Complex tone sandhi types in the Chinese Wu dialect of Huangyan

The alteration of tones in specific phonetic contexts, namely tone sandhi, often displays asymmetry: one tone changes and another remains unchanged. This asymmetry helps to understand how phonology represents and assesses tonal sequences. This study examines tone sandhi patterns for disyllabic words in the Sinitic Southern Wu dialect of Huangyan (黄岩), which typically shows right-dominance—tones on final syllables remain unchanged while those on initial syllables change following complex sandhi rules (Rose & Yang, 2023). However, exceptions include left-dominance (only final tones change), both-change (both initial and final tones change), and no-change cases. These exceptions can be systematically explained by a sandhi system that considers positional restriction (i.e., right-dominance) and tonal constraints.

Background. Huangyan Wu has eight tones in monosyllabic words (Table 1; modified slightly from van de Weijer et al., 2023), represented using Chao's five-point tone letters (Chao, 1930): high-mid falling 42, low falling 21, high falling 51, mid falling 31, high level 55, low rising 13, short high 5, and short low 2. These tones fall into four Middle Chinese tonal categories, each with one tone in the high register (*yin*; T1, T3, T5, T7) of modal phonation, and another in the low register (*yang*; T2, T4, T6, T8) of breathy phonation.

Regular tonal behaviors. We build on the first sketch of Huangyan sandhi by Qian (1992) and limit our investigation to disyllabic lexical nominals. Right-dominance is the most common sandhi type; strikingly, all four types (right-dominance, left-dominance, both-change, no-change) are observed in Huangyan. Notably, three regular tonal behaviors occur in disyllabic words: 1) Short high /5/ (T7) consistently changes to short low /2/ (T8) word-initially; 2) High level /55/ (T5) and short low /2/ (T8) remain stable word-initially, with most left-dominant sandhi cases featuring the word-initial high level /55/ that triggers tonal spreading; 3) Falling tones (T1, T2, T3, T4) and rising tone (T6) neutralize to level tones in initial position due to the phonetic motivation that non-final syllables, having shorter duration, cannot bear tonal contrasts involving contours (Zhang, 2002).

Explaining irregularity. Irregular tonal bahaviors can be explained using five phonological constraints in Table 4 that assess tone sequences regarding Register and Contour in the tonal representation, following Bao (1990, 1999). Most of these constraints resemble the Obligatory Contour Principle (Leben 1973; Yip 1988), either at the Contour or Register level. For example, in the word *ɲiŋ βəʔ* /21+2/ 'figure', the initial tone changes to [22+2] following positional sandhi, but further changes to [22+3] to satisfy the contour constraint *LL+L(L).

Implication. The tone sandhi system in Huangyan Wu is phonetically motivated, with regular sandhi rules transforming word-initial contour tones to level tones. Exceptions arise from the stability of specific tones (e.g., T5 and T8) or the need to satisfy contour constraints on output tones. Words with both initial and final tonal changes are explained by a mechanism where the dominant final tone requires further change to satisfy contour constraints. Words with no tonal changes inherently meet all constraints, hence, do not undergo sandhi.

Table 1. Base tones in Huangyan Wu (T for tone; rows for register; columns for tonal category)

Register	Macro tonal categories			
	I (*ping*)	II (*shang*)	III (*qu*)	IV (*ru*)
a. high (*yin*)	T1 /42/ high-mid falling [toŋ^{42}] 'east'	T3 /51/ high falling [toŋ^{51}] 'understand'	T5 /55/ high level [toŋ^{55}] 'freeze'	T7 /5/ short high [toʔ^{5}] 'supervise'
b. low (*yang*)	T2 /21/ low falling [d̰o̤ŋ^{21}] 'same'	T4 /31/ mid falling [d̰o̤ŋ^{31}] 'move'	T6 /13/ low rising [d̰o̤ŋ^{13}] 'hole'	T8 /2/ short low [d̰o̤ʔ^{2}] 'read'

Table 2. Tone sandhi in Huangyan Wu of all tonal combinations (unchanged syllable in bold)

Sandhi type	Right-dominant	Left-dominant	Both change	No change	Total
Example	xəʔ mi 'black rice' /5 31/ [2 **31**]	tɕiŋ mjɛ 'facade' /55 13/ [**55** 55]	tsjəu ljo 'tavern' /51 21/ [55 51]	loʔ iŋ 'record' /2 42/ [**2 42**]	
Count	32 (50%)	6 (9.4%)	14 (21.9%)	12 (18.8%)	64

Table 3. Behaviors of basic tones in Huangyan Wu (unchanged/dominant syllable in bold)

σ1 \ σ2		T1 /42/	T2 /21/	T3 /51/	T4 /31/	T5 /55/	T6 /13/	T7 /5/	T8 /2/
I	T1 /42/	[35-**42**]	[33-51]	[33-**51**]	[33-**31**]	[33-**55**]	[33-55]	[33-**5**]	[33-3]
	T2 /21/	[25-**42**]	[22-51]	[33-**51**]	[33-**31**]	[22-**55**]	[22-55]	[22-**5**]	[22-3]
II	T3 /51/	[33-**42**]	[55-31]	[33-**51**]	[33-**31**]	[22-**55**]	[22-**13**]	[22-**5**]	[22-3]
	T4 /31/	[33-**42**]	[55-31]	[33-**51**]	[33-**31**]	[22-**55**]	[22-**13**]	[22-**5**]	[22-3]
III	T5 /55/		[**55**-31]				[**55**-55]		[**55**-3]
	T6 /13/	[33-**42**]	[33-31]	[33-**51**]	[33-**31**]		[**13**-55]	[33-**5**]	[33-3]
IV	T7 /5/	[2-**42**]	[**5**-51]	[2-**51**]	[2-**31**]	[2-**55**]	[2-**13**]	[2-**5**]	[2-3]
	T8 /2/		[**2**-51]						[2-3]

Table 4. Contour and Register constraints for Huangyan Wu

Constraints	**Definition**	**Examples**
1 *FALL FALL	Avoid consecutive falling tones	T1+T3: /42 51/→[33 51]
2 *RISE RISE	Avoid consecutive rising tones	T6+T6: /13 13/→[13 55]
3 *FALL RISE	Avoid rising tones after falling tones	T4+T6: /31 13/→[22 13]
4 *LL+L(L)	Avoid a streak of low-register tones (1 or 2)	T2+T8: /21 2/→22 2→[22 3]
5 *(H)H+LL	Avoid a tone with low-register onsets and offsets (1 or 2) after a tone with a high-register offset (3, 4, or 5)	T6+T2: /13 21/→33 21→[33 31]

References

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