Frank Kügler

The phonology and phonetics of nuclear rises in Swabian German*

1. Introduction

A systematic description of dialectal variation in prosody has long been a desideratum since most research on intonation and prosody is based on standard varieties, e.g. American English (Pierrehumbert 1980), British English (Gussenhoven 1984), Japanese (Pierrehumbert & Beckman 1988), German (Féry 1993), and recently European Portuguese (Frota 2000). This may be due to the fact that intonologists mainly focus on theoretical developments of the theory proper rather than describe and cover dialectal variation. Traditional dialectologists, on the other hand, have treated the issue of prosody scarcely since in this research tradition it has not been clear which parts of intonation can fulfill the function of distinct linguistic units (cf. Auer, Gilles, Peters & Selting 2000).[1] It is a well-known fact that intonation not only captures distinct linguistic units but also the gradual phonetic expression of the emotional state of a speaker and pragmatic conversational functions, which makes intonation analysis complicated (see for instance Fox (2000: chapter 5) for a general discussion of this aspect). In the recent past, however, the theory of intonational phonology (Ladd 1996) has entered the field of dialectology (e.g. Barker 2002) and researchers have become particularily interested in intonational variation.

In 1997, a research project on German dialect intonation started which focuses on urban varieties from all geographical parts of Germany (Auer et al. 2000). The main goal of this project is to analyse and describe regionally salient intonation contours both phonetically and phonologically. A similar project on English focused on aspects of phonological intonational properties and their phonetic realization in several dialects of British English (Grabe & Nolan 1997-2002; Grabe *this volume*). Dialectal variation in Swedish is currently under investigation as well (e.g. Engstrand et al. 1997, Bruce et al. 1999). While the project's main focus is on the documentation of Swedish varieties spoken around the year 2000, intonational variation is also addressed. In particular, Bruce & Thelander (2001) investigate the relationship between word accent and phrasal intonation, as has been the case in Bruce (1977).

In a number of studies on German dialect intonation, different theoretical aspects of intonational phonology have been concentrated on. While Fitzpatrick-Cole's (1999) study on Bern Swiss German concerns intonational typology, Truckenbrodt (2002, in press, *Ms*.) deals with tonal scaling and downstepping in Southern German. A comprehensive intona-

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[1] See also Heike (1983) for an overview of prosody research within German dialectology.

tional account of Tyrolean German, a South Eastern German variety, has been provided by Barker (2002). In his dissertation, he includes a description of the tonal inventory of Tyrolean German and discusses realizational as well as typological aspects of Tyrolean intonation. Besides intonational variation at the level of dialects, Ulbrich (*this volume*) compares the prosodic properties of the two German standard varieties of Germany and Switzerland.

Dialectologists have always pointed out that speech melody seems to be a distinctive perceptual characteristic of a dialect (see Albrecht 1881 as an early example[2], Frey 1975 on the singing quality of Stuttgart Swabian[3] and Zimmermann 1998 for a comprehensive overview of the metaphor 'singing' in German dialectology). From a larger geographical perspective, Sievers (1912) impressionistically postulates a fundamental distinction between Northern and Southern German intonation: he proposes an inversion of all tonal targets going from one dialect area to the other.[4] Implicitly, this proposal means that in the German-speaking area two distinct intonation systems co-occur.

More recent claims on the intonational variation in German confirm Sievers observation of two independent intonational systems in German in the sense that the use and the function of tonal categories differ between Northern and Southern German (Frey 1975; Gibbon 1998, Féry 1993; Fitzpatrick-Cole 1999, Barker 2002). While speakers of Northern Standard German use a final intonational fall, for instance in a declarative utterance, Southern German speakers use an intonational rise, thus mirroring the final accent of Northern Standard German.[5]

The present study has two aims: Firstly, we will analyse the nature of the observed intonational rise phonologically in Swabian, a South Western German dialect. So far only unsystematic and impressionistic views have been reported on that issue. An exception is Fitzpatrick-Cole (1999) who analyzed Bern Swiss German, a variety which is genetically

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[2] "Nach Erfahrungen, die ich bei längerem oder wiederholtem Aufenthalt in Dresden, in der Lausitz und im Erzgebirge, im Vogtlande und in Böhmen, in Altenburg und Thüringen, in Berlin und Magdeburg, in Hamburg und Holstein, Frankfurt a. M., am Rhein und im Elsass, im Odenwald und in Altbaiern, in Tirol, im Allgäu und in der Schweiz gesammelt habe, glaube ich dreist behaupten zu dürfen: Sie singen Alle, nur Jeder in einer andern Tonart" (Albrecht 1881: X-XI). [After having made experiences during longer and repetitive stays in [almost all parts of the German speaking area, F.K.], I believe to maintain boldly: All of them are singing, however, everyone in another key (my translation)].

[3] "Einem Sprecher des Hochdeutschen fällt an der Intonation des Stuttgarter Dialekts als erstes ein leichter 'Singsang', eine Häufigkeit der Gleittöne auf." (Frey 1975:67). [A speaker of Standard German notices first a slight 'singsong' in the intonation of the Stuttgart dialect, i.e. frequently gliding tones. (my translation)]

[4] "Die dialektische Umlegung des Tonischen ist in der Regel leicht zu fassen. Bei ruhiger, leidenschaftsloser Rede handelt es sich […] nur um direkte Umkehrung aller Tonverhältnisse, sobald wir aus dem einen Gebiet in das andere hinübertreten." (Sievers 1912: 63-64). [The dialectal inversion of the tonality is as a rule easy to comprehend. Speaking calmly and dispassionately, it is solely about a direct inversion of all tonal events if we go from one area to the other. (my translation)]

[5] We will not constraint the tonal differences between Northern and Southern German to the South Western German dialects, i.e. the Alemannic area including Swabian, since Barker (2002) observes a similar tonal pattern for the Bavarian dialect Tyrolean, i.e. a South Eastern German dialect. See also Martens (1950) who, on the other hand, seems to find final rising accents in Munich Bavarian only in certain circumstances.

related to Swabian. Her analysis shows that the intonational rise has a phonological status and serves as the default pitch accent type in this variety. In line with the findings on Bern Swiss German and with Truckenbrodt (2002), we will assume the rise to be the default accent in Swabian German. Secondly, the observed phonological facts will be characterized by means of an analysis of their phonetic realization. The phonological rise will be analyzed in terms of peak alignment and pitch realization over time.

The organization of this chapter is as follows. In section 2 we provide an overview of studies on Southern German and in particular Swabian intonation. The discussion of these studies shows that there is no general agreement on the status of the rising accent pattern in Swabian. After describing methodological issues in section 3, we present a phonological analysis of the rising-falling accent pattern in Swabian in section 4. The last section of this chapter, section 5, deals with the phonetic realization of the rising pitch accent, which supports its analysis as a distinct intonational category. The phonetic analysis makes the impressionistic views of pitch accent realization more systematic and, thus, clarifies the phonological nature of the rising pitch accent pattern in Swabian.

