

## THE PROCESS OF MONOPHTHONGIZATION IN AUSTRIA (READING MATERIAL AND SPONTANEOUS SPEECH)

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### 1. Introduction

Apart from the extreme west, Austria can be divided in two large dialect regions: the South Bavarian and the Middle Bavarian. In the city of Vienna (Middle Bavarian), a process of monophthongization is said to have begun around 1900 among the lower social classes (Traunmüller 1982). The process has changed the Standard diphthongs /æ/ and /ɔ/, as for example in /vaes/ *weiß* 'white' and /hɑʊs/ *Haus* 'house', into the monophthongs /æ:/ or rather /ɛ:/ and /ɔ:/ or rather /ɔ:/ respectively, resulting in /vɛ:s/ and /hɔ:s/. The inherent durational aspects of the diphthongs are said to have been compensated by a lengthening of the resultant monophthongs. This process occurs as a prelexical process<sup>1</sup> in the Viennese dialect; consequently, these diphthongs /æ/ and /ɔ/ are excluded from the phoneme inventory of this variety. Viennese dialect speakers therefore often fail to produce diphthongs (see Vollmann 1996, Moosmüller 1996).

In Vienna, the process has spread gradually over all social classes, consequently, today, it can be observed in the Viennese Standard variety as well, especially affecting weak prosodic positions, and restricted particularly to informal speech situations. Contrary to the Viennese dialect, in the Standard variety, the process is also extended to such items as e.g. *breit* 'broad' or *Baum* 'tree'; which, for historical reasons has resulted in /a:/ in the Viennese dialect<sup>2</sup>. Due to this "particular" application, the pro-

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<sup>1</sup> According to Natural Phonology, prelexical processes make up the phoneme inventory of a language or language variety, whereas postlexical processes are responsible for any sort of allophonic variation (see Dressler 1984, 1985).

<sup>2</sup> MhG /i:/ and /u:/ have been diphthongized in the Bavarian dialects, resulting in e.g. /væb/ *Weib* 'wife' and /hɑʊs/ *Haus* 'house', whereas mhG /ei/ and /ou/ changed to /a:/ in the Viennese dialect, resulting in /brɑ:d/ *breit* 'broad' and /bɑ:m/ *Baum* 'tree' respectively. The remaining Bavarian dialects changed mhG /ei/ to /ɔ/, i.e. /brɔ:d/ *breit* 'broad', whereas in the Standard variety, the diphthongs are preserved, i.e. /bræd/ *breit* 'broad' and /baʊm/ *Baum* 'tree' (Kranzmayer 1956).

cess results in homophonous forms in the Viennese Standard variety, as e.g. [vɛs]<sup>3</sup> for *weiß* 'white' and 'know'. The Viennese dialect, however, maintains the distinction: [vɛ:s] for *weiß* 'white' and [va:s] for *weiß* 'know'.

On the horizontal axis, the process affects large parts of the Middle-Bavarian region too. Again, it can be observed mainly amongst speakers of the lower social classes, i.e. genuine dialect speakers<sup>4</sup>. Therefore, the process of monophthongization is fairly generalized in Lower Austria, parts of Upper Austria and parts of the Burgenland<sup>5</sup>.

The process of monophthongization is not exclusively restricted to the Middle Bavarian region, but it can be observed in the South Bavarian region too, although to a lesser degree. Due to its proximity to the city of Vienna, monophthongization is more frequently applied in Graz; in Innsbruck, for example, a slight tendency towards monophthongization, primarily affecting weak prosodic positions, can be observed.

## 2. Description of the diphthongs in reading material

In order to analyze the variation of the diphthongs and any possibly resulting monophthongs, subjects were instructed to read the two sentences:

sentence 1:

Aber	<i>leider</i>	<i>überheizte</i>	Eberhard	während der	<i>Arbeitszeit</i>	den	<i>Raum</i>
But	unfortunately	overheated	Eberhard	during the:DAT	working hours	the:ACC	room

sentence 2:

In der	<i>Pause</i>	wartete	Paula	<i>draußen</i>	mit Papier	bepackt	auf	Leopold
During the	pause	waited	Paula	outside	loaded with	paper	for	Leopold

alternatively with six repetitions. The first two formants<sup>6</sup> of the first five tokens of each diphthong were calculated, resulting in 35 analyzed diphthongs per subject. In addition, the first two formants of five tokens of the vowels /a/, /ɛ/ and /ɔ/ were calculated. Thus, for the reading material, 15 male subjects were analyzed, five speakers of the Austrian Viennese Standard, five speakers of the Viennese Dialect, four

speakers of the Lower Styrian Dialect and one speaker of Austrian Innsbruck Standard. For the spontaneous speech, interviews with five male speakers from Vienna, Graz and Innsbruck have been analyzed.

A closer look at the articulatory movement of the intended diphthongs in *leider* 'unfortunately' and *Pause* 'pause' reveal considerable differences between the varieties under consideration (see Fig. 1). The items *leider* 'unfortunately' and *Pause* 'pause' have been chosen, because they seldom undergo the process of monophthongization, due to their stressed position.

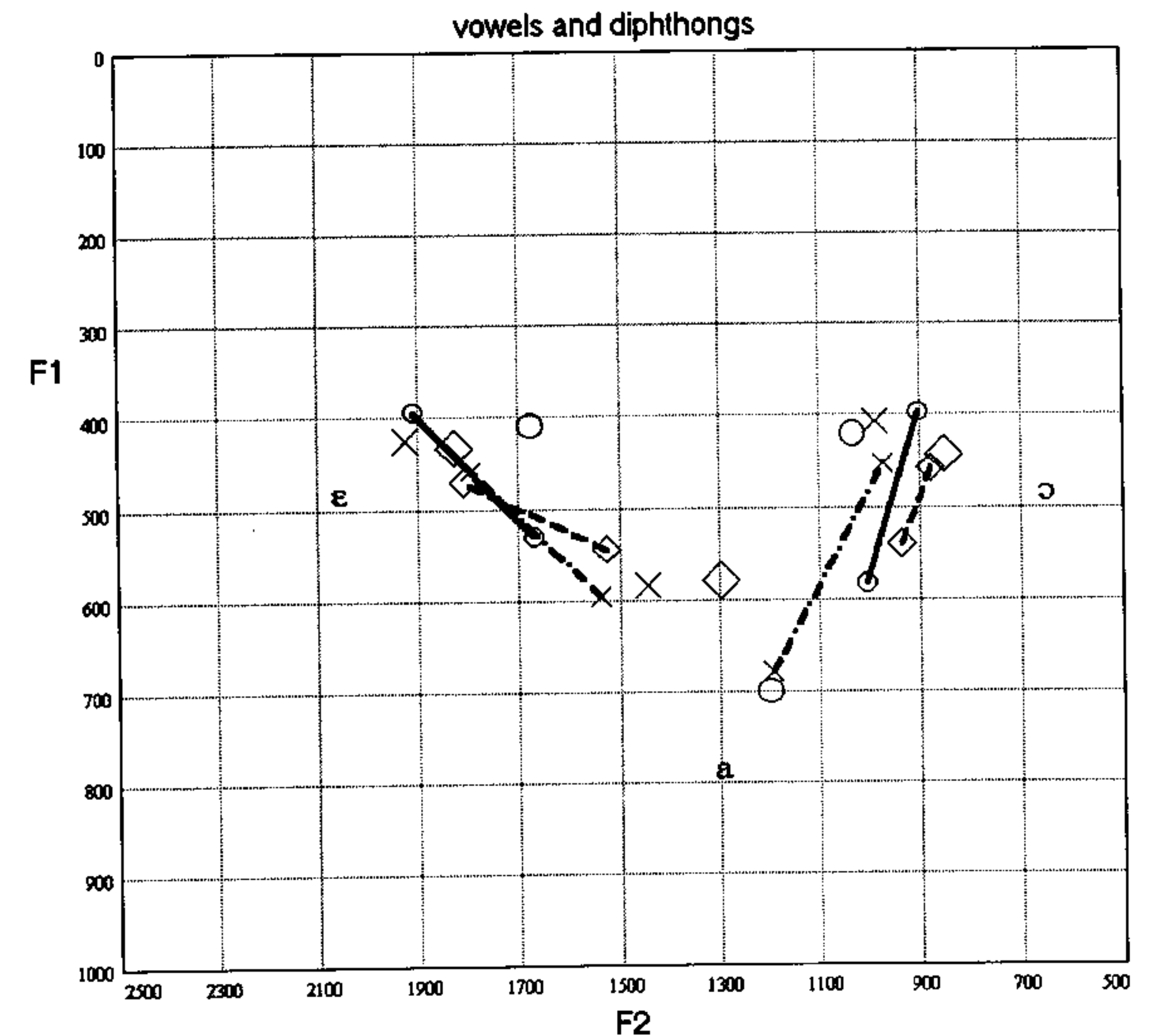


Fig. 1: F1/F2 plot of the vowels [a<sup>l</sup>ɛ<sup>j</sup>ɔ] and the diphthongs [aɛ<sup>j</sup> aɔ];

o, — = Viennese Standard  
 □, - - - = Viennese Dialect  
 x, ····· = Styrian Dialect

<sup>3</sup> The resulting monophthong is short in the Standard variety, see below.

<sup>4</sup> For a discussion of the definition of dialect and standard in Austria see Moosmüller (1991).

