Rethinking Spanish L*+H and L+H*

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1. Introduction

Work on many varieties of Spanish (including Castilian Spanish, which is the focus of this paper) has found that broad focus declarative utterances in these varieties are characterized by a pre-nuclear rising pitch accent that has two characteristics. First, the pre-nuclear rising pitch accent results in a valley in the fundamental frequency (F0) that occurs at or very near the onset of the stressed syllable to which the pitch accent is associated. Second, the pre-nuclear rising accent results in an F0 peak that is realized in a post-tonic syllable rather than within the stressed syllable with which the pitch accent is associated. In addition, the F0 valley near the onset of the stressed syllable is more stable in its temporal realization than is the F0 peak, whose temporal realization is readily affected by a variety of factors, such as the distance between pitch accents. Within the Autosegmental-Metrical theory of intonational phonology, a standard analysis for this pre-nuclear rising pitch accent in broad focus declaratives is L*+H (e.g. Face 2002, Hualde 2003a, Sosa 1999). The bitonal nature of the pitch accent accounts for the rise in F0, with the L(ow tone) accounting for the F0 valley and the H(igh tone) accounting for the F0 peak. The * suffixed to the L indicates autosegmental association of this tone to the stressed syllable. This association, according to the standard analysis, gives the L preference for alignment with the stressed syllable, and this is why the F0 valley is more stable in its alignment with the stressed syllable than is the H in its temporal alignment in a post-tonic syllable. Examples of this pre-nuclear rising pitch accent can be seen in the first two pitch accents in Figure 1. In this figure the stressed syllables are delimited by s> and S>.

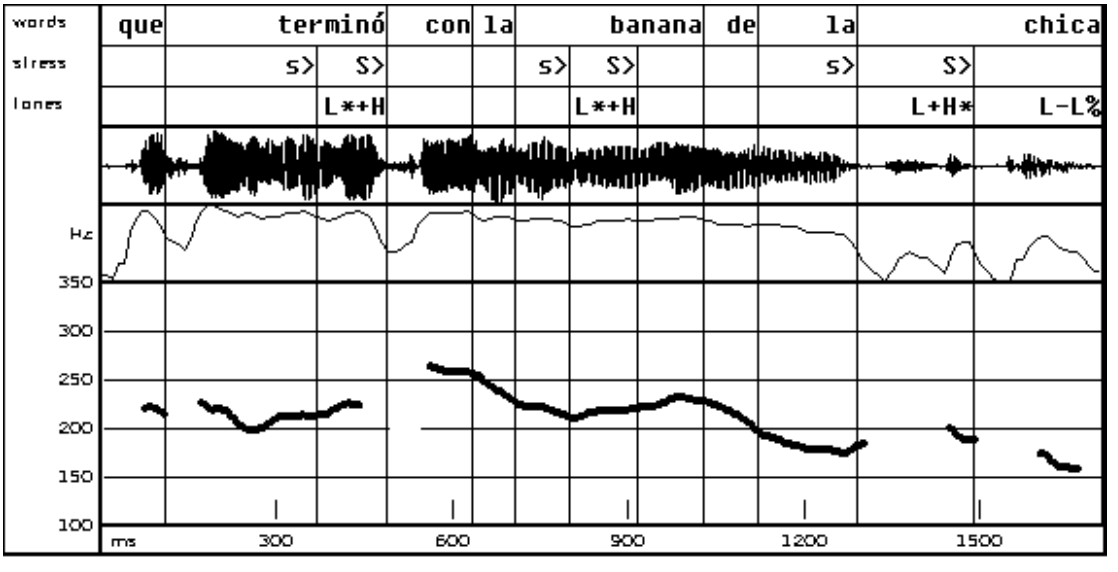

Figure 1. Castilian Spanish broad focus declarative utterance from Face (2002).

In Castilian Spanish there is also a pre-nuclear rising pitch accent on a word in narrow focus in declaratives, but the F0 rise is somewhat different. While the F0 valley again occurs at or very near the

onset of the stressed syllable, the F0 peak occurs within the stressed syllable rather than in a post-tonic syllable. In comparison with the broad focus pitch accent, the F0 peak of the narrow focus pitch accent is more stable in its temporal realization. While other analyses have at times been proposed, the standard Autosegmental-Metrical analysis of this Castilian Spanish declarative narrow focus rising pitch accent is L+H* (e.g. Face 2002, Hualde 2003a). It is bitonal, like the broad focus pitch accent, and therefore accounts for the F0 valley and the F0 peak. The suffixation of the * to the H indicates association of this tone to the stressed syllable, accounting for the realization of the F0 peak within the stressed syllable rather than after it as in the broad focus pitch accent. An example of this narrow focus pitch accent can be seen in Figure 2.

