feature (raised tongue palate, laminal articulation), since [ʂʷ] and [ʐʷ] probably lack the raised tongue palate (though it may be obscured by the retroflexion/velarization gesture) and [t͡s] certainly does
  - It cannot be an acoustic feature because [ʂʷ], [ʐʷ] and [t͡s] lack the F2 transition at around 2,500 Hz shared by other palatalized consonants
  - I conclude it is an entirely abstract (substance-free) feature (see also tomorrow's talk)

Dispersion

- Padgett & Tabain (2005) concentrate on the role of dispersion in reduction
- Cannot explain the difference between [ʌ] and [ɐ] (hard to say without the numbers, but their charts certainly suggest it is there)
- Explains how the vocal space is contracted at shorter durations
- Does not explain why the neutralizations happen and why they happen in this particular pattern (there are many others in related varieties: e. g. in Standard Belarusian /e/ neutralizes with /a/; cf. Shaulskiy, 2008 for a very complete overview); i. e. an account in terms of features is still needed (Padgett, 2004)
  - For instance, Padgett & Tabain (2005) claim to have discovered lack of neutralization of /e/ and /i/, which is good for the dispersion account, approach
  - But /o/ and /a/ still neutralize
  - Given their set of speakers, the lack of /e/–/i/ neutralization is to be expected, since this is in fact the conservative norm
  - Their one undoubtable speaker of MSR certainly neutralizes

Functional account

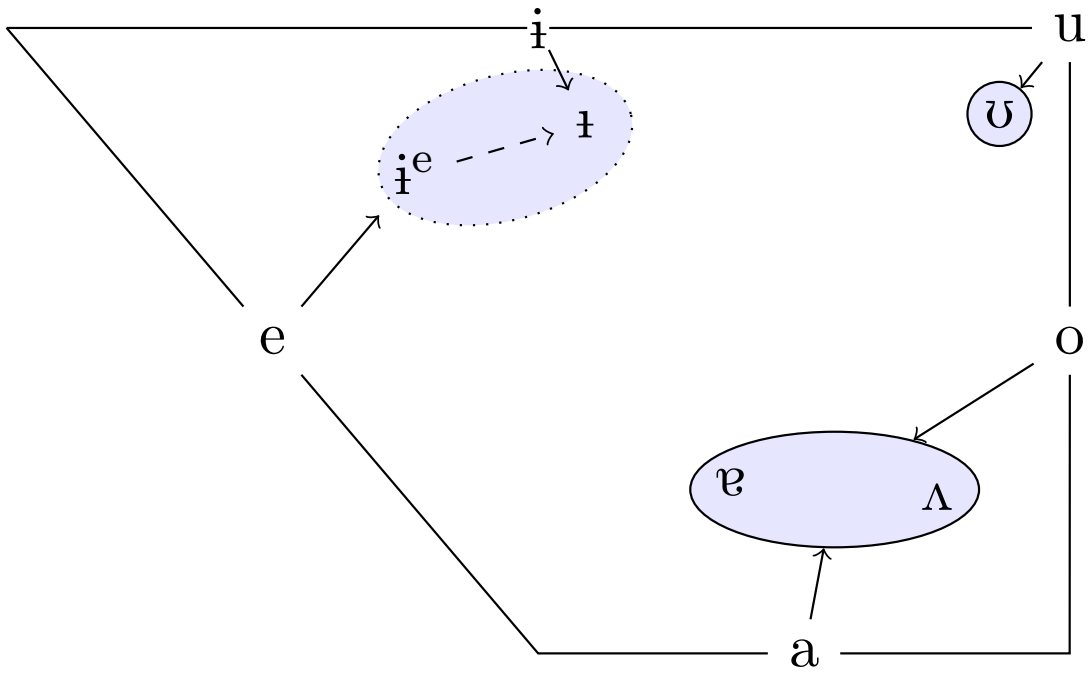
- Crosswhite (2001): stressed vowels are heads of feet
- Moderate reduction is footed non-head
- Radical reduction is unfooted
- Morae licensed by feet
- Nonperipheral (here = mid) vowels only licensed by stress
- Alignment of syllable and mora boundary if possible (i. e. if no consonants intervene)
- Captures most of the distribution (but no role for speech rate/continuous factors)

