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An information structure view on Romance yes-no question contours

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Abstract

The paper presents an information structure (IS) analysis of YNQ contours of nine Romance languages from a psycholinguistic perspective. The contours are presented in Frota & Prieto (2015). The psychological IS model defines four IS categories for describing IS partitions of information units and rules for the nuclear stress identification. Information units are contrast units (CUs) generated by the speech production mechanism at the cortex level in order to pair words/word groups within speech data flow. The contrast is an IS functional one at the information packaging level and is conveyed at the prosodic level by contrasted tonal features of IS functional elements. CU_predicate-CU_argument and CU_theme-CU_rheme are the two structural dimensions of IS partitions. The model formulates two IS-based nuclear stress rules that we have used in Romance YNQ contour analysis in order to identify nucleus (focus) of IS partitions that is an important factor to discriminate between different contour types: information seeking YNQ, confirmation seeking YNQ, or echo YNQ within the nine Romance languages.

Keywords: information structure; nuclear constituent; psycholinguistic IS model.

1. Introduction

The paper proposes a new interpretation of Romance YNQ contours presented in Frota & Prieto (2015), where intonational contours and their nuclear sequences are described at the phonological level by using compatible ToBI annotation systems. Nuclear accent is one aspect used in Romance YNQ contour description and the present paper proposes an information structure (IS) basis for the nuclear accent rules. In the previous paper, nuclear configurations are related to the phrase-final contour of the most of the utterances. The last accent in sentence is the strongest one of the sentence claims (Chomsky & Halle, 1968) and this can explain the treatment of final sequences of F0 contours as nuclear sequences in Frota & Prieto (2015). Féry (2010: 227) says about this claim that "it is certainly true for an accent standing for a narrow contrastive focus" but in all-new cases the nuclear stress is generally the pitch accent with the lowest F0 frequency. She finds that the reason for relating nucleus to a low prominence is to be found in the downstep feature of pitch accents which represent heads of embedding downstepped regions. Finally, Féry (2010: 278) admit that information structure modulates the range of pitch accents and of their related p-phrases: "A narrow focus has the effect of raising the top line of the corresponding p-phrase, and a given constituent has the effect of lowering it". Féry's model is a semantic IS approach that tries to fit IS functional elements to different types of phonological events. All semantic IS models have problem in relating functional IS categories to phonological event types because intonational contours firstly encode word packaging within utterances, and a model of this process can fit phonological events to IS categories only.

The present paper proposes a psycholinguistic IS model with two structural levels and four categories for describing information structure of intonational contours. The IS model is a good instrument of Romance YNQ contour analysis presented in Frota & Prieto (2015) because it proposes IS-based rules for nucleus identification. The rules can be used in testing the hypothesis about the existence of Romance YNQ contours with non-final nuclear accent, as in certain contour cases presented in Jitcă et al. (2015) for Romanian.

Three theoretical aspects are important in IS analysis: the information unit definition, the IS functional categories for describing information unit structure (IS partition), and rules for nuclear stress identification within IS partitions. The paper proposes contrast unit (CU) as the basic information unit in utterance partitioning leading to CU hierarchies for describing the utterance structure. CUs are units of the speech production mechanism from the brain level that transforms pairs of words/word groups into contrasted elements in order to be packaged. The contrast is a functional one and is conveyed at the prosodic level by contrasted tonal features.

Féry (2010) uses p-phrases for introducing recursivness at the prosodic level. Thus, p-phrases are related to one significant pitch accent (head) and embedded p-phrases are identified by their lower-level heads. Féry maps IS partitions directly on prosodic domains (p-phrases and

i-phrases). In the current paper recursivness is related to CU hierarchies (IS partition hierarchies) where CUs may correspond to prosodic phrases, part of prosodic phrase or compound of prosodic phrases.

Féry (2013) analyses the content of phrases and observes that prominence is not a universal prosodic property of focus as Truckenbrodt (2005) and Büring (2010) claim. She proposes that "prosodic realization of focus to be subsumed typologically under the notion of alignment: a focused constituent is preferably aligned prosodically with the right or left edge of a prosodic domain. Alignment is understood as a reason for combining constituents with different IS roles within a prosodic domain, to 'package' them individually".

In this perspective the alignment notion does not essentially express the focus phenomenon. The present paper transforms the discussion about focus into a discussion about information packaging where focus is the function of one of the two elements of IS partitions. If prosodic phrases of utterances have more than two prosodic words, its constituents are organized into nested CU hierarchy where lower-level CUs have their focus element.

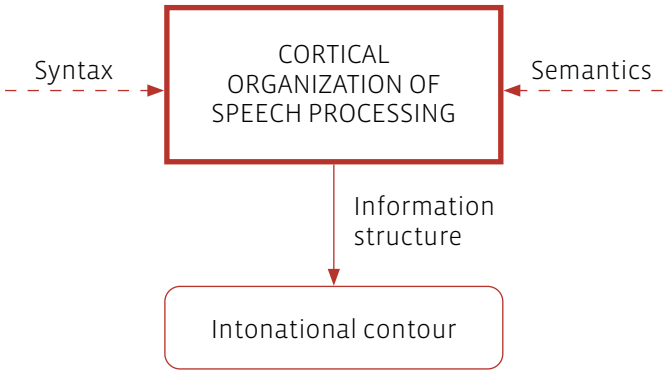
In the remainder of the paper, section 2 presents the psycholinguistic IS model having two structural levels and five functional categories. In section 3 the methodology used in this research is presented. In section 4 examples of Romance YNQ contours are described at the phonological level and the psycholinguistic levels. The resulted IS parttions with nuclear position are the basis for discussing the similarities and differences between Romance YNQ contours.

2. A psycholinguistic model of information structure

The IS model presented in the paper defines contrast unit (CU) as information unit (IU) with IS partition. Halliday (1967) and Steedman (2000) approaches assign information unit to tonal groups where a single prominent constituent with IS semantic function is identified. The rest of IU is considered background. In this model IU is a binary unit of two functionally contrasted constituents. CUs may be related to prosodic phrases but also may correspond to only a part of them (lower-level CUs) or to a compound of them (higher level CUs). In this view the functional constituents of IS partitions have roles firstly at the cortical organization of speech processing and then they may bear linguistic meaning accordingly to syntactic, semantic and discourse contexts (figure 1). The IS approach presented in the paper aims to model word packaging process, by means of their prosodic words.