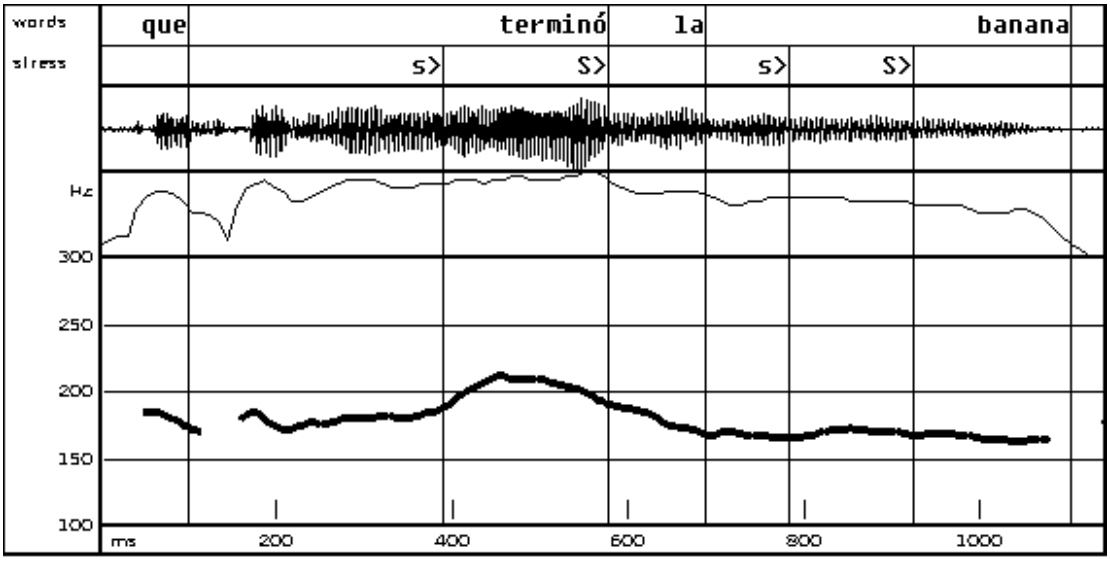

Figure 2. Castilian Spanish utterance with contrastive focus on *terminó* (Face 2002).

While the distinction between the Castilian Spanish broad focus L*+H and the contrastive focus L+H* has become a standard Autosegmental-Metrical analysis of the corresponding F0 patterns, there is a potential difficulty in maintaining this distinction. In Section 2 I will present evidence that one of the strategies at a speaker's disposal in Castilian Spanish to communicate narrow focus on a word within an absolute interrogative is to use a third rising pitch accent distinct from the two discussed above. Like the other two rising pitch accents, the third rising pitch accent also has a clear F0 valley and a clear F0 peak, indicating that this pitch accent also merits a bitonal L+H analysis. Standard Autosegmental-Metrical notation allows only for a two-way contrast between L+H accents, being that the suffixed * can occur on either the low tone (i.e. L*+H) or the high tone (i.e. L+H*). A third rising F0 pattern has been reported for Dominican Spanish (Willis 2003) as well, but it is not clear in this case that there is a three-way phonological contrast, as there seems to be an allophonic relationship between two of the rising F0 patterns. Nonetheless, there is evidence that three distinct rising pitch accents may exist in a language. Recent work on Catalan shows just this situation (Prieto in press, Prieto et al. in press), and supports the need for a system of intonational phonology to be able to represent such contrasts.

In Section 2 I present new data from Castilian Spanish on the intonation patterns used to mark narrow focus in absolute interrogatives. In Section 3 I consider the limitations of the current representational system of the Autosegmental-Metrical theory of intonational phonology and suggest that the incorporation of secondary association of tones may be able to adequately represent the three-way distinction in rising pitch accents in Castilian Spanish. Finally, Section 4 will present a brief conclusion of the findings and claims of this study.

2. Narrow focus in Castilian Spanish absolute interrogatives

For part of a larger study (e.g. Face 2004, submitted), I recorded five native speakers of Castilian Spanish reading sentences in contexts in which they produced (among other things) absolute interrogatives with one of the words in narrow focus. Subjects would read a context sentence to which they would respond with a question requiring focus on one of the words in the answer. For example, for the context sentence "Le dieron la hora del vuelo" the subjects would respond by asking "¿Le dieron el número de vuelo?", where 'número' would be expected to be produced with narrow focus, as it is the only new information in the utterance and contrasts with 'hora' from the context sentence. In all there were five target sentences, each containing three stressed content words, and each was placed in three contexts, with each context forcing a production with narrow focus on one of the three content words. Each subject read and produced each utterance twice, resulting in a total of 150 produced absolute interrogatives with narrow focus (5 subjects x 5 sentences x 3 focus positions x 2 productions of each). All of the produced utterances were analyzed using the Pitch Works software designed for intonational studies.

