Alignment of high tones in regional French: a case study

Svetlana Kaminskaïa
University of Waterloo
skaminskaia@uwaterloo.ca

ABSTRACT

In regional French, tonal alignment has been understudied and remains an important empirical question. In this paper, samples of text readings from two historically related dialects - Quebec and Vendée varieties - are examined to determine whether these dialects exhibit differences in alignment of stress group initial and final peaks with respect to vowel boundaries. The results of this preliminary analysis showed that although in both varieties the peaks are more stable with respect to vowel end, when it comes to vowel onset Canadian speakers realize the peaks significantly later than the European participants.

Key words: intonation, tonal alignment, dialectal variation, Ontario French

1. Introduction

1.1. Tonal alignment

Comparative intonational studies across languages and dialects contribute to our understanding of both intonation structure and the relationship between languages and their varieties. Most recently, research on intonation has focused on the analysis of tonal scaling (i.e., the value of fundamental frequency F0) and tonal alignment (i.e., the synchronisation, or timing, of melodic peaks and valleys with various reference points - segmental or prosodic landmarks: left or right boundaries of vowels, syllables, words, etc.). This paper reports the results of the preliminary analysis of peak alignment in two historically related varieties of French. One is spoken in Quebec in the region of Quebec City, and the other, in France in Vendée department.[17]

Tonal alignment by itself does not depend on any theoretical framework but "is generally subsumed under the more general autosegmental-metrical (AM) framework of intonation" (D'Imperio 2006: 3). Since the AM approach proposed by Liberman (1979) and Pierrehumbert (1980), the intonation of numerous languages has been described in terms of L(ow) and H(igh) tonal targets, pitch accents (*), phrasal accents (-), boundary tones (%), and domains of tonal association.[18] For French, the AM framework was adapted by Jun & Fougeron (1995, 2000, 2002)[19], who proposed that the minimal prosodic unit in French is an Accentual Phrase (AP), which is defined by an obligatory final (primary) stress marking the AP's right boundary and an optional initial (secondary) stress. The final stress is realized by lengthening the vowel and is

[17] According to Morin (2002), about a third of French settlers in Quebec originated from that region of Western France.

[18] The concept of starredness (Grice 1995; Arvaniti, Ladd & Mennen 2000), the discussions of primary and secondary association of tonal targets (Prieto, D'Imperio & Gili Fivela 2005), and of edge tones are very important theoretical issues, but they are beyond the scope of this analysis.

[19] For other models of French intonation, see Hirst & Di Cristo (1996), Di Cristo (1998), as well as Post (2000).

usually accompanied by a pitch movement, whereas the initial stress is purely melodic.[20] Jun & Fougeron propose the underlying tonal pattern LHiLH* to be associated with an AP. Depending on the number of syllables in the AP, its morphological structure, stress realizations, segmental material and speaking rate (Fougeron & Jun 1998), this underlying tonal pattern can have different surface specifications: LH*, LLH*, LHiH*, HiLH*, LHiLH* (for mid-utterance continuations) or LHiL* and HiL* (for finalities) (Jun & Fougeron 2000). In these patterns, high tones are linked to syllables bearing primary (H*) or secondary (Hi) stress, whereas low tones are usually realized on the same or preceding syllables (but see details on tonal alignment in French below in this paper). The reader is referred to Jun & Fougeron (2000, 2002) for details on AP phrasing.

In a number of languages, such as Greek, English, Dutch, Spanish or Mandarin, the timing of tonal targets occurs with a regularity that led to the tonal anchoring hypothesis (Ladd et al. 1999). The exact appearance of a tone has been found to play different roles: contrastive - e.g., statement vs. question in Neapolitan Italian (D'Imperio 2000), pragmatic - e.g., uncertainty vs. assertion in English (Pierrehumbert & Steele 1989), or discursive - e.g., differences between nuclear and prenuclear accents in different languages (Arvaniti & Baltazani 2005; Schepman, Lickely& Ladd 2006). In addition, the timing of tonal targets has been found to contribute to regional prosodic variation in a number of languages, e.g., Swedish (Bruce & Gårding 1978), English (Ladd et al. 2009), German (Atterer & Ladd 2004), among others. Tonal alignment in French dialects has not been explored nearly enough. The following section addresses the previous analyses of timing in French.

