In TONAL CHANGE AND TONAL NEUTRALIZATION, Mouton

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Common tone sandhi processes across Sino-Tibetan languages

Abstract: The present study aims to uncover similar patterns in tone sandhi processes that recur across prosodically diverse languages of the Sino-Tibetan family. On the one hand, the Sinitic branch of the family, comprised of Chinese "dialects," has lexical tone specified on almost all syllables. On the other hand, western Tibeto-Burman languages typically exhibit sparse tone specification. In spite of these differences, it is argued herein that across both groups of languages, dominant spreading tones are aligned with the left edge of the prosodic unit, and spread rightward. On the other hand, while dominant non-spreading tones in Sinitic are aligned with the right edge of their domain, Tibeto-Burman languages display variable placement of such tones. Support for this typology comes from both previously published work, as well as recent fieldwork by the author. In addition to previously mentioned explanatory principles that could contribute to the observed typology, it is proposed that the accent-like properties of dominant tones play a role, as well as typical word length and the language-specific historical path of tonogenesis. After presenting evidence from Sino-Tibetan languages, additional support for the typology is drawn from geographically distant, unrelated languages.

Keywords: dominant tones, tone spreading, accent, typology, Tibeto-Burman languages

Note: I would like to thank the audience at the 3rd International Conference on Phonetics and Phonology at the National Institute for Japanese Language and Linguistics for their comments, and also the Ministry of Science and Technology (Taiwan) for funding this research (100-2628-H-001-008-MY4). Helpful comments on earlier drafts were given by (alphabetically listed) Katia Chirkova, Larry Hyman, Guillaume Jacques, Haruo Kubozono, Yuwen Lai, Martine Mazaudon, Alexis Michaud, Clemens Poppe, Mark Post, Ruiqing Shen, Nathaniel Sims, Nathan Straub, Jackson T.-S. Sun, Amos Teo, Jie Zhang, and by two anonymous reviewers. Remaining errors are mine alone.

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https://doi.org/10.1515/9783110567502-010

1 Introduction

East Asian tone systems are known for their larger tonal inventories (3 to 11 contrastive tones), for specifying tone on nearly every syllable, for contour tones that function as units, for a lack of floating tones, etc. (cf. Yip 2002; Chen 2007, Brunelle & Kirby 2015; among others). These features tend to be found among Sinitic languages (Chinese "dialects"), Tai-Kadai, Vietnamese, the Yi-Burmese branch of Tibeto-Burman,[1] etc. Most languages in the large Sino-Tibetan family are tonal, and "all branches of the family have at least some tonal members" (Matisoff 1999). For languages of Mainland Southeast Asia, "monosyllabic languages tend to have more tones than sesquisyllabic or polysyllabic languages," while 20 % of languages surveyed do not display tonal distinctions (Brunelle & Kirby 2015).

In spite of the ubiquity of tone systems, there is no agreed-upon reconstruction of tones at the level of Proto-Sino-Tibetan despite several attempts (Benedict 1972, Weidert 1987). Although tone systems have been reconstructed for some subfamilies, evidence for an even earlier tone system is inconclusive (Mazaudon 1985, 1988; Matisoff 1994). On the Sinitic side, it is widely held that Old ("Archaic") Chinese did not have tones (Pulleyblank 1962; Mei 1970; Baxter 1992). The first description of a tonal system in Chinese dates to the early 6th century AD.

Recent documentation of Sino-Tibetan languages spoken in the Himalayan mountains, to the west of the abovementioned languages, yields descriptions of languages with tonal inventories and properties quite different from those found in Sinitic, Tai languages, etc. Among these languages one finds patterns that are common among Bantu languages and Japanese dialects, such as: smaller inventories of just one to two underlying tones, toneless lexical syllables, floating tones, contours consisting of a sequence of level tones, morphological tones, etc. (Matisoff 1999; Evans 2008; Hyman 2010). Within this paper, these are termed western Tibeto-Burman languages in order to differentiate them from the more monosyllabic "Sino-spheric" Tibeto-Burman languages (Matisoff 1994, 1999).

In spite of these phonological differences, there are commonalities in the patterns of tone reduction that occur due to tone sandhi. That is, across this large group of languages, there is a tendency for certain tones or tone bearing units (TBU) in a prosodic unit to be privileged and keep their underlying tonal values, while other syllables undergo tonal changes. For the purposes of this

1 I do not assume that the Sino-Tibetan language family was historically bifurcated into a Sinitic branch and a Tibeto-Burman branch. However, given the typological differences between Sinitic languages and the rest of the family, the term "Tibeto-Burman" is used herein as a shorthand notation for "the non-Sinitic languages of the Sino-Tibetan family."

study, "tone sandhi" refers to this kind of change. Privileged or dominant tones (Zhang 2007) affect the larger prosodic word or phrase in characteristic ways, depending on whether they are located with reference to the left or right edge of the prosodic unit.

This study begins with Zhang's (2007) observations on the tone sandhi asymmetries found in Chinese dialects, and asks whether those asymmetries are also found in western Tibeto-Burman languages. Zhang observes that left-dominant and right-dominant tone sandhi systems have different tendencies. Namely, in left-dominant tone sandhi, the tone of the initial syllable typically extends rightward to assign pitch to additional syllable(s) in the prosodic domain. On the other hand, the tendency for right-dominant sandhi is for earlier tones to be replaced by paradigmatic insertion. Zhang expresses the tendencies as typological universals, which he summarizes roughly as follows:

In a Sinitic language with both left-dominant and right-dominant tone sandhis:

- If the left-dominant sandhi involves paradigmatic insertion, then the right-dominant sandhi also involves paradigmatic insertion;
- If the right-dominant sandhi involves tone extension, then the left-dominant also involves tone extension.

For many tonal languages in this family, within a prosodic unit, a particular location, tone, or tone-bearing unit (TBU) is privileged for the realization of its specified pitch, while other locations/tones undergo changes. This privileged status has been called prosodic headedness (Yip 2002: 176), dominance (Zhang 2007), etc. It is the claim of this present study that among Sino-Tibetan languages, there are two principal ways in which the dominant tone is expressed, with different word-level properties ensuing. First, some tone systems align the privileged tone with regard to the left edge, in which case, tonal influence tends to spread rightward (Sec. 2). There do not appear to be any uncontroversial cases within Sino-Tibetan of spreading tones associating with the right edge and spreading leftward. Second, within Sinitic languages, non-spreading dominant tones display a strong tendency to be located at the right edge; however, within Tibeto-Burman languages, these tones can be located anywhere within the word (Sec. 3). In this kind of sandhi, pitch is assigned to non-dominant syllables paradigmatically.

