Article

Contact-Induced Layering and Diffusion in Yuè Chinese Varieties—The *-iun/iut and *-un/ut Merger Reconsidered

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Abstract: This study re-investigates the merger of *-iun/iut and *-un/ut in 46 Yuè Chinese varieties, which lacks explanatory treatment, from the variant derivative patterns of *-iun/iut > [yn]/[yt] and *-un/ut > [yn]/[yt]. The historical-comparative method was employed as the frame to analyze spatial (geographic) variation obtained from QGIS. The data showed that the merger of the reflexes of *-iun/iut and *-un/ut does not prevail in the majority of Yuè varieties, while mergers of *-iun/iut with *-in/it and *-iun/iut with *-on/ot or *-ion/iot are dominant. The spatial patterns of *-iun/iut and *-un/ut suggest different diffusion patterns and background factors.

Keywords: Yue Chinese; Pearl River Delta; Nanning; dialect geography; QGIS; geographic pattern; historical-comparative linguistics; historical demography

1. Introduction

This paper examines the spatial (geographic) variation patterns of *-iun/iut > [yn]/[yt] and *-un/ut > [yn]/[yt] in *Yuè* Chinese 粵語.[1] In *Yuè*, the pronunciations of reflexes of *-iun/iut and *-un/ut following alveolar initials are complex.[2] For example, the main vowel of the reflexes is mainly [œ] for *-iun/iut and [y] for *-un/ut in *Guǎngzhōu Yuè* 廣州粵語 (with some exceptions), which generally retained the rounded features and the distinction between *-iun/iut and *-un/ut that are seen in the reconstructed ancestral forms. Far to the west in *Nánníng* 南寧, the main vowel of the reflexes of *-un/ut is mainly [y], that of *-iun/iut is either [y] or [ɐ] depending on the correspondence set, but sometimes even co-existing as two variants for a single reflex. For instance, *tshun¹ "村" 'village' and *chiun¹ "春" 'spring' are [tsʰyn¹] and [tsʰœn¹], respectively, in *Guǎngzhōu Yuè*, while they are [tsʰyn¹] and [tsʰɐn¹]/[tsʰyn¹] in *Nánníng Yuè*. However, in other *Yuè* varieties, the main vowel [ɐ] is predominant in the reflexes. The rise and spread of [y] among forms with [ɐ] is of great significance.

In the *Qièyùn* 切韻 phonological system represented in the *Qièyùn* rime dictionary compiled in 601 CE and its successors, *-iun/iut and *-un/ut were assigned to the *Zhēnshè Hékǒu* 臻攝合口 rime group, due to their shared combination of dental coda and rounded main vowel. The former was sorted into *Zhēnshè hékǒu* division III while the latter was assigned to *Zhēnshè hékǒu* division I on the basis of the difference in rime onset (medial). Given that the *Qièyùn* system is generally cited to explain contemporary changes in Chinese dialects, previous studies simply note that the *Zhēnshè hékǒu* division III had lost the medial and thus *Zhēnshè Hékǒu* rime divisions have merged together in the specific *Yuè* varieties affected by the change, such as *Liánzhōu* 廉州 (Zhang 2012), *Xīnhuì* 新會 (Tang 2004), *Dōngguǎn* 東莞 (Li 2010) and *Nánníng* (Lin and Qin 2008). Some studies also state that *Zhēnshè Hékǒu* rimes have lost the rounded feature and merged with *Zhēnshè kāikǒu* 臻攝開口 (*-en/et, *-in/it), which is the corresponding rime group of *Zhēnshè Hékǒu* with an unrounded main vowel, for example in *Gāozhōu* 高州, *Xìnyí* 信宜, *Liánjiāng* 廉江, *Wúchuān* 吳川, *Zhànjiāng* 湛江 and *Yángjiāng* 陽江 (Weng 2012), with similar observation also recorded for *Zēngchéng* 增城 (Liang 2016), *Yángchūn* 陽春 (Weng 2012; Liu 2019) and

Hèzhoū 賀州 (Wei 2019). However, these are merely descriptions of the matter and not explanations or detailed studies. Therefore, this study re-examines the merger of *-iun/iut and *-un/ut from the variant patterns of *-iun/iut > [yn]/[yt] and *-un/ut > [yn]/[yt] using a historical-comparative linguistic methodology and a dialect geography-based analysis. This approach reveals that the reflexes of *-iun/iut and *-un/ut are not merged in the vast majority of *Yuè* varieties and are not inseparable as these two groups of reflexes have different diffusion patterns across the linguistic map. The discussion below focuses on three research questions:

1.   Is *-iun/iut and *-un/ut a common merger in *Yuè* Chinese?
2.   What are the diffusion patterns of *-iun/iut > [yn]/[yt] and *-un/ut > [yn]/[yt] and related merger with other group(s) of reflexes (if any), respectively?
3.   What are the factors that affect the patterns?

2. Background Regarding *Yuè* Chinese

As one of the dialect groups of the Sinitic languages in China, *Yuè* is widely spoken in *Guǎngdōng* 廣東省 and *Guǎngxī* Province 廣西省of China, Hong Kong and Macau (Zhan 2004, p. 1). As with other Chinese dialect groups, many studies have approached the classification issue for different *Yuè* varieties, yet a consensus has not been reached. The *Language Atlas of China* (Li 1987) categorized *Yuè* into seven subgroups: *Guǎngfǔ* 廣府, *Sìyì* 四邑, *Gāoyáng* 高陽, *Gōulòu* 勾漏, *Wúhuà* 吳化, *Yōngxún* 邕潯and *Qīnlián* 欽廉. Yue-Hashimoto (1991) classified it into five major subgroups with four micro-groups, including *Guǎngfǔ*, *Sìyì*, *Liǎngyáng* 兩陽, *Běi sānjiǎozhōu* 北三角洲 (*Nèilù* 內陸 & *Sānyì Zhàoqìng* 三邑肇慶) and *Nán sānjiǎozhōu* 南三角洲 (*Qīnlián* & *Zhōngshān* 中山). Zhan et al. (2002) and Zhan (2004) classified *Yuè* into *Guǎngfǔ*, *Sìyì*, *Xiāngshān* 香山, *Gwǎnbǎo* 莞寶, *Gāoléi* 高雷and *Guìnán* 桂南. Apart from the name of the subgroups, many varieties have different groupings among these three classifications (See Table 1).

Table 1. Classification of Yuè dialects in the *Language Atlas of China* (Li 1987); Yue-Hashimoto (1991); Zhan et al. (2002) and Zhan (2004), with date sites selected for this study (underlined) #.

Yuè **Varieties (Examples)**	*Language Atlas of China* **(Li 1987)**	**Yue-Hashimoto (1991)**	**Zhan et al. (2002) and Zhan (2004)**
Dōngguǎn and Bǎoān 寶安		*Nán sānjiǎozhōu- Qīnlián*	*Gwǎnbǎo*
Zhōngshān and Zhūhǎi 珠海		*Nán sānjiǎozhōu-Zhōngshān*	*Xiāngshān*
Fóshān 佛山, *Gāomíng* 高明, *Shùndé* 順德, *Nánhǎi* 南海, *Sānshuǐ* 三水, *Zhàoqìng*, *Zhàoqìng (Gāoyào* 高要*)*	*Guǎngfǔ*	*Běi sānjiǎozhōu- SānyìZhàoqìng*	*Guǎngfǔ*
Sháoguān 韶關		*Běi sānjiǎozhōu- Nèilù*	
Yúnfú 雲浮, *Lèchāng* 樂昌, *Qīngyuǎn*, *Fógāng* 佛岡, *Yīngdé* 英德, *Shēnzhèn* 深圳		No data	
Guǎngzhōu, *Macau*, *Pānyú* 番禺, *Huādū* 花都 *, *Cónghuà* 從化, *Zēngchéng*		*Guǎngfǔ*	
Nánníng, *Guiping* 桂平	*Yōngxún*		*Guìnán*
Yōngníng 邕寧, *Héngzhōu* 橫州 *		*Běi sānjiǎozhōu- Nèilù*	
Táishān 台山, *Jiāngmén* 江門, *Dǒumén* 斗門, *Kāipíng* 開平, *Xīnhuì*, *Ēnpíng* 恩平, *Hèshān* 鶴山	*Sìyì*	*Sìyì*	*Sìyì*
Yángjiāng and Yángchūn	*Gāoyáng*	*Liǎngyáng*	*Gāoléi*
Gāozhōu, Xìnyí		*Guǎngfǔ*	

Table 1. *Cont.*

Yuè **Varieties (Examples)**	*Language Atlas of China* (**Li 1987**)	**Yue-Hashimoto (1991)**	**Zhan et al. (2002) and Zhan (2004)**
Sìhuì 四會, *Guǎngníng* 廣寧, *Déqìng* 德慶, *Fēngkāi* 封開, *Luódìng* 羅定, *Huáijí* 懷集, *Yángshān* 陽山, *Liánzhōu* 連州 *, *Liánshān* 連山	*Gōulòu*	No data	*Guǎngfǔ*
Guìgǎng 貴港 *			*Guìnán*
Yùlín 玉林, *Běiliú* 北流		*Běi sānjiǎozhōu- Nèilù*	
Wúzhōu 梧州	*Guǎngfǔ*		
Huàzhōu 化州, *Wúchuān*	*Wúhuà/Gāoyáng*	No data	*Gāoléi*
Zhànjiāng			
Liánjiāng		*Nán sānjiǎozhōu- Qīnlián*	
Liánzhōu 廉州	*Qīnlián*		*Guìnán*
Língshān 靈山			Not mentioned

* *Huādū*, *Héngzhōu*, *Liánzhōu* and *Guìgǎng* previously named as *Huāxiàn* 花縣, *Héngxiàn* 橫縣, *Liánxiàn* 連縣 and *Guìxiàn* 貴縣, respectively, which were also employed in the three studies. # *Qūjiāng* (*Mǎbà*), *Xīnxīng* and *Língmíng* were not included in Yue-Hashimoto (1991); Zhan et al. (2002) and Zhan (2004), while in *Language Atlas of China*, *Qūjiāng* (*Mǎbà*) was classified as *Guǎngfǔ* with *Xīnxīng*, and *Língmíng* was grouped as *Yōngxún*.

