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Liko phonology and grammar : a Bantu language of the Democratic Republic of the Congo

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3 Vowel Harmony and Phonological Processes

3.1 Introduction

The main part of this chapter consists of a presentation of ATR vowel harmony, which is pervasive in the language. The analysis presented here is based primarily on the theory of autosegmental phonology. In autosegmental phonology, assimilation processes are represented by spreading rules.⁹⁴ The second part of this chapter describes Vowel Sandhi.

[+ATR] dominance is widespread and reported for many Niger-Congo languages and [+ATR] dominant suffixes are widely attested in languages with an [ATR] contrast in the high vowels, i.e. where /ɪ/ alternates with /i/ and /ʊ/ with /u/.⁹⁵ The following researchers have published data or given papers on vowel harmony in Liko, in chronological order: Kutsch Lojenga (1999), Casali (2002), Nederveen (2004), De Wit (2007) and Kutsch Lojenga (2009). The subject is of interest because in Liko, where [+ATR] is the dominant feature, underlying [−ATR] enclitics influence preceding [+ATR] vowels.

The data gathered during my latest field-research visits to the Liko people in 2010 and 2013 contain several new elements that were not available at the time when the analyses of the Liko vowel system mentioned above were made. These new elements include: data on three [−ATR] dominant verbal enclitics, data on the domain of [ATR] spreading and data relevant for the analysis of the transparency of the low vowel /a/. [−ATR] verbal enclitics provide contexts in which ATR harmony can be shown with new verb forms, in contrast to [−ATR] noun-class enclitics. ATR vowel harmony is the subject of 3.2.

⁹⁴ According to Archangeli and Pulleyblank (1994), the four parameters of autosegmental rules are: Function: insert / delete, Type: path / F-element, Direction: left to right / right to left and Iteration: iterative / noniterative.

⁹⁵ Casali (2008:515, 520), who refers to Hall et al. 1974; Kaye et al. 1985.

Section 3.3 on Vowel Sandhi presents vowel elision, height coalescence, heterosyllabification and desyllabification. The section aims to give an overview of where these processes occur, but does not envisage describing the verb forms in detail. The reader is referred to Chapter 7 "Verbs" for more information on verb morphology.

3.2 ATR vowel harmony

Liko is a nine-vowel language with an [ATR] contrast in the high and mid vowels. The language has an ATR harmony system with five [−ATR] vowels /ɪ ɛ a ɔ u/ and four [+ATR] vowels /i e o u/. In this harmony system, /ɪ/ alternates with /i/, /ʊ/ with /u/, /ɛ/ with /e/, /ɔ/ with /o/ and /a/ with /o/. The vowel /o/ functions as the [+ATR] counterpart of /a/.⁹⁶ Morphemes have either [+ATR] or [−ATR] vowels. The exceptions involve the [−ATR] /a/: Liko has root morphemes with both [+ATR] vowels and /a/.

Liko has [+ATR] dominant suffixes (including one verbal extension). [+ATR] suffixes have one of the high vowels /i u/. With the presence of [+ATR] dominant suffixes⁹⁷, this type of language is commonly referred to as an ATR-dominant harmony language. In the ATR literature summarized in Casali (2008:514), two types of harmony are distinguished: (1) root-controlled harmony: the [ATR] values of affix vowels harmonize with those of the root; the [ATR] value of root vowels do not change; (2) dominant harmony: affixes (predominantly suffixes) which do not alternate in their [ATR] value, but are invariantly [+ATR], and which cause [−ATR] root vowels to become [+ATR]. Affixes which are associated with the word will typically become [+ATR] as well. Liko has a [+ATR] dominant harmony system.

⁹⁶ Kutsch Lojenga (2009:66) comments that there are no non-Bantu languages anywhere near Liko which exhibit this particular pair in their vowel-harmony processes. She adds that one of the neighbouring Bantu languages, Budu, has /a/ → /o/ changes, but only in left-to-right processes.

⁹⁷ Casali (2008:515): "Although root-controlled harmony is characteristic of Niger-Congo languages of West Africa, there are also Niger-Congo languages with at least one or two potential [+ATR] dominant affixes."

Remarkably, the language has several [−ATR] enclitics which either resist assimilation in a [+ATR] context or show [−ATR] dominant properties. [−ATR] enclitics have either /ʊ/ or /ɔ/.⁹⁸

This section on ATR vowel harmony in Liko starts by giving evidence for [ATR] contrast in roots (3.2.1). Section 3.2.2 focusses on [+ATR] spreading and the domain of [+ATR] spreading. In 3.2.3, the status and surface realizations of the low vowel /a/ are presented. Section 3.2.4 describes the enclitics which are [−ATR] dominant. In environments with some [−ATR] enclitics, vowel-height dissimilation occurs. The findings are summarized in 3.2.5.

3.2.1 ATR contrast in roots

Liko roots exhibit underlying contrast between [+ATR] and [−ATR] in roots with high or mid vowels. If a root is underlyingly linked to a [+ATR] value, then the [+ATR] feature is linked within the root domain to all non-low vowels. In my data about 40% of the disyllabic noun stems are [+ATR] and almost 30% of the -CVC-verb roots are [+ATR].

ATR contrast of disyllabic noun stems with high and mid vowels is exemplified in the following two sets:

(3.1)	<u>[−ATR] high vowels</u>		<u>[+ATR] high vowels</u>	
	ɡɪní	'9.ripe bananas'	ɡɪní	'9.stories'
	tʃtʃ	'1a.bird, sp.'	mu-tʃtʃ	'1-swelling'
	ʃʊŋɡú	'9.clay blocks'	ʃʊŋɡú	'9.back sides (of houses)'
	kúkú	'1a.fish, sp.'	kúkǔ	'1a.parrót'
(3.2)	<u>[−ATR] mid vowels</u>		<u>[+ATR] mid vowels</u>	
	li-sɛnzé	'5-tree, sp.'	li-sɛnzé	'5-flute'
	beze	'9.stupidity'	ŋɡbeze	'1a.bird, sp.'
	ɔŋɡó	'9.rows'	ɔŋɡó	'9.distance'
	li-mbǒmbó	'5-tree, sp.'	ʃu-mbombó	'14-slowness (to react)'

⁹⁸ The enclitics are: negative **-ɡu**, Supplicative **-no**, Insistive **-tɔ** and noun-class enclitic **-Co**.

In trisyllabic noun stems, all high and mid vowels are either [+ATR] or [−ATR] vowels:⁹⁹

(3.3)	lu-kólúgbé	'5-gourd'	[−ATR]
	mu-ngímbólí	'1-insect'	
	li-gwolípo	'5-cross eyes'	[+ATR]
	mu-lúkutú	'3-bundle of leaves'	

Contrasts of verb roots with high vowels are:¹⁰⁰

(3.4)	<u>[−ATR] high vowels</u>		<u>[+ATR] high vowels</u>
	-lík-	'set traps'	-lík- 'dry'
	-pík-	'swing, sway'	-pík- 'build'
	-gum-	'iron'	-gum- 'crawl'
	-pup-	'blow'	-pup- 'come out'

Examples of ATR contrast in adverbs include:

(3.5)	<u>[−ATR] high vowels</u>		<u>[+ATR] high vowels</u>
	bí-bó	'very good'	bí-bó 'very early, at daybreak'
	bí-dúku-dúku	'fat, plump'	bí-dúku-dúku 'busy with work'

3.2.2 [+ATR] dominance

Liko has roots and suffixes that are underlyingly [+ATR]. [+ATR] spreads to [−ATR] vowels, causing them to assimilate to the [+ATR] value. First, [+ATR] spreading from roots is described, followed by [+ATR] spreading from suffixes. The domain of [+ATR] spreading is investigated at the end of this section.

3.2.2.1 [+ATR] spreading from roots

All prefixes are [−ATR]. When they precede [+ATR] roots, the prefix vowel assimilates to the [+ATR] value of the root.

⁹⁹ There are virtually no examples in my data, where one high or mid vowel is [+ATR] and the other is [−ATR]. The only exceptions are probably compounds or may have a petrified enclitic: **pómbáyí** '1a.monkey, sp.', **sómbwáyí** '1a.antelope, sp.' and **mu-nzikabó** '1-man without mercy'.

¹⁰⁰ There are no -CVC(V)-verbs with mid [−ATR] vowels in the language.

Noun-class, adjective and enumerative prefixes are given in order to show [+ATR] spreading. When [+ATR] is associated with a root, it spreads to the prefix vowel, as can be seen in the examples in (a) in the three sets below. The prefixes in the examples in (3.6-8b) precede a [-ATR] root morpheme.

Noun-class prefixes preceding [+ATR] and [-ATR] noun stems:

- (3.6)a. 6o-ndindĩ '2-insect, sp.'
 li-kúbu '5-umbilical cord, navel'
 mu-pumí '3-door'
- b. 6a-kótu '2-ant, sp.'
 lɪ-sísí '5-oil palm tree'
 mu-tíwɪ '3-advice'

Adjective prefixes preceding [+ATR] and [-ATR] adjectives:

- (3.7)a. mu-kúďú '3.ADJ-short'
 yí-dingĩ '9.ADJ-big'
- b. mu-kédě '3.ADJ-small'
 yɪ-kúngú '9.ADJ-tall, high'

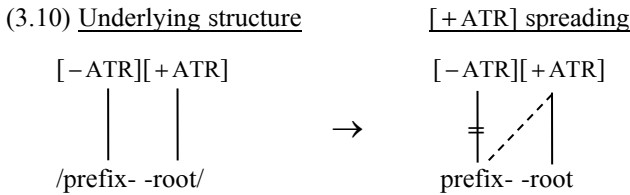
Enumerative prefixes preceding a [+ATR] and a [-ATR] numeral stem:

- (3.8)a. mí-motí '3.NUM-one'
 b. mí-6ã '3.NUM-two'

Modifier prefix **6í-** precedes manner adverbs, ideophones and nominal modifiers and it assimilates to the [+ATR] value of the following root. As with the above examples, (3.9a) shows [+ATR] spreading and (3.9b) the prefix preceding a [-ATR] root:

- (3.9)a. 6í-tidi 'MOD-completely'
 6í-kukuku 'MOD-heavy rain with storm, pounding strongly (heart)'
 6í-nzengé 'MOD-scattered'
- b. 6í-6ulu 'MOD-silently'
 6í-ďaluuu 'MOD-viscous'
 6í-ngbú 'MOD-red'

[+ATR] spreading can be visualized as follows:



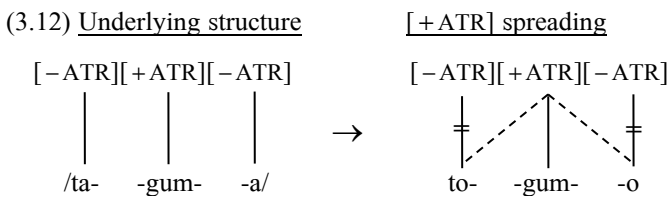
Spreading from [+ATR] roots does not affect the [ATR] value of other roots. In compounds, noun stems of either value may co-occur, e.g. **li-gombomóya** '5-branch used for roof support' and **fo-twómabısyá** '2-star constellation'.

Verb forms consist of roots and affixes. All verb prefixes are underlyingly [−ATR]. The verb suffixes with underlyingly a [+ATR] association are listed in Table 7 in the next section. Other verb suffixes are underlyingly [−ATR].

I start by looking at simple verb forms with a subject prefix and a final vowel. In the verb forms below, the verb roots in (3.11a) are underlyingly [+ATR] and the ones in (3.11b) are [−ATR]. In (3.11a), the subject prefix and the final vowel **-a** assimilate to the [+ATR] value:

- (3.11)a. to-lík-o 1PL-dry-FV¹⁰¹ 'we will dry'
 to-gum-o 1PL-crawl-FV 'we will crawl'
- b. ta-lík-a 1PL-set a trap-FV 'we will set a trap'
 ta-gǔm-a 1PL-iron-FV 'we will iron'

[+ATR] spreading in **to-gumo** 'we will crawl' can be visualized as follows:



¹⁰¹ The Low surface tone on the subject prefix and on the final vowel indicate that time reference is to the future. Tone melodies on verb forms are described in 7.6.

Baković proposes that the preferred direction of spreading is universally 'root-outward' (in Casali 2008:534), also called bi-directional (anticipatory and progressive). Other languages with bidirectional [+ATR] spreading include Akan (Clements 1981) and Nkengo (Leitch 1996). Because Liko does not have a root-controlled ATR vowel harmony system, it is not necessary to specify directionality.

The subsequent examples illustrate the assimilation of high vowels. In the first set, the verb root is preceded by the reflexive prefix *ĩ-*, and in the second set by the class 2 object prefix *ũ-*, while in the third set, the verb root is followed by the Subjunctive final vowel *-i*.

Reflexive prefixes harmonize preceding roots linked to [+ATR] (3.13a) or surface with their [-ATR] value (3.13b):

- (3.13)a. *ĩ-dĩng-o* 3SG:REFL-paint-FV 'she¹⁰² will put on make-up'¹⁰³
ĩ-šumb-o 3SG:REFL-burn-FV 'he will burn himself'
 b. *ĩ-bũnk-a* 3SG:REFL-carry-FV 'he will boast'¹⁰⁴
ĩ-bũsy-a 3SG:REFL-wash-FV 'he will wash himself'

The final vowel harmonizes as well. The vowel of the subject prefix in (3.13) and (3.14) is elided because of *V₁-elision* in the context of a sequence of two vowels across a morpheme boundary (see 3.3.1).

The class 2 object prefix and the final vowel assimilate to the [+ATR] value of the root as in (3.14a) or surface with their [-ATR] value as in (3.14b):

- (3.14)a. *ũ-vid-o ɓo-mboɓú* 'he will flay small rodents'
 3SG:2.O-peel-FV 2-small rodent
 b. *ũ-pun-a ɓa-súkwá* 'he will gather caterpillars'
 3SG:2.O-gather-FV 2-caterpillar

¹⁰² For reasons of space, third person singular subjects and class 1 objects are translated with the general masculine form 'he'/'him', unless the context or the action of the verb implies a female referent or the subject is indefinite.

¹⁰³ Literally, 'she will paint or draw lines on herself'.

¹⁰⁴ Literally, 'he will carry or lift himself'.