Three intonation patterns were found to mark narrow focus in pre-nuclear (i.e. non-final) position in Castilian Spanish absolute interrogatives. Two of the three patterns resemble patterns used to mark narrow focus in declaratives (Face 2002). One pattern is a rising pitch accent with the rise beginning near the onset of the stressed syllable and continuing into a post-tonic syllable. In these cases the peak is generally higher when the word is in narrow focus than when it is not. An example can be seen in Figure 3, where the stressed syllable of the word in narrow focus is shaded. In some of these cases, but not all, the focal word also marks the end of an intermediate phrase and a H- phrase accent (and sometimes a pause) occurs at the end of the word in focus.

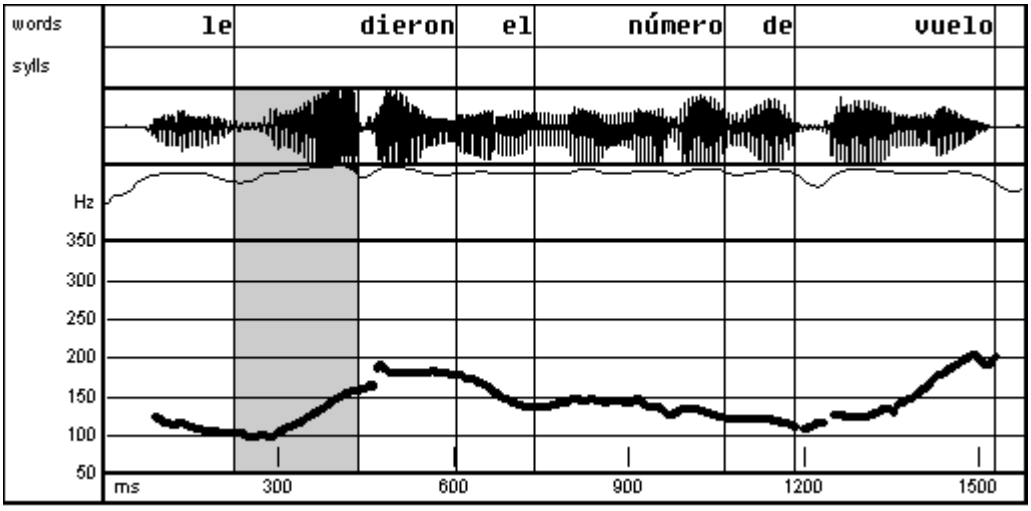

Figure 3. Castilian Spanish absolute interrogative with narrow focus on *dieron*.

Another intonation pattern found to mark narrow focus in absolute interrogatives also resembles a pattern used to mark narrow focus in declaratives. This pattern also involves a rising pitch accent, but the rise ends within the stressed syllable and then the F0 falls to the end of the word due to the L- phrase accent marking the edge of an intonational phrase. An example is given in Figure 4.

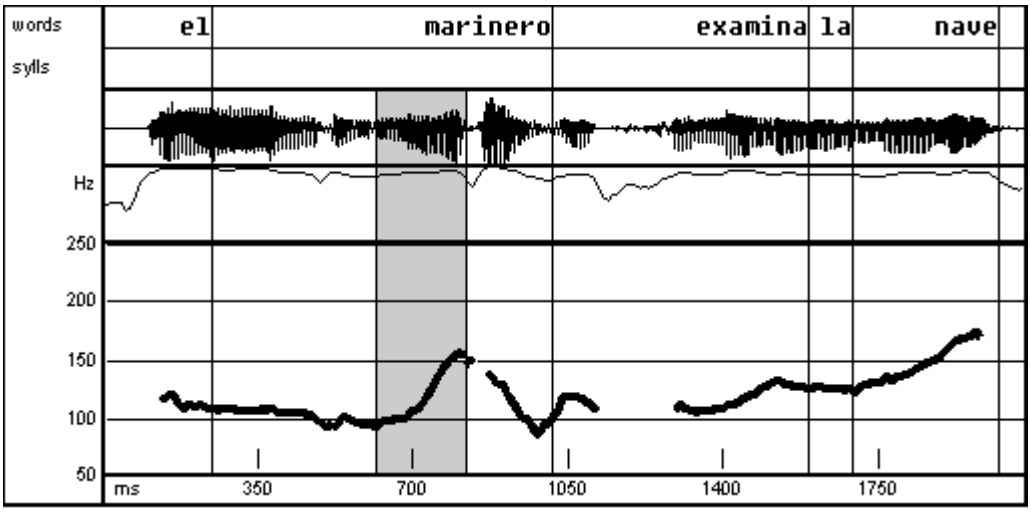

Figure 4. Castilian Spanish absolute interrogative with narrow focus on *marinero*.

