Tonal polarity and inflection allomorphy in Nuer*

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Abstract

This paper discusses the highly irregular suffix allomorphy observed in Nuer and identifies patterns with tonal polarity. In oblique case constructions, nouns can be inflected through suffixation or non-concatenative forms. I argue that the choice of these two allomorphs are connected with the underlying stem tones, which is revealed by tonal polarity: Toneless nouns tend to undergo non-concatenative inflection, and their stems are subject to tonal polarity, while L-toned nouns tend to get a suffix with a polar tone. In an OT analysis with an input allomorph set, I show that the choice of allomorphs is phonological-conditioned for these nouns. The main idea is that non-concatenative forms arise through so-called bidirectional defectiveness when both the stem and affix material are defective.

Keywords
Tonal polarity, suffixation, inflection allomorphy, OCP, Nilotic

1   Introduction

This study is on tonal polarity and inflection patterns in Nuer (Nilo-Saharan; Western Nilotic) and is based on the Ethiopian variant of the dialect continuum called 'Eastern Jikany'. Nuer is a tone language where case and number inflection for nouns can involve either suffixation with -kɛ̠ and -nɪ̠ or stem-internal modifications. The distribution of the suffixes in Nuer is noted for its high degree of irregularity (Baerman and Monich, 2021; Baerman et al., 2019; Baerman, 2012; Baerman and Corbett, 2009; Frank, 1999). It has been in the spotlight for its unpredictable inflection patterns (Ackerman et al., 2013; Sims and Parker, 2016; Enger, 2014), not untypical for Western Nilotic languages.

The primary goal of this paper is to shed new light on inflection allomorphy based on data from the Ethiopian variant of Jikany Nuer. I examine whether tonal polarity can reveal patterns in the inflectional allomorphy of the oblique case. Although inflection in Nuer is highly irregular, this study argues that nouns have phonological-motivated tendencies to choose a suffix over a non-concatenative inflection.

The Ethiopian variant has an underlying /H/, /L/, and /Ø/ tonal contrast with allomorphic realizations of each tone. Tonal polarity is crucial to understand inflection in Nuer. It can be defined as a sandhi process where a TBU gets a tone with the opposite value of another TBU. The most known cases are from African languages with the pioneering study by Kenstowicz et al. (1988). It is often restricted to specific morphological constructions typically applying to affixes, and this is also the case for Nuer, as it mainly happens in oblique case constructions.

Underlying L-toned stems in Nuer contrast with a small group of toneless stems in terms of tonal polarity and suffixation patterns in the oblique singular case (OBL SG): In (1) below, the nominative (NOM) form of /lʊɲ/ 'lion' is toneless and gets a non-concatenative form with a morphological stem-vowel change: *lʊɔɲ* (referred to as 'vowel grade') and a polar tone realized as mid when following the L-toned word *cɔ̀a̤ː*. L-toned nouns show the mirror image: The underlying L-toned stem /gàt/ 'child' in (2) gets a suffix with a polar tone. The preceding L-toned possessum noun also gets a polar tone realized as mid: [cɔ̄a̤ː] 'bone'.

Non-concatenative OBL SG

(1) NOM: /ᴴᵘcɔ̀a̤ː, lʊɲ/
     cɔ̀a̤ː lʊ̄ɔɲ
     bone lion\OBL.SG
     'the bone of the lion'

Suffixal OBL SG

(2) NOM: /ᴴᵘcɔ̀a̤ː, gàt, -kɛ̤/
     cɔ̄a̤ː gàt-kɛ̤́
     bone child-OBL.SG
     'the bone of the child'

These tonal differences also prevail in the nominative case, as nouns like /lʊɲ/ 'lion' are subject to tone sandhi changing from a L tone sentence-finally in (3a) to mid tone sentence-medially (3b). This contrast with L-toned nouns like /gàt/ 'child', which are not affected by tone sandhi in these contexts and stay L (4).

(3) Toneless
     a. /nɛ·n lʊɲ/
         nɛ̄·n   lʊ̀ɲ
         see.IMP.SG lion
         'Look at the lion!'
     b. /c-ɛ̀ lʊɲ nɛ·n/
         c-ɛ̀   lʊ̄ɲ nɛ̂·n
         PFV-3SG lion see
         '(S)he has seen the lion.'

(4) L tone
     a. /nɛ·n gàt/
         nɛ̄·n   gàt
         see.IMP.SG child
         'Look at the child!'
     b. /c-ɛ̀ gàt nɛ·n/
         c-ɛ̀   gàt nɛ̂·n
         PFV-3SG child see
         '(S)he has seen the child.'

I argue that tonal polarity and suffixation patterns go hand-in-hand in the oblique case. The proposal is an Optimality Theory analysis (Prince and Smolensky 1993/2004)

with an input allomorph set involving floating tones, vowel grades, and a suffix. The main idea of the analysis is that non-concatenative morpho-phonology happens when defective nouns – i.e. toneless stems – interact with defective affix material such as floating tones. This is referred to as 'bidirectional defectiveness' and can be considered an extension of the *Generalized Non-linear Affixation* (GNLA), a research program proposed by Bermúdez-Otero (2012) where defective affix material accounts for non-concatenative morphology.

In this study, the tonal polarity patterns are considered a dissimilation process following a general OCP constraint. Nuer offers insight into the tonal polarity research from a typological perspective since tonal polarity is more commonly discussed for languages with a two-tone system and is only found in a handful of studies for languages with more tonal levels (e.g. Hantgan 2009 – isolate; Meyase 2021 – Tibeto-Burman). Due to the voice quality contrasts in Nuer, this study allows observation of the rich allophonic realizations of the polar tones. For example, /H/ is realized as mid or HL on modal-voiced syllables and as mid, H, or LH on breathy-voiced syllables.

In the remaining paper, Section 2 provides a language background, Section 3 explains the vowel grade system for nouns, and Section 4 presents the tonal inventory. Section 5 narrows down on toneless and L-toned nouns explaining the sandhi process FSC (Floating Suprasegmental component) for L-toned nouns. Section 6 shows the inflection forms of L-toned, toneless, and H-toned nouns in relation to their singular oblique case forms. These patterns are analyzed with an OT analysis in Section 7 followed by a summary and discussion in Section 8 and a short appendix in Section 9.

2 Language background

Nuer is spoken by more than 1.7 million people in South Sudan and Ethiopia (Eberhard et al., 2021) and has three dialect clusters: Western Nuer, Central Nuer, and Eastern Nuer (Reid Forth.). In the Eastern dialect cluster, there is the dialect 'Eastern Jikany', which is spoken on the South Sudanese and Ethiopian sides of the border. The variant presented in this study is referred to as 'Ethiopian Jikany' as it is spoken in Ethiopia in the Gambela region at the south-western border to South Sudan. It shows dialectal differences from the other Nuer variants of South Sudan.

The data of this study result from elicitations between 2016–2017 in Addis Abeba, Israel, Leipzig, and Oslo, and remote elicitations from 2021–2022. I worked with seven main consultants: six males and one female, aged 26–42. All consultants are speakers of Ethiopian Jikany and self-identified as members of the Gajaak and Gajiök communities.

The syllable structure in Nuer is typically CVC, and monosyllabic words are common in lexemes, inflection, and derivation since Nuer has a very rich non-concatenative morphology: Both inflection and derivation strongly involve stem-internal changes in vowel quality, voice quality, vowel length, diphthongization, and tone. Nuer has the following consonant inventory: voiceless and voiced plosives at five places of articulation: /p, b, t̪, d̪, t, d, c, ɟ, k, g/, and corresponding nasals: /m, n̪, n, ɲ, ŋ/. There are also two glides /w, j/, a liquid /l/, and a trill /r/. This variant of Nuer has no phonemic fricatives, but

the dental plosive /t̪/ has the allophonic variant [θ] when /t̪/ is a coda. For example, the coda of the oblique singular form of 'moon': /pat̪/ is often pronounced [θ].

Nuer has a rich vowel inventory with a phonemic contrast in voice quality, whereby vowel phonemes are either modal (e.g. /a/) or breathy (e.g. /a̤/). There are at least 14 monophthong phonemes: /ɪ, i̤, e, e̤, ɛ, a, a̤, ɐ̤, ɔ, ɔ̤, o, o̤, ʊ, ṳ/. For more details on the vowel and consonant system, see Reid (Forth.) Nuer also has three degrees of vowel length. I transcribe short vowels without length diacritic and mark long and overlong vowels using /ˑ/ and /ː/, respectively – for example /a, aˑ, aː/.[1] Tone is annotated on the first vowel in diphthongs.

There are dialectal differences in the realization of phonation and vowel length, and some nouns have lost the breathy property in Ethiopian Jikany. For example, in the South Sudanese variants, 'hand' has a modal voice in singular: /tĕt/ and a breathy voice in plural with a long vowel: /té̤t/ (Bond et al., 2020), but this difference is lost in Ethiopian Jikany and /tét/ is uttered for both the singular and plural forms with a H or HL tone. It gets a HL tone in front of L-toned suffixes.

3 Vowel grades and inflection

Nuer nouns are inflected in the singular and plural of the nominative and oblique case. The term 'oblique' refers to the case-marked noun in constructions with possessive and locative meanings, which has dependent case marking with stem-internal modification or suffixation of -(k)ɐ̤ (singular) and -(n)i̤ (plural). As shown in (5a)–(6a) below, the possessum noun appears first and is unmarked with a nominative case form, while the possessor noun follows with a suffix which marks the oblique case. The same form appears after a preposition, which precedes the noun with the oblique case form (5b)–(6b). The underlying tones are given in the nominative (NOM). In Ethiopian Jikany, suffixation is the productive inflection pattern. One indication of this is that loan words tend to get a suffix: For example, càkîˑn 'knife'; càkìˑn-kɐ̤́ knife-OBL.SG – See Gjersøe (2019).[2]

(5)　NOM: /ᴴᵘrí̤i̤et, rɛ́ˑj páˑl/
　　a.　rí̤i̤et　pâˑl-kɛ̀
　　　　word　prayer-OBL.SG
　　　　'the word of the prayer'
　　b.　rêˑj　pâˑl-kɛ̀
　　　　inside　prayer-OBL.SG
　　　　'in the prayer'

(6)　NOM: /bíɛˑl, ɟɔ́ˑ, ᴴᵘgwàk/
　　a.　bîɛˑl　gwàk-ɐ̤́
　　　　color　fox-OBL.SG
　　　　'the color of the fox'
　　b.　ɟɔ̂ˑ　　gwàk-ɐ̤́
　　　　behind　fox-OBL.SG
　　　　'behind the fox'

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[1]Note that other Nuer studies use different annotation conventions, e.g. long vowels are /aa/ and overlong /aaa/, and the vowel ʌ̞ (Bond et al., 2020). The latter vowel corresponds here to /ɐ̤/. When citing examples from other Nuer dialects, I use the annotation of this study for more coherence.

