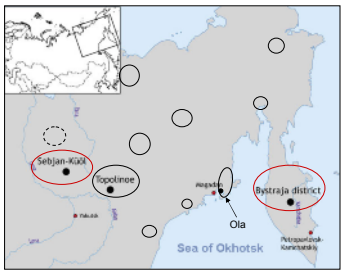
Does Even have ATR?

Natalia Aralova
natalia_aralova@eva.mpg.de

Sven Grawunder
grawunder@eva.mpg.de

Max Planck Institute for Evolutionary Anthropology

The current language situation



- Even is a Tungusic language of the Altaic language family
- About 7.000 native speakers (census 2002) – an overstated number
- Dialectal diversity: from 11 to 14 dialectal varieties
- Most dialects are endangered (three of them are being documented within DoBes-project)
- The dialect of Ola was chosen as a basis for literary Even

The vowel harmony in Even

- all vowels are divided into two sets

Set 1	i iː	u uː	o oː	e eː	ie
Set 2	ị ịː	ụ ụː	ọ ọː	a aː	ịa

- within one word vowels of only one set are possible
- stem vowels determine suffix vowels

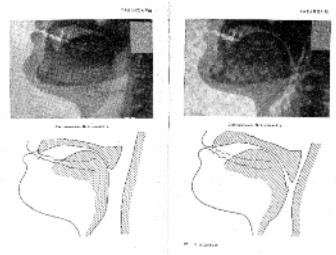
Set 1	Set 2
toŋeːr-e-ńdʒe-le	hịakịta-ńdʒa-la
lake-EP-AUG-LOC	larch-AUG-LOC
on the big lake	on the big larch

(Novikova 1960: 53)

The previous research of Even vowel harmony

- Only descriptions of some individual dialects are available
- Different terminology describing vowel classes
  - Okhotsk dialect (Benzing 1955):
    "light" vs. "dark" vowels
  - Moma dialect (Lebedev 1978):
    "soft" (palatal) vs. "hard" (guttural) vowels
- The most detailed phonetic description concerns Ola dialect (literary Even, Novikova 1960)
  - Pharyngealization
    → lack of acoustic data

Pharyngealization in the Ola dialect



Set 1 non-pharyngealized u Set 2 pharyngealized uˤ

- Novikova (1960) provides x-rays for each pair of vowels
- The settings of the experiment are not clear (speakers, wordlist, sustained vowels?, technique of recording)

Ladefoged & Maddieson (1996): "we should be cautious in fully accepting the validity of the rest of the indicated vocal tract shape"

ATR / RTR in Tungusic Languages

- first proposed by Ard (1980)
- relies mainly on the data of Even (Novikova 1960 and other descriptions) and other Tungus languages in comparison with data from West African languages
- Pharyngealization in the Ola dialect is explained by decrease of the pharynx size, triggered by tongue root retraction
- generally accepted

comparison with other vowel harmony systems

- Vowel inventory and vowel oppositions
  - widespread ATR system of African model

    [+ ATR] [i e ɑ o u]

    [- ATR] [ɪ ɛ a ɔ ʊ] (Local & Lodge 2004)
  - Even

    [Set 1] [i a o u ie]

    [Set 2] [i̱ e o̱ u̱ i̱a] (Novikova, 1960)

Research questions

- Is there a distinction between two sets?
  - auditorily hard to distinguish vowels of different sets
- What kind of distinction is it?
  - No clear pharyngealization attested in the examined dialects
- Is it the same for all varieties of Even?

Data

- Two dialects (Sebian-Küöl and Bystraja district)
- Two male and two female speakers in each dialect
- About 5 words of each vowel quality and length
- Recorded three times in isolation and three times within a carrier phrase
- 3367 items in total

Data

- The dataset included minimal pairs and near-minimal pairs
- unbalanced
  - number of vowel qualities

    E.g.: 201 items of short Set 1 u

    255 items of long Set 1 u
  - number of consonant contexts

    E.g.: 1269 vowels in onset

    796 vowels after velar consonant

Methodology: linear mixed model

- allows to deal with relatively small, unbalanced datasets

Methodology: analysis factors

fixed effects

- ATR-group (advanced/retracted)
- vowel quality (I, U, E/A, O)
- vowel height (high/non-high)
- *gender*
- *dialect*
- *proficiency/fluency (age)*

random effects

- word
- speaker
- repetition

Methodology: linear mixed model

- to handle a number of fixed and random factors at the same time
- lme4-package (Bates & Maechler, 2009) and languageR-package (Baayen, 2009) for R (R-Project, 2010)

Acoustic analysis of ATR

- Akan (Stewart 1967, Lindau 1979, Ladefoged & Maddieson 1996)
- Degema (Fulop et al. 1998)
- Maa (Guion et al. 2004)
- Kalenjin (Local & Lodge, 2004)

… etc.