2. Background: Southern German intonation

While most research on German intonation is based on Standard German[6] (e.g. Barker 1925, von Essen 1964, Fox 1984, Wunderlich 1988, Uhmann 1991, Féry 1993, Gibbon 1998, Grabe 1998*a*, Grice & Baumann 2002), little is known about dialectal variation concerning intonation although phonological variation at the segmental level receives great attention. Yet, studying the work of dialectologists, some impressionistic descriptions of a few individual dialects provide information about their prosody (see for instance footnote 2). The proposal of an inverted intonation system in Southern German (Sievers 1912) is in line with other impressionistic observations (see footnote 4).

Frey (1975), in his description of his own Stuttgart Swabian dialect, tries to explain the singing quality of Swabian intonationally. He gives evidence for gliding tones ("Gleittöne", p. 67), the most common pattern of that dialect. He analyzes gliding tones as a phonemic sequence of /°1 3 1 ↓/ following the American structuralist tradition of intonational description (e.g. Pike 1945). Frey's description of intonation is based on four tone levels, 1 being the lowest and 4 the highest level. Additional symbols are used to indicate secondary information of tonal levels: the small round circle corresponds to sentence stress ("Satzton tragende Silbe", p. 67), and a downward arrow indicates falling intonation towards the end of a sentence ("fallende Endkontur", p. 68). Frey illustrates this intonation pattern with a question-answer pair that is reproduced in example (2-1).

[6] Generally, Standard German is referred to as a variety of German spoken in the northern part of Germany.

(2-1) (a) /ˌwan ˑ'komš 'den / /ˌam ˑ'naxmi'dāg /
(b) °1 3 1↓ °1 3 1↓ (tonal transcription given by Frey)
(c) L*+H L% L*+H L% (my own tonal adaptation)

If we compare the tonal realization of the *wh*-question in (2-1a) *Wann kommst du denn?* 'When will you come?' with the answer, i.e. a declarative phrase *Am Nachmittag* 'In the afternoon', it becomes clear that for both sentence types the same tonal pattern is used (see (2-1 b)). According to Frey, the relative low main sentence stress (tonal level °1) followed by a sharp rise (tonal level 3) is responsible for the gliding perceptual quality of Swabian. Our interpretation of Frey's tonal analysis is given in (2-1c) applying the framework of the tone-sequence model (Pierrehumbert 1980, Pierrehumbert & Beckman 1988, Gussenhoven 1984, Ladd 1996) on which the current study is based. The tone sequence model of intonation assumes two tonal values, a low tone (L) and a high tone (H). These tones may occur in isolation or in combination. Additional diacritics divide the tonal events into pitch accents, i.e. tones labeled with an asterisk (*), and into boundary tones, i.e. tones labeled with a percentage (%). (2-1 c) reveals that *wh*-questions and declarative sentences in Swabian are realized with a rising nuclear pitch accent (L*+H) followed by a low boundary tone (L%).

From the example given in (2-1) it may not be clear whether the level 1 tone after the sentence stress belongs to the pitch accent or forms a low boundary tone, as proposed by Frey. He points out, however, that the tonal fall after the pitch peak does only occur if no further syllable with word stress occurs after the nuclear pitch accent. Frey takes the optional quality of the fall as evidence for a rising pitch accent with the fall being part of the boundary specification.

A more recent, yet cursory observation of South Western German intonation is provided by Gibbon (1998) who proposes a rising pitch accent in South Western dialects, labeled as L*+H, where the peak is generally reached in one of the syllables after the sentence stress. Accent realization is thus characterized by a delayed pitch peak. According to Gibbon, such an accent pattern is "common to a chain of dialects along the Rhine valley, from Switzerland ('Schwyzer Dütsch') to Cologne ('Kölsch')" (p. 93).

Besides the ongoing studies within the research project on German dialect intonation (see Auer et al. 2000), to our knowledge, two systematic phonological analyses of German dialect intonation exist: Fitzpatrick-Cole (1999) examines the South Western dialect of Bern Swiss German from a typological perspective, and Barker (2002) provides a comprehensive account of the South Eastern variety of Tyrolean German. Fitzpatrick-Cole (1999) claims phonological rather than phonetic differences to be the source of the nuclear accent difference between Bern Swiss German and Northern Standard German. Just as Gibbon (1998), Fitzpatrick-Cole labels the rising nuclear accent as L*+H. Moreover, her discussion of the observed fall following the pitch peak results in the assumption of a low boundary tone (L%), "which has the option of being stress-seeking" (p. 944). Barker (2002) observes a nuclear rising pitch accent for Tyrolean German as it is the case for the South Western varieties of German. He claims that a rising nuclear pitch accent followed by a low phrase tone (L*+H L-) forms the default accent for Tyrolean German in a declarative sentence (Barker 2002: chapter 6).

To sum up, while in Northern Standard German an intonational falling accent pattern functions both as default accent and as focus accent realization (e.g. Féry 1993), in South-

ern German inverted tonal relations are claimed to exist (Sievers 1912). More specifically, a rising accent pattern has been claimed for Southern German dialects in general (Gibbon 1998), and in particular for Bern Swiss German (Fitzpatrick-Cole 1999) and for Tyrolean German (Barker 2002). It has been shown to function as the default and focus accent realization. Contrary to the studies just mentioned, Féry (1993: section 3.1.4) claims a tritonal movement, i.e. a rise-fall (L*+HL), to frequently occur in Southern German dialects, in particular in Swabian. Her analysis does not specifically point to dialectal variation but assumes this accent pattern to belong to the inventory of German intonation.[7]

In view of Féry's analysis, two major questions emerge for the present study. The first one concerns the nature of the accent pattern itself: is there enough evidence to assume a tritonal movement, or is the rising pitch accent rather bitonal followed by a boundary tone (Frey 1975)? From the phonological as well as phonetic analysis of our data, we propose that the rising-falling accent pattern in Swabian German is to be analysed as a bitonal rising pitch accent that is realized on the accented syllable and followed by a low boundary tone.

The second issue concerns intonational variation: The assumption of a distinct intonation system for Southern German (Sievers 1912) is not reflected by Féry's observation, where a tritonal accent is assumed to be part of the intonational inventory of German and that it can be found as a common Swabian realization. Does the rising-falling pattern belong to the Standard German intonation system, and is it just common in Southern Germany, or do we have evidence for claiming that Southern German exhibits its own intonation system? On the basis of our analysis of focus structure, we claim that, at least with respect to the rise-fall, this pattern is distinct to Standard German where focus is expressed by means of a simple falling accent.

3. Speech Materials

3.1 Subjects

From a sociolinguistic point of view, urban vernaculars play an important role in the process of language change (e.g. Kerswill 1996; Chambers & Trudgill 1998; Auer et al. 2000). A larger city can be considered a center for language change from which innovations spread to other cities and/or the periphery. The urban vernacular of Stuttgart has been chosen for investigation since we assume it to serve as the center of the Southern German variety Swabian.

All subjects are born and raised in the urban area of Stuttgart and are speakers of the urban vernacular of Stuttgart. Three female and three male speakers participated in this study. Their age ranged from 30 to 65 years.

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[7] Féry (1993: 94) restricts the function and use of the rise-fall pattern in Standard German to an expression of "of course", and to television police inspectors addressing suspects.

