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The Retroflex Sound of Languages Spoken in Southeast Tibet: Feature Floating, Feature Recombination and Its Historical Typological Value

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Abstract: In Southeast Tibet, some Tibeto-Burman languages have apparent retroflex feature floating. Some initial research on this phenomenon shows that different sound categories, such as a post consonant *r* and retroflex vowels (or finals), are not totally independent. This feature is likely the result of the evolution of one sound category toward another, and the evolution mechanism is the feature recombination between *r* and the basic consonant. This research approach can be applied to studying the whole Sino-Tibetan historical typology, including Chinese and Tibeto-Burman languages.

Keywords: languages spoken in southeast Tibet; retroflex feature; feature floating; historical typology; feature recombination



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1. Introduction

As a translingual characteristic with the retroflex feature, the rhotic sound usually refers to various consonants and vowels emitted when the tongue tip bends backward to a certain extent (Trask 2004), such as the retroflex fricative consonant *sh* [ʂ], [ʐ] and *r*-coloring coda (also called Erhua 儿化) [ə] in Mandarin. In addition, the rhotic sound is an auditory sound category named by perceptual characteristics based on Ohala (1985), Ladefoged (2001) and Chen (2022). Zhu (2010) defined retroflex as ‘the tip of the tongue flipping’. Mai (2005) indicated that retroflex is the only type of sound named not by the place of blocking during articulation, but by the shape or movement of the tongue. At the symbol level, the International Phonetic Alphabet is consistent in the marking of the retroflex feature, which adds a ‘ɻ’ to a single symbol, such as ‘ɻ, ɻ, ɻ¹’. However, the phonetic symbols applied in the literature to record the sound with the retroflex feature are not entirely consistent. As long as a certain vowel or consonant has the retroflex feature in the text, or if a specific vowel or consonant has retroflex or even retroflex features in the language flow, this paper identifies this vowel or consonant as having the retroflex feature.

In the following part, this paper first investigates the distribution of the retroflex feature in different languages spoken in southeast Tibet and discusses relevant phenomena based on the theoretical background of phonotypology. This study could help understand the phonological variation of the Tibeto-Burman language and promote the historical comparative linguistics of Tibeto-Burman languages.

2. Distribution of the Retroflex Feature in the Syllables of Languages Spoken in Southeast Tibet

2.1. Overview of Language Spoken in Southeast Tibet and Source of Data

Southeast Tibet mentioned in this paper refers to Chayu County 察隅县, Motuo County 墨脱县 and Milin County 米林县 in Linzhi 林芝市, Tibet, and Longzi County 隆子县 and Cuona County 错那县 in Shannan 山南市. In addition to the Tibetans and Han Chinese,

several ethnic groups live in this area, such as the Luoba, Menba and Deng. About 20 distinct languages are used by these ethnic groups. For example, certain Luoba groups use languages named Yidu, Boga'er, Sulong², Bengni and Bengru. The Prami group of the Menba³ uses the Prami language, the Cangluo group of the Menba uses the Cangluo language, and the Geman and the Darang group of the Deng people use Geman and Darang, respectively. In addition, some indigenous Tibetan groups also have their local languages, such as the mixed language, Zha, in Songgu Village 松古村 and Ladin Tama Village 拉丁塔玛村 of Lower Chayu Town 下察隅镇, the Songlin language in Songlin Village 松林村 of Upper Chayu Town 上察隅镇, as well as the Suku language in Yazhong Village 亚中村 and Bendui Village 本堆村. Table 1 illustrates the linguistic profile in southeast Tibet.

Table 1. Distribution of languages in southeast Tibet.

Shannan	Longzi County	Douyu Luoba Ethnic Township	Sulong Luoba language, Bengni Luoba language, Bengru Luoba language
	Cuona County	Le, Gongri, Jiba, Mama Luoba Ethnic Township	Cuona Menba language—Prami dialect
	Milin County	Nanyi Luoba Ethnic Township	Boga'er Luoba language
Linzhi	Chayu County	Lower Chayu Town	Geman language, Darang language, Zha language
		Upper Chayu Town	Yidu Luoba language, Songlin language, Suku language
		Chawalong Township	Dulong language, Naxi language
	Motuo County	Damu Luoba Ethnic Township	Damu Luoba language, Tibetan Kham dialect Mixing language
		Dexing Township	Cangluo Menba language
		Beibeng Township	Cuona Menba language—Prami dialect

Most of the data in this paper are from the corpus of the Chinese Language Resources Protection Project (2015–2019) in southeast Tibet. Unless otherwise indicated, all the data in this study were taken from the corpus constructed during our fieldwork.

2.2. Five Distributions of the Retroflex Feature in Languages Spoken in Southeast Tibet

According to a recent survey, most languages have the retroflex feature, but the specific situations vary to different degrees due to the quantity and distribution of the rhotic sound.

Based on a previous analysis, the distribution of the rhotic sound in these languages is summarized as follows:

A. A retroflex fricative or approximant ζ or r used as the initial consonant has been proved to be a common feature of southeast Tibetan languages, such as *rum*⁵⁵ 'help' in Geman and *ruk*'jo 'ridge', in Boga'er.

B. r or ζ has been proved to be the post consonant in consonant clusters, such as *br-*, *kh-*, etc.

C. A retroflex affricate consonant has been proved, such as *tʂa*⁵⁵ 'cut', *tʂha*⁵⁵ 'eagle' and *dzʂ*⁵⁵ 'rub', in Songlin.

D. The retroflex coda: The rhotic sounds are located at the ends of syllables and attached to the whole vowel, which is similar to the r -coloring ending (Erhua) in Mandarin, such as *tor* 'mill' in Prami and *ɛer*, 'gold', in Boga'er.

E. The rhotic sounds and vowels are merged into retroflex vowels, which can form syllables or act as a nucleus, such as *pia*'k, 'gap', in Sulong.

The above five can be summarized as follows in Table 2:

Table 2. Five distributions of retroflex features in sound categories.

