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VOWELS AS COMPLEX SEGMENTS IN NILOTIC

Gerrit J. Dimmendaal*

1. INTRODUCTION

Many Nilotic languages, in particular those belonging to the Western Nilotic branch, have distinctive vowel length distinction (Andersen 1987) and Nuer has been claimed to have both rising and falling diphthongs, or even triphthongs (Crazzolara 1933). However, recent studies in non-linear phonology state that vocalic nuclei with three x-positions (in syllable templates) are excluded on principled grounds and that languages do not have both falling and rising diphthongs.

The primary purpose of this article is to describe the structural status of vowel sequences in a number of Nilotic languages, and to investigate how well these theoretical claims hold for them. Section 2 sets out to define general notions of syllabicity and of simple versus complex segments in relation to syllable structure. In section 3 syllable nuclei in Eastern Nilotic languages are discussed. This is followed by a

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section on the syllable nucleus in Southern Nilotic (4) and Western Nilotic (section 5). Finally (in section 6), I consider some implications of the proposed phonological representations for the historical development of Nilotic languages.

2. CLARIFICATION

Segments, in particular high segments like **i/y** or **u/w**, may belong to a syllabic onset, nucleus, or coda. Many languages allow for sequences of vowels but they may differ in the way such sequences are treated, e.g. as complex unit phonemes (diphthongs or long vowels) or, alternatively, as vowel sequences forming separate syllable peaks. In the present section a number of criteria are proposed for a structural analysis of these phenomena.

2.1. NUCLEAR CONSTITUENTS

Although presumably no consonant is to be excluded from a position as a syllabic segment forming the core of a syllable - some varieties of Berber, for example, allow for syllabic voiceless stops - some consonants are more likely candidates in this respect than others cross-linguistically. (See also Vennemann 1988 for observations on preferred syllable types and notions of sonority hierarchies.) Nilotic languages generally avoid consonant clusters in syllable onsets or codas although there are some exceptions, whereas the nucleus is formed by a vowel or sequence of vowels rather than some consonant. Analytical issues for these languages tend to revolve around the status of the high segments **i/y** and **u/w** as part of a nucleus or, alternatively, of an onset or coda, and around vowel sequences and their structural status.

In quite a number of languages there are co-occurrence restrictions between elements occurring in the same onset, nucleus or coda of a particular syllable. In the Germanic language Dutch, for example, a high rounded segment before an adjacent vowel functions as an onset constituent with regard to syllable structure. But this high segment cannot be preceded by a sonorant consonant in the same onset. Sequences of **n** plus **w** in a syllable onset, for example, are

excluded in the language. On the other hand, **w** can be followed by any (nuclear) vowel in Dutch (e.g. **dwaas** 'fool ', **dweil** 'mop, swab').[1]

In his description of the phonemic system of Päri, Andersen (1989) has argued that this Western Nilotic language distinguishes between a glide **w** as an onset constituent and high segments which are to be treated as the first component of a nuclear diphthong. **w** in Päri occurs before vowels of any height, before short or long vowels, and before diphthongs. On the other hand, **w** is subject to co-occurrence restrictions with preceding consonants in the same onset : **w** does not occur after labial and interdental consonants (Andersen 1989 : 8). In other words, **w** functions as a typical onset constituent.

With regard to vowel sequences in Päri, Andersen (1989 : 7-9) gives a number of reasons for analyzing the sequences **ie, ɪɛ, uo, ʊɔ** as complex units (diphthongs) underlyingly :

1. The first component of these diphthongs is phonetically vocalic rather than consonantal.
2. The two components of the diphthong are both either rounded or unrounded.
3. The second component of the diphthong in Päri is always a mid vowel.

As observed by Andersen (1989 : 9), the high component of the diphthong also takes part in vowel alternations, whereas **w** does not. (Note also that there is no length contrast in these complex segments in Päri.)

	singular	plural	
(1)	**lɪ̈èc**	**lié́c**	'elephant'
	bʊ̈ɔc	**buó́c**	'castrated bull'
	á-pɪ̈ɛɛmb́-ɛ́		'(s)he opposed him/her'
	C-V+M-3S		'(reapeatedly)'
	á-pɪ̈èmb́-è		'they opposed him/her'
	C-V-3P		

[1] This does not mean that syllabic onset constituents and nuclear always co-occur freely without any restrictions (as pointed out by Paul Kiparsky, p.c.). Given such assimilation processes, one expects certain consonants and adjacent vowels to share features (e.g. palatal rather than alveolar consonants before front vowels). Such processes, however, would not seem to invalidate the general tendency for onset and nucleus contituents to co-occur freely.