3.2 Recordings

The recordings were made at the speakers' homes in order to achieve maximal naturalness in conversation. Two subjects participated in each conversation. The recordings were made using a portable Sony DAT-recorder and two Sony tie-clip condenser microphones (ECM-TS125). Each recording session consisted of three parts: first, subjects were asked to summarize a story which had been presented before on a video screen, and to discuss whether the story is false or true; second, a map task game (Anderson et al. 1991, Claßen 2000) had been carried out. Each subject acted at one time as instruction giver and at another time as instruction receiver, resulting in two map task conversations per session; third, the speakers were asked to engage in free conversation. The present analysis is restricted to speech data from the map task.

The recording procedure for the map task was as follows. Two subjects were separated by a shield. One of them, the instruction giver, had to describe as accurately as possible a route which was painted on his map. The instruction receiver's task was to draw the route on her map. Participants were not allowed to look at each others map. Both maps contained a starting point and different symbols, e.g. a caravan, a dragon fly, or a fisherman. However, the two maps differed in three ways: (a) symbols were placed in a different order, (b) not every symbol occurring on one map was given on the other map, (c) symbols were labeled with different names. This procedure caused lively conversations. The participants were informed that the experiment deals with how exactly information may be coded and transmitted. For that reason, they were told that deviations from the original route will be measured. They were instructed not to gesture, but only to speak with each other.[8] No time limit for the task was given. The map tasks chosen for this study are maps II and III of Claßen (2000).[9]

3.3 Transcription

Speech data have been digitized at a sampling rate of 16 kHz, 16 bit, mono format. The sound files have been transcribed and analyzed using Praat (© Boersma & Weenink 1992-2002). A total of six map task dialogues have been analyzed in this study. The speech data have been transcribed according to GAT (Selting et al. 1998), which is a system of conventions for transcribing conversational speech data. Phrases have been labeled intonationally using Pierrehumbert's (1980) tone-sequence model as a basis. Labeling has been based on auditory perception and visual inspection of F_0 traces.

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[8] As a consequence, subjects in fact only looked at their own maps. No eye contact and almost no attempt to gesture occurred.

[9] I am grateful to Kathrin Claßen at the IMS Stuttgart who provided me her map task files.

4. The phonological status of rising-falling accent patterns in Swabian

4.1 Nuclear rising-falling patterns

4.1.1 Selection of phrases and tonal analysis

Due to the heterogeneous material that emerges from map task dialogues, no identical and thus no directly comparable test sentences are available. Moreover, in spontaneous speech a sentence is not always completely realized. Thus, for the present study intonation phrases rather than sentences have been chosen for analysis. An intonation phrase may coincide with a syntactic well-formed sentence. However, in the majority of cases an intonation phrase contains parts of a sentence, in some cases just a single word. In the present study, intonation phrases with overall falling intonation have been selected. These are phonologically labeled as L*+H L- or L*+H L%, depending on focus structure (see 4.1.3).

4.1.2 Nuclear rising pitch accents

If the nuclear pitch accent is associated with the final word of an intonation phrase its realization depends on the number of syllables of the phrase final word. In phrase final words containing at least two syllables with word stress on the penultimate syllable (or even before the penultimate syllable), the low tone of the pitch accent is realized on the stressed syllable. It is followed by a rise to the high target of the pitch accent. The pitch is then gradually falling to a low target which is reached on the last syllable of the phrase as illustrated schematically in Figure 4-1. If the final word contains only one post-nuclear syllable (Figure 4-1a) the fall ends on that syllable. Final words with more than one post-nuclear syllable show a less steeper fall with the low target on the last syllable (Figure 4-1 b and c).

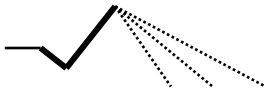

Figure 4-1: A nuclear rising pitch accent with a low boundary tone on the (a) first, (b) second, and (c) third post-stressed syllable. Thick lines correspond to the pitch accent, dotted lines represent options that depend on the number of syllables.

In phrase final monosyllabic words, a similar pattern arises. However, the accent peak is shifted leftwards into the syllable leaving enough space to realize the final fall (see Figure 4-2). In these cases, the accent pattern is compressed. As can be seen in Figure 4-2, low pitch is realized at the beginning of the phrase final word *MEHL* ‘flour’. The rise, although relatively flat, continues throughout the accented vowel, and ends almost at the end of the syllable nucleus, followed by a final fall.

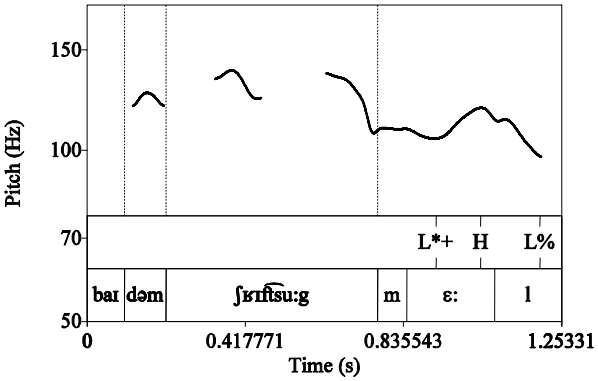

Figure 4-2: Nuclear rising pitch accent on phrase final monosyllabic word *Mehl* 'flour' in the phrase *bei dem schriftzug MEHL* 'at the word flour'.

The accent pattern given in Figure 4-1a equals the accent pattern given by Frey (1975), Gibbon (1998), and Féry (1993). Considering cases as Figure 4-1b/c we can reject the tritonal analysis of Féry (1993). If more than one postnuclear syllable follows the pitch accent, the F_0 interpolates between the accent peak and the low boundary. Thus, the association of the low tone at the end of the word does not depend on the pitch accent but on the boundary, no matter how many syllables follow the pitch accent. This is apparent in Figure 4-3, which presents a phrase-final word consisting of seven syllables with main word stress on the first syllable (the compound *SÄNGerinnenseminar* 'college of female singers'). The low tone aligns with the accented syllable *SÄNG* 'sing' and the high tone is associated with the postnuclear syllable. The subsequent fall extends to the end of the first part of the compound. The second part remains flat. In this case, it is obvious that the low tone of the fall is associated with a boundary, i.e. a morphological boundary. We therefore conclude that the accent pattern should be labeled as L*+H L-. This analysis is in line with the findings of Barker (2002) who considers the L*+H L- pitch accent as the default realization in Tyrolean German.

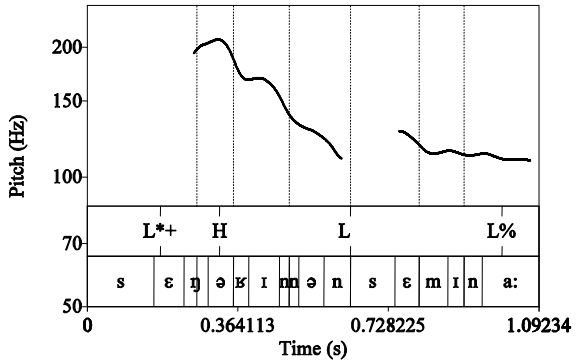

Figure 4-3: Nuclear rising pitch accent on phrase final word containing seven syllables. The intonation phrase consists solely of the word *SÄNGerinnenseminar* 'college of female singers'.

