

# Vietnamese tonal system in Nghi Loc: A preliminary report

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This paper is a preliminary report on Vietnamese tones in Central Vietnam, the most conservative dialects of Vietnamese. It describes and discusses the F<sub>0</sub> contours and tonal neutralizations in the two sub-dialects of Nghe An Province. The results show that, unlike in the Northern and Southern dialects, there are no falling-rising contours in the examined dialects. The general shape of all tones is slightly falling. Contour does not play the same crucial role as in Northern and Southern dialects. In addition, the difference in the F<sub>0</sub> values between tones is very small. Spectrographic inspection shows that unlike the Northern dialects, these dialects do not have creaky voice. An examination of the tonal neutralization suggests that the tonal inventory in these two sub-dialects consists of 4, or even 3, tones in open syllables, the smallest inventory found among all dialects. However, only an analysis of a large sample of data from one speaker and across speakers, along with perceptual tests would confirm the tonal inventory in each sub-dialect.

## 1 Introduction

In the literature on Vietnamese tones, the Northern dialects are well described and discussed. Other dialects are rarely the objects of similar studies. Moreover, among studies on Vietnamese, there are few that focus on tones and on phonation types, especially in ‘non-standard’ dialects. Some recent work on tone focuses on the study of L1 transfer of tonal properties in producing and perceiving English stress and rhythm (Nguyen 2004).

In a study on Northern Vietnamese dialects Pham 2003 showed that relative pitch level is not a good indicator of tone. Instead, changes in the voice qualities of the vowels, namely, the phonation types of breathiness and creakiness, appear to be consistently the most important phonetic cues to identify tone.

This work is a part of an on-going project that aims to expand the theory and methodology used in investigating the Northern dialects in Pham 2003 to other major dialects of Vietnamese. The report here, however, focuses on the tonal contours and inventory of the Nghi Loc dialect of Central Vietnam. Comments on phonation types are based on a visual inspection of the spectrographic characteristics of tones.



All dialects share the same phonological tonal system; Central dialects, however, stand out as ‘odd’ because they have a very different acoustic tonal system.

Being one of the most conservative dialects of Vietnamese, the Central dialect demonstrates extremely interesting tonal phenomena and shows large acoustic differences from Northern dialects. For example, the tonal contour, i.e., tone changes in direction during the time course, does not seem to be as different between tones as it is in the Northern dialects, where we find level, rising, falling, and falling-rising contours. In Central dialects there appears to be only a falling contour. Consequently, tones in Central dialects are often described by speakers of other dialects as being ‘flat’, i.e., ‘level’, and are said to sound ‘very similar’ to each other. Moreover, there is neutralization of certain tones in these dialects, which reduces the tonal inventory significantly. However, such claims about the inventory and acoustic properties are impressionistic observations only.

We know that Vietnamese tone developed from historical segments. Initial voicing created two registers, ‘high register’ and ‘low register’. Tonal contours were established from the loss of final fricatives and the final glottal stop, with some laryngealization remaining on the quality of the vowel as a ‘residue’ of the final glottal stop (Haudricourt 1954). It has been suggested that this process is still in progress in the Central dialects, manifested as ‘heavy’ voice qualities. This claim, again, remains an observation only.

The findings that phonation types are important in Northern Vietnamese lead to some interesting predictions. One of that is if neither contour nor pitch is a significant acoustic cue in the Central dialects, then phonation types would play a distinctive role there. According to this prediction, non-modal phonation types would function as a trade-off for pitch and contour differences: smaller pitch and contour differences will correlate with greater phonation differences.

The data for this on-going project were collected in 2004 from 46 speakers in various areas of Central Vietnam. There are many sub-dialects in Central Vietnam. The dialect reported in this paper is spoken by two speakers from Quan Hanh and Nghi Trung villages. Both belong to Nghi Loc district, Nghe An province of Northern Central Vietnam. It has been said that this dialect has very special tonal neutralizations and as a result, a small tonal inventory.

The goals of this paper are: (i) to provide a preliminary description of the tonal system of Nghi Loc, a Central Vietnamese dialect, (ii) to justify that tonal inventory and (iii) to find out whether there are any local peculiarities with regard to phonation.

## 2 Background

The classification of dialects varies depending on which category of classification is used. In terms of the distribution of final consonants, ‘Southern dialects’ extend from Hue to the Southern tip of Vietnam and include “Central” dialects. Based on the general tonal features, “Central dialects” extend from Ha Tinh province to Hue city. Within this group, there are many sub-dialects, some of which show significant differences in terms of tonal neutralization and contours.

Studies on Vietnamese tones often focus on the Northern dialects (Han 1969, Hoang Cao Cuong 1989, Vu 1999, Michaud 2004, Nguyen and Edmondson 1997, Pham 2003). Central dialects, however, have not been the object of such studies. When they

have, the dialect investigated has been either one of the more popular ones of the Central area (e.g., Hue in Vu 1982), or the tonal inventory is briefly mentioned without a detailed description (Ferlus 1995 and 1996). Tran 2002 reports a study on the dialect in Nghi Loc district using data from 5 speakers, who live in different villages from those reported in this paper. He, however, uses only numeric numbers to describe tones. The tonal inventories suggested in this study will be discussed later.

There are 6 or 8 phonological tones in Vietnamese, depending on which view of tone one adopts. The six-tone view treats the two tones, *sac2* and *nang2*, which occur only in stop-final syllables as another version of *sac1* and *nang1* in non-stop final syllables. The eight-tone view regards tones in stop-final syllables as different tonemes. Table 1 below shows eight tones in Northern Vietnamese, a standard and prestige dialect, using their Vietnamese names: *ngang* (high-level), *huyen* (low-level), *sac1* (rising), *nang1* (falling, creaky), *hoi* (falling-rising), *nga* (broken, creaky), *sac2* (short, rising), *nang2* (short, falling). The Northern dialects have the fullest tonal inventory. In Southern and Southern Central dialects *nga* is neutralized to *hoi*.

<i>ngang</i>	<i>sac1</i>	<i>hoi</i>	<i>sac2</i>
<i>huyen</i>	<i>nang1</i>	<i>nga</i>	<i>nang2</i>

Table 1. Eight tones in Northern dialects

Figure 1 provides a general picture of tonal contours and pitch height of 6 tones in [ka] along with *sac2* and *nang2* for [ka:k] from a female of the Hanoi dialect (Pham 2003:69). In the legend ‘ca’ stands for [ka], ‘ng’ for ‘*ngang*’, ‘hu’ for ‘*huyen*’, ‘sac’ for ‘*sac1*’, ‘na’ for ‘*nang1*’, ‘sac-cac’ for ‘*sac2*’ and ‘na-cac’ for ‘*nang2*’.