3. Methods and Materials

3.1. Methods

3.1.1. Historical-Comparative Method

This study employs Common Dialectal Chinese (CDC), a phonological system reconstructed by (Norman 2006, 2011, forthcoming), as the framework for the historical-comparative analysis. Unlike the works of Karlgren (1940), Pulleyblank (1984), Baxter and Sagart (2014)[3] as well as Proto-Yue of McCoy (1966), which heavily relied on *Qièyùn* or its successors for reconstruction, thus maintaining non-phonemic differences in their system, CDC was developed on the basis of a comparative treatment of the phonological systems of contemporary Chinese dialects with the *Qièyùn* primarily as a supplement only.[4] It adjusted the categories of *Qièyùn* with reference to modern dialects, excluding the *Mǐn* dialects 閩語 (Norman 2006). Therefore, CDC is more powerful in reflecting the actual common phonological system of the dialects as well as their differing phonological developments.

3.1.2. Dialect Geography

Dialect geography, also known as dialectology, is the study of the geographical patterns of dialects or language variations on linguistic maps, considering the evidence not only in geographic perspective but also in economic, political and social cultural perspectives (Chambers and Trudgill 1998, p. 14; Lauder 2006 as cited in Saddhono and Hartanto 2021). There are two types of linguistic maps used in dialect geography, namely display maps and interpretive maps. The former simply lists the results obtained from interviews onto a map, while the latter is developed based on primary sources together with comparative representation (Chambers and Trudgill 1998, pp. 25–27). Although display maps can be seen in various studies on Sinitic dialects, such as *Linguistic Atlas of Chinese Dialects* (Cao 2008), the use of interpretive maps with dialect geography-based analysis has not been widely adopted in the field of Sinitic dialectology.

For the purpose of visualizing the spatial variations in linguistic data and developing interpretive maps, this study makes use of QGIS (QGIS Development Team 2023). The base map of the maps is Open Street Map available in the QGIS's plugin "QuickMapServices". Unless otherwise specified, the syllables selected for map production are commonly spoken colloquial words.

3.2. Materials

3.2.1. Data Source and Sites

The dataset of this study includes 46 *Yuè* varieties (Supplementary Material). Sites with [yn]/[yt] in the reflexes of either *-iun/iut or *-un/ut or both were selected from *A Survey of Dialects in the Pearl River Delta* (Zhan and Cheung 1987), *A Survey of Yue Dialects in North Guangdong* (Zhan and Cheung 1994), *Guǎngxī Tōngzhì: Hànyǔ Fāngyánzhì* 广西通志● 汉语方言志 [Compilation of Chinese Dialects in Chronicles of Guangxi] (Guangxi Local Records Compilation Committee 1998), *A Survey of Yue Dialects in West Guangdong* (Zhan and Cheung 1998) and *Guǎngxī Hànyǔ Fāngyán Yánjiū* 广西汉语方言研究 [A Study on Chinese Dialects in Guangxi] (Xie 2007). Thereby, the dataset of this study included *Guǎngzhōu* (Urban), Macau (Urban), *Pānyú* (*Shìqiáo* 市橋), *Huādū* (*Huāshān* 花山), *Cónghuà* (Urban), *Fóshān* (Urban), *Nánhǎi* (*Shātóu* 沙頭), *Shùndé* (*Dàliáng* 大良), *Sānshuǐ* (*Xīnán* 西南), *Gāomíng* (*Míngchéng* 明城), *Zhōngshān* (*Shíqí* 石岐), *Zhūhǎi* (*Qiánshān* 前山), *Qīngyuǎn*, *Fógāng*, *Yīngdé* (*Hánguāng* 洤洸), *Yángshān*, *Liánzhōu* 連州 (*Qīngshuǐ* 清水), *Sháoguān*, *Qūjiāng* (*Mǎbà*) 曲江 (馬壩), *Lèchāng*, *Nánníng*, *Yùlín*, *Wúzhōu*, *Zhàoqìng* (*Gāoyào*), *Sìhuì*, *Guǎngníng*, *Huáijí*, *Fēngkāi* (*Nánfēng* 南豐), *Yúnfú* (*Yúnchéng* 雲城), *Xīnxīng* 新興, *Luódìng*, *Guìpíng* (County seat), *Héngzhōu* (County seat), *Guìgǎng* (*Nánjiāng* 南江), *Běiliú* (*Tángliáo* 唐僚), *Língshān* (County seat) and *Língmíng* (County seat).[5] *Dōngguǎn* (*Guǎnchéng* 莞城), *Táishān* (*Táichéng* 台城), *Kāipíng* (*Chìkǎn* 赤坎), *Ēnpíng* (*Niújiāng* 牛江) and *Liánzhōu* 廉州 were also taken into the dataset to cover more *Yuè* subgroups and facilitate spatial distribution analysis of *-un/ut or *-iun/iut, although [yn]/[yt] are not reflected in the reflexes of these two groups in these sites. For the same reasons, *Huàzhōu* (*Xiàjiāng* 下江), *Yángjiāng*, *Yángchūn* (*Hékǒu* 河口) and *Xìnyí* were chosen as well from *Huàzhōu Yuèyǔ Gàishuō* 化州粤语概说 [An outline of Huazhou Yue] (Li 1996), *Study of Yangjiang Dialect in Guangdong Province China* (Huang 2018), *The Phonological Study on Yue Dialect of Hekou in Yangchun City* (Liu 2019) and *Xìnyí Fāngyánzhì* 信宜方言志 [Compilation of Chinese Dialects in Xinyi] (Luo and Ye 1987). All 46 data sites as well as their given classification are shown in Table 1 (underlined).

The geographic location of the sites is provided in Figure 1. According to the *Language Atlas of China* (Li 1987), *Lèchāng*, *Sháoguān* and *Qūjiāng* are *Yuè* exclaves surrounded by Hakka Chinese, additionally *Língmíng* and *Liánzhōu*, two other exclaves, are encircled by Zhuang languages and lu Mien languages, respectively. *Nánníng, Guìgǎng, Guìpíng, Huáijí, Yángshān, Liánzhōu, Fógāng* and *Dōngguǎn* are located in the boundary of *Yuè*. North or northwest of *Nánníng, Héngzhoū, Guìgǎng, Guìpíng* and *Huáijí* are within the domain of Southwestern Mandarin and Hakka. Finally, *Yángshān, Liánzhōu, Fógāng* and *Dōngguǎn* are adjacent to Hakka.

3.2.2. Data Selection

The reflexes of *-iun/iut and *-un/ut following alveolar affricates, fricatives and an approximant in CDC (*ts-, *tsh-, *dz-, *c-, *ch-, *j-, *s-, *z-, *sh-, *zh-, *l-) comprise the dataset of this study. This selection of initials is consistent with the environment of *-iun/iut which only occurs with alveolar affricates, fricatives and approximants. This selection is also congruent with the restricted environment of *-iun/iut, *-un/ut > [yn]/[yt], as it is a conditioned sound change that is not observed following labial consonants (Table 2).

Table 2. Examples of the reflexes of *-un/ut following labial and alveolar consonants.

Sites	*phun¹/phun⁵ "噴" 'spray'	*tshun⁵ "寸" 'inch'
Guǎngzhōu	$p^hɐn^5$	ts^hyn^5
Zhōngshān	$p^hɐn^5$	ts^hyn^5
Yùlín	p^han^5	t^hyn^5
Nánníng	$p^hɐn^5$	ts^hyn^5

Figure 1. Map of the data sites.

3.3. Representation of Data

Unless otherwise specified, the International Phonetic Alphabet (IPA) presented in the data of this study is the same as stated in the data sources, for example [œ] of *Guǎngzhōu Yuè* is maintained as the transcription of Zhan and Cheung (1987), although it is probably [ɵ] preceding [-n] or [-t], same as Hong Kong, as stated in the *Handbook of the International Phonetic Association* (The International Phonetic Association 1999, p. 59). Additionally, the aspiration "' " employed in the data sources is transcribed as "ʰ " in this study.

Tones are denoted by a numerical system (Table 3) that is commonly used in Chinese dialectology and is also adopted by CDC. In addition to the eight tones of common Chinese phonology, this study also distinguishes upper *Yīnrù* 陰入 = 7A, lower *Yīnrù* = 7B, upper *Yángrù* 陽入 = 8A, lower *Yángrù* = 8B.

Table 3. Numerical system of tonal representation.

Number	Tone
1	*Yīnpíng* 陰平
2	*Yángpíng* 陽平
3	*Yīnshǎng* 陰上
4	*Yángshǎng* 陽上
5	*Yīnqù* 陰去
6	*Yángqù* 陽去
7	*Yīnrù*
8	*Yángrù*