The IS analysis of intonational contours based on this psycholinguistic model has to decode the IS functions of all accented constituents of one intonational phrase and then to pair them into a logical CU hierarchy. This improves the intonational contour comprehension given by the intonational phonology (Ladd, 2008) and the ToBI adnotation system (Pierrehumbert, 1980; Beckman et al., 2005).

FIGURE 1
A psycholinguistic view on information structure



2.1. The two structural levels of IS partitions

Information packaging process produces binary units which pair accented words by applying them contrasted intonational marks. The contrast is a functional one at the cortical organization of speech processing, having two structural levels.

One of the two functional contrasts is marked at the phonetic level by the tonal contrast between the target tones of CU functional elements. The contrast conveys, as in von der Gabelentz' psycholinguistic model (1869), a contrast between a psychological subject (PS) and a psychological predicate (PP). PS-PP can be also viewed at the semantic level as Topic-Comment structure but we propose to take it as CU_predicate-CU_argument structure produced at any CU level by the speaker's text representation at the cortical level. CU_predicate is marked by lower target tone and CU_argument by higher target tone.

CU_predicate-CU_argument structure has a cognitive basis as Hurford (2003: 261) says: "Neural evidence exists for predicate-argument structure as the core of phylogenetically and ontogenetically primitive (prelinguistic) mental representations. The structures of modern natural languages can be mapped onto these primitive representations".

The second functional contrast is marked at the tonal level by different temporal features of pitch variations during the two functional elements (prosodic words) of IS partition: e.g. (i) slow pitch variation on a downsteping tendency; (ii) abrupt pitch variation or constant level pitch movement during their accented syllable (and non-accented syllable). In the psycholinguistic model, we named this level by CU_theme - CU_rheme structure that can be equivalent, at the semantic level, with theme and rheme parts of utterances. The CU_theme-CU_rheme structure conveys at the psycholinguistic level a 'cause-effect' relation between two constituents marked by different temporal features at the Fo contour level.

In the psycholinguistic IS model, one CU constituent has two overlapped IS functions at the two structural levels. This overlapping is possible because these two functions are encoded by different acoustic cues involving the two dimensions of pitch variation: tonal target levels and shape or slope of pitch excursion (temporal features). The CU_predicate-CU_argument and CU_theme-CU_rheme structures have determination, firstly, in the cortical organization of speech processing and, secondly, in organizing communication (enouncement).

The proposed IS model is a basis for utterance IS partitioning allowing to discuss functional contrasts in direct relation to their intonational marks without invoking semantic aspects.

The constituent with CU_ predicate function is named *predicat enunţiativ* in Romanian by Pană-Dindelegan (2008). She presents different levels of predication in Romanian: syntactic, semantic and at the utterance (enouncement) level. While the CU_argument defines a general category of objects, CU_predicate introduces a particular feature that maps the relation into a subcategory.

The four IS categories of the psychological model describes any IS partitions within utterances. The semantic IS models need additional concepts in certain cases for applying different semantic descriptions to different prosodic phrases. This is due to the fact that semantic models—e.g. Halliday's model (1967)—were not thought to describe prosodic structures. It needs the psycholinguistic IS model to describe the word packaging structures produced at the cortical level.

2.1.1. A description system of IS partitions

In the perspective of the IS model presented in this paper any simple or complex utterance may be decomposed into a hierarchy of CUs, each of them having its own IS partition. P and A labels were introduced for annotating CU_Predicate and CU_Argument constituents, and T and R labels for annotating CU_theme and CU_rheme elements within IS partition descriptions. In the proposed IS description system two labels are used for annotating each element of IS partition because it has functions at the two IS levels. They are linked by "+" and enclosed between round parentheses.

The description of one IS partition is a sequence of two pairs of round parentheses separated by slash, that are related to the two CU constituents. In (1) all four possible IS partition variants for one CU are presented.

(1) a. (A+T)/(P+R) b. (A+R)/(P+T) c. (P+T)/(A+R) d. (P+R)/(A+T)

The description of one CU with lower-level CU(s) as constituents encloses the description of lower level IS partitions between brackets and places a functional label in the indice position after the right bracket. In (2) one IS partition variant for sentence with SVO structure is pre-

sented, where F/NF sequence corresponds to one of 1.a-d IS partition variants. The lower-level CU with NF functional label is paired with the first functional constituent (the subject) having a contrasted F label at the intonational phrase level.

(2) $\{(F)^{Subject} / \{(F)^{Verb} / (NF)^{Object}\}_{NF}\}$

The paper aims to demonstrate that the CU_argument, CU_predicate, CU_theme and CU_rheme functions and the nuclear attribute can be viewed as a minimal set of IS functional categories that can describe IS partitions at any level of CU hierarchy.

2.2. Nuclear accents and hierarchical organization of IS partitions

At the semantic level, nuclear accent corresponds to the word to which the respective sentence/enouncement refers. This word is the focus word of phrases and it corresponds at the cognitive level to the nuclear constituent of prosodic phrases. At the Fo contour level, it has not always an acoustical salience and other criteria have to be found for its identification. In the psychological IS model view the role of nucleus is to project IS functions of nuclear constituent to the whole CU to which it belongs. In this manner, the whole CU becomes a functional element at the higher-level CU where it is one of the two paired elements. This can be viewed in (2) where the lower-level CU of verbal phrase is a generic NF element annotated after the right bracket. That is due to the nuclear function of the NF element (the object) in the lower-level CU. At the global level, the NF element is paired with the F element (the subject).

2.2.1. Nuclear accent rules

At the psycholinguistic level, the prominence of one element within IS partition is a pragmatic one and has an IS basis. Within IS partitions with emphasized Fo contour, produced when one functional element subordinates the contrasted element, positive prominence is significant and the element with the higher tone on the accented syllable bears the prominence. On the contrary, within IS partitions with non-emphasized contour, produced by two coordinated functional elements, negative prominence is significant and the element with the lower tone on the accented syllable bears the prominence. The functional element bearing such types of prominence is nuclear.

The paper proposes two nuclear accent rules which must be used in the nuclear position identification. They are related to the non-emphasized and emphasized contours. From the IS point of view emphasis has to be viewed as an information packaging phenomenon.

The NSR_NE rule for the nuclear accent assignment in non-emphasized contours is formulated in (3) and the NSR_E rule for the nuclear accent assignment in emphasized contours is formulated in (4).