So far, we have presented the nuclear rise associated to the final word of the intonation phrase. Figures 4-4 and 4-5 illustrate the nuclear rise in non-phrase-final words. The rise in Figure 4-4 is associated with the penultimate word of the phrase *ZWEI* 'two'. The accent shape resembles that of the previous examples. The L tone aligns with the beginning of the accented syllable and the H tone aligns with the end of that syllable. The postnuclear pitch interpolates between the pitch peak and the low boundary (cf. Figure 4-1c).

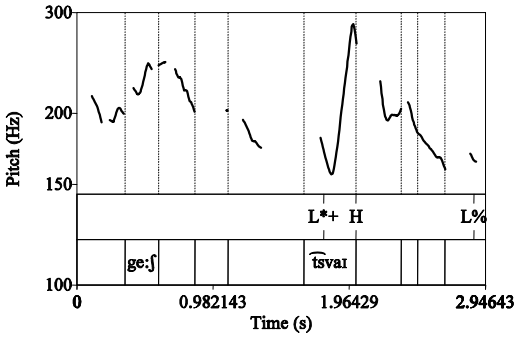

Figure 4-4: Nuclear rising pitch accent on the penultimate word *ZWEI* 'two' in the phrase *un=dann gesch du ogfähr so=so ZWEI zentimeter* 'and then, you proceed approximately two centimeters'.

Contrary to the pitch curve in Figure 4-4, we observe a low pitch target at the end of the accented word in Figure 4-5, where the nuclear pitch accent occurs on the first word. The early position of the nuclear pitch accent is due to focus structure. While the structure in Figure 4-4 corresponds to new information, Figure 4-5 presents a case of contrastive accent. The nuclear L tone in Figure 4-5 associates to the beginning, and the H tone to the end of the syllable nucleus. The postaccentual fall stretches across the following two postnuclear syllables. After that, the F_0 curve remains flat until the end of the phrase. As in example 4-3, a low tone is associated with a word boundary. The accent is thus labeled L*+H L-.

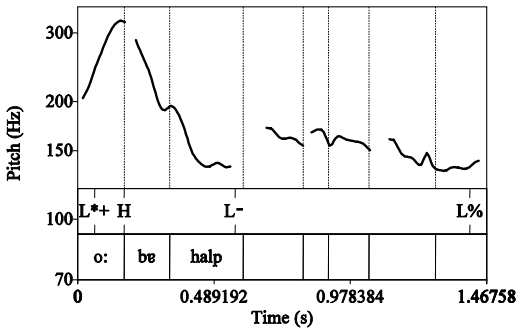

Figure 4-5: Nuclear rising pitch accent on the phrase initial word *Oberhalb* 'above' of the phrase *Oberhalb von der libelle* 'above the dragon fly'.

4.1.3 Focus and the nuclear rising pitch accent

In the previous section we have argued for a bitonal nuclear rising pitch accent which is followed by a low boundary tone with pitch interpolating between the pitch peak and the boundary (cf. Figure 4-1). Concerning the low boundary tone, however, we have also observed variation as to where the boundary tone associates with the segmental string. Whereas the examples in Figures. 4-2 and 4-4 clearly support the analysis of a rising pitch accent followed by a low intonation phrase boundary, the examples in Figures. 4-3 and 4-5 do not. Instead, the pitch in Figures. 4-3 and 4-5 seem to align to the right edge of the word bearing the pitch accent. In these cases, the low tone may be interpreted as a boundary tone as well, though not as an intonation phrase boundary tone. In line with Grice, Ladd & Arvaniti (2000), who propose that a trailing tone of a nuclear pitch accent may associate to different anchors in the segmental string depending on the language, we argue for the L boundary tone in Swabian to be a boundary tone that aligns with the right edge of the pitch accented word.[10] If we consider the focus structure of the examples presented above, we may explain the variation between the nuclear rising pitch accent followed by a low intonation phrase boundary tone and the one followed by a low phrase accent.

It is generally assumed that the two types of focus to be accounted for are *narrow* and *broad* focus (Ladd 1980, see also von Stechow 1991). Féry's (1993) definition of narrow focus is followed here; this is "an accent standing for a focus which is limited to a smaller constituent" (Féry 1993: 13, based on Ladd 1980). The focused constituent forms a variable taken from a set of alternatives usually determined by the context. Broad focus, on the other hand, represents "an accent standing for an unspecified focus" (Féry 1993: 13). According to this view, (4-1) can be analyzed as narrow focus. The phrase in (4-1) is embedded in the context of the map task (cf. section 3.2) where the two speakers have to discuss the route on the map. (4-1) is the answer to the question of which direction the route would continue. The interlocutor opens a set of directional possibilities where the answer *Oberhalb* 'above' represents one alternative. This constituent is thus in narrow focus.

(4-1) L*+H L- L%
| | |
[$_F$ Oberhalb] von der Libelle.
'Above the dragon fly.'

The phrase in (4-2), on the other hand, represents an example of broad focus. The speaker provides new information to the interlocutor as to where to draw the way on the map.

[10] The theory of intonational phonology acknowledges two different kinds of phrase accents. In the sense of Pierrehumbert (1980) a phrase accent simply captures the pitch curve between the nuclear pitch accent and the intonation phrase boundary. A phrase accent may, however, also function as a boundary tone, i.e. to delimit an intermediate phrase (Pierrehumbert & Beckman 1988; Hayes & Lahiri 1991).

(4-2) L*+H L*+H L%
| | |
[$_F$ Richtung drehende Windmühle]
'direction to 'rotating windmill'.'

Comparing (4-1) with (4-2) we can conclude that two different accent patterns of the rising nuclear pitch accent occur in Swabian (see Figure 4-6). While the nuclear rise is the same in both accent shapes, the following low tone varies as to where it aligns with the segmental string. The choice of accent pattern depends on the focus structure of the phrase. In broad focus, the end of the fall aligns with the end of the intonation phrase, where pitch interpolates between the accent peak and the phrase boundary depending on the number of postnuclear syllables (variants (a) through (c) in Figure 4-6). An example of variant (a) was shown in Figure 4-2 above, while the F_0-trace of (4-2) in Figure 4-7 resembles variant (c). In narrow focus (variant (d) in Figure 4-6), the end of the fall aligns with the end of the accented word (cf. (4-1)).

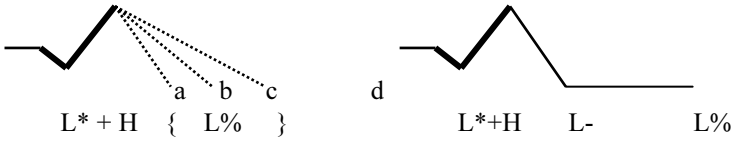

Figure 4-6: Two types of accent shapes of the nuclear rising pitch accent.