[2]The suffix -(k)ɐ̤ has no gemination if the stem ends in a /k/ as seen in (6) so that *gwàk-kɐ̤́ is avoided; and Ethiopian Jikany has less deletion of /k/ in the singular suffix compared to other dialects, as most speakers realize it even after stems ending in a liquid as pâˑl-kɛ̀ in (5b), while the South Sudanese Jikany realize -k only after a stem ending in a vowel.

The allomorphic variant of the oblique case form is the non-concatenative inflection, which involves changes such as vowel length, diphthongization, and tone as in (7)–(8).[3] Some nouns have two possible inflection forms such as /búk/ 'book', which gets the oblique singular form /buɔk/ or /búk-ḛ̀/.

(7) NOM: /rîɛˑm lɔ́ˑc/

    a. rîɛˑm lɔ̀ːc
        blood heart\OBL.SG
        'the blood of the heart'

    b. ɟɔ̂ˑ   lɔ̀ːc
        behind heart\OBL.SG
        'behind the heart'

(8) NOM: /màˑc gɔ́ˑl/

    a. màˑc gɔ̂aːl
        fire   bonfire\OBL.SG
        'the spark of the bonfire'

    b. rɛ̂ˑj gɔ̀aːl
        inside bonfire\OBL.SG
        'inside the bonfire'

The stem-internal changes in Nuer inflection are prolific but can be reduced to a system of morphological complexity referred to as 'vowel grades' (VG), which has been adopted for Nuer by Reid (2019): Verbal inflection and derivation is structured based on the complexity of the verbal stems, as shown in Table 1. Based on the derivation patterns, Reid (2019) proposes grade 1 vowels, which are all modal, and grade 2 vowels, which are primarily breathy. This system has been adopted for the nominal inflection by Bond et al. (2020); Baerman and Monich (2021). The lexical stem of a noun can have either grade 1 or grade 2. Within these two vowel grades, inflection can change a stem from VG A (basic) to B (modified) Reid (2019, p. 123). The change from grade A to B often involves diphthongization. The vowels /e, o/ in VG 2 stand out as they are breathy in VG A and modal in VG B. The examples above in (7)–(8) illustrate the tendency of a grade A nominative stem to get a grade B stem in non-concatenative inflection.

Grade 1		Grade 2	
Grade A	**Grade B**	**Grade A**	**Grade B**
ɪ	ɪɛ	i̤	i̤e
ɛ	ɛa	e̤	e
-	-	e̤	e̤a
a	a	ʌ̈	a̤
-	-	ɔ̈	ɔ̈a
ɔ	ɔa	o̤	o
ʊ	ʊɔ	ṳ	ṳɔ

Table 1: Vowel grades from Reid (2019, p. 109)

As Monich and Baerman (2019) rapport, nominal singular forms can have any vowel grade, but this determines the vowel grade of the other inflection forms. Baerman and

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[3] /lɔ́ˑc/ is L-toned in the South Sudanese variant (Bond et al., 2020).

Monich (2021) find that all non-concatenative genitive forms have a grade B vowel which often involves vowel lengthening from the nominative grade A form, as seen above in (7)–(8), or suffixation with a grade A stem vowel (or 1A/B), as seen in (5)–(6).

A third generalization from Baerman and Monich (2021) is that when a nominative singular stem has a vowel grade B and gets a suffix, the stem changes to vowel grade A when attaching to the suffix. This can be observed below in (9)–(10).[4]

(9)   NOM: /múˑn, rɛ́ˑj kɔ́aːk/

  a. múˑn kɔ́ˑk-è̩
     earth hole\OBL.SG
     'the earth of the hole'

  b. rɛ̂ˑj kɔ́ˑk-è̩
     inside hole\OBL.SG
     'inside the hole'

(10)   NOM: /míe̩m, wíː, wúɔ̩ːk/

  a. míe̩m wúːk-è̩
     hair.PL shoulder\OBL.SG
     'the hair of the shoulder'

  b. wíː wúːk-è̩
     at shoulder\OBL.SG
     'at the shoulder'

The vowel grades provide a system for the many ways of inflecting a noun in Nuer: Stems change from grade A to B in non-concatenative forms, and no change happens when grade A vowels combine with a suffix. The third option is peculiar in that a nominative singular form with VG B will likely get a suffix as its stem cannot modify further into a non-concatenative inflection form. By getting a suffix, however, the stem changes back to a VG A, as suffixes in Nuer do not like to combine with stems with VG B. Perhaps the most important generalization is that grade A singulars are more likely to have a non-concatenative oblique form, and grade B singulars to have a suffix in genitive singular (Baerman and Monich, 2021, p. 11).

In the following sections, I show that tone is also an indicator of the inflection forms in addition to vowel grades. Section 5 shows a group of nouns with VG A that are toneless and contrast with L-toned nouns, which often have VG B. Toneless nouns get non-concatenative inflection and are subject to tonal polarity on the stem, while nouns with underlying L tones tend to get a suffix. I argue that tone can even be a more robust indicator of the inflection pattern, e.g., when the stem vowel is /a/ and corresponds to VG A/B. In that case, L-toned stems are more likely to get a suffix, and toneless nouns get non-concatenative inflection. To understand this, I first present the tonal inventory in Ethiopian Jikany in the following section.

4   Tonal inventory

I propose three underlying tones for Ethiopian Jikany: /H/, /L/, and toneless /Ø/. These tones have many allomorphic realizations, and their surface-phonological form is laid out in this section.

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[4]Note the following differences with the South Sudanese Nuer dialects: 'hole' and 'earth/soil' have a rising tone /mŭˑn, kɔ̌aːk/ (Bond et al., 2020).

The realization of the /H/ tone depends on phonation as observed by Monich (2020) for South Sudanese Jikany: H appears on breathy-voiced nouns as in (11), while HL appears on modal-voiced nouns, as in (12). The /H/ tone on modal-voiced vowels is also realized as mid by some speakers.[5]

(11) /H/ tone on breathy-voice
nē̤·n   ɲé̤·r
see.IMP.SG gum
'Look at the gum!'

(12) /H/ tone as [HL] on modal voice
né·n   ɲâ·r
see.IMP.SG crocodile
'Look at the crocodile!'

The /H/ tone contrasts with the /L/ tone as the minimal pairs illustrate in the breathy-voiced nouns in (13) and the modal-voiced nouns in (14)–(15). I postulate the syllable as the TBU.

(13) a. bé̤·r
          'Anyuak people'
      b. bè̤·r
          'shoot'/'length'

(14) a. lâ̱t
          'cotton'
      b. là̱t
          'shaking'

(15) a. wâːr
          'sheep/goat dung'
      b. wàːr
          'grass'

In addition to the /H/ and /L/ tones, I postulate toneless syllables in Nuer. Examples of these are the inflection suffix -(k)e̤ – see e.g. (5)–(6) above, and the noun /ɲa·l / 'girl' below. One indication that such syllables are toneless is that they are subject to tone sandhi rules, and their tone depends on surrounding ones or the sentence position. Toneless nouns alternate between mid and L tones. The mid tone is observed on short or long modal-voiced nouns as in (17). In final positions, they get a L tone (16).

(16) tîεːm-è̤   ɲà·l
      remember.\TR-1SG. girl
      'I remember the girl.'

(17) /tíεːm-e̤ ɲa·l kὲ rṵ́nwà·ŋ/
      tîεːm-è̤   ɲā·l kὲ rṵ́nwà·ŋ
      remember.\TR-1SG. girl in morning
      'I remember the girl in the morning.'

The derivation of surface tones on toneless, modal-voiced syllables are hypothesized as follows: They are assigned a default H tone to avoid surfacing as toneless syllables. The phonetic realization of this tone is mid because they are modal-voiced. In sentence-final positions, they are always L. This lowering is attributed to the fact that they undergo final lowering, which phonetically lowers /H/ and /L/ tones in Nuer. This lowering affects toneless syllables to be realized as [L]. In contrast, /H/ tones are only partially lowered – see Gjersøe (2019).

An alternative approach to /Ø/ tones is an underlying /M/ specification reported by Reid (2019). The advantage of a toneless specification over a /M/ tone is that the binary

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[5]The [HL] tone on modal-voiced vowels is annotated as /V́/ when referring to its underlying tone. There are also some modal-voiced vowels realized with [H] tone: For example, the underlying tone of the verb form is /Ø/, and some speakers realize it as H or LH before L or HL tones [né·n]. It is most commonly realized as M [nē·n].

/H/ vs. /L/ tone feature is maintained. Furthermore, the /H/ and /L/ tones are active in Nuer phonology: they participate in tone sandhi rules such as OCP; /H/ tones are subject to dissimilation (Reid, 2019, p. 152) and are floating tones in FSC nouns, as the next section will show. Mid tones, on the other hand, are often derived from floating tones or are a result of the OCP.

Nuer also has LH tones which appear on long or overlong breathy-voiced nouns (19). Just as mid tones, they get lowered to L sentence-finally (18).[6] The specification of these nouns is likely toneless, as they appear in restricted environments and behave similarly to the modal-voiced toneless nouns. However, some nouns with /H/ tones are also realized as LH, and not all surface rising tones might be underlyingly toneless. There are also phonetic factors influencing the tones, and Reid (Forthcoming) reports that breathy-voiced tones generally have a higher F0 than modal-voiced voiced ones. Therefore, it is not entirely clear what the underlying tone of nouns like [děj] is.

(18) nêaːn-ə̀   dèj
      see\TR-1SG hammer
      'I see the hammer.'

(19) /néaːn-ə̤ dej ɛ̀n té̤mɛ̀/
      nêaːn-ə̀   děj   ɛ̀n   té̤mɛ̀
      see\TR-1SG hammer PART   now
      'I see the hammer now.'

In the following sections, I focus on toneless syllables with modal-voiced vowels, which contrast with L tones, and relate their patterns with the oblique case forms.

5 Toneless and L-tones nouns

The toneless nouns addressed in this paper are a small group of stems with vowel grades A or A/B. Semantically, they are nouns with older forms, such as body parts and animals. In the nominative case, their surface tone depends on the sentence's position. In (20), the toneless noun /ɟaˑt̪/ is mid before a L- or H-toned predicative and L sentence-finally in (22). Examples of more nouns are given in (21) and (23).

