

"Non-conclusive" Slopes in French: First Results

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BACKGROUND

Some recurrent prosodic pattern in non-conclusive position

In corpora of French spontaneous speech, one finds in general a melodic rise at the end of A in juxtaposed declarative clauses (i.e. AB, where A and B are clauses linked by a unmarked discourse relation).

It indicates that A is an unfinished constituent at the discourse level, and it can be associated with the notion of "grouping" or "major" continuation contour, in Delattre's holistic and functionalist approach.

GOAL OF THE STUDY

Study two kinds of non-conclusive configurations in French

- **Syntactic level:** slope of the final segment of a subject NP in an declarative sentence, followed (=CIA) or not (=CIS) by another sentence.
- **Discourse level:** slope of the final segment of A in a two clause utterance AB, where A and B are declarative clauses connected by a discourse relation, marked (=CAO) or not (=CAP) by a conjunction.

Main questions addressed here

1) Do the observed final patterns have the same properties as the two Delattre's continuations, assuming that CIA-CIS correspond to minor continuation and CAO-CAP to major continuation?

- Can the patterns be rising and falling in CIA-CIS? Are their peak inferior to CAO-CAP peak?
- Do CAO-CAP always rise, as it is the case for Delattre's major continuation?
- Are the segments produced in CIA-CIS and CAO-CAP significantly different from the corresponding segments found in questions (QIS and QAS resp.) and in assertions (DIS and DAS resp.)?

2) Can the discourse relation marking between two clauses influence the first clause final pattern? Is there a systematic difference between CAO and CAP final slopes?

METHOD & PROTOCOL

Recording

Recording a production experiment is designed to contrast pairs, with 32 French native speakers. Around 40 recorded occurrences are obtained for each configuration (CIS, CIA, CAO, CAP, etc.) with 5 different sentences per configuration.

CIS : Les **agneaux** ont vu leur mère.
CIA : Les **agneaux** ont vu leur mère elle sort du bosquet.
DIS : Les **agneaux**.
QIS : Les **agneaux**?
CAO : Il a vu **Maria** car elle est rentrée.
CAP : Il a vu **Maria** elle vient de rentrer.
DAS : Il a vu **Maria**.
QAS : Il a vu **Maria**?

CIS=continuative configuration on a subject NP.
CIA=continuative configuration on a NP subject in the first clause of a two clause sentence.
DIS=declarative configuration on a simple subject NP.
QIS=interrogative configuration on a simple subject NP.
CAO=continuative configuration at the end of the first clause in a two clause sentence, with a coordinating conjunction.
CAP=continuative configuration at the end of the first clause in a two clause sentence, without any coordinating conjunction.
DAS=declarative configuration at the end of a clause.
QAS=question configuration at the end of a clause.

The targets of the study correspond to the words in bold.

Figure 1. Configuration types and illustration.

Sentences are presented with a small context. Speakers record only the sentence in bold, they can listen to their recordings and record again if the speech signal has too low or a saturated energy or if they find their pronunciation unnatural. Four different sentence distributions are used to avoid a reduplication effect.

