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VOWEL HARMONY AND THE MORPHOPHONOLOGY OF THE VERB ENDING *-IDE IN THE KIKONGO LANGUAGE CLUSTER (WEST-COASTAL BANTU): A HISTORICAL-COMPARATIVE ANALYSIS

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This article presents a historical-comparative analysis of the morphophonological effects of the reflexes of the Proto-Bantu (PB) verb ending ***-ide**, i.e., imbrication and vowel lowering, in the Kikongo Language Cluster (KLC). It focuses on a type of vowel lowering that is different from progressive Vowel Height Harmony (pVHH) as triggered by mid vowels in the root (Goes and Bostoen 2019). Kikongo stands out in being the sole Bantu group to include languages that miss pVHH but display vowel harmony in the presence of ***-ide**. After having identified cross-linguistic patterns of variation and uniformity in the morphophonological effects of PB ***-ide** reflexes in four relatively well-described Kikongo languages that do not undergo pVHH, we examine the geographic distribution of those patterns across the KLC and observe a south-north bias, especially in the spread of vowel lowering.

The morphophonological effects of ***-ide** reflexes across the KLC are far more widespread than pVHH, both in terms of geography and genealogy. Hence, reconstructing vowel lowering of and triggered by the reflex of ***-ide** to Proto-Kikongo (PK) is far more likely than would have been the reconstruction of pVHH. We conclude that when not imbricated into a preceding morpheme, the reflex of ***-ide** always had two identical vowels in PK. It was either ***-idi** or ***-ele** depending on the root vowel, i.e., a bisyllabic final suffix whose V1 and V2 were identical and whose intermediary consonant was coronal.

Finally, we account for the non-lowering of ***-ide**, occurring mostly in the northern part of the KLC, as an innovation resulting from the push back of this morphophonological alternation. We argue that those Kikongoid, West and North Kikongo languages which miss ***-ide** vowel lowering lost it due to analogical levelling aiming at paradigm uniformity. Likewise, some South and North Kikongo languages constrained its effects following the emergence of pVHH. Thus, rather than being a conservative relic area not affected by ***-ide** vowel lowering, the northwestern part of the KLC and Kihungan in the far east are innovative in having dismantled much of the morphophonology of ***-ide**. Today's variation within KLC is best explained by varieties being more or less progressive in their tendency towards disactivating the PK morphophonology of ***-ide**.

Keywords: Bantu, Kikongo Language Cluster, vowel harmony, vowel lowering, imbrication, morphophonology, diachronic phonology, analogical levelling, classification, subgrouping

1. Introduction

Vowel Height Harmony (VHH), i.e., the requirement of adjacent vowels in a given grammatical domain to agree in terms of height (Finley 2008: 1; Gafos and Dye 2011: 2164), is a widespread long-distance assimilatory phonological process in Bantu. This is especially the case for progressive Vowel Height Harmony (pVHH), which is most commonly observed with the high vowel of verbal derivation suffixes reconstructed in PB with a second-degree, near-close vowel (i.e., ***ɪ** and ***ʊ**), such as applicative ***-ɪd**, neuter ***-ɪk**, impositive ***-ɪk** and separative ***-ʊd**/***-ʊk** (Schadeberg 2003:72; Schadeberg & Bostoen 2019:173). When the preceding verb root contains a mid vowel, pVHH lowers their high vowel to a mid vowel (Hyman 2003: 46; Pulleyblank 2011: 497). Across Bantu, the application of pVHH varies as to whether (i) it equally affects verbal derivation suffixes with a front

and back vowel; (ii) it is only triggered by mid vowels in the root or also occurs when the root vowel is low; and (iii) it only has scope over suffixes reconstructed with PB *ɪ and *ʊ or also extends to those reconstructed with the first-degree front vowel ***i**, such as causative ***-ic** (Bastin 1986: 73ff)[1] and "anterior" ***-ide** (Bastin 1983: 12ff)[2]. In her Bantu-wide study on the morphophonology of the latter verb ending, Bastin (1983: 22) points out that Kikongo stands out in being the sole language group to include varieties that exclusively display VHH in the presence of ***-ide**. To account for the fact that certain suffixes undergo vowel lowering only when they are both preceded by a root with a mid vowel and followed by ***-ide** in some Kikongo varieties, especially Kiyaka (H31), Hyman (1998) argues that the final mid front vowel of ***-ide** is needed to trigger an assimilatory process which he calls 'plateauing' or 'bridging'. It is distinct from pVHH as defined above in that the mid property of the root vowel and the final vowel of ***-ide** are required conjointly to activate VHH. Relying on data from Ruttenberg (1971), Hyman (1999: 259) argues that in Kiyaka (H31) "neither the ***i*** of the applicative or causative suffixes ***-il*** and ***-is***, nor the ***u*** of the reversive suffixes ***-uk*** and ***-ul*** undergo lowering after ***e*** and ***o***." The data in (1) illustrate the total absence of pVHH with those suffixes and contrast them with the occurrence of vowel lowering when the same verbs end in ***-ídí***, the Kiyaka reflex of PB ***-ide**, the assimilation called 'plateauing' or 'bridging' by Hyman (1998).

(1) Kiyaka (H31) (Ruttenberg 2000)

No pVHH			Vowel lowering in ***-ide** reflex	
bóók-íl-á	'call for' (APPL)	vs.	*bóók-él-élé*	(°*bóók-íl-ídí*)
séény-ís-á	'make glean' (CAUS)	vs.	*séény-ésé*	(°*séény-ís-ídí*)
lóng-úk-á	'learn, study' (SEP.INTR.)	vs.	*lóng-ók-élé*	(°*lóng-úk-ídí*)
téémb-úl-á	'peel off bark' (SEP.TR.)	vs.	*téémb-wélé*	(°*téémb-úl-ídí*)

The fact that the underlying °***ís-ídí*** and °***úl-ídí*** sequences in the second and last example in (1) respectively are not realized as ***#-és-élé*** and ***#-ól-élé***, but as ***-ésé*** and ***-wélé***, is due to another morphophonological phenomenon commonly triggered by reflexes of ***-ide** across Bantu.[3] In Bantu studies, this kind of morpheme merger is known as 'imbrication' (Bastin 1983). It is characterized by the loss of the consonant of the final morpheme, in this case ***-ídí***, and the insertion of its vowel in front of the preceding consonant: V1 C1 V2 C2 V3 → V1 V2 C1 V3, i.e., °***séény-ís-ídí*** → °***séény-és-élé*** (vowel lowering) → °***séény-éésé*** (imbrication) → ***séény-ésé*** (vowel shortening) and °***téémb-úl-ídí*** → °***téémb-ól-élé*** (vowel lowering) → °***téémb-óélé*** (imbrication) → ***téémb-wélé*** (glide formation). As it will become clear throughout this article, the actual surface realization of imbrication depends on the sequence of morphemes involved and on the language in which it happens.

Finding out how the morphophonology of ***-ide** varies across the Kikongo Language Cluster (KLC), how suffix vowel lowering in its presence differs from and interacts with pVHH and how the synchronic cross-linguistic variation emerged through time is the central aim of the current article.

The KLC constitutes a discrete branch of West-Coastal Bantu (WCB), itself a major clade of the Bantu family (de Schryver *et al.* 2015; Grollemund *et al.* 2015; Bostoen and de Schryver 2018b; a;

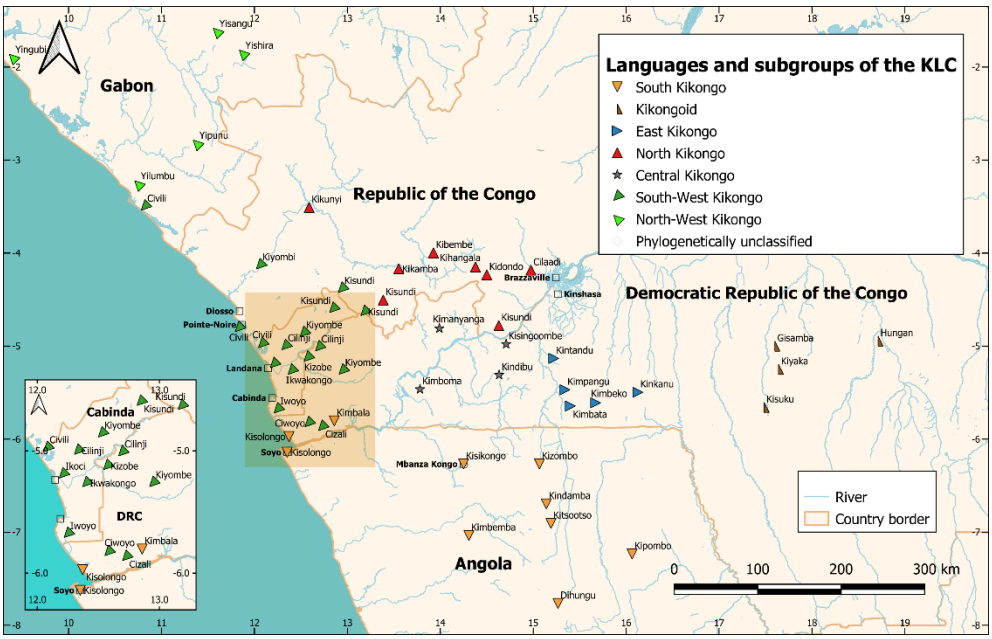
[1] Bastin (1986) reconstructs this causative suffix as ***-ici**, unlike Meeussen (1967: 92) who originally reconstructed it without a final vowel. Reassessing the evidence provided by Bastin (1986), Bostoen and Guérois (2022) argue for the need to distinguish between two causative suffixes with a different time depth: 1. PB ***-ic** and 2. ***-ɪki** of later coinage.

[2] The label "anterior" is from Nurse (2008: 24), who uses it as a synonym of "perfect". Bastin (1986) rather refers to ***-ide** as "perfective". The semantic value of the suffix varies across Bantu and is not relevant to the present study focusing on its morphophonology behavior in the Kikongo Language Cluster (KLC).

[3] As we use the asterisk to mark historical reconstructions in this article, we cannot use it here to signal ill-formedness, which is a common convention in linguistics. We therefore use the superscript pound sign, i.e., #, to mark unacceptable forms. The degree sign, i.e., °, indicates synchronically underlying morphemes.

Pacchiarotti *et al.* 2019). It not only includes the languages of Guthrie's Kongo (H10) group, but also the Shira-Punu group (B40), the Yaka group (H30), Kihungan (H42) of the Mbala-Hungana group, and Gisamba (L12) of the Pende group (cf. Guthrie 1971; Maho 2009). The KLC stretches from the south of Gabon to the north of Angola, including parts of the Republic of the Congo and the Democratic Republic of the Congo and the Angolan exclave of Cabinda. See map in Figure 1.

Figure 1: Languages and language varieties spoken in the KLC including those not selected for this article because of lack of data



As for pVHH independently from ***-ide**, Goes and Bostoen (2019) show that it does not go back to Proto-Kikongo (PK), the most recent common ancestor of the KLC, and that its different subtypes, i.e., asymmetric, symmetric, back, irregular and total, are later developments restricted to specific subgroups, as summarized in Table 1.

Table 1: Distribution of pVHH types within KLC (based on Goes and Bostoen 2019)

West Kikongo (WK)		**East Kikongo (EK)**		**North Kikongo (NK)**	
Yisangu	NO	Kintandu	NO	Kikunyi	NO
Yipunu	NO	Kinkanu	NO	Kibembe	TOTAL/NO
Yilumbu	NO	Kimbeko	NO	Kidondo	BACK
Civili	NO	Kimbata	NO	Kikamba	BACK
Kiyombi	NO	**Central Kikongo (CK)**		Kisundi[4]	BACK
Kiyombe	NO	Kimanyanga	NO	Kihangala	NO
Kisundi	NO	Kindibu	SYM	Cilaadi	SYM
Cilinji	NO	**South Kikongo (SK)**		Kilaadi	NO
Ikoci	NO	South Kikongo (17TH c.)	SYM	Kilaari	IRREG
Ikwakongo	NO	Kisolongo	ASYM	**Kikongoid (KK)**	
Kakongo (18 c.)	IRREG	Kizombo	SYM/IRREG	Kiyaka	NO
Kakongo (19 c.)	IRREG				
Iwoyo (20 c.)	IRREG	Kitsootso	IRREG	Kisuku	NO
Iwoyo (21 c.)	NO	Dihungu	IRREG		
Ciwoyo	NO				

The specific outcomes of pVHH do not really matter here. What does matter for this article is the fact that in languages undergoing pVHH of some kind the morphophonological effects of ***-ide** in terms of vowel lowering are hard to distinguish from those of pVHH more generally. This is shown in (2) and (3) with data from Kisolongo, as documented by Visseq (1889). In this late 19th c. source, pVHH is asymmetric, unlike in the early 20th c. grammar of Tavares (1915), where it is symmetric, possibly due to more intensive contact with Kisikongo, the more prestigious South Kikongo language spoken further east in the ancient capital area of the former Kongo kingdom. In 19th c. Kisolongo as reported in Visseq (1889), only suffixes with a high front vowel, such as causative ***-is*** (***-iss*** in Visseq's orthography) in (2a) or neuter ***-ik*** in (2b), always undergo vowel lowering when they follow a root with a mid vowel. Suffixed to the forms in (2a) and (2b), the Kisolongo reflex of ***-ide**, i.e., ***-idi***, undergoes vowel lowering if and only if the preceding suffix(es) undergo(es) pVHH. As illustrated in (2a), ***-is*** and ***-idi*** undergo imbrication to either ***-isi*** (without pVHH) or ***-ese*** (with pVHH), and not #***-iisi*** or #***-eese***. Vowel length is not present, or if present phonetically not noted, because phonologically not contrastive. In (2b), it is shown that when ***-ik*** is lowered, the reflex of ***-ide** also is when suffixed to it, in this case without imbrication. If ***-ik*** is not lowered, no lowering at all takes place. The examples in (2c) do not have any suffixes and show that vowel lowering and pVHH yield the same surface results on the reflex of ***-ide**: it is realized as ***-ele*** or ***-ene*** when the root has a front or mid back vowel and as ***-idi*** or ***-ini*** when not. The realization of ***-ide** with a nasal consonant, a phenomenon known as 'nasal harmony' (Greenberg 1951; Schadeberg 1990: 24-26), occurs whenever the root ends in a nasal and this across Bantu, just like the 'imbrication' of ***-ide** into the root ***món** 'see' (BLR 2206) (cf. Bastin *et al.* 2002): °***món-ide*** → °***món-ine*** (nasal harmony) → °***món-ene*** (vowel harmony) → °***móene*** (imbrication) → ***mwéne*** (glide formation) (Bastin 1983: 186).

[4] This is the Kisundi variety spoken in the Mboko-Songho district in Congo, also known as Boko-Songho, Boko-Songo, Mboukou Nsongo. Unlike the other languages in this table and the following maps, its affiliation is not based on phylogenetic research, as it has not been included in such a classification so far. It is classified here as North Kikongo because it manifests back pVHH, a shared innovation unique to this subgroup of the KLC.

(2) Kisolongo (H16a) (Visseq 1889)

a.	*zenz-ess-a*	‘sweeten’	vs.	*zenz-esse*	(°*zenz-is-idi*)
	sek-ess-a	‘sharpen’	vs.	*sek-esse*	(°*sek-is-idi*)
	tom-ess-a	‘make good’	vs.	*tom-esse*	(°*tom-is-idi*)
	lomb-ess-a	‘blacken’	vs.	*lomb-esse*	(°*lomb-is-idi*)
	samb-iss-a	‘fill, charge, embark’	vs.	*samb-issi*	(°*samb-is-idi*)
	voud-iss-a	‘broaden, widen’	vs.	*voud-issi*	(°*vud-is-idi*)
b.	*tent-ek-a*	‘swim’	vs.	*tent-ek-ele*	(°*tent-ik-idi*)
	somp-ek-a	‘hire’	vs.	*somp-ek-ele*	(°*somp-ik-idi*)
	koub-ik-a	‘care for, use sparingly’	vs.	*koub-ik-idi*	(°*kub-ik-idi*)
c.	*zeng-a*	‘mutilate’	vs.	*zeng-ele*	(°*zeng-idi*)
	somp-a	‘hire, rent’	vs.	*somp-ele*	(°*somp-idi*)
	mon-a	‘see’	vs.	*mouene*	(°*mon-idi*)
	voun-a	‘deceive’	vs.	*voun-ini*	(°*vun-idi*)
	tal-a	‘admire’	vs.	*tad-idi*	(°*tal-idi*)

The asymmetry can be seen only with high back vowel suffixes, such as the intransitive separative suffix ***-uk*** (<***-ouk***> in Visseq’s orthography) in (3a), and transitive separative suffix ***-ul*** (<***-oul***> in Visseq’s orthography). These only undergo lowering when the root has a mid back vowel, as in the first two examples in (3a) and the first four examples in (3b), but not when it has a mid front vowel, as in the last two examples in (3a) and (3b). As the last example in (3a) shows, when ***-is*** follows a non-harmonizing ***-uk*** it also does not undergo pVHH. There is no imbrication of ***-uk-idi*** but there is imbrication of ***-ul-idi***, whether lowered or not.

In sum, when it comes to vowel lowering, the morphophonological behavior of the reflex of ***-ide** could be seen as entirely accountable for through the rules of pVHH in Kisolongo, as is the case in all other Kikongo varieties manifesting pVHH of some sort (cf. Table 1).

(3) Kisolongo (H16a) (Visseq 1889)

a.	*vol-ok-a*	‘fall’	vs.	*vol-ok-ele*	(°*vol-uk-idi*)
	zot-ok-a	‘thrust’	vs.	*zot-ok-ele*	(°*vol-uk-idi*)
	sek-ouk-a	‘emigrate’	vs.	*sek-ouk-idi*	(°*sek-uk-idi*)
	lenv-ouk-iss-a	‘submit’	vs.	*lenv-ouk-issi*	(°*lenv-uk-is-idi*)
b.	*tomb-ol-a*	‘disembark, unload’	vs.	*tomb-ouele*	(°*tomb-ul-idi*)
	somb-ol-a	‘provoke’	vs.	*somb-ouele*	(°*somb-ul-idi*)
	tob-ol-a	‘pierce’	vs.	*tob-ouele*	(°*tob-ul-idi*)
	lomb-ol-ol-a	‘resort to, fall back on’	vs.	*lomb-ol-ouele*	(°*lomb-ul-idi*)
	teng-oul-a	‘cut’	vs.	*teng-ouidi*	(°*teng-ul-idi*)
	tek-ou-loul-a	‘resell’	vs.	*tek-oul-ouidi*	(°*tek-ul-ul-idi*)
c.	*fik-oul-a*	‘print’	vs.	*fik-oul-ouidi*	(°*fik-ul-idi*)
	kamb-oul-a	‘hustle’	vs.	*kamb-ouidi*	(°*kamb-ul-idi*)

The same asymmetry is found in present-day Kisolongo, both to the north and the south of the Congo Delta, as shown with examples in (4) from Kisolongo as spoken today in Muanda (DRC) and in (5) from Soyo (Angola).

(4) Kisolongo (DRC) (Fieldnotes Heidi Goes 2019)

Yaleembekele o nkeentu ame.	(°*ya-leemb-ik-idi*)	‘I just calmed down my wife.’
Yana bavolokele ku manga.	(°*ba-vol-uk-idi*)	‘The children fell from the mango tree.’
Madeezo mabotomokene.	(°*ma-bot-um-uk-idi*)	‘The beans are well cooked.’
Undeemvukidi o mene wawu.	(°*u-n-leemv-uk-idi*)	‘He has forgiven me this morning.’
Akweelukidi.	(°*a-kweel-uk-idi*)	‘She is married.’

(5) Kisolongo (Angola) (Fieldnotes Heidi Goes 2020)

Bavolokele.	(°*ba-vol-uk-idi*)	‘They fell.’		
yeel-uk-a	‘heal’	vs.	*yeel-uk-idi*	(°*yeel-uk-idi*)
leemv-uk-a	‘forgive’	vs.	*leemv-uk-idi*	(°*leemv-uk-idi*)

There is only one context in which Kikongo varieties with pVHH of some type manifest vowel lowering in the presence of ***-ide** that cannot be accounted for as an instance of pVHH more generally, namely when following suffixes having the low central vowel /**a**/, such as ***-am*** in (6). In this specific context, the reflex of ***-ide** may undergo vowel lowering, even if the root has no mid vowel. This is shown in (6) for the South Kikongo variety Dihungu, where pVHH is irregular and contact-induced (Goes and Bostoen 2019). This generalized application of vowel lowering following suffixes with /**a**/ indicates that this specific aspect of ***-ide** morphophonology in the KLC is independent from more common Bantu pVHH.

(6) Dihungu (Fieldnotes Heidi Goes 2015)

Awu abetamene.	(°*a-bet-am-idi*)	‘They were beaten.’
Yandi yekamene ku kiyaka.	(°*yek-am-idi*)	‘He leant against the wall.’
Yandi fukamene.	(°*fuk-am-idi*)	‘He kneeled down.’
Awu akubamene.	(°*a-kub-am-idi*)	‘They prepared themselves.’

The structure of this article is as follows. In Section 2, we discuss extensively the morphophonology of ***-ide** reflexes in four relatively well described Kikongo varieties that do not undergo pVHH but do lower the reflex of ***-ide**. They belong to four distinct subgroups of the KLC. In Section 3 the patterns of vowel lowering in and triggered by ***-ide** reflexes in the KLC are described, according to the type of suffix preceding the reflexes of ***-ide**. Extra examples can be found in the Appendix. In Section 4 these patterns are summarized and analyzed to determine which features can be reconstructed to PK. In Section 5, by way of a conclusion, the patterns as we reconstruct them to PK are treated.

2. Identifying cross-linguistic uniformity and variation in the morphophonology of *-ide

In this Section we take a closer look at four languages from the KLC which do not manifest pVHH (cf. Table 1) to get a better understanding of how suffixal vowel lowering interacts with the morphophonology of ***-ide**. We chose these languages because the morphophonological behavior of their ***-ide** reflex is relatively well described: 20th c. Kiyaka (Kikongoid) (§2.1), 20th c. Kintandu (East Kikongo) (§2.2), 20th c. Kimanyanga (Central Kikongo) (§2.3) and the late 19th c. variety spoken in Kakongo (West Kikongo) (§2.4). Moreover, as indicated between brackets, they belong to four distinct subgroups of the KLC (de Schryver *et al.* 2015; Bostoen and de Schryver 2018b; a), which allows us to make a preliminary assessment of the possible ancienty of certain morphophonological features of ***-ide**.

