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A RECONSTRUCTION OF PROTO-YUE VOWELS

KAREN HUANG

This paper presents an alternative reconstruction of Proto-Yue vowels in the literary stratum. Opposed to previous studies, the rhyme categories are not considered. I analyze the literary stratum of eighteen Yue dialects and reconstruct the vowel system based on the comparative method. I reconstruct nine monophthongs, nineteen diphthongs, and two triphthongs. Importantly, I reconstruct an advanced tongue root distinction, which is responsible for the *yin-ru* tone split in Proto-Yue. This study further suggests that the advanced tongue root distinction might be the "inner turn" vs. "outer turn" distinction in Middle Chinese, which will aid in a better understanding of Chinese historical phonology.

1. INTRODUCTION. Traditionally, the study of Chinese historical phonology has been based on written records of Middle Chinese, rather than on a comparison of modern Chinese dialects.[1] Middle Chinese often refers to the Chinese "language" in the sixth to tenth century. The sources of Middle Chinese are the rhyme books, such as 切韻 *Qieyun*, and the rhyme tables, such as 韻鏡 *Yunjin*. Although the rhyme books or tables provide a phonological system, it is controversial whether this phonological system was the documentation of a single Chinese variety, or a diasystem that preserved all the distinctions in different varieties. *Qieyun*, for example, was compiled by *Lu Fayan* in AD 601 in order to present a standard sound system. It is unclear where this sound system was spoken or whether it was spoken by anyone. Also, the rhyme tables, such as *Yunjin* written in the tenth century, record the rhyme category and phonetic features of each character. *Yunjin*, for example, marked the phonetic features of the initial consonants, the tones, and the "features" of the rhyme such as 開/合口 *kai/he kou* (open/close mouth), 內/外轉 *nei/wai zhuan* (inner/outer turn), and 等 *deng* (division).[2] Therefore most scholars in Chinese historical phonology have mainly reconstructed the phonological system of Middle Chinese based on the rhyme categories and the scholars' interpretation of the phonetic distinctions and "features" written in the rhyme tables, and then assigned phonetic values according to the modern reflexes or the loanwords found in foreign languages. Although evidence from modern reflexes or foreign loanwords was considered to assign phonetic values, the reconstructed phonological system is still based on the rhyme categories, not the comparative data.

This tradition in Chinese historical phonology affects the way scholars treat the modern dialects. Except for Min, all the Chinese dialects are assumed to be the daughter languages of Middle Chinese.[3] Therefore, the study of the dialects is still based on how the modern dialects reflect the Middle Chinese rhyme categories. For example, most of the documentation of the Yue dialects is a record of the elicitation of the characters organized according to the rhyme categories. The description of the phonology of

[1] According to Gordon (2005), there are fourteen Chinese languages. Due to the shared political history and writing system, traditionally even linguists often refer to these different varieties as dialects.

[2] In regard to the terminology generally used in the rhyme books, scholars disagree on what these terms denote. Generally the open/close distinction is associated with the feature of lip-rounding. For example, /wa/ is "close-mouthed" and /a/ is "open-mouthed." For the inner/outer turn distinction, some scholars such as Yue (1979) believe that inner or outer turn is the lax and tense distinction: inner turn marked lax vowels and outer turn marked tense vowels. Others, following Luo (1933), believe that outer turn corresponds to open (low) vowels, and inner turn corresponds to close (high) vowels. Division is the most controversial feature. Most linguists think that the four divisions differentiate the vowel height and the presence or absence of the glide /j/, but they disagree on the actual distinction.

[3] Min is the only dialect that does not have labiodental fricatives. In all other dialects, some of the labial stops became labiodental fricatives. The labiodentalization is a sound change that took place during the Middle Chinese period.

the modern dialects is based mostly on the merger or split of certain rhyme groups, but does not mention the actual sounds. Also, earlier scholars (McCoy 1966; Tsuji 1980) based their reconstruction of Proto-Yue on the distinctions indicated by the rhyme books. For example, since almost all of the Yue dialects have *miu̯* 'seedling', it is natural to reconstruct *miu̯. However, McCoy reconstructed *miəu and Tsuji reconstructed *miau, because this word belongs to the 效 *xiao* rhyme group with division III marking, which most scholars believe to be an indication of medial /j/. Although the evidence from other Chinese dialects suggests that Middle Chinese 效 *xiao* rhyme division III is probably *-iau or *iəu, the evidence from the Yue dialects suggests that in Proto-Yue, it should be *-iu̯. Otherwise we have to say that the monophthongization happened many times independently in various Yue dialects.

There are two problems with relying on the rhyme books. First, the relationship between the rhyme books and Yue dialects is not clear. Karlgren (1954:212) believes that *Qieyun* codified the dialect of Chang'an; Pulleyblank (1991:2) held the view that *Qieyun* represented the dialect of Luoyang; Zhou (1966) , and most scholars nowadays think that *Qieyun* reflected a compromised phonological system in the area of Jinling and Yexia. All of the places mentioned above are far from the Yue speaking area. Second, Middle Chinese is not the parent language of the Chinese dialects. The Yue speaking area, for example, was originally inhabited by other ethnic groups. Starting in 222 B.C., long before the era of Middle Chinese, Chinese from the North began to migrate to the area in waves whenever the North was in turmoil (Yuan 1960). Therefore, Yue dialects might be influenced by Middle Chinese, but Yue does not derive from Middle Chinese. Thus, any attempt to reconstruct Proto-Yue based on the reconstruction of the rhyme books would distort the data. It is a circular argument to interpret the Yue dialects in the Middle Chinese framework and claim the close relationship between the Yue dialects and Middle Chinese.

Recently, scholars such as Norman and Coblin (1995) and Yue (1995) began to recommend doing comparative research on "the real language" in various dialects, instead of the "systems" indicated by the rhyme books. Only modern comparative data can provide new evidence on the real development of Chinese. Several scholars have begun working on the reconstruction of the proto dialects. Norman (1973, 1974) has reconstructed Proto-Min initials and tones based on the comparison of dialects; Yue (2003, 2006) has revisited Proto-Yue initials and stop endings using the comparative method.

In this paper, I attempt to reconstruct the Proto-Yue vowel system based on the comparison of Yue dialects, and I further illustrate vowel development in the Yue dialects. Although the Proto-Yue vowel system has been reconstructed by McCoy (1966) and Tsuji (1980), their analyses were based on a limited number of the dialects. Their reconstructions were also highly influenced by the traditional Middle Chinese reconstruction and the rhyme distinctions based on the rhyme books. In this paper, I collect the pronunciations of the characters (literary stratum) from more extensive Yue dialects. Moreover, I use the comparative method and reconstruct the Proto-Yue vowels according to their sound correspondences. The reconstruction is based on the reflexes and the phonetic motivation of the sound change, instead of what rhyme books or other dialects suggest. Reconstructing Proto-Yue will contribute to the way linguists understand the relationship between the Yue dialects and other Chinese dialect groups, as well as to our knowledge of the historical phonology of Chinese.

2. THE YUE DIALECTS. Yue is one of the major dialect groups in the south of China. The term "Yue" is commonly associated with Cantonese. However, Yue refers to a group of Chinese dialects, and Cantonese refers to the standard dialect, spoken in the city of Guangzhou (Yue 1991). Nowadays, the Yue dialect region includes Hong Kong, Macau, the central and southwest parts of Guangdong province, and the southeast part of Guangxi province (Yuan 1960). Yue dialects are also spoken in many other countries, due to mass immigration in the past three hundred years.

There are several criteria for defining the Yue dialect group. The split of the *yin ru*[4] (upper entering) tone seems to be the one that most scholars agree upon (Norman 1988:216; Yue 1988). Most but not all

[4] *Yin-ru* (upper entering tone) is one of the tone categories in the Chinese tone boxes, which are explained in detail in the appendix. In the Yue dialects, the *yin-ru* tone category split into two tones: high entering (mostly 55) and

of the Yue dialects also include: (1) the split of Middle Chinese voiced stops and affricates into voiceless aspirates and voiceless non-aspirates; (2) the retention of all Middle Chinese final consonants, and (3) the presence of at least eight tones (Norman 1988:215–16).

Yue (1988) classified the Yue dialects according to isoglosses, based on the features of tone, initial consonants, rhymes, and vocabulary. After her revision (Yue 2006), she finalized her classification into two large groups: the Wuyi Liang-Yang group and the Delta group. Wuyi Liang-Yang is further classified into Wuyi and Liang-Yang subgroups; the Delta group is further classified into Northern Delta, Southern Delta, and Guangfu subgroups. Among the subgroups, Wuyi, Guangfu, and Northern Delta are further divided into two subdialect groups; and Southern Delta is divided into three subdialect groups. The dialect classification is illustrated in figure 1 below.

