

ILLUSTRATION OF THE IPA

Ladin, varieties of Val di Fassa

Yifan Yang
University of Southern California
yangyifa@usc.edu

Rachel Walker
University of Southern California
rwalker@usc.edu

Alessandro Vietti
Free University of Bozen-Bolzano
alessandro.vietti@unibz.it

Armin Chiocchetti
Uppsala University
armin.92@live.it

Introduction

Ladin (ISO 639-3: lld) is a Romance language spoken in the Italian Central-Eastern Alps by a community of about 30,000 speakers (Dell'Aquila 2010). The classification of Ladin within Western Romance has been the subject of a long-lasting scientific and at times ideological debate, particularly because at the end of the 19th century the region was contested between the new-born Italian state and the Habsburg empire. The varieties of Ladin share phonetic-phonological, morphological, syntactic and lexical features with the other languages spoken in the Central-Eastern Alps, such as Friulian and Romansh, thus leading to the identification of the Rhaeto-Romance group (Haiman & Benincà 1992). However, in Ladin there are still many linguistic phenomena that connect it to the Romance dialects of Northern Italy. Therefore, a clear assignment of Ladin to a group is by no means a simple and uncontroversial operation (Salvi 2016).

The Ladin community lives in the valleys around a mountain range called the Sella massif. Although the valleys are close to each other, communication between the valleys has not always been easy. In addition, after the First World War, the valleys which were previously part of the Austro-Hungarian Empire were annexed by Italy and divided administratively into three provinces: Bolzano-Bozen (South Tyrol), Trento (Trentino) and Belluno (Veneto) (see Figure 1).



Figure 1. Location of the Ladin community

Due mainly to the geographical configuration of the territory, the Ladin language shows considerable internal linguistic variation. Ladin is subdivided into different varieties that are spoken in the valleys around the Sella massif. The valleys and their respective varieties are:

- (a) Val Badia/Gadertal with two varieties *Marèo* and *Badiòt* (further divided into lower valley variety *Ladin* and upper valley variety *Badiòt*);
- (b) Val Gardena/Gröden/Gherdëina, with *Gherdëina*;
- (c) Val di Fassa with *Fascian*, divided into one upper valley variety *Cazet* and two lower valley varieties *Brach* and *Moenat*;
- (d) The upper valley of Cordevole river, more specifically the area around the municipality of Livinallongo del Col di Lana (*fodóm*), with *Fodóm*.

In this paper we focus on the Val di Fassa Ladin varieties: *Cazet*, spoken in the village of Canazei, *Brach*, spoken in the village of Vigo di Fassa, and *Moenat*, spoken in the village of Moena.

From a sociolinguistic point of view, the Ladin linguistic community is characterized by complex multilingual repertoires that include, depending on the valley, Italian, German, Tyrolean dialect (southern Bavarian dialect), and Trentino and Veneto dialects (Italo-Romance dialects) (Dell’Aquila & Iannaccaro 2006). More specifically, the Badia and Gardena valleys are more in contact with Italian, German and Tyrolean dialect, the Fassa valley with Italian and Trentino dialect, while Livinallongo with Italian and Veneto dialect. The influence of Italian and German in multilingual repertoires poses a threat to the vitality of this language. For this reason, Ladin is protected by Italian law (n. 482/1999) as a minority language. The status of Ladin has been characterized as *threatened* (Simons & Fennig 2018), using the *Expanded Graded Intergenerational Disruption Scale (EGIDS)* for assessing language endangerment (Lewis & Simons 2010). In Val di Fassa, Standard Fascian Ladin is taught at school. Standard Fascian Ladin is based on *Cazet* (Chiocchetti & Iori 2002, *DILF: Dizionario italiano-ladino fassano / Dizionèr talian-ladin fascian* 2013).

Acoustic recordings of Ladin words in this paper were acquired in June 2018 in Vigo di Fassa. The recordings were made onto a laptop computer using a head-mounted USB microphone and Praat software at a sampling frequency of 44,100 Hz (Praat software developed by Paul

Boersma and David Weenink, available at <http://www.praat.org>; Boersma 2001). Four speakers of varieties of Val di Fassa Ladin were recorded: Two speakers (both female) from Vigo di Fassa whose pronunciation is representative of Brach, one speaker (female) from Canazei whose pronunciation is representative of Cazet, and one speaker (male) from Moena whose pronunciation is representative of Moenat. The speakers fell within an age range of 18–35, and at the time of our recordings, each of our speakers continued to reside at least part of the year in the village where their variety is spoken. Words were elicited in the frame ['dime __ 'maria] for the speakers of Brach and Cazet and ['dimo __ 'maria] for the speaker of Moenat, meaning ‘say __, Maria’. Illustrations of the consonants and vowels were collected from speakers across all three varieties; for additional details, including diphthongs, triphthong, and stress, the speaker of Moenat provided illustration.

All four speakers largely converge on the main descriptive points for the sound system of Val di Fassa Ladin. The findings we provide here contribute to the documentation and understanding of the language as a whole. We also make note of some differences in the speech patterns of our speakers and indicate where such they are consistent with previous descriptions of characteristics of regional varieties. However, further work with more speakers would be needed for an investigation of systematic differences across varieties.

Consonants

The consonant phoneme inventory of Val di Fassa Ladin is generally consistent across our speakers with the exception that the speaker of Moenat lacks the affricate /ts/. Further, while our phonemic transcriptions for the sibilants produced posterior to the alveolar region are /s, z/ and /ts, dz/ for all speakers, there are some differences within and across speakers in the realization of these sibilants, as we will discuss presently.

	Bilabial	Labio-dental	Dental/Alveolar	Post-alveolar	Palatal	Velar
Plosive	p b		t d			k g
Affricate			ts	<u>ts</u> <u>dʒ</u>		
Nasal	m		n		ɲ	
Trill			r			
Fricative		f v	s z	<u>s</u> <u>z</u>		
Lateral Approximant			l			

(Near-)minimal pairs were identified for specific consonant contrasts rather than across the entire consonant set, because full (near-)minimal sets were not available in the lexicon. Owing to lexical and phonological variation, a separate set of words was assembled for each variety. The word sets contain pairs that illustrate contrasts for place of articulation, voicing, and manner (plosive vs. affricate, fricative and nasal, affricate vs. fricative, nasal vs. liquid, trill¹ vs. lateral approximant). Near-minimal pairs match minimally in the vowel following the consonants under comparison. To meet these pairwise aims, in some cases more than one word illustrating a given consonant is included in our wordset. Note that we transcribe the first vocoid in a rising diphthong with /j/, as we discuss later. The transcriptions in the following table are all phonemic.

The Ladin orthography conventions followed here are those used for the Ladin-Fascian standard, as encoded in Chiochetti & Iori (2002) and *DILF* (2013). In this writing system, an accent is marked on stressed vowels under various conditions that we discuss in the section on word stress. On mid vowels, the choice of accent mark is sensitive to vowel quality such that a grave accent on *e* or *o* indicates an open-mid vowel and an acute accent indicates a close-mid vowel.

	<i>Brach</i>		<i>Cazet</i>²		<i>Moenat</i>
/p/	/pal/ <i>pal</i> 'pole'		/pɛl/ <i>pel</i> 'skin' /pɛl/ <i>pel</i> 'can 3.SG.PRS'		/pal/ <i>pal</i> 'pole'
/t/	/tal/ <i>tal</i> 'such, similar, of that kind'		/tɛl/ <i>tɛl</i> 'that one (person)'		/tal/ <i>tal</i> 'such, similar, of that kind'
	/ton/ <i>ton</i> 'thunder'		/ton/ <i>ton</i> 'thunder' /'tapa/ <i>tapa</i>		/ton/ <i>ton</i> 'thunder'

			'incision, notch; stage (for sports)'			
/k/	/kal/	<i>cal</i>	/kel ³	<i>chel</i>	/kal/	<i>cal</i>
		'corn (dead skin)'		'that'		'corn (dead skin)'
	/'kola/	<i>cola</i>	/'kola/	<i>cola</i>	/'kola/	<i>cola</i>
		'filter 3.SG.PRS'		'filter 3.SG.PRS'		'filter 3.SG.PRS'
/b/	/bal/	<i>bal</i>	/bal/	<i>bal</i>	/bal/	<i>bal</i>
		'dance' (noun)		'dance' (noun)		'dance' (noun)
	/bon/	<i>bon</i>	/bon/	<i>bon</i>	/bon/	<i>bon</i>
		'good'		'good'		'good'
			/beɪ/	<i>bel</i>		
				'beautiful'		
/d/	/'data/	<i>data</i>	/'data/	<i>data</i>	/dat/	<i>dat</i>
		'date'		'date'		'given'
	/don/	<i>don</i>	/don/	<i>don</i>	/don/	<i>don</i>
		'gift'		'gift'		'gift'
/g/	/'gola/	<i>gola</i>	/'gola/	<i>gola</i>	/'gola/	<i>gola</i>
		'throat'		'throat'		'throat'
/ts/	/tsak/	<i>zach</i>	/tsak/	<i>zach</i>		
		'tenacious'		'tenacious'		
/ts/	/'tsata/	<i>ciata</i>	/'tsata/	<i>ciata</i>	/'tsata/	<i>ciata</i>
		'paw'		'paw'		'paw'
	/'tsodo/	<i>ciodo</i>	/'tsodo/	<i>ciodo</i>	/'tsodo/	<i>ciodo</i>
		'nail'		'nail'		'nail'
/dz/	/'dzata/	<i>giata</i>	/'dzata/	<i>giata</i>	/'dzata/	<i>giata</i>
		'female cat'		'female cat'		'female cat'
/m/	/'mama/	<i>mama</i>	/'mama/	<i>mama</i>	/'mama/	<i>mama</i>
		'mommy'		'mommy'		'mommy'
	/ma'na/	<i>manà</i>	/ma'na/	<i>manà</i>	/'mana/	<i>mana</i>
		'drive 2.PL.IMP'		'drive 2.PL.IMP'		'drive 3.SG.PRS'
	/mut/	<i>mut</i>	/mut/	<i>mut</i>		
		'dumb'		'dumb'		
/n/	/'noe/	<i>noe</i>	/neɪ/	<i>nèsc</i>	/nas/	<i>nas</i>
		'really'		'nose PL'		'nose'
	/nut/	<i>nut</i>	/nut/	<i>nut</i>		
		'naked'		'naked'		
			/non/	<i>non</i>	/non/	<i>non</i>
				'godfather'		'godfather'
/ɲ/	/ma'ɲa/	<i>magnà</i>	/ma'ɲa/	<i>magnà</i>	/'maja/	<i>magna</i>
		'eat.SG.M.PST.PTCP'		'eat.SG.M.PST.PTCP'		'eat 2.SG.IMP'