I want to be explicit about the claim that similar processes are at work in spite of the fact that in Sinitic, tone is specified on nearly every syllable, while many western Tibeto-Burman languages have very low lexical "tonal density" (Gussenhoven 2001; Hyman this volume), in which tone may be specified as seldom as once per polysyllabic prosodic word. The types of dominant tone sandhi observed in Sinitic cause Sinitic tone patterns at the phonetic level to resemble the sparsely

specified tone systems of western Tibeto-Burman. Because this surface resemblance exists in spite of vastly differing lexical inputs and language histories, this study seeks shared phonetic and phonological explanatory principles.

Among the Sino-Tibetan languages, tone systems arose at diverse times and places, within multiple sub-families. In spite of divergent language histories, and despite more sparsely specified tone systems among western Tibeto-Burman languages, similar tone reduction processes are found in both Tibeto-Burman and Sinitic.

This finding suggests that the tone sandhi processes that are common to both language groups should reflect general phonetic and phonological principles, as well as common historical trends (Sec. 4). These principles can be seen to also affect tone sandhi in languages elsewhere in the world (Sec. 5).

2 Spreading dominant tones

Although there is a strong preference for rightward spreading of tones, Zhang (2007) discusses two Sinitic cases in which tones appear to spread leftward. First, in the Southern Wu dialect Wenzhou, in disyllables with a falling tone on the second (final) syllable, the word is sometimes pronounced with a contour that falls over both syllables, suggesting leftward spread of the tone (analysis based on Zheng-Zhang 1964). However, based on his own fieldwork corpus, M. Chen (2007: 476–490) argues that Wenzhou surface tones on disyllables result from interaction between both the initial and final syllable. Thus, whether Wenzhou has leftward spreading is inconclusive.

Second, tone sandhi in Danyang, a Wu dialect of Jiangsu, is typified by rightward spreading of the leftmost tone (Lü 1980, cited in Zhang 2007 and M. Chen 2007: 325–341 and also in references in both later publications). However, for Danyang words ending in a final Mid tone, all preceding syllables are also Mid-toned. As this is the only example cited of leftward spreading in this language, it is difficult to rule out a contrary analysis of paradigmatic replacement by a mid tone, which may turn out to be a default specification. With the acknowledgment that the two documented cases of leftward tone spreading are problematic, we make the following claim for Sino-Tibetan tone sandhi:

Claim 1: If a tone spreads, then it is aligned with the left edge of its prosodic domain, and spreads rightward.

One reviewer asked if the underlying form is /Ø-L/ and the surface form is [L-L], how would one decide whether the tone had aligned left and spread rightward, or if it had simply spread leftward from its original position. For the languages

examined in this study, unambiguous cases, such as those of Shixing (above) are used to resolve the ambiguous ones.

Claim 1 allows for non-spreading dominant tones also to be aligned at the left edge of their prosodic domains.

Left-dominant spreading tone systems are found among the Northern Wu dialects of Chinese and among Tibeto-Burman. Shanghai, a dialect of Northern Wu, presents a well-documented case of left-edge dominant tone, operating at the lexical level (cf. Zee and Maddieson 1979; Duanmu 1999, Yip 2002:187, M. Chen 2007:307, Y. Chen 2008, Zhu 1999, 2006, among others). Table 1 presents Zee and Maddieson's (1979) analysis of Shanghai tone spreading (Some phonetic details related to the effect of [ʔ] on pitch have been left out of the table):

Tab. 1: Shanghai lexical tone spreading (Zee and Maddieson 1979: 116–117)

T	σ	σ σ	σ σ σ	σ σ σ σ
/HL/	[HL]	[H.L]	[H.M.L]	[H.M.L$^{\uparrow}$.L]
/MH/	[MM$^{\uparrow}$]	[M.M$^{\uparrow}$]	[M.H.L]	[M.H.M.L]
/LH/	[LM$^{\uparrow}$]	[L.M$^{\uparrow}$]	[L.H.L]	[L.H.M.L]
/Hʔ/	[H]	[H.H]	[H$^{\downarrow}$.H.L]	[H$^{\downarrow}$.H.M.L]
/LHʔ/	[LM$^{\uparrow}$]	[L.LM$^{\uparrow}$]	[L.L.LM$^{\uparrow}$]	[L.H.M.L]

According to Zee and Maddieson (1979), Duanmu (1999) and Y. Chen (2008), for words of three or more syllables, all syllables after the second receive default tone assignments, moving toward L. That is, the tone of the initial syllable in Shanghai spreads over one disyllabic foot, and underlying tones on later syllables in the word are not expressed. Zhu (2006) calls this left-aligned dominant tone spreading "Type A" sandhi in Shanghai (also cf. Xu, Tang, and Qian 1981–3; Xu and Tang 1988)). Zhu (2006) also documents a right-edge based tonal reduction ("Type B") which occurs at the phrasal level, and is presented in Sec. 3.

Although N. Wu appears to be the only documented left-dominant Sinitic language, left-dominant tone reduction is common among non-Sinitic languages. Among these languages, the distance that a spreading tone can travel is a variable that ranges from a single syllable, to spreading all the way to the right edge of the word. In Shixing (or Xumi, Qiangic, Sichuan, China; ISO 69-3: sxg), lexical tones (H, L, HL) spread rightward from the leftmost syllable all the way to the right edge of the prosodic word, as in Tab. 2. Tones /L, HL/ merge to /L/ in polysyllables, and an all /L/-toned word has postlexical /H/ added to the rightmost syllable. In this respect, Shixing resembles the N. Wu dialect Wuxi, in which an initial HHL tone is replaced by LLH, which then spreads rightward (Chan and Ren 1988).

Tab. 2a: Schematic of Shixing tone spread

$\sigma_1 \setminus \sigma_2$ (σ_3)	/H/	/L/	/HL/
/H/		/H/	
/L/		/L/	
/HL/		[L(L)H]	

Tab. 2b: Examples of tone spread in Shixing trisyllables (Chirkova and Michaud 2009, tone transcription slightly modified).