Category	Characteristics	Examples
A	With an independent <i>r</i> or <i>ɹ</i> ; it can be applied as an initial consonant	All southeast Tibetan languages except Tibetan dialects
B	With post consonant <i>r</i> or <i>ɹ</i> in consonant clusters, such as <i>br</i> -, <i>chr</i> -, etc.	Geman, Darang, Yidu, etc.
C	With a retroflex affricate consonant	Suku, Songlin, Zha, etc.
D	With a retroflex coda: The retroflex is located at the end of the syllable and attached to the whole final, which is similar to Erhua in Mandarin	Boga'er, Sulong, Cangluo, etc.
E	Rhotic sounds and vowels are merged into retroflex vowels, which can form syllables or act as a nucleus *	Sulong, Zha, etc.

* This paper distinguishes D and F categories by marking 'r' as an independent phoneme, and the superscript form 'r' as the retroflex feature.

2.3. Five Distributions of the Retroflex Feature in Different Languages

In Section 2.2, five distributions of the retroflex feature in the languages spoken in southeast Tibet are presented. In fact, the distribution of retroflex features varies among the languages spoken in southeast Tibet. Categories A and B are common phenomena, and the distribution of categories C, D and E is different among the 13 languages we investigated. The following part shows the specific manifestations of the above five distributions of the retroflex feature in languages spoken in southeast Tibet.

2.3.1. Feature A in Languages Spoken in Southeast Tibet

It is common that *r* or *ɹ* is an independent phoneme in languages spoken in southeast Tibet, as shown in Table 3.

Table 3. The distribution of *r* or *ɹ* as independent phonemes in southeast Tibet.

Language	With r/ɹ Phoneme	Examples
Geman	+	ram ⁵³ 'rotten'; ra ⁵⁵ 'equal'; rum ⁵⁵ 'help'
Darang	+	rum ⁵³ 'include'; rai ⁵³ 'twist'; rwo ⁵³ 'grasp'; rau ⁵³ 'melon vine'
Yidu	+	ruŋ ⁵⁵ 'shout'; bu ³¹ ra ³⁵ 'thunder'
Zha	+	rui ⁵⁵ 'snake'; roŋ ⁵³ 'wood mortar'
Songlin	+	zɑ ²⁴ 'goat'; ɹɿ ²⁴ 'mountain'
Suku	+	zɑ ³⁵ 'yes'; zɛ ³⁵ 'horse'
Boga'er	+	ruk'jo 'field ridge'; u're: 'rainbow'; a'rə 'tomorrow'; roa: 'the day after tomorrow'; a'ro 'morning'; ko're: 'sweet potato'; ri'poŋ 'rabbit'
Sulong	+	ra ⁵⁵ 'copper'; sɑ ³¹ ru ⁵⁵ 'liquor'; ra ⁵⁵ luh ⁵⁵ 'October'; da ³¹ ra ⁵⁵ 'deer'; sɑ ³¹ ru ⁵⁵ 'goat'; ra ³³ ka ⁵³ 'bamboo hat'; ku ³¹ zak ³³ wiaŋ ⁵⁵ 'haircut'
Bengni	+	to'ri 'wind'; o'ri 'rainbow'; mɑ'ri 'carbon'; ha'rik 'cold water'; a'ru 'tomorrow'; ə'rik 'pig'; mɑ'rəŋ 'sove'; ta'ra 'deer'
Bengru	+	dɑ ³¹ rai ⁵⁵ 'snow'; ha ⁵⁵ ru ⁵⁵ 'now'; buo ⁵⁵ roŋ ⁵⁵ 'monkey'; su ⁵⁵ ru ⁵³ 'sheep'; mu ⁵⁵ rə ⁵⁵ 'younger sister'; mɑ ⁵⁵ ru ⁵³ 'leg'; rai ⁵⁵ 'six'
Cangluo	+	ɹɿ ⁵⁵ 'water'; ɹɿ ³¹ ti ⁵⁵ 'wind'; ɹɿ ³¹ ko ⁵⁵ 'mountain'; zɑ ³¹ pa ⁵⁵ 'sheep'
Prami	+	ɑ ⁵⁵ riŋ ⁵¹ 'paddy field'; mu ³¹ ri ⁵¹ 'snake'; ɑ ⁵⁵ ra ⁵⁵ 'liquor'
Damu Luoba	+	zɔ ¹² 'he'; a ⁵⁵ zɛŋ ⁵⁵ 'paddy field'; zɑŋ ¹² 'oneself'
Chayu Tibetan	+	ra ³⁵ 'goat'; ro ³⁵ 'shave'; rin ³⁵ 'tall'
Gongbu Tibetan	+	ra ³⁵ 'goat'; ri ⁵¹ 'mountain'; rum ⁵⁵ 'incubate'
Lasa Tibetan	+	ri ¹³² 'mountain'; mi ¹³ re ¹¹ re ⁵⁵ 'everyone'; a ⁵⁵ ra ⁵⁵ 'moustache'

2.3.2. Feature B in Languages Spoken in Southeast Tibet

It is common that *r* or *z* works as a post consonant *r* or *z* in consonant clusters to form the compound initial consonants *Cr/z* in languages or dialects spoken in southeast Tibet. The details are as follows (Table 4):

Table 4. The phenomenon of *r* or *z* as a post consonant to form a compound initial consonant.

