

# Tonal Geography. Geographical Variation in Declarative and Interrogative Intonation along the West Coast of Sweden

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## INTRODUCTION

Sentence intonation exhibits clear differences between declarative and interrogative intonation in Swedish, see for example Gårding 1979 and Bredvad-Jensen 1980. The dialect in the southern region of Sweden is classified as type 1A in the tonal typology of Gårding (Gårding 1975). The dialect spoken in Gothenburg is a typical representative of western Swedish and is classified as type 2B. For geographical orientation see figure 1 alongside this page. In the area surrounding Steninge (which is situated about halfway between Malmö and Gothenburg) the tonal configuration of declarative intonation is classified as a transitional form, type 2AB (Gårding, Bruce & Willstedt 1981). This classification is based on statement contours. The Gothenburg dialect is traditionally characterized as a dialect with a rising sentence intonation both in statements and in questions. (This is also said about eastern Norwegian which is spoken not far from western Swedish). How are these two rising intonations manifested in statements and in questions? Do they exhibit the same or different kinds of rising characteristics, e.g. local or global effects on the tonal contour?

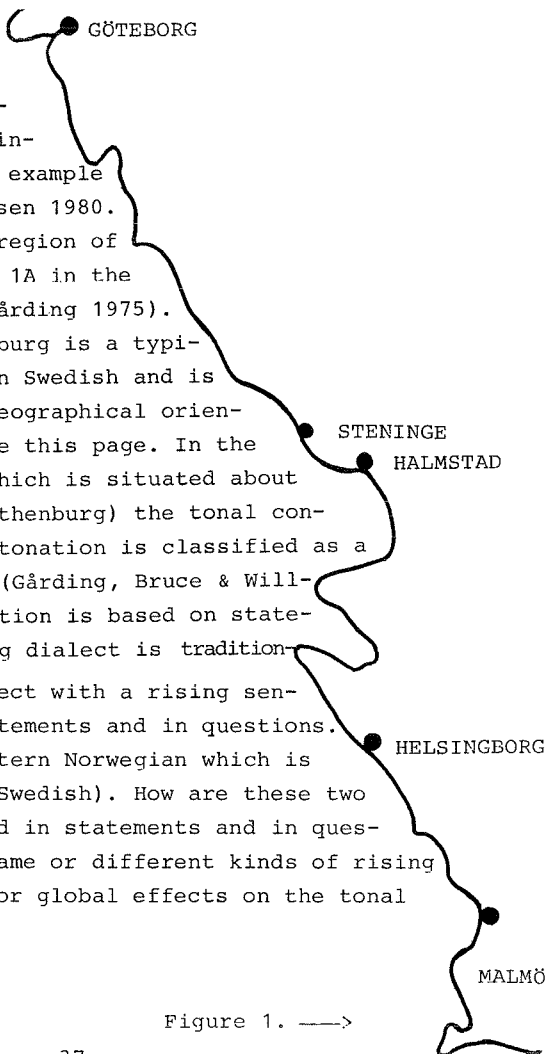


Figure 1. —>

Are these rising intonations really rising on all occasions, irrespective of e.g. the position of sentence accent? These are the questions I want to study in this paper alongside the following: is it possible to describe the different tonal manifestations of question intonation along the west coast of Sweden as a gradual or continuous tonal development, so that the result of one change at one place is the basis of the next change at another place, or rather will these manifestations be more adequately described as abrupt or discontinuous changes randomly distributed from a geographical point of view?

#### MATERIAL AND PROCEDURE

The speakers were three women from Malmö, Halmstad (south of Steninge) and Gothenburg, respectively. They were not phonetically trained.

The basis of the speech material that will be discussed here consists of a FVO-sentence consisting of accent 2 words, "Manne lämnar nallarna" ("Manne is leaving the teddy-bears"), which was pronounced both as a question and as a statement. The position of sentence accent, SA, was systematically varied so that either of the three different words in the sentence received SA. Thus three different statements and three different questions were obtained. Each of the sentences was preceded by a context sentence, designed to elicit the appropriate SA in the sentence in question. To obtain continuous Fo-contours which were fairly undisturbed by segmental factors, the test words were composed of sonorant consonants and vowels of the same degree of opening, here non-high vowels.

The sentences were recorded five times each in random order. Tracings of the Fo-contours were made for each sentence and among these one contour could easily be chosen as a typical representative for each of the six sentences.