(C=completive marker ; V+M=multiplicative verb form.)

Here a parallel may be pointed out regarding co-occurrence restrictions between components of complex segments (diphthongs) in the Germanic language Frisian. As argued by, for example, Booij (1989), Frisian has falling diphthongs. These are all [+round] or [-round] (as in Päri). Frisian also has glide plus vowel sequences, whereby the glide (in the syllable onset) freely occurs with following vowels (both long and short, monophthong or diphthong). The following singular/plural pair, with a falling diphthong in the singular, and a glide plus vowel in the plural illustrate this for Frisian :

(2)	stien	[sti«n]	'stone'
	stiennen	**[st̯imən]**	'stones'

(The **i̯** with a subscript equals **y** as a notional variant in our system.)

Note also that the glide in Frisian can be followed by a (falling) diphthong, as in kwea ([**kwɛə**]) 'angry '. Similarly, Päri **w** can be followed by a rising diphthong, e.g. **gwiɛn** 'chickens').

Due to historical assimilation or dissimilation rules, for example, alveolar consonants may palatalize before front vowels thus precluding the occurrence of alveolar consonants (in syllable onsets) before (nuclear) vowels. Consequently, there may be certain co-occurrence restrictions between adjacent elements in onsets and nuclei. This, however, does not invalidate the generalization that segments within the same onset, nucleus or coda tend to share features whereas those not occurring in the same structural slot of the syllable do not necessarily do so.

One property distinguishing nuclear constituents from coda constituents is the fact that the latter - but not the former - can be subject to resyllabification, thereby shifting to the onset of the next syllable. Again in Dutch, the coda constituent y (written as i) in the word for 'bay ', baai, becomes part of the next syllable in the plural baaien ([**baa$yən**]).

2.2. VOWEL SEQUENCES VERSUS COMPLEX SEGMENTS OR DIPHTHONGS.

The mere fact that languages allow for sequences of vowels is of course not in itself a criterion for setting up complex segments (or underlying diphthongs). Such sequences of vowels may constitute separate syllables, as they do in fact in some Eastern Nilotic languages. Turkana, for example, allows for sequences of different vowels, but each of these forms a separate syllable peak. At no point in the grammar of Turkana do such vowel sequences operate as structural units, i.e. as complex segments. Instead, they function as sequences of vowels each forming a separate syllable peak and each potentially carrying a distinctive tone.

(3)	**ɛko(y)i̯**	'matter, affair'
	ŋasʊ̀a	'iron'
	ɛkʊɔm	'wind'
	arɪ̀ɛt	'desert'
	arait	'fruit'

Note also that these vowel sequences may differ from each other in terms of height and rounding, as well as in their ATR feature.[2]

Languages may also distinguish between « real diphthongs » operating as complex segments and « fake diphthongs » (or « fake triphthongs »). In fact Päri is a case in point. Next to diphthongs (introduced above), it has vowel sequences that are best treated as sequences of vowels (as in Turkana above) rather than complex segments. These sequences form separate syllable peaks, they allow for more tonal complexity than the Päri diphthongs, and they do not observe restrictions of height or rounding. They are due to deletion of an intervening glide, glottal stop, or zero consonant (cf. Andersen 1988 : 68).

(4)	**kʌ́(w)ɪ̀**	'bamboos'
	ʊ̀pɪ́(y)à	'mouse'
	ù(ˀ)ʊ̀ol	'(s)he is tired'

[2] It has been argued by Noske (1991 : 248) that coda constituents in Turkana should be analysed as « extra-metrical » constituents.