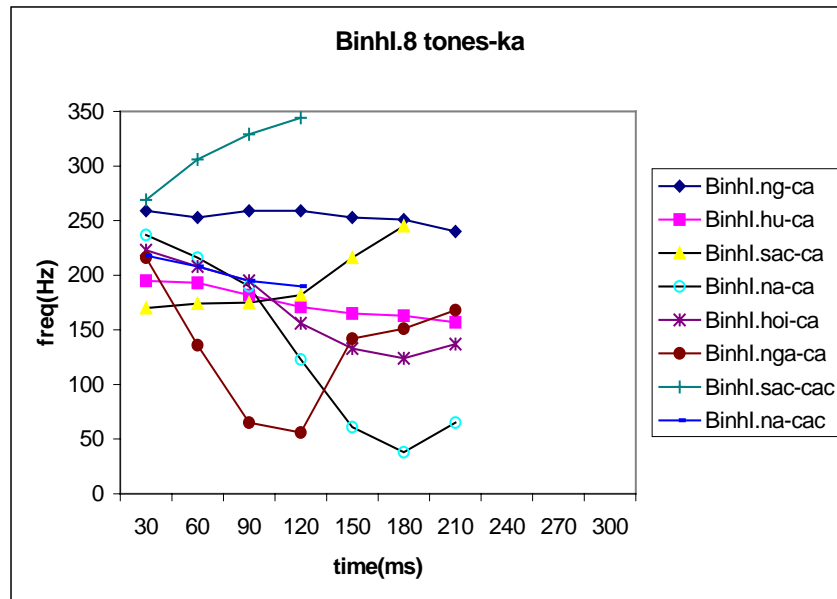


Figure 1. Eight tones in [ka], [ka:k] from a female of the Northern dialect

Central Vietnamese dialects are regarded as the ‘most conservative dialects’. For example, using vocabulary excerpted from folk songs, Hoang 1995 observes that one initial consonant in these dialects can correspond to from between 2 and 7 different consonants in the standard dialect. Many old-Vietnamese words and certain rhymes can still be observed only in this area (Hoang 1995). These dialects also demonstrate extremely interesting tonal patterning in neutralizations. For example, ‘*nga*’ is said to neutralize to ‘*nangl*’, and ‘*hoi*’ to ‘*sac*’. Tones in the Central dialects are also said to have a very narrow pitch-span, i.e., tones do not vary greatly in their pitch height.

Various aspects of the Central dialects have been studied. The dialects received certain attention as early as Cadière’s work in 1902 (cited from Ferlus 1996). There have been experimental studies (Vu 1982, Hoang Cao Cuong 1989), and the tonal inventory and tonal neutralization in Central dialects have been noted in a number of works. Ferlus (1995, 1996) describes Cao Lao Ha, a dialect in the Quang Binh province. He briefly gives the tonal inventory of this dialect. It consists of 4 tones, and he states that the three tones, ‘*nangl*’, ‘*hoi*’ and ‘*nga*’ that occur in Northern dialects, neutralize to one (Ferlus assumes the six-tone view). Table 2 shows the tonal inventory given in Ferlus 1995, 1996, using numbers for tones, i.e., tone 1 is equivalent to ‘*ngang*’ in Table 1, tone 2 is ‘*huyen*’, tone 3 is ‘*sac*’, tone 4 is a result of neutralization between ‘*nang, hoi, nga*’ (tone 4, tone 5 and tone 6).

tone 1	tone 3	
tone 2	tone 4	

Table 2. Four tones in the tonal inventory of Cao Lao Ha (Ferlus 1996)

Tran 2002 conducted a study in Thu Lung and Yen Luong villages, another sub-dialect of the Nghi Loc district. Tran uses two speakers from Yen Luong and three from Thu Lung. The methodology was not mentioned, but the investigator apparently listened to the recording and transcribed tones, and included comments on laryngelization based on auditory impressions. The tonal contours are described using numeric representations with 5 being highest and 1 being lowest on the scale. According to Tran, there are 5 tones in this dialect (Tran also adopts the six-tone view). Hoang Thi Chau’s claim earlier (1989:206) is that Yen Luong has 4 tones only: *huyen* and *nga* are neutralized to *nangl*. The neutralization in Yen Luong dialect according to Hoang Thi Chau is shown in Table 3.

<i>ngang</i>	<i>sac</i>	<i>hoi</i>
<i>huyen</i> →	<i>nang</i>	← <i>nga</i>

Table 3. Tonal neutralization in Yen Luong dialect.

Tran 2002 argues that this claim does not hold, and there are 5 tones in Yen Luong with *nga* neutralized to *nang*, both are realized as 32 in Yen Luong. *Huyen*, a low level in Northern dialect is realized as 43. According to Tran, the native speakers of this dialect still distinguish the three tones that others considered to be ‘neutralized’ and do use differences in pitch height, although the actual realizations are different from those in other dialects. Interestingly, Tran shows that two villages have two slightly different

systems with different tonal contours, e.g., the rising tone in Northern Vietnamese is described as 55 (high level) in Thu Lung, but 25 (rising) in Yen Luong.

The study reported here investigates the speech of a female speaker from Nghi Trung village, and a male speaker from Quan Hanh village, both belonging to the Nghi Loc district.

### 3 Study on the Nghi Trung and Quan Hanh systems

A preliminary analysis shows some very interesting results.

#### 3.1 Methodology

The test was designed mainly in the same way as in Pham 2003 with two major modifications, i.e., two high vowels /i/ and /u/ were added along with a reading paragraph to be read aloud. Speakers were selected using the following criteria. In order to read the word lists, they had to have good reading skills. All speakers had to have at least 7 years of schooling, and many even had some postsecondary education; they all still had to have their front teeth and they had to have never traveled or had not lived outside the community for more than a few years. The two speakers reported on this paper were 20 years old and first year students at Vinh University at the time of recording.

Short and long /a/ were used in open syllables with 6 tones and in closed syllables with the final voiceless labial stop. This paper describes 6 tones in open syllables only. Henceforth, ‘*sac*’ stands for ‘*sac1*’ and ‘*nang*’ for ‘*nang1*’. Initial consonants include the bilabial nasal, alveolar stops and fricatives, both voiced and voiceless, and the voiceless velar stop. Diphthongs are also included at the beginning and end of every block (10 carrier sentences). Each form was randomly arranged in each list. Recordings were made using a Shure 512 microphone and a Sony DAT tape recorder, digitized by CLS 4400 at the University of Florida lab.

Each speaker read a set of 149 phonological monosyllabic words. Three lists (for three repetitions) were used. The total number of files is 894 (149 forms x 3 repetitions = 447 tokens x 2 speakers). The data from the first repetition were used. The second or third repetition was used in cases such as a slip of the tongue or unusual harshness.

Data were digitized using Cool Edit program. Before each file was cut off from the chunk and saved, the carrier sentence, which contains the target syllable was checked to ensure it is the intended form that is elicited, because the speakers from time to time overlooked the written forms and made errors. Each individual file was then opened in Praat (Boersma and Weenink 2005) to obtain the spectrograms and F0 values.

#### 3.2 Description and discussions of the F0 contours

This section describes and discusses the F0 contours and the phenomenon of neutralization in the dialect of Nghi Trung and Quan Hanh. It also comments on the phonation types in some tones through waveforms and spectrograms.

