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Variations in the realization of the French Accentual Phrase in the light of language contact

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Abstract

In this paper we discuss French prosody in the light of language contact. Data of three contact varieties of French are compared with two varieties spoken in monolingual contexts. The data are semi-automatically processed, and three prosodic features are analyzed: metrical weight of the Accentual Phrases (AP), respect of AP formation constraints, and realizations of sandhi phenomena. Rhythmic constraints and speech rate measurements are also considered. Our findings suggest that the contact varieties share several features with word prosodic systems.

Index Terms: French Prosody, Accentual Phrase, Language contact, Lexical Prosody, Prominence, Tones

1. Introduction

The aim of this paper is to discuss how data from contact varieties can contribute to our knowledge of French prosody. We have studied prosodic features of three contact varieties (henceforth [+contact] varieties): (i) Swiss German French (henceforth SW-GER), spoken by L1 Swiss German speakers living in the French-speaking city Neuchâtel, (ii) Central African French (henceforth AF-CFA), spoken by L1 speakers of Sango, and (iii) Senegalese French (henceforth AF-SN) whose speakers' L1 is wolof (see 3). The [+contact] varieties are compared with two control groups of monolingual French-speakers (henceforth [-contact] varieties): Parisian speakers (FR-75) and Neuchâtel speakers (SW-NE).

The prosodic system of French differs from the speakers' L1 prosodic systems in that prosodic features are not assigned at the lexical, but at the phrasal level [1]-[9]: the domain of primary stress and pitch accents, the **Accentual Phrase (**henceforth **AP)**, can consist of several content words and French has therefore been described as being more of a "boundary language" than an accent language. In contrast, prosodic features are assigned at the lexical level in all the L1s: Swiss German and Wolof have lexical stress and Sango has lexical tones.

Prosodic transfers in contact varieties are commonly attested (*cf.* similar studies of other contact varieties, such as [10]-[12]) and the prosody of each [+contact] variety may present several idiosyncrasies. Our main interest in this paper is phrasing: we hypothesize that a feature shared by the speakers of the [+contact] varieties is that they segment the speech flow into smaller units than APs, as a result of contact with the lexical systems of their L1s. Statistical tests and the agglomerative hierarchical clustering method are used to assess significant differences between the [+contact] and [-contact] varieties as well as their degree of proximity.

2. Background

The French **Accentual Phrase** [3] has been extensively described ([4]-[9]) and there exists a certain degree of consensus about its nature: it consists minimally of one content word and the dependent function words [1], but is often larger (1.2 lexical words, namely 3.5/3.9 syllables on average [3]). The formation of the AP can be predicted by two main constraints (see [7]-[9] for the description of other constraints).

The first is syntactic in nature and can be formulated as the **ALIGN-XP CONSTRAINT** [8]. It stipulates that a content word at the non recursive side of a lexical head loses its primary stress (**le sympat<u>hique</u> <u>maire</u> → sympathique <u>maire</u>*).

The second, the **NO-CLASH CONSTRAINT**, prohibits the adjacency of word stresses belonging to different content words (**une jour<u>née</u> <u>chaude</u> → journée <u>chaude</u>*) (see [5]and [9] among others).

Moreover, the AP is considered to be the domain for obligatory **sandhi** phenomena; liaisons (*les enfants* pronounced *les_z_enfants*) and re-syllabifications (*il a mangé* pronounced *i-la-man-gé*) are obligatory within APs [7][8]. In addition, French has optional sandhi phenomena across AP boundaries (*enfants heureux* pronounced *enfant_z_heureux*) [9].

Our hypothesis is that speakers whose L1 has prosodic marking of every content word by stress or tone will also tend to segment the speech flow in French according to lexical units and thus not respect the constraints of AP formation. We also hypothesize that this tendency will be reflected in the realization of few sandhis. Such tendencies have already been attested in spontaneous Central African Speech [13] but, to our knowledge, no systematic comparison between similar data of +/- contact varieties of French has been undertaken (see [14] for a preliminary study).

3. Data

Our corpus consists of readings of the journalistic text of the **Phonologie du Français Contemporain** (PFC) project [15]. The speakers were selected according to classic sociolinguistic variables: sex (two female and two male speakers for each variety) and age (two age groups for each variety: 25-40 years and 40-55 years). Even though the AF-CFA, AF-SN and SW-GER speakers acquired French as an L2 through formal education, they used it on a daily basis in their professional life at the moment of the recordings and cannot be considered as **learners** of French. The main difference between the groups is that SW-GER speakers moved from German-speaking Switzerland when they were about 20 years old, while the AF-CFA and AF-SN speakers grew up in a context where French is omnipresent.