4. Results and Discussion

4.1. Merger of *-iun/iut and *-un/ut in Yuè Chinese

Figure 2 presents the merger or contrast of *-iun/iut and *-un/ut in *Yuè* using *tshun[1] "村" 'village' and *chiun[1] "春" 'spring' as an example. Although *tsh- has merged with *ch- in many *Yuè* varieties, *tshun[1] and *chiun[1] retain the contrast not only in the sites which have [yn]/[yt] in the reflexes of *-un/ut or *-iun/iut, but indeed in the majority of the varieties. With the exception of *Fēngkāi* and *Kāipíng*, it seems that the merger of *-iun/iut and *-un/ut happens randomly in *Yuè*. However, if the pronunciations of *tshun[1] "村" and *chiun[1] "春" are closely examined (Table 4), it can be observed that *Kāipíng* retains the contrast between *tshun[1] and *chiun[1] not by rime but by initials only. A similar situation can be discerned in *Táishān* and *Ēnpíng*, which retain the distinction by initials and tone, respectively, but not by rime. Indeed, the change *-iun/iut, *-un/ut > [un]/[ut] occurred in *Táishān*, *Kāipíng* and *Ēnpíng*, varieties under the *Sìyì* subgroup (Table 5; also see Table 4). Therefore, it is obvious that the merger of *-iun/iut and *-un/ut is not a common characteristic in *Yuè* Chinese, though it is in the *Sìyì* subgroup. A separate analysis of *-iun/iut > [yn]/[yt] and *-un/ut > [yn]/[yt] will be made to examine their geographical distributions and diffusion patterns.
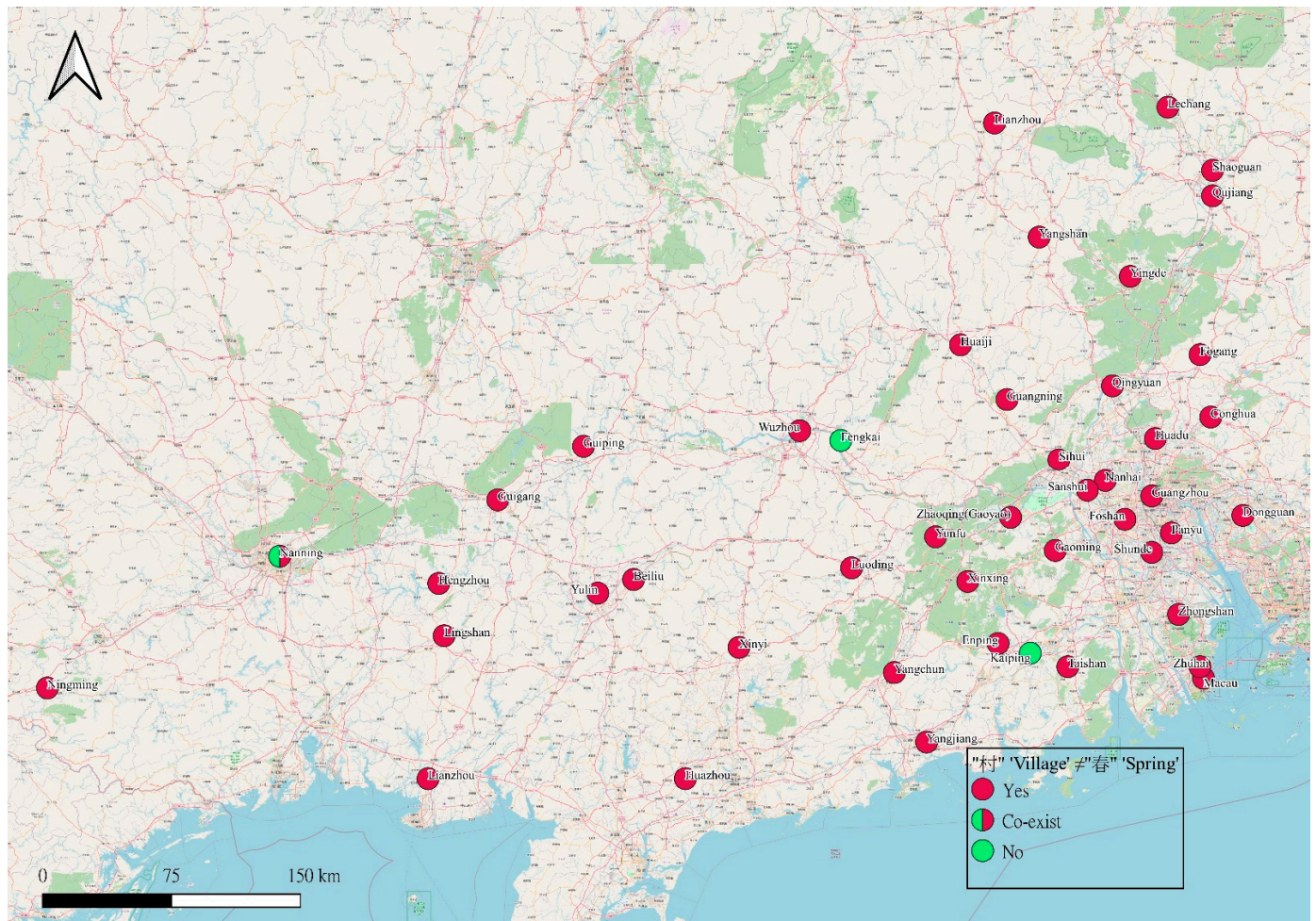

Figure 2. Contrast of *tshun[1] "村" and *chiun[1] "春" in the data sites.

Table 4. Pronunciations of "村" and "春" in the data sites (examples).

Sites	*tshun[1] "村" 'village'	*chiun[1] "春" 'spring'
Guǎngzhōu	tsʰyn[1]	tsʰœn[1]
Huàzhōu	tʰin[1]	tʃʰɐn[1]
Yángjiāng	tʃʰun[1]	tʃʰɐn[1]
Nánníng	tsʰyn[1]	tsʰɐn[1]/ tsʰyn[1]
Yùlín	tʰyn[1]	tɕʰan[1]
Liánzhōu 廉州	tʃʰun[1]	tʃʰɐn[1]
Héngzhoū	tʃʰun[1]	tʃʰɐn[1]
Xìnyí	tsʰyn[1]	tsʰɐn[1]
Fēngkāi	tsʰɐn[1]	tsʰɐn[1]
Kāipíng	tʰun[4]	tsʰun[1]
Táishān	tʰun[1]	tsʰun[1]
Ēnpíng	tsʰun[5]	tsʰun[1]

Table 5. Pronunciations of *sun[3] "損" and *siun[3] "筍" in *Kāipíng*, *Táishān* and *Ēnpíng*.

| Sites	*sun[3] "損" 'hurt/loss'	*siun[3] "筍" 'bamboo shoots'
Kāipíng	łun[3]	łun[1]
Táishān	łun[3]	łun[3]
Ēnpíng	sun[3]	sun[3]

4.2. Diffusion Pattern of *-iun/iut > [yn]/[yt] and Related Mergers

Before examining the geographical distribution of *-iun/iut > [yn]/[yt], it is worth noting that a correspondence between [œ] and [ɐ] exists regularly in the reflexes of *-iun/iut, despite the presences of a few abnormalities, such as is seen in *Guǎngzhōu* (Table 6). Previous research on this correspondence revealed that [œ] changed to [ɐ] in the majority of *Yuè* varieties aside from *Guǎngzhōu* and the adjacent varieties (Sung and Hui 2022). This suggests that reflexes of *-iun/iut have merged with *-en/et and *-in/it in a branch of *Yuè* varieties.[6] Figure 3 depicts the merger or contrast between *-iun/iut and *-in/it in *chiut[7] "出" 'out' and *tshit[7] "七" 'seven'. Similar to [œ] > [ɐ] in which *Guǎngzhōu* and the adjacent varieties stand out, *Guǎngzhōu* and other varieties near the Pearl River Delta (such as Macau, *Fóshān*, *Nánhǎi*, *Shùndé* and *Sānshuǐ*) retained the contrast on the rime between *-iun/iut and *-in/it, as well as the varieties in the north of *Guǎngdōng* Province (*Yīngdé, Sháoguān, Qūjiāng* and *Lèchāng*) and *Nánníng*. This pattern brings up the two following questions:

- Is there any relationship in the contrast situation between the Pearl River Delta, the north of *Guǎngdōng* Province and *Nánníng*?
- If yes, what is/are the factors behind it?

Table 6. Pronunciations of *jiun[2] "唇" in the data sites (examples).

Sites	*jiun[2] "唇" 'Lip'
Guǎngzhōu	sœn[2]
Huàzhōu	ʃɐn[2]
Yángjiāng	ʃɐn[2]
Yùlín	ʃɐn[2]
Liánzhōu	ʃɐn[2]
Héngzhoū	ʃɐn[2]
Xìnyí	sɐn[2]
Fēngkāi	tsɐn[2]
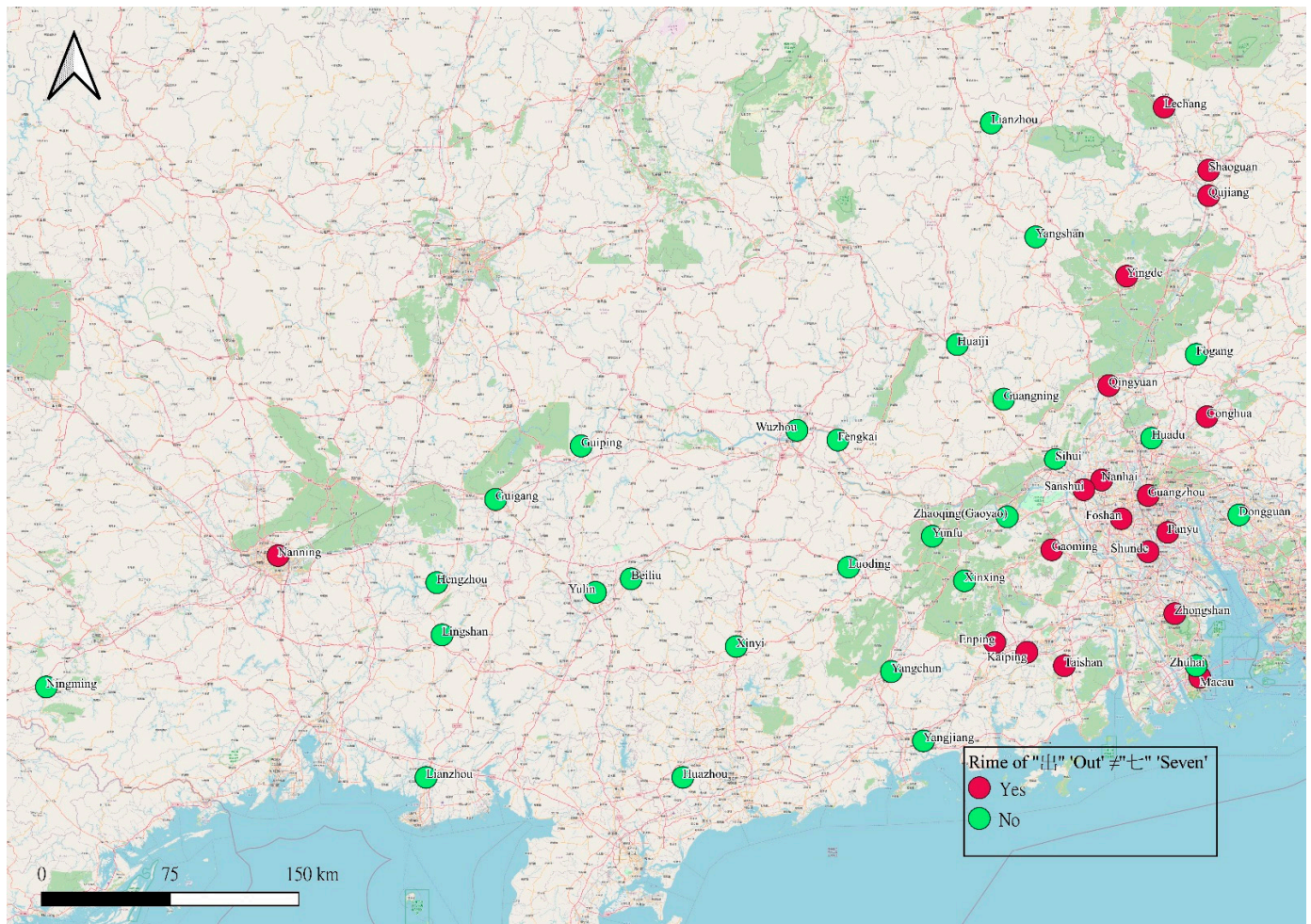
Figure 3. Contrast of the rime between *chiut[7] "出" and *tshit[7] "七" in the data sites.