2.1 Kiyaka How the Kiyaka reflex of ***-ide** is involved in suffixal vowel lowering specifically and its morphophonology more generally are dealt with in depth by Hyman (1998). We retake here the main morphophonological characteristics of the reflex of ***-ide** chiefly relying on Kiyaka data from Van Den Eynde (1968) and Ruttenberg (2000).

In Kiyaka, the non-lowered reflex of ***-ide** is ***-idi***. It surfaces, for example, when it is suffixed directly to a root without a mid vowel, as in (7a), and is realized as ***-ini***, when the root ends in a nasal, as in (7b). Its lowered allomorph ***-ele*** features when suffixed to a root with a mid vowel, as in (7c) and is realized as ***-ene*** following nasal harmony, as in (7d). The examples in (7d) show that ***-idi*** also

undergoes nasal harmony in Kiyaka when the root starts with a nasal, and not only when it ends in a nasal, as in (7b), which is more common in Bantu.

(7) Kiyaka (Ruttenberg 2000)

a.	*bíl-á*	'boil'	vs.	*bíd-idi*	(°*bid-idi*)
	fút-á	'pay'	vs.	*fút-idi*	(°*fut-idi*)
b.	*bím-á*	'pay'	vs.	*bím-ini*	(°*bim-idi*)
	hám-á	'beat (with a stone)'	vs.	*hám-ini*	(°*him-idi*)
c.	*bóók-á*	'cry, yell, shout'	vs.	*bóók-ele*	(°*book-idi*)
	téék-á	'crack'	vs.	*téék-ele*	(°*teek-idi*)
d.	*nók-á*	'rain'	vs.	*nók-ene*	(°*nok-idi*)
	méék-á	'bleat (sheep, goat)'	vs.	*méék-ene*	(°*meek-idi*)

As already shown in (7) above, the high vowels /**i**/ and /**u**/ in any suffix occurring between a root with a mid vowel and ***-idi*** are lowered to /**e**/ and /**o**/ respectively. Hyman (1998) calls this kind of vowel harmony 'plateauing' or 'bridging', because the same suffixes do not undergo vowel lowering in Kiyaka when they are just preceded by a root with a mid vowel but not followed by ***-idi***. More examples contrasting the total absence of pVHH with vowel lowering in the presence of ***-idi*** are shown in (8), i.e., with roots having a mid front vowel in (8a) and a mid back vowel in (8b). As several examples in (8) illustrate, when the suffix preceding ***-idi*** ends in a coronal consonant, i.e., /**l**/, /**n**/, /**s**/ and /**t**/, imbrication takes place. The imbrication leads to the loss of the consonant of ***-idi*** and contact between its first vowel and the vowel of the preceding suffix. When the latter vowel is a back vowel, the vowel hiatus resolution is glide formation, i.e., **°uiC$_{[+cor]}$ → wiC$_{[+cor]}$** or **°oeC$_{[+cor]}$ → weC$_{[+cor]}$**. When it is a front vowel, vowel shortening applies to the sequence of identical vowels, i.e., **°iiC$_{[+cor]}$ → iC$_{[+cor]}$** or **°eeC$_{[+cor]}$ → eC$_{[+cor]}$.**

(8) Kiyaka (Van Den Eynde 1968; Ruttenberg 2000)

a.	*lémb-íd-íl-á*	'beg'	vs.	*lémb-él-élé*	(°*lémb-il-il-idi*)
	swét-ík-ís-á	'make straight'	vs.	*swét-ék-ésé*	(°*swét-ik-is-idi*)
	téw-úk-íl-á	'pant (like bird on nest)'	vs.	*téw-ók-élé*	(°*téw-uk-il-idi*)
	béét-ík-á	'beat (with a stick)'	vs.	*béét-ek-ele*	(°*béét-ik-idi*)
	béét-úk-á	'be beaten'	vs.	*béét-ók-éle*	(°*béét-uk-idi*)
b.	*tóómb-úk-á*	'climb'	vs.	*tóómb-ok-ele*	(°*tóómb-uk-idi*)
	sók-ún-á	'pick (fruits)'	vs.	*sók-wéné*	(°*sók-un-idi*)
	bók-út-á	'murmur'	vs.	*bók-wété*	(°*bók-ut-idi*)
	kók-úm-ún-á	'have many things and carry them'	vs.	*kók-óm-wéné*	(°*kók-um-ul-idi*)
	wóóng-úl-á	'destroy'	vs.	*wóóng-wélé*	(°*wóóng-úl-idi*)

As shown in (9), the Kiyaka ***-ide** reflex can also trigger glide formation without imbrication taking place. Instead of just lowering a suffixal back vowel, it is realized as ***we***. In other words, vowel harmony does not only involve here lowering but also fronting. Such fronting of a back vowel under the influence of a front vowel in the following syllable – whether or not accompanied by diphthongization as is the case here – is a vowel mutation known as 'umlaut' (Hock 1991: 66; Bussmann *et al.* 1996: 502; Crowley and Bowern 2010: 43). This specific kind of umlaut effect is a common diachronic sound shift in several WCB languages outside of the KLC (Bostoen and Koni Muluwa 2014), amongst others in the KLC's closest relatives of the 'KLC Extended' branch, such as Nsong (B85d), Mpiin (B863), Ngong (B864), and Mbuun (B87) (cf. Pacchiarotti *et al.* 2019). In Kiyaka, it only occurs as a morphophonological change and not systematically.

(9) Kiyaka (Ruttenberg 2000)

lób-úk-á	'go out'	vs.	*lób-wek-ele*	(°*lob-uk-idi*)
tél-úng-á	'slip'	vs.	*tél-weng-ene*	(°*tel-ung-idi*)

As illustrated in (10), vowel lowering with or without umlaut effect is in free variation, at least with certain verb forms.

(10) Kiyaka (Ruttenberg 2000)

syéét-úm-úk-á	'slip'	vs.	*syéét-wem-ek-ene/syéét-om-ok-ene*	(°*syeet-um-uk-idi*)
bók-úl-úk-á	'stoop'	vs.	*bók-wel-ek-ele/bók-ol-ok-ele*	(°*bok-ul-uk-idi*)

In Kiyaka suffix sequences ending in ***-idi***, ***we*** is not only observed as the outcome of either imbrication or umlaut in back vowel suffixes following a root with a mid vowel. It also surfaces as the result of the imbrication of ***-idi*** into a suffix with a back vowel, such as ***-ul***, ***-un*** and ***-ut***, when the root has no mid vowel, as in (11). Hyman (1998: 53) considers this realization of an expected ***#wi*** as ***we*** in Kiyaka as "a phonotactic constraint barring the sequence [wi]". Whenever imbrication results in ***wi***, the latter is avoided by regressive spreading or copying the final mid vowel of ***-ide**: °***Cwile*** → ***Cwele***. As this vowel lowering happens independently of the height of the root vowel, it can be analyzed here as a purely regressive assimilatory effect of the final vowel of ***-idi***.

(11) Kiyaka (Ruttenberg 2000)

láb-úl-á	'transfer'	vs.	*láb-wéle*	(°*lab-ul-idi*)
núng-út-á	'tremble'	vs.	*núng-wété*	(°*nung-ut-idi*)

In stems hosting more than one verb extension, ***we*** resulting from ***wi*** avoidance can be copied from the suffix into which final ***-idi*** is imbricated onto preceding suffixes, even though the latter are not adjacent to ***-idi*** and therefore not directly accessible to imbrication. As shown in (12a), this right-to-left copying of ***we*** happens again irrespectively of the height of the root vowel and is thus to be seen as a purely regressive effect of the ***-ide** reflex. Instead of speaking of 'copying', Hyman (1998: 54) rather speaks of 'at-a-distance spreading' of the final vowel of the ***-ide** reflex, although he only gives examples as in (12b), which are actually instances of right-to-left 'shifting'. In (12b), ***we*** shifts from the syllable containing the suffix into which ***-idi*** was actually imbricated to the syllable immediately following the root, and is not repeated on the following syllables. Nonetheless, syllables following ***we*** do have a lowered vowel, which is still a regressive assimilatory effect of the final vowel of the ***-ide** reflex. So, one could say that ***we*** undergoes either right-to-left spreading (12a) or right-to-left shifting (12b) up to the first syllable following the root. In the dictionary of Ruttenberg (2000), cases as in (12a) are far more common than those in (12b). Finally, there are also some cases as in (12c), in which ***we*** is restricted to the syllable preceding the final of vowel of ***-idi***, i.e., to the suffix undergoing imbrication, but vowel lowering further extends leftwards up to the root whether or not accompanied by diphthongization. In other words, the regressive assimilation exerted by the final vowel of the ***-ide** reflex has a phonological domain that always includes all high vowels following the root but manifests free variation in its phonetic realization.

(12) Kiyaka (Ruttenberg 2000)

a.

land-úm-ún-á	'lengthen, stretch'	vs.	*land-wém-wéné*	(°*land-um-ul-idi*)
bénd-úm-ún-á	'turn (e.g., a stone')	vs.	*bénd-wém-wéné*	(°*bénd-um-ul-idi*)
sénd-úm-ún-á	'revile, slander'	vs.	*sénd-wém-wéné*	(°*send-um-ul-idi*)
zíng-úm-ún-á	'unroll, untie'	vs.	*zíng-wém-wéné*	(°*zing-um-ul-idi*)
lónd-úm-ún-á	'blow, inflate'	vs.	*lónd-wém-wéné*	(°*lond-um-ul-idi*)
fúf-úm-ún-á	'let fall'	vs.	*fúf-wém-wéné*	(°*fuf-um-ul-idi*)

b.	*bál-úl-úl-á*	'turn again'	vs.	*bál-wél-élé*	(°*bal-ul-ul-idi*)
	dínd-úm-ún-á	'roll (tr.)'	vs.	*dínd-wém-éné*	(°*dind-um-ul-idi*)
	kúl-úm-ún-á	'descend (tr.)'	vs.	*kúl-wém-éné*	(°*kul-um-ul-idi*)
c.	*wúng-úm-ún-á*	'provoke a big landslide'	vs.	*wúng-wóm-wéné*	(°*wung-um-ul-idi*)
	búl-úk-út-á	'grind'	vs.	*búl-ók-wété*	(°*bul-uk-ut-idi*)

It is important to note that the regressive assimilatory effects linked with ***wi*** avoidance are not restricted to the final vowel of the ***-ide** reflex but are also observed when other suffixes with a front vowel, such as causative ***-is*** and applicative ***-il***, imbricate into a preceding suffix with a back vowel, independently of the height of the root vowel. In such case, as discussed by Hyman (1998: 53-54) and shown in (13), the verb's final vowel /**a**/ is copied, not only to the adjacent syllable as in (13a), but as far as the syllable following the root when this is the one hosting the imbricated suffix as in (13b). This shows that the regressive assimilatory effects of the final vowel of the ***-ide** reflex are only one specific manifestation of a wider phonological constraint in Kiyaka, i.e., ***wi*** avoidance, and not so much a particular morphophonological feature of ***-idi***.

(13) Kiyaka (Ruttenberg 2000)

a.	*zíb-úl-á*	'open'	vs.	*zib-was-a*	(°*zib-ul-is-a*)
	húl-úl-á	'save, deliver'	vs.	*húl-wás-á*	(°*húl-ul-is-a*)
	bál-úl-á	'overturn'	vs.	*bal-was-a*	(°*bal-ul-is-a*)
	yék-úl-á	'separate'	vs.	*yék-wás-á*	(°*yék-ul-is-a*)
	tób-úl-á	'pierce'	vs.	*tob-was-a*	(°*tob-ul-is-a*)
b.	*kab-úl-á*	'return'	vs.	*káb-wás-ál-á*	(°*káb-ul-is-il-a*)
	mók-á	'chatter'	vs.	*mók-wán-án-á*	(°*mók-ul-il-il-a*)
	yék-úl-á	'separate'	vs.	*yék-wás-án-á*	(°*yék-ul-is-an-a*)
	zíímb-úl-á	'explain, show'	vs.	*zíímb-wás-án-á*	(°*zíímb-ul-is-an-a*)

When a verb suffix ending in a coronal consonant has the low central vowel **a**, the imbrication of the ***-idi*** leads to the creation of a mid front vowel, as shown in (14a): **°aiC$_{[+cor]}$ → eC$_{[+cor]}$**. The verb's final vowel is then also lowered to /**e**/. This lowering happens whatever the root vowel is. When the imbricated suffix is disyllabic and also contains /**a**/ in its first syllable, this vowel is either maintained as is, as in (14b), or also shifts to /**e**/, whatever the root vowel is, as in (14c). So, here again, as with imbrication of ***-idi*** into suffixes with a back vowel, we see that vowel lowering can spread leftward to affect all low vowels following the root, but that there is free variation in its phonetic realization in that it can also not extend up to the root.

(14) Kiyaka (Ruttenberg 2000)

a.	*káb-án-á*	'to divide'	vs.	*káb-éné*	(°*káb-an-idi*)
	sík-ám-ás-á	'to wake up (tr.)'	vs.	*sík-ám-ésé*	(°*sík-am-as-idi*)
	fwááfw-át-á	'search profoundly'	vs.	*fwááfw-été*	(°*fwááfw-at-idi*)
b.	*fít-alal-a*	'be patient'	vs.	*fít-alélé*	(°*fít-alal-idi*)
	tal-ásán-á	'look at each other'	vs.	*tál-áséné*	(°*tál-asan-idi*)
	yál-ángán-á	'lament, suffer'	vs.	*yál-ángéné*	(°*yál-angan-idi*)
c.	*kák-álál-á*	'block the road'	vs.	*kák-élélé*	(°*kák-alal-idi*)
	kúnd-álál-á	'bend; boast'	vs.	*kúnd-élélé*	(°*kúnd-alal-idi*)
	nát-ásán-á	'help each other to carry'	vs.	*nát-éséné*	(°*nát-asan-idi*)
	lwéék-ásán-á	'injure each other'	vs.	*lwéék-ésén-é*	(°*lwéék-asan-idi*)
	món-ásán-á	'meet/see each other'	vs.	*món-éséné*	(°*món-asan-idi*)
	zíímb-wásán-á	'tell each	vs.	*zíímb-wéséné*	(°*zíímb-ul-asan-idi*)

When ***-am*** precedes ***-idi***, no imbrication takes place, as shown in (15). Nonetheless, the vowels of the verb ending are still lowered, and the resulting mid vowel can even spread onto ***-am***, as in (15b), but once again this does not happen systematically, as can be seen in (15a), where the low vowel of ***-am*** remains low. In other words, vowel lowering of ***-idi*** happens here independently from not only the root vowel, but also imbrication. Whether the mid vowel of ***-ene*** extends onto the suffix seems to be a matter of free variation again.

(15) Kiyaka (Ruttenberg 2000)

a.	*túúng-ám-á*	'be built'	vs.	*túúng-am-ene*	(°*tung-am-idi*)
	yíínd-ám-á	'have bad luck'	vs.	*yíínd-am-ene*	(°*yind-am-idi*)
	béénd-ám-á	'curb oneself, incline'	vs.	*béénd-am-ene*	(°*beend-am-idi*)
	bák-ám-á	'be taken, be occupied'	vs.	*bák-am-ene*	(°*bák-am-idi*)
	bót-ám-á	'be baptized, submerged'	vs.	*bót-am-ene*	(°*bót-am-idi*)
b.	*yék-ám-á*	'push oneself against'	vs.	*yék-em-ene*	(°*yek-am-idi*)
	sók-ám-á	'be placed between'	vs.	*sók-em-ene*	(°*sok-am-idi*)
	hát-ám-á	'be carried'	vs.	*hát-em-ene*	(°*hát-am-idi*)
	fwééb-ám-á	'be curved, hunchbacked'	vs.	*fwééb-em-ene*	(°*fwééb-am-idi*)
	kóóf-ám-á	'be curved, lowered'	vs.	*kóóf-em-ene*	(°*kóóf-am-idi*)

2.2 Kintandu In Kintandu, ***-idi*** and ***-ini*** are the non-lowered reflexes of ***-ide**. Both can be suffixed directly to roots without a mid vowel, as in (16a), the first two when the root does not contain a nasal, the last two when it does. These allomorphs are lowered to ***-ele*** and ***-ene*** respectively when suffixed to a root with a mid vowel, as in (16b).

(16) Kintandu (Butaye 1909)

a.	*bak-a*	'take, grab'	vs.	*bak-idi*	(°*bak-idi*)
	kib-a	'walk'	vs.	*kib-idi*	(°*kib-idi*)
	kun-a	'plant, sow'	vs.	*kun-ini*	(°*kun-idi*)
	nik-a	'polish, grind'	vs.	*nik-ini*	(°*nik-idi*)
b.	*yeng-a*	'be open'	vs.	*yeng-ele*	(°*yeng-idi*)
	zonz-a	'speak, discuss'	vs.	*zonz-ele*	(°*zonz-idi*)
	yem-a	'suck'	vs.	*yem-ene*	(°*yem-idi*)
	nok-a	'rain'	vs.	*nok-ene*	(°*nok-idi*)

As illustrated in (17), suffixal high vowels occurring between a root mid vowel and ***-idi*** are also lowered, whether they are imbricated by ***-idi***, as in (17a) or not, as in (17b). The left-sided examples in (17) show once more that pVHH does not take place in Kintandu in the absence of ***-idi***. As shown in the last two examples of in (17a), glide formation occurs when ***-ide** imbricates into a suffix with a back vowel: °***uCide*** → °***uiCe*** → °***ueCe*** → ***weCe***, spelled as <***ueCe***> in Butaye (1909). The spreading of mid vowels in between the final vowel of the reflex of ***-ide** and the mid vowel of the root is the same 'plateauing' effect which Hyman (1998) describes for Kiyaka (cf. supra).

(17) Kintandu (Butaye 1909; Daeleman 1966)

a.	*bok-il-a*	'cry for'	vs.	*bok-ele*	(°*bok-il-idi*)
	gong-is-a	'make big'	vs.	*gong-ese*	(°*gong-is-idi*)
	kod-is-a	'make strong'	vs.	*kod-ese*	(°*kod-is-idi*)
	kok-ul-a	'emptying a trap'	vs.	*kok-uele*	(°*kok-ul-idi*)
	gok-ut-a	'become big and strong'	vs.	*gok-uete*	(°*gok-ut-idi*)
b.	*kemb-id-ik-a*	'rejoice, glorify'	vs.	*kemb-el-ek-ele*	(°*kemb-id-ik-idi*)
	ted-ik-a	'put on the fire'	vs.	*tel-ek-ele*	(°*ted-ik-idi*)
	son-ik-a	'write'	vs.	*son-ek-ene*	(°*son-ik-idi*)

lem-uk-a	'run away'	vs.	*lem-ok-ene*[5]	(°*lem-uk-idi*)
tomb-uk-a	'go up, ascend'	vs.	*tomb-ok-ele*	(°*tomb-uk-idi*)

As in Kiyaka, vowel lowering also occurs in Kintandu as a ***wi*** avoidance strategy, i.e., when the root has no mid vowel and ***-idi*** imbricates into a preceding suffix with a back vowel. Imbrication results then in a ***we*** sequence, spelled as <***ue***> in Butaye (1909), as shown in (18). However, unlike in Kiyaka, vowel lowering or the regressive spreading of ***we*** does not extend up to the root, as illustrated in (18b). It remains restricted to the verb-final imbricated suffixes, even when the root has a mid vowel, although Daeleman (1966: 269) provides the one counterexample presented in (18c). The same counterexample is found in several Kintandu texts available on the BantUGent documentation share. One of them also contains *kolomwene* (°*kol-um-un-idi*) from *kolumuna* 'remove leaves' (Butaye 1909: 91).

(18) Kintandu (Butaye 1909; Polis 1938; Anon. 1964; Daeleman 1966)

a.	*suk-ul-a*	'wash, clean with water'	vs.	*suk-uele*	(°*suk-ul-idi*)
	sam-un-a	'warn, announce'	vs.	*sam-uene*	(°*sam-un-idi*)
	nunk-ut-a	'flare, feel'	vs.	*nunk-uete*	(°*nunk-ut-idi*)
	fuk-us-a	'make boil'	vs.	*fuk-uese*	(°*fuk-us-idi*)
	suk-us-a	'make wash'	vs.	*suk-uese*	(°*suk-us-idi*)
	yuk-ut-a	'be saturated'	vs.	*yuk-wete*	(°*yuk-ut-idí*)
b.	*yind-ul-ul-a*	'meditate'	vs.	*yind-ul-wele*	(°*yind-ul-ul-idi*)
	tamb-ul-ul-a	'confess'	vs.	*tamb-ul-wele*	(°*tamb-ul-ul-idi*)
	ken-un-un-a	'disgust'	vs.	*ken-un-uene*	(°*ken-un-un-idi*)
	bong-un-un-a	'collect, find'	vs.	*bong-un-uene*	(°*bong-un-un-idi*)
	bem-um-un-a	'burn to the end'	vs.	*bem-um-uene*	(°*bem-um-un-idi*)
	leng-um-un-a	'put on fire'	vs.	*leng-um-uene*	(°*leng-um-un-idi*)
c.	*seng-um-un-a*	'find'	vs.	*seng-om-wene*	(°*seng-um-un-idi*)

Vowel lowering with imbrication only occurs to avoid ***wi***. In other imbrication contexts or in the absence of imbrication, as in (19), no lowering takes places when the root does not have a mid vowel.

(19) Kintandu (Butaye 1909)

gang-il-a	'arrange for'	vs.	*gang-idi*	(°*gang-il-idi*)
king-is-a	'make wait'	vs.	*king-îsi*	(°*king-is-idi*)
lák-uk-a	'burn, be in flames'	vs.	*lak-uk-idi*	(°*lak-uk-idi*)
sum-ik-a	'to put in place'	vs.	*sum-ik-ini*	(°*sum-ik-ini*)

Nonetheless, as in Kiyaka, ***wi*** avoidance in Kintandu is more general than verb conjugations involving ***-idi***. As shown in (20), also final vowel /**a**/ can be copied to the left to repair ***wi*** resulting from imbrication, or the /**i**/ of the imbricated suffix – in this case causative ***-is*** – can just be dropped to obtain /**u**/ instead of ***wi***.

(20) Kintandu (Butaye 1909)

taamb-ul-a	'receive'	vs.	*taamb-was-a/taamb-us-a*	(°*taamb-ul-is-a*)
nik-un-a	'shake'	vs.	*nik-was-a/nik-us-a*	(°*nik-ul-is-a*)
taf-un-a	'chew'	vs.	*taf-was-a/taf-us-a*	(°*taf-un-is-a*)

5 Along with several similar examples of vowel lowering when a root with a mid vowel is followed by the intransitive separative *-uk*, Polis (1938) also provides some counter-examples, such as *lemukene* (6x), *kendukene* (2x), *nyokukene* (1x), *notukene* (2x).

