

## 2.7 More on downstep: bitonal pitch accents with a downstepped H element (!H)

In the previous section, we introduced the downstepped H pitch accent (!H\*) [and a downstepped High phrase accent, shown with a Low boundary tone (!H-L%)]. We will see in this section additional contexts for which the downstep diacritic is used. Namely, there are three bitonal pitch accents which have a downstepped H element: L+!H\*, L\*+!H and H+!H\*.

### 2.7.1 Examples of L+!H\* and L\*+!H

As was the case for the single-tone !H\* pitch accent, the L+!H\* and L\*+!H pitch accent labels are only used to mark a relationship between the high element of the pitch accent under consideration, and an immediately preceding pitch accent containing a High tone element. And much like the two non-downstepped bitonals we have looked at previously (L+H\* and L\*+H), the L+!H\* and L\*+!H indicate that there are two tonal targets associated with the prominence: a Low and a High (this time a downstepped High).

The file <bloomingdales1><sup>1</sup> is an utterance of the sentence *There's a lovely one in Bloomingdales*. This Intonational Phrase contains two bitonal pitch accents, and culminates in a Low phrase accent-Low boundary tone sequence. The first pitch accent is the bitonal L+H\*, such as we have seen in previous sections. Notice how the f<sub>0</sub> does not begin to rise (i.e. it stays relatively low) until the first syllable, *love-* of the word *lovely*, peaking around the end of the prominent syllable, again *love-*. This f<sub>0</sub> alignment reflects the L+H\* pitch accent. The second pitch accent, on the syllable *Bloom-* of *Bloomingdales*, shows similar behavior: the f<sub>0</sub> is low leading up to the prominent syllable, *Bloom-*, and then rises sharply to a peak around the end of that syllable. What makes this pitch accent L+!H\*, as opposed to L+H\* (with no downstep) is that the High target of the bitonal pitch accent on *Bloom-* is perceptually lower than the High target of the preceding pitch accent (the pitch accent on *love-* of *lovely*). This relationship among perceptual pitch heights is comparable to that between the single-tone !H\* pitch accent and the pitch accent with a High target that immediately precedes it. (The example <illuminating3> shows another example of the same pattern of tones, L+H\* L+!H\* L-L%, on the words *that's really illuminating*.) In these two examples, you may have noticed that the leading tone of the L+!H\* (on *Bloom-* of *Bloomingdales* and *-lum-* of *illuminating*) is also lower than the leading L of the first pitch accents (the L+H\* on *love-* and *real-*). However, this is not necessarily always the case; the L+!H\* does not reflect any height relationship with the Low of the preceding pitch accent.

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<sup>1</sup> From this point in the tutorial, we will include the spectrograms (see Chapter 1) in our displays because they are useful in aligning the intonational contour with the sounds in a syllable. You may notice that you can locate, e.g. where the /l/ in *lovely* begins and ends from the light band in the spectrogram of <bloomingdales1>.