The systematic contrast between *-iun/iut and *-in/it as well as in the rime of "出" in the data sites suggests a relationship between the Pearl River Delta, northern *Guǎngdōng* and *Nánníng* (Figures 3 and 4). The morpheme "出" with [yt] is recorded in *Nánhǎi*, *Qīngyuǎn*, *Lèchāng* and far west—*Nánníng*. In *Guǎngzhōu*, *Lìwān* 荔灣 (the rural of old *Guǎngzhōu* city), *Tiānhé Shípái* 天河石牌 (the oldest urban village in *Guǎngzhōu*) and *Huángpǔ Luógāng* 黄埔蘿崗 (suburban of *Guǎngzhōu*) additionally have the same circumstance (Project for the Protection of Language Resources of China 2022; Liang 2016). Zhuang (2004, p. 16) pointed out that *Guǎngzhōu* accent as well as *Guǎngfǔ Yuè* have prevailed in *Sháoguān*, *Qūjiāng* and *Lèchāng* after World War II, due to the temporary relocation of the *Guǎngdōng* provincial capital from *Guǎngzhōu* to *Sháoguān* during World War II and the commission of the Beijing–Guangzhou railway. The Guangzhou–Hankou railway, the precursor of the Beijing–Guangzhou railway, has connected *Guǎngzhōu* with *Qīngyuǎn*, *Yīngdé* and *Sháoguān* with *Lèchāng* (*Qīngyuǎnshì Dìfāngzhì Biānzuǎn Bàngōngshì* 清遠市地方志編纂辦公室 'Qingyuan Chronicles Compilation Committee' (Qingyuanshi Difangzhi Bianzuan Bangongshi 1995, p. 370; Construction Administration Chu-Shao Section Canton-Hankow Railway 1935); *Lèchāngxiàn Dìfāngzhì Biānzuǎn Bàngōngshì* 樂昌縣地方志編纂辦公室 'Lechang Chronicles Compilation Committee' (Lechangxian Difangzhi Bianzuan Bangongshi 1994, p. 222); also see Figure 5). The influence from *Yuè* varieties in the Pearl River Delta as well as the phonological characteristics might thus travel along the rail line to northern *Guǎngdōng* and leave a trail parallel to the railway, which would also be the case with the contrast between *-iun/iut and *-in/it as well as the rime of "出" as [yt] and [œt] or [øt] (Figures 3 and 4). It is worth noting that that the rime of "出" in northern *Guǎngdōng* is

unlikely to be influenced by *Tǔhuà* 土話 and Hakka in the same region, which pronounce "出" as either [ut] or [-ʔ], over even as an open syllable (Zhuang 2004, p. 99; Zhuang and Bei 2022, pp. 824–25); migrants from the Pearl River Delta and *Qīngyuǎn* settled into *Lèchāng* after World War II (*Lèchāngxiàn Dìfāngzhì Biānzuǎn Bàngōngshì* 樂昌縣地方志編纂辦公室 'Lechang Chronicles Compilation Committee' (Lechangxian Difangzhi Bianzuan Bangong-shi 1994)), and they probably brought the phonological characteristics of the *Yuè* varieties in the Pearl River Delta to *Lèchāng*. Therefore, the distribution of "出" with [yt] in the Pearl River Delta, *Qīngyuǎn* and *Lèchāng* is not a random coincidence, but an effect of migration. However, comprehensive studies on modern demographic history, genealogy, as well as the relationship between [yt] and [œt] or [øt] are necessary to thoroughly scrutinize and verify the distribution of "出" as [yt] and [œt] or [øt] in northern *Guǎngdōng*.
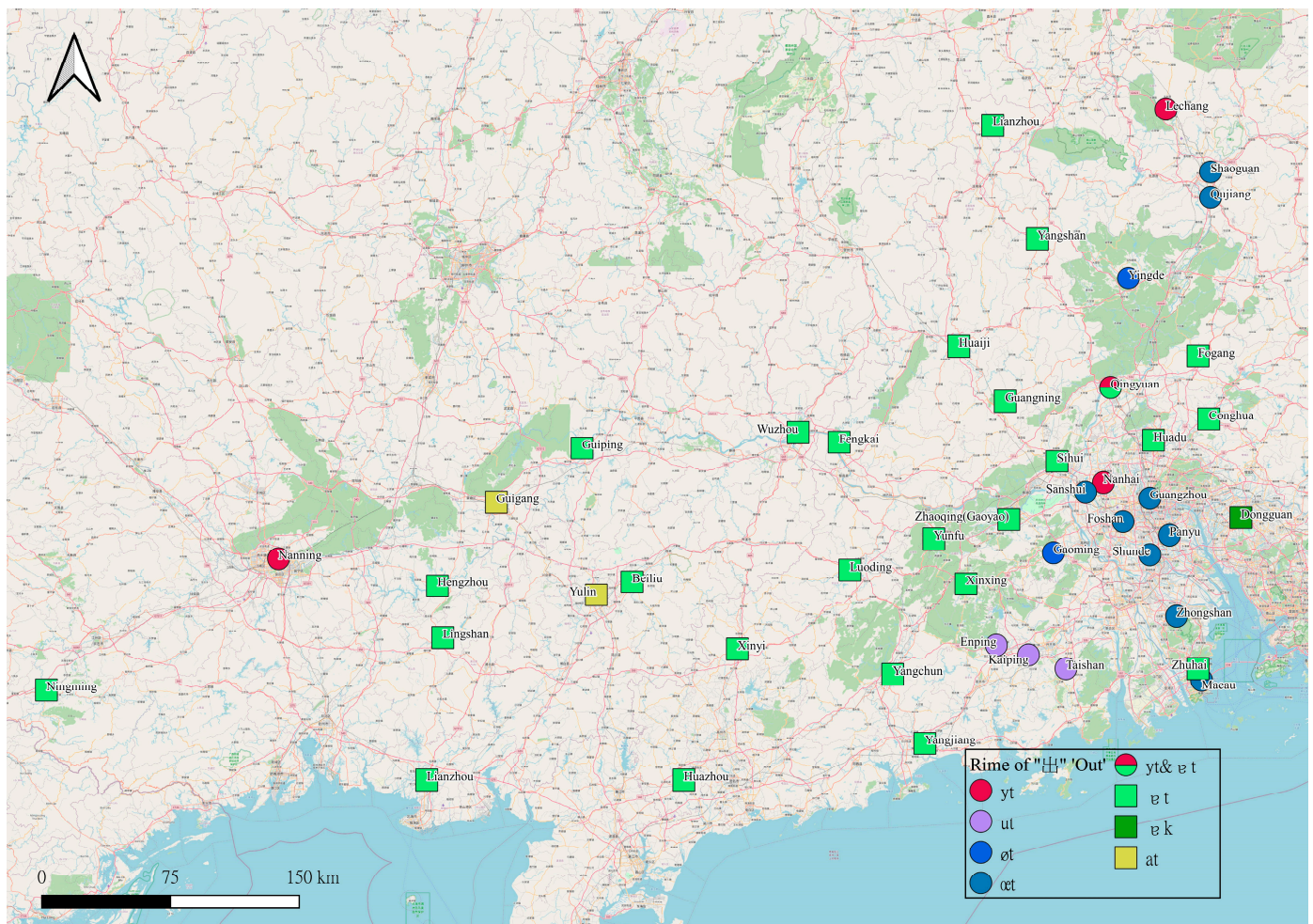

Figure 4. Rime of *chiut[7] "出" in each site.

Similar to the case with *Lèchāng*, the contrast between *-iun/iut and *-in/it, as well as the pronunciation of "出" with final [yt] in *Nánníng* might have been brought by migrants. Migration to *Guǎngxī* Province from the Pearl River Delta following the lifting of maritime prohibitions after the First Opium War (1839–1842), as well as that by people escaping the effects of World War II in later times, led to the formation of the large *Yōngxún Yuè* community in *Nánníng*. The language of that community is difficult to distinguish from that of *Guǎngfǔ Yuè* (de Sousa 2022; Kwok 2019, pp. 10–11). This situation provides a plausible explanation for the differing classifications of *Nánníng Yuè* in the *Language Atlas of China* and Zhan et al. (2002); Zhan (2004) (Table 1). In light of the phonological features shared between *Nánníng* and the Pearl River Delta, even with geographical constraints

(illustrated in Figures 3 and 4), it is conceivable that the contrast between *-iun/iut and *-in/it, as well as the pronunciation of "出" with [yt] were brought by migrants from the Pearl River Delta to *Nánníng*.
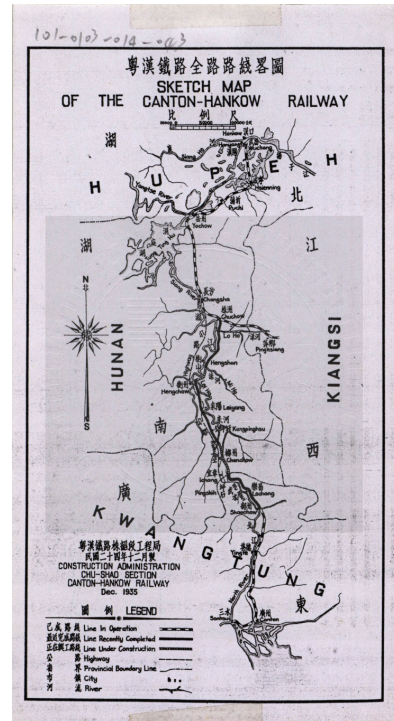
Figure 5. Map of the Canton (Guangzhou)–Hankou Railway (Construction Administration Chu-Shao Section Canton-Hankow Railway 1935).