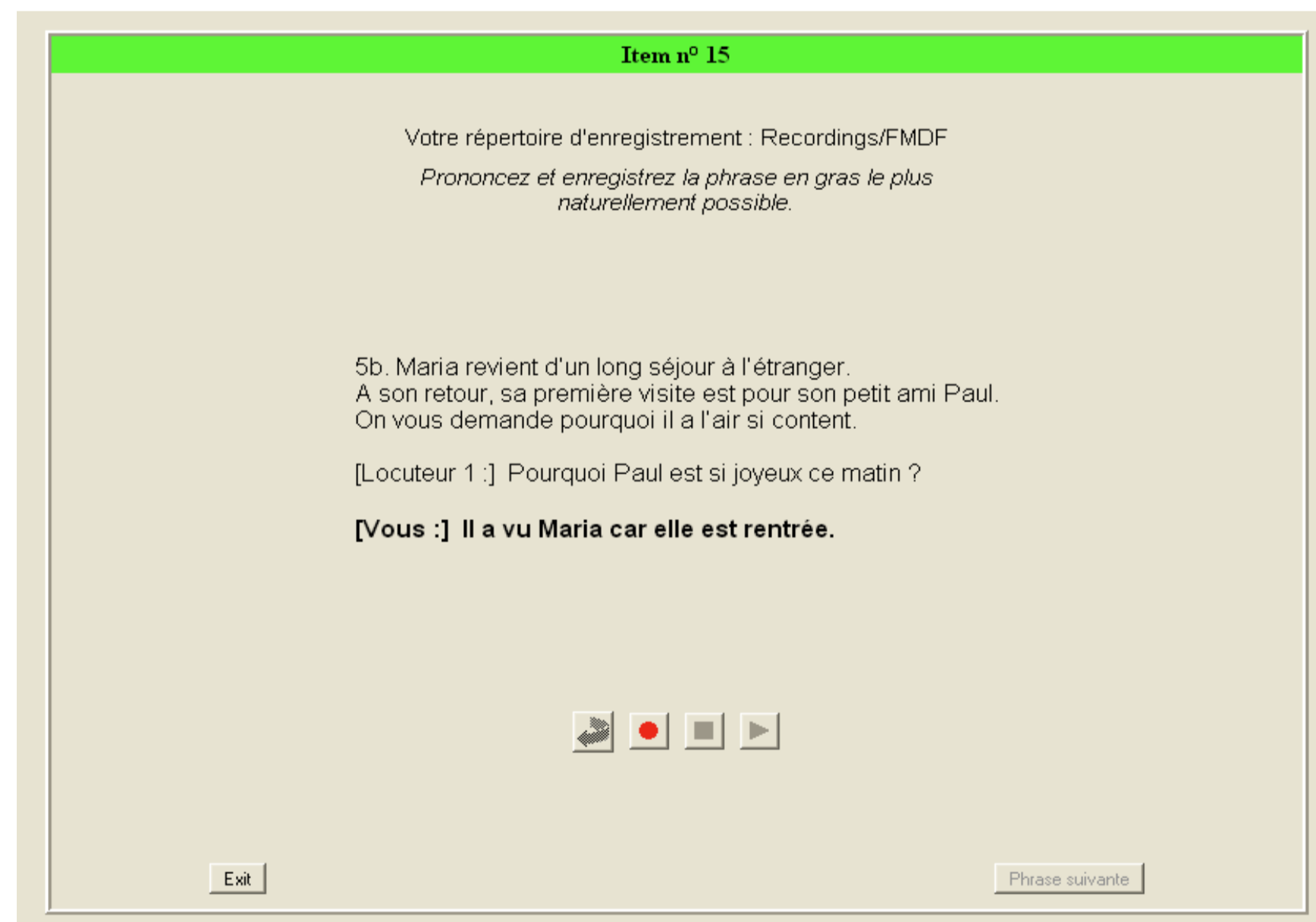


Figure 2. The recording interface CorpusRecorder (Loria), software adapted for the project.

Segmentation and annotation of the signal

Each speech signal was manually segmented and annotated in phonemes by an expert phonetician using Winsnoori, a signal editor software (<http://www.loria.fr/~laprie/WinSnoori>). The final presentation is also visible with Praat (<http://www.fon.hum.uva.nl/praat>).