Analytical problems of the type illustrated for Päri and Turkana abound in Nilotic. It therefore seems appropriate to establish general patterns of syllable structure in Nilotic, specifically with regard to the treatment of complex vowels, and to investigate what kind of variation there is between individual languages. Whether the nucleus has a hierarchical structure with a branching rhyme structure (consisting of a nucleus plus coda), or a more flat CV-structure does not concern us here.[3]

3. The nucleus in Eastern Nilotic

As concluded by Vossen (1982 : 299) in his historical-comparative study of Eastern Nilotic languages, « vowel length cannot be said to have existed in PEN [Proto-Eastern Nilotic] on the basis of [the] reconstructions ». A comparison with Southern Nilotic and Western Nilotic languages suggests that vowel length probably was lost as a distinctive feature in the Eastern Nilotic branch due to a merger with short vowels. There is a regular correspondence between long high and low vowels or diphthongs in Western Nilotic languages like Päri, for example, and long monophthongs in the Southern Nilotic Kalenjin cluster. These vowels correspond to short vowels in Eastern Nilotic. Next to these correspondence sets, there are correspondence sets for short vowels in al three branches of Nilotic. The following examples illustrate some of the cognate sets (see also Dimendaal 1988 for examples) with representatives from each of the three branches (Western Nilotic Päri, Southern Nilotic Nandi, and Eastern Nilotic Turkana). Tones are not marked in these examples.

[3]As pointed out by Manuela Noske (p.c.), there is an additional problem from the point of view of phonological representation because one has to be able to distinguish between short and long diphthongs, as for instance in certain Amerindian languages.

Table 1. *Lexical cognates in three Nilotic languages*

Päri	Nandi	Turkana	
pɪɪth	**pɪɪt**	**-pɪt**	'sow, plant'
wɪɲɔ	(other root)	**-kɛŋ**	'bird'
thʊn	**kɪtɪn**	**-sɪkɪn**	'breast(s)'
cʊʊl	**cʊʊl**	**-ɪcʊl**	'straighten (out)'
kʊʊt	**kʊʊt**	**-ʊt**	'blow'
dhɔk	(other root)	**-kɪ-tʊk**	'mouth'
?	**ŋʊl**	**-kɪ-mʊl**	'saliva'
caak	**ceekû**	(other root)	'milk'
jaaŋ	**ɛɛŋ**	**-yɛŋ**	'skin'
ɲaaŋ	**tɪ-ŋɔɔŋɔɔt**	**-kɪ-ɲaŋ**	'crocodile'
maat	(other root)	**-mat**	'drink'
(other root)	**-aaŋ-**	**- aŋ-**	'see'
paac	**paac**	**-pac**	'strip'
yaaŋ	**(other root)**	**-yɛŋ**	'insult'
cam	**cam**	**-cam**	'like'
lam	(other root)	**-lam**	'curse'

(Note that short ɔ in Päri is historically a merger of *ʊ and *ɔ, as shown by Andersen 1989.)

Despite the historical loss of vowel length in Eastern Nilotic, distinctive vowel length does occur in Lotuxo-Maa and the Teso-Turkana cluster (which form a genetic unit within Eastern Nilotic, called Non-Bari by Vossen 1982). Vowel length in these languages seems to have re-emerged from the loss of intervening consonants, e.g. from intervocalic ***y*** (Vossen 1982 : 391), as in the following example :

(5) Proto-Eastern Nilotic	Maasai	Turkana	
***-mayat**	**-máat-î**	**-máasè**	'locust'

It has been observed by de Chene (1979) that loss of intervocalic consonants (followed by syllable coalescence) is a common way in which languages acquire vowel length. De Chene (1979 : 97) further observes : "... when a language without distinctively long vowels acquires them through coalescence, syllable counting rules are

automatically transformed into mora-counting rules, since coalescence of sequences of vowels that result from intervocalic consonant loss involves coalescence of syllables as well. Conversely, we may hypothesize that mora-counting never occurs except as the result of such a change." Languages such as Maasai and Turkana clearly belong to the mora-counting type. Interestingly, Maasai and the Teso-Turkana languages do indeed treat sequences of vowels as bimoraic units, whose structural behavior is analogous to VCV structures (i.e. forms with an intervening consonant). Whereas the mora-counting principle is probably most prominent in the Teso-Turkana group (see Dimmendaal 1985), it is also operative in Maasai. As shown by Levergood (1992), segmental allomorphy is partly conditioned by moraic structure in Maasai. Bimoraic noun stems tend to take a number suffix **-i**, whereas trimoraic (or larger) stems ending in a vowel tend to take the suffix **-ni.** (Tucker and Mpaayei 1955 : 169 already observed that "double vowels... would appear to behave always as dissyllables" in Maasai.) In other words, languages such as Maasai or Turkana do not count weight along the lines common for syllable weight languages. In the Chadic language Hausa, for example, CVV has the same weight as CVC. CVV structures in Turkana and Maasai pattern with CVCV structures, rather than with CVC (or CV) structures. Phonetically long vowels in Teso-Turkana function as sequences of (identical) vowels, not as unit phonemes with a feature length (or a V-slot associated with two timing slots). Sequences of non-identical vowels do not function underlyingly as complex segments (diphthongs) either in Eastern Nilotic languages. As observed by Spagnolo (1933 : 4) for the Eastern Nilotic language Bari, "in most cases where two vowels come together, each forms a separate syllable".