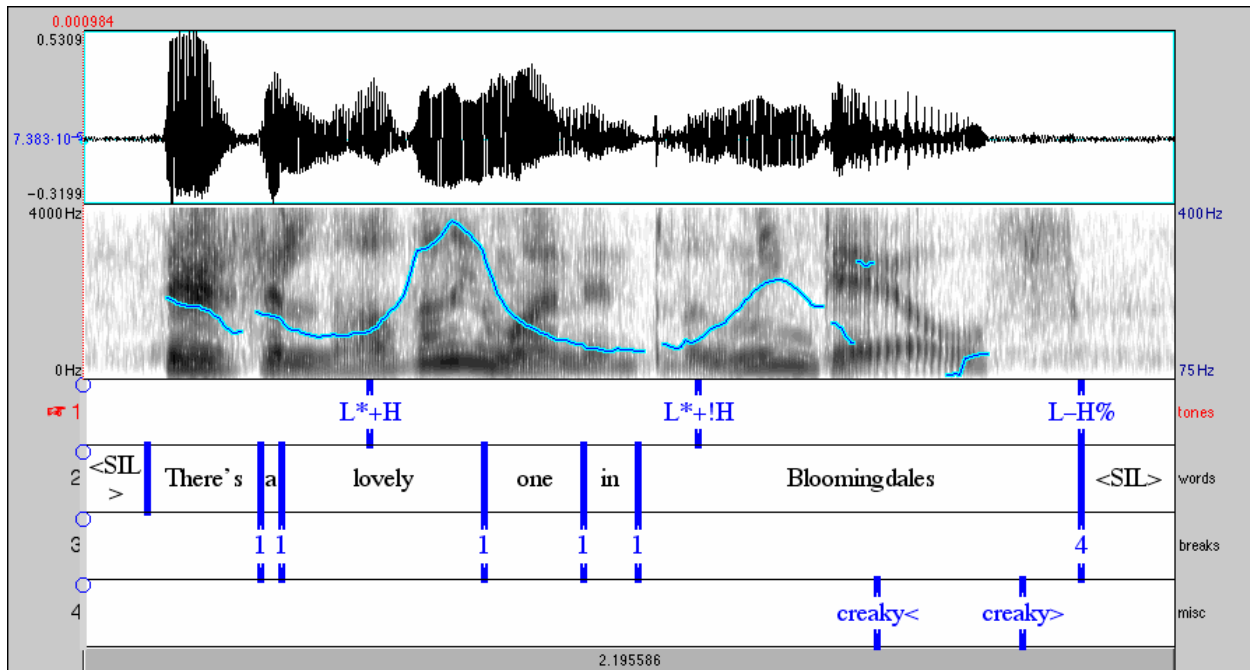


Figure 2.7.1 L+H\* L+!H\* L-L%

<bloomingdales1>

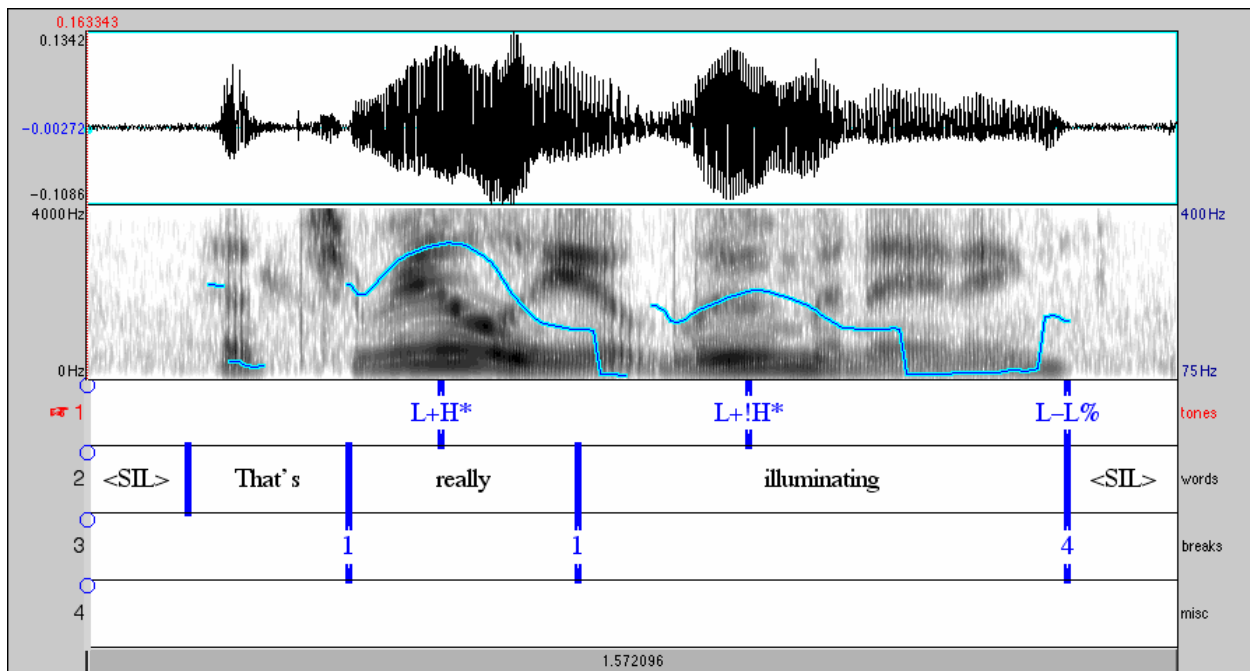


Figure 2.7.2 Another example of L+H\* followed by L+!H

<illuminating3>

The example <yellow\_mini>, shown below for comparison, has a sequence of two L+H\* pitch accents with no downstep relationship between them; the peak of the second pitch accent, on the *yel-* of *yellow* is approximately the same height as that of the first pitch accent, on *John*.

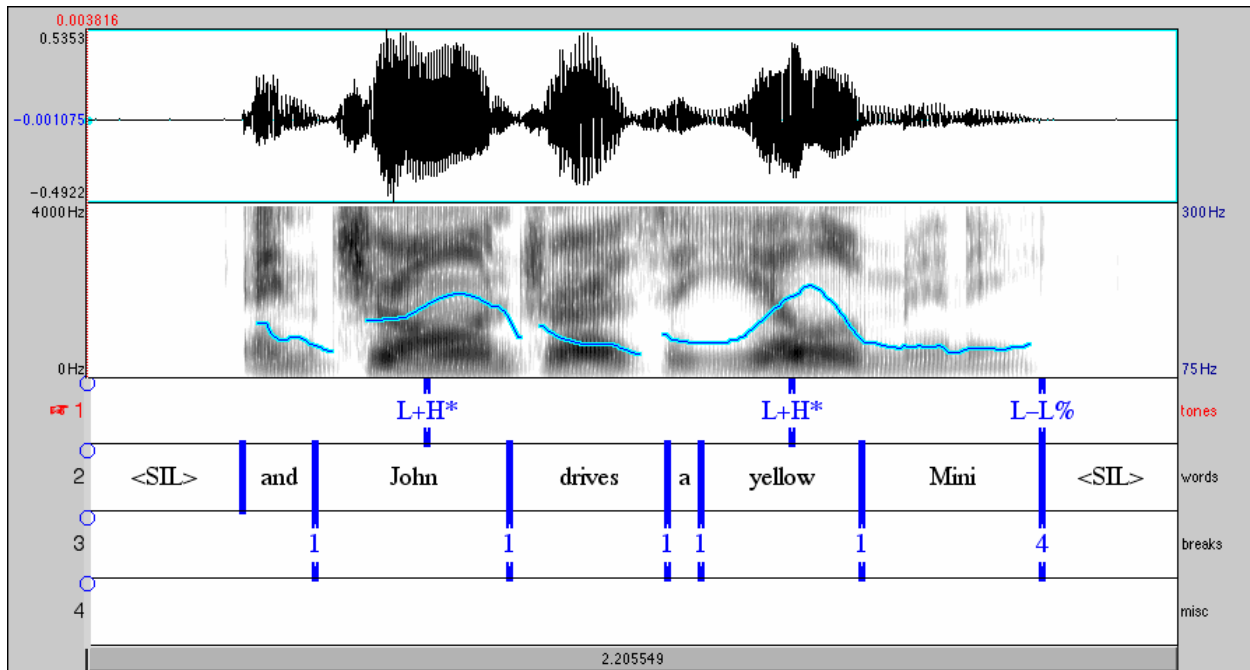


Figure 2.7.3 L+H\* L+H\* (no downstepping between the two accents) <yellow\_mini>

Another example is shown in <marianna>, where both L+H\* accents occur in the small word. The High tone in the second L+H\* is actually higher than the first.