In the third set, the vowel of the subject prefix and the final vowel of the Subjunctive assimilate to the [+ATR] value of the root (3.15a) or surface with their [-ATR] value (3.15b):

- (3.15)a. *nó-sil-í* 1SG-arrive-FV.SUBJ 'that I arrive'
 b. *ná-ptk-í* 1SG-sway-FV.SUBJ 'that I sway'

3.2.2.2 [+ATR] spreading from suffixes

Liko has non-root morphemes that are underlyingly linked to a [+ATR] value. They invariably surface with a [+ATR] value.

Table 7 [+ATR] suffixes

-i	Anterior aspect final vowel (FV position) ¹⁰⁵
-í	negative Conditional final vowel (FV position)
-ni	Plural Addressee suffix (post-FV position)
-ní	Perfective aspect suffix (post-FV position)
-ní	negative Subjunctive suffix (post-FV position)
-kú	Directional suffix (post-FV position)
-is-	Causative extension (extension position)

[+ATR] spreading in verb forms in which these morphemes occur is illustrated by the following examples of [-ATR] verb roots. Spreading from the [+ATR] suffixes affects both roots and affixes. The verb forms are given in pairs, the Infinitive form of a verb (the class 9b prefix *ká-* and final vowel *-a*, with the H tone of the Infinitive TAM melody on the final vowel, see 4.3.2 and 7.6), followed by an inflected form of the same verb with the [+ATR] dominant morpheme. For clarity, the underlying form is given for the first verb.

The Anterior aspect final vowel *-i*:

- (3.16) *ká-lál-á* 9b-sleep-FV
nólóli 'I slept'
 /na-lál-i/
 1SG-sleep-FV.ANT
-

¹⁰⁵ For the positions in the verb structure, see 7.2.

kábíká	'to despise'	noǒíki	'I despised'
kákpudá	'to approach'	nokpuǒí ¹⁰⁶	'I approached'
kábángá	'to fear'	noǒóngi	'I feared'

The negative Conditional final vowel **-í**:

(3.17) ká-gbt-á		9b-fell (tree), bite-FV	
wákógbítí		'if you do not fell (the tree)'	
/wá-ká-gbt-í/			
	2SG-COND-fell-FV.NEG		
kábumá	'to hit'	wákóbumí	'if you do not hit'
káundá	'to go'	wákí ¹⁰⁷ ndí	'if you do not go'
kályá	'to eat'	wákólyí	'if you do not eat'

The negative Conditional forms have two prefixes, the subject prefix and the Conditional prefix. The Conditional prefix **ka-** assimilates to the [+ATR] value, whereas the second person singular subject prefix **wa-** does not. The same phenomenon can be seen with the negative Subjunctive below. More information on the left boundary of the domain of [+ATR] spreading will be provided in the next section.

The Plural Addressee suffix **-ni**:

(3.18) ká-pík-á		9b-prepare (a field) for sowing-FV	
pík-ó-ni		'prepare (a field) for sowing (pl)!' ¹⁰⁸	
/pík-á-ni/			
	prepare for sowing-FV.IMP-ADDR		
kásíká	'to insult'	usíkóni ¹⁰⁹	'insult (pl) them!'
kákpulá	'to rummage in'	kpulóni	'search (pl)!'
kásámá	'to open (mouth)'	sómóni	'open the mouth (pl)!'

¹⁰⁶ In the case of -CVC- verbs with a L primary tone, the vowel of the verb root remains Low and the floating H tone of the Anterior aspect TAM melody is linked to the final vowel, see 7.6.

¹⁰⁷ Preceding a vowel-initial verb, the vowel of the Conditional prefix undergoes V₁-elision.

¹⁰⁸ **-pík-** can also mean 'sway'.

¹⁰⁹ u-sík-ó-ni 2.O-insult-FV.IMP-ADDR. The H tone of the third person plural object prefix **ǔ** is reassociated with the following H, see 4.6.2 and 7.5.

The Perfective aspect suffix **-ní**:

(3.19)	ká-gbang-á		9b-curse-FV	
	nógbongóní		'I have cursed'	
	/ná-gbang-á-ní/			
	1SG ^P -curse-FV ^P -PFV ¹¹⁰			
	kábíkyá	'to say'	nóbíkyóní	'I has said'
	kádundá	'to touch'	nódundóní	'I has touched'
	kákalyá	'to pay'	nókolyóní	'I has paid'

The negative Subjunctive suffix **-ní**:

(3.20)	ká-gbang-á		9b-curse-FV	
	nakogbongonító		'that I do not curse'	
	/na-ka-gbang-a-ní-tó/ ¹¹¹			
	1SG-NEG-curse-FV-NEGSUBJ-INS			
	kábíkyá	'to say'	nakobíkyonító	'that I not say'
	kádundá	'to touch'	nakodundonító	'that I not touch'
	kákalyá	'to pay'	nakokolyonító	'that I not pay'

The Directional suffix **-kú**.¹¹²

(3.21)	ká-matíl-á		9b-add, increase-FV	
	omitolokú		'he will add (speaking to s.o.)'	
	/a-matíl-a-kú/			
	3SG-add-FV-DIR			
	kábuniká	'to carry'	ābinikokú ¹¹³	'he will carry s.o.'
	kákpudǎ	'to approach'	ākpudokú	'he will approach s.o.'
	kánaná	'to stretch'	ononokú ¹¹⁴	'he will stretch'

¹¹⁰ Superscript "P" is used as notation for a High TAM tone which indicates time reference to the past.

¹¹¹ Insistive enclitic **-tó** is one of the [−ATR] enclitics. In these examples, it assimilates to the [+ATR] value of the suffix. See 3.2.4 for a description of [−ATR] enclitics.

¹¹² In the examples in this set, 'towards someone or some place' is understood.

¹¹³ With respect to the third person singular subject prefix /a/, which does not assimilate in **abinikokú** and **akpudokú**, see 3.2.2.3.

¹¹⁴ The verb form **ononokú** can be used when someone sees a person stretching his/her arm.

The Causative extension **-is-**:

(3.22)	ká- ɖak -á	9b-climb-FV
	kóɖókísó	'to cause to climb'
	/ká- ɖak -ís-á/	
	9b-climb-CAUS-FV	
	kákítílá 'to block the road'	kókítílísó 'to cause to block the road'
	kábumá 'to hit'	kóbumísó 'to cause to hit'
	kágbatá 'to spread out'	kógbotísó 'to cause to spread out'

The Causative extension does not occur word-finally. It is followed by the verb-final vowel or another extension. Affixes following the Causative extension also assimilate to the [+ATR] value. In (3.22) and in (3.23b), the final vowel **-a** assimilates and in (3.23c), the Pluractional extension **-ag-** and the final vowel **-a** assimilate.

- (3.23)a. mu-kó a-**ɓú**kut-a
 1-woman 3SG-produce-FV
 'The woman will give birth.'
- b. mu-kó **ã**-**ɓú**kut-is-o
 1-woman 3SG:1.O-produce-CAUS-FV
 'The woman will cause her to give birth.', i.e. one time
- c. mu-kó yi ní-n^{ɔ̃}¹¹⁵ o-**ɓú**kut-is-og-o
 1-woman 1.DEM.III COP-1.DEM.I 3SG-produce-CAUS-PLUR-FV
 'the midwife', literally, 'The woman who will cause someone to give birth repeatedly.'

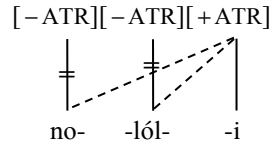
[+ATR] spreading from underlyingly [+ATR] suffixes can be visualized as follows, using (3.16) **no-lól-i** 1SG-sleep-FV.ANT, 'I slept', from **ká-lál-á** 9b-sleep-FV, 'to sleep', and (3.23c) **o-ɓúkut-is-og-o** 3SG-produce-CAUS-PLUR-FV from **ká-ɓúkut-á** 9b-give birth-FV, 'to give birth'.

In this case, there is no class 1 object prefix ^{ɔ̃}-, see 7.5.1.

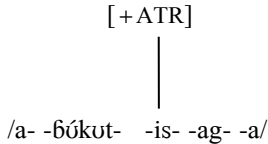
¹¹⁵ Demonstratives of type I also function as relative pronouns, see 8.4.

(3.24) Underlying structure

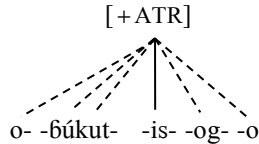
→

[+ATR] spreading

In the visualization below, the [-ATR] value is left out and only [+ATR] spreading is shown. All morphemes which are not associated with a [+ATR] value are [-ATR], and all are delinked from their [-ATR] value by [+ATR] spreading.

(3.25) Underlying structure

→

[+ATR] spreading3.2.2.3 **The domain of [+ATR] spreading**

Casali (2008:501) remarks that ATR harmony languages may limit the domain of [ATR] agreement to an identifiable span of segments or morphemes that is smaller than the entire word. Verb forms may have multiple affixes occurring on both sides of the root, which provides a suitable context to investigate the left and right boundary of the domain of [+ATR] spreading. In all examples presented thus far, [+ATR] spreads to the end of the word. As for the left boundary of [+ATR] spreading, (3.17), (3.20), (3.21) and (3.23b) illustrate that [+ATR] does not always spread to the beginning of the word.

Compare (a), (b), (c) and (d) in the next three sets. One prefix precedes the verb root in (a) and (c). The forms in (c) show that the subject prefix is within reach of [+ATR] spreading if the verb root is linked to a [+ATR] value. In (c), where the verb is [+ATR], the vowel of the subject prefix assimilates. Two prefixes precede the verb root in (b) and (d): the first person plural subject prefix **ta-** followed by a prefix in the TA position or by an object prefix. When there is more than one prefix present, as in (b) and (d), only the prefix adjacent to the root harmonizes with the [+ATR] value.

- (3.26)a. ta-ngbút-a 1PL-sulk-FV 'we will sulk'
 b. ta-ka-ngbút-á 1PL-COND-sulk-FV 'if we sulk'
 c. to-ḃín-o 1PL-dance-FV 'we will dance'
 d. ta-ko-ḃín-ó 1PL-COND-dance-FV 'if we dance'
- (3.27)a. ta-púk-a 1PL-leave-FV 'we will leave (quietly)'
 b. ta-ná-¹¹⁶púk-a 1PL-INCH-leave-FV 'we are about to leave'
 c. to-pím-o 1PL-measure-FV 'we will measure'
 to-pup-o 1PL-come out-FV 'we will come out'
 d. ta-nó-¹¹⁶pím-o 1PL-INCH-measure-FV 'we are about to measure'
 ta-nó-pup-ó 1PL-INCH-come out-FV 'we are about to come out'
- (3.28)a. ta-dünd-a 1PL-touch-FV 'we will touch'
 b. ta-mú-dünd-a 1PL-2PL.O-touch-FV 'we will touch you (pl.)'
 c. to-gbusy-o 1PL-curse-FV 'we will curse'
 d. ta-mú-gbusy-o 1PL-2PL.O-curse-FV 'we will curse you (pl.)'

Notice how vowel height is not involved in determining the left boundary: in (3.28d), the vowel of the subject prefix does not assimilate to [+ATR] when it precedes a prefix with a high vowel.

In the above examples of verb roots with a [+ATR] value, the left boundary of [+ATR] spreading is the prefix adjacent to the [+ATR] root. The prefix adjacent to the suffix is not the left boundary for underlying [+ATR] suffixes. The following examples, with a [+ATR] and a [-ATR] verb root, have several [-ATR] suffixes between the verb root and the word-final [+ATR] suffix:

- (3.29)a. 6ólutónógóní 'they have pulled at e.o. repeatedly'
 /ḃá-lut-án-ág-á-ní/
 3PL^P-pull-ASS-PLUR-FV^P-PFV
- b. 6óḃítónógóní 'they have slapped e.o. repeatedly'
 /ḃá-ḃít-án-ág-á-ní/
 3PL^P-slap-ASS-PLUR-FV^P-PFV

¹¹⁶ The second floating L tone of Inchoative aspect prefix ⁻¹ná^L- causes non-automatic downstep if the verb root has a primary H tone, see 4.6.5.

In (a), the vowel of the prefix adjacent to the [+ATR] verb root and all vowels between the verb root and the [+ATR] suffix assimilate. In (b), where the verb root does not have a [+ATR] value, all vowels assimilate to the [+ATR] value as well: not only the final vowel which is adjacent to the [+ATR] suffix, but also the vowels of the extensions, the vowel of the verb root **-fít-** and the vowel of the subject prefix.

In order to determine the left boundary of spreading from [+ATR] suffixes, verb forms with more than one prefix should be included. In the following examples, the verb roots **-gbít-** 'fell' and **-dím-** 'labour' are preceded by two prefixes:

- (3.30)a. wá-kó-gbít-í
2SG-COND-fell-FV.NEG
'If you do not fell (the tree) ...'
- b. 6o-míkí 6á-kó-dím-í 6o-tíko, nzǎ ik-a-tú
2-child 3PL-COND-labour-FV.NEG 2+9-field 9.hunger 3SG:be-FV-INS
'If the children do not cultivate the fields, there will be hunger.'

[+ATR] spreading does not reach the left word boundary. The left boundary of the domain of [+ATR] spreading is the prefix adjacent to the verb root.

The left boundary for [+ATR] spreading which is seen in verbs can also be observed in nominals that have more than one morpheme preceding the root. Noun class 1a contains nouns with a **nV-** proclitic. The plural takes the class 2 prefix **6a-**, which precedes the proclitic. The vowel of the proclitic assimilates to the [+ATR] value in (3.31b, d), but the class 2 prefix does not:

- (3.31)a. na-pɔnzɔ 'na:1-vine, sp.' 6a-na-pɔnzɔ '2-na:1-vine, sp.'
na-kwálí 'na:1-sparrowhawk' 6a-na-kwálí '2-na:1-sparrowhawk'
- b. nõ-dingbo 'na:1-water snail' 6a-nõ-dingbo '2-na:1-water snail'
no-kpódóku 'na:1-toad' 6a-no-kpódóku '2-na:1-toad'
- c. né-kuta 'na:1-tree, sp.' 6a-né-kuta '2-na:1-tree, sp.'
né-lungyá 'na:1-chameleon' 6a-né-lungyá '2-na:1-chameleon'
- d. ne-kulé 'na:1-insect, sp.' 6a-ne-kulé '2-na:1-insect, sp.'
népúmúkyó 'na:1-weed, sp.' 6a-né-púmúkyó '2-na:1-weed, sp.'