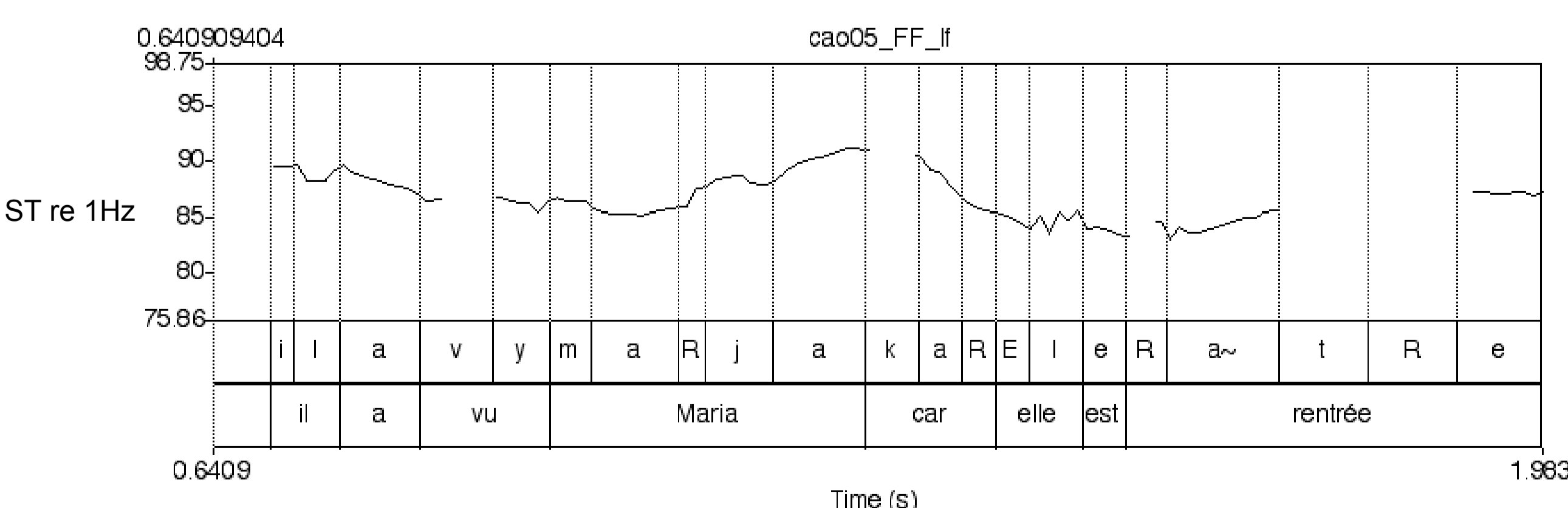
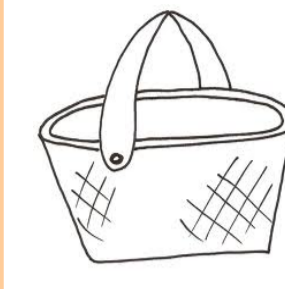


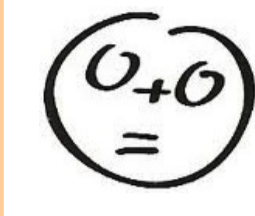
Figure 3. Segmentation, annotation and visualisation of the acoustic signal with Praat and SAMPA.

PARTIAL RESULTS



Intonation data

Intonation slopes are computed as regression slopes (Rslope ST) using F0 values in semitones estimated every 10 ms. Slopes are calculated on the two last syllables of the target segments (in bold in figure 1) of every sentence.



Statistical tests

Next, data were analysed by fitting mixed linear regression models with baseline rotation (R packadge lme4). One can contrast the different configuration types and show which differences are significant or not.

