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Adjusting to the New Normal(ization):
Adapting *Atlas of North American English* Benchmarks to Lobanov-Normalized Data

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In this paper I offer a method for translating formant benchmarks from the *Atlas of North American English* (Labov et al. 2006) into Lobanov-normalized formant values, so that Lobanov-normalized data can be compared to and contextualized against benchmarks set by *ANAE* in a replicable and standardizable way. I propose using the means and standard deviations of the entire *ANAE* data set in order to translate the original benchmarks into *z*-scores relative to the *ANAE* corpus, and then using those *z*-scores as the corresponding benchmarks for Lobanov-normalized data. The relevant values are as follows:

	ANAE corpus
F1 mean	650.7 Hz
F1 s.d.	150.0 Hz
F2 mean	1595.5 Hz
F2 s.d.	435.2 Hz

E.g., the benchmark F1 < 700 Hz becomes the Lobanov-transformed benchmark F1 < 0.329, since 700 Hz is 0.329 standard deviations greater than the mean F1 in the *ANAE* corpus.

The FAVE software package (Rosenfelder et al. 2014) uses Lobanov normalization to produce its normalized formant measurements, but translates them back into hertz-like values as its output. The mean and standard deviation used for this translation in F1 are very close to the *ANAE* corpus mean and standard deviation, but this is not the case for F2: the FAVE F2 mean is 1700 Hz, with s.d. 420 hz. This implies that *ANAE* benchmarks in F1 can be used at face value for FAVE-normalized data, but F2 benchmarks cannot; they must be translated back through *z*-scores in order to be meaningfully compared against FAVE data.

I compare my Lobanov transformations of benchmarks to the original *ANAE* benchmarks in order to evaluate how well they characterize *ANAE* regions, using the isogloss parameters of homogeneity, consistency, and leakage. An ideal isogloss has maximal homogeneity and consistency and minimal leakage.

The data used is Fruehwald (2010)'s packaging of the *ANAE* data, which codes each speaker as belonging to one of 22 dialect groups. These dialect groups, rather than the exact isoglosses from the corresponding *ANAE* maps, are used in most cases as the regions against which isogloss parameters are evaluated in this paper.

The tables on the following pages compare the homogeneity, consistency, and leakage of each region under the original *ANAE* benchmarks to the same values calculated using Lobanov-transformed benchmarks; the dialect groups and/or cities included in each region for the purposes of evaluating its dialect parameters are listed below each table.

Southeastern super-region cf. *ANAE* map 11.11		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		166	269			
ANAE benchmark	F2(GOAT) > 1200 Hz	152	107	**.916**	**.587**	**.398**
Lobanov-transformed	F2(GOAT) > –0.909	155	105	**.934**	**.596**	**.390**
FAVE-rescaled	F2(GOAT) > 1318 Hz					

Regions included: South, Inland South, Texas South, Midland, Mid-Atlantic, Florida, Charleston

North cf. *ANAE* map 11.8		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		117	318			
ANAE benchmark	F2(GOAT) < 1200 Hz	98	78	**.838**	**.557**	**.245**
Lobanov-transformed	F2(GOAT) < –0.909	98	77	**.838**	**.560**	**.242**
FAVE-rescaled	F2(GOAT) < 1319 Hz					

Regions included: North, Inland North, Western New England, Providence

Inland North cf. *ANAE* map 14.4		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		71	364			
ANAE benchmark	F1(TRAP) < 700 Hz	53	54	**.746**	**.495**	**.148**
Lobanov-transformed	F1(TRAP) < 0.329	60	37	**.845**	**.619**	**.102**
FAVE-rescaled	F1(TRAP) < 700 Hz					

Regions included: Inland North, St. Louis corridor

Inland North cf. *ANAE* map 14.5		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		62	373			
ANAE benchmark	F2(LOT) > 1450 Hz	48	38	**.774**	**.558**	**.102**
Lobanov-transformed	F2(LOT) > –0.334	50	37	**.806**	**.575**	**.099**
FAVE-rescaled	F2(LOT) > 1559 Hz					

Regions included: Inland North

Eastern Corridor cf. *ANAE* map 9.2		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		24	411			
ANAE benchmark	F1(THOUGHT) < 700 Hz	19	37	**.792**	**.339**	**.090**
Lobanov-transformed	F1(THOUGHT) < 0.329	19	30	**.792**	**.388**	**.073**
FAVE-rescaled	F1(THOUGHT) < 700 Hz					