$\sigma_1 \setminus \sigma_2\sigma_3$	/k^ha^H-miæ/ 'footprint'	/$\underset{\circ}{m}$iæ^L-tsũ/ 'tail'	/ɲɜ^{HL}-mi/ 'heart'
/ʔɛ̃^{H}/ 'sheep'	[ʔɛ̃^{H} k^ha^H miæ^H]	[ʔɛ̃^{H} $\underset{\circ}{m}$iæ^H tsũ^H]	[ʔɛ̃^{H} ɲɜ^H mi^H]
/rõ^L/ 'horse'	[rõ^L k^ha^L miæ^H]	[rõ^L $\underset{\circ}{m}$iæ^L tsũ^H]	[rõ^L ɲɜ^L mi^H]
/bõ^{HL}/ 'yak'	[bõ^L k^ha^L miæ^H]	[bõ^L $\underset{\circ}{m}$iæ^L tsũ^H]	[bõ^L ɲɜ^L mi^H]

Although spreading as far as the third syllable is reported, Chirkova and Michaud state that Shixing demonstrates a tendency toward no more than two units in a prosodic word, with disyllables greatly prevailing in number over longer words. The left-edge alignment of tone is a strong enough constraint in Shixing that if the first syllable is a toneless prefix, then the tone of the second syllable is relocated to the left edge and spreads rightward, in the same way as an initial tone in a compound (Tab. 3).

Tab. 3: Left edge alignment and spreading of tone following prefix in Shixing

prefix		verb root		tone shift	tone spread	
/miæ-/	+	/ɕĩ^H/	→	/miæ^H-ɕĩ/	[miæ^H ɕĩ^H]	'look downward'
/k^hu-/	+	/dzõ^L-dzõ/[dzõ^L-dzõ^H]	→	/k^hu^L-dzõ-dzõ/	[k^hu^L-dzõ^L-dzõ^H]	'run inward'
/miæ-/	+	/kh$ɪ^{HL}$/	→	/miæ^L-xɪ/	[miæ^L xɪ^H]	'throw downward'

Evidence that the tone relocates to the first syllable, rather than spreading leftward, comes from the behavior of HL. The H does not spread leftward resulting in a HLL sequence. Rather, the entire /HL/ tone is linked to the first syllable, causing its tonal pattern to merge with that of L.

In the Muka dialect of Southern Qiang (Qiangic, Sichuan, China: ISO qxs), the tone of the first morpheme spreads rightward to the right edge of the prosodic word, which never exceeds four syllables (author fieldwork). Possible tones include L, H, HL, and LHL. Like Shixing, words receive a post-lexical H tone on the

rightmost syllable. In Tab. 4, /sé.ŋi/ [sé-ŋí] 'liver' occurs as the second element in compounds whose pitch patterns are determined by the tonal specification of the first morpheme.

Tab. 4: Left edge alignment and spreading of tone onto /sé.ŋi/ [sé-ŋí] 'liver' (Muka Qiang)

H	/ŋu^{H}-se^{H}.ŋi/	→	/ŋu^{H}-se.ŋi/	[ŋu^{H} se^{H} ŋi^{H}]	cow liver
L	/i^{L}-se^{H}.ŋi/	→	/i^{L}-se.ŋi/	[i^{L} se^{L} ŋi^{H}]	chicken liver
H.L	/ʐu^{HL}-se^{H}.ŋi/	→	/ʐu^{H}-se^{L}.ŋi/	[ʐu^{H} se^{L} ŋi^{L}]	horse liver
L.H.L	/ksə^{L}.zə^{HL}-se^{H}.ŋi/	→	/ksə^{L}.zə^{H}-se^{L}.ŋi/	[ksə^{L} zə^{H} se^{L} ŋi^{L}]	musk deer liver

For the Wadu, Dayang dialect of Pumi (Qiangic, Sichuan and Yunnan, China: ISO pmi), Daudey (2014) presents a tone system in which H, L, HL or LH spread rightward from the first morpheme of a noun or a verb to the rest of the prosodic domain, which can include disyllabic clitics. Table 5 illustrates tone spreading of mono- and disyllabic nouns and verbs. Illustrations of these forms as well as trisyllabic tone patterns may be found in Daudey (2014: 71–79).

Tab. 5: Rightward tone spreading of Pumi mono- and disyllables

/σ^{H}/	→	[σ^{H}σ^{H}σ^{L}]	/σ^{H}σ/	→	[σ^{H}σ^{H}σ^{L}σ^{L}]
			/σσ^{H}/	→	[σ^{L}σ^{H}σ^{H}σ^{L}]
/σ^{L}/	→	[σ^{L}σ^{L}σ^{H}] ~ [σ^{L}σ^{H}σ^{H}]	–		
/σ^{HL}/	→	[σ^{H}σ^{L}σ^{L}]	/σ^{HL}σ/	→	[σ^{H}σ^{L}σ^{L}σ^{L}]
			/σσ^{HL}/	→	[σ^{L}σ^{H}σ^{L}σ^{L}]
/σ^{LH}/	→	[σ^{L}σ^{H}σ^{H}]	/σσ^{LH}/	→	[σ^{L}σ^{L}σ^{H}σ^{H}]

Varying analyses for different dialects of Pumi tone are found in Matisoff (1997), Ding (2006), Greif (2010), and Jacques (2011). However, all studies of polymorphemic forms in Pumi show some kind of tonal alignment with the left edge of the prosodic unit, with rightward spreading of that tone which overrides other underlying tones.

Rightward tone spreading is also the norm in the Tamangic group (Bodish, Nepal), where tones also spread onto suffixes. Table 6 shows Manange (ISO nmm) tone spreading in disyllabic compounds; similar sandhi patterns are found in the other Tamangic languages (Tamang, Thakali, Gurung). Tamangic words can be longer than two syllables, especially when Nepali loan words are considered (Mazaudon 1973).

Tab. 6: Manange tone spreading (Hildebrandt 2005, tone marks adjusted)

L	[tʃʰi^{22}] 'lard'	[kju^{33}] 'water'	→	[tʃʰu^{22} ku^{21}] 'cooking oil'
HM	[nɑ^{53}] 'jungle'	[huŋ^{33}] 'copse'	→	[nɑ^{54}huŋ^{33}] 'forest'
ML	[mʷi^{42}] 'silver'	[ʃʌ^{22}] 'flesh' (?)	→	[mʷi^{32} ʃʌ^{21}] 'money'

Closely related to the Tamangic languages are the Tibetic languages. In Kami, a dialect of Khams Tibetan (Tibetic, Sichuan, China; ISO khg), the tone of an initial syllable spreads over a noun compound (K. Chirkova 2014); cf. Tab. 7

Tab. 7: Kami Tibetan tone spreading

/kɔ̃^{H}/	'foot'	/ʑi^{H}/	'trace'	→	[kɔ̃^{H}-ʑi^{H}]	'footprint'
/kɔ̃^{H}/	'foot'	/Ndzui^{L}/	'finger'	→	[kɔ̃^{H}-Ndzui^{H}]	'toe'
/jɔ^{L}/	'hand'	/ʑi^{H}/	'trace'	→	[ja^{L}-ʑi^{L}]	'hand print, finger print'
/ʒa^{L}/	'yak'	/χɔ^{H}/	'meat'	→	[ʒa^{L}-χɔ^{L}]	'yak meat'

A similar process has been observed in Meithei (Manipur, India; ISO mni), where the tone of the first syllable root spreads rightward over toneless syllables (Chelliah 1997: 25–48). It is not clear from the published analysis whether root tones are relocated to prefixes and spread rightward, or whether they also spread leftward onto a toneless prefix.