(6) **pi$oŋ** 'water'
ga$ɔ$rɔ 'a kind of trap'

There are no rising or falling diphthongs in Bari. The so-called « real diphthongs » in Bari are glides with a following or preceding vowel. These glide elements do not carry a separate tone, and do not form separate syllable peaks:

(7) **ku$lya** 'speak'
möy$tö$ni 'enteritis'

Maasai is a further typical representative of Eastern Nilotic in this respect. Compare the following examples :

(8) **eŋwês** 'wild animal, game'
amwéy 'to be ill'

The high segments (**y** and **w**) combine freely with preceding or following vowels, including long vowels, and vowels of different height, and do not carry distinctive tone. This suggests that they are not syllabic, or part of a complex segment (diphthong). The final segment in the example meaning 'to be ill ' clearly functions as a coda constituent. Maasai does not allow for branching codas ; since no other consonant may follow in the same syllable in Maasai in examples ending in a glide (as in the form 'to be ill' above), this restriction now follows from the more general structure constraint for syllabic codas. Tucker and Mpaayei (1955) transcribe the examples above as **eŋúès** and **amúéi**. But they note that the phonetic equivalent of, for example, 'wild animal, game' is [**eŋwês**] (p. 169). I would like to argue here that not only is their phonetic realization that of glides, structurally the high segments in these examples function as such for the reasons outlined above. Nevertheless, the glides may share certain features with preceding vowels in the same syllable in Maasai. Glides preceded by [-ATR] vowels in the same syllable in Maasai are also [-ATR] and are [+ATR] after [+ATR] vowels in the same syllable.

(9) **/aɪsʊy/** -> [**aɪ̯sʊ̟ɪ̯**] 'singe, scorch'

Given their semi-vocalic nature, the spreading of the ATR feature to glides seems to be a natural process. To summarize, phonetically long vowels in Eastern Nilotic languages may constitute the core of a syllable, but structurally the long vowels appear to function as sequences of short (identical or non-identical) vowels, parallel to VCV sequences, and parallel to sequences of distinct vowels.

The situation for Southern Nilotic is quite similar, with one important difference as shown next.

4. The nucleus in Southern Nilotic

There do not seem to be diphthongs in Southern Nilotic languages either, but contrary to Eastern Nilotic languages, long vowels in Southern Nilotic function as structural units rather than as sequences of short vowels. For instance, short and long vowels seem to allow for the same number of tonal configurations except that rising tones are only found on long vowels. But as argued by Creider (1982 : 16), a rising tone is the realization of a surface high tone on a long vowel after a low tone or pause. Vowel length as such in Southern Nilotic appears to be a retention from Proto-Nilotic, as correspondences illustrated in the preceding section suggest.

Similar to Eastern Nilotic, there is no evidence for diphthongs as structural units in Southern Nilotic. Glides may be the only consonant in the syllabic onset, or they may be preceded by another consonant, as in the following examples from the Kipsikiis dialect of Kalenjin :

(10)	**-yí**	'bear'
	-yɛ́	'drink'
	-syɛ̀	'burp'
	-nwɑ́c	'it is short'

For Kipsikiis, Toweett (1979) writes high segments preceded by short or long vowels with **i** (after a [+ATR] vowel) or I (after a [-ATR] vowel). He refers to this phenomenon as diphthongal /i/ (p. 4) :

(11)	**kûɪ**	'when (in future)'
	-tuɦi	'pound'
	móòi	'calves'
	méɛ́i	'casual workers'
	táái	'ants'
	mɔ́ɔ̀ɪ	'calf'

No other segment may follow the glide in the same syllable. No branching codas are allowed in Kipsikiis, i.e. only one consonant may occur in this position in the syllable. For phonotactic reasons, then, the palatal segment in these examples again is to be interpreted as a coda element, i.e. as a glide /**y**/. The spreading of the [-ATR] feature to the glide would seem to be similar to the Maasai case described above. (The high back segment in this position, transcribed with **u** by Toweett, is also to be interpreted as a coda consonant for the same reason. It seems to be restricted to ideophonic words, as noted by Toweett 1979 : 15.)