	FR-75		SW-NE		SW-GER		AF-SN		AF-CAF	
1. Prominences										
AP weight	3.4	(0.7)	3.1	(0.5)	3.1	(0.4)	3.1	(0.5)	2.8	(0.4)
Prominence ratio	35.0	(5.1)	41.8	(5.7)	46.2	(9.1)	43.3	(7.8)	46.5	(9.5)
2. AP restructuring										
Align-XP	43	(19)	68	(29)	71	(11)	69	(18)	57	7
No-clash	18	(17)	36	(7)	82	(13)	57	(20)	89	(17)
3. Sandhis										
Intern sandhi	100	(0)	98	(2)	74	(8)	83	(15)	66	(10)
ExternSandhi	81	(10)	56	(7)	38	(6)	27	(13)	4	(8)
4. Rhythm										
Articulation rate	6.1	(0.5)	5.3	(0.5)	4.6	(0.6)	5.2	(0.7)	4.5	(0.8)
ΔC	4.1	(0.7)	5.3	(0.9)	5.4	(1.3)	6.3	(1.4)	6.2	(1.8)
%V	48.4	(5.8)	48.8	(4.8)	41.6	(6.6)	51.9	(6.9)	41.6	(7.9)
5. Silences										
Silence number	3.0	(2.1)	2.9	(2.1)	2.8	(1)	3.7	(2.9)	4.2	3.6
Silence duration (ms)	506	(143)	546	(233)	905	(453)	830	(300)	789	(210)

Table 1. *Mean values and standard deviations for the 5 varieties.*

It is particularly interesting to study this category of speakers since they have probably acquired most aspects of the L2 system. We can therefore hypothesize that the difference between their prosody and that of the monolingual speakers reflects the aspects of the system that are the most difficult to acquire. In fact, the lack of prosodic marking of lexical units that characterizes French is rare cross-linguistically and our hypothesis is that this is a "marked" feature of French prosody in that it is challenging to acquire for L2 speakers who assign prosodic features to every lexical unit in their L1.

In all, 20 speakers are represented in the corpus, which is nearly 43 minutes long. The data were semi-automatically aligned with a Praat script, Easyalign [16][17], which provides a 3-layer segmentation structure: a phone string, a syllabic string, and a word string. The alignments were checked manually by two of the authors, and syllables presenting false starts and/or hesitations were coded with a specific marker and not taken into account in the statistics presented here.

4. Annotation

We conducted three kinds of annotation in order to compare the three varieties. Each content word and its dependent function words (the distinction between function and content words in the text was made according to [18]) were identified by morphosyntactic criteria (not prosodic criteria) and considered as a potential AP. For instance, the sentence *le premier ministre ira-t-il à Beaulieu* consist of four possible AP: [*le premier*] [*ministre*] [*ira-t-il*] [*à Beaulieu*]). **Prominent syllables**, defined as syllables that stand out from their environment by virtue of the perception of different prosodic cues [19], were identified. Two experts of prosody (two of the authors) listened to small parts of the recordings at most three times, and detected prominent syllables on the basis of their perceptual judgments (the methodology is based on [20]). A third expert intervened in cases of disagreement between the two annotators and decided the final value of the syllable (+/- prominent). The actual prosodic phrasing of each speaker was studied in the following way: each final syllable of a lexical word that was coded as prominent was considered as a boundary of a prosodic constituent (that we refer to as APs even though they are in many cases closer to prosodic words than to APs) including every element without prominence on its left side.

