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DISCOVERING THE PROSODIC DOMAIN OF ACEH HAKKA TONE SANDHI

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ABSTRACT

This research investigated the tonal system of the Hakka dialect spoken in the Aceh province of Indonesia. The purpose of this research was twofold. First, it retranscribed the dialect's tonal inventory and provided a comparison with Meixian Hakka and the inventory found in Chen's (2007) research. Second, it analyzed the Shang Tone Sandhi Rule (STSR) of the dialect and its prosodic domain. The data were collected with a careful design based on the number of syllables, different prosodic structures, and a variety of tonal combinations. The data were collected from two informants, who were female Hakka native speakers that originated from Banda Aceh, Indonesia. This research used mainly an impressionistic approach with some support from Praat Version 6.2.14 to evaluate the pitch of the tones. As for this research's transcription, the researchers opt for the simpler yet phonologically distinct three-level height system (H, M, L) rather than the five-pitch category of Chao. This research identifies that there are six tonal values in this dialect. The tonal alternation rule, i.e., STSR, operates in a multisyllabic domain, and only the tone at the end of a domain is intact from tonal alternation. The STSR is not sensitive to the syntactic domain c-command relation of the Direct Reference Hypothesis. It also behaves differently compared to the Guangxing dialect Yangping Tone Sandhi Rule. As for prosody, the hierarchical domain of the rule in Aceh Hakka is bounded within the Utterance (U), which is different from the Yinping tone sandhi domain in Meinong Hakka, in which tone sandhi is blocked by the I domain (intonational phrase domain). Therefore, the researchers postulate that the domain for Aceh Hakka Shang tone sandhi lies in the Utterance (U).

Keywords: *Aceh Hakka, tonal inventory, tone sandhi, prosodic domain, c-command*

INTRODUCTION

Hakka is a dialect spoken in Southern China (Lau, 2016; Zhang, 2021). As discussed by Chang, Chang, and Chang (2021), Hakka people also migrate to other countries, so it is spoken in Southeast Asia, such as Malay (Wang, 2017; Liao, 2020; Ong, 2020), Thailand (Wang, 2018; Ungsitipoonporn, 2020), and different regions in Indonesia such as Medan (Nasution & Ayuningtyas, 2020), Aceh (Azeharie, Sari, & Tjhin, 2017; Srimulyani et al., 2018), and Singkawang (Wulandari, 2018). Regarding Aceh Hakka, the dialect focuses on the diasporic Chinese organization of Hakka Banda Aceh (Srimulyani et al., 2018) and the president of Yayasan Hakka Aceh in 2022 that is spoken by around 4.000 overseas Chinese.

One of the important aspects of Hakka's studies is the phonology of the dialects spread in other places and their comparison with the dialects they originated from and dialects with certain phonological properties. A phonological study on Aceh Hakka is previously conducted by Chen (2007). Chen's (2007) research focuses more on descriptions of the dialect's segmental properties, while only a little attention is given to

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studying its tonal properties, which the researchers carefully address in this research.

The purpose of this research is twofold. First, it transcribes the dialect's tonal inventory and compares it to Meixian Hakka and the inventory provided in Chen's research. It compares the tonal system with Meixian Hakka due to the fact that many of the citation tones are actually similar to those of Meixian Hakka. It is verified later that most Hakka people's ancestors come from China's Meixian district, although some say that they originated from Dabu County. Second, it analyzes the tone Sandhi rule of Aceh Hakka. Tone sandhi refers to the tonal alternation, in which the pitch level and contour of a tone change due to the influence of the tone of adjacent words or morphemes (Chen, 2000; Yip, 2002; Lin, 2007). Recent studies have researched the Hakka tone Sandhi phenomenon (Chen, 2018; Zhang, 2019; Chai & Ye, 2022). Substantially, this research investigates the prosodic domain that defines the tone Sandhi domain of Aceh Hakka from the perspective of the direct reference hypothesis and indirect reference hypothesis. Previous studies have defined the prosodic domain in which Hakka tone Sandhi applies. For instance, the tone Sandhi rules apply within the intonational phrase domain in Meinong Hakka (Tung, 2010) and Zhuolan Raoping Hakka (Hsiao, 2017). However, this research contends that the tone Sandhi rule in Aceh Hakka is bounded within the utterance.