Analogous to other consonants, /**y**/ can be preceded by short or long nuclear vowels in Kipsikiis. Moreover, there are restrictions on the kind of consonant that may occupy the coda position. Morphophonemic alternations in the Kalenjin cluster point in this direction. Structures resulting from syncope are subject to a further rule involving simplification of the coda structure in, for example, Nandi. Because a branching coda is excluded by general constraints, the first of two consonants has to be deleted, as the following primary and secondary forms for 'children' illustrate :

(12) Primary form : laakooy
Secondary form : laakooy-**ik** > ***laakooyk** (syncope)
> **laakook** (coda simplification)

The failure of another segment to be added to the syllabic coda is now explained in a natural fashion as a restriction on the size of the prosodic unit.[4]

A rather interesting though not yet fully understood aspect of Kalenjin is a shortening rule for long vowels. According to the description by Tucker and Bryan (1964/65), certain long vowels within

[4] This would also imply, inter alia, that some of the Proto-Kalenjin reconstructions may have to be modified. Rottland (1982 : 318) reconstructs a form ***ayn** for 'river'. But since a sequence VGC (i.e. with a complex coda) is not a possible syllable structure or word structure in Kalenjin, it seems likely that the root ended in a vowel. Because in all Kalenjin dialects a long vowel (plus **t**) follows the nasal in this form (thus suggesting the presence of a specifier suffix ***-it**), the root form most likely was ***ayna-** (whereby **ayna-it** > **ayneet**).

a morphologically complex word have to be shortened half way between long and short vowels. Although the vowel shortening rule seems to follow certain metrical rules, the details for this rhythmic rule still need to be worked out for members of the Kalenjin cluster. One linguistic stereotype found among speakers of northern Marakwet, for example, is the observation that speakers of southern varieties of Kalenjin, such as Kipsikiis, speak much slower than their northern neighbors (including northern Marakwet and Pokot). Presumably this auditory effect is caused by the fact that the number of long vowels allowed within a word in Kipsikiis is higher than in, say, northern Marakwet.

So far none of our statements would seem to contradict any of the theoretical claims mentioned earlier. None of the Eastern and Southern Nilotic languages have diphthongs with a long vowel component, or a three-way vowel length distinctions underlyingly. However, data from some Western Nilotic languages turn out to be more problematic for some of the theoretical claims.

5. The nucleus in Western Nilotic

Vocalic systems in Western Nilotic languages tend to be rich and complex. Languages like Agar Dinka have seven short, long or extra long vowels each of which can be either breathy or creaky. (There appear to be a number of systematic gaps, for which see Andersen 1987.) Some of the languages of the Western Nilotic subgroup of Nilotic have a rather classic ten vowel system with five (short and long) [-ATR] and five (short and long) [+ATR] vowels, and vowel harmony of the cross-height type. Päri belongs to this type (cf. Andersen 1989). Päri has ten short and ten long monophthongs, as well as four diphthongs, **ie**, **ɪɛ**, **uo**, **ʊɔ**. The high segment in the diphthong in Päri is characteristically oriented in the same direction with respect to the lower vowel throughout the entire system of diphthongs, i.e. as an onglide (creating a rising diphthong).