(20) /ɟaˑt̪, gwà-ɛː, ɟé̤ˑ-gɛ/
      a. ɟāˑt̪ gwà-ɛ̀ː
          tree good-3SG
          'tree is good.'
      b. ɟāˑt̪ ɟé̤ˑ-gɛ̀
          tree bad-3SG
          'tree is bad.'

(21) Mid tone sentence-initially

Gloss	Noun	'is good/is bad'
'moon'	pāj	gwà-ɛ̀ː/ɟé̤ˑ-gɛ̀
'eye'	wāŋ	gwà-ɛ̀ː/ɟé̤ˑ-gɛ̀
'person'	rāːn	gwà-ɛ̀ː/ɟé̤ˑ-gɛ̀
'lion'	lūɲ	gwà-ɛ̀ː/ɟé̤ˑ-gɛ̀
'back'	ɟɔ̄k	gwà-ɛ̀ː/ɟé̤ˑ-gɛ̀
'girl'	ɲāˑl	gwà-ɛ̀ː/ɟé̤ˑ-gɛ̀

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[6]The LH tone is analyzed as underlying in both modal-voiced nouns and breathy-voiced nouns in Monich (2020), who reports on similar contexts as (17)–(19).

(22) /nɛ·n, tiɛ́·d-ɐ̥, ɟa·t̪/

   a. nɛ́·n   ɟà·t̪
     see.IMP.SG tree
     'Look at the tree!'

   b. tiɛ̂·d-ɛ̥̀   ɟà·t̪
     observe.TR-1.SG tree
     'I observe a tree.'

(23) L tone sentence-finally

'Look at/I observe'	Noun	Gloss
nɛ̄·n/tiɛ̂·d-ɛ̥̀	pàj	'moon'
nɛ̄·n/tiɛ̂·d-ɛ̥̀	wàŋ	'eye'
nɛ̄·n/tiɛ̂·d-ɛ̥̀	ràːn	'person'
nɛ̄·n/tiɛ̂·d-ɛ̥̀	lòɲ	'lion'
nɛ̄·n/tiɛ̂·d-ɛ̥̀	ɟɔ̄k	'back'
nɛ̄·n/tiɛ̂·d-ɛ̥̀	ɲà·l	'girl'

Other tonal contexts indicate that the mid – L alternation is conditioned by the position (final vs. medial) as opposed to the surrounding tones. Observe the noun /lʊɲ/ 'lion' with a mid tone sentence-medially preceding a H or L tone, and sentence-initially before a L tone (24). It appears with a L tone sentence-finally after the H-toned verb in (25a), the L-toned imperative in (25b), and the mid-toned imperative form in (25c).[7]

(24) /ŋwɔ́·ɲ lʊɲ, -dɛ̤́, -dɛ̀/

   a. ŋwɔ́·ɲ lʊ̄ɲ-dɛ̤́
     smelly lion-POSS.1SG
     'My lion is smelly.'

   b. ŋwɔ́·ɲ lʊ̄ɲ-dɛ̀
     smelly lion-POSS.3SG
     'Her lion is smelly.'

   c. lʊ̄ɲ cɛ̀   jâ·ŋ càm
     lion PFV-3SG cow eat
     'The lion has eaten the cow.'

(25) /ŋwɔ́·ɲ, gwìc, ka·ɲ, lʊɲ/

   a. ŋwɔ́·ɲ lòɲ
     smelly lion
     'A lion is smelly.'

   b. gwìc   lòɲ
     watch.IMP.SG lion
     'Watch a lion!'

   c. kā·ɲ   lòɲ
     scare.IMP.SG lion
     'Scare a lion!'

The toneless nouns contrast with L-toned stems in several aspects. First, /L/-toned nouns surface as L in positions where the toneless nouns get a mid tone. Below, the breathy-voiced nouns /^{Hμ}nɛ̤̀ːn/ 'mirror' and /^{Hμ}tɔ̤̀t/ 'plant season' in (26), and the modal-voiced nouns /^{Hμ}gwàk/ 'fox' and /gàt/ 'child' in (27) are all L-toned sentence-initially in front of a L-toned copula, as well as in final position (28)-(29).

(26) /^{Hμ}nɛ̤̀ːn, ^{Hμ}tɔ̤̀t, gwà-ɛ̀/

   a. nɛ̤̀ːn gwà-ɛ̀ː
     mirror good-3SG
     'The mirror is good.'

   b. tɔ̤̀t   gwà-ɛ̀ː
     plant.season good-3SG
     'The plant season is good.'

(27) /^{Hμ}gwàk, gàt, gwà-ɛ̀/

   a. gwàk gwà-ɛ̀
     fox   good-3SG
     'The fox is good.'

   b. gàt gwà-ɛ̀
     child good-3SG
     'The child is good.'

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[7]Nouns analyzed as toneless such as /lʊɲ/ 'lion' have a mid tone after mid-toned imperatives in South Sudanese Jikany – Monich (2020, p. 39).

(28) /nɛ·n ᴴᵘnȅːn, ᴴᵘtɔ̰t/   (29) /nɛ·n ᴴᵘgwàk, gàt/

  a.   nɛ̄·n   nȅːn   a.   nɛ̄·n   gwàk
      see.IMP.SG mirror   see.IMP.SG fox
      'Look at the mirror!'   'Look at the fox!'
  b.   nɛ̄·n   tɔ̰t   b.   nɛ̄·n   gàt
      see.IMP.SG plant.season   see.IMP.SG child
      'Look at the plant season!'   'Look at the child!'

Many L-toned nouns trigger a mid tone on preceding L-toned syllables – so-called 'stable nouns' in Gjersøe (2019). When they follow a L-toned syllable, they raise them to mid. I adopt the term 'Floating Suprasegmental component' (FSC) by Reid and Remijsen (2022); Reid (2021) who analyze such nouns as having a floating mora and H tone, which associates left-ward on open syllables. FSC nouns can also be /H/-toned and induce the same tone process, but toneless nouns are not observed with FSC in this study. One diagnostic for FSC is when the nouns follow the L-toned auxiliary *c-ɛ̀*. Observe the contrast below between FSC and toneless nouns: In (30), the underlying toneless nouns follow *c-ɛ̀* and precede a toneless verbal stem. They get a mid tone as expected. In comparison, the L-toned FSC nouns in (31) induce vowel lengthening and a mid tone on the preceding auxiliary: *c-ɛ̄·*.[8]

    /Ø/-toned nouns (no FSC)   L-toned FSC nouns
(30) /c-ɛ̀,ɲa·l,waŋ,lʊɲ,ɟɔk,nɛ·n,tím/   (31) /c-ɛ̀,ᴴᵘkȅːr,ᴴᵘnȅːn, ᴴᵘlà·ŋ,ᴴᵘtɔ̰t,tɔ́t/

  a.   c-ɛ̀   ɲā·l nɛ̂·n   a.   c-ɛ̄·   kȅːr nɛ̂·n
      PFV-3SG girl see   PFV-3SG line see
      '(S)he has seen the girl.'   '(S)he has seen the line.'
  b.   c-ɛ̀   wāŋ nɛ̂·n   b.   c-ɛ̄·   nȅːn   nɛ̂·n
      PFV-3SG eye see   PFV-3SG mirror see
      '(S)he has seen the eye.'   '(S)he has seen the mirror.'
  c.   c-ɛ̀   lʊ̄ɲ nɛ̂·n   c.   c-ɛ̄·   là·ŋ   tɔ́t
      PFV-3SG lion see   PFV-3SG mosquitonet pull.CF
      '(S)he has seen the lion.'   '(S)he pulled the mosquito net thither.'
  d.   c-ɛ̀   ɟɔ̄k tîm   d.   c-ɛ̄·   tɔ̰t   nɛ̂·n
      PFV-3SG back remember   PFV-3SG plant.season see
      '(S)he has remembered the back.'   '(S)he has seen the plant season.'

The floating H tone from FSC nouns also affects the toneless suffix -ɛ̰, which gets a rising tone (33), as opposed to its L tone before toneless nouns (32). Closed L-toned syllables like /gwìc/ also get a H tone before FSC nouns, but without vowel lengthening (35). It is L before non-FSC nouns (34).

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[8]The non-finite verb /nɛ·n/ 'look' has a falling tone after a mid and L tones: [nɛ̂·n], and is L after /H/ tones: [nɛ̀·n]. Other verbal stems are specified for tone e.g. /tím/ and /tɔ́t/.

10

Toneless nouns without FSC

FSC nouns

(32) /lá·r-ẹ lʊɲ kákêl/
     lâ·r-ẹ̀   lōɲ kákêl
     say-1SG lion once
     'I say 'lion' once.'

(33) /lá·r-ẹ ^{Hμ}nὲ:n kákêl/
     lâ·r-ẹ̆·   nὲ:n kákêl
     say-1SG mirror once
     'I say 'mirror' once.'

(34) /gwìc ɲa·l/
     gwìc   ɲà·l
     watch.IMP.SG girl
     'Watch the girl!'

(35) /gwìc ^{Hμ}gwàk/
     gwĭc   gwàk
     watch.IMP.SG fox
     'Watch the fox!'

Examples of L-toned nouns without FSC are /gàt/ (36) 'child' and /wàt̪/ 'relative' (37), which have a L tone as the auxiliary.

L-toned nouns without FSC

(36) /c-ὲ gàt nɛ·n/
     c-ὲ   gàt nê·n
     PFV-3SG child see
     '(S)he has seen the child.'

(37) /c-ὲ wàt̪ nɛ·n/
     c-ὲ   wàt̪ nê·n
     PFV-3SG relative see
     '(S)he has seen the relative.'

The next section looks at the connection between tonal specification and inflection patterns, especially comparing toneless nouns with L-toned in relation to suffixation and tonal polarity.

6 Oblique case form

This section discusses the singular inflection forms of the oblique case. Nouns have allo-morphic variation between suffixation and non-concatenative forms, and some nouns even have alternative inflection forms. This makes inflection in Nuer highly irregular. Among this irregularity are subpatterns, where the tonal specification of nouns is connected with their suffixation patterns. This goes together with their vowel grades, as discussed in Section 3. Section 6.1 aims to show that the tonal specification in the nominative forms of toneless and L-toned nouns is relevant for their suffixation patterns, while Section 6.2 shows that it is not for H-toned nouns. The inflected forms are subject to tonal polarity, and their patterns reveal whether the stems are toneless or not. Each section addresses lexically specified forms with L tones and non-concatenative inflection.