Functional account: problems

- Cannot capture all of the distribution
- No account for hyperarticulation and other length-related facts
- Problematic phonological representations (essentially SPE features)
- "Functionally motivated" *ad hoc* constraints (*NONMORAIC/[−high]), cf. also criticism by de Lacy (2006)
- The account does not have a good enough grounding in the phonetics, i. e. if its phonetic predictions are taken seriously, it seems to fall
- Cross-linguistically, onsetless syllables can be prosodically deficient, not prominent (Downing, 1998)
- Could work as a substance-free account, but I suggest a better one

Summary so far: phonetics

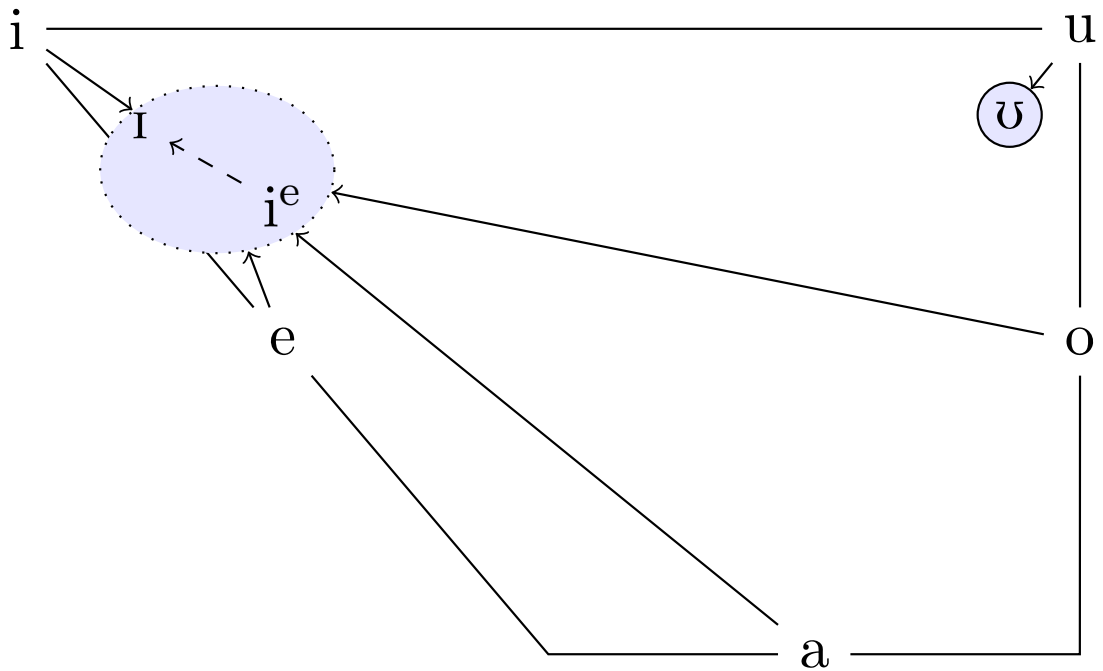
Moderate reduction following non-palatalized consonants