As in Kiyaka, ***-idi*** also imbricates into verb suffixes with the low central vowel /**a**/ and ending in a coronal consonant, in which case a mid front vowel is created and the verb's final vowel is lowered to /**e**/, as shown in (21). This lowering happens whatever the root vowel is. When the imbricated suffix is disyllabic and contains /**a**/ in its first syllable, its first vowel is always maintained as /**a**/, as in (21b). Unlike in Kiyaka, we did not find any examples where it also shifts to /**e**/, as in (14c).

(21) Kintandu (Butaye 1909)

a.	*swéng-an-a*	'breath noisily'	vs.	*swéng-ene*	(°*sweng-an-idi*)
	puk-an-a	'boil, make noise'	vs.	*puk-ene*	(°*puk-an-idi*)
	pangu-as-a	'wash the dishes'	vs.	*pangu-ese*	(°*pangw-as-idi*)
	vutu-ása	'compensate'	vs.	*vutu-ese*	(°*vut-u-as-idi*)
b.	*tum-akán-a*	'be able to be sent'	vs.	*tum-akene*	(°*tum-akan-idi*)
	kind-akan-a	'fortify oneself'	vs.	*kind-akene*	(°*kind-akan-idi*)

When ***-idi*** follows a suffix with /**a**/ not ending in a coronal consonant, no imbrication takes place, as shown in (22). However, as in Kiyaka, ***-idi*** also is lowered to ***-ele***. However, unlike in Kiyaka (15b), the mid front vowel never is extended onto the preceding suffix.

(22) Kintandu (Daeleman 1966)

Bafúkamene.	(°*bá-fuk-am-idí*)	'They have fallen on their knees.'
Tubakamené.	(°*tu-bak-am-idí*)	'We have been captured.'
Bakálangele.	(°*bá-kal-ang-idí*)	'They have roasted.'
Bakándabele.	(°*ba-kand-ab-idí*)	'They were passing heavily.'
Lupwátakele.	(°*lú-pwa:t-ak-idi*)	'It pearles.'

2.3 Kimanyanga In Kimanyanga, as shown in (23), the reflex of ***-ide** is realized as either ***-idi*** (non-lowered), ***-ini*** (non-lowered, nasal harmony), ***-ele*** (lowered), or ***-ene*** (lowered, nasal harmony). The non-lowered allomorphs are illustrated in (23a), the lowered ones in (23b).

(23) Kimanyanga (Laman 1936)

a.	*fw-a*	'die'	vs.	*fw-idi*	(°*fw-idi*)
	di-a	'eat'	vs.	*di-idi*	(°*di-idi*)
	kin-a	'dance'	vs.	*kín-ini*	(°*kin-idi*)
	kún-a	'plant'	vs.	*kún-ini*	(°*kun-idi*)
b.	*kémb-a*	'hire'	vs.	*kémb-ele*	(°*kemb-idi*)
	kòmb-a	'group'	vs.	*kómb-ele*	(°*komb-idi*)
	kém-a	'filter'	vs.	*kém-ene*	(°*kem-idi*)
	wóm-a	'iron'	vs.	*wóm-ene*	(°*wom-idi*)

As shown in (24), high vowels in verbal suffixes do not undergo vowel lowering when the root has a mid vowel, except when they are also followed by ***-idi***. When the suffix preceding ***-idi*** has a coronal consonant, imbrication takes place, as in (24a). Unlike in Kiyaka (8b) and Kintandu (17a), the imbrication of ***-idi*** into a suffix with a back vowel does not lead to glide formation in Kimanyanga, as seen in the last three examples of (24a). The back vowel is lowered, and the front vowel of the imbricated verb ending is deleted: °***uCide*** → °***uiCe*** → °***oeCe*** → ***oCe***. The verbal ending is thus shortened. When the suffix preceding ***-idi*** has a non-coronal consonant, as in (24b), the suffix is not imbricated, and the verbal ending is not shortened but still lowered to ***-ele***.

(24) Kimanyanga (Laman 1912: 164-165; 1936: L)

a.	*veed-is-a*	'clean'	vs.	*veed-ese*	(°*veed-is-idi*)
	vod-il-a	'injure'	vs.	*vod-ele*	(°*vod-il-idi*)
	bond-ul-a	'tear down'	vs.	*bond-ole*	(°*bond-ul-idi*)

	sek-ul-a	'change, translate'	vs.	*sek-ole*	(°*sek-ul-idi*)
	sek-ul-ul-a	'change again'	vs.	*sek-ol-ole*	(°*sek-ul-ul-idi*)
b.	*lemb-ik-a*	'calm'	vs.	*lemb-ek-ele*	(°*lemb-ik-idi*)
	long-uk-a	'learn'	vs.	*long-ok-ele*	(°*long-uk-idi*)

When the root has no mid vowel, neither the vowel of the suffix nor the vowels of the verbal ending are lowered, as shown in (25). Unlike in Kiyaka (11-12) and Kintandu (18), neither glide formation nor vowel lowering takes place as a ***wi*** avoidance strategy in the absence of a root mid vowel. As the last two examples in (25) show, this sequence is also avoided in Kimanyanga, but simply by deleting the front vowel of the imbricated suffix whose final vowel is realized high: °***uCide*** → °***uiCe*** → °***uiCi*** → ***uCi***.

(25) Kimanyanga (Laman 1912: 164-165)

bind-uk-a	'be untied; pass the top'	vs.	*bindukidi*	(°*bind-uk-idi*)
sung-ik-a	'make straight, do right'	vs.	*sungikidi*	(°*sung-ik-idi*)
kang-il-a	'bound for'	vs.	*kangidi*	(°*kang-il-idi*)
kang-is-a	'cause to bound'	vs.	*kangisi*	(°*kang-is-idi*)
kang-ul-a	'loosen, untie'	vs.	*kangudi*	(°*kang-ul-idi*)
kang-us-a	'cause to be untied'	vs.	*kangusi*	(°*kang-ul-i-idi*)

Again, ***wi*** avoidance in Kimanyanga is more general than verb conjugations involving of ***-idi***, as can be seen in (26).

(26) Kimanyanga (Laman 1912: 166)

sak-us-a	(°*sak-ul-is-a*)	'cause to be cleaned'
nik-us-a	(°*nik-ul-is-a*)	'cause to be shaken'
sok-us-a	(°*sok-ul-is-a*)	'cause to be washed'
tol-us-a	(°*tol-ul-is-a*)	'cause to be broken off'
teng-us-a	(°*teng-ul-is-a*)	'cause to be poured out'

When ***-idi*** follows a suffix with the vowel /**a**/ and ending in a coronal consonant, imbrication happens but the outcome in terms of vowel lowering is different as compared to Kiyaka and Kintandu. When the preceding suffix is monosyllabic, only the final vowel of the verb ending is lowered to /**e**/, as in (26a). It is first vowel which is deleted, as the preceding vowel remains /**a**/, i.e., °***aCide*** → °***aiCe*** → ***aCe***, like what we observed above for suffixes with back vowels, except that /**a**/ is not affected. When the preceding suffix is disyllabic, as in (27b), imbrication also leads to the creation of a mid front vowel in the imbricated suffix, i.e., °***aCide*** → °***aiCe*** → ***eCe*** (see also Westlind 1888: 285). As the examples in (27b) show, the mid front vowel of the imbricated suffix never extends to the left, as sometimes happens in Kiyaka (14c).

(27) Kimanyanga (Laman 1912: 35)

a.	*kang-al-a*	'wander about'	vs.	*kang-ale*	(°*kang-al-idi*)
	kam-at-a	'catch'	vs.	*kam-ate*	(°*kam-at-idi*)
	vamb-an-a	'separate'	vs.	*vamb-ane*	(°*vamb-an-idi*)
b.	*fin-angan-a*	'approach each other'	vs.	*fin-angene*	(°*fin-angan-idi*)
	zol-asan-a	'love each other'	vs.	*zol-asene*	(°*zol-asan-idi*)
	lamb-alal-a	'lie outstretched'	vs.	*lamb-alele*	(°*lamb-alal-idi*)

When the suffix containing /**a**/ does not end in a coronal consonant, as in (28), no imbrication takes place, but ***-idi*** still lowers to ***-ene*** without the mid vowel further spreading to the left.

(28) Kimanyanga (Laman 1912: 35; 1936: 1124)

kang-am-a	'tie'	vs.	*kang-am-ene*	(°*kang-am-idi*)
Ngyekamene salu kyokyo.			(°*ng-yek-am-idi*)	'I took this work on me.'

2.4 19th c. West Kikongo spoken in Kakongo In the late 19th c. West Kikongo variety spoken in Kakongo, situated in present-day Cabinda, pVHH has been labeled 'irregular' but instances with pVHH are much less frequent than the ones without pVHH, which makes this language variety eligble for this Section. The non-lowered reflex of ***-ide** is ***-izi***, as in (29a), which is lowered to ***-eze*** following mid vowel roots, as in (29b). As proposed by Dom and Bostoen (2015: 188), the fricative consonant of the suffix is the outcome of Bantu Spirantization (BS) (Schadeberg 1995; Bostoen 2008), which is also common in the KLC (cf. Bostoen and Goes 2019): ***-ide** > ***-idi*** > ***-izi***. For all language varieties manifesting this BS in ***-idi***, this is noted in the underlying forms, even if it is not visible anymore in the surface form, for example because of imbrication.

(29) 19th c. West Kikongo as spoken in Kakongo (Carrie 1888; Le Louët 1890)

a.	*bik-a*	'abstain'	vs.	*bik-izi*	(°*bik-izi*)
	samb-a	'adore'	vs.	*samb-izi*	(°*samb-izi*)
b.	*lend-a*	'hate'	vs.	*lend-eze*	(°*lend-izi*)
	vemp-a	'disown'	vs.	*vemp-eze*	(°*vemp-izi*)
	sol-a	'choose'	vs.	*sol-eze*	(°*sol-izi*)
	tond-a	'thank'	vs.	*tond-eze*	(°*tond-izi*)

Suffixes with a high vowel do not undergo lowering when the root has a mid vowel, also not in the presence of the reflex of ***-ide**, while ***-izi*** itself does get lowered to ***-eze***, as shown when confronting (30a) and (30b). This is distinct from Kiyaka, Kintandu and Kimanyanga, which also do not manifest pVHH, but whose high vowel suffixes do undergo vowel lowering when occurring between a root with a mid vowel and ***-izi***.

(30) 19th c. West Kikongo as spoken in Kakongo (Carrie 1888; Le Louët 1890)

a.	*lemb-ik-a*	'soften, calm'	vs.	*lemb-ik-eze*	(°*lemb-ik-izi*)
	lenv-uk-il-a	'obey'	vs.	*lenv-uk-ele*	(°*lenv-uk-il-izi*)
	bel-uk-a	'heal'	vs.	*bel-uk-eze*	(°*bel-uk-izi*)
	loss-uk-a	'yell'	vs.	*loss-uk-eze*	(°*los-uk-izi*)
b.	*tat-ik-a*	'begin'	vs.	*tat-ik-izi*	(°*tat-ik-izi*)
	vit-ik-a	'receive, accept'	vs.	*vit-ik-izi*	(°*vit-ik-izi*)
	kub-ik-a	'collect'	vs.	*kub-ik-izi*	(°*kub-ik-izi*)
	sus-uk-a	'be terrified'	vs.	*sus-uk-izi*	(°*sus-uk-izi*)

As in shown in (31), suffixes only get lowered when they undergo imbrication by ***-izi***. When the imbricated suffix has a back vowel, as in (31b), glide formation takes place as in Kiyaka (8b) and Kintandu (16), i.e., ***we*** noted as <***ue***>. As shown in (31c), ***we*** does not surface as a ***wi*** avoidance strategy in this language. Unlike in Kiyaka, Kintandu and Kimanyanga, ***wi***, noted as <***ui***>, is allowed.

(31) 19th c. West Kikongo as spoken in Kakongo (Cuénot 1775; Carrie 1888)

a.	*vond-issi-a*	'make kill'	vs.	*vond-esse*	(°*vond-is-izi*)
	leng-issi-a	'make light'	vs.	*leng-esse*	(°*leng-is-izi*)
b.	*vem-un-a*	'blow with the mouth'	vs.	*vem-uêné*	(°*vem-un-izi*)
	tek-ul-a	'take from fire'	vs.	*tek-uêlé*	(°*tek-ul-izi*)
	bot-ul-a	'abolish'	vs.	*bot-uêlé*	(°*bot-ul-izi*)
	bok-un-a	'break'	vs.	*bok-uene*	(°*bok-un-izi*)
	bok-ut-a	'whisper'	vs.	*bok-uete*	(°*bok-ut-izi*)
	gniong-ut-a	'walk slowly'	vs.	*gniong-uete*	(°*gniong-ut-izi*)

c.	*tamb-ul-a*	'receive, accept'	vs.	*tamb-uili*	(°*tamb-ul-izi*)
	sus-ul-a	'intimidate'	vs.	*sus-uili*	(°*sus-ul-izi*)
	kak-ut-a	'to bite in a fruit'	vs.	*kak-uiti*	(°*kak-ut-izi*)

Some examples in Cuénot (1775) show imbrication but no lowering of ***-izi*** following mid vowel root and high vowel suffix.

(32) 18th c. West Kikongo as spoken in Kakongo (Cuénot 1775)

kong-ul-a	'bathe'	vs.	*kong-uili*	(°*kong-ul-izi*)
tomb-ul-a	'lower to the bottom'	vs.	*tomb-uili*	(°*tomb-ul-izi*)
kok-il-a	'crow'	vs.	*kok-ili*	(°*kok-il-izi*)

As shown in (33a), sequences of a suffix with /**a**/ ending in a coronal consonant and the reflex of ***-izi*** trigger imbrication and the realization of a mid front vowel in the last two syllables of the verb, just like in Kiyaka and Kintandu. When such as suffix is disyllabic, as in (33b), the mid front vowel never further spreads leftwards, as in Kintandu and Kimanyanga. When the suffix with /**a**/ does not end in a coronal consonant, as in (33c), imbrication does not take place, but the vowels of the verb ending are still lowered to ***-eze***.

(33) 19th c. West Kikongo as spoken in Kakongo (Le Louët 1890; Bastin 1983)

a.	*bund-an-a*	'flow'	vs.	*bund-ene*	(°*bund-an-izi*)
	lak-at-a	'burn'	vs.	*lak-ete*	(°*lak-at-izi*)
b.	*zab-angan-a*	'be accredited'	vs.	*zab-angene*	(°*zab-angan-izi*)
	lamb-alal-a	'bow down'	vs.	*lamb-alele*	(°*lamb-alal-izi*)
c.	*tel-am-a*	'stand up'	vs.	*tel-am-eze*	(°*tel-am-izi*)
	iek-am-a	'collide'	vs.	*iek-am-eze*	(°*iek-am-izi*)

2.5 Summary In Section 2, we have focused on the morphophonology of ***-ide** reflexes in four languages of the KLC. We purposefully opted for those four languages for three reasons: (1) they belonging to four distinct KLC subgroups; (2) they have relatively well-developed descriptions; (3) they do not undergo pVHH. It is mainly this last fact that allows for properly studying the morphophonological changes triggered by the reflexes of ***-ide**, because some of them, such as vowel lowering, also occur with pVHH.

The in-depth examination of the morphophonological behavior of ***-ide** in four languages not manifesting pVHH and belonging to four distinct subgroups of the KLC resulted in the observation of not less than seven shared features, which are possibly retentions inherited from their most recent common ancestor, i.e., PK:

1. The reflex of ***-ide** is realized with two mid vowels whenever it is suffixed directly, i.e., without any intervening suffix, to a root with a mid vowel, whether back or front;
2. Whenever the ***-ide** reflex follows a suffix ending in a coronal consonant, imbrication takes place;
3. Whenever the ***-ide** reflex imbricates into a suffix beginning with a front vowel and ending in a coronal consonant, high vowels occurring between a mid vowel root and ***-ide** are lowered;
4. Whenever the ***-ide** reflex follows a suffix not ending in a coronal consonant, no imbrication occurs;
5. Whenever the ***-ide** reflex imbricates into a monosyllabic suffix with /**a**/, the verb form ends in a mid front vowel, whatever vowel the root has;
6. Whenever the ***-ide** reflex imbricates into a disyllabic suffix with two successive /**a**/, the last two syllables of the verb form have a mid front vowel, whatever vowel the root has.

7. Whenever the ***-ide** reflex follows a suffix with /**a**/ not ending in a coronal consonant, it does not trigger imbrication and it is realized with two mid front vowels, whatever vowel the root has.

Minor variations are observed regarding following morphophonological features:
1. When the ***-ide** reflex imbricates into a suffix with a back vowel, the vowel hiatus resolution involves glide formation (Kiyaka, Kintandu, Kakongo) or not (Kimanyanga), whatever vowel the root has;
2. When the ***-ide** reflex imbricates into a suffix with a back vowel, the vowel hiatus resolution involves some form of ***wi*** avoidance (Kiyaka, Kintandu, Kimanyanga) or not (Kakongo), whatever vowel the root has;
3. When the ***-ide** reflex imbricates into a suffix with a back vowel and wi avoidance occurs, it involves glide formation (Kiyaka, Kintandu), i.e., ***we***, or back vowel lowering (Kimanyanga), i.e., /**o**/;
4. When the ***-ide** reflex imbricates into a suffix with a back vowel, some form of vowel lowering takes place in the last two syllables of the verb form, either whatever vowel the root has (Kiyaka, Kintandu) or only when the root has a mid vowel (Kimanyanga, Kakongo);
5. When the ***-ide** reflex does not imbricate into a suffix with a back or front vowel (e.g., when the consonant is non-coronal), the high back or front vowel of the suffix between a root with a mid vowel and the verb ending ***-ide** is lowered (Kiyaka, Kintandu, Kimanyanga) or remains high (Kakongo);
6. When the ***-ide** reflex imbricates into a monosyllabic suffix with /**a**/, the vowel of the imbricated suffix is realized as either /**e**/ (Kiyaka, Kintandu, Kakongo) or a (Kimanyanga);
7. The mid front vowel resulting from imbrication can extend leftwards to all suffixes following the root (Kiyaka) or not (Kintandu, Kimanyanga, Kakongo).

In the next section, we test these morphophonological features of ***-ide** reflexes by also considering languages manifesting pVHH. We will examine whether those features display the same lines of uniformity and variation cross-linguistically and how they interact with pVHH. The patterns of vowel lowering in and triggered by ***-ide** reflexes in the KLC are described according to the type of morpheme preceding them.

3. Geographic patterns of variation in the morphophonology of *-ide in the KLC

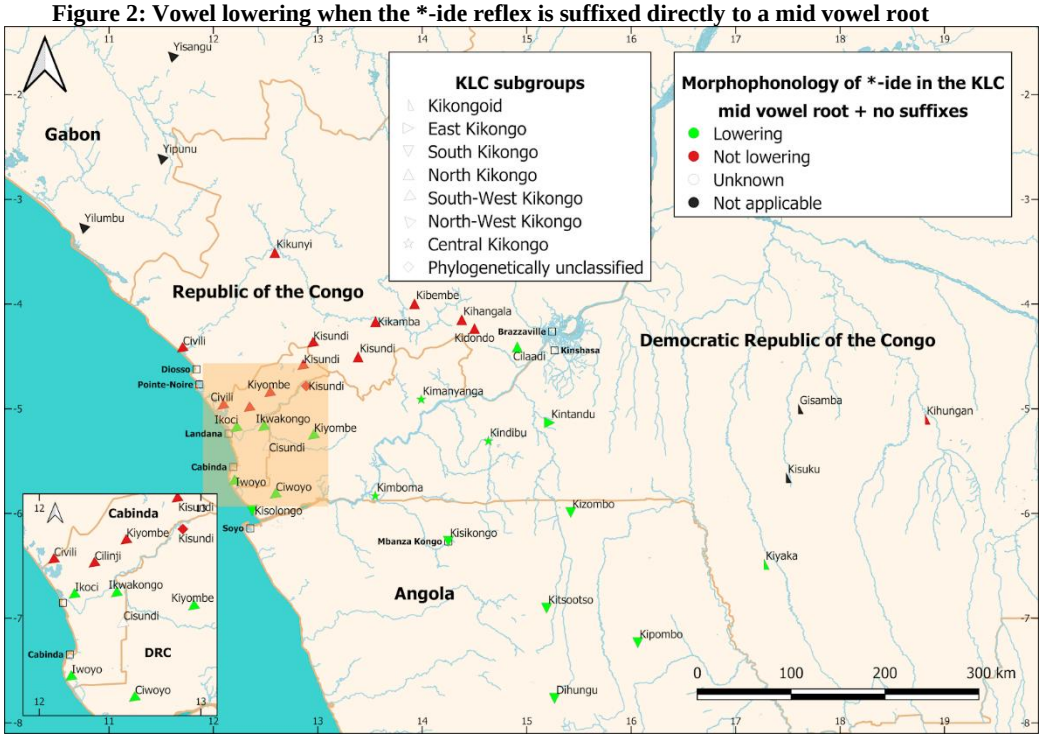
After having examined how the morphophonology of ***-ide** varies across four well-described varieties missing pVHH in §2, we focus in this Section on how these synchronic patterns of variation, especially regarding suffixal vowel lowering, are distributed across the KLC. For that purpose, we do not take languages as our point of departure as we did in §2. Here we start out from the morphophonological features listed in §2.5, especially from those which turned out to be constant across the four varieties, to be able to assess in Section 4 whether they are shared retentions reconstructable to PK, the most recent common ancestor of the KLC. Each subsection begins with a language map presenting the main synchronic patterns of morphophonological variation which the reflex of ***-ide** triggers in a specific morphophonological environment across the KLC. In all these maps, each symbol stands for a different language variety. The symbol's form refers to the phylogenetic clade to which the variety belongs (cf. de Schryver *et al.* 2015; Bostoen and de Schryver 2018b; a), its color indicates which variation the variety's reflex of ***-ide** manifests in a specific morphophonological context. Varieties for which no data are available have a white symbol. The North-West Kikongo languages of Guthrie's B40 group, such as Punu (B43) (Bonneau 1956) and Lumbu (B44) (Blanchon 1984), and the Kikongoid languages Kisuku (H32) (Piper 1977) and Gisamba (L12a) (Van Acker 2018: 86-87, 101; Van Acker and Bostoen 2020) are excluded from our survey, because they do not have an unambiguous reflex of ***-ide**. They have the perfect(ive)/anterior

ending **-i** (or a variant thereof), which Nurse and Watters (2022) consider to be distinct from and of more ancient origin than ***-ide**. These languages are marked with black symbols on our KLC distribution maps.

