Comparative Kadai
The Tai Branch

Publications in Linguistics 124

Kadai... Isn’t that a subdialect of a minority somewhere in Thailand?

Hardly! Comparative Kadai defines the linguistic range of an immense, interrelated, and varied area extending from eastern India to southern China and includes the southeast Asian peninsula. This area is comprised of many millions of people with histories, languages, and traditions largely unknown to the Westerner. Powerfully interesting economic, political, and social forces are emerging in the countries of this part of the world. Of particular interest from a linguist’s point of view are the characteristics of this huge area, what research has been completed, and what further work needs to be done.

In the past it has generally been assumed that Tai is a part of a grand Sino-Tibetan family, but inevitably questions have arisen: What languages are involved, how diverse are they, and how are the language families interrelated?

Those who wish to study these varied Kadai languages have serious research materials available in Comparative Kadai.

The volume editors are Professor Jerold A. Edmondson, Chairman of the Linguistics Department of the University of Texas at Arlington and specialist in Southeast Asian languages, and Dr. David B. Solnit, specialist in minority languages of East and Southeast Asia.
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Wuming Zhuang Tone Sandhi: A Phonological, Syntactic, and Lexical Investigation

Wil C. Snyder, Summer Institute of Linguistics
and
Lu Tianqiao, Central University of Nationalities, Beijing, China

1 Introduction

The Zhuang language of Southern China extends over most of Guangxi Province, and is also found in Yunnan, Guizhou, and Guangdong Provinces, as well as in Vietnam. The Zhuang language actually consists of two major varieties, Northern Zhuang and Southern Zhuang. According to the classic divisions in Li (1977), Northern Zhuang belong to the Northern Tai subbranch and Southern Zhuang belongs to the Central Tai subbranch. These two major varieties are then divided by Chinese scholars in turn into seven northern vernacular areas and five southern vernacular areas (see map 1). It must be stated, however, that even within these divisions, many...

We would like to thank Jerry Edmondson for his help and encouragement in researching this topic, and Prof. Zhang Yuansheng for sharing his insight into the Zhuang language with us. Responsibility for errors is ours alone. Finally, we would like to express our thanks to the people at the Central University of Nationalities, Beijing, China for their cooperation and help in researching the Zhuang language.
subdivisions exist that differ in tones, lexicon, and in initials and rhymes. The linguistic situation in Zhuang is, needless to say, complex (cf. Zhang and Wei, this volume).

The Zhuang people comprise the largest minority group in China; recent statistics show the ethnic Zhuang population to be around 15,000,000. Of this 15,000,000, there are among the Zhuang many whose first language is not Zhuang; some speak Han or other minority languages. Nonetheless, those ethnic Zhuang that actively use the Zhuang language make up the larger portion of the population. There are no reliable statistics concerning the number of speakers, however.

The official Zhuang language and the basis of the writing system is Wuming County, Shuangqiao Village (Northern Zhuang). Since this kind of Zhuang plays such an important role, we have chosen to discuss it as a point of reference to which two other varieties can be compared (see Li 1990). This geographic sector is clearly linguistically active in Zhuang. Long’an is, for example, west of Wuming and belongs to Southern Zhuang, whereas Pingguo is just north of Long’an but belongs to Northern Zhuang. Wuming County is 42 kilometers north of Nanning, the capital of Guangxi. All three of these counties are located within a 50 kilometer radius approximately, but their tonal systems, as will be shown, are very different.

In this paper we investigate Shuangqiao Zhuang tone sandhi from an autosegmental and syntactic perspective. We attempt to explain the sandhi phenomena in Shuangqiao in depth, covering phonological, syntactic, and lexical factors, in addition to positing a method for analyzing the peculiarities of Zhuang tone sandhi.

One of the characteristics of Kadaí languages is an abundance of tones. We will posit an autosegmental sandhi mechanism for the Zhuang varieties, which we hope will prove useful in analyzing other Kadaí languages with tone sandhi.

2 Zhuang tone system and possible sandhi changes

2.1 Data. Shuangqiao Zhuang has a total of six tone values. Open syllables (all syllables except for those with oral stops as coda) can take any of the six.

<table>
<thead>
<tr>
<th>Tone</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
<td>pail²</td>
</tr>
<tr>
<td>2</td>
<td>21</td>
<td>nüüg²</td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>ha³</td>
</tr>
<tr>
<td>4</td>
<td>42</td>
<td>yam⁴</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
<td>xwi⁴</td>
</tr>
<tr>
<td>6</td>
<td>33</td>
<td>tasc⁶</td>
</tr>
</tbody>
</table>

Closed syllables have long/short vowel contrast, and can take the following tone values:

<table>
<thead>
<tr>
<th>Tone</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>55</td>
<td>tis⁵</td>
</tr>
<tr>
<td>7'</td>
<td>55</td>
<td>nüüg⁷</td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>nüüg⁸</td>
</tr>
<tr>
<td>9</td>
<td>33</td>
<td>krip⁹</td>
</tr>
<tr>
<td>9'</td>
<td>33</td>
<td>nüüg⁹</td>
</tr>
<tr>
<td>10</td>
<td>42</td>
<td>lasp¹⁰</td>
</tr>
</tbody>
</table>

2.2 Sandhi. Tones 1, 2, 5, 6, 8, 9, 9' undergo change in context. Specifically, tones 1, 5, 8 can change to 55. Tones 2, 6, 9 can change to 42. Notice that tones 7 and 7' do not undergo sandhi changes, even though they have the same tone values as 9 and 9'. What is the mechanism that causes Wuming tones to undergo sandhi in this way? First, we will discuss how to represent this kind of complex tone system geometrically and then show how the sandhi changes can be accounted for.