The noun-class prefix of class 17 is **kú-** which harmonizes with the [ATR] value of the noun. It is retained in plural forms where it is preceded by the class 2 prefix **ḡa-**. As can be seen in the examples below, the vowel of the class 2 prefix does not assimilate to the [+ATR] value of the root:

(3.32)	kú-gǔ	'17-top'	ḡa-kú-gǔ	'2-17-top'
	kú-bi	'17-riverside'	ḡa-kú-bi	'2-17-riverside'
	kú-bumǔtí	'17-side'	ḡa-kú-bumǔtí	'2-17-side'
	kú-syokoto	'17-bottom' ¹¹⁷	ḡa-kú-syokoto	'2-17-bottom'

In associative constructions, the associative prefix **Ca-** precedes the noun which modifies the head noun of the NP, see 5.3.2. Associative prefixes agree with the noun class of the preceding head noun. Liko nouns in classes 1a or 9 do not have a noun-class prefix, which makes it possible to compare constructions of an associative prefix immediately preceding a noun stem with those where a noun-class prefix is present between an associative prefix and a noun stem.

Examples of class 1 associative prefix **wa-** and class 5 **lá-** preceding a noun are:

(3.33)a.	nyamá	wo-tutú	'animal of the forest'
	1a.animal	1.ASS-1a.forest	
b.	lu-syé	ló-dumó	'day of the feast'
	5-day	5.ASS-1a.feast	
c.	kpóló-kpóló	wa-mu-gǔ	'environment of the village'
	1a.border	1.ASS-3-village	
d.	li-gubó	lá-li-lólómbí	'work of preparing (food)'
	5-work	5.ASS-5-preparing	

In (a) and (b), the vowel of the associative prefix is adjacent to the noun stem and it assimilates to the [+ATR] value of the noun. If a noun-class prefix intervenes as in (c) and (d), the vowel of the noun-class prefix assimilates and the vowel of the associative prefix surfaces with its [-ATR] value.

¹¹⁷ I.e. of a bed.

In genitival constructions, the vowel of the genitive prefix **ka-** is changed into [+ATR] only when it occurs adjacent to the noun stem (3.34a, b), otherwise, it does not assimilate and remains [-ATR] (3.34c, d):

- | | | | |
|----------|-----------|-------------------|---------------------------|
| (3.34)a. | líno | ko-míkí | 'name of the child' |
| | 5:name | GEN-1a.child | |
| b. | ḃángú | ko-gbungúlu | 'blood of the billy goat' |
| | 9.blood | GEN-1a.billy goat | |
| c. | ɿ-vananza | ka-mu-súnzú | 'family of the slave' |
| | 9a-family | GEN-1-slave | |
| d. | ma-lílí | ka-ḃo-bikó | 'food of the visitors' |
| | 6-food | GEN-2-visitor | |

Based on these data, it can be concluded that the left side of the domain of [+ATR] spreading is determined morphologically and that the prefix adjacent to the root constitutes the left boundary.¹¹⁸ It is remarkable that speakers of the language are somehow aware of the number of morphemes preceding a root.

Liko uses vowel elision, vowel-height coalescence, heterosyllabification and desyllabification to deal with a sequence of two prefix vowels. For a description of phonological processes in the context of Vowel Sandhi, I refer the reader to 3.3. In height coalescence, two vowels of opposite vowel height result in a single short vowel. In the cases relevant for the domain of [+ATR] spreading, the first prefix happens to have a low vowel and the second consists of a high vowel. In the examples below, of verbal prefixes, the first prefix is the subject prefix (C)a-, negative **ka-**, Conditional **ka-**, Inchoative aspect ^L-ná^L- and Infinitive **ká**-¹¹⁹. The second prefix is the first person singular object prefix **ɿ-**.

- | | | | |
|----------|---------------------------------|---|--------------------------|
| (3.35)a. | ḃé-gbody-ó | 3PL ^P :1SG.O-smear-FV ^P | 'they smeared me' |
| b. | ḃá-ké-gbody-i-gu ¹²⁰ | 3PL-NEG:1SG.O-smear-FV-NEG | 'they will not smear me' |

¹¹⁸ The prefixes which are outside of the domain of [+ATR] spreading all have a low vowel. A prefix with a non-low vowel, which precedes another prefix, does not occur.

¹¹⁹ I.e. the class 9b prefix, also referred to in this book as Infinitive prefix.

¹²⁰ The negative enclitic **-gu** is invariably [-ATR], see 3.2.4.1.

- | | | | |
|----|-----------------------------|--------------------------|------------------------------|
| c. | ḅa-ke-gbody-ó | 3PL-COND:1SG.O-smear-FV | 'if they smear me' |
| d. | ḅá- ^h né-gbody-ó | 3PL-INCH:1SG.O-smear-FV | 'they are about to smear me' |
| e. | ḅá ^h ké-gbody-ó | 3PL:be 9b:1SG.O-smear-FV | 'they are smearing me' |

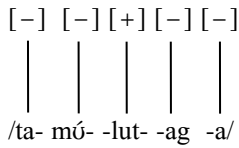
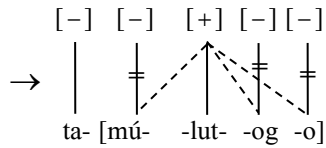
These examples give further evidence for the existence of the left boundary of [+ATR] spreading within the word: the third person plural subject prefix **ḅá-** does not assimilate when a syllable with a vowel resulting from height coalescence is adjacent to a [+ATR] verb root.

Two of the environments in which V₁-elision takes place are verb forms where the Conditional prefix **ka-** or the negative prefix **ka-** is followed by a vowel-initial verb root. In (3.36a), the vowel of the Conditional prefix **ka-** undergoes V₁-elision preceding the vowel-initial verb root **-und-** 'go' and in (3.36b), V₁-elision applies to the vowel of the negative prefix **ka-** preceding **-ingi-** 'enter, go to bed'. The [+ATR] suffix in (3.36) is the negative Conditional final vowel **-i**.

- | | | |
|----------|-----------------------|---------------------------|
| (3.36)a. | wákí ^h ndí | 'if you do not go' |
| | /wá-ká-und-í/ | 2SG-COND:go-FV.NEG |
| b. | má-kíngy-i-gu | 'you (pl) will not enter' |
| | /ma-ka-ingy-i-gu/ | 2PL-NEG:enter-FV-NEG |

After the process of V₁-elision has taken place, the subject prefixes **wa-** and **má-** are adjacent to the (surface) [+ATR] vowel of the root in the above verb forms, but they do not harmonize. Another morpheme, which is adjacent to the root but has lost its vowel, still counts for [+ATR] spreading. This provides further evidence that the left boundary is sensitive to morphological structure.

I now turn to the right boundary of [+ATR] spreading. The right boundary of [+ATR] spreading in **ta-mú-lut-og-o** 1PL-2PL.O-pull-PLUR-FV 'we will pull you (pl)' is the end of the word. This can be visualized as follows (square brackets indicate the domain boundaries and, for reasons of space, [-] represents [-ATR] and [+] represents [+ATR]):

(3.37) Underlying structure[+ATR] spreading

Liko verb forms can have multiple extensions (see 7.11), which follow the verb root. Extensions, except the Causative, and the final vowel are underlyingly [-ATR]. The function of the extensions **-an-**, **-lt-** and **-ag-** in the examples below is: Associative, Benefactive and Pluractional respectively. In (3.38a), with verb root **-bít-** 'slap', all extensions and the final vowel surface with their [-ATR] value. In (3.38b), with [+ATR] verb root **-lut-** 'pull', [+ATR] spreading causes the class 9b prefix **ká-** of the Infinitive, the vowels of the extensions and the verb-final vowel all to assimilate to the [+ATR] value.

- | | | | |
|----------|---|---------------------|------------------------------------|
| (3.38)a. | ká-bít-á | 9b-slap-FV | 'to slap' |
| | ká-bít-ág-á | 9b-slap-PLUR-FV | 'to slap repeatedly' |
| | ká-bít-án-á | 9b-slap-ASS-FV | 'to slap each other' |
| | ká- ^h bít-íly-á ¹²¹ | 9b:1.O-slap-BEN-FV | 'to slap for someone' |
| | ká-bít-án-ág-á | 9b-slap-ASS-PLUR-FV | 'to slap each other repeatedly' |
| | | | |
| b. | kó-lut-ó | 9b-pull-FV | 'to pull' |
| | kó-lut-óg-ó | 9b-pull-PLUR-FV | 'to pull repeatedly' |
| | kó-lut-ón-ó | 9b-pull-ASS-FV | 'to pull at each other' |
| | ká-lut-íly-ó | 9b:1.O-pull-BEN-FV | 'to pull for someone' |
| | kó-lut-ón-óg-ó | 9b-pull-ASS-PLUR-FV | 'to pull at each other repeatedly' |

Spreading of [+ATR] to the end of the word as in the last verb form of (3.38b), **kólutónógó** 'to pull at each other repeatedly', can be visualized as follows:

¹²¹ In this case, the class 1 object prefix is ^h-. The nasalisation of the preceding vowel occurs when the class 1 object is not expressed. Otherwise, the form of the class 1 object prefix is **mð-** in Imperative forms, or ^h-, see 7.5.1.

- (3.42)a. to-gbusy-o 1PL-curse-FV 'we will curse'
 to-bud-o 1PL-smear-FV 'we will smear'¹²⁴
 b. tã-gbusy-o 1PL:1.O-curse-FV 'we will curse him'
 tã-bud-o 1PL:1.O-smear-FV 'we will smear her'

In (b), surface **tã-** is underlyingly /ta-[˜]-/ '1PL-1.O'. Only the class 1 object prefix [˜]- is within the domain of [+ATR] spreading.

In the examples below, the class 1 object prefix [˜]- occurs between the Infinitive prefix **ká-** and a [+ATR] verb root. Its presence prevents the vowel of the Infinitive prefix from assimilating to the [+ATR] value of the verb root:

- (3.43)a. na ká-dĩng-ó mu-kó 'I am making a woman up.'
 1SG:be 9b:1.O-make up-FV 1-woman
 b. na ká-kos-íly-ó¹²⁵ mu-kó 'I am pouring out s.th. for a woman.'
 1SG:be 9b:1.O-pour out-BEN-FV 1-woman

The presence of the class 1 object prefix [˜]- is not only made manifest by the fact that the vowel of a preceding prefix does not assimilate, but also by the non-automatic downstep of the H tone of a verb root in environments in which the object prefix L tone is delinked (see 4.6.5). This can be seen, for instance, in **na ká[˜]ḃíká mulókú** (/na ká-[˜]-ḃík-á mu-lókú/, 1SG:be 9b-1.O-despise-FV 1-man) 'I am despising the man'. Other examples include:

- (3.44)a. álutílyóní ngámá 'He has pulled for the chief.'
 /á-[˜]-lut-ílí-á-ní/
 3SG^p-1.O-pull-BEN-FV^p-PFV 1a.chief
 b. á[˜]ḃítílyóní ngámá 'He has slapped for the chief.'
 /á-[˜]-ḃít-ílí-á-ní/
 3SG^p-1.O-slap-BEN-FV^p-PFV 1a.chief

In both (a) and (b), the third singular subject prefix **a-** is associated with the H tone of the Past TAM melody, see 4.3.2 and 7.6. In (a), there is no non-automatic downstep, because the floating L tone of the object prefix is merged with the L tone of the verb, but in (b), the floating Low causes a non-automatic downstep.

¹²⁴ Usually to give a colour.

¹²⁵ The object prefix refers to the Beneficiary.

Two more sets are given below. In the first one, the first person singular subject prefix **na-** harmonizes in (3.45b) only, because the class 1 object prefix ̀ is absent:

- (3.45)a. ná-kís-á ndi p̃si
 1SG^P-look for-FV^P P₃ 9.road
 'I looked for the road.'
- b. no-kís-i p̃si
 1SG-look for-FV.ANT 9.road
 'I looked for the road.'
- c. na-kís-i mu-mbánzú
 1SG:1.O-look for-FV.ANT 1-person
 'I looked for a man.'

In (3.46a) there is no class 1 object prefix, because the object is in class 9. That means that the vowel of the first person singular subject prefix **na-** is within the domain of [+ATR] spreading and thus it assimilates. This does not happen in (3.46b), because of the presence of the class 1 object prefix ̀:

- (3.46)a. nó-gbody-ó¹²⁶ ndi pwáyı na mo-lingó
 1SG^P-smear-FV^P P₃ 9.wound with 6-oil
 'I smeared¹²⁷ the wound with oil.'
- b. ná-gbody-ó ndi míkí na mo-lingó
 1SG^P:1.O-smear-FV^P P₃ 1a.child with 6-oil
 'I smeared the child with oil'

An underlying sequence of two low vowels does not explain the non-assimilation of the prefix vowel. The verb **-am-** 'stop' is preceded by the first person singular subject prefix **na-** in (3.47a, b). In (3.47b), the [+ATR] suffix causes all vowels to assimilate, including the merged vowel of the subject prefix and the verb root. Hence a sequence of two low vowels does not constitute a [-ATR] domain. In (3.47c), where the class 1 object prefix ̀ is present, the vowel /a/ of the subject prefix does not assimilate:

¹²⁶ The final vowel does not assimilate and surfaces as **-a** when ^H**ndi** cliticises to the verb form, see below, (3.68b).

¹²⁷ **-gbodi-** is the general verb for 'smear'.

- (3.47)a. nam-a li-gubó kǎmu
 1SG:stop-FV 5-work 1SG.POSS
 'I will finish my work.'
- b. nom-os-o¹²⁸ It-tá-lu
 1SG:stop-CAUS-FV 5-stone-5
 'I will put a stone [in a position].'
- c. nam-om-os-o mu-lúkú
 1SG:1.O-stop-CAUS-FV 1-man
 'I will put the man [in a position].'