Yue (2006:76) classified the dialects based on the similarity of tone values in the tonal system, development of the consonants, and lexical items. Although she based her subgrouping on features that affect mutual intelligibility instead of using exclusively shared innovations, this subgrouping provides a basic topography of various Yue dialects.

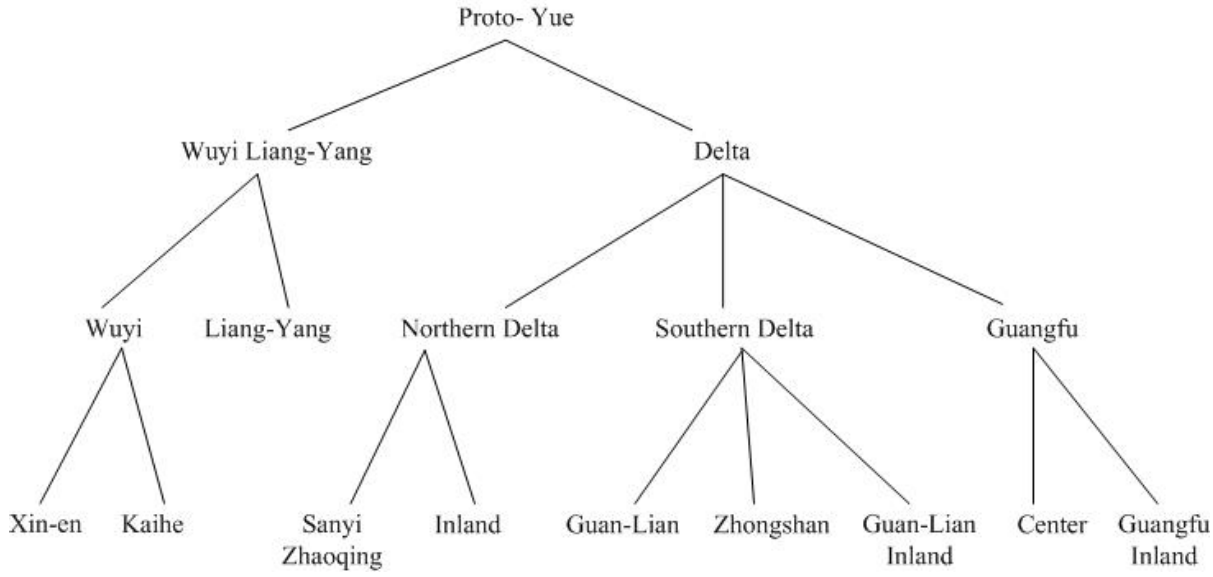

FIGURE 1. The classification of the Yue dialects, based on Yue 2006.

3. THE RECONSTRUCTION OF PROTO-YUE VOWELS.

3.1 METHOD. The data for this reconstruction are from a survey of Pearl River dialects done by Zhan and Cheung (1987) and Tsuji's research on eight Guangxi dialects (1980). Both works document and organize the pronunciation of each character instead of the elicitation of each word. Therefore, the vowel system I reconstruct only represents the literary stratum of Proto-Yue. One possible problem with the data is that the characters are organized according to rhyme categories, which might bias my reconstruction. However, even though the data are organized in the rhyme categories, I base my reconstruction solely on the sound correspondences. The only legitimate argument for the reconstruction is the sound correspondences, not the rhyme categories the characters belong to. Also, the reconstruction is based only on their modern reflexes and possible phonetic motivations. The "features" of the rhyme categories do not influence the reconstruction.

The dialect points being tested are based on Yue's classification (2006). Ideally I should include all the dialects in order to be able to detect all the possible changes. However, many documented dialects are

mid entering (mostly 33). In many dialects, the vowels with high entering tone are always shorter than the vowels with mid entering tone. For example in Guangzhou [ka:p^{33}] means 'to clip' and [kɐp^{55}] means 'to hurry'.

not published, or the published data are not comprehensive enough to compare with other dialects. I have chosen at least two dialects from each subdialect group to be the sample dialects. This is a way to ensure that the sample dialects are diverse enough to represent the sound correspondences in the Yue dialects. Since Yue's subgrouping (1988, 2006) was not based on shared innovations but shared similarities (mostly not vowels), her subgrouping is a good indication of diversity instead of genetic relationship. Unfortunately, I do not have enough data for comparison from a dialect of the Liang-Yang subgroup. In addition, I have data only from one dialect (Nanning Pinhua) in the Northern Delta Inland subgroup. The table below gives the dialects used in the reconstruction and their abbreviations.

TABLE 1. The sample Yue dialects.

Dialect subgroups		Dialects
廣府 Guangfu (GF)	中心 Center (CT)	廣州 Guangzhou (GZ)
		花山 Huashan (HS)
		寶安沙井 Bao'an shajin (BA)
	廣府內陸 Guangfu Inland (GF-In.)	蒼梧 Cangwu (CW)
		思賀 Sihe (SH)
南三角洲 Southern Delta (S. Delta)	莞簾 Guanlian (GL)	東莞莞城 Dongguan guancheng (DG)
		新界錦田 Xinjie jintian (XJ)
	中山 Zhongshan (ZS)	中山 Zhongshan (ZS)
		珠海前山 Zhuhai qianshan (ZH)
	莞簾內陸 Guanlian-inland (GL-In.)	容縣 Rongxian (RX)
		岑溪 Cengxi (CX)
		賓陽 Binyang (BY)
北三角洲 Northern Delta (N. Delta)	三邑肇慶 Sanyi-zhaoqing (S-Z)	順德大良 Shunde daliang (SD)
		高明明城 Gaoming mingcheng (GM)
	內陸 Inland (In.)	南寧平話 Nanning pinhua (NP)
五邑 Wuyi (WY)	新恩 Xin-en (XE)	新會 Xinhui (XH)
		台山 Taishan (TS)
		恩平牛江 Enping niujiang (EP)
	開鶴 Kaihe (KH)	開平赤崁 Kaiping chikan (KP)
		鶴山 Heshan (HE)
兩陽 Liang-yang		(No data available)

3.2 PROTO-YUE VOWELS. The vowels I have reconstructed are shown in tables 2 and 3. The monophthongs are either vowels with advanced tongue root ([+ATR]): *i, *y, *u, *o, *æ; or vowels without

advanced tongue root ([–ATR]): *ɪ, *ɛ, *ɑ,*ʊ. As for the diphthongs and the triphthongs, I mark the onglides and offglides as non-syllabic, e.g., [u̯o, ɑu̯]. Therefore, the syllable structure of Proto-Yue is (C)(V̯)V(V̯) or (C)(V̯)V(C), for example *ku̯ai̯ 'weird' and *ku̯ok 'country'. In addition, [–ATR] vowels occur only in closed syllables.

TABLE 2. Proto-Yue monophthongs.

	Front	Central	Back
High	i y		u
	ɪ		ʊ
Mid	ɛ		o
Low	æ		ɑ

TABLE 3. Proto-Yue diphthongs and triphthongs.

Rising Diphthongs	i̯æ		i̯o	i̯ɑ	i̯u			
	u̯æ	u̯e	u̯o	u̯ɑ		u̯i	uə̯	
Falling Diphthongs	æi̯		oi̯	ɑi̯	ui̯			
	æu̯	ɛu̯	ou̯	ɑu̯		iu̯		
Triphthongs	u̯æi̯				u̯ɑi̯			

According to Norman (1988:217), a vowel-length distinction is crucial to the split of the *yin-ru* (upper entering) tone found in most of the Yue dialects,[5] which suggests that a vowel-length distinction must have been a feature of Proto-Yue. Synchronically, for the dialects that have both long and short vowels, high entering tone always has a short vowel, and mid entering tone always has a long vowel. However, although synchronically there is a vowel length difference (Bauer and Benedict 1997), this difference is not phonemic (Hashimoto 1972). In addition, there is not much phonetic motivation for a vowel-length distinction to condition the tone split into two level tones (Lee 1993:108–10). Neither can a tense/lax distinction account for the tone split.

Instead of reconstructing the vowel-length distinction to account for the tone split, as suggested by Norman (1988:217), I account for it by reconstructing the [+ATR]/ [–ATR] distinction. This is because an advanced tongue root is usually accompanied by lowering of the larynx or a slightly breathy quality (Ladefoged and Maddieson 1996:300–302), which lowers the tone (Ohala 1972). Gregerson (1976:351–57) has also suggested that the pitch split in Vietnamese is related to tongue-root advancement, based on the comparative Mon-Khmer data.