Considering the demographic history of *Nánníng*, one may wonder why distinctive distributional patterns are found in *Nánníng* and the Pearl River Delta in the reflexes of *-iun/iut and *-un/ut (Figure 2). The relationships between the variants [yn]/[yt] and [ɐn]/[ɐt] in *Nánníng* may help shed some light on this problem. The reflexes of *-iun/iut following alveolar initials such as in *chiun[1] "春" 'spring' are pronounced as [yn]/[yt] in old *Nánníng Yuè*, while they are pronounced as [ɐn]/[ɐt] in new *Nánníng Yuè* (Lin and Qin 2008, pp. 83–84). This leveling may be influenced by contact with adjacent *Yuè* varieties in *Guǎngxī* (Figure 6), which is a type of regional dialect leveling proposed by Kerswill (2003). Considering the reflexes of *-iun/iut and *-un/ut in the Pearl River Delta and northern *Guǎngdōng*, it is possible that *-iun/iut and *-un/ut were merged as [yn]/[yt] in these varieties and in *Nánníng*; but these reflexes of *-iun/iut and *-un/ut have now been splitting due to contact influences. This assumption cannot be completely verified in this paper, however, in part because [ɐn]/[ɐt] in the reflexes of *-iun/iut might not be the product of internal regular sound change from [yn]/[yt] in *Nánníng*, since [yn]/[yt] in the *Nánníng* reflexes of *-on/ot and *-ion/iot are unaffected and show no variation between [yn]/[yt] and [ɐn]/[ɐt]. To further examine this assumption, intensive fieldwork is needed to obtain more data in the Pearl River Delta as well as for *Nánníng*. What is certain, however, is that the merger of *-iun/iut and *-un/ut is not a common characteristic in *Yuè*, as noted earlier in Section 4.1.
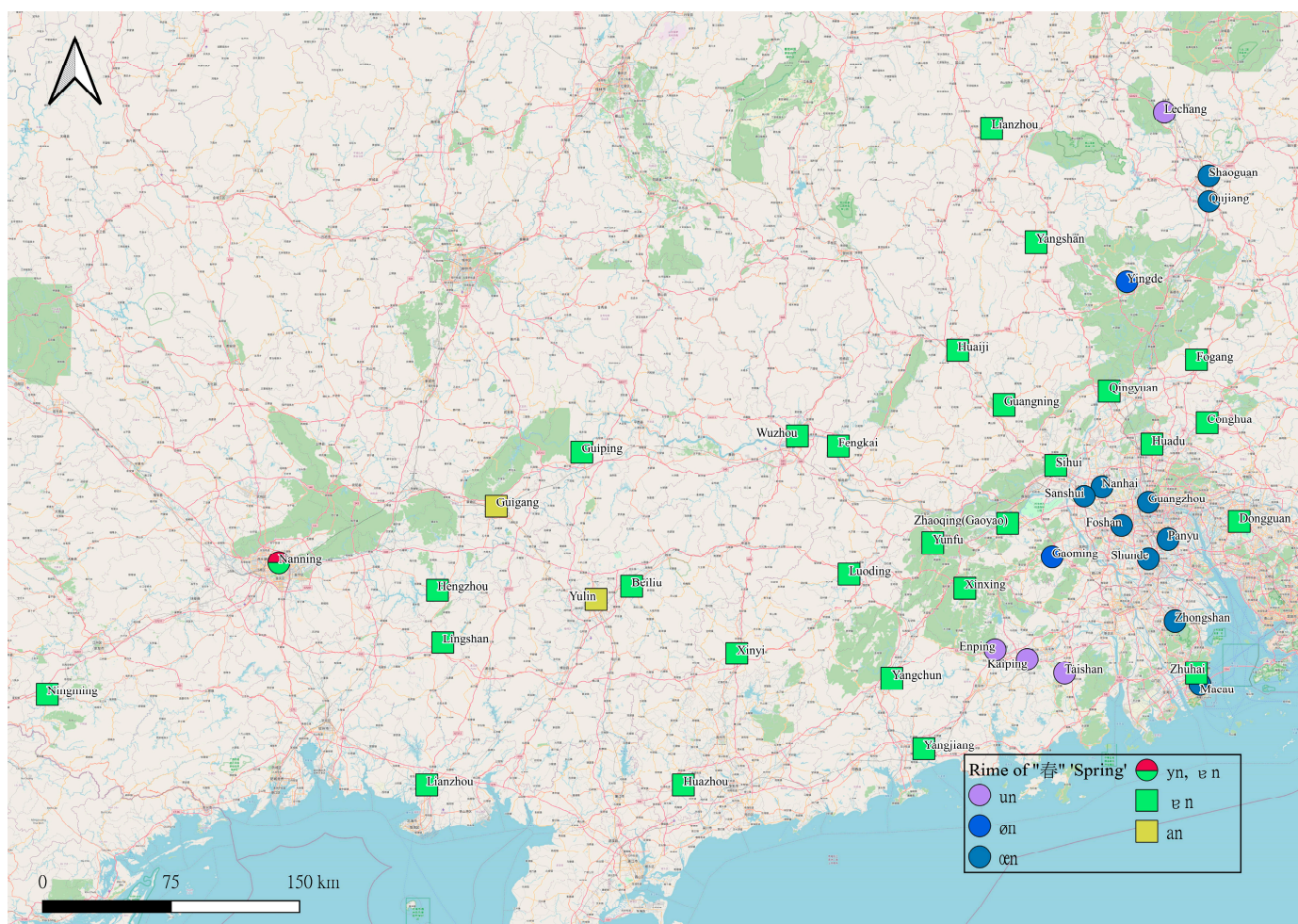
Figure 6. Rime of *chiun[1] "春" in each site.

4.3. Diffusion Pattern of *-un/ut > [yn]/[yt] and Related Mergers

As shown in Figure 7, the reflexes of *-un/ut following alveolar initials are [yn]/[yt] in the majority of the data sites. This contrasts with the reflexes of *-iun/iut (Figures 4 and 6), again suggesting that different processes led to *-un/ut > [yn]/[yt] and related merger(s).

The reflexes of *-on/ot and *-ion/iot are [yn]/[yt] in some sites such as *Guǎngzhōu*, *Yùlín*, *Héngzhoū*, *Xìnyí* and *Fēngkāi* (Table 7). Yet that is not an influence from the initials, as can be inferred from the comparison between *son[1] "酸" and *sun[1] "孫". Plotting the contrast between *-on/ot with *-un/ut (Figure 8) as well as *-ion/iot with *-un/ut (Figure 9), it is clear that these mergers are prevalent in *Yuè* varieties, although they were reported by only a few researchers, including Liu (2015), Li (2010), Weng (2012) and Xu (2013).[7] It is also noteworthy that *Yángjiāng*, *Yángchūn* and *Héngzhoū* maintain the distinction between *-un/ut and *-ion/iot, while the *Sìyì* subgroup, *Huàzhōu*, *Fēngkāi* and *Língshān*, retain both distinctions between *-on/ot with *-un/ut and *-ion/iot with *-un/ut. These are the varieties located in the southwest of the Pearl River Delta or near the boundary of *Yuè*, whilst the mergers and *-un/ut > [yn]/[yt] (see also Figure 7) spread from the Pearl River Delta not only to northern *Guǎngdōng* but also along the *Xījiāng* 西江 river to *Xúnjiāng* 潯江 and *Yùjiāng* 郁江 (*Zhàoqìng, Yúnfú, Wúzhoū, Guipíng, Guìgǎng* and *Nánníng)* as well as their branches (*Xīnxīng, Luódìng, Xìnyí, Běiliú* and *Yùlín*). Given the higher cultural and economic prestige of the Pearl River Delta in *Guǎngdōng* and *Guǎngxī* Province, it is plausible that the mergers and *-un/ut > [yn]/[yt] were diffused westward by a mobile population and their contacts along the river routes.
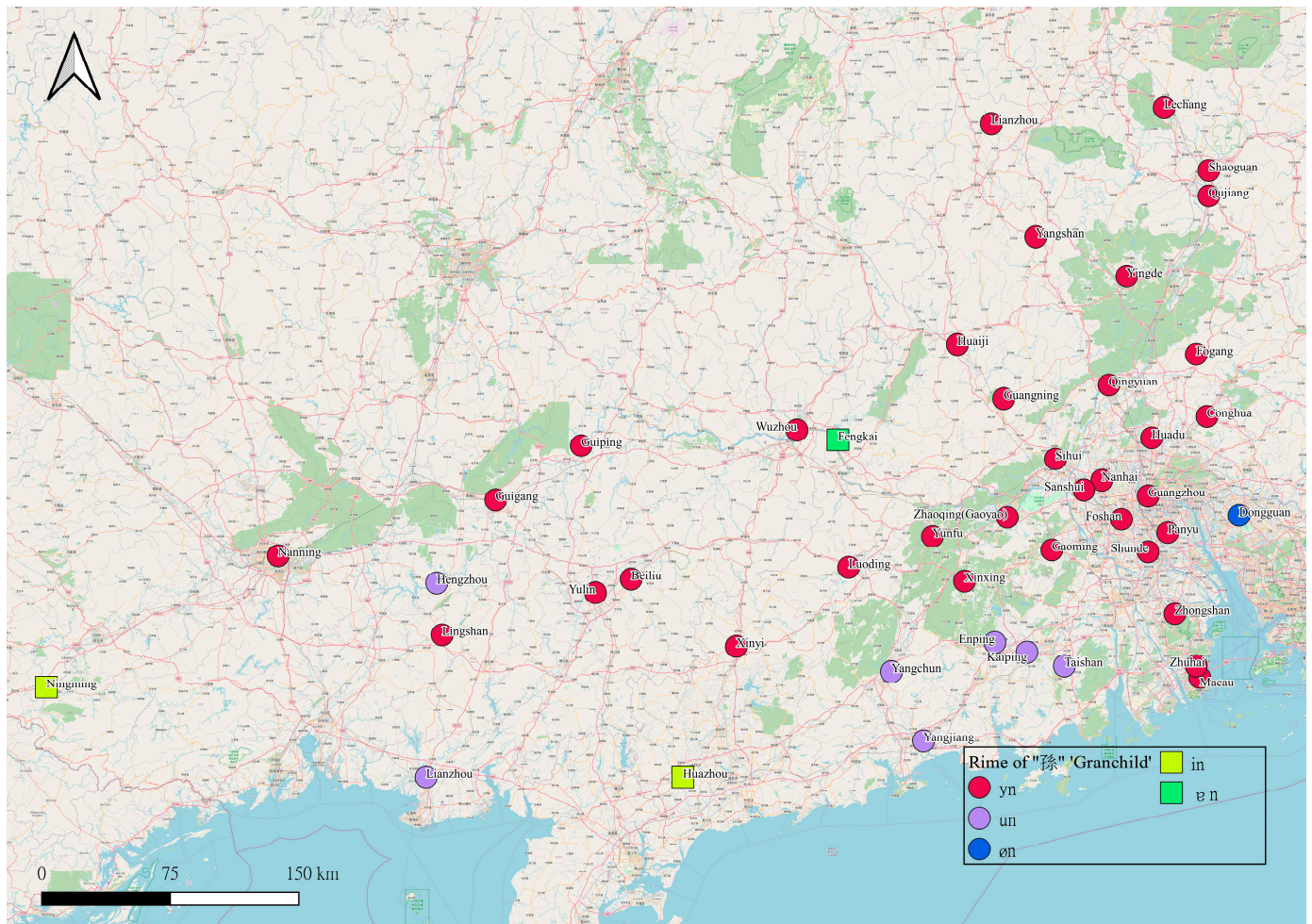
Figure 7. Rime of *sun[1] "孫" in each site.