## DISCUSSION OF TONAL CONTOURS

The sentence accented word, focus, is indicated in Figure 2-4, with an arrow in the first CV-boundary of the word. The accent is manifested as a fall beginning in the second consonant in the word in the Malmö and in the Halmstad dialects. In the Gothenburg dialect on the other hand the sentence accent is manifested tonally with a high peak in the first vowel of the postfocal word. The frequency peaks were connected with a straight line, the topline. The direction of the topline indicates the global direction of sentence intonation (1).

### MALMÖ

#### Global characteristics in the tonal contour

As can be seen from Figure 2 there are only small differences between the slope of the toplines (2) before focus in statement and question. Postfocally the topline either falls slightly or is level in the questions, while the corresponding statements exhibit a relatively steeper fall.

All three sentence pairs exhibit an overall frequency level which is higher in the questions than in the corresponding statements.

#### Local characteristics in the tonal contour

A very pronounced final fall is exhibited in all the three questions, as the starting point of the fall is higher for the questions (due to the higher overall  $F_0$ ) and as the endpoint is at the same  $F_0$  in both question and statement. It seems as if the voice departs from the same resting position in all the sentences regardless of the sentence intonation and that it falls to the same low  $F_0$  (final valley) which then could be interpreted as the bottom of the voice.

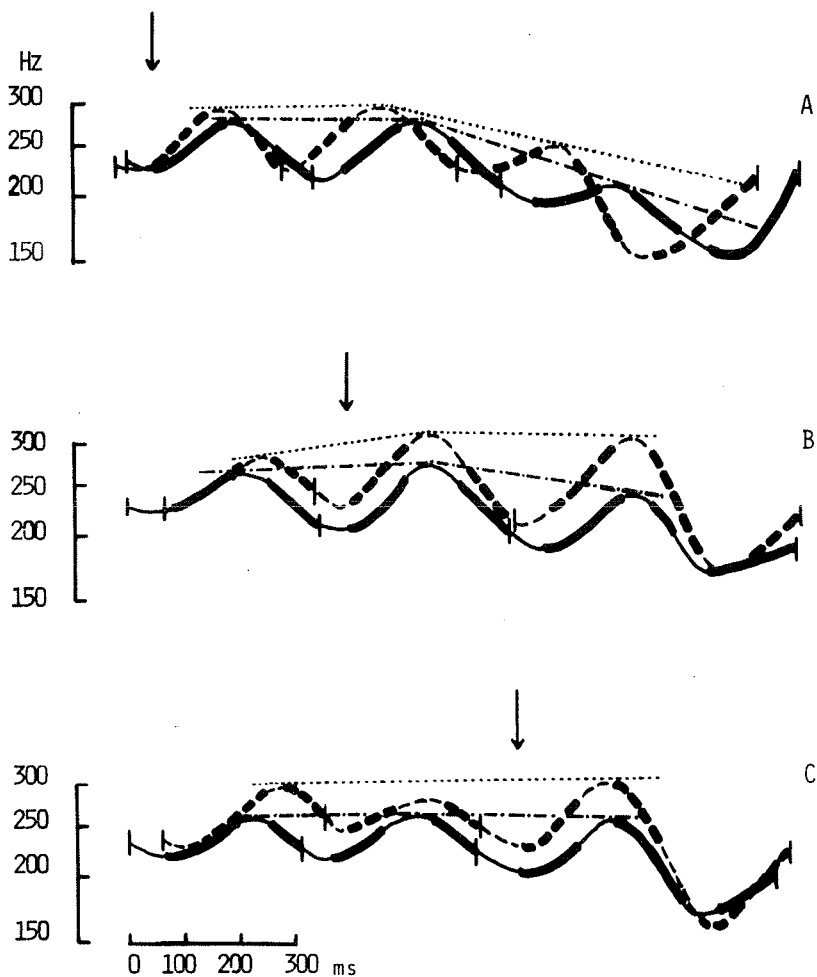


Figure 2. "Manne lämnar nallarna" pronounced as statements (unbroken lines) and as questions (broken lines). Thick contour lines = vowels, thin contour lines = consonants. Vertical bars = word boundaries. A sentence accented word is indicated with an arrow in the first CV-boundary of the word. This boundary is used as a common line-up point in the time domain for each sentence pair. --- = topline (statements), ..... = topline (questions) (3).  
MALMÖ

## Discussion

Perceptual experiments, using different synthesized versions based on the medially focussed sentence above, showed that the most important cue to the perception of questions in this dialect is the higher overall Fo (Predvad-Jensen 1983). This means that in this case a global intonation characteristic overrides a local one, as it is clear that the higher overall Fo in the questions is not preserved in order to make possible the pronounced final fall but that the high overall Fo in the questions is preserved because it is important per se.