As discussed in Yip (1989), tones of East Asian languages seem to have a different structure than those of African languages. The East Asian tone is thought to consist of a melodic unit (sequence of highs and lows) under a higher node. African languages involve clusters of highs and lows.

(3) East Asian

\[ \sigma \]

| T1 | T2 |

(4) African

\[ \sigma \]

| T1 | T2 |

\[ 1^{\text{Also see Edmondson and Yang (1994).}} \]
The East Asian tone consists of a **Tone Root Tier**, symbolized by $\oplus$, along with the geometric branching structure. The tone root adds a new level beyond that found in previous representations, thus simultaneously accounting for Asian contours as (a) being made up of high tones and low tones as well as (b) acting together as a unit, since East Asian tones can occur on any syllable. On the other hand, African tones act as clusters, only building up into contours at the end of a polysyllabic sequence by spreading. As discussed in Yip (1989), the root tone can take values of $H$ or $L$, and the root tone’s value is held constant over the syllable (unlike $T_1$, $T_2$ above, which can branch to form rises or falls).

Now, in complex tonal languages such as Kadai languages, the question is what sort of geometry is involved? In Wuming Zhuang, there are two level, two rising, and two falling tones. The two rising tones both can have a branching structure such as:

\[
\begin{array}{c}
\oplus \\
L \\
H \\
\end{array}
\]

Yip has suggested that such systems can be better described by having the tone root tier be a high and a low register. The difference between the two rising tones, and for that matter the two falling and two level tones, is simply that one is higher overall (register) and the other is lower overall (register). This can be represented in a geometrical fashion:

\[
\begin{array}{c}
\sigma \\
H \\
\end{array} ;
\begin{array}{c}
\sigma \\
L \\
\end{array}
\]

(two rising tones)

\[
\begin{array}{c}
H \\
L \\
H \\
\end{array} ;
\begin{array}{c}
L \\
H \\
\end{array}
\]

(two falling tones)

Wuming Zhuang Tone Sandhi

The structures in (5) represent the Wuming tones 5 (35), 1 (24), 4 (42), and 2 (21). There is, however, a further and necessary refinement to representing level tones. A 55 tone value would clearly be (with the Obligatory Contour Principle):

\[
\begin{array}{c}
\oplus \\
H \\
\end{array}
\]

But a 33 tone is structurally ambiguous, being either:

\[
\begin{array}{c}
\oplus \\
H \\
\end{array} ;
\begin{array}{c}
\oplus \\
L \\
\end{array}
\]

$H$ or $L$

We believe that if the tone is truly mid (33), and not 44 or 22 (see below for discussion of other Zhuang varieties with these tone values), its representation might be determinable by its behavior within the system, by its sandhi properties. For Wuming Zhuang we have chosen the 33 tone to be represented as:

\[
\begin{array}{c}
\oplus \\
H \\
\end{array}
\]

L

As a consequence of the preceding discussion, we will represent the tone structure of languages such as Zhuang as

2In these representations, there is a case of identical pitch values being assigned different features, and a case of identical feature specifications representing different pitch values. For the former: tones 1 (24) and 4 (42) cover an identical pitch range, yet one is assigned to the Low register and the other to the High. For the latter: both the coda of tone 1 and the onset of tone 4 are Low register dominating H tone, yet the former is 4 on the pitch scale while the latter is 2. It may be that the 4 and the 2 in these cases have the value 3, as the analyses of the internal contouring correctly predict Wuming sandhi phenomena.
Wuming Zhuang Tone Sandhi

It can be seen by this that the tonal structure of the sandhi tone is

\[
\sigma
\]

where \(T_{C2}\) is the right edge of the original tone. So the change \(1\rightarrow[3]\) geometrically looks like

\[
\sigma
\]

Both sandhi forms begin high, then either continue high or fall. Tones 1 (24) and 5 (35) are represented as follows, the right edge of the tone contour ending high.

\[
\sigma
\]

Tones 2 (21) and 6 (33) are represented as follows, with the right edge ending low.

\[
\sigma
\]

It can be seen that the value of the right edge of the contour remains unchanged. Tones 1, 2, 5, 6, 8, 9 and 9' all change to the structure of (13). It should be stressed that for this language, the sandhi rule is, in effect, 'context free', or more properly, that this alternation cannot be analyzed as an assimilation. That is, the rule does not take into account the environment for its form. A tone undergoing sandhi always, regardless of environment—as long as there is one—changes to the form (13). In §3.1 we discuss the fact that for tones which can undergo sandhi, only certain following tones 'trigger' sandhi on that syllable. However, this does not mean that the form (13) depends on the melody of the following tone for its form; it only depends on the existence of a following tone to trigger it. The restriction on which following tones can trigger sandhi is more of a restriction on tonal combinations, and does not affect form (13). So the sandhi form (13) is rather a 'preferred' or default tonal geometry into which any tone that undergoes sandhi will change.

As is seen in the following section, the other two varieties under consideration have no restriction on sandhi with regard to following tones. This sort of sandhi phenomenon is a result, we believe, of the 'rigid' nature of East Asian tone contours, especially in this case of Kadai tonal structure. The edges of the tonal geometry seem to be less affected by environment. As should be noted, there are Kadai languages which do not have tonal sandhi at all. For example, Kam has a total of nine distinctive contours, yet has absolutely no tone sandhi. This testifies as to the rigidity of tones in these kinds of languages. Edmondson and Yang (1994:54) state:
From the data thus far it appears as if contours in Africa have amorphousness of powdered charcoal that can be whisked along in the wind, those of the Han language the large lattice structure of coal breakable into smaller pieces, and in Kadai and Hmongic-Mienic they may have the internal structure of more compact and dense crystals.