6.1 L and toneless nouns

The contrast between toneless and L-toned nouns is carried out in the oblique case forms. Toneless nouns such as /lʊɲ/ 'lion' get a non-concatenative form which is subject to tonal

polarity: it gets a L tone after a HL-toned preposition in (39a) or the H-toned noun in (39b). In comparison, L-toned stems such as /ᴴᵘgwàk/ get a suffix in the oblique case. The suffix is toneless: -e̤, and gets a tone which is polar to the stem tone (38).[9]

(38) NOM: /ló·c, ᴴᵘgwàk/, /ɟó·/
    a. ɟɔ̂·   gwàk-é̤
        behind fox-OBL.SG
        'behind the fox'
    b. lō·c gwàk-é̤
        heart fox-OBL.SG
        'the heart of the fox'

(39) NOM: /mí̤em, lʊɲ/
    a. ɟɔ̂·   lʊ̀ɔɲ
        behind lion\OBL.SG
        'behind the lion'
    b. mí̤em lʊ̀ɔɲ
        hair.PL lion\OBL.SG
        'the hair of the lion'

When L-toned nouns like /ᴴᵘcɔ̀a̤ː/ 'bone' appear as possessum nouns, they trigger a polar tone on toneless, non-concatenative forms, like the possessor noun in (41), which is realized with a mid tone. In contrast, L-toned nouns stay L when they are possessor nouns. The floating H tone of the FSC noun /ᴴᵘgwàk/ triggers a mid tone on the possessum noun in (40). Vowel lengthening is blocked because the vowel is overlong in (40).

(40) NOM: /ᴴᵘcɔ̀a̤ː, ᴴᵘgwàk/
    cɔ̄a̤ː gwàk-é̤
    bone fox-OBL.SG
    'the bone of the fox'

(41) NOM: /ᴴᵘcɔ̀a̤ː, lʊˑɲ/
    cɔ̀a̤ː lṳ̄ɔɲ
    bone lion\OBL.SG
    'the bone of the lion'

The effect of the FSC noun can be observed after the preposition /gé·-ke̤/.[10] Before a L-toned noun, the last syllable of this preposition gets a mid tone with vowel lengthening (42), while before a toneless noun, this syllable is L and the toneless possessor noun gets a HL tone (43), which is another allotone of the /H/ polar tone on modal-voiced nouns besides the mid tone in (41) above.

(42) NOM: /ᴴᵘgwàk/, /gé·ke̤/
    gé·kē̤· gwàk-é̤
    next.to fox-OBL.SG
    'next to the fox'

(43) NOM: /lʊɲ/
    gé·kè̤ lɔ̂ɲ
    next.to lion\OBL.SG
    'next to the lion'

The mid tone appearing on possessum nouns in e.g. (40) is not restricted to constructions where the possessor noun has FSC, but also occurs with L-toned nouns which do not have FSC in the nominative case such as /gàt/ 'child' and /wà̱t/ 'relative' below. Since they are L-toned, they get a suffix with a polar tone. Just as FSC nouns, /gàt/ triggers a mid tone on the possessum noun in (44a), and /wà̱t/ triggers a LH tone in (45a). The LH

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[9]Polar tones on suffixes have also been reported by Monich and Baerman (2019) and Reid (2019).

[10]This preposition means lit. gê·k 'side' + suffix /-(k)e̤/. The vowel becomes more open and shorter when the suffix attaches, which corresponds to /e̤/. Most speakers realize it with a H tone, but some also realize it as M.

tone is another allotone of /H/, which can appear on long and breathy vowels. They both trigger a mid tone and vowel lengthening on the preposition /gə́·kə̞/ as in (42) above.[11] This indicates that they are the same as FSC nouns in the oblique case.

(44) NOM: /gàt, ^{Hμ}cɔ̀a̤ː/, /gə́·kə̞/

    a. cɔ̄a̤ː gàd-ə́
       bone child-OBL.SG
       'the bone of the child'

    b. gə́·kə̞̄ː gàd-ə́
       next.to child-OBL.SG
       'next to the child'

(45) NOM: /lə̤̀·k wàt̪/

    a. lə̤̀·k wàd̪-ə́/
       dream relative-OBL.SG
       'the dream of the relative'

    b. gə́·kə̞̄ː wàd̪-ə́
       next.to relative-OBL.SG
       'next to the relative'

The data indicate that L-toned nouns in the oblique case get a suffix with a polar tone, and a floating H tone prefix. The floating H tone prefix makes L-toned nouns the same as FSC nouns in the oblique case with singulars. Thus, nouns like /gàt/ 'child' and /wàt̪/ 'relative' get assigned a floating H tone prefix in the oblique case: /^{Hμ}/. The autosegmental representation of the tonal processes of e.g. (44a) is shown in (46) with the allotones of breathy possessum nouns: The possessor noun has a floating H tone in prefix position that links to the left on the possessum noun. The underlying L tone of the possessum noun delinks and lowers the H tone to a mid tone or creates a rising tone. The polar tone, which goes on the suffix, appears as a floating tone that links to the suffix syllable: H on L-toned stems. Since the suffix is toneless and breathy, it surfaces as H.

(46) Tonal polarity in suffixed forms: Surface tones on breathy voice

Input	Output	Surface tone realizations
LHLH	L H LH	
| | →		[M#L-H] or [LH#L-H]
V̤#V-V̤	V̤#V-V̤	

Not all L-toned nouns get a suffix, and some nouns are lexically specified with a non-concatenative inflection in the oblique singular such as the FSC noun /^{Hμ}tɔ̀t/ 'plant season' – see (31d) above. It behaves consistently as an underlying L-toned in that its inflected stem does not get a polar tone. Instead, it induces a H tone on L-toned possessum nouns, which surfaces as mid (47).

(47) NOM: /là·ŋ ^{Hμ}tɔ̀t/
       lā·ŋ   tɔ̤̌at
       mosquito.net plant.season\OBL.SG
       'the mosquito net of the plant season'

Table 2 provides some examples of L-toned nouns and their oblique case forms. In the nominative, L-toned nouns either have FSC or not, while in the oblique case, all the

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[11]Some speakers delete the onset of the suffix and realize the stem coda as voiced: [gàd-ə́], while others realize the suffix: [gàt-kə́].

tested nouns have FSC. The vowel grade can be both A and B. As expected, the ones with VG 1A/B do not change when a suffix attaches, and the ones with a VG B change to A with a suffix, e.g. /ᴴᵘcɔ̀aː/ → ᴴᵘcɔ̀ː-kɛ́ 'bone'.

VG	NOM SG	VG	OBL SG	Gloss
1A/B	ᴴᵘlà˙ŋ	1A/B	ᴴᵘlà˙ŋ-ɛ̰́	'mosquito net'
1A/B	ᴴᵘgwàk	1A/B	ᴴᵘgwàk-ɛ̰́	'fox'
1A/B	wàt̪	1A/B	ᴴᵘwàḓ-ɛ̰́	'relative'
1A/B	gàt	1A/B	ᴴᵘgàt-kɛ̰́	'child'
2A	ᴴᵘkɛ̰̀ːr	2A	ᴴᵘkɛ̰̀ːr-ɛ̰́	'line'
2A	ᴴᵘnɛ̰̀ːn	2A	ᴴᵘnɛ̰̀ːn-kɛ̰́	'mirror'
2A	ᴴᵘkɛ̰̀˙n	2A	ᴴᵘkɛ̰̀˙n-ɛ̰́	'type of bird'
1B	rɔ̀aːm	1A	ᴴᵘrɔ̀ːm-kɛ̰́	'sheep'
2B	ᴴᵘcɔ̀aː	2A	ᴴᵘcɔ̀ː-kɛ̰́	'bone'
2A	ᴴᵘlɛ̰̀˙k	2A	ᴴᵘlɛ̰̀˙k-ɛ̰́	'dream'

Table 2: Underlying L-toned nouns with a polar tone on the suffix.

Returning to toneless nouns, the examples above showed that tonal polarity applies to the stem in non-concatenative forms. The toneless nouns discussed here have modal-voiced vowels and do not have FSC.[12] They have a HL allotone in addition to the mid tone shown in (41) above. This can be observed for /ɟɔk/ 'back' and /raːn/ 'person' in (48b)–(49b) after the L-toned noun /ᴴᵘcɔ̀aː/ 'bone'. They appear with a L tone as expected after a /H/-toned possessum noun (48a) or preposition in (49a).

(48) NOM: /mḭ́ḛm, gṵ̀ɔ̰˙p, ɟɔk/
    a. mḭ́ḛm ɟɔ̀ak
        hair.PL back\OBL.SG
        'the hair of the back'
    b. nɛ̄˙n   gṵ̀ɔ̰˙p ɟɔ̂ak
        see.IMP.SG skin back\OBL.SG
        'Look at the skin of the back!.'

(49) NOM: /ɟɔ́˙, ᴴᵘcɔ̀aː, raːn/
    a. ɟɔ̂˙   ràn
        behind person\OBL.SG
        'behind the person'
    b. nɛ̄˙n   cɔ̀aː rân
        see.IMP.SG bone person\OBL.SG
        'Look at the bone of the person!'

The idea is that the polar tone is the same floating tone that links to the suffix of L-toned nouns. It manifests as a floating H or L tone depending on the tone of the preceding word (a preposition or possessum noun) and links to non-concatenative stems. The autosegmental process is shown for constructions when the toneless non-concatenative forms follow a L-toned word in (50): The floating /H/ tone in the oblique case links to the non-concatenative stem and has two allomorphs: HL and mid.

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[12]Some nouns have FSC and a mid tone as [ᴴᵘgwēk] 'frog' and [ᴴᵘbṵ̄n] 'coffee' – Tatiana Reid (p.c.). They behave differently than the toneless nouns of this study in terms of suffixation and surface tones.