1.2. Tonal alignment in French

The seminal work on text-to-tune alignment in standard French by Welby (2006) suggests that in the LHiLH* tonal pattern, only the initial L and the final H* tones show evidence of association, whereas the other tones not only are not aligned with segmental content, but can be completely undershot. The initial rise LHi is different from the final one LH*: the first one is a phrase accent, and the second one is a pitch accent. In an initial rise, Hi often appears at the beginning of a content word, and the L shows double association – with the beginning of the first content word and with the left boundary of an AP. In a final rise, the L tone is most often realized on the same syllable as the H*, which, in turn, is aligned with the end of the stressed syllable. The H* target has a tendency to appear within a certain zone instead of a point, and, as a result, Welby & Loevenbruck (2006) proposed that it is "anchoraged" rather than "anchored". Thus, showing different associations, LHi and LH* rises differ structurally, but not functionally: they mark the left and right AP boundaries, respectively.

Studies of alignment in regional French by Miller (2007) confirm these findings. Furthermore, in her analysis of Vaudois Swiss French, this author finds that, in comparison with standard French, this variety shows a "less peripheral" alignment of tones associated with the initial and final rises within the AP. According to D'Imperio et al. (2006), who looked at standard and South-Eastern varieties of French, both prenuclear and nuclear tones are realized earlier in the former than the latter variety. In addition to the effect of regional factors and of utterance structure, social variables have also been shown to affect tonal timing in French (Kaminskaïa 2012, 2013).

[20] See Pasdeloup (1991), Vaissière (1991), Hirst & Di Cristo (1997), Astésano (2001), Di Cristo (1999, 2000), among others, for a discussion of stress in French.

1.3. Goals and hypotheses

The purpose of this paper is to examine timing of Hi and H* tones in Quebec and Vendée dialects of French (henceforth, QF and VF) that have not been previously considered. I focus on the alignment of high tones associated with primary (H*) and secondary (Hi) stresses in French in the LHiLH* pattern. Other patterns were not taken into consideration here since little is known about the consequences of tonal undershooting (non-realization of targets due to the structure and the length of an AP, or due to the speaking rate; e.g., LH* pattern), boundary effect (for the HiLH* pattern), or tonal crowding (clash of two high or low tones, e.g., LHiH* or LLH*) in French. To compare alignment of the peaks, I chose vowel boundaries as landmarks. This approach will reduce variability of the intervals between the peaks and the boundaries due to various syllable structures.

It is expected that, in both dialects, the H* tone will show alignment with respect to the end of the vowel bearing AP final stress (following Welby 2006). There is no specific hypothesis about the gravitation of the initial peak relative to either of vowel's boundaries. Since the dialects compared evolved separately because of geographical distance, it is not unusual to hypothesize that differences in tonal alignment would be found between the data sets. These hypotheses were tested based on the data and using the methods described in the next section.

2. Methods

2.1. Data and participants

To achieve the specified goals, I analysed QF and VF speech samples that are part of the database of the international project "Phonologie du français contemporain" (Durand, Laks, & Lyche 2002, 2009), which gathers data from all over the French-speaking world. For each speaker, the recording consists of two sociolinguistic interviews and two readings, a list of words and a text. While in spontaneous speech regional prosodic markers may be more salient (Carton 1986; Simon 2004), controlled recordings allow the comparison of samples of similar duration, expressivity, and the same segmental content. In fact, earlier studies of tone alignment in French used read sentences and paragraphs (Welby 2006; Welby & Loevenbruck 2006), as well as text readings (Miller 2007, Kaminskaïa 2012). Therefore, I chose text readings for this study. They are performed by four female speakers: two from Québec City, Canada (que1 and que2), and two from Vendée province, France (ven1 and ven2). Both Canadian speakers are university students under 30 years of age, while French participants belong to different age groups (under 30 and over 50), have no higher education and are working as a waitress and a nurse's aide respectively. This analysis did not include a sociolinguistic scope, and these differences were not expected to have an impact on the results. Given the small size of our data sample and speakers' sociolinguistic differences, the scope of our findings is limited to regional variation within the analysed corpus and the tendencies observed for intonational variation and tonal alignment are preliminary.