- Mongolian (Svantesson 1985, 2005)
- Solon (Svantesson 1985)
- Oroqen (Lulich & Whaley, ms.)

acoustic parameters

Parameters	Hypotheses for ATR
FORMANTS	
F1	lower F1 for +ATR
F2	indifferent F2
F3	lower F3 for –ATR
SPECTRAL SLOPE	
Amplitude difference A1-A2	A1-A2 lower for -ATR
FUNDAMENTAL FREQUENCY	
F0	F0 higher in +ATR
DURATION	
vowel duration	

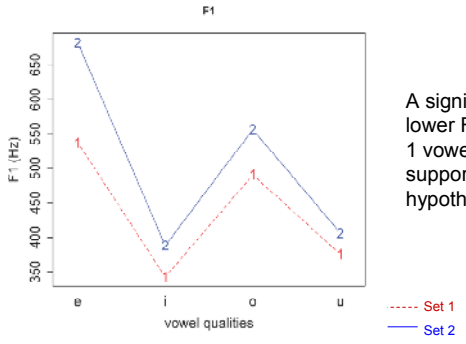
Results

Results

	main effects				interactions		
Para-meter	set1/set2 (advanced vs. retracted)	dialect (Sebian vs. Kam-chatka)	vowel height (high vs. non-	gender (male vs. female	set: dialect	set: vowel-height	set: gender
F1	***	n.s.	*	**	*	***	n.s.
F2	***	**	***	***	n.s.	*	n.s.
F3	***	**	***	**	***	***	**
A1-A2	***	n.s.	***	n.s.	n.s.	***	n.s.
F0	n.s.	***	***	***	n.s.	n.s.	*
duration	**	n.s.	n.s.	n.s.	*	****	n.s.

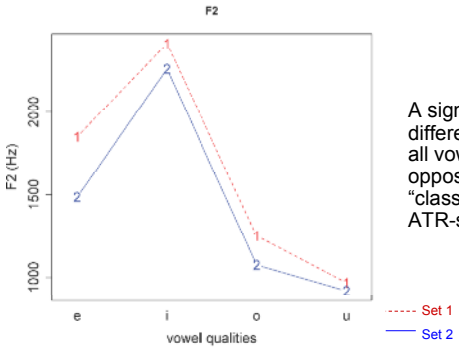
Signif. codes: 0 '****' 0.001 '***' 0.01 '**' 0.05 '*'

Vowel quality: F1



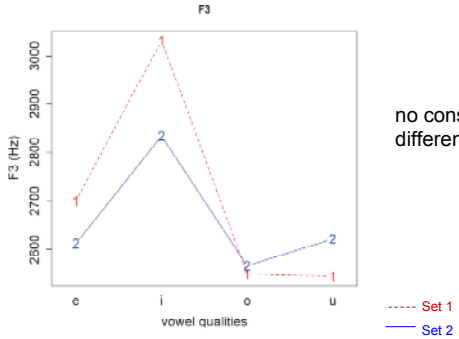
A significantly lower F1 for Set 1 vowels, that supports ATR-hypothesis

Vowel quality: F2



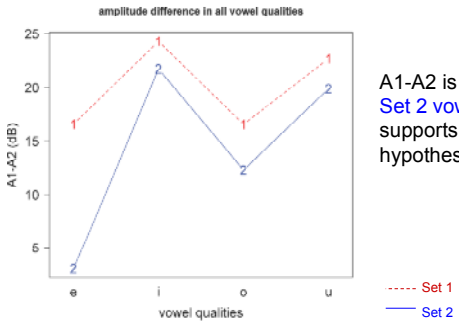
A significantly different F2 for all vowels (as opposed to "classical" ATR-systems)

Vowel quality: F3



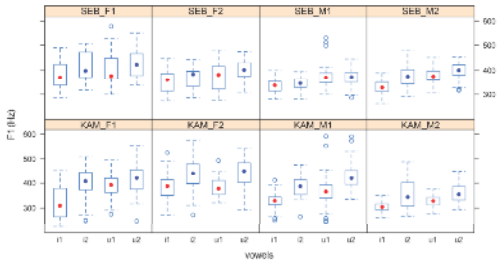
no consistent F3 difference

Spectral Slope



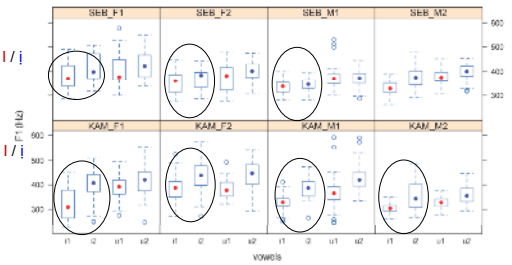
A1-A2 is lower for Set 2 vowels that supports the hypothesis