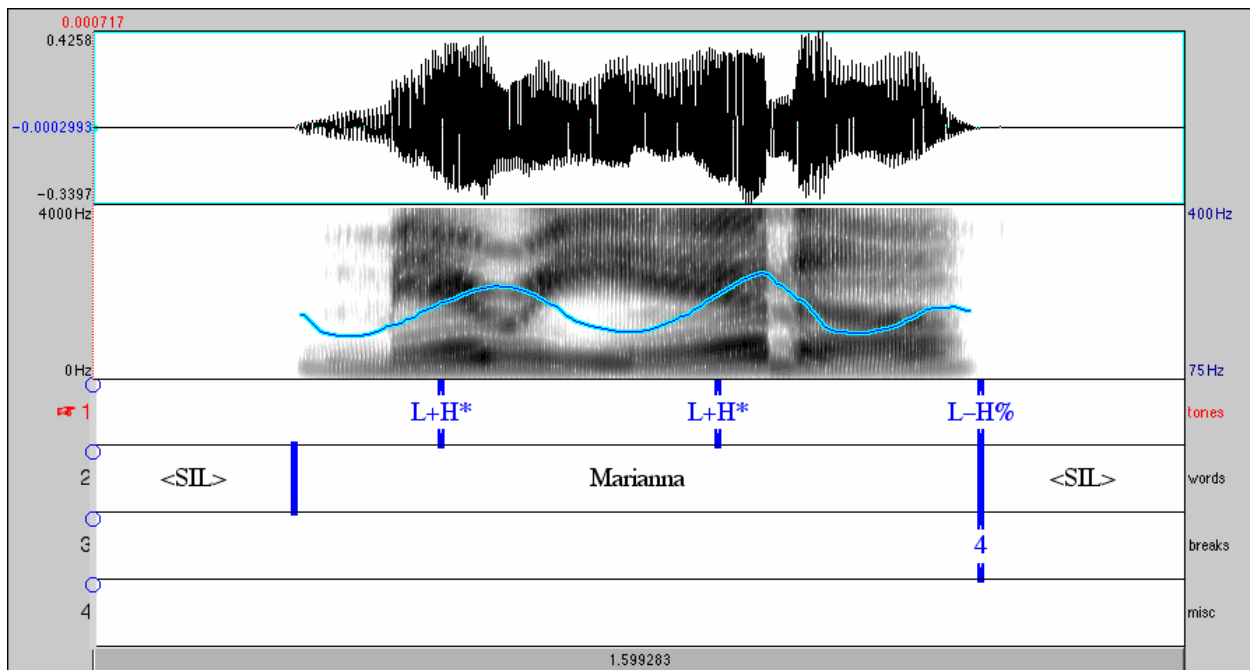


Figure 2.7.4 L+H\* L+H\* (again, no downstepping between accents) <marianna>

The relationship between the L\*-based bitonals (L\*+H vs. L\*+!H) is quite similar to that of the H\*-based bitonals (L+H\* vs. L+!H\*): the downstep diacritic before the H symbol always indicates that the High tone of the pitch accent in question is realized with a perceptually lower

pitch range than the High tone target of the immediately preceding pitch accent. However, note that in the case of the L\*+!H pitch accent, the H symbol associated with the ! diacritic is not the starred tone.

The example <bloomingdales2>, shown in *Figure 2.7.4* below, has an instance of L\*+!H on the syllable *Bloom-* of *Bloomingdales*. In this example, the L\*+!H follows a (non-downstepped) L\*+H pitch accent. (Again, note that while the L target of the second pitch accent in this sequence is also perceptually lower than the L target of the preceding pitch accent on the *love-* of *lovely*, this is not necessary to the use of the L\*+!H label, nor is this pitch difference between the two Low tones indicated in ToBI.)