In Lizu (Ersuish, Sichuan, China; ISO ers) compounds, the tone of the first word is "realized over the whole compound domain" (Chirkova and Chen 2013; see also Yu 2009). Combining the phonological analyses of these two reports, we see that Lizu monosyllables may be analyzed as occurring with HL or LH tones, longer words with HL, LH, or M (or toneless). Contour tones spread over two syllables, becoming L-H and H-L. In compounds, the tone of the first morpheme spreads over the entire word. Due to complexities in the tone spreading that go beyond the scope of this paper, tones are only marked on the first syllable in this study (Tab. 8). For details on tone realization, see Chirkova and Chen (2013). Table 8 shows that in compounds, only the first morpheme's tone is realized.

Tab. 8: Left aligned tone spreading in Lizu

M	/sə^{M} Nge/	'lion'	+	/me^{HL} Ntʃʰo/	'tail'	→	/sə^{M} Nge me Ntʃʰo/	'lion's tail'
HL	/to^{HL} Nbu/	'nose'	+	/wu^{HL} li/	'head'	→	/to^{HL} Nbu wu li/	'tip of the nose'
LH	/mu^{LH} tsə/	'cat'	+	/Ndo^{HL} qo/	'eye'	→	/mu^{LH} tsə Ndo qo/	'cat's eye'

Alignment with the left edge can exclude prefixes. In Yongning Na (Naic, Yunnan and Sichuan, China; ISO nxq), tones on verbs align with the root and spread rightward; prefixes always occur with default M tone (Tab. 9).

Tab. 9: Yongning Na verb tonal patterns (Michaud, 2008)

	/H/	/M/	/L/	/MH/
Negative	M.H [mɤ^{33} dzɯ^{55}]	M.M [mɤ^{33} li^{33}]	M.L [mɤ^{33} dzi^{11}]	M.MH [mɤ^{33} ʈ^{h}æ^{35}]
Perfect	M.H.L [lə^{33} dzɯ^{55} zə^{11}] 'to eat'	M.M.M [lə^{33} li^{33} zə^{33}] 'to look'	M.L.L [lə^{33} dzi^{11} zə^{11}] 'to strike'	M.M.H [lə^{33} ʈ^{h}æ^{33} zə^{55}] 'to bite'

In Nungish languages, such as Dulong and Rawang, words tend to have a "sesquisyllabic" (Matisoff 1999) structure, in which the initial CV sequence (presyllable) of a word is prosodically light, with a neutral vowel. The nuclear syllable has one of three tones: H, M, or L in Mvtwang (Morse 1963; Nathan Straub p.c.) or H, HM, ML in Central Dulong (H. Sun 1982). Central Dulong tones have also been analyzed as level, falling, and reduced (LaPolla 2001). In longer words and phrases, the first nuclear syllable tends to be stressed, with its tone spreading rightward. Thus, in the Rvmøl dialect of Rawang, the falling tone on the second syllable of /kəlɯm^{HL}gəmzisi/ separates into H and L tones, with rightward spreading: [k^{h}ə.løm^{H}gəm^{L}zi^{L}si^{L}] (Nathan Straub, p.c.). Similarly, "in rapid speech, the phonological word becomes longer, expanding from one or two syllables to include an entire phrase, and the tones of stressed nuclear syllables spread rightward over the entire word." (Straub, p.c.).

In conclusion, in western Tibeto-Burman languages, as in Sinitic, dominant tones that spread are located at the left edge of their domain and spread rightward. Even though western Tibeto-Burman languages often allow longer morphological and phonological words than are common within Sinitic, there is still a strong preference for the left edge as the location of dominant tones that spread.

3 Non-spreading dominant tones

Zhang (2007) points out that in Sinitic, dominant tones on the right edge are accompanied by paradigmatically inserted tones earlier in the word. For example, Shanghai, which has been documented above with left-dominant spreading tones, also has a less frequently documented pattern in which the rightmost tone

is retained, with neutralization of non-final tones. Specifically, in this "Type B" sandhi, which applies to phrasal disyllables, the final syllable keeps its citation tone, while the penultimate syllable receives a mid level tone (Zhu 2006: 46–47). For the following forms, they can be treated as words, with left-aligned tone, or as noun-phrases, with right edge tone dominance (Tab. 10).

Tab. 10: Type A vs. Type B tone sandhi in Shanghai (Zhu 2006: 36)

		Type A (left edge)	**Type B (right edge)**
/pao^{MH} tao^{HL}/	'treasure knife'	[pao^{M}tao^{H}]	[pao^{M}tao^{HL}]
/chieu^{HL} seu^{HL}/	'autumn harvest'	[chieu^{H} seu^{H}]	[chieu^{M} seu^{HL}]

Within Sinitic, right-dominant tone patterns are found in "most of Min, Southern Wu, and Mandarin" (Zhang 2007). The most well-documented case of Chinese tone sandhi is probably the rule by which the Standard Mandarin Low-Falling-Rising tone (a.k.a. Tone 3) becomes Rising (Tone 2) before another Low syllable. That is, while there are four tonal possibilities on lexical monosyllables, there are only three possibilities on a syllable preceding a Low tone. Both the trigger and target syllables must be within the same phonological grouping, so that the dominant tone occurs on the right edge of its foot, and the reduced possibilities are located on the preceding syllable.

A more sweeping example of right edge dominance with paradigmatic tone insertion occurs in the Southern Wu dialect Wuyi (Zhang 2007; Fu 1984). Non-final syllables become H or L, while final syllables retain their citation form, called T# in Tab. 11.