Shading: neutralization
Dotted lines: younger norm

Summary so far: phonetics

Moderate reduction following palatalized consonants



Summary so far: phonetics

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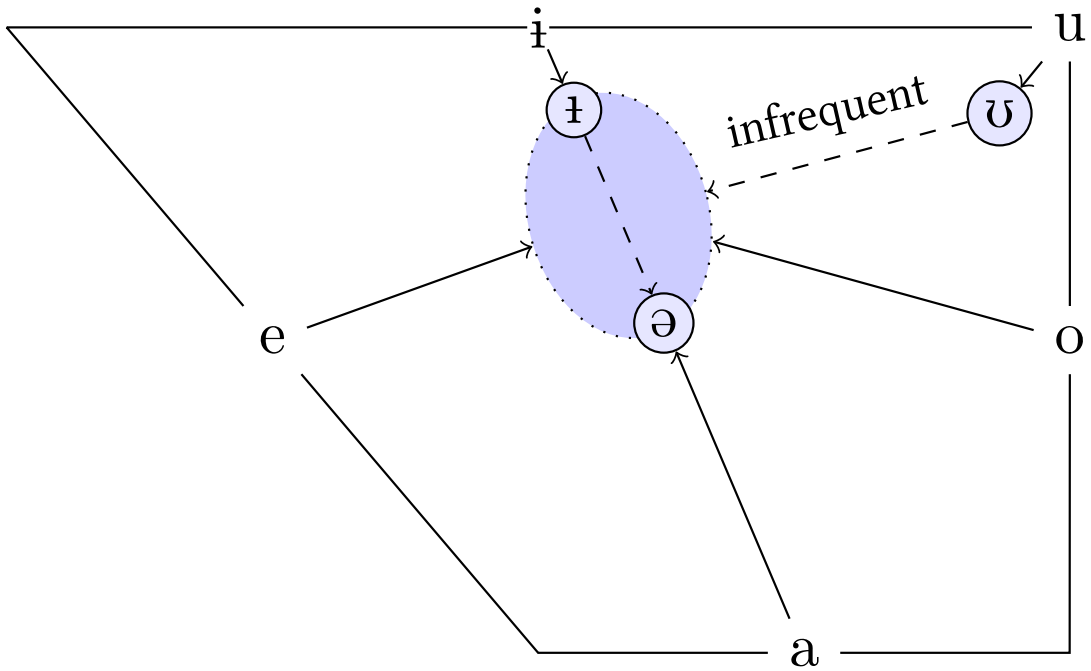
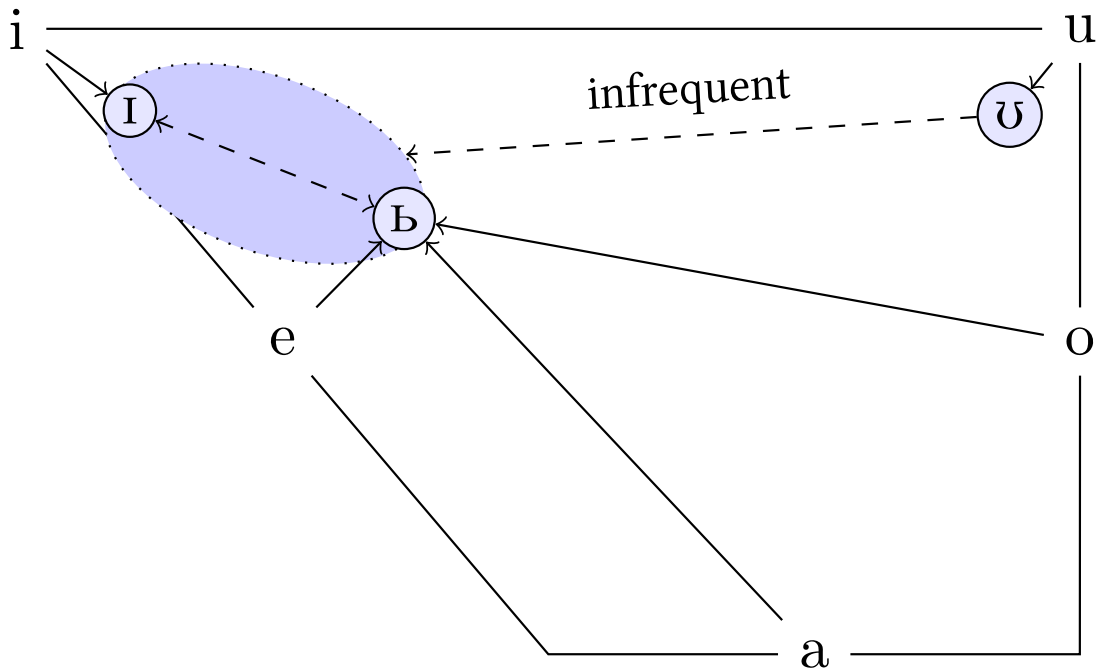


Summary so far: phonetics

Radical reduction following palatalized consonants



Summary so far: phonology

The actual phonological picture is then as follows:

	Underlying vowels				
Context	/a/	/o/	/e/	/i/	/u/
C_	/a/		/e/ /i/		/u/
			/i/		
C^j_	/e/			/i/	/u/
	/i/				
Š_	/e/			/i/	/u/
	/a/		/i/		