2.3 Comparison of sandhi systems. We now compare the sandhi systems of the three Zhuang varieties studied in this article. It is noteworthy that the sandhi mechanisms are different for each variety.

The Long'an variety has the following tones:

<table>
<thead>
<tr>
<th>Tone</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>na¹</td>
</tr>
<tr>
<td>2</td>
<td>na²</td>
</tr>
<tr>
<td>3</td>
<td>na³</td>
</tr>
<tr>
<td>4</td>
<td>ma⁴</td>
</tr>
<tr>
<td>5</td>
<td>ma⁵</td>
</tr>
<tr>
<td>6</td>
<td>ma⁶</td>
</tr>
<tr>
<td>7</td>
<td>tap⁷</td>
</tr>
<tr>
<td>7'</td>
<td>thap⁷²⁷</td>
</tr>
<tr>
<td>8</td>
<td>nap⁸</td>
</tr>
<tr>
<td>8'</td>
<td>lacp⁸⁸</td>
</tr>
</tbody>
</table>

The geometry for these tones is

![Diagram](image)

(15) Tone Value

![Diagram](image)

(16) Tone 1 H (tone 2) L (tone 3) H

(17)

\[
\begin{array}{cc}
\sigma & \sigma \\
T_R & T_R \\
T_C_1 & T_C_2 \\
L & L
\end{array}
\]

(18) \( phja^{25} + hun^{25} \rightarrow phja^{44} + hun^{25} \) 'big mountain'

(19) \( H + H \rightarrow \) mountain big

3It must be noted that in Long'an Zhuang there is a class of words which undergo a tone sandhi change of [6] \( \rightarrow [3] \). The Wuming cognates of these words have high rising tone and implosive stops as initials, whereas in Long'an the words have 21 pitch value and nasal initials. It is unknown exactly why this particular class of words undergoes sandhi in this manner. This sandhi process contradicts the general sandhi rule (17) for Long'an tone sandhi, but will not be considered further in this paper.
The Pingguo variety has the following tones:

| Tone | Value | Tonic
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
<td>‘year’</td>
</tr>
<tr>
<td>2</td>
<td>21</td>
<td>‘day’</td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>‘yellow’</td>
</tr>
<tr>
<td>4</td>
<td>33</td>
<td>‘rice’</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
<td>‘cotton’</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>‘river’</td>
</tr>
<tr>
<td>7</td>
<td>55</td>
<td>‘fungus’</td>
</tr>
<tr>
<td>7'</td>
<td>55</td>
<td>‘tower’</td>
</tr>
<tr>
<td>8</td>
<td>35</td>
<td>‘fruit’</td>
</tr>
<tr>
<td>9</td>
<td>11</td>
<td>‘root’</td>
</tr>
<tr>
<td>10</td>
<td>33</td>
<td>‘wax’</td>
</tr>
<tr>
<td>10'</td>
<td>33</td>
<td>‘child’</td>
</tr>
</tbody>
</table>

Tones 1, 5 change to 55, and tones 2, 6 change to 33. The sandhi forms are both in the high register, differing only in the relative height of the tones. We propose a sandhi rule of the following form:

(21) \[ \sigma \xrightarrow{TR} \sigma \xrightarrow{H} \]

The tones that change are either rising or falling, and are raised to the high register. If the right hand edge of the original tone is low (\(T_{C2} = L\)), then the resulting sandhi tone is the 33. If the right hand edge of the original tone is high (\(T_{C2} = H\)), then the resulting sandhi tone is 55.

It can be seen from comparing these three varieties that the tone sandhi mechanisms, even for relatively close varieties, can be very different.

3 Factors affecting sandhi

3.1 Tonal combinations. In Wuming Zhuang, unlike the other two varieties under consideration, tone sandhi depends on the tone that follows (as well as the syllable shape of that following tone (see §3.2)). For example:

(22) a. \(\text{wun}^2\text{huŋ}^l\text{ku}^6\text{tai}^l\text{hoy}^l\)
    person big do work
    Adults work.

b. \(\text{wun}^2\text{zi}^l\text{ku}^6\text{tai}^l\text{yam}^l\)
    person small do go game
    Children play.

(23) a. \(\text{sai}^l\text{pau}^l\text{pai}^l\text{ram}^l\text{tai}^2\)
    two CLF go carry table
    Two persons go to carry the table.

b. \(\text{sai}^l\text{pau}^l\text{pai}^l\text{ram}^l\text{hau}^l\)
    four CLF go carry rice
    Four persons go to carry the rice.

In the above examples, the (a) sentence has a word which undergoes tone sandhi that does not undergo tone sandhi in the (b) sentence (\(\text{wun}^2\) and \(\text{ram}^l\)), the difference being the tone value of the following word (the words occur in the exact same syntactic environment). Each tone that can undergo sandhi is affected by the following tone; with some following tones it can change, with others it cannot. Below is a chart of the various tonal combinations, with the combinations producing sandhi marked (x). The spaces marked ‘l’ indicate that only if the second tone is of the Light syllable type can sandhi occur on the first syllable (see §3.2 below). (See appendix for examples of all combinations.)