/r/	/ˈrata/	<i>rata</i>	/ˈrata/	<i>rata</i>	/ˈrana/	<i>rana</i>
		‘installment’		‘installment’		‘frog’
	/ˈroe/	<i>roe</i>	/rɛs/	<i>rɛsc</i>		
		‘water spring PL’		‘completely full PL’		
/f/	/fal/	<i>fal</i>	/fɛl/	<i>fɛl</i>	/fal/	<i>fal</i>
		‘mistake’		‘mistake’		‘mistake’
			/fɔrt/	<i>fort</i>	/fjor/	<i>fior</i>
				‘strong’		‘flower’
/s/	/sal/	<i>sal</i>	/sɛl/	<i>sɛl</i>	/sal/	<i>sal</i>
		‘salt’		‘salt’		‘salt’
	/das/	<i>das</i>	/gas/	<i>gas</i>	/ˈpisa/	<i>piza</i>
		‘give 2.SG.PRS’		‘gas’		‘itch’ (noun)
			/sak/	<i>sach</i>		
				‘bag, sack’		
/ʃ/	/ʃal/	<i>scial</i>	/ʃal/	<i>scial</i>	/ʃi/	<i>sci</i>
		‘shawl’		‘shawl’		‘yes’
	/ˈʒɔdo/	<i>sciodo</i>	/ˈʒɔdo/	<i>sciodo</i>	/ʃjor/	<i>scior</i>
		‘hard (hard-boiled)’		‘hard (hard boiled)’		‘gentleman (often referring to tourists)’
	/das/	<i>dasc</i>	/gas/	<i>gasc</i>	/ˈʒɔdo/	<i>sciodo</i>
		‘give 3.SG.PRS’		‘gas PL’		‘hard (hard-boiled)’
					/ˈpisa/	<i>piscia</i>
						‘urinate 3.SG.PRS’
/v/	/val/	<i>val</i>	/val/	<i>val</i>	/val/	<i>val</i>
		‘valley’		‘valley’		‘valley’
			/vers/	<i>vers</i>		
				‘scream; towards’		
/z/	/zal/	<i>śal</i>	/zal/	<i>śal</i>	/zal/	<i>śal</i>
		‘yellow’		‘yellow’		‘yellow’
/z̥/	/z̥a/	<i>jà</i>			/z̥al/	<i>jal</i>
		‘already’				‘at (downwards) the’
					/z̥i/	<i>jì</i>
						‘go 2.PL.IMP’
/l/	/lat/	<i>lat</i>	/lat/	<i>lat</i>	/lat/	<i>lat</i>
		‘milk’		‘milk’		‘milk’
	/lum/	<i>lum</i>	/lum/	<i>lum</i>		
		‘light’		‘light’		

All consonants can occur in word-initial position, as illustrated in the lists of (near-)minimal pairs, with the exception of /ɲ/, which is rare in this context. Nevertheless, /ɲ/ is

attested in a few words in word-initial context, for example, /ɲɔk/ *gnoch* ‘dumpling’, /ɲiˈɲɔla/ *gnignola* ‘lizard’, /ˈɲapa/ *gnapa* ‘mouth (rude, childish)’. Our recorded illustrations of these words are from the Moenat speaker. A minimal pair for /n/ ~ /ɲ/ was identified for post-vocalic context. Although /s/ and /s̥/ both occur in word-initial context, it is difficult to find a minimal pair for this contrast; however, they are contrasted after a vowel. Likewise, pairs contrasting word-initial /z/ and /z̥/ are rare, but a near-minimal pair with these consonants before /a/ was found.

All consonants are attested in word-final context, except voiced obstruents, consistent with what was reported by Heilmann (1955) for Moenat.

	<i>Brach</i>			<i>Cazet</i>			<i>Moenat</i>		
/p/	/tsomp/	<i>zomp</i>	‘bad’	/grɔp/	<i>grop</i>	‘knot’	/grɔp/	<i>grop</i>	‘knot’
/t/	/nut/	<i>nut</i>	‘naked’	/dut/	<i>dut</i>	‘all, every- thing’	/mut/	<i>mut</i>	‘dumb’
/k/	/tak/	<i>tach</i>	‘heel of shoe’	/ɲɔk/	<i>gnoch</i>	dumpling	/pek/	<i>pech</i>	‘baker’
/ts/	/bets/	<i>bez</i>	‘child’	/pats/	<i>paz</i>	‘dirty’	–		
/t̥s/	/bets̥/	<i>bec</i>	‘child PL’	/duts̥/	<i>duc</i>	‘all PL’	/pets̥/	<i>pec</i>	‘fir’
/m/	/pom/	<i>pom</i>	‘apple’	/lum/	<i>lum</i>	‘light’	/dzom/	<i>giom</i>	‘ball of wool’
/n/	/bon/	<i>bon</i>	‘good’	/pin/	<i>pin</i>	‘pine’	/son/	<i>son</i>	‘sound’
/ɲ/	Not elicited			/piɲ/	<i>pign</i>	‘pine PL’	/piɲ/	<i>pign</i>	‘pine PL’
/r/	/par/	<i>par</i>	‘couple’	/pɛr/	<i>pèr</i>	‘even’	/par/	<i>par</i>	‘couple’
/f/	/dzaf/	<i>giaf</i>	‘grand- father’	/sjef/	<i>sief</i>	‘fence’	/tsɔf/	<i>ciof</i>	‘lock (of hair), bunch (of flowers)’
/s/	/das/	<i>das</i>	‘give 2.SG.PRS’	/pas/	<i>pas</i>	‘step’	/pas/	<i>pas</i>	‘step’
/s̥/	/das̥/	<i>dasc</i>	‘give 3.SG.PRS’	/gas̥/	<i>gasc</i>	‘gas PL’	/pes̥/	<i>pec</i>	‘fish’
/l/	/pal/	<i>pal</i>	‘pole’	/bal/	<i>bal</i>	‘dance’ (noun)	/pal/	<i>pal</i>	‘pole’

Voiced plosives

Voiced plosives (/b, d, g/) show both within and across speaker variations. Though some tokens are perceived to be less voiced than others, they still show a qualitative difference from their voiceless counterparts (/p, t, k/), and we transcribe these plosives as voiced rather than voiceless unaspirated. For the Moenat speaker, there is typically a clear prevoicing portion of the voiced plosives, with a long negative VOT, as exemplified in Figure 2.

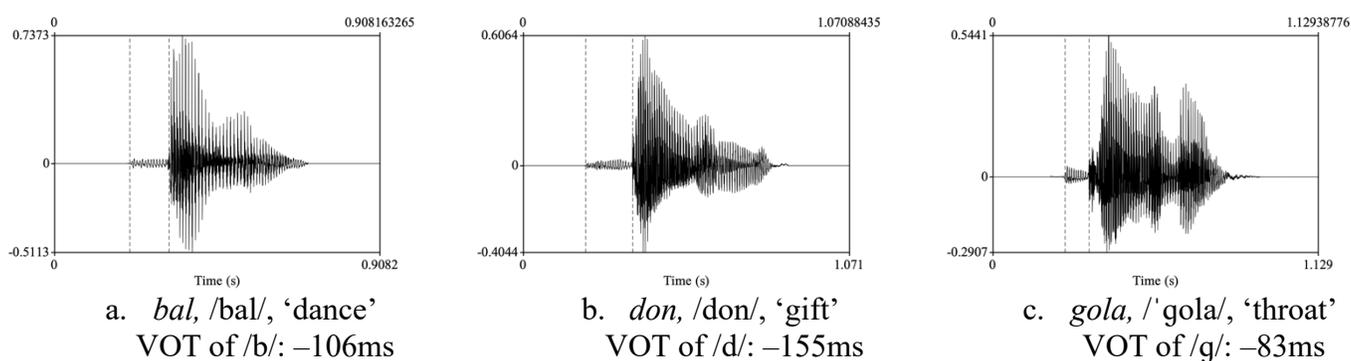


Figure 2. Waveforms of three words pronounced by the Moenat speaker. Intensity is scaled to -70dB. The duration of VOT is demarcated by two dashed lines in each panel.

For the Brach and Cazet speakers, there is also prevoicing for /b, d, g/, as shown by a comparison of representative waveforms for *dime bal* /'dime bal/ ‘say dance’ and *dime pal* /'dime pal/ ‘say pole’ for a Brach speaker in Figure 3. A similar comparison between *dime bal* /'dime bal/ ‘say dance’ and *dime pel* /'dime pel/ ‘say skin’ for the Cazet speaker is shown in Figure 4. Since our tokens were embedded in a carrier sentence, the preceding word *dime* is included for better illustration.