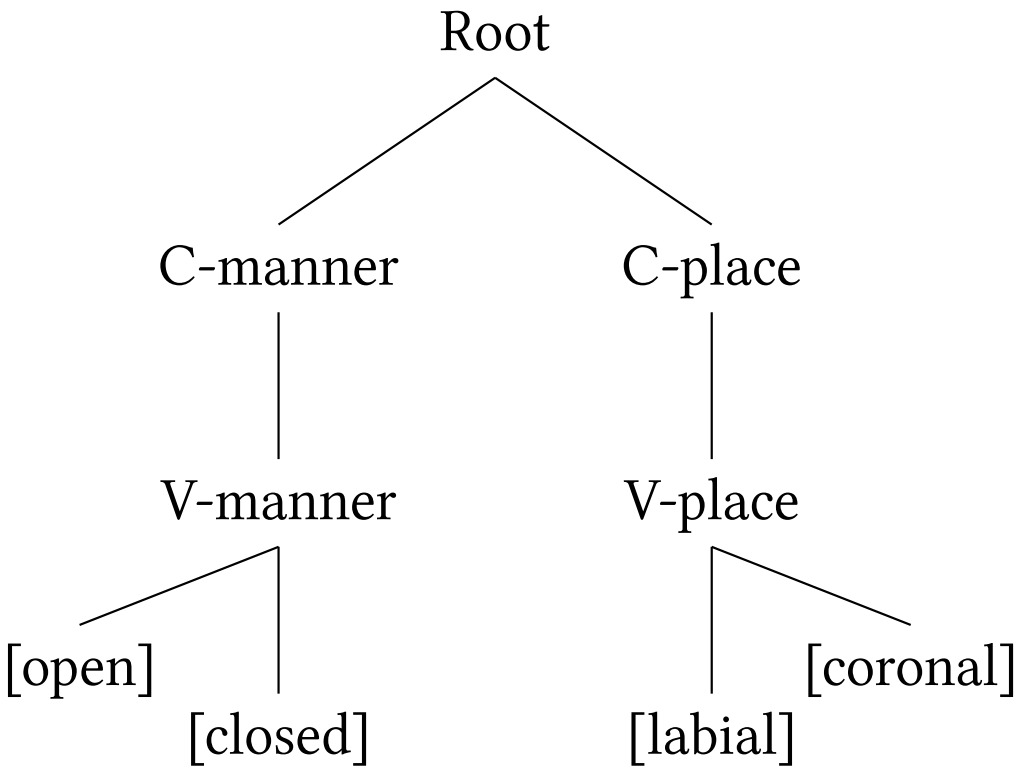
Top: elder norm
Bottom: younger norm

Outline

Preliminaries

- I use the Parallel Structures Model (Morén, 2003)
- UFT-style feature geometry
- Language-specific phonetic implementation of features
- I assume features can be totally abstract, with no consistent phonetic correlate even within a language
- This implies a heavier emphasis on the role of alternations in discovering the featural make-up

Russian vowels: the feature geometry



Russian vowels: the specifications

	V-manner		V-place	
Vowel	[open]	[closed]	[labial]	[coronal]
/a/	✓			
/o/	✓	✓		
/e/		✓		✓
/i/				✓
/u/			✓	

The idea of the account

- The principal constraint is *V-manner[closed] (essentially *Mid)
- Given these representations, it is essentially a constraint against more complex structures (mid vowels are here complex à la Element Theory)
- Active only in unstressed syllables thanks to positional faithfulness
- After non-palatalized consonants, deletion of V-manner[closed] simply gives the pattern
- After palatalized consonants, there is an additional consonant banning V-manner[open] as well
- Both manner features are deleted, V-place[coronal] (the palatalization feature) spreads rightward, giving /i/

Reduction after non-palatalized consonants

'to	$\textsc{Max}_{\textsc{Hd}}$(V-man[cl])	*V-man[cl]	Max(V-man[cl])
a. ☞ 'to		*	
b. 'ta	*!		*

to	$\textsc{Max}_{\textsc{Hd}}$(V-man[cl])	*V-man[cl]	Max(V-man[cl])
a. to		*!	
b. ☞ ta			*

Reduction after palatalized consonants

- Several options on what would trigger the additional restriction
- Feature adjacency: *{V-pl[cor]}{[V-man[op]}
- Easy, but problematic in terms of locality: can features on different tiers interact?
- Spreading: assume it is more important to spread V-pl[cor] (in non-head positions) than to keep V-manner features
- Empirical problem: spreading of V-pl[cor] must only be possible rightwards, otherwise lack of unstressed "[ɨ]" is (wrongly) predicted
- Possible solution: spreading is driven by domain binarity, domains are left-headed