METHODS

This research addresses the tone sandhi environment and the prosodic domain that confines the tone sandhi in Aceh Hakka. Therefore, the data are collected with a careful design based on the number of syllables, different prosodic structures, and a variety of tonal combinations. The researchers prepare a list of mono-syllabic, di-syllabic, and tri-syllabic words and phrases. The researchers also design longer strings of syllables into intonational phrases and utterances. Those syllables have different combinations of tones according to the traditional tone category by checking with the dictionary. The data are collected from two informants, who are female Hakka native speakers that originate from Banda Aceh, the capital city of its province. The informants are asked to read the research's designed data, of which they check the grammaticality and acceptance. The data are recorded in a consistently quiet area.

This research uses mainly an impressionistic approach with some support from Praat Version 6.2.14 (Boersma & Weenink, 2022) to evaluate the pitch of the tones. As for this research's transcription, the researchers opt for the simpler yet phonologically distinct three-level height system (H, M, L) rather than the five-pitch category of Chao (1930). The researchers then formulate the tone sandhi rule observed in the dialect and verify the domain of the rule from the direct reference hypothesis and indirect reference hypothesis. Previous research on the Hakka dialect carried out by Chung (1989) has suggested that the *Yangping* Tone Sandhi Rule (YTSR) of the *Guangxing* dialect is sensitive to syntactic structure. Therefore, regarding the direct reference hypothesis, it is necessary to carefully investigate the structure by using the notion of Domain C-command proposed by Kaisse (1985). As for the Domain C-command, the researchers also explore the possibility of categorizing the domain of the operation of the tone sandhi rule into the K-Condition domain proposed by Chung (1989) in his analysis of the *Guangxing* dialect's YTSR. Vis-à-vis the indirect reference hypothesis with insight from Tung (2010), this research will observe if the operation of the tone sandhi rule is bounded within the domain of intonational phrase (*I*) or utterance (*U*).

RESULTS AND DISCUSSIONS

This section introduces the tonal inventory and the *Shang* Tone Sandhi Rule of Aceh Hakka, which is collected from two informants. This research has identified six citation tones in this dialect, which is similar to Meixian Hakka and the investigation reported in Chen's (2011) studies. The comparison table consisting of the Meixian Hakka inventory provided by Cheung (2011) and the inventory found in Chen's study is given in Table 1.

Regarding the tonal inventory, the researchers identify a high degree of similarity to Meixian Hakka, which is reported in other studies. Aside from the differences in the phonetic details, the inventory is pretty identical when it is compared to Chen's (2011) study and other studies of Hakka, i.e., *Yinping* is a mid-level tone, *Yangping* is a low-level tone, *Shang* is a low-falling tone, qu is a high-falling tone, and two ru tones are a short-high and a short-low tone, respectively. There is only one Sandhi tone (ST) in the dialect, which is the mid-level tone derived from *Shang*, which has relatively the same pitch height and contour as the mid-level of *Yinping*. Nonetheless, unlike Lee (2016), who assumes that the two tones possess different registers, this research remains agnostic regarding the register value.

Nevertheless, compared to the tone sandhi phenomena reported in Cheung's (2011) study and other studies of Meixian Hakka, the number of tone sandhi rules in Aceh Hakka is different. Unlike the Meixian Hakka reported in Cheung's (2011) study, there is only one tone that undergoes tone sandhi in Aceh Hakka, which is the *Shang* tone. The low falling tone ML alternates to a mid-level tone MM when it is preceded by any tone in the inventory. The tone sandhi rule is formulated in data (1), and some examples are given in Table 2. The Chinese characters used throughout this research follow the Dictionary of Frequently-Used Taiwan Hakka provided by the Ministry of Education, ROC (2022).

(1) The *Shang* Tone Sandhi Rule (STSR) of

Aceh Hakka

/ML/ → [MM] / ___ T (where T is any tone)

One important thing that is recognized from studying Aceh Hakka's tone sandhi rule is the operation of the rule. Unlike the previous study by Cheung (2011) and Lee (2016), who culminate their investigation within the disyllabic structure, this research has found that the STSR performs in multisyllabic words. Some examples of the tone sandhi within some of Aceh Hakka's trisyllabic words can be seen in Table 3.