The two intonation patterns mentioned to this point to mark narrow focus in absolute interrogatives are patterns also found to mark narrow focus in declaratives. However, these two patterns combined mark less than half of the cases of narrow focus in absolute interrogatives. The most common intonation pattern for marking narrow focus in absolute interrogatives, accounting for slightly over half of the cases in that study, is a pattern not reported for Castilian Spanish declaratives. This most common focal intonation pattern in absolute interrogatives involves a low F0 valley extending through the stressed syllable followed by a rise that begins at or near the offset of the stressed syllable. Examples are shown in Figures 5 and 6.

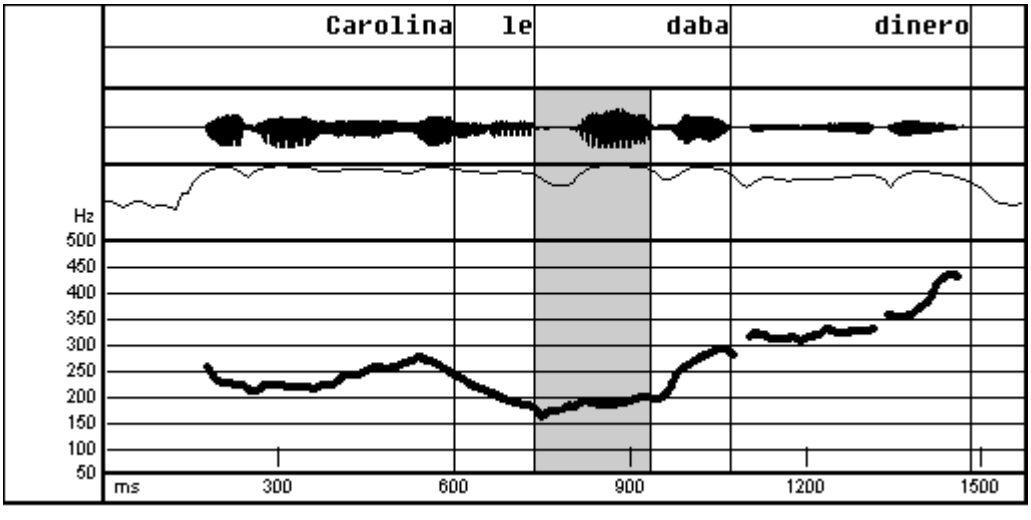

Figure 5. Castilian Spanish absolute interrogative with focus on *daba*.

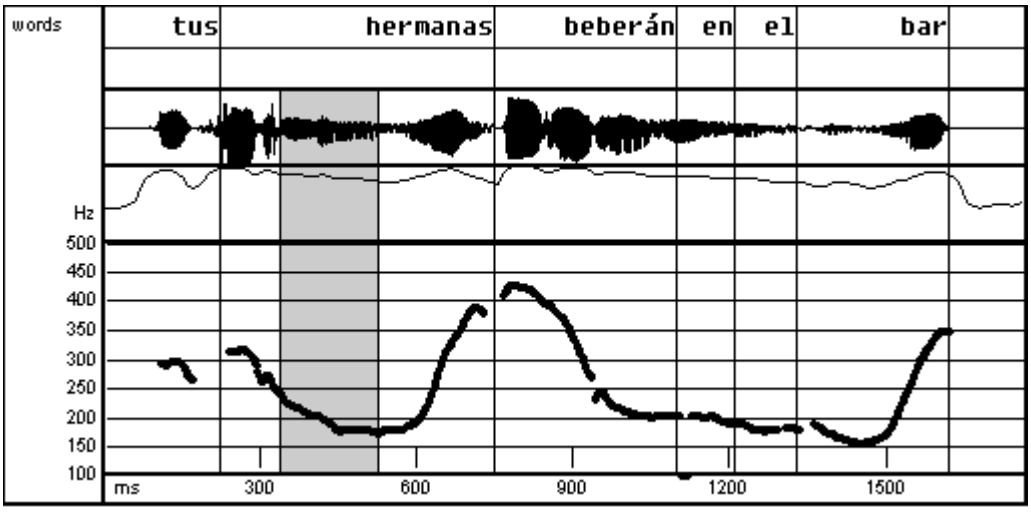

Figure 6. Castilian Spanish absolute interrogative with focus on *hermanas*.