<sup>5</sup> In the Burgenland, the process of monophthongization is the result of commuters travelling to and from the city of Vienna.

<sup>6</sup> The recorded speech samples were digitized at 16 kHz, 16 Bit by means of the acoustic work station S\_Tools (Deutsch and Noll 1994). Formants were calculated by LPC, 22 coefficients and a pre-emphasis of 0.9, linear time-standardization was ensured by calculating 30 frames over each diphthong.

<sup>7</sup> According to the measurements carried out by Iivonen (1994), only one a-quality can be observed in the Viennese Standard variety.

### 2.1. The diphthong /aɔ/

As regards the diphthong /aɔ/, the Styrian diphthong is closest to the Standard phonological representation. The onset value of the Styrian diphthong /aɔ/ exposes the same quality as the Viennese Standard [a], and the offset value reaches the quality of the Viennese Standard [ɔ]. Both Viennese varieties, however, are far from articulating an [a]-quality at the onset. The offset, however, is marked by a clear [ɔ]-quality in all varieties. Moreover, in the Viennese dialect, almost no articulatory movement can be observed. In all varieties no movement of the second formant can be observed, because of the transition towards the fricative /s/.

### 2.2. The diphthong /æɛ/

Again phonological representation is best expressed in the realization of the Styrian diphthong. The onset value of the Styrian diphthong can still be interpreted as the front vowel [a], whereas in the Viennese Standard variety the onset value represents the higher vowel [æ]. The offset values of all varieties are marked by the vowel [ɛ]. Again, the articulatory movement is smallest within the Viennese dialect.

### 2.3. Variability

Compared with the results of the analysis carried out by Iivonen (1989, 1994), both the vowels and the diphthongs of the Iivonen study are less centralized, moreover, both diphthongs in the Iivonen study show a greater articulatory movement than the diphthongs in the present study. The differences could be explained by the fact that Iivonen's measurements were made on isolated words, whereas in the present study, diphthongs and vowels from connected speech have been analysed.

These results nevertheless show that great variability (from an articulatory point of view) and tolerance (from the point of view of perception) with regard to diphthong articulation can be observed within the Austrian varieties. Great variability of onset and offset values have been reported for many languages (see e.g. Lehiste and Peterson 1961, Collier, Bell-Berti and Raphael 1982) and the tolerance for variability definitely correlates with the number of diphthongs in a given language or variety (Svantesson 1984). As only three phonologically relevant diphthongs, namely /æɛ/, /ɔɛ/ and /aɔ/, occur in the Austrian Standard variety, any rising movement in the front or the back vowel space will be interpreted correctly as /æɛ/ or /aɔ/ respectively. The situation is slightly different in the Styrian dialect; in this variety a postlexical process of diphthongization of stressed vowels can be observed. The stressed vowels of e.g. *Leben* 'life' or *Stock* 'floor' are diphthongized, resulting in [ɛem] and [ɔo] respectively. Therefore, Styrian speakers can not afford the same variability of articulatory movement of the diphthongs /æɛ/ and /aɔ/ as the Viennese speakers.

### 2.4. Spectral change over time

The observed differences apply not only to onset and offset values, but also to timing relations within the diphthong. Following the definition given by Lehiste (1964: 5), a diphthong is defined as a sequence consisting of an initial steady state which is followed by a transition and a final steady state. The timing relations between these three elements are language- or variety-specific (Lindau, Norlin and Svantesson 1985, Peeters 1991, Geumann 1997) and contribute to qualitative difference of one and the same diphthong. As far as the varieties under consideration are concerned, differences with respect to these timing relations can be observed. The typical Styrian diphthong is characterized by a relatively long onset steady state portion, comprising half of the diphthong, followed by a short transition and a short offset steady state portion (see Fig. 2).

This pattern can best be observed in the movement of the second formant, as the first formant exhibits a rather gliding movement. In order to observe the same pattern in the first formant as well, a diphthong of the variety of Innsbruck has to be analyzed (see Fig. 3). In the Innsbruck variety, both the first and the second formant exhibit a long onset steady state portion. The characteristic pattern of the diphthong is more distinct in the Innsbruck variety, because this variety is still less susceptible to the process of monophthongization, especially with regard to stressed positions and formal speech situations.

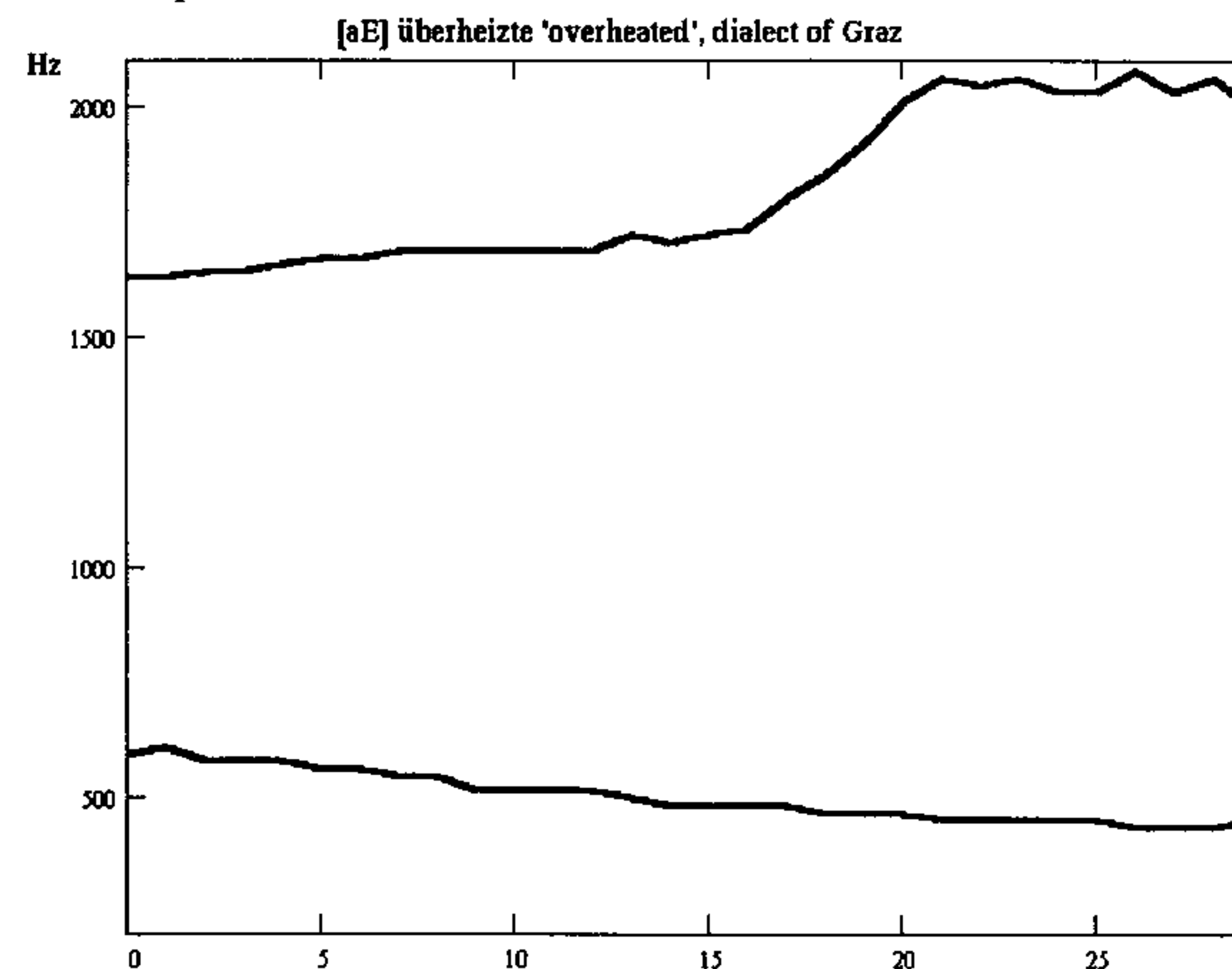


Fig. 2: Linear time-standardized diphthong /æɛ/ spoken by a dialect speaker from Graz. x-axis: time (ms), y-axis: frequency (Hz).

