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ADJECTIVE REDUPLICATIONS IN FUZHOU: A MORPHO-PHONOLOGICAL ANALYSIS*

This paper studies adjective reduplications in Fuzhou within the framework of autosegmental phonology and lexical phonology. I first examine the morphological process of reduplication, focusing on the definition of base as the target of reduplication. I argue that the bimorphemic base for reduplication is defined in two ways: either morphologically, where the entire compound reduplicates as a whole, or prosodically, where reduplication applies under positive prosodic circumscription accessing either or both edges of the bimorphemic base. I then investigate the phonological changes subsequent and unique to reduplication. I propose that a binary iambic foot is constructed at the right edge in each reduplication output where the penult syllable dominated by the weak node undergoes regular sandhi. The antepenult and preantepenult, if any, are unfooted and will have their tones delinked and later get a default low tone. I also show that the fixed melodic material in one of the reduplication patterns is the result of a default vowel realization. Finally, I discuss the extension of the metrical treatment to the non-reduplication data as provided in Chan (1985).

1. INTRODUCTION

This paper is an attempt to analyze adjective reduplications in Fuzhou within the framework of autosegmental phonology and lexical phonology. It has four sections. Section 1 introduces the general Fozhou phonology and the adjective reduplication data. Section 2 provides the morphological and phonological analysis. It argues that (1) that the diverse patterns of reduplication observed in Fuzhou are attributed to two kinds of base circumscriptions, prosodic and morphological, and to one type of reduplication: total reduplication; (2) the foot structure, which is independently attested in this language, is closely related to tone sandhi. Section 3 addresses some residual issues, and section 4 summarizes the major points of this research.

1.1. *Fuzhou Phonology*

1.1.1. *Consonants*

In traditional Chinese philology, a syllable is divided into two parts, an **initial** (the first consonant) and a **final** (the rest of the syllable).

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According to Chen and Zheng (1990), Fuzhou has the following initial consonants.

(1) Fuzhou Initial consonants:[1]

p	t	k
p^h	t^h	k^h
	s	x
		ts
		ts^h
m	n	ŋ
	l	

When two syllables are pronounced together, the onset of the second syllable may change, generating under specific conditions two new onset consonants β and 3, which are not part of the underlying inventory. Basically, the changes are as follows:

(1) If the previous syllable ends in a nasal, stops and fricatives become their homorganic nasals, and a syllable without an initial may surface with an initial ŋ.

(2) After an open or ʔ-final syllable, *p* and p^h become β; *t*, t^h, *s* become *l*; and *k*, k^h, and *x* get deleted.

(3) *ts* and ts^h become 3 after either a nasal coda or an open or ʔ-final syllable.

1.1.2. *Tones*

It is generally agreed that Fuzhou has seven citation tones, but their actual pitch values vary from one transcription to another. As shown in (2), the phonetic values assigned by Chen and Zheng (1990) for the reduplication data are somewhat different from those in Chan (1985), where she converts the tones into tonemes based on a detailed analysis of their phonological behaviors:

(2) Toneme Representations of Fuzhou Citation Tones:

Chen and Zheng:	Chan:	Tonemes (Chan):
44	44	H
53, ʔ5	51, ʔ5	HL
213, ʔ23(B)[2]	213, ʔ13(B)	LH
242	131	LHL
31, ʔ23(A)	32, ʔ13(A)	L (L with a floating H)

Tones may undergo sandhi, depending on their positions in a word or phrase. In a disyllabic sandhi domain, the first tone undergoes sandhi, the

value of which is determined in part by the tone of the final dominant syllable. In this paper, I adopt Chan's (1985) tonemic analysis since it is the most extensive and recent phonological examination of Fuzhou data available. As in the case of citation values, some of her phonetic sandhi values may differ slightly from Chen and Zheng's (1990), but this does not affect our phonological analysis of the reduplication data.[3] The following table from Chan (1985: 299) lists the disyllabic tone sandhi patterns:

(3) The Disyllabic Tone Sandhi Patterns:

T1\T2	H, HL	L	LH(L)
L	L	LH	H
HL	H	L	L
LH(L), H	H	HL	HL

1.1.3. *Vocalic changes*

Some vowels in Fuzhou have two sets depending on the tones they are associated with. The so-called lax vowels co-occur only with such contour tones as LH or LHL (*213, 242* or *ˀ23*). If one of these tones undergoes sandhi, the lax vowel will change to its tense counterpart. Generally speaking, the major difference is that (1) a tense vowel tends to be higher than its lax counterpart (e.g., au → ou); (2) it is more fronted (e.g., a → a); and (3) the lower half of a lax diphthong is dropped, leaving behind a tense monothong (e.g., ɛi → i).

For clarity and ease of comparison, a two-line notation is used for data presentation. The upper line is the phonemic representation, and the lower line indicates changes in the output only.[4]

(4) lɛi LHL 'sharp'

Reduplication:	lɛi	lɛi	LHL	LHL	
	li		HL		'sharp'

This indicates that 'sharp' in citation is pronounced as *lɛi LHL* but surfaces as *li HL* in the penult position in reduplication with both its vowel and tone changes.

1.2. *Fuzhou Adjective Reduplications*

According to Chen and Zheng (1990), Fuzhou adjective reduplications have seven patterns which can be subdivided into 24 categories according to the resultant sound changes. An example from each of their categories is given below. For ease of reference, I number the segments in the patterns from left to right as I assume that reduplication in Fuzhou proceeds from left to right as a suffixation process (see section 2.1.1).

(5) **I. A1-A2**

a.	u H 'black':	u	u	H	H	'black'
b.	lɛi LHL 'sharp':	lɛi	lɛi	LHL	LHL	
		li		HL		'sharp'
c.	pa L 'full':	pa	pa	L	L	
				LH		'full'

II. X1-A2-A3

(X represents a kind of a derived syllable: its initial is the same as that of A's, but its final is either *i* or *iŋ*, depending on whether A's rhyme ends in a non-nasal or a nasal. It is also noticed that except for pattern VI, a reduplication output with more than two syllables has the last two syllables undergo regular tone sandhi, with the antepenult and preantepenult syllables realized with an invariable low tone.)

a.	uai H 'lopsided':	uai	uai	uai	H	H	H	
		i			L			'lopsided'
b.	luaŋ LHL 'messy':	luaŋ	luaŋ	luaŋ	LHL	LHL	LHL	
		liŋ	luaŋ		L	HL		'messy'
c.	nuoŋ L 'soft':	nuoŋ	nuoŋ	nuoŋ	L	L	L	
		niŋ[5]			L	LH		'soft'

III. A1-A2-A3

a.	aŋ LH 'dim':	aŋ	aŋ	aŋ	LH	LH	LH	
		aŋ	aŋ		L	HL		'dim'
b.	touŋ HL 'level':[6]	touŋ	touŋ	touŋ	HL	HL	HL	
			nouŋ	nouŋ	H	H		'long'

(This is a closed class: only 5 out of the 384 adjectives investigated are subject to this pattern (Chen and Zheng (1990:365).)