3.2.2.4 [+ATR] and loanwords

Most loanwords are in classes 1a or 9 and do not have a noun-class prefix. Plurals are formed in classes 2, 6 or 2 + 9 with prefix **Ca-**. The great majority of loanwords with [+ATR] surface vowels have plural prefixes in which the vowel does not assimilate to [+ATR].¹²⁹ In loanwords from the Congo variety of Swahili, the complete plural form (including the prefix) may have been borrowed. Examples of loanwords from Congo Swahili and French are:

- | | | | | | |
|--------|-------|---------------|----------|----------------|---|
| (3.48) | gúndi | '9.eraser' | ḡa-gúndi | '2 + 9-eraser' | Congo Swahili <i>gundi</i> ¹³⁰ |
| | kikó | '9.pipe' | ḡa-kikó | '2 + 9-pipe' | Congo Swahili <i>kiko</i> |
| | púnda | '1a.donkey' | ḡa-púnda | '2-donkey' | Congo Swahili <i>punda</i> |
| | foní | '9.radio' | ḡa-foní | '2 + 9-radio' | French <i>phonie</i> |
| | kílo | '9.scale' | ḡa-kílo | '2 + 9-scale' | French <i>kilo</i> |
| | sizó | '1a.scissors' | ḡa-sizó | '2-scissors' | French <i>ciseaux</i> |

Examples of verb borrowings from Congo Swahili are:

- | | | | | |
|--------|------------|----------------------|---------------------|-------------------------------|
| (3.49) | kó-líp-ó | 9b-pay-FV | 'to pay' | Congo Swahili <i>kulipa</i> |
| | kó-tumík-ó | 9b-work-FV | 'to work | Congo Swahili <i>kutumika</i> |
| | kó-túng-ó | 9b-invent a story-FV | 'to invent a story' | Congo Swahili <i>kutunga</i> |

¹²⁸ With some verbs, the Causative extension is **-os-** instead of **-is-**, see 7.11.1.

¹²⁹ In a number of loanwords, the prefix vowel does assimilate, e.g. **ḡo-zipó** 'skirts' (French *jupe*), **ḡo-fúlu** 'ovens' (French *four*), **ḡo-kíti** 'chair' (Congo Swahili *kiti*) and **ḡo-súpa** 'bottles' (Congo Swahili *chupa*).

¹³⁰ The meaning is 'gum paste'.

The vowel of the class 9b prefix and the final vowel always assimilate to the [ATR] value of the verb root. The reflex of borrowed Congo Swahili vowel /o/ of verb roots is /u/ in Liko, e.g. **ká-súm-á**, 9b-read-FV, 'to read', Congo Swahili *kusoma*.

3.2.3 The vowel /a/

In this section, the status and surface realizations of the low vowel /a/ are investigated. In the Liko nine-vowel system, /a/ lacks a [+ATR] counterpart. Phonologically, /a/ is a [-ATR] vowel as can be seen from the behaviour of noun-class prefixes that surface with their [-ATR] value, if all vowels in the stem are low:

(3.50)	băga	'9.big basket'	6a-băga	'2 + 9-big basket'
	kangá	'9.bed'	6a-kangá	'2 + 9-bed'
	lɪ-pála	'5-wooden roofing tile'	ma-pála	'6-wooden roofing tile'
	mu-wanzá	'1-young person'	6a-wanzá	'2-young person'

In the first two sections, the occurrence of /a/ in noun stems with [+ATR] vowels is presented, followed by more data with /a/ in noun-class prefixes.

3.2.3.1 The vowel /a/ in [+ATR] noun stems

I start with a list of disyllabic nouns in which /a/ co-occurs with [+ATR] vowels. These nouns amount to about 6% of all disyllabic [+ATR] nouns in my data. The first set contains nouns with /a/ as V₁, the second set has nouns in which /a/ occurs as V₂. If it exists, the other member of the gender is given as well. Disyllabic nouns with /a/ as V₁ and a [+ATR] vowel as V₂ include:

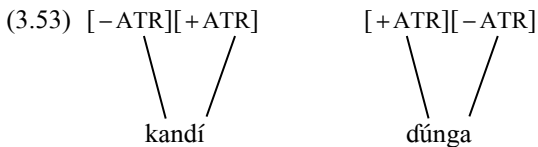
(3.51)	<u>Singular</u>		<u>Plural</u>	
	kandí	'1a.hevea'	6a-kandí	'2-hevea'
	maḃu	'1a.leaf-stalk'	6a-maḃu	'2-leaf-stalk'
	maḃó	'1a.privateer'	6a-maḃó	'2-privateer'
			ma-káli	'6-mix of water and ashes'
	mapí	'1a.adventurous person'	6a-mapí	'2-adventurous person'
	mbali	'1a.chance'	6a-mbali	'2-chance'
	ndáki	'1a.road'	6a-ndáki	'2-road'
	ngbabi	'1a.big drum'	6a-ngbabi	'2-big drum'
	wayí	'1a.friend'	6a-wayí	'2-friend'

The noun-class prefixes in the third column surface with their underlying [−ATR] value. They do not assimilate to the [+ATR] value of the root. If a [+ATR] noun stem has /a/ as V₁, then the [+ATR] feature does not spread across /a/ to the prefix. This means that /a/ in [+ATR] noun stems should be analysed as underlyingly [−ATR] and opaque to [+ATR] spreading.

Disyllabic nouns with a [+ATR] vowel as V₁ and /a/ as V₂ include:

(3.52) <u>Singular</u>		<u>Plural</u>	
mǔma	'1a.male'	fo-mǔma	'2-male'
ǎ́ngá	'9.winning basket'	fo-ǎ́ngá	'2 + 9-winning basket'
mu-píla	'3-scarification'	píla	'9.scarification'
mu-sísa	'3-plant, sp.'	sísa	'9.plant, sp.'
kpóya	'9.dance'		
ndóya	'9.chickenpox'		
i-dumá-su	'7-mourning-7'	fo-dumá	'2 + 9:9a-mourning'

The /a/ in [+ATR] noun stems is underlyingly [−ATR]. This can be visualized as follows:



Verb roots with both a [+ATR] vowel and /a/ are not attested. Here is an exhaustive list of cases from other word classes in my data with /a/ as well as [+ATR] vowels:

(3.54) bí-kinyaaa	'IDEO, people or objects who are being scattered'
bí-lǎya	'IDEO, cry'
bí-siya-siya	'ADV, supple, sporty'
-ǎ́bú-ǎ́bú	'nominal modifier, bad' (for behaviour)
-dapulu	'nominal modifier, insipid'
íba	'CONJ, it means that'
mísa	'ADV, towards'
píma	'ADV, accurately'

Two of these words, the nominal modifiers, have /a/ as V_1 . Nominal modifiers take an associative prefix, which is within the domain of [+ATR] spreading. As the following examples show, the vowel /a/ of the associative prefix is not affected by [+ATR] spreading:

- (3.55)a. yǐgya¹³¹ yá-ǰábú-ǰábú
 9a:custom, habit 9.ASS-bad
 'a bad habit'
- b. ma-lǐlǐ má-ndapulǔ
 6-food 6.ASS-insipid
 'tasteless food'

3.2.3.2 The vowel /a/: opaque and transparent?

In the previous section, the noun-class prefixes of noun stems with /a/ in the first syllable and a [+ATR] vowel in the second one, all have a low vowel. Liko also has noun-class prefixes with high vowels. Examples in which they precede a [+ATR] noun stem with /a/ as V_1 include:

(3.56) <u>Singular</u>		<u>Plural</u>	
li-badú	'5-hole'	ma-badú	'6-hole'
li-bagwé	'5-plant, sp.'	ma-bagwé	'6-plant, sp.'
li-láki	'5-bean'	ma-láki	'6-bean'
li-sási	'5-bullet'	ma-sási	'6-bullet'
mu-kadú	'3-cooking pot'	kadú	'9.cooking pot'
mu-zabǐbu	'1-grape'	ǂa-zabǐbu	'2-grape'

It is remarkable that [+ATR] spreads across /a/ in the cases in the first column, especially since the noun-class prefixes of classes 2 and 6 surface with their [−ATR] value. These cases are typologically interesting:

"In a given harmonic system, neutral vowels may have the active value of the harmonic feature, i.e., the value that spreads, or the passive value, i.e., the value that is assigned by default rule. Van der Hulst and Smith (1986) argue that in the former case the invariant vowel acts as transparent, and that in the latter

¹³¹ The H tone of the LH contour on yǐgyǎ merges with the following High.

case they act opaquely, regardless of whether these vowels appear in a stem or an affix." (Van der Hulst and Van de Weijer 1995:499)

However, in Liko, high vowels of noun-class prefixes assimilate to the [+ATR] value of a noun stem whereas the low prefix vowel does not in an identical context, i.e. preceding an /a/ as V₁ in a [+ATR] noun stem.

These cases are problematic for autosegmental theory, because crossing association lines is not permitted. An underlying [-ATR] vowel constitutes a boundary for [+ATR] spreading. Yet in Liko, a high prefix vowel is able to "see" the [+ATR] feature across a [-ATR] vowel and it assimilates accordingly.¹³² In the sections on noun-class prefixes with /a/ (see 3.2.3.3) and [-ATR] enclitics (see 3.2.4) the language shows additional indications of a relation between [ATR] and vowel height.

3.2.3.3 The vowel /a/ in noun-class prefixes

Noun-class prefixes with /a/ are expected to assimilate to the [+ATR] value of a harmonic noun stem. The prefixes concerned are class 1b **a-**, 2 **6a-**, 6 **ma-**, 9b **ká-** and 2+9 **6a-**. In many cases, they do assimilate. In the examples, I give both members of the singular/plural pair, if they exist:

(3.57)	<u>Singular</u>		<u>Plural</u>	
	o-dulú	'1b-weevil'	6o-dulú	'2:1b-weevil'
	o-língi	'1b-tree, sp.' ¹³³	6o-língi	'2:1b-tree, sp.'
	mu-kingó	'1-bloodsucker'	6o-kingó	'2-bloodsucker'
	mu-ndindĩ	'1-insect, sp.'	6o-ndindĩ	'2-insect, sp.'
	li-đukú	'5-pile, heap'	mo-đukú	'6-pile, heap'
	li-lúngo	'5-breast'	mo-lúngo	'6-breast'
	nzunzú	'9.swarm'	6o-nzunzú	'2+9-swarm'
	zigö	'9.mane'	6o-zigö	'2+9-mane'

The vowel of class 9b **ká-** always assimilates, e.g. **kó-hum-ó** '9b-invade-FV' and **kó-póbbó** '9b-chatter-FV'.

¹³² Trying to resolve this problem is outside the scope of this book.

¹³³ A tree used to make musical instruments, **6o-língi** means also '2-wooden xylophone'.

There are, however, cases in which the prefix vowel does not assimilate and the percentage of cases depends on the quality of the first vowel of the noun stem. Almost all noun-class prefixes with /a/ assimilate to the [+ATR] value of the noun when V_1 is a high vowel. In the above examples, all nouns have a high vowel as V_1 and all noun-class prefixes assimilate. Here is an exhaustive list of disyllabic [+ATR] nouns in my data, where a noun-class prefix with /a/ does not assimilate before a high vowel (17 out of 177, or 9.7%).

(3.58) <u>Singular</u>		<u>Plural</u>	
mu-kpúdíú	'1-s.th. new and expensive'	6a-kpúdíú	'2-s.th. new and expensive'
mu-túgbǔ	'1-rat, sp.'	6a-túgbǔ	'2-rat, sp.'
kúkpe	'1a-termite, sp.'	6a-kúkpe	'2-termite, sp.'
		6a-kukpé	'2-dental plaque'
kupé	'1a-one-room house'	6a-kupé	'2-one-room house'
ndútú	'1a-rat, sp.'	6a-ndútú	'2-rat, sp.'
a-6útú	'1b-palm tree, sp.'	6a-6útú	'2:1b-palm tree, sp.'
a-budí	'1b-infertile land'	6a-budí	'2:1b-infertile land'
á-búlá	'1b-monkey, sp.'	6ǎ-búlá	'2:1b-monkey, sp.'
á-dúgbá	'1b-alcohol'		
a-dula	'1b-leprosy'		
a-kúpé	'1b-hardwood tree'	6a-kúpé	'2:1b-hardwood tree'
a-nviyó	'1b-one-bedroom house'	6a-nviyó	'2:1b-one-bedroom house'
a-pí6ú	'1b-cushion of leaves'	6a-pí6ú	'2:1b-cushion of leaves'
		6a-sikpí	'2+9-jokes'
li-silí	'5-hemp'	ma-silí	'6-hemp'
li-simó	'5-inheritance'	ma-simó	'6-inheritance'

Most noun-class prefixes with /a/ assimilate to the [+ATR] value of the noun if V_1 is the mid round vowel /o/. Examples include:

(3.59) <u>Singular</u>		<u>Plural</u>	
mu-goyó	'1-flea, sp.'	6o-goyó	'2-flea, sp.'
mu-nzyogǔ	'1-caterpillar, sp.'	6o-nzyogǔ	'2-caterpillar, sp.'
o-wóngo	'1b-tree, sp.'	6o-wóngo	'2:1b-tree, sp.'

li-kwóbo	'5-joke'	mo-kwóbo	'6-joke'
bu-tónzi	'14-tree, sp.'	mo-tónzi	'6-tree, sp.'
yokó	'9.grudge'	bo-yokó	'2 + 9-grudge'

In the next set, V_1 is mid round and [+ATR], but the low vowel of the noun-class prefix does not assimilate (in my data 9 out of 42, or 21.4%):

(3.60)	<u>Singular</u>		<u>Plural</u>
	gbóngo	'1a.bird, sp.'	ḡa-gbóngo '2-bird, sp.'
	movú	'1a.friend'	ḡa-movú '2-friend'
	á-yóko	'1b-good dancer'	ḡǎ-yóko '2:1b-good dancer'
	a-yómbé	'1b-heron'	ḡa-yómbé '2:1b-heron'
	á-yopé	'1b-land crab'	ḡǎ-yopé '2:1b-land crab'
	bu-ḡombú	'14-fruit tree, sp.'	ma-ḡombú '6-fruit tree, sp.'
	bolú	'9.clearing'	ḡa-bolú '2 + 9-clearing'
	koḡé	'9.cave'	ḡa-koḡé '2 + 9-cave'
	nzoyí	'9.desire'	ḡa-nzoyí '2 + 9-desire'

There are no noun-class prefixes with /a/ in my data that assimilate to the [+ATR] value of the noun if V_1 is the mid unrounded vowel /e/. Examples of cases in which the low vowel noun-class prefix does not assimilate are:

(3.61)	<u>Singular</u>		<u>Plural</u>
	kéú	'1a.insect, sp.'	ḡa-kéú '2-insect, sp.'
	dembú	'1a.large mammal'	ḡa-dembú '2-large mammal'
	ngbezě	'1a.bird, sp.'	ḡa-ngbezě '2-bird, sp.'
	li-sénzě	'5-flute'	ma-sénzě '6-flute'
	li-kembé	'5-thumb piano'	ma-kembé '6-thumb piano'
	nzéde	'9.special meal'	ḡa-nzéde '2 + 9-special meal'

The presence of the [+ATR] mid unrounded vowel /e/ as V_2 in a noun stem seems to influence the assimilation of the low vowel of the noun-class prefix. In the above examples of non-assimilation, there are several cases in which /e/ occurs as V_2 . The only example in my data of a disyllabic noun with final /e/ and assimilation of a low prefix vowel is **ngúde** '1a.white rock', **ḡo-ngúde** '2-white rock'.