The type of rising pitch accent seen in Figures 5 and 6, where the rise starts near the offset of the stressed syllable, is clearly different from those seen in Figures 1 and 2 where the rise starts near the onset of the stressed syllable. Previous work has shown that the broad focus pitch accent and the narrow focus pitch accent in Castilian Spanish declaratives must be phonologically distinct pitch accents rather than allophonic variants of one pitch accent given not only the different meaning they communicate but also their different properties of phonetic alignment in situations where tonal crowding is not a factor (e.g. Face 2002). In the case of the focal pitch accent in absolute interrogatives there is quite clearly a difference in phonetic alignment that cannot be due to tonal crowding (i.e. there is no tone realized in an immediately preceding syllable placing time pressure on the realization of the F0 valley and forcing it to occur later in the stressed syllable). While the meaning of focus communicated by this pitch accent is identical to the meaning communicated by the focal accent found in declaratives, these cannot be seen as two allophones of one pitch accent given their clear differences in phonetic realization. Thus we must assume that a distinct pitch accent is often used to communicate narrow focus when this focus occurs in absolute interrogatives. Significantly, the presence of this focal accent in absolute interrogatives means that Castilian Spanish has three phonologically distinct rising pitch accents.

3. Autosegmental-Metrical analysis of the three Castilian rising pitch accents

While the standard Autosegmental-Metrical analysis of the Castilian Spanish pre-nuclear broad focus pitch accent as L*+H and of the pre-nuclear narrow focus pitch accent as L+H* represents a phonological difference between these two rising accents, the analysis is complicated by the presence of a third pre-nuclear rising pitch accent in Castilian Spanish. As shown in Section 2, narrow focus in absolute interrogatives is often marked by a rising pitch accent unique to interrogatives. Rising accents need to be represented as a sequence of a L and a H, accounting for both the F0 valley and the F0 peak, respectively. However, standard notation allows for only two possible L+H pitch accents: L*+H and L+H*. In Spanish, as well as in many other languages, the suffixed * which was originally intended to indicate the metrically stronger tone (Pierrehumbert 1980), has come to be understood as marking the tone of the bitonal pitch accent that is phonetically aligned with the stressed syllable. Thus for Castilian Spanish, L+H* represents the narrow focus accent in declaratives since the F0 peak is aligned with the stressed syllable (i.e. the F0 peak occurs within the temporal boundaries of the stressed syllable). In broad focus accents in declaratives, the F0 peak is realized in a post-tonic syllable, and the L*+H analysis is used, representing the lack of alignment of the F0 peak, but the fact that the F0 valley is aligned at or near the onset of the stressed syllable. While this analysis represents the contrast between these two pitch accents, it is not without problems.

One problem is that the F0 patterns represented by L*+H and L+H* would be expected to be mirror images of each other. That is, just as the pattern represented by L*+H has an F0 valley aligned with the stressed syllable and an F0 peak that is relatively free and is realized in a post-tonic syllable, one would expect the pattern represented by L+H* to have an F0 peak aligned with the stressed syllable and a preceding F0 valley that is relatively free and is realized in a pre-tonic syllable. This, however, is not the case. Rather the pattern typically analyzed as L+H* has an F0 valley that is aligned near the onset of the stressed syllable, just as it is in the pattern commonly analyzed as L*+H. Thus the phonetic alignment of L is identical regardless of whether it bears the suffixed * or not. Furthermore, Arvaniti et al. (2000) have shown that there are cases in Greek where neither tone is phonetically aligned with the stressed syllable. If the * is meant to mark alignment with the stressed syllable, then this is clearly problematic. If, on the other hand, the * is meant to indicate the metrically stronger tone of the two tones in a bitonal pitch accent (i.e. the head of the pitch accent), a different problem arises with the standard Spanish analysis.

The original meaning of the suffixed * was to indicate the strong tone of the pitch accent that associates (in the autosegmental sense of association) with the stressed syllable. From this point of view the * does not necessarily indicate anything about the phonetic alignment of the pitch contour with the stressed syllable, but rather has a more abstract phonological meaning. In the case of the standard Spanish L*+H and L+H* analyses in declaratives, this viewpoint would indicate that in L*+H the L is the strong tone while in L+H* the H is the strong tone. Yet when speakers of Castilian Spanish hear these accents, they perceive both of them as primarily high. This corresponds to what Prieto et al. (in press) report when they state that "in order for a syllable to be perceived as high, the pitch level needs to stay high or rise for a good portion of the accented syllable; conversely, in order for a syllable to be perceived as low the pitch level must stay low or fall during the accented syllable." Thus following the viewpoint that the * indicates the strong tone of the pitch accent that is associated with the stressed syllable, and given that both of the declarative pitch accents in Spanish are perceived as high, it seems that both of these accents should be analyzed as L+H*. Clearly, though, there must be a way to distinguish phonologically between these two contrasting pitch accents.