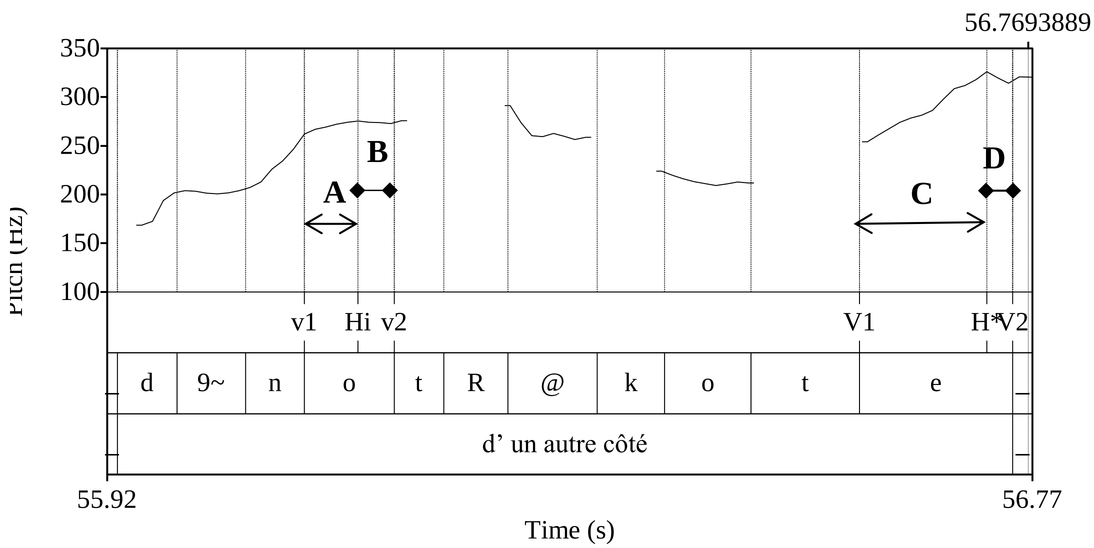
2.2. Procedure and analyses

Using Praat software (Boersma & Weenink 2005), the data were segmented into syllables and phones with the help of EasyAlign (Goldman 2011). This automatic segmentation was manually verified and corrected. Then, speech material was phrased into APs, to which tonal patterns were assigned based on criteria defined by Jun & Fougeron (2000, 2002). After that, APs having LHiLH* tonal specification were selected, and the following points were identified and tagged in Praat: F0max values of the initial (Hi) and final (H*) rises, and the start and the end of the vowel of that syllable (v1 and v2 for the initial rise, and V1 and V2 for the final rise). The tagging of F0max values was performed using Praat functions: the pitch peaks corresponded to the two highest extracted frame values in the contour accompanying the stressed vowel. When a series of identical frames occurred, the first F0 value was chosen, as in Ladd et al. (2009). If the pitch track was interrupted by perturbations, a measurement was not taken.

Time values corresponding to these tags were then extracted. From these time values, the following time distances (intervals/latencies) were calculated:

- Intervals from the Hi to the beginning of the vowel of the syllable bearing the initial stress (Hi-v1) and to the end of that vowel (v2-Hi) (Figure 1, A and B respectively);
- Intervals from the H* to the beginning of the vowel of the syllable bearing the final stress (H*-V1) and to the end of that vowel (V2-H*) (Figure 1, C and D respectively).

Figure 1. Intervals measured



Based on the number of tokens obtained from each speaker for each interval (each under 30 items, see below), nonparametric Mann-Whitney tests were performed to judge the presence of significant intra- and inter-dialectal differences between the sets of results. According to this test, differences between data sets are real if $p \leq .05$.

Then I extracted durations of corresponding vowels, and I performed correlation tests in order to find which intervals show the most stability in Hi and H* alignments (i.e., to better understand how tones are associated). As I do not assume equal distribution of the variables, I also performed Spearman tests in which r values indicate the strength of correlation and the *p* values show the significance of correlation.

3. Results

Phrasing the data and assigning tonal patterns allowed me to establish the typology and frequency of occurrence of the latter. Out of all melodic patterns in QF dataset, 16.2% were identified as LHiLH* patterns, and in VF data set, the proportion of this pattern was 17.9%. After discarding a few contours with pitch disturbances, the following number of contours were analysed for each speaker: 20 (que1), 29 (que2), 24 (ven1), and 28 (ven2). Consequently, the same numbers of intervals of each type were considered.[21]

The results of the tests looking at the stability of tonal alignment with respect to the left and right edges of the vowels are presented in section 3.1; the results of the comparisons of the intervals measured relative to vocalic landmarks appear in section 3.2.

3.1. Stability of alignment of tonal targets

Spearman correlation tests were performed for each speaker in order to find which latency (from the left or the right edge of the stressed vowel) showed more stable temporal alignment of both F0 peaks. As for either Hi or H* no differences between speakers were apparent, so the results for the two participants in each variety were pooled together, and they are based on 49 (QF) vs. 52 (VF) occurrences of each tone, and, thus, on the same numbers of each interval.