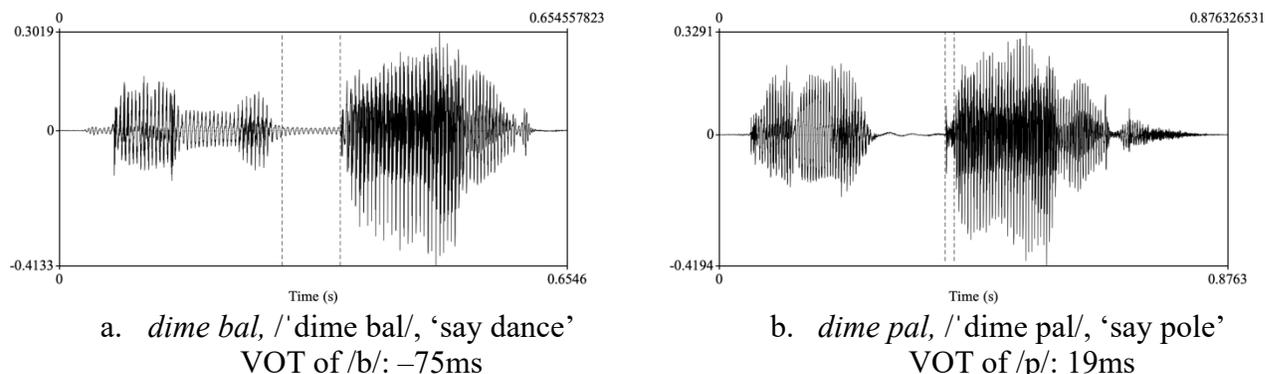


Figure 3. Waveforms of *dime bal* and *dime pal* produced by a Brach speaker. Intensity is scaled to -70dB. The duration of VOT of /b/ and /p/ is demarcated by two dashed lines in each panel. Figure 3-a shows prevoicing of *bal*, comparing to *pal* in Figure 3-b.

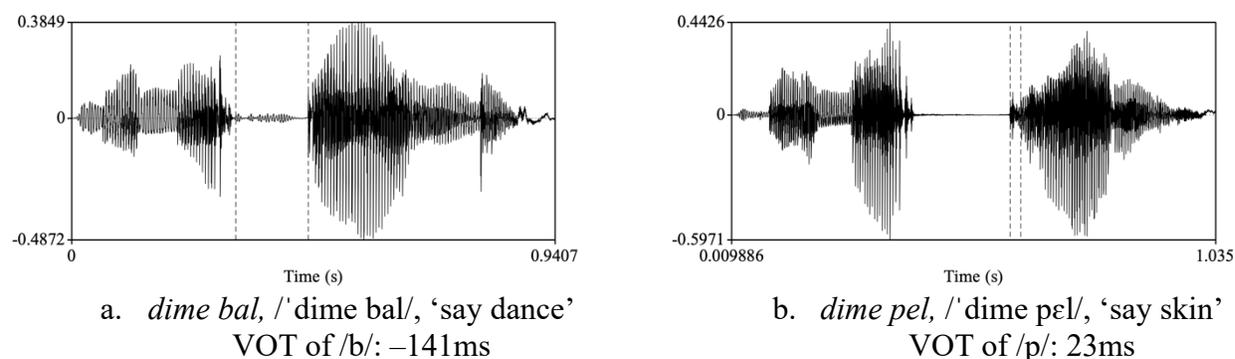


Figure 4. Waveforms of *dime bal* and *dime pel* produced by the Cazet speaker. Intensity is scaled to -70dB. The duration of VOT of /b/ and /p/ is demarcated by two dashed lines in each panel. Figure 4-a shows prevoicing of *bal*, comparing to *pel* in Figure 4-b.

Nevertheless, some tokens produced by these speakers show less typical prevoicing patterns, with less intense vocal fold vibration. Two tokens of *dime gas* /'dime gas/ 'gas' produced by the Cazet speaker are shown in Figure 5 to illustrate this variation. A token of *dime cai* /'dime kai/ 'say corns' is also included for comparison.

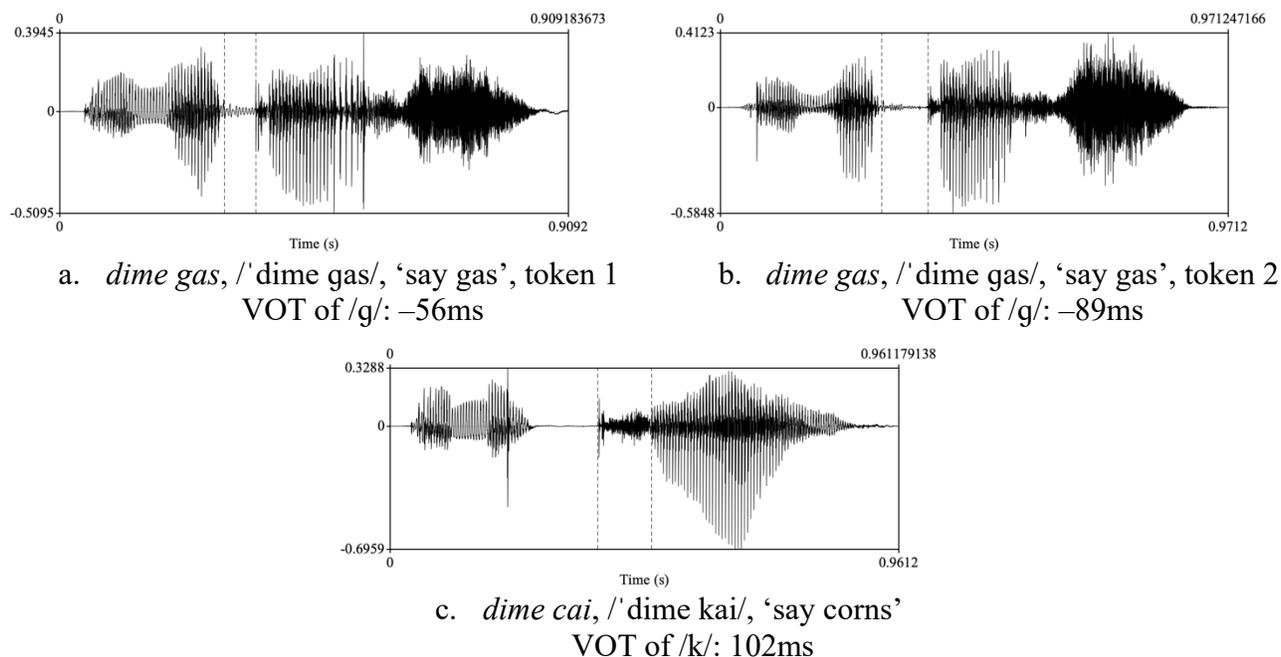


Figure 5. Waveform of two tokens of *dime gas* and a token of *dime cai* produced by the Cazet speaker. Intensity is scaled to -70dB . The prevoicing portion of onset /g/ is between two dashed lines. The token in Figure 5-a shows more intense prevoicing than the token in Figure 5-b. Additionally, no prevoicing is observed in Figure 5-c, *dime cai* /'dime kai/. The duration of VOT of the voiceless aspirated /k/ is marked by two dashed lines.

Sibilants

Dental/alveolar sibilant fricatives in Val di Fassa Ladin are /s, z/, which are commonly dentalized for the Moenat speaker, such as /son/ [s̪on] *son* 'sound', /sal/ [s̪al] *sal* 'salt' and /zal/ [z̪al] *sal* 'yellow'. The dental/alveolar affricate /ts/, which figures in the phoneme inventory of the speakers of Brach and Cazet, is produced as /s/ by the speaker of Moenat; compare /'pitsa/ *piza* 'itch' (noun), as produced by the Cazet speaker, with /'pisa/ *piza* 'itch' (noun), as produced by the Moenat speaker.

The sibilant series produced posterior to the alveolar region are transcribed as /s̠, z̠/ and /ts̠, dz̠/ with a retracted diacritic. In the absence of articulatory data, we do not make any claims about the apical or laminal nature of these sibilants, but this would be useful to investigate in future work. The postalveolar series for the Moenat speaker stands out in general, tending to be realized as retroflex [s̠, z̠] and [ts̠, dz̠], while those for the Cazet and Brach speakers, albeit with some variations and neutralization, tend to be [s̠, z̠] and [tʃ, dʒ], which are not retroflex but still perceived to be posterior to the dental/alveolar series.⁴ Despite the variations observed in the speech of the Brach and Cazet speakers, to be discussed shortly, the phonemic status of /s, z/ and /s̠, z̠/ in Val di

Fassa Ladin is supported by spelling and morphological functions. In Ladin orthography, /s/ and /z/ are written as *s* and *ś*, while /s̥/ and /z̥/ are written as *sc/sci* and *j*. Word-finally, /s/ and /s̥/ are used for distinguishing singular and plural forms, respectively, as well as in the conjugation for verbs. However, there is a low functional load for the contrast between dental/alveolar and postalveolar sibilants. Furthermore, for the Brach and Cazet speakers, the realization of postalveolar fricative phonemes show more inter- and intraspeaker variation, and sometimes they tend to nearly or fully merge with dental/alveolar fricatives. As for the affricates, the contrasts are well maintained and the phonetic realizations are consistent, both within and across speakers.