3.1 Morphophonology of *-ide reflexes when suffixed directly to mid vowel roots

In §2.5, we have observed that in Kiyaka (KK), Kintandu (EK), Kimanyanga (CK) and 19th c. West Kikongo as spoken in Kakongo (WK) the reflex of ***-ide** is realized with two mid vowels whenever it is suffixed directly, i.e., without any intervening suffix, to a root with a mid vowel, whether back or front. The lowering of ***-ide** in this context is not omnipresent across the KLC. Figure 2 below displays a rough south-north divide between respectively those varieties that do lower and those that do not lower ***-ide** when suffixed directly to a mid vowel root.

Figure 2: Vowel lowering when the *-ide reflex is suffixed directly to a mid vowel root



Lowering of ***-ide** in this environment is found in all major clades of the KLC, but SK, EK and CK are the only ones where it occurs systematically. However, EK is represented here by Kintandu only, due to lack of enough reliable data for the other EK varieties. Moreover, CK is rather a contact zone than a true genealogical subgroup (cf. de Schryver *et al.* (2015)), and Kindibu, the only other CK language represented in this study (besides Kimanyanga described in §2.3), has clear affinities with SK (cf. Bostoen and de Schryver (2018a)). In other words, the only KLC clade in which the reflex of ***-ide** is systematically lowered when suffixed directly to a root with a mid vowel is SK. As discussed already in §1 with examples from Kisolongo in (2) to (5), it is impossible to distinguish the outcomes of pVHH from the lowering of ***-ide**. This is further illustrated in (34) with examples from Kisikongo, which manifests symmetric pVHH (cf. Goes and Bostoen 2019). The reflex of ***-ide** is only lowered following a root with a mid vowel, as in (34a), but not with a root having a high or low vowel, as in (34b). Further examples of systematic ***-ide** lowering in this context are presented in the Appendix, i.e., in (96) for Kitsootso, in (97) for Kizombo, in (98) for Dihungu, in (99) for Kipombo,

all SK and in (100) for Kindibu (CK).

(34) Kisikongo (Bentley 1887; Ndonga Mfuwa 1995)

a.	*Ebùlù yìkòtèlè òmúmfinda.*	(°*yì-Ø-kòt-idi*)	'The animals have penetrated in the forest.'
	Mu nkele ame kaswekele kio.	(°*ka-swek-idi*)	'He hid it in my box.'
b.	*Bantumbidi e kimfumu.*	(°*ba-n-tumb-idi*)	'They appointed him king.'
	Oyandi oyitidi awanso.	(°*o-yit-idi*)	'He came before all.'
	Bavavidi madia.	(°*ba-vav-idi*)	'They sought food.'

In all other KLC subgroups, i.e., KK, NK and (S)WK, ***-ide** lowering in this specific context has a very uneven distribution. Figure 2 displays languages of those subgroups with and without the feature, and sometimes even variation between different varieties of one and the same language.

Within KK, the first subgroup to split off from within the shared genealogy of the KLC (cf. de Schryver *et al.* (2015)), Kiyaka turns out to be the only language to systematically lower ***-ide** when it is suffixed directly to a mid vowel root. While Gisamba (KK) and Kisuku (KK) do not have a reflex of ***-ide** (cf. supra), its reflex in Kihungan (H42) (KK), which Takizala (1974) considers to be **°-ili** underlyingly, never undergoes this morphophonological change when suffixed directly to a root.

As for NK, Kihangala (H111), which misses pVHH (cf. Goes and Bostoen 2019), Nkouanda (1997) mentions the examples in (35) of what he calls '*assimilation progressive*', which shows lowering of ***-ide**. However, more recent fieldwork done by Guy Kouarata in 2016 for the KongoKing project in the same region did not result in Kihangala data manifesting of lowering of ***-ide** in this context, as shown in (36). It might be that this language shows internal variation or that one of the two is an archaism.

(35) Kihangala (Nkouanda 1997)

Mbòlèlé.	(°*n-bol-idi*)	'I am wet.'
Nokèné.	(°*nok-idi*)	'It rained.'
Ndè:kèlé.	(°*n-lek-idi*)	'I went to lay down.'

(36) Kihangala (KongoKing Fieldwork G. Kouarata 2016)

Mukási wú nsóóríri wááwu.	(°*n-soor-idi*)	'Here is the woman I have chosen.'
Monitéri yiseyíri?	(°*yi-sey-idi*)	'The teacher has laughed.'

In NK languages which have back pVHH, such as Kidondo, the reflex of ***-ide** is never lowered following mid root vowels, as can be seen in (37). Such is the case in Kikamba (101) and Kisundi (Mboko-Songho) (102) for which examples are shown in the Appendix. In Kidondo texts, the reflex of ***-ide** is only found being realized as ***-ele*** in conjugations of ***zola*** 'want, love' (i.e., ***n'zolele***, ***zolele***), which is also one of the few exceptions in WK Civili (cf. infra).

(37) Kidondo (Pouchet 1957)

Tu ku tondidi mu diambu dia. (°*tu-ku-tond-idi*)
'We thank to thee for thy great glory.'
Ni ha ho ndombidi ku Mama Maria […] mu n'sambidila kun Nzambi, Mfumu eto. (°*N-lomb-idi*)
'Therefore, I beseech blessed Mary, to pray for me to the Lord our God for us.'

Within WK, ***-ide** underwent the diachronic sound change known as 'Bantu Spirantization' (cf. (Schadeberg 1995; Bostoen 2008) in Cizali, Iwoyo, Ikoci, Ikwakongo, Ciwoyo, Civili, Cilinji, resulting in ***-izi*** in the first five varieties and the devoiced ***-isi*** in the last two (cf. Dom and Bostoen 2015: 188, fieldnotes Heidi Goes 2015, 2018). In Civili, ***-isi*** is not lowered when following a root with a mid vowel, as shown in (38), some rare exceptions notwithstanding, as in (39). According to Laman (1936: LXXI), such exceptions, which are found in several historical Civili sources, can be

accounted for as contact-induced influence from Kakongo. Cabindan Civili also does not manifest ***-ide** lowering, as shown in the Appendix (104).

(38) Civili (Congo) (Marichelle 1907)

Lu vondisi.	(°*vond-isi*)	'You have killed.'
I kofisi.	(°*kof-isi*)	'I have circumcised.'
I tondisi.	(°*tond-isi*)	'I have thanked.'
I bonghisi.	(°*bongh-isi*)	'I have taken.'

(39) Civili (Congo) (Derouet 1896; Marichelle 1902; 1907; 1912)

Na u zolese ku tambula zi ndobo?		(°*u-zol-isi*)	'Who wants to take advances?'
I zolese kuenda ku Ylu.		(°*i-zol-isi*)	'I want to go to Paradise.'
Nela mbiḳi u zolese?		(°*u-zol-isi*)	'Which ring do you want?'
Uzolese ku isa ke minu?		(°*u-zol-isi*)	'Do you want to come to me?'
vioka	'surpass'	*viokese*	(°*viok-isi*)
tonda	'thank'	*tondisi, tondese*	(°*tond-isi*)

Kiyombe displays more variation in ***-ide** lowering. While the suffix is never lowered in the variety spoken in Cabinda, as illustrated in (40), the variety from the Mayombe region of present-day DRC as documented by Bittremieux (1923-1927) does manifest lowering of ***-ide** following mid root vowels, as in (41), with one exception in the last example.

(40) Kiyombe (Cabinda) (A. Massiala, p.c.)

Nandi thebidi.	(°*N-teb-il-idi*).	'He bit me.'
Uloozidi baana.	(°*u-looz-idi*)	'He left the children.'
Ilongidi.	(°*i-long-idi*)	'I taught.'
Ibongidi.	(°*i-bong-idi*)	'I pulled.'
Nandi uledidi baana.	(°*u-leel-idi*)	'He took care of the children.'

(41) Kiyombe (DRC) (Bittremieux 1923-1927)

Wau bavondele.	(°*ba-vond-idi*)	'They kill those.'
Zimbongo zibodele.	(°*zi-bod-idi*)	'Money rotted.'
Zitsafu zinombele.	(°*zi-nomb-idi*)	'The safou's are black.'
Kivembele.	(°*ki-vemb-idi*)	'It is crooked.'
Ndiudiu vombele.	(°*vomb-idi*)	'The hut is burnt down.'
Ndyobele.	(°*N-yob-idi*)	'I swam.'
Bidia biyengele.	(°*bi-yeng-idi*)	'The food is burnt.'
Pfumu usesidi.	(°*u-ses-idi*)	'The boss has arrived.'

In Iwoyo as described by Mingas (1994) ***-ide** is also lowered following mid root vowels without any intermediate suffixes, as can be seen in (42), the last example being a root with a high vowel not triggering lowering.

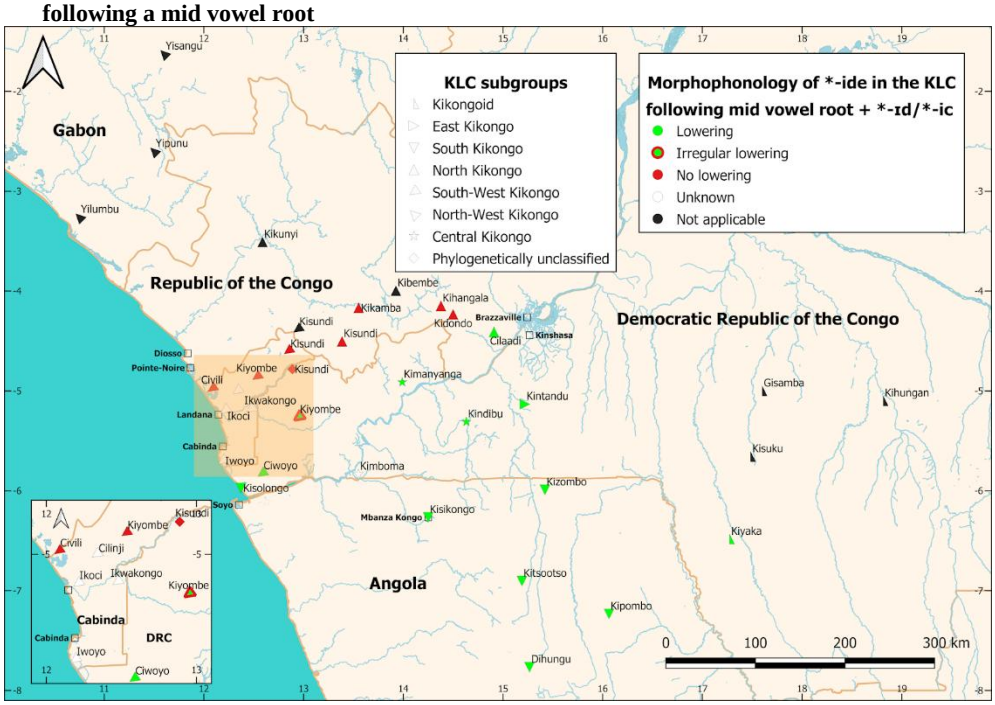
(42) Iwoyo (Mingas 1994)

Nàndi ùkótèzé múnzo.	(°*ù-Ø-kót-ìzì*)	'He has entered the house.'
´Nkùndí ámí ùnòngèzé zímànga.	(°*ù-Ø-nòng-ìzì*)	'My friend has collected mangoes.'
Nàndi ùvélèzé mákùndí mázítà.	(°*ù-Ø-vél-ìzì*)	'He has picked heavy fruits.'
Itìmbá cíàkú cìñévèzé kò.	(°*cì-Ø-ñév-ìzì*)	'Your pipe is not beautiful.'
Nàndí ùkùnízí yònò.	(°*ù-Ø-kùn-ìzì*)	'He has cultivated yesterday.'

3.2 Morphophonology of *-ide reflexes when suffixed to reflexes of applicative **-ɪd* or causative **-ic* In §2, we have shown that two other shared features of Kiyaka (KK), Kintandu (EK), Kimanyanga (CK) and 19th c. West Kikongo as spoken in Kakongo (WK) are that (1) imbrication

takes places whenever the reflex of ***-ide** follows a suffix ending in a coronal consonant and (2) when this suffix has a front vowel all high vowels following the mid vowel root are lowered. We show here that the first feature occurs all over the KLC. However, the second one is not omnipresent in the KLC. As Figure 3 shows, it basically has the same distribution pattern as vowel lowering when ***-ide** directly suffixed to a mid vowel root (cf. Figure 2 in §3.1).

Figure 3: Vowel lowering when the *-ide reflex is suffixed to reflexes of *-ɪd or *-ɪc following a mid vowel root



In this environment, lowering of ***-ide** and all high vowel suffixes that precede it following a mid vowel root is found again in all major clades of the KLC, but only systematically in SK, CK, and EK (only represented by Kintandu). It was shown in (2a) above for Kisolongo (SK), which has asymmetric pVHH. In (43a), the same morphophonological processes – imbrication and vowel lowering – are illustrated for Kisikongo, which has symmetric pVHH. The examples in (43b) show the absence of both pVHH and vowel lowering with ***-ide** when the root has no mid vowel. The last column of (43) shows the passive form of the same verbs. Here as well there is lowering following mid root vowels.

More examples from SK are in the Appendix: for Kizombo in (105) and for Kitsootso in (106). For CK Kindibu examples are in (107).

(43) Kisikongo (Bentley 1887; Ndonga Mfuwa 1995)

a.	*Ndong**es**ele yandi ovo wenda.*	(°*n-long-is-il-idi*)			‘I recommended him to go.’	
	*nok**en**a*	‘rain on, for’	vs.	*nokene*	(°*nok-il-idi*)	*nokeno*
	*bong**el**a*	‘get for’	vs.	*bongele*	(°*bong-il-idi*)	*bongelo*
	*tond**es**a*	‘ingratiate oneself.’	vs.	*tondese*	(°*tond-is-idi*)	*tondeso*
b.	*natina*	‘carry with, for’	vs.	*natini*	(°*nat-il-idi*)	*natinu*
	bakisa	‘cause to catch’	vs.	*bakisi*	(°*bak-is-idi*)	*bakisu*

In all other KLC subgroups, i.e., KK, NK and WK, vowel lowering in this specific context has a very uneven distribution. Examples from languages without lowering are in (44) for Civili (WK) as spoken in Congo, in (45) for Civili (WK) as spoken in Cabinda, and in (46) for Kiyombe (WK) as spoken in Cabinda. Examples for Kihangala (NK) are in (108), for Kisundi as spoken in the DRC (Nganda Tsundi) (phylogenetically unclassified) in (109), for Ciwoyo (WK) in (110) and for Kisundi as spoken in Cabinda (WK) in (111) in the Appendix. Languages without lowering of ***-ide** have a red symbol in Figure 3. These languages situate in the northern part of the KLC, as with the former parameter.

(44) Civili (Congo) (Derouet 1896; Marichelle 1912)

tebila	'bite'	vs.	*tebili*	(°*teb-il-isi*)
lepila	'caress, appease for'	vs.	*lepili*	(°*lep-il-isi*)
sonsila	'begin to fall (rain)'	vs.	*sonsili*	(°*sons-il-isi*)

(45) Civili (Cabinda) (Fieldnotes Heidi Goes 2018)

Yono batulongisi kusonika. (°*ba-tu-long-is-isi*) 'Yesterday they taught us to write.'

(46) Kiyombe (Cabinda) (A. Massiala, p.c.)

Beetu tuvekidi baatu.	(°*tu-vek-il-idi*)	'We sent for people to come.'
Beetu tubombididi Nzambi.	(°*tu-bomb-il-il-idi*)	'They begged God.'
Bau bavondisidi mbwa.	(°*ba-vond-is-il-idi*)	'They caused the death of the dog.'
Nandi undengisi mwana.	(°*u-n-deng-is-idi*)	'He brought the child to me.'

In Kiyombe (WK) as spoken in DRC both non-lowering (47a) and lowering (47b) have been found, which shows again the uneven distribution of vowel lowering within WK.

(47) Kiyombe (DRC) (Bittremieux 1923-1927)

a.	*Koko kuyendididi mu diambu di p'uta*.	(°*ku-end-il-il-idi*)
	'The hand is gone because of a wound.'	
	Vama vendididi.	(°*ku-va-end-il-il-idi*)
	'That place is gone forever.'	
	Umbedisidi nkanu.	(°*u-N-bel-is-idi*)
	'He made him loose the case.'	
b.	*Bayendedele.*	(°*ba-end-il-il-idi*)
	'They are gone forever.'	
	Muana utomene ngolo.'	(°*u-tom-il-idi*)
	'The child is very beautiful.'	
	Nandi umônesene ti pene weka?	(°*u-mon-is-il-idi*)
	'Who told you that you are naked?'	

In NK, Kidondo, Kikamba (H112a) and Kisundi (as spoken in Mboko-Songho) have back pVHH (Goes and Bostoen 2019): high back vowel suffixes are lowered following mid vowel roots, but high front vowel suffixes are not lowered, e.g., in Kidondo: ***kutobóka*** 'to pierce' vs. ***kukekilá*** 'to cackle'. The lowering of high back vowel suffixes is maintained in ***-ide** forms, and ***-ide** itself is not lowered. High front vowel suffixes are not lowered, as shown for Kikamba in (48).

(48) Kikamba (KongoKing Fieldwork G. Kouarata 2016)

Bindya bimubéédisí. (°*bi-mu-beel-is-idi*) 'This food has sickened him.'

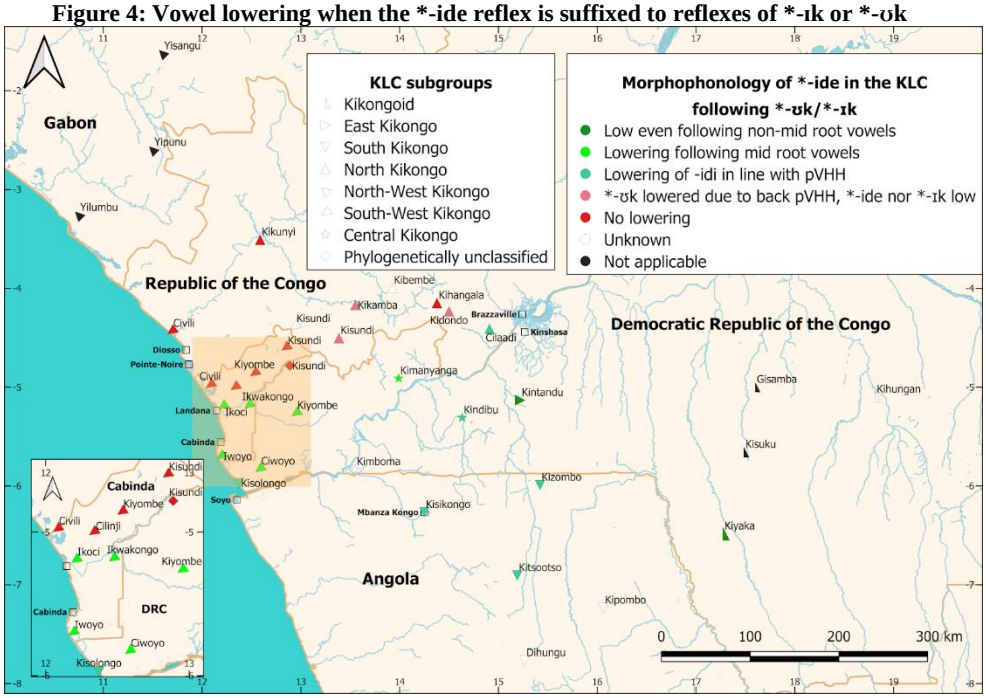
In Cilaadi, which has pVHH, there is lowering of front vowel suffixes when followed by ***-ide**, as can be seen in (49).

(49) Cilaadi (Jaffré 1930; Grégoire 1976; Jacquot 1982)

Tufwekené.	(°*tu-fwek-il-idi*)
'We whined.'	
Tubeelelé.	(°*tu-ba-il-idi*)
'We stayed.'	
Bou n'a komese nkouya.	(°*kom-is-idi*)
'I've dedicated a fetish of the family.'	
Bou n'a yokese mvou oua nkaka, me ka ki foungoudi.	(°*yok-is-idi*)
'I've omitted the yearly confession.'	

3.3 Morphophonology of *-ide reflexes when suffixed to reflexes of neuter *-ɪk or separative intransitive *-ʊk Another common feature of Kiyaka (KK), Kintandu (EK), Kimanyanga (CK) and 19th c. West Kikongo as spoken in Kakongo (WK) established in §2 is that the reflex of ***-ide*** never imbricates into a preceding suffix not ending in a coronal consonant. However, when such a suffix has a high vowel, either front as in neuter ***-ik*** or back as separative intransitive ***-uk***, these four languages show variation in that the suffixal high vowel is lowered following a root with a mid vowel in Kiyaka, Kintandu, Kimanyanga, but not in Kakongo. As shown on Figure 4, more variation in this regard exists in other languages of the KLC. Not only are there non-lowering vs. lowering languages in this environment, but also different types of lowering (i.e., those marked with a kind of green in Figure 4) and non-lowering (i.e., those marked with a kind of red in Figure 4). Once again, the main divide is between lowering in the south and non-lowering in the north, roughly along the same lines as in Figures 2 and 3. The different types of lowering and non-lowering are explained and illustrated below.

Figure 4: Vowel lowering when the *-ide reflex is suffixed to reflexes of *-ɪk or *-ʊk



In languages with symmetric and asymmetric pVHH, lowering of the ***-ide*** reflex is in line with pVHH: when the high vowel suffix is lowered, the ***-ide*** reflex is lowered as well. Examples for Kisikongo (SK) are in (50). Examples of other languages with symmetric pVHH are in the Appendix: in (112) for Kizombo, in (113) for Dihungu, in (114) for Kitsootso (all SK), in (115) for Kindibu

(CK) and in (116) for Cilaadi (NK). Examples of Kisolongo (SK), with asymmetric pVHH, are in (2b) and (3a) in the Introduction.