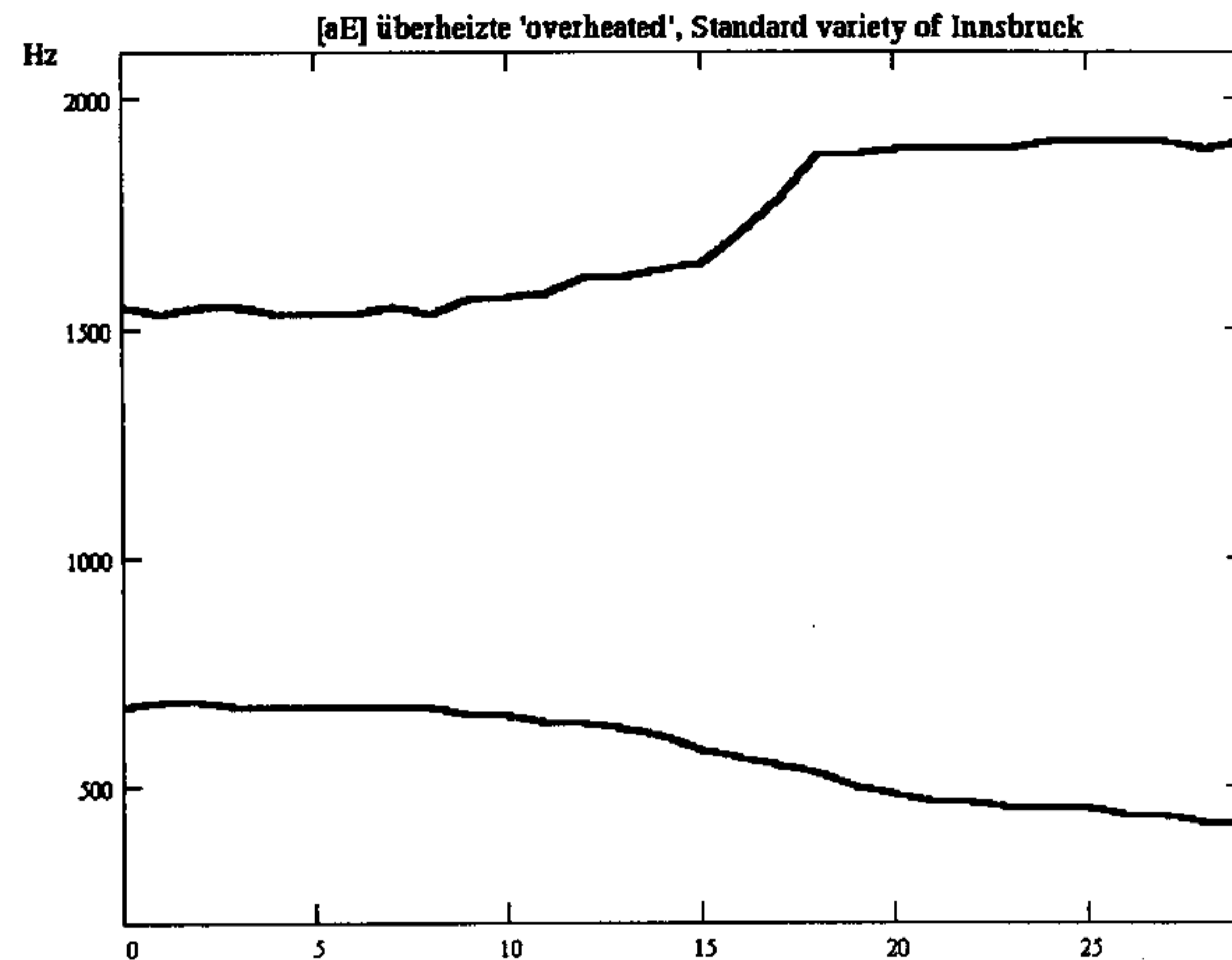


Fig. 3: Linear time-standardized diphthong /ae/ spoken by a Standard speaker from Innsbruck. x-axis: time (ms), y-axis: frequency (Hz).

As far as the Viennese Standard variety is concerned, the most typical pattern is a gliding movement with almost no steady state portions (see Fig. 4). A greater span of gliding within the Standard Viennese variety as compared with East Middle German has also been described by Iivonen (1989: 17). In cases where a steady state portion can be observed in a Standard Viennese diphthong, it occurs instead at the offset of the diphthong (see Fig. 5).

Interestingly enough, the application of perception tests has demonstrated that for Germanic diphthongs, long offset steady states are preferred (Peeters 1991). With respect to Austrian varieties these results mean that Middle Bavarian diphthongs (long offset steady states) are preferred over South Bavarian diphthongs (long onset steady states). Within a larger framework concerning the question of which variety is accepted as Austrian Standard, these results accord with the findings in Moosmüller (1991)<sup>8</sup>.

The existence of long offset steady states in diphthongs seems to be a relatively new phenomenon in the Viennese Standard variety, as in the late fifties, diphthongs have still been realized with long onset steady states (Moosmüller 1997). This result

<sup>8</sup> Evaluation tests carried out on the question of which Austrian variety is most commonly accepted as Austrian Standard demonstrated that the Viennese variety spoken by the upper and middle social classes is most accepted as Austrian Standard (Moosmüller 1991).

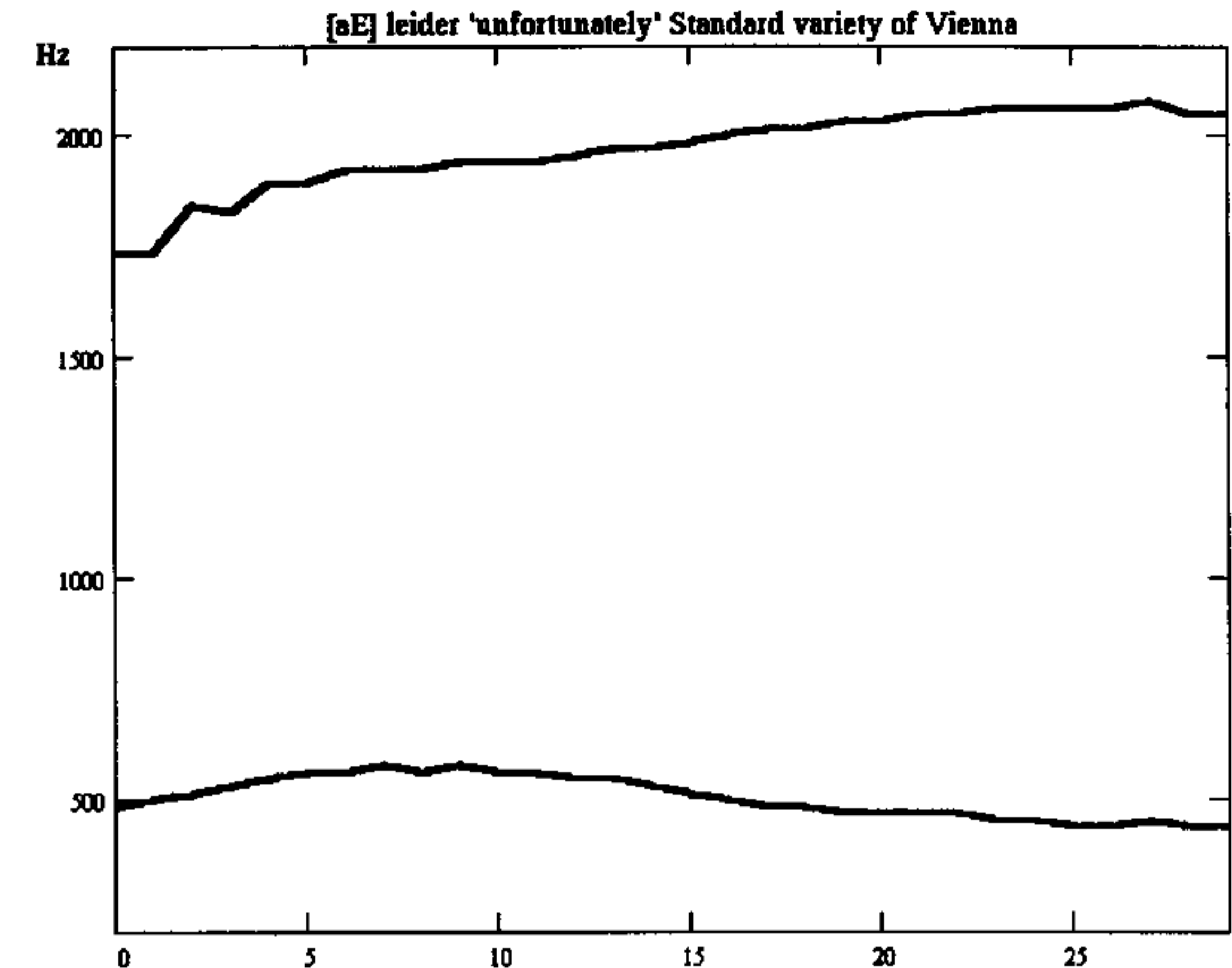


Fig. 4: Linear time-standardized diphthong /ae/ spoken by a Standard speaker from Vienna. x-axis: time, y-axis: frequency (Hz).