Language	Cr/z	Examples
Geman	+	pra ⁵⁵ ‘send out’; phrau ⁵⁵ ‘delay’; brat ⁵³ ‘grain’; krau ⁵⁵ ‘mutual’; khrai ⁵⁵ ‘tell’; gri ³⁵ ‘clothes’
Darang	+	pri ⁵⁵ ‘tear’; phri ⁵³ ‘knife stone’; bre ⁵³ ‘sharp’; ba ³¹ mroŋ ⁵⁵ ‘brother’; ha ³¹ kri ⁵⁵ ‘cactus’; khro ⁵³ ‘cry’; groŋ ³⁵ ‘hoof’; thro ⁵³ ‘candles’; hru ³⁵ ‘acid’
Yidu	+	pri ⁵⁵ ‘engage’; ndio ⁵⁵ phreŋ ⁵⁵ ‘ladder’; bra ⁵⁵ ‘germination’; ja ⁵⁵ mra ⁵⁵ ‘tiger’; mbra ⁵⁵ ‘seed’; kraŋ ⁵⁵ ‘crevice’; khro ⁵⁵ pa ⁵⁵ ‘stride’; a ⁵⁵ gra ⁵⁵ ‘basket’
Zha	+	ka ³¹ pra ⁵⁵ ‘color’; phri ⁵⁵ sa ³¹ ‘fly’; an ³³ bru ⁵⁵ ‘wool’; gra ⁵⁵ ‘dehiscence’; grai ⁵⁵ ‘chicken’; kri ³¹ ki ⁵⁵ ‘play’; khro ⁵⁵ ‘decay’
Songlin	+	pzo ²⁴ ‘land’; phzo ²⁴ ‘pull out’; bza ²⁴ ‘pine needles’; kza ²⁴ ‘chicken’; khza ⁵⁵ ‘dismantle’; gzu ⁵⁵ ‘loong’; ndzoŋ ⁵⁵ ‘yes’; nbzaŋ ²⁴ ‘horse’; ngzo ⁵⁵ ‘call’
Suku	+	phza ³³ phza ⁵¹ ‘dilute’; bze ⁵¹ (one) ‘grain’
Boga’er	-	-
Sulong	+	aŋ ³³ pru ⁵³ ‘rain’; a ³¹ praŋ ⁵⁵ ‘long’; min ³³ trə ⁵⁵ ‘grass’; graŋ ⁵³ ‘mountain’; hren ⁵⁵ ‘tree’
Bengni	+	kra ⁵⁵ teu ⁵³ ‘howl’; brər ‘burn’
Bengru	+	bre ⁵⁵ ‘crevice’; ma ³¹ braŋ ⁵⁵ ‘long’; bra ⁵⁵ ‘august’; ŋgo ⁵⁵ khren ⁵⁵ ‘head’
Cangluo	+	pru ⁵⁵ ‘dragon’; phras ⁵⁵ ‘frost’; bra ⁵⁵ ‘steep cliff’
Prami	+	bruk ⁵⁵ ‘thunder’; phras ⁵⁵ ‘frost’; pra ⁵⁵ ‘monkey’; bra ⁵¹ ‘golden monkey’
Damu Luoba	+	bre ⁵⁵ ‘cloud’; bru ⁵⁵ ‘thunder’; brə ²³¹ ‘snake’; pra ¹² ‘cut’
Chayu Tibetan	+	pra ³⁵ ‘cut’; phru ⁵¹ ‘snatch’; brok ³³ dzi ⁵³ ‘lightning’; mbre ³⁵ ‘twist’
Gongbu Tibetan	-	-
Lasa Tibetan	-	-

Table 4 shows that only Boga’er (Luoba), Bengni, Gongbu Tibetan and Lasa Tibetan find no post consonant *r* or *z* to form the consonant clusters of *Cr/z*. Other languages have at most five compound consonants of *Cr/z* such as in Darang, as follows:

Bilabial plosive consonant+r: pri⁵⁵ ‘tear’; bre⁵³ ‘sharp’

Postalveolar plosive consonant+r: thro⁵³ ‘candle’; ma³¹ter⁵³dru⁵³ ‘flood’

Velar plosive consonant+r: ha³¹kri⁵⁵ ‘cactus’; khro⁵³ ‘cry’; groŋ³⁵ ‘hoof’

Bilabial nasal consonant+r: ba³¹mroŋ⁵⁵ ‘brother’; tu³¹mroŋ⁵⁵ ‘partner’

Glottal fricative+r: hru³⁵ ‘acid’; ta³¹hro⁵³ ‘six’

There are at least two sets, such as in Bengni, as follows:

Bilabial plosive consonant+r: brər ‘burn’

Velar plosive consonant +r: kra⁵⁵teu⁵³ ‘howl’

2.3.3. Feature C in Languages Spoken in Southeast Tibet

Retroflex affricate consonants have been found in most languages spoken in southeast Tibet, such as Yidu, Zha, Songlin, Suku, Cangluo, Prami and Damu Luoba. Regardless of recent loanwords, retroflex affricates have not been found in only four languages, e.g., Geman, Sulong, Bengni and Bengru⁴. Moreover, it is postulated in this paper that, as the correlation with Tibetan becomes higher, the number of retroflex fricatives or fricatives a language may have also increases.

Details are shown in Table 5:

Table 5. Retroflex affricate and fricative consonants in languages spoken in southeast Tibet.