Reduction after palatalized consonants: adjacency option

- To save space, V-man here refers to both [open] and [closed], whether as two constraints or a single constraint on a node
- Candidates with an empty root node which satisfy the markedness constraint are ruled out by some interpretive mechanism

Reduction after palatalized consonants: adjacency option

	ˈtʲo	MAX$_{Hd}$(V-man[cl])	*{V-pl[cor]}{V-man}	MAX(V-man[cl])
a. ☞	ˈtʲo		*	
b.	ˈtʲa	*!	*	*
c.	ˈtʲi	*!		*

	tʲo	MAX$_{Hd}$(V-man[cl])	*{V-pl[cor]}{V-man}	MAX(V-man[cl])
a.	tʲo		*!	
b.	tʲa		*!	*
c. ☞	tʲi			*

Reduction after palatalized consonants: spreading option

- Assume some constraint SPREAD which favours left-headed binary domains of V-pl[cor]
- (We will need to assume a mechanism to ensure coda palatalization does not happen, cf. tomorrow's talk with DEPLINK)
- It is not possible to have both V-manner[open] and V-place[coronal] in the same segment
- Here I formalize it as a conjoined constraint for expository purposes, cf. Morén (2007); Blaho (2008) for discussion of inventories in substance-free phonology
- This will ensure that (modulo positional faithfulness) spreading will happen at the expense of the manner features
- The *V-man[cl] constraint works as in the previous case to ensure the /e/ → /o/ mapping

Reduction after palatalized consonants: spreading option

ˈtʲo	MAX$_{Hd}$(V-man[cl])	*V-pl[cor]&*V-man[op]	SPREAD	MAX(V-man[cl])
a. ☞ ˈtʲo			*	
b. ˈtʲa	*!		*	*
c. ˈtʲi	*!			*

tʲa	MAX$_{Hd}$(V-man[op])	*V-pl[cor]&*V-man[op]	SPREAD	MAX(V-man[op])
a. tʲ{V-pl[cor],V-man[op]}		*!		
b. tʲa			*!	*
c. ☞ ˈtʲi				*

tʲo	MAX$_{Hd}$(V-man[cl])	*V-pl[cor]&*V-man[op]	SPREAD	MAX(V-man[cl])
a. tʲo			*!	
b. tʲa			*!	*
c. ☞ ˈtʲi				*

The CoMP theory of markedness

- De Lacy (2006) proposes a theory of markedness he calls CoMP (Competence, Conflation, hierarchy Conflict, Markedness, Preservation of the Marked)
- Crucially, he argues specifically for universal feature specifications and against approaches based on contrast and/or phonological activity
- Vowel reduction in CoMP results from conflicting pressures to increase sonority in syllable nuclei and decrease it in non-heads (unstressed syllables)
- It is thus possible to get the /i u a/ inventory
- But do universal features work?

No ranking predicts the Russian pattern

Input	Winner ∼ Loser	IDENT[rd]	IDENT[hi]	IDENT[lo]	IDENT[bk]	$^*-\Delta_\omega \geq$ {e,o}	$^*\Delta_\sigma \leq$ {e,o}
/to/	[ta] ∼ [to]	L		L	L		W
	[ta] ∼ [ti]		W	L		L	W
	[ta] ∼ [te]			L			W
	[ta] ∼ [tu]	L	W	L	L	L	W
/te/	[ti] ∼ [ta]		L	W	L	W	
	[ti] ∼ [to]	W	L		L	W	
	[ti] ∼ [te]		L			W	
	[ti] ∼ [tu]	W			L		
/ta/	[ta] ∼ [ti]		W	W		L	W
	[ta] ∼ [tu]	W	W	W	W	L	W
/ti/	[ti] ∼ [ta]		W	W		W	L
/tu/	[tu] ∼ [ta]	W	W	W	W	W	L

No ranking can be established which would satisfy all the ERCs

Universal specification is incorrect

- The table assumes that /a/ is [+back], but the result is not helped if it is [−back] as de Lacy (2006) assumes
- The problem is that the representations for /e/ and /o/ are too symmetrical, unlike in the theory proposed here
- Might or might not be an argument against the CoMP theory of markedness
- But certainly is an argument against universal specification
- Will probably fare even worse in asymmetrical dialect systems (Shaulskiy, 2008)

Future directions

- Accounting for the elder norm
- Preliminary idea: different represenation of /e/
- Dialect patterns