

# A Comparative Study of Intonation in Three Standard Varieties of German

*Christiane Ulbrich*

Department of Speech Science and Phonetics  
University of Halle (Saale)-Wittenberg/Germany  
c.ulbrich@phonetik.net

## Abstract

This paper presents a comparative analysis of declarative intonation produced by standard speakers of German from Austria, Germany and Switzerland. The analysis was based on a directly comparable corpus of speech data. A perception test with phoneticians from the three countries suggested (1) that speakers from the three varieties produce different tunes on accented syllables, and (2) that there are differences in the phonetic realisation of accented syllables. German speakers produce salient intensity differences between accented and unaccented syllables but Swiss and Austrian speakers do not.

These hypotheses were investigated via phonological and acoustic analyses. The results revealed cross-varietal differences in tune structure in the German data on the one hand and the Swiss and the Austrian data on the other. Swiss and Austrian tunes ended with an intonation-phrase internal, possibly stress-seeking boundary tone followed by a final boundary tone. German utterances did not have two boundary tones. Cross-varietal differences in the phonetic realisation of accents were found also. In nuclear accents, intensity differences between accented and unaccented syllables were greater in German utterances than in Swiss and Austrian utterances.

## 1. Introduction and Background

Recent studies have shown that dialectal variation in intonation can be considerable [2, 8, 9]. This paper provides evidence for variation in German intonation, but it does not deal with what is traditionally termed a 'dialect'. Instead, the paper focuses on differences between three standard varieties of German spoken in Austria, Germany and Switzerland.

In most publications on variation in German, authors agree that there are three different standard varieties of German rather than one [e.g. 1, 4, 15; a description of the Swiss German and Austrian German standard for news readers is given in 18 and 20]. The differences between the three German standards are said to involve primarily the prosodic level [e.g. 15 for cross-varietal differences at other linguistic levels, see 1]. Panizzolo [19], for instance argues that the Swiss German Standard has „...a different melody and consequently a different speech rhythm than the German language (my translation)“ [18]. In a first sketch of the phonetic, syntactic and semantic characteristics of the Swiss German Standard, Panizzolo includes some pitch patterns for different grammatical structures. She suggests that Swiss German speakers use pitch changes rather than intensity changes to distinguish stressed from unstressed syllables. A first comparative study of Bern Swiss German and Northern Standard German was carried out by Fitzpatrick-Cole [6]. Fitzpatrick-Cole found that the intonational differences

between Northern Standard German and Bern Swiss German difference were systemic in nature [14]; the varieties are characterised by (some) different tunes. In Standard German declaratives, speakers produce H\*L on accented syllables [7] but in Bern Swiss German, they use L\*H. A perception study by Stock [21], finally, suggested that Swiss German speakers produce late rising-falling tunes that follow the accented syllable.

This paper presents a first comparison of declarative intonation in three standard varieties of German; German spoken in Austria, Germany and Switzerland. The research is part of a larger study investigating the prosody of German, Austrian and Swiss news readers in broadcasting agencies under public law (ARD; ZDF; DR Berlin; ORF; SFDRS; DRS II).

## 2. Method

### 2.1. The corpus

A corpus of directly comparable data was collected. The corpus contained read speech; eleven news broadcasts (between 4-6 sentences in length) and the fairytale „Rotkäppchen“ / 'Little Red Riding Hood'[7]. The subjects were five Swiss, four Austrian and five German news readers. Generally, in the German speaking areas, news readers are expected to speak the relevant standard varieties, and in the perception test described below, all subjects were judged to be standard speakers.

### 2.2. Perception Test

A perception test was carried out, using a selection of data from the corpus. The intention was to generate a first set of hypotheses about cross-varietal differences which could then be investigated via acoustic analyses. In this experiment, the subjects were thirty linguists and phoneticians from Switzerland, Germany and Austria. They were given a questionnaire and two CDs containing three news broadcast, and extracts of the fairytale.

### 2.3. Hypotheses

The perception test led to the following hypotheses:

- (1) Stressed syllables produced by Swiss German and Austrian German speakers are produced with more salient pitch movement than stressed syllables produced by speakers from Germany.
- (2) Intensity differences between stressed and unstressed syllables provide an important cue to stress in German spoken in Germany. Intensity differences are less marked in Austrian and Swiss German.