(3) **NSR_NE:** *In non-emphasized contour the nuclear accent is assigned to the global CU_predicate element related to the "low prominence" produced by the lowest target tone.*

(4) **NSR_E:** *In emphasized contour the nuclear accent is assigned to the global CU_argument element related to the "high prominence" of an emphasis produced by the highest target tone.*

The two rules formulated in (3) and (4) say that, if the emphasis is not present, the nuclear accent of IS partition is related to a low prominence and, if it is present, nucleus is related to its high prominence. In other words, the presence of emphasis within CU leads to a nuclear function of its CU_argument constituent. On the contrary, a non-emphasized contour leads to a nuclear function of its CU_predicate constituent. In the former case, CU becomes at the next higher level, a CU_argument element, and, in the latter case, a CU_predicate element. The relation of nuclear constituent with low prominence can be explained by the importance of CU_predicate as a particular feature of a more general category of objects defined by CU_argument.

The connection of CUs and IS partitions within utterance hierarchy is made by means of nuclear accents. That's why it is necessary to identify all IS partitions with their nuclear position in order to understand intonational contour architecture. In the second part of the paper, we try to identify the nuclear positions within the selected Romance YNQ contours and to justify certain nuclear positions with no acoustical salience.

3. Methodology

This research uses the data base with yes-no question contours built for Frota & Prieto (2015) available at http://global.oup.com/booksites/content/9780199685332/. The data base contains utterances related to different types of Romance YNQ: information-seeking (I-S), confirmation-seeking (C-S), echo YNQ and even emotional YNQ variant (e.g. ironical YNQ). In the most cases they are YNQs with only two significant elements at the IS level: e.g. questions with verb-object morpho-syntactic structure. Each F0 contour is related to a skeleton where the two accented syllables are marked by grey squares and all pitch movements are approximated by lines.

YNQ contours are divided into four categories by using two pitch features: the tonal contrast between target tones (weak or strong contrast) and the type of the last pitch accent, high type (H*/L+H*/H*+L) or low type (L*/H+L*/L*+H). Each contour within the four categories is presented by the following information: the skeleton, the corresponding text and the phonological description as it is presented in Frota & Prieto (2015), where a compatible ToBI annotation system is used for each language. Contours are partitioned into IS relevant functional elements which are annotated by using the labels presented in section 2. IS functions are related to prosodic words and deduced by analyzing their pitch contour features: tonal target levels and pitch movement shapes. Then the modality of nuclear stress generation (high or

low prominence) is analyzed in order to set the proper rule for nuclear stress identification. Nuclear accent is added to the IS partition description related to each contour.

4. IS analysis of Romance YNQ contours

All YNQ contours selected for this research are divided in four categories by using two acoustic features: (i) the last pitch accent type; (ii) the size of the contrast between target tones that differentiates between contours with close levels for their target tones and contours with contrasted target tones. The intonational analysis results are summarized by four tables presented in 4.1-4.4 subsections.

Two aspects are important in YNQ contour analysis: (i) the phonological description of pitch events outlining phrase-final contour which is involved in interrogation marking; (ii) the IS description which reflects utterance organization into one CU or one CU hierarchy. Frota & Prieto (2015) analyzes YNQ contours from the phonological view and finally identifies the tonal sequence of phrase-final contours that is used in deducing differences and similarities between languages. The PH_nuclear column of tables 1-4 contains the phrase-final contour description as it is presented in Frota & Prieto (2015), including the page and figure numbers where the description of the respective contour can be found.

In the present paper the IS analysis is added to the phonological analysis leading to the YNQ contour partitioning comprehension. The IS description has two levels: CU_predicate (annotated by P label)-CU_argument (annotated by A label) structure, and CU_theme (annotated by T label)-CU_rheme (annotated by R label) structure. Each element of IS partitions have two functions and are annotated by two labels linked by "+".

The IS description of YNQ contours are duplicated and overlapped firstly on the phonological description and secondly on the text structure. The latter description includes nuclear position annotation by using the N label.

In tables 1-4 the contours with the same skeleton are grouped. These groups are useful in analyzing similarities of contours within groups and contour differences across groups.

4.1. YNQ contours with low last pitch accent and close target tones

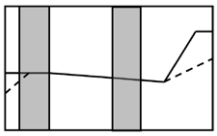
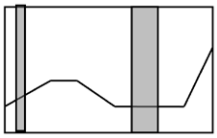
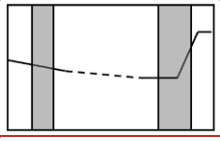
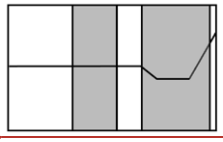
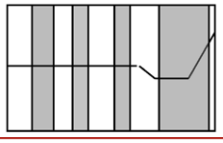
One of the contour types of this category corresponds to the first skeleton presented in table 1. This contour type has two pitch accents with close target tones and a final rising pitch movement during the boundary tone. It was identified in Romanian (Moldova) information-seeking (I-S) YNQ and Peninsular Spanish I-S YNQ contours. The two Italian YNQ contours from Lecce, I-S and confirmation-seeking (C-S) YNQ, are introduced in this category because both L+H* and H+L* pitch accents are pitch event at low level comparatively to the high level of the final boundary tone. They reach the first target tone by small pitch range L+H* pitch

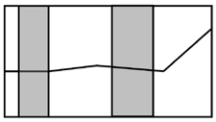
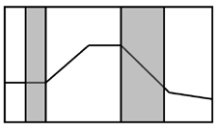
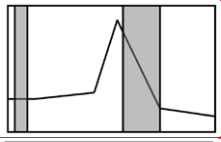
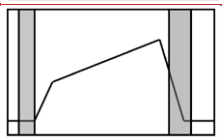
accents comparatively to the first two YNQ contours presented in table 1. The contours from Lecce have very slow final rises and reach lower-level boundary tone than other contours related to the first skeleton.

The first four contours in table 1 corresponding to the first skeleton have the lowest target tone on the object which is the CU-predicate element in the IS partition. The contours have no emphasis and thus the IS_nucleus is on CU_predicate element (the object) related to the lowest tonal level reached on the last accented syllable (NIR_NE rule). The IS_nucleus position coincides with the position of the phonological-based nucleus (PH_nucleus). The constant level pitch accent or rising pitch accents which stop rising movement after their accented syllable leads to CU_rheme function on the first constituent. The slow downsteping tendency during the second prosodic word gives CU_theme function to the syntactic object.