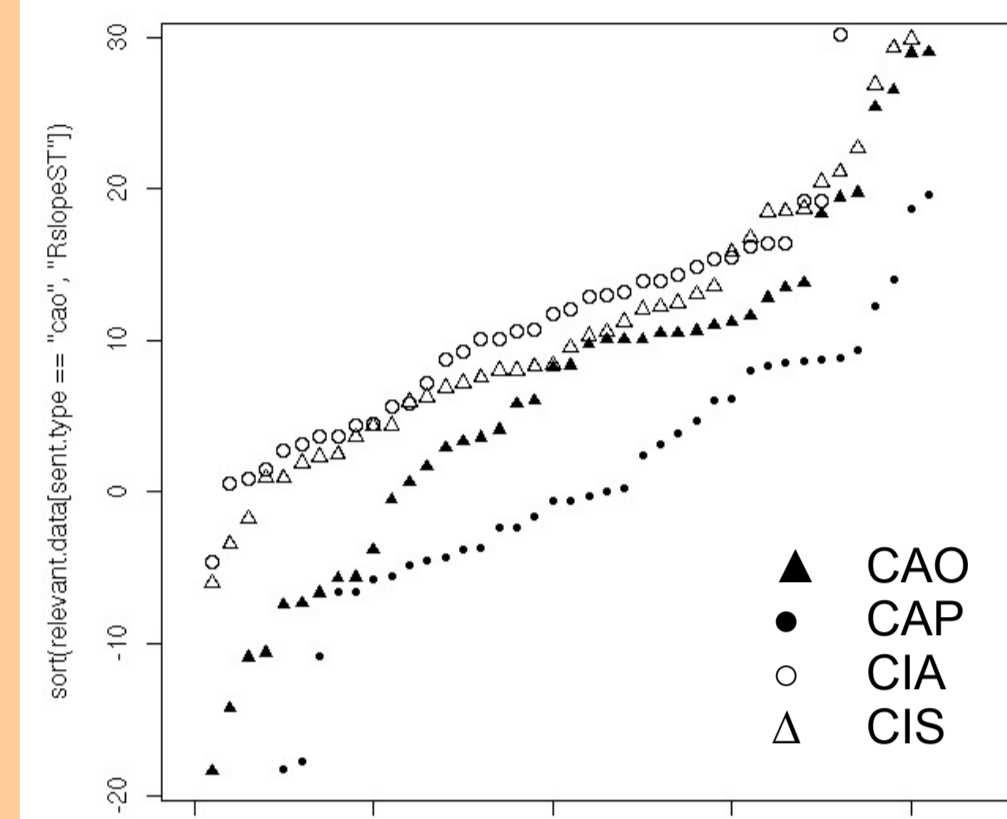
Intercept: bold capitals.

*: observed difference is significative.

RslopeST: slope of the regression line of the pitch data points in semitones measured on the target segment.

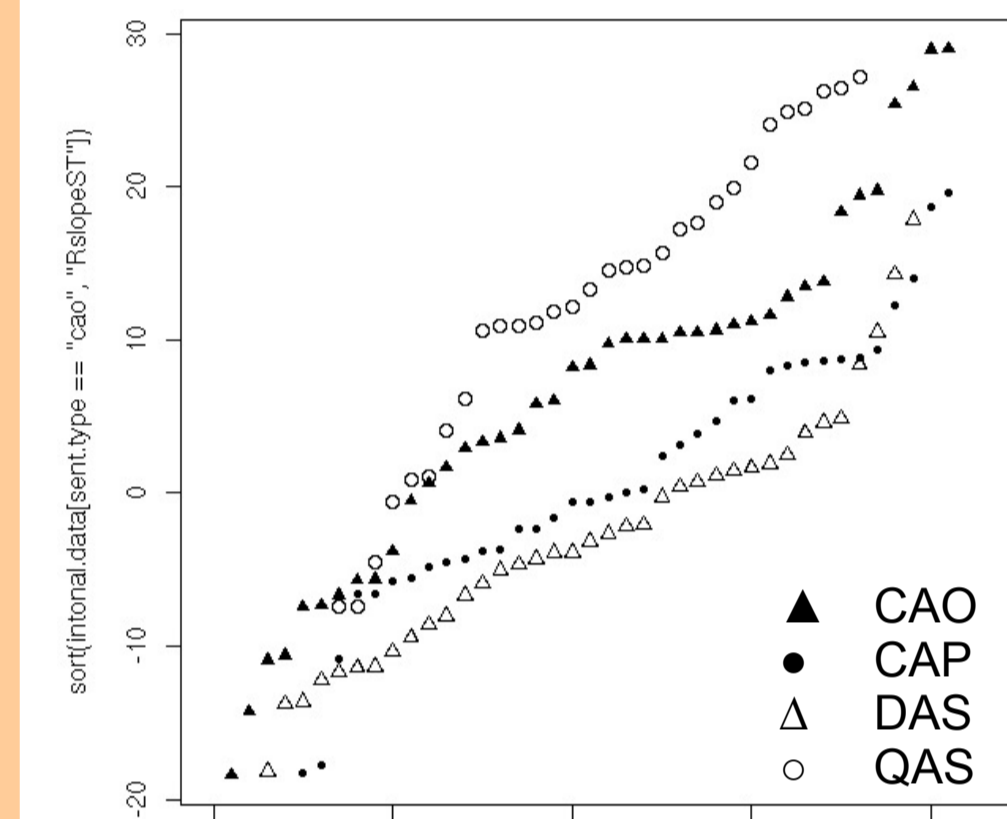
Y axis: Rslope ST value and **X axis:** increasing ordering of observations (each point is an observation).