The problems that we have seen to this point with the standard Spanish L*+H and L+H* analysis are present when just the two pitch contours corresponding to these units are considered. How does the situation change when we try to account also for the interrogative focal accent discussed in Section 2? If the * is taken to indicate phonetic alignment, then the difficulty with the L*+H vs. L+H* distinction is enhanced when the interrogative focal pitch accent is considered. Not only would the L have nearly identical alignment between the L*+H and L+H* accents as currently used, but the addition of the interrogative focal accent would also seem to require a L*+H analysis since it is the L that is aligned with the stressed syllable. This would result in a L* indicating two different phonetic alignments with the stressed syllable (an F0 valley at the beginning of the stressed syllable and a low F0 throughout the stressed syllable), in addition to one of the L* alignments (the F0 valley at the beginning of the stressed syllable) being identical to the alignment of the L in the L+H* pitch accent. Clearly the Spanish rising accents make it difficult to maintain the * as an indicator of phonetic alignment of the pitch accent with the stressed syllable.

If the * is taken to indicate the strong tone (or the head) of the pitch accent, we have seen that the two Castilian Spanish accents commonly analyzed as L*+H and L+H* should both be analyzed as L+H* since the stressed syllables bearing these accents are perceived as being high. However, the interrogative focal pitch accent with its low F0 throughout the stressed syllable seems quite clearly to merit a L*+H analysis. The low F0 throughout the stressed syllable leads syllables bearing this accent to be perceived as low, indicating that the L is the strong tone of the accent. In spite of the common use of L*+H in analyses of Spanish intonation, the L*+H label is used in other languages (e.g. English) for precisely the intonation pattern found in the Castilian Spanish interrogative focal accent. When the * is taken in its original sense of indicating the metrically strong tone of the pitch accent, the interrogative focal accent is quite easily incorporated into the analysis as L*+H as it is the only one of the three rising pitch accents in Castilian Spanish where the L is the strong tone of the accent. This is an advantage over the other viewpoint, where the * indicates phonetic alignment, since the addition of the interrogative focal accent makes that analysis even more complicated and inconsistent. Nonetheless, assuming the * indicates the metrically strong tone of the pitch accent, there is still an

issue to be resolved. While the interrogative focal pitch accent seems to clearly require a L*+H analysis, the broad focus declarative accent (typically analyzed as L*+H) and the narrow focus declarative accent (typically analyzed as L+H*) both seem to merit a L+H* analysis. Given that these are clearly two distinct accents, occurring in the same pre-nuclear positions but communicating different meanings, an analysis must distinguish them phonologically and not analyze them both as identical L+H* pitch accents.

The question that arises, then, is how to mark both the broad focus and narrow focus declarative pitch accents as rising accents with a strong H, yet also mark them as phonologically distinct pitch accents. If languages have three or more contrasting rising (or falling) bitonal pitch accents – and recent studies on Catalan provide another example of such a language (Prieto in press, Prieto et al. in press) – then the Autosegmental-Metrical model of intonational phonology must be able to account for such three-way contrasts. Some might question, as did an anonymous reviewer, whether this is really a matter of phonological theory or purely one of notation. The reviewer stated that "even if three different types of rising accent had to be distinguished that would not be a problem for the Autosegmental-Metrical theory. In order to distinguish among three phonologically contrastive rising accents, one would have to change the notation, perhaps adding subscripts or superscripts or italics, or some other diacritic, but that would not have any implications beyond notation that I can see." The problem with this viewpoint is that incorporating diacritics into the notation might allow the model to distinguish more than two distinct rising pitch accents, but in doing so would offer no explanation for the different patterns that exist. While it is important that any theory be able to represent the contrasts present in a language, I believe it is equally important that the theory offer an explanation. Diacritics could be proposed to represent a large number of aspects of an intonation contour, including many that would be of no phonological importance. Aspects that are contrastive in the language, however, must be represented. Diacritics allow for an arbitrary representation and offer no explanation for the patterns found. When at all possible, it is preferable for a theoretical analysis to offer an explanation for the patterns found rather than just acknowledging their existence. With this in mind, I offer a tentative analysis of the three Castilian Spanish rising pitch accents.