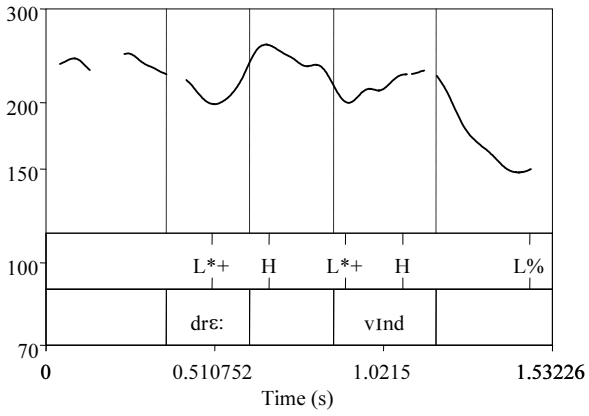

Figure 4-7: Nuclear rising pitch accent in a phrase with broad focus.

The fact that the tonal structure differs with respect to focus type has been reported for different languages, e.g. Hayes & Lahiri (1991) for Bengali, Zybatow & Mehlhorn (2000) and Alter (1997*a*,*b*) for Russian, and Frota (2000) for European Portuguese. In Bengali, if "there is no intent of placing focus on any particular constituent" (Hayes & Lahiri 1991: 66) a declarative utterance bears a high pitch accent and a low intonation phrase boundary (H* L_l) (p. 66ff.). If, on the other hand, a constituent of a declarative utterance is focused, a low

pitch accent associates to the focussed constituent, which is delimited by a high boundary tone. Regardless of the position of the focused constituent in the phrase, an additional low intonation phrase boundary is realized (L* H_P L_I) (Hayes & Lahiri 1991: 58ff.). While in Bengali the pitch accent differs across focus condition (cf. L* vs. H*), in Russian and European Portuguese the alignment of an intonational fall differs across focus condition. In Russian, the low tone of the fall is realized on the accented syllable with a pitch peak preceding it in case of broad focus (HL*). Contrastive focus, on the other hand, is expressed by a high tone on the accented syllable with a preceding low and a following low tone (LH*+L) (Zybatow & Mehlhorn 2000: 424, 426). Similarly, in European Portuguese the L tone of the falling pitch accent is either realized on the accented syllable in case of broad focus (H+L*) or after the accented syllable in case of narrow focus (H*+L) (Frota 2000: 210ff.). For Standard German, however, no distinct accent types in relation to different focus structures have been found (Féry 1993). In a recent study on Berlin German, Peters (2001) found evidence for the use of nuclear L*+H signaling contrastive focus.[11]

4.2 Prenuclear rising pitch accents

For reasons of completeness I will briefly turn to the issue of prenuclear accents. Figure 4-8 presents an intonation phrase with two pitch accents. As can be seen from the F_0 trace in Figure 4-8, a rise in pitch is realized on the stressed (second) syllable *um.'KREISCH* 'circle'. The shape of the F_0 rise equals that of the nuclear rises presented before (cf. Figure 4-6), i.e. the L target is aligned with the beginning and the H target is aligned with end of the voiced part of the stressed syllable.

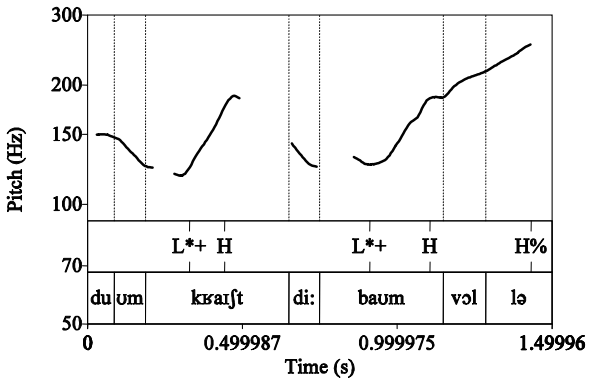

Figure 4-8: Prenuclear rising pitch accent in the phrase *du umkrEIsch die BAUMwolle* 'you'll circle the cotton'.

If we recall the assumption of two independent tonal inventories that are inverted between Northern Standard German and Southern German (Sievers 1912), we have to admit that the data analysis does yet not suffice. Prenuclear rises are common in Standard German (Féry

[11] See also Delattre et al. (1965) on the occurrence of rising pitch accents in German.

1993, Grabe 1998*a*, Grice & Baumann 2002), in Tyrolean German (Barker 2002), in Bern Swiss German (Fitzpatrick-Cole 1999), and in Swabian German, as has been shown here. Also, prenuclear falling pitch accents exist in the varieties mentioned. In order to systematically account for an inverted tonal system in Southern German, a functional analysis of the different types of prenuclear accents would be necessary. Only if rising and falling prenuclear pitch accents were found to be bound to certain functions and/or contexts in Northern and Southern German, respectively, and if the occurrence of different types of pitch accent differed between Northern and Southern German, we would have evidence in favour of an intonational system of Southern German that is entirely inverted in comparison to that of Northern Standard German.

4.3 Summary

The phonological analysis of the rising-falling accent pattern in Swabian has shown that in nuclear and prenuclear position a rising bitonal pitch accent L*+H occurs. In addition to the nuclear pitch accent, a low boundary tone is assumed to occur in Swabian as well. This analysis contradicts the assumption of a tritonal pitch accent as supposed by Féry (1993), where the postaccentual fall counts as being part of the pitch accent. In addition to the low boundary tone, a low phrase accent has been observed. It has been argued that the nuclear rising pitch accent pattern delimited by a low phrase accent occurs on narrow focused constituents while broad focus is expressed by a nuclear rising pitch accent with pitch gradually falling to a low intonation phrase boundary tone.

5. The phonetic realization of the nuclear rising pitch accent L*+H

The phonological inventory of pitch accents differs from language to language and/or from dialect to dialect. With regard to the phonetic realization of pitch accents, the same phonological tone may be realized differently between languages and dialects as well. This phonetic variation thus covers cross-linguistic ‘realizational’ distinctions between pitch accents (Ladd 1996: 119). Based on the assumption of systematic phonetic surface realizations of tonal categories within one language or dialect, we now turn to the phonetic properties of the rising nuclear pitch accent in the Southern German variety of Stuttgart Swabian.

5.1 Timing of pitch peaks

The alignment of F_0 with respect to the segmental string has recently been proved to be invariant for certain pitch accents across languages (Arvaniti, Ladd & Mennen 1998, Ladd, Faulkner, Faulkner & Schepman 1999, Ladd, Mennen & Schepman 2000) and is thus considered to be an important phonetic property of a tonal category. As far as the Southern German dialect Swabian is concerned, Gibbon (1998) reports that pitch accents are gener-

ally characterized by a "*right-displaced prominence peak*" (p. 93 [emphasis as in the original]), i.e. the pitch peak of the rising tone is realized after the accented syllable. However, no systematic data support this assumption. Therefore, we conducted a systematic analysis of pitch peak alignment with respect to segmental anchoring in Swabian German.

Within the autosegmental metrical approach to intonation, bitonal pitch accents are represented by L*+H or L+H* for rising and H*+L or H+L* for falling accents. The asterisk marks a tone that is consistently associated with the metrical strongest syllable. Visual inspection of F_0 traces usually determines which tone receives the asterisk. An analysis of segmental anchoring, however, provides systematic phonetic details that support phonological argumentation.