(50)   Tonal polarity in non-concatenative forms: Surface tones on modal voice

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Input       Output      Surface tone realizations
L   H       L   H
|       →   |   ¦        [L#M] or [L#HL]
V#V         V#V
```

In addition to the polar pattern, some of the toneless nouns get a non-concatenative form with a L tone – similar to /ᴴᵘtɔ̰t/ in (47) above. They also trigger a mid tone on the preceding word and are annotated with a floating H tone prefix in the oblique case. This can be observed for the nouns /ɲaˑl/ 'girl' and /ʈaˑʈ/ 'tree', which both get an overlong vowel with a L tone regardless of the tone of the preceding word (51)–(52). The L-toned possessum nouns /ᴴᵘgwàk/ in (51b) and /rɛ̰̀ɛ̰ːt/ in (52b), get a mid tone.

(51)   NOM: /ᴴᵘgwàk, ɲaːl/, nɛˑn/   (52)   NOM: /ʈaˑʈ, bíɛˑl, rɛ̰̀ɛ̰ːt/

    a. jɔ̂ː   ɲàːl   a. nɛ́ˑn   bîɛˑl ʈàːʈ̰
       behind girl\OBL.SG   see.IMP.SG color tree\OBL.SG
       'behind the girl'   'Look at the color of the tree.'

    b. nē̠ˑn   gwāk ɲàːl   b. nē̠ˑn   rɛ̄ɛ̰t ʈàːʈ̰
       see.IMP.SG fox   girl\OBL.SG   see.IMP.SG crack tree\OBL.SG
       'Look at the fox of the girl.'   'Look at the crack of the tree.'[13]

The autosegmental process is shown in (53) below, for examples like (47), (51), and (52) above. The process is similar to (46) except that they do not get a suffix. They are lexically specified for L tones and get a floating H tone prefix which links to the preceding word.

(53)   L tone in non-concatenative forms

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Input       Output      Surface tone realizations
L  HL       L  HL
|   |   →   ⊤¦´  |       [M#L] or [LH#L]
V # V       V # V
```

Table 3 below shows the group of toneless nouns with non-concatenative inflection forms. They are not as frequent as the forms with a suffix and also have non-concatenative plural forms.[14] They have a grade A or A/B in the nominative. Grade 1A changes to grade 1B in the oblique singular forms, while the rest with 1A/B remain the same. Short vowels do not change, but overlong vowels become short, and long vowels become overlong, as predicted by Baerman and Monich (2021). The left columns show the tone alternation in the nominative case from Section 5: they are mid-toned sentence-initially and sentence-medially, and L-toned sentence-finally, regardless of the preceding tones.

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[13]/rɛ̰̀ɛ̰ːt/ 'crack' in the South Sudanese dialect is /rɛ̀aːt/ (Bond et al., 2020).
[14]See 'unstable nouns' in Gjersøe (2019)

The right columns show their inflected forms in the oblique case with singular, where the first row of nouns are subject to tonal polarity: L after /H/ tones and mid or HL after /L/. The second row of nouns are L-toned and get a floating H tone prefix in the inflected form.[15]

VG	NOM SG		VG	OBL SG		Gloss
Context:	Initial/medial	Final		/H/__	/L/__	
	M	**L**		**L**	**M/HL**	
1A	lō̠ɲ	lò̠ɲ	1B	lṑɔɲ	lṓɔɲ	'lion'
1A	ɟɔ̄k	ɟɔ̀k	1B	ɟɔ̀ak	ɟɔ̂ak	'back'
1A/B	wāŋ	wàŋ	1A/B	wàŋ	wāŋ	'eye'
1A/B	rā:n	rà:n	1A/B	ràn	rân	'person'
	M	**L**		**L**		
1A/B	pāj	pàj	1A/B	$^{H\mu}$pàt̠		'moon'
1A/B	ɟā·t̠	ɟà·t̠	1A/B	$^{H\mu}$ɟà:t̠		'tree'
1A/B	ɲā·l	ɲà·l	1A/B	$^{H\mu}$ɲà:l		'girl'

Table 3: Underlying toneless nouns with non-concatenative inflection.

The data in this section has shown two polarity patterns in non-concatenative forms: [L#M] and [M#L]. Some nouns have both options, which result in a difference between alienable or inalienable possession, as reported by Monich (2021). When /ɲa·l/ 'girl' is in a possessive construction: /cɔ̀a̠: ɲa:l/, a [L#HL] pattern yields an inalienable meaning denoting a bone in a girl's body (54). A sentence with the imperative can also give an idiomatic meaning: 'Look at the tall girl'. The [M#L] or [LH#L] pattern denotes an alienable meaning, referring to some bone she has collected from e.g. an animal (55). This indicates that possessive constructions use tonal polarity to distinguish between inalienable and alienable meanings in Nuer.

(54) Inalienable possession
néˑn   cɔ̀a̠: ɲā:l
see.IMP.SG bone girl\GEN.SG
(i) 'Look at the bone of the girl!'
(ii) 'Look at the tall girl!'

(55) Alienable possession
nɛ̄ˑn   cɔ̄a̠: ɲà:l
see.IMP.SG bone girl\GEN.SG
'Look at the bone of the girl!'

To summarize, suffixation in Nuer patterns with the underlying tones in the nominative. L-toned nouns tend to get a suffix in the oblique singular forms, while a group of toneless nouns gets non-concatenative forms. In the nominative case, only FSC nouns trigger a H tone on the preceding word, while in the oblique case, this applies to all

[15]There are some dialectal differences for the nouns of this table: /waŋ/ 'eye' has the same vowel length (short) in the nominative and oblique forms, while in South Sudanese Jikany, it has a long vowel with L tone in the oblique case: /wàˑŋ/ (Bond et al., 2020); and ɟɔ̀k 'back' is the same in both possessive and locative constructions: ɟɔ̂ak , while in South Sudanese Jikany, the form in possessive constructions is ɟɔ̂ak (VG B) and the form in locative constructions ɟɔ̂k (VG A) (Monich and Baerman, 2019, p. 512).

L-toned nouns (suffixed or not). They contrast with toneless, non-concatenative forms that are subject tonal polarity. The following section discusses the oblique case form of /H/-toned nouns, which also have tonal polarity patterns.

6.2   H and HL stems

While L-toned nouns tend to get a suffix in the oblique case form, and toneless nouns do not, nouns with a /H/ tone specification in the nominative case show no tendencies with these two allomorphs. However, other stem properties such as vowel grades and FSC are helpful: Nouns that undergo non-concatenative inflection in the oblique case are not observed with FSC in the nominative case, while many nouns which get a suffix are.

The /H/-toned nouns that get non-concatenative inflected forms in the oblique case show the same tendencies as toneless nouns. Their stems are toneless and subject to tonal polarity, as shown below with the /H/-toned nouns /rɔ́ˑt̪/ 'armpit' and /dɛ́ˑl/ 'sheep/goat'. After a /H/ tone, their inflected forms get a L tone (56a)–(57a), and after a /L/ tone, they get a mid tone in (56b)–(57b) – also realized as LH on breathy-voiced stems.[16]

(56)   NOM:/ᴴᵘcɔ̀aˑ, rɔ́ˑt̪/, /rɛ́ˑj/   (57)   NOM: /bíɛˑl, ᴴᵘcɔ̀aˑ, dɛ́ˑl/

    a.   rɛ̂ˑj   rɔ̀aˑt̪   a.   bîɛˑl   dɛ̀e̤ˑl
       inside armpit\OBL.SG   color sheep\OBL.SG
       'inside the armpit'   'the color of the sheep'

    b.   cɔ̀aˑ   rɔ̄aˑt̪   b.   cɔ̀aˑ   dɛ̄e̤ˑl
       bone armpit\OBL.SG   bone sheep\OBL.SG
       'the bone of the armpit'   'the bone of the sheep'

The HL allotone on non-concatenative forms appears on modal-voiced stems: This can be observed with /jáˑŋ/ 'cow' and /mɔ́k/ 'buffalo'. The latter mutates to vowel grade 2B with a modal-voiced vowel. Both nouns get a L tone after a /H/ tone (58a)–(59a), and a HL tone after a L tone (58b)–(59b).

(58)   NOM: /jáˑŋ/ 'cow'   (59)   NOM: /mɔ́k/

    a.   jɔ̂ˑ   jàˑŋ   a.   nɛ̄ˑn   bîɛˑl   mòk
       behind cow\OBL.SG   seeIMP.SG color buffalo\OBL.SG
       'behind the cow'   'Look at the color of the buffalo!'

    b.   cɔ̀aˑ   jâˑŋ   b.   cɔ̀aˑ   môk
       bone cow\OBL.SG   bone buffalo\OBL.SG
       'the bone of the cow'   'the bone of the buffalo'

The L tone pattern on non-concatenative forms – see (53) above – is found with the noun /kút̪/ 'god' below (60). Data indicate that this oblique form acquires a floating H

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[16]In South Sudanese Jikany, /rɔ́ˑt̪/ 'armpit' has a different locative form with a longer vowel: /rɔ́ːð/ - see Bond et al. (2020). In Ethiopian Jikany, it maintains the coda /t̪/ in the inflected forms and has a long vowel in the nominative singular. Most speakers pronounce the nouns in possessive and locative constructions the same: rɔ̀aːt̪, except for one speaker, which has a suffix only in the locative form.

tone and mora: /ᴴᵘkʊ̀ɔt̪/: It induces a LH tone on the L-toned possessum noun in (61a), and a mid tone and vowel lengthening on the open, toneless syllable in (61b).

(60)   NOM: /kʉ́t̪/, /jɔ́ˑ/

jɔ̂ˑ   kʊ̀ɔt̪
behind god\OBL.SG
'behind god'

(61)   NOM: /lȅ̤ˑk/, /gé̤kɛ̤/

a.   lȅ̤ˑk   kʊ̀ɔt̪
     dream god\OBL.SG
     'the dream of god'

b.   gé̤kɛ̤̄ˑ   kʊ̀ɔt̪
     next.to god\OBL.SG
     'next to god'

Table 4 gives some examples of /H/-toned nominative forms which undergo non-concatenative inflection. In contrast with the toneless nouns in Table 3, they are found with breathy vowels and vowel grade 2A in addition to modal-voiced ones with vowel grade 1A or 1A/B. The inflected forms get vowel grade B, as expected.[17] The first two rows with nouns are toneless and subject to tonal polarity, while the last row with the noun /kʉ́t̪/ 'god' has a L-toned oblique form after /H/ and /L/ tones, and acquires a floating H tone prefix and mora.