TABLE 1

Romance YNQ contours with low last pitch accent and close target tones

LANG./REGION	CONTOUR TYPE	TEXT	PH_NUCLEUS	IS_DESCRIPTION +IS_NUCLEUS
I-S YNQ Romanian-Moldavia		Aveţi marmeladă?	L* H% p.301, Fig. 8.13	$(A+R)_{L*}/(P+T)_{L*}$ $(A+R)^{Aveţi}/(P+T)_{N}$ marmeladă
I-S YNQ Peninsular Spanish		¿Bebe limonada?	L*+H H% p.372, Fig. 10.13	$(A+R)_{L*+H}/(P+T)_{L*}$ $(A+R)^{bebe}/(P+T)_{N}$ la limonada
I-S YNQ Italian Lecce		Avete delle mandorle?	H+L* LH% p.167, Fig. 5.9-top	$(A+R)_{L+H*}/(P+T)_{H+L*}$ $(A+R)^{avete}/(P+T)_{N}$ delle mandorle
C-S YNQ Italian Lecce		Vuoi le mandorle?	H+L* LH% p.167, Fig. 5.9-mid	$(A+R)_{L+H*}/(P+T)_{H+L*}$ $(A+R)^{vuoi}/(P+T)_{N}$ le mandorle
I-S YNQ Occitan-Aranese		Auetz mandarines?	L* ^H% p.214, Fig. 6.12	$(A+T)_{L+<H*}/(P+R)_{L*}$ $(A+T)^{Auetz}/(P+R)_{N}$ mandarines
C-S YNQ Romanian		Ţi-e frig? 'Are you cold?'	L*H% p.305, Fig. 8.19	$(A+T)_{H*}/(P+R)_{L*}$ $(A+T)^{Ti\text{-}e}/(P+R)_{N}$ frig
Echo YNQ European Portuguese-SEP		São nove?	L*+H LH% p.258, Fig. 7.17	$(A+R)_{H*}/(P+T)_{L*+H}$ $(A+R)^{São}/(P+T)_{N}$ nove
Echo YNQ Romanian		Aţi spus că este ora nouă?	H+L*^H% p.303, Fig. 8.16	$(A+R)_{H*}$ aţi spus [(A+R)H* că este [(A+R) $_{H*}$ ora/(P+T) $_{N}$ nouă] P+T]$_{P+T}$

Echo YNQ Italian Lecce		Sono le nove?	H+L* LH% p.168, Fig. 5.9-bottom	$(P+R)_{L*}/(A+T)_{L*}$ $(P+R)_{N}$ $^{sono}/(A+T)^{le\ nove}$
Echo-YNQ Balearic Catalan		Que són la una?	H+L* L% p.27, Fig. 2.10	$(P+R)_{L*+H}/(A+T)_{H+L*}$ $(P+R)_{N}$ $^{que\ són}/(A+T)^{la\ una}$
C-S YNQ Balearic Catalan		Teniu mandarines?	¡H+L* L% p.30, Fig. 2.13-bottom	$(P+R)_{L*}/(A+T)_{¡H+L*}$ $(P+R)_{N}$ $^{teniu}/(A+T)^{mandarins}$
I-S YNQ Romanian-NE Transylvania		Aveţi marmeladă?	H+L* L% p.301, Fig. 8.14	$(P+T)_{L*H}/(A+R)_{H+L*}$ $(P+T)_{N}$ $^{aveţi}/(A+R)^{marmeladă}$

The Occitan Aranese I-S YNQ and Romanian C-S YNQ contour produces (A+T)/(P+R) IS partitions comparatively to the first four contours which have (A+R)/(P+T) IS partitions. The first constituent of the Occitan Aranese contour does not stop the rising pitch movement after the vowel of the first accented syllable and it is marked for CU_theme function. The final rising pitch movement has a wide pitch range and an abrupt pitch movement leading to the CU_rheme function of the last constituent. The first constituent of the Romanian contour has a slow falling pitch movement which marks it for the topic function. Both contours have CU_predicate and nuclear functions on the syntactic object.

European Portuguese and Romanian echo YNQ contours have constant level pitch accents for the sentence-initial constituent. The constant tonal level is higher than the target tone of the last constituent leading to the CU_argument and CU_rheme functions for the sentence-initial constituents. The last constituent in both contours is prominently marked as CU_predicate and CU_theme functions. The CU_predicate constituent bears nuclear function because its tonal space overlaps that of the other(s) constituents by the last rising pitch movement (NIR_NE rule).

Italian echo YNQ contour (Lecce variety) has also a low stretch during the most part of the contour but it has a very slow ascending tendency. This lower target level of the first accented syllable moves the CU_predicate and IS_nuclear functions on the verb. The contour has a very small falls in the beginning of the last non-accented syllable and H+L* pitch accent is in fact an H* pitch accent followed by an LH% boundary tone. This contour is a case where IS analysis and phonological interpretation give different results in respect to the nuclear position.

The following three contours have also two pitch accents with close low target tones if we consider their last pitch accent as being of H+L* or ¡H+L* type. These pitch accents have a fall

from a very high level on their stressed syllable producing at the perception level a dominant high tone which is not the target tone from the phonological view. The tone on first accented syllable has low prominence comparatively with the following dominant high tone and this leads to the CU_predicate and IS_nuclear functions of the first word (NIR_ NE rule).

Balearic Catalan echo YNQ contour holds low level during the first stressed syllable and, then, the following rising pitch movement ends just before the second accented syllable. The Fo contour falls during the second constituent. The continuous fall from a very high level during the H+L* pitch accent produces a perceivable high tone but it does not produce emphasis and this leads to low prominence and an IS_nucleus on the first constituent, verb (NIR_ NE rule).

In the case of the Balearic Catalan C-S YNQ the Fo contour rises to an extra high level during the second constituent, just before the last accented syllable. The fall from this very high level during the ¡H+L* pitch accent generates a high tone at the perception level than that on the first accented syllable. The low target of the ¡H+L* pitch accent does not generate emphasis because it has a continuously variation with abrupt slope. Thus, the low prominence is on the first syllable and the IS_nucleus is on the verb (NIR_ NE rule).

I-S YNQ contour from NE Transylvania holds the verb at a low level during the its accented vowel and then the Fo contour has a rising pitch movement until the last accented syllable beginning. The fall during the H+L* pitch accent from a very high level on the second accented syllable produces high dominant tone that leads to a low prominence on the verb leading to its CU_predicate and IS_nucleus (NIR_ NE rule).

The first two contours with non-final position of the IS_nucleus have (P+R)/(A+T) IS partitions and the Romanian contour has (P+T)/(A+R) IS partition. In the first two contours, the constant during the first accented syllable marks the verb as CU_rheme constituent, and the slow falling pitch movement during the second accented syllable marks the object as CU_theme element. The last pitch accent of the three contours has two target tones but only the high one is relevant at the IS level and marks the last constituent by CU_argument function. The last four contours in table 1 confirm the hypothesis about the existence of phrase-initial nuclear positions (on the verb) in the Romance YNQ contours.