As for Swabian German, it remains an open question whether the pitch peak is constantly anchored at some distance after the accented syllable and whether its location is affected by segmental or tonal influences or by the number of unaccented syllables that follow it or not. Gibbon's (1998) vague statement of pitch peak location may indicate that stable alignment is not at issue. Moreover, considering recent shortcomings on the nature of phrase accents Grice, Ladd & Arvaniti (2000) show that in several languages phrase tones exhibit a stress seeking tendency, i.e. they are in fact "edge tones with a secondary association to an ordinary tone bearing unit" (p. 180). Since Gibbon (1998) assigns prominence to the pitch peak, while the location of this peak is not clear, a timing analysis can provide phonetic information necessary to decide whether the pitch peak belongs to the pitch accent or behaves as a phrase tone.

In addition, the analysis of pitch peak alignment contributes to a basic debate within intonation research. This debate concerns the so-called *levels* vs. *configurations* approach to intonation.[12] Within the autosegmental-metrical approach to intonation, local F_0 targets are assumed to be crucial for intonational analysis. This view is reflected by the tonal inventory of the theory. The local minima and maxima in pitch observed as turning points in the F_0 curve represent the course of intonation. The two pitch levels are thus tones that constitute a pitch accent. Researchers of the British School of intonation (e.g. Bolinger 1986) and of the IPO school (e.g. 't Hart, Collier & Cohen 1990), on the other hand, favour a model of intonation in which F_0 movements are crucial to the linguistic description of intonation. This view expects the slope of a movement and its duration to be dependent on movement type. Contrary to that, the level view of intonation expects slope and duration of movement to depend on the localization of the tonal targets. Arvaniti et al. (1998) demonstrate that the latter seems to hold for Greek by systematically varying segmental material in the accented syllable and the following syllables. They have shown that in modern Greek the low pitch level of prenuclear rising pitch accents aligns consistently "approximately 5 ms before the onset of the accented syllable" (p. 5), while the high level aligns just after the beginning of the first postaccentual vowel (p. 23). The invariant alignment of tonal targets has further been proved by Ladd et al. (1999), who showed that a decrease or an increase in speech rate does not affect segmental anchoring. In addition to this, Ladd et al. (2000) show that segmental anchoring of tonal targets in Dutch depends on syllable structure.

[12] See Ladd (1996: chapter 2.3) for a review of the levels vs. configurations debate.

5.1.1 Method

In contrast to the studies by Arvaniti et al. (1998) and Ladd et al. (1999, 2000), we chose *nuclear* rising pitch accents for purposes of analysis since this study is mainly concerned with characterizing the nuclear rising pitch accent. Following Ladd et al. (2000) who focus on the influence of different syllable structures on peak alignment, we performed the analysis on different syllable structures in order to shed light on the unsolved issue of delayed pitch peaks in Swabian raised by Gibbon (1998). Due to the corpus design, it has not been possible to extract test items which are coherent in segmental material like those in the studies by Arvaniti et al. (1998), and Ladd et al. (1999, 2000). Nevertheless, many test items occurred several times since the nature of the map task provoked repeated references to the same symbols on the map. Phrases with falling intonation have been chosen according to the above mentioned criteria (see also section 3.3). Syllable structures chosen are listed in Table 5-1.

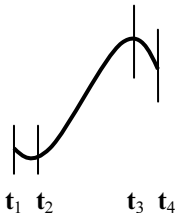

Figure 5-1: Measuring points at the F_0 curve of the nuclear rising pitch accent.

A schematic accent shape is presented in Figure 5-1. Usually, F_0 in the accented syllable falls to a low target followed by a sharp rise that may dip slightly after the pitch peak. As can be seen from Figure 5-1, F_0 is measured at four different points: t_1 is at the beginning of the periodical signal, t_2 is at the F_0 minimum, t_3 is at the F_0 maximum, and t_4 is at the end of the periodical signal. Note that only t_1, t_3, and t_4 are relevant to the present analysis, while t_2 will only become relevant for the measurement analysis in section 5.2. The position of the pitch peak is expressed as the distance between the F_0 maximum and the beginning of the voiced part of the accented syllable relative to the overall duration of the voiced part, as in (5-1).

(5-1) $$t(H) = \frac{t_3 - t_1}{t_4 - t_1} * 100$$

5.1.2 Results

Table 5-1 summarizes the results of the analysis of peak alignment for different syllable structures. High values indicate a late peak alignment in relation to the end of the voiced part of the syllable. In all syllable structures but one the pitch peak of the rising pitch accent was located near the end of the syllable. In syllables with long vowels (/(C)V:/), the peak

occurred at 86.8%. Interestingly, syllables containing a diphthong and no coda (/(C)VV/) showed an unexpected early mean peak position of 71.1%. A closer look at the data, however, reveals that phrase-final syllables exhibit an early peak at about 42.7%, while the peak on non-phrase-final syllables occured at 82.4%. The relatively early peak position of phrase-final diphthongs is due to the realization of an additional low boundary tone (cf. Figure 4-2 in which the pitch accent and boundary tone are realized on a monosyllabic word with long vowel plus liquid). Since no more syllables follow, the peak of the rising pitch accent was shifted leftwards. The peak location on non-final syllables was about the same as for syllables containing a long vowel or diphthong.

Table 5-1: Relative position of H target relative to the duration of F_0 of the accented syllable for each syllable structure. C = voiced consonant in onset or coda position, V/V: = phonologically short / long vowel, VV = diphthong, (C) = optional onset.

Syllable structure	H position (%)	N	Examples
(C)V:	86.8	26	*oben* ‘above’
(C)VV	71.1	7	*vorbei* ‘along’
(C)V:C	74.7	10	*Wohnwagen* ‘caravan’
(C)VVC	77.6	2	*Baumwolle* ‘cotton’
CVC		18	
	78.9	11	*runter* ‘down’
	right-displaced	7	*Sängerinne* ‘female singer’

In syllables with a voiced coda and a long vowel (/CV:C/) or diphthong (/CVVC/), the peak occurred at 75,2%. Compared to open syllables, this is about 10% earlier. This might indicate that pitch peak position is aligned with the right edge of the syllable nucleus rather than with the syllable rhyme. However, the measurement was taken relative to the voiced part of the syllable and does neither give information about the length of the syllable nucleus nor about the length of the coda. Thus, from these data we can only deduce that the pitch peak is realized relatively late in the accented syllable. The main point is, however, that the pitch peak of the rising pitch accent is realized within the accented syllable.

Strikingly, syllables containing a short vowel, a voiced onset and a voiced coda showed no uniform behaviour. In 11 out of 18 occurrences, the pitch peak was realized within the accented syllable. In seven cases, a right-displaced pitch peak was observed. A more detailed analysis of these two groups reveals that on penultimate syllables the peak occurred with the accented syllable, while on antepenultimate syllables and on syllables occurring even earlier in the intonation phrase, as in *Sän.ge.rin.nen* (see Figure 4-3), the peak was displaced to the right.