(24) second syllable

<table>
<thead>
<tr>
<th></th>
<th>24</th>
<th>21</th>
<th>55</th>
<th>42</th>
<th>35</th>
<th>33</th>
</tr>
</thead>
<tbody>
<tr>
<td>first</td>
<td></td>
<td>x</td>
<td>x</td>
<td>L</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>syllable</td>
<td>21</td>
<td>x</td>
<td>x</td>
<td>L</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

Of the many different Zhuang varieties, Wuming is by far the most complex with regard to tonal change in context (Zhang Yuansheng, pc). The other two varieties studied in this article, Long’an and Pingguo, have no restrictions on sandhi with regard to the following syllable. In
other words, for Long'an and Pingguo, the above chart would be completely filled with x's. Long'an and Pingguo sandhi depends only on syntactic and speech rate factors.

We now discuss why Wuming sandhi occurs only with certain tonal combinations, and attempt to formulate rules governing the sandhi system.

In many tonal languages, the mechanism involved when sandhi is influenced by the following tone is one of association of the following tone (or the left edge of the following tone) with the preceding one. Goldsmith (1976:25) gives an example from Igbo:

(25) ekwe ci akhwa \rightarrow ekwe ci akhwa

Ekwe was carrying eggs.

The high (H) tone on we, becomes falling HL due to the influence of the following L on ci. In Mandarin Chinese, however, a different sort of process seems to take place. Two third tones together give rise to sandhi of the preceding third tone to a second tone (third is 214, second is 35).

(26) hen\textsuperscript{3} + hao\textsuperscript{3} \rightarrow hen\textsuperscript{2} + hao\textsuperscript{3}
very good
very good

The tonal structure can be viewed as

(27)

What seems to cause sandhi here is not an influence of the left edge of the following tone on the right edge of the preceding one, but simply a deletion of the left edge of the preceding tone.

Wuming Zhuang Tone Sandhi

(28)

\begin{align*}
\sigma & \rightarrow \sigma \\
[\text{H}] & L H H L H H
\end{align*}

The two third tones, both being falling-rising, are physiologically difficult to produce in normal or rapid speech, and therefore the first H is omitted, making the tones of the two words fit together in a 'smoother' manner. The third tone followed by any other tone (except another third) also undergoes a similar deletion process.

(29) hen\textsuperscript{2}\textsuperscript{3} + man\textsuperscript{4} \rightarrow hen\textsuperscript{2}\textsuperscript{1} + man\textsuperscript{4}
ADV slow
very slow

The third tone in this case changes from 214 to 21, in a process such as

(30)

\begin{align*}
\sigma & \rightarrow \sigma_1 + \sigma_2 \\
H & L H L H
\end{align*}

where the H-L of \sigma_1 is lower overall than the H-L of \sigma_2 (inadequately captured here still).

We believe that some of the sandhi processes in Zhuang relate to the following tones with a similar principle, that is, physiological ease of speech. The tonal contours simply change their structure to be physiologically more economical.

Three rules can be posited to account for the influence of the following tone in Wuming Zhuang. These rules hold for all Wuming (see §3.2 on the influence of light syllables).

(31) RULE 1 If two syllables occur together (\sigma_1, \sigma_2), each having Tr = L, then \sigma_1 can change.

\begin{align*}
\sigma_1 & \rightarrow \sigma_2 \\
T_{\alpha} & L T_{\beta} H T_{\gamma} \\
T_{\delta} & T_{\zeta} T_{\eta}
\end{align*}
RULE 2 If two syllables occur together \((σ₁, σ₂)\) and have the same \(T_R\) and the same contour, tone sandhi can occur.\(^4\)

\[
\begin{align*}
σ₁ & \quad + \quad σ₂ \\
T_R & \quad + \quad T_R \\
T_α \quad T_β & \quad T_α \quad T_β \\
H & \quad H
\end{align*}
\]

RULE 3 The mid-level even tone seems to be very ‘unstable’ and can change with any following tone except tone 4 (42).

3.2 The CVC Influence. The ‘dead’ or checked tones in Kadai languages seem to have a special status. The checked syllables are thought to have had no tone originally, but later borrowed the tones of other syllable types. The original CV syllables had three tones which split into high and low reflexes under influence of the voicing state of the initial consonant. In Zhuang, and possibly in other Kadai languages, we can posit that \((C)(V)(V)C_4\) syllables (where \(C_4\) is a stop), although having branching structure, count as light, while the other syllable types \(CVV, CVG (VG = \text{glide}), CVGC_4 (C_4 = \text{nasal})\), act as heavy syllables.\(^5\) In Zhuang, the CVC syllable (with both long and short vowels) has a special status in regard to tone change in context. A following word of syllable type\(^6\) \((C)(V)(V)C_4\), irrespective of tone, can cause tone sandhi on the previous word, if the previous word has \(T_R = L\) (i.e., tones 1, 2). For example:

\[
\begin{align*}
(32) \quad a.\text{an}^1 & \quad kja^7 \quad \text{nai}^4 \quad kai^3-lai^1 \quad \text{yan}^2 \\
& \quad \text{CLF bamboo}^* \text{hat} \quad \text{this how-much} \quad \text{money} \\
& \quad \text{How much is this bamboo hat?}
\end{align*}
\]

\(^4\)This does not apply, of course, to two 42 or 55 tones, since both 55 and 42 tones do not change. They are already in the sandhi form.

\(^5\)The rationale in calling syllables with final stops ‘light’, lies in the timing of these syllables. In Zhuang, no other syllable is spoken with a shorter time span than the checked syllable. The checked syllables are of two types, having ‘long’ and ‘short’ vowels. However, even the checked syllables with long vowels occupy a very short time span. In this paper we follow the standard Chinese practice of writing \(v\) for the ‘long vowel’ and \(\nu\) for the ‘short vowel’.