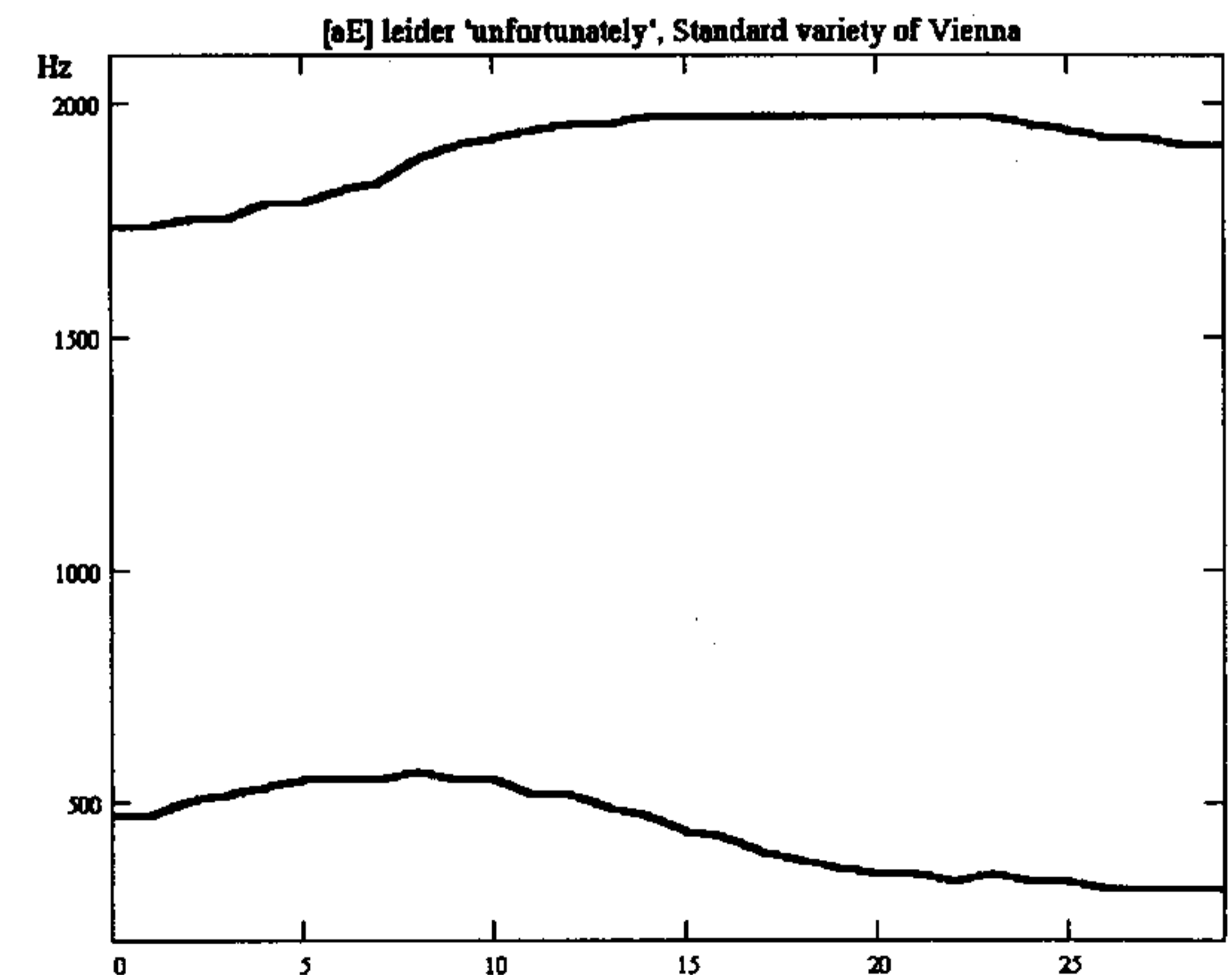


Fig. 5: Linear time-standardized diphthong /ae/ spoken by a Standard speaker from Vienna. x-axis: time, y-axis: frequency (Hz).

leads to the question why and when diphthong articulation has changed? Is this change due to an assimilation towards the articulation patterns of other Germanic varieties or rather to an uncertainty concerning diphthong articulation resulting from the rapid spread of the process of monophthongization especially in the Viennese Standard? The latter interpretation is supported by the fact that a large variability of diphthong articulation can be observed within the Viennese Standard. Nevertheless, this question has still to be answered and requires further research especially on historical speech material.

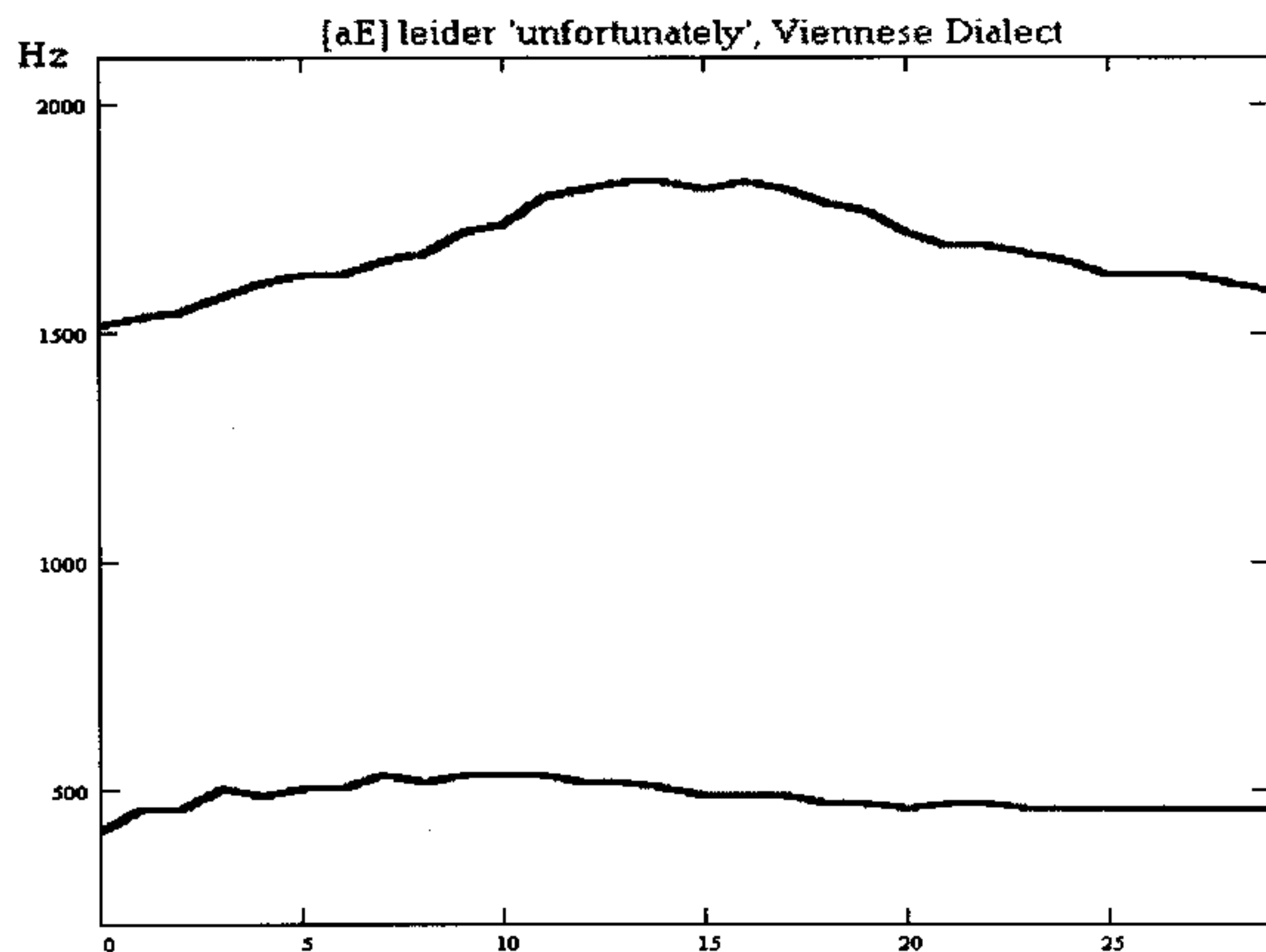


Fig. 6: Linear time-standardized diphthong /æ/ spoken by a dialect speaker from Vienna. x-axis: time, y-axis: frequency (Hz).

Viennese Dialect speakers who lack diphthongs in the phoneme inventory very often fail to produce diphthongs. The existence of “wrong diphthongs”<sup>9</sup> in the Viennese dialect variety, i.e. diphthongs moving towards a “wrong” target, has been described for the first time by Vollmann (1996). Figure 6 shows the spectral change over time of the diphthong /æ/ of *leider* ‘unfortunately’. The rising movement of the second formant reveals that the speaker’s articulatory aim is a diphthong. However, the offset of the diphthong is marked by a drop of the second formant towards the frequency region of the onset of the diphthong. The perceptual result is a mon-

<sup>9</sup> The term “hypercorrection” has been avoided deliberately.

ophthong<sup>10</sup>. Articulatory attempts of that kind can mainly be observed when speakers of the Viennese Dialect try to use the Standard variety. Provided a true diphthong is articulated in the Viennese Dialect, a great uncertainty with regard to timing relations can be observed.

The different timing relations between the Viennese Standard variety and the Styrian variety can also be observed with the diphthong /ɑɔ/. Figure 7 reveals that the Styrian Dialect is predominantly marked by a long onset steady state, which comprises almost half of the diphthong, whereas the Viennese Standard variety is marked by a gliding movement.