In my reconstruction, when the syllable was in the upper entering tone group, the [+ATR] vowels result in mid entering tone (33), and the [–ATR] vowels result in high entering tone (55). Words with mid entering tone came from the [+ATR] nuclei *i, *y, *u, *æ, *o, *i̯æ, *i̯o, or *u̯o, and words with high entering tone came from the [–ATR] nuclei *ɪ, *ɑ, *ʊ, *ɛ, or *u̯ɑ. The vowel-length differences found in contemporary Yue dialects are a later development after the tone split and the loss of the [+ATR]/[–ATR] feature distinction. It is also possible that the vowel-length feature was associated with the [+ATR]/[–ATR] feature; [+ATR] vowels might be longer in order to exaggerate the [+ATR] feature. Later, after the tone split, the [+ATR]/[–ATR] feature was lost, but the vowel length differences remained.[6]

[5] Although the tone split is a criterion for defining the Yue dialects, Lee (1993) noted that not all the Yue dialects have the *yin-ru* tone split. However, based on geographical distribution, she concluded that the tone split was a Proto-Yue development, and the dialects without the split underwent a merger.

[6] Synchronically, there is a vowel-length difference in many Yue dialects, such as Guangzhou dialect (Bauer and Benedict 1997). For the dialects that exhibit a vowel-length difference, high entering tone (55) always has a shorter vowel, and mid entering tone (33) always has a longer vowel. However, the vowel-length difference is phonetic, and is predictable from the vowel quality (Hashimoto 1972).

3.3 PROTO-YUE MONOPHTHONGS. This section gives the sound correspondences of the Proto-Yue monophthongs. [+ATR] vowels *i, *y, *u, *æ, and *o each have more than two sets of sound correspondences, which are conditioned by the surrounding consonants. Therefore, I discuss each of them independently, after which I discuss the [–ATR] vowels *ɪ, *ɛ, *ɑ, *ʊ.

3.3.1 PROTO-YUE *i. *i is reconstructed as a [+ATR] vowel because when *i belongs to the *yin-ru* tone category, the [+ATR] vowel *i with a proto-voiceless initial and a final stop created a mid entering tone (tone value 33 in Guangzhou). For example, the modern reflex of *ts^{h}it 'cut' is /ts^{h}it^{33}/ in Guangzhou.

There are four sets of sound correspondences, which depend on the environment, as shown in table 4. Row 1 gives the correspondences when the initial consonant was alveolo-palatal or palatal; row 2 gives the correspondences when the initial consonant was an alveolar sibilant; row 3, when the initial consonant was a bilabial, an alveolar stop, or a velar; and row 4, when *i was in a closed syllable.

TABLE 4. The sound correspondences of Proto-Yue *i.

		Guangfu					Southern Delta					Northern Delta			Wuyi				
		CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
		GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*i	1	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i	i
	2	i	i	i	i	əi	ɐi	i	i	i	ei	y	i	i	i	u	y	i	y
	3	ei	ɐi	ɐi	i	əi	ɐi	i	i	i	ei	i/ei	i/ei	i	ei	ei	i	ei	ɑi
	4	i	i	i	i	i	i	i	i	i	i	i	i	i	i	e/ia	ia/ie	i	i

As row 1 in table 4 shows, when the initial consonant was alveolo-palatal, or palatal all of the reflexes remain /i/.[7] The sources of these consonants include *alveolo-palatals (*tɕ, *tɕ^{h}, *dʑ, *ɕ, *ʑ, *ȵ), *palatals (*j), and *retroflex stops (*ʈ, *ʈ^{h} *ɖ), and *ŋ. *Retroflex stops merged with *alveolo-palatal affricates, and in many of the dialects *ŋ > j/ __ [high vowel] (Yue 2006). Table 5 gives some examples of this set of sound correspondences.

TABLE 5. Examples of Proto-Yue *i after alveolo-palatal or palatal.

	Gloss	Guangzhou (GZ)	DongGuan (DG)	ShunDe (SD)	Taishan (TS)
*tɕ^{h}i	'teeth'	ts^{h}i (*tɕ^{h}>ts^{h})	ts^{h}i	ts^{h}i	ts^{h}i
*ɕi	'poem'	si (*ɕ> s)	si	si	si
*ji	'already'	ji	zi (*j>z)	hi (*j>h)	zi
*ŋi	'doubt'	ji	zi (*ŋ>j>z)	ji	^{ŋ}gei (*ŋ>^{ŋ}g)
*ɖi	'hold'	ts^{h}i	ts^{h}i	ts^{h}i	ts^{h}i

As illustrated in table 5, the initial consonants with palatality maintained the palatality of the following vowels.

The sound correspondences of *i in row 2 in table 4 occurred when the initial consonant was an alveolar sibilant. The sources of the alveolar sibilants are *alveolar sibilants (*ts, *ts^{h}, *dz, *s, *z) and *retroflex sibilants (*ʈʂ, *ʈʂ^{h}, *ɖʐ, *ʂ, *ʐ). The proto retroflex sibilants had merged into alveolar sibilants before the dialects split. As shown in row 2 in table 4, *i with an initial alveolar sibilant behaved like *i in row 1 in many dialects; it behaved like *i in row 3 in SH, DG, and BY. It behaved like neither row 1 nor row 3 in SD, TS, EP, and HE. Examples of this environment are given in table 6.

TABLE 6. Examples of Proto-Yue *i after alveolar sibilants.

[7] Alveolo-palatals later merged with alveolars in Yue dialects.

	Gloss	GZ	DG	SD	TS	EP	HE
*ts^{h}i	‘this’	ts^{h}i	ts^{h}ɐi	ts^{h}y	ɬu	sy	t^{h}y
*ʤʐi	‘lavoroty’	ts^{h}i	ts^{h}ɐi	ts^{h}y	ɬu	sy	ɬy

Most of the vowels in row 3 of table 4 became diphthongized. This diphthongization seems general, except where the initial consonant maintained the palatality of the *i. Therefore *i > ii > ei (or another falling diphthong), as shown in the examples in table 7. These initial consonants mostly include bilabials, alveolar stops, and velars. However, in SD and GM, initial velar stops also prevented the vowels from diphthongization, possibly because velar stops fronted before *i. Overall, the diphthongization was context-free except where a palatalizing consonant prevented it.

TABLE 7. Examples of Proto-Yue *i after bilabials, alveolar stops, and velars.

	Gloss	Guangzhou(GZ)	DongGuan(DG)	Zhongshan(ZS)	Shunde(SD)	Taishan (TS)
*bi	‘nose’	pei	pɐi	pi	pei	pei
*di	‘ground’	tei	tɐi	ti	tei	ei
*ki	‘record’	kei	kɐi	ki	ki	kei

The first three rows of table 4 indicate how *i behaves in open syllables. Row 4 of table 4 shows the sound correspondences when *i is in a closed syllable (final nasals and final stops). As shown in row 4, *i usually stayed /i/ in closed syllables except in TS and EP. The down-gliding diphthongization in TS and EP suggests that the *i probably became a lax vowel after the tone split. Examples are given in table 8.

TABLE 8. Examples of Proto-Yue *i in closed syllables.

	Gloss	Guangzhou(GZ)	DongGuan(DG)	Taishan (TS)	Enping(EP)
*pin	‘change’	pin	pin	pen	pian
*ts^{h}it	‘cut’	ts^{h}it^{33}	ts^{h}it^{33}	t^{h}et^{33}	ts^{h}iet^{33}

3.3.2 Proto-Yue *y. *y is reconstructed as a [+ATR] vowel in order to account for the mid entering tones in yin-ru tone category in the modern reflexes. For example, *syt ‘snow’ became /syt^{33}/ in Guangzhou. Table 9 shows the sets of sound correspondences of Proto-Yue *y.

TABLE 9. The sound correspondences of Proto-Yue *y.

		Guangfu					Southern Delta					Northern Delta			Wuyi				
		CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
		GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*y	1	y	y	y	y	y	y	y	y	y	y	y	y	y	i	i	i	i	y
	2	y	y	y	y	y	y	y	y	y	ui	y	y	y:	ui	ui	ui	ui	y
	3	œy	oi	ui	y	y	ui	y	y	y	ui	y	y	y:	ui	ui	ui	ui	ui
	4	y	y	iɔ	u	y	ø	y	y	y	u	y	y	i	i	u	ie	i	y

Similar conditional changes are found for *y. In row 1 of table 9, the initial consonants were alveolo-palatals and palatals, which maintain the palatality of the following vowels. Therefore all of the dialects have monophthongs. Some of the Wuyi dialects unrounded the vowel. The sources of these alveolo-palatals and palatals are similar to what has been mentioned in 3.3.1, except that *ʤ behaves differently.

The correspondences of *y with an initial *ʤ are illustrated in row 2 of table 9. When the initial was *ʤ (*ʤ > *tɕ^{h} > ts^{h}), *y behaved like *y with an initial non-palatal consonant, as in row 3 of table 9 in BY, NP, XH, TS, EP, and KP; it behaves like *y in row 1 elsewhere. This suggests that in BY, NP, XH, TS, EP, and KP, *ʤ had not yet merged with *tɕ^{h} or it had already merged with *ts^{h} when *y was diphthongized. On the other hand, in other dialects, *ʤ merged with the *tɕ^{h} and thus prevented the diphthongization.