3.2.4 [–ATR] enclitics

Liko has underlyingly [–ATR] noun-class enclitics **-Cɔ** and underlyingly [–ATR] verbal enclitics. The noun-class enclitics are described in 5.1.2.

Table 8 [–ATR] verbal enclitics

-nɔ	Supplicative
-gɔ	negative
-tɔ	Insistive

First, the negative enclitic **-gɔ** and the Supplicative enclitic **-nɔ** are described, followed by the Insistive enclitic **-tɔ** and the [–ATR] noun-class enclitics **-Cɔ**. The Insistive enclitic **-tɔ** and the noun-class enclitics have in common that the vowel of the enclitic is subject to vowel-height dissimilation, whereas the vowel of the negative enclitic **-gɔ** or the Supplicative enclitic **-nɔ** does not change. The other difference between the negative and the Supplicative enclitic on the one hand and the Insistive and the noun-class enclitics on the other is that only the latter are subject to [+ATR] spreading.

Apart from tone, the noun-class enclitics are similar in behaviour and surface form to the Insistive enclitic **-tɔ**. The vowel harmony processes involved with these two kinds of enclitics will be investigated, starting with the Insistive enclitic **-tɔ**. The Insistive enclitic **-tɔ** is productive, whereas it is not possible to add noun-class enclitics to new nouns. In nouns with a noun-class enclitic, irregularities are found that do not occur in verb forms with the Insistive enclitic.

3.2.4.1 Negative **-gɔ** and Supplicative **-nɔ**

The negative enclitic **-gɔ** and the Supplicative enclitic **-nɔ** cliticise to the end of the verb form (see 7.7.4).

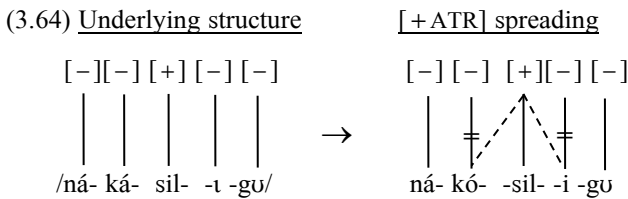
- (3.62)a. ná-ká-ngbút-t-gɔ 1SG-NEG-sulk-FV-NEG 'I will not sulk'
 ná-ká-ptk-t-gɔ 1SG-NEG-sway-FV-NEG 'I will not sway'
- b. bíky-á-nɔ say-FV.IMP-SUPP 'please say'
 t-ptl-t-á-nɔ 1SG.O-be immobile-APPL-FV.IMP-SUPP 'please forgive me'

In (3.63), enclitics **-gu** and **-no** follow a [+ATR] verb. All affix vowels within the domain of [+ATR] spreading assimilate, but the vowels of the enclitics remain [-ATR]:

- (3.63)a. ná-kó-bín-i-gu 1SG-NEG-dance-FV-NEG 'I will not dance'
 ná-kó-sil-i-gu 1SG-NEG-arrive-FV-NEG 'I will not arrive'
 b. ó-pup-í-no 3SG-leave-FV.SUBJ-SUPP 'that he please leave'
 b́ó-kpummy-í-no 3PL-chase away-FV.SUBJ-SUPP 'that they please chase s.th. away'

In (a), the vowel of the negative prefix **ka-** and the negative Future final vowel **-i** are changed to the [+ATR] value. In (b), [+ATR] spreading causes the vowel of the subject prefix and the Subjunctive final vowel **-i** to assimilate.

[+ATR] spreading in the second verb form in (3.63a), **nákósiligu** 'I will not arrive', can be visualized as follows:



The examples in (3.63) also show that [-ATR] enclitics do not prevent [+ATR] spreading to a high vowel in the suffixes.

When these [-ATR] enclitics occur following a [+ATR] suffix, the vowel of the enclitic still surface with the [-ATR] value, e.g.:

- (3.65)a. ø-kó-tígól-ó-kú-gu 3SG^p-NEG-stay-FV^p-DIR-NEG 'he did not stay with us'
 b. tí-pó-kú-no 1PL.O-give:FV.IMP-DIR-SUPP 'please give towards us'

In (a), the verb **-tígól-** 'stay' and the Directional suffix **-kú** are underlyingly [+ATR]. In (b), the vowel of the verb **-pá-** 'give' assimilates to the [+ATR] value of the Directional suffix.

In the cases thus far, a high vowel precedes the enclitics **-gu** and **-no**. In many verb forms, the final vowel is the low vowel /a/. In a [+ATR] context, the final vowel is changed into the [+ATR] counterpart of /a/, i.e. /o/. In environments in which the

vowel /a/ is within the domain of [+ATR] spreading, but followed by a [−ATR] enclitic, it does not assimilate to the [+ATR] value, as can be seen in (3.66b, c):

- (3.66)a. nó-bín-ó 1SG^P-dance-FV^P 'I danced'
 b. bín-á-nɔ dance-FV.IMP-SUPP 'please dance!'
 *bín-ó-nɔ
 c. ná-kó-bín-á-gu 1SG^P-NEG-dance-FV^P-NEG 'I did not dance'
 *ná-kó-bín-ó-gu

The verb **-bín-** 'dance' is underlyingly [+ATR]. In (a), [+ATR] spreading causes the vowel of the subject prefix and the final vowel to assimilate to the value of [+ATR]. In (b) and (c) however, that does not happen to the final vowel.

Other examples of [+ATR] verbs where the final vowel does not assimilate preceding the [−ATR] negative enclitic are:

- (3.67) ø-kó-sil-á-gu 3SG^P-NEG-arrive-FV^P-NEG 'he did not arrive'
 ø-kó-kúmb-á-gu 3SG^P-NEG-carry-FV^P-NEG 'he did not carry'¹³⁴
 ø-kó-yúkúm-á-gu 3SG^P-NEG-breathe-FV^P-NEG 'he did not breathe'

The same phenomenon can be observed when the monosyllabic post-verbal time adverbial ^H**ndi** 'earlier than about a week ago' (see 7.7.1) cliticises to the end of the verb form. The vowel of the cliticised time adverbial is invariably [−ATR] /ɪ/ and a preceding low final vowel does not assimilate in the domain of [+ATR] spreading. For example:

- (3.68)a. ó-dim-ó-ní-ndi tíko
 3SG^P-clear-FV^P-PFV-P₃ 9.field
 'He has cleared a field.'
 b. ó-dim-ís-á-ndi tíko
 3SG^P-clear-CAUS-FV^P-P₃ 9.field
 'He cleared a field.'

In (a), ^H**ndi** follows a high [+ATR] vowel, but its vowel does not assimilate. In (b), the final vowel, which is preceded by a [+ATR] suffix and followed by ^H**ndi**, surfaces as /a/.

¹³⁴ I.e. on one's back.

- b. no-**díkít**-i-tó 1SG-throw-FV.ANT-INS 'I certainly threw'
 c. na-**díkt**-a-tú 1SG-throw-FV-INS 'I will certainly throw'

In (a), the negative prefix **ka-**, the verb root **-díkt-** 'throw' and the final vowel **-a** assimilate to the [+ATR] value of the negative Subjunctive suffix **-ní**, but the vowel of the Insistive enclitic does not assimilate. In (b), the preceding subject prefix and the verb root as well as the following Insistive enclitic assimilate to the [+ATR] value of the Anterior aspect final vowel **-i**. In (c), following the low final vowel, the vowel of the Insistive enclitic is changed into a high vowel.

The tone of the Insistive enclitic surfaces as High as in (3.71b, c) and in (3.72a), as non-automatic downstepped High as in (3.71a), and as Low in (3.72b):

- (3.72)a. no-**ḡín**-i-tó 1SG-dance-FV.ANT-INS 'I certainly danced'
 ã-**ḡúkt**-is-a-tú 3SG:1.O-produce-CAUS-FV-INS 'she will certainly
 cause to give birth'
 b. no-**ḡo**-kú-to 1SG-come:FV-DIR-INS 'I will certainly come'
 nó-**ḡín**-á-tu 1SG^p-dance-FV^p-INS 'I certainly danced'

The surface tone of the Insistive enclitic in word-final position is Low if the tone on the preceding morpheme is High (see 4.6.6). Between a H tone on the final vowel of the verb and the negative enclitic **-ḡu**, the tone of the Insistive enclitic is realized at a pitch between High and Low. A floating L tone between the verb form and the Insistive clitic causes the non-automatic downstep, see 4.6.5.

Surface realization of the vowel of the Insistive enclitic is /ɔ/ or /o/ following a high vowel and /u/ following a low vowel. The fourth potential surface vowel, /u/, does not occur. For /u/ to surface, it would require a preceding [+ATR] non-high vowel. There is no environment in which this is the case: Liko does not have a [+ATR] suffix with a non-high vowel. Surface realization as /ɔ/ is only found in negative Subjunctive forms, such as:

- (3.73)a. Ø-ko-pik-o-ní 'tḡ-ḡu
 3SG-NEG-sway-FV.SUBJ-NEGSUBJ INS-NEG
 'that he not sway'
 b. Ø-ka-kúl-o-ní 'tḡ-ḡu mémí
 3SG-NEG:1.O-untie-FV.SUBJ-NEGSUBJ INS-NEG 1a.goat
 'that he not untie the goat'

Suppose that the vowel of the Insistive enclitic were underlyingly /ʊ/. To affect the vowel-height change, a rule of vowel-height dissimilation would be needed to realize /ɔ/ following /ʌ/ and /o/ following /i/. However, although /i-ʊ/ and /i-u/ do not occur in disyllabic noun stems, Liko has no co-occurrence restrictions on /i-Cʊ/ and /i-Cu/ sequences that occur across morpheme boundaries, for both prefixes and suffixes or enclitics:

- (3.74)a. *li-ḥógu* '5-plantain'
li-ḥúki '5-parcel'
- b. *ná-ká-ngbút-t-gu* 'I will not sulk'
 1SG-NEG-sulk-FV-NEG
a-mbímb-i-kú 'he threw recently towards s.o.'
 3SG:1.O-throw-FV.ANT-DIR

This means that there is no phonological reason for /ʊ/ to change into a mid vowel.

If the vowel of the Insistive enclitic would be underlyingly /ʊ/, it would be expected that it would assimilate to a [+ATR] value like the other high vowel /ʊ/. The final vowel of the negative Future, **-i**, for instance, assimilates to a [+ATR] value, even preceding the underlying [-ATR] enclitic **-gu** in (3.63a). In (3.73), the Insistive enclitic follows the [+ATR] negative Subjunctive suffix **-ní**. The vowel of the Insistive enclitic does not assimilate, neither to ***kopikoni'túgu** nor to ***kopikoni'tógu** (after vowel-height dissimilation).

If the underlying vowel of the Insistive enclitic were /u/, it would be problematic to explain why it is not [+ATR] dominant like the other [+ATR] suffixes with a high vowel. There would also be no apparent reason why a [+ATR] vowel would change into [-ATR] in a [+ATR] dominant language, i.e. why **-tú** would surface as as **-tu** in **nóbínátu** 'I certainly danced'. Underlying /o/ is also problematic for at least the last reason.

To sum up the discussion, /ɔ/ is posited as the underlying vowel of the Insistive enclitic. The rule of vowel-height dissimilation as formulated below is required to produce the surface realization of the high vowel /ʊ/ following /a/.

(3.75) Vowel-height dissimilation

$$\begin{bmatrix} +\text{syllabic} \\ +\text{round} \\ -\text{high} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{syllabic} \\ +\text{round} \\ +\text{high} \end{bmatrix} / \begin{bmatrix} +\text{syllabic} \\ -\text{high} \end{bmatrix} + -$$

A mid round vowel changes to a high round vowel in the environment of a preceding non-high vowel at a morpheme boundary.

The Vowel-Height Dissimilation rule does not operate globally in Liko.¹³⁷ It operates within the context of a morpheme boundary, and it is only found to apply to the Insistive and the noun-class enclitics.

With respect to [+ATR] spreading in relation to the Insistive enclitic **-tɔ**, I will repeat some of the above examples. In (3.76), the vowel of the enclitic assimilates to a [+ATR] value; in (3.77), it does not:

- (3.76) no-bín-i-tó 1SG-dance-FV.ANT-INS 'I certainly danced'
 no-díkít-i-tó 1SG-throw-FV.ANT-INS 'I certainly threw'
 no-do-kú-to 1SG-come:FV-DIR-INS 'I will certainly come'

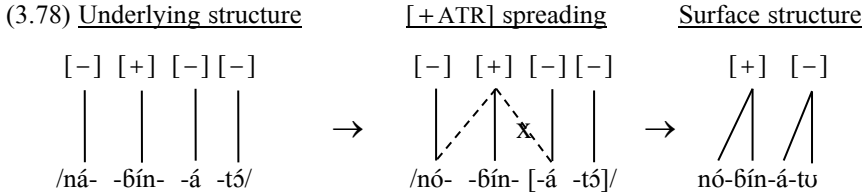
- (3.77) nó-bín-á-tu 1SG^p-dance-FV^p-INS 'I certainly danced'
 ã-búkut-is-a-tú 3SG:1.O-produce-CAUS-FV-INS 'she will certainly
 cause her to give birth'

As seen with the [-ATR] negative and Supplicative enclitics, a sequence of one or more non-high vowels and a [-ATR] enclitic constitutes a [-ATR] domain, which cannot be affected by [+ATR] spreading. As a result, [+ATR] spreading is unable to change the final vowel in (3.77).

The vowel of the enclitic in /ná-bín-á-tɔ/ and /a[̃]-búkut-is-a-tɔ/, the underlying forms of (3.77), is subject to vowel-height dissimilation. The underlying H tone is changed into a L tone in the context of a preceding High.

¹³⁷ In other environments /a-ɔ/ sequences are attested, e.g. **ba-sódu** '2-cricket, sp.', **sil-á-no**, arrive-FV.IMP-SUPP, 'please arrive!'.