VG	NOM SG	VG	OBL SG		Gloss
Context:			/H/__	L__	
	/H/		**L**	**M/HL**	
2A	rɔ́ˑt̪	2B	rɔ̀aːt̪	rɔ̄aːt̪	'armpit'
2A	d̪ó̤ːl	2B	d̪ò̤l	d̪ō̤l	'boy'
2A	mó̤k	2B	mò̤k	mô̤k	'buffalo'
2A	mʉ́ˑn	2B	mʉ̀ɔ̤ːn	mʉ̄ɔ̤ːn	'soil'
1A	lɔ̂ˑc	1B	lɔ̀aːc	lɔ̂aːc	'heart'
1A	dɛ̂ˑl	1B	dɛ̀ɛ̤ːl	dɛ̂ɛ̤ːl	'sheep'
1A/B	jâˑŋ	1A/B	jàːŋ	jâːŋ	'cow'
			L		
1A	kʉ̂t̪	1B	ᴴᵘkʊ̀ɔt̪		'god'

Table 4: /H/ stems with non-concatenative inflection

The polarity patterns in the oblique case can depend on the Nuer variant. This is the case with the noun /díˑt/ 'bird'. In a possessive construction following a L-toned noun, it can be realized as [LH#L] (62) or [L#HL] (63). According to Nuer speakers, both of these melodies yield the same meaning, and they are due to varieties within Ethiopian Jikany. It might be due to age, as the younger speaker realizes the [L#HL] pattern. F0 tracks are found in Figure 1 in the appendix – Section (9). A [L#L] pattern is not observed in oblique case constructions but is found in other Nuer dialects such as Lou Nuer and South Sudanese Jikany.

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[17]Note that the vowel grade 1B /ɛa/ is realized as /ɛɛ̤/ in Ethiopian Jikany.

(62)   LH#L: speaker A (Gambela)   (63)   L#HL: Speaker B (Gambela)
c̤ɔ̆a̤ː   dìɛːt   cɔ̀a̤ː   dîɛːt
bone bird\OBL.SG   bone bird\OBL.SG
'the bone of the bird'   'the bone of the bird'

Nouns with /H/ tones in the nominative also take the suffix allomorph in the singular forms of the oblique case. The tone of the suffix is polar to the stem tone and is L, as seen in (64)–(65).[18]. No tone changes are observed on the possessum nouns or prepositions.

(64)   NOM: /wṳ́ɔ̤ːk/, /wíː/   (65)   NOM: /tét/
wíː wṳ́ːk-è̤   wíː têt-è̤
on   shoulder-OBL.SG   on   hand-OBL.SG
'on the shoulder'   'on the hand'

Table 5 gives some examples of suffixed /H/-toned nouns. Many are found with FSC, contrasting with most nouns that get non-concatenative inflection which do not have FSC in the nominative case. As predicted, they often have vowel grade B in their nominative singular stem that changes to A in the inflected form. This is expected, as stems with VG B cannot mutate further and get a suffix.[19]

VG	NOM SG	VG	OBL SG	Gloss
	/H/		**/H/-L**	
2B	wṳ́ɔ̤ːk	2A	wṳ́ːk-è̤	'shoulder'
2B	kɔ̆́a̤ːk	2A	kɔ̆́·k-è̤	'hole'
2B	lṳ́ɔ̤·r	2A	lṳ́·r-è̤	'Acacia Seyal tree'
2B	ᴴᵘrḭ́et	2A	ᴴᵘrḭ́t-è̤	'word'
2B	ᴴᵘgá̤·c	2B	ᴴᵘgá̤·j-kè̤	'belt'
2B	tét	2A	têt-kè̤	'hand'
2B	ᴴᵘdê̤·c	2B	ᴴᵘdê̤·j-kè̤	'soldier'
1A	dɛ̤̂·p	1A	dɛ̤̂·p-kè̤	'butter'
1A/B	pâ̤·l	1A/B	pâ̤·l-kè̤	'ritual/prayer'
1A/B	t̪â̤ːk	1A/B	t̪â̤ːk-è̤	'clock'

Table 5: /H/ stems with a polar tone suffix.

This section showed tendencies between the tonal specification of singular nouns in the nominative case and their suffixation patterns in the oblique case. In addition to tone, other stem properties follow with these inflection forms: Stem-internal inflection appears with a group of toneless nouns without FSC in the nominative case. Their stems have

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[18]In South Sudanese Jikany, hand-OBL.SG has VG 2A: t̤ét-è̤ and the NOM SG has a LH tone (Bond et al., 2020)

[19]Same as the noun /tét/ 'hand', the noun ᴴᵘdê̤·c 'soldier' diverges from the vowel grade system because it does not change from VG B to A. It is possible that the oblique form has lost breathiness and has vowel grade 2A in other Nuer dialects.

a grade A vowel, which changes to grade B in the inflected forms. They contrast with the L-toned nouns, which tend to get a suffix: Many are morphologically complex, have a vowel grade B, and FSC. The morphological explanation is that a suffix is preferred over a non-concatenative case form since these nouns cannot modify further. In other words, tonal specification, vowel grades and FSC indicate whether a noun gets a suffix. For /H/-toned nouns, vowel grades, and FSC appear to be the only indicators for suffixation: Nouns that get a suffix are observed with FSC in the nominative case, while the ones with non-concatenative inflection are not.

In addition, the L tone appears to be a relatively strong indicator of whether a noun gets a suffix or not in the oblique case with singulars. For example, there are nouns with vowel grade 1A/B with the vowel /a/ such as /raːn/ 'person' and /^{Hμ}gwàk/ 'fox'. In these cases, the L-toned nouns tend to take a suffix.

Tonal polarity is active in the oblique case in Nuer. It applies to toneless syllables such as suffixes. Furthermore, tonal polarity reveals when non-concatenative stems are toneless as they behave like the suffixes by getting a tone that is polar to the one of the preceding word. Other non-concatenative stems have a L tone and pattern with suffixed L-toned stems by behaving as FSC nouns: they trigger a H tone and vowel lengthening on the preceding syllable, regardless of whether they have FSC in the nominative case. The dissimilatory tone pattern with stem-internal inflection might be unique to Ethiopian Jikany, as other Nuer dialects can have [L#L] sequences in oblique case constructions.

The next section proposes an OT analysis. It captures how tonal polarity in Nuer works, and how the tonal specification of the nouns drives the choice of the inflection allomorphs.

7 Analysis

This section proposes an analysis of the different suffix- and tonal polarity patterns observed in the previous sections. The choice of allomorphs – i.e. a suffix or non-concatenative marking – is intrinsically connected with the supra-segmental and segmental stem properties of the nouns: Suffixes want to attach to stems which are tonally specified, and toneless stems get non-concatenative forms and acquire a vowel grade B. I propose an OT analysis where I adopt an input allomorph set (cf. Kager, 1996; Lapointe, 2001; Bonet, 2004; Mascaro, 2007; Bonet and Harbour, 2012), as conventional OT cannot account for such cases. The morphology provides the affix material in the input set.

In this analysis, all nouns come with an allomorph selection of the suffix -kẹ (66), and a vowel grade B (67). Both of these exponents are accompanied by an underspecified floating tone – referred to as 'the oblique tone': T_{obl}. The underspecified tone manifests as polar to the stem tone because of the OCP. It targets toneless syllables, as often observed in tonal polarity since it does not violate faithfulness constraints from the input. Faithfulness and markedness constraints determine whether the output has a suffix or a non-concatenative form. The allomorphs appear in a suffix position, i.e. to the right of the possessor noun.

(66) OBL SG exponent
(suffix + floating tone)

T_{obl}

-kɛ̈

(67) OBL SG exponent
(vowel grade B + floating tone)

T_{obl}

B_{VG}

The vowel grade feature mutates a stem with grade A into the corresponding grade B, according to the system in Table 1 above. A vowel grade 1A/B does not change but might undergo vowel lengthening.[20] Some nouns have vowel grade B that changes to A when getting a suffix. This is due to a restriction hypothesized for Nuer against vowel grade B stems with suffixes. I assume that the suffix in (66) follows with a grade A feature responsible for changing the stem from grade B to A with a suffix.

An overview of the autosegmental operations is given below in Table 6. All nouns come with the two exponents shown under 'input'. The allomorph with a grade B is preferred with toneless stems such as /lʊɲ/ 'lion' since the underspecified tone can freely link to it (output). The tone manifests as /H/ and links to /lʊɲ/ as a dissimilation because the possessum noun /cɔ̀aː/ 'bone' is L. If the toneless stem were to get a suffix, it would yield two toneless syllables (the suffix and the nominal stem), and constraints work against this in Nuer. Specifying them for tone would either involve inserting a new tone or spreading an existing one – two options that are penalized in Nuer. The suffixal inflection of /gàt/ 'child' is straightforward because the oblique tone cannot link to the stem since it is already specified for tone. Instead, the suffix is preferred because it offers a toneless syllable to link to. It has a H tone output to avoid OCP violations with the L stem. The H tone prefix of /gàt/ goes on the possessum noun, but this is not a pure dissimilation process since all L-toned nouns in oblique case get a floating H tone prefix which associates left-ward to the preceding word. Therefore, true dissimilation only happens with toneless syllables in Nuer.

Stem tone	Input	Output
Toneless	L T_{obl}, T_{obl} | cɔ̈aː lʊɲ {-kɛ̈, $_{VG}$}	L H_{obl} | ⁄ cɔ̈aː lʊ́ɲ
L	L H L T_{obl}, T_{obl} | | cɔ̈aː gat{-kɛ̈, $_{VG}$}	L H L H_{obl} ǂ⁄ | ⁄ cɔ̈aː gat-kɛ̈

Table 6: Input and output of L-toned and toneless nouns.

The constraints relevant to Nuer are given below. H- and L-tone dissimilation arise from the obligatory contour principles saying any two adjacent tonemes must be distinct (Goldsmith, 1976). In the OT analysis, the constraint OCP is violated when identical tones

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[20]The autosegmental process of vowel length is not shown in this analysis, as the focus is on tone and suffixation, but it works similarly as mutation in the stem.

are linked to adjacent syllables as defined in (68). Note that a tone sequence with contour tones such as /L#HL/ does not violate this constraint because they are not identical.

(68)   OCP
         Assign a violation mark for every pair of identical tones that are adjacent and linked to distinct syllables.

Deleting a linked tone in Nuer is penalized by the faithfulness constraint MAXT—σ in (69) militating against deletion of association lines between syllables and tones in the input.

(69) $\text{MAX}\overset{\text{T}}{\underset{\sigma}{|}}$

         Assign a violation mark for every pair of syllable σ_1 and tone τ_1 in the input which correspond to a pair of syllable σ_2 and tone τ_2 in the output, where σ_1 and τ_1 are linked, but σ_2 and τ_2 are not linked.

At a higher ranking, the more specific version of this constraint is active: MAXT]$_\phi$–σ It refers to prosodic structure and wants to preserve the right-most tone in a p-phrase which is linked to a syllable (70). This makes it very difficult to delete a linked tone of the possessor noun.