First, I assessed the alignment of Hi tone. In both data sets, the Hi-v1 interval correlated with the respective vowel duration (Quebec: $r = .778$, $p < .05$, $N = 49$; Vendée: $r = .531$, $p < .05$, $N = 52$). In other words, variation in Hi-v1 latency durations appears dependent on variation in vowel durations. This means that the Hi tone is not realized at a certain point counting from the vowel onset in either of the dialects. Correlation between v2-Hi intervals and vowel durations was not significant in Quebec data set ($r = .-159$, $p > .05$, $N = 49$) or in Vendée data set ($r = .088$, $p > .05$, $N = 52$). These results suggest that in both dialects the v2-Hi interval does not depend on changes in vowel duration, and that Hi is produced at a more regular distance from the vowel end.

The picture is similar when we look at correlations between the intervals related to the H* tone in Vendée, where the H*-V1 interval is positively correlated with the vowel duration ($r = .770$, $p < .05$, $N = 52$) but the V2-H* interval is not correlated with it ($r = -.167$, $p > .05$, $N = 52$). In Quebec, both intervals show positive correlation with the vowel durations: for H*-V1, $r = .892$, $p < .05$, $N = 49$; for V2-H*, $r = .443$, $p < .05$, $N = 49$). However, only one of the Canadian speakers showed correlations for both intervals, the other one followed previously described patterns with no correlation between the alignment of H* relative to vowel end and the vowel

[21] The individual averages of the articulation rate of the analysed APs with LHiLH* pattern are as follows: 5.27 syll/s. (que1), 6.04 syll/s. (que2), 5.97 syll/s. (ven1), 6.23 syll/s. (ven2). The rate difference between the dialects was marginally significant (Kruskal-Wallis test $p = .048$). Pearson's tests evaluating correlations between the individual articulation rate and interval values revealed no relationship ($p \geq 0.83$). Based on this finding, the articulation rate did not seem to have an effect on the alignment of F0 peaks in the present data.

duration. These results confirm the tentative character of our findings and emphasize the need for further investigation. To conclude so far, three out four speakers show more stable alignment of both peaks with respect to vowels' end. Now let us find out if the intervals show dialectal differences.

3.2. Alignment of peaks

As mentioned above in note 5, there was no significant correlation between the speakers' articulation rate and the interval values; besides, there was no significant difference between vowel durations in VF vs. QF (Mann-Whitney test: for vowels associated with Hi p = .137, and for vowels associated with H* p = .115). These observations authorize the interval comparisons, since the intervals are measured in real time.

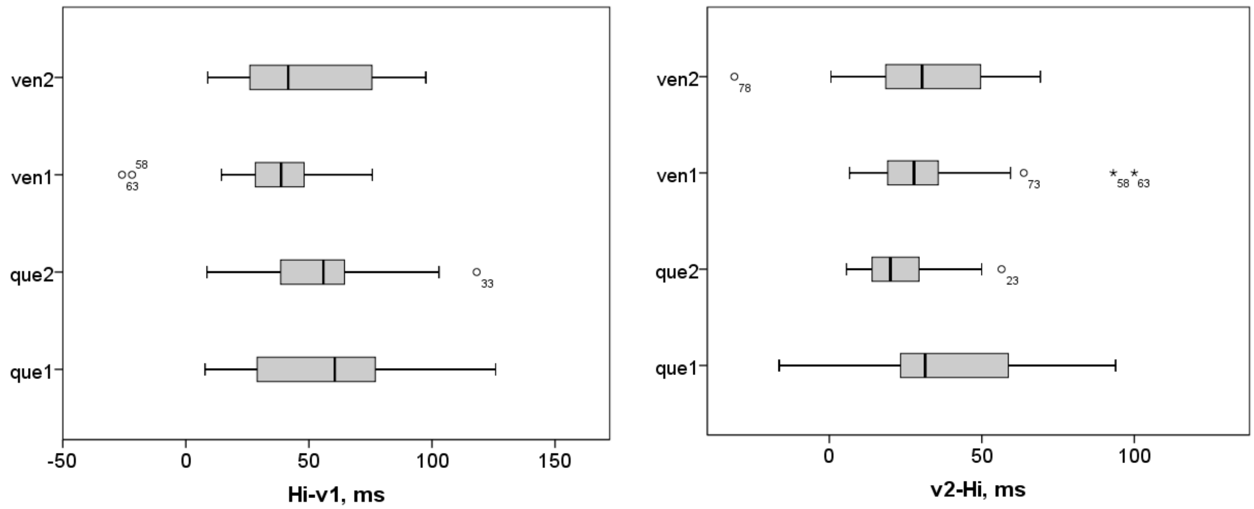
Starting with the Hi-v1 interval, let us consider alignment of the initial peak with respect to vowel edges. As Table 1 shows, the individual averages across our four speakers range between 36 ms (ven1) and 60 ms (que1), with ven1 and que2 showing less variance than the other two speakers (Figure 2a). Despite this, the difference between the speakers within each data set was not significant (p > .05). On the other hand, the difference of 11 ms between the data sets (55 ms in QF and 44 ms VF) was marginally significant: p = .048, Table 2a.