4.2. Romance YNQ contours with last pitch accent of high type and close target tones

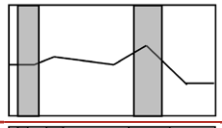
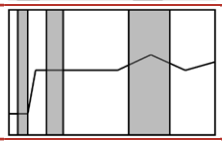
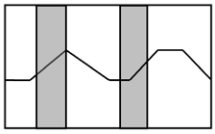
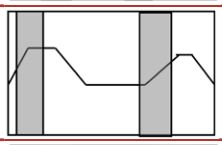
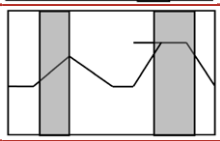
The YNQ contours of this category have a high last pitch accent producing one rising-falling pitch movement during the last prosodic word. C-S Peninsular Spanish and echo Italian (Consenta) YNQ contours have only one rising-falling pitch movement while the other contours in this category have two rising-falling pitch movements. Both subcategories of contours are presented in table 2.

In the I-S Peninsular Spanish YNQ contour, the two target tones being in small tonal contrast are related to the low tone of the first accented syllable of the verb (L*+H pitch accent) and to the high tone of the accented syllable on the syntactic object (L+H* pitch accent). Thus, the verb bears the CU_predicate and the syntactic object bears the CU_argument. The latter one is marked by emphasis which gives it the IS_nuclear function (NIR_E rule). The verb has CU_rheme function marked by stopping rising tendency during the last non-accented syllable of the L*+H pitch accent. The syntactic object bears CU_theme function marked by slow pitch movements during the L+H* pitch accent.

The echo Italian YNQ contours from Consenta reaches the first high target tone on the until the last accented syllable. The last L+H* pitch accent produces a rising-falling pitch movement with a small pitch range during the second word nove 'nine'. The second prosodic word is produced in a high tonal register which does not overlap that of the first constituent. Thus, the second word bears emphasis and the contour has IS_nucleus on it (NIR_E rule). The verb is marked for the CU_rheme function by stopping the abrupt rising pitch movement from low level during the first prosodic word. The object bears CU_theme function having slow pitch movements during its L+H* pitch accent.

TABLE 2

Romance YNQ contours with last pitch accent of high type and close target tones

LANG./REGION	CONTOUR TYPE	TEXT	PH_NUCLEUS	IS_DESCRIPTION +IS_NUCLEUS
C-S YNQ Peninsular Spanish		¿Bebe limonada?	L+H* L% p.373, Fig. 10.14	$(P+R)_{L*+H}/(A+T)_{L+H*}$ $(P+R)^{bebe}/(A+T)_{N}$ la limonada
Echo YNQ-Italian-Consenta		Che sono le nove?	L+^H* LH% p.174, Fig. 5.16-top	$(P+R)_{H*}/(A+T)_{L+^H*}$ $(P+R)^{che\ sono}\ (A+T)_{N}$ le nove
I-S YNQ French Geneva (Swiss)		Vous avez des mandarines?	L+H* L% p.84, Fig. 3.17	$(A+R)_{H*}/(P+T)_{L+H*}$ $(A+R)^{vous\ avez}/(P+T)_{N}$ des manda rines
I-S YNQ Friulian- Gleris		I veisu marmelada?	L+H* L% p.122, Fig. 4.14	$(A+R)_{L+H*}/(P+T)_{L+H*}$ $(A+R)^{I\ veisu}/(P+T)_{N}$ marmelada
Echo YNQ French Fribourg (Swiss)		Vous avez dit qu'il est une heure?	H* L% p.87, Fig. 3.21	$(A+R)_{H*}/(P+T)_{H*}$ $(P+R)^{vous\ avez\ dit}/(A+T)_{N}$ qu'il est une heure

The last three contours belong to the second subcategory of contours with two rising-falling pitch movements in phrase. All of them have CU_rheme-CU_theme structure of their partitions which applies CU_rheme function on the verb by stopping first rising pitch movement in the end of the verbal part and CU_theme function on the object by slow rising-falling movement during the last pitch accent.

The French I-S YNQ contour from Geneva (Swiss) has two high pitch accents having close target tone levels. The first falling movement reaches a low tone annotated by L in Delais-Roussarie et al. (2015: 84). The second pitch accent of L+H* type (H* in the original presentation) keeps the L low tone in the beginning of the last accented syllable producing the low prominence on the object. Thus, the IS_nucleus is on the second word (NIR_NE rule).

The I-S YNQ of Friulian (Gleris) is non-emphasized contour having two high pitch accents with close target tone levels. The second word with its L+H* pitch accent produces a low prominence in the first part of the accented syllable comparatively to the first L+H* pitch accent which begins the voiced part directly at a high level. Thus, the IS_nucleus is on the last word (NIR_NE rule).

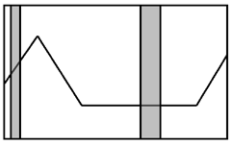
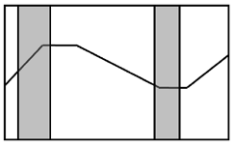
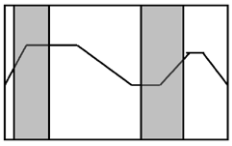
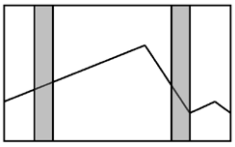
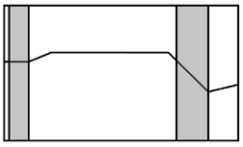
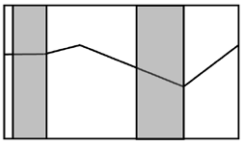
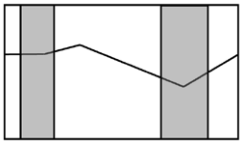
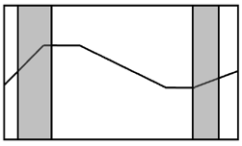
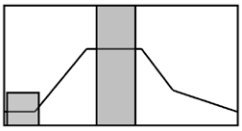
The echo YNQ uttered by a French (Swiss) speaker from Fribourg has also L low tone on the penultimate syllable, but the contour does not keep this level in the beginning of the second stressed syllable, because the voiced part of the last stressed syllable begins directly at high tone. On this syllable an emphasis is generated and the last word *heur* bears the IS_nucleus. The French (Fribourg) echo YNQ contour has a phrase-final IS_nuclear accent as the French (Geneva) I-S YNQ contour but the former one is generated by emphasis. We conclude that Peninsular Spanish variant of C-S YNQ contour and the echo French (Fribourg) YNQ contour presented in table 2 has sentence-final nuclear position. This claim is in agreement with PH_nuclear positions presented in Hualde & Prieto (2015: 373) for Spanish contour and Delais-Roussarie et al. (2015: 87) for French contour.