## 2.4. Prosodic transcriptions and acoustic analysis

One directly comparable declarative utterance was analysed, produced by fourteen speakers from the three countries. The test utterance was *Auch heute kam es wieder zu Zusammenstößen*. ('Another day of collisions.')

*Auch heute kam es wieder zu Zusammenstößen.*  
 'Also - today - came - it - again - to - collisions.'

The last accentable word in the phrase is *Zusammenstößen* and the word has lexical stress on *sam*. The intonation phrase-final stressed syllable is *stō* in *stößen*.

Prosodic transcriptions of the utterances were made using an adaptation of the IViE system [8, 9]. This system allows for machine-readable transcriptions of phonological, phonetic and rhythmic differences on separate levels. The phonological transcriptions are autosegmental-metrical in nature; H and L symbols are associated with stressed syllables and intonation phrase boundaries. The phonetic transcriptions provide a syllable-by-syllable record of  $f_0$  patterns and  $f_0$  alignment. The rhythmic transcriptions provide a record of the location of stressed and accented syllables in the utterance. Originally, the IViE system was developed for cross-varietal comparisons of intonation systems in the British Isles, but considering the documented similarities between standard English and German intonation systems [7], the IViE approach can be taken as a starting point for transcriptions of standard varieties of German. In the present study, the utterances were first labelled orthographically. Then the location of stressed and accented syllables was transcribed, followed by  $f_0$  movement and alignment. The phonological transcriptions were based on comparisons of identical utterances produced in identical contexts by speakers from the three varieties of German. Acoustic analysis were carried out in PRAAT [3]. The following measurements were taken:

- $f_0$  at each syllable onset and offset in each utterance [NB. syllabification in German is less controversial than in English; for microprosodic effects in German see Kohler 13]
- a maximum intensity value for each syllable
- the duration of syllables, words and utterances.

## 3. Results

We will begin by describing the data from each standard variety, separately. Then we will provide acoustic data and contrast the three varieties directly.

### 3.1. Data from Germany

The top panel in Figure 1 shows a fundamental frequency trace for the test utterance produced by a speaker from Germany. IViE style phonological and phonetic transcriptions are given underneath the figure [10]. The lines in the figure indicate the locations of prominent syllables. Figure 1 shows that the speaker produced high  $f_0$  targets on the first and the last prominent syllable (*heu*, *sam*). A further prominent syllable (*wie*) appears between them and is realised with a high target also, but this high target appears to be downstepped. The three high targets are followed by falls in  $f_0$ , and H\*L !H\*L H\*L % is the first-pass phonological analysis that we suggest.

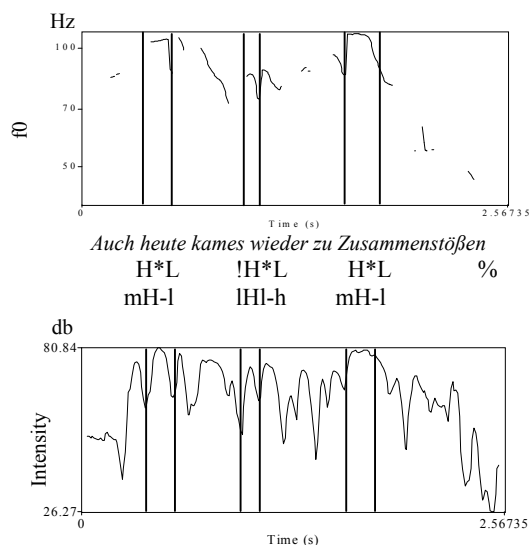


Figure 1. Example of the test utterance produced by a speaker from Germany

In the following sections of this paper, we will focus on cross-varietal differences in nuclear accent production. Figure 1 shows that the German speaker produced a very sharp fall in  $f_0$  from the last accented syllable *sam* to the end of the IP.

The lower panel in Figure 1 shows an intensity trace. The figure shows that the nuclear accent is produced with a decrease in intensity from the accented syllable to the end of the utterance.

### 3.2. Data from Switzerland

The top panel in Figure 2 shows an example of the test utterance from a Swiss speaker. Again, the location of accented syllables is shown by the lines. The dotted lines mark the location of *stō*, the last stressed syllable in the utterance, for reasons which will become clear shortly.