Regions included: New York City, Mid-Atlantic, Providence

Canada cf. *ANAE* map 15.4		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		24	411			
ANAE benchmark	F1(DRESS) > 660 Hz	23	203	**.958**	**.102**	**.494**
Lobanov-transformed	F1(DRESS) > 0.062	23	182	**.958**	**.112**	**.443**
FAVE-rescaled	F1(DRESS) > 659 Hz					

Regions included: Canada

Canada cf. *ANAE* map 15.4		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		24	411			
ANAE benchmark	F2(TRAP) < 1825 Hz	24	169	**1.00**	**.124**	**.411**
Lobanov-transformed	F2(TRAP) < 0.527	24	145	**1.00**	**.142**	**.353**
FAVE-rescaled	F2(TRAP) < 1922 Hz					

Regions included: Canada

Canada cf. *ANAE* map 15.4		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		24	411			
ANAE benchmark	F2(LOT) < 1275 Hz	21	88	**.875**	**.193**	**.214**
Lobanov-transformed	F2(LOT) < –0.736	22	90	**.917**	**.196**	**.219**
FAVE-rescaled	F2(LOT) < 1391 Hz					

Regions included: Canada

Inland Canada cf. *ANAE* map 15.7		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		9	23			
ANAE benchmark	F2(FACE) > 2200 Hz	7	11	**.778**	**.389**	**.478**
Lobanov-transformed	F2(FACE) > 1.39	7	9	**.778**	**.438**	**.391**
FAVE-rescaled	F2(FACE) > 2283 Hz					

Cities included: Edmonton, Calgary, Saskatoon, Regina, Winnipeg, Thunder Bay, vs. other Canadian locations.

Inland Canada cf. *ANAE* map 15.7		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		9	23			
ANAE benchmark	F2(GOAT) < 1100 Hz	7	5	**.778**	**.583**	**.217**
Lobanov-transformed	F2(GOAT) < –1.14	8	8	**.889**	**.500**	**.348**
FAVE-rescaled	F2(GOAT) < 1222 Hz					

Cities included: Edmonton, Calgary, Saskatoon, Regina, Winnipeg, Thunder Bay, vs. other Canadian locations.

Atlantic Provinces cf. *ANAE* map 15.6		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		8	24			
ANAE benchmark	F2(START) > 1450 Hz	6	3	**.750**	**.667**	**.125**
Lobanov-transformed	F2(START) > –0.334	5	1	**.625**	**.833**	**.042**
FAVE-rescaled	F2(START) > 1559 Hz					

Regions included: Atlantic Provinces., vs. other Canadian locations.

North Central cf. *ANAE* map 11.13		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		9	424			
ANAE benchmark	F2(GOOSE) < 1700 Hz	6	89	**.667**	**.063**	**.210**
Lobanov-transformed	F2(GOOSE) < 0.240	6	85	**.667**	**.066**	**.200**
FAVE-rescaled	F2(GOOSE) < 1800 Hz					

Cities included: Brockway, Lemmon, Minot, Bismarck, Fargo, Bemidji, Chisholm, Superior, Marquette.
GOOSE after coronal consonants.

North Central cf. *ANAE* map 11.13		*n* inside region	*n* outside region	homogeneity	consistency	leakage
total speakers		9	407			
ANAE benchmark	F2(GOOSE) < 1300 Hz	9	138	**1.00**	**.061**	**.339**
Lobanov-transformed	F2(GOOSE) < –0.679	8	145	**.889**	**.052**	**.356**
FAVE-rescaled	F2(GOOSE) < 1415 Hz					

Cities included: Brockway, Lemmon, Minot, Bismarck, Fargo, Bemidji, Chisholm, Superior, Marquette.
GOOSE after non-coronal consonants.

For the majority of benchmarks and parameters, the Lobanov-transformed benchmark is at least as effective at distinguishing the dialect region as the original *ANAE* benchmark is. Most of the exceptions are regions defined by a very small number of data points, or worse than the *ANAE* benchmarks by a very small margin. This suggests that the transformation defined in this paper is an appropriate tool for adapting *ANAE* benchmarks to be compared against Lobanov-normalized data.

	better with Lobanov benchmarks	same results	better with original benchmarks
homogeneity	5	6	3
consistency	11	0	3
leakage	10	0	4

Overview of results.

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