Table 1. Average duration of the intervals (ms) between peaks and vocalic landmarks.

	Intervals for the initial peak		Intervals for the final peak	
	Re left boundary	Re right boundary	Re left boundary	Re right boundary
	Hi-v1	**v2-Hi**	**H*-V1**	**V2-H***
que1	60	37	100	43
std	*34*	*27*	*40*	*18*
que2	54	24	92	24
std	*28*	*14*	*42*	*28*
ven1	36	34	94	28
std	*24*	*24*	*44*	*14*
ven2	50	31	64	34
std	*29*	*22*	*27*	*18*
QF	**55**	**29**	**96**	**32**
std	*30*	*21*	*41*	*26*
VF	**44**	**33**	**78**	**31**
std	*27*	*23*	*38*	*16*

As for the distance between Hi and the vowel offset, the difference of 4 ms between QF and VF (29 ms in QF and 33 ms in VF, Table 2) was not significant ($p > .05$, Table 2b) due to a larger individual variation between Canadian speakers (37 ms vs. 24 ms, $p < .05$) than between French speakers (34 ms vs. 31 ms, $p > .05$) (Table 2a, b, Figure 2b).

Figure 2. Boxplots for Hi-v1 (a) and v2-Hi (b) intervals



(a) Interval Hi-v1 (b) Interval v2-Hi

Table 2. Mann-Whitney test results for significance of differences between interval values within and between dialects.

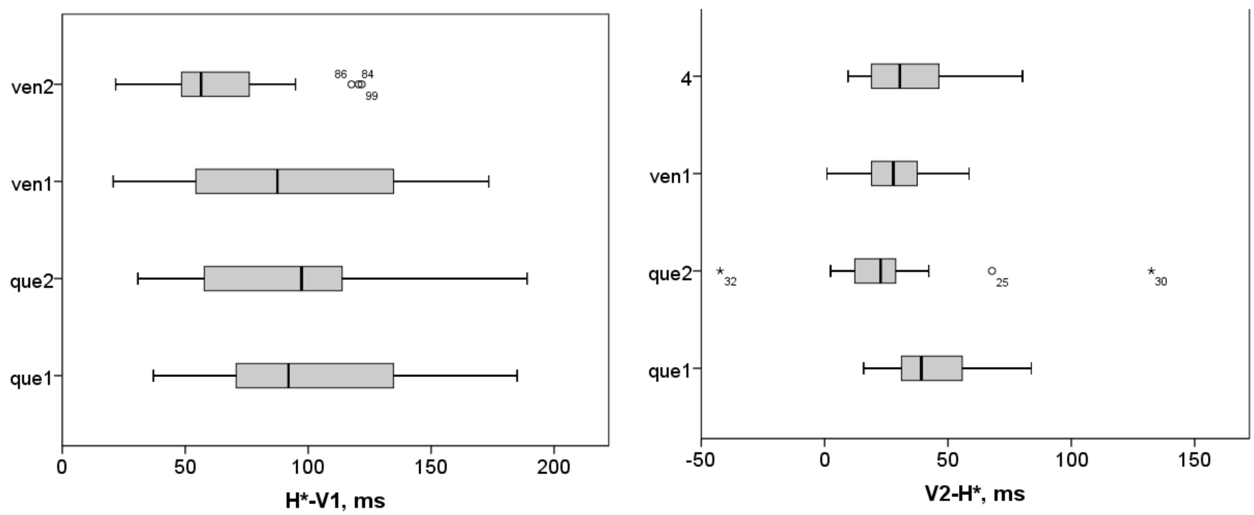
(a) Hi-v1	*Differences within QF:* U=257.000, n1=20, n2=29, *p*=.502, two-tailed	(b) v2-Hi	*Differences within QF:* U=169.000, n1=20, n2=29, ***p*=.014,** two-tailed
	Differences within VF: U=269.000, n1=24, n2=28, *p*=.219, two-tailed		*Differences within VF:* U=332.000, n1=24, n2=28, *p*=.941, two-tailed
	Difference between QF and VF: U=983.000, n1=52, n2=49, ***p*=.048**, two-tailed		*Difference between QF and VF:* U=1141.000, n1=52, n2=49, *p=.366*, two-tailed
(c) H*-V1	*Differences within QF:* U=253.000, n1=20, n2=29, *p*=.452, two-tailed	(d) V2-H*	*Differences within QF:* U=110.000, n1=20, n2=29, ***p*=.000**, two-tailed
	Differences within VF: U=194.000, n1=24, n2=28, ***p*=.009**, two-tailed		*Differences within VF:* U=291.000, n1=24, n2=28, *p*=.499, two-tailed
	Difference between QF and VF: U=959.000, n1=52, n2=49, ***p*=.032**, two-tailed		*Difference between QF and VF:* U=1230.000, n1=52, n2=49, *p*=.765, two-tailed