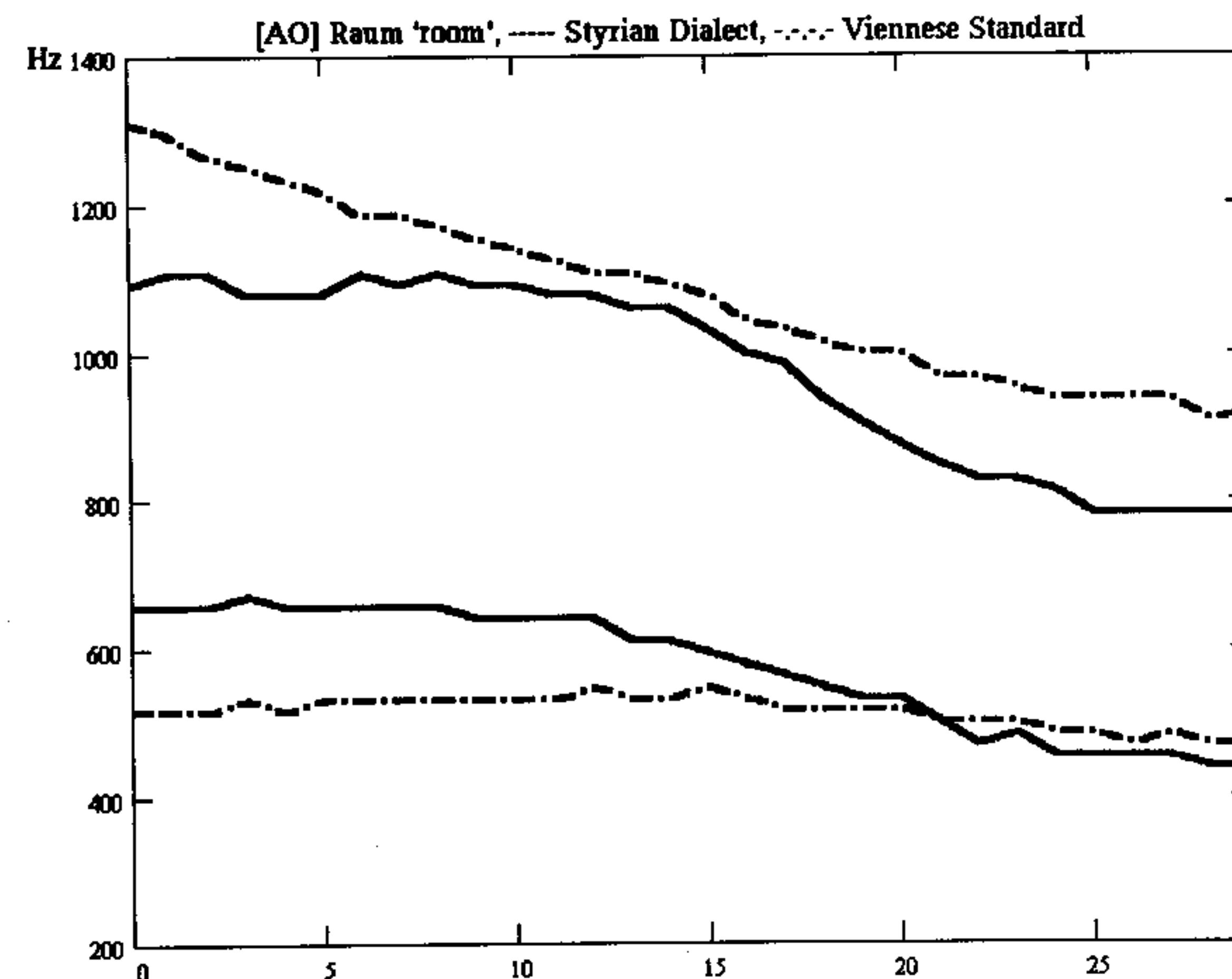


Fig. 7: Linear time-standardized diphthongs /ɑɔ/ spoken by a dialect speaker from Graz (—) and a Standard speaker from Vienna (---). x-axis: time (ms), y-axis: frequency (Hz).

### 3. The process of monophthongization

The differences described in articulatory movement have consequences for the process of monophthongization. It has been stated that Styrian diphthongs are marked by a relatively long onset steady state portion, whereas Viennese Standard

<sup>10</sup> According to Bladon (1985: 152), “a diphthong’s endpoints are highly relevant for its identification, so much so that the percept is negligibly affected if the transitional part is artificially removed”. For a discussion on the perception of diphthongs see e.g. Harrington and Cassidy (1994), Peeters (1991), Fox (1983), Collier and t’Hart (1983).

diphthongs are marked, if at all, by a long offset steady state portion. Therefore, if the diphthong /aɔ/ is monophthongized in the Viennese variety, the frequency of the second formant is lowered at the onset, rendering an [ɔ]-quality to the resultant monophthong, i.e., an assimilation towards the offset portion takes place (see Fig. 8).

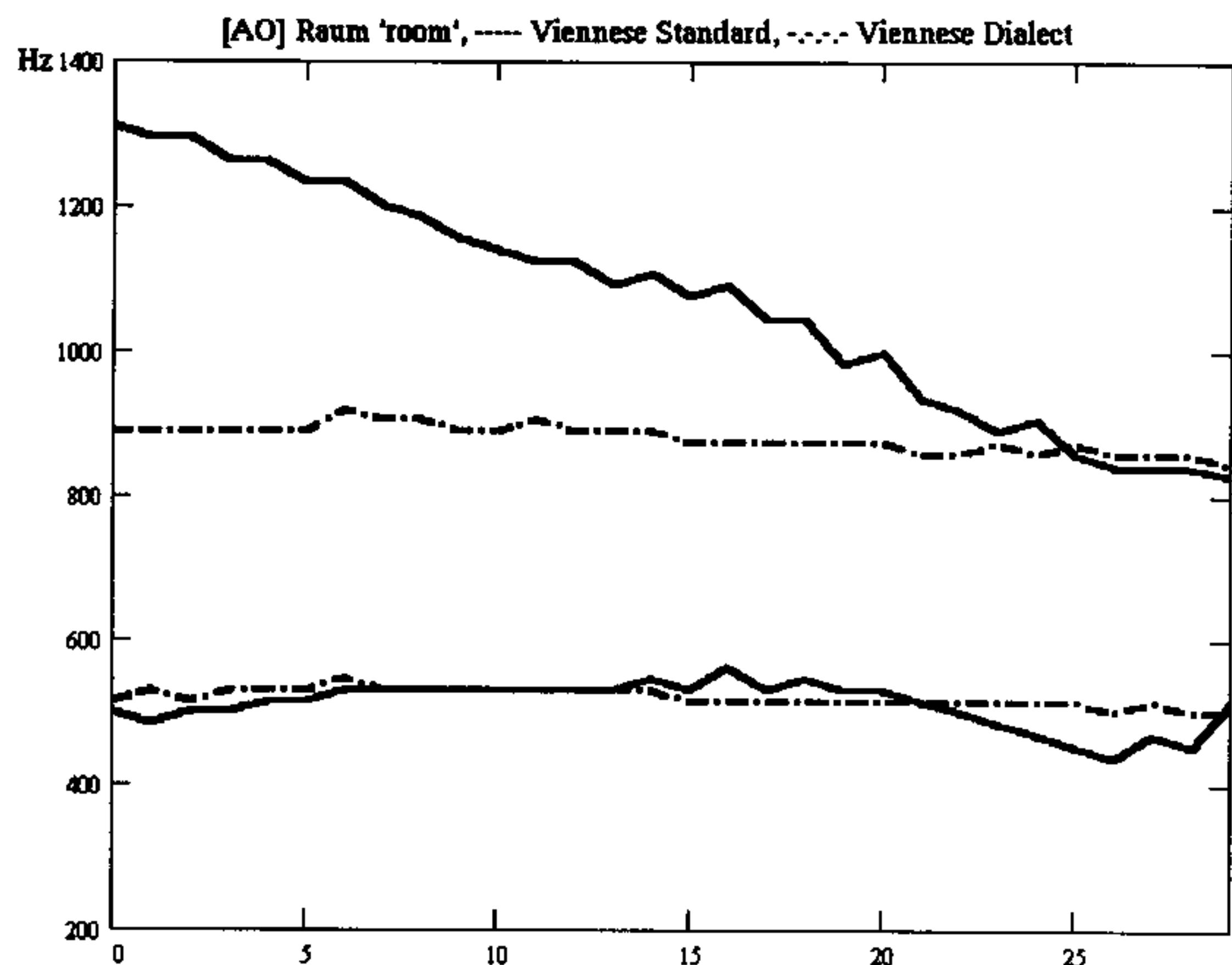


Fig. 8: Linear time-standardized intended diphthongs /aɔ/ spoken by a dialect speaker from Vienna (---) and a Standard speaker from Vienna (—). x-axis: time (ms), y-axis: frequency (Hz).

In the Styrian variety, however, an assimilation towards the onset portion of the diphthong can be observed, i.e. in case of the diphthong /aɔ/, the second formant is raised at the offset, resulting in an [ɑ]-quality of the monophthong (see Fig. 9).

The same assimilation pattern can be observed in the case of the diphthong /aɛ/, although the difference in monophthongal quality is not as audible. In the Viennese variety, the onset is affected: the frequency of the second formant is raised and the frequency of the first formant is lowered. Again, in the Styrian variety, the offset is affected: the frequency of the second formant is lowered and the frequency of the first formant is raised. The same assimilation pattern observed in the Styrian dialect can also be observed in the Innsbruck variety (see Fig. 10). The difference between the Styrian and the Innsbruck variety seems to be a mere quantitative one, as the tendency to monophthongization is less developed in Innsbruck.