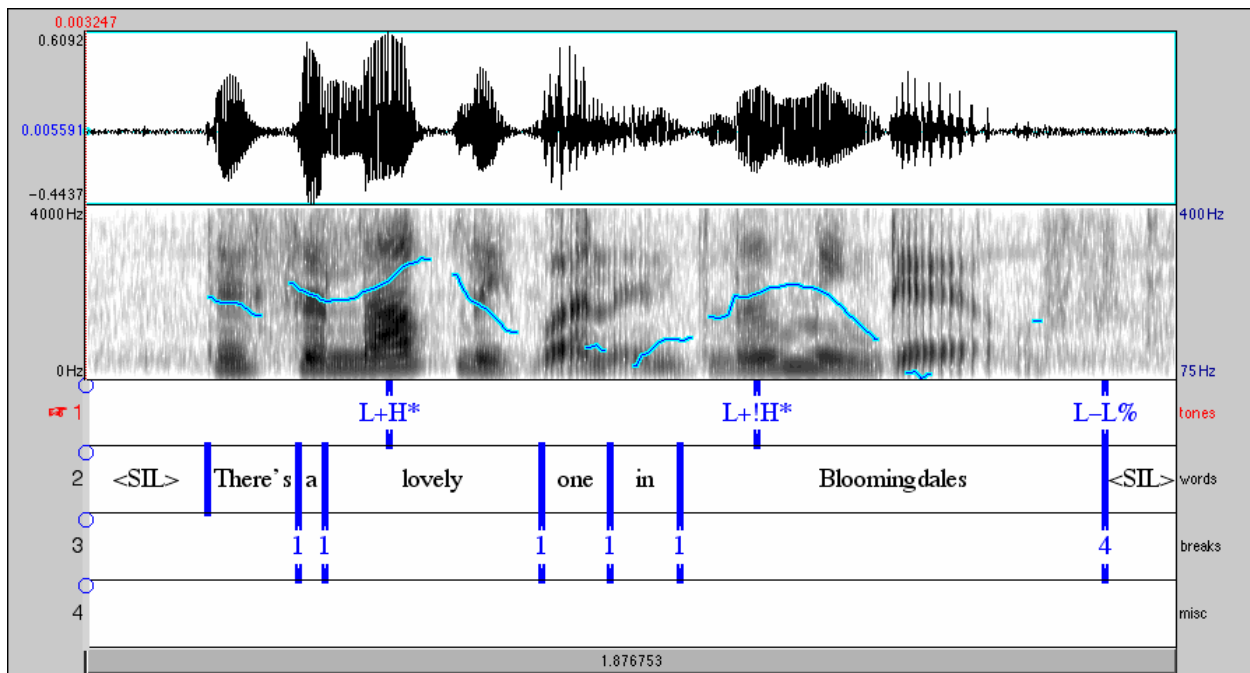


Figure 2.7.5 L\*+H L\*+!H L-L% <bloomingdales2>

Like the single-tone !H\* pitch accent, these two bitonal pitch accents with a downstepped H tone can follow any pitch accent with a High tone target. Specifically, this means that they can follow H\*, L+H\*, L\*+H but also other pitch accents with a downstepped High target: !H\*, L+!H\* or L\*+!H. The example <joey> shows H\* followed by L\*+!H, and <plenty> shows H\* followed by L+!H\*.