The two speakers reported here are from the same district, Nghi Loc. The initial impression was that though each comes from a different village, both speak the same sub-dialect. However, the more we look into the data, the more it appears that they speak two different sub-dialects. Therefore, I describe them in separate sub-sections with comparisons where needed. This report, again, is preliminary only, but from this

investigation, it would be extremely interesting to do a follow-up with data from other speakers of the areas, and with perceptual tests in order to confirm the tentative suggestions here.

### 3.2.1 Nghi Trung

The tonal contours from the Nghi Trung speaker differ strikingly from those in Northern dialects shown in Figure 1. At first glance, it seems all six tones have a very similar contour, which is slightly falling.

Figures 2, 3, and 4 provide a general picture of F0 contours of six tones with the syllables /ka/, /ki/, and /ku/ from the female speaker, S1. From these figures the general contour seems to be slightly falling, or level in some cases. Except for *ngang* (line with small diamonds) that slightly rises, there are no clear rising or falling-rising contours as found in Northern dialects in Figure 1.

The F0 contours of six tones can be described as follows:

- *ngang*, ‘ng’ in the legend, line connected by small diamond dots, rises slightly.
- *huyen*, ‘hu’, line connected by small squares, is level, generally lower or has a lower ending than *ngang* in both speakers.

The F0 contours of these two tones are still similar to those in Northern and Southern Vietnamese.

- *sac*, ‘sac1’ line connected by small triangles, falls slightly. This contour is very different from the sharp rising contour in Northern and Southern dialects. This contour almost overlaps with that of *hoi* in Figures 2, 3 and 4. Figure 5 shows this tone in 6 different syllables from the female speaker.

- *nan*, ‘na1’, line connected by small ‘x’s, falls slightly, similar to the shape in Northern dialects. However, unlike the Northern dialects, it does not have creakiness. It often belongs to the lowest group.

- *hoi*, line connected by small stars, and *nga*, line connected by small circles, both fall. In Northern dialects shown in Figure 1, these two tones are falling-rising. Figures 2, 3 and 4 show *hoi* is clearly higher than *nga* in the pitch range. Moreover, *nga*, unlike in Northern dialects, does not have creakiness.

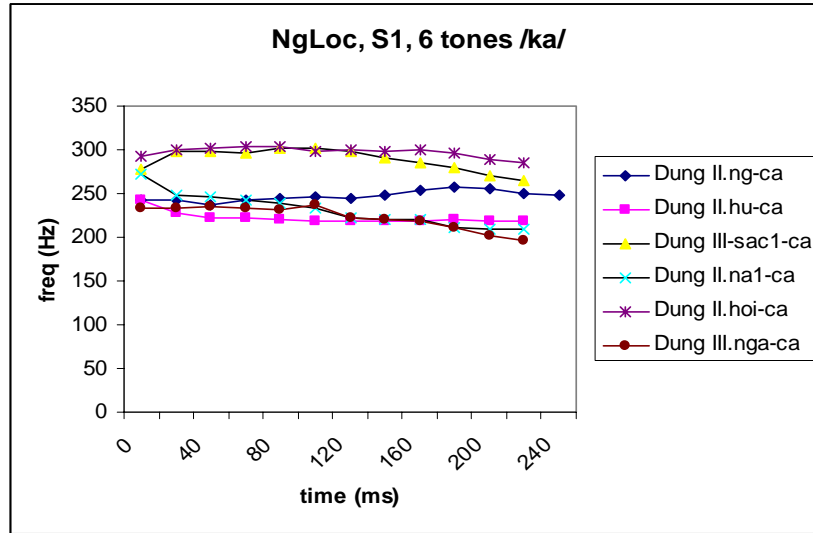


Figure 2. Six tones in /ka/, from a female of the Nghi Trung village

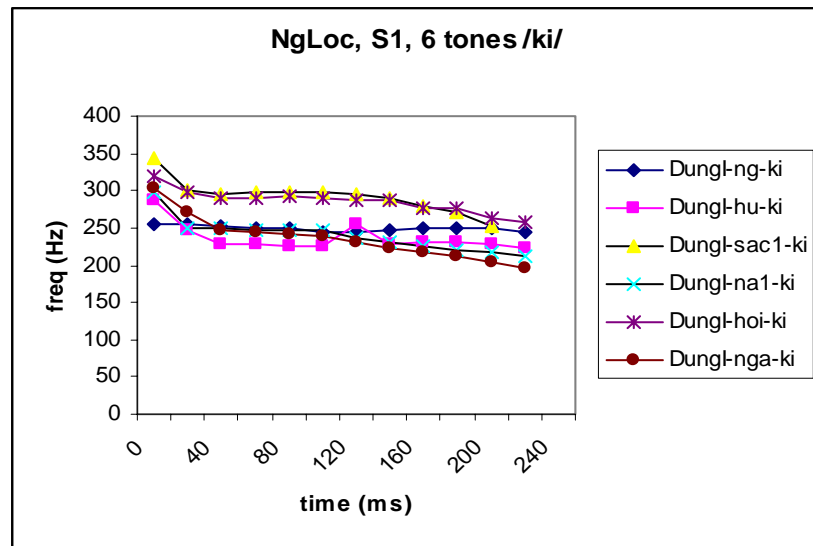


Figure 3. Six tones in /ki/ from a female of the Nghi Trung village

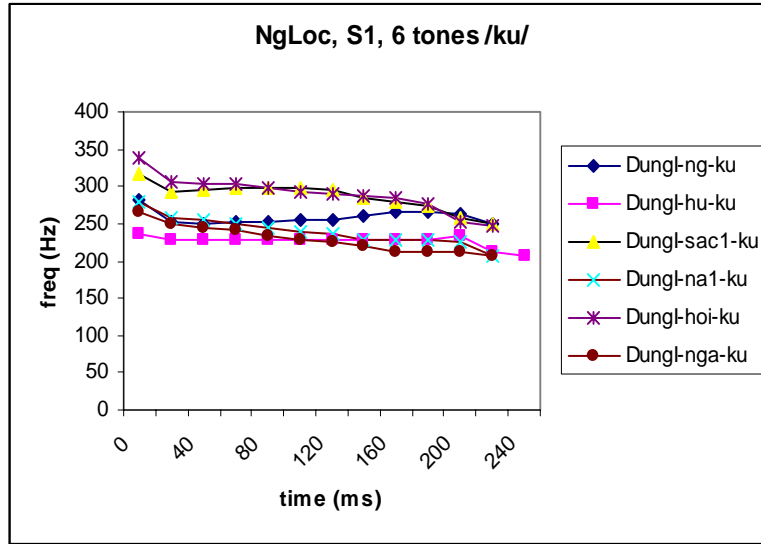
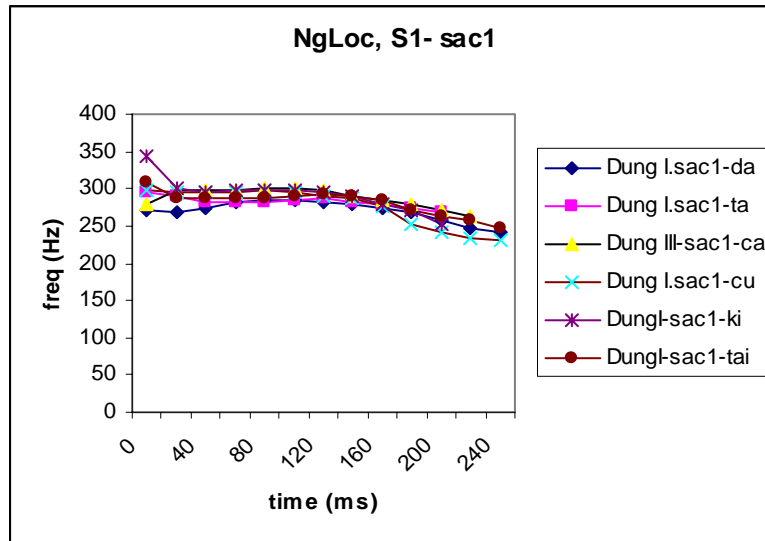