Until this point, it can be concluded that the rule is actually bounded within a multisyllabic domain, and

Table 1 Comparison of the Tone Letters Assigned to the Six Citation Tones in Aceh Hakka and Meixian Hakka

Dialects	**Traditional Tone Category**					
	yinping	***yangping***	***shang***	***qu***	***yangru***	***yinru***
Aceh Hakka This study	MM	LL	ML MM (ST)	HM	H	L
Aceh Hakka (Chen, 2007)	33	11	42	54	4	32
Meixian Hakka (Cheung, 2011)	33	11	41	51	55 or 5	41
Meixian Hakka (Norman, 1988)	44	12	31	42	44	21
Meixian Hakka (Huang, 1992)	44	11	31	52	5	1
Meixian Hakka (Xie, 1994)	44	11	31	52	5	1
Meixian Hakka (Yuan et al., 2001)	44	11	31	52	4 or 5	21 or 1
Meixian (Hashimoto, 1973)	mid level legato	low level (a little falling) legato	mid falling legato	high level (a little rising) legato	high rising staccato	mid falling staccato

Table 2 Examples of the Operation of the STSR in Disyllabic Words

Underlying Form (UR)		**Surface Form (SR)**	**Glossing**
*fo*ML-*fa*MM 火　花	→	*fo***MM**-*fa*MM	'fireworks'
*fu*ML-*kua*LL 苦　瓜	→	*fu***MM**-*kua*LL	'bitter gourd'
*tsung*ML-*thung*ML 總　統	→	*tsung***MM**-*thung*ML	'president'
*kong*ML-*fa*HM 講　話	→	*kong***MM**-*fa*HM	'to speak'
*lon*ML-*p*^{h}*ak*H 卵　白	→	*lon***MM**-*p*^{h}*ak*H	'egg white'
*tshiong*ML-*kiap*L 搶　劫	→	*tshiong***MM** *kiap*L	'robbery'

Table 3 Examples of the Application of Trisyllabic Words

Underlying Form (UR)		**Surface Form (SR)**	**Glossing**
ftaML-luiLL-kungLL 打　雷　公	→	*ta***MM**-*lui*LL-*kung*LL	'thunder'
*ai*ML-*tun*ML-*tun*ML 矮　頓　頓	→	*ai***MM**-*tun*MM-*tun***ML**	'stubby, a nickname for someone short'
*ta*ML-*lon*ML-*ki*LL 打　卵　機	→	*ta***MM** *lon*MM *ki*LL	'egg beater'
*lin*ML-*fo*ML-*tsok*H 膦　火　著	→	*lin***MM**-*fo*MM-*tsok*H	'extremely angry'

the tone at the end of the domain is intact from tone sandhi. As exemplified in Table 3, the domain-final tunML in aiMM-tunMM-tunML does not undergo tone sandhi. To verify the operation of the tone sandhi rule, it is worthwhile to investigate the prosodic domain of the Aceh Hakka dialect's tone Sandhi.

This research will investigate if the tone sandhi rule is sensitive to some syntactic constructions, which is the central tenet of the direct reference hypothesis. Two of the four parameters of the c-command proposed by Kaisse (1985) and the K-condition proposed by Chung (1989) will be utilized for the investigation of the tone sandhi's domain.

This research will first discuss c-command parameters, which are proposed by Kaisse (1985), who suggests that there exist phonological rules that are sensitive to syntactic structures, and they are termed "P1 rules". These rules are highly related to the c-command condition between two words within the maximal projection. The definition of the c-command condition is given in data (2).

(2) The c-command condition (Kaisse, 1985):
One of the words must c-command the other.

Aside from this c-command condition, Kaisse (1985) has also provided four possible settings for the c-command condition that can be considered to be the domain of the P1 rules. The parameters are rearticulated in data (3).

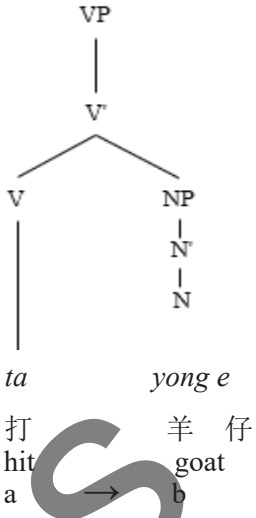
(3) C-command parameters for P1 rules (where a sandhi pair consists of a word a followed by a word b)
(i) Word a must c-command word b
(ii) Word b must c-command word a
(iii) Word a and b must c-command each other (government required)
(iv) There is no c-command requirement

It discusses if the STSR belongs to either the (i) or (ii) parameter, as they are cited in Selkirk (1986). In addition, two other rationales take as reasons to leave out parameter (iii) in the analysis. First, despite it being mentioned in Kaisse's research, no exact syntactic structure can be used as a reference. Second, the current theory of syntax has eliminated the notion of government.