To illustrate the differences across speakers, we first examined the acoustic properties of the voiceless sibilant fricatives. For each speaker, words containing voiceless postalveolar sibilants were selected, as listed in Table 1. For each token, a 40-ms window in the middle of the sibilant was selected, and the spectral envelope of the window was extracted. The averaged spectral envelopes across speakers are shown in Figure 6. We note that these analyses serve as a preliminary study only, since the tokens used for spectral analysis were not strictly controlled for syllable position and vowel quality; however, they offer a basis for future hypothesis formation and investigation.

	orthography	transcription		number of tokens	
				Speaker 1	Speaker 2
onset	<i>scial</i>	/s̥al/	‘shawl’	2	2
	<i>sciampar</i>	/s̥am'par/	‘to run away’	2	2
	<i>sciodo</i>	/'s̥odo/	‘hard’	2	2
	<i>sciudar</i>	/s̥u'dar/	‘to warm up’	2	2
	<i>scigol</i>	/'s̥igol/	‘whistle’	2	2
coda	<i>pasc</i>	/pas/	‘peace’	3	2
	<i>dasc</i>	/das/	‘give 3.SG.PRS’	2	2
	<i>orsc</i>	/ors/	‘bear PL’	5	5

a. *Brach*

	orthography	transcription		number of tokens
onset	<i>scial</i>	/s̥al/	‘shawl’	2
	<i>sciamper</i>	/s̥am'pɛr/	‘to run away’	2
	<i>sciodo</i>	/'s̥odo/	‘hard’	2
	<i>sciudèr</i>	/s̥u'dɛr/	‘to warm up’	2
	<i>scigol</i>	/'s̥igol/	‘whistle’	2
coda	<i>pèsc</i>	/pɛs/	‘peace’	15
	<i>dasc</i>	/das/	‘give 3.SG.PRS’	2
	<i>orsc</i>	/ors/	‘bear PL’	2

b. *Cazet*

	orthography	transcription		number of tokens
onset	<i>scial</i>	/s̥jal/	‘shawl’	2
	<i>piscia</i>	/'p̥isa/	‘urinate 3.SG.PRS’	2
	<i>sciodo</i>	/'s̥odo/	‘hard’	2
	<i>spudar</i>	/s̥pu'dar/	‘spit’	3
	<i>scior</i>	/s̥jor/	‘gentleman’	2
coda	<i>lösc</i>	/lɔs/	‘place PL’	2
	<i>dasc</i>	/das/	‘give 3.SG.PRS’	2
	<i>orsc</i>	/ors/	‘bear PL’	4

c. *Moénat*

Table 1. Words for spectral analyses of /s̥/.

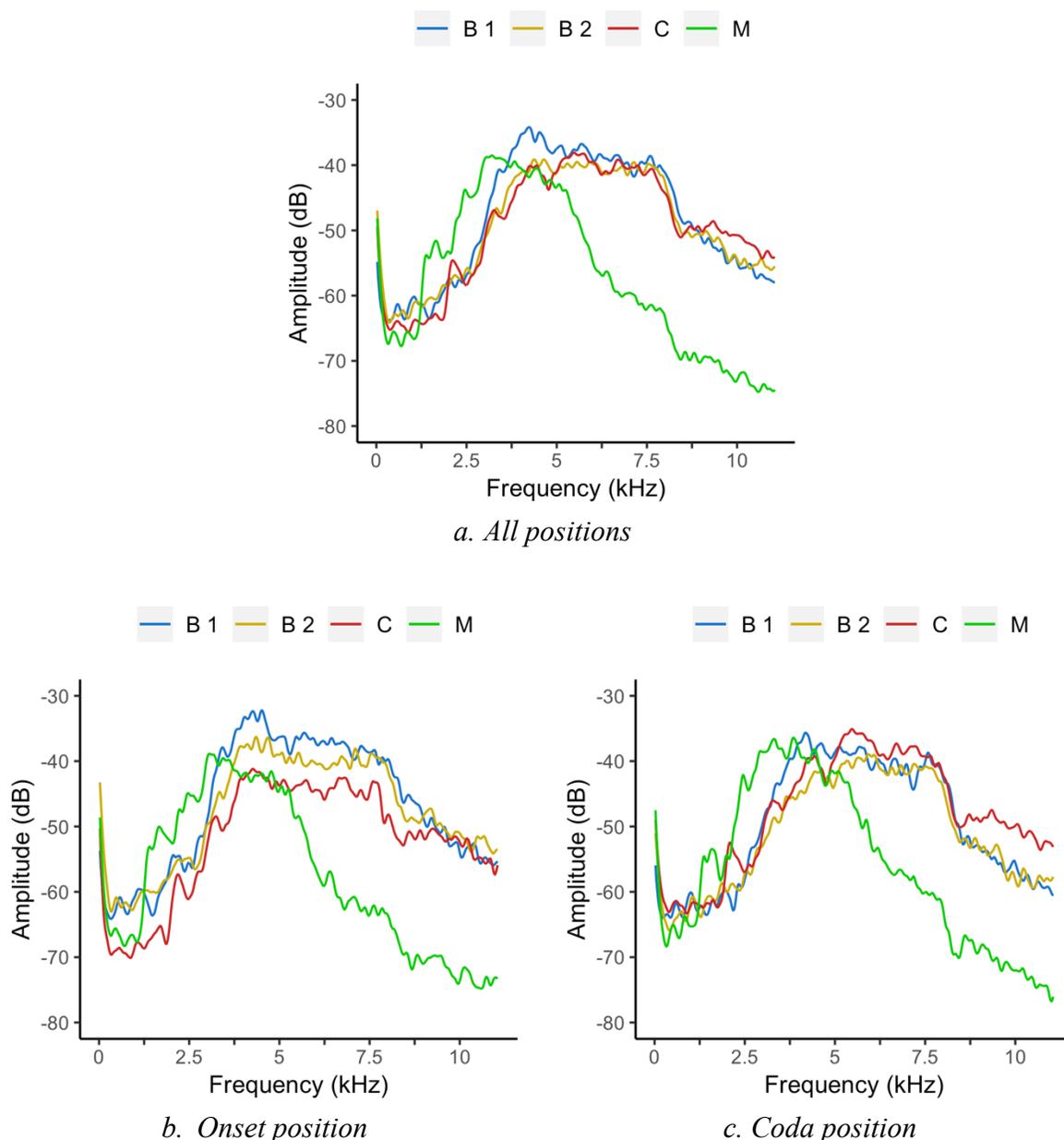
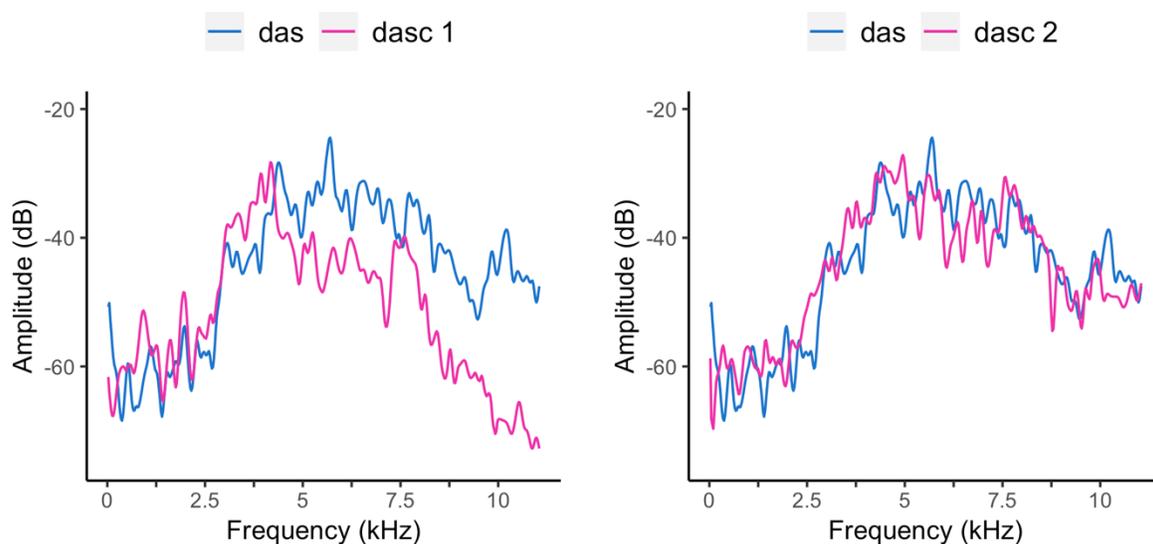


Figure 6. Averaged raw spectra of voiceless postalveolar sibilant /s/. Spectra are averaged by speaker: 'B1' (Brach speaker 1), 'B2' (Brach speaker 2), 'C' (Cazet speaker), and 'M' (Moenat speaker). Upper panel shows spectra for /s/ in all positions, lower left panel for /s/ in onset position, and lower right panel for /s/ in coda position.

The general spectral shape for /s/ produced by the Moenat speaker is distinguishable from that of the others, with a peak at lower frequency around 2500 Hz – 3000 Hz, across syllable positions. This suggests that the voiceless postalveolar fricative for the Moenat speaker is qualitatively different.