As mentioned above, recent studies have shown that Catalan also has more than two contrastive rising pitch accents. Prieto et al. (in press) have proposed that the Autosegmental-Metrical model can account for this situation by incorporating secondary associations of tones into the theory. Secondary associations of edge tones (i.e. phrase accents and boundary tones) were a part of Pierrehumbert and Beckman's (1988) analysis of the Japanese intonational system and have also been proposed for a number of other languages (e.g. Elordieta 1998 for Leketio Basque, Frota 2003 for European Portuguese, Grice 1995 for Palermo Italian, Welby 2003 for French). According to these studies, edge tones are linked phonologically to the edge of a metrical phrase (e.g. intermediate phrase, intonation phrase), but may also acquire additional links (or "secondary associations") to a specific site in the metrical tree. Edge tones have been proposed to have secondary associations to stressed syllables (e.g. Grice 1995 for Palermo Italian; Grice et al. 2000 for Romanian and Greek; D'Imperio 2001 for Neapolitan Italian), to moras (e.g. Pierrehumbert & Beckman 1988 for Japanese; Gussenhoven 2000 for Roermond Dutch), and to word edges (e.g. Jun & Fougeron 2000, Welby 2003, 2004 for French; Hualde 2003b for Occitan; Frota 2003 for European Portuguese). An autosegmental representation of a secondary association of an edge tone is shown in Figure 7. In this figure, based on Pierrehumbert and Beckman's (1988) analysis of Japanese, the H phrase accent has a primary association to the edge of the accentual phrase and a secondary association to the second mora.

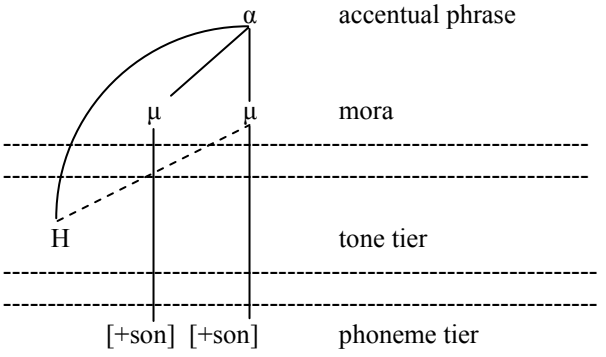

Figure 7. Autosegmental representation of the primary association of the H phrasal tone to the accentual phrase and its secondary association to the second mora in Japanese (following Pierrehumbert and Beckman 1988:129).

Prieto et al. (in press) propose that secondary associations may occur not only for edge tones, but also for pitch accents. The strong tone of the pitch accent is associated with the stressed syllable (perhaps indirectly through a foot, as represented below in Figure 8), but as has already been mentioned, this association does not necessarily indicate a specific phonetic alignment of the tone to the stressed syllable. In fact, I have claimed here that the broad focus and narrow focus declarative pitch accents must both be analyzed as L+H*, yet the alignment of the H is contrastive in these two cases, occurring in a post-tonic syllable in the case of the broad focus pitch accent and within the stressed syllable in the case of the narrow focus pitch accent. Prieto et al. propose that some strong tones have a secondary association as well as their primary association, and that "these secondary associations will play a primary role in determining the phonetic timing of tones by overriding the standard mapping procedure applied to pitch accents with only primary associations of tones." This is identical to the way that a secondary association of an edge tone may result in the phonetic realization of the edge tone occurring other than at the edge of the metrical phrase, but rather at a specific mora, syllable, or word edge.

Adapting the analysis of Prieto et al. (in press) to Spanish, we can say that since there is only one L*+H accent known at this point (i.e. the interrogative focal accent), there is no evidence for a secondary association of the L in this pitch accent. While the phonological association of the L to the stressed syllable does not necessarily mean that this tone will be phonetically aligned with the stressed syllable, in this case there is phonetic alignment. While it may be possible to propose a secondary alignment to the stressed syllable as well, I propose only a primary association until such point as there is evidence for a contrast between two L*+H accents.

With respect to the two L+H* accents, I propose that a secondary association of the H of one of these accents is what distinguishes them. The narrow focus declarative accent has an F0 peak that is aligned with the stressed syllable, and therefore I propose that this accent has a secondary association of the H to the stressed syllable. The broad focus declarative accent, on the other hand, has an F0 peak realized in a post-tonic syllable, and does not seem to be aligned with any particular metrical unit. While one could propose a secondary association to the first following unstressed syllable, there are occasional cases where the F0 peak occurs on the second post-tonic syllable. Therefore the realization of the H appears to have only a primary association. The difference between the two L+H* accents, then, is that the broad focus declarative accent has only a primary association (i.e. L+H*), leaving phonetic alignment of the H unspecified phonologically, while the narrow focus declarative accent has both a primary association and a secondary association to the stressed syllable (i.e. L+H*]σ), with the secondary association being responsible for the alignment of the H within the stressed syllable. The autosegmental representation of the three rising pitch accents in Castilian Spanish is given in Figure 8, following Prieto et al.'s (in press) representation for Catalan.