(5) **IV. A1-B1-B2**[7]

a. iu HL 'oily' nɸy LHL 'greasy':

Compound:	iu	nɸy		HL	LHL		
				L			
Reduplication:	iu	nɸy	nɸy	HL	LHL	LHL	
		ny		L	HL		'oily'

b. kaŋ H 'dry' ta H 'burnt':

Compound:	kaŋ	ta		H	H		
		na					
Reduplication:	kaŋ	ta	ta	H	H	H	
		na	la	L			'dry'

c. t^ho L 'appropriate' tɔuŋ LH 'proper':

Compound:	t^ho	tɔuŋ		L	LH		
		lɔuŋ		H			
Reduplication:	t^ho	tɔuŋ	tɔuŋ	L	LH	LH	
		louŋ	nɔuŋ	L	HL		'appropriate"

V. A1-A2-B1

a. sɛi LH 'four' kɔyʔ LH 'corner':

Compound:	sɛi	kɔyʔ		LH	LH		
	si			HL			
Reduplication:	sɛi	sɛi	kɔyʔ	LH	LH	LH	
	si	si		L	HL		'four-cornered'

b. paŋ HL 'level' tiʔ HL 'straight':

Compound:	paŋ	tiʔ		HL	HL		
		niʔ		H			
Reduplication:	paŋ	paŋ	tiʔ	HL	HL	HL	
		maŋ	niʔ	H	H		'straight'

c. ts^hy H 'leisurely' t^huɔŋ LH 'smooth':

Compound:	ts^hy	t^huɔŋ	H	LH			
		luɔŋ	HL				
Reduplication:	ts^hy	ts^hy	t^huɔŋ	H	H	LH	
		3y	luɔŋ	L	HL		'happy'

(5) **VI. A1-B1-A2-B2**

aŋ H 'calm' tsɛiŋ LHL 'quiet':

Compound:	aŋ	tsɛiŋ			H	LHL			
					HL				
Reduplication:	aŋ	tsɛiŋ	aŋ	tsɛiŋ	H	LHL	H	LHL	
					HL		HL		
									'quiet'

VII. A1-A2-B1-B2

a. t^ho L 'appropriate' tɔuŋ LH 'proper':

Compound:	t^ho	tɔuŋ			L	LH			
		lɔuŋ			H				
Reduplication:	t^ho	t^ho	tɔuŋ	tɔuŋ	L	L	LH	LH	
		lo	louŋ	nɔuŋ	L	L	HL		
									'proper'

b. xuoŋ L 'crush' ts^{h}ɔy LH 'pieces':

Compound:	xuoŋ	ts^{h}ɔy			L	LH			
					H				
Reduplication:	xuoŋ	xuoŋ	ts^{h}ɔy	ts^{h}ɔy	L	L	LH	LH	
		ŋuoŋ	ts^{h}ɸy		L	L	HL		
									'crushed'

c. nɔuŋ LHL 'tender' nɛi LHL 'oily':

Compound:	nɔuŋ	nɛi			LHL	LHL			
	nouŋ				HL				
Reduplication:	nɔuŋ	nɔuŋ	nɛi	nɛi	LHL	LHL	LHL	LHL	
	nouŋ	nouŋ	ni	lɛi	L	L	HL		
									'careful'

d. sɛi LH 'four' kɔyʔ LH 'corner':

Compound:	sɛi	kɔyʔ			LH	LH			
	si				HL				
Reduplication:	sɛi	sɛi	kɔy	kɔyʔ	LH	LH	LH	LH	
	si	si	kɸy		L	L	HL		
									'square'

e. ts^{h}uɔŋ LHL 'resemble' yɔŋ LHL 'shape':

Compound:	ts^{h}uɔŋ		yɔŋ		LHL	LHL			
	ts^{h}uoŋ		ŋyɔŋ		HL				
Reduplication:	ts^{h}uɔŋ	ts^{h}uɔŋ	yɔŋ	yɔŋ	LHL	LHL	LHL	LHL	
	ts^{h}uoŋ	ʒouŋ	ŋyoŋ	ŋyɔŋ	L	L	HL		
									'acceptable'

(5) f. kuoŋ H 'bright' tsʰieŋ H 'fresh':

Compound:	kuoŋ	tsʰieŋ			H	H		
Reduplication:	kuoŋ	kuoŋ	tsʰieŋ	tsʰieŋ	H	H	H	H
		ŋuoŋ			L	L		

'clean and beautiful'

g. mieŋ L 'grudging' kyoŋ L 'strong':

Compound:	mieŋ	kyoŋ			L	L		
					LH			
Reduplication:	mieŋ	mieŋ	kyoŋ	kyoŋ	L	L	L	L
					L	L	LH	

'far-fetched'

h. tieŋ HL 'lingering' puaŋ LHL 'sentimental':

Compound:	tieŋ	puaŋ			HL	LHL		
		muaŋ			L			
Reduplication:	tieŋ	tieŋ	puaŋ	puaŋ	HL	HL	LHL	LHL
		nieŋ	muaŋ	muaŋ	L	L	HL	

'tearful'

i. xuoŋ L 'pink' ɸyŋ HL 'red':

Compound:	xuoŋ	ɸyŋ			L	HL		
		ŋɸyŋ			L			
Reduplication:	xuoŋ	xuoŋ	ɸyŋ	ɸyŋ	L	L	HL	HL
		ŋuoŋ	ŋɸyŋ	ŋɸyŋ	L	L	H	'pink'

As observed earlier, the data subsumed under the twenty-four categories listed above reflect the analysis made by Chen and Zheng (1990). They propose that reduplications in Fuzhou are of two kinds: those without melodic or tonal changes (as in I-a) and those with changes. Here, changes refer to any differences between the reduplication output and the form of the base. In the case of bimorphemic bases for patterns IV–VII (cf. footnote 7), the differences crucially refer to those between the **surface** form, not the underlying form, of the compound base and the reduplication output. Take pattern IV (A1-B1-B2) for instance. In IV-b, the surface form of the initial compounding is *kaŋ H na H*, but in the reduplication output *kan L na H la H*, the last segment B2 is changed from *na* to *la*. Taking B1, which has no changes, as the original copy, Chen and Zheng call this kind of reduplication with initial changes **progressive** reduplications since the reduplicated copy, i.e. B2, is to the right of the original copy B1. Chen and Zheng also postulate **regressive** reduplications, which involve some final or tonal changes as in IV-a. Different from the surface form of the

compound base *iu L nϕy LHL*, B1 in the reduplication output *iu L ny HL nϕy LHL* is *ny HL*. As B2 does not undergo any changes, it is considered to be the original copy, and reduplication is therefore regressive. If both copies in the output undergo changes, reduplication is then analyzed as **directionless** as is the case with most of the data (e.g., IV-c).