The first parameter we will be looking at is the parameter (i). This parameter is identified as a domain for the Italian syntactic doubling rule and Kimatuumbi vowel shortening. It requires a phonological rule to be applied at two adjacent syllables, a and b, when a c-commands b. An example of such a condition is provided in data (4).

The verb ta 'hit' in (4) c-commands the N yong e 'goat' and the STSR is applied in this syntactic construction. While it appears that such a construction can serve as a domain for STSR, there are other constructions that are problematic for such assumptions. Let us take a look at the example in (5).

(4) 'hit a goat'
*ta*ML *yong*LL-*e*ML (UR)
*ta***MM** *yong*LL-*e*ML (SR)
打 羊－ 仔
hit goat



(5) 'nicely (kindly) wait for me'
*ho*ML-*ho*ML =*ten*ML *ngai*LL (UR)
*ho*MM-*ho***MM** =*ten*MM *ngai*LL (SR)
好－ 好 等 俚
nicely wait 1SG
a b

In (5), we recognize that the adverb *ho-ho* 'nicely' is not in c-command relation with *ten* 'wait' and therefore they are not in a single domain. If the STSR is indeed a rule with this parameter, the second syllable of the adverb *ho-ho* should not undergo tone sandhi. However, as we can identify from the transcription, the second syllable of the word actually undergoes tone sandhi. From this example, we can conclude that the STSR cannot be categorized as a parameter like the Italian syntactic doubling rule and Kimatuumbi vowel shortening.

Therefore, the question is whether the STSR be categorized as a rule with parameter (ii) (word b must c-command word a) like French Liaison and Ewe tone sandhi. This parameter seems to solve the previous problem encountered by the parameter (i) since the v nodes can now c-command the adverb, triggering the tone sandhi. However, this does not seem to be the case. It can be recalled that solving this problem by considering the STSR will create a paradoxical effect and will block the application of the rule at the earlier [V+NP]VP construction.

It has shown that the STSR has no domain-c-command requirement (parameter (iv)) and cannot be categorized into Kaisse's (1985) P1 rule. There is, however, another parameter posited by Chung (1989) in his study of the K-condition for Guangxing Hakka's *Yangping* tone Sandhi.

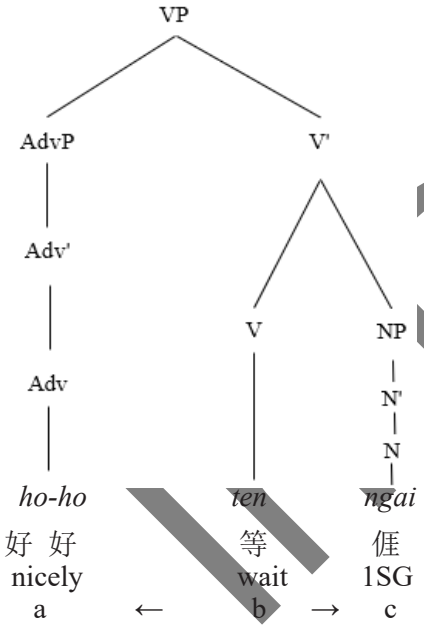
Chung (1989) has proposed an extension of the domain c-command parameters proposed by Kaisse

(1985) to account for the *Yangping* Tone Sandhi Rule (YTSR). This rule is stated as K-condition. The definition of this parameter is given in data (6).