Dialects & F1



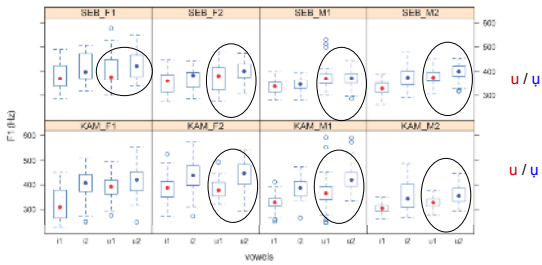
- A smaller difference for Set 1 and Set 2 i and u for Sebian

Dialects & F1



- A smaller difference for Set 1 and Set 2 i and u for Sebian

Dialects & F1



- A smaller difference for Set 1 and Set 2 i and u for Sebian

Duration – Set interaction

- Significant duration distinctions on the speaker level for :
  - Set 1 and Set 2 short o (4 Speakers from Sebjan, 3 speakers from Kamchatka)
  - Set 1 and Set 2 short i (3 speakers from Kamchatka)

acoustic parameters

Parameters	Hypotheses for ATR	
FORMANTS		
F1	lower F1 for +ATR	✓
F2	indifferent F2	?
F3	lower F3 for –ATR	✗
SPECTRAL SLOPE		
Amplitude difference A1-A2	A1-A2 lower for –ATR	✓
FUNDAMENTAL FREQUENCY		
F0	F0 higher in +ATR	✗
DURATION		
vowel duration		!

conclusions

- There is a distinction between two sets
- ATR justified?
  - not yet
  - only two parameters (F1, A1-A2) similar
- No significant difference between two dialects
  - A tendency to reduce distinction in Sebian (F1 for high vowels)

→ Duration might play a role for the distinction of vowels

conclusion

- For Even further research in needed
  - other parameters
  - other factors
  - other dialects
  - perception tests
- Necessity of investigation the phonetic evidence of the label “ATR”
- An endangered language might show a comlicated picture

Aknowledgements

- Volkswagen Foundation, DoBeS Programme
- Bodo Winter, Luise Zippel, Evgeniya Zhivotova, Brigitte Pakendorf (Max Planck Institute for Evolutionary Anthropology)
- Speakers from Kamchatka and Sebian-Küöl

References

Ard, Josh. 1980. A sketch of Vowel harmony in the Tungus Languages. International Review of Slavic Linguistics 5, 23 – 43

Baayen, R. H. 2009. languageR: datasets and functions with “Analyzing Linguistic Data: A practical introduction to statistics”. R package version 0.9555

Bates, D. M. & Maechler, M. 2009. lme4: Linear mixed-effects models using S4 classes. R package version 0.9999375-32

Benzing, J. 1955. Lamutische Grammatik. Wiesbaden

Fulop, S. A., Kari, E., Ladefoged, Peter. 1998. An Acoustic Study of the Tongue Root Contrast in Degema Vowels. Phonetica 55, 80 – 98

Guion, Susan G., Post, Mark W., Payne, Doris L. 2004 Phonetic correlates of tongue root vowel contrasts in Maa. Journal of Phonetics 32, 517 – 542

Ladefoged, P., I. Maddieson. 1996. Sounds of the World’s Languages. Oxford: Blackwells, 300 – 306

Lebedev, V. D. 1978. Jazyk Evenov Jakutii. Leningrad: Nauka

Lindau, M. 1979. The feature expanded. Journal of Phonetics 7, 163 – 76

Local, J., Lodge, K. 2004. Some auditory and acoustic observations on the phonetics of [ATR] harmony in a speaker of a dialect of Kalenjin. Journal of the International Phonetic Association 34/1, 1 – 16

Lulich, Steven M., Whaley, Lindsay J. (ms): An Acoustic Phonetic Study of Orogen Vowels. L. Whaley, Malchukov A. (eds.). Advances in Tungusic Linguistics. forthcoming in Harrassowitz

Novikova, K. A. 1960. Ocherki dialektov Evenskogo jazyka: Ol’skij govor. Moscow-Leningrad: Akademija nauk. part 1

R Development Core Team (2009). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. http://www.R-project.org

Stewart, J.M. 1967. Tongue root position in Akan vowel harmony. Phonetica 16.185-204.

Svantesson, J.-O. 1985. Vowel harmony shift in Mongolian. Lingua 67, 283 – 327

Svantesson, J.-O., Tsendina A., Karlsson A., Franzén V. 2005. The Phonology of Mongolian. Oxford University Press

Vaux, Bert. 2009. [atr] and [back] harmony in the Altaic languages. S. Tatevosov (ed.) Investigations into Formal Altaic Linguistics: Proceedings of WAFL 3. Moscow: MAKS Press, 50 – 67