Chen and Zheng's analysis basically consists of mechanical and unnecessarily complicated classifications. As it lacks theoretical orientation and ignores the inner workings of general Fuzhou phonology, it fails to capture any linguistically significant generalizations. This paper is an attempt to seek an alternative account for the data.

2. Analysis

The current analysis consists of two parts. Section 2.1 examines the morphological process of reduplication, focusing on the definition of the base as the target of reduplication. Section 2.2 takes up the phonological side of the analysis, looking at the phonological changes subsequent and unique to reduplication. Sample derivations are provided to illustrate the theoretical proposal in the last section.

2.1. *Morphological Processes*

As shown in section 1.2, Fuzhou adjectives display seven patterns of reduplication, repeated as in (6):

(6) Reduplicative Patterns for Fuzhou Adjectives:

Pattern I:	A1-A2
II:	X1-A2-A3
III:	A1-A2-A3
IV:	A1-B1-B2
V:	A1-A2-B1
VI:	A1-B1-A2-B2
VII:	A1-A2-B1-B2

Given such an assortment of patterns, some immediate questions arise: (1) Does reduplication operate as diversely as its output patterns display, or is there a unified and principled account for it? (2) What is the base of reduplication in each pattern? (3) Do we need "template" for all the reduplications in Fuzhou? These are the issues which will be addressed in this section.

2.1.1. *Defining the Base*

The bases for patterns I, II, and III are relatively easy to define. I follow Chiang (1992) in assuming that reduplication in Fuzhou proceeds from left to right as a suffixation operation.[8] In these three patterns, A1 (X1 for pattern II) is postulated as the base, which undergoes total reduplication to the right, generating A2. Unlike pattern I, patterns II and III have an extra morpheme, i.e., A3. I will leave their further derivations until we have defined the bimorphemic bases.

The identification of the bases for patterns IV, V, VI, and VII is not straightforward. In IV and V, only B or A reduplicates to the right; in VII, they both reduplicate respectively; and in IV, A and B reduplicate as a whole. Given these facts, there are at least two possible hypotheses with respect to the identification of the base for these reduplications.

2.1.1.1. *Hypothesis I: The base is a monomorpheme and reduplicates before concatenating with another morpheme.*[9]

Take pattern IV A1-B1-B2 for instance. Under this hypothesis, B1 as a Minimal Word reduplicates to the right, assuming that A is not a defined part of the base for this reduplication process. Then the resultant B1-B2 combines with A to form A1-B1-B2. Take the word *kaŋ ta ta* 'dry' for example:

(7) Base: [ta]

a. Total reduplication: $[[ta]_{base}$ ta]

b. Concatenation: [kaŋ [ta-ta]]

Though it derives a good result, Hypothesis I encounters two problems. One is semantics. In Chinese, monosyllabic morphemes are often polysemic. In the example above, *kaŋ* by itself means 'dry (both as a verb and adjective); empty; for nothing; do,' etc., and *ta* means 'burnt; worried,' etc. The combination of these two morphemes has a more restricted meaning, viz. 'dry'; and the reduplicated form *kan ta ta* is closely related semantically to this bimorphemic compound. To put it differently, this hypothesis for designating B1 as the base does not respect the semantic integrity of the original compound. It also generates impossible words (i.e., B1-B2) in the process of reduplication.

Another problem with this hypothesis is that it implies a different order of morphological operations with respect to pattern VI A1–B1-A2-B2. For this pattern, we would have to specify that A and B concatenate first before reduplicating as a unit, an order which is different from that for other patterns. Schematically, the order for pattern VI would be as follows:

(8) a. Concatenation: [A] + [B] ⇒ [AB]base

b. Reduplication: [[AB] [AB]]

In Fuzhou, most adjectives can be subject to more than one pattern of reduplication. The compound *aŋ siŋ* 'carefree', for instance, can become *aŋ niŋ aŋ niŋ* (pattern VI) or *aŋ ŋaŋ niŋ* (pattern V). Under the current hypothesis, we would have to say that for pattern V, reduplication proceeds with *aŋ* as the base before it concatenates with *siŋ*; for pattern VI, the base would be *aŋ siŋ* resulting from an initial concatenation of these two mono-morphemes. Postulating a different order for the same morphological processes for the same adjective is, indeed, a most undesirable result.

If VI is the *only* pattern that ever co-occurs with one of the others, this would seem to imply an independent reduplication rule for this pattern and hence a different ordering from that of others. However, the data from Zheng (1988: 304) do not lend empirical support for this hypothesis. Of the 169 disyllabic adjective compounds, 16 can have patterns V and VII, 10 can have IV, V and VII, etc. Semantically, all the seven patterns serve the same purpose of intensification though to varying degrees. In short, this digression justifies our assumption that morphological ordering should be the same for all the last four patterns: concatenation precedes reduplication.

2.1.1.2. *Hypothesis II: The bimorphemic stem AB is the base, but reduplication can apply to a prosodically characterized segment of the base.*

This hypothesis is inspired by the prosodic morphology model initiated by McCarthy and Prince (1990). They propose that morphological or phonological operations can apply to a base under positive prosodic circumscription, i.e., to the segment of the base characterized by the prosodic constraint (1990: 229). One of the advantages of this hypothesis is that it recognizes the semantic integrity of the AB base and hence captures the semantic affinity between the base and the reduplicated form.[10] Again take *aŋ siŋ* (AB) 'carefree' for example. To derive a pattern V reduplication (A1-A2-B1), let us assume that for this pattern, positive prosodic circumscription accesses the **left** edge of the compound base, and *aŋ* (A), representing a legitimate prosodic unit, a syllable, is thus parsed as the target of reduplication.[11] After reduplication applies, the output (A1-A2) concatenates with the residue of the base *siŋ* (B), arriving at *aŋ ŋan niŋ*. The formalism introduced in McCarthy and Prince (1990) is adopted here with the following notions: -R stands for reduplication as a suffixation

process, $\phi < \sigma, L >$ for the parsing function accessing the left syllable of the bimorphemic AB base, AB: ϕ for the prosodically circumscribed segment of the base, and AB/ϕ for the residue of the base and + for concatenation.