Figure 4. Six tones in /ku/ from a female of the Nghi Trung village

Figure 5. Tone *sac* from /da/, /ta/, /sa/, /ka/, /ku/, /ki/ and /ta:j/ from the female.

I now turn to the issue of tonal inventory. It is important to note that the paper refers to tones (by names) as a phonological category, something contrastive that is not pitch height, although their phonetic realization might be very different from dialect to dialect. For example, *sac*, a rising tone in Northern dialects, is phonetically falling in a Central dialect. Therefore, when we say, e.g., in Nghi Trung dialect *hoi* neutralizes to *sac*, it means the two phonological tones *hoi* and *sac* are realized as a falling tone in this dialect. Or in another case, two phonological tones neutralize and the resulting tone is something phonetically different from either.

It appears that in the female, *hoi* neutralizes to *sac*. The F0 patterns of three tones *huyen*, *nang*, and *nga* also suggest these tones neutralize, resulting in a low falling tone.



Figures 2, 3, and 4 clearly and consistently show that the two tones *hoi* and *sac*, highest in the pitch graphs, are almost inseparable in their F0 values. Figure 6 below shows six tones in another syllable that presents a similar pattern of these two tones.

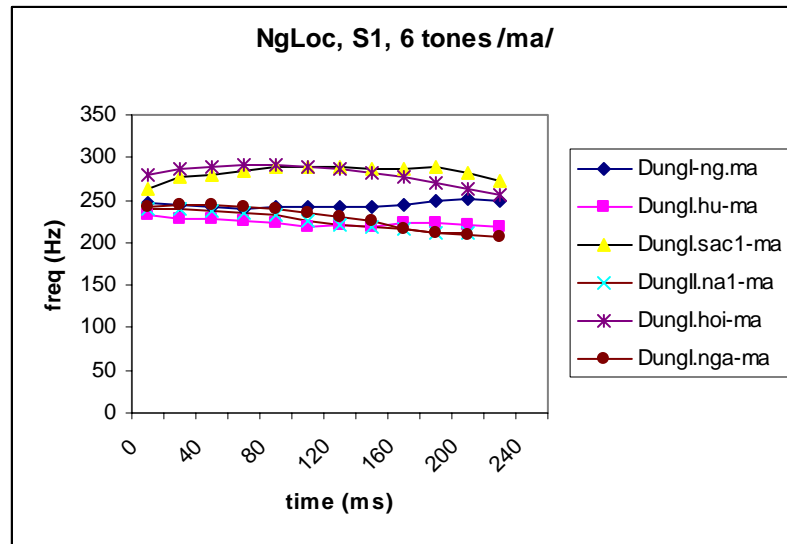


Figure 6. Six tones in /ma/ from a female of the Nghi Trung village

Along with Figures 2, 3, 4, Figure 6 also shows that *huyen*, *nang* and *nga* appear to be very close to each other. They form the lowest group. Note that in this chart, the first token of /ma/ with *nang* was not normally produced, the second token with the same tone is added and it clearly clusters with the other two tones in the figure.

The pattern of tonal neutralization in Nghi Trung dialect is summarized in Table 4.

ngang	sac	← hoi
huyen →	nang	← nga

Table 4. Tonal neutralization in Nghi Trung dialect.

However, there are some cases where *nga* seems to have similar F0 values to *sac*. Figure 7 shows *nga* and *sac* are close to each other in /da/ and /ta/, i.e., the higher group with 4 lines. From Table 4, we would expect *nga* to pattern with *huyen* and *nang*. When *nang* from /da/ and /ta/ were added for comparison, the F0 values of *nang* clearly appear to be lower in the graph, i.e., the lowest two lines in Figure 7, compared to those of *sac* and *nga*. It could be that the speaker confused *nga* and *hoi*, a common mistake in Southern speakers where *nga* is neutralized to *hoi* in those dialects. This tonal contrast is reflected in the orthography (and in the Northern dialects), which normally causes spelling mistakes for speakers of dialects others than Northern Vietnamese.

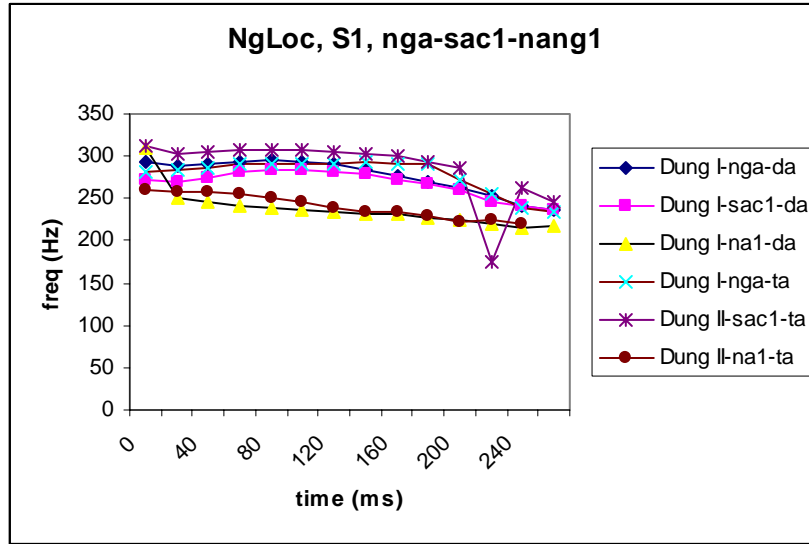


Figure 7. *Nga, sac* and *nang* from the female of Nghi Trung

Regarding phonation types, there are two tones, *nang* and *nga*, with creaky voice in Northern Vietnamese. The creakiness is distinctive in these tones and consistently found in every token from every speaker. Figure 8 below shows the wide band spectrograms and sound wave of *nang*, one of creaky voice tones, from one Northern speaker (see Kirk, Ladefoged and Ladefoged 1993 for characteristics of different phonation types in sound waves and spectrograms). The creaky voice portion, appearing at the second half of the vowel, is seen through non-periodic, irregular glottal pulses.