The [ATR] harmony process in the first example of (3.77), **nóǫínátu** 'I certainly danced', can be visualized as follows (the square brackets indicate the [–ATR] domain):



The examples below show that multiple syllables with non-high vowels preceding the [–ATR] Insistive enclitic are included in the [–ATR] domain. All non-high [–ATR] vowels within the domain surface with their [–ATR] value:

- (3.79)a. nó-ǫín-ág-á-tu 1SG^p-dance-PLUR-FV^p-INS 'I certainly danced'
 b. no-yúkum-ag-a-tǫ 1SG-breathe-PLUR-FV-INS 'I will certainly breathe'

The surface tone of the Insistive enclitic is High, Low or non-automatic downstepped High. Relevant examples for the non-automatic downstep are the negative Subjunctive forms in (3.71a), (3.73a, b) and the following examples:

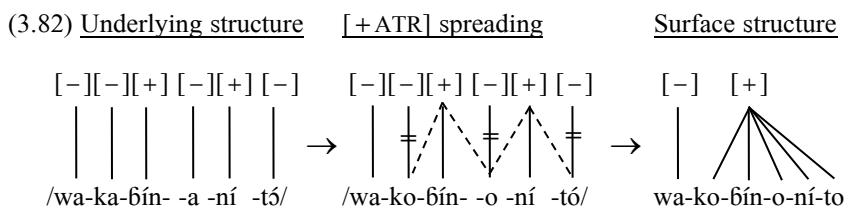
- (3.80)a. wa-ko-ngbút-o-ní ^htǫ-gu
 2SG-NEG-sulk-FV-NEGSUBJ INS-NEG
 'that you (sg) would not sulk' / 'Do not sulk!'
 b. wa-ko-ǫín-o-ní ^htǫ-gu
 2SG-NEG-dance-FV-NEGSUBJ INS-NEG
 'that you (sg) would not dance' / 'Do not dance!'

The [–ATR] domain formed by the non-high vowel and the [–ATR] enclitic provides a rationale for the failure of the vowel of the Insistive enclitic to assimilate to the preceding [+ATR] suffix. In negative Subjunctive forms, the negative enclitic **-gu** is optional. When this [–ATR] enclitic **-gu** is absent, the vowel of the Insistive enclitic assimilates to the [+ATR] value of the preceding suffix and the tone on the Insistive enclitic is Low:

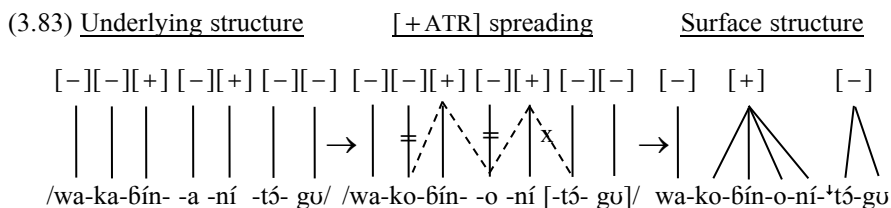
- (3.81)a. wa-ko-ngbút-o-ní-to
 2SG-NEG-sulk-FV-NEGSUBJ-INS
 'that you (sg) would not sulk' / 'Do not sulk!'

- b. wa-ko-**ḃín**-o-ní-to
 2SG-NEG-dance-FV-NEGSUBJ-INS
 'that you (sg) would not dance' / 'Do not dance!'

Here is a visualization of (3.81b); adjacent identical [ATR] values are merged through the 'obligatory contour principle' (OCP):



[ATR] spreading and the [-ATR] domain in (3.80b), **wakoḃínóní tṣgu** 'that you (sg) would not dance' / 'Do not dance!', can be visualized as follows:



The second person singular subject prefix **wá-** is beyond the left boundary of the domain of [+ATR] spreading.

Several processes distinguish the verbal enclitics **-gu** and **-no** from **-tṣ**: firstly, vowel-height dissimilation (3.75) applies only to **-tṣ**, secondly, the tone on the Insistive enclitic is changed into a L tone in the environment of a preceding H tone (see 4.6.6) and thirdly, [+ATR] spreading causes **-tṣ** to assimilate unless the Insistive enclitic forms a [-ATR] domain with a preceding non-high vowel. These processes mark the Insistive enclitic **-tṣ** as being part of the word, at least to a greater extent than the other verbal enclitics.

The polysyllabic complex of two enclitics, **tṣgu**, has created an environment which is different from cases in which **-tṣ** occurs word-finally. When a H tone occurring

on a word-final syllable is preceded by another H tone across a morpheme boundary, the sequence of two H tones surfaces as H.H or H.L, not as H.⁴H. If, however, the second H tone is linked to the first syllable of a word, a floating L tone causes non-automatic downstep of the second H in at least one other environment, i.e. an auxiliary followed by an Infinitive, see 4.6.5.

3.2.4.3 Noun-class enclitics

A characteristic of the Liko noun-class system is the existence of noun-class enclitics in addition to noun-class prefixes. The vowel of the enclitic surfaces as /ɔ/, /o/ and /u/ in noun classes 7, 13, 15 and 19, where most nouns with a noun-class enclitic are found. In other noun classes, some of these realizations are attested. A few nouns in class 9 have an enclitic form with /u/ in addition to /ɔ/, /o/ and /u/. For details, I refer the reader to 5.1.2. Table 9 presents the realizations attested by noun class:

Table 9 Noun-class enclitics - surface forms

Class	Enclitic
3	-mʊ
5	-lʊ
6	-mo, -mʊ
7	-sɔ, -so, -sʊ
9	-yɔ, -yo, -yʊ, -yt
13	-tɔ, -to, -tʊ
15	-kɔ, -ko, -kʊ
19	-sɔ, -so, -sʊ

Examples of surface realizations of the vowels of noun-class enclitics following high or low vowels include:

- (3.84)a. kǔnzɪŋɔ́-kɔ '15:sweet potato-15'
 (s)ɪ-bukú-sɔ '19-shrub, drug-19'
- b. sukú-so '7:burning piece of wood-7'
 ku-tíli-ko '15-ear-15'
- c. kú-bɪsyá-ku '15-smithy-15'
 ɪ-bálá-su '19-stool-19'

Here are some examples of surface realizations of the vowel of noun-class enclitics following mid vowels:

- (3.85)a. st-bě-su '7-thigh-7'
 kū-nzě¹³⁸nzé-ku '15-leaf, sp.-15'¹³⁸
- b. kū-ḥḥó-ku '15-lie-15'
 ɪ-kpɔŋḍ-su '19-bed frame-19'

The realization of the vowel of a noun-class enclitic is determined by the values of the preceding vowel for [ATR] and [high]. Surface /ɔ/ follows [−ATR] high vowels as in (3.84a), /o/ follows [+ATR] high vowels as in (3.84b) and /u/ follows [−ATR] non-high vowels as in (3.84c) and (3.85). A noun-class enclitic following a surface [+ATR] non-high vowel does not occur in the language.

If /ɔ/ is posited as the underlying vowel, then the change to /u/ can be accounted for by vowel-height dissimilation (3.75) and the change to /o/ by [+ATR] spreading. The Insistive enclitic also has surface realizations /ɔ/, /o/ and /u/. The argumentation for /ɔ/ as the underlying vowel of the Insistive enclitic, given in the previous section, also applies in the case of noun-class enclitics. Noun-class enclitics may originate from type I demonstratives indicating 'near'. The vowel of this type of demonstratives is /ɔ/.

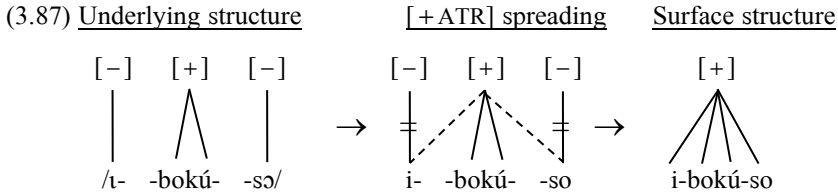
[+ATR] spreading causes the vowel of a noun-class enclitic to assimilate to the value of the root, see (3.84b). It is only attested in cases in which a high [+ATR] vowel precedes the enclitic.

Other examples include:

- (3.86)a. ku-sí'ngí-ko '15-shoulder strap-15'
 si-kpí-so '19-hat-19'
- b. ku-lulú-ko '15-shadow-15'
 i-bokú-so '19-skin, bark-19'

The second example in (3.86b), **i-bokú-so** '19-skin, bark-19', can be visualized as:

¹³⁸ This leaf is used as a plate.



Problematic are [+ATR] nouns with surface root-final /a/ and a noun-class enclitic, because it is not always possible to determine whether the root-final vowel is underlyingly /a/ or /o/, and because there are cases in which the [-ATR] enclitic causes underlying /o/ to be changed to /a/.¹³⁹

In (3.88), I present all nouns in the gender 19/13 in my data where the root-final vowel is underlyingly either /a/ or /o/. Recall that /a/ may occur in [+ATR] noun stems (see 3.2.3.1), e.g. **ǎ́nga** '9.winnowing basket' and **kpóya** '9.dance'.

(3.88)	i-bikyá-su	'19-fury, madness-19'	bikyá-tu	'13.fury, madness-13'
	i-tikimá-su	'19-tree, sp.-19'	tikimá-tu	'13.tree, sp.-13'
	(s)i-kú ⁴ bá-su	'19-chest, cough-19'	kú ⁴ bá-tu	'13.chest-13'
	i-kpóngóbá-su	'19-shell-19'	kpóngóbá-tu	'13.shell-13'

If the underlying root-final vowel is /a/, then the combination with a [-ATR] enclitic creates a [-ATR] domain, in the same way as seen in the previous sections with [-ATR] verbal enclitics. The vowel /ɔ/ of the noun-class enclitic is out of reach for [+ATR] spreading and is subject to vowel-height dissimilation (/a-Cɔ/ → /a-Cu/). If, however, /o/ is the underlying root-final vowel, then the [-ATR] enclitic has created a [-ATR] domain at the expense of the [+ATR] value of /o/.

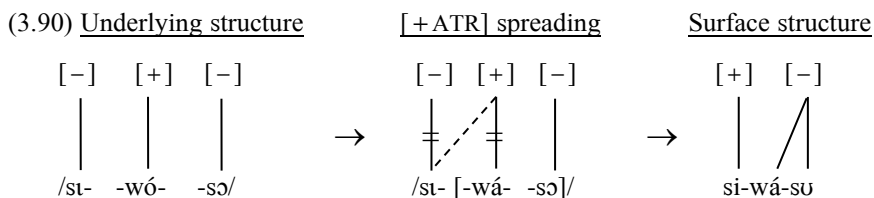
¹³⁹ In Kutsch Lojenga (1999) and (2009:67), this change in the [ATR] value of the vowel of a noun stem is seen as a case "where dominance reversal is created as a repair strategy for a higher-ranking constraint, namely against the [+ATR] high, back vowel /u/ in a suffix." This constraint is based on the analysis of /u/ as the underlying vowel of the [-ATR] enclitic. The presence of the Directional suffix **-kú** shows that Liko does not have a constraint on /u/ in a suffix.

This must be the case in (3.89) (listing all cases in my data), where [+ATR] noun stems have a plural form with /o/ and a singular with /a/.

(3.89)	ku-kwá-ku	'15-death-15'	mo-kwó	'6-death'
	ku-kpukú'má-ku	'15-cassava-15'	kpukúmo	'9.cassava'
	kú'wá-ku	'15:thorn-15'	mówo	'6:thorn'
	ku-yá-ku	'15-fishing net-15'	mo-yó	'6-fishing net'
	sílosí'lá-su	'7:burnt log-7'	bílobílo	'8:burnt log'
	sí'ngá-su	'7:neck-7'	bíngo	'8:neck'
	si-wá-su	'7-bell for a hound-7'	bi-wó	'8.bell for a hound'

The reduplicated noun **si-losí'lá-su** has both surface vowels: /o/ in the first part is not affected by the noun-class enclitic.

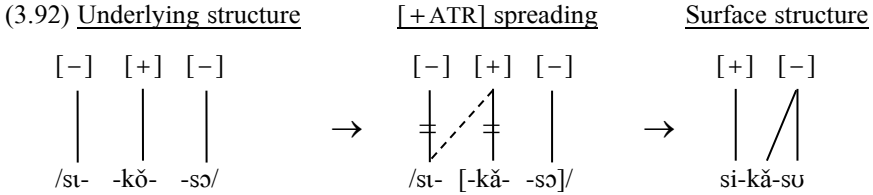
The data in the above set show that the [-ATR] noun-class enclitics are able to create a [-ATR] domain with any preceding non-high vowel, even if there is a [+ATR] value associated with the noun. The [+ATR] value of a non-high vowel can be delinked by a following [-ATR] enclitic. [ATR] association in the case of **si-wá-su** '7-bell for a hound-7' can be visualized as follows (square brackets indicate the [-ATR] domain):



In (3.91), [+ATR] nouns do not surface with a [+ATR] vowel, but only with /a/. The [+ATR] value is evident by looking at the vowel of the noun-class prefix, which is [+ATR]:

(3.91)	si-kǎ-su	'7-drying shed-7'	bi-kǎ-tu	'8-drying shed-8'
	kú'bá-ku	'15:theft-15'	-	
	ku-káká-ku	'15-housekeeping-15'	-	
	kú'má-ku	'15:greed-15'	-	

[ATR] association can be visualized as follows, using the first example (square brackets indicate the [-ATR] domain):



3.2.5 Conclusion

ATR vowel-harmony processes occur across morpheme boundaries of all word classes in Liko, in noun-class prefixes and enclitics, in verbal inflectional and derivational affixes as well as enclitics, in noun-class concords of adjectives, numerals, associative constructions and **ḡt**-modifiers.

In the dominant ATR vowel harmony system in Liko, [+ATR] is the active value, but [-ATR] enclitics can create a [-ATR] domain with preceding non-high vowels. Underlyingly, [+ATR] is linked to roots and suffixes (including one verbal extension). They do not alternate in their [ATR] value, but are invariably [+ATR]. Affixes with a [-ATR] value surface with a [+ATR] vowel when they are within the domain of [+ATR] spreading. Verb roots are subject to [+ATR] vowel harmony as well. In affixes and verb roots, /a/ harmonizes with a [+ATR] value if /a/ occurs within the domain of [+ATR] spreading. When /a/ assimilates to [+ATR], it surfaces as the mid round vowel /o/.

The low vowel /a/ is opaque in [+ATR] noun stems. There is a problem for autosegmental theory with respect to its opaqueness, because in Liko, a high prefix vowel is changed into a [+ATR] value preceding noun stems where /a/ occurs as V₁ and a [+ATR] vowel as V₂.