(9) Formal Representation for Pattern-V Reduplications:

$$\begin{aligned} \text{-R:}\phi < \sigma, L > (AB) &= \text{-R } (AB{:}\phi) + AB/\phi \\ &= \text{-R } (A) + B \\ &= A1\text{-}A2 + B \\ &= A1\text{-}A2\text{-}B1 \end{aligned}$$

To derive a pattern-IV reduplication (A1-B1-B2), we assume that prosodic circumscription accesses the **right** edge of the AB base, and B, being a legitimate prosodic unit, is thus positively circumscribed as the target of reduplication:[12]

(10) Formal Representation for Pattern-IV Reduplications:

$$\begin{aligned} \text{-R:}\phi < \sigma, R > (AB) &= AB/\phi + \text{-R } (AB{:}\phi) \\ &= A + \text{-R } (B) \\ &= A + B1\text{-}B2 \\ &= A1\text{-}B1\text{-}B2 \end{aligned}$$

Given the analysis above, pattern VII reduplications (A1-A2-B1-B2) constitute a de facto combination of pattern IV and V reduplications. In other words, prosodic circumscription accesses **both** edges of the bimorphemic base, enabling both A and B to undergo reduplication respectively. Based on the representations in (9) and (10), the formal derivation for pattern VII is as follows:

(11) Formal Representation for Pattern-VII Reduplications:

$$\begin{aligned} \text{-R:}\phi < \sigma, \{L,R\} > (AB) &= \text{-R } (AB{:}\phi) + \text{-R } (AB{:}\phi) \\ &= \text{-R } (A) + \text{-R } (B) \\ &= A1\text{-}A2 + B1\text{-}B2 \\ &= A1\text{-}A2\text{-}B1\text{-}B2 \end{aligned}$$

For pattern VI, it is proposed that the base AB reduplicates as a whole without undergoing prosodic circumscription. In other words, unlike patterns IV, V, and VII, the base for VI is **morphologically** defined, rather than **prosodically** defined. The reduplication output consists of two morphological words: [[A1-B1] [A2-B2]].[13]

Here is a schematic summary of base parsings for patterns IV–VII reduplications:

(12)	BASE PARSING	REDUPLICATION
	Pattern IV [A1 $[B1]_{target}$]	[A1 + B1-B2]
	V $[[A1]_{target}$ B1]	[A1-A2 + B1]
	VI [A1 B1]	[[A1 B1]–[A1 B2]]
	VII $[[A1]_{target}$ $[B1]_{target}$]	[A1-A2 + B1-B2]

We are now in a position to complete the discussion of patterns II and III. It has been observed that A1 (X1 for pattern II) is reduplicated to the right, generating [[A1] A2] as in pattern I. But this reduplicated form can serve as the base for further reduplication under positive prosodic circumscription.[14] Considerations of subjacency and consistency will take A2 as the real target of reduplication. What is interesting about this cycle of reduplication is that it resembles that for pattern IV, where the rightmost member of the AB base reduplicates. The procedures are illustrated in (13):

(13) Steps of Reduplication for Patterns II and III:
Base: [A1]
(a) [A1 $[A2]_{target}$]b
(b) [A1 + A2 – A3]

To conclude, there are two kinds of parsing for bimorphemic bases under Hypothesis II: morphological parsing for pattern VI and prosodic parsing for the other three. This treatment has three advantages. First, treating AB as the base maintains the semantic relationship between the base and its reduplicated counterpart. Second, the order of morphological operations will be the same for all the last four patterns: A and B combine first before reduplication. Moreover, such an ordering allows for the fact that the AB base can be subject to more than one pattern of reduplication. Third, the parsing of the base, either prosodic or morphological, accords well with the current thinking in prosodic morphology for languages in general. Given these considerations, I adopt Hypothesis II for defining the base for Fuzhou adjective reduplications.[15]

2.1.2. *The Template*

In the literature on reduplication, a template has been postulated onto which segments from the base are mapped. The question here is whether the Fuzhou data also need a template. The answer to this question depends on whether reduplications in question are total or partial. I propose that all the adjective reduplications in Fuzhou are total reduplications.

According to McCarthy and Prince (1986, 1988, 1990), total redupli-

cation is tautologous compounding, i.e., compounding with the base itself, and thus there is no need for a template. For Fuzhou adjectives, reduplication accesses either member, or both members, of the base, a property which is lexically determined.[16] For instance, for pattern IV adjectives, the rightmost morpheme B of the AB base is parsed as the reduplication target. Though total reduplication targets the whole base in theory, it is the syllable B which is in reality reduplicated under positive prosodic circumscription, generating A1-B1-B2. The thrust of the whole argument is that without recourse to the extra machinery "template", it is still possible to derive the correct result so long as the base is appropriately parsed. Hence, "template" is eliminated from our analytical model for total reduplication, as McCarthy and Prince propose.

2.2. *Phonological Processes*

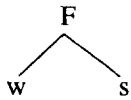
Apart from inheriting the complexities of general Fuzhou phonology, reduplicated adjectives have their own phonological intricacies each of which deserves a separate treatment. This section first examines foot construction in Fuzhou, arguing for a metrical treatment of tone sandhi for the reduplicative data. It will then focus on pattern II and address the invariant nucleus of X1.

2.2.1. *Defining the Foot*

Treating syllable duration as one of the most important criteria for determining stress, both Wright (1983) and Chan (1985) argue that there exists an iambic stress system in Fuzhou. Chan (1985: 202) specifies that it is a quantify-insensitive, unbounded iambic foot erected at the right edge of a word or a phrase.[17]

While I accept the iambic foot type for Fuzhou, I differ from Chan by adopting a more recent proposal of McCarthy and prince (1986: 9) and Prince (1990) that feet are maximally binary. In addition, I do not assume stray adjunction and iterative foot construction for the reduplication data. The consequence of such assumptions is that a three-way distinction is made among syllables with respect to the foot structure in a polysyllabic sandhi domain in Fuzhou.

(14) Foot Construction in a Sandhi Domain:



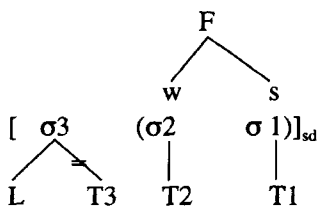
$[\sigma 4 \ \sigma 3 \ \sigma 2 \ \sigma 1]_{sd}$ sd = sandhi domain

In (14), σ1 is strongly stressed, and σ2 is weakly stressed; σ3 and σ4 are not footed. The construction of such a binary QI iambic foot at the right edge of the domain finds support in the tonal effects to be discussed in the next section.

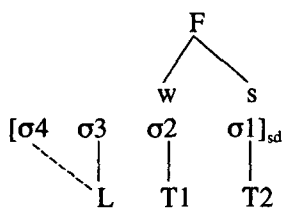
2.2.2. *Default Low Tone Mapping*

It has been noted that except for pattern VI, the reduplicated output constitutes one sandhi domain where the last two syllables undergo regular sandhi, and the antepenult and pre-antepenult ones, if any, are realized with the invariable low tone. There are two possible derivations for this phonological process. One is to extend McCarthy and Prince's (1990) overwriting mechanism for melody in total reduplication and formulate a L tone overwriting rule and an L tone spreading rule.