5.1.3 Discussion: Taxonomy of nuclear pitch peak alignment

The main concern of the analysis of peak alignment was to characterize the bitonal rising pitch accent. From Gibbon (1998) it is not clear whether the H target of the rising pitch accent belongs to the pitch accent or may be interpreted as a phrase accent. The results for Swabian German show that in almost all cases the H target is realized within the accented

syllable (cf. Figure 5-2). Only for one syllable structure, /CVC/, and only in certain distances to the end of the intonation phrase, we found a delayed peak that is constantly realized on the postnuclear syllable. Thus, the data support the analysis of a bitonal pitch accent and contradict Gibbon's claim that the rising pitch accent is generally realized with a right displaced prominence peak. Instead, the delayed peak occurs only on a certain syllable structure. Why this is the case, however, remains an open question.

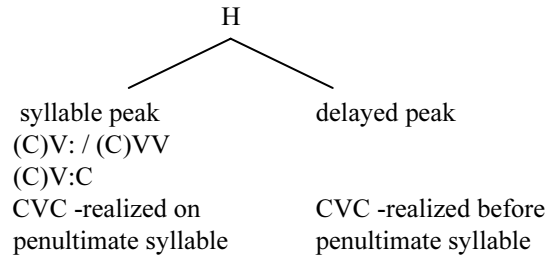

Figure 5-2: Taxonomy of pitch peak alignment in Swabian German.

Since the timing of the pitch peak depends on the number of postaccentual syllables, one could argue that this holds even for the other syllable structures tested. However, on items like *Wohn.wa.gen* 'caravan' or *Baum.wol.le* 'cotton' with two postaccentual syllables the pitch peak is realized on the accented syllable. Since the delayed peak only occurs on syllables with a short vowel and a voiced coda, we propose the taxonomy of pitch peak placement as in Figure 5-2.

The accent pattern analyzed here is also found in Berlin German (Peters 2001). Although it only occurs in case of contrastive focus in Berlin, the phonetic realization corresponds to that of the Swabian rising accent. The pitch peak is realized on the accented syllable itself following the accentual low tone. This accent realization is not in line with rising accents of the form L*+H where the peak is realized on the postaccentual syllable, e.g. prenuclear rising accents in Northern Standard German (Grabe 1998*a*).

5.2 The temporal organization of accent realization

A second microprosodic property of pitch accent realization concerns the temporal organization of F_0 within the accented syllable when less sonorant material is available (truncation/compression). Bannert & Bredvad-Jensen (1975, 1977), Grønnum (1989), and Grabe, Post, Nolan & Farrar (2000) have shown that this parameter differs cross-dialectally, and both Peters (*Ms.*) and Gilles (2001) report these cross-dialectal differences for German varieties as well.

The issue of temporal organization of accent realization goes back to the early studies of Erikson & Alstermark (1972), and Bannert & Bredvad-Jensen (1975, 1977) who analyse the course of fundamental frequency as a function of vowel duration in accented position. The common goal of these studies was to provide insights in the tonal distinction between Accent I and Accent II in Swedish (Bruce 1977). Realizational differences in F_0 and duration have been identified as acoustic correlates of accent type. Two hypotheses have been tested by systematically shortening the vocalic and voiced part of the accented syllable: if

the voiced part of the syllable is considerably shorter, the fundamental frequency may (1) "be identical initially but be cut off at the end of the voiced period" (Erikson & Alstermark 1972: 54), or (2) affected by means of a temporal reorganization in which the fundamental frequency change increases. The former is called "truncation", while the latter has been named "rate adjustment" by Erikson & Alstermark (1972: 54) and "compression" by Bannert & Bredavad-Jensen (1975: 16).

Recently, Grabe (1998*a*, *b*) analyzed truncation and compression in German and English and assumed the acoustic measure of *rate of F_0 change* to be a correlate of realizational properties of pitch accents. In her studies, she compared realizational properties of Southern British English with Northern Standard German in order to systematically account for different realizations in the languages. She considered both rising and falling nuclear pitch accents elicited on declarative sentences and yes/no-questions, respectively. Contrary to the Swedish studies that aim at establishing acoustic correlates of different accent types, Grabe's goal is to explain surface phonetic variation that refers to the same phonological tonal categories. Furthermore, in a cross-dialectal study of English varieties, Grabe et al. (2000) provided a systematic account of cross-dialectal differences in pitch accent realization. The results show, on the one hand, that the same tonal category is realized in different ways in different dialects and, on the other hand, that different realizations may reflect one and the same tonal category. For Northern German, i.e. speech data from Braunschweig German, Grabe (1998*a,b*) establishes truncation for falling accents but compression for rising accents. The truncation pattern for falling accents has also been observed in Berlin German (Gilles 2001, Peters *Ms*.). However, in Hamburg German, which is geographical nearer to Braunschweig than to Berlin, both Gilles (2001) and Peters (*Ms.)* observe compression for falling accents. These results emphasize the importance of dialectal data in order to account for intonational variation. Since there are no systematic data on the temporal organization of pitch accent realization available for Swabian, we examine the speech data with regard to the phonetic effects "truncation" and "compression".

5.2.1 Method

As has been mentioned before, the corpus design did not allow for test items with nearly identical segmental material like in the studies by Grabe (1998*a*, *b*) and Grabe et al. (2000). Still, many test items occur several times since the map task makes the subjects repeat words. Moreover, Kügler (2003) shows that the concept of truncation or compression may be extended to syllable structures containing more sonorant material than only the syllable nucleus.[13] Therefore, voiced syllables are compared to syllables with lesser voicing. Examples are *Mehl* 'flour' [meːl] and *obe* 'above' [oːbə]. Bisyllabic words have been included in the analysis because of the findings of the analysis of peak alignment (see section 5.1) where we have shown that the tonal domain of the rising accent in almost all cases is the accented syllable.

Following Grabe (1998*a*, *b*), the rate of F_0 change is assumed to be the acoustic correlate of truncation and compression. The measure is "calculated by dividing the maximum F_0

[13] See also Peters (*Ms*.) who analyzes the factors onset and coda with respect to truncation and compression in Hamburg and Berlin German.

excursion on a test word by F_0 duration for that word, as measured from the F_0 trace" (Grabe 1998*b*: 134). This algorithm measures the highest and lowest points of the F_0 curve from left to right in the accented syllable. Peters (Ms.) extends the algorithm to be able to deal with more variation within the spontaneous speech materials by including locally occurring F_0 minima and maxima before and after the accent peak. This method is used here as well. Moreover, a prototypical rising pitch accent in Swabian exhibits a local dip after the pitch peak. This pattern is shown schematically in Figure 5-1 above (see section 5.1). Assuming this shape as prototypical, the rate of F_0 change (E_{rel} as in 5-2a) is calculated on the basis of the formulas given in (5-2).

The frequencies f_1, f_2, f_3, and f_4 represent the F_0 measurements taken at the corresponding time points, which can be seen in Figure 5-1 above. The value of F_0 excursion (E) of the accented syllable is calculated as the sum of the difference between two adjacent F_0 measurement points (5-2b). The distance t_4 - t_1 is equivalent to the F_0 duration of the accented syllable.