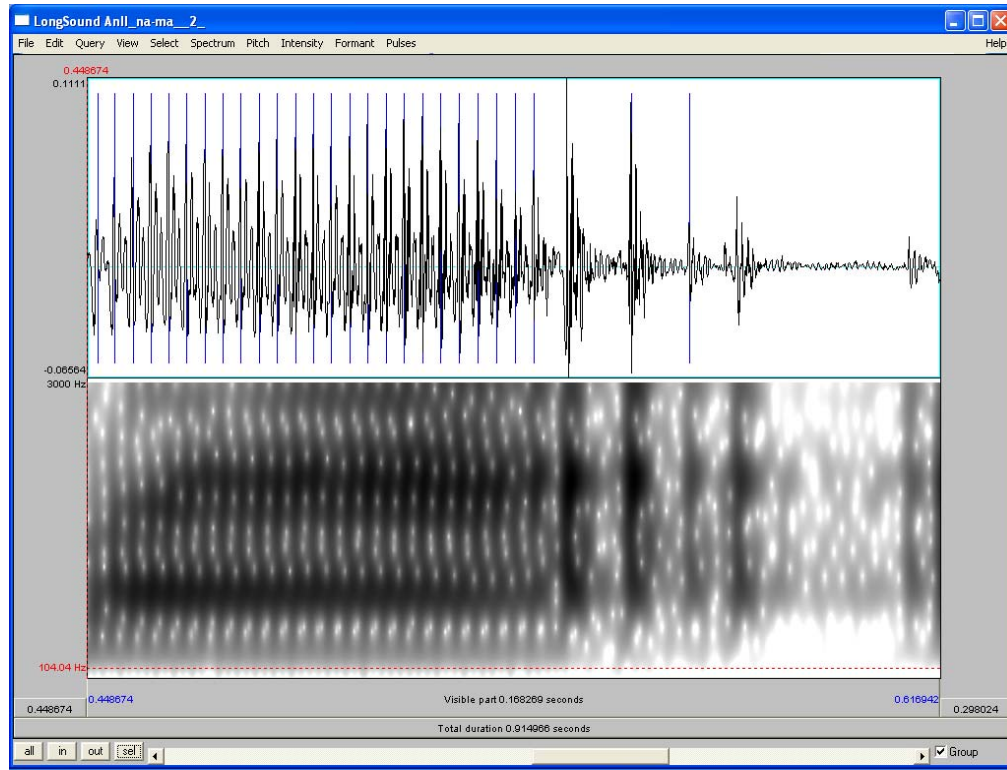


Figure 8. Sound wave and spectrogram of the creaky tone *nang* in Northern Vietnamese.

The Nghi Trung speaker does not have creaky voice in any tones. Figure 9 shows *nang* in /ka/ from the female. We see that there are no vertical striations at irregular spaced pitch intervals as seen in Figure 8, or pulses with great duration. Figure 10 shows *nga*, another creaky tone in Northern dialects, in the speech of Nghi Trung. Again, we do not see any signal for creaky voice in Figure 10.