Row 3 is the elsewhere condition, where the initial consonants were non-palatal, and not able to maintain the palatality or frontness in some of the dialects. The diphthongization (*y > yy > œy or *y > yy > yi > ui) was similar to that of *i; that is, the context-free diphthongization applied to *y except where it was prevented by the quality of the preceding consonant. Table 10 shows examples of *y in open syllables.

TABLE 10. Examples of Proto-Yue *y in open syllables.

	Gloss	Guangzhou (GZ)	DongGuan (DG)	Xinjie(XJ)	Taishan (TS)
*tɕy	'master'	tsy	tsy	tsy	tsi
*ʈy	'spider'	tsy	tsy	tsy	tsi
*ɖy	'pillar'	ts^hy	ts^hy	ts^hy	ts^hui
*ky	'sentence'	kœy	kui	ky	kui
*sy	'need'	sœy	sui	sy	ɬui

Row 4 in table 9 shows the sound correspondences when *y occurred in closed syllables. As can be seen in row 4, *y remains /y/ in most of the dialects. Some dialects lose the roundness, frontness, or height of *y in closed syllables such as CW, DG, NP, XH, and KP; some dialects diphthongized the vowel into down-gliding diphthongs such as BA and EP, all of which suggest that the vowels became lax in this environment. Note that the rising diphthongs in the Wuyi reflexes of *i also give some suggestion of laxing.

TABLE 11. Examples of Proto-Yue *y in closed syllables.

	Gloss	Guangzhou(GZ)	DongGuan(DG)	Xinhue(XH)	Taishan (TS)	Enping(EP)
*ŋyt	'moon'	jyt	zøt	^{ŋ}git	^{ŋ}gut	^{ŋ}giet
*syt	'snow'	syt^{33}	søk	sit	ɬut	siet
*sun	'garlic'	syn	søn	sun	ɬ^{u}ɔn	suan

3.3.3 Proto-Yue *u. *u is a [+ATR] vowel, which causes the tone split to result in mid entering tone (33) before voiceless stops. For example *t^{h}ut 'take off' became /t^{h}yt^{33}/ in Guangzhou. Table 12 shows the sets of the sound correspondences of *u.

TABLE 12. The sound correspondences of Proto-Yue *u.

		Guangfu					Southern Delta					Northern Delta			Wuyi				
		CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
		GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*u	1	u	u	u	u	u	u	ʊ	u	u	ou	u	u	u:	u	u	u	u	u
	2	ou	ou	ou	u	ou	ɔu	ʊ	u	u	ou	ou	ou	u:	æu	u	u	ou	ɑu
	3	u	u	u	u	u	u	ʊ	u	u	u	u	u	u:	u	u̯ɔ	ua	ua	ɔ
	4	y	y	iɔ	u	y	ø	y	y	y	u	y	y	u:	u	u̯ɔ	ua	ua	ɔ

The conditions for the sound changes of *u are different from those for *i and *y. The sound correspondences in row 1 occurred when the initial consonant was a *bilabial fricative (> f), a *velar, *h, *w, or *Ø (< *ʔ), which all preserve the labiality of the vowel. The sound correspondences in row 2 occurred when the initial consonant was an alveolar or bilabial stop. Compared to row 1, row 2 shows that *u is more often diphthongized after alveolars and bilabial stops. This is probably because the bilabial and alveolar stops were not rounded, and were thus less likely to preserve the vowel's lip rounding. On the other hand, *w and *velars might encourage rounding, and *h, *Ø (< *ʔ) would at least not interfere with rounding. The bilabial fricatives (or later /f/) require a strong airflow, which may interfere with diphthongization; or the bilabial fricatives could had merged with /ʍ/ (> f), become rounded in this environment, and maintained the rounding. Also, *ŋu became a syllabic velar nasal. This set of sound correspon-

dences is not listed in table 12, but the example of *ŋu is provided in table 13, along with other examples of *u in open syllables.

TABLE 13. Examples of Proto-Yue *u in open syllables.

	Gloss	Guangzhou(GZ)	Sihe(SH)	Zhongshan(ZS)	Shunde(SD)	Xinhue(XH)	Taishan(TS)
*hu	'tiger'	fu	ɸu	hu	fu	fu	fu
*βu	'father	fu	ɸɦu	hu	fu	fu	fu
*wu	'crow'	wu	u	u	wu	vu	vu
*ŋu	'five'	ŋ̍	ŋ̍	ŋ̍	ŋ̍	ŋ̍/m̩	ŋ̍/m̩
*lu	'road'	lou	lou	lu	lou	læu	lu
*lou	'old'	lou	lou	lou	lɔ	lou	lau

Row 3 and row 4 in table 12 are the sets of sound correspondences when *u occurred in closed syllables. Row 4 occurred when the initial consonant was alveolar. The alveolar consonants fronted the high back vowel, and *u merged with *y in most of the Delta dialects except for Nanning Pinhua (NP). This similarity in the treatment of *u and *y suggests the early merger of *u > *y in closed syllables when following alveolars in Delta dialects (except for NP). The reflexes shown in row 3 occurred elsewhere. The sound correspondences of row 3 are similar to *u in open syllables (row 1 in table 12), except in BY and many Wuyi dialects. In these Wuyi dialects, *u became a rising (down-gliding) diphthong in closed syllables, probably because it became lax in closed syllables: (*u > uə̯ > wə > wa). A similar down-gliding sound change was found in *i and *y in closed syllables in Wuyi dialects. Note that this change must have occurred after the *yin-ru* tone split, in which the [+ATR] features cause the lowering of the tone, because lax and [+ATR] are incompatible features. (In fact, some linguists use [+ATR] for [tense].)

TABLE 14. Examples of Proto-Yue *u in closed syllables.

	Gloss	Guangzhou(GZ)	DongGuan(DG)	Xinhue(XH)	Taishan (TS)	Enping(EP)
*mun	'full'	mun	mun	^{m}bun	^{m}bu̯ɔn	^{m}buan
*kun	'officer'	kun	kun	kun	ku̯ɔn	kuan
*nun	'warm'	nyn	nøn	lun	^{n}du̯ɔn	^{n}duan
*t^{h}ut	'take off'	t^{h}yt^{33}	t^{h}øt^{33}	hut^{33}	hu̯ɔt^{33}	huat^{33}

3.3.4 PROTO-YUE *æ. *æ is reconstructed, although almost all the dialects have /a/ reflexes. *æ is reconstructed in order to signify the [+ATR] feature, because syllables with /a/ in *yin-ru* tone always have a mid entering tone. *æ signifies the [+ATR] low vowel as opposed to the [–ATR] low vowel *ɑ. For example, *pæk 'hundred' became /pak^{33}/ and *pɑk 'north' became /pɐk^{55}/ in Guangzhou.

TABLE 15. The sound correspondences of Proto-Yue *æ.

		Guangfu					Southern Delta					Northern Delta			Wuyi				
		CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
		GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*æ	1	a	a	a	a	a	a	ɑ	a	a	a	a	a	a	a	a	a	a	ɑ
	2	a	a	a	a	a	a	ɑ	a	a	a	a	a	aː	a	a	a	a	e
	3	a	a	æ	a	a	ɛ	æ	a	a	a	a	a	aː/ɛː	a	a	a	a	ɑ/iɑ

Row 1 of *æ shows the sound correspondences in open syllables. Generally *æ is very stable in open syllables. Rows 2 and 3 show the sound correspondences in closed syllables.

Row 2 indicates the sound correspondences when the final consonant is labial. The only phonemic change is in HE, where *æ merged with /e/ (< *ɪ) before labials (*æp > ep; *æm > em). Row 3 shows the sound correspondences when the final consonant is alveolar or velar. In BA, DG, and XJ, *æ has different reflexes in rows 2 and 3. In these dialects, final alveolars merged into final velars; therefore the sound

change (or retention) is probably conditioned by the final velars. Before final alveolars, *æ > a: in NP and *æ > ɑ in HE. Before final velars, *æ > ɛ in NP and *æ > iɑ in HE.

Table 16 gives examples. Note that *æ caused mid entering tone in the *yin-ru* tone category.

TABLE 16. Examples of Proto-Yue *æ.

	Gloss	GZ	BA	DG	XJ	NP	HE
*mæ	'horse'	ma	ma	ma	mɑ	ma	mɑ
*næm	'south'	nam	naŋ	naŋ	nɑm	na:m	nem
*mæn	'slow'	man	mæŋ	mɛŋ	mæŋ	ma:n	mɑn
*ŋæŋ	'hard'	ŋaŋ	ŋæŋ	ŋɛŋ	ŋæŋ	ŋɛ:ŋ	ŋiɑŋ
*pæk	'hundred'	pak^{33}	pæ^{35}	pɛ^{224}	pæk^{35}	pɛ:k	viɑk^{33}

3.3.5 PROTO-YUE *o. As with *æ, *o is reconstructed to signify the [+ATR] feature in Proto-Yue, because syllables with this set of sound correspondence in *yin-ru* tone always have a mid entering tone. For example, *kok 'horn' became /kɔk^{33}/ in Guangzhou.