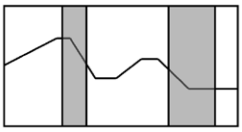
4.3. YNQ contours with the last pitch accent of low type and contrasted target tones

This category includes a large number of contours because the most of Romance YNQ contours ends in a low pitch accent. The contours presented in table 3 have a contrast between one constituent with high target tone in phrase-initial part and a second constituent with low target tone. The highest tone of the first constituent is the high beginning tone or is reached after a phrase-initial ascending pitch movement. The high target tone of the first eleven skeletons does not produce emphasis and the IS_nucleus position is deduced by the NSR_NE rule on the constituent with low target tone.

TABLE 3

Romance YNQ contours with the low last pitch accent and contrasted target tones

LANG./REGION	CONTOUR TYPE	TEXT	PH_NUCLEUS	IS_DESCRIPTION +IS_NUCLEUS
I-S YNQ Valencian Catalan		Tenen mandarines?	L* H% p.24, Fig. 2.9	$(A+R)_{L+<H*}/(P+T)_{L*}$ $(A+R)^{tenen}/(P+T)_{N}$ mandarines
I-S YNQ Occitan-Cauna		Avètz de mandarinas?	L* H% p.214, Fig. 6.11	$(A+R)_{L+H*}/(P+T)_{L*}$ $(A+F)^{Avètz}/(P+T)_{N}$ mandarinas
I-S YNQ Italian-Turin		Avete delle mandorle?	L*+H HL% p.172, Fig. 5.13-top	$(A+R)_{L+H*}/(P+T)_{L*+H}$ $(A+R)^{Avete}/(P+T)_{N}$ **delle** mandorle
I-S YNQ Italian-Lucca		Avete delle mandorle?	H+L* HL% p.173, Fig. 5.15	$(A+T)_{L+<H*}/(P+R)_{H+L*}$ $(A+T)^{avete\ delle}/(P+R)_{N}$ mandorle
I-S YNQ Central Catalan		Teniu mandarines?	H+L* L% p.24, Fig. 2.8	$(A+R)_{H*}/(P+T)_{H+L*}$ $(A+R)^{teniu}/(P+T)_{N}$ mandarines
I-S YNQ Balearic Catalan		Teniu mandarines?	H+L* L% p.30, Fig. 2.13-top	$(A+R)_{H*}/(P+T)_{H+L*}$ $(A+R)^{teniu}/(P+T)_{N}$ mandarines
I-S YNQ European Portuguese SEP		Tem compota?	H+L* LH% p.256, Fig. 7.14	$(A+R)_{H*}/(P+T)_{H+L*}$ $(A+R)^{Tem}/(P+T)_{N}$ compota
I-S YNQ Brazilian Portuguese Sulista		Tem compota?	L*+H H% p.255, Fig. 7.12	$(A+R)_{H*}/(P+T)_{L*+H}$ $(A+R)^{Tem}/(P+T)_{N}$ compota
I-S YNQ French –Marseille		Voulez vous un bonbon?	L* H% p.85, Fig. 3.18	$(A+R)_{H*}/(P+T)_{L*}$bonbon $(A+R)^{Voulez\ vous}/(P+T)_{N}$ an bonbon
Echo YNQ Friulian- Negrons		As undis?	L+¡H* L% p.124, Fig. 4.16	$(P+R)_{L*}/(A+T)_{L+H*}$ $(P+R)^{As}/(A+T)_{N}$ undis

I-S YNQ Sardinian Logudorese		Mandarinu, che nd'at?	H+L* L% p.333, Fig. 9.8	$(A+R)i_{H+L*}/(P+T)_{H+L*}$ $(A+R)_{Mandarinu}/(P+T)_{N}$ a che nd'at

The I-S YNQ of Valencian Catalan reaches the highest tone in the end of the verb and produces a lower-level target tone on the accented syllable. Then, the Fo contour falls at low level where it generates a L* pitch accent. This last pitch accent bears the low prominence and produces the IS_nucleus on the last word. The Valencian contour has a CU_rheme-CU_theme structure of the IS partition that applies CU_rheme function on the verb (pitch accent with stopping rising pitch movement in the end of the prosodic word) and CU_theme function on the syntactic object by keeping the low tone during the following non-accented syllable, delaying the last rising pitch movement.

The I-S YNQ Occitan (Cauna) and I-S YNQ Italian (Turin) contours also have CU_rheme-CU_theme partition. CU_rheme function is justified by the stopping rising pitch movement before the end of the first prosodic word. CU_theme function on the second constituent is due to the slow rising pitch movement during the phrase-final contour. After the two Fo contours reach the highest tonal level, they fall and stop their falling pitch movement just before the second accented syllable. After a low tone is reached, an L* pitch accent occurs in the Cauna contour and a L*+H pitch accent in the Turin case. In both cases the low pitch accents produce low prominence in the IS_nucleus on the second word.

In the case of the Italian (Lucca) YNQ contour, the ascending pitch movement does not stop in the ends of the verb and applies it a CU_theme function. The abrupt falling pitch movement during the second accented syllable gives CU_rheme function to the syntactic object. The first pitch accent has a high target tone (L+‹H* pitch accent) on the verb and a low target tone on the object (the H+L* pitch accent) leading to a CU_predicate function on the object. Thus, the IS_nucleus is on the sentence-final word.

The central and Balearic Catalan I-S YNQ contours have the same skeleton with a high target tone during the first pitch accent and a H+L* pitch accent during the last accented syllable. This leads to a CU_predicate and nuclear function on the object. The non-abrupt pitch fall gives a CU_theme function to the second constituent. Stopping the pitch rising during the non-accented syllable of the sentence-initial word (the verb) marks it as a CU_rheme element at the IS level.