Three verbal [-ATR] enclitics, negative **-ḡu**, Supplicative **-no** and Insistive **-tḡ**, as well as the [-ATR] noun-class enclitics, **-Co**, may form a [-ATR domain] consisting of the [-ATR] enclitic and one or more preceding non-high vowels.

Typologically interesting is the occurrence of [+ATR] dominance together with the establishment of a [−ATR] domain, including delinked [+ATR] non-high vowels. There has been a lot of debate on the question whether [−ATR] can function as the regularly dominant value in a language. Some theories claim that only [+ATR] dominance should normally be possible (e.g. Van der Hulst 1988) and others state that only either [+ATR] or [−ATR] functions as the systematically dominant value in a language (Archangeli and Pulleyblank 1994, Leitch 1996). Kutsch Lojenga (1999), Baković (2000) and Kutsch Lojenga (2009) among others have proposed the idea of "dominance reversal": following [+ATR] assimilation, [−ATR] dominant enclitics restore the original [−ATR] value.

In the ATR system in the Liko language, vowel height is an important feature. The [+ATR] "strength" of high vowels is greater than that of non-high vowels. The only vowels in [+ATR] dominant suffixes are the high vowels /i u/. [+ATR] spreading to noun-class prefixes with /a/ is much more successful when the first vowel of the noun stem is a high vowel than when it is a non-high vowel (see 3.2.3.3). In the presence of a [−ATR] enclitic, preceding low vowels form a [−ATR] domain with the enclitic, and a preceding [+ATR] non-high vowel /o/ loses its ATR association and becomes part of the [−ATR] domain as well.¹⁴⁰ Only in the case of [+ATR] high vowels does [+ATR] spread to the [−ATR] Insistive and noun-class enclitics.

[+ATR] dominance can be reformulated as follows:

- (3.93) [+ATR] spreads within its domain, which ranges from the prefix adjacent to the left of the root up to the end of the word or to a [−ATR] domain.

In autosegmental analysis, values on the [ATR] tier spread within their domain. The [ATR] domain in Liko is established before spreading.

¹⁴⁰ Dominance of [−ATR] vowels is reported to be a characteristic property of languages with no [ATR] contrast in the high vowels (Casali 2008:520).

3.3 Vowel Sandhi

The following factors contribute to the widespread occurrence of Vowel Sandhi in Liko. Liko has only open syllables CV and V. The reflexive prefix, frequently used object prefixes (1SG, 2SG, class 2) and the prefixes of the noun-classes 1b, 1c, 9a and 19 consist of a single vowel. A number of verbs and nouns are vowel-initial, and the verb-final vowel may follow a verb with an open syllable root-finally or a V-type verbal extension.

A sequence of two vowels generally has to be resolved. I refer to them as V_1 and V_2 in this section. V_1 represents the vowel of the first morpheme and V_2 the vowel of the following morpheme. The language uses the following strategies in case of adjacent prefix vowels or a sequence of a prefix vowel and a root-initial vowel: V_1 -elision, height coalescence and heterosyllabification. In the case of vowel-initial suffixes following a root-final vowel, two identical vowels merge, V_1 is desyllabified, or height coalescence takes place. No strategy dealing with a sequence of two vowels leads to the formation of a long vowel. The resulting vowel after vowel elision, height coalescence or desyllabification is the nucleus of a short syllable. Vowel elision, height coalescence or desyllabification may lead to surface tonal changes, e.g. a L tone on V_1 and a H tone on V_2 may result in a LH contour tone on V_2 after V_1 -elision or desyllabification, see Chapter 4 "Tone".

Elision of V_1 leads to re-syllabification to recreate a well-formed syllable. The syllabification conventions in Liko are:

(3.94)

- CV-syllables: every vowel forms a syllable together with the consonant to its left;
- V-syllables: a vowel without consonantal onset forms a syllable in itself.

When a vowel is elided by V_1 -elision, the syllable has lost its nucleus and the first convention applies: V_2 is linked to the consonantal onset on its left.

How the hiatus resolution takes place is a matter of morphophonology: it depends on the morphemes involved and on the vowel height. Noun-class prefixes of classes 2 and 2+9 preceding either V-syllable noun-class prefixes or vowel-initial

nouns, for instance, exemplify the effect of vowel height. The noun-class prefixes of noun classes 1b, 1c and 9a, i.e. **a-**, **ɪ-** and **ɪ-** respectively, are retained in plural forms. If the prefix vowel is **a-**, then the vowel of class 2 plural prefix **ɓa-** is subject to V₁-elision. If the prefix is the high unrounded vowel **ɪ-**, height coalescence takes place, resulting in a mid unrounded vowel. Classes 2 or 2+9 plural prefix **ɓa-** preceding a vowel-initial noun with /ɔ/ surface as **ɓɔ-** after V₁-elision.

In the description and the examples, I have given an overview of all relevant morphemes in my data. Vowel Sandhi in Liko is rare post-lexically, which is probably due to word structure: the overall majority of words begin with a CV-syllable.

In the sections below, V₁-elision is presented first, followed by height coalescence, heterosyllabification and desyllabification. Interestingly, Liko has, to some extent, symmetric height coalescence, which applies not only to a sequence of a low and a high vowel (see 3.3.2), but, in one context, also to a sequence of a high and a low vowel (see 3.3.3).

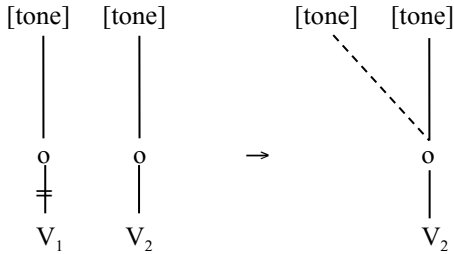
3.3.1 V₁-elision

The following set of verbal prefixes lose their morpheme-final vowel when they precede a vowel-initial verb root or a V-syllable verbal prefix:

- the subject prefix (C)**a-**
- the Conditional prefix **ka-**
- the negative prefix **ka-**
- the Inchoative aspect prefix -^L**ná**^L-

The V-syllable verbal prefixes involved are the reflexive prefix **ɣ-** and the object prefixes second person singular **u-** and class 2 **ǃ-**. In order to facilitate the understanding of the examples, I have added footnotes with underlying morphemes. The vowel of a noun-class prefix is elided preceding a V-syllable noun-class prefix or a vowel-initial noun.

V₁-elision removes the vowel and the vowel position; the duration of the resulting vowel is the same as for a single vowel. The association line with [ATR] is also deleted, but not the tone of V₁.

(3.95) V₁-elision**a. V₁-elision preceding a vowel-initial verb root**

The vowel of vowel-initial verbs is either high /t i u u/ or low /a/. The examples show that the vowel of the prefix is elided when it precedes a vowel-initial verb.

(3.96)a. *subject prefix (C)a-*

/ná + tná/ ¹⁴¹	→ ntná	'I saw'
/ná + ulá/	→ núlá	'I broke'
/ná + alá/	→ nálá	'I cleaved'

b. *negative prefix ka-*

/ná-ká + ulágu/ ¹⁴²	→ nákulágu	'I did not break'
/ná-ká + alágu/	→ nákalágu	'I did not cleave'

c. *Conditional prefix ka-*

/na-ka + ulá/ ¹⁴³	→ nakulá	'if I break'
/na-ka + alá/	→ nakalá	'if I cleave'

d. *Inchoative aspect prefix -^Lná^L-*

/na- ^L ná ^L + undá/ ¹⁴⁴	→ naní ^t ndá	'I am about to go'
--	-------------------------	--------------------

¹⁴¹ /ná-tn-á/ 1SG^P-see-FV^P.

¹⁴² /ná-ká-ul-á-gu/ 1SG^P-NEG-break-FV^P-NEG.

¹⁴³ /na-ka-ul-á/ 1SG-COND-break-FV.

¹⁴⁴ /na-^Lná^L-und-á/ 1SG-INCH-go-FV.

/na- ^L ná ^L + úlá/	→ nanú ^L lá	'I am about to break'
/na- ^L ná ^L + alá/	→ naná ^L lá	'I am about to cleave'

Notice the tone on the initial vowel of the verb in (3.96a, b and c). Verb roots have either a primary H tone or L tone. The verbs in the above examples have a H tone, apparent by the H tone on the final vowel (otherwise, it would have been a rising tone). The initial vowel in these examples does not carry the primary tone of the verb. All verbs except one in my data with a root-initial vowel have a surface L tone on that vowel.¹⁴⁵

b. V₁-elision preceding the reflexive prefix ĭ-

The following examples show that the vowel of the verbal prefix is elided when it precedes the reflexive prefix ĭ-. The reflexive prefix assimilates to a [+ATR] value, but the vowel of a preceding verbal prefix as in (3.97d) does not, because it is outside the domain of [+ATR] spreading.

(3.97)a. <i>subject prefix (C)a-</i>		
/ná + ĭ-sumbó/ ¹⁴⁶	→ nísumbó	'I burned myself'
/ná + ĭ-kúlá/	→ níkúlá	'I untied myself'
b. <i>negative prefix ka-</i>		
/ká + ĭ-sumbigu/ ¹⁴⁷	→ kísumbigu	'he will not burn himself'
/ká + ĭ-kúlgú/	→ kíkúlgú	'he will not untie himself'
c. <i>Conditional prefix ka-</i>		
/ka + ĭ-sumbó/ ¹⁴⁸	→ kǐsumbó	'if he burns himself'
/ka + ĭ-kúlá/	→ kǐkúlá	'if he unties himself'
d. <i>Inchoative aspect prefix -^Lná^L-</i>		
/a- ^L ná ^L + ĭ-sumbó/ ¹⁴⁹	→ anísumbó	'he is about to burn himself'
/a- ^L ná ^L + ĭ-kúla/	→ aníkúla	'he is about to untie himself'

¹⁴⁵ The exception is -**ók-** 'heal'.

¹⁴⁶ /ná-ĭ-sumb-á/ 1SG^P-REFL-burn-FV^P.

¹⁴⁷ /∅-ká-ĭ-sumb-t-gu/ 3SG-NEG-REFL-burn-FV-NEG.

¹⁴⁸ /∅-ka-ĭ-sumb-á/ 3SG-COND-REFL-burn-FV.

¹⁴⁹ /a-^Lná^L-ĭ-sumb-á/ 3SG-INCH-REFL-burn-FV.

With respect to the three different surface tones on the reflexive prefix: LowHigh is realized if the preceding prefix and the verb have a L tone; High is realized if the preceding prefix has a H tone (L-tone deletion in the context of HLH → H, see 4.6.4); and Low is realized if the preceding prefix is Low and the verb is High (in which case LowHigh breaks up). For more information, I refer the reader to 4.6.2 and 7.5.2.

c. V₁-elision preceding the object prefixes 2SG *u-* and class 2 *ǔ-*

The following examples show that the vowel of the verbal prefix is elided when it precedes the second person singular object prefix *u-* or class 2 *ǔ-*. The object prefixes assimilate to a [+ATR] verb root.

(3.98)a. *subject prefix (C)a-*

/bá + u-sumbó/ ¹⁵⁰	→ búsumbó	'they burned you (sg)'
/bá + u-kúlá/	→ bú ⁴ kúlá	'they untied you (sg)'
/bá + ǔ-sumbó/ ¹⁵¹	→ búsumbó ¹⁵²	'they burned them'
/bá + ǔ-kúlá/	→ búkúlá	'they untied them'

b. *negative prefix ka-*

/tá-ká + u-gbodyigu/ ¹⁵³	→ tákúgbodyigu	'we will not smear you (sg)'
/tá-ká + u-lúmbigu/	→ tákú ⁴ lúmbigu	'we will not bury you (sg)'
/tá-ká + ǔ-gbodyigu/ ¹⁵⁴	→ tákúgbodyigu	'we will not smear them'
/tá-ká + ǔ-lúmbigu/	→ tákúlúmbigu	'we will not bury them'

c. *Conditional prefix ka-*

/ta-ka + u-gbodyó/ ¹⁵⁵	→ takugbodyó	'if we smear you (sg)'
/ta-ka + u-lúmbó/	→ takulúmbó	'if we bury you (sg)'
/ta-ka + ǔ-gbodyó/ ¹⁵⁶	→ takǔgbodyó	'if we smear them'

¹⁵⁰ /bá-u-sumb-á/ 3PL^P-2SG.O-burn-FV^P.

¹⁵¹ /bá-ǔ-sumb-á/ 3PL^P-2.O-burn-FV^P.

¹⁵² The verb forms with 2SG or class 2 object prefixes are identical in several environments.

¹⁵³ /tá-ká-u-gbody-1-gu/ 1PL-NEG-2SG.O-smear-FV-NEG.

¹⁵⁴ /tá-ká-ǔ-gbody-1-gu/ 1PL-NEG-2.O-smear-FV-NEG.

¹⁵⁵ /ta-ka-u-gbody-á/ 1PL-COND-2SG.O -smear-FV.

¹⁵⁶ /ta-ka-ǔ-gbody-á/ 1PL-COND-2.O -smear-FV.

- /ta-ka + ů-lúmbó/ → takulúmbó 'if we bury them'
- d. *Inchoative aspect prefix* -^Lná^L-
- /ta-^Lná^L + u-gbodyo/¹⁵⁷ → tanúgbodyó 'we are about to smear you (sg)'
- /ta-^Lná^L + u-lúmbo/ → tanú^Hlúmbo 'we are about to bury you (sg)'
- /ta-^Lná^L + ů-gbodyo/¹⁵⁸ → tanúgbodyó 'we are about to smear them'
- /ta-^Lná^L + ů-lúmbo/ → tanúlúmbo 'we are about to bury them'

In the examples above, the second person singular object prefix **u-** has either a Low or a High tone at the surface. If the preceding prefix has a L tone or if the following verb root has a L tone, the L tone of the object prefix **u-** merges with the adjacent L tone, leaving no trace. In the absence of an adjacent L tone, the Low tone of the object prefix **u-** causes non-automatic downstep. The tone on the class 2 object prefix **ů-** surfaces as LowHigh, High or Low, like the surface tone of the reflexive prefix **ř-**. Detailed information can be found in 4.6.2 and 7.5.

d. V₁-elision preceding a V-syllable noun-class prefix or a vowel-initial noun stem

The following examples show V₁-elision when the class 2 prefix **6a-** precedes the class 1b prefix **a-** or a noun with an initial vowel /ɔ/.