## HALMSTAD

### Global characteristics in the tonal contour

The topline ascends postfocally in the questions whereas it descends in the statements thus indicating the difference between a global rising intonation versus a global falling one, as can be seen in Figure 3. This difference is even implied in the final part of the last word in the finally focussed sentence pair (pair C).

The overall Fo is higher in the questions than in the corresponding statements.

A frequency compression of the tonal movements before and after focus can clearly be seen in the questions in comparison with the statements.

### Local characteristics in the tonal contour

A wider frequency expansion of the tonal movements in connection with focus is exhibited in the questions as compared to the statements.

The tonal configuration in the questions displays a final rise ending at a fairly high Fo whereas the tonal configuration in the corresponding statements shows either a pronounced final

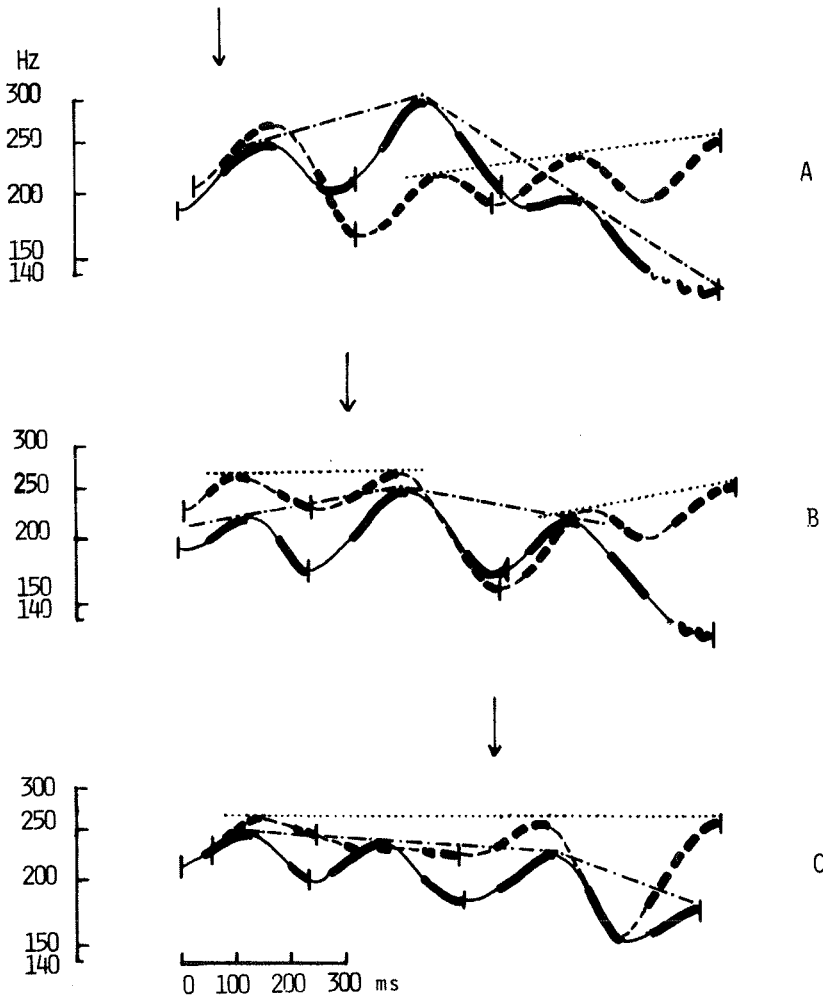


Figure 3. "Manne lämnar nallarna" pronounced as statements (unbroken lines) and as questions (broken lines). Thick contour lines = vowels, thin contour lines = consonants. Vertical bars = word boundaries. A sentence accented word is indicated with an arrow in the first CV-boundary of the word. This boundary is used as a common line-up point in the time domain for each sentence pair. - - - = topline (statements), ..... = topline (questions). **...** = creaky voice.

fall ending in a creaky voice or a final low Fo as opposed to the very much higher Fo in the corresponding question.

### Discussion

The tonal configurations show clear differences between questions and statements in this dialect manifestation concerning both local and global characteristics.

### GOTHENBURG

As I am uncertain about the interpretation of the tonal curve of the medially focussed question I will use the corresponding VSO-question for the comparisons. Note that for this sentence only the interrogative function is signalled by both intonation and reversed word order.