The I-S YNQ contour from European Portuguese (SEP), Brazilian Portuguese (Sulista)-BP and French (Marseille) have the phrase-initial prosodic word at high level. A descending pitch movement begins after the first prosodic word and ends after the last accented syllable in the SEP contour case or after the first part of the last accented syllable (in BP contour case) or before the accented syllable in the case of French (Marseille) contour. The low prominence

in all three cases is generated during the second pitch accents and, thus, the object bears the CU_predicate and IS_nuclear function. The low pitch accents have in all three contours slow pitch movement around the last target tone leading to CU_theme function on the object. High level pitch accents in the Portuguese cases, and the stopping rising pitch movement in the end of the first prosodic word in the French case, mark the verb as CU_rheme element.

In echo Friulian YNQ the word *undis* 'eleven o'clock' has two accentual parts: on the syllables *un* and *dis*, respectively. The large rising pitch movement of the L+¡H* pitch accent related to *un* syllable and the falling pitch movement on the syllable *dis* produces a peak bearing emphasis in respect to the word *as*. Thus, *undis* is the nuclear constituent. Further, the slow falling pitch movements mark *it* as CU_theme element.

The Sardinian I-S YNQ (Logudorese) has two prosodic units with significant rising-falling pitch movements. The first unit of the word *mandarinu* 'tangerines' produces a ¡H+L* pitch accent and a very high target tone comparatively to the second target tone. The abrupt falling pitch movement from an extra high tonal level during the first accented syllable does not produce emphasis but marks *mandarinu* as a CU_rheme constituent. The slow falling pitch movement on the second accented marks the verb as CU_theme constituent. The last constituent has lower target tone that marks it as CU_predicate and nuclear element of partition (NIR_NE rule).

We conclude that all contours in table 3 have the first constituent with high target tone and the second with low target tone. All contours, excepting Friulian echo YNQ one, produce low prominence on the second word and IS_nucleus is identified with NSR_NE rule.

4.4. Romance YNQs with last pitch accent of high type and contrasted target tones

The Fo contours of this category presented in table 4 have ascending phrase-final contours, excepting the incredulity question of Italian (Pisa) contour. They can be divided in two categories of contours. The first category contains non-emphasized contours with sentence-intial IS_nucleus due to the low prominence on the first accented syllable. The second category includes contours with a very upstepped tendency after the first accented syllable and a high boundary tone, leading to an emphasis on the syntactic object because the two pitch accents evolves in two separated tonal spaces.

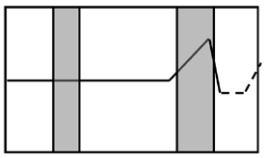
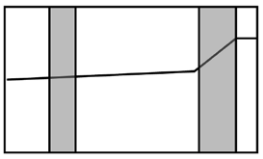
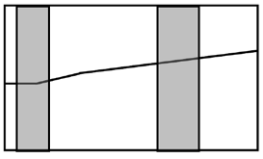
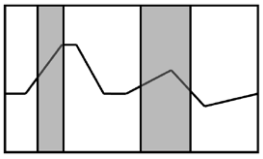
Contours in the first category are non-emphasized ones and NSR_NE relates the IS_nuclear word to the CU_predicate element (the verb), while contours in the second category are emphasized ones and NSR_E relates the IS_nuclear word to the CU_argument element (the object). Contours in both categories have the (P+R)/(A+T) structure of IS partitions.

The first four contours from table 4—Romanian (Moldova), Italian (Salerno), Italian (Naples) and Italian (Bari) I-S YNQ contours—are related to the first category. The low stretch is fol-

lowed by a rising pitch movement during the last pitch accent of L+H* or H* types. On the last accented syllable contours, all contours fall to L% boundary tone, excepting that from Bari which end in a LH% boundary tone. The contours have the verb as CU_predicate constituent. Their constituents have overlapping tonal spaces and CU_predicate bears the IS_nucleus (NIR_NE rule).

TABLE 4

Romance YNQs contours with last pitch accent of high type and contrasted target tones

LANG./REGION	CONTOUR TYPE	TEXT	PH_NUCLEUS	IS_DESCRIPTION +IS_NUCLEUS
I-S YNQ Romanian Moldavia		Aveţi mandarine?	H*L% p.300, Fig. 8.12	$(P+R)_{L*}/(A+T)_{H*}$ $(P+R)_{N}$ $^{ave_{,}ti}/(A+T)$ ^{mandarine}
I-S YNQ Italian-Salerno		Avete dei mandarini?	L+H* L% p.171, Fig. 5.12-bottom	$(P+R)_{L*}/(A+T)_{L+H*}$ $(P+R)_{N}$ $^{avete}/(A+T)^{mandarini}$
I-S YNQ Italian-Naples		Avete dei mandarini?	L+H* L% p.172, Fig. 5.13-bottom	$(P+R)_{L*}/(A+T)_{L+H*}$ $(P+R)_{N}$ $^{avete}/(A+T)^{mandorle}$
I-S YNQ Italian-Bari		Avete delle mandorle?	L+H* LH% p.170, Fig. 5.11	$(P+R)_{L*}/(A+T)_{L+H*}$ $(P+R)_{N}$ $^{avete}/(A+T)^{mandorle}$
I-S YNQ French-Geneva		Vous voulez un bonbon?	H* H% p.83, Fig. 3.16	$(P+R)_{H*}/(A+T)_{\wedge H}*$ $(P+R)^{voulez}/(A+T)_{N}$ $^{a\ bonbon}$
I-S YNQ EP Northern Variety		Um pronto a vestir?	L+H* H% p.256, Fig. 7.13	$(P+R)_{L*}/(A+T)_{L+H*}$ $(P+R)$ $^{pronto}/(A+T)_{N}$ $^{a\ vestir}$
Ironical YNQ French- Fribourg (Swiss)		Tu as faim?	H* H% p.89, Fig. 3.24	$(P+T)_{L*}/(A+R)_{H*}$ $(P+T)^{tu\ as}/(A+R)_{N}$ ^{faim}
I-S YNQ Peninsular Spanish		¿Bebe limonada?	H* H% p.373, Fig. 10.15	$(P+R)_{L*+H}/(A+T)_{H*}$ $(P+R$ $^{bebe}/(A+T)_{N}$ $^{la\ limonada}$
Incredulity-question Italian Pisa		Loredana un ingegnere?	!H*+L LH% p.176, Fig. 5.17-bottom	$(A+R)_{L+H*}/(P+T)_{!H*+L}$ $(A+R)^{Loredana}/(P+T)_{N}$ ^{ingegnere}

The following three contours from table 4, European Portuguese Northern variety, French (Geneva) I-S YNQs and ironical French (Fribourg) YNQ contour, are related to the second category. The low stretch is followed by a rising pitch movement during the last pitch accent of L+H* or H* types. The ascending tendency of the contours and the separating tonal spaces of

constituents produce emphasis on the last constituent with high target tone and IS_nucleus has the same position as the PH_nucleus.

The Peninsular Spanish I-S YNQ contour does not hold the tonal stretch between the two accented syllables at a constant level. After the first accented syllable the Fo contour has a continuously rising pitch movement which includes the segment of the second accented syllable. This leads to separated tonal registers for the two pitch accents and to an emphasis and IS_nucleus on the sentence-final word. The low-level pitch accent on the first word marks it for CU_rheme function while the slow rising pitch movement during the second word marks it as CU_theme function.

The last contour presented in table 4, the Italian (Pisa) incredulity question, is a descending contour which has an extra-high L+H* pitch accent, but it does not generate emphasis because the peak of the word *Loredana* does not produce a tone at the top level, having a rising and a falling pitch movement. The contour ends the first rising pitch movement in the end of the first accented syllable and then it continues with a falling pitch movement. This produces CU_rheme function on the first word. The second pitch accent of H*+L type has a slow rising-falling pitch movement during the second accented syllable and that marks the second word as CU_theme element. The position of IS_nucleus can be deduced by NSR_NE rule and it is related to the CU_predicate *ingegnere*.

5. Conclusions

The IS perspective introduced in intonational analysis improves the Fo contour comprehension by relating phonological events to the information packaging function of prosodic constituents. In the psycholinguistic IS model view, the information packaging process transforms word sequence of one utterance into a hierarchy of contrast units which include pairs of words or word groups organized as IS partitions. Nuclear accents are important elements in implementing the hierarchical CU organization within utterance/phrase. At the semantic level, the nuclear element bear sentence/phrase accent and the focus function. The model formulates nuclear stress identification rules on IS basis that link nuclear elements on the lowest or highest target tones of phrases.

The IS model proposes two IS levels and four IS categories for describing IS partitions. Both phonological events and other phonetic details are important in understanding the two structures of IS partitions. Phonological events (pitch accents) and the whole Fo contour of constituents are discussed in relation to their psycholinguistic functions.

CU-predicate and CU-argument constituents can be deduced after identifying their target tones. CU_theme and CU_rheme constituents of one CU can be identified by temporal feature analysis of their pitch movements. Skeletons illustrate the main pitch events of Fo contours: all pitch movements and their Fo patterns during accented syllables. Target tones are used

in the paper for grouping Fo patterns of the analyzed YNQ contours into several categories in order to restrict their variability within these groups: contours with weak phonological contrast (tables 1-2) and with strong phonological contrast (tables 3-4).

After Fo contour partitioning, similarities and differences of YNQ contours can be discussed in terms of IS partition type and IS_nucleus position. The first eight contours presented in table 1 have related both pitch events to low target tones which are also dominant tones during their accented syllables. The downsteping tendency of their Fo contours leads to a lower level for the second target tone. These contours in table 1 are non-emphasized and their nucleus has sentence-final position.

In the same category we place the contour where both pitch accents have low target tones, but the last H+L* or ¡H+L* pitch accent has two relevant tones: the low tone is relevant as target tone at the phonological level and the dominant high tone which is relevant at the IS level. The fall from a very high tone of H+L* or ¡H+L* pitch accent produces at the perception level a dominant high tone which contrasts with the lower tone of the first accented syllable. For this subcategory of contours, the IS_nucleus moves to the left on the first word (the verb) because it bears CU_predicate function. It is the case of the C-S and echo Balearic Catalan YNQ contours and the I-S Romanian YNQ contour from NE Transylvania that have two low target tones but the IS contrast is produced between the low tone of the verb and the dominant high tone of the last bitonal pitch accent.

Table 2 contains two contours, French (Geneva) and Friulian (Gleris) I-S YNQ contour, where the phonological contrast is weak (between two high target tones) but the IS functional contrast is a strong one. The latter one is produced between the first high target tone on the verb and the dominant low tone which occurs in the first part of the last bitonal pitch accent (L+H* pitch accent). This low tone bears the low prominence which applies the CU_predicate and nuclear functions to the last word. In Delais-Roussarie et al. (2015) and Roseano et al. (2015) this low part on the last accented syllable is annotated with a separate label (L) but it is not presented as being the cause of the nucleus on the last constituent of the sentence.

The most of contours in table 3 have a phrase-initial high target tone in contrast with a low target tone produced by a low pitch accent (L*, H+L* or L*+H). The contrast between the IS functional elements is also a strong one. The low target tone produces the low prominence which applies the CU_predicate and nuclear functions on the last word.

The IS-based analysis discovers, through these contours with strong phonological contrast, one contour where the high pitch accent and the following falling pitch movement produce emphasis. This is the Friulian echo I-S YNQ contour presented in table 3.

The contours presented in table 4 represent, in the most cases, the contours with strong contrast between a low pitch event on the first accented syllable and a high event in the second

accented syllable. Low pitch event may be of L* or L*+H pitch accent types and high pitch events may be of H* or L+H*. Fo contour differences can be also observed at the boundary tone level, L% or H%. The contours have constituents with overlapping tonal spaces. They are non-emphasized contours and IS_nucleus is related to the low prominence. This explains its sentence-non-final position in the first four contours presented in table 4.

IS differences of YNQ contours can be related to their type differences (e.g. I-S, C-S, echo) within the intonational system of languages. Intonational system of Romanian has contours with non-final position of nuclear stress for I-S YNQs and contours with final position of nuclear stress for C-S and echo YNQs. Romanian also has I-S YNQ contour with sentence-final nuclear word. It differs from C-S and echo YNQ contours by the modality of reaching the lowest level: a very slow downsteping tendency in the I-S case and a pitch fall before or during the last accented syllable in the C-S and echo cases. Romanian C-S and echo YNQ contours differ in IS partition type: (A+T)/(P+R) in the C-S YNQ case and (A+R)/(P+T) in the echo YNQ case.

In the intonational system of Balearic Catalan, I-S YNQ contours have sentence-final position of nuclear stress and sentence-non-final position of nucleus in C-S and echo YNQ contours. Other Romance languages have also echo YNQ contours with nucleus in sentence-non-final position: Italian (Lecce, Consenta), French (Fribourg).

We conclude that the psychological IS model gives a cognitive meaning to the phonological categories that can be transferred to the semantic IS categories. Thus, Topic-Comment and Theme-Rheme structures can be viewed as CU_predicate-CU_argument and CU_theme-CU_rheme structures of phrases where the semantic focus element corresponds to the nucleus of IS partitions.

6. References

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