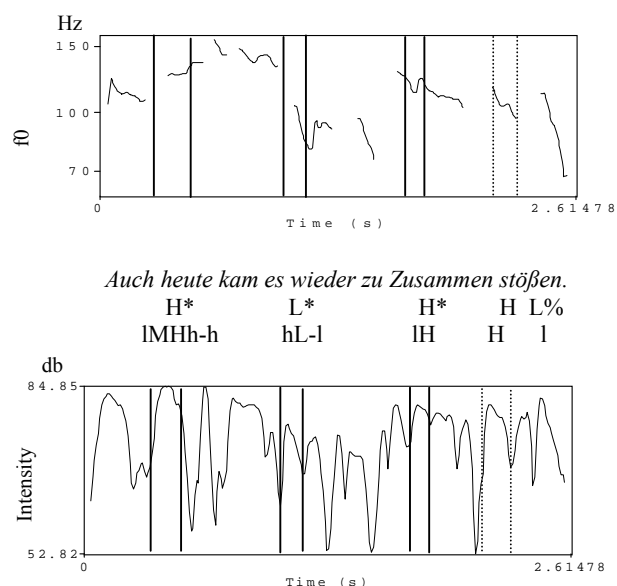


Figure 2. Example of the test utterance produced by a speaker from Switzerland

The f0 pattern shown in the top panel in Figure 2 provides evidence of cross-variety differences in intonational structure. In the Swiss utterances, accented syllables were observed on the same syllables as in the German utterance, but the intonation patterns produced by the Swiss speaker were different. A high target appeared on the first prominent syllable *heu*, but the second target on *wie* was low. The third on *sam* was high again and after that, the trace remained high until the IP-final syllable when the f0 trace fell sharply. Additionally, the syllable *stō* appeared to be prominent (unlike in the German realisation). In the phonetic transcription underneath the f0 panel in Figure 2, this fall is transcribed with a capital H on *stō* and a final l on *ben*. A capital H was chosen to capture the salience of *stō*. A similarly late fall and salience of *stō* was observed in the utterances from the other four Swiss speakers also. The first-pass analysis suggested is H\* L\* H\* H L%. Following Grice et al. [11], we suggest that the final H\* is followed by two boundary tones and that the internal boundary tone may be stress-seeking. Alternatively both boundary tones may be associated with the edge of the IP. Further evidence is required.

The lower panel in Figure 2 shows the accompanying intensity trace. The intensity trace shows that the Swiss speaker did not produce the nuclear word with a fall in intensity. Instead, the intensity level over the word remains relatively level, giving the impression of a succession of postnuclear stressed syllables.

### 3.3. Data from Austria

The top panel in Figure 3 shows an example of the test utterance produced by an Austrian speaker. Again, the location of prominent syllables is shown by the lines.

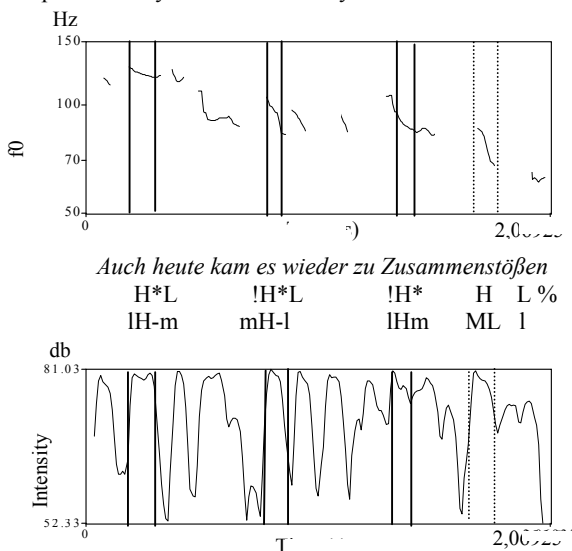


Figure 3. Example of the test utterance produced by a speaker from Austria

Figure 3 shows that each of the prominent syllables was produced with relatively high f0 target, but in contrast to the utterance from the speaker from Germany, the second and the third high target are downstepped. Like in the Swiss utterances the syllable *stō* (the final stressed syllable in the IP) appears to be prominent (note the small rise in f0 between *sam* and *stō*). Our first-pass analysis is H\*L !H\*L !H\* H L%.

The lower panel in Figure 3 shows the accompanying intensity trace. The trace from the Austrian speaker is similar to that from the Swiss speaker and differs from that from the German speaker. Austrian and Swiss speakers do not produce a sharp decrease in intensity at the end of the utterance, but speakers from Germany do.