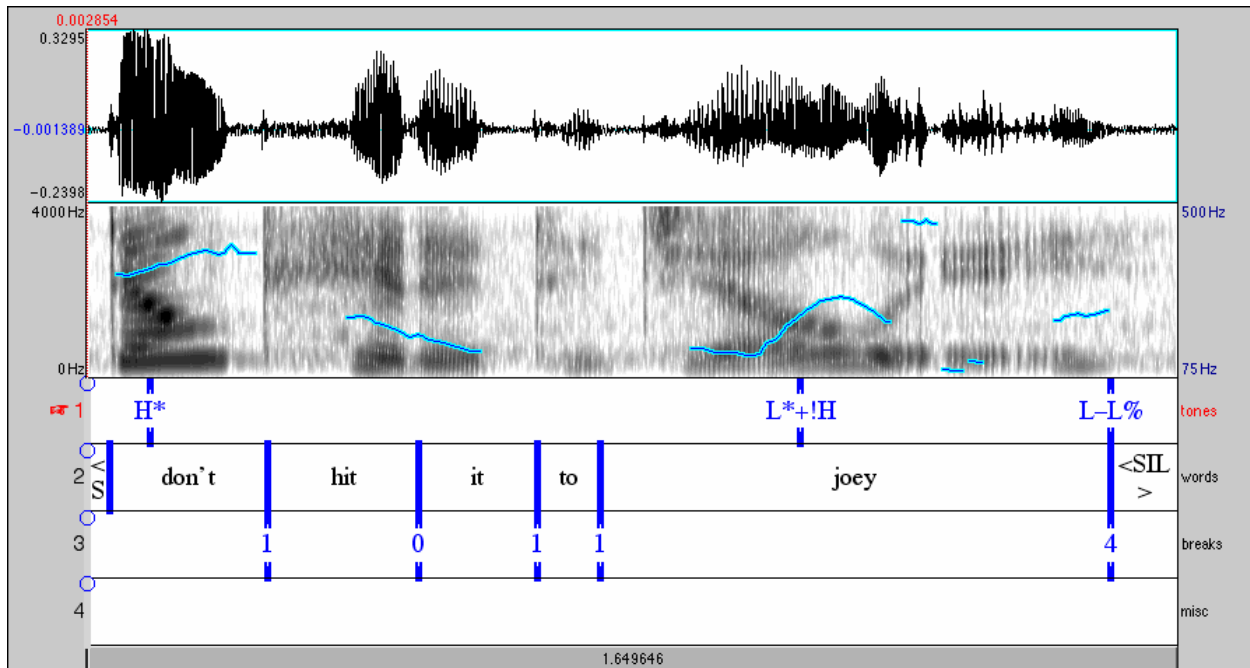


Figure 2.7.5  $L^*+!H$  following a single-tone  $H^*$  pitch accent

<joey>

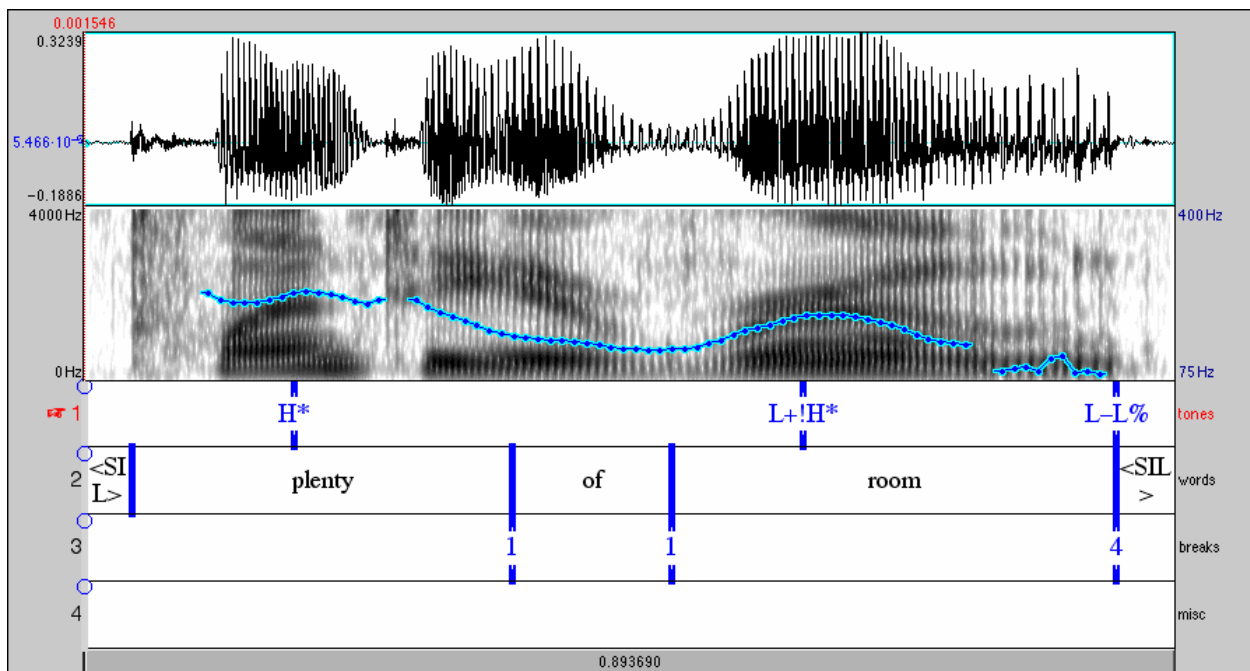


Figure 2.7.6  $L+!H^*$  following a single-tone  $H^*$  pitch accent

<plenty>

## 2.7.2 The $H+!H^*$ pitch accent

There is one final pitch accent type that has not been introduced: the  $H+!H^*$  pitch accent. The  $H+!H^*$  pitch accent (also referred to as “H plus downstepped H star”) is different from other pitch accents in the ToBI inventory in two ways. First, the downstep symbol (!) is used somewhat differently than in other pitch accent events. While it still demarcates a tone that is

lower in relation to a preceding High, in this case, the preceding High is not that of a preceding pitch accent. Instead, the downstep symbol marks a relationship between tones within a single prominence-lending tone event; the !H\* part of the pitch accent is downstepped in relation to the leading High tone (the first H of the H+!H\*) of the same pitch accent.

The other way in which the H+!H\* pitch accent differs from others in the ToBI inventory is that it is a bitonal pitch accent that does not have contrasting High and Low targets. Each of the previously introduced bitonal pitch accents (L+H\*, L\*+H, L+!H\* and L\*+!H) has a Low target, followed by a High target. The H+!H\* has two High targets.

The example <mother\_theresa>, shown below, contains two full Intonational Phrases, the second of which, on the text *Mother Theresa*, contains an H+!H\* pitch accent. The pitch accent in question is on the prominent syllable *-re-* of *Theresa*, and is followed by the phrase accent-boundary tone combination L-L%. Look carefully at the pitch track over the words *Mother* and *Theresa*. Notice how the highest F0 in the pitch track (for the Intonational Phrase on the words *Mother Theresa*) occurs at the beginning of the word *Theresa*: this is a reflection of the first H tone (the unstarred H) of the H+!H\*. The pitch is falling through the word *Theresa*, and is quite a bit lower by the time it reaches the prominent syllable *-re-*, a reflection of the !H\* portion of the bitonal pitch accent H+!H\*. The pitch then continues to fall through the end of the word and the end of the intonational phrase, as it heads towards the Low targets of the phrase accent and boundary tone. (As we have seen before, the pitch track disappears due to pitch tracking errors, as the speaker reaches the bottom of her pitch range; notice that there is no reasonable pitch track for the final syllable *-sa* of *Theresa*.)