(15) Tonal Overwriting Rule:



(16) Tonal Spreading Rule:

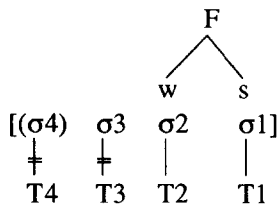


In (15), the last two syllables constitute a foot which undergoes the regular sandhi rules and is extrametrical for the purpose of tonal overwriting in the reduplicative patterns. As phonological rules cannot count more than two syllables (McCarthy and Prince 1986: 1), rule (15) will access σ3 as the first syllable available for tonal overwriting. If the domain has a pre-antepenult syllable, the L tone then spreads to it from the antepenult as indicated by the L Tone Spreading Rule in (16).[18]

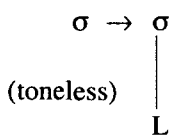
While these two rules account for the data, they are quite mechanical and lack phonological motivation. Especially the stipulation that the weak L overwrite other possibly stronger tones makes these rules highly implausible.

The following alternative analysis is the one I will adopt. As observed in section 2.2.1, a three-way distinction is proposed among syllables in a reduplicative output: the last two syllables in a domain are iambically footed, with the right-most one keeping its citation tone and the penult undergoing the regular sandhi. In contrast, the antepenult and preantepenult cannot be footed since one sandhi domain accommodates only one foot, and quite consistently these unfooted syllables have the invariable L tone. It has been commonly assumed in the literature that toneless tone-bearing units (TBUs) receive a language-specific 'core value' which may be universally L (Wright (1983: 99, 155), Pulleyblank (1986)). Following the common assumption that L is the default tone in a two-level system, I propose the following rules for the invariant L tone.

(17) Tone Delinking Rule:
If unfooted, tones are delinked from the TBUs.



(18) Default L Insertion Rule (cf. Pulleyblank (1986: 126):
Toneless TBUs receive the default L tone.



The advantage of such a metrical treatment is that it not only captures the interrelation between the foot structure and tone sandhis but also conforms to the universal assumption for a default L tone which come free from UG. In addition, it provides phonological evidence for the validity of the three-way distinction among syllables with respect to the foot structure.[19]

Take the word *tieŋ HL puaŋ LHL* 'tearful' for instance. First, these two words concatenate to form a compound. If they surface as a bimorphemic compound, a foot is erected over them, and *tieŋ*, which is dominated by the weak node, will undergo the regular sandhi rules. If, however, it undergoes pattern VII reduplication, it will serve as a base where the operation targets each of the two morphemes separately under positive prosodic circumscription.[20] In the output of reduplication [A1-A2+B1-B2], a foot

structure is formed over the last two syllables, licensing the regular tonal sandhi for the penult syllable. The antepenult and preantepenult syllables will have their original tones delinked since they are not footed but will receive the default L tone later. Phonological rules responsible for consonant and vowel changes are ignored in the following derivations.

(19) A Complete Sample Derivation:

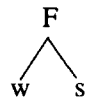
W_{min}: tieŋ HL, puaŋ LHL

Compounding: [tieŋ HL puaŋ LHL]

Reduplication (VII):

[tieŋ HL – tieŋ HL puaŋ LHL – puaŋ LHL]

Foot Construction:



[tieŋ HL tieŋ HL puaŋ LHL puaŋ LHL]

Tone Delinking:

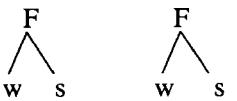
[tieŋ tieŋ puaŋ LHL puaŋ LHL]

Tone Sandhi and Default L Insertion:

[tieŋ L nieŋ L muaŋ HL muaŋ LHL]

It has been noted that in pattern VI, the antepenult and preantepenultimate syllables do not get the default L. Recall that reduplication of pattern VI accesses the entire compound as a whole, resulting in [[A1-B1] [A2-B2]]. It is proposed that the internal morphological brackets play a crucial role in sandhi input, i.e., the survival of the morphological brackets maintains the original morphological and sandhi domains since both A1-B1 and A2-B2 are legitimate words on their own.[21] As one domain permits one foot, each of the two domains in the reduplicative output can have a foot structure built in it, thus licensing the regular sandhi operations for A1 and A2.

(20) Domain and Foot Construction for Pattern VI:



$[[A1\ B1]_{sd}\ [A2\ B2]_{sd}]$

In brief, the fact that all the syllables in pattern VI are footed makes rules of tone delinking and L insertion inapplicable and therefore makes it different from other patterns in terms of tone sandhi.

The major concern of this paper is to account for the phonological changes resultant from reduplication for Fuzhou adjectives. The Tone Delinking and Default L Insertion rules introduced in (17) and (18) are adequate for the adjective reduplication data at hand. Section 3 will look beyond reduplication and discuss whether the metrical treatment can be extended to non-reduplicative data.

2.2.3. *X1 and its Fixed Melodic Material*

Observationally, X1 in Pattern II has the same onset as that of A2 and A3, but its rhyme is either *i* or *iŋ*, depending on whether A2 and A3's rhyme ends in a non-nasal or a nasal. Note that *i* can replace one, or two, or three segments as shown in (21):

(21)	(a)	ŋɔ	→ ŋi ŋo ŋɔ	'arrogant'
		nɸ	→ ni nɸ nɸ	'tough'
	(b)	luaŋ	→ liŋ luaŋ luaŋ	'messy'
		xɛu	→ xi xɛu xɛu	'finicky'
	(c)	uai	→ i uai uai	'lopsided'

The same process is also found in Fuzhou verb reduplications where the penult has the invariant *i(ŋ)*. Wright (1983: 129) provides the following data which originally come from Chen and Norman (1965):

(22) Verb Reduplications

$t^hiŋ$	$t^hiaŋ$	'just go ahead and listen'
mi	ma	'just go ahead and sell it'

Both Wright (1983: 130) and Chan (1985: 384) adopt basically the same derivation for (22). They propose that these cases of reduplication involve a CVC prefixation with the V (= vowel) slot prelinked to the /i/ vowel. However, this kind of CV specification is not allowed in the current theoretical models suggested by McCarthy and Prince (1986, 1988, 1990). Moreover, since we assume with Chiang (1992) that reduplication in Fuzhou is suffixation, X1 is then the original base, not a reduplicative copy which is mapped onto some template.