TABLE 17. The sound correspondences of Proto-Yue *o.

		Guangfu					Southern Delta					Northern Delta			Wuyi				
		CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
		GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*o	1	ɔ	ɔ	ɔ	ɔ	ɔ	ɔ	ɔ	ɔ	o	ø	ɔ	ɔ	ɔ	u̯ɔ	u̯ɔ	ua	u	ɔu
	2	ɔ	o	u	ɔ	o	u	ʊ	ɔ	o	ø	ɔ	ɔ	a:	u	u̯ɔ	ua	ua	ɔ
	3	ɔ	ɔ	ɔ	ɔ	e̯o	ɔ	ɔ	ɔ	ɔ	e̯o	ɔ	ɔ	a:	ɔ	ɔ	ɔ	ɔ	œ

In table 17, row 1 shows the sound correspondences of *o in open syllables. In open syllables, *o fronted in BY, and diphthongized in Wuyi dialects.

Rows 2 and 3 show the sound correspondences of *o in closed syllables.[8] Row 2 indicates the sound correspondences when the final consonant is alveolar. In this environment, several dialects have higher vowels than in row 1; Wuyi dialects even show the pre-diphthongization merger of *o before alveolars with *u. Therefore, the sound correspondences of the Wuyi dialects in row 2 of table 17 are the same as in rows 3 and 4 of table 12.

Row 3 gives the sound correspondences when the final consonant is velar. *o is stable except for the diphthongization in SH and BY and the fronting in HE. In NP *o merged with *æ in all closed syllables. Table 18 shows the examples of *o.

TABLE 18. Examples of Proto-Yue *o.

	Gloss	Guangzhou(GZ)	Sihe(SH)	Xinjie(XJ)	Xinhue(XH)	Heshan(HE)
*to	'many'	tɔ	tɔ	tɔ	tu̯ɔ	ɔu
*kot	'cut'	kɔt	kot	kʊk	kut	kɔt
*bok	'thin'	pɔk	p^{h}e̯ok	pɔk	pɔk	vœk
*kok	'horn'	kɔk^{33}	ke̯ok	kɔk^{35}	kɔk^{33}	kœk^{33}

3.3.6 PROTO-YUE [–ATR] VOWELS. I have reconstructed four [–ATR] vowels, because in the *yin-ru* tone category, the [–ATR] vowels resulted in high entering tone. These four vowels are chosen because they are usually considered [–ATR]. Notice that Proto-Yue [–ATR] vowels can only occur in closed syllables.

TABLE 19. The sound correspondences of Proto-Yue [–ATR] vowels.

[8] *o did not occur with final bilabials.

	Guangfu					Southern Delta					Northern Delta			Wuyi				
	CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
	GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*ɪ	e	ə	e	ɪ	i	ə	ə	e	ɪ	ɪ	e	ə	əi	e	e	e	e	e
*ɑ	ɐ	ə	ɐ	a	a	ɐ	ə	ɐ	aː	ə	a	ɐ	ʌ	a	a	a	a	ɑ
*ɛ	ɐ	ɐ	ɐ	ə	a	ɐ	ə	ɐ	ə	ə	ɐ	ɐ	ʌ	æ	i	ia	e	ɑ
*ʊ	o	o	o	o	o	o	o	o	ʊ	o	o	o	ɔː	ou	ø	o	o	ɔ

As shown in table 19, the *ɑ correspondence set shows that *ɑ and *æ merged into /a/ in all the Wuyi dialects and some Delta dialects. This happened after the tone split. Other dialects mostly raised *ɑ to /ɑ̈/, /ɐ/, or /ʌ/. As for *ɛ, *ɛ mostly centralized or merged with *ɑ in Delta dialects, and remained fronted in most of the Wuyi dialects. *ʊ became /o/ in most of the dialects (after *o > ɔ). Examples of reflexes of Proto-Yue [–ATR] vowels are shown in table 20.

TABLE 20. Examples of Proto-Yue [–ATR] vowels.

	Gloss	Guangzhou(GZ)	Sihe(SH)	Xinhue(XH)
*lɪk	'strength'	lek	lik	lek
*ɕɪk	'know'	sek^{55}	śik	sek^{55}
*tɑŋ	'wait'	tɐŋ	taŋ	taŋ
*pɑk	'north'	pɐk^{55}	pak	pak^{55}
*pæk	'hundred'	pak^{33}	pak	pak^{33}
*pɛt	'pen'	pɐt^{55}	pat	pæt^{55}
*tʊŋ	'east'	toŋ	toŋ	touŋ
*k^{h}ʊk	'cry'	hok^{55}	hok	houk^{55}

3.4 PROTO-YUE DIPHTHONGS.

3.4.1 RISING DIPHTHONGS WITH ᵘ̯. I reconstruct six rising diphthongs with ᵘ̯. Some of them have different sets of sound correspondences depending on the initial consonants.

TABLE 21. The sound correspondences of Proto-Yue rising diphthongs with ᵘ̯.

		Guangfu					Southern Delta					Northern Delta			Wuyi				
		CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
		GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*ᵘ̯æ	1	ᵘ̯a	ᵘ̯a	ᵘ̯a	ᵘ̯a	ᵘ̯a	ᵘ̯a	ᵘ̯ɑ	ᵘ̯a	ᵘ̯a	ᵘ̯a	ᵘ̯a	ᵘ̯a	ᵘ̯a	ᵘ̯a	a	a	a	ᵘ̯ɑ
	2	a	a	a	ᵘ̯a	a	a	ɑ	a	a	a	ᵘ̯a	ᵘ̯a	a	a	a	a	a	ɑ
*ᵘ̯o	1	ᵘ̯ɔ	ᵘ̯ɔ	ᵘ̯ɔ	ɔ	ø	ᵘ̯ɔ	ᵘ̯ɔ	ɔ	ɔː	u	ᵘ̯ɔ	ᵘ̯o	o	ɔ	ɔ	ɔ	ɔ	u
	2	ɔ	ɔ	ɔ	ɔ	ø	ɔ	ɔ	ɔ	ɔː	u	ɔ	ᵘ̯o	o	ɔ	ɔ	ɔ	ɔ	u
*ᵘ̯ɑ	1	ᵘ̯ɐ	ᵘ̯ɐ	ᵘ̯ɐ	ᵘ̯ə	ᵘ̯ə	ᵘ̯ɐ	ᵘ̯ə	ᵘ̯ɐ	ɐ	ə	ᵘ̯ɐ	ᵘ̯ɐ	ᵘ̯ʌ	ᵘ̯æ	u	u	u	u
	2	ɐ	ɐ	ɐ	ə	ə	ɐ	ə	ɐ	a	ə	ɐ	ᵘ̯ɐ	ʌ	æ	u	u	u	u
	3	œ	ɐ	ɐ	ə	ə	ɐ	ə	œ	ə	ə	œ	ø	ʌ	æ	u	u	u	ɔ
*ᵘ̯i	1	ᵘ̯ɐi̯	ᵘ̯ɐi̯	ᵘ̯ɐi̯	ᵘ̯əi̯	ᵘ̯ɐi̯	ᵘ̯ɔi̯	ᵘ̯ei̯	ᵘ̯ɐi̯	ᵘ̯əi̯	ᵘ̯ei̯	ᵘ̯ɐi̯	ᵘ̯ɐi̯	ᵘ̯ʌi̯	ᵘ̯æi̯	ei	ui	ui	vi
	2	ei	ei	ɐi	i	ai	ɐi	ei	i	ui	ei	ei	ei	ui	ei	ei	ui	ui	ɑi
	3	œy	oi	ui	ʊi	oi	ui	ɵy	œy	ui	e	œy	oi	ui	ui	ui	ui	ui	ui
*ᵘ̯e	1	ᵘ̯e	a	ua	ɪ	e	ə	uæ	ue	uɛ	uɪ	ua	uə	ᵘ̯ɛ	a	a	e	a	e
*ᵘ̯ə	1	y	y	iɔ	u	y	ø	y	y	y	u	y	y	y	æ	u	u	u	u

Row 2 of *ᵘ̯æ, *ᵘ̯o, *ᵘ̯ɑ, and *ᵘ̯i indicate the sound correspondences when the initial consonant was labial or *x. It is difficult to distinguish two consecutive labial gestures. When the initial consonant is la-

bial, many dialects deleted the labial semivowel. When the initial consonant was *x, a *xu̯ sequence became /ʍ/ (voiceless /w/), and further became /f/ in many dialects, such as 'flower' *xu̯æ > ʍæ > fa in Guangzhou. Notice that in row 2 of *u̯i, *u̯i further diphthongized (*u̯i > i > ei). This diphthongization is a different sound change from the diphthongization of *i mentioned above in table 4, since they are two different sets of sound correspondences. On the other hand, some dialects did not reduce the consecutive labiality. These dialects strengthened the semivowels into nuclei and weakened or deleted the original nuclei. For example *u̯ɑ > uu̯ > u in TS, EP, KP, and *u̯i > ui̯ in EP, KP.