Tab. 11: Right edge tone dominance in Wuyi Chinese disyllables

σ1 \ σ2	**24**	**213**	**53**	**31**	**55**	**13**
24 213 53			H-T#			
31 55 13			L-T#			

One other case of right-tone dominance exists in the tone circles found in Min dialects. In Taiwanese (Southern Min), citation tone is only retained in final position. In non-final position, each sonorant-final citation tone changes according

to the sequence shown in Figure 1 (M. Chen 2007, among others). A key difference between the patterns of Min and those of other examples in this study is that almost all of the Southern Min tonal distinctions are maintained in non-dominant position, but they are preserved with sandhi tones, such that the underlying tonal category is expressed, but only within that context.

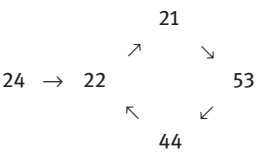

Fig. 1: Taiwanese S. Min tone circle

Because Sinitic paradigmatic tone sandhi processes are well-documented, this present study does not go into more detail about non-spreading dominant tones in those languages. For Tibeto-Burman languages, such tones can be located anywhere, as stated in Claim 2:

Claim 2: Non-spreading dominant tones in Tibeto-Burman languages can be located on any syllable in their prosodic domain.

From the perspective of formal logic, if the only claim made in the paper were Claim 1 (left-edge alignment of spreading tones), then Claim 2 would follow by inference. However, for the purpose of organizing and discussing the data, it seems helpful to make the second claim explicit.

As observed among Sinitic languages, non-spreading dominant tones in Tibeto-Burman can be located relative to the right edge of a word or stem, as is common in Jiarongic (or Rgyalrongic) languages. For example, in the Zhuokeji (or Cogtse) variety of Situ, (Sichuan, China: ISO jya), contrastive H (underlying Ø), HL and L are pronounced on the last syllable in the prosodic word (Lin 2012). Tonal assignments on earlier syllables occur paradigmatically, as can be inferred from Tab. 12, excerpted from Lin (2012).

Tab. 12: Right edge tone assignment in Zhuokeji Jiarong (Lin 2012)

σ	σσ	σσσ
H	L.H	L.H.H
HL	L.HL	L.H.HL
L	H.L	L.H.L

Alignment with regard to the right edge does not infer that only the rightmost syllable receives a lexical tone specification. In the Caodeng (or Tshobdun) language (Sichuan, China: ISO jya), lexical tone falls on the stem-penultimate syllable. The counting requirement assigns tone to the prefix of a monosyllabic verb root, as in "roll" (Tab. 13).

Tab. 13: Caodeng Jiarong penultimate tone location (Sun 2008)

kɛ́d-ⁿdʒev	to roll'	kɛ-qɛ́se	to look for'
kɛ-sə́-ⁿdʒev	to cause to roll'	kɛ-qɛsə́se	to look for each other'

In Mianchi Qiang (Sichuan, China: ISO qxs) only the leftmost H tone in a prosodic word is pronounced; toneless syllables receive a default L: /ti^{H}/ 'bear' + /χua^{H}/ 'thin' à /ti^{H}-χua/ à [ti^{H}-χua^{L}] "thin bear" (Evans 2008). Thus, the dominant, non-spreading H can be assigned to the initial syllable of a Mianchi Qiang prosodic word. In other words, the leftmost H is dominant, and no other H can occur in the same domain.

Tawrã (Arunachal Pradesh, India and Tibet, China: ISO mhu) has the tones H, HL, LH, and Ø, which surfaces as M tone (author fieldwork). Tone is only specified once in a word; L tone on the first syllable spreads ('horse'), but other tonal specifications do not (Tab. 14).

Tab. 14: Tawrã tone placement

	H	**HL**	**M**	**L**
	/ha^{H}/ 'thigh'	/nja^{HL}/ 'wool strip'	/nja/ 'face'	/nja^{L}/ 'feel pain'
Syll 1	/ga^{H}.ʔa/ [ga^{H}.ʔa^{M}] 'nearby'	/ts^{h}ũ^{HL}daŋ/ [ts^{h}ũ^{HL}daŋ^{M}] 'pole star'	/halo/ [ha^{M}lo^{M}] 'moon'	/ga^{L}wri/ [ga^{L}wri^{L}] 'horse'
Syll 2	/haza^{H}/ [ha^{M}za^{H}] 'king'	/tamjum^{HL}/ [ta^{M}mjum^{HL}] 'monkey'		/tatʃ^{h}oŋ^{L}/ [ta^{M} tʃ^{h}oŋ^{L}] 'furniture'

Tawrã trisyllabic morphemes (which are rare and may all be borrowed from Indo-Aryan languages) also have tone specified on just one syllable. The possibilities seem to be limited to H on the first or second syllable, or HL on the second syllable: /tha^{H}kala/ 'shadow', /katsab^{H}ba/ 'tortoise', /adaj^{HL}tjang/ 'scorpion'.

Non-spreading tones can be assigned exclusively to the left-most position, as in Lhasa Tibetan, where initial syllables are lexically specified L or H (/ka^{L}/ 'saddle', /ka^{H}/ 'order'), and all non-initial syllables bear H tone (Sun 1997, 2003). Lhasa final syllables can have a falling pitch that is historically conditioned by a glottal coda; e. g., [k^{h}am(ʔ)^{HL}] from Written Tibetan *khams*, 'the Khams region'.

In conclusion, a subtle distinction must be drawn between the attested sandhi systems of Sinitic versus western Tibeto-Burman languages. For both groups of languages, dominant spreading tones are aligned with the left edge of their domain. However, for dominant tones that cause paradigmatic tone assignment to other syllables, Sinitic languages as a whole show a strong preference for the right edge of the word, while Tibeto-Burman languages do not.

The next two sections delve into synchronic and historical factors that play a role in the patterns of tone sandhi observed in Sino-Tibetan languages.

4 Underlying factors

There are two factors mentioned in Zhang (2007) that play a role in the observed tone sandhi patterns. Zhang comments on the "universal preference for rightward tonal coarticulation." Putting this into articulatory terms, we state the following principle:

Principle 1: Speakers tend to reach pitch targets late in the prosodic domain. Measurements of fundamental frequency in Igbo and Yoruba show that within a string of same-toned syllables, the pitch target is realized at or near the right edge of the string (Akinlabi and Liberman 2000). Xu and Wang (2001) express this tendency in Mandarin Chinese as: "Throughout the duration of its host, the approximation of the pitch target is continuous and asymptotic." On the phonological level, the lateness tendency has been noted to affect tone behavior across a large group of languages (Hyman and Schuh 1974; Hyman 2007).