The solution I will adopt is the one proposed by Yip (1992) for Chaoyang onomatopoeic reduplications. In Chaoyang as in Fuzhou, the vowel /i/ is substituted for all [-cons] elements in the rhyme:[22]

(23) Chaoyang Onomatopoeic Reduplication (Zhu 1982, Yip 1992):
k^{h}i k^{h}a la kio
tsi tsiau liau kio
piŋ paŋ laŋ kio
i uai nuai kio

Yip (1992: 466) proposes that "onomatopoetic reduplication is subject to a rhyme condition disallowing Place features in the rhyme (or possibly a rule of Place truncation removes Place features). This neutralizes all vowel qualities, and all vowels surface as the default vowel, here /i/." This analysis is directly applicable to adjective reduplications in Fuzhou: /i/ surfaces as the default vowel. One of the advantages of adopting this default vowel analysis is that it is more simple, and therefore more elegant, than the melodic overwriting analysis as in Chiang (1992). Furthermore, treating /i/ as the default vowel in Fuzhou achieves a kind of analytical consistency with respect to the /i/ in other Chinese languages such as Chaoyang and Baijingese (Zhu 1982).[23]

2.3. *Exemplifications*

To recapitulate the analysis, the base for the last four patterns can be defined in two ways: one prosodic and the other morphological. The former type includes patterns IV, V, and VII, where reduplication applies under positive prosodic circumscription accessing either or both edges of the bimorphemic base. Pattern VI exemplifies the second kind of base parsing: the entire compound reduplicates as a whole. It is also proposed that all the reduplications are total reduplications and that there is no need for a template.

As for patterns II and III, their base for the initial reduplication is A1, as for pattern I. Then the A1-A2 base is parsed in the same way as pattern IV and has A2 available for further reduplication, generating A1-A2-A3.

Phonologically, it is proposed that one iambic foot is constructed at the right edge in each domain where the penult, which is dominated by the weak node, undergoes regular sandhi. The antepenult and preantepenult, if any, are unfooted and will have their tones delinked and later get a default L tone. In VI, the inner brackets crucially demarcate two morphological domains in the reduplicative output, thus licensing the construction of two feet and the regular sandhi for A1 and A2. Furthermore, in X1 in pattern II, /i/ as the default vowel is substituted for all [-cons] elements in the rhyme.

The interactions between morphological and phonological operations are diagrammed below:

(24) The Analytical Model for Fuzhou Adjective Reduplications:

MORPHOLOGY		PHONOLOGY
compounding		
reduplication	→	foot construction
		tone delinking
		regular tone sandhi and other rules
		default L insertion

In the following illustrations, the initial step of compounding is omitted to save space, and the processes are shown in the following three steps starting with the base prosodically parsed where applicable:

(25) Processes:

a. Reduplication

b. Foot construction

c. Phonological rules

(26) Sample Derivations:

Pattern I A1-A2

[pa L]b (= base) 'full'

a. [pa L – pa L]

b. [pa L pa L]

c. [pa LH pa L]

Pattern II X1-A2-A3

[uai H] 'lopsided'

a. [uai H [uai H]$_{target}$]b

a′. [i H [uai H – uai H]]

b. [i H uai H uai H]

c. [i L uai H uai H]

(26) **Pattern IV** A1-B1-B2

[kaŋ H [ta H]$_{target}$]b 'dry'

a. [kaŋ H [ta H – ta H]]

b. [kaŋ H ta H ta H]

c. [kaŋ L na H la H]

Pattern VI A1-B1-A2-B2

[aŋ H tsɛiŋ LHL]b 'quiet'

a. [[aŋ H tsɛiŋ LHL] [aŋ H tsɛiŋ LHL]]

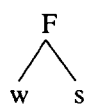
b. [[aŋ H tsɛiŋ LHL] [aŋ H tsɛiŋ LHL]]

c. [aŋ HL tsɛiŋ LHL aŋ HL tsɛiŋ LHL]

Pattern VII A1-A2-B1-B2

[[mieŋ L]$_{target}$ [kyoŋ L]$_{target}$]b 'far-fetched'

a. [[mieŋ L – mieŋ L] [kyoŋ L – kyoŋ L]]



b. [mieŋ L mieŋ L kyoŋ L kyoŋ L]

c. [mieŋ L mieŋ L kyoŋ LH kyoŋ L]

As demonstrated in (26), the proposed analysis can account for all the adjective reduplications provided in Chen and Zheng (1990) except for two words *touŋ HL* and *paŋ HL*, which will be discussed in the next section.

3. Excursus

In section 2.2.2, a metrical treatment is proposed for adjective reduplication, a proposal which is not only empirically valid but also theoretically desirable. Looking beyond the reduplication data, it is hoped that this analysis is extendable to non-reduplicative trisyllabic and quadrasyllabic sandhi domains. Although most of the data provided in Chen (1985)

is subject to this treatment, it is challenged by a particular subset of data.

According to Chan (1985), if the penult in an ordinary trisyllabic or quadrasyllabic sandhi domain is not a **HL** citation, the antepenult will be the L tone as in reduplication. As is shown in (27a) below, this set of non-reduplication data strengthens our iambic foot analysis. However, if the penult syllable is a **HL citation**, the antepenult undergoes regular sandhi whose value is determined by the **sandhi** value of the penult. The preantepenult has invariably a L tone. Here are some data from Chan (1985):

(27) Non-reduplication Data:

(a) The Penult Tone is **not** a **HL** Citation:

saŋ tsui ua:	H	**L**	LHL		
	L	H	LHL		'landscape painting'
ha liu sia hui:	LHL	HL	**LHL**	LHL	
	L	L	HL	LHL	'lower society'

(b) The Penult Tone is a **HL** Citation:

tsieŋ t^hau t^ho:	L	**HL**	LH	
	H^{24}	L	LH	'pillow case'
ho peiŋ iu:	L	**HL**	L	
	LH	L	L	'good friend'
ɸyŋ t^hau iu:	HL	**HL**	HL	
	H	H	HL	'red hair-oil'
u paŋ nɸy:	H	**HL**	HL	
	H	H	HL	'native of Uping'[25]

Now compare the reduplicative data which motivate the metrical analysis:

(28) Reduplication Data where the Penult Tone is a **HL Citation**:[26]

Pattern III (X1-A2-A3):

kouʔ HL →	HL	**HL**	HL	'slippery'
	L	H	HL	

Pattern V (A1-A2-B1):

tiʔ HL t^hau LH →	HL	**HL**	LH	'straight'
	L	L	LH	
tsy HL yoŋ HL →	HL	**HL**	HL	'natural'
	L	H	HL	

(28) Pattern VII (A1-A2-B1-B2):

xuoŋ L ɸyŋ HL →	L	L	**HL**	HL	'pink'
	L	L	H	HL	
tiaŋ LHL tɯʔ HL →	LHL	LHL	**HL**	HL	'quiet'
	L	L	H	HL	

As shown above, the penult HL tone behaves differently in the ordinary sandhis than in the reduplication sandhis. In the non-reduplication data in (27b), the penult HL induces an ordinary sandhi value for the antepenult syllable; in the reduplication data in (28), the antepenult invariably has the L tone even though the penult has a HL citation tone. The reduplication data have been successfully taken care of by the Tone Delinking rule for the unfooted syllables and the Default L Insertion rule. Now the question is whether it is possible to account for the non-reduplication data in (27b) under the metrical analysis.