(3.99) *class 2 prefix 6a-*

- /6a + a-bulí/ → 6a-bulí '2:1b-fish, sp.'
- /6a + o-ngútu/ → 6o-ngútu '2:1b-bracelet'
- /6a + ɔgǔ/ → 6ɔgǔ '2:fish, sp.'

V₁-elision occurs when class 5 prefix **l-** or class 6 **ma-** precede a noun with a root-initial vowel:

(3.100) *class 5 prefix l- and class 6 prefix ma-*

- /l + akí/ → lakí '5:egg'
- /l + íno/ → líno '5:name'

¹⁵⁷ /ta-^Lná^L-u-gbodyo-á/ 1PL-INCH-2SG.O-smear-FV.

¹⁵⁸ /ta-^Lná^L-ů-gbodyo-á/ 1PL-INCH-2.O-smear-FV.

/ma + akí/	→ makí	'6:egg'
/ma + íno/	→ míno	'6:name'

V₁-elision also occurs when class 7 prefix **st-** or class 8 **bt-** precedes a noun with a root-initial high vowel:

(3.101) *class 7 prefix st- and class 8 prefix bt-*

/st + íngo-su/	→ sí ^h ngásu	'7:neck, throat-7'
/bt + íngo/	→ b́ingo	'8:neck, throat'
/st + úkwá-su/	→ sukwásu	'7:yam (generic)-7'
/bt + úkwá/	→ b́ukwá	'8:yam (generic)'

3.3.2 Height coalescence: low + high

In the following instances of a sequence of a low prefix vowel and a high prefix vowel, the process of height coalescence results in a single mid vowel.

(3.102) Coalescence of low + high vowel-height features of prefix vowels

$$\left[\begin{array}{c} +\text{syllabic} \\ +\text{low} \end{array} \right] + \left[\begin{array}{c} +\text{syllabic} \\ +\text{high} \\ -\text{round} \end{array} \right] \rightarrow \left[\begin{array}{c} +\text{syllabic} \\ -\text{high} \\ -\text{low} \\ -\text{round} \end{array} \right]$$

Coalescence of a low prefix vowel and a high unrounded prefix vowel results in a mid unrounded vowel.

a. verbal prefixes: V₁ low and V₂ high

The first person singular object prefix **t-** can be preceded by subject prefix **(C)a-**, negative **ka-**, Conditional **ka-**, Inchoative aspect **-^hná^h-** and Infinitive **ká-**. The following examples show that the [+high] feature of V₂ is lost, whereas its position feature is retained.

(3.103)a. *subject prefix (C)a- and 1SG object prefix t-*

/bá + i-gbodyó/ ¹⁵⁹	→ bégbodyó	'they smeared me'
/bá + i-lúmbó/	→ b́é ^h lúmbó	'they buried me'
/bá + t-kúlá/	→ b́é ^h kúlá	'they untied me'

¹⁵⁹ /bá-t-gbody-á/ 3PL^p-1SG.O-smear-FV.

- b. *negative prefix ka-* and *1SG object prefix ɪ-*
 /bá-ká+i-gbodyigu/¹⁶⁰ → bákégbodyigu 'they will not smear me'
 /bá-ká+i-lúmbigu/ → báké⁴lúmbigu 'they will not bury me'
 /bá-ká+ɪ-kólu/ → báké⁴kólu 'they will not untie me'
- c. *Conditional prefix ka-* and *1SG object prefix ɪ-*
 /ba-ka+i-gbodyó/¹⁶¹ → ba⁴kegbodyó 'if they smear me'
 /ba-ka+i-lúmbó/ → ba⁴kelúmbó 'if they bury me'
 /ba-ka+ɪ-kóla/ → ba⁴kekóla 'if they untie me'
- d. *Inchoative aspect prefix -^Lná^L-* and *1SG object prefix ɪ-*
 /bá-^Lná^L+i-gbodyo/¹⁶² → bá⁴négbodyó 'they are about to smear me'
 /bá-^Lná^L+i-lúmbo/ → bá⁴né⁴lúmbo 'they are about to bury me'
 /bá-^Lná^L+ɪ-kóla/ → bá⁴né⁴kóla 'they are about to untie me'
- e. *Infinitive prefix ká-* and *1SG object prefix ɪ-*
 /bá ^Lká+i-gbodyó/¹⁶³ → bá ⁴kégbodyó 'they are smearing me'
 /bá ^Lká+i-lúmbó/ → bá ⁴ké⁴lúmbó 'they are burying me'
 /bá ^Lká+ɪ-kóla/ → bá ⁴ké⁴kóla 'they are untying me'

b. noun-class prefixes: V₁ low and V₂ high

The noun-class prefix ɪ- of classes 1c or 9a can be preceded by the noun prefix **ba-** of classes 2 or 2+9. The following examples show that that the [+high] feature of V₂ is lost, whereas its position feature is retained.

- (3.104) *classes 2 or 2+9 prefix ba-* and *classes 1c or 9c ɪ-*
- | | | | |
|--------------|---|----------|---------------------|
| ba + ɪ-mbúbú | → | be-mbúbú | '2:1c-civettes' |
| ba + í-bőko | → | be-bőko | '2:1c-pigeons, sp.' |
| ba + ɪ-duma | → | be-duma | '2+9:9a-lake' |
| ba + i-dúlu | → | be-dúlu | '2+9:9a-big noise' |

¹⁶⁰ /bá-ká-ɪ-gbody-ɪ-gu/ 3PL-NEG-1SG.O-smear-FV-NEG.

¹⁶¹ /bá-ka-ɪ-gbody-á/ 3PL-COND-1SG.O-smear-FV.

¹⁶² /bá-^Lná^L-ɪ-gbody-á/ 3PL-INCH-1SG.O-smear-FV.

¹⁶³ /bá ^Lká-ɪ-gbody-á/ 3PL:be 9b-1SG.O-smear-FV.

3.3.3 Height coalescence: high + low

In the instance of a sequence of a high vowel and a low suffix vowel, the process of height coalescence results in a single mid vowel.

(3.105) Coalescence of high + low vowel-height features

$$\begin{bmatrix} +\text{syllabic} \\ +\text{high} \\ \alpha \text{ round} \end{bmatrix} + \begin{bmatrix} +\text{syllabic} \\ +\text{low} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{syllabic} \\ -\text{high} \\ -\text{low} \\ \alpha \text{ round} \end{bmatrix}$$

Coalescence of a high vowel and a low vowel results in a mid vowel, while preserving the value for roundness of the former.

Constraint: applies only to the [−ATR] vowel of a -CV- verb root and the verb-final vowel.¹⁶⁴

A high vowel of a [−ATR] -CV- verb root is followed in the Infinitive form by the verb-final vowel **-a**. This process of height coalescence causes the verb root [−ATR] high vowels /i/ and /u/ to lose their [+high] feature. The feature for roundness of the first vowels in the sequence is retained. The resulting vowels are /ε/ and /ɔ/ respectively. Examples include:

- (3.106)a. /ká-ti-á/ → ká-tě '9b-put aside:FV'
 /ká-síu-á/ → ká-syé '9b-pass (time), sleep:FV'
 b. /ká-pu-á/ → ká-pǒ '9b-rot:FV'
 /ká-múu-á/ → ká-mwó '9b-kill, cut down:FV'

When the final vowel of a verb root is [+ATR], it is realized as a glide preceding a suffix vowel: /i/ is desyllabified to /y/ and /u/ to /w/.

3.3.4 Heterosyllabification

In a number of morphological contexts, neither V₁-elision nor height coalescence take place to resolve the vowel hiatus. The vowel sequence is left unchanged and

¹⁶⁴ The difference between height coalescence and desyllabification in monosyllabic verbs can be attributed to the lack of a [+ATR] low vowel in the Liko vowel system. The [+ATR] counterpart of /a/ is /o/, which is not a low vowel, hence the conditions for height coalescence are not met.

the two vowels are syllabified into separate syllables. The morphological contexts include:

- vowel-initial verb roots preceded by the Infinitive prefix;
- the reflexive prefix or an object prefix preceded by the Infinitive prefix;
- nouns with stem-initial high round vowels.

Examples of vowel-initial verb roots preceded by the Infinitive prefix:

(3.107) *Infinitive prefix ká-*

/ká + uná/ ¹⁶⁵	→ [káná]	'to see'
/ká + ulá/	→ [káulá]	'to break'
/ká + alá/	→ [káalá]	'to cleave'

Examples of the reflexive prefix or an object prefix preceded by the Infinitive prefix:

(3.108)a. *Infinitive prefix ká- and reflexive prefix ĩ-*

/ta ká + ĩ-gbodyó/ ¹⁶⁶	→ [ta káĩgbodyó]	'we are smearing ourselves'
/ta ká + ĩ-lúmbó/	→ [ta káilúmbó]	'we are burying ourselves'
/ta ká + ĩ-kúlá/	→ [ta káukúlá]	'we are untying ourselves'

b. *Infinitive prefix ká- and 2SG object prefix u-*

/ta ká + u-gbodyó/ ¹⁶⁷	→ [ta káugbodyó]	'we are smearing you (sg)'
/ta ká + u-lúmbó/	→ [ta káulúmbó]	'we are burying you (sg)'
/ta ká + u-kúlá/	→ [ta káukúlá]	'we are untying you (sg)'

c. *Infinitive prefix ká- and class 2 object prefix ů-*

/ta ká + ů-gbodyó/ ¹⁶⁸	→ [ta káũgbodyó]	'we are smearing them'
/ta ká + ů-lúmbó/	→ [ta káulúmbó]	'we are burying them'
/ta ká + ů-kúlá/	→ [ta káukúlá]	'we are untying them'

Examples of nouns with root-initial high round vowels /u u/ preceded by classes 2 or 2 + 9 prefix **ba-** include:

¹⁶⁵ /ká-ın-á/ 9b-see-FV.

¹⁶⁶ /ta ká-ĩ-gbody-á/ 1PL:be 9b-REFL-smear-FV.

¹⁶⁷ /ta ká-u-gbody-á/ 1PL:be 9b-2SG.O-smear-FV.

¹⁶⁸ /ta ká-ũ-gbody-á/ 1PL:be 9b-2.O-smear-FV.

- (3.109) *classes 2 or 2+9 prefix 6a-*
 /6a + úmbó/ → [6aúmbó] '2-squirrel, sp.'
 /6a + úzu/ → [6aúzu] '2+9-island'

Examples of nouns with root-initial high round vowels /u u/ preceded by the class 5 prefix **h-** include:

- (3.110) *class 5 prefix h-*
 /h + úgu/ → [húgu] '5-charm'
 /h + úwa/ → [húwa] '5-coloured leaf'

3.3.5 Desyllabification

When a morphological process creates a CV₁ + V₂ sequence where V₁ is a high vowel and V₂ is mid or low, the process of desyllabification changes V₁ into a palatal or labial-velar oral sonorant, depending on the [round] value of V₁. This is a frequent process in monosyllabic [+ATR] -CV- verb roots, as well as in disyllabic -CVCV- verb roots. For example, **-đu-** 'move' in the Infinitive form with final vowel **-a** is realized as **kóđwǒ** 'to move', **-mi-** 'swallow' as **kómyǒ** 'to swallow'¹⁶⁹ and **-mísi-** 'have one child after the other' as **kámísyá**.

(3.111) Desyllabification

$$\left[\begin{array}{l} +\text{syllabic} \\ +\text{high} \\ \alpha \text{ back} \end{array} \right] \rightarrow \left[\begin{array}{l} -\text{syllabic} \\ +\text{oral sonorant} \\ +\text{high} \\ \alpha \text{ back} \end{array} \right] / [+ \text{consonantal}] - \left[\begin{array}{l} +\text{syllabic} \\ -\text{high} \end{array} \right]$$

A high vowel between a consonant and a vowel becomes a palatal or labial-velar oral sonorant while keeping its feature specification for roundness.

In [-ATR] high vowel -CVV- verbs such as **-sí-** 'pass (time), sleep', the second vowel is subject to height coalescence with the final vowel **-a** of the Infinitive and the first vowel is desyllabified, resulting in **ká-syé**.

Desyllabification does not take place when the vowel of the verb suffix, V₂, is identical in height to the final vowel of the root, V₁, as in the following examples

¹⁶⁹ /a/ assimilates to /o/ in this [+ATR] context.

(**ká-** is the Infinitive prefix, **-l-** the Resultative extension, **-ik-** the Neuter extension). Instead, two identical high vowels are reduced to a single vowel.

(3.112)	<u>root</u>	<u>suffix</u>	<u>Infinitive</u>	
	/-kɪŋɪ-/	/-a/	kákingyá	'to taste, to try'
		/-l-a/	kákingílá	'to learn'
	/-misi-/	/-a/	kómisyó	'to sow'
		/-ik-an-a/	kómisíková	'to be spread'

As for the Benefactive extension **-l-**, final /ɪ/ is desyllabified preceding the verb-final **-a**:

(3.113)	<u>root</u>	<u>suffix</u>	<u>Infinitive</u>	
	/-bɪmɪ-/	/-a/	kábɪmyá	'to spy'
		/-l-a/	kábɪmɪlyá	'to spy for s.o.'
	/-misi-/	/-a/	kómisyó	'to sow'
		/-l-a/	kámisílyó	'to sow for s.o.'

In some verb forms, the glide is assumed to be lexicalized, e.g. **ká-bɪky-á** [káβíkjá] 9b-declare-FV, 'to declare', **ká-bɪky-lɪy-á** [káβíkjljá], 9b:1.O-declare-BEN-FV, 'to plead for s.o.' and **ká-bɪky-ís-ó** [káβíkjisó], 9b:1.O-declare-CAUS-FV, 'to make s.o. talk after torture'.

In the case of vowel-initial classes 7 or 8 nouns, the vowel of the noun-class prefix is desyllabified preceding /a/. Examples include:

(3.114)	<i>class 7 prefix</i> sɪ- <i>and class 8 prefix</i> βɪ-		
/sɪ + angí-sɔ /	→	[syangísɔ]	'7-shelter, den, lair-7'
/sɪ + á ^h ngá-sɔ /	→	[syá ^h ngásɔ]	'7-dry season, year-7'
/βɪ + angító /	→	[βyangító]	'8.shelter, den, lair'
/βɪ + ánga /	→	[βyǎnga]	'8.dry season, year'

Notice how the vowel sequence does not lead to height coalescence (see 3.3.3). The difference compared to (3.106a) is that the second vowel in the sequence in (3.114) is a stem vowel.