(50) Kisikongo (Bentley 1887; Ndonga Mfuwa 1995)

*E ukayi ilonz**ok**ele kuna mpembe.*	(°*i-lonz-uk-idi*)	‘The antelope came a bit out into the open.’			
*zeng**ok**a*	‘become, be, get cut’	*vs.*	*zengokele*	(°*zeng-uk-idi*)	*zengokelo*
bakuka	‘rend, be rent’	*vs.*	*bakukidi*	(°*bak-uk-idi*)	*bakukilu*

In the southern Cabindan varieties without pVHH, ***-ide** is lowered following mid root vowels. As discussed above, this also happens in 19th c. West Kikongo as spoken in Kakongo (30), when there are intervening suffixes neither undergoing lowering nor imbrication, such as ***-uk*** and ***-ik***, resulting in ***-uk-eze*** and ***-ik-eze***. In its closest present-day relatives, i.e., Iwoyo (51), Ikwakongo (122) and Ikoci (123), intervening ***-ik*** is also lowered, resulting in ***-ek-eze***, while ***-uk*** is not, resulting in ***-uk-eze*** or ***-uk-weze***. This is in line with the fact that there once was an irregular front pVHH in Iwoyo (Mingas 1994; Goes and Bostoen 2019).

(51) Iwoyo (Fieldnotes Heidi Goes 2018)

Tata ulembekeze mwan'andi.	(°*u-lemb-ik-izi*)	‘The father calmed down his child.’
Basonekeze nkaanda yono.	(°*ba-son-ik-izi*)	‘Yesterday, they wrote a letter.’
Yono babelekeze zindoonga.	(°*ba-bel-ik-izi*)	‘Yesterday, they collected plates.’
Yono nandi ulongukweze.	(°*u-long-uk-izi*)	‘Yesterday, he learned.’
Yono minu uzolukweze.	(°*u-zol-uk-izi*)	‘Yesterday, I was loved.’

Examples for languages without lowering of the ***-ide** reflex are in (52) for Civili (WK) as spoken in Congo, in (53) for Civili (WK) and in (54) for Kiyombe (WK), both as spoken in Cabinda. In Cabindan Kiyombe some variation has been noted in that ***-uk-idi*** is pronounced as ***-uk-utsi*** by several speakers. Examples for other languages without lowering in this environment are in the Appendix: in (116) for Cilaadi (NK), in (117) for Kihangala (NK), in (118) for Kisundi as spoken in Mboko-Songho, Congo (NK), in (119) for Kisundi (phylogenetically unclassified) as spoken in DRC (Nganda-Tsundi), in (120) for Kisundi (WK), in (121) for Cilinji (WK) both as spoken in Cabinda and for Ciwoyo in (124).

(52) Civili (Congo) (Marichelle 1902; 1907)

Nsinga u nonukisi.	(°*non-uk-isi*)	‘The cord is extended.’
I sonikisi.	(°*son-ik-isi*)	‘I’ve written.’

(53) Civili (Cabinda) (Fieldnotes Heidi Goes 2018)

Yono nandi longukwisi kusonika.	(°*long-uk-isi*)	‘Yesterday, he learned to write.’
Cibeli yono nandi belukwisi.	(°*bel-uk-isi*)	‘Yesterday, he was healed.’
Yono minu i telikisi nzuungu fu mbaasu.	(°*i-tel-ik-isi*)	‘Yesterday, I’ve put a pot on the fire.’
Yono mwana kotukisi.	(°*kot-uk-isi*)	‘Yesterday, the child woke up.’

(54) Kiyombe (Cabinda) (Fieldnotes Heidi Goes 2019)

Nandi ulongukidi/ulongukutsi kibeedi yono.	(°*u-long-uk-idi*)	‘He studied yesterday.’
Beefu tubeelukidi/tubeelukutsi.	(°*tu-beel-uk-idi*)	‘We recovered (from sickness).’
Bawu badeekudi kibeedi yono.	(°*ba-deek-ul-idi*)	‘They reduced the price yesterday.’
Nandi uthetikidi kibeedi yono.	(°*u-thet-ik-idi*)	‘He loaded/put on top yesterday.’

In Kiyombe from DRC, ***-idi*** is also lowered irregularly in this specific context (see also §3.2). This irregularity is found in the lexicon by Bittremieux (1923-1927) as well as in corpus material. In some examples neither ***-idi*** nor the preceding suffix is lowered, as can be seen in (54a) and (55a). In

others only ***-idi*** is lowered, as can be seen in (55b) and (56b). Finally, but only for front vowel suffixes, both the suffix and ***-idi*** can be lowered, with examples in (55c), (56c) and (57).

(55) Kiyombe (DRC) (Bittremieux 1923-1927)

a.	*Banlemikini.*	(°*ba-N-lem-ik-idi)*	'They have defeated/shamed him.'
	Babotukidi ku buala.	(°*ba-bot-uk-idi*)	'They left the village.'
	Wau veka (*nti*) *uyikelukidi.*	(°*u-yi-kel-uk-idi*)	'That (tree) was already broken by itself.'
	Mbi undyombukidi?	(°*u-N-yomb-uk-idi*)	'Why did you sneak away?'
	Ntoto usesukidi kuna.	(°*u-ses-uk-idi*)	'The earth there has been upheaped.'
	Mvuva totukidi mu nzungu.	(°*tot-uk-idi*)	'Vapor has come out of the pot.'
b.	*Disuku dimonikene.*	(°*di-mon-ik-idi*)	'The cause is known.'
	Ngonde imonikene.	(°*i-mon-ik-idi*)	'The new moon.'
	Divanzi dibotukele.	(°*di-bo-uk-idi*)	'The medal has lost its hook.'
	Vita ditobukele.	(°*di-tob-uk-idi*)	'The war has begun.'
	Tembukele.	(°*temb-uk-idi*)	'He left without saying a word.'
	Nsinga uvonukene.	(°*u-von-uk-idi*)	'The cord slips out of it.'
	Diwongumukene.	(°*di-wong-um-uk-idi*)	'[The pit] has collapsed.'
c.	*Kik'utu kiau uketekele vana.*	(°*u-ket-ik-idi*)	'That coat, which you hung there.'
	Nyandi up'ekekele.	(°*u-N-vek-ik-idi*)	'He has retained me/held me back.'

(56) Kiyombe (DRC) (De Cleene 1913)

a.	*Nzambi badi tèbukidi Noë moyo.*	(°*teb-uk-idi*)	'God has remembered Noah.'
	Moyze bòtukidi vadi Farao.	(°*bot-uk-idi*)	'Mozes has left the Pharaoh.'
	Kòtukidi.	(°*kot-uk-idi*)	'He has woken up.'
b.	*Bòtukele vadi Farao.*	(°*bot-uk-idi*)	'He has left the Pharaoh.'
c.	*Diyilu dimonekene.*	(°*di-mon-ik-idi*)	'Heaven has appeared.'

(57) Kiyombe (DRC) (De Cleene and De Clercq 1920)

Utuzonzekele.	(°*u-tu-zonz-ik-idi*)	'He embarked us.'

The NK languages Kisundi (Mboko-Songho), Kidondo and Kikamba, have back pVHH. This means that only back vowel suffixes are lowered following a mid vowel root. Back vowel suffixes are still lowered when followed by the reflex of ***-ide**, but the latter itself is not lowered, as shown in (58) for Kidondo. Examples for Kisundi (NK) as spoken in Congo (118) are in the Appendix.

(58) Kidondo (Pouchet 1957, KongoKing Fieldwork G. Kouarata 2016)

Bonso bu tu lemvokidi ba tu sidi bubi.	(°*lemv-uk-idi*)	'We forgive all who trespass against us.'
Yulu na nsi bi tebokidi mu mukembo aku.	(°*teb-uk-idi*)	'Heaven and earth are full of your glory.'
Mwaana beelókídi.	(°*beel-uk-idi*)	'The child has recovered.'

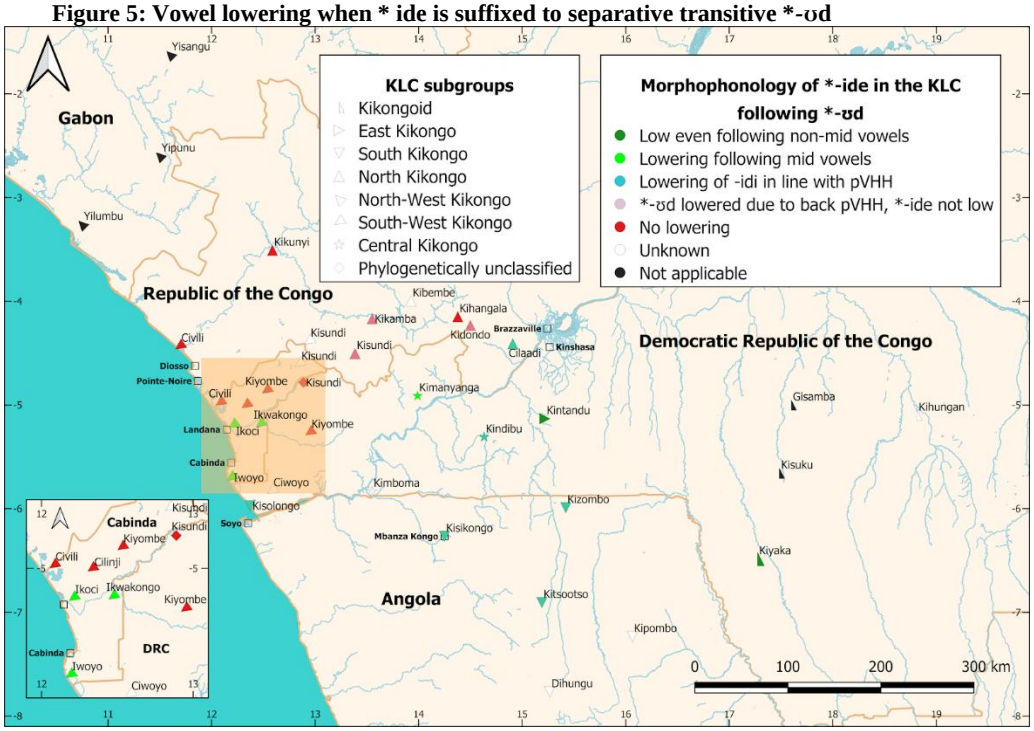
If we take together the languages where lowering of the ***-ide** reflex is in line with pVHH (teal in Figure 4), and the languages where ***-ide** is lowered even following non-mid vowel roots (dark green in Figure 4), and the languages where there is no pVHH, but there is lowering of ***-ide** (bright green), then we see again that this is the southern part of the KLC, while languages without lowering of ***-ide** are situated further north.

3.4. Morphophonology of *-ide reflexes when suffixed to reflexes of separative transitive *-ʊd

In §2, we have observed variation in the outcomes of imbrication of ***-ide** into the separative transitive suffix ***-ul*** in that Kiyaka (KK), Kintandu (EK), Kimanyanga (CK) manifest some form of ***wi*** avoidance, whatever vowel the root has, while 19th c. West Kikongo as spoken in Kakongo (WK) does not. Moreover, to circumvent ***wi***, Kiyaka (KK) and Kintandu (EK) lower the sequence to ***we***, while Kimanyanga turns the sequence into a simple mid back vowel. A further variation is that some

form of vowel lowering takes place in the last two syllables of the verb form, either whatever vowel the root has (Kiyaka, Kintandu) or only when the root has a mid vowel (Kimanyanga, Kakongo). Figure 5 displays all variation observed in the morphophonology of ***-ide** when suffixed to the separative transitive suffix ***-ul***. As one can see, Kiyaka and Kintandu, the only two languages in dark green on Figure 5, are atypical in that they are the only ones where the imbricated outcome of ***-ul*** followed by ***-ide** is lowered whatever the vowel of the root is, and not only following mid vowel roots, as shown in (8b), (11) and (12) for Kiyaka and (17a) and (18) for Kintandu.

Figure 5: Vowel lowering when * ide is suffixed to separative transitive *-ʊd



Apart from Kiyaka and Kintandu, vowel lowering in this environment – if any – is only observed after mid root vowels. The categorization of the different types of lowering of ***-ide*** when suffixed to ***-ul*** is very similar to those observed when ***-ide*** is suffixed to ***-ik*** and ***-uk***, as described in §3.3, except that imbrication always takes place, though not always in the same way. When there is no lowering of ***-ide***, the imbricated outcome of ***-ul-idi*** is either ***-udi*** or ***-uli***, which certain authors analyze as ***-ul*** followed by a short allomorph of ***-ide*** instead of imbrication properly (Bastin 1983). Once again, the main divide on Figure 5 is between lowering in the south and non-lowering in the north, roughly along the same lines as in Figures 2 to 4. In Figure 5, we consider as lowering languages those where the outcomes of ***-ide*** lowering cannot be distinguished from pVHH (teal), those where ***-ide*** is lowered even following non-mid vowel roots (dark green), and those with lowering of ***-ide*** without pVHH (bright green). Those lowering languages, marked in a kind of green mainly occurring in the south of the KLC, while languages without lowering of ***-ide***, marked in a kind of red, are mainly further north. The different types of lowering and non-lowering are explained and illustrated below.

In languages with symmetric pVHH, ***-ide*** imbricates with ***-ul*** in such a way that it involves glide formation: °***-ul-ide*** > wVCV. When preceded by a mid vowel root, both resulting vowels are mid,

while these remain high when preceded by non-mid vowel roots. Examples for Kisikongo are in (59a) for roots with a mid vowel and in (59b) for roots without a mid vowel.

(59) Kisikongo (Bentley 1887; Ndonga Mfuwa 1995)

a.	*tondola*	'cease to love'	vs.	*tondwele*	(°*-tond-ul-idi*)
	dongona	'pick out'	vs.	*dongwene*	(°*-dong-un-idi*)
	yokosa	'shout'	vs.	*yokwese*	(°*-yok-us-idi*)
	wombotota	'walk slowly'	vs.	*wombotwete*	(°*-womb-ut-ut-idi*)
b.	*kukula*	'drift'	vs.	*kukwidi*	(°*-kuk-ul-idi*)
	bangumuna	'roll over'	vs.	*bangumwini*	(°*-bang-um-un-idi*)
	vuluza	'save'	vs.	*vulwizi*	(°*-vul-uz-idi*)
	yukuta	'be satisfied'	vs.	*yukwiti*	(°*-yuk-ut-idi*)

Similar examples as for Kisikongo are in the Appendix: in (125) for Kizombo (SK) and in (126) for Kindibu (CK).

In Kitsootso (SK), which has irregular pVHH, there is also lowering, but no glide formation: the back suffix vowel is lowered and the front vowel of the imbricated verb ending is deleted, which results in ***-ole***. Examples are in (60). The last example shows that when there is a non-mid vowel in the root, the result has the same form, only non-lowered. The same type of imbrication is found in Kimanyanga (CK), which does not have pVHH, as seen in (24).

(60) Kitsootso (J.P. Panda, p.c.)

Andyengole nsingo.	(°*a-N-leng-ul-idi*)	'They broke his neck.'
Tengole menga.	(°*teng-ul-idi*)	'He spilled blood.'
Sengole mambo.	(°*seng-ul-idi*)	'He showed the problems.'
Yangudi kyelo.	(°*yang-ul-idi*)	'He opened the door.'

In Cilaadi (NK), the imbrication of the extensions ***-ul***, ***-us*** with ***-idi*** can result in ***-ole***, just like in Kimanyanga (CK) and Kitsootso (SK), according to Grégoire (1976) (61) or in ***-wele***, spelled as <***-uele***> according to phrases in the Laadi catechism (Jaffré 1930) (62).

(61) Cilaadi (Grégoire 1976)

Tubeelolé.	(°*tu-beel-ul-idi*)'	We cured.'
Sokóle ngáji mu tsikaanká.	(°*sok-ul-idi*)	'He detached the nut from the bunch.'
Kunyongose.	(°*ku-nyong-us-idi*)	'It was teeming.'

(62) Cilaadi (Jaffré 1930)

Bou n'a longuele baka nlongui mia mbi.	(°*long-ul-idi*)	'I gave bad advise.'
Bou n'a songuele baka bifou bia bibi.	(°*song-ul-idi*)	'I've shown bad to others.'
[…] *b'a longuese nsamou mia Nzambi.*	(°*long-us-idi*)	'They taught the message of God.'

There is no lowering following a low or high root vowel. Depending on the suffixes there can be imbrication or not, as shown in (63).

(63) Cilaadi (Grégoire 1976)

Tukutumunini.	(°*tu-kut-um-ul-idi*)	'We unfolded.'
Tufulusí.	(°*tu-ful-ul-is-idi*)	'We filled.'

In Cilaadi as used in Jaffré (1930), there is no ***wi*** avoidance, as can be seen in (64), while there in according to Grégoire (1976) there is ***wi*** avoidance also in other environments, as shown in (65).

(64) Cilaadi (Jaffré 1930: 184)

Bou n'a singuidi baka. (°*sing-ul-idi*) 'I cursed others.'

(65) Cilaadi (Grégoire 1976)

fungusá	(°*fung-ul-is-a*)	'make confess'
giukusu	(°*giuk-ul-isu-a*)	'get used to'

Hence, once again, in languages with symmetric and languages with asymmetric pVHH, lowering of ***-ide** is in line with pVHH: when ***-ul-*** is lowered in the infinitive, the imbrication of ***-ide** with ***-ul*** is lowered as well, even though the way of imbricating can be different.

In the southern Cabindan varieties (WK), without pVHH, ***-ide** is lowered following mid vowels. When combined with ***-ul***, the imbrication results in ***-wele***. Examples for Iwoyo are in (66), and for Ikwakongo (130) and Ikoci (131) in the Appendix.

(66) Iwoyo (Fieldnotes Heidi Goes 2018)

Yono nandi ukondwele likuundi.	(°*u-kond-ul-izi*)
'Yesterday he picked a fruit.'	
Yono ngaanga ubelusweze mwan'ami.	(°*u-bel-us-izi*)
'Yesterday, the doctor healed my child.'	
Yono babavengwele.	(°*ba-ba-veng-ul-izi*)
'Yesterday, they fastened [smth.].'	
Yono bazebwele.	(°*ba-zeb-ul-izi*)
'Yesterday, they loosened [smth.].'	
Yono tusekwele mazi.	(°*tu-sek-ul-izi*)
'Yesterday, we put the water in another place.'	

In Ciwoyo (WK) (67) the imbrication is again similar to the southern Cabindan languages, with the low/central final vowel being unique characteristic of Ciwoyo.

(67) Ciwoyo (DRC) (Fieldnotes Heidi Goes 2018)

Mbyotwela bola va meeza. (°*N-bot-ul-izi*) 'I've put the pot on the table.'

The examples from Civili as spoken in Congo (68), and Civili as spoken in Cabinda (69), both WK, show that there is no difference between the ***-ide** forms following a mid or non-mid vowel root.

(68) Civili (Congo) (Marichelle 1902; 1907)

ku kolula	'pluck'	vs.	*koluli*	(°*kol-ul-isi*)
ku tembula	'startle, frighten away'	vs.	*tembuli*	(°*temb-ul-isi*)
ku safula	'to abandon a child'	vs.	*safuli*	(°*saf-ul-isi*)

(69) Civili (Cabinda) (Fieldnotes Heidi Goes 2018)

Nandi yono bokuni limpa.	(°*bok-ul-isi*)	'Yesterday, he broke the bread.'
Yono ikotuli bana babonso.	(°*i-kot-ul-isi*)	'Yesterday, I woke up all the children.'
Yono babotuli i nti u beeli mu nzila.	(°*ba-bot-ul-isi*)	'Yesterday, they pulled the tree from the road.'

One difference with the pattern in §3.3 is that in Kiyombe (WK) as spoken in the DRC, no lowering at all has been found with ***-ul-idi***, as shown in (70).

(70) Kiyombe (DRC) (Bittremieux 1923-1927)

P'emo uvevudi mvula.	(°*u-vev-ul-idi*)	'The wind chased the rain away.'
Zivembudi.	(°*zi-vemb-ul-idi*)	'They became white (flowers)'
Ndiyombudi	(°*ndi-yomb-ul-idi*)	'I took it away stealthily.'

Tiemuni.	(°*tiem-ul-idi*)	'He is awake.'
Zivembudi.	(°*zi-vemb-ul-idi*)	'They (*safu* fruits) became white.'

(71) Kiyombe (Cabinda) (Fieldnotes Heidi Goes 2019, Abel Massiala, p.c.)

Bawu badeekudi kibeedi yono.	(°*ba-deek-ul-idi*)	'They reduced the price yesterday.'
Bawu bakombudi.	(°*ba-komb-ul-idi*)	'They sweeped.'
Ngieyo ukoludi zitsafu.	(°*u-kol-ul-idi*)	'You plucked the *safu* fruits.'

There is also no lowering of ***-ide** in Kihangala (NK) (127), Kisundi (Nganda-Tsundi) (phylogenetically unclassified) (DRC) (128) and Cilinji (WK) (129) as shown in the Appendix.

In the languages with back pVHH, there is no lowering of ***-ide**, but the high back vowel of the suffix remains low as it was already in the infinitive. The outcome of imbrication of ***-ide** into ***-ul*** is the same as in the WK language discussed above, but the back vowel is lowered, i.e., ***-odi***, in accordance with back pVHH. Examples are in (72) for Kidondo (NK), in (73) for Kisundi (NK) and in (74) for Kikamba (NK).

(72) Kidondo (KongoKing Fieldwork G. Kouarata 2016, 2021)

Kilesi kyáání tóbodí ndiimbu. (°*tob-ul-idi*)
'My brother has pierced the balloon.'
Bàmùbótòdí há kibúka. (°*ba-mu-bot-ul-idi*)
'They have removed him from the [his] post.'

(73) Kisundi (Mboko-Songho) (KongoKing Fieldwork G. Kouarata 2016)

Ná kohódi? (°*koh-ul-idi*) 'Who has coughed?'

(74) Kikamba (Bouka 1989)

Babokodi. (°*ba-bok-ul-idi*) 'They have hunted.'

3.5 Morphophonology of *-ide reflexes when imbricated into a suffix with a low central vowel In §2, we have also shown that Kiyaka (KK), Kintandu (EK), Kimanyanga (CK) and 19th c. West Kikongo as spoken in Kakongo (WK) generate the same morphophonological output when ***-ide** imbricates into a suffix starting with a low central vowel and ending in a coronal consonant: when that suffix is monosyllabic the verb form always ends in a mid front vowel and when it is disyllabic and has two successive /**a**/, the last two syllables of the verb form always have a mid front vowel, in both cases whatever vowel the root has. Variation between the four languages in this environment exists with regard to the vowel of the imbricated suffix when the latter is monosyllabic, i.e., either /*e*/ (Kiyaka, Kintandu, Kakongo) or a (Kimanyanga), and concerning the possibility of further leftward spread of the mid front vowel, which only exists in Kiyaka. In this Section, we consider uniformity and variation in this specific morphophonological environment across the KLC. Figure 6 offers an overview. The suffixes concerned here are the reflexes of extensive ***-ad** (i.e., ***-al***), tentive/contactive ***-at** (i.e., ***-at***) and reciprocal ***-an** (i.e., ***-an***) or a polysyllabic reciprocal marker ending in ***-an***, such as ***-asan***, ***-azian***, ***-akan***, ***-angan***, etc.