As indicated above (section 3) long high vowels (**ii**, **ɪɪ**, **uu**, **ʊʊ**) and low vowels (**aa** and **ʌʌ**) in Päri correspond to long vowels in Southern Nilotic Nandi. By applying methods of internal

reconstruction, Andersen (1989) has shown that the four diphthongs in Päri historically derive from long mid vowels :

(13)	***ɛɛ**	>	**ie**
	***oo**	>	**uo**
	***ɛɛ**	>	**Iɛ**
	***ɔɔ**	>	**ʊɔ**

For Päri, the structural status of these vowel sequences is clear ; they function as complex vocalic units. (See the arguments given by Andersen 1989 repeated in section 2 above.) The «breaking» of long mid vowels is an innovation shared by at least some members of the Lwoo group to which Päri belongs, and which includes Luo, as shown by Andersen (1990). Andersen (1990 : 8) furthermore suggests that Luo has retained the diphthongs **ie**, **ɪɛ**, **uo**, and **ʊɔ**. Luo also has **ɪa** and **ia**, these latter sequences going back to the same source as diphthongs in Päri, namely long medial vowels. **ɪa** in Luo derives from ***ɛɛ** via ***ɪɛ**, and **ia** from ***ɛɛ** via ***ie** as a result of secondary splits. However, we would like to claim here that these so-called rising diphthongs in Luo are in fact glide-plus-vowel sequences where the glide forms part of the syllable onset, rather than being part of the nucleus. In other words, Luo no longer has diphthongs, due to a change in syllabicity for **i** and **u** :

(14)	***ie**	>	**yɛ, ya**
	***uo**	>	**wo**
	***Iɛ**	>	**yɛ, ya**
	***ʊɔ**	>	**wɔ**

(In those cases where there already was a glide in the onset, the newly emerging glide was absorbed, i.e. ***gwɪɛnɔ** > **gwɛ̀nɔ̀** 'chicken' ; cf. Andersen 1990 : 14).

Why is the **i**-part or the **u**-part in Luo no longer part of a rising diphthong (complex segment) ? Contrary to Päri, the high segments in Luo do not participate in any alternating vowel type (at least in any productive sense) possible as a corollary of the phonological reinterpretation. Note that in Päri multiplicative (frequency) marking

involves vowel alternation. This type of alternation has disappeared in Luo. Also, the high segments freely combine with following vowels of different height in Luo. Accordingly, high segments in Luo originating from broken nuclei must now be interpreted as the pre-nuclear (onset) constituents **w/y**.

Historically long high and low vowels (still found in Päri) also have been shortened in Luo, as shown by Andersen (1990 : 10-12). This innovation seems to have been shared by languages like Alur and Lango, which have short vowels where Luo has short vowels and Päri has long vowels (or diphthongs) :

(15)	Luo	Alur	Lango	Päri	
	càk	**càk**	**càk**	**càak**	'milk'
	wàŋ	**wàŋ**	**wàŋ**	**wàŋ**	'eye'

Analyzing **y/w** as onset constituents as suggested here would allow one to make a generalization about the syllable nucleus in Luo, Alur, and Lango (versus Päri or Acholi), namely that it occupies a maximum of one X-slot, i.e. no contrastive length or complex nucleus segment is allowed in these languages. Both processes then, nucleus shortening as well as the glide formation process have had the effect of shortening the rhyme of syllables in Luo and a number of closely related languages.[5] Parallel to Eastern Nilotic languages, long vowels in Luo only appear across morpheme boundaries, or where glides disappear between vowels :

(16) **lɔ̀yɔ̀** or **lɔ̀ɔ̀** 'to excel, exceed'

In his description of the phonology of Agar Dinka Andersen (1987) has argued that this dialect of Dinka has phonemically distinctive three-way vowel length distinction, as in :

[5] The root vowel is lengthened in Standard Luo and receives stress. Because lengthening occurs in predictable environments, it does not have phonemic status in the language according to current information ; in other varieties of Luo there is stress but no vowel lengthening.

(17)	**t̪ɔ̰ŋ**	'spear'
	t̪ɔ̰ɔŋ	'knock at it (e.g. the door) !'
	V+2S	
	tɔ̰ɔ̰ɔŋ	'spears'

Kenstowicz and Rubach (1987 : 476) have argued that, as a general restriction on the size of syllabic nuclei, a nuclear node may dominate at most two skeletal slots in languages. « The failure of another vocalic segment to be added in the representation... is now explained in a natural fashion as a restriction on the size of a prosodic unit. » The fact that Agar Dinka allows for a three-way phonemic vowel length distinction clearly presents a counterexample to the proclaimed universality of maximally binary branching of nuclear vowels. Nevertheless, it is interesting to observe that such extra long vowels in Agar Dinka are restricted to morphologically complex forms, i.e. to derived forms in the sense of Kiparsky (1982).