#### 4. Spontaneous speech

Regarding spontaneous speech material, monophthongization is fairly generalized in all the varieties under investigation. In weak prosodic positions, nearly all the

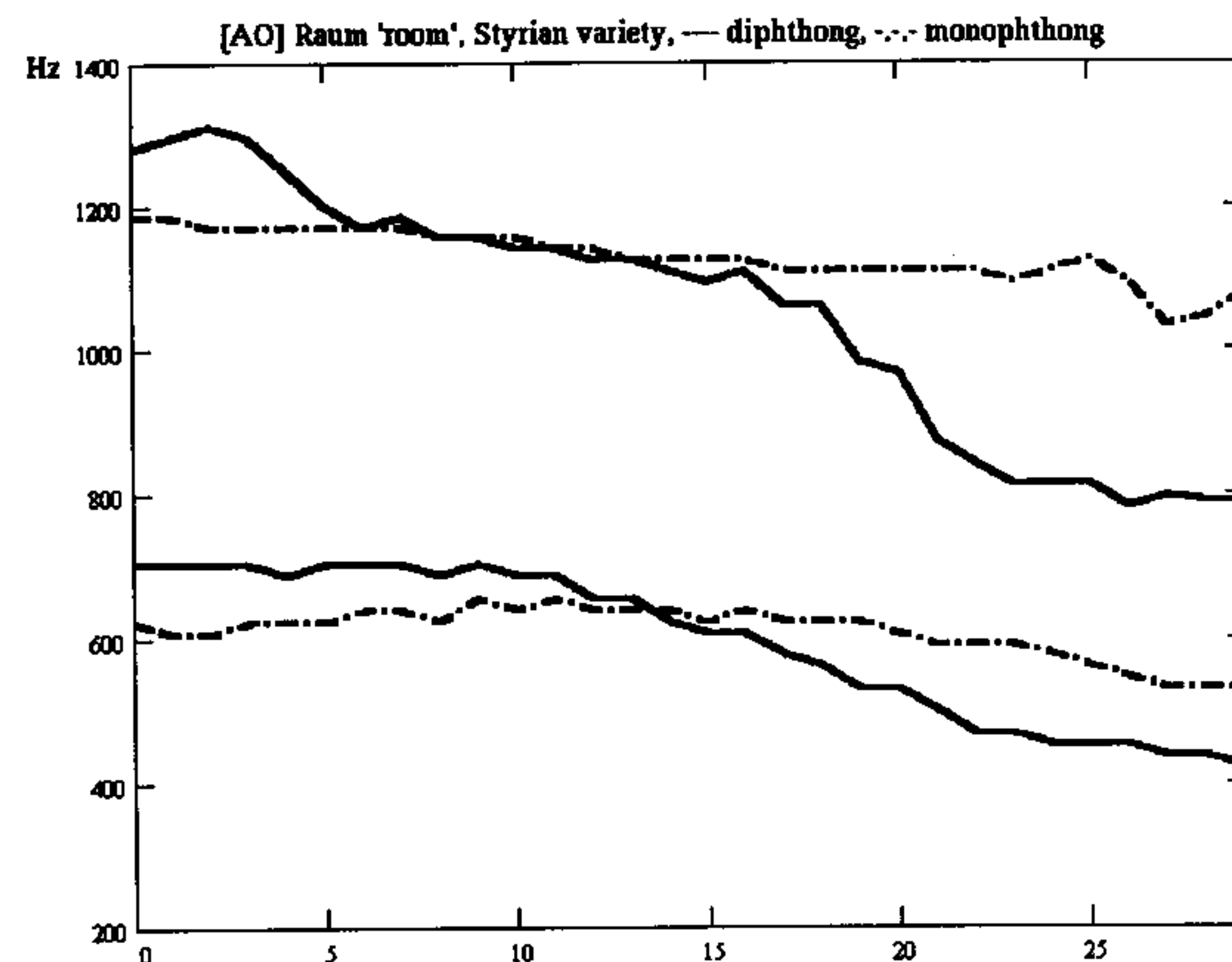


Fig. 9: Linear time-standardized intended diphthongs /aɔ/ spoken by two Styrian dialect speakers. x-axis: time, y-axis: frequency (Hz).

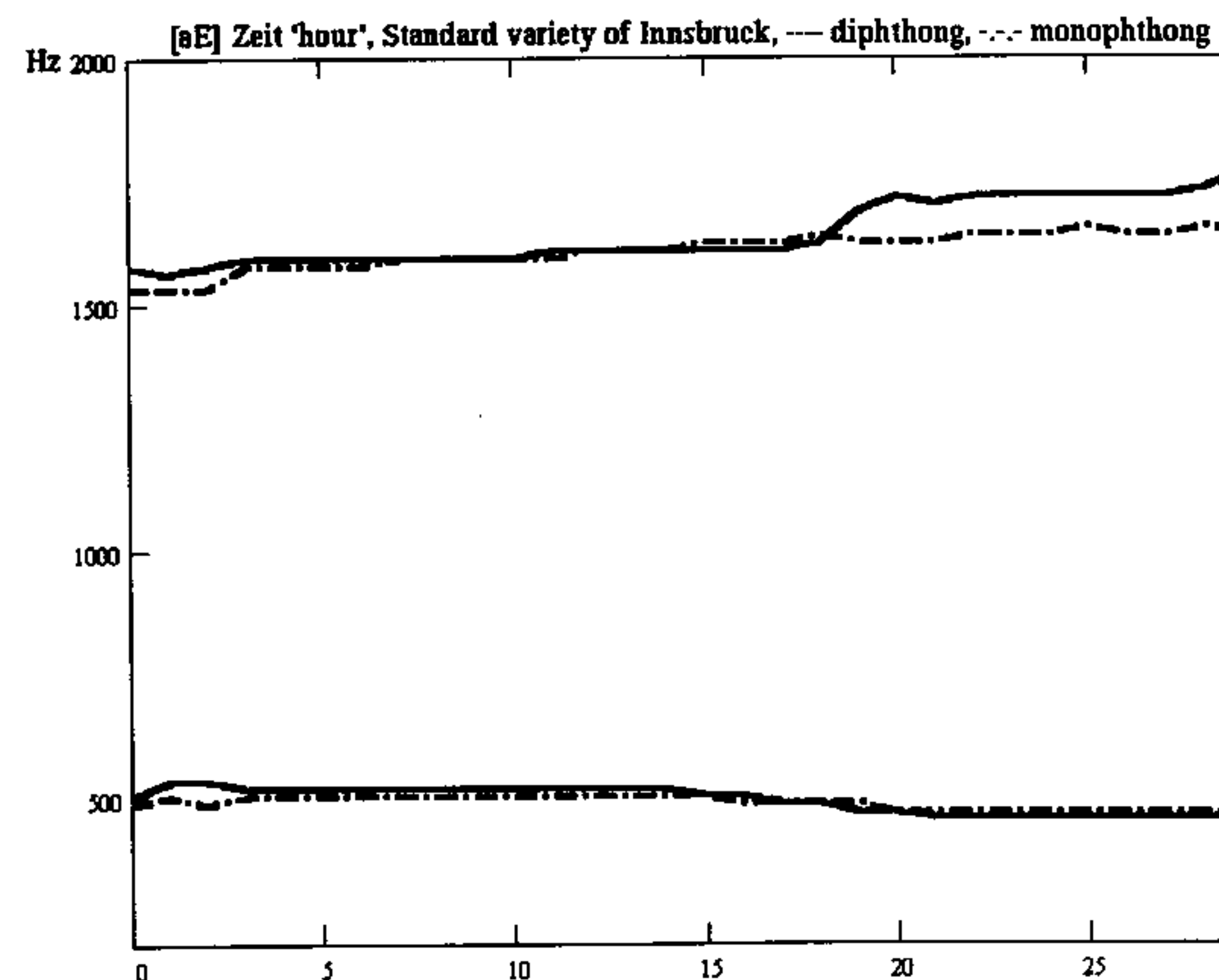


Fig. 10: Linear time-standardized intended diphthongs /aɛ/ spoken by a Standard speaker from Innsbruck. x-axis: time, y-axis: frequency (Hz).

diphthongs are monophthongized both in the Innsbruck and in the Styrian variety. Considering diphthong articulation, steady state portions give way to a more gliding movement especially of the second formant in both diphthongs (see Fig. 11; the same has been observed in the reading material of the Viennese variety).