Chan (1985: 359–360) attributes the unique effect of the penult HL tone on the antepenult to its highest phonetic pitch: "due to the correlation of pitch, intensity and stress, a high falling tone accompanied by high initial intensity, for example, would be perceived as being greatly stressed and would thus compete with the final syllable for perception of main stress." She provides one example to prove the power of the HL: when the verb *hua L* 'display" combines with the compound noun *pi HL* k^h*ei LH* 'temper', the output is *hua L pi HL // (*k^h*)ei LH*. Here the tone sandhi breaks into the disyllabic noun and treats the HL tone in the penult position as the final, ignoring the last syllable.

I have no definitive explanation for (27b) in the metrical account initiated for adjective reduplications, but I have two speculative suggestions.

The first suggestion is that in the domain consisting of (σ4)-σ3-σ2-σ1 where the penult σ2 has a HL citation, a binary iambic foot is built over σ3-σ2 with σ1 as extrametrical. But the problem is that σ2, despite an "s" node, does not keep its citation tone although in all the other cases there is an unfailing correlation between the retention of the citation tone and the location of the "s" node of the foot. Furthermore, the value of σ3 depends exclusively on the **sandhi**, not the underlying, value of σ2. Therefore, foot construction must start with σ2–σ1 causing the HL citation in σ2 to undergo sandhi before sandhi moves on to σ3–σ2.

The other possible solution is that foot construction is built over σ2–σ1 as usual. But since σ2 with its HL citation competes with σ1 in intensity, a new binary iambic foot is erected over σ3–σ2, leaving a default foot over σ1. The implication of this hypothesis is that foot construction can be sensitive not only to weight but also to tonal values, presumably a

parametric variation.[27] It also entails that a sandhi domain in Fuzhou can contain an optional default foot as well as a well-formed foot and that only the syllable with the rightmost "s" node keeps its citation tone.

As noted earlier, there are two words which are exceptions to the reduplication-type tonal sandhis:

(29) Pattern III-b:

touŋ HL:	HL	**HL**	HL	
	H	H	HL	'long'

Pattern V-b:

paŋ HL tiʔ HL:	HL	**HL**	HL	
	H	H	HL	'straight'

Specifically, when these two HL-toned words are the penultimate syllables in the reduplication output, they trigger the regular sandhi on the antepenult on a par with the non-reduplication data as in (27b), rather than with the reduplication data as in (28). As the exceptions are limited exclusively to these two lexical items, they should be considered to be morphologically motivated, and their explanation depends eventually on a valid analysis of the HL penult in the non-reduplicative data.

4. Summary

This paper studies the morphological and phonological processes in adjective reduplications in Fuzhou. Section 1 presents the data, preceded by a brief introduction to general Fuzhou phonology. Section 2 is divided into two parts. It first argues that (1) the bimorphemic base for reduplication is either morphologically or prosodically defined, and (2) adjective reduplications in Fuzhou are uniformly total reduplications.

The second half of section 2 focuses on the phonological aspect of reduplication. Assuming that a foot is maximally binary, it is proposed that there is a correlation between tone sandhi and the syllable's position in a foot at least in adjective reduplications: a terminal syllable with an "s" node in the foot keeps its citation tone, whereas one with a "w" node is subject to the regular sandhi; the unfooted syllables have their tones delinked and later get a default L tone. The fixed melody in X1 in pattern II is the realization of the default vowel. Section 3 discusses the extension of the metrical treatment to the non-reduplication data as provided in Chan (1985).

To conclude, the present analysis of the adjective reduplications repre-

sents progress towards simplicity and explanatory adequacy. It also provides a potential analytical model for Fuzhou phonology in general.

NOTES

* I am much indebted to Pat Shaw not only for her teaching and guidance in general, but also for her critical acumen and constant input specifically for this research. Her influence on my phonological thinking is palpably felt throughout this paper and will remain with me in the years to come. I am grateful to Doug Pulleyblank for his helpful questions, which clarify my analysis. I thank Bruce Bagemihl, Ewa Czaykowska-Higgins, Ola Olanike, and Edwin Pulleyblank for discussing certain issues with me. I also thank two anonymous reviewers for many insightful comments and suggestions. All errors are completely my own.

[1] Chen and Zheng (1990) claim that the initial can also be a "zero consonant". Chan (1985: 544) includes a *ʔ* in the inventory for the syllable-initial position which lacks an initial consonant.

[2] The transcription of *ʔ* at the beginning of tones *23* and *5* indicates that they are associated with checked syllables, i.e., syllables ending in a glottal stop. *ʔ23* has two types of sandhi. If *ʔ* is the original one, its sandhi values are the same as those of *31*. If, however, *ʔ* comes from an earlier *-k*, it resembles *213* in sandhi. Also notice that *ʔ* is lost when the syllable is in a preterminal position in a sandhi domain and undergoes tone sandhi.

[3] Apart from phonological rules, Chan (1985) also proposes phonetic rules to drive some specific pitch values.

[4] Underlying representations are enclosed in slashes while phonetic ones are in square brackets. Phonological changes, including tones, which are not relevant to the discussion, are ignored in the representations.

[5] *ni*, instead of *niŋ*, appears in the original article (Chen and Zheng (1990: 365)), and this, I believe, is a printing error. For in Zheng (1988: 306), *niŋ* is used, a correct result which conforms to the reduplication pattern.

[6] *touŋ HL* in III-b and *paŋ HL* in V-b constitute the only two exceptions to the generalization that an invariable low tone appears on the antepenult syllable in reduplication.

[7] The initial compounding outputs for patterns IV–VII are also provided below in order to evaluate Chen and Zheng's (1990) analysis. They have little bearing on the analysis proposed in the current work.

[8] I thank one reviewer for directing me to Chiang's (1992) work. Chiang argues that all reduplication should be suffixation in Chinese. One of her arguments is that typologically affixation in Chinese is overwhelmingly suffixing, not prefixing. Pat Shaw (p.c.) notes that Turkish is consistently suffixing, but its reduplication is arguably prefixing (see Yip (1992: 470) for a compounding analysis for Turkish).

[9] One reviewer also suggests that reduplication found in AAB or ABB could be morpheme reduplication, not word reduplication as in ABAB. Also see Chiang (1992) for more discussion.

[10] As noted above, Chen and Zheng (1990) also treat AB as the base for patterns IV, V, VI, and VII, presumably out of semantic considerations, for AB does surface as a legitimate compound in Fuzhou.