Across most of the KLC, when ***-ide** follows such a suffix, imbrication takes place and the last two vowels of the verb form are front mid, whatever vowel the root has: °**aC**$_{[+cor]}$**-ide** → °**aiC**$_{[+cor]}$**e** → **eC**$_{[+cor]}$**e**. So, both the verb's final vowel and the one before are realized as /**e**/, whether the imbricated suffix is monosyllabic or disyllabic. Apart from Kitsootso (SK) (cf. infra), Kimanyanga is unique in maintaining /**a**/ in the penultimate syllable when ***-ide** imbricates into a monosyllabic suffix with a low central vowel. When the imbricated suffix is disyllabic, the low central vowel in the suffix's first

syllable is mostly maintained as is across the KLC, unlike in Kiyaka where the mid front vowel of the last two syllables can spread leftward up to the root.

The oldest Bantu dictionary, i.e., the one of 17th c. South Kikongo (Van Gheel 1652), contains a rare surface realization of the reflexes of ***-an** and ***-ide** following each other. This ***-an-ini*** sequence, illustrated in (75a), manifests neither imbrication nor vowel lowering, which is unique for the KLC. However, as shown in (75b), ***-ini*** can be lowered to ***-ene*** following ***-an***, though without imbrication. Moreover, ***-an*** and ***-ini*** can also be found imbricated, i.e., realized as ***-ene***, as in (75c). One example has been found in both forms, i.e., *cucancana* 'to resist' → *ncancanini* and *ncanqúéne* (°*N-kank-an-idi*). All other suffixes with /**a**/ followed by a coronal consonant, including compound ones ending in ***-an***, do systematically manifest imbrication and vowel lowering, as shown in (75d).

(75) Kisikongo (Van Gheel 1652)

a.	*cúcanána*	'to say goodbye'	vs.	*ncananini*	(°*N-can-an-idi*)
	cuzengana	'to get lost'	vs.	*nzenganini*	(°*N-zeng-an-idi*).
	cuzolana	'to love each other'	vs.	*nzolanini*	(°*N-zol-an-idi*)
	cúboqúiána	'to yell, shout'	vs.	*nboqúianini*	(°*N-bok-i-an-idi*)
	cufuncana	'to compete'	vs.	*nfuncanini*	(°*N-funk-an-idi*)
	cussimaziana	'to wonder, be amazed'	vs.	*nssimazianini*	(°*N-sim-azian-idi*)
b.	*cubhobheçiana*	'to talk with each other'	vs.	*npobheçianene*	(°*N-vov-isian-idi*)
c.	*cussacana*	'to make fun'	vs.	*nssaqúène*	(°*N-sak-an-idi*)
	cuacana	'to make sound'	vs.	*nguaquéne*	(°*N-sak-an-idi*)
	cunúcana	'to kiss'	vs.	*nnúquene*	(°*N-nuk-an-idi*)
d.	*cuzimbala*	'to loose'	vs.	*nsimbele*	(°*N-zimb-al-idi*)
	cúlandacana	'to follow'	vs.	*ndandaqúéne*	(°*N-land-akan-idi*)
	cusindacana	'to loose'	vs.	*nsindaquene*	(°*N-sind-akan-idi*)
	cussompacana	'to change'	vs.	*nsompaqúene*	(°*N-somp-akan-idi*)
	cubulangana	'to find'	vs.	*nbúlangúene*	(°*N-bul-angan-idi*)

It is not clear whether these two ways of realizing ***-aC$_{[+cor]}$-ide*** sequences reflects real variation within 17th c. South Kikongo or whether it is rather an artifact of inconsistent documentation. In the first case, it could indicate that one of the variations is a relatively recent phenomenon, possibly limited to this specific variety of South Kikongo. In the second case, it has little consequence for our historical linguistic analysis. Two centuries later, Bentley (1887) still describes both strategies, i.e., with imbrication and lowering (76a) vs. without (76b). Remarkably enough, in the Appendix to his dictionary, Bentley (1895) considers the non-lowering forms as the only correct ones and provides no other examples (77). However, examples from the late 20c. PhD dissertation of Ndonga Mfuwa (1995) show that lowered and imbricated realizations of ***-an-idi*** did not disappear from Kisikongo (78). A more recent Bible translation (Anon. 2001), which probably relies on earlier sources, uses again both realizations, i.e., (79a) vs. (79b).

(76) Kisikongo (SK) (Bentley 1887)

a.	*vilakana*	'become lost'	vs.	*vilakene*	(°*vil-akan-idi*)
	bulangana	'meet'	vs.	*bulangene*	(°*bul-angan-idi*)
	kwakasa	'rub on something rough'	vs.	*kwakese*	(°*kwak-as-idi*)
	sansala	'stagger'	vs.	*sansele*	(°*sans-al-idi*)
b.	*landakiana*	'to go one after another'	vs.	*landakianini*	(°*land-ak-ian-idi*)
	Vangana <u>ovanganini</u>.	(°*vang-an-idi*)	'You are too soon.'		
	Lekwa ke <u>kiakanini</u> nkutu ko.	(°*ki-ak-an-idi*)	'The thing not yet ready'		

(77) Kisikongo (SK) (Bentley 1895)

zolana	'love each other.'	vs.	*zòlànìnì*	(°*zol-an-idi*)
Batezanini nlaka a ntinu.			(°*ba-tez-an-idi*)	'They raced together.'
I bosi bavambanini ya Ntoni.			(°*ba-vamb-an-idi*)	'Then they separated from Ntoni.
Bawananini.			(°*ba-wan-an-idi*)	'They met.'
Bayakanini.			(°*ba-yak-an-idi*)	'They shared.'

(78) Kisikongo (SK) (Ndonga Mfuwa 1995)

oNsimba y(e) oNzuzi asimbanene	(°*à-Ø-sìmb-àn-idi*)	'Nsimba and Nzuzi have held e.o.'
àsòmpànénè.	(°*a-somp-an-idi*)	'They are united in marriage.'

(79) Kisikongo (SK) (Anon. 2001)

O nkaz'andi ozayakene muna mavitu.	(°*o-zay-ak-an-idi*)
'Her husband is respected at the city gate.'	
Unzingalakene muna nsingu.	(°*u-nzing-alak-idi*)
'He threw his arms around his neck.'	
Bavovazianini.	(°*ba-vov-az-ian-idi*)
'They said to each other.'	
Ofwananini.	(°*o-fuan-an-idi*)
'He appeared.'	
Ombimbakene.	(°*o-bimb-ak-an-idi*)
'He embraced him.'	

Imbrication and vowel lowering also happens in Kisolongo, as shown in (80).

(80) Kisolongo (SK) (Visseq 1889)

zakana	'recognize'	vs.	*zakene*	(°*zak-an-idi*)
koutakana	'unite several people'	vs.	*koutakene*	(°*kut-akan-idi*)
boulangana	'meet'	vs.	*boulangene*	(°*bul-ang-an-idi*)
boulangaziana	'meet each other'	vs.	*boulangaziene*	(°*bul-ang-azian-idi*)

In §2 examples have been given for Kintandu (EK) (21) and Kakongo (WK) (33). More examples are given in the Appendix for Kizombo (SK) (132) and Cilaadi (NK) (133). The realization of the ***-ide** reflex with mid front vowels is more widespread in the KLC when it imbricates into a suffix with a low central vowel (see Figure 6) than in other morphophonological contexts (see Figures 2-5). As shown in (81) and (82) respectively, it even happens in Civili (WK) and Iwoyo (WK), where the ***-ide** reflex is rarely realized with mid vowels.

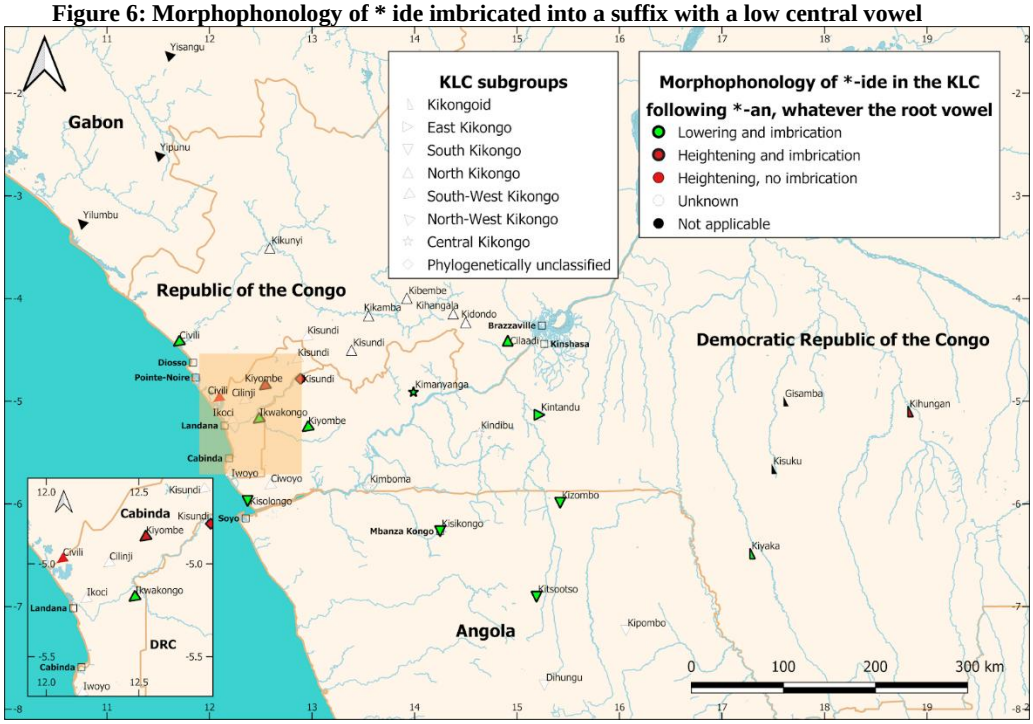
(81) Civili (Congo) (WK) (Marichelle 1907)

zakana	'meet, see, find someone'	vs.	*zakene*	(°*zak-an-isi*)
diengana	'meet'	vs.	*dienghéné*	(°*dieng-an-isi*)
findana	'discuss, contest'	vs.	*findene*	(°*fin-an-isi*)
kutakana	'assemble'	vs.	*kutakéné*	(°*kut-akan-isi*)
kukasana	'agree'	vs.	*kukasene*	(°*kuk-asan-isi*)

(82) Iwoyo (WK) (Fieldnotes A. Massiala 2021)

Bawu badengene.	(°*ba-deng-an-izi*)	'They met each other.'
Bawu bavontengene.	(°*ba-vont-angan-izi*)	'They mixed up.'
Bawu bavindengene va ntoto.	(°*ba-vind-angan-izi*)	'They got dirty in the earth.'
Bawu bazakaziene.	(°*ba-zak-azian-izi*)	'They met each other.'
Bawu bavangaziene i mbi.	(°*ba-vang-azian-izi*)	'They did each other wrong.'
Bawu bateleziene mbila.	(°*ba-tel-ezian-izi*)	'They called each other.'

Figure 6: Morphophonology of * ide imbricated into a suffix with a low central vowel



Nonetheless, even in this context, there are also languages where the reflex of ***-ide*** and the suffix in which it imbricates are never realized with mid front vowels, but with high front vowels. In Kiyombe as spoken in Cabinda, for example, the imbrication of the underlying suffix sequence ***-an-idi*** results in ***-ini***, as in (83a). The first syllable of disyllabic low vowel suffixes is also heightened to /**i**/, as in (83b).

(83) Kiyombe (WK) (Cabinda) (A. Massiala, p.c.)

a.	*Tukabini.*	(°*tu-kab-an-idi*)	'We have divided.'
	Tubundini.	(°*tu-bund-an-idi*)	'We have gathered.'
	Tudengini.	(°*tu-deng-an-idi*)	'We have met each other.'
	Uzungini.	(°*u-zung-an-ini*)	'You have walked without purpose/goal.'
b.	*Tuzolisini.*	(°*tu-zol-as-an-idi*)	'We loved each other.'
	Tuvambisini.	(°*tu-vamb-as-an-idi*)	'We waited for each other.'
	Tukambisini.	(°*tu-kamb-as-an-idi*)	'We talked with each other.'
	Ideedikini	(°*i-deed-ak-an-idi*)	'It is similar to.'
	Ibeelikini nandi.	(°*i-beel-ak-an-idi*)	'I approached him.'
	Phaalikini.	(°*N-vaal-ak-an-idi*)	'He embraced me, supported me.'

As shown in (84), the same output is observed in the data available for Kiyombe from the DRC, even if these contain also counterexamples, such as *dibokelengene* (°*di-bok-al-angan-idi*) 'it has made it dark', with a mid front vowel spreading from the root to the end.

(84) Kiyombe (WK) (DRC) (Bittremieux 1923-1927)
Batingini ku tsi dikunzi. (°*bat-angan-idi*)
'He was stuck under a pole.'
Bula-matadi bokelingini va muelo. (°*bok-al-angan-idi*)
'The medaled chief makes the wholehut dark by standing in the doorway.'

There are further variations on this theme. As seen in §2, in Kimanyanga (27), ***-aC$_{[+cor]}$-ide*** sequences are realized as ***-aC$_{[+cor]}$e***. The same process is observed in Kitsootso (SK), as shown in (85), with the exception of *tukanini* (°*tu-kan-an-idi*) 'We bid farewell'. No other SK languages for which we have data manifest such an output of this sequence. The only other language with a similar output is Kihungan (KK), except that the final vowel – if not deleted as commonly is the case in that language with irregular final vowel loss – is not lowered to /**e**/, but realized as /**i**/ as in the three last examples in (86).

(85) Kitsootso (P.J. Panda, p.c.)

Tusompane.	(°*tu-somp-an-idi*)	'We are marrying.'
Ndukane.	(°*N-nuk-an-idi*)	'I smelled.'
Tufungane.	(°*tu-fung-an-idi*)	'We got nervous.'
Tuzolane.	(°*tu-zol-an-idi*)	'We love each other'
Tuzangane.	(°*tu-zeng-an-idi*)	'We are stupid.'
Tulandakane.	(°*tu-land-akan-idi*)	'We chased each other.'
Tudingalale.	(°*tu-ding-alal-idi*)	'We kept silent.'
Tusompakane.	(°*tu-somp-akan-idi*)	'We borrowed from each other.'
Tubulakane.	(°*tu-bul-akan-idi*)	'We met in some place.'

(86) Kihungan (Fieldwork data J. Koni Muluwa 2017)

Bakwélán.	(°*ba-kwɛl-an-idi*)	'They are married.'
Báhénán mbɔt.	(°*ba-han-an-idi*)	'They have greeted e.o.'
Bayíbán.	(°*ba-yib-an-idi*)	'They have stolen from each other.'
Báfíndání.	(°*ba-find-an-idi*)	'They have accused each other.'
Umɔ́nání.	(°*u-mɔn-an-idi*)	'He has met (with someone)'

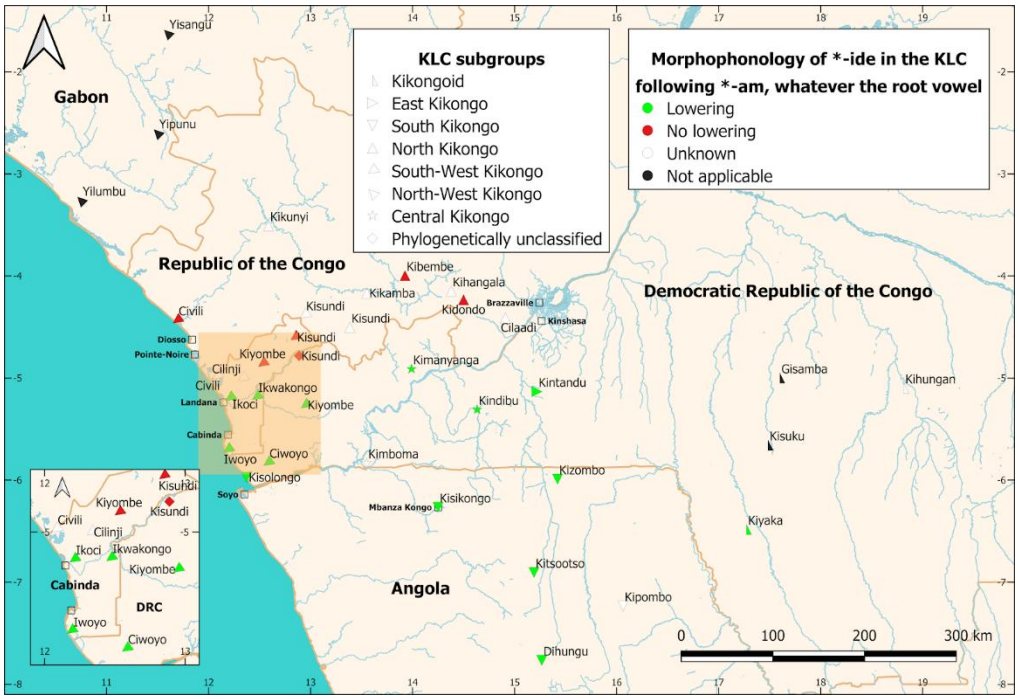
In Kidondo (NK), there is also no lowering in this context prone to lowering.

(87) Kidondo (Fieldwork data G. Kouarata 2021)

Màbìàlà na Ngìmbì <u>bàbèlàsàní</u>.	(°*ba-bel-asan-idi*)	'Mabiala and Ngimbi hated each other.'
Yààwú <u>bàsàlàsàní</u>.	(°*ba-sal-asan-idi*)	'They have helped each other.'
Mìtìmá <u>mìlèmbàmàní</u>.	(°*mi-lemb-am-an-idi*)	'The hearts have softened.'
<u>Tùzònzàsàní</u> nà (*y*)*ándì.*	(°*tu-zonz-asan-idi*)	'We have talked with him.'
Nyòbìdììngí.	(°*N-yob-il-ang-idi*)	'I have washed myself.'
Màbìàlà <u>wùbàyènììngí</u>.	(°*wu-ba-yen-ang-idi*)	'Mabiala has seen them.'
Màámá <u>lèèmbììngí</u> ntòbà.	(°*leemb-ang-idi*)	'Mother has prepared manioc leaves.'

3.6 Morphophonology of *-ide reflexes when suffixed to the reflex of stative-positional *-*am* A final feature shared by Kiyaka (KK), Kintandu (EK), Kimanyanga (CK) and 19th c. West Kikongo as spoken in Kakongo (WK), as discussed in §2, is that whenever ***-ide*** follows a suffix with /**a**/ not ending in a coronal consonant, it does not trigger imbrication and it is realized with two mid front vowels, whatever vowel the root has. This specific morphophonological context is most often created by the reflex of stative-positional ***-am*** preceding the reflex of ***-ide***. Figure 7 shows that this feature is widespread in the KLC (the languages marked in green), but not omnipresent (the languages marked in red). Although data is missing for several Kikongo languages, especially in NK, the North-South partition is visible again: no lowering in the North, versus lowering in the South. In most Kikongo languages this lowering does not involve any imbrication. Within the two broad categories of lowering vs. non-lowering in this context, there is still quite some variation.

Figure 7: Lowering of * ide following the reflex of *-am



In the oldest dictionary for South Kikongo (Van Gheel 1652), ***-am*** and ***-idi*** never imbricate, as still is the case in present-day Kisikongo. However, ***-idi*** is not always lowered when following ***-am***, unlike in current-day Kisikongo. As a matter of fact, the dictionary contains less examples with lowering, as in (88a), than without, as in (88b), even when considering verbs with a mid vowel root. Sometimes equivalent past forms are given for the same verb stem, e.g., *cúsintama* 'to be quiet' vs. *nsintamini*/*nsintamene* (°*N-sint-am-idi*) and *cunangamena* 'to be stubborn, obstinate' vs. *nnangaméne*/*nnangamini* (°*N-nang-am-idi*).

(88) 17th c. South Kikongo (Van Gheel 1652)

a.	*cútimpama*	'to rest'	vs.	*ntimpamene*	(°*N-timp-am-idi*)
	cúbhúbhama	'appease'	vs.	*npubhaméne*	(°*N-bhubh-am-idi*)
	cutenzama	'to sit on, lay on'	vs.	*tenzamene*	(°*tenz-am-idi*)
	cuengama	'to be hanging	vs.	*yengamene*	(°*i-eng-am-idi*)
	cuecáma	'to lie down'	vs.	*iecaméne*	(°*i-ec-am-idi*)
b.	*culalama*	'to be on top of another thing'	vs.	*ndalamini*	(°*N-lal-am-idi*)
	cuacama	'take care of something'	vs.	*iacamini*	(°*i-ac-am-idi*)
	cubhilama	'to hide oneself'	vs.	*npilamini*	(°*N-pil-am-idi*)
	cufungamina	'to understand'	vs.	*nfungamini*	(°*N-fung-am-idi*)
	culembama	'to progress'	vs.	*ndembamini*	(°*N-lemb-am-idi*)
	cubhecama	'to delay'	vs.	*npecamini*	(°*N-bhec-am-idi*)
	cúenssama	'to be hung'	vs.	*ienssamini*	(°*i-ens-am-idi*)
	cubhétama	'to be leaning'	vs.	*npetamini*	(°*N-bhét-am-idi*)
	cucocama	'to bind'	vs.	*ncocamini*	(°*N-coc-am-idi*)
	cússonama	'to write'	vs.	*nssonamini*	(°*N-son-am-idi*)

In more recent Kisikongo sources (Bentley 1887; Ndonga Mfuwa 1995), only lowering has been found.

(89) Kisikongo (SK) (Bentley 1887; Ndonga Mfuwa 1995)

Òmwìvì òkángàmènè.	(°*ò-Ø-káng-àm-idi*)	‘The thief has been stopped/arrested’.
Kiwandamene muna etadi.	(°*ki-and-am-idi*)	‘It struck on or against a stone.’
O mavuku manyembamene.	(°*ma-n-yemb-am-idi*)	‘The waves rolled over him.’

The same lowering has already been shown in §2 for Kiyaka (12), Kintandu (22), Kimanyanga (28) and Kakongo (33). It also happens in Kisolongo (135), Kitsootso (136), Kizombo (137), all SK and Kindibu (CK) (138), as shown in the examples in the Appendix.

In Civili (WK), ***-isi***, the regular reflex of ****-ide***, undergoes neither nasal harmony nor lowering, as can be seen in (90). In Iwoyo (WK), there is also no nasal harmony, but vowel lowering is observed, as shown in (91). When the root has a mid front vowel, as in the first example, even ***-am*** shifts to ***-em***.