This observation that pitch targets are realized or approximated near the end of their host prosodic unit accounts for a tendency for tones to spread rightward, that is, to be articulated gradually. It also suggests a trend for tones to be articulated at the right edge of their prosodic domain, from where there are no further tone bearing units on which to spread. One reviewer pointed out that it has been noted in various studies that rises take more time to articulate than do falls (cf. Zhang 2013). Moreover, if the tone in question is a phonological contour, then it is not clear whether there are several targets, or whether the pitch curve itself is a target. For these two reasons, Zhang (2007) states this principle as the "preference for progressive tonal coarticulation." In this study, I have given the principle

in terms of pitch targets because in western Tibeto-Burman languages, there is often only one underlying tone that is being articulated, thus there does not seem to be any "tonal coarticulation."

Regardless of wording, this principle predicts that tones aligned at the left edge of a prosodic domain will tend to be pronounced over a period of time that may be longer than one syllable.

Zhang's (2007) second property is that of domain-final lengthening. This principle, which contributes to right-edge alignment of dominant tones, can be expanded and reworded as:

Principle 2: Syllables in domain-final position tend to be phonetically longer than other syllables in the same domain. This greater duration allows more time for tonal targets to be reached.

For many tone languages, the final syllable is special, in that it is the only one that can bear (certain) contour tones (Zhang 2009, 2013), especially those that rise. Zhang (2007) treats this generalization as a way of summarizing the cross-linguistic tendency for final syllables to have longer duration than earlier syllables, hence to permit more contours than are found elsewhere in the word. In the Southern Min tone sandhi, the rising tone is outside of the circle; that is, it only occurs on final syllables (Fig. 1). In both the tone spreading and the tone insertion examples cited in this study, the sandhi process reduces contours on non-final syllables. Outside of Sino-Tibetan, similar examples abound. For example, in San Juan Copala Trique (ISO trc), only the last syllable can contrast all eight tones (Hollenbach 1977, 2005).

In addition to the principles based on Zhang (2007), there are phonological and word-structure principles that play a role in Sino-Tibetan tone sandhi. Phonologically, dominant tones bear some resemblance to stress, which is encoded in the third principle:

Principle 3: Like prototypical stress accent, dominant tones are culminative (no more than one occurrence per prosodic unit).

In the WALS database, out of 282 languages with fixed stress, the attestation of stress placement is approximately as follows: penultimate (50 %), initial (42 %), final (23 %), second syllable (7 %), antepenultimate (5.5 %), third syllable (0.5 %) (Goedemans and van der Hulst 2013). For more on the attraction of stress to edges, cf. Hyman (1977) and Gordon (2002). Following Zhang (2007) we are careful not to equate dominant tones with lexical stress; moreover, many Tibeto-Burman languages are under-documented with regard to stress placement,

further necessitating caution. Nevertheless, fixed culminative tone placement serves a similar function to stress in demarcating prosodic units. Therefore, we expect to find shared placement properties between stress and dominant tone. Within Sinitic, dominant tone alignment appears to correspond closely with the left and right edges of the word (partly due to shorter words, as mentioned above). However, in western Tibeto-Burman languages, alignment at the left edge is a stronger typological tendency for spreading tones than alignment at the right edge is for non-spreading dominant tones.

While stress and culminative tone share these important properties, there are important differences. Like stress, culminative tones can relocate, as seen in Caodeng Jiarong and Shixing. Unlike stress, tones can spread rightward from a host syllable to one or more others. Stress often occurs in feet, such that secondary stress occurs at regular intervals from the stressed syllable. However, we do not observe regular secondary assignments of tones on alternating syllables. While the spreading of tones onto adjacent syllables is widely documented, grammars often avoid sequences of stressed syllables (stress clash reduction). Thus, while culminative tones appear to serve a demarcative function, they do not perform a rhythmic function, even though the tones may be hosted on stressed syllables.[2]

For tonal languages where stress has been studied more closely, it is sometimes found that stress and dominant tone position are located on the same syllable. Duanmu (1995) claims that Type A Shanghai tonal domains are left-headed, and that left edge prosodic heads are stressed, retain their tonal specifications, and other syllables lose their tones. Conversely, Southern Min forms right-headed tonal domains that correspond to right edge stress. This headedness is expressed by retention of citation tone on right edge syllables. In Southern Qiang (e. g., Mianchi), tone arose from a reinterpretation of stress, due to contact with Chinese. Thus, within these dialects, H tone has stress-like properties, such as culminative H and/or obligatory H (Evans 2001). Within the Mianchi dialect, only the leftmost H in a word is pronounced; all other syllables surface with default L pitch assignment. Caplow (2009) makes a strong case for the role of stress in Tibetan tonogenesis. In the non-tonal dialects of Tibetan that she surveyed, pitch was a significant correlate of stress.

Among other languages in this study, it may be seen that, as Cahill (2007) predicts, "sequences of all Low tones are dispreferred." Cahill's observation is based on findings in languages of Africa, Oceania, North Asia, etc., but hold for the present set of data. In fact, most of the non-Sinitic languages surveyed require at least one

2 One reviewer asked about the case of the Ryukyuan language Irabu, which has rhythmic pitch assignment (Shimoji 2009). We note that in this language the alternating HH and LL pattern is non-distinctive, as the possible patterns are determined solely by word length in morae.

H in poly-syllables. In Shixing and Muka Qiang, the grammars require postlexical H on the last syllable if all the other syllables are L or toneless. The insertion of H on the right edge when there is no tone on the left edge (Shixing, Muka Qiang, possibly Lizu) closely resembles Hayes' (1995) Default-to-Opposite stress patterns.

In conclusion, dominant tones may be expected to share some properties with stress accent.

The fourth principle states that:

Principle 4: Typical word length affects the number of fixed positions available for tone alignment.

Western Sino-Tibetan languages commonly have agglutinative morphology; it is common for a word to consist of one lexical morpheme combined with one or more affixes. Polysyllabic morphemes are also common in some Western Sino-Tibetan languages. For example, in a Swadesh list of about 200 words in Mongsen Ao, 62 % were disyllables, and 17 % were trisyllables (Coupe 2007). On the other hand, Lolo-Burmese, many Sinitic, and other easterly Sino-Tibetan languages are more isolating with predominantly monosyllabic lexemes, and fall into the category of "omnisyllabic" (Matisoff 1999), a term which reflects minimal tone reduction at the word level.

Among western Sino-Tibetan languages, grammars tend to be asymmetric in the number of prefix/suffix slots. For example, Tamangic languages, which favor suffixes, have tones that anchor to the lexical morpheme on the left and spread rightward, onto the grammatical morphemes. On the other hand, verbs in Jiarongic languages display up to 14 pre-stem slots, with only three suffix slots (Jacques 2013). Thus, it is not surprising that the Jiarong tone reduction processes observed in this study favor tone specifications on the right edge, further from the bulk of grammatical affixes.