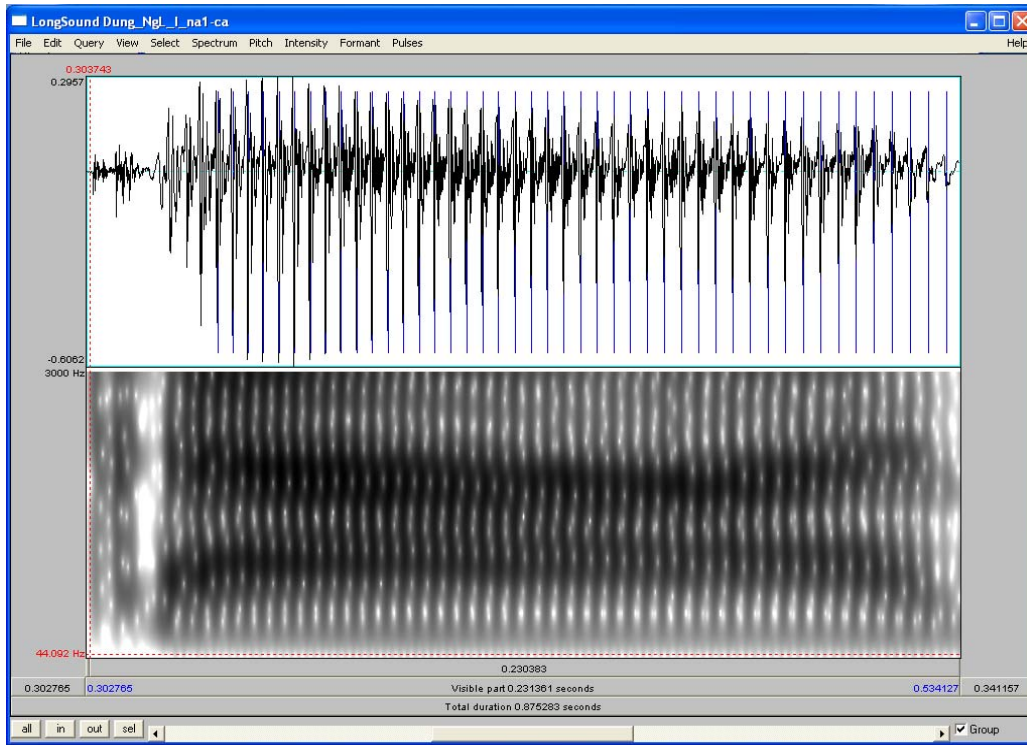


Figure 9. *Nang* in /ka/ from the female of Nghi Trung

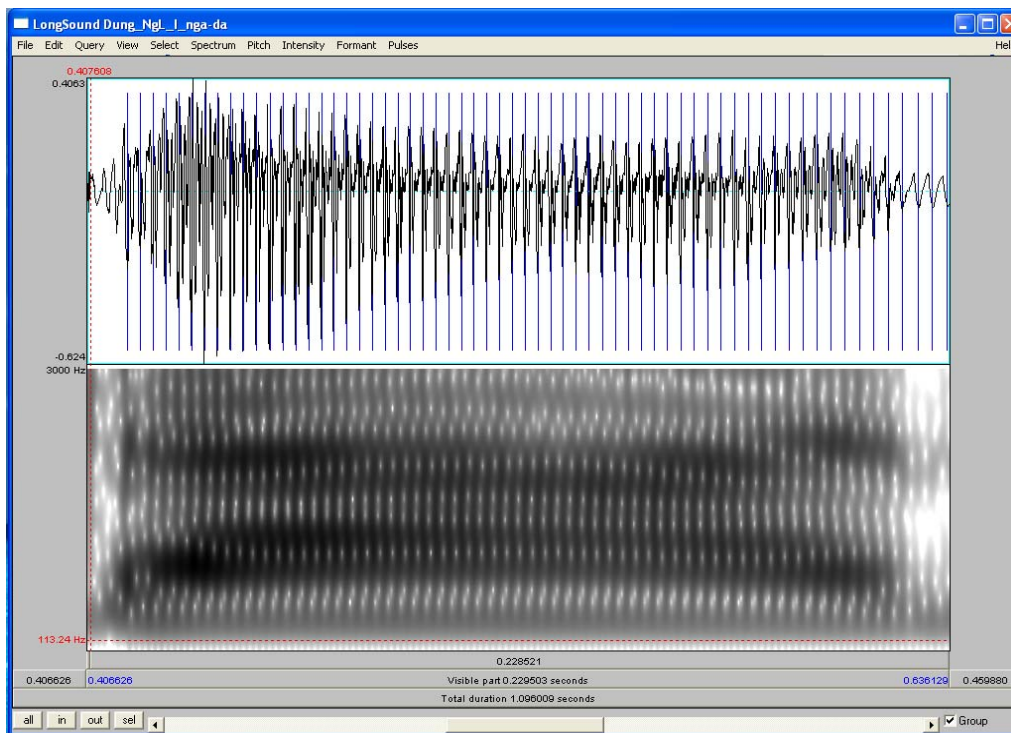


Figure 10. *Nga* in /da/ from the female of Nghi Trung

The other phonation type that is found in Northern dialects is breathy voice, characterized by decreased amplitude in the wave form and aperiodic energy in the spectrogram. This characteristics is rather difficult to inspect visually. If in this dialect, breathy and modal voice contrast, it needs to be shown consistently using parameters that are commonly said to be reliable indicators of phonation types, such as the difference in amplitude between the first and second harmonics (H1-H2), between the first harmonic and the first formant peak H1-A1. These measurements will be the subject of another paper.

The tonal system of the Nghi Trung village from the female speaker can be tentatively summarized in Table 5 below. The traditional names of the tones are put in parentheses to show phonological tones that neutralize. The division of two rows does not strictly represent the relative value of ‘high/low’ registers. Classification of tonal registers in these dialects would go beyond the purpose of this paper (see Pham 2003 for discussions on register features of Northern Vietnamese tones). There are 3 tones in the speech of Nghi Trung. Tone 1 is mid, level (or slightly rising). Tone 2 is high, falling. Tone 3 is also falling but lowest in the F0 values.

level/rising	falling
tone 1 ( <i>ngang</i> )	tone 2 ( <i>sac, hoi</i> )
	tone 3 ( <i>huyen, nang, nga</i> )

Table 5. Three tones in the tonal inventory of Nghi Trung speech

There are several variations of tones shown in this speaker; for example there is a case where both *ngang* and *huyen* overlap on their pitch track. We need more detailed analysis to sort out variations in this dialect, and determine which features remain distinct for tones.

As stated before, we need to analyze more samples and from more speakers of the same village, and especially use a perception test, to see whether the speakers do make the distinction perceptually with these tones.

### 3.2.2 Quan Hanh

I now go to the speech of Quan Hanh village, spoken by the male speaker.

Figures 11, 12, and 13 show the general shape of contours from 6 tones in open syllables. We see a similar pattern of contours from the female speaker of Nghi Trung: all tones seem to share the slightly falling contour. However, pitch contours seem to be more separable from each other.

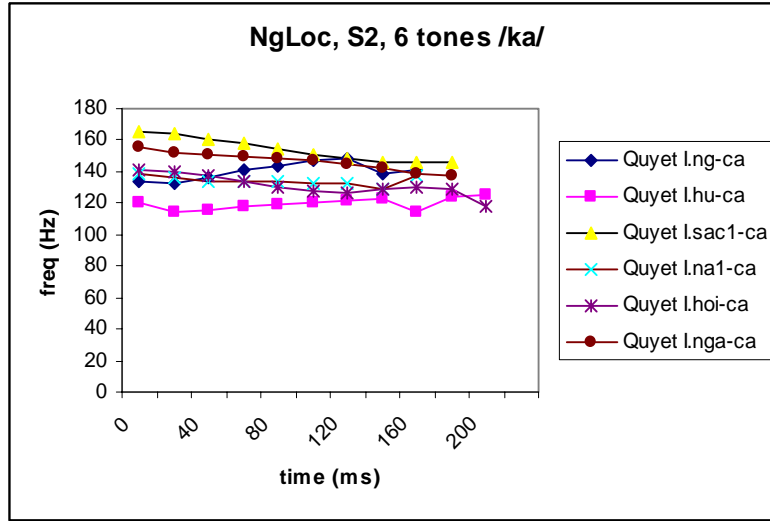


Figure 11. Six tones in /ka/ from a male of the Quan Hanh village

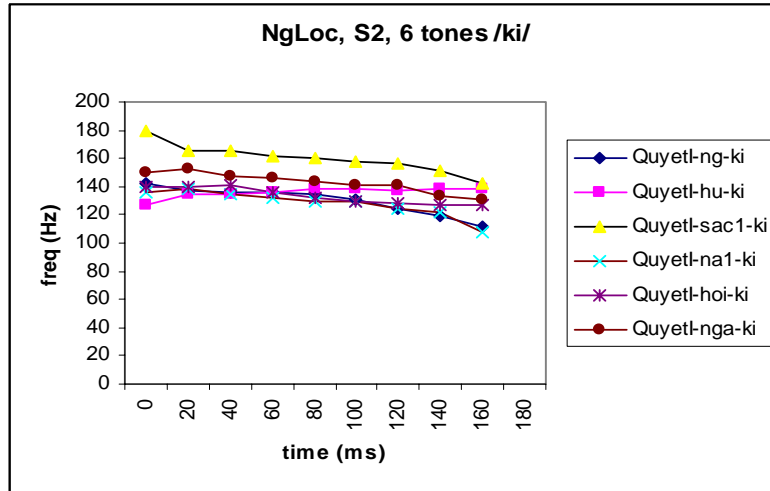


Figure 12. Six tones in /ki/ from a male of the Quan Hanh village

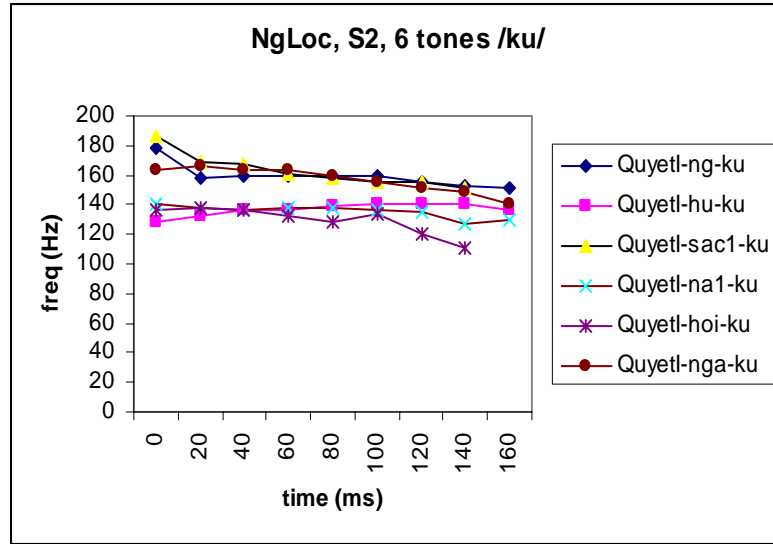


Figure 13. Six tones in /ku/ from a male of the Quan Hanh village

- *Ngang* and *huyen*: from Figures 11, 12, and 13, *ngang* and *huyen* are clearly different in their F0, *ngang* is higher. To make it easy to follow, Figure 14 shows only these two tones with respect to each other in /ka/ and /sa/. Although the onset of the vowel is not consistent, the mid and end points of the two tones always separate. *Ngang* also rises in Figure 14, but not in Figures 12 and 13. We therefore should consider *ngang* a level tone. *Huyen* seems to be level in all those figures.