(5-2) Formula for calculation F_0 excursion (E) and rate of F_0 change (E_{rel}) in Hz/sec (after Peters Ms.)

(a) $$E = \sum_{i=1}^{3} | f_i - f_{i+1} |$$ (b) $$E_{rel} = \frac{E}{t_4 - t_1}$$

Due to variation of the rising pitch accent, the slight ingliding movement at the beginning of the accent or the slight dip at the end are not realized in every item. Thus, it is possible that the measuring points f_1 and f_2 or f_3 and f_4 show the same F_0 value.

5.2.2 Results

As expected, syllables with less sonorant material were found to have shorter F_0 durations compared with structurally identical syllables that contain more sonorant material (Figure 5-3, left panel). An additional syllable type (long vowel without an onset or coda) was taken for reference and shows an even shorter duration. Thus, F_0 modifications can be expected when less sonorant segmental material is available for accent realization.

As can be seen from Figure 5-3 (right panel), the mean rate of F_0 change increased when less sonorant material was available for accent realization. Voiced syllables (e.g. the first syllable of the word *nunter* [nʊn.də] 'down') had a mean rate of F_0 change of 245 Hz/sec, while syllables with a voiced onset but an unvoiced coda had a mean rate of F_0 change of 354 Hz/sec. Syllables that only contain a long vowel showed an even higher mean rate of F_0 change, which was 471 Hz/sec. This reflects a compression pattern for Swabian. Thus, as far as rising pitch accents are concerned, Swabian belongs to the compression type of dialect.

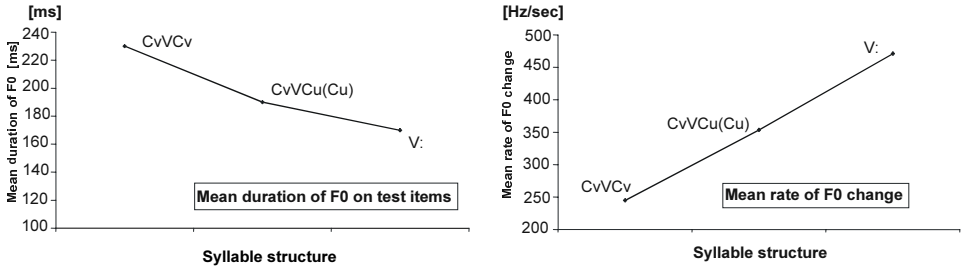

Figure 5-3: Mean F_0 duration (left) and mean rate of F_0 change (right) on test items. Cv = voiced consonant in onset or coda position, V = vowel, Cu = unvoiced consonant.

5.2.3 Discussion

From the point of view of intonational variation, this study provides data on the temporal organization of accent realization of a German dialect, emphasized by Grabe et al. (2000) for varieties of British English. Grabe (1998*a*, *b*) shows for Northern Standard German that nuclear rising accents in yes/no questions are compressed. In this respect, Swabian does not differ from Standard German. Contrary to Grabe, however, we have analyzed rising accents that occur in declaratives with falling intonation. Concerning falling accents in Swabian it remains open whether they are truncated or compressed. Falling accents in Hamburg German are compressed (Gilles 2001, Peters *Ms.)*, but truncated in Braunschweig (Grabe 1998*a, b*) and in Berlin German (Peters *Ms*.). No data on rising accents exist for these varieties as yet.

Extending the temporal organization of accent realization to the interplay between a pitch accent and a boundary tone, Grice et al. (2000) reported on a phenomenon in Standard Hungarian where the low boundary tone gets truncated if the phrase final syllable is also associated with the nuclear pitch accent and the obligatory phrase accent, thus no additional space for boundary tone realization is available. Contrary to Hungarian, for a phrase final monosyllabic word in Swabian German both the rising pitch accent and a low boundary tone are realized (e.g. Figure 4-2). The shift of the pitch peak to the left is in accordance with the compression pattern in Swabian. Yet, a correlation between the effect of tonal target shifting into the syllable under time pressure and the temporal organization of accent realization should be systematically carried out in an experiment.

6. Summary and discussion

In this chapter, the phonological and phonetic properties of the rising-falling accent pattern in the Southern German variety of Stuttgart Swabian have been discussed. In accordance with Frey (1975) and Gibbon (1998), we argue that the rise-fall is a bitonal rising nuclear pitch accent rather than a tritonal movement (Féry 1993). As a consequence, the postaccen-

tual fall has been attributed to a low boundary tone. Furthermore, observed variation in the alignment of the fall has been related to different focus structures: narrow focus forces a low phrase accent that is aligned with the right edge of the accented word. Broad focus, on the other hand, exhibits no phrase accent but a low intonation phrase boundary tone. Thus, the nuclear rising accent functions as the default accent.

With respect to the hypothesis of an inverted tonal system for Southern German in comparison to Northern German (Sievers 1912), this study has provided evidence for the assumption of a tonal system for Swabian that is inverted as far as nuclear accents are concerned at least. Comparing the Swabian data with Bern Swiss German (Fitzpatrick-Cole 1999) and with Tyrolean German (Barker 2002), it becomes clear that the nuclear rising accent seems to function in the same way in these dialects. We therefore conclude that in the intonation system of Southern German the nuclear rising pitch accent might be a shared feature. Taking prenuclear accents into account we have shown that rising pitch accents also occur in prenuclear position. Since rising accents occur in prenuclear position in Standard German as well, it is not clear whether it is advisable to extend Siever's hypothesis to prenuclear accents too. In order to clarify this, more research on the nature of prenuclear accents in Swabian needs to be done.

The analysis of the alignment of the pitch peak of the rising accent has provided evidence against Gibbon's (1998) characterization of Southern German dialects by means of a right displaced prominence peak. As far as Swabian is concerned, a taxonomy of peak alignment reveals that the peak is realized after voiced CVC-syllables that contain word stress and only if more than two unstressed syllables follow the accented syllable before the intonation phrase boundary. A preliminary inspection of prenuclear accents seems to support the behaviour of the CVC-syllable structure, i.e. if more than two syllables occur between the prenuclear and the nuclear accent, the peak is realized on the postaccentual syllable. For all other syllable structures, the peak is aligned near the end of the accented syllable. Furthermore, the analysis of peak alignment has provided evidence for the phonological analysis of a rising pitch accent by showing that the tonal domain is the accented syllable itself and that the peak target belongs to the pitch accent which results in a bitonal pitch accent. Peters (2001) observes a similar rising accent in Berlin German (L*+H), where the pitch peak is realized in the accented syllable. However, in Berlin German this accent type occurs only for certain types of narrow focus.

The analysis of the temporal organization of pitch accents has shown that Swabian can be classified as a compressing dialect – as far as rising accents are concerned. Compression is not only responsible for the microprosodic implementation of pitch accents but is also relevant to the interplay between a pitch accent and a boundary tone: if a nuclear pitch accent is realized on a phrase-final monosyllabic word, the H target of the pitch accents shifts to the left in order to provide space for the realization of the boundary tone.

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