I would like to argue here (contra Andersen 1989) that Dinka does not have diphthongs or triphthongs. In other words, for phonotactic reasons all high segments in the following examples are to be analyzed as glides rather than as nuclear segments :

(18)	**rn̪̆w**	'two'
	pɛ̰̆ɛy	'moon, month'
	puɔ̰̆ow	'heart'
	riɔ̰̆op	'nail'
	ruaă̰ay	'relationship'
	rioŏ̰oc	cowardice

Whereas long (VV) or extra long (VVV) monophthongs in Agar Dinka can be followed by a consonant, monophthongal words consisting of a vowel plus a high palatal or velar semi-vowel (Andersen 1987 : 5) cannot be followed by a consonant in the same syllable. Also, when a vowel-initial morpheme follows, the final high segment forms a syllable with the following vowel, as do final consonants, i.e. resyllabification takes place, which is typical for coda constituents (as against nuclear constituents). In other words, the glide counts as a consonant when it occurs in syllable final position after a vowel, and

accordingly, it is to be interpreted as the coda constituent **w** or **y**. But we would like to argue here that high segments followed by a short, long, or extra long vowel in the same syllable also function as non-nuclear segments. Whereas it is correct that « treating them as onset constituents would create consonant clusters not otherwise found in Dinka except across syllable boundaries » (Andersen 1987 : 12-13), this would seem to be a consequence rather than a criterion for an analysis as a glide. (In fact, consonant plus glide sequences are the only consonant clusters in many Nilotic languages.) Moreover, these high segments combine freely with following rounded and unrounded vowels in Agar Dinka. The high segments do take part in morphophonemic alternations which otherwise only affect the vowel. From the available evidence for Agar Dinka, it seems however that such morphophonemic alternations affecting vowels are rare and strongly morphologised (as in Luo, where there are also remnants of vowel alternations). In other words, **w** and **y** in the following forms should be analyzed structurally as glides : [6]

(19)	**pwo̱ow**	'heart'
	ryo̱op	'nail'
	wa̱ay	'relationship'
	yoo̱oc	'cowardice'

Crazzolara (1933 : 3-4) has claimed that Nuer has various diphthongs as well as triphthongs. According to a more recent source on Nuer as spoken in western Ethiopia, Moges Yigezu (1992a, 1992b), Nuer has seven plain (or creaky) vowels : **i, e, ɛ, a, ɔ, o, u**, nine breathy vowels : **i̤, e̤, ɛ̤, ë, ä̤, ɐ̤, ɔ̤, o̤, o̤** but no diphthongs or triphthongs. (The central breathy vowels are labeled as a third type of vowels by Tucker and Bryan (1966 : 402).) There is a short versus long contrast for most creaky or breathy vowels in Nuer, as in :

(20) **tɛ̈r** 'conflict' **tɛ̈ɛ́r** 'September'

[6] Torben Andersen (p.c.) has informed me that he independently arrived at the same conclusion regarding (the absence of) diphthongs and triphthongs in Agar Dinka, i.e. that the high segments preceding short, long or extra long monophthongs structurally function as glides.

Moges Yigezu treats long vowels as sequences of juxtaposed identical vowels, similar to sequences of non-identical vowels. According to the same author, long vowels in Nuer always carry a complex tone, whereas short vowels carry a level tone (low, mid or high). This would seem to suggest that vowel length serves to provide a « landing site » or anchor for complex tones. Nevertheless, Nuer also allows for sequences of non-identical vowels with a complex tone.

(21)	**yɔac**	'to pull'
	n̰iam	'face'

Nuer as described by Moges Yigezu (1992b) also has syllable weight. One consequence of this principle for Nuer is that the second part of a diphthong or a phonetically long vowel is deleted when it occurs in a closed syllable, as a result of a morphophonemic rule of nucleus shortening. Long vowels plus consonant are allowed, however, in non-derived forms :

(22)	**mɐ̈̈̈t**	'friend'	**mɐ́d-ní**	'friends'
	míèt	'to eat'	**míd̰-nì**	'eat! (2SG.IMP)'

Compare words of the following type, ending in a high segment preceded by a vowel : [**lèi**] 'tooth'. The high segment in such sequences can never be followed by a consonant in the same syllable (or word). This suggests that the i-part is itself a coda constituent. Accordingly, such examples are best analyzed as sequences of vowel plus glide, e.g. **/lèy/** 'tooth'. It would seem, then, that underlyingly Nuer has neither rising nor falling diphthongs.