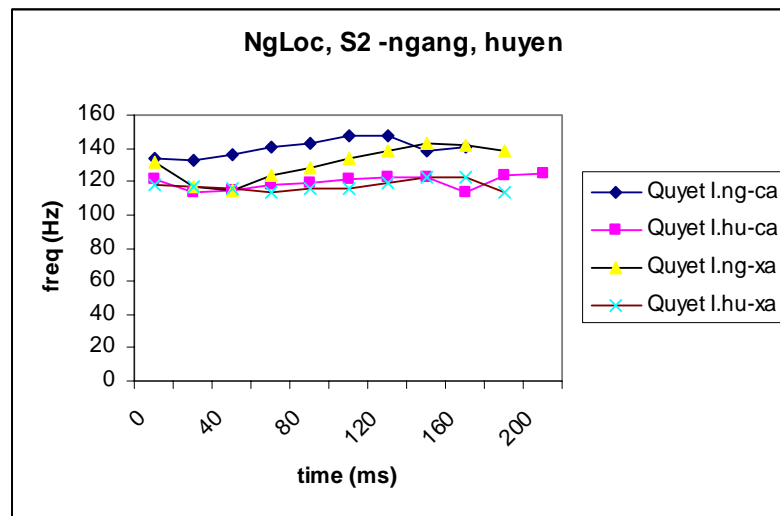


Figure 14. *Ngang* and *huyen* in /ka/ and /sa/ from the Quan Hanh speaker

-*Sac* and *nang* both are falling in Figures 11, 12 and 13. The two tones have different F0 values. *Sac* is higher than *nang*. Figure 15 provides more examples of these tones, but only the two tones in questions are shown here for ease. Except the tone *nang* in ‘xa’ falls and rises, the rest falls slightly.

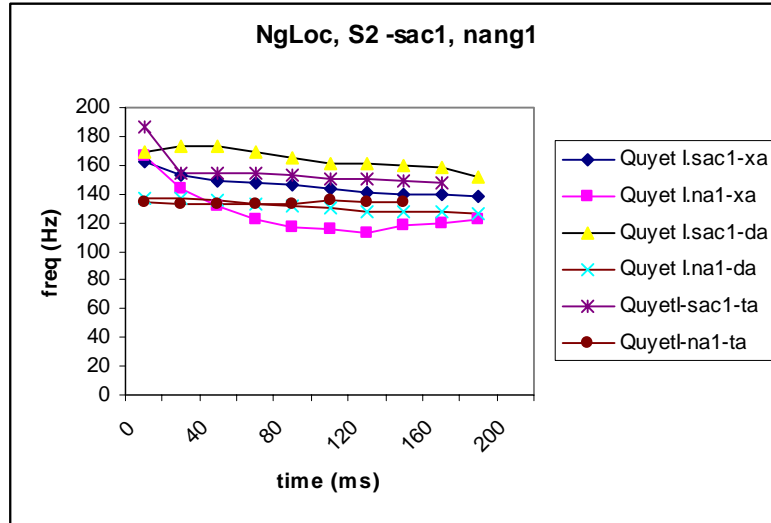


Figure 15. *Sac* and *nang* in /sa/, /da/, /ta/ from the Quan Hanh speaker

- *Hoi* and *nga* are both falling. However, there is an important difference in the F0 of these two tones in two speakers with respect to each other: in the female, *hoi* is clearly higher than *nga*. It is the reverse in the male speaker, for in Figures 11, 12 and 13, *hoi* appears lower than *nga*.

I now discuss the neutralization of tones in the Quan Hanh speaker.

Unlike for the Nghi Trung speaker, *hoi* does not neutralize to *sac*. They stay apart as seen in Figures 11, 12 and 13, and also in Figure 16 below. In this figure four tokens of each tone clearly appear close to each other in their group. *Sac* is in the higher group in the pitch graph.

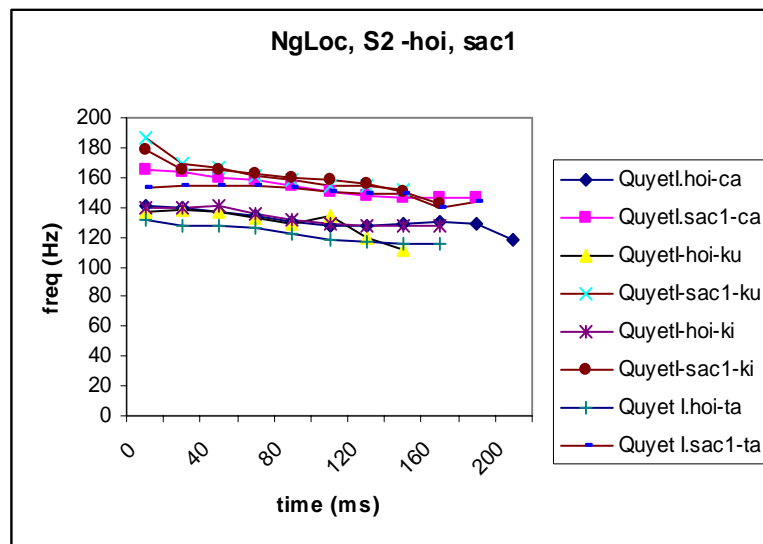


Figure 16. *Hoi* and *sac* from the Quan Hanh speaker in /ka/, /ki/, /ku/, /ta/



However, *nga* and *sac* appear to be very close in their F0 values, as seen in Figure 17 in four syllables, /ku/, /ka/, /ta/ and /ta:j/. It suggests that *nga* neutralizes to *sac*, or vice versa because the realization of the resulting tone is not similar to neither *nga* nor *sac* in Northern Vietnamese. However, because the merger of these two tones is mentioned in the literature as *nga* to *sac*, I have followed this approach here.

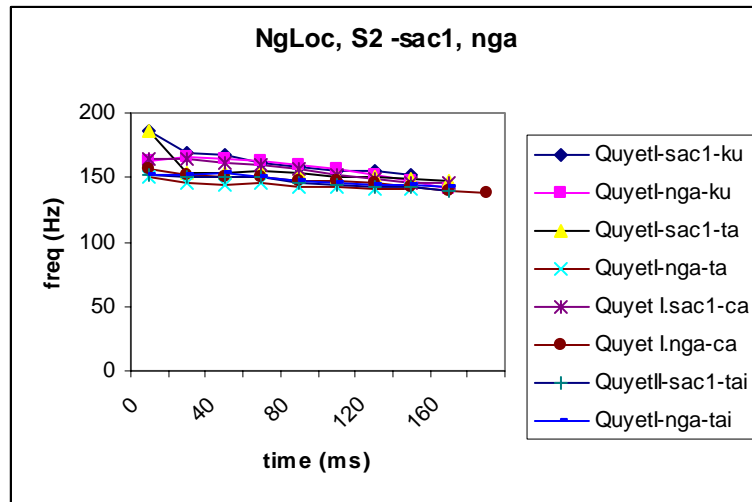


Figure 17. *Nga* and *sac* in /ku/, /ta/, /ka/, /ta:j/ from the Quan Hanh speaker

*Hoi* and *nang* in Figures 11, 12, and 13 also appear to be very close in their F0 values. Figure 18 excerpts tones from Figures 12, 13 and adds tokens for /da/. We can suggest that *nang* neutralizes to *hoi*.