(90) Civili (Congo) (WK) (Marichelle 1902)

lalama	‘float’	vs.	*lalamisi*	(°*lal-am-isi*)
gnekama	‘spread, support’	vs.	*gnekamisi*	(°*gnek-am-isi*)
lebama	‘calm’	vs.	*lebamisi*	(°*leb-am-isi*)
lingama	‘calm down, be silent’	vs.	*lingamisi*	(°*ling-am-isi*)
gnokama	‘be abandoned’	vs.	*gnokamisi*	(°*gnok-am-isi*)
kukama	‘babble’	vs.	*kukamisi*	(°*kuk-am-isi*)

(91) Iwoyo (WK) (Fieldnotes A. Massiala 2021)

Yono minu yitelemeze.	(°*tel-am-izi*)	‘Yesterday I was standing.’
Nti yono wulalameze.	(°*lal-am-izi*)	‘The tree floated yesterday.’
Likaalu livangameze.	(°*li-vang-am-izi*)	‘The car was repaired.’

In Kisundi (WK), as spoken in Cabinda (92), ***-am-idi*** results in ***-am-ani***. While the first vowel of the ***-ide** reflex harmonizes completely with the preceding suffix vowel, the last vowel remains high.

(92) Kisundi (WK) (Cabinda) (Fieldnotes Heidi Goes 2019)

Beetu tutelamani.	(°*tu-tel-am-idi*)	‘We were standing.’

In Kiyombe (WK), as spoken in Cabinda, the low vowel of ***-am*** is heightened to ***-im*** preceding ***-ini***, as shown in (93).

(93) Kiyombe (WK) (Cabinda) (A. Massiala, p.c.)

Ufukimini.	(°*u-fuk-am-idi*)	‘He kneeled.’
Tubwongimini.	(°*tu-bwong-am-idi*)	‘We sat/stood with the legs crossed.’
Tukindimini.	(°*tu-kind-am-idi*)	‘We are steadfast.’
Ukundimini.	(°*tu-kund-am-idi*)	‘She ascended the throne.’ or ‘She entered marriage.’
Nzo ivangimini.	(°*i-vang-am-idi*)	‘The house is made.’

However, in Kiyombe (WK), as spoken in the DRC, both ***-amene*** (94a) and ***-imini*** (94b) are found in Bittremieux (1923-1927) as well as in the religious texts translated by De Cleene (1913), sometimes even with the same verb stem, cf. *yilama* ‘be abundant, be piled up’.

(94) Kiyombe (DRC) (Bittremieux 1923-1927)

a.	*Nzo ibafamene.*	(°*i-baf-am-idi*)	‘The house is well closed.’
	Nkanda uvebamene.	(°*u-veb-am-idi*)	‘The skin is very burnt.’
	Singamene va nsenga.	(°*sing-am-idi*)	‘He lies against a stone pine.’
	Kondamene ku mbusa.	(°*kond-am-idi*)	‘He is laying on the back (of someone).’
	Biyilamene.	(°*bi-yil-am-idi*)	‘They are very numerous.’

b.	*Sukamene.*	(°*suk-am-idi*)	'He is done talking.'
	Málóóndá téélímíní.	(°*teel-am-idi*)	'Malonda sits up (today).'
	Bondimini.	(°*bond-am-idi*)	'It has been watered.'
	Bisono binutimini.	(°*bi-nut-am-idi*)	'The letters are too small.'
	Biyidimini.	(°*bi-yil-am-idi*)	'It is all on a pile.'

A unique outcome of °-***am-idi*** is observed in Kidondo (NK), where it is realized as -***ami***.

(95) Kidondo (NK) (Fieldwork G. Kouarata 2021)

Mùkéémbò wùkàbàkàmí.	(°*wu-kab-ak-am-idi*)	'The party was canceled.'

3.7 Summary In §2.5, by way of summarizing our comparative study of the morphophonology of ***-ide** reflexes in four well-documented languages not manifesting pVHH and belonging to four distinct subgroups of the KLC, we identified seven shared morphophonological features, which are possibly retentions inherited from PK, as well as seven lines of minor variation. In this section, we have tested these morphophonological features against the evidence available across the KLC. Of the seven features shared between Kiyaka (KK), Kintandu (EK), Kimanyanga (CK) and 19th c. Kikongo from Kakongo (WK), only the following concerning imbrication can be retained as being omnipresent in the KLC: imbrication always takes place when ***-ide** follows a suffix ending in a coronal consonant and never when it follows a suffix ending in another consonant.

As for vowel harmony, none of the shared features identified in §2.5 is found across the entire KLC. Only the realization of the ***-ide** reflex with two mid front vowels following a suffix with /**a**/ not triggering imbrication, mostly the reflex of ***-am**, is almost ubiquitous, some minor exceptions notwithstanding (see Figure 7 in § 3.6). Civili (WK), Cabindan Kisundi (WK), and Kidondo (NK) are the only present-day varieties where -***am-eCe*** as a reflex of ***-am-ide** is not attested at all. Kiyombe (WK) manifests variation between -***am-ene*** and -***im-ini*** as does Kisikongo (SK) between -***am-ene*** and -***am-ini***. When the reflex of ***-ide** imbricates into a suffix containing /**a**/, the verb form also generally ends in a mid front vowel, whatever vowel the root has, and when the imbricated suffix is disyllabic, e.g., -***angan***, -***akan***, or -***asan***, even the last two syllables of the verb form mostly have a mid front vowel (see Figure 6 in § 3.5). Nonetheless, minor deviations do occur across the KLC: in Kitsootso (SK) both ***-an-idi** and ***akan-idi** keep the low vowel, forming respectively -***ane*** and -***anane*** and in Kiyombe both in Cabinda and the DRC (WK) and Kibembe (NK) there is raising of all three vowels: iCini.

In other morphophonological contexts the realization of the ***-ide** reflex and possible suffixes preceding it with mid vowels is less widespread. Vowel lowering in those environments is still observed in the vast majority of languages in the KLC, in all its different genealogical subgroups, and in languages both with and without pVHH. Nonetheless, there are also languages, especially in the northwestern part and belonging to the NK and WK subgroups, which never realize the reflex of ***-ide** or prefixes preceding it with mid vowels.

When the reflex of ***-ide** is suffixed directly to a root with a mid vowel, whether back or front, Civili, Cilinji, Kiyombe (Cabinda), Kisundi (Cabinda) (all WK) and Kisundi (Mboko-Songho, Congo), Kikunyi, Kibembe, Kihangala as in the fieldwork data of G. Kouarata (in contrast with Kihangala as described by Nkouanda (1997)), Kidondo, Kikamba (all NK), and Kihungan (KK) are the only varieties not realizing it with two mid vowels (see Figure 2 in § 3.1). Leaving aside the WK languages of Guthrie's B40 group, which do not have a reflex of ***-ide**, and except for Kihungan (KK), all these languages are concentrated in the northwestern part of the KLC. Apart from Kihungan (KK), for which we do not have enough data, those same varieties are also the ones never to lower

the vowels of the imbricated outcome of the reflexes of applicative ***-ɪd**/causative ***-ic** + ***-ide** (see Figure 3 in § 3.2).

Most morphophonological variation is observed within the KLC when the reflex of ***-ide** is suffixed to either the reflexes of neuter ***-ɪk** or separative intransitive ***-ʊk** (see Figure 4 in § 3.3), not involving imbrication, or the reflexes of separative transitive ***-ʊd** (see Figure 5 in § 3.4), involving imbrication. The same types of variation already observed between Kiyaka (KK), Kintandu (EK), Kimanyanga (CK) and 19th c. Kikongo from Kakongo (WK) in §2.5 also occur elsewhere in the KLC. However, when it comes to vowel lowering, the realization of ***-ide** and preceding suffixes, whether imbricated or not, without mid vowels is once again only observed in the northwestern part of the KLC, i.e., in the same series of languages belonging to the WK and NK subgroups as mentioned above: Civili, Cilinji, Kiyombe (Cabinda), Kisundi (Cabinda) (all WK), Kisundi (Mboko-Songho, Congo), Kikunyi, Kibembe, Kihangala, Kidondo, and Kikamba (all NK).

4. Reconstructing the morphophonology of *-ide in Proto-Kikongo

Within the KLC, the morphophonology of ***-ide** reflexes turns out to be a complex interplay between two main processes, i.e., imbrication and vowel lowering. The considerable crosslinguistic variation, which these two morphophonological changes trigger, is furthermore conditioned by the types of roots and suffixes preceding ***-ide**. Despite all dissimilarities between languages of the KLC, both in the present and in the past, there are also certain patterns of regularity suggesting that some of the morphophonological features observed today go back to PK, the most recent common ancestor of the KLC. Reconstructing the morphophonology of ***-ide** in PK is a matter of identifying those morphophonological properties that are most plausibly shared retentions. Additionally, one should try to decrease the remaining synchronic variation to earlier uniformity by undoing those changes that are most probably later innovations (cf. Hock 1991: 581). To tell apart retentions and innovations in the variable morphophonological behavior which reflexes of ***-ide** manifest within the KLC, three factors are of key importance: geography, genealogy, and analogy. Let us first briefly explain why these are decisive.

As for geography, the different maps presented throughout Section 3 have shown that patterns of variation in the morphophonology of ***-ide** reflexes are not randomly distributed throughout the KLC. Especially when it comes to vowel lowering, we have seen that across morphophonological contexts there are languages which always manifest verbs forms ending in mid vowels while there are others that (almost) never do. The last ones are systematically found in the northwestern part of the KLC, and mainly belong to two distinct genealogical subgroups, i.e., WK and NK, while lowering languages are found everywhere else. The occurrence of both lowering and non-lowering in clusters of contiguous languages begs for the question whether language contact played a role in the emergence of these present-day geographic patterns of variation.

As for genealogy, the comparative data presented in Sections 2 and 3 have shown that differences in the morphophonology of ***-ide** are also not distributed haphazardly across KLC subgroups. All main types of morphophonological change are attested in all phylogenetic clades of the KLC (KK, NK, WK, EK, SK) as well as in the CK contact zone. Neither imbrication nor vowel lowering are entirely absent from one of those subgroups, even though ***-ide** verb forms ending in one or more mid vowels are far less common within NK and WK than elsewhere. This distribution across the genealogical tree of the KLC is telling for the reconstruction of the morphophonological behavior of ***-ide** in PK.

As for analogy, or more specifically analogical leveling, i.e., the reducing of variation within one and the same paradigm through analogy (cf. Hock 1991: 44-47; Dimmendaal 2011: 101-105), it is vital to recognize that ***-ide** is a verb-final inflectional suffix, which conveys specific meanings in the

tense-aspect system of a language and is thus integral part of grammar. Unlike the verbal derivation suffixes oftentimes preceding it, ***-ide** is not involved in the formation of new words and cannot be lexicalized. Consequently, morphophonological changes triggered by ***-ide** can less easily become petrified and are therefore also more straightforwardly undone. Given that ***-ide** causes alternations in certain conjugations of a verb stem, which are absent in other conjugations of the same verb stem, these morphophonological changes can be levelled out more easily under analogical pressure than, let us say, a sound change in verbal derivation. For example, in English language acquisition, *fell*, the irregular umlaut past form of *fall*, is often overregularized to the regular past form *falled* (cf. Marcus *et al.* 1992: 27, 51; Matthews and Theakston 2006: 1041). In this it is treated just like other English irregular past forms, but unlike the homophonous historical causative form *fell*, although the latter results from the same sound shift diachronically. Causative *fell* is entirely lexicalized and a grammatically more regular alternative is not available. Likewise, vowel lowering in the presence of ***-ide** is assumedly pushed back more readily through paradigm leveling than pVHH in verbal derivation, even if the outcomes of both morphophonological processes are very similar on the surface. To answer the question whether ***-ide** triggered vowel lowering in PK, the possible operation of analogical leveling is to be reckoned with.

Considering geography and genealogy, Goes and Bostoen (2019) conclude that pVHH is a relatively late innovation within the KLC. After the divergence of their respective most recent common ancestors, it rose independently and in different disguises within the SK and NK subgroups. From there (mostly from SK), it diffused through contact-induced change to some of the nearest neighbours where pVHH is attested irregularly in the lexicon and grammar. As for ***-ide**, its morphophonological effects, i.e., imbrication and vowel lowering, are far more widespread than pVHH, both in terms of geography and genealogy. Nothing but from this perspective, reconstructing these two morphophonological alternations triggered by ***-ide** to PK is far more likely than would have been the reconstruction of pVHH. This is certainly so for the imbrication of ***-ide** into suffixes ending in a coronal consonant, which happens everywhere in the KLC, some minor and very rare exceptions (e.g., only not with the reflex of ***-an** in Kisikongo) notwithstanding. Hence, considering ***-VC**$_{[+cor]}$**-ide** → ***-ViC**$_{[+cor]}$**e** as a shared retention from PK, irrespective of the specific phonetic outcome of vowel hiatus resolution in the penultimate syllable, needs no further argumentation. It merits to be noted, nonetheless, that imbrication of ***-ide** into suffixes ending in a non-coronal consonant does occur outside of the KLC. According to Bastin (1983), the absence of imbrication with the reflexes of ***-ɪk** and ***-ʊk**, not only in the KLC, but also in other languages of zones H and S would suggest that imbrication is a relatively recent phenomenon with Bantu.

In any event, in contrast to imbrication, to make a convincing case in favor of different types of PK vowel lowering in the presence of ***-ide**, at least two key questions need to be addressed: (1) why are the languages that realize ***-ide** verb conjugations with mid vowels in the final syllable(s) geographically contiguous, and (2) why did certain languages in the KLC not retain the vowel lowering effects of ***-ide** in PK.

As for the geography of vowel lowering languages, it strikes that final mid vowels in the presence of ***-ide** are only omnipresent in the SK, CK and EK subgroups. In KK, NK and WK, only languages immediately adjacent to SK, CK and EK have that feature. This can be seen most clearly on Figure 2 in §3.1, which depicts the realizations of ***-ide** when suffixed directly to a mid vowel root, because it includes the highest number of languages in terms of available data. The KK, NK and WK languages further removed from SK, CK and EK miss vowel lowering triggered by ***-ide**. For NK and WK, these are the northernmost languages, for KK the easternmost (i.e., Kihungan). Such an isogloss that cross-cuts genealogical subgroups and presents a focal area with the innovation and peripheral areas without it is reminiscent of the classical contact-induced spread process known as ‘dialectal

diffusion' (Andersen 1988). Despite some differences, its specific configuration with a center of innovation that seems to coincide with SK even closely resembles that of noun prefix reduction, which Bostoen & de Schryver (2015) analyze as a case of contact-induced innovation. The fact that SK is exactly one of the clades where also pVHH originated (Goes and Bostoen 2019), suggests that vowel lowering in the presence of ***-ide** might be a relatively late change that emerged in the wake of pVHH. There are at least two strong arguments that plead against such a scenario. First, this morphophonological alternation also occurs in languages such as those discussed extensively in §2 which entirely miss pVHH. Moreover, in certain of these languages, especially in Kintandu (EK) and Kiyaka (KK), the intricacies and the domain of operation (e.g., all suffixes up to the root) of vowel lowering triggered by ***-ide** are superior to what we observe in SK where it would have emerged. This higher complexity and the absence of pVHH argue against a contact-induced spread process originating in SK. Secondly, ***-ide** vowel lowering is most widespread in the KLC in morphophonological contexts where pVHH never occurs, i.e., following suffixes with /**a**/, whether or not involving imbrication. Final mid vowels at the end of ***-ide** verb conjugations are most common in the KLC when this verb-final inflectional suffix is preceded by a reflex of either ***-am**, ***-an** or ***-ad**. Certain NK and WK languages, which attest mid vowels in no other verb forms ending in the reflex of ***-ide**, do have them when one of those verbal derivation suffixes with a low central vowel is involved. The fact that ***-ide** vowel lowering is more prominent precisely in those contexts where pVHH never occurs suggests that the latter constraints the morphophonological effects of ***-ide** rather than inducing them.

Instead of playing a role in promoting ***-ide** vowel lowering, pVHH and geography rather played a role in pushing it back. We argue that those WK, NK and KK languages which miss ***-ide** vowel lowering lost this morphophonological alternation due to paradigm leveling and that some SK and NK languages reduced its effects following the emergence of pVHH. A first argument for the possible disappearance of morphophonological effects of ***-ide** that once occurred is the fact that unlike elsewhere in Bantu (cf. Bastin 1983; Hyman 2003), the initial high front vowel of ***-ide** never triggers spirantization in the KLC, while the same vowel regularly does within the root (Bostoen 2008; Bostoen and Goes 2019). This shows that the heteromorphemic effects of spirantization – also in front of the reflexes of the agentive suffix ***-i** by the way – have been pushed back. In other words, the analogical leveling of other morphophonological changes in front of ***-ide** also occurred in the KLC, even more successfully in the case of spirantization compared to vowel lowering. A second and more forceful argument in considering the absence of ***-ide** vowel lowering as an innovation rather than a retention from PK is the fact that similar though unsuccessful attempts to analogical leveling are historically documented elsewhere in the KLC, most outstandingly in historical SK varieties. The fact that both lowering and non-lowering of ***-ide** following suffixes with /**a**/ has been found in 17th c. South Kikongo, 19th c. Kisikongo and even more recent Kisikongo sources (Van Gheel 1652; Bentley 1887; Anon. 2001), just like both ***-an-ini*** and ***-ene*** as reflexes of ***-an-ide**, shows that during many centuries competing morphophonological strategies have co-existed. Similar rival heterogeneity is also found in Kiyombe as spoken in the DRC today and in the 18th c. Cabindan WK dictionary of Cuénot (1775) (cf. supra). The fact that the paradigm leveling failed in certain SK and WK varieties but did succeed in several other WK and NK varieties might have to do with the later emergence of pVHH in SK creating new contexts of vowel lowering, which complicated its eradication. Nonetheless, even in NK (e.g., Kihangala, Kidondo) and WK (e.g., in Civili and Kiyombe), there are still remnants of ***-ide** lowering in certain archaic contexts, especially following suffixes with /**a**/, indicating that it was not eradicated entirely. Thirdly, apart from the complete suppression of ***-ide** vowel lowering in certain morphophonological contexts, it can also be curtailed partially. This is most transparent in Kisolongo, where vowel lowering triggered by ***-ide** is confined to the limits of

asymmetric pVHH, which emerged relatively recently within the history of SK. While elsewhere in the KLC, vowel lowering in front of ***-ide** happens whatever mid vowel the root has, a process which is best visible in languages without pVHH, it only occurs in Kisolongo when the mid root vowel is front, but not when it is back. This indicates that the conditioning of asymmetric pVHH prevails over that of ***-ide** vowel lowering in Kisolongo and that the broad operation of the latter was restricted by the narrower operation domain of the former when it emerged. As soon as asymmetric pVHH evolves into symmetric pVHH, as happened in Kisikongo (SK), the confining effects of pVHH on ***-ide** vowel lowering are no longer visible as there is no longer a conflict between the operation of both types of vowel harmony. Similarly, it is not unlikely that the development of so-called 'back pVHH', i.e., vowel height harmony only applying to suffixes with back vowels, in NK varieties such as Kidondo, Kikamba and Kisundi (cf. Table 1 in §1) actually contributed there to the abolition of ***-ide** vowel lowering, because the latter involves only front vowels. This particular kind of pVHH also explains odd outcomes of imbrication with vowels of different height, such as ***-odi***, which is the imbricated reflex of ***-ʊd-ide** in those languages.

Reconsidered in this way, rather than being a conservative relic area not affected by ***-ide** vowel lowering, the northwestern part of the KLC (and Kihungan in the far east) is an innovative region where much of the morphophonology of ***-ide** inherited from PK was dismantled. Geography and genealogical relatedness within NK and WK respectively were no doubt instrumental in spreading these innovations. The innovativeness of WK has also been observed with regard to tense-aspect morphology (Dom and Bostoen 2015: 187, 200), food-related vocabulary (Ricquier 2016: 136-139), and diminutive morphology (Goes and Bostoen 2021). Certain food-related vocabulary also manifests a North-South divide (Ricquier 2016: 119), as we have found for ***-ide** lowering.

Back pVHH, which may have facilitated the crackdown of ***-ide** vowel lowering (cf. *supra*), is possibly a shared innovation which Kidondo, Kikamba and Kisundi (Mboko-Songho) inherited from the most recent common ancestor which they share with each other but not with other NK languages. The close geographical proximity of several closely related WK of Guthrie's B40 group, which lost ***-ide** all together as a tense-aspect marker, may have contributed to the deactivation of certain of its morphophonological operations in WK languages spoken just south of them, such as Civili, Kisundi and Cabindan Kiyombe.

To conclude, if we admit that ***-ide** did trigger vowel lowering in different morphophonological contexts in PK, how then to reduce the variation observed today across the KLC to earlier invariance in order to reconstruct its original morphophonological behavior. To this end, let us go through the different possible morphophonological contexts.

Whenever the reflex of PB ***-ide** was suffixed directly to a root with a mid vowel, i.e., either ***e** or ***o**, it was realized as ***-ele**, and as ***-idi** everywhere else. Dom and Bostoen (2015: 171, 188) observe that unlike in PB, the reflex of ***-ide** in the KLC always has two identical vowels. Referring to Bastin (1983: 49), they argue that the first vowel of ***-ide** triggered progressive assimilation on its second vowel, resulting in **-iCi**, whereby C reflects the phonetic variation in the realization of the intermediate consonant across the KLC. We finetune this reconstruction here by confirming that the direct reflex of ***-ide** in PK, i.e., when not imbricated into a preceding morpheme, did indeed always have two identical vowels, but that it was either ***-idi** or ***-ele** depending on the root vowel. In other words, we can reconstruct a bisyllabic final suffix whose V_1 and V_2 are identical and whose intermediary consonant is coronal.

Whenever that suffix followed a derivational suffix not ending in a coronal consonant, no imbrication took place.

When non-imbricated derivational suffixes had a high vowel, whether back or front, such as neuter ***-ɪk** or separative intransitive ***-ʊk**, all high vowels following the root were realized mid, i.e.,

either ***e** or ***o**, provided that the root itself had a mid vowel. This is the so-called 'plateauing' or 'bridging' effect which Hyman (1998) described for Kiyaka. We argue that it goes back to PK and that Kiyaka and many of its close relatives from the KLC are conservative in that regard. On the contrary, when the root itself did not have a mid vowel, all suffixal vowels following it, including the ones of final ***-idi**/***-ele,** were realized high.