### 3.5 Acoustic measurements: fundamental frequency

F0 was measured at each syllable onset and offset. Figure 4 illustrates the data, averaged for each variety.

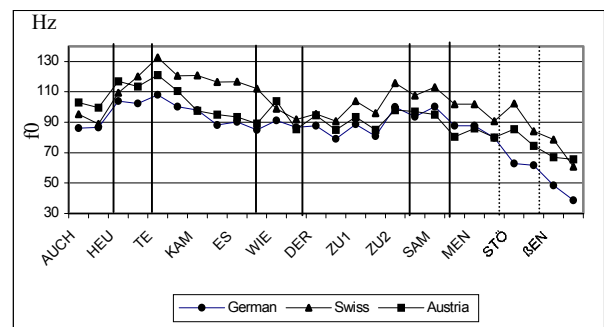


Figure 4. f0 movement in the utterance measured at syllable onset and syllable offset for each syllable

The data support the cross-variety differences discussed in the preceding sections. The Swiss speakers (triangles) produced a high target on *heu* followed by drop in f0 to the low target on *wie*. The prenuclear pattern is convex (H\* L\*). By contrast, the pattern produced by Austrian and German speakers is concave (H\*L (!)H\*L). In the Swiss utterances, the low target is then followed by another high on *Zusam* (the last accented syllable). F0 declines very gently over *Zusammen*, followed by another high on *stō*, the IP-final stressed syllable. It is this high target which gives the impression of a 'postnuclear accent' [14]. In section 3.2., we suggested that this high target may be evidence of an IP internal boundary tone. The Austrian trace in Figure 4 for *Zusammen* is more like the Swiss trace than like the German trace. In the German utterances (circles), the final fall in f0 over the nuclear accent is much sharper.

### 3.4. Acoustic measurement: intensity

Figure 5 shows that German speakers produced larger intensity differences between stressed and unstressed syllables. This observation supports our second hypothesis, namely that German speakers would produce greater intensity differences between stressed and unstressed syllables.

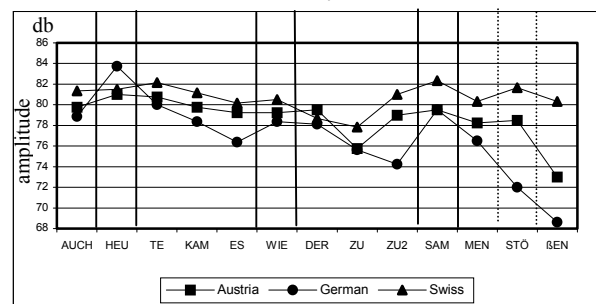


Figure 5. Intensity measurements; one per syllable

### 3.5. Variation within varieties

In the test sentence, we did not observe any intra-varietal phonological or phonetic differences. This is not surprising; all speakers produced the same sentence in the same context, and all speakers were news readers and trained to conform to a standard which is to some extent dictated by their employers. Male-female differences in pitch range were observed within but not across varieties.

## 4. Conclusion

We have presented evidence of prosodic differences between the standard varieties of German spoken in Austria, Germany and Switzerland. Analyses of one declarative utterance cross-varietal showed (1) that there are phonetic differences in the realisation of nuclear tones, and (2) that there are cross-varietal differences in the structure of tunes.

Speakers from Germany produced nuclear accents with an early, sharp fall in f0 accompanied by a similarly sharp fall in intensity. Swiss speakers did the opposite; the fall in f0 was extremely late and there was no fall in intensity. Austrian speakers produced data that were more similar to the Swiss data than to the German data.

The phonological differences between the German data on the one hand and the Swiss and the Austrian data on the other appeared to be systemic. The most important difference involved the nuclear accents. The Swiss and the Austrian nuclear tones were analysed as (!) H\* H L%; they appeared to involve two boundary tones. We proposed that the internal boundary tone may be stress-seeking; the external boundary tone associates with the IP boundary. This finding is in line with findings from other languages. Gussenhoven [12] provides evidence of two boundary tones in the Roermond dialect of Dutch. The German utterances did not have two boundary tones [5, 7]. The alignment of boundary tones in Swiss and Austrian German will be investigated in future experiments.