6) K-condition (Chung, 1989, p.194)
(a) *a* must domain-c-command *b* or
(b) *b* must domain-c-command *a*

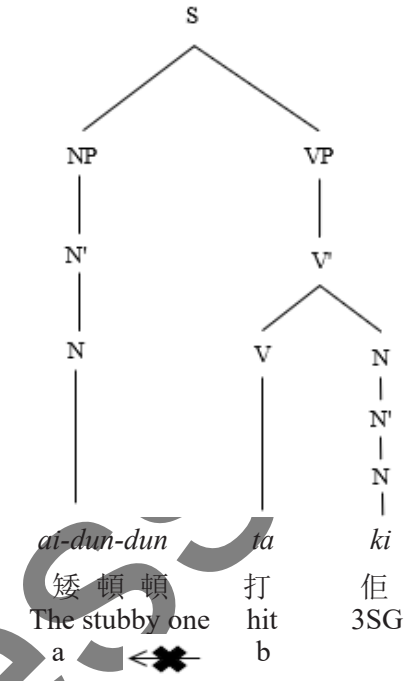
Chung (1989) has added that the YTSR of Guangxing Hakka is classified as an external P1 rule with K-condition as the domain. This rule can solve the paradox that cannot be solved by parameters (i) and (ii) of Kaisse since the c-commanding directions are more flexible. The following tree shows how the K-condition can solve the problem encountered with c-command parameters (i) and (ii) found in Kaisse (1985). A similar example is repeated in data (7).

(7) 'nicely (kindly) wait for me'
*ho*ML-*ho*ML = *ten*ML *ngai*LL (UR)
*ho*MM-*ho*MM = *ten*MM *ngai*LL (SR)
好– 好 等 偓
nicely wait 1SG



Chung (1989) has solved the paradoxical constructions that cannot be accounted for by parameters (i) and (ii) with this optional bidirectional domain-c-command. Nonetheless, some of the longer data has revealed that there are some syntactic constructions that Chung (1989) states should be blocked by the tone group (hereafter) boundary, but this is not the case for the STSR. According to Chung (1989), the K-condition cannot have the maximal projection as its domain, so the sentence structure is theorized to block the domain c-command at the end of the subject. The incorrect prediction made by the K-condition is illustrated in data (8) and (9).

(8) 'Ai-dun-dun (the stubby one) hit him/her'
*ai*ML -*dun*ML-*dun*ML = taML = kiLL (UR)
*ai***MM** -*dun***MM**-*dun***MM** = taMM = kiLL (SR)
*aiMM -*dun*MM-*dun***ML** #taMM = kiLL (SR)
矮 – 頓 – 頓 打 佢
The stubby one hit 3SG



(9) 'The yellow dog barked at the black dog.'
*vong*LL *keu*ML = *phoi*HM *u*LL *keu*ML (UR)
*vong*LL *keu***MM** = *phoi*HM *u*LL *keu*ML (SR)
黃 狗 吠 烏 狗
yellow dog bark black dog

If the STSR in data (8) complies with the K-condition, then there is a boundary at the right edge of *ai*MM-*dun*MM-*dun***ML**, which blocks tone sandhi. However, the rightmost *dun*ML still undergoes tone sandhi and surfaces as dunMM. Likewise, data (9) seems not to be constrained by K-condition.

Another structure that allows for the operation of the STSR in this dialect is the double object construction with the verb *pun* 'give'. The low falling of the final syllable in the NP1 is assigned a TG marker in Guangxing Hakka's tone sandhi. However, the rule can apparently cross such construction in Aceh Hakka, as illustrated in data (10).

(10)'Give Lo-geu meal fee.'
*pun*LL = *lo*ML-*geu*ML = *fan*HM *tshien*LL (UR)
*pun*LL = *lo*MM-*geu*MM = *fan*HM *tshien*LL (SR)
give Lo- geu meal money
分 老– 狗 飯 錢

Moreover, the STSR is also allowed in specific constructions involving suffixation *e*ML and possessive *e*HM that are also blocked in Guangxing Hakka. The examples of the suffixation structures are

given in data (11) and data (12), while the examples of the possessive constructions are given in data (13) and data (14).

(11) 'dog'
*keu*ML *e*ML (UR)
*keu***MM** = *e*ML (SR)
**keu*ML # *e*ML (SR)
狗- 仔
dog suffix

(12) 'ghost'
*kui*ML *e*ML (UR)
*kui***MM** = *e*ML (SR)
kui*ML** # *e*ML (SR)
鬼- 仔
ghost suffix

(13) 'dog's fur (associative phrase)'
*keu*ML *e*HM *mo*LL (UR)
*keu***MM** = *e*HM *mo*LL (SR)
狗 的 毛
dog POSS fur

(14) 'a fish ball made by my aunty'
*ngai*LL *ku*LL *ta*ML *e*HM *ng*LL *yen*LL (UR)
*ngai*LL *ku*LL *ta***MM**=*e*HM *ng*LL *yen*LL (SR)
僅 姑 打 的 魚 圓
1SG aunt hit particle fish ball

Based on the observations, it is safe to conclude that the STSR is insensitive to syntactic conditions and, therefore, cannot be accounted for in the domain-c- relation. Besides, the sentential [NP + VP] S construction suggests that the domain is actually beyond the phonological phrase level leading this research to directly investigate if the domain of the operation of the STSR is bounded within Intonational Phrase (*I*) or Utterance (*U*).