Additional analytic issues may arise for the Burun-Mabaan cluster when it comes to the phonemic interpretation of vowel sequences. In his discussion of Mabaan tonology, Andersen (1992) notes that Mabaan has the following diphthongs : **ie, iɛ, uʌ, ua**, next to a set of long diphthongs where length is usually manifested in the first component : **iie, iiɛ, uuʌ, uua**. In addition, the following long vowel occur : **ii, ee, ɛɛ, ʌʌ, aa, ɔɔ, uu**. Some near minimal pairs :

(23) **ṭùuaŋ** when **tûaŋgȁ** 'spears (absolute)'

Whether diphthongs with a long vowel component are restricted to morphologically complex forms (i.e. to derived environments) is not clear. Until further data become available, in particular on Mabaan morphology and morphophonology, the presence of diphthongs with a long vowel remains problematic for the theoretical stipulation that diphthongs may not be headed by a long vowel, as claimed by, for example Kaye et al. (1985).

6. Some potential implications for historical changes in Nilotic

Vowel length in Nilotic, at least the contrast between short and long vowels, is an old phenomenon. In many Western Nilotic languages there was a drift historically towards internal morphology or symbolism, whereby certain suffix vowels were anticipated and, subsequently, merged with the preceding root vowels. As shown by Andersen (1990 : 16) this process resulted in extra long vowels in Agar Dinka. Consequently, this language now has a three-way vowel length contrast. It could be argued that it merely is a historical coincidence that extra long vowels in Agar Dinka are restricted to derived environments. There is no reason, it would seem, why forms with extra long vowels could not become lexicalised, and appear in non-derived environments subsequently. Nevertheless, no such cases seem to exist in Agar Dinka. It is therefore still possible that the absence of extra long vowels in non-derived environments in Agar Dinka does reveal a deeper structural constraint against the three-way length distinctions in morphologically simplex forms.

(24) Non-derived environment :

rɔ̰̀th	'wizard'
tyɛ̰̀ɔp	'soil'

(25) Derived environment :

rɔ̰̀ɔth	'wizards'
tyɛ̰̀oop	'in the soil'
soil+Locative	

There are additional phenomena in Agar Dinka which may be explained on the basis of more universal structural constraints on phonological structures. Compare the following stative versus inchoative verb constructions in Agar Dinka :

(26)

à̰-cɛ̰̀ol	'it is black'
à̰-cị cwɛ̰̀ɔl	'it has become black'
à̰-pà̰th	'it is good'
à̰-cị̈ pyà̰ath	'it has become good'

The labial and palatal prosody in the derived (inchoative) forms in Agar Dinka may be a reflex of the ventive (centripetal) suffix ***-u** still found in Eastern and Southern Nilotic languages (see also Andersen 1988 : 106-10). The question arises, however, why anticipation of the suffix vowel ***CV(V)C-u** resulted in labial or palatal prosody in combination with the root-initial rather than with the root-final consonant (**CGVV(V)C** rather than **CVV(V)GC**). As in numerous other Nilotic languages, there may have been a constraint on branching codas. Alternatively, the anticipation could have given rise to a falling diphthong in pre-Dinka. It has been claimed in a number of recent theoretical studies (including Kenstowicz and Rubach 1987) that the co-occurrence of rising and falling diphthongs in a single language is excluded as a general principle. If this stipulation is correct, and if the diphthongization rule (i.e. the formation of rising diphthongs) is old in Western Nilotic (i.e. if this historical rule was shared by the common ancestor of Päri and Dinka), anticipation of the suffix vowel could not have resulted in the creation of falling diphthongs, given the presence of rising diphthongs in the ancestral language. Accordingly, the anticipated suffix vowel had to be anchored onto the root-initial consonant, or, alternatively, it had to become the first component of a rising diphthong. Whether these latter assumptions are correct can only be ascertained once the relative chronology of the diphthongisation

rule and the anticipation of the inchoative suffix vowel in Western Nilotic has been determined.

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