## 5. Acknowledgements

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## 6. References

- [1] Ammon, U., 1995. *Die deutsche Sprache in Deutschland, Österreich und der Schweiz*. Berlin: De Gruyter.
- [2] Auer, P.; Gilles, P.; Peters, J.; Selting, M., 2000. Intonation deutscher Regionalsprachen - Vorstellung eines Forschungsprojekts. In: *Akten des 1. Kongresses der Internationalen Gesellschaft für deutsche Dialektologie*. Stellmacher et al. (eds.), Wiesbaden: *Interaction and Linguistic Structures*. Freiburg: Steiner (=ZDL Beihefte).
- [3] Boersma, P.; Weenink, D., PRAAT <http://www.fon.let.uva.nl/praat/>.
- [4] Clyne, M. G., 1995. *The German Language in a changing Europe*. Cambridge University Press.
- [5] Féry, C., 1993. *German Intonational Patterns*. Tübingen: Niemeyer.
- [6] Fitzpatrick-Cole, J., 1999. The alpine intonation of (B)ern (S)wiss (G)erman. *Proceedings of the XIVth International Congress of Phonetic Sciences (ICPhS)*, John J. Ohala (ed.), San Francisco, 941-944.
- [7] Grabe, E. 1998. *Comparative Intonational Phonology: English and German*. MPI Series 7: Wageningen, Ponsen en Looien bv.
- [8] Grabe, E.; Nolan, F. and Farrar, K., 1998. IViE - a Comparative transcription system for intonational variation in English. *ICSLP 5*, Sydney, Australia.
- [9] Grabe, E.; Post, B.; and Nolan, F., to appear. Modelling intonational Variation in English. The IViE System. In *Proceedings of Prosody 2000*, 2-5 October, Krakow, Poland.
- [10] Grabe, E. IViE-Labeling Guide <http://www.phon.ox.ac.uk/~esther/ivyweb/guide.html>.
- [11] Grice, M.; Ladd, D. R.; Arvaniti, A., 2000. On the place of phrase accents in intonational phonology. In: *Phonology 17*. Cambridge University Press. 143-185.
- [12] Gussenhoven, C., 2000. The boundary tones are coming: on the nonperipheral realization of boundary tones. In: Michael B. Broe & Janet B. Pierrehumbert (eds.) *Papers in Laboratory Phonology V*. Cambridge University Press. 132 – 151.
- [13] Kohler, K., 1990. Macro and Micro F0 in the Synthesis of Intonation. In: *Papers in Laboratory Phonology I*. Kingston, J.; Beckman, M.E. (eds.) Cambridge University Press. 115-138.
- [14] Ladd, D. R., 1996. *Intonational phonology*. Cambridge University Press.
- [15] Moosmüller, S., 1987. *Soziophonologische Variation im gegenwärtigen Wiener Deutsch*. Eine empirische Untersuchungen. Stuttgart. Dudenverl.
- [16] Muhr, R.; Schrodt, R.; Wiesinger, P. (eds.), 1995. *Österreichisches Deutsch. Materialien und Handbücher zum österreichischen Deutsch und Deutsch als Fremdsprache*. Vol. 2. Wien: Hölder-Pilcher-Tempsky.
- [17] Muhr, R.; Schrodt, R.; Wiesinger, P. (eds.), 1997. *Österreichisches Deutsch und andere nationale Varietäten plurizentrischer Sprachen in Europa*. In: *Materialien und Handbücher zum österreichischen Deutsch und Deutsch als Fremdsprache*. Vol. 3. Wien: Hölder-Pilcher-Tempsky.
- [18] ORF, Berufsaus- und -fortbildung (eds.), 1987. *Sprache und Sprechen in Hörfunk und Fernsehen*. Ein Lernbehelf des Österreichischen Rundfunks. Wien.
- [19] Panizzolo, P., 1982. Die schweizerische Variante des Hochdeutschen. In: *Deutsche Dialektographie*, Vol. 108. Marburg: Elwert.
- [20] Schweizer Radio DRS (eds.), 1997. *Deutsch sprechen am Radio/ Mundart sprechen am Radio*. Basel.
- [21] Stock, E., 2000. Zur Intonation des Schweizerhochdeutschen. In: *Wortschatz und Orthographie in Geschichte und Gegenwart*. Festschrift für Horst Haider Munske zum 65. Geburtstag. M. Habermann; P.O. Müller; B. Naumann (eds.). Tübingen. 299-314.