Language	With Retroflex Affricate	Examples
Geman	+	tʂoŋ ⁵⁵ kuo ⁵⁵ ‘China’; tʂhəŋ ³⁵ tsi ³¹ ‘orange’; ʂau ⁵³ tsi ³¹ ‘whistle’
Darang	+	tʂhuŋ ⁵⁵ ‘decay’; dʒoŋ ³¹ lu ⁵³ ‘basket’
Yidu	+	tʂu ⁵⁵ bra ⁵⁵ ‘foam’; tʂhu ⁵⁵ ‘run’; i ⁵⁵ dʒu ⁵⁵ khw ⁵³ ‘fire pond’; ʂu ⁵⁵ li ⁵⁵ ‘small intestine’
Zha	+	tʂoŋ ⁵⁵ ‘swollen’; tʂha ⁵⁵ ‘rice’; dʒin ⁵⁵ ‘cloud’; ʂu ⁵⁵ ‘burn’
Songlin	+	tʂa ⁵⁵ ‘shear’; tʂha ⁵⁵ ‘eagle’; dʒu ⁵⁵ ‘rub’; ʂu ⁵⁵ ‘get up’
Suku	+	tʂa ⁵¹ ‘a meal’; tʂha ⁵ ‘aismantle’; dʒu ⁵¹ ‘feather’; ʂa ⁵⁵ ‘tear’
Boga’er	+	puw ⁵⁵ tʂen ‘dove’; tʂo ⁵⁵ ma ‘bodhisattva’; gi ⁵⁵ tʂu ‘apprentice’; tʂhi ⁵⁵ tee ‘machine’
Sulong	+	ʂi ⁵⁵ ku ⁵⁵ ‘paper’; sak ⁵⁵ tʂa ⁵⁵ ‘map’
Bengni	+	namtʂa ⁵⁵ a’jo ‘kitchen god’; tʂa ⁵⁵ pa ‘Buddhist monk’; lap ⁵⁵ tʂa ‘student’
Bengru	+	ta ⁵⁵ tʂi ⁵⁵ ‘reed’; ʂi ⁵⁵ khai ⁵⁵ bua ³¹ teiu ⁵³ ‘ride the horse’
Cangluo	+	tʂu ⁵⁵ ‘barley’; tʂhap ⁵⁵ ‘rein’; dʒaŋ ³⁵ ‘count’
Prami	+	tʂu ⁵⁵ ‘barley’; tʂhap ⁵⁵ ‘rein’; dʒaŋ ³⁵ ‘count’; ʂe ⁵⁵ mo ⁵⁵ ‘yellow weasel’
Damu Luoba	+	tʂø ⁵³ ‘plant’; tʂhø ⁵³ ‘traction’; ndʒi ⁵³ ‘ghost’; ntʂu ⁵³ ‘go’
Chayu Tibetan	+	tʂin ³¹ ‘cloud’; tʂhu ⁵¹ ‘iron’; dʒe ³⁵ ‘root’; ndʒe ³⁵ ‘bite’
Gongbu Tibetan	+	tʂu ³⁵ ‘pick’; tʂhu ⁵¹ ‘wash’; dʒa ³⁵ ‘cut’; ndʒe ⁵⁵ ‘rice’
Lasa Tibetan	+	tʂu ¹¹ ke ⁵³ ‘thunder’; tʂho ¹¹ roŋ ⁵³ ‘valley’

2.3.4. Feature D in Languages Spoken in Southeast Tibet

In addition to Yidu, Songlin and Suku, the retroflex coda can also be found in other languages spoken in southeast Tibet. See Table 6 for details.

Table 6. Distribution of retroflex coda in languages spoken in southeast Tibet.

Language	With Retroflex Coda	Examples
Geman	+	xar ⁵³ kur ³⁵ ‘rice’; tshar ⁵⁵ ‘know’; par ⁵³ ‘sentence’
Darang	+	teir ⁵³ ‘humidity’; um ⁵⁵ eir ⁵⁵ ha ⁵⁵ run ⁵³ ‘weather’; ei ⁵³ eur ³¹ ‘result’
Yidu	-	-
Zha	+	khər ⁵⁵ ‘excrement’; kor ³³ zək ⁵⁵ ‘intention’; par ⁵⁵ ‘appreciate’; phur ⁵⁵ ‘contagion’
Songlin	-	-
Suku	-	-
Boga’er	+	ta’kar ‘star’; lunteir ‘typhoon’; pir ‘quantifier for plants’; di’pur ‘drought’; u’teur ‘stream water’; a’tər ‘corner’; kərku ‘rattan’; turku ‘walnut’
Sulong	+	yər ³³ mək ⁵³ ‘thunder’; par ⁵⁵ tset ³³ ‘sand’; min ³³ tər ⁵³ ‘grass’; a ³¹ kar ⁵⁵ ‘brother’; eiər ³³ teia ⁵⁵ ‘wolf’; sər ⁵⁵ pu ⁵³ ‘belly’
Bengni	+	ta’kar ‘star’; sər ‘hail’; mərɡu ‘rape’
Bengru	+	khər ⁵⁵ /khər ⁵³ ‘cry’; sir ⁵⁵ ‘liquor’; tēhyr ⁵⁵ ma ⁵⁵ ‘saliva’
Cangluo	+	thar ⁵⁵ ‘edge’; nir ⁵⁵ ma ⁵⁵ ‘wrinkle’; ser ⁵⁵ pa ⁵⁵ ‘hail’; sər ⁵⁵ ‘gold’; thor ⁵⁵ ‘one’; nūr ³⁵ ‘dew’
Prami	+	ər ⁵¹ ‘east’; der ³⁵ ‘webbed feet’; sir ³⁵ ‘light’; gor ⁵¹ ‘stone’; zur ⁵¹ ‘corner’
Damu Luoba	+	tər ²³¹ ‘file’; sir ⁵³ ‘gold’; eyr ⁵⁵ ‘whistle’; nor ¹² ‘cattle’; tər ⁵⁵ ‘acid’; phur ⁵⁵ ‘rub’
Chayu Tibetan	+	ər ⁵⁵ ‘east’; jər ³¹ ‘borrow money’; mər ¹³ ‘people’; nər ³⁵ ‘cattle’
Gongbu Tibetan	+	tar ⁵⁵ ‘hit’; jər ³³ su ⁵⁵ ‘sunny’; khər ⁵⁵ tu ⁵¹ ‘straightforward’; eor ⁵¹ ‘abortion’; tər ³³ ‘spit’
Lasa Tibetan	+	ɣər ⁵⁵ lo ⁵⁵ ‘previous years’; kar ⁵⁵ ma ⁵⁵ ‘stars’; ser ¹¹ ra ⁵⁵ ‘hail’

2.3.5. Feature E in Languages Spoken in Southeast Tibet

From investigations on the Sulong language (Li 2004), researchers have found a noteworthy phenomenon. The retroflex vowel of the syllable, which is similar to the Mandarin *r*-coloring coda, may appear before the vowel coda. For example,

eri:	çi ³³ be ^r i ⁵⁵ ‘yak’	a ^r i:	bari ³³ ci ⁵⁵ ‘next year’
aru:	a ³¹ ga ^r u ⁵³ ‘tall’	ə ^r i:	vəri ⁵⁵ ‘four’

It can even appear before the consonant coda. Such as:

ern:	bua ⁵⁵ pe ^r n ⁵⁵ ‘fly’	a ^r ŋ:	a ³¹ ba ^r ŋ ⁵³ ‘name’
ark:	dza ^r k ⁵⁵ ‘thousand’	ia ^r ʔ:	a ³¹ jet ⁵³ hia ^r ʔ ³³ ‘afternoon’

In the first line of each example above, the retroflex vowels appear between the nucleus and the end of the nasal consonants, and the second line shows that the retroflex vowels occur before the end of the stop-consonants. It should also be noted that the retroflex feature of the nucleus vowel at this time is implicit.