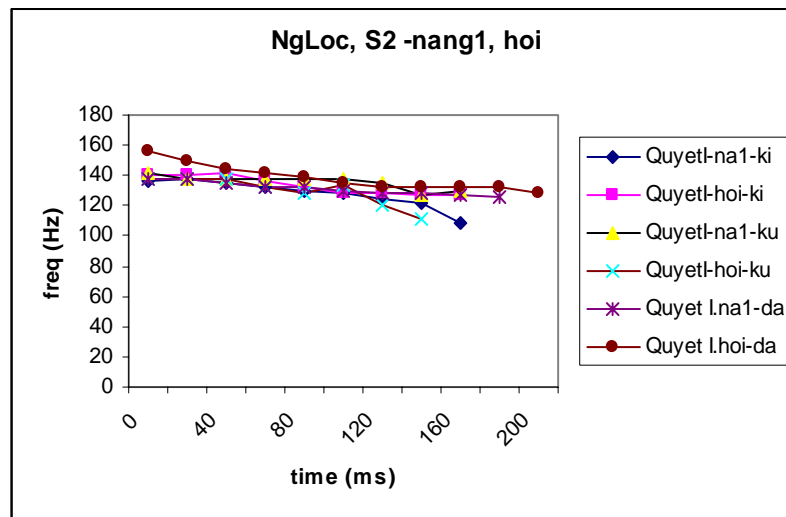


Figure 18. *Hoi* and *nang* in /ki/, /ku/, /da/ from the Quan Hanh speaker

Analyzing a large sample with normalized pitch of one speaker, or across speakers should confirm or disconfirm whether these tones are really neutralized to each other.

However, a clear observation can be made about *hoi* and *nga*. That is unlike in the Southern dialects *nga* neutralizes to *hoi*, in the Central area *nga* does not. Although only three syllables are randomly chosen here to show the tonal shapes, *hoi* and *nga* consistently have different F0 values in each speaker.

The pattern of neutralization in the Quan Hanh speaker shown in Table 6 appears to be different from that in the Nghi Trung speaker. *Hoi* neutralizes to *sac*, and *nga* neutralizes to *nang*.

ngang	sac	← nga
huyen	nang	← hoi

Table 6. Pattern of tonal neutralization in Quan Hanh dialect.

Just as with the Nghi Trung speaker, creaky voice does not appear in the Quan Hanh speaker in any tone. We can assume if there is a phonation contrast, it would be between modal voice and breathy voice, but again this comment needs further examination.

We now can summarize the tonal system in Quan Hanh as in Table 7. Tone 1 is high and level, tone 2 is low and level, tone 3 is high and falling, and tone 4 is low and falling.

level	falling
tone 1 ( <i>ngang</i> )	tone 3 ( <i>sac, nga</i> )
tone 2 ( <i>huyen</i> )	tone 4 ( <i>nang, hoi</i> )

Table 7. Four tones in the tonal inventory of Quan Hanh speech

Although *ngang* and *huyen* from time to time do not obey their ‘high/low’ register, e.g., they have the same F0 values in some tokens, or *ngang* is even lower than *huyen*, at the moment we can attribute these cases to variations. It could be that there is only one level tone, like in the Nghi Trung speech. However, the falling tones in the two speakers clearly result from the merger of different tones.

From the preliminary analysis of the dialect of the two speakers, we can suggest that the two speakers might speak two different sub-dialects.

#### *Summary of the findings:*

a/ The dialect(s) reported in this paper seem to be dominated by the falling contour (slightly falling). Processing a larger sample to normalize the general F0 contour might reveal some subtle distinction in contour shape, i.e., slightly rising. However, from the preliminary result, it seems that contour does not play the same crucial role as it does in Northern or Southern dialects.

b/ In terms of phonation types, these dialects do not employ creaky voice, which is an important acoustic key in Northern tones. It seems that only modal voice and, perhaps breathy voice, are used. The contour pattern reported here recalls the case of Green

Mong, where Andruski and Ratliff (2000) analyzed three tones that have similar F0 contours. It turns out that breathiness emerges alongside pitch as one of crucial features in this language.

Measurement of H1-H2 would confirm whether breathy voice is used distinctively in Nghi Trung and Quan Hanh. If Contour and F0 values are not primary in these dialects, phonation types might be important.

An alternative hypothesis is that these dialects are still undergoing the process of developing tonal contour and register from the initial voicing and historical final segments. The alternation in F0 of *ngang* and *huyen* with respect to each other in both sub-dialects shows that register (indicating the general high or low within the pitch range) is not yet stabilized. Contours seem to be established earlier than registers.

c/ Because of the consistency in the neutralization patterns of tones from the two speakers, we can tentatively conclude that they have two different tonal systems, which are sub-dialects of a Central dialect. The female speaks the Nghi Trung dialect, which has 3 tones, and the male speaks the Quan Hanh dialect which consists of 4 tones.

A perceptual test using speakers of the same dialect and across dialects will confirm the tonal inventory in each. If it turns out that the tonal inventories suggested here are correct, this report will be the first experimental study that confirms a three-tone system of Vietnamese, the smallest inventory heard in the language.

#### 4 Conclusion

This paper presents a preliminary report on the speech of two speakers in Nghi Loc district, Central Vietnam. It turns out that the two speakers indeed use two different sub-dialects. The paper describes the tonal system of two sub-dialects, focusing on tonal contours and tonal neutralizations.

Although the results are tentative, they are very intriguing. This paper, as mentioned above, is the first step to systematically investigate the tonal system in Central dialects. In order to make valid generalizations about the dialects, the study needs to incorporate a large sample of data and many other speakers from the same villages. And as pointed out in Geratt and Kreiman (2001:366), “although two voice samples may have been produced rather differently, and the acoustic waveforms may look rather different, these differences are important only if they result in a perceptually salient difference in vocal quality”. This is testable with a perception study.

Understanding the tonal system of Central dialects will also further our understanding of how tones have developed in Vietnamese the very interesting and complex tonal systems we find today, and how different tonal systems of Vietnamese relate to each other as being part of the same phonological tonal system although strikingly different in acoustic realization. The fact that in the same language, a three - or four - tone system coexists with a six-tone system provides an interesting case for studies on the phonology - phonetics interface. It would raise again the question, how close a phonological representation is to a phonetic one.

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