When non-imbricated derivational suffixes had a low central vowel, such as stative-positional ***-am**, the PK reflex of ***-ide** was always realized with two mid vowels, in this case as ***-ene**, because also nasal harmony was operational in PK. This vowel lowering following ***-am** occurred whatever vowel the root had, also when it was not mid.

Whenever ***-idi**/***-ele** followed a derivational suffix ending in a coronal consonant, imbrication took place.

When the imbricated suffix had a front vowel, such as applicative ***-ɪd** or causative ***-ɪc**, bridging took place and all suffixal high front vowels following the root were lowered to /**e**/, provided that that root had a mid vowel. Otherwise, the suffixal front vowels were realized high.

When the imbricated suffix had a back vowel, such as separative transitive ***-ʊd**, the vowels of the imbricated outcome of ***-ʊd-ide** definitely also had mid vowels when the root itself had a mid vowel. However, in this context, it is not so straightforward whether there were also no mid vowels when the root itself had no mid vowel. Several languages of the KLC have as so-called ***wi*** avoidance' strategy (cf. Hyman 1998). They realize ***-ʊd-ide** either as ***-wele*** (e.g., Kiyaka and Kintandu) or as ***-ole*** (e.g., Cilaadi, Kimanyanga, Kitsootso or Civili) whatever the root vowel is. Other languages, such as 19th c. Kakongo or Kisikongo, do accept ***-widi*** in this context and only realize it as ***-wele*** when the root does have a mid vowel. Given that a ***wi*** avoidance strategy of some sort is attested in all subgroups of the KLC, it seems most parsimonious to reconstruct it to PK and to consider languages allowing ***wi*** as innovative. Whether the outcome of ***wi*** avoidance involved diphthongization (i.e., ***-wele***) or not (***-ole***) is hard to say. Given that the ***-wele*** output is phonetically closer to the underlying input ***-ʊide**, or rather ***-ʊele** in PK terms, it is maybe the most probable PK ***wi*** avoidance strategy to reconstruct. The segmental simplification to ***-ole*** would then be a later innovation. Also in languages missing ***wi*** avoidance, ***-widi*** is a more common reflex of ***-ʊd-ide** than ***-udi*** when no lowering takes place.

When the imbricated suffix had a low central vowel, such as extensive ***-ad**, tentive/contactive ***-at** and reciprocal ***-an** (or complex suffix including the latter), the reflex of ***-aC**$_{[+cor]}$**-ide** must have been realized with front mid vowels in PK, whether the root had a mid vowel or not, i.e., ***-eC**$_{[+cor]}$**e**, and definitely so when the imbricated suffix was disyllabic. Although certain present-day languages do have ***-aC***$_{[+cor]}$***e*** (e.g., ***-ane*** in Kimanyanga and Kitsootso) or even ***-aC***$_{[+cor]}$***i*** (e.g., ***-ani*** in Kihungan and Kidondo), when the imbricated suffix is monosyllabic, such realizations no doubt result from the pushing back the morphophonological shift in order to keep paradigm uniformity with non-imbricated reflexes of ***-ad**, ***-at** and ***-an**.

5. Conclusions

After having figured out that PK was a spirantizing 7V language (Bostoen and Goes 2019), of which the verbal derivation suffixes were not subject to pVHH (Goes and Bostoen 2019), we conclude here that vowel lowering did occur in PK, along with imbrication, as part of the morphophonology of the verb-final tense-aspect marker ***-idi**. This PK reflex of PB ***-ide** was always realized with two identical vowels, i.e., either both high ***i** (non-lowered) or both mid ***e** (lowered), and an intermediate voiced alveolar consonant, which could be realized as an oral stop, i.e., ***d** (before high vowel), ***l** (before mid vowel), ***n** (in case of a preceding nasal in the stem). We consider ***-idi** as the basic form of the suffix, as it occurs in the widest array of possible contexts (i.e., suffixed to roots without nasals

and mid vowels), whose positional allomorphs are ***-ini** (nasal harmony), ***-ele** (vowel lowering) and ***-ene** (nasal harmony + vowel lowering).

When PK ***-idi** was suffixed immediately to the root, *-**idi** surfaced when the root had neither a nasal nor a mid vowel, *-**ini** when it had a nasal both no mid vowel, *-**ele** when it had a mid vowel both no nasal, and ***-ene** when it had both a nasal and a mid vowel.

When one or more verbal derivation suffixes occurred between the root and PK ***-idi**, no imbrication took place whenever the suffix immediately preceding ***-idi** did not end in a coronal consonant. In such a case, when the root had a mid vowel, both ***-idi** and all intermediate suffixes were realized with a mid vowel, a phenomenon called 'bridging' or 'plateauing'. When the root had no mid vowel, no vowel lowering occurred within the stem, except when ***-idi** was preceded by a suffix with a low central vowel not ending in a coronal consonant, most commonly stative-positional ***-am**. In the latter case, ***-idi** underwent both nasal harmony and lowering and was realized as ***-ene**.

When one or more verbal derivation suffixes occurred between the root and PK ***-idi**, imbrication did take place whenever the suffix immediately preceding ***-idi** ended in a coronal consonant: ***VC**$_{[+cor]}$**-idi** → ***ViC**$_{[+cor]}$**i**. The actual phonetic realization of ***ViC**$_{[+cor]}$**i** depended on the phonology of the remainder of the verb stem. When the V in ***ViC**$_{[+cor]}$**i** was a front vowel, for instance when the imbricated suffix was a reflex of applicative ***-ɪd** or causative ***-ɪc**, all stem vowels were realized mid when the root was also mid. When the **V** in ***ViC**$_{[+cor]}$**i** was a back vowel, for instance when the imbricated suffix was a reflex of separative transitive ***-ʊd**, the sequence was always realized as ***-wele*** (or ***-wene*** when there was a preceding nasal in the stem) according to our reconstruction, also when the root did not have a mid vowel. Such was the case because PK did not tolerate ***wi** as still is the case in many present-day KLC languages. When the **V** in ***ViC**$_{[+cor]}$**i** was a low central vowel, for instance when the imbricated suffix was a reflex of extensive ***-ad**, tentive/contactive ***-at** or reciprocal ***-an**, the last two syllables were realized as ***-ele***, ***-ete*** and ***-ene*** respectively, independently of the height of the root vowel.

Bits and pieces of the original morphophonology of PK ***-idi** are still attested in the KLC today. Certain languages such as Kiyaka (KK) and Kintandu (EK) seem to have conserved it pretty well, notwithstanding some possible minor extensions to domains it did not cover in PK (for instance the leftward spread of /**e**/ resulting from imbrication up to the root). Other languages dismantled major components of the ancestral system. We have argued that analogical levelling aiming at paradigm uniformity within the different conjugations of a same verb stem played a major role in push back morphophonological alternations triggered by PK ***-idi**. NK and WK languages in the northwestern part of the KLC are the most innovative when it comes to undoing the ancestral morphophonology of PK ***-idi** in that they eradicated nearly all shifts involving vowel lowering. Others are less progressive in their tendency towards deactivation in that they simply restricted the operation of vowel lowering to the confines imposed by the type of pVHH they developed at a later stage, most notably asymmetric pVHH in the case of Kisolongo (SK).

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6. Appendix

6.1 Morphophonology of *-ide reflexes when suffixed directly to mid vowel roots

(96) Kitsootso (Fieldnotes Heidi Goes 2015)

Mono ndombele maza.	(°*N-lomb-idi*)	'I asked for water.'
Yandi untswekele.	(°*u-sweek-idi*)	'He hid me.'
Yandi welele.	(°*wel-idi*)	'He was sick.'
Mono mbongele dinkondo.	(°*m-bong-idi*)	'I took the banana.'

(97) Kizombo (Carter and Makondekwa 1987)

Nvula i-nok-ene (°*i-nok-idi*) 'It rained.'

tóma	'do carefully'	vs.	*tomene*	(°*tom-idi*)
zeénga	'cut'	vs.	*zeéngele'*	(°*zeeng-idi*)

(98) Dihungu (Atkins 1954)

Tuhondele-zo.	(°*tuhond-idi*)	'We killed them (chickens).'
Tsehele.	(°*tseh-idi*)	'I laughed.'
Yandi umvididi.	(°*u-m-vil-idi*)	'He has forgotten me.'

(99) Kipombo (Fieldnotes Heidi Goes 2015)

Mono mbokene yandi. (°*N-mok-il-a*) 'I talked to him.'

(100) Kindibu (Lukoki 1996; Wanginavo Ntendo 2001)

Bana ba zolele nzo yina.	(°*zol-idi*)	'The children love this house.'
Vovondele ngo, kuté ntangù ko.	(°*vo-vond-idi*)	'If you kill a leopard don't sing it'/brag about it.'

(101) Kikamba (KongoKing Fieldwork G. Kouarata 2016)

Nsúsu yikekídi.	(*yi-kek-idi*)	'The rooster has just cackled.'
Bwaabú nsusu teetidí dííki.	(°*teet-idi*)	'Now, the chicken hatches the eggs.'
Ndóngidí mabúla matatú búbedí.	(°*ndong-idi*)	'He has shown me three villages today.'

(102) Kisundi (Mboko-Songho, Congo) (KongoKing Fieldwork G. Kouarata 2016)

Nsusu yikéékídi.	(°*yi-kek-idi*)	'The rooster has just cackled.'
Wusoodidí munkeeto.	(°*wu-sol-idi*)	'He has chosen a woman.'

(103) Kibeembe (Kouarata 2016)

Mayaka mayeridi.	(°*ma-yer-idi*)	'The cassava is mature'.
Bindya bitaswekiri dzoono biboridi.	(°*bi-bor-idi*)	'The food that we kept yesterday is rotten.'
Yaaya toridi kitari kya kaka.	(°*tor-idi*)	'The big brother has collected another iron.'

(104) Civili (Cabinda) (Fieldnotes Heidi Goes 2018)
Yono bawu bazongisi madeesu (°*ba-zong-idi*) 'Yesterday, they measured the beans.'

6.2 Morphophonology of *-ide reflexes when suffixed to reflexes of applicative **-ɪd* or causative **-ic*

(105) Kizombo (Carter and Makondekwa 1987)
Lusavu lu-sev-es-e a-atu. (°*sev-is-idi*) 'The story caused people to laugh.'
Nzumba vond-el-e a-ana mu-ntu. (°*vond-il-idi*) 'N. killed a person for his children.'
-vuúngila 'water' vs. *vuungiidi* (°*vuung-il-idi*)
-kayíla 'divide/share with' vs. *kayíidi* (°*kay-il-idi*)

(106) Kitsootso (J.P. Panda, p.c.)
Unzongolese taata. (°*u-N-zong-ul-is-idi*) 'He made me spy on father.'
Mwana untsekele kinzu. (°*u-N-sek-il-idi*) 'The child scrubbed the pot for me.'
Unsongele etata e nkaanda…. (°*u-N-song-il-idi*) 'He showed the letter to father.'

(107) Kindibu (Coene 1960)
Mpondese. (°*m-vond-is-idi*) 'I made (someone) kill.'

(108) Kihangala (KongoKing Fieldwork Kouarata 2016)
Bidyá bímubeerisí. (°*bi-mu-beer-is-idi*)
'This food has made him sick.'
Muntwarisi ááwu wumulongisisi lúmputu. (*wu-mu-long-is-is-idi*)
'The director has him made teach French as well.'
Monitéri yiseyíri, báála bámúseyisí. (°*yi-sey-idi, °ba-mu-sey-is-idi*)
'The teacher has laughed, because the pupils have made him laugh.'
Nkasi ááni wumubóóngisí mbisi. (°*wu-mu-boong-is-idi*)
'My brother has made him take the meat.'
Kisalu kyááwu manísiní? (°*man-is-il-idi*)
'Have you finished the work for me?'

(109) Kisundi (Nganda-Tsundi, DRC) (Fieldnotes Heidi Goes 2019)
Ndilongisidi yono. (°*N-dilong-is-idi*) 'You have walked yesterday.'
Mweende utebidi yono. (°*u-teb-il-idi*) 'Yesterday, the dog has bitten.'

(110) Ciwoyo (DRC) (Fieldnotes Heidi Goes 2019)
Ndemvukwela va mena. (°*N-lemv-uk-il-idi*) 'He has forgiven me this morning.'

(111) Kisundi (Cabinda) (Fieldnotes Heidi Goes 2019)
Ngeyo yobidi. (°*yob-il-idi*) 'You took a bath.'

6.3 Morphophonology of *-ide reflexes when suffixed to reflexes of neuter *-ɪk or separative intransitive *-ʊk

(112) Kizombo (Carter and Makondekwa 1987)
yondéka 'steep, soak' vs. *yondékele* (°*yond-ik-idi*)
zékoká 'to turn' vs. *zekokele* (°*zek-uk-idi*)
kosoka 'sit down' vs. *kosokele* (°*kos-uk-idi*)
sónekená 'write to' vs. *sonekeene* (°*son-ik-il-idi*)

(113) Dihungu (Atkins 1954)
Yandi longokele. (°*long-uk-idi*) 'He kneeled.'
Yandi tombokele ku mongo. (°*tomb-uk-idi*) 'He climbed the mountain.'
Awu asonekene o nkanda. (°*a-son-ik-idi*) 'They prepared themselves.'

Yandi yanikini e mvwatu. (°*yan-ik-idi*) 'He extends the dress.'

(114) Kitsootso (Panda 2017)
Nkómbò tómbòkèlè mo. (°*tomb-uk-idi*) 'The goat got up from there.'
Ngudi unsonekene `nkanda. (°*u-n-son-ik-idi*) 'Mother wrote me a letter.'
Swamba sombokele mo maza. (°*somb-uk-idi*) 'The frog jumped out of the water.'

(115) Kindibu (Vuylsteke 1923; Wanginavo Ntendo 2001)
Batensekele moko. (°*ba-tens-ik-idi*) 'They threw.'
Bazonzekele. (°*ba-zonz-ik-idi*) 'They picked up.'
Umbotekele. (°*u-N-bot-ik-idi*) 'He baptized him.'
Batombokele ku maza. (°*ba-tomb-uk-idi*) 'They came out of the water.'
Ibosi ba lemokene. (°*lem-uk-idi*) 'They run immediately.'
Lubanzi luaku lutolokele. (°*lu-tol-uk-idi*) 'Your rib is broken.'

(116) Cilaadi (KongoKing Fieldwork G. Kouarata 2016).
Mwaaná belókelé. (°*bel-uk-idi*) 'The child is healed.'
Bále yitobókelé. (°*yi-tob-uk-idi*) 'The balloon is pierced.'
Lungají lukolókelé mu tsikaanká. (°*lu-kol-uk-idi*)
'The nut has detached itself from the bunch/cluster.'

(117) Kihangala (KongoKing Fieldwork G. Kouarata 2016).
Lungasi lusokúkiní. (°*lu-sok-uk-idi*) 'La noix s'est détachée de la grappe.'

(118) Kisundi (Mboko-Songho, Congo) (KongoKing Fieldwork G. Kouarata 2016)
Mwáána béélókidí. (°*beel-uk-idi*) 'The child has recovered.'
Ndiimbu yitobókidí. (°*yi-tob-uk-idi*) 'The balloon is punctured.'
Bíndya bimubéédísi. (°*bi-mu-beel-is-idi*) 'This food has made/rendered him sick.'

(119) Kisundi (Nganda Tsundi, DRC) (Fieldnotes Heidi Goes 2019)
Ubeelukidi yono. (°*u-beel-uk-idi*) 'You got better/healed yesterday.'
Tumonikini yono. (°*tu-mon-ik-idi*) 'We appeared yesterday.'

(120) Kisundi (Cabinda) (Fieldnotes Heidi Goes 2019)
Yandri monikini. (°*mon-ik-idi*) 'He appeared.'
Bawu balongukidi. (°*ba-long-uk-idi*) 'They learned/studied.'
Beetu tubeelukidi. (°*tu-beel-uk-idi*) 'We got better/healed yesterday.'

(121) Cilinji (Cabinda) (Fieldnotes Heidi Goes 2018)
Yono tubembikisi kopu fu mongo mesa. (°*tu-bemb-ik-idi*) 'Yesterday, we put a cup on the table.'
Yono ilembikisi nkhasi'ama. (°*i-lemb-ik-idi*) 'Yesterday I calmed down my uncle.'
Yono ulongukisi kusonika. (°*u-long-uk-idi*) 'Yesterday, he learned to write.'
Yono uyonzukisi. (°*u-yonz-uk-idi*) 'Yesterday he grew.'

(122) Ikwakongo (Cabinda) (Fieldnotes Heidi Goes 2018)
Cibele yono nandi utentekeze ŝaku vana mongo meze. (°*u-tent-ik-idi*)
'Yesterday, she put a bag on the table.'
Cibele yono bawu basonekeze nkaanda. (°*ba-son-ik-idi*)
'Yesterday, they wrote a letter.'
Lupulao lumonekeze (*cibele*) *yono.* (°*lu-mon-ik-idi*)
'The plane appeared yesterday.'
Cibele yono minu ikotukweze. (°*i-kot-uk-idi*)
'Yesterday, I woke up.'

(123) Ikoci (Cabinda) (Fieldnotes Heidi Goes 2018)
Lupulano lumonekeze yono. (°*lu-mon-ik-idi*) 'The plane appeared yesterday.'

Basonekeze nkaanda yono.	(°*ba-son-ik-idi*)	'Yesterday, they wrote a letter.'
Nandi ulongukweze.	(°*u-long-uk-idi*)	'He learned.'

(124) Ciwoyo (DRC) (Fieldnotes Heidi Goes 2019)

Mbyelukweza va mena.	(°*N-bel-uk-idi*)	'I'm healed/feel better this morning'
Tusonakeza nkaanda va mena.	(°*tu-son-ik-idi*)	'We have written a letter this morning.'

6.4 Morphophonology of *-ide reflexes when suffixed to reflexes of separative transitive *-*od*

(125) Kizombo (Carter and Makondekwa 1987)

fwokóla	'finish tr.'	vs.	*fwokwéele*	(°*-fwok-ul-idi*)
solóla	'find'	vs.	*solwéele*	(°*-sol-ul-idi*)
vengomona	'clear tr., disperse'	vs.	*vengómweene*	(°*-veng-um-ul-idi*)

In contrast with roots with high or low vowel:

vúunzuná	'erase'	vs.	*vuunzwiini*	(°*-vuunz-ul-idi*)
vukúmuna	'tempt'	vs.	*vukúmwiini*	(°*-vuk-um-ul-idi*)
yalúmuna	'open tr.'	vs.	*yalúmwiini*	(°*-yal-um-ul-idi*)
váangula	'hurt tr., harm'	vs.	*vaangwiidi*	(°*-vaang-ul-idi*)

(126) Kindibu (Vuylsteke 1923)

[…] *bakutakese awonso basolwele* […] (°*ba-sol-ul-idi*)
'[…] gathered all the people they could find […]'
[…] *usempwele meso ku zulu, usambulwidi* […] (°*u-semp-ul-idi*, °*u-samb-ul-idi*)
'[…] looking up to heaven, he gave thanks […]'

(127) Kihangala (KongoKing Fieldwork Kouarata 2016)

Náni kófuri?	(°*kof-ul-idi*)	'Who has coughed?'
Bamusukurí máálu.	(°*ba-mu-suk-ud-idi*)	'One has washed his feet.'

(128) Kisundi (Nganda-Tsundi, DRC) (Fieldnotes Heidi Goes 2019)

Ulobudi yono.	(°*u-lob-ul-idi*)	'He has spitted yesterday.'

(129) Cilinji (Cabinda) (Fieldnotes Heidi Goes 2018)

Yono tuvemuni.	(°*tu-vem-ul-idi*)	'Yesterday, we blew.'
Nandi yono ubokuni i nti.	(°*u-bok-ul-idi*)	'Yesterday, he broke the stick.'

(130) Ikwakongo (Cabinda) (Fieldnotes Heidi Goes 2018)

Cibele yono nandi utekwele nzila.	(°*u-tek-ul-idi*)	'Yesterday, I took another road.'
Mungaanga ubelwese mwan'ami	(°*u-bel-us-idi*)	'The doctor healed my son.'
Cibele yono nandi ukondwele makuundi.	(°*u-kond-ul-idi*)	'Yesterday, he picked fruits.'

(131) Ikoci (Cabinda) (Fieldnotes Heidi Goes 2018)

Bawu babotwele nti mu nzila cibeli yono. (°*ba-bot-ul-idi*)
'The pulled the tree from the road yesterday.'

6.5 Morphophonology of *-ide reflexes when imbricated into a suffix with a low central vowel

(132) Kizombo (Carter and Makondekwa 1987) (Carter and Makondekwa 1987)

yángalalá	'become happy'	*vs.*	*yangaleele*	(°*-yang-alal-idi*)
vilákana	'forget'	vs.	*vilakeene*	(°*-vil-akan-idi*)
sóngazyaaná	'show each other'	vs.	*songazyeene*	(°*-song-azyan-idi*)

(133) Cilaadi (NK) (Grégoire 1976)

Tuzakaleeké.	(°*-tu-zak-al-ak-idi*)	'We have been sitting down.'

Tukábeenge.	(°*-tu-kab-ang-idi*)	'We could share regularly.'
Tukoteengé.	(°*-tu-kot-ang-idi*)	'We entered regularly.'

(134) Kisundi (Nganda-Tsundi, DRC) (Fieldnotes Heidi Goes 2019)

Lukaangidi yono.	(°*lu-kaang-al-idi*)	'You have walked yesterday.'

6.6 Morphophonology of *-ide reflexes when suffixed to the reflex of stative-positional *-am

(135) Kisolongo (SK) (Visseq 1889)

tantama	'squall, yell'	*tantamene*	(°*tant-am-idi*)
tekama	'be out of balance'	*tekamene*	(°*tek-am-idi*)
singama	'improve'	*singamene*	(°*sing-am-idi*)
pokama	'go into raptures'	*pokamene*	(°*pok-am-idi*)
foukama	'adore'	*foukamene*	(°*fouk-am-idi*)

(136) Kitsootso (SK) (Panda 2017)

Mwívì kángàmènè.	(°*kang-am-idi*)	'The thief is captured.'
Madyoko mazóngàmènè.	(°*ma-zong-am-idi*)	'The cassava is measured.'

(137) Kizombo (Carter & Makondekwa 1987)

váangamá	'done, get'	vs.	*vaangamene*	(°*-vaang-am-idi*)
léembamá	'be gentle'	vs	*leembamene*	(°*-leemb-am-idi*)
fináma	'approach'	vs.	*finamene*	(°*-fin-am-idi*)

(138) Kindibu (Anon. 1934)

Utelamene.	(°*u-tel-am-idi*)	'He stood up.
Ufinamene.	(°*u-fin-am-idi*)	'He approached.'

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