5. Results

We analyzed three features of our speakers' APs: (i) the ratio of prominent syllables and the number of syllables pronounced per AP, (ii) whether the constraints ALIGN-XP and NO-CLASH were respected, and (iii) the realization of potential sandhis (external and internal). We also examined (iv) rhythmic parameters and (v) the distribution of silent pauses in order to determine to what extent the differences in segmentation were linked to the reading rate. The general overview of the data indicates differences between the varieties (table 1). AP weight is given in syll./sec., prominence ratio in %, the restructuring constraints in number of respected ALIGN-XP CONSTRAINTS and in number of violations of the NO-CLASH CONSTRAINT, the sandhis in number of realizations, and articulation rate in syll./sec.The clustering of each variety was determined using an **agglomerative hierarchical clustering method** [21], in which groups are iteratively clustered by pairs according to the distance to the mean characteristics. Additionally, post-hoc analysis (one-way ANOVA) was used to assess significant differences within and between the clusters. The figures belove present examples of the clustering: significant differences are shown by means of a color representation; there is no significant difference between the groups with the same color, while different colors indicate significant differences. The significance threshold was set at a 95% confidence level (*p-value*<0.05).

In the following, we comment on four examples of figures representing two configurations: expected classifications (§5.1) and partially coherent classifications (§5.2).

5.1 Expected classification

Differences between the [+contact] and [-contact] varieties are revealed for most of the variables we studied. As an illustration, figure 1 shows the clustering obtained for the NOCLASH CONSTRAINT; there are significant differences between the [+contact] and [-contact] varieties.

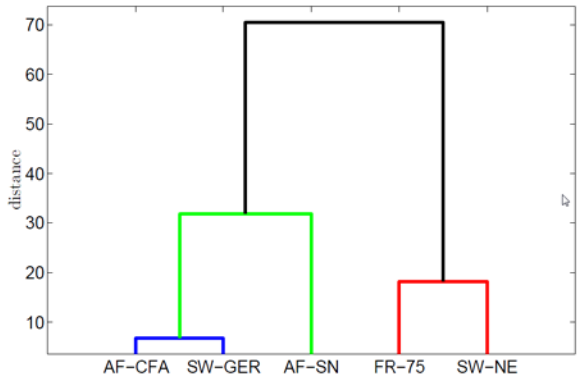

Figure 1: *Clustering with respect to NOCLASH.*

[+contact] varieties are also clustered apart from the [-contact] varieties in the case of the distribution of number of silences (as shown in figure 2).

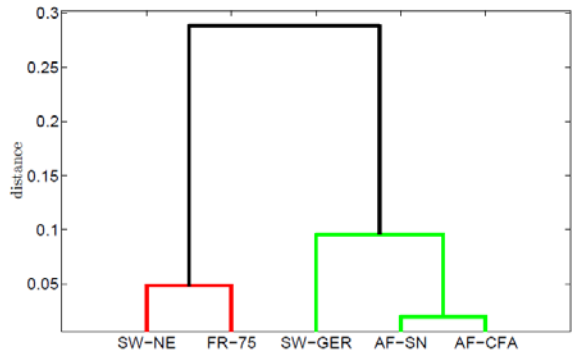

Figure 2: *Clustering of number of silences distribution.*

5.2 Partial coherent classification

In some instances, the FR-75 variety is discriminated from the [+ contact] varieties SW-GER and AF-CFA, but the AF-SN and the SW-NE are grouped together. This is the case for the AP weight, the prominence ratio and the articulation rate. Figures 3 and 4 illustrate this clustering (ratio prom./syll. and articulation rate).

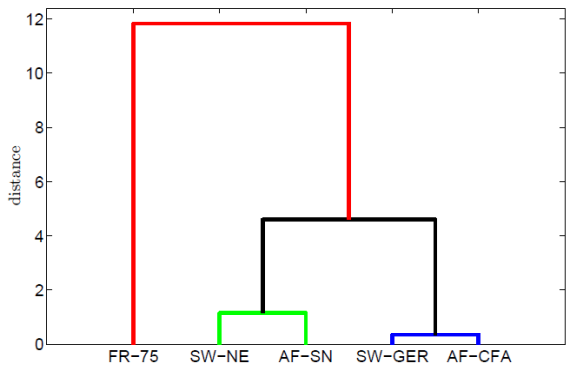

Figure 3: *Clustering of ratio prom./syll.*

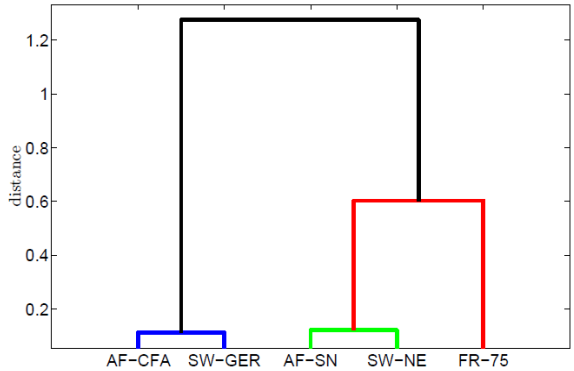

Figure 4: *Clustering of articulation rate.*

5.3 Summary

Table 2 gives an overview of the variables we have studied: the cases where the classification is as expected are marked (++), the partially coherent classification (+) and the variables which do not discriminate between the varieties are marked (-):

1. Prominences	
AP weight	+
Prominence ratio	+
2. AP restructuring	
Align-XP	-
No-Clash	++
3. Sandhis	
Internal sandhis	++
External sandhis	++
4. Rhythm	
Articulation rate	+
ΔC	+
%V	-
5. Silences	
Silence number	++
Silence duration	+

Table 2: *The significance of the variables studied*

To sum up, our hypothesis is strengthened by some of the observations we have presented here: There are significant differences between the +/- contact varieties with respect of four variables: (i) the realizations of sandhis, (ii) whether the speakers respect the NO-CLASH CONSTRAINT, and (iii) the number of silent pauses. Moreover, the speakers of the [+ contact] varieties tend to produce shorter APs, more prominent syllables, articulate more slowly and make longer pauses than the speakers of the [- contact] varieties, but the differences are not significant. However, we found no significant differences between the [+/- contact] varieties with respect to the ALIGN-XP CONSTRAINT or V%.

6. Towards a typology of the AP realization

An overview of our data is presented in Figure 5, which was obtained by estimating a distance for each pair of speakers (cumulative sum of the differences) using **Multi-Dimensional Scaling** [22]. Each of the 5 groups of varieties is discriminated from each other. Clear lines separate the [+contact] varieties

from the [-contact] ones, and a dotted line separates the stress-language speakers from the tone-language speakers.

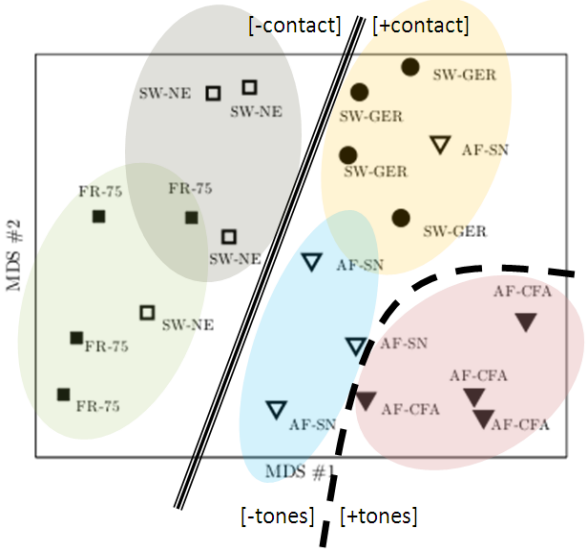

Figure 5: *Bottom-up clustering obtained for all variables*

7. Conclusion

The general picture of the data shows a tendency that the speakers of the [+contact] varieties segment speech flow according to word boundaries whereas the speakers of the [-contact] varieties, in contrast, tend to realize APs as predicted by the model of French prosody. Even though there are exceptions, this study strengthens our initial hypothesis: the segmentation of the speech flow into APs and not prosodic words tend to disappear in varieties where French is in contact with languages where prosodic features are assigned at the lexical level.

However, there are internal differences between [+contact varieties]. We observed that the L1 speakers of the tone language differ more from the monolingual varieties than the stress language speakers. There can be many reasons for this result (the reading skills of the speakers, the sampling etc.), but it might also be easier for a speaker of a stress language to acquire the stress patterns of another stress language than for a speaker of a tone language to acquire the concept of stress; in fact, the prosodic system of AF-CFA has several features in common with a lexical tone language [13]. This could also partially explain why the AF-SN speakers are grouped together with the [-contact] varieties. The difference between the AF-SN and SW-GER can be related to the exposition to French; the first group grew up a context where French is omnipresent (it is the language of teaching in Senegal), the second group has probably been less exposed to French before they moved to a French-speaking part of Switzerland.

In order to confirm the tendencies we have found here, studies of L2 speech of other languages without word prosody should be undertaken. Future work should also include fine acoustic analyses of prominent syllables in order to determine if they are of a different nature (tones, primary vs. secondary stress, etc.).

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