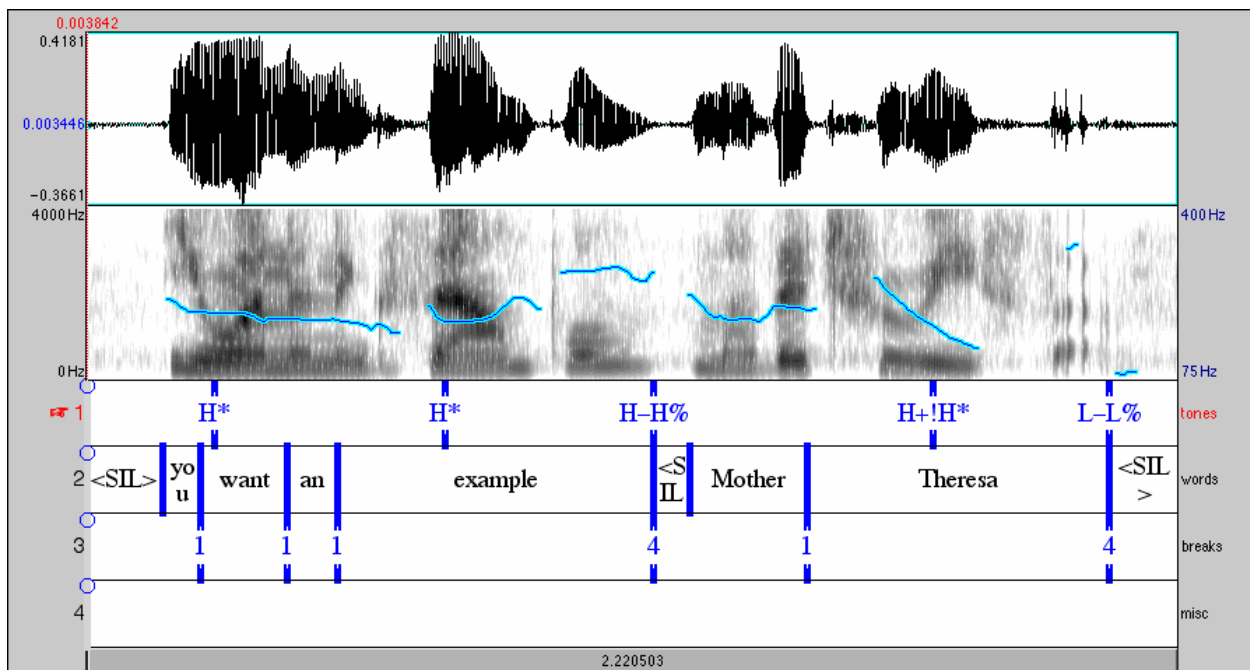


Figure 2.7.7 H+!H\* followed by L-L%

<mother\_theresa>

The example <design>, shown below, includes another instance of the H+!H\* pitch accent, also followed by L-L%. In this example, the pitch accent in question is on the syllable *-prove-* in the

word *improvements*. As with other bitonal pitch accents we have seen, the unstarred tone is often realized on syllables adjacent to the prominent syllable. Here, the highest pitch associated with the H+!H\* pitch accent again occurs in the syllable before the prominent syllable: in this case the highest F0 actually occurs on the *im-*.

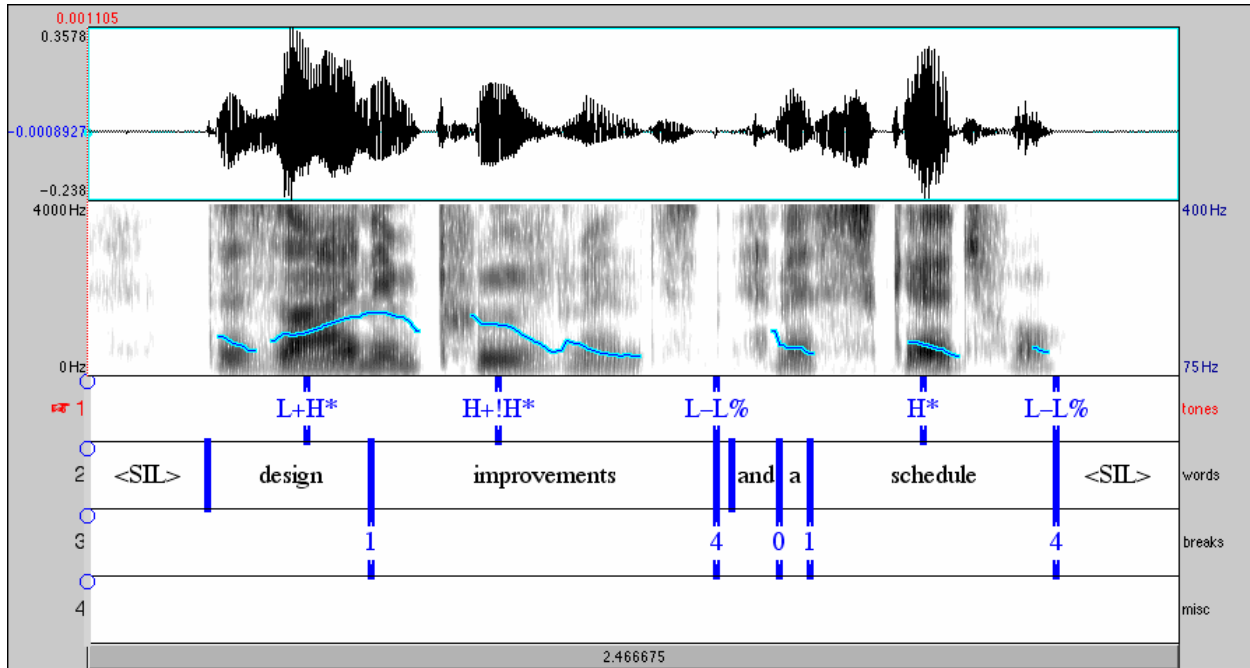


Figure 2.7.8 Another example of H+!H\* L-L% <design>

As with other pitch accents in the ToBI inventory, the H+!H\* pitch accent can occur with a range of other pitch accents and phrase accent-boundary tone combinations. The example <minimum2> contains an H+!H\* pitch accent followed by a High phrase accent-Low boundary tone combination (H-L%). In this example, the pitch starts high on the word *a* at the beginning of the Intonational Phrase, and falls slightly into the syllable *min-* of *minimum*, and then stays flat through the end of the Intonational Phrase. The change from the high pitch on *a* to the lower (downstepped) high pitch on *min-* is captured in the pitch accent label H+!H\*. The following high flat stretch through the final two syllables of the word *minimum* reflects the H-L%. This flat, but high, f0 stretch is comparable that seen in previous examples where the H-L% combination follows a High-tone pitch accent, such as H\* or !H\*. Two examples of other high, flat f0 stretches associated with the H-L% phrase accent-boundary tone combination are reproduced below. The example <money2>, originally seen in section 2.4, shows H-L% following a (plain) H\* pitch accent, and <alejna2> shows H-L% following a downstepped H\* (!H\*) pitch accent.