The retroflex vowel mentioned above is Feature E, and details are shown in Table 7:

Table 7. Distributions of feature E in languages spoken in southeast Tibet.

Language	With the Retroflex Vowel before the Coda		Examples
Geman	-	-	
Darang	-	-	
Yidu	-	-	
Songlin	-	-	
Suku	-	-	
Boga'er	-	-	
Bengru	-	-	
Sulong	+		və ⁵⁵ i ⁵⁵ 'four'; a ³¹ va ⁵⁵ 'dry'; wa ⁵⁵ 'kill'; he ⁵⁵ n ⁵⁵ 'tree'
Bengni	-	-	
Zha	+		mə ³¹ ʔ ³¹ do ^r ʔ ⁵⁵ 'flower'; ei ^r ʔ ³³ khu ⁵⁵ 'broth'
Chayu Tibetan	-	-	
Gongbu Tibetan	-	-	
Lasa Tibetan	-	-	

2.4. Summary

To summarize, regardless of recent loan words, manifestations of the five distributions of the retroflex feature in languages spoken in southeast Tibet can be summarized in Table 8:

Table 8. Manifestations of the five retroflex features in languages spoken in southeast Tibet *.

	A: r/ʔ Is an Independent Phoneme	B: Cr/ʔ _L	C: With Retroflex Fricatives	D: With a Retroflex Coda	E: With Retroflex Vowels before the Coda
Geman	+	+	-	+	-
Darang	+	+	+	+	-
Yidu	+	+	+	-	-
Zha	+	+	+	+	+
Songlin	+	+	+	-	-
Suku	+	+	+	-	-
Boga'er	+	-	+	+	-
Sulong	+	+	-	+	+
Bengni	+	+	-	+	-
Bengru	+	+	-	+	-
Cangluo	+	+	+	+	-
Prami	+	+	+	+	-
Damu Luoba	+	+	+	+	-
Chayu Tibetan	+	+	+	+	-
Gongbu Tibetan	+	-	+	+	-
Lasa Tibetan	+	-	+	+	-

* Type C in this table is different from the previous summary. Researchers did not take loanwords into account, so type C in Sulong, Bengni, Bengru and Geman is marked as '-'.

Table 8 shows that at least three types of retroflex features can be found in each of the 13 investigated language. Among them, category A features are common in languages spoken in southeast Tibet, and category B features have been found in every language except Lasa Tibetan. Furthermore, category C features and D features have been found in most languages, whereas category E features are relatively rare, only existing in Zha and Sulong. Therefore, only Zha and Sulong languages have all five retroflex features.

3. Floating of Retroflex Features in Languages Spoken in Southeast Tibet—A Case Study of Sulong

Among the languages mentioned thus far, Sulong is one of the few languages that have retroflex vowels before the coda. According to several investigations of the Sulong language, a rhotic sound before a coda in Sulong shows a floating phenomenon with a certain floating pattern. In this section, the retroflex features of the language are analyzed, and some phenomena worthy of discussion by the historical typology community are presented as well.

3.1. Retroflex Vowels in Sulong

According to Li (2004), some vowel phonemes in Sulong can be merged with retroflex features to form retroflex vowels. There are four such retroflex vowels: a^r , e^r , ∂^r and o^r . For example,

a^r :	va^{r55}	'he';	$mu^{r31}ba^{r55}$	'song';	$a^{31}la^{r55}$	'empty'
e^r :	ve^{r55}	'buy';	pe^{r55}	'sow (seeds)'		
∂^r :	$z\partial^{r33}$	'cloth shoes';	$a^{31}k\partial^{r55}$	'melon (general name of all melon plants)'		
o^r :	$teia^{53}po^{r55}$	'corn';	$gran^{31}ko^{r53}$	'ant';	$mu^{r31}bo^{r55}$	'bamboo'

In 2021, we conducted another investigation into the Sulong language. Combining the expanded vocabulary in this survey and the data of Li (2004), we added the retroflex vowel ' u^r ' phoneme to the Sulong phonology, such as

u^r :	$gu^{r31}lia^{55}$	'sweet potato';	$pu^r\partial^{55}$	'hatch';	$kuai^{55}tu^{r55}wa^{33}$	'canyon'
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This retroflex vowel has the function of distinguishing lexical meaning. For example,

ve^{55}	'bang'(the table)	ve^{r55}	'wear'
tua^{55}	'bite'	tua^{r55}	'oneself'
$a^{31}m\eta^{55}$	'fine power'	$a^{31}m\eta^{r55}$	'low'

It is still in doubt as to whether the ' $-r$ ' coda (D-type distribution) in Sulong is an independent syllable structure (the retroflex feature is attached to the whole vowel), or whether the five retroflex vowel phonemes directly act as the nucleus. However, this controversy can be easily solved by taking into account the retroflex of the vowels before the coda, which is discussed in Section 2.3.5. In fact, the ' $-r$ ' coda in Sulong is only an appearance, but its essence is the inevitable result of the merging of the retroflex feature with the vowels, serving as the nucleus together. In other words, Sulong characterizes retroflex vowels as the nucleus vowels of syllables. Table 9 shows the distribution of retroflex vowels in Sulong.

Table 9. Distribution of retroflex vowels in Sulong.