### Global characteristics in the tonal contour

The topline ascends up to the high peak in the postfocal word in the questions after which it descends, as is shown in Figure 4. This means that there is a global rise in intonation up to the peak mentioned. If the question has final focus as in C in Figure 4, the entire contour can be characterized as a global rise. In the statements the topline starts to level off or to fall slightly at one peak earlier than in the questions; after the next peak the topline descends as in the corresponding questions.

The overall Fo is higher for the questions than for the corresponding statements.

A frequency compression of the tonal movements is exhibited before the highest frequency peak in the questions as compared with the corresponding statement contours.

### Local characteristics in the tonal contour

The questions with medially or finally focussed words display a

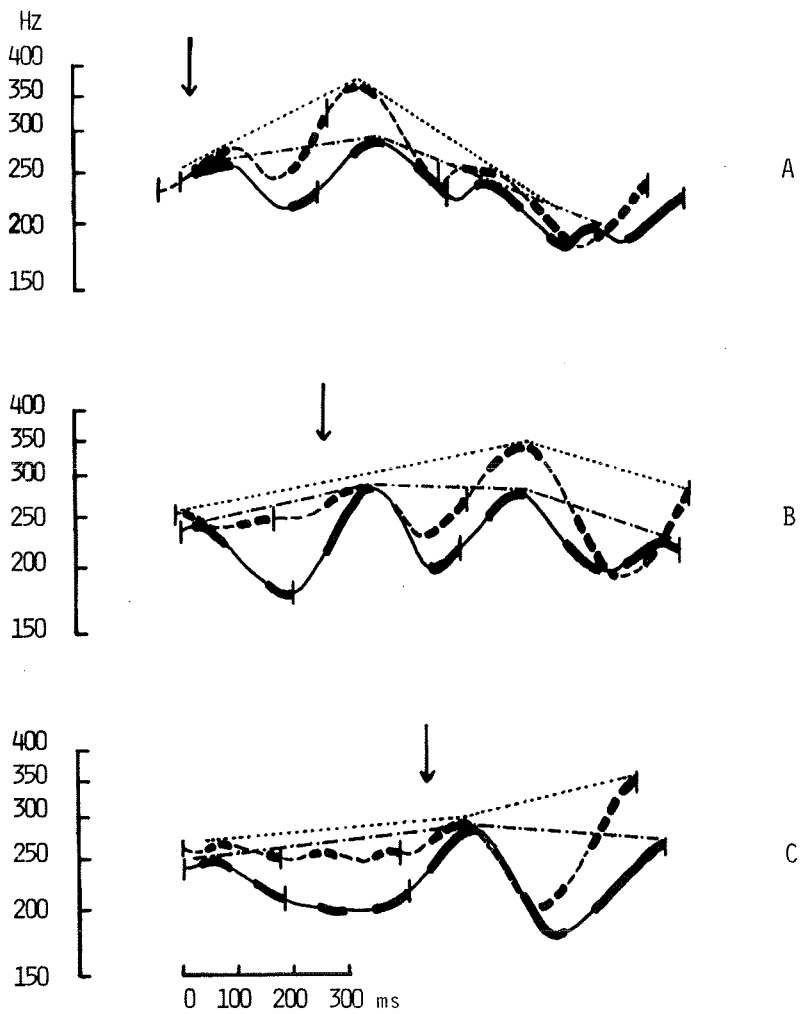


Figure 4. "Manne lämnar nallarna" pronounced as statements (unbroken lines) and as questions (broken lines). Thick contour lines = vowels, thin contour lines = consonants. Vertical bars = word boundaries. A sentence accented word is indicated with an arrow in the first CV-boundary of the word. This boundary is used as a common line-up point in the time domain for each sentence pair. Note that for sentence pair B the question is a VSO-question. - - - = topline (statements), ..... = topline (questions).



final rise which is more pronounced and which reaches a higher  $F_0$  than the corresponding statement contours.

The postfocal peak mentioned above reaches a higher  $F_0$  in the questions than in the corresponding statements for all three sentence pairs.

### Discussion

In the introduction of this paper questions about possible configurations of the intonation in statements and questions were proposed. Referring to the discussion about rising intonation it seems clear that the tonal contours of both statements and questions display a global rise, but this rise both lasts for a longer period of time and reaches a higher  $F_0$  (the high peak in the postfocal word) in the questions. These differences in timing and  $F_0$  result in tonal contours which are predominantly rising for the questions but not so for the statements.