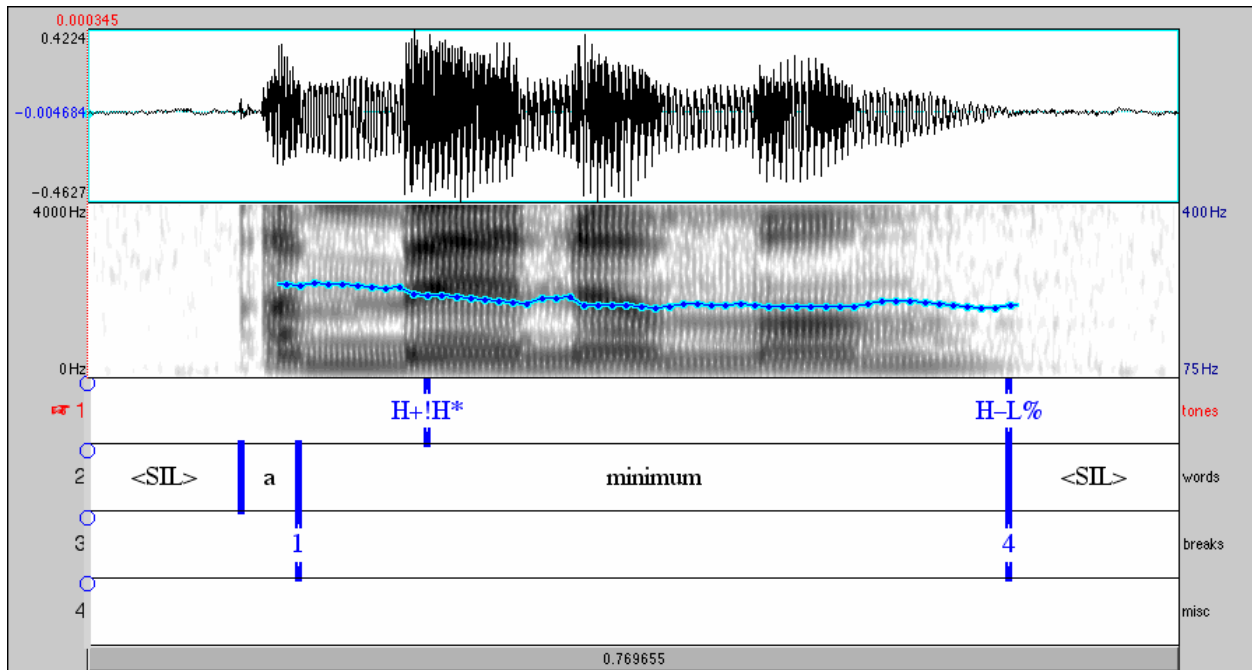


Figure 2.7.9 H+!H\* followed by H-L%

<minimum1>

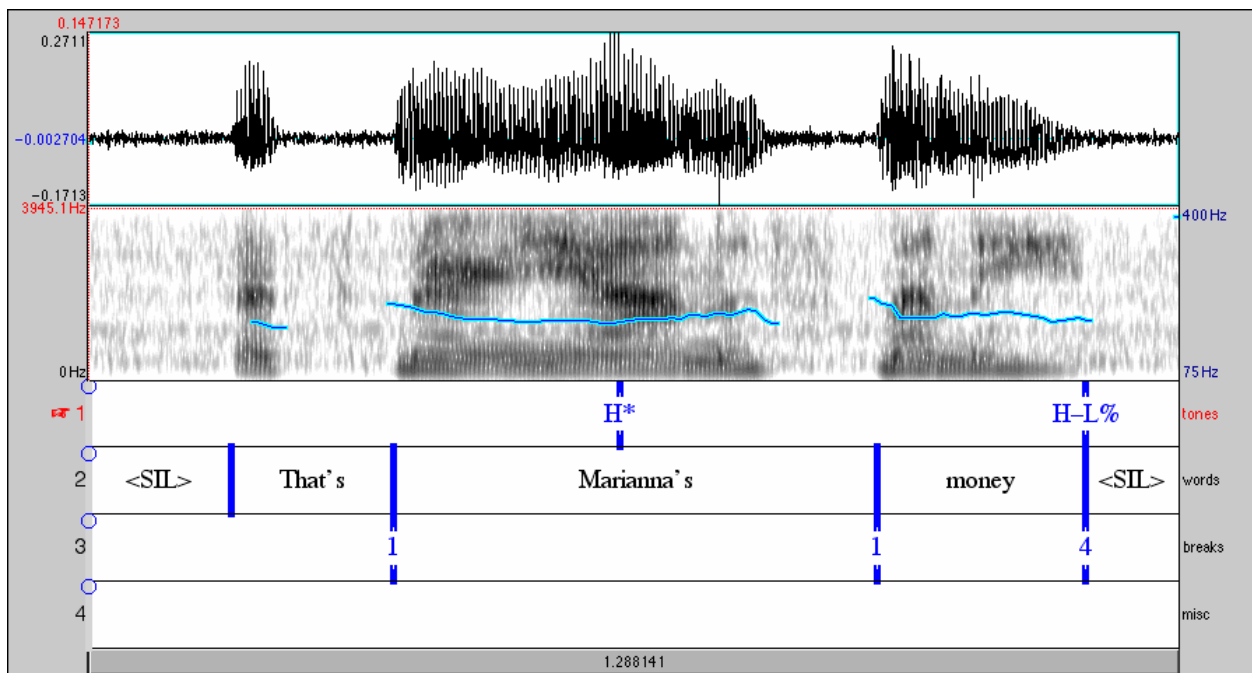


Figure 2.7.10 H\* H-L% (shown for comparison with H+!H\* H-L%)

<money2>



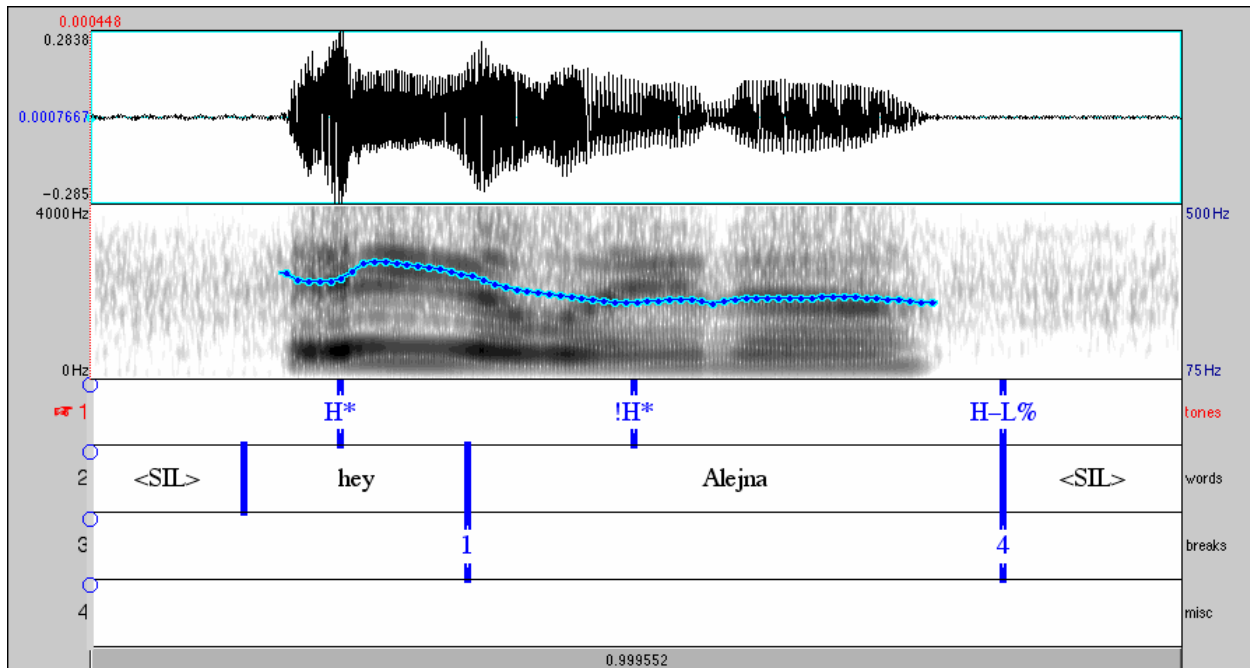


Figure 2.7.11 H !H\* H-L% (shown for comparison with H+!H\* H-L%) <alejna2>

### Summary of ToBI labels introduced so far:

Tones:

H\*: high pitch accent

L\*: low pitch accent

L+H\*: bitonal pitch accent with low tone followed by high tone prominence

L\*+H: bitonal pitch accent with low tone prominence followed by high tone

!H\*: downstepped high pitch accent

L+!H\*: bitonal pitch accent with low tone followed by a downstepped high tone prominence

L\*+!H: bitonal pitch accent with low tone prominence followed by downstepped high tone

H+!H\*: bitonal pitch accent with high tone followed by downstepped high prominence

L-L%: low phrase accent, low boundary tone

H-H%: high phrase accent, high boundary tone

L-H% low phrase accent, high boundary tone

H-L% high phrase accent, low boundary tone

Break indices:

0: word boundary erased

1: typical inter-word disjuncture within a phrase

4: end of an intonational phrase

Optional labels:

<: late High Tonal peak

### **Apparent gaps in the inventory of pitch accents**

All pitch accents (and other tones) in ToBI are composed of one or more High (H or !H) or Low tone elements. In addition to the three single-tone pitch accents (H\*, L\* and !H\*), there are five bitonal pitch accents, which are composed of two tones: L+H\*, L+!H\*, L\*+H, L\*+!H and H+!H\*. You may have realized that there are other logical possibilities for tone combinations, such as H\*+L, H\*+H, L\*+L or L+L\*. Some of these possibilities have been proposed by researchers as additional pitch accent categories for ToBI, but to date are not included in the official inventory. Pitch accent labels that have been proposed include: H\*+L, H+L\* and H\*+H.