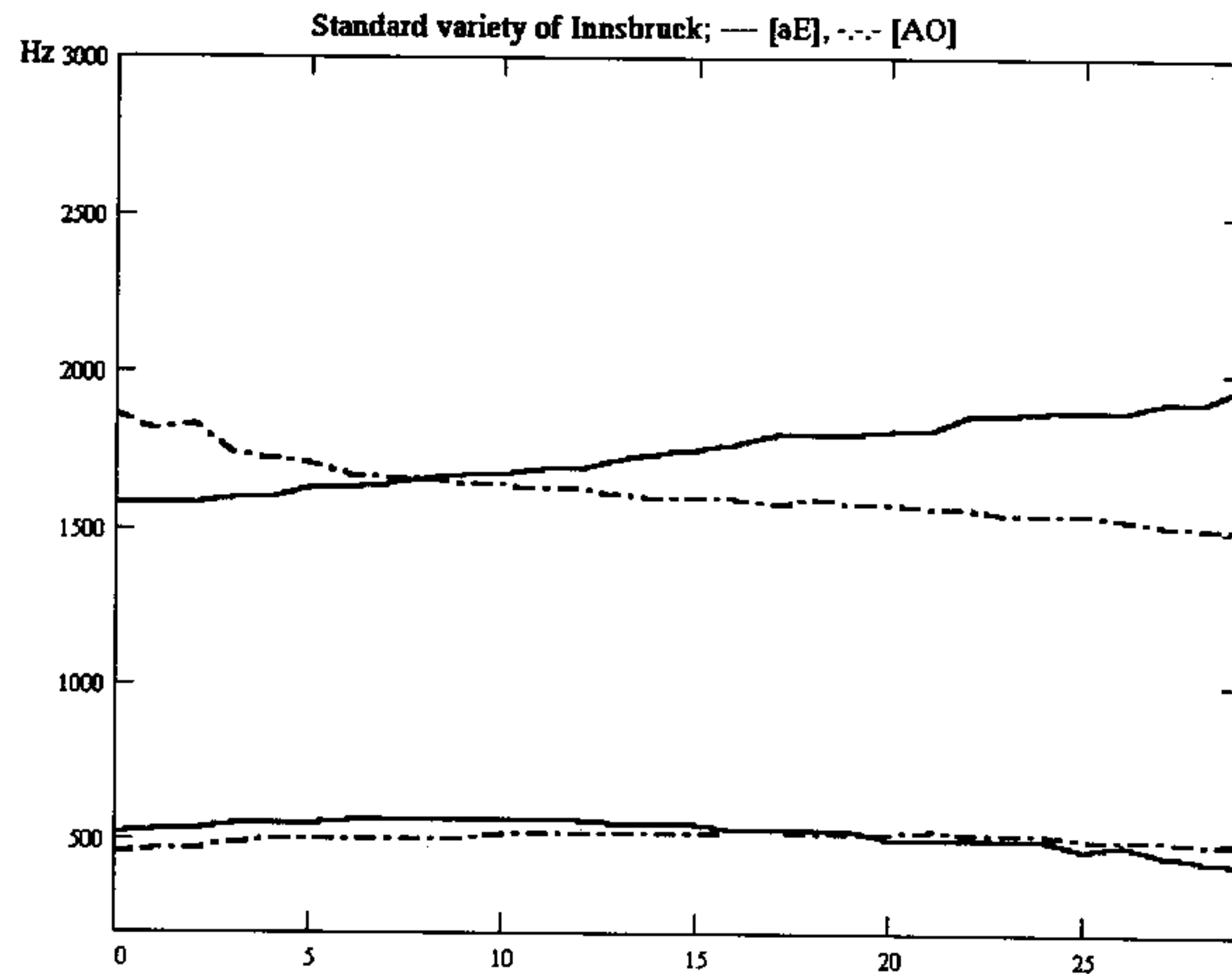


Fig. 11: Linear time-standardized intended diphthongs /æ/ and /ɑ/ spoken by a Standard speaker from Innsbruck. x-axis: time (ms), y-axis: frequency (Hz).

With respect to the process of monophthongization, the assimilation patterns remain the same. Whenever the diphthong /æ/ is monophthongized in the Styrian or Innsbruck variety, the second formant is lowered at the offset. Figure 12 shows four items of the diphthong /æ/ of *vielleicht* 'perhaps' of one and the same speaker. The gradual steps from diphthongal towards monophthongal articulation are nicely represented in this example.

Again, in the Viennese Standard variety, the onset is assimilated towards the offset, i.e., the second formant is raised at the onset. Four items of the diphthong /æ/ of *vielleicht* 'perhaps' of a Viennese Standard speaker shall illustrate the difference in the assimilation process (see Fig. 13).

The diphthong /ɑ/ shows the same regional differences with respect to the assimilation process. In Innsbruck as well as in the Styrian variety, the offset is assimilated towards the onset, resulting in an [ɑ]-quality. In the Viennese variety, the onset is assimilated towards the offset, resulting in an [ɔ]-quality. The qualitative differences of the resulting monophthongs are considerable. Figure 14 shows the diphthong /ɑ/ of *geglaubt* 'thought' in stressed position and the diphthong /ɑ/ of

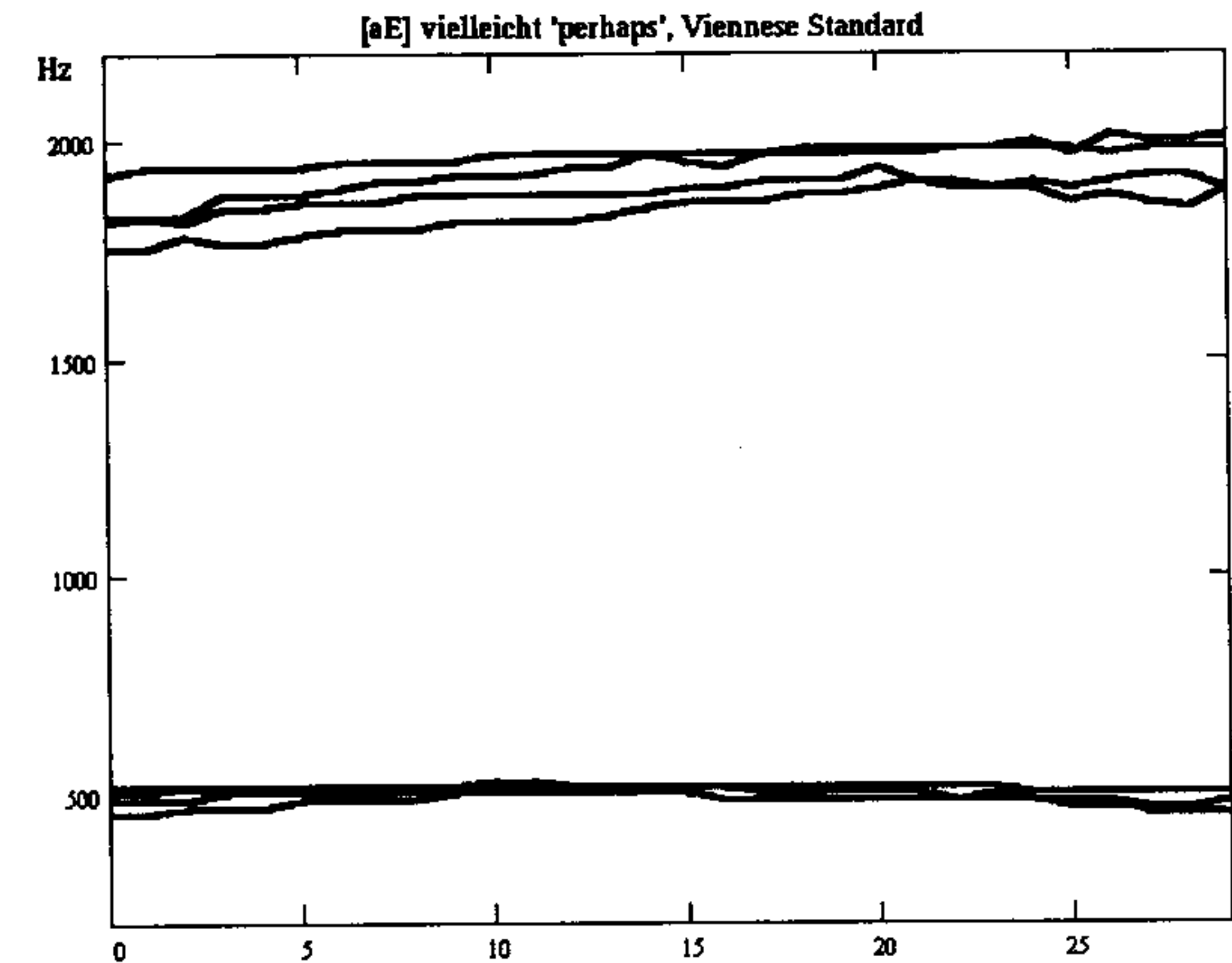


Fig. 12: Linear time-standardized intended diphthongs /æ/ spoken by a Standard speaker from Graz. x-axis: time, y-axis: frequency (Hz).