Distribution Characteristics	Final Structural Form	Examples
No medial and coda	V ^r	za ^{r55} ‘braised’; zo ^{r33} ‘cloth shoes’
Nucleus with a medial and without a coda	M+V ^r	tua ⁵⁵ ‘bite’; teia ⁵³ po ^{r55} ‘corn’
Nucleus without a medial and with a vowel coda	V ^r + V _E	vo ^{r55} ‘four’
Nucleus without a medial and with a nasal coda	V ^r + C _{NE}	he ⁿ⁵⁵ ‘tree’; a ³¹ mo ^r ŋ ⁵⁵ ‘low’
Nucleus without a medial and with a stop-consonant coda	V ^r + C _{CE}	so ^r ŋe ⁱ⁵⁵ ‘character’; a ³¹ va ^r 55 ‘dry’
Nucleus with a medial and a stop-consonant coda	M+V ^r + C	pia ^{k55} ‘gap’; bia ^{r53} ‘drought’
Nucleus with a vowel coda and a stop-consonant coda	C + M + V ^r + V _E C _{CE}	ha ³¹ ŋai ⁵³ re ^r it ‘meteor’

3.2. The Pronunciation Variation of Syllables with the Retroflex Feature in Sulong

According to Li (2004), abundant consonant clusters are in Sulong, with ‘basic consonants + post consonants’ as their basic pattern. The post consonants are -r, -l, -w and -j, forming 19 compound initial consonants that can be classified into four groups, such as

- A. Basic consonants + r: br, pr, gr, kr, fr, hr, sr;
- B. Basic consonants + l: bl, pl, gl, kl, hl, ɣl;
- C. Basic consonants + w: bw, mw, hw, ŋw;
- D. Basic consonants + j: lj, lj.

There is less friction in the post consonants in group A, but the retroflex feature is obvious. If the retroflexion extends to the final part, it may become the retroflex vowel. In some cases, the post consonants fall off, resulting in the prominent retroflex feature of the vowel. For example,

madman:	a ³¹ bra ⁵⁵	a ³¹ bra ^{r55}	a ³¹ ba ^{r55}
sow (seeds):	prei ⁵⁵	pre ^r i ⁵⁵	pe ^r i ⁵⁵
tree:	hren ⁵⁵	hre ^r n ⁵⁵	he ^r n ⁵⁵

If the consonant clusters of the ‘basic consonant + r’ in contemporary Tibeto-Burman languages originates from the proto-Sino-Tibetan language, this consonant cluster has undergone a process of disintegration, migration and stabilization in Sulong. The disassembly process can be summarized as follows:

Initial phase	→	Floating phase	→	Stable phase
C r V	→	C ^r V ^r	→	CV ^r

In the survey conducted twenty years ago, most syllables of *C r V were found to be stable, and only some syllables showed a floating state toward *C^rV^r. For example, the pronunciation of ‘tree’ could be hren⁵⁵, hre^rn⁵⁵, or he^rn⁵⁵.

However, in the survey conducted in 2021, most syllables in the utterance of the same speaker were found to be changed from *C r V to *C V^r. For example, the pronunciation of ‘tree’ could only be he^rn⁵⁵. In addition, quite a few words have also experienced a transitional process of retroflex features, such as

Chinese	2004	2021
fly	bua ³³ pre ⁿ⁵⁵	bua ³³ pe ^r n ⁵⁵
pillar	tər ³³ grəŋ ⁵⁵	tər ³³ gə ^r ŋ ⁵⁵
madman	a ³¹ bra ⁵⁵	a ³¹ ba ^{r55}
sing	bra ⁵³	ba ^{r53}
wipe	hraŋ ⁵⁵	ha ^r ŋ ⁵⁵
high	a ³¹ grau ⁵⁵	a ³¹ ga ^r u ⁵³
sow	prei ⁵⁵	pe ^r i ⁵⁵
tree	hren ⁵⁵	he ^r n ⁵⁵

It is also worth noting that the retroflex feature of the post consonant *r* starts to float and partially stops on the vowel nucleus. Here, a question arises: why does the retroflex *r* only float to the vowel nucleus of the final, not the coda? This question is answered in the following part.

3.3. The Blocking Effect of the Coda in the Syllable Structure of Sulong on the Floating of the Retroflex Feature

The questions raised in the previous section can be summarized from another perspective, as follows: when the retroflex feature of the post consonant *r* in Sulong floats to the vowel, the coda has a strong blocking effect on the retroflex feature.

In the syllable structure of the natural language, the nucleus vowel is the loudest, where the peak lies. Moreover, the coda is the end of the decreasing loudness, which is the lowest. However, the segments with low loudness can hardly hold the retroflex feature. In other words, it is difficult for the coda, whether it is the vowel coda or consonant coda or the nasal consonant or plosive consonant, to hold retroflex features due to its insufficient loudness.

Based on the aforementioned analysis, the post consonant *-r* in Sulong is a consonant with a strong retroflex feature. Once the retroflex feature falls off, it needs to find vowels with higher loudness to hold it. If the retroflex feature of the post consonant *r* in Sulong floats to the vowel, the coda has a strong blocking effect on the retroflex feature. This is perhaps the reason why the retroflex feature in Sulong is blocked by the coda and merged with the nucleus.

For example,

prei ⁵⁵	→	pe ^r i ⁵⁵	→	pei ^{r55}	sow(seeds)
hren ⁵⁵	→	he ^r n ⁵⁵	→	hen ^{r55}	tree
a ³¹ mrəŋ ⁵⁵	→	a ³¹ mə ^r ŋ ⁵⁵	→	a ³¹ məŋ ^{r55}	low
prak ⁵⁵	→	piak ⁵⁵	→	piak ⁵⁵	gap

3.4. Unified Interpretation of the Retroflex Category in Sulong

So far, a unified interpretation of the retroflex category in the Sulong language can be made.

First, the retroflex affricate ‘tʂ, ʂ, ʐ’ in Sulong results from language contact. For example,

ʂi ⁵⁵ ku ⁵⁵ ‘paper’	sak ⁵⁵ tʂa ⁵⁵ ‘map’
ʂə ³³ du ⁵⁵ ‘mule’	ku ³¹ ʐak ³³ wiaŋ ⁵⁵ ‘haircut’

The above words with a retroflex fricative ‘tʂ ʂ ʐ’ are rare in the daily life of the Luoba Sulong tribe but are found in loanwords that are used when communicating with other ethnic groups nearby.