\(^6\)It has been reported by Zhang Yuansheng (1983) that for some speakers in Wuming county, only if the following syllable is \((C)(V)(V)C_4\) (a checked syllable with a short vowel) can sandhi occur.

Wuming Zhuang Tone Sandhi

\[
\begin{align*}
b.\text{an}^1 & \quad \text{piu}^1 \quad \text{nai}^4 \quad \text{ti}^3 \quad \text{ha}^4 \quad \text{pack}^8 \quad \text{man}^2\text{y} \quad \text{yan}^2 \\
& \quad \text{CLF watch this worth 5 100 yuan money} \\
& \quad \text{This watch is worth 500 yuan.}
\end{align*}
\]

\[
\begin{align*}
a.\text{kau}^1 & \quad \text{siyi}^3 \quad \text{fiyi}^4 \quad \text{jiyi}^2\text{man}^2 \quad \text{luk}^9 \\
& \quad \text{I want raise sheep child} \\
& \quad \text{I want to raise some lambs.}
\end{align*}
\]

\[
\begin{align*}
b.\text{tau}^2 & \quad \text{dai}^7 \quad \text{ru}^2 \quad \text{fan}^6 \\
& \quad \text{hold tight ear scale} \\
& \quad \text{Hold tight the handle of the steel-scale!}
\end{align*}
\]

In (32a) and (33a), tone sandhi occurs on \(\text{an}^1\) and on \(\text{jiyi}^2\). In (32b) and (33b), sandhi does not occur on \(\text{an}^1\) or on \(\text{ru}^2\), even though the tonal environment is the same as in the (a) sentence. As a result, a final rule must be posited dealing with this phenomenon.

\[
\begin{align*}
(34) \quad \text{RULE 4 If two syllables occur together } (σ₁, σ₂) \text{ where } σ₁ \text{ is a syllable} \\
& \text{with } T_R = L \text{ and } σ₂ \text{ is a light syllable } (C)(V)(V)C_4, \text{ then } σ₁ \\
& \text{can undergo tone sandhi.}
\end{align*}
\]

3.3 Syntactic factors. The phonological factors discussed above can be viewed as necessary but not sufficient conditions for sandhi to occur. Another factor involved in the sandhi process is the syntactic structure. The syntactic structure influences which words are paired closely with other words. For example, a noun and modifying adjective are both within the same syntactic constituent, the Noun Phrase, and are closely bound semantically. As a result, a pair of words of this sort constitute a phonological phrase. The timing between syllables (whether the syllables are linked rapidly or slowly) greatly influences the occurrence of sandhi. For example, in Mandarin, two third tones occurring together produce sandhi on the first (see (26) above). The rate of speech threshold which will produce sandhi in different syntactic positions differs for each speaker and in different circumstances. In Wuming Zhuang, we believe the rate of speech between two syllables
is definitely a factor. In Mandarin, however, in a string of three tones, all the preceding third tones can change, leaving only the last tone unchanged. Mandarin sandhi can occur across syntactic boundaries. In very rapid speech the following can occur:

(35) \[ ba^{112} shui^{312} guo^{312} gei^{112} wo^{i} \]

PTC fruit give me
Give me the fruit.

\[ [s[mp[obi mrkr ba][n shui-guo]][vp[v gei]][n wo]] \]

In Wuming Zhuang, the syntactic conditions for sandhi are somewhat stricter. Using the notation of X-bar syntax, the syntactic condition for sandhi can be stated as:

(36) If two syllables occur together under an \( X \) constituent (where \( X \) can be Noun, Verb, Preposition, etc.) with the structure

\[
\begin{array}{c}
X \\
\alpha_1 \\
\alpha_2 \text{(where } \alpha_1, \alpha_2 \text{ are terminal nodes and } x, y \text{ are not phrasal, } x^* \text{ or } x^*, \text{ etc.)}
\end{array}
\]

Then \( \alpha_1 \) can undergo sandhi.

In no other syntactic configurations can sandhi take place. The following two sentences are examples:

(37) a. \( te^{i} pai^{l} ya^{113} saw^{l} \)

he go read book
He goes to look for books.

b. \( te^{i} pai^{l} saw^{113} kun^{l} \)

he go read book Chinese
He goes to look for Chinese books.

\( 1/3 \) indicates a sandhi change from tone 1 to 3. According to the rules posited in the phonological section, in each sentence any of the words except the last could change. However, the syntactic structure restricts

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sandhi. Only when both the syntactic and phonological conditions are met, does sandhi occur. The structures of these two sentences are:

(38) a.

\[ S \]

\[ N' \]

\[ V' \]

\[ V \]

\[ N \]

\[ te^{i} pai^{l} ya^{113} saw^{l} \]

b.

\[ S \]

\[ N' \]

\[ V' \]

\[ V \]

\[ N' \]

\[ ADJ \]

\[ te^{i} pai^{l} ya^{l} saw^{113} kun^{l} \]

In each sentence, the sandhi takes place whenever the constituents are related in the manner demonstrated in (36). In (37a) it is under \( V' \); in (37b) it is under \( N' \). As another example, take the following two sentences with verb combinations:

(39) a. \( wun^{114} sai^{i} pai^{l} sai^{113} na^{2} \)

person male go plough field
The men go to plough the field.

b. \( te^{i} ma^{l} ku^{l} \)

he come back eat
He comes back to eat.
In (39a) the first verb in the verb combination *fai*13 *na*2 changes, but the first verb in the combination *ma*1 *kui*1 of sentence (39b) does not. We can see why in the following diagrams.