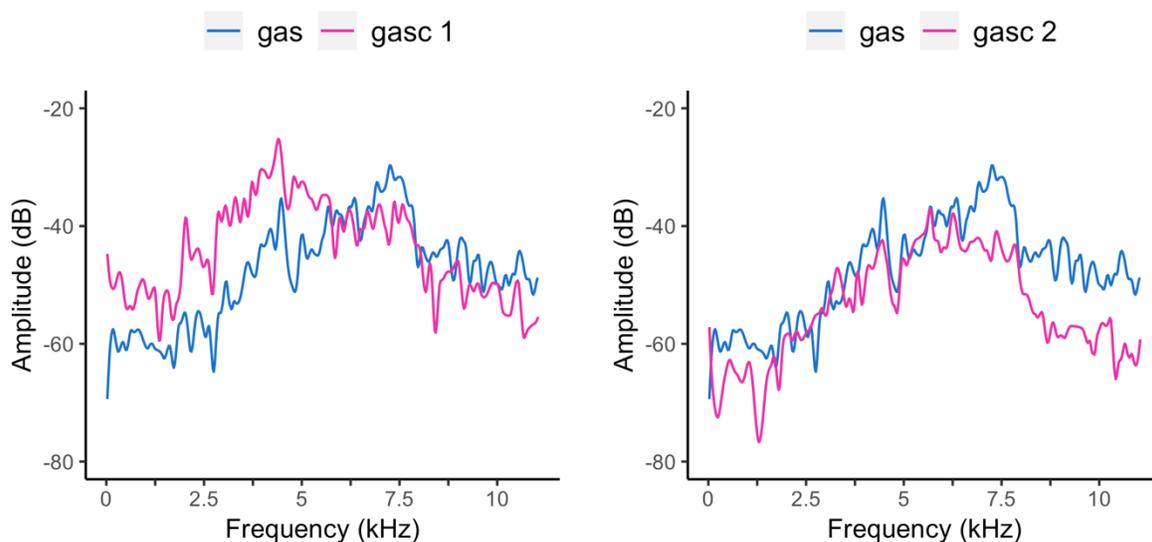
As for the Brach and Cazet speakers, more intraspeaker variation for the phonetic realization of the postalveolar fricatives was found, including the degree of fronting and (near-)merger with the dental/alveolar fricative. For instance, for a Brach speaker, two tokens of /das̥/ *dasc* ‘give 3.SG.PRS’ that were acquired from randomized word lists are compared with a token of /das/ *das* ‘give 2.SG.PRS’ in Figure 7, where the spectral information of the sibilants is extracted and illustrated with the same method introduced above. In Figure 7-a, the sibilant in /das̥/ [das̥] *dasc* ‘give 3.SG.PRS’ shows a different spectral shape from the sibilant in /das/ [das] *das* ‘give 2.SG.PRS’, while in Figure 7-b, the sibilant in the other token of /das̥/ [das̥] *dasc* ‘give 3.SG.PRS’ nearly merges with the dental/alveolar sibilant. A similar comparison between /gas/ [gas] *gas* ‘gas.SG’ and two tokens of /gas̥/ [gas̥, gas] *gasc* ‘gas.PL’ is given in Figure 8 for the Cazet speaker.



a. /das̥/ [das̥] *dasc* ‘give 3.SG.PRS’ token 1

b. /das̥/ [das̥] *dasc* ‘give 3.SG.PRS’ token 2

Figure 7. Two tokens of dasc compared with a token of das produced by a Brach speaker. The spectra of the sibilants were extracted and plotted. Figure 7-a shows a distinctive spectral shape with a peak at lower frequency for the sibilant in dasc; Figure 7-b shows near-merger.

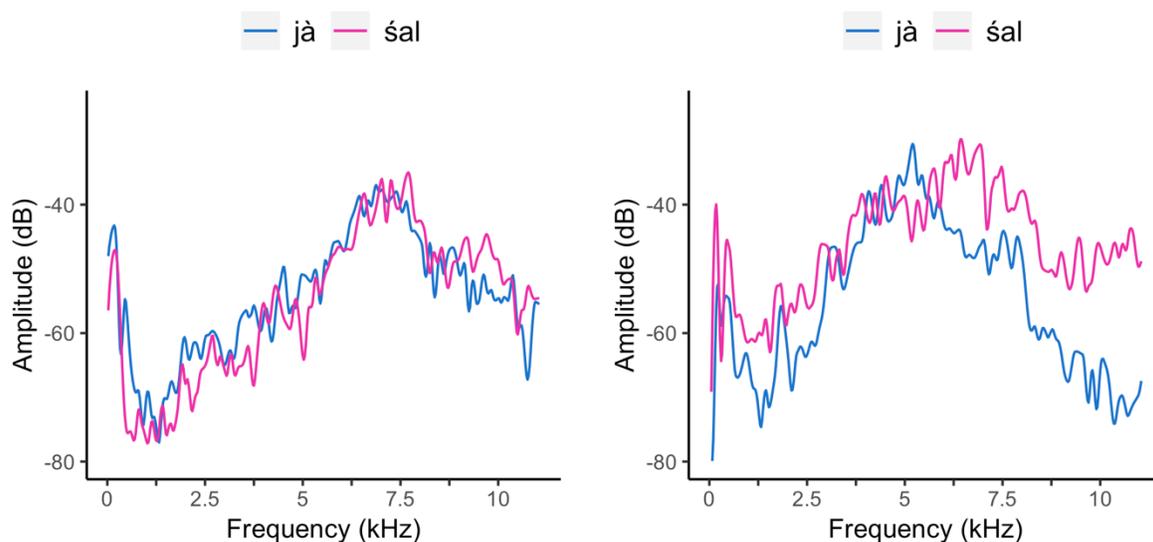


a. /gas/ [gas] *gasc* 'gas.PL' token 1

b. /gas/ [gas] *gasc* 'gas.PL' token 2

Figure 8. Two tokens of *gasc* compared with a token of *gas* produced by a Cazet speaker. The spectra of the sibilants were extracted and plotted. Figure 8-a shows a distinctive spectral shape with a peak at lower frequency for *gasc*; Figure 8-b shows near-merger, especially below 7,000 Hz, though some difference can be still observed at higher frequencies.

Voiced sibilants are relatively rare in Val di Fassa Ladin. Although the contrast between /z/ and /z̥/ is maintained by the Brach and Moenat speakers, this contrast is almost neutralized for the Cazet speaker, as illustrated by the comparison between the sibilants in Cazet [za] *jà* 'already' and [zal] *śal* 'yellow' in Figure 9-a. Figure 9-b illustrates that the sibilants in the same words are pronounced distinctly as [za] *jà* 'already' and /zal/ [zal] *śal* 'yellow' by a speaker of Brach.



a. *jà* ~ *śal*, Cazet speaker

b. *jà* ~ *śal*, Brach speaker

Figure 9. The sibilants in *jà* and *śal* pronounced by the Cazet speaker and a Brach speaker. Figure 9-a shows near-merger between the sibilants in *jà* and *śal*; Figure 9-b shows distinctive spectral shapes.

Final devoicing

Voiced obstruents become voiceless in word-final position. Some alternations are illustrated with word pairs from Moenat.

Voiceless final obstruent			Voiced intervocalic obstruent		
[bono'rif]	<i>bonorif</i>	'early'	[bono'rives̩]	<i>bonorives</i>	'early PL'
['uʃ]	<i>usc</i>	'door'	['uz̩eʃ̩]	<i>ujes</i>	'door PL'
[ʃpak]	<i>spach</i>	'string'	[ʃpage̩]	<i>spaghes</i>	'string PL'

Note that intervocalic voiceless obstruents are permissible, for example, ['tʃof̩eʃ̩] *ciofes* 'lock (of hair), bunch (of flowers) PL', ['gr̩oʃ̩eʃ̩] *gropes* 'knot PL' (Moenat), confirming that the above alternations are the product of final devoicing rather than intervocalic voicing.

Nasal assimilation

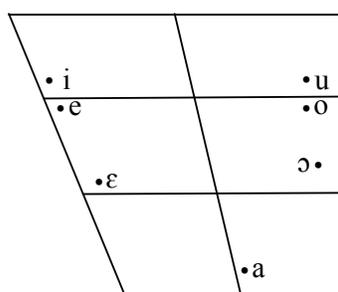
Nasals are homorganic with a following consonant in coda clusters. In all three varieties, this results in [ŋ] before [k], as in [foŋk] *fonch* 'mushroom'. Further examples of homorganic nasals are provided from Moenat.

[mp]	[tʃamp]	<i>ciamp</i>	‘field’
[mʃf]	[ʃtimʃf]	<i>stinf</i>	‘sock’
[nt]	[i'nant]	<i>inant</i>	‘before’
[nʧʃ]	[manʧʃ]	<i>manc</i>	‘young bull PL’
[ŋk]	[lonʧk]	<i>lonch</i>	‘long’

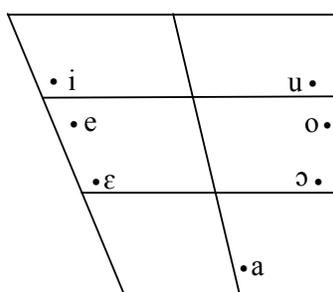
Vowels

Monophthongs

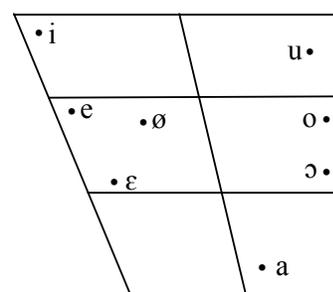
The speakers of Brach and Cazet have seven phonemic vowels, /i u e o ε ɔ a/, consistent with Standard Fascian Ladin (Chiocchetti & Iori 2002). The Moenat speaker has an eight-vowel inventory, with an additional mid rounded vowel /ø/, consistent with previous research on Moenat (Heilmann 1955). The vowel chart for each variety is illustrated below, followed by lists of (near-)minimal pairs. In the following charts, the relative position of the vowels is marked on the basis of the formant charts shown later in this section. As with the consonants, a separate list of words was formed for each variety due to cross-varietal differences.