We now turn to the alignment of the H* tone to observe its alignment relative to the vowel beginning (H*-V1). In Table 2, one observes close individual values in QF (100 and 92 ms) that show no significant variability ($p > .05$, Table 2c). However, the difference between individual averages in VF is considerable: 94 and 64 ms (see also the spreads in Figure 3a). This variation leads to a significant difference ($p < .05$, Table 2c). Nonetheless, dialectal differences between VF and QF samples also emerge as significant ($p < .05$, Table 2c). This result needs to be considered with caution because the effect of ven2's interval values (see her boxplot in Figure 3a) might have been important here.

Finally, the last interval that was considered (V2-H*) shows more variation in individual QF mean values (43 ms and 24 ms) than in VF (28 ms and 34 ms) (see also Figure 3b).

Consequently, this variability is significant in QF ($p < .05$) but not in VF ($p > .05$). No inter-dialectal difference was statistically revealed between our data sets for the V2-H* interval ($p > .05$, Table 2d).

Figure 3. Boxplots for H*-V1 (a) and V2-H* (b) intervals



(a) Interval H*-V1

(b) Interval V2-H*

In summary, for both Hi and H* tones, regional differences were shown in their timing with respect to vowel onsets: according to the results, the QF speakers realized the Hi tone target 11 ms and the H* tone 18 ms later than the VF speakers.

4. Conclusions and discussion

This case study looked at variation in the realization of high targets in Quebec and Vendée varieties of French. By considering high tones associated with final and initial rises of the LHiLH* pattern, I looked at the intervals measured relative to left and right vocalic edges in order to evaluate stability and differences in peak alignment.

When examining correlations between vowel durations and Hi-v1 and v2-Hi intervals, no relationship between the alignment relative to vowel end and the duration of the vowel was found in either dialect. At the same time, Hi-v1 latencies were positively correlated with vowel durations. These results suggest that in the sample analysed the Hi-v1 interval values change together with vowel duration and that the AP initial peak is not regularly timed with respect to vowel beginning. Instead, it seems to be more stable with respect to vowel end, which can be interpreted as alignment relative to right boundary, without anchoring though, given irregularity of interval values in the dataset.

As for the H* tone, in three out of four speakers the H* tone showed behaviour similar to the Hi tone: positive correlations between the alignment of the peak relative vowel beginning and vowel durations, but no correlation for the V2-H* interval and vowel durations. These results suggest similar conclusions as above for Hi – a more stable alignment of AP final peak with respect to vowel offset. The results of one of Canadian speakers do not support this, which confirms the limited character of these observations.

After comparing latencies between VF and QF to determine if the data sets show regional variation in tonal alignment, it was found that the Hi tone came out 11 ms and the H* tone 18 ms later in the Quebec data in comparison with the Vendée set. Thus, both peaks are delayed in QF. At the same time, latencies from tone targets to vowel end were close in both dialects: 29 ms (QF) and 33 ms (VF) for Hi, and 32 ms (QF) and 31 ms (VF) for H*. Altogether, this information suggests a possible longer duration of stressed vowels in QF. Indeed, the average duration of the vowel associated with the Hi tone was 9 ms longer in QF (86 ms) than in VF (77 ms), and the average duration of the vowel associated with the H* tone was 16 ms longer in the first variety (127 ms) than in the second one (111 ms). However, none of the differences in vowel durations between the dialects were not significant (see above), which allows me to conclude that the later peak alignment in Quebec data set than in Vendée data appears genuine; an analysis of a more representative sample will verify these observations.