[11] One reviewer points out that if this is positive circumscription of a syllable, then either the syllable equals a Minimal Word or a foot, or this is a counterexample to McCarthy and Prince's claim (1990: 231) that only the Minimal Word may be positively circumscribed. Following Yip (1990: 17), I assume that a Minimal Word in Chinese, including Fuzhou, is a monosyllable which is isomorphic with a morpheme. Chiang (1992) independently analyses reduplication like AAB in other Chinese languages as syllable reduplication, but with A as the base. One of her motivations for treating A as the base is to account for the

onomatopoeic data where an adjective head Y takes an onomatopoeic complement XX. For example, in *kau kau tai* (XXY) 'very big', *tai* is the adjective head meaning 'big' while *kau kau* is the onomatopoeic and reduplicative complement. This kind of data is not found in Fuzhou as provided in Chen and Zheng (1990).

The same reviewer further suggests that pattern V is also subject to negative circumscription of the base. Specifically, B can be negatively circumscribed (i.e., remove the last syllable), and the residue A is used as the target of reduplication. Either positive circumscription of A as proposed in the text or negative circumscription of B as suggested here is compatible with suffixation to the base. In order to distinguish, we need longer inputs. However, since bases for Fuzhou adjective reduplications are at most bimorphemic (Zheng (1988), Chen and Zheng (1990)), we have no way to make this distinction. The same negative circumscription possibility also applies to patterns IV and VII to be discussed below.

[12] A pertinent question is at what stage the rightward or leftward edge-in prosodic circumscription is assigned. On one hand, targeting for reduplication is a **lexical** property since different bases can have different patterns of reduplication, thus rendering the bimorphemic compounds as *listed*. On the other hand, lexical morphology (Kiparsky (1982)) treats compounding as a level 2 operation and the outputs as *derived* items where lexical information is no longer accessible. One possible solution to this dilemma is to elevate compounding (and reduplication) in Fuzhou to level 1 where it is possible to allow for **lexical** targeting (cf. the assignment of irregular affixes at level 1 in English). The justification for such an elevation is that compounding in Fuzhou as in other Chinese dialects is the most productive morphological operation (cf. Anderson (1985)).

[13] The reason for proposing morphological parsing for pattern VI is that the domain of reduplication is co-extensive with a morphological word. But as suggested by one reviewer, what is involved here could also be a larger prosodic category, e.g., a foot or prosodic word.

[14] Empirical support for postulating [AA] as the legitimate intermediate stage of derivation comes from the fact that except for two words, all the adjectives subject to X1-A2-A3 or A1-A2-A3 patterns can undergo A1-A2 reduplication (Zheng (1988), Chen and Zheng (1990)). Our analysis of patterns II and III coincides with Chiang's (1992) proposal that reduplication in Chinese can apply on more than one cycle.

[15] Chiang (1992) independently adopts the same formalism in a footnote but rejects it for two reasons. Her first reason is that this kind of analysis requires additional mechanisms, such as 'residue'. My reply is that since concepts like 'residue' and 'circumscription' are independently available as UG mechanisms, they are not costly in terms of language acquisition. Furthermore, as this approach is formalized and conforms to current theories of phonology and morphology, it should be considered as having an advantage over the 'informal' analysis she presents in her text. Her second reason for rejecting the McCarthy-Prince style analysis is that for A1-A2 reduplication, it is uncertain whether the base should be set as the right syllable or the left one. This argument is puzzling since the base or input for A1-A2 reduplication is a monosyllable, and therefore there is no need for the base to undergo prosodic circumscription. Furthermore, since reduplication is suffixation as she proposes, the question of base selection should not arise: only A1 should be taken as the base. She also claims that to derive A1-A2-A3 from A1-A2, A2 must be circumscribed as the base. In my analysis, the second cycle of A1-A2-A3 reduplication is treated on a par with A1-B1-B2 reduplication. In other words, A1 in both patterns is the 'residue' and A2 and B1 reduplicate to the right respectively. In short, treating A2 as the base in the second cycle of A1-A2-A3 reduplication comes 'free' in terms of derivational mechanism and is consistent with the suffixation analysis.

[16] It would be nice if this choice could be correlated with or derived from some independent (set of) properties. For example, it might be that either the "head" or the "non-head" of the forms gets reduplicated. However, this hypothesis can not stand, for many of the disyllabic adjective compounds can be subject to more than one pattern of reduplication, as

observed earlier, and most of them are exocentric or appositional compounds (as defined in Spencer (1991: 311)) which consist of a simple conjunction of two elements.

[17] Chan (1985: 184) also observes that stress has other physical correlates: intensity, pitch range, and the shape of the pitch contour.

[18] An alternative proposal is to subject both σ3 and σ4, if any, to the L overwriting. I have no preference for one technical implementation of L overwriting over the other since I do not pursue this approach.

[19] One reviewer notes that outside reduplication, the behavior of syllables outside the final foot is more complex than reported here. I briefly discuss the non-reduplication data in section 3.

[20] One reviewer correctly notes that this operation cross-cuts the [AB] stem, thus violating strict layering and all the usual constituency assumptions. This is in contrast to pattern VI reduplication (to be discussed below) where the original morphological entity [AB] is maintained.

[21] Wright (1983: 120) also proposes, though for a different set of data, that internal brackets of compounds are important in determining different tonal sandhis.

[22] Here, we ignore the Chaoyang data involving final stop merging since Fuzhou does not have this process. We also ignore the onset replacement in the third syllable in each example.

[23] The default vowel analysis was also independently suggested to me by Doug Pulleyblank. He points out the unfooted X1 not only gets the default L tone after losing its original tone but also gets the default /i/ after losing its original vowel melody. But the question is why the antepenultimate syllables in other patterns are not reduced to *i(ŋ)*. I have no interesting explanation to offer except to make the following observation. According to Zheng (1988), although all seven patterns of reduplication have varying degrees of intensifying effect, only pattern II, which has the fixed melody, carries a derogatory connotation. Chiang (1992) observes the same effect in the reduplicative syllable containing a fixed melody in other Chinese languages.

[24] According to the sandhi table, the antepenult here should be LH, not H as given here. Chan (1985: 347) has a rule for the replacement of LH by H specifically for cases of this kind. I will not repeat her analysis here. What is relevant to my purpose is that the antepenult undergoes the regular sandhi because of the penult HL citation.

[25] The last two words were solicited from my Fuzhou informants. I thank one reviewer for suggesting that I should look at non-reduplicated compounds with /X HL HL/ tones.

[26] It should be noted that just as in the non-reduplication data, **derived** HL has no effect on the antepenult in the reduplication data.

[27] According to Chan (1985: 87), stress in Mandarin and Fuzhou is tone sensitive though not quantity sensitive. She also suggests that foot construction must take into consideration whether the syllable is full-toned or lacks toneme assignment.

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