TABLE 22. Examples of Proto-Yue rising diphthongs with u̯ after labials or *x.

	Gloss	GZ	CW	SH	XJ	ZS	RX	BY	SD	NP	XH	TS	KP	HE
*xu̯æ	'flower'	fa	fu̯a	fa	fɑ	fa	wa	wa	u̯a	wa	fa	fa	fa	fɑ
*xu̯oŋ	'lie'	fɔŋ	fɔŋ	ɸøŋ	fɔŋ	fɔŋ	ɔːŋ	uŋ	fɔŋ	hoŋ	fɔŋ	fɔŋ	fɔŋ	fuŋ
*βu̯oŋ	'room'	fɔŋ	fɔŋ	ɸɔŋ	fɔŋ	fɔŋ	ɸwɔːŋ	fuŋ	fɔŋ	ɸwoŋ	fɔŋ	fɔŋ	fɔŋ	fuŋ
*xu̯ɑn	'merit'	fɐn	fən	ɸən	fəŋ	fɐn	wan	wən	fɐn	wʌn	fæn	fun	fun	fun
*mu̯ɑn	'ask'	mɐn	mən	mən	məŋ	mɐn	mɦan	mən	mɐn	mʌn	^{m}bæn	^{m}bun	^{m}bun	mɔn
*βu̯i	'fly'	fei	fi	ɸai	fei	fi	ɸui	fei	fei	ɸui	fei	fei	fui	fɑi

Row 3 of *u̯ə and *u̯i in table 21 indicate the sound correspondences when the initial consonants are [+acute]—that is, dental, alveolar, retroflex, and palatal. In this environment, the diphthongs were monophthongized. *u̯ɑ in some Delta dialects monophthongized and lost the roundness (*u̯ɑ > ɵ > ə/ɐ/ʌ). *u̯ɑ in other Delta dialects such as GZ, ZS, SD, and GM monophthongized and fronted (*u̯ɑ > ɵ > ø/œ), which is motivated by the [+acute] initials. Generally in Wuyi dialects, the syllabicity in *u̯ɑ shifted to /u/ (*u̯ɑ > uu̯ > u) regardless of the environment.

*u̯i, on the other hand, when following acute initials, shifted the syllabicity (*u̯i > ui̯) in most of the dialects. Some of them changed further, to /oi̯/ or /ʊi̯/. This is probably because that *u̯i occurred only in open syllables. When the syllabic was long (as in open syllables), glide-vowel became vowel-glide. Several other dialects, such as GZ, XJ, ZS, and SD, fronted the diphthongs; *u̯i either had assimilation and then dissimilation (*u̯iː > yː > œy) or dissimilation and then assimilation (*u̯iː > o̯iː > œy).

*u̯ə is reconstructed as shown in table 21. *u̯ə occurred only after alveolars. In Delta dialects, this set of sound correspondences is the same as *u after alveolars except for NP (row 4 in table 12). However, in Wuyi dialects, this set of sound correspondences is the same as *u̯ɑ. Therefore, I reconstruct *u̯ə, *u̯ə > u in Delta dialects and *u̯ə > *u̯ɑ in Proto-Wuyi.

TABLE 23. Examples of Proto-Yue rising diphthongs with u̯ after acute initials.

	Gloss	GZ	HS	BA	CW	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS
*tu̯ɑn	'pause'	tœn	tɐn	tɐn	tən	tɐn	təŋ	tœn	dən	tən	tœn	tøn	tʌn	tæn	un
*ʂu̯i	'water'	sœy	soi	sui	ɕʊi	sui	søy	sœy	ɕui	ɕe	sœy	(soi)	ɕui	sui	sui
*su̯ən	'grandson'	syn	syn	siɔn	θun	søn	syŋ	syn	ɬyn	ɬun	syn	syn	θyːn	sæn	ɬun

Last, as can be seen in row 1 of *u̯æ, *u̯o, *u̯ɑ, *u̯i, and *u̯e, when the initial consonants were velar or laryngeal (except for *x because *xu̯ > ʍ, which behaved like a labial), the semivowels are mostly preserved except in most Wuyi dialects and a few Delta dialects. In those dialects, *u̯ became part of the initials, and sometimes even became another consonant (e.g., *k^{h}u̯ > hu̯ > w > v), or simply deleted when following velars (*ku̯ > kw > k).

Wuyi dialects tend to delete the semivowels *u̯ in *u̯æ, *u̯o, and *u̯e. However, *u̯ɑ > u and *u̯i > ui̯, regardless of the initial consonants.

As shown in row 1 of *u̯i in table 21, since *u̯i is found only in open syllables, the semivowel is maintained and the following /i/ is diphthongized, and then triphthongized in all the Delta dialects.

Among Wuyi dialects, XH has a triphthong reflex, while EP and KP preserved the *u̯. In HE, *u̯ became /v/ (*h+*u̯ > *w > *v) or caused an affricate when the preceding consonant was /k/ (*k+*u̯ > *kv).

TABLE 24. Examples of Proto-Yue rising diphthongs with u̯ after velars or laryngeals.

	Gloss	GZ	SH	DG	XJ	ZS	BY	SD	NP	XH	TS	EP	HE
*ku̯æ	'melon'	ku̯a	ku̯a	ku̯a	ku̯ɑ	ku̯a	ku̯a	ku̯a	ku̯a	ku̯a	ka	ka	ku̯ɑ
*hu̯ek	'area'	wu̯ek	wek	vək	wuæk	uek	wɪk	uak	wɐɛk	vak	vak	vet	vek
*ku̯ok	'country'	ku̯ɔk	køk	ku̯ɔ	ku̯ɔk	kɔk	kuk	ku̯ɔk	kok	kɔk	kɔk	kɔk	kuk
*ku̯ɑt	'bone'	ku̯ɐt	ku̯ət	ku̯ɐk	ku̯ək	ku̯ɐt	kət	ku̯ɐt	ku̯ʌt	ku̯æt	kut	kut	kut
*hu̯ɑn	'spirit'	wu̯ɐn	wən	vɐn	wu̯ən	u̯ɐn	wən	u̯ɐn	wʌn	væn	vun	vun	vun
*ku̯i	'turtle'	ku̯ɐi̯	ku̯ɐi̯	ku̯ɔi̯	ku̯ei̯	ku̯ɐi̯	ku̯ei̯	ku̯ɐi̯	ku̯ʌi̯	ku̯æi̯	kei	kui	kvi

3.4.2 RISING DIPHTHONGS WITH *I̯. I reconstruct three rising diphthongs with i̯: *i̯æ, *i̯o, and *i̯u. All three of them caused the mid entering tone in the *yin-ru* tone category. This shows that the non-syllabic *i̯ behaved like an onset because the rhyme acted like a [+ATR] vowel, resulting in the mid entering tone. The examples are shown in table 26 and 27.

Most of the Delta dialects monophthongized these diphthongs, while Wuyi dialects mostly preserved the non-syllabic vowels. Some of the diphthongs here have two sets of sound correspondences, depending on the initial consonants and whether the syllables are open or closed.

TABLE 25. Examples of Proto-Yue rising diphthongs with i̯.

		Guangfu					Southern Delta					Northern Delta			Wuyi				
		CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
		GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*i̯æ	1	ɛ	iɛ	ia	ɛ	ɛ	ø	ɛ	ɛ	e	e	ɛ	iɛ	e	ia	iɛ	ia	ia	iɵ
	2	ɛ	ia	ia	e	e	ø	ɛ	ia	ɪ	e	ɛ	iɛ	əɛ	ia	ia	ia	ia	i
*i̯o	1	œ	iɔ	iɔ	ø	iu	ø	œ	œ	e̯a	e̯a	œ	ø	ɛː	iɔ	ia	iɔ	ia	u
	2	iœ	iɔ	iɔ	ø	iu	ø	iœ	iɔ	iu	e̯ə	iœ	iɔ	ɛː	iɔ	ia	iɔ	ia	u
*i̯u	1	y	y	iɔ	u	y	ø	y	y	y	u	y	y	i	i	u	ie	i	y
	2	y	y	iɔ	u	y	ø	y	y	y	u	y	y	i	i	ᵘɔ	ie	ua	y

In table 25, row 1 of *i̯æ shows the sound correspondences in open syllables, and row 2 of *i̯æ shows the sound correspondences in closed syllables. Only five of the sample dialects show differences between open or closed syllables. As for *i̯o, it was monophthongized to a front rounded vowel in several Delta dialects. Row 2 of *i̯o shows the sound correspondences when the initial consonant is /j/ or /Ø/. In this environment, dialects shown with shade did not undergo the monophthongization because the *i̯ was probably reanalyzed as an initial by the speakers.[9] The examples of *i̯æ and *i̯o are shown in table 26 below.