Brach speakers



Cazet speaker



Moenat speaker

Brach

i / u / o

/ˈpitsa/ *piza* ‘itch (noun)’

/ˈputsa/ *puza* ‘bad smell’

/ˈpotsa/ *poza* ‘puddle of water’

i vs. e

/pik/ *pich* ‘pick’/pek/ *pech* ‘baker’

e vs. o

/pet/ *pet* ‘fart’/pots/ *poz* ‘water well; puddle of water’

e / ε / a

/pets/ *pec* ‘fir’/pets/ *pez* ‘period of time’/pats/ *paz* ‘dirty’

ε vs. ɔ

/tεk/ *tech* ‘soft’/tɔk/ *toch* ‘piece’

o / ɔ / a

/bot/ *bot* ‘barrel’/bɔt/ *bòt* ‘heart attack; pop sound’/bat/ *bat* ‘knock down/hit/beat 3.SG.PRS’

Cazet

i / u / o

/’pitsa/ *piza* ‘itch (noun)’/’putsa/ *puza* ‘bad smell’/’potsa/ *poza* ‘puddle of water’

i vs. e

/pik/ *pich* ‘pick’/pek/ *pech* ‘baker’

e vs. o

/kel/ *chel* ‘that’

/ˈkɔla/	<i>cola</i>	‘filter 3.SG.PRS’
e vs. ε		
/pɛs̄/	<i>pesc</i>	‘fish’
/pɛs̄/	<i>pèsc</i>	‘peace’
ε vs. ɔ		
/pɛst/	<i>pest</i>	‘plague’
/pɔst/	<i>pòst</i>	‘a place’
ε / o / a		
/pɛts/	<i>pez</i>	‘period of time’
/pats/	<i>paz</i>	‘dirty’
/pɔts/	<i>poz</i>	‘water well; puddle of water’
o vs. ɔ		
/son/	<i>son</i>	‘sound’
/sɔrt/	<i>sòrt</i>	‘kind, sort; destiny’
ɔ vs. a		
/bɔt/	<i>bòt</i>	‘heart attack; pop sound’
/bat/	<i>bat</i>	‘knock down/hit/beat 3.SG.PRS’

Moenat

i / u / e / ε / a

/mis/	<i>miz</i>	‘wet’
/mus/	<i>mus</i>	‘face’
/mes/	<i>mes</i>	‘month’
/mɛs/	<i>mez</i>	‘half’
/mas/	<i>maz</i>	‘deck of cards’

e vs. o

/pɛts/	<i>pec</i>	‘fir’
/pɔts/	<i>poc</i>	‘water well PL’

ε vs. ɔ

/tɛk/	<i>tech</i>	‘wet’
/tɔk/	<i>toch</i>	‘piece’
o vs. ɔ		
/bot/	<i>bot</i>	‘barrel’
/bɔt/	<i>bòt</i>	‘heart attack; pop sound’
ɔ vs. a		
/ɔs/	<i>os</i>	‘bone’
/as/	<i>as</i>	‘ace’
ø vs. e		
/nøf/	<i>nöf</i>	‘new’
/nef/	<i>nef</i>	‘snow’
ø vs. o		
/kør/	<i>cör</i>	‘heart’
/kor/	<i>cor</i>	‘run 3.SG.PRS’
ø vs. ɔ		
/nø̥s̥/ ⁵	<i>nösc</i>	‘our PL’
/nɔ̥s̥/	<i>nosc</i>	‘our SG’

Though the vowel inventory across the speakers is broadly similar, some differences are found in vowel quality, which can be observed quantitatively. To illustrate differences in vowel quality, seven words selected from Brach and Cazet and eight from Moenat were repeated ten times by the speakers, and the formants (F1 and F2) were extracted and analyzed with the Praat script *FormantPro* (Xu & Gao 2018). Outliers were excluded⁶. The formant charts in Figure 10-12 below were created with the phonR library in R (McCloy 2016). The words used for measurements are listed below.

Brach

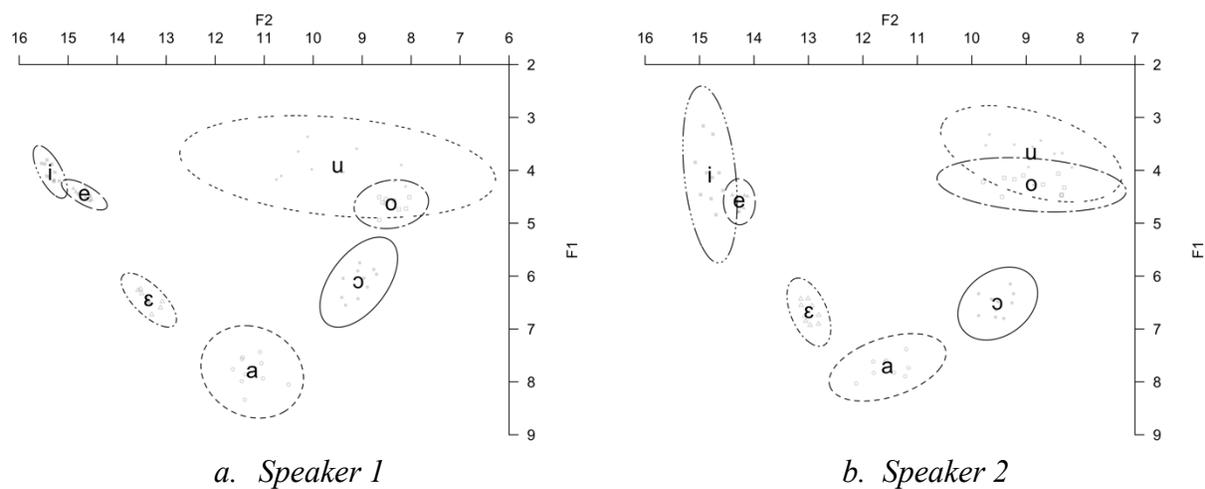


Figure 10. Vowel formants in Bark scale for each of two female Brach speakers. The ellipsis indicates 95% confidence level.⁷

Vowel	Transcription	Orthography	Gloss
/i/	/pik/	<i>pich</i>	‘pick’
/u/	/'putsa/	<i>puza</i>	‘bad smell’
/e/	/pek/	<i>pech</i>	‘baker’
/o/	/'potsa/	<i>poza</i>	‘puddle of water’
/ɛ/	/pets/	<i>pez</i>	‘period of time’
/ɔ/	/bɔt/	<i>bòt</i>	‘heart attack; pop sound’
/a/	/pats/	<i>paz</i>	‘dirty’

Cazet

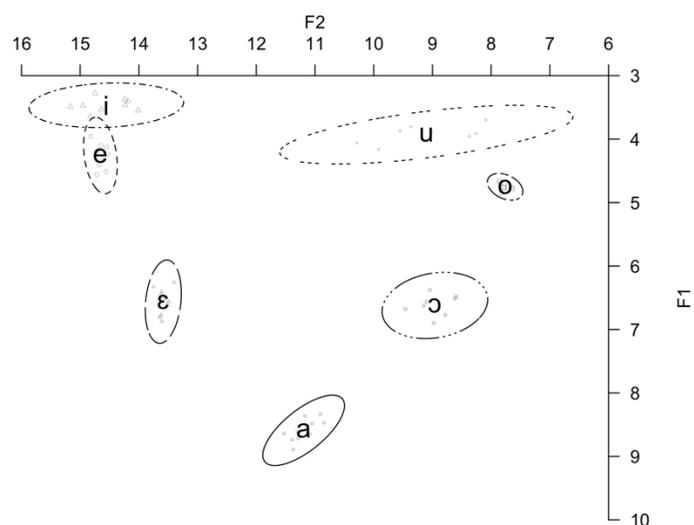


Figure 11. Vowel formants in Bark scale for a female Cazet speaker. The ellipsis indicates 95% confidence level.⁸

Vowel	Transcription	Orthography	Gloss
/i/	/pik/	<i>pich</i>	‘pick’
/u/	/’putsa/	<i>puza</i>	‘bad smell’
/e/	/pes/	<i>pesc</i>	‘fish’
/o/	/pots/	<i>poz</i>	‘water well; puddle of water’
/ɛ/	/pɛs/	<i>pèsc</i>	‘peace’
/ɔ/	/pɔst/	<i>pòst</i>	‘a place’
/a/	/pats/	<i>paz</i>	‘dirty’

Moenat

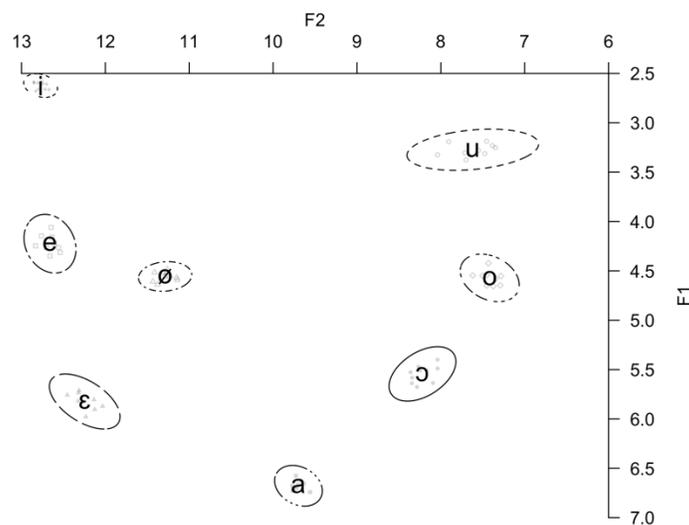


Figure 12. Vowel formants in Bark scale for a male Moenat speaker. The ellipsis indicates 95% confidence level.⁹

Vowel	Transcription	Orthography	Gloss
/i/	/p̥is/	<i>pis</i>	‘top (of mountain)’
/u/	/but/	<i>but</i>	‘bud (of flower)’
/e/	/pe̥s/	<i>pesc</i>	‘fish’
/ø/	/nøf/	<i>nöf</i>	‘new’
/o/	/pos/	<i>poz</i>	‘water well; puddle of water’
/ɛ/	/mɛs/	<i>mez</i>	‘half’
/ɔ/	/bɔt/	<i>bòt</i>	‘heart attack; pop sound’
/a/	/pḁs/	<i>pasc</i>	‘peace’

For the speakers of Brach the data are reported in separate panels for each speaker in Figure 10. The acoustic variation for each vowel is illustrated by an ellipsis, with a confidence level of 95% (likewise for the other speakers). For the Brach speakers, there is overlap between high vowels /i u/ and mid-close vowels /e o/, showing a tendency towards a merger. For the speaker of Cazet, mid-close vowels are close to the high vowels, similar to the Brach speakers, as shown in Figure 11. In contrast, the vowels in Moenat are more evenly distributed in the vowel space, as in Figure 12.

Diphthongs and triphthong

Our discussion of diphthongs and triphthongs focuses on Moenat. There are eight diphthongs in Moenat: /eu, ou, au, ei, oi, øi, ɛi, ai/. The list below gives examples of the diphthongs, including a phrase with vowels and diphthongs only.

<i>Diphthong</i>	<i>Transcription</i>	<i>Orthography</i>	<i>Gloss</i>
/eu/	/ze'neure/	<i>zeneure</i>	'juniper'
/ou/	/lou/	<i>lou</i>	'wolf'
	/zou/	<i>jou</i>	'yolk'
/au/	/lau/	<i>l'au</i>	'the bee F'/'the grandfather M'
	/sauts/	<i>sauc</i>	'jump PL'
/ei/	/pei/	<i>pei</i>	'body hair PL'
	/deits/	<i>deic</i>	'finger PL'
/oi/	/doits/	<i>doic</i>	'sweet'
	/doi/	<i>doi</i>	'two'
/øi/	/vøit/	<i>vøit</i>	'empty'
	/sføi/	<i>sføi</i>	'sheet of paper'
/ɛi/	/ɛi/	<i>ei</i>	'yes'
	/dzei/	<i>gei</i>	'come SG.IMP'
/ai/	/lai/	<i>l'ai</i>	'the garlic'
	/ai'dar/	<i>aidar</i>	'to help'

/aεo ai ɔio e ua ɛi/ *Aeo ai, oio e ua? Ei!* 'Do you have garlic, oil and grapes? Yes!'

Though there are eight diphthongs in Moenat, /eu/, /ou/, and /ɛi/ are rare. In most cases, /ou/ in Brach and Cazet corresponds to /oi/ in Moenat, and it is not very common. Our speaker was aware of only two Moenat words in which /ɛi/ exists. Despite the rarity of /ɛi/, there is a clear difference in quality between /ei/ and /ɛi/ for our speaker of Moenat. The figure below shows time-normalized formant trajectories of /ei/ and /ɛi/ extracted from multiple Moenat words containing these diphthongs. In the graph below, /ɛi/ shows a stable portion of /ɛ/, in contrast to /ei/.

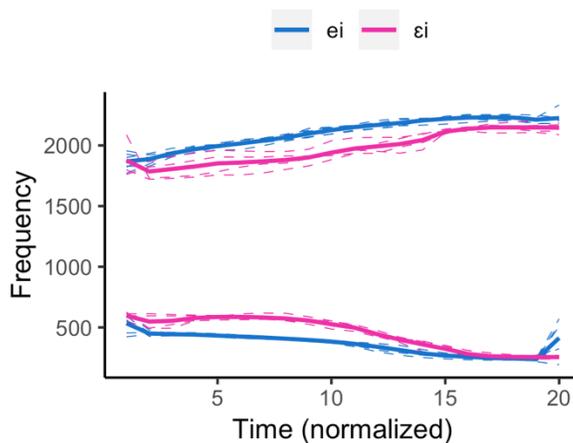


Figure 13. F1 and F2 trajectories of /ɛi/ and /ei/ in words produced by the Moenat speaker, extracted from multiple tokens of *gei* /d͡zɛi/ (2 tokens), *ei* /ɛi/ (2 tokens), *deit* /deit/ (2 tokens), *deic* /deits/ (2 tokens), and *pei* /pei/ (2 tokens). The formants are time-normalized automatically by FormantPro (Xu & Gao 2018). The dashed lines indicate the raw trajectories of each token; the solid lines are the average trajectories.

There are also several combinations that are usually called ‘rising diphthongs’, such as /je/, /jø/, /jɛ/, /ja/, /ju/, /jo/, and /jɔ/. However, in related languages such as Italian, these are usually viewed as a sequence of a glide and vowel, where the glide is analyzed as part of a complex onset (e.g. Krämer, 2009). Therefore, we do not describe these combinations in detail.

In Moenat, there is only one sequence of a glide followed by a diphthong, /jøi/, which is traditionally called a triphthong. Some examples are given below, followed by a spectrogram illustrating the formant trajectories.

<i>Transcription</i>	<i>Orthography</i>	<i>Gloss</i>
/mjøi/	miöi	‘my PL’
/tjøi/	tiöi	‘your PL’
/sjøi/	siöi	‘his/her PL’

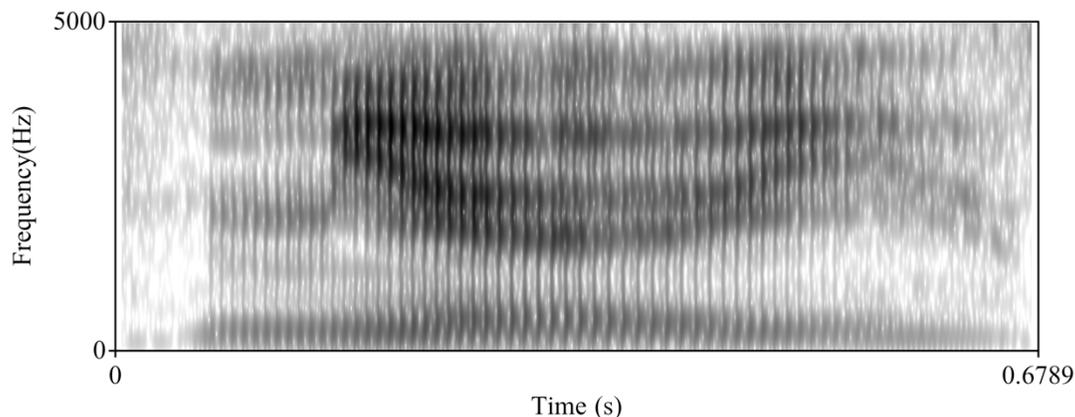


Figure 14. Spectrogram of *mjöi*

Word stress

In general, primary stress falls on one of the last three syllables in a word. Illustrations of stress in each of these positions are provided with words from Moenat.

Final stress

/ka'ʒtra/ *castrà* 'castrated'

/bono'rif/ *bonorif* 'early ADJ'

Penultimate stress

/ʒi'ʒola/ *gnignola* 'lizard'

/'sezla/ *sesla* 'sickle'

Antepenultimate stress

/'femena/ *fèmena* 'woman'

/'tsaneva/ *ciàneva* 'cellar'

In the orthographic tradition that we follow here, the stressed syllable may be indicated by an accent mark. The accent mark is grave for all vowels except those pronounced as close-mid /e/ or /o/, for which the accent is acute. An accent is regularly marked in words ending in a vowel with stress on the final syllable and to indicate the pronunciation of words with vowel hiatus, such as /sa'uk/ *saùch* 'cricket, grasshopper; elder tree' (Brach), which is pronounced distinct from a diphthong /'au/. An accent is often used in words ending in a vowel with stress on the antepenultimate syllable, and in words ending in a stem consonant with stress on the penultimate

syllable, e.g. /'tsekol/ *zécól* 'stick' (Brach). It is also sometimes marked on a mid vowel in a penultimate stressed syllable regardless of the word shape to indicate whether the vowel is open mid or close mid. According to these conventions, when no accent mark is present in a polysyllabic word, stress is most often penultimate. Further research is needed to gain insight into Ladin foot structure and any categorical or gradient influences of word shape on the locus of stress assignment.¹⁰

Illustrative passage in transcription

The North Wind and the Sun

Brach

Orthographic transcription

Na di l vent del nord e l soreie i costionaa su chi che l'era l più fort, canche l'é passà n viajador fat ite te n ciaut mantel. Chisc i se à metù a una che l prum che fossa stat bon de ge far tirar fòra so mantel l fossa stat conscidrà più fort che chel auter. Emben l vent del nord l'à sofia più fort che l podea, ma più fort che l sofiaa e più l viajador se fajea ite te so mantel; e tinultima l vent del nord à zedù. Te chel moment l soreie l'à tacà a sciudar, e sobito l viajador se à tirà fòra so mantel. E coscita l vent del nord à cognù ameter che l soreie l'era l più fort di doi.

Phonemic transcription

na di ɭ ven del nɔrd el so'reie i koʃtjo'na su ki ke 'lera ɭ pju fɔrt, 'kanke le pa'san vjaza'dor fat 'ite ten tʃau man'tel. kiʃ i se a me'tu a 'una kel prum ke 'fosa ʃta bon de dze far ti'rar 'fɔra so man'tel ɭ 'fosa stat (...) ¹¹ konʃi'dra pju fɔrt ke kel 'auter. em'ben ɭ ven del nɔrd la 'sofia pju fɔr kel po'dea, ma pju fɔrt kel sofi'a e pjul vjaza'dor se fa'ze 'ite te so man'tel; e ti'nultima ɭ vent del nɔrd a tse'du. te kel mo'ment ɭ so'reie la ta'ka a ʃu'dar, e 'sobito ɭ vjaza'dor se a ti'ra 'fora so man'tel. e ko'ʃita ɭ ven del nɔrd a ko'ju a'meter kel so'reie 'lera ɭ pju fɔrt di doi.

Cazet

Orthographic transcription

Na di l vent del nord e l soreie i costionèa su chi che l'era l più fòrt, canche l'é passà n viajador fat ite te n ciaut mantel. Chisc i se à metù a una che l prum che fossa stat bon de ge fèr tirèr fòra l mantel l fossa stat conscidrà più fort che chel auter. Emben l vent del nord l'à sofià più fort che l podea, ma più fort l sofièa più l viajador se fajea ite te si mantel; e inultima l vent del nord à zedù. Cosci l soreie l'à tacà a sciudèr, e sobito l viajador se à tirà fòra si mantel. E coscita l vent del nord à cognù ameter che l soreie l'era l più fort di doi.

Phonemic transcription

na di l vent del nòrd el so'reie i kɔstio'nea su ki ke lera l pju fòrt, 'kanke le pa'san vjaza'dor fat ite ten 'tʃjaut man'tɛl. kis i se a me'tu a 'una kel prum ke 'fosa ʃtat bon de dʒe fɛr tirer 'fɔra l man'tɛl l 'fosa ʃtat kɔŋsi'dra (i) pju fòrt ke kel 'auter. em'bɛn l vent del nòrd la 'sofia pju fòrt ke l po'dea, ma pju fòrt l sɔ'fia pju l vja'zador se fa'zɛ ite te si man'tɛl, e inul'tima (...) el ven del nòrd a 'tsedu. ko'si el so'reie la ta'ka a 'suder, e so'bito l vja'zador se a ti'ra fo'ra si man'tɛl. e ko'sita el vent del nòrd (...) a ko'ŋu a'meter kel so'reie lera pju fòrt di doi.

Moenat

Orthographic transcription

Na di l vent del nord e l sol i costionava su chi che l'era l più fort, canche l'é passà n viajador fat int te n ciaut mantel. Chisc i se à metù a una che l prim che fosse stat bon de ge far tirar fòra so mantel l fosse stat conscidrà più fort che chel auter. Emben l vent del nord l'à sofià più fort che l podeva, ma più che l sofiava e più l viajador l se fajeva int te so mantel; e inultima l vent del nord l'à zedù. En te chela l sol l'à tacà a sciaudar, e subit l viajador se à tirà fòra so mantel. E coscita l vent del nord l'à cognù ameter che l sol l'era l più fort dei doi.

Phonemic transcription

na di el ven del nörd el sol i koſtjo'nava su ki ke lera ɭ pju fört, 'kanke le pa'san vja'zador fat int ten 'tʃjaut man'tel. kiʃ i se a me'tu a 'una kel prim ke 'fose ſtat bon de dʒe far 'tirar fɔ'ra so man'tel el 'fose ſtat koſi'dra pju fört ke ke 'lauter. em'bɛn el vent del nörd la so'fia pju fört kel po'deva, ma pju kel so'fiava e pjul vja'zador el se fa'zɛva int te sɔ man'tel, e inul'tima ɭ vent del nörd la se'du. en te 'kela ɭ sol la ta'ka a ſtʃau'dar, e 'subit el vja'zador se a ti'ra 'fɔra sɔ man'tel. e ko'ʃita ɭ vent del nörd la ko'ŋu a'meter kel sol 'lera ɭ pju fört dei doi.

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References

- Boersma, Paul. 2001. Praat: a system for doing phonetics by computer. *Glott International* 5:9/10, 341–345.
- Chiocchetti, Armin. 2017. Mutamenti fonetici e fonematici nel ladino fassano dagli anni '60 ad oggi. *Mondo Ladino* 41, 13–91.
- Chiocchetti, Nadia & Vigilio Iori. 2002. *Gramatica del ladin fascian*. Vich/Vigo di Fassa: Institut Cultural Ladin “majon di fascegn”.
- Dell'Aquila, Vittorio. 2010. *Comunità ladina*. In Raffaele Simone (ed.), *Enciclopedia dell'italiano*. Roma: Istituto dell'Enciclopedia Italiana G. Treccani.

http://www.treccani.it/enciclopedia/comunita-ladina_%28Enciclopedia-dell%27Italiano%29/

- Dell'Aquila, Vittorio & Gabriele Iannaccaro. 2006. *Survey Ladins. Usi linguistici nelle valli ladine*. Trento: Regione Autonoma Trentino - Alto Adige.
- DILF: *Dizionario italiano-ladino fassano / Dizionèr talian-ladin fascian*, third edition. 2013. Vigo di Fassa: Institut Cultural Ladin “majon di fascegn”.
- Gu, Chong. 2002. *Smoothing Spline ANOVA Models*. New York: Springer.
- Haiman, John & Paola Benincà (eds.). 1992. *The Rhaeto-Romance Languages*. New York: Routledge.
- Heilmann, Luigi. 1955. *La parlata di Moena nei suoi rapporti con Fiemme e Fassa. Saggio fonetico e fonemico*. Bologna: Zanichelli.
- Krämer, Martin. 2009. *The phonology of Italian (Oxford Linguistics)*. New York: Oxford University Press.
- Lewis, M. Paul & Gary F. Simons. 2010. Assessing endangerment: Expanding Fishman's GIDS. *Revue Roumaine de Linguistique* 55(2):103–120. http://www.lingv.ro/RRL_2010_art01Lewis.pdf.
- McCloy, Daniel R. 2012. Vowel normalization and plotting with the phonR package. Ms. http://dan.mccloy.info/pubs/McCloy2012_phonR.pdf. (February 5, 2019)
- Miglio, Viola. 2005. *Markedness and Faithfulness in Vowel Systems*. New York: Routledge.
- Salvi, Giampaolo. 2016. *Ladin*. In Adam Ledgeway & Martin Maiden (eds.), *The Oxford Guide to the Romance Languages*, 154-168. Oxford: Oxford University Press.
- Simons, Gary F. & Charles D. Fennig (eds.). 2018. *Ethnologue: Languages of the World, Twenty-first edition*. Dallas, Texas: SIL International. Online version: <http://ethnologue.com>
- Xu, Yi. and Hong Gao. 2018. FormantPro as a tool for speech analysis and segmentation. *Revista de Estudos da Linguagem* 26:4, 1435-1454.

Footnotes

¹ The consonant /r/ tends to be clearly a trill in more careful speech, while it may be realized as a tap in more casual and faster speech.

² In a few cases, the Cazet speaker's productions did not correspond to the existing dialectological description. However, they might reflect the characteristics of Cazet as spoken by young speakers. Three cases we noted are /fɛl/ *fèl* 'mistake', /bɛl/ *bel* 'beautiful', and /pij/ *pign* 'pine PL'.

³ As illustrated in Figure 7, mid-close vowels are close to the high vowels in Cazet, and therefore, a velar plosive before mid-close vowel /e/ tends to be palatalized, such as /kɛl/ [k^hɛl, c^hɛl] *chel* 'that'.

⁴ A retroflex realization of the postalveolar fricatives was found for three Cazet speakers recorded in 1960 (Chiocchetti 2017), which could suggest that the postalveolar fricative phonemes of Val di Fassa Ladin were historically retroflex, but for the present-day variation among the younger speakers we investigated, the retracted transcription is more widely representative.

⁵ The vowel /ø/ in Moenat is not all that frequent in the lexicon. While we were able to find minimal pairs for /ø/ vs. each of /e/, /o/ and /ɔ/, it contrasts with other vowels in our wordlist in a near-minimal context, between a nasal consonant and a sibilant.

⁶ For each vowel, a token was identified as an outlier if either its F1 or F2 exceeds the lower limit, $Q_1 - 1.5(IQR)$, or higher limit, $Q_3 + 1.5(IQR)$, where Q_1 and Q_3 are the first and third quartile respectively and IQR is the interquartile range.

⁷ For Brach speaker 1, 70 tokens were analyzed, while 67 were plotted; 2 outliers were excluded and 1 token was discarded due to poor recording quality. For Brach speaker 2, 70 tokens were analyzed, while 66 were plotted; 3 outliers were excluded.

⁸ For Cazet, 70 tokens were analyzed, while 65 were plotted; 5 outliers were excluded.

⁹ For Moenat, 80 tokens were analyzed, while 73 were plotted; 7 outliers were excluded.

¹⁰ Accent marks are also employed in some cases for purposes other than marking stress. The presence or absence of an accent mark is used in some monosyllables to distinguish homophones with distinct grammatical status, for example, in *é* 'be 3.SG.PRS' versus *e* 'and'. Further, an accent is used to indicate an /ɛ/ in Cazet that has evolved from stressed /a/, as in *pèrt* 'birth' (Cazet) versus *part* (Brach, Moenat).

¹¹ We use "(...)" to represent where a few words were immediately corrected by the speaker.