(40) a.

(42)

\[ S \]

\[ \alpha_2 \text{ in (42)} \text{ changes because it occurs under the structure (36).} \]

Another interesting phenomenon in Zhuang can be seen in the following examples:

(43) a. *te*1 *tok*910 *saw*1 *?dai*1

he read book good
It’s good that he goes to school.

b. *te*1 *tok*9 *saw*113 *?dai*1

he read book good
He reads good books.

Although the lexical items and word order are the same, the meaning is quite different. The difference is signaled on the surface by sandhi. Consider the syntactic structures of (44ab):

(44) a.

(41) a. *mu*1 *ro*1 *pai*1 *kau*1 *pai*113 *ma*1

you descend go I go back
You go down, I go back.
4 Exceptions

4.1 Lexical factors. In Wuming Zhuang there are certain words that can undergo sandhi in combination with any tone. These particular words are ones that are very frequently used, or are used as a sort of prefix with other words. For example, \( ta^6 \) is a word meaning 'young female'.

\[
\begin{align*}
\text{(46)} & \quad ta^{614} lau^1 \quad \text{‘granddaughter’} \\
& \quad ta^{614} hai^2 \quad \text{‘maternal aunt’} \\
& \quad ta^{614} pa^3 \quad \text{‘maternal aunt’} \\
& \quad ta^{614} kim^4 \quad \text{‘aunt (wife of mother’s brother)’} \\
& \quad ta^{614} ni^5 \quad \text{‘little girl’} \\
& \quad ta^{614} yai^6 \quad \text{‘second daughter’} \\
& \quad ta^{614} tiak^8 \quad \text{‘horrid girl’} \\
& \quad ta^{614} hek^7 \quad \text{‘girl guest’} \\
& \quad ta^{614} fat^7 \quad \text{‘seventh daughter’} \\
& \quad ta^{614} luck^9 \quad \text{‘girl from the mountains’} \\
& \quad ta^{614} mek^{10} \quad \text{‘the wheat girl’} \\
& \quad ta^{614} sak^9 \quad \text{‘the girl pickpocket’}
\end{align*}
\]

In Zhang (1983), other words are cited which undergo sandhi in combinations with any other tone.

\[
\begin{align*}
\text{(47)} & \quad me^6 \quad \text{‘mother’} \\
& \quad po^6 \quad \text{‘father’} \\
& \quad luk^9 \quad \text{‘small child’} \\
& \quad ta^5 \quad \text{‘number … .’ (as in ‘number 1’, etc.)}
\end{align*}
\]

An obvious reason for sandhi of this sort is close cognitive association. This particular class of words is used often, closely associated with many other words, forming word groups of sorts. An interesting fact about this class of words, though, is that they are all of tone value 33 (6, 9, 9') or tone value 21 (2). Why this is so is not clear at present.

4.2 Syntactic factors. Consider the following two examples.

\[
\begin{align*}
\text{(48)} & \quad \text{a. yan}^{214} \text{ fan}^1 \text{ yan}^{214} \text{ kja}^3 \text{ fug}^3 \text{ mi}^2 \\
& \quad \text{money real money false all have} \\
& \quad \text{There is both real and false money.}
\end{align*}
\]
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b.\text{\textit{ram}}^{214} \text{\textit{kim}}^{1} \text{\textit{nau}}^{2} \text{\textit{ram}}^{214} \text{\textit{tit}}^{7} \\
house \text{gold or} \ house \text{iron} \\
gold \text{house or iron house}

In each of these examples, the first word undergoing sandhi does so according to the above-mentioned phonological and syntactic rules, but the second word undergoing sandhi does so in violation of the phonological conditions. In (48a) and (48b) \textit{gan}^{2} and \textit{ram}^{2} change before tone 1 according to Rule 1. But they also change before tones 3 and 7, respectively. This is because these sentences are of the form

\[(49) \ \sigma_1 + \sigma_2 \ldots + \sigma_1 + \sigma_n\]

where \(\sigma_1 + \sigma_2\) fit the phonological conditions for change, but \(\sigma_1 + \sigma_n\) do not. The \(\sigma_1 + \sigma_n\) change occurs presumably to match the change in the beginning. In addition to form (49), the following form also causes sandhi on both \(\sigma_1\)'s:

\[(50) \ \sigma_1 + \sigma_n \ldots + \sigma_1 + \sigma_2\]

where the conditions of (49) are the same for (50).

In the syntactic structure (36) if \(\sigma_2\) is a pronoun, \(\sigma_1\) does not change.

Take, for example, the following two phrases:

\[(51) \ \text{\textit{ra}}^{1} \text{\textit{kau}}^{1} \]
look for me

\[(52) \ \text{\textit{ra}}^{13} \text{\textit{kau}}^{1} \]
look for vine

\textit{kau}^{1} has two meanings, ‘I/me’ and ‘vine’. When \textit{kau}^{1} ‘I/me’ is used, no change occurs. When \textit{kau}^{1} ‘vine’ is used, change occurs.

A final exception to be noted is the sandhi occurring on the verb \textit{tu\textcircled{9}} to be’. In most sentences, \textit{tu\textcircled{9}}, even under the proper phonological and syntactic conditions, does not undergo sandhi. However, in passive sentences, sandhi does occur.

\[(52) \ \text{\textit{a}}^{12} \text{\textit{nai}}^{4} \text{\textit{tu\textcircled{9}}}^{9} \text{\textit{mau}}^{4} \]
CLF this is pig

This is a pig.

The non-passive sentence (52a) has no change, whereas the passive (52b) does.