The tonal curves also exhibit local differences, e.g. the size of the final rise which reaches a much higher  $F_0$  in the questions than in the statements for sentence pairs B and C. There is also a difference between the high peak in the postfocal word in the statements and in the questions, but this phenomenon is related to the extent of the global rise and will not be discussed further.

Question A, the initially focussed one, is characterized by a global rise to a much lesser extent than the other questions, P and C. This will answer another question asked in the introduction. The position of sentence accent is crucial for the course of the tonal movements yielding a pronounced rising-falling intonation in the initially focussed question whereas the corresponding contour with final focus displays an entirely rising intonation.

To summarize the answers: a) the tonal curves of both questions

and statements are similar because they exhibit global rises as well as local rises. b) They are dissimilar with respect to the extent of the rises which are more pronounced in the questions. c) The position of sentence accent determines the extent of the global rise in both sentence types.

#### CONCLUDING DISCUSSION

In the introduction it was asked whether it was possible to describe the different tonal manifestations of question intonation along the west coast of Sweden as continuous transitions or as abrupt changes. Going from south to north comparisons will be made regarding both global and local tonal qualities.

##### Global characteristics

The direction of the topline after focus is level or falling in the questions whereas the statements exhibit a fall which is steeper than in the corresponding questions for the Malmö speaker. The tonal contours of the Halmstad speaker show clear rises of the topline postfocally in the questions which contrast well with the falls in the statements. So far the change in the slopes of the topline, going from Malmö to Halmstad, could be attributed to a gradual change. But looking at the postfocal topline slopes for the Gothenburg speaker, displaying either falls (in the statements) or rise-falls (in the questions), the changes would rather be referred to as discontinuous. Prefocally the topline is either level or rising in both questions and statements which can not be interpreted as a continuous change.

As all three dialect samples have a higher overall F<sub>0</sub> in the questions there is no change in this respect.

The prefocal and postfocal frequency compression which is absent in the Malmö data, is introduced in the Halmstad data.

It is kept prefocally in the material from the Gothenburg speaker. This change therefor might be interpreted as a gradual development.

The frequency range is wider for the majority of the questions in comparison with the corresponding statements in all three dialects. This characteristic is correlated with others (high overall Fo, high focal or postfocal Fo-peaks), which are discussed above and below. As no change is introduced in this respect, it will not be treated further.

#### Local characteristics

In the Malmö tonal contours the two sentence types end with final rises but in the Halmstad contours a great difference is exhibited between final rises reaching a very high Fo in the questions and the pronounced fall (or fall-rise) ending at a much lower Fo in the statements. This great difference between the final parts of the tonal contours is not preserved in the Gothenburg dialect, especially not in sentence pair A, which exhibits final rises which are similar to those in the Malmö contours. Therefore these changes could be estimated as discontinuous, going partly back to an earlier condition.

The widening of the frequency range in connection with SA is only vaguely anticipated in the Malmö contours but becomes very apparent in the Halmstad contours. A different tonal pattern elicited by SA is exhibited in the Gothenburg questions (the high postfocal peak). These changes then might be judged as gradual developments the one leading on to another rather than going back to a former state.

#### Conclusion

Although it did not turn out to be an easy task to categorize these tonal changes as continuous or gradual on the one hand and as discontinuous and randomly distributed on the other hand, the discussion above leads up to the following observations:

Both global and local tonal qualities are represented among those changes which can not favourably be categorized as continuous.

The only changes which might be categorized as gradual changes according to the analysis above are 1) a tonal change in connection with SA (Halmstad, Gothenburg) and 2) a frequency compression outside the domain of SA (Halmstad, Gothenburg). These two changes seem to be correlated with each other, and might be interpreted as only one change resulting in different tonal adjustments in focal and nonfocal positions. Together these adjustments will emphasize the intended tonal change, e.g. the frequency compression outside focus will reinforce the increased Fo-register of the SA-fall in the Halmstad dialect.

For those tonal qualities which show no dialectal changes (higher overall Fo and wider frequency range in the questions) it might be hypothesized that they are the most important ones perceptually.

This is partly confirmed by the perceptual test for the Malmö dialect. Accordingly, perceptual tests are planned for the Halmstad and Gothenburg dialects also.

#### NOTES

1) The topline is construed using intonational concepts in works of Gårding (e.g. Gårding 1983, Gårding 1984). It seems clear that the second Fo-peak in question C in figure 2 is an example of an undershoot mechanism and that the topline therefore should be drawn as a straight ascending line and not as a fall rise.

2) See note 1 above

3) See note 1 above

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