On the other hand, across Sinitic, due to shorter words, most syllables are located at an edge. This may account for the observation that dominant non-spreading tones show a more consistent attraction to the right edge of the prosodic domain in Sinitic than they do in Tibeto-Burman. Longer words allow specifications like that of Caodeng Jiarong, in which tone always falls on the stem-penultimate syllable.

Principle 5: Phonological tone contrasts often arise from segmental changes at word edges.

For some western Tibeto-Burman languages, historical factors may play a role in the location of tones near edges. Written Tibetan, the oldest alphabetic

Sino-Tibetan writing system, was standardized between the 7th and early 9th centuries AD, at which time the writing system did not encode tonality. Rather, tones in modern Tibetic languages can be traced to segmental properties of Written Tibetan. Loss of initial voicing contrasts has been rephonologized as pitch height on initial syllables (a similar process occurred in the closely related Tamangic languages), while final glottalization lead in many cases to a falling tone on final syllables (Sun 1997, 2003; Hyman this volume). Phonological stress appears to have played a role in Tibetan tonogenesis as well (Caplow 2009). Similarly, loss of obstruent codas in Khaling (klr, Kiranti, Nepal) led to a split between level and falling tones (Jacques 2016). Having thus been located at the left or right edge of a prosodic unit, tones are then subject to the aforementioned principles. Similar tonogenetic processes are traceable in Tamangic languages (Mazaudon 1973, 1985). For more on tonal distinctions arising from loss of consonantal distinctions, cf. Haudricourt (1954), Thurgood (2002).

In conclusion, there are at least five factors that play a role in the placement and behavior of dominant tones: pitch targets tend to be reached late, final syllables are lengthened, dominant tones share some properties with stress accent, typical word length affects the possible locations for fixed tone assignment, and tonogenesis often specifies tones at edges.

5 Dominant tones and tone sandhi in other languages

Assuming that the underlying principles behind the phonological behavior are not language specific, it is to be expected that languages from other families and regions would exhibit tone sandhi patterns similar to what has been observed above.

Looking further afield, Bantu languages, Japanese dialects, and other languages display phonological behaviors reminiscent of the two claims summarized above. A well-documented case of culminative left edge tone spreading occurs on Mende nouns (Tab. 15).

Tokyo Japanese appears to have both a predictable spreading tone aligned with the left edge, and a lexical non-spreading dominant tone. In this language, one lexical tone surfaces per prosodic unit; one of the main areas of controversy concerns the density of tonal specification (spreading or not). Analyses such as those of Haraguchi (1977, 1999) assign H or L to each mora, the TBU in Japanese dialects. Pierrehumbert and Beckman (1988) assign tone markings at F0 maxima and minima and at clause edges, allowing the intervening pitches

to be interpolated, rather than directly assigned H or L. In either analysis (or in McCawley, 1978), only one lexically assigned tone (accent) surfaces per prosodic phrase. In this present discussion, only the tone patterns of nouns will be considered, and these in a fashion which ignores the special tonal properties of certain tonally special morphemes (e. g., the deletion of final tone by the genitive marker /no/). Proponents of an accentual analysis of pitch patterns in Japanese assign some mark (usually ‘ or *) after a mora that marks the boundary between /H/ and /L/. However, a marking that requires less interpretation merely indicates the tone sequence /H.L/ in the lexical representation. Table 16 shows the tonal possibilities on monomorphemic nouns:

Tab. 15: Tone spread in Mende (Leben 1978; Zoll 2003)

	σ	σσ	σσσ(σ)
H	H	H.H	H.H.H
L	L	L.L	L.L.L
HL	HL	H.L	H.L.L.
LH	LH	L.H	L.L.H (Zoll)
			L.H.H (Leben)
LHL	LHL	L.HL	L.H.L
HLH		H.LH	H.L.H
HLHL			H.L.HL
			H.L.H.L

Tab. 16: Realizations of Tokyo noun tone locations (Haraguchi 1999)

Toneless	**Tone on 1st μ**	**2nd μ**	**3rd μ**	**4th μ**
e-ga L H “handle”-Nom	e^{HL}-ga H L “picture”-Nom			
hasi (-ga) L H H “edge”-Nom	ha^{HL}si (-ga) H L L “chopstick”-Nom	hasi^{HL} (-ga) L H L “bridge”-Nom		
sakura (-ga) L H H H “cherry”-Nom	ka^{HL}rasu (-ga) H L L L “crow”-Nom	koko^{HL}ro (-ga) L H L L “heart”-Nom	otoko^{HL} (-ga) L H H L “man”-Nom	
kamigata (-ga) L HHH H “hair style”-NOM	se^{HL}kitan (-ga) H LLL L “coal”-Nom	asa^{HL}gao (-ga) L H LL L “morning glory”-NOM	aozo^{HL}ra (-ga) LHH L L “blue sky”-Nom	kaminari^{HL} (-ga) L HHH L “thunder”-Nom

This author's analysis of the data is that nouns are assigned a default L.H tone that aligns to the first mora and spreads rightward until it reaches H.L or prosodic boundary, and that the default tone assignment is blocked by H.L on the initial mora. Thus, there is both a spreading tone aligned with the left edge, and optionally, a non-spreading tone somewhere in the word. The following forms show that only the leftmost /H.L/ tone gets pronounced in a Tokyo Japanese accentual phrase (Tab. 17):

Tab. 17: Tokyo Japanese culminativity in phrases (Haraguchi 1999)

HL on 1st μ	HL on 2nd μ	HL on 3rd μ	HL in 2nd word
/ka^{HL}rasu-ma^{HL}de/	/koko^{HL}ro-ma^{HL}de/	/otoko^{HL}-ma^{HL}de/	/sakura-ma^{HL}de/
H LL LL	LH L LL	LH H LL	L HH HL
'crow'-even	'heart'-even	'man'-even	'cherry'-even

However, in noun compounds, it is the final member of the compound that determines accent placement (Tab. 18).

Tab. 18: Tokyo Japanese culminativity in noun compounds (Kubozono 2012)

pe^{HL}ru.sya	+	ne^{HL}.ko	→	peru.sya-ne^{HL}.ko	"Persian cat"
tyoo.kyo^{HL}.ri	+	ba^{HL}.su	→	tyoo.kyo.ri. ba^{HL}.su	"long-distance coach"
sak^{HL}.kaa	+	ku^{HL}.ra.bu	→	sak.kaa-ku^{HL}.ra.bu	"soccer club"
ya^{HL}.ma.to	+	na.de^{HL}.si.ko	→	ya.ma.to.na.de^{HL}.si.ko	"Japanese lady"

If the final member of the compound is toneless, then the compound receives paradigmatic tone insertion based on the length of the final member (Kubozono 2012).

The western Tibeto-Burman languages surveyed in this study did not display an overall preference for alignment of dominant tones with the right edge of the domain, although Sinitic languages did show this tendency. As mentioned above, because dominant tones bear some similarity to lexical stress, and because of the preference for stress to be located near word edges (especially penultimate syllables), it is expected that there will be languages in other areas that exhibit this preference. In fact, there are unrelated languages where, like Caodeng Jiarong, tone can only fall on the penultimate syllable. For example, in Chizigula (Bantu, Tanzania), if a verb has a tone, then that tone appears on the penultimate (Tab. 19).

Tab. 19: Chizigula verbs (Kenstowicz and Kisseberth 1990, Yip 2006)

Toneless verbs		**Toned verbs**	
ku-damaŋ-a	to do'	ku-lombéz-a	to request'
ku-damaŋ-iz-a	to do for'	ku-lombez-éz-a	to request for'
ku-damaŋ-iz-an-a	to do for each o.'	ku-lombez-ez-án-a	to request for each o.'

In some languages, the dominant tone is constrained to fall not more than a certain distance from the right edge. In Attic Greek there were two lexical tones, marked with an acute or a circumflex diacritic. Both tones represent a rise in pitch over a mora, followed by a return to a neutral pitch (Mastronarde 1993:16–20. The tone marked with a circumflex only occurred on heavy (bi-moraic) syllables, and the return to normal pitch occurred during the toned syllable. On the other hand, the acute mark could fall on either monomoraic or bimoraic syllables, with the return to neutral pitch occurring during the subsequent syllable (whether long or short). No more than one mora in the word could follow the return to normal pitch, whether that return occurred during a circumflex tone or following an acute tone. Similarly, in Kagoshima and Koshikijima dialects of Japanese, and in the Bantu language Chimwiini, lexical tone falls on either the ultimate or penultimate mora; all other morae have paradigmatic pitch assignment (Kubozono 2012; Hyman, this volume). In the Bantu language Giryama, H tones are displaced rightward to locate on penultimate syllables (Hyman, this volume).

The languages used for comparison in this section have tended, like western Tibeto-Burman, to have longer monomorphemic words, agglutinative morphology, and low lexical tone density. Nevertheless, it has been demonstrated that the tone sandhi processes are similar to those active in both western Tibeto-Burman and Sinitic languages, even though the latter tend to have short morphemes and words, isolating morphology, and high tonal density.

In spite of the existence of hundreds of Tibeto-Burman languages, only a few have been cited in this study, as many languages are under-described. In addition, tone categories and processes can be difficult to elucidate in many western Tibeto-Burman languages. For example, among the Tani languages, monosyllabic words are scarce. Post (2014) observes that in four of the Tani languages, there are only about ten to twenty monosyllabic words to be found within lexica ranging from 1,000 to 5,000 entries. Further complicating the analysis, many lexical morphemes never occur in isolation. Moreover, different sets of rules seem to apply to words with more than two syllables, and each rule seems to be quite limited in its

application. Mongsen Ao (Nagaland, India; njo) also presents a particularly complicated set of tone interactions, which may turn out to be the norm for languages of Northeast India (Coupe 2007).

6 Conclusions

The present study compares common tone sandhi patterns found among Sinitic and western Tibeto-Burman languages. Sinitic languages lexically specify a tone on almost every syllable, while western Tibeto-Burman languages tend to have much sparser tone specification. Nevertheless, there are similarities between the two groups of languages in the ways that dominant tones affect other tones in the prosodic unit. Namely, we find the following two principles at work, which were first identified as operating within Sinitic (Zhang 2007), but the present study shows to also be active among Tibeto-Burman languages, albeit with minor modification:

(1) If a tone spreads, then it is aligned with the left edge of its prosodic domain, and spreads rightward.
(2) Non-spreading dominant tones in Tibeto-Burman languages can be located on any syllable in their prosodic domain.

These two phonological claims are driven by the following five principles, which are assumed to be language-independent, with the exception of the fifth principle:

(1) Speakers tend to reach pitch targets late in the prosodic domain.
(2) Syllables in domain-final position tend to be phonetically longer than other syllables in the same domain. This greater duration allows more time for tonal targets to be reached.
(3) Like prototypical stress accent, dominant tones are culminative (no more than one occurrence per prosodic unit).
(4) Typical word length affects the number of fixed positions available for tone alignment.
(5) The process of tonogenesis often results in tone specification at left or right word edges.

Examination of well-documented cases of tone sandhi in languages that are both nonrelated and geographically diverse suggests that these principles do in fact play an important role in tonal phonology.

Appendix: Cited Sino-Tibetan languages and sandhi patterns

Language	Grouping	Sandhi type(s)	Location
Standard Chinese	Sinitic, Mandarin	Right edge w/ replacement	Beijing, China
Southern Min	Sinitic, Mandarin	Right edge w/ replacement	Taiwan and Fujian, China
Shanghai	Sinitic, N. Wu	Left edge spread (word)	
		Right edge w/ replace (phrase)	Shanghai, China
Wuyi	Sinitic, S. Wu	Right edge w/ replacement	Zhejiang, China
Na	Tibeto-Burman, Na-ic	Left edge spread	Sichuan, China
Manange	Tibeto-Burman, Bodish	Left edge spread	Nepal
Caodeng Jiarong	Tibeto-Burman, Qiangic	Right edge w/ replacement	Sichuan, China
Zhuokeji Jiarong	Tibeto-Burman, Qiangic	Right edge w/ replacement	Sichuan, China
Lizu	Tibeto-Burman, Qiangic	Left edge spread	Sichuan, China
Shixing	Tibeto-Burman, Qiangic	Left edge spread	Sichuan, China
Pumi	Tibeto-Burman, Qiangic	Left edge spread	Sichuan, China
Muka Qiang	Tibeto-Burman, Qiangic	Left edge spread	Sichuan, China
Kami Tibetan	Tibeto-Burman, Tibetic	Left edge spread	Sichuan, China
Lhasa Tibetan	Tibeto-Burman, Tibetic	Left edge w/ replacement	Tibet, China
Tawrā	Tibeto-Burman, Digarish	Left edge spread of L	Arunachal Pradesh, India; Tibet, China

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