5 Conclusion

Although there is much research yet to be done on Zhuang tone sandhi, especially with regard to the many varieties of Zhuang, we have found from initial research that the geometrical structure of Zhuang tones is hard-and-fast, being little affected by the edges of neighboring tones. In addition, the syntactic structure plays an important role in determining tone sandhi. In Shuangqiao Zhuang the syntax (in addition to the phonological component) seems to determine almost completely the occurrence of sandhi. However, as mentioned above, the other two varieties discussed may be influenced less directly by the syntax, and more by the mapping of the syntactic component onto the metrical structure of the language. Much more work needs to be done in this area.

In comparing the three varieties of Zhuang it is interesting to note the differences in tone sandhi. The sandhi structure for each as represented in (13), (17), and (21) is different. Shuangqiao Zhuang, unlike the other two, depends on the following tones with regard to sandhi. The relationship between the historical development of these varieties and the differences in sandhi may be an interesting topic to pursue.

Appendix: Examples of tonal combinations

(Tone 1 + tone n)

\[\text{\textit{kau}}^{1} \text{\textit{tau}}^{3} \text{\textit{nai}}^{3} \text{\textit{ya}}^{13} \text{\textit{kim}}^{1}\]
I come here look gold
I came to look for gold.

\[\text{\textit{kau}}^{1} \text{\textit{pet}}^{8} \text{\textit{tim}}^{3} \text{\textit{fuy}}^{4} \text{\textit{tau}}^{3} \text{\textit{fuy}}^{3} \text{\textit{ba}}^{3} \text{\textit{yan}}^{13} \text{\textit{wun}}^{2}\]
I eight point clock come even not see person
I didn’t see anybody even though I came as early as eight.
luk⁶⁷⁸⁴ ye² te¹ han¹ kw¹ pin⁴ child his likes eat cakes
His child likes to eat cakes.

ʔdum¹ nai⁴ ʔdum¹ ʔfiː⁷
month this month festival
This month is a festival month.

te¹ hat⁷⁷⁷⁷ naŋ² kw¹ ʔfuk⁷³
he every morning eat porridge
He eats porridge every morning.

hun¹ pla¹ ʔdam¹ fai⁴
go up hill plant tree
Go up the hill to plant trees!

au⁴ ʔlap¹ ma¹ timg³ tag¹
get wax return ignite lamp
Get some wax as a light.

hau⁴ ʔfum³ teŋ¹ ʔfum¹ ya² teŋ³ teu² lo⁶
rice all suffer rain sudden flush away PTC
The rice has been washed away by a shower.

kai³ kw¹ naŋ¹ mak⁸
do not eat skin fruit
Don’t eat the rind.

te¹ ʔbau³ mi² yan² ʔjui⁴ pin⁴
he not have money treat illness
He doesn’t have money to treat his illness.

tu²⁷³ ma¹ ʔkia³⁹ nai⁴ pur¹ ʔbau³ ʔdai³ lo⁶
CLF dog paralyzed this run not okay PTC
This paralyzed dog cannot run now.

yau² au⁴ yan⁴ ʔmak⁹ ma¹ ku⁶⁴ mak⁹
we use stone ink to make ink
We make ink with an ink stick.

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(Tone 2 + tone n)

yau² te¹ tuk⁵⁷⁵ yau² yan¹ yin¹
house his is house stone
His house is a stone house.

yau² kau⁴ tuk⁵⁷⁵ yau² yan⁴ ʔkja³
house my is wall house
My house is an earthen wall house.

ʔbau¹ nai⁴ tuk⁵⁷⁵ ʔbau⁴ tuk⁹ ʔyan³ kja³
piece this is not is money false
Is this false money?

ki³ nai⁴ taː⁷⁷⁷⁴ teŋ² taː⁷⁷⁷⁴ ʔfum³ mi²
place this table bronze table iron all have
There are both bronze tables and iron tables here.

wun⁷⁷⁷⁴ ʔkik⁷⁷⁵ ʔtung⁴ ʔtik⁸
person lazy stomach hungry
A lazybones is often hungry.

pau¹ ʔbau³ pau¹ jau² yan⁴
go not go swim water
Are you going swimming?

toi³ hai³ nei⁴ mu² fai¹⁰
pair shoe this rub sock
This pair of shoes wears out socks.

yan² nai⁴ mi² yam² ?i⁵
day this has wind small
There is a breeze today.

wun⁷⁷⁷⁴ ʔjak³ fi³ ʔjum³ nai⁴ kai³
person evil only manner this talk
Only an evil person talks this way.

jau² tu⁶ ham¹ yam⁴
oil bean comparatively fragrant
Soy-bean oil smells more delicious.
te¹ mi³ sog¹ to³ hai² ku³ kijk³
he has two pairs of shoe wood shoe
He has two pairs of wooden shoes.

kau¹ mi² sog¹ tu² waj² tak³
I have two CLF buffalo male
I have two male buffaloes.

(Tone 3 + tone n)

yau² taŋ² jin¹ jau⁶ ka³ mau¹
we arrive spring festival just kill pig
We'll kill the pig as soon as spring festival arrives.

sai² lau² huo³ taŋ² ha⁶
time which start class PTC
When does the class begin?

na³ tin³ ho³ jau³ yai³ jai⁴
face short hard see much
A short face looks very ugly.

an¹ nai⁴ tuk⁹ ?wam³ tî³ STCLF this is bowl iron
This is an iron bowl.

kai³ ku¹ fuk⁹ sap⁷
do not eat porridge cold
Don't eat cold porridge!

au¹ bû³ yam⁴ ma¹ jau⁴
use pot water return contain
Get a water pitcher to hold it.

yau² hâm⁶ nag⁷ tim³ lap¹⁰
we every evening ignite wax
We use wax as a source of light every evening.

mûŋ² ku¹ ?bau³ ku¹ jau³ kai⁵
you eat not eat head chicken
Do you eat chicken heads?

au¹ fai¹ ma¹ fui² sap⁹
use fire return burn roach
Burn the roaches with fire.

tu² yo³ nai⁴ tat⁷ fui² lo⁶
CLF bird this cut wing PTC
The wings of this bird have been cut off.

tel jau⁵ la³ fai³ tag¹ luk⁹
he at under tree wait child
He was waiting for his child under the tree.