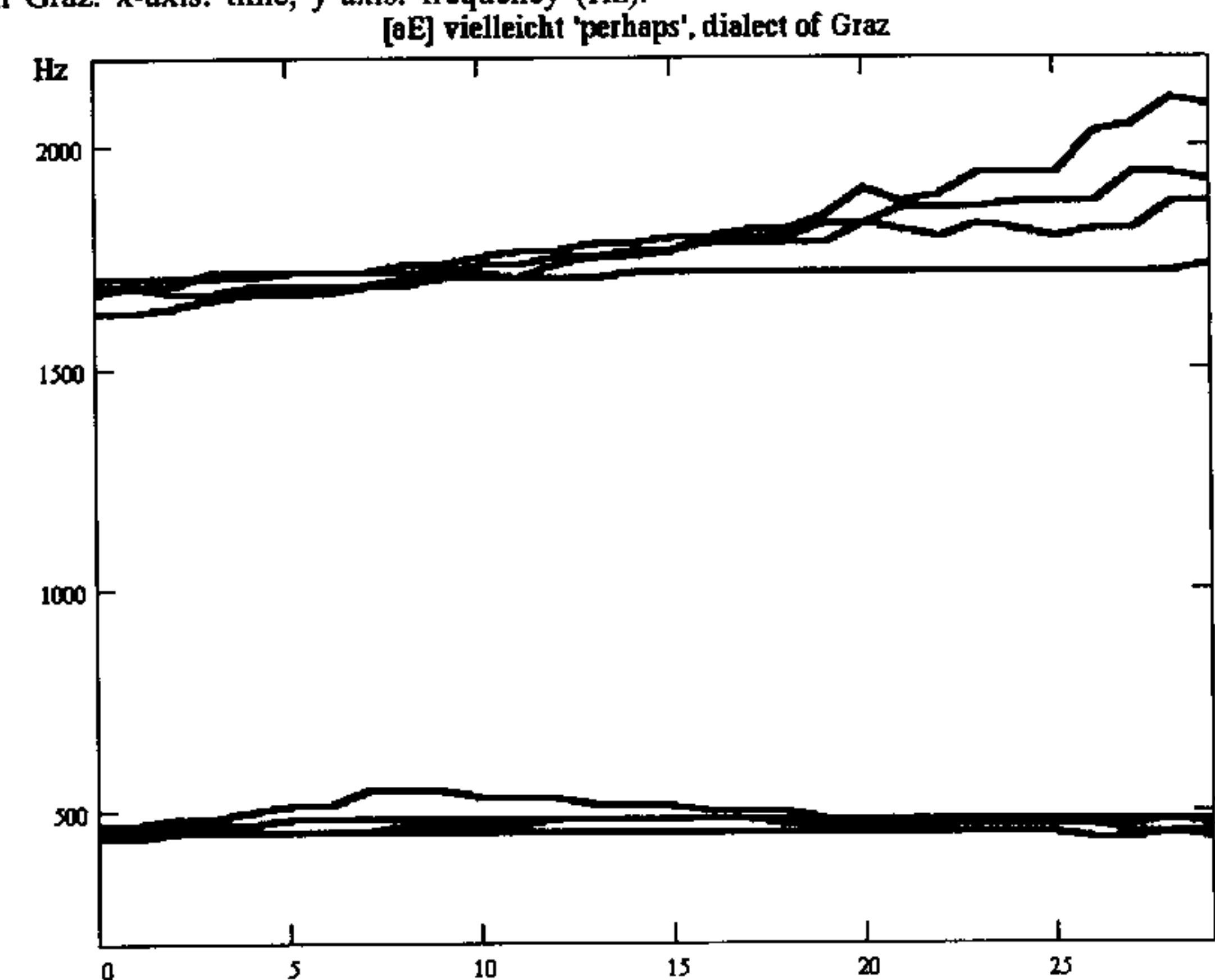


Fig. 13: Linear time-standardized intended diphthongs /æ/ and /ɑ/ spoken by a Standard speaker from Vienna. x-axis: time, y-axis: frequency (Hz).

*Urlaub* 'holidays' in the unstressed position of a Standard speaker of Innsbruck. Notice the gliding movement of the articulation of the diphthong no longer exhibiting a steady state portion.

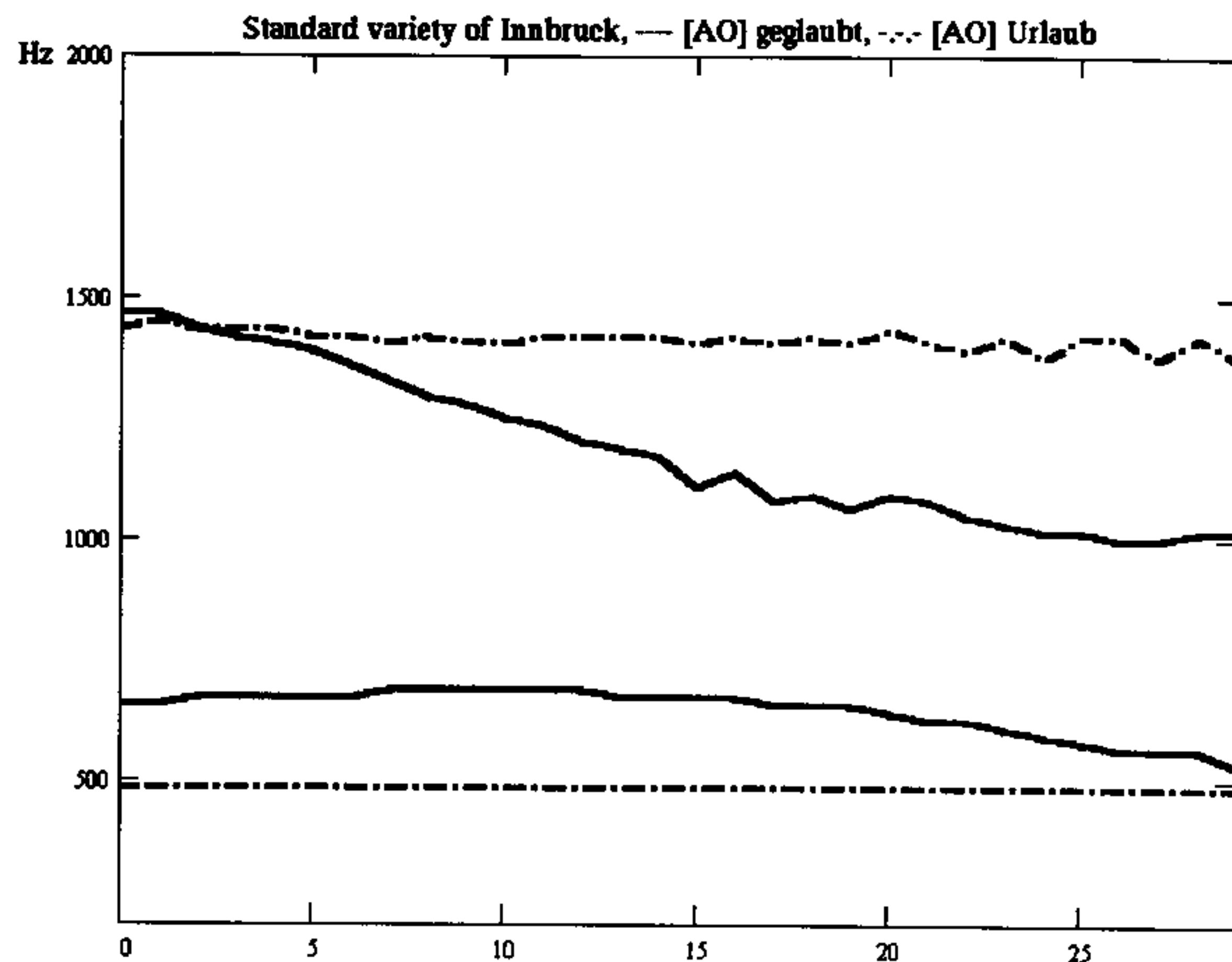


Fig. 14: Linear time-standardized intended diphthongs /aʊ/ spoken by a Standard speaker from Innsbruck. x-axis: time (ms), y-axis: frequency (Hz).

## 5. Discussion

The question of why a standard variety adopts a process of the most negatively evaluated dialect variety of Austria<sup>11</sup> remains to be answered. A brief look at the durational aspect of the diphthongs and the resulting monophthongs might answer this question. Table 1 reveals that the diphthong realizations of the Viennese standard variety are the shortest. Moreover, all the measured diphthongs are very short as compared with other languages. For example, the durations measured in the present study correspond to the durations measured for fast speech in American English (see Gay 1968). According to Gay (1968), steady state portions are shortened in cases of fast speech. This result, together with the findings of Bladon (1985; onset and offset values are relevant for diphthong perception), answers the question of why Viennese standard diphthongs expose a more or less gliding movement.

<sup>11</sup> For the evaluation of Austrian dialects see Moosmüller (1991).

Table 1. Mean durations (in ms) of the various diphthong realizations.

	Viennese standard	Viennese dialect	Lower Styrian dialect
<i>leider</i> 'unfortunately'	147	175	192
<i>überheizte</i> 'overheated'	97	108	118
<i>Arbeitszeit</i> 'working hour'	88	110	117
<i>Pause</i> 'pause'	178	198	203
<i>Raum</i> 'room'	166	180	174

Considering further the fact that monophthongization started within weak prosodic positions, i.e. positions prone to even further durational reductions, the step towards monophthongization becomes evident<sup>12</sup>. From such considerations, the notion of compensatory lengthening might be reevaluated: Long monophthongized diphthongs do not result from a compensation for the inherent duration of the former diphthongs, but from postlexical stress assignment which lengthens syllables in strong prosodic positions (see Madelska and Dressler 1996). On the basis of the analysis of reading and spontaneous speech material the following stages for the process of monophthongization are suggested:

1. Special rhythmic conditions of the Viennese Standard variety are responsible for the relatively short duration of the diphthongs<sup>13</sup>.
2. Due to the relatively short duration of the diphthongs steady state portions are deleted and the diphthong exposes rather a gliding movement.
3. Further shortenings result from postlexical stress assignment in prosodically weak positions and are responsible for the process of monophthongization.
4. Generalization of the process of monophthongization in prosodically weak positions gives way to the application of the process in prosodically strong positions.
5. Finally, due to postlexical stress assignment, the monophthongs resulting from the process are lengthened in prosodically strong positions.

<sup>12</sup> Prosodically determined monophthongization of diphthongs has been observed in other languages as well, see e.g. Maclagan and Gordon (1996).

<sup>13</sup> The durations of Austrian vowels and diphthongs differ from the durations of for example German vowels and diphthongs insofar as Austrian long vowels and diphthongs are shorter than German long vowels and diphthongs, whereas Austrian short vowels are longer than German short vowels (Iivonen 1989).



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