Table 7. Pronunciations of *son[1] "酸", *sun[1] "孫", *cion[1] "磚" and *tshun[1] "村" in the data sites (examples). #

Sites	*son[1] "酸" 'Sour'	*sun[1] "孫" 'Grandchild'	*cion[1] "磚" 'Brick' #	*tshun[1] "村" 'Village'
Guǎngzhōu	syn[1]	syn[1]	tsyn[1]	tsʰyn[1]
Huàzhōu	ɬin[1] ɬun[1]	ɬin[1]	tʃin[1] tʃun[1]	tʰin[1]
Yángjiāng	ɬun[1]	ɬun[1]	tʃin[1]	tʃʰun[1]
Yùlín	ɬyn[1]	ɬyn[1]	tɕyn[1]	tʰyn[1]
Liánzhōu	ɬun[1]	ɬun[1]	tʃun[1]	tʃʰun[1]
Héngzhōu	ɬun[1]	ɬun[1]	tʃyn[1]	tʃʰun[1]
Xìnyí	ɬyn[1]	ɬyn[1]	tsyn[1]	tsʰyn[1]
Fēngkāi	syn[1]	sɐn[1]	tsyn[1]	tsʰɐn[1]

There are no vernacular words which can form a minimal pair from the reflexes of *-ion/iot and *-un/ut. Thus, the relevant contrast is illustrated here with a comparison between *cion[1] "磚" and *tshun[1] "村", which both have voiceless affricate initials and the same tone in CDC in addition to their shared final.
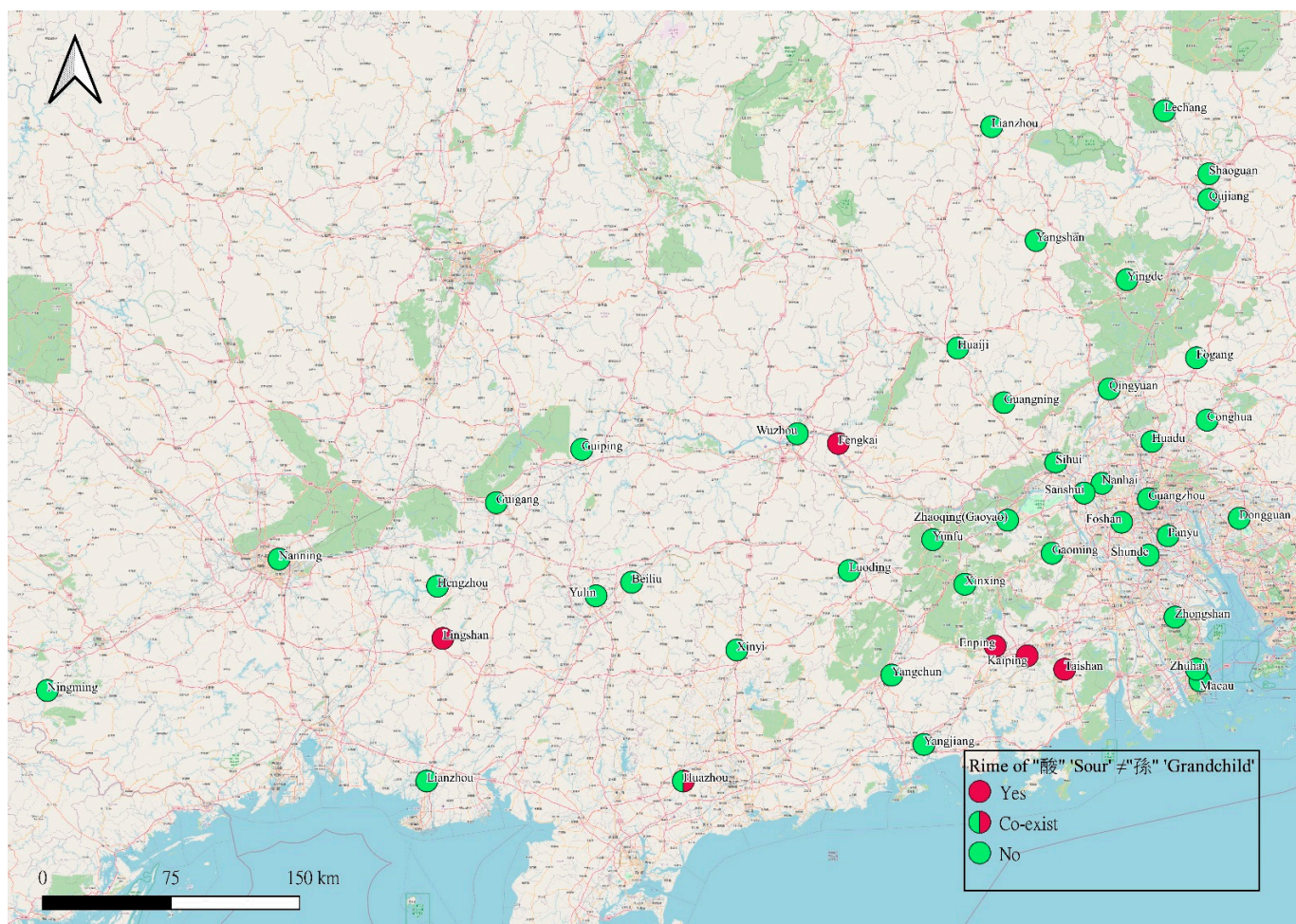
Figure 8. Contrast of the rime between *son[1] "酸" and *sun[1] "孫" in the data sites.

In the mergers of *-on/ot with *-un/ut as well as *-ion/iot with *-un/ut, literary words show different distribution patterns from vernacular words, revealing a possible diffusion pattern from the center of culture. Figure 10 displays the geographical distribution of the contrast between *-on/ot and *-un/ut, using *son[5] "算" 'count' and *sun[3] "損" 'hurt/loss' as examples of literary words.[8] The merger of *-on/ot with *-un/ut is slightly more prevalent than in vernacular words (Figure 8). Furthermore, it is the same case with the merger of *-ion/iot and *-un/ut if literary words (Figure 11) are compared with vernacular words (Figure 9). In these comparisons between literary words and vernacular words, it can be seen that some sites maintain the contrast in vernacular words but lose it in literary words, including *Héngzhōu* and *Fēngkāi*. Ongoing sound changes related to [yn]/[yt] in these two sites can be seen if the dataset of this study is compared with two studies from the late 2010s. In *Héngzhōu* (Table 8), data from Xie (2007) showed that only three reflexes of *-un/ut and *-on/ot were pronounced as [yn]/[yt], including *tshot[7] "撮" 'to assemble' 'tuft of', *sun[3] "損" 'hurt/loss' and *tshun[5] "寸" 'inch', of which "撮" and "損" are literary words. For those reflexes which were [un]/[ut] in Xie (2007), Mo (2019) recorded as [yn]/[yt]. In other words, *-un/ut and *-on/ot have changed from [un]/[ut] to [yn]/[yt] in both literary and vernacular words, thus merging with the reflexes of *-ion/iot. Although this change may be led by internal or local factors in *Héngzhōu Yuè*, it could also be influenced by the contact with adjoining varieties as shown in Figure 7, given the fact that geographical diffusion follows the regularity of sound change (Labov 1994, p. 501; Hui 2022). During a similar time frame in *Fēngkāi*, data from Zhan and Cheung (1998) reported a literary word *sun[5] "遜" 'inferior/modest' as [sin[5]], while it is [ʃyn[5]] in Hou (2016)[9], thus merging with *son[5] "算" 'count' and *son[5] "蒜" 'garlic' as well as sharing the same rime with the

reflexes of *-ion/iot (Table 9). Comparison of Zhan and Cheung (1998) with Hou (2016) supports the finding of a merger of *-un/ut, *-on/ot and *-ion/iot, and the change [in] > [yn] in *Fēngkāi*. This merger and change might be affected by adjacent *Yuè* varieties such as *Guǎngníng*, *Luódìng* and *Zhàoqìng*, but given that *tshiun⁵ "俊" 'handsome' was affected by [in] > [yn] at the same time and this syllable is [ɐn] in those adjacent *Yuè* varieties, this merger and change was probably influenced by *Guǎngzhōu* (Table 10), which has a higher cultural and economic prestige, as previously mentioned in Section 4.3, in a skewed copy of the [œn] of *Guǎngzhōu*. Future studies are needed to confirm the source of [in] > [yn] in *Fēngkāi*, especially a record of *siun⁵ "迅" 'speedy', which is recorded as [yn] in Hou (2016). However, what can be inferred from the details of *Fēngkāi* is that the source of the aforementioned merger and change is contact with *Yuè* varieties from the east, rather than with *Wúzhoū* which retains the contrast between *tshion⁵ and *son⁵ as shown in Table 10.

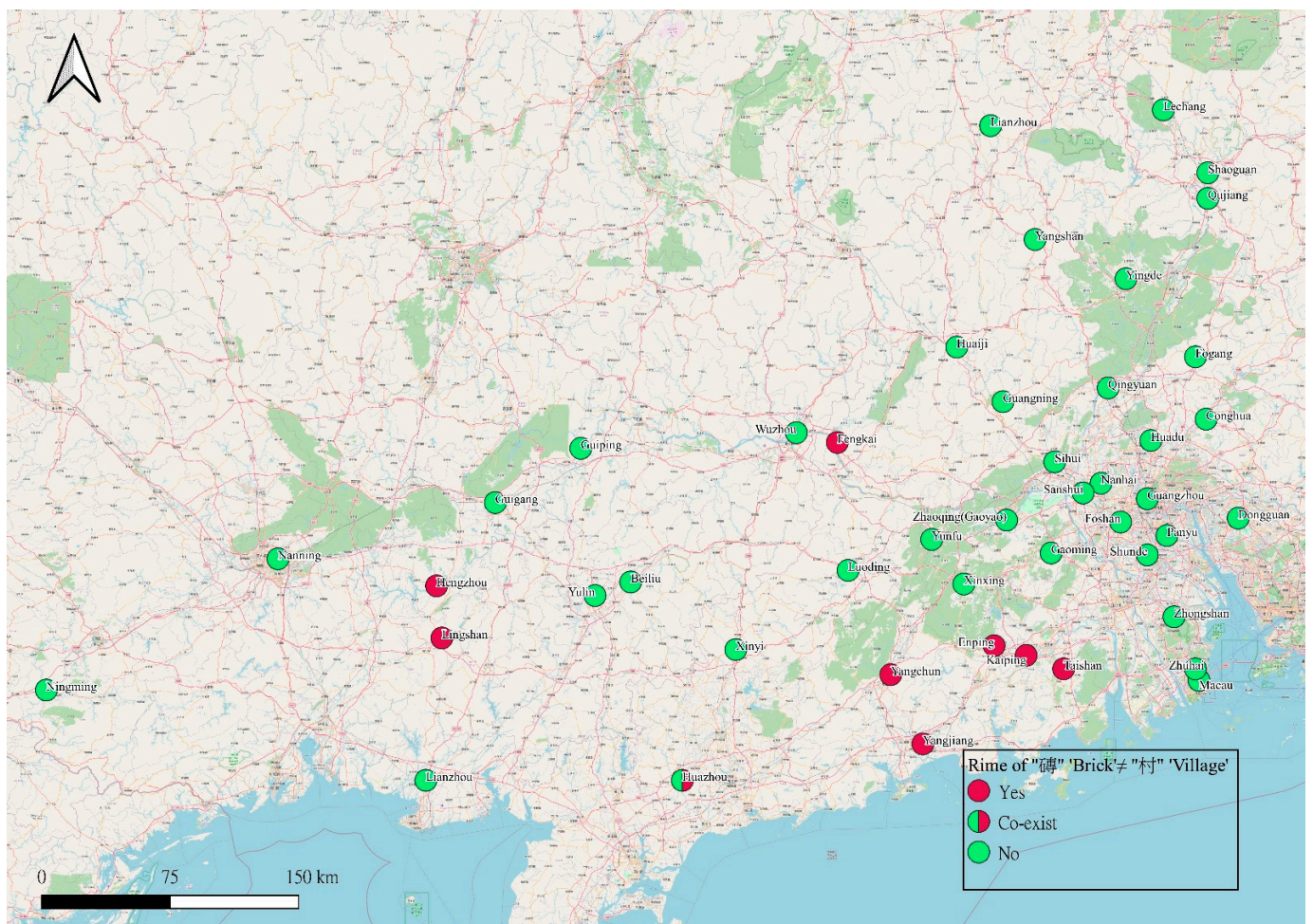**Figure 9.** Contrast of the rime between *cion^1 "磚" and *tshun^1 "村" in the data sites.
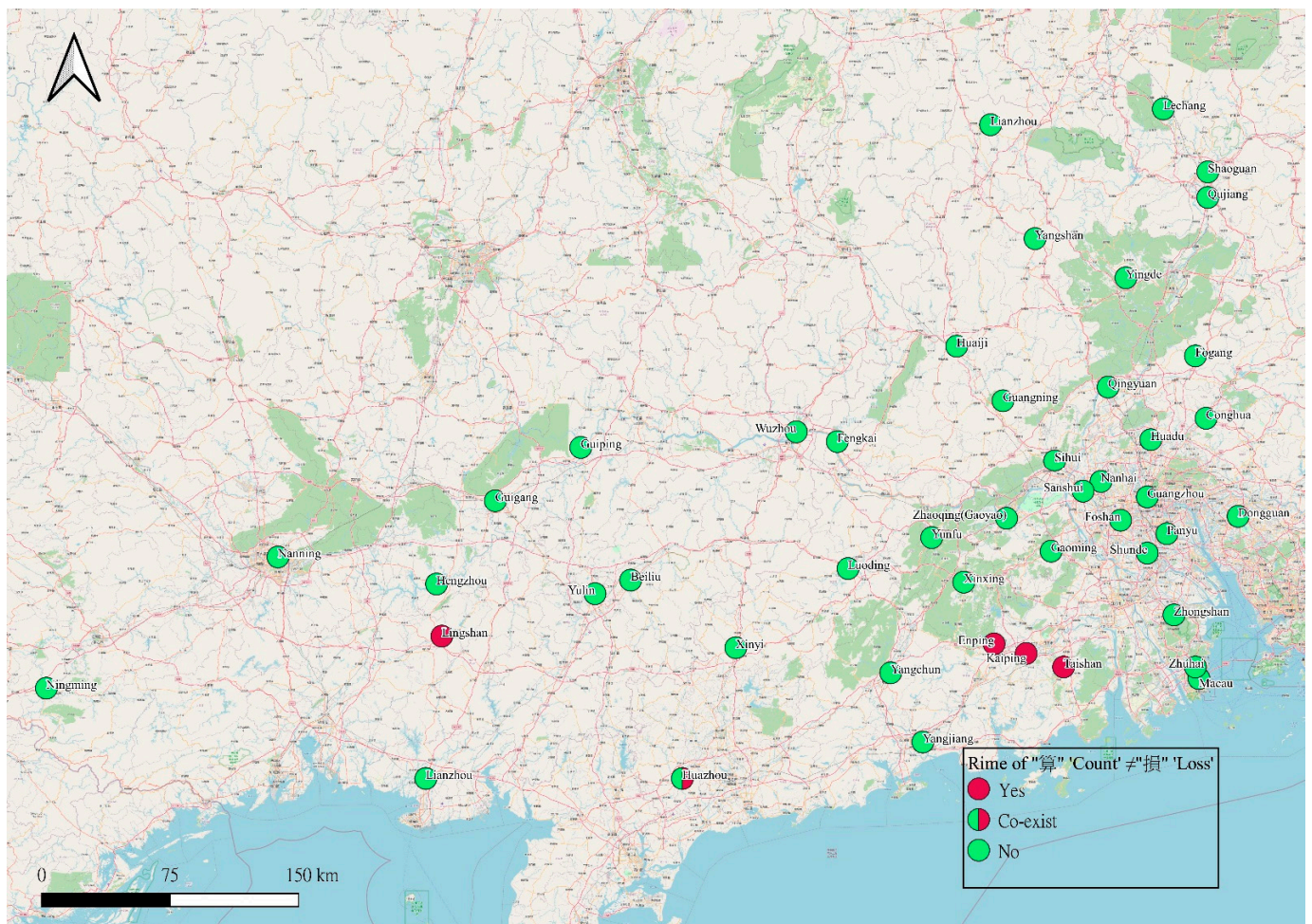
Figure 10. Contrast of the rime between *son[5] "算" and *sun[3] "損" in the data sites.

Table 8. The reflexes of *-ion/iot and [un]/[ut] > [yn]/[yt] in *Héngzhoū*.

| Word	Héngzhoū (Xie 2007)	Héngzhoū (Mo 2019)
*tshot[7] "撮" 'to assemble' 'tuft of'	tʃyt[7B]	tʃyt[7B]
*sun[3] "損" 'loss'	ɬyn[3]	ɬyn[3]
*tshun[5] "寸" 'inch'	tʃʰyn[5]	tʃʰyn[5]
*tson[1] "鑽" 'to bore'	tʃun[5]	tʃyn[1]
*tson[5] "鑽" 'drill'	tʃun[5]	tʃyn[5]
*son[1] "酸" 'sour'	ɬun[1]	ɬyn[1]
*son[5] "算" 'count'	ɬun[5]	ɬyn[5]
*son[5] "蒜" 'garlic'	ɬun[5]	ɬyn[5]
*tsun[1] "尊" 'respect'	tʃun[1]	tʃyn[1]
*dzun[2] "存" 'save'	tʃʰun[2]	tʃʰyn[2]
*tshun[1] "村" 'village'	tʃʰun[1]	tʃʰyn[1]
*sun[1] "孫" 'grandchild'	ɬun[1]	ɬyn[1]
*dzion[2] "全" 'all'	tʃʰyn[2]	tʃʰyn[2]
*chion[1] "川" 'stream'	tʃʰyn[1]	tʃʰyn[1]
*chion[5] "串" 'string'	tʃʰyn[5]	tʃʰyn[5]
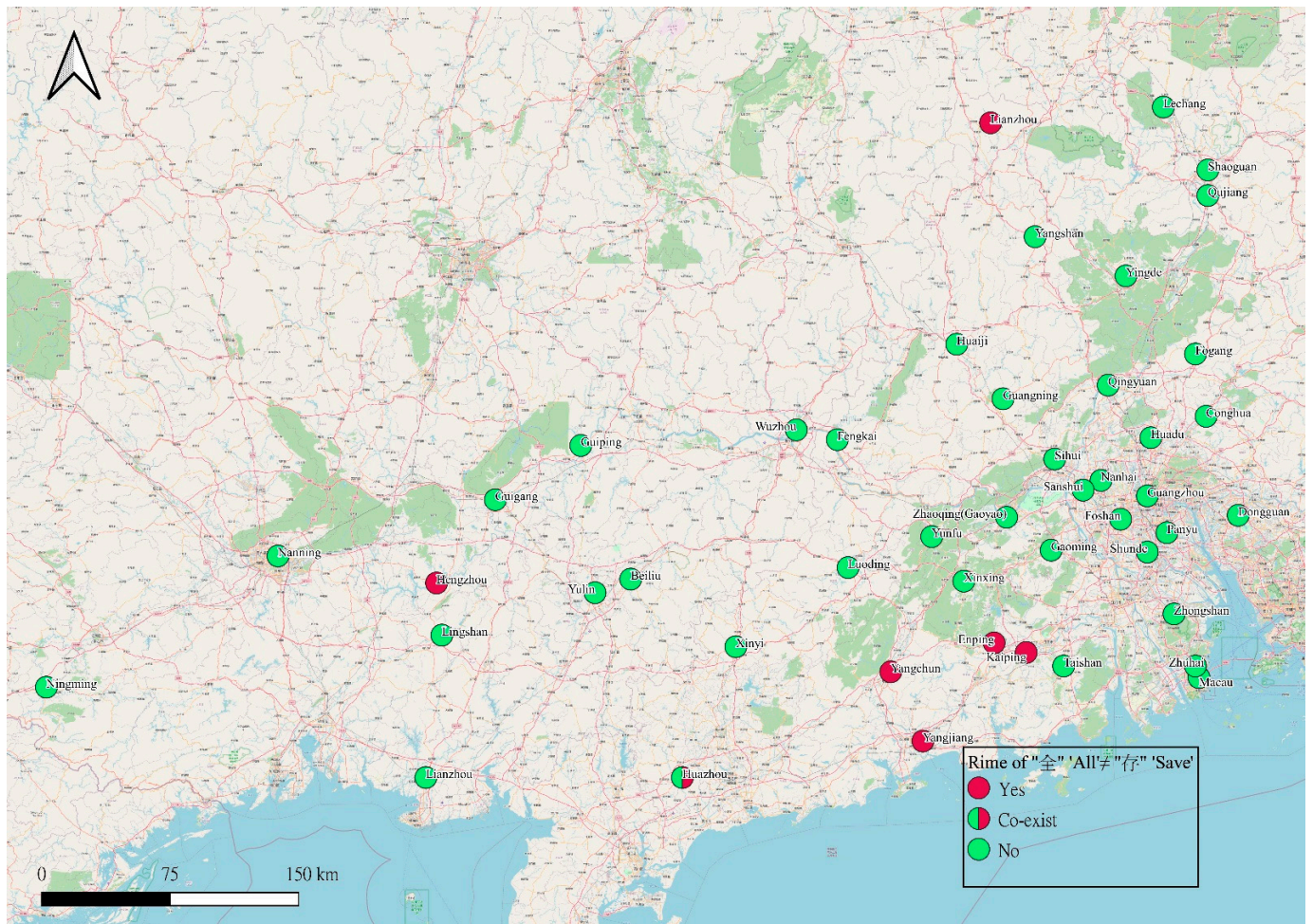
Figure 11. Contrast of the rime between *dzion[2] "全" and *dzun[2] "存" in the data sites.

Table 9. The reflexes of *-on/ot, *-ion/iot and [in] > [yn] in *Fēngkāi*.

Word	*Fēngkāi* (Zhan and Cheung 1998)	*Fēngkāi* (Hou 2016)
*sun[5] "逊" 'inferior/modest'	sin[5]	ʃyn[5]
*son[5] "算" 'count'	syn[5]	ʃyn[5]
*son[5] "蒜" 'garlic'	syn[5]	ʃyn[5]
*chion[5] "串" 'string'	tsʰyn[5]	tʃʰyn[5]

Table 10. The reflexes of *-on/ot, *-ion/iot and [in] > [yn] in *Guǎngzhōu*, *Fēngkāi* with its adjacent sites.

Word	*Fēngkāi* (Zhan and Cheung 1998)	*Fēngkāi* (Hou 2016)	*Guǎngníng*	*Luódìng*	*Zhàoqìng*	*Wúzhōu*	*Guǎngzhōu*
*sun[5] "逊" 'inferior/modest'	sin[5]	ʃyn[5]	syn[6]	syn[5]	syn[6]	ɕɐn[5]	sœn[5]
*son[5] "算" 'count'	syn[5]	ʃyn[5]	syn[5]	syn[5]	syn[5]	ɕyn[5]	syn[5]
*son[5] "蒜" 'garlic'	syn[5]	ʃyn[5]	syn[5]	syn[5]	syn[5]	ɕyn[5]	syn[5]
*tshiun[5] "俊" 'handsome'	tsin[5]	tʃyn[5]	tsɐn[5]	tsɐn[5]	tsɐn[5]	tɕɐn[5]	tsœn[5]
*siun[5] "迅" 'speedy'	sin[5]	ʃin[5]	sɐn[3]	sɐn[5]	sɐn[5]	ɕɐn[5]	sœn[5]

5. Conclusions

The pronunciations of reflexes of *-iun/iut and *-un/ut following alveolar initials are complex in *Yuè* Chinese, although previous studies did not examine the situation in detail

or offer an explanation. This study reveals that the mergers of the reflexes of *-iun/iut and *-un/ut do not prevail in the vast majority of *Yuè* varieties and are only seen in the *Sìyì Yuè* subgroup. It was also found that the mergers of *-un/ut > [yn]/[yt] and *-iun/iut > [yn]/[yt] have different diffusion patterns across the linguistic map.

With respect to *-iun/iut, *Yuè* varieties in the Pearl River Delta, in the north of *Guăngdōng* and in *Nánníng* stand out with the retention of the contrast in the reflexes of *-iun/iut and *-in/-it that is seen in the ancestral forms. Considering the shared development of *-iun/iut > [yn]/[yt] with the historical demography and transportation patterns in these three places, a possible explanation for the coexisting variants and non-variants would be the arrival of immigrants from the Pearl River Delta and the ensuing linguistic contact between speakers of the different varieties.

For *-un/ut, the reflexes of *-un/ut have merged with *-on/ot and *-ion/iot in the majority of *Yuè* varieties, with the exception of the *Sìyì* subgroup. In light of the natural geographic environment, the different geographical distribution patterns between literary words and vernacular words suggest that the *-un/ut > [yn]/[yt] merger is ongoing from the Pearl River Delta westward. This is consistent with the fact that the Pearl River Delta has higher cultural and economic prestige.

With these observations, this study provides a methodological contribution to the field of Sinitic dialectology. It highlights the feasibility of applying dialect geography and the historical-comparative linguistic method to scrutinize the phonetic and phonological developments of dialects. However, this study also raises new questions, such as whether or not *-iun/iut and *-un/ut following alveolar initials used to be merged in the Pearl River Delta, and the exact source of [in] > [yn] in *Fēngkāi*. To uncover the possible answers to these questions, intensive fieldwork with a sociolinguistics base and acoustic analysis is needed to obtain more data for analysis in future studies.

Notes

[1]　This study employs " > " to represent "change(s) to" in sound changes.

[2]　"Reflex(es)" means "modern reflex(es)" in this study.

[3]　Baxter and Sagart (2014) provide a reconstruction of Old Chinese, but a 'transcription' of Middle Chinese is included.

[4]　The reflexes of *-iun/iut and *-un/ut from CDC following alveolar initials remain the consistent differences as rimes in Karlgren (1940), Pulleyblank (1984), Baxter and Sagart (2014) and McCoy (1966) with a different form of reconstruction. For instance, these are *-win/*wit and *-won/wot in Baxter and Sagart (2014) as well as *-uon/uot and *-uan/uat in McCoy (1966), correspondingly.

[5]　*Guăngzhōu Yuè* is prevailing in Hong Kong (Zhan 2004, p. 7), so Hong Kong (Urban) is not included in the dataset.

[6]　The reflexes of *-en/et following alveolar initials are solely based on literary words, such as *cen[1] "臻" 'to reach/to be full'. Although *shet[7] "蝨" 'louse' seems to be comparable with *shiut[7] "蟀" 'gryllidae', the interviewees of the data sources as well as Zhan and Cheung (1988) gave different pronunciations including but not limited to the data of *Luódìng* and *Yúnfú*; some sources even had different words, for example "土狗" (literally "local dog") for 'gryllidae' when vocabulary lists were used instead of reading word lists in *Língshān* and various data sites. This indicates that the reflex of *shiut[7] from the data is a literary word, and it should not be compared with the reflex of *shet[7]. Thus this study only uses the examples from *-in/it to show the merger

of *-iun/iut with other groups of reflexes. The reflexes of *-en/et indeed are pronounced as [ɐn]/[ɐt] or its correspondent, thus overlapping with those of *-in/it (for examples see Table S1).

7. In Liu (2015), Li (2010), Weng (2012) and Xu (2013) used *Shānshè Hékǒu* I 山攝合口一等 and *Shānshè Hékǒu* III 山攝合口三等, the terms from *Qièyùn* system, to designate the reflexes of *-on/ot and *-ion/iot.

8. There are no literary words that can form a minimal pair from the reflexes of *-ion/iot and *-un/ut. Thus, the only solution was to compare *son[5] "算" and *sun[3] "損", which both have the same initial in CDC. Furthermore, while *sun[3] "損" is widely used to say 'hurt' in *Guǎngzhōu Yuè*, other *Yuè* varieties tend to use other forms of lexicon to express the same meaning, which is the case in *Nánníng* (Lin and Qin 2008, p. 172), *Yùlín* and Qīnzhōu (Guangxi Local Records Compilation Committee 1998, pp. 166, 223). This suggests that the same syllable can be classified differently as a "literary word" or "vernacular word" depending on the variety. However, it is challenging to determine the feature of *sun[3] "損" in the data sites because 'hurt' is not always included in the questionnaires of the sources. What can be inferred is that the frequency of *sun[3] "損" may not be as high as that of *son[1] "酸", *sun[1] "孫", *cion[1] "磚" and *tshun[1] "村" in general *Yuè*. Therefore, this study treats *sun[3] "損" as a literary word in comparison to the other four syllables.

9. *Kāijiàn* 開建 (*Nánfēng*) or *Fēngkāi* (*Kāijiàn*) were employed by Hou (2016) to represent *Fēngkāi* (*Nánfēng*) in (Zhan and Cheung 1998).

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