Figure 4. RslopeST: CAO-CAP-CIS-CIA: 160 observations



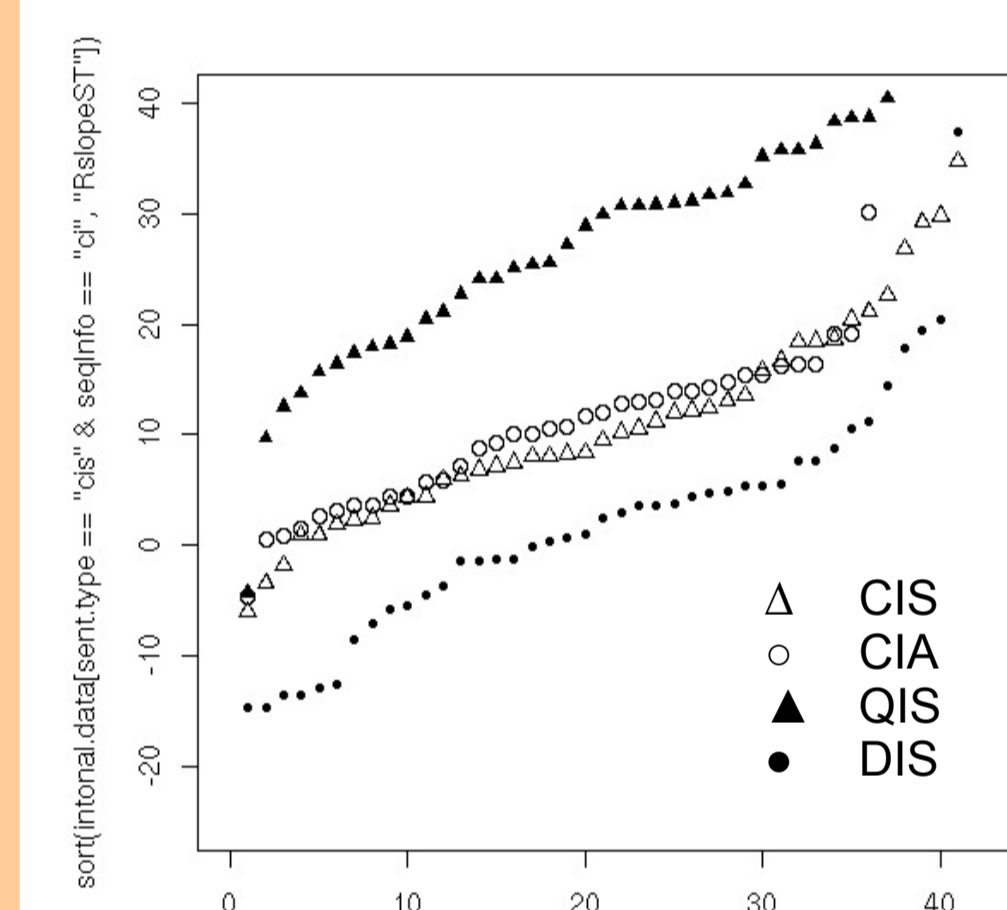
	Estim.	T value		Estim.	T value
CAO	6.521	3.485*	CAP	-1.468	-0.783
cis	3.948	1.488	cao	7.989	3.803*
cap	-7.989	-3.803*	cis	11.937	4.493*
cia	4.841	1.796	cia	12.830	4.756*
CIA	11.3618	5.860*	CIS	10.4693	5.562*
cap	-12.8298	-4.756*	cia	0.8925	0.411
cao	-4.8406	-1.796	cap	-11.9373	-4.493*
cis	-0.8925	-0.411	cao	-3.9481	-1.488

Figure 5. RslopeST: CAO-CAP-QAS-DAS: 160 observations



	Estim.	T value		Estim.	T value
CAO	6.4722	3.088*	CAP	-1.3966	-0.666
cap	-7.8688	-2.655*	cao	7.8688	2.655*
das	-8.3980	-2.833*	das	-0.5293	-0.179
qas	0.5316	0.175	qas	8.4004	2.761*
DAS	-1.9259	-0.919	QAS	7.0038	3.175*
qas	8.9296	2.935*	cap	-8.4004	-2.761*
cap	0.5293	0.179	cao	-0.5316	-0.175
cao	8.3980	2.833*	das	-8.9296	-2.935*

Figure 6. RslopeST: CIS-CIA-QIS-DIS: 159 observations



	Estim.	T value		Estim.	T value
CIS	10.4752	5.911*	CIA	11.3592	6.222*
cia	0.8841	0.431	cis	-0.8841	-0.431
dis	-8.8635	-3.544*	dis	-9.7476	-3.839*
qis	17.1813	6.843*	qis	16.2972	6.394*
QIS	27.656	15.549*	DIS	1.612	0.913
cia	-16.297	-6.394*	qis	26.045	12.988*
cis	-17.181	-6.843*	cia	9.748	3.839*
dis	-26.045	-12.988*	cis	8.864	3.544*

CONCLUSION: back to the initial questions

1) Our continuative configurations and Delattre's continuation features

- CIS-CIA mainly rise. CIS-CIA peak mean is quite similar to CAP-CAO peak mean (for rising data only), but the distribution of observations between 80 and 105 semitones are significantly different (Wilcoxon test).

Our result is more nuanced than Delattre's conclusions are and further research is needed in order to take into account larger segments (not only the last two syllables), the location and the duration of the pitch accent, intra-sentential differences.

- CAP-CAO show only 59% of rising patterns (positive slopes).

This is not consonant with Delattre's claim about major continuations. However, our observations is based only on the focal part of the sentence (an effect of the protocol, see figure 2). See also answer to question 2, below.

- The slopes of CIS and CIA, mostly rising, are not mutually different. However, CIS and CIA slopes are significantly different from DIS slopes, which are lower, and from QIS slopes, which are higher (fig. 6).

CAO slopes are significantly different from CAP slopes (CAO slopes > CAP slopes). CAP slopes, though higher than DAS slopes, are not significantly different from them. Similarly, CAO slopes, though slightly lower than QAS slopes, are not significantly different from QAS (fig. 5).

This is not consonant with Delattre's claim: we find: (i) falling patterns (CAP) for major continuation; (ii) rising CAOs (also associated with major continuations) are not significantly different from question. We intend to study possible differences in the curve convexity in further work.

2) CAO and CAP slopes are significantly different (see above) and this distribution is not expected. Speakers use a rising contour at the end of the first clause, in a two clause sentence, when the discourse relation is marked, but they use a falling pattern when the discourse relation is implicit (juxtaposition).

Further research will have to determine whether, in such sentences, (i) marking the discourse relation can influence the final pattern of the first clause; (ii) the nature of the syntactic dependency (coordination, subordination, juxtaposition) has an influence on the final pattern of the first clause.

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