TABLE 26. Examples of Proto-Yue rising diphthongs with i̯.

	Gloss	Guangzhou(GZ)	Huashan(HS)	Zhongshan(ZS)	Xinhue(XH)	Taishan (TS)
*si̯æ	'write'	sɛ	siɛ	sɛ	sia	ɬiɛ
*tɕʰi̯æk	'ruler'	tsʰɛk^{33}	tsʰi̯ak^{33}	tsʰi̯ak^{33}	tsʰi̯ak^{11}	tsʰi̯ak^{11}
*tsi̯ok	'sparrow'	tsœk^{33}	tsiɔk^{33}	tsœk^{33}	siɔk^{55}	tiak^{55}
*ŋi̯oŋ	'let'	jiœŋ	jiɔŋ	iɔŋ	ᵑgiɔŋ	ᵑgiaŋ

[9] The monophthongization is a later sound change, after the initial consonant change *ŋ > ɲ > j.

Row 2 of *i̯u in table 25 shows the sound correspondences when the initial consonant was *alveolo-palatal or *j (< *h, *Ø, *j), and row 1 of *i̯u gives the sound correspondences elsewhere. Only TS and KP show a difference between row 1 and row 2. In Delta dialects, there is no difference between these two correspondence sets, and the sound correspondence is the same as for *y (see row 4 of table 9). Therefore in Proto-Delta, *i̯u merged with *y. As for Wuyi dialects, *i̯u has different reflexes in TS and KP; i̯u merged with *u (see table 12) when the initials were *alveolo-palatals or *j.

TABLE 27. Examples of Proto-Yue rising diphthongs with i̯ after *alveolo-palatal or *j.

	Gloss	Guangzhou(GZ)	Bao-an(BA)	Xinhue(XH)	Taishan (TS)	Kaiping (KP)
*s̯iut	'snow'	syt^{33}	siɔ^{35}	sit^{55}	ɬut^{55}	ɬit^{55}
*ɕ̯iut	'talk'	syt^{33}	siɔ^{35}	sit^{55}	sy̯ɔt^{55}	suat^{55}
*h̯iun	'circle'	jyn (*h>j)	jiɔn	zin (*h>j>z)	zy̯ɔn	zuan

Notice that in DG, *i̯æ, *i̯o, and *i̯u all became /ø/. *i̯æ, *i̯o, and *i̯u probably merged into /i̯ɵ/ first, and then changed to /ø/.

3.4.3 FALLING DIPHTHONGS. I reconstruct nine falling diphthongs with semivowels i̯ or u̯. Falling diphthongs cannot have codas, as the syllable structure is (C)(V̯)V(V̯) or (C)(V̯)V(C).

TABLE 28. The sound correspondences of Proto-Yue falling diphthongs.

	Guangfu					Southern Delta					Northern Delta			Wuyi				
	CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
	GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*æi̯	ai̯	ai̯	ai̯	ai̯	ai̯	ai̯	ɑi̯	ai̯	a:i̯	ɑi̯	ai̯	ai̯	a:i̯	ai̯	ai̯	ɑi̯	ɑi̯	ei
*æu̯	au̯	au̯	au̯	au̯	au̯	au̯	ɑu	au̯	a:u̯	au̯	au̯	au̯	a:u̯	au̯	au̯	au̯	au̯	ɛ
*oi̯	ɔi̯	oi	ui	ɔi	oi	ui	ɔi	ɔi̯	ɔ:i̯	ɑi̯	ɔi̯	oi̯	a:i̯	ui	u̯ɔi̯	uai	u̯ɔi̯	yɵ
*ɑi̯	ɐi̯	ɐi̯	ɐi̯	əi	ai̯	ɔi̯	əi	ɐi̯	ə̯i̯	ə̯i̯	ɐi̯	ɐi̯	ʌi	æi̯	ai̯	ai̯	ai̯	ɔ
*ɑu̯	ɐu̯	ɐu̯	ɐu̯	əu	ə̯u̯	au̯	əu	ɐu̯	ə̯u̯	au̯	ə̯u̯	ou̯	əu	æu̯	eu̯	ei	au̯	ɔu
*ɛu̯	ɐu̯	ɐu̯	ɐu̯	ə̯u̯	ə̯u̯	au̯	ə̯u̯	ɐu̯	ə̯u̯	ou̯	ɐu̯	ɐu̯	ə̯u̯	æu̯	iu̯	ei	ɛu̯	ɑu̯
*ou̯	ou̯	au̯	ou̯	ou	ou̯	ɔu̯	əu	ou̯	ə̯u̯	eo	ɔ	ou̯	a:w	ou̯	au̯	au̯	ɔ	ɛ
*ui̯	œy	oi	ui	ɔi	oi	ui̯	ɵy	ui̯	ui̯	ui̯	y	ui̯	u:i	ui̯	ui̯	ui̯	ui̯	ui̯
*ui̯	ui̯	ui̯	ui̯	ɔi	oi̯	ui̯	ui	ui̯	ui̯	ui̯	ui̯	ui̯	u:i	ui̯	u̯ɔi̯	u̯ai̯	u̯ɔi̯	yɵ
*iu̯	iu̯	iu̯	iu̯	iu̯	iu̯	iu̯	Iu	iu̯	iu̯	iu̯	iu̯	iu̯	iu̯	iu̯	iau	iu̯	iu̯	iɵ

For the falling diphthongs with the nucleus *æ, the sound change is parallel to the development of *æ (*æ > a; *æ > ɑ). Except for in HE, *æi̯ is raised to /ei/ and possibly *æu̯ > ɛu > ɛ.

As for *oi̯, many dialects have the reflexes /oi/, /ui/ or /ɔi/, and some dialects (BY, NP) merged *oi̯ with *æi̯. In Wuyi dialects, the development of *oi̯ is parallel to the development of *o (*ɔ > u̯ɔ or ua), in which *oi̯ became /u̯ɔi/ or /uai/. In Heshan (HE), it is unclear how *oi̯ became /yɵ/.

TABLE 29. Examples of Proto-Yue *ai̯, *au̯, and *ɔi̯.

	Gloss	Guangzhou(GZ)	Bao-an(BA)	Taishan (TS)	Enping(EP)	Heshan (HE)
*mai̯	'buy'	mai̯	mai̯	^{m}bai̯	^{m}bai̯	mei̯
*k^{h}au̯	'broil'	hau̯	hau̯	hau̯	hau̯	k^{h}ɛ
*lɔi̯	'come'	lɔi̯	lui̯	lu̯ɔi̯	luai	lyɵ

*ɑi̯ mostly became /əi/, /ɐi/ or /ʌi/, which is parallel to the development of *ɑ. Many dialects, such as SH and TS, also merged *ɑi with *æi. Notice that for those dialects that did not merge *ɑi with *æi, the nucleus in *ɑi̯ must have raised before the nucleus *æ became /ɑ/. In XH, nucleus *ɑ tends to be fronted to /æ/ in diphthongs (*ɑ > ɐ > æ).

The development of the nucleus in *ɑu̯ is similar to that in *ɑi̯. Several dialects merged *ɑu̯ with *æu̯ or *ou̯, and *ɑu̯ > eu in TS, *ɑu̯ > ɔu in HE. Interestingly, *ɑu became /ei/ in EP, which is a very different sound change.

Similar to the sound correspondences of *ɛ in the nucleus, I reconstructed *ɛu̯. *ɛu̯ merged with *ɑu̯ in most of the dialects, except for BY, SD, GM, TS, KP, and HE. These dialects maintain the distinction between *ɛu̯ and *ɑu̯. For example *ɛu̯ > iu̯ and *ɑu̯ > eu̯ in TS; *ɑu̯> ɔu̯ and then *ɛu̯ > ɑu̯ in HE.

For the development of *ou̯, *ou̯ merged with *æu̯ in HS, NP, TS, EP, and HE, and *ou̯ and *ɑu̯ merged in RX. *ou̯ also monophthongized into /ɔ/ in SD and KP. In BY, *ou̯ became /eo/, which probably came from *ou̯ > eu̯ > eo.

TABLE 30. Examples of Proto-Yue *ɑi̯, *ɑu̯, *ɛu̯, and *ou̯.