(70) $\text{Max}\overset{\text{T}]_\phi}{\underset{\sigma}{|}}$

         Assign a violation mark for every pair of syllable σ_1 and tone τ_1 in the input which are p-phrase-final and correspond to a pair of syllable σ_2 and tone τ_2 in the output, where σ_1 and τ_1 are linked, but σ_2 and τ_2 are not linked.

Tone mobility applies mainly in contexts with FSC nouns or toneless syllables. Other tonal operations, such as spreading tones to syllables already specified, is highly penalized in Nuer by the constraint in (71). Similarly, new contour tones in Nuer are only found in very specific contexts (e.g. due to tone sandhi in sentence-final position on verbal stems), and the constraint in (72) militates against new contour tones.

(71) $\overset{\text{*T}}{\underset{\sigma\,\sigma}{/\,|}}$

         Assign a violation mark for every tone associated to more than one syllable.

(72) $\overset{\text{*TT}}{\underset{\sigma}{\backslash\,/}}$

         Assign a violation mark for every pair of tones T_1 and T_2 associated to a syllable, where T_1 and T_2 have different association line types (±epenthetic).

In Nuer, toneless syllables want to get specified as the constraint in (73) demands. On the same note, inflection generates floating tones which want to associate to a syllable.

This is especially important for H tones, as the constraint in (74) specifies. This constraint ensures that the floating H tone prefix links to a syllable.

(73) $\overset{\text{T}}{\underset{\sigma}{\nearrow\!\!\!\!\!|}}$ (modified from Trommer 2011)

   Assign a violation mark for every syllable that is not linked to a tone (τ).

(74) $\overset{\text{H}}{\underset{\sigma}{\downarrow\!\!\!|}}$ (modified from Trommer 2011)

   Assign a violation mark for every tone H tone that is not linked to a syllable.

There is also a constraint militating against tones floating at the right edge of a p-phrase in (75). This militates against candidates that let the oblique tone in the input float.

(75) $\underset{\sigma}{\overset{\tau]_\phi}{\downarrow}}$(modified from Trommer 2011)

   Assign a violation mark for every Prosodic Phrase-final tone (τ) which is not linked to a syllable.

Finally, two constraints are violated when a new tone appears (DEP-τ) and is linked to a syllable (DEP|). The constraints defined in (76)–(77) militate against the insertion of a tone and an association line that are not in the input.

(76)   DEP-τ
   Assign a violation mark for every output tone (τ) which does not have an input correspondent.

(77)   DEP|
   Assign a violation mark for every pair of syllable σ_1 and tone T_1 in the input which correspond to a syllable σ_2 and tone T_2 in the output, where σ_2 and T_2 are associated, but σ_1 and T_1 are not associated.

The following alignment constraint ensures that -kɛ̰ always appears to the right of the stem, i.e. as a suffix. I assume that this constraint is undominated, since segmental prefixation in Nuer is very restricted.

(78)   Align([kɛ̰]Af, R, Stem, R) (McCarthy and Prince, 1993)

The ranking is shown below in (79). The constraint OCP is low ranked but strictly ranked above DEP|, because tonal polarity mainly happens with toneless syllables. If OCP were higher ranked than MAXT—σ, then sentences with [L#L] sequences found in the nominative case in e.g. (36) would be unattested in Nuer.

Delinking tones and inserting new ones are avoided when possible, and DEP-τ must be ranked above OCP. For example, input sequences with /L#L/ tones are not repaired to [H#L] because of OCP if it involves inserting a new tone. However, since OCP is active,

the floating oblique tone manifests as polar to other tones when linking to a syllable. Furthermore, the high ranking of $\text{MaxT}]_{\phi}\text{–}\sigma$ ensures the integrity of the linked L tone of the possessor stem. Together with the constraint $H\rightarrow\sigma$, inputs with the floating H tone prefix: $/L\#^{H}L/$ have the output $[H\#L]$ instead of $[L\#H]$.

The high ranking of $^{*}\text{T}_{\sim}\,\sigma$ and $\overset{*}{\boxminus}\,\overset{\cdot}{\sigma}$ also reflects the restricted tonal mobility Nuer has compared with other tonal languages. Thus, the main tone sandhi processes result from lexical floating tones, such as FSC nouns, morphological tones, and dissimilation with toneless nouns.

Furthermore, toneless syllables are avoided, and floating tones want to link to a syllable because of the high ranking of the constraints $T\leftarrow\sigma$, which ensures outputs with tonal specification of all syllables, and $\tau]_{\phi}\rightarrow\sigma$, which prefers outputs where the oblique tone links to a syllable. The high ranking of these two constraints ensures that possessor stems with a linked tone prefer the suffix allomorph because the vowel grade allomorph would generate an extra floating tone without a free syllable to link to.

The strict ranking of constraint DEP| below DEP-τ ensures that the allomorph with the vowel grade feature is favored when the input has a toneless noun. The suffix allomorph suffix would involve inserting a new tone to avoid a toneless syllable, while the former only requires inserting an association line.

(79)   Constraint ranking in Nuer

$$\text{Max}|\overset{\text{T}]_{\phi}}{\sigma} \quad \overset{\text{T}}{\underset{\sigma}{\uparrow}} \quad \overset{^{*}\text{TT}}{\underset{\sigma}{\backslash/}} \quad \overset{^{*}\text{T}}{\underset{\sigma\sigma}{/|}} \quad \overset{\text{T}]_{\phi}}{\underset{\sigma}{\downarrow}} \quad \overset{\text{H}}{\underset{\sigma}{\downarrow}} \quad \text{DEP-}\tau \gg \quad \text{MAX}|\overset{\text{T}}{\sigma} \quad \text{OCP} \gg \quad \text{DEP}|$$

Tableau 1 shows the inflection form for the oblique case of singular with the L-toned possessor noun /gwàk/ 'fox' in (40) above, and the two allomorphic variants of the oblique case in singular: the suffix -kɛ̤ and the vowel grade B feature, each with the underspecified oblique tone. The input yields output candidates with two floating tones: the H tone prefix and the oblique tone, which can be H or L. The constraints $\tau]_{\phi}\rightarrow\sigma$ and $H\rightarrow\sigma$ are fatally violated if one or both of these remain floating (candidates b–f). Floating tones cannot link to syllables specified for tone without violating $^{*}\text{T}_{\sim}\,\sigma$, as in candidate (d), since they create a contour tone which was not in the input. If the tone of the possessum noun is deleted, this violates $\text{MAXT}]_{\phi}\text{–}\sigma$ as candidates (a-b). Furthermore, candidate (e) with the vowel grade allomorph is ruled out because the possessor noun already has a linked tone, and the oblique tone remains floating, fatally violating $\tau]_{\phi}\rightarrow\sigma$. Additional candidates with this allomorph would also be ruled out. For example, if the oblique tone were to link to the possessor noun, it would violate $^{*}\text{T}_{\sim}\,\sigma$ if the tone were not deleted.

If it were deleted, it would violate $\text{MAXT}]_{\phi}\text{–}\sigma$ The suffix cannot remains toneless, as in candidate (c), because it fatally violates $T\leftarrow\sigma$. Thus, the floating oblique tone must link to the suffix as in candidates (f–h). Candidate (h) wins over (g) as the oblique tone has

a H output avoiding OCP violations between the stem and suffix. The floating H tone prefix links to the possessum noun, only violating the low-ranked constraints MAXT—σ and DEP|. Therefore, it is fundamental that these two constraints are ranked below the others to avoid candidates like (c) or (d) winning with floating tones in the output. The output is: cɔ̄ạ: gwàk-ę́ – bone fox-OBL.SG.

$\begin{array}{ccc} \text{L} & \text{H} & \text{L} \quad \text{T}_{obl}, \text{T}_{obl} \\ \mid & & \mid \\ \text{cɔạ:} & \text{gwak}\{\text{-kę},\text{B}_{VG}\} \end{array}$	Max T]$_\phi$ σ	T↑ σ	*TT σ	*T $\sigma\sigma$	T]$_\phi$ ↓σ	H ↓σ	DEP-τ	MAX T σ	OCP	DEP|
a. $\quad$ L H L L$_{obl}$ $\qquad$ cɔạ: gwak -ę	★!							★		★★
b. $\quad$ L H LH$_{obl}$ L $\qquad$ cɔạ: gwak -ę	★!					★	★	★		★★
c. $\quad$ L H L H$_{obl}$ $\qquad$ cɔạ: gwak -ę		★!			★	★★				★
d. $\quad$ L H LH$_{obl}$ L $\qquad$ cɔạ: gwak -ę			★!			★	★			★★
e. $\quad$ L H L L$_{obl}$ $\qquad$ cɔạ: gwak B$_{VG}$					★!			★		★
f. $\quad$ L H L H$_{obl}$ $\qquad$ cɔạ: gwak -ę						★!			★	★
g. $\quad$ L H L L$_{obl}$ $\qquad$ cɔạ: gwak -ę								★	★!	★★
h. ☞ $\quad$ L H L H$_{obl}$ $\qquad$ cɔạ: gwak -ę								★		★★

Tableau 1: Evaluation of L-toned stem in the oblique case SG with a L-toned possessum noun

Tableau 2 gives the inflection of the toneless stem /ɟɔk/ 'back' with vowel grade 1A – see (80) below. Candidate (c) corresponds to the input, which has taken the vowel grade B allomorph with the floating oblique tone. Since the stem is toneless, it fatally violates T←σ. The tone of the possessum noun is the rightmost linked tone of the p-phrase,

since the possessor noun is toneless in the input. Therefore, this tone cannot delink, as in candidate (a), which fatally violates $\text{M{\scriptsize AX}T]}_\phi\text{–}\sigma$. Candidates (b), (d), and (e) have the allomorph with a suffix. Since the possessor noun is toneless, the outputs involve two toneless syllables (the suffix and the stem), but there is only one floating tone. $\text{T}{\leftarrow}\sigma$ is fatally violated if one or more syllables are toneless (candidate b). Spreading the oblique tone, as in candidate (d), violates $\text{*}{\sqsubseteq}{\cdot}\frac{\sigma}{\sigma}$ and is ruled out. Inserting a tone as in candidate (e) violates $\text{D{\scriptsize EP}-}\tau$ and is also out. Candidate (g) is the winner where the oblique tone is H and has linked to the toneless stem with vowel grade B, and the stem gets a diphthong. In this way, the toneless stem gets specified without any O{\scriptsize CP} violations as opposed to candidate (f), which creates a L#L sequence with a L oblique tone.