(Tone 4 + tone n)

pi¹ nai¹ mi³ yam⁴ huo¹ pu⁶
year this have water big PTC
Mind you, there are floods this time of year.

kun² jiu³ jin³ tuk⁹ hai⁴ jiŋ²
above grass all is dung sheep
There is sheep dung all over the grass.

tu² hong² nai⁴ tuk⁹ ma⁴ to³
CLF red one is horse local
This red one is a local horse.

kai³ au¹ ki³ yam⁴ kijk² lo⁶
do not want CLF water sediment PTC
Don't keep this sedimentary water!

kai³ hau³ tu² kai⁵ sai⁴ plak⁷
Do not let CLF chicken peck vegetables
Don't let the chicken peck the vegetables.

kau¹ ?bau³ mi⁴ gan² fau⁴ hau⁴ lo⁶
I not have money buy rice PTC
I've run out of money to buy rice.

wau¹ au¹ jin³ tom¹ ma¹ lum⁴ mek¹⁰
quick get earth return cover wheat
Be quick to cover the wheat with earth.
Wil C. Snyder and Lu Tianquiao

ma⁴ ²i³ ³bau³ mi⁴ mi⁴ yeg²
horse small not have strength
A small horse is not powerful.

la³ ³fug² ³fug³ ³tuk⁹ ³hai⁴ ³sap³
under bed all is droppings roach
There are roach droppings all under the bed.

kau¹ si⁵ fu³ ma⁶
I want buy cap
I want to buy a cap.

fai⁴ kwak⁹ ku⁷ ³bau³ ³dai¹
tree crack make table not good
Cracked wood is not good for making tables.

ko¹ fai⁴ luk⁶ nai⁴ ma³ ³dai³ waï⁵
CLF tree child this grow obtain fast
This tree shoot grows fast.

(Tone 5 + tone n)

tei¹ tai³ ³jou³ ³fug³ ³ti⁵ ³bau³ ³yan¹
he even strike gong even listen not see
He can't even hear the striking of a gong!

pái¹ au¹ fai⁴ to⁵ taj²
go get wood make table
Go get some wood to make a table!

kaï³ to³ ³ham³ ³dai¹ kwu¹
chicken local more good eat
Home bred chicken tastes better.

Tú² lau² tu² ³han³ pau⁴
CLF which is goose male
Which is a gander?

te¹ wa³ ³le:k¹⁰ ³fug³ tan³
he pants split even wear
He even wears split pants!

an¹ yai¹⁵³ kaï³ nai³ ³jou³ ³dai³
CLF egg chicken this small much
This egg is too small.

fu³³ an¹ ³kai³ ³ye:k³ ³fau³ ³dai³
put CLF rack pan just okay
It'll be okay to just put up a pan rack.

yau² pail² ³hen² ³swi³ ³pu³
we go side river wash clothes
We go to the river to wash clothes.

¿jau² nai³ ³swi³ waï⁹
at here wash dipper
Wash the wooden dipper here.

kau¹ pail² kaï¹ fai⁴ kai³ lu²
I go street buy chicken child
I'm going downtown to buy some young chickens.

(Tone 6 + tone n)

no⁶¹ ma³ ³dai¹ ³fau³ ³pan³
meat pig fat much not good
Pork that's too fat is not good.

kai³ ³jau³ ³dau¹ ³ym³ ³fau³ ³dai³ ³laï³
do not at inside water put in oil
Don't put oil into the water!

tan³ ³pu³ ³ti⁵ ³fau³ ³dai³ ³lo³
wear clothes short just okay PTC
It'll be okay to just put on a short jacket.
kau¹ han³ ku¹ no⁶⁴ ʔjip⁷
I like eat meat pickled
I like to eat salted meat.

yai⁶ plak⁷ hau⁵ la³
plot vegetable dry PTC
Is the vegetable plot dry yet?

hu² plai⁶ kwai⁹ ʔai⁴
go up hill dig tree
Go up to the hills to dig trees!

ʔdau¹ hau⁴ mi⁶ se⁶ me:k¹⁰
inside rice have grain wheat
There are wheat grains in the rice.

wa:i⁵ tau² pau⁴ ʔak⁹ ʔe⁷ ke⁵ ha⁴
quick hold CLF thief old PTC
Be quick to catch that hardened thief.

au¹ ti:i⁷ ma¹ ku⁶⁴ ʔe:k⁸ ʔdai¹
get iron return make pan good
It's good to make cooking pans with iron.

au¹ ki²ma² tau³ mu⁶⁴ mi:n⁶
get what come grind wheat
What shall I use to grind the wheat?

yau² au¹ jai³ ku⁶⁴ ʔak⁹
we use straw make rope
We make ropes with straw.

fau⁴ ti¹ no⁶⁴ ʔuk⁹ ma¹ ku¹³ ʔai²
buy some meat cooked return eat lunch
Go buy some prepared meat for lunch.

References