	Gloss	Guangzhou(GZ)	Dongguan(DG)	Binyang(BY)	Enping(EP)	Heshan (HE)
*mɑi̯	'rice'	mɐi	mɔi	məi	^{m}bai	mɔ
*t^{h}ɑu̯	'head'	t^{h}ɐu	t^{h}au	tɦau	hei	hɔu
*kɛu̯	'nine'	kɐu̯	kau̯	cou̯	kɛi	kɑu̯
*mou̯	'hair'	mou	mɔu	meo	^{m}bau	mɛ

As shown in table 28, *ui̯ has two sets of sound correspondences: row 1 is when the initial consonant was *[+acute], and row 2 is elsewhere. When following a [+acute] consonant, *ui̯ fronted in several dialects, giving, for example, /œy/ in GZ, /ɵy/ in XJ, and /y/ in SD. In Wuyi dialects, the initial [+acute] consonants also prevent *ui̯ from merging with *oi̯, whereas in row 2 of *ui̯, the sound correspondences of Wuyi dialects are the same as the sound correspondences of *oi̯. As for *iu̯, most reflexes remain the same, except for the diphthongization in TS and fronting in HE.

TABLE 31. Examples of Proto-Yue *ui̯ and *iu̯.

	Gloss	Guangzhou(GZ)	Dongguan(DG)	Xinjie(XJ)	Taishan(TS)	Heshan (HE)
*sui̯	'broken'	sœy	sui̯	sɵy	ɬui̯	ɬui̯
*mui̯	'sister'	mui̯	mui̯	mui̯	^{m}bu̯ɔi̯	myɵ
*siu̯	'smile'	siu̯	siu̯	siu̯	ɬiau̯	siɵ

3.5 PROTO-YUE TRIPHTHONGS. I reconstruct two triphthongs in Proto-Yue. As shown in table 32, the sound correspondences of *u̯æi̯ are exactly the same as *u̯æ with an additional coda /i̯/. *u̯ɑi̯ shows the same kind of parallelism with *u̯ɑ, in which the initial consonant influenced the following vowel. When the initial consonant was labial, the diphthong tended to lose the u̯, as shown in the first row; when the initial consonant was velar or glottal, the diphthong tended to preserve the on-glide /u/. *u̯ɑi̯ was not found after the acute consonants.

TABLE 32. The sound correspondences of Proto-Yue triphthongs.

	Guangfu					Southern Delta					Northern Delta			Wuyi				
	CT			GF-In.		GL		ZS	GL-In.		S-Z		In.	XE			KH	
	GZ	HS	BA	CW	SH	DG	XJ	ZS	RX	BY	SD	GM	NP	XH	TS	EP	KP	HE
*u̯æi̯	u̯ai̯	u̯ai̯	u̯ai̯	u̯ai̯	u̯ai̯	u̯ai̯	u̯ɑi̯	u̯ai̯	u̯a:i̯	u̯ai̯	u̯ai̯	u̯ai̯	u̯a:i̯	u̯ai̯	ai̯	ai̯	ai̯	u̯ɑi̯
*u̯ɑi̯	ɐi̯	ei̯	ɐi̯	i	əi̯	ɔi̯	əi̯	ɐi̯	ui̯	əi̯	ɐi̯	ei̯	ui̯	ei̯	i	ui̯	ui̯	ei̯
	u̯ɐi̯	u̯ɐi̯	u̯ɐi̯	u̯əi̯	u̯əi̯	u̯ɔi̯	u̯əi̯	u̯ɐi̯	u̯əi̯	u̯əi̯	u̯ɐi̯	u̯ɐi̯	u̯ʌi̯	u̯æi̯	i	ui̯	ui̯	vi

TABLE 33. Example of Proto-Yue triphthongs.

	Gloss	Guangzhou(GZ)	Dongguan(DG)	Xinhue(XH)	Taishan(TS)	Enping(EP)
*kʊ̯æ̯i̯	'weird'	kʊ̯ai̯	kʊ̯ai̯	kʊ̯ai̯	kai̯	kai̯
*βʊ̯ɑ̯i̯	'lung'	fɐ̯i̯	fɔi	fei	fi	fui
*kʊ̯ɑ̯i̯	'laurel'	kʊɐ̯i̯	kʊ̯ɔi̯	kʊ̯æ̯i̯	ki	kui

4. CONCLUSION. This is a preliminary reconstruction of the Proto-Yue vowel system. The biggest difference between this reconstruction and McCoy's or Tsuji's is that I reconstruct three more vowels: *y, *ɪ, and *ʊ. The overwhelming evidence from the dialects suggests that there were at least nine monophthongs in Proto-Yue. Also, many sets of sound correspondences suggest that we have to reconstruct monophthongs and posit diphthongization in some dialects. Despite what is suggested by the rhyme books, the sound correspondences point to a different reconstruction.

On the other hand, this reconstruction gives a rather large number of vowels for a tonal language. Following the comparative method, the reconstructed system may be more complex than the proto language really was, because the reconstructed system has to account for all sets of sound correspondences. However, the large sets of sound correspondences might be due to dialect mixing or dialect borrowing, especially given the historical background of the region, to which immigrants have come in waves over a long period of time. Unfortunately, we do not currently have enough evidence to claim that certain sets of sound correspondences are due to dialect mixing or dialect borrowing.

The reconstruction of the feature [+/–ATR] provides a phonetic motivation for the tone split. This may help to explain the mystery of the "inner turn vs. outer turn" feature in the rhyme books, because those syllables that split into the mid entering tone are always marked as outer turn, and those syllables that split into the high entering tone are always marked as inner turn. My reconstruction suggests that "inner turn" means [–ATR] and "outer turn" means [+ATR] in the rhyme tables. According to Norman (1988:31), the terms "inner" and "outer" that Chinese used in the rhyme tables likely originated from the Sanskrit phonological terms *ābhyantara* 'internal' and *bāhya* 'external'. According to Allen (1953:22–47), *ābhyantara* refers to the phonetic processes that are within the mouth, such as different degrees of constriction; and *bāhya* refers to the processes that are outside the mouth, such as the state of the glottis and the nasality of the sound. It is possible that sounds with the [+ATR] feature were interpreted as sounds with certain glottal features, because [+ATR] is often accompanied by a deep, muffled, or breathy quality.

This reconstructed vowel system corresponds to the literary stratum of Yue dialects. The literary stratum is the pronunciation of the written language, and was arguably influenced by the standard variety used in government or commerce (which is usually the dialect of the capital, often in northern China). However, there are significant differences between this reconstructed vowel system and the vowel system of Middle Chinese in the rhyme books, which suggests that the Proto-Yue literary stratum might not be represented in Middle Chinese rhyme books. The Proto-Yue literary stratum might be influenced by the standard varieties in a different era or a different area, or as suggested by Yue (2006), the stratum we see is the sediment of various influences from the standard variety.

Further research is needed in order to reconstruct the phonological system of the colloquial stratum, and such research needs to be expanded to include more dialects. A comparison of the colloquial stratum and the literary stratum could help explain what this literary stratum represented in the development of the Yue dialects. Also, more dialects from different sources need to be compared. It is possible that my sampling of the Yue dialects misses important information from certain dialects. Unfortunately, there are not many published data available. For the documentation of Yue dialects that has been published, most of it focuses on the literary stratum. The colloquial stratum of various dialects is rarely published. Within the comparison of the literary stratum, some of the word lists are insufficient, and it is hard to compare the dialects. Also, documentation was done by different linguists. The ways they document the sounds are very different, sometimes the important information might be overlooked when the data are written. The

publication of the complete documentation of the Yue dialects is hoped for, and fieldwork needs to be done in order to have a better understanding of the history of the Yue dialects.

APPENDIX

Tones in Middle Chinese were traditionally categorized in the rhyme books into four tone categories: *ping* (even tone), *shang* (rising tone), *qu* (departing tone), and *ru* (entering tone). These four categories were believed to be conditioned by the finals in tonogenesis. The even tone came from characters with open syllables and final nasals, the rising tone came from syllables with final glottal stop, the departing tone came from syllables with final *h, and the entering tone came from syllables with final stops.

A register split took place sometime after Early Middle Chinese. Each of the four tones was split into two registers, *yin* (upper) and *yang* (lower). The upper register is generally matched with voiceless initials, and the lower register with voiced initials.

These two dimensions are often represented in a table such as table 34 below. Since Chinese dialects do not usually share tone values, Chinese linguists usually use the name of the tone category (such as *yin-ping*) to refer to the tone that they are describing.

TABLE 34. Chinese tones.

	Tonal category			
Register	*ping* (even) *-nasal, *-V	*shang* (rising) *-ʔ	*qu* (departing) *-h	*ru* (entering) *-p, *-t, *-k
yin *[-voi]-	*yin-ping*	*yin-shang*	*yin-qu*	*yin-ru*
yang *[+voi]-	*yang-ping*	*yang-shang*	*yang-qu*	*yang-ru*

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