L T_obl, T_obl | cɔaː ɟɔk{-kɛ, B_VG}	$\text{Max T]}_\phi/\sigma$	$\text{T}{\uparrow}\sigma$	$\text{*TT}/\sigma$	$\text{*T}/\sigma\sigma$	$\text{T]}_\phi{\downarrow}\sigma$	$\text{H}{\downarrow}\sigma$	$\text{D{\scriptsize EP}-}\tau$	$\text{MAX T|}\sigma$	OCP	DEP|
a. L H_obl L / cɔaː ɟɔak_B	⋆!					⋆		⋆		⋆⋆
b. L H_obl / cɔaː ɟɔk -kɛ		⋆!								⋆
c. L H_obl / cɔaː ɟɔak_B		⋆!			⋆	⋆				
d. L H_obl / cɔaː ɟɔk -kɛ				⋆!						⋆⋆
e. L H L_obl / cɔaː ɟɔk -kɛ							⋆!			⋆⋆
f. L L_obl / cɔaː ɟɔak_B									⋆!	⋆
g. ☞ L H_obl / cɔaː ɟɔak_B										⋆

Tableau 2: Evaluation of toneless stem in the oblique case SG with a L-toned possessum noun

To generate the output in (80), it is crucial that D{\scriptsize EP}| is ranked lower than $\tau\text{]}_{\phi\to\sigma}$. If not, candidate (c) would win, where the oblique tone remains floating in the output.

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Candidate (g) shows that the non-concatenative stem behaves like the suffix in Tableau 1 above: It is toneless and gets specified by the oblique tone.

(80)　　cɔ̀ạː ɟ̂ak
　　　　bone back\OBL.SG
　　　　'the bone of the back!'

Nouns that have a /H/-toned stem and get non-concatenative inflected forms are hypothesized to be toneless in the oblique case following the derivation in Tableau 2. Nouns that get a suffix are hypothesized to have a linked tone, as in Tableau 1 above. The latter process is shown for /wúɔ̣ːk/ 'shoulder' when it follows the H-toned preposition /wíː/ from example (64) above. The input stem has a vowel grade B / wúɔ̣ːk/. It changes to vowel grade A when combined with a suffix (wúːk-), which is compatible with the suffix allomorph. In Tableau 3 below, the H#H sequence violates OCP, but since both H tones are linked in the input, and this constraint is low-ranked, the possible repairs are ruled out for Nuer. For example, inserting a L tone and delinking a H tone violates the constraint DEP-τ and MAXT—σ in candidates (a), (d), and (e). In addition, the constraint H→σ is violated since a H tone remains floating. MAXT]$_\phi$–σ is also violated by candidate (a) since it delinks the rightmost tone of the p-phrase.

　　Candidate (d) fatally violates τ]$_\phi$→σ since it has taken the non-concatenative allomorph, and the oblique tone is floating. This violation could be avoided by a candidate linking it to the stem, but that would violate *T–σ or MAXT]$_\phi$–σ, similarly to candidate (b). The candidates with the suffix allomorph needs to link it to a tone to avoid violations of T←σ as in candidates (b) and (c). It has to be the oblique tone that links to the suffix, since it involves the fewest changes from the input and only violates DEP| – ranked lower than the other constraints. The gradient violations of the constraint OCP determine that candidate (h), with a L suffix and only one violation, wins over (g), with a H suffix and two OCP violations.

Tableau with input header: H H T_obl,T_obl over wiː wuɔ̰ːk {-kɛ̰, B_VG}

	Max T]φ/σ	T↑σ	*TT \σ	*T /σσ	T]φ↓σ	H↓σ	DEP-τ	MAX T|σ	OCP	DEP/
a. (wi, w uːk -ɛ̰ ; H H **L** H_obl)	★!					★	★	★		★★
b. (wiː, w uːk -ɛ̰ ; H H L_obl)		★!	★							★
c. (wiː, w uːk -ɛ̰ ; H H L_obl)		★!			★				★	
d. (wiː, wuɔ̰ːk B_VG ; H **L** H H_obl)					★!	★	★	★		★
e. (wiː, w uːk -ɛ̰ ; H **L** H L_obl)						★!	★	★		★★
f. (wiː, w uːk -ɛ̰ ; H H L_obl **H**)							★!		★★	★
g. (wiː, w uːk -ɛ̰ ; H H H_obl)									★★!	★
h. ☞ (wiː, w uːk -ɛ̰ ; H H L_obl)									★	★

Tableau 3: Evaluation of H-toned stem in the oblique case SG with a H-toned preposition

Tableau 4 below derives the toneless noun from Tableau 2 /ɟɔk/ 'back' following a H-toned possessum noun /míɛ̰m / 'hair' – see (48a) above. Candidates (b), (d), (e), and (f) have chosen the suffix allomorph, but there are not enough tones for all the syllables, as the stem is toneless, and there is only one floating tone in the input. It cannot remain toneless as for candidates (b–c), since this violates T←σ. Spreading the oblique tone violates ⊥*⊏≺σ/σ and candidate (d) is ruled out. Candidates (e) and (f) link the oblique tone as H to the suffix and insert a new tone onto the stem. This fatally violates DEP-τ. Candidate (f) is worse, as it also violates OCP by inserting a H tone.

The candidates with the non-concatenative allomorph avoid these problems and only need to link the oblique tone to the toneless stem as candidates (a), (g), and (h) do. They have different strategies for resolving OCP violations: Candidate (a) delinks the tone of the possessum noun and inserts a L, violating MaxT]$_\phi$–σ, H→σ and DEP-τ. Similarly to the other tableaux below, OCP determines that candidate (h) wins over (g), since the oblique tone has a L output in the former and avoids adjacent H tones.

H T_obl, T_obl | m̰ièm ɟɔk{-kḛ, B_VG}	Max T]$_\phi$ σ	T↑σ	*TT σ	*T /| σσ	T]$_\phi$↓σ	H↓σ	DEP-τ	MAX T] σ	OCP	DEP/
a. H **L** H_obl m̰ièm ɟɔak_B	⋆!					⋆	⋆	⋆		⋆⋆
b. H L_obl m̰ièm ɟɔk -kḛ		⋆!								⋆
c. H H_obl m̰ièm ɟɔak_B		⋆!			⋆	⋆				
d. H L_obl m̰ièm ɟɔk -kḛ				⋆!						⋆⋆
e. H **L** H_obl m̰ièm ɟɔk -kḛ							⋆!			⋆⋆
f. H **H** H_obl m̰ièm ɟɔk -kḛ							⋆!		⋆⋆	⋆⋆
g. H H_obl m̰ièm ɟɔak_B								⋆!		⋆
h. ☞ H L_obl m̰ièm ɟɔak_B										⋆

Tableau 4: Evaluation of toneless stem in the oblique case SG with a H-toned possessum noun

So far, the analysis has accounted for why toneless nouns prefer a stem-internal inflection form and get a tone polar to the preceding noun, while tonally specified ones prefer a suffix with a polar tone. The other pattern observed in Nuer is the non-concatenative inflection forms, which is lexically specified for L tone – See (53). Examples of these nouns are repeated below: /^{Hµ}tɔ̰̀t/ in (81) is a L-toned FSC noun, while /ɲaˑl/ in (82) is toneless in the nominative form. In the oblique case, they both get a vowel grade B with a L tone and a H tone prefix.

(81) /làˑŋ ^{Hµ}tɔ̰̀t/
      lāˑŋ   tɔ̰àt
      mosquito.net plant.season\OBL.SG
      'mosquito net of the plant season'

(82) NOM: /^{Hµ}gwàk, ɲaˑl/
      nɛ̄ˑn   gwāk ɲàːl
      see.IMP.SG fox   girl\OBL.SG
      'Look at the fox of the girl.'

The tonal process for these forms is illustrated below with the toneless noun /ɲaˑl/ 'girl', which gets lexically specified for L tone, vowel grade B with vowel lengthening. As all singular L-toned nouns in the oblique case, it also gets a floating H tone prefix: /^{Hµ}ɲàːl/. The input is shown in (83) where it follows a L-toned possessum noun. The H tone prefix links to the possessum noun, and its L tone is delinked – just as the winner in Tableau 1 above. Since the possessor noun has vowel grade 1A/B, the stem vowel does not change but is lengthened to an overlong one. The output is a L-toned possessor noun with a mid-toned possessum noun (84). The same process applies for tɔ̰̀t in (81).

This [H#L] polarity pattern is preferred over [L#H] since the nouns have a linked L tone in the input that make them the right-most syllable in the p-phrase. The derivation is similar to the one in Tableau 1 above.

(83) Input:
$$\begin{array}{cc} \text{L} & \text{H} \ \text{L}_{\text{obl}} \\ | & | \\ \text{gw a k} & \text{ɲaˑl µ B}_{\text{VG}} \end{array}$$

(84) Output:
$$\begin{array}{cc} \text{L} & \text{H L}_{\text{obl}} \\ \neq \diagup & | \\ \text{gw a k} & \text{ɲaːl}_{\text{B}} \end{array}$$

8   Discussion and summary

The topic of this paper was inflection allomorphy and tonal polarity in Nuer. The irregularity of suffixation in this language has been a highly discussed topic in the typological research on inflection. I aimed to show that the choice of inflection exponents is mainly phonologically motivated for certain groups of nouns. I argued for a pattern observed with L-toned nouns vs. toneless nouns, where the former gets suffixes, and the latter gets stem-internal inflection. The contrast of their stems is revealed by tonal polarity, as non-concatenative forms can be toneless and get a polar tone on their stems. In contrast, L-toned stems trigger a polar tone on their suffix and a H tone on neighboring L-toned syllables to the left.

The tonal specification is intrinsically connected with vowel grades: Non-concatenative inflection is observed with a group of toneless nouns with a basic stem with vowel grade

A, while suffix inflection is often observed with complex stems with vowel grade B that are specified for tone. The L tone specification is prevailing in the latter, and I argued that tone could be even more reliable than vowel grades. For example, when the stem vowel is /a/, it is ambiguous between a basic and a complex vowel grade (1A/B). In this case, L-toned stems are more likely to undergo suffixation and toneless stems to get stem-internal inflection. Furthermore, many L-toned stems have FSC – involving a floating H tone prefix – and it appears that most stems with an underlying tone also have this floating tone, as the toneless stems are not observed with the FSC. From a morphological perspective, this makes sense, as the FSC adds structure to the stems, and toneless stems are morphologