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Schmid, Stephan ; Negrinelli, Stefano

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# PALATAL OBSTRUENTS IN TWO RHAETO-ROMANCE VARIETIES: ACOUSTIC ANALYSIS OF A SOUND CHANGE IN PROGRESS

Stephan Schmid & Stefano Negrinelli

University of Zurich, Switzerland  
stephan.schmid@uzh.ch; stefano.negrinelli@uzh.ch

## ABSTRACT

This study provides a comparative analysis of palatal stops and postalveolar affricates in two Rhaeto-Romance varieties, namely i) Jauer, a Romansh dialect spoken in the Canton of Grisons (Switzerland), and ii) Maréo, a Ladin dialect spoken in the province of Bolzano (Italy). An acoustic analysis is carried out on the realizations of ten speakers of each variety, using the spectral mean or ‘Center of Gravity’ in order to verify the degree of difference between the two places of articulation.

The results show an almost complete merger of the two categories in Jauer, whereas Maréo offers a more differentiated picture according to the age factor, given that older speakers appear to be more conservative.

**Keywords:** palatal obstruents, center of gravity, Rhaeto-Romance, sound change

## 1. INTRODUCTION

The diachronic merger of two sound categories often implies the loss of the typologically more marked of the two. For instance, some Northern Italo-Romance dialects have abandoned the contrast between palatal obstruents and postalveolar affricates in favor of the latter. The phoneme /c/ had arisen as an innovation from Latin /k/ before /a/ in many varieties of Northern Italy and France, but then it was replaced either by the reintroduction of /k/ or by a subsequent fronting process, as is witnessed by the French word *chien* [ʃjɛ̃] ‘dog’ as opposed to Italian *cane* [ˈkaːne] (< lat. CĀNE(M)). Palatalization of /k/ before /a/ must have been quite pervasive in large parts of Northern Italy, but nowadays it has survived mainly in conservative dialects spoken in the Alps (cf. [16, 20, 15]). In particular, the retention of /c/ (and of its voiced counterpart /ɟ/) has traditionally been considered to be a characteristic of the so-called ‘Rhaeto-Romance’ language family.

## 2. RHAETO-ROMANCE

Though widely used in the scientific literature, the concept of ‘Rhaeto-Romance’ as a separate subgroup within Romance is not uncontroversial.

Introduced in the late 19th century by Ascoli and Gartner ([1], [5]), the terms ‘Ladin’ and ‘Rhaeto-Romance’ are used to refer to three geographically separated, but allegedly related groups of language varieties: i) Friulian, ii) Dolomitic Ladin, and iii) Swiss Romansh (cf. [9]). It is not the purpose of this study to discuss issues of language classification, but it should nonetheless be pointed out i) that the two dialects analysed here do pertain to two groups of Rhaeto-Romance (Jauer belongs to Romansh and Maréo to Dolomitic Ladin), and ii) that the phenomenon under analysis, i.e. the existence of the phoneme /c/ as an outcome of Latin /k/ before /a/, is the first of a series of criteria established by Ascoli [1] for defining the Rhaeto-Romance unity.

### 2.1. Jauer

Jauer is a subdialect of Vallader, one of the five Romansh idioms; it is spoken in Val Müstair, a valley situated between the lower Engadine and Vintschgau, a German-speaking area of South Tyrol in Italy. According to the Swiss census in the year 2000, Val Müstair had a total population of 1'605 inhabitants, of whom 1'190 (74%) declared themselves native speakers of Romansh. In our study, informants were recorded from the two major villages: Müstair with 543 Romansh speakers (73% of the population), and Sta. Maria with 228 Romansh speakers (70% of the population). Most of the remaining residents are native speakers of (Swiss) German, and all Romansh speakers are bilingual with Swiss German, which is the most spoken variety in the Canton of Grisons. Romansh has served as the language of schooling, either in the variety of Vallader or, more recently, in the standardized norm of *Rumantsch Grischun* (cf. [7]).

The sound system of Jauer has been described in a monograph by Schorta [18]. According to this diachronically oriented study of the dialects spoken in the 1930s, the phonemes /c/ and /tʃ/ exist in the whole valley with the exception of Müstair. The ‘inner valley’ would distinguish two outcomes of Latin /k/: /c/ before /a/ (as in *chaun* [caʊ̃n] ‘dog’ < lat. CĀNE(M)) and /tʃ/ before non-low front vowels (as in *tshaira* [tʃajrɛ] ‘wax’ < lat. CĒRA(M)). In contrast, the dialect of Müstair – located at the Italian border, thus in the ‘outer valley’ – would

yield /c/ in both cases: [caɥn] and [ˈcaɣrɐ]. This merger in favor of the marked element of the opposition – surprising if compared to the diachronic development in similar varieties – is explained by Schorta in sociolinguistic terms, i.e. as a consequence of language contact. The ‘inner valley’ adheres to the Protestant confession, whereas the inhabitants of the ‘outer valley’ are Catholics; therefore, men from Müstair used to marry wives from the neighbouring Vintschgau who learned Jauer as a second language. Now, Tyrolean dialects only have /tʃ/ and lack /c/, but according to Schorta’s hypothesis, the generalization of /c/ in Müstair is due to the hypercorrection of the German-speaking mothers who then transmitted this feature to their children.

During our fieldwork in Müstair, a school teacher reported that children do have difficulties to master the distinction between the graphemes <ch> and <tsch> (which correspond to the phonemes /c/ and /tʃ/). This could imply that the phonemic opposition does not exist anymore in the dialect of Müstair. Nevertheless, it is not clear which of the two consonants has been abandoned: it could also be that the shift goes towards /tʃ/, as suggested by a recent study on the neighbouring Vallader dialect ([17]).

At this point, an additional remark regarding the phonetic nature of the palatal obstruents is in order. For the sake of convenience, we adhere to the traditional labelling of these Romansh consonants as palatal stops, e.g. /c/ (cf. [12]). However, a different transcription of the same sound can be found, i.e. [tʃ] which refers to an alveolo-palatal affricate (cf. [8]). It lies outside the scope of the present study to verify the exact place of articulation of these consonants; regarding the manner of articulation, it is true that “the palatal stops in many languages tend to be more affricated than the others, perhaps because of the mechanical difficulty of quickly withdrawing the front of the tongue” [11].

## 2.2. Maréo

Maréo is one of the six dialects of Dolomitic Ladin; it is spoken in the commune of Maréo, situated in a side valley of Val Badia. According to the Italian census, the municipality of Maréo had 2’914 residents in 2011, among whom 92% were native speakers of Ladin. Children receive instruction in their mother tongue, but all Maréo speakers are to be considered trilingual with Maréo-German-Italian, as the valley belongs to the trilingual province of Bolzano (Germ. Bozen).

Traditional accounts of the Maréo sound system (e.g., [10]) indicate the presence of the phoneme /c/

as an outcome of Latin /k/ before /a/ (e.g., [caˈval] ‘horse’ < lat. CĀBALLU(M)) and of /tʃ/ as an outcome of lat. /k/ before non-low front vowels (e.g., /ˈtʃejes/ ‘eyelashes’ < lat. CILIA).

## 3. DATA AND METHOD

### 3.1. Corpus

In order to test the vitality of the /c/ ~ /tʃ/ contrast in Jauer and Maréo, fieldwork was done in June 2011. Interviews were conducted with speakers of different ages mainly in their homes, using digital recorders (Fostex FR-2LE and Marantz PMD 671) which were connected to external omni-directional lavalier microphones (Sennheiser MKE 2 P-C). Recordings were made in .wav format at 44.1 kHz/16 bits.

In both valleys we interviewed ten speakers from two different villages. Table 1 provides some biographical information about the informants from Val Müstair (five of each village and gender).

**Table 1:** Jauer informants.

Speaker	Village	Gender	Age
AnC	Müstair	f	67
JaM	Müstair	f	70
PrG	Müstair	m	39
GiC	Müstair	m	54
PeA	Müstair	m	67
ReB	Sta. Maria	f	68
RaR	Sta. Maria	f	30
AIL	Sta. Maria	f	91
MaC	Sta. Maria	m	36
RaS	Sta. Maria	m	45

A questionnaire containing 34 words was used to elicit the six consonants /tʃ dʒ c ɟ k g/ in word-initial position, followed by different vowels in order to neutralize possible coarticulation effects. The words were suggested in their German translation to the informants, who then repeated them three times embedded in the carrier sentence *Jau n’ha dit X la prüma/segunda/terza jada* (‘I said X for the first/second/third time’).

In Maréo, we again recorded ten speakers (six females and four males) from two different villages, i.e. the main village of the municipality Al Plan de Maréo and the hamlet La Pli de Maréo (cf. Table 2).

The Maréo questionnaire contained 35 words with initial /tʃ dʒ c ɟ k g/ followed by different vowels. Informants were asked to translate the words from a German stimulus and then to repeat them within the carrier sentence *Iu à dit X por le pröm/secundo/terzo iade* (‘I said X for the first/second/third time’).

**Table 2:** Maréo informants.

Speaker	Village	Gender	Age
ErV	Al Plan	f	73
EmM	Al Plan	f	78
LyA	Al Plan	f	78
EmF	Al Plan	f	89
LoE	Al Plan	m	73
TeP	La Pli	f	62
MaD	La Pli	f	76
PaW	La Pli	m	29
GiA	La Pli	m	53
GiP	La Pli	m	77

### 3.2. Acoustic Analysis

In order to acoustically determine the place of articulation of obstruents, two different methods can be applied. As regards stops, some scholars analyze the formant transition patterns of the following vowels according to the classical ‘locus theory’ (e.g., [3]); a more recent elaboration of this method calculating ‘locus equations’ ([19]) has been applied to the study of palatal stops in a dialect of Northern Italy ([15]).

An alternative approach instead looks at the distribution of the spectral noise produced during the articulation of the obstruents themselves. For instance, it has been shown that calculating four ‘spectral moments’ – i.e. mean, variance, skewness, and kurtosis – allows one to discriminate the place of articulation of English stops ([4]). In particular the first spectral moment, also called ‘Center of Gravity’, has permitted to distinguish between different fricatives in a number of languages ([6]). In this study, we use the Center of Gravity (CoG) in order to verify the vitality (or the lack) of the distinction between /tʃ/ and /c/. We assume that CoG correlates with place of articulation, thus expecting to find higher mean values for the postalveolar consonant.

The data have been analysed with the software *Praat* ([2]). We i) annotated the release phase of the sounds on a Textgrid, ii) extracted the selected parts, iii) created a ‘spectrum object’, and iv) calculated the spectral moments using the functions offered by the ‘query’ menu. The procedure has been automated with the help of a script.

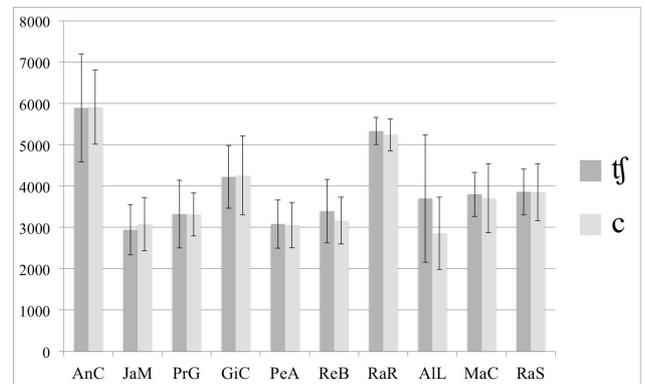
## 4. RESULTS

### 4.1. Jauer

Figure 1 reports the mean CoG values of [tʃ] and [c] and their standard deviations for the ten Jauer speakers – to the left the informants from Müstair

(AnC–PeA) and to the right the informants from Sta. Maria (ReB–RaS). The number of tokens uttered by each speaker for the two types ranges from 14 to 31; all in all, 499 measurements were computed.

**Figure 1:** Center of Gravity (in Hz) of [tʃ] and [c] for ten Jauer speakers



All in all, the acoustic measurements show that the the two consonants are rather similar: the mean CoG of all speakers for [tʃ] (4027 Hz) is only slightly higher than for [c] (3864 Hz). Indeed, an unpaired t-test revealed no significant difference between the two consonants:  $t(497) = 1.47$ ,  $p = .14$ .

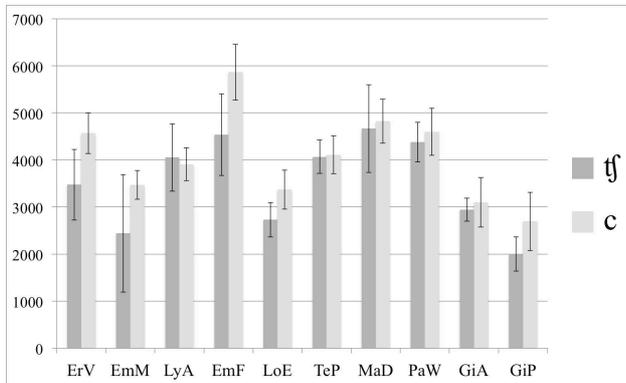
Regarding possible differences between the two villages of Müstair and Sta. Maria, an univariate ANOVA with two independent variables (consonant, village) yielded no effect of ‘consonant’ nor of ‘village’, and no interaction between the two. We might deduce from this that the dialectal difference between the two villages described by Schorta ([18]) does not exist anymore.

Nevertheless, one can detect a certain relationship between the age of the speakers and the degree of CoG difference, which results from the subtraction of the mean CoG of [c] from the mean CoG of [tʃ]. In Müstair, the situation is not very clear, as three speakers have higher mean CoG values for [c] than for [tʃ], whereas we would have expected the opposite (Pearson correlation coefficient  $r$  of -0.43). Sta. Maria, on the contrary, offers a more homogeneous picture, as older speakers seem to keep apart the two consonants somewhat better (Pearson correlation coefficient  $r = 0.89$ ), and here we find the expected higher CoG for [tʃ]. Finally, and most interestingly for the purpose of this study, we observe that one speaker does indeed distinguish between the two consonants: ALL, by far the oldest informant (a 91 year old female from Sta. Maria) has a mean CoG of 3700 Hz for [tʃ] as opposed to 2855 Hz for [c].

## 4.2. Maréo

Figure 2 reports the mean CoG values ( $\pm$  standard deviations) of [tʃ] and [c] for the ten Maréo speakers.

**Figure 2:** Center of Gravity (in Hz) of [tʃ] and [c] for ten Maréo speakers



To the left we find the informants from Al Plan (ErV–LoE) and to the right the informants from La Pli (TeP–GiP). The number of tokens uttered by each speaker for the two consonant types ranges from 5 to 24; all in all, 272 measurements were computed.

The acoustic measurements again show a rather small CoG difference (199 Hz) between the two places of articulation, but in the opposite direction than in the case of Jauer: the mean CoG of all speakers amounts to 3810 Hz for [tʃ] and to 4009 for [c]. Not surprisingly, an unpaired t-test failed to show a significant difference between the two consonants:  $t(270) = 1.79$ ,  $p = .07$ .

Descriptively, some differences between the two villages can be observed. In Al Plan, four out of five informants show a mean CoG of [c] which is clearly higher than the one for [tʃ]: the differences amount to 1098 Hz (ErV), 1031 Hz (EmM), 1327 Hz (EmF), and 641 Hz (LoE); only LyA shows a slightly slower CoG for [c]. Similarly, the speakers from La Pli always have a higher mean CoG for [c], but the differences are smaller, ranging from 43 Hz in the case of TeP to 218 Hz in the case of PaW; only for GiP, the oldest male speaker from La Pli, we find a CoG of [c] which is 696 Hz higher than the one of [tʃ]. All in all, the mean CoG difference between the two consonants is considerably higher in Al Plan (791 Hz) than in La Pli (254 Hz). Nevertheless, an univariate ANOVA for all ten speakers with two independent variables (consonant, village) yielded a slight effect only of ‘consonant’ ( $F(1, 268) = 3.98$ ,  $p = 0.047$ ), but not of ‘village’, with no interaction between the two.

Finally, the apparent difference between Al Plan and La Pli might be due not so much to the factor ‘village’, but rather to the factor ‘age’. All speakers of Al Plan are more than 70 years old (mean age 78, range 73–89), whereas three speakers of La Pli are less than 70 years old (mean age 59, range: 29–77). Indeed, we find a correlation between the age of all Maréo speakers and their CoG differences: the older the speakers, the more they differentiate between /c/ and /tʃ/, the former having a higher CoG (Pearson correlation coefficient  $r = -0.49$ ).

## 5. CONCLUSION

Regarding the principal research question of our study, i.e. the vitality of the /c/ vs. /tʃ/ contrast in the two Rhaeto-Romance varieties, we have found that the Jauer speakers show more or less the same mean CoG for both consonants. This lack of distinction holds both for male and female speakers, and the small difference between the two villages of Müstair and Sta. Maria fails to be statistically significant. However, the CoG difference is slightly more coherent among the speakers of Sta. Maria, and it is possible that in this village the distinction between the two phonemes was well alive at the times when Schorta wrote his monograph. One piece of evidence comes from the speaker AIL, who does indeed differentiate between [tʃ] and [c]. Note that AIL is not only 21 years older than the second oldest informant, but she is also the only one who was already alive when Schorta wrote his description; therefore, she might represent the last generation of speakers still able to distinguish palatal and postalveolar obstruents.

We thus conclude that Jauer has abandoned the contrast between postalveolar and palatal obstruents and that the sound change under analysis has been completed in this variety. On the contrary, our results suggest that in Maréo the sound change is still underway: the mean CoG of several speakers exhibits a certain distinction between [tʃ] and [c], and apparently this inter-speaker variation correlates with age.

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