The nature of the corpus analysed did not allow for a classification of syllables by their types and by the quality of the segment in the rhyme position, both of which may affect the alignment of the H*(Welby and Loevenbruck 2006). Therefore, I do not have additional support for H* tone anchorage as opposed to anchoring, except for referring the reader to Figure 4, which shows the spreads of H* latencies in the 50-60 ms zone, and quoting Welby &Loevenbruck (2006: 60): "the segmental anchorage for H2 [here H*] is the region stretching from approximately 20 ms before the end of the vowel to the end of the AP".

To determine whether tendencies observed in the current comparative study are sustainable, further analyses are needed, which would use larger data samples and would take into consideration different types of pitch patterns and other prosodic effects, such as the length of an AP, its position within an utterance and with respect to the focal structure.

References

Arvaniti, Amalia; Ladd Robert & Mennen, Ineke. 2000. What is a starred tone? Evidence from Greek. In Janet Pierrehumbert & Michael Broe (eds.). *Papers in Laboratory Phonology V: Acquisition and the Lexicon,* 119-131. Cambridge: Cambridge University Press.

Arvaniti, Amalia & Baltazani, Mary. 2005. Intonational analysis and prosodic annotation of Greek spoken corpora. In Jun, Sun-Ah (ed.). *Prosodic typology: the phonology of intonation and phrasing,* 84-117. Oxford: Oxford University Press.

Astésano, Corine. 2001. *Rythme et accentuation en français: invariance et variabilité stylistique.* Paris : L'Harmattan.

Atterer, Michaela & Ladd, Robert. 2004. On the phonetics and phonology of "segmental anchoring" of *f0*: evidence from German. *Journal of Phonetics* 32: 177–197.

Boersma, Paul & Weenink, David. 2005. PRAAT: Doing phonetics by computer. Computer program. Retrieved from <www.fon.hum.uva.nl/praat/>

Bruce, Gösta & Gårding, Eva. 1978. A prosodic typology for Swedish dialects. In Eva Gårding, Gösta Bruce & Robert Bannert (eds). *Nordic prosody,* 219-228. Lund: Lund University.

Carton, Ferdinand. 1986. À la recherche d'intonations « régionales ». In *Actes du XVIIème Congrès International de Linguistique et Philologie Romanes*, Vol. 6: Variation

linguistique dans l'espace: dialectologie et onomastique, 247-257. Aix-en-Provence: Université de Provence.
D'Imperio, Mariapaola. 2000. The Role of Perception in Defining Tonal Targets and their Alignment. PhD dissertation. Ohio State University.
D'Imperio, Mariapaola. 2006. Preface to Current Issues in Tonal Alignment. *Italian Journal of Linguistics/Rivista di Linguistica* 18(1): 3-18.
D'Imperio, Mariapaola; Bertrand, Roxane; Di Cristo, Albert & Portes, Cristel. 2006. The phonology and phonetics of prenuclear and nuclear accents in French. In *Proceedings of Workshop Experimental Linguistics (ISCA)* (Athens, GREECE), 121-124.
Di Cristo, Albert. 1998. Intonation in French. In Daniel Hirst & Albert Di Cristo (eds.). *Intonation Systems: a survey of twenty languages*, 195–218. Cambridge: University Press.
Di Cristo, Albert. 1999. Vers une modélisation de l'accentuation du français (première partie). *Journal of French Language Studies* 9(2): 143–179.
Di Cristo, Albert. 2000. Vers une modélisation de l'accentuation du français (seconde partie). *Journal of French Language Studies* 10(1): 27–45.
Durand, Jacques; Laks, Bernard & Lyche, Chantal. 2002. Synopsis du projet PFC, la Phonologie du Français Contemporain: Usages, Variétés et Structure. *Bulletin PFC #1: Protocole, conventions et directions d'analyse,* 5-7.
Durand, Jacques; Laks, Bernard & Lyche, Chantal. 2009. Le projet PFC: une source de données primaires structurées. In Jacques Durand; Bernard Laks & Chantal Lyche (eds.). *Phonologie, variation et accents du français,* 19-61. Paris: Hermès.
Fougeron, Cécile & Jun, Sun-Ah. 1998. Rate effects on French intonation: Prosodic organization and phonetic realization. *Journal of Phonetics* 26: 45-69.
Goldman, Jean-Philippe. 2011. EasyAlign: a friendly automatic phonetic alignment tool under Praat. In *Proceedings of Interspeech*, Florence, Italy.
Grice, Martine. 1995. *The intonation of Palermo Italian: implications for intonation theory*. Tübingen: Niemeyer.
Hirst, Daniel, & Di Cristo, Albert. 1996. Y a-t-il des unités tonales en français? In *Actes des XXIes Journées d'Études sur la Parole* (Avignon), 223-226.
Hirst, Daniel, & Di Cristo, Albert. 1997. L'accentuation non-emphatique en français: stratégies et paramètres. In Jean Perrot (ed.). *Polyphonie pour Iván Fónagy*, 71-101. Paris-Montréal: L'Harmattan.
Jun, Sun-Ah & Fougeron, Cécile. 1995. The accentual phrase and the prosodic structure of French. In *Proceedings of International Congress of Phonetic Sciences.* (Stockholm), vol. 2. 722–725.
Jun, Sun-Ah & Fougeron, Cécile. 2000. A phonological Model of French Intonation. In *Intonation*, Antonis Botinis (ed.). 209–242. Kluwer Academic Publishers.
Jun, Sun-Ah & Fougeron, Cécile. 2002. Realizations of accentual phrase in French intonation. *Probus* 14: 147–172.
Kaminskaïa, Svetlana. 2012. Language maintenance and tonal variation in French in contact. In Silvia Calamai, Chiara Celata & Luca Ciucci (eds.). Proceedings of 'Sociophonetics, at the crossroads of speech variation, processing and communication', Pisa, December 14th-15th, 2010, 33-36. Pisa: Edizioni della Normale.
Kaminskaïa, Svetlana. 2013. Le timing des pics mélodiques en français spontané en milieu minoritaire. In Paula Caxaj-Ruiz (ed.). *Proceedings of the 2012 Canadian Linguistics*

Association Annual Conference. http://homes.chass.utoronto.ca/~cla-acl/actes2012/actes2012.html
Ladd, Robert; Faulkner, Dan; Faulkner, Hanneke & Schepman, Astrid. 1999. Constant « segmental anchoring » of F0 movements under changes in speech rate. *Journal of the Acoustical Society of America* 106: 1543-1554.
Ladd, Robert; Schepman, Astrid; White, Laurence; Quartmby, Louise May & Stackhouse, Rebekah. 2009. Structural and dialectal effects on pitch peak alignment in two varieties of British English. *Journal of Phonetics* 37: 145–161.
Liberman, Mark. 1979. *The intonational system of English*. New York: Garland.
Miller, Jessica Sertling. 2007. Swiss French prosody: intonation, rate, and speaking style in the Vaud canton. PhD dissertation. Univeristy of Illinois at Urbana-Champaign.
Morin, Yves-Charles, 2002. Les premiers immigrants et la prononciation du français au Québec. *Revue québécoise de linguistique* 31(1): 39-78.
Pasdeloup, Valérie. 1991. Exploiting the secondary accent in a prosodic model for French synthesis. In *Proceedings of International Congress of Phonetic Sciences*. (Aix-en-Provence) vol. 2. 254-257.
Pierrehumbert, Janet. 1980. The phonology and phonetics of English intonation. PhD thesis, MIT.
Pierrehumbert, Janet & Steele, Shirley. 1989. Categories of Tonal Alignment in English. *Phonetica* 46: 181-196.
Post, Brechtje. 2000. *Tonal and phrasal structures in French intonation.* The Hague: Thesus.
Prieto, Pilar; D'Imperio, Mariapaola & Gili Fivela, Barbara. 2005. Pitch accent alignment in Romance: primary and secondary associations with metrical structure. *Language and Speech* 48(4): 359-396. (Special issue on Variation in Intonation, ed. by Paul Warren)
Schepman, Astrid; Lickely, Robin & Ladd, Robert. 2006. Effects of vowel length and « right context » on the alignment of Dutch nuclear accents. *Journal of Phonetics* 34: 1–28.
Simon, Anne Catherine. 2004. Analyse de la variation prosodique du français dans les données conversationnelles : propositions théoriques et méthodologiques. Version 1.0. In Jacques Durand, Bernard Laks & Chantal Lyche (eds.). *Du segmental au prosodique: Protocoles, outils, extensions et travaux en cours. (Bulletin PFC #3),* 99-113.CNRS & Université de Toulouse-Le Mirail.
Vaissière, Jacqueline. 1991. Perceiving rhythm in French ? In *Proceedings of International Congress of Phonetic Sciences.* (Aix-en-Provence).Vol. 4, 258-261.
Welby, Pauline. 2006. French intonational structure: Evidence from tonal alignment. *Journal of Phonetics* 34: 343-371.
Welby, Pauline & Loevenbruck, Hélène. 2006. Anchored down in Anchorage: syllable structure, rate and segmental anchoring in French. *Italian Journal of Linguistics* 18: 74-124.