In addition, the retroflex nuclei in Sulong—*a^r*, *e^r*, *ə^r*, *o^r* and *u^r*—are formed by the floating of retroflex features caused by the gradual weakening or even loss of *r* in the consonant cluster ‘basic consonant + *r*’. However, this process is fundamentally different from the Erhua vowels in Mandarin and various Chinese dialects. The retroflex nucleus is from the post consonant *r* in the consonant clusters. Therefore, the *r*-coloring retroflex nucleus in Sulong does not extend to the coda, as the coda has a strong blocking effect on retroflex feature floating. This is the second characteristic of retroflex nucleus in Sulong, which is different from the Chinese Erhua coda. The retroflex nucleus can have a vowel coda, such as *və^ru⁵⁵*, ‘rehabilitation’, and a consonant coda, such as *a³¹va^r⁵⁵* ‘dry’, *he^rn⁵⁵* ‘tree’; etc.

4. The Historical Typological Value of the Retroflex Feature

Through exploring the properties and source of the retroflex feature in the Sulong language, the present paper sheds new light on the formation of voice categories related to the retroflex feature in different languages. Using this method, researchers can explore the origin and development of retroflex sounds in southeastern Tibet. According to Sun (2011), before or during differentiation, the basic structure types of kindred languages are consistent, or in other words, identical or similar. However, due to long-time differentiation, each has evolved quite differently. This work can help us explore the evolution of the phonological structure of Sino-Tibetan languages, and can enrich the historical typology of Sino-Tibetan languages.

4.1. Feature Recombination and the Formation of the Retroflex Stop and Affricate

Phonology and Vocabulary of Tibeto-Burman Language: Based on the comparison between the pronunciation of characters and the spoken language, the transition from consonant clusters to affricates can be revealed. For example, almost all the subjoined letters with *r*, such as *p*, *ph*, *b*, *t*, *th*, *d*, *k*, *kh*, and *g* in Lasa Tibetan, are *tʂ*, *tʂh*:

Mandarin	Tibetan	Lasa	Xiahe	Dege
cliff	brag	tʂha ¹³	tʂak	tʂa ³¹
six	drug	tʂu ¹³	tʂək	tʂhu ³¹
ant	grogma	tʂho ¹³ ma ¹³	teokma	tʂhuŋ ¹³ ma ⁵³
ten thousand	khri	tʂhi ⁵³	tʂhə	tʂhi ⁵³
otter	sram	tʂam ⁵⁵	ʂam	saŋ ⁵⁵

The above data show that the development of consonant clusters with retroflex features into affricates in Tibetan-Burmese can be summarized as follows:

‘Stop-Consonant + *r*’ → Retroflex affricate

Based on this finding, researchers thought that it involved the recombination of various distinctive features, including retroflex features, at the level of combination. See the discussion below.

4.2. Two Retroflex Finals from Different Sources

According to the *Phonology and Vocabulary of Tibeto-Burman Language* (The Sound and Vocabulary of Tibetan-Burman Languages Authoring Team 1991), there are two sources for retroflex vowels. One is from the influence of the *r* and *l* coda falling process on the nucleus of the final. In other words, the loss of the *r* and *l* coda equips the nucleus vowel with the retroflex feature, which is similar to the Erhua phenomenon in Mandarin and some Chinese dialects. The other is formed under the influence of the post consonants in consonant clusters on vowels. For example, the retroflex vowel *er*, *ər*, etc., exists in languages spoken by the Naxi and Bai ethnic groups, but the corresponding retroflex vowels in most syllables of some other languages contain a post consonant *r/l*. For example,

‘Pus’:			
Burmese	praŋ ²	Achang	pʂəŋ ⁵⁵
Jino	pɿu ³¹	Naxi (Lijiang)	mbəɿ ³¹
‘Write’:			
Tibetan	bris	Menba (Cuona)	pri ¹³
Menba (Motuo)	bry	Derung	bɿi ⁵³
Naxi (Lijiang)	pəɿ ⁵⁵	Bai (Dali)	ve ⁵³

This situation is similar to the retroflex floating feature in Sulong. However, it is noteworthy that the coda in Sulong and Zha blocks the floating of retroflex features. In a word, the retroflex vowels result from retroflex floating and merging with the main vowels when the post consonant *-r/l* is weakened. Moreover, retroflex vowels may be in an intermediate state when the post consonant *-r/l* is in a dropping state. This should be distinguished. Regarding the formation of the *-r/l* coda, this is another problem. Perhaps these sounds

are derived from a process in which the retroflex floats to the coda in earlier pre or post *r/l* consonants.

4.3. Separation and Reconstruction of the Retroflex Feature in the Post Consonant *r/l*

According to the *Phonetics and Vocabulary of Tibeto-Burman Language* (The Sound and Vocabulary of Tibetan-Burman Languages Authoring Team 1991): Changes happen for post consonants of consonant clusters *z, s, l, r*, etc., during the dropping process. The process of change is as follows:

Consonant → Semivowel → Vowel (Medial)

Examples:

Chinese	Burmese	Burmese(Yangon)
many	mja ⁵⁵	mja ⁵⁵ (mia ⁵⁵)
grass, sharp	mrak ⁴⁴	mje ⁴⁴ (mia ⁴⁴)
land	mle ¹¹ (epitaph)	mje ¹¹ (mie ¹¹)
wooden plate	bjap ⁴⁴	bja ⁴⁴ (bia ⁴⁴)
absolutely	bra ⁵³ saj ⁵³	bja ⁵³ sr ⁵³ (bia ⁵³ sr ⁵³)
mat	phja ¹¹	phja ¹¹ (phia ¹¹)
disperse	phra ¹¹	phja ¹¹ (phia ¹¹)
bee	pja ⁵⁵	pja ⁵⁵ (pia ⁵⁵)
break	prat ⁴⁴	pja ⁴⁴ (pia ⁴⁴)
do	plu ⁵³ (epitaph)	pju ⁵³ (piu ⁵³)

Therefore, the dropping process of the post consonant is believed to be more complicated than this. Taking the syllable *dra*, in which *dr* is the initial consonant, as an example, first, dropping is based on feature decomposition. The feature matrix of *r* or *z* can be characterized as (1), the feature matrix of *d* can be characterized as (2), and the feature matrix of *a* can be characterized as (3), as follows:

- (1) *r* or *z*: [+dental, +voiced, +retroflex, +micro-fricative]
- (2) *d*: [+voiced, +stop, +blade-alveolar, – aspirate]
- (3) *a*: [alveo-palatal sound, +voiced, – fricative, +front, +high pitch]

Once the three independent phonemes are combined, they can be demonstrated in the pattern of example (4):

- (4) *d+ r/z+ a*: {[+voiced, +stop, +blade-alveolar, – aspirate] + [+dental, +voiced, +retroflex, +micro-fricative] + [+alveo-palatal sound, +voiced, – fricative, +front, +high pitch]}

The feature matrix (3) of the above nucleus ‘*a*’ has two situations due to the influence of factors such as cooperative pronunciation:

- I. The three features are realized as independent segments to obtain ‘*dra*’;
- II. Feature recombination.

In this light, feature recombination has two possibilities, such as

A. The recombination of feature bundles (1) and (2) can form a retroflex stop or affricate, which is:

- (5) {[+voiced, +stop, +blade-alveolar, – aspirate] + [+retroflex] + [+dental, +voiced, +micro-fricative] + [+alveo-palatal, +voiced, – fricative, +front, +high pitch]} → {*q* + [+blade-alveolar, +voiced, +micro-fricative] + *a*}

Only if the [+retroflex] of the [+dental, +voiced, +retroflex, +micro-fricative] takes part in recombination is the *q* recombined as in the pattern of [+voiced, +stop, +blade-alveolar, – aspirate, +retroflex]. The outcome of the syllabic development is likely to be *qja*.

If both the [+retroflex] and [+micro, – fricative] join in recombination, the recombination result of the [+dental, +voiced, +retroflex, +micro, – fricative] is *dz*. The syllable obtained is likely to be *dzja* or *dzia*.

For the convenience of description, we temporarily name the recombination under this situation as forward recombination.

B. The recombination of feature bundles (2) and (3) can form the retroflex final or coda, which is

(6) {[+ voiced, + stop, + blade-alveolar, – aspirate +] [+ blade-alveolar, + voiced, + retroflex, + micro-fricative, +alveo-palatal, + voiced, – fricative, + front, +high pitch]} → {d [+ blade-alveolar, + voiced, + retroflex, + micro-fricative, + alveo-palatal, + voiced, – fricative, + front, + high pitch]}

The [+ blade-alveolar, + voiced, + retroflex, + micro-fricative, + alveo-palatal, + voiced, – fricative, + front, + high pitch] has three possibilities:

C.dɿ/ja^r

D.da^r

E.dar/l

Examples: Darang—*dja*^{r55} ‘Far’

Examples: Sulong—*ran*³³*da*^{r53} ‘Mill’

Examples: Geman—*dal*/*da*^r ‘Skirt’

All the examples above belong to the backward floating *r*, which can be named ‘backward recombination’.

4.4. Summary

The retroflex feature of a post consonant *r* or *z* in proto-Sino-Tibetan, as well as in some languages spoken in southeast Tibet, undergoes floating development. This floating development might activate a recombination of the phonetic features into the syllable structure. There are two possible ways for recombination: forward recombination and backward recombination. Forward recombination constitutes the supralingual sound, whereas backward recombination is the main reason for the formation of the retroflex vowel/final and retroflex coda.

5. Conclusions

This paper first probes into the distribution of retroflex features in languages spoken in southeast Tibet, and then inquires into the feature of retroflex floating in the Sulong language. Based on historical typology, this paper further analyzes the explanatory role of floating in retroflex features. At least three findings can be presented.

First, some languages spoken in southeast Tibet show various spatial variations due to geographical factors. Research on these variations is of great value in enriching the historical typology of Sino-Tibetan languages. Based on an analysis of 13 languages spoken in southeast Tibet, this paper finds that the retroflex features of languages spoken in southeast Tibet can be divided into five categories. Differences in the quantities of retroflex features are vital variation phenomena. In addition, a retroflex feature floating phenomenon in the Sulong language and Zha language is found, which deserves further investigation.

Second, an apparent feature of retroflex feature floating exists in the Sulong language. There are five retroflex vowels in this language: ar, er, ər or and ur. They are formed by the floating of retroflex features caused by the gradual weakening or even loss of *r* in the consonant cluster ‘basic consonant + *r*’. Moreover, the retroflex features in the Sulong language do not extend to the coda, as the coda has a strong blocking effect on retroflex feature floating. The discussion of this floating phenomenon shows that the latter post-consonant ‘*r*’, retroflex vowel (or the final of a syllable) and other different retroflex sounds are not entirely uncorrelated. This phenomenon is likely to be induced by the evolution of a post consonant ‘*r*’ to a retroflex nucleus. Therefore, by examining these phonetic categories together, researchers can establish a close relationship between the Tibetan-Burman language and the Sino-Tibetan language from the perspective of historical-phonetic typology.

Third, according to the above discussion of the source and floating of retroflex features, other retroflex features of languages spoken in southeast Tibet are analyzed. It is found that the development of retroflex affricates and frictions in a wide range of languages spoken in southeast Tibet derives from the recombination of ‘*r*’ features and basic consonants containing ‘*r* + basic consonants’ or ‘basic consonants + *r*’. The basic path is

as follows: the floating of r-coloring retroflex features activates the forward or backward recombination of phonetic features in the entire syllable structure.

This paper aims to provide some new ideas for the historical typology study of Sino-Tibetan languages.

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Notes

- ¹ Certainly, there is one ʋ constituted by ʋ and ɿ, but this ɿ just means turbidity.
- ² Roche and Suzuki (2018) pointed out that the Sulong language should be called Puroik, as Sulong is an insulting term. However, the present survey shows that the insulting meaning of Sulong has been lost, and speakers tend to use Sulong to call themselves.
- ³ The Prami group of the Menba is also called Cuona Menba.
- ⁴ Geman, Sulong and other retroflex fricatives and affricate fricatives appear in Chinese and Tibetan loanwords.

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