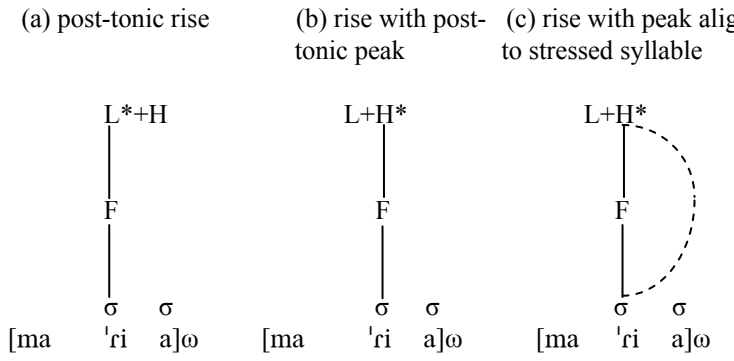

Figure 8. Autosegmental representation of the three Castilian Spanish rising pitch accents, with primary associations of the strong tone and the secondary association of the H in (c).

4. Conclusion

The finding that Castilian Spanish has three contrasting rising pitch accents poses a challenge to the traditional application of the Autosegmental-Metrical theory of intonational phonology, which can only distinguish between two such accents (i.e. L*+H and L+H*). I have proposed here, following Prieto et al.'s (in press) analysis of Catalan, that the Autosegmental-Metrical theory can indeed account for the three-way contrast by incorporating secondary associations of tones in pitch accents, much as has been done for edge tones in various languages. The primary association of a tone indicates that it is that tone of the pitch accent that has an autosegmental association with the stressed syllable (via the foot). This association has no implications for the phonetic alignment of the F0 contour, but rather indicates the strong tone of the accent that leads to perception of a syllable bearing this accent as high or low. The secondary association, when present, encodes into the metrical structure the metrical unit (e.g. syllable, mora, word edge) with which the tone aligns phonetically in the F0 contour. In the case of the Spanish rising pitch accents, I presented evidence that the broad focus declarative accent (typically analyzed as L*+H) and the narrow focus declarative accent (typically analyzed as L+H*) must both be analyzed as L+H* since they are both shapes that lead speakers of Castilian Spanish to perceive them as primarily high. The difference between them, however, comes in that the H* of the narrow focus declarative accent has not only a primary association, but also a secondary association to the stressed syllable. This difference in the metrical structure can be represented as L+H*]σ. The narrow focus interrogative accent described in Section 2 is a rising accent that is primarily perceived as low, and therefore merits an analysis of L*+H. While the L* is realized within the stressed syllable, I do not propose a secondary association of this tone at the present time, since there is no evidence of another L*+H accent contrasting with this one and the L*+H analysis without a secondary association does not in any way indicate a lack of phonetic alignment with the stressed syllable.

An important issue to mention here is the concern that any analysis not be purely a matter of notation. As mentioned previously, it would be possible to add diacritics to the standard Autosegmental-Metrical notation to account for a three-way contrast in rising accents. However, it is important that the notation not just recognize that a three-way contrast exists but also that the analysis offer an explanation for the patterns found. The analysis proposed here does not just add diacritics to the standard notation, but rather the notation reflects a phonological difference in the metrical structure. That is, each of the three rising pitch accents in Castilian Spanish has its own unique metrical structure, and therefore the analysis offers an explanation as to why these three patterns are found. Furthermore, the analysis makes predictions about other F0 contours that could be found since there is a fixed set of other metrical units (e.g. the word edge) to which tones may have secondary associations.

While the analysis proposed here offers a tentative account of the three-way contrast in rising pitch accents in Castilian Spanish, there is clearly more work to be done on this issue. Are there other secondary associations of rising accents in Castilian Spanish that have not yet been identified? Does secondary association occur in this language with tones other than those in pitch accents? Does

applying secondary associations to pitch accents predict secondary associations that do not occur in the world's languages? While these and other similar issues will require further study, the application of secondary associations to the tones of pitch accents seems to offer a promising explanation for three-way contrasts in rising accents in Castilian Spanish and other languages with similar contrasts.

Acknowledgments

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