This research will attest if the domain for the STSR actually lies within the intonational phrase or utterance. Nespor and Vogel (1986) have suggested that there are certain universal constructions in which the domain is established based on intonation contour and the potential for pauses that can form the intonation domain on their own. This section lists two types of constructions, which are vocative and tag questions, that are articulated by the informants in order to investigate if the domain for the STSR is the intonational phrase.

(15) Vocative
(a) 'A-Keu, don't go gambling, okay?'
*a*MM-*keu*ML # *mok*L̲ *hi*MM *tu*MM *pok*LL *ya*HH (UR)
*a*MM-*keu***MM** # *mok*L̲ *hi*MM *tu*MM-*pok*LL yaHH (SR)
阿- 狗 莫 去 賭 博 *ya*
AKeu Neg go gamble yes
(Indonesian)

(b) 'A-Long, where are you going?'
*a*MM *long*ML # *nyi*LL *oi*MM *hi*MM *ne*HM-*e*ML (UR)
*a*MM *long***MM** # *nyi*LL *oi*MM *hi*MM *ne*HM-*e*ML (SR)
阿- 龍 你 愛 去 哪 仔
A-Long 2SG love go where

(16) Tag questions
'You are looking for kerosene, right?'
nyiLL ts^{h}imLL foML-suiML # heHM-moLL (UR)
nyiLL ts^{h}imLL fo**MM**-sui**MM**# heHM-moLL (SR)
你 尋 火 - 水 係 - 無
2SG look for kerosene Q

In (15), *A Keu* is a Chinese name that means dog. Traditionally, Chinese parents who stay in rural areas tend to name their children after animals, but it is less common nowadays.

As noticed in the examples in (15-16), tone sandhi is not blocked by the intonational phrase boundary. It is concluded that the domain is not larger than the intonational phrase. Therefore, the tone sandhi domain must be bounded within the largest prosodic domain, Utterance (*U*). The STSR of Aceh Hakka in data (1) is now modified with domain boundary as that in data (17).

(17) /ML/ → [MM] / ___ T]$_{\text{Utterance}}$ (where T is any tone)

CONCLUSIONS

The research discusses the tonal inventory of Aceh Hakka and formulates the *Shang* tone sandhi rule (STSR). In addition, it also investigates the correlation between the syntactic structure and the domain of operation of the STSR, which has yet to be discussed in previous studies. From the observations of some controlled phrases and sentences in this dialect, it can be identified that the STSR of Aceh Hakka has a different domain of application compared to the Guangxing dialect *Yangping* tone sandhi rule reported in Chung (1989). The STSR domain of operation cannot be stated solely by the domain c-command since it is not sensitive to the syntactic structure. Therefore, it cannot be categorized as a P1 rule. The domain of the STSR in Aceh Hakka is also different from the *Yinping* Tone Sandhi Rule of Meinong Hakka reported in Tung (2010) and the tone sandhi rules in Zhuolan Rouping in Hsiao (2017), both of which lie within the intonational phrase. Both special I (tag questions and vocatives) constructions verified in this research do not block the STSR from crossing the I domain. It can be concluded that the utterance (U) is the domain for *Shang* tone sandhi in Aceh Hakka.

During the investigation, the researchers

identify that the informants pronounce a few syllables differently and prefer different phrase structures. The researchers have yet to figure out what exactly makes them do so. It leaves the gap to be filled in future research to probe into their ancestors. It is of interest for future research to find whether the place of origin in Guandong, China contributes to the few differences the researchers encountered during this research or whether their pronunciation is influenced by Indonesian. Moreover, the researchers have yet carefully applied acoustic analysis in this research. An acoustic study in future research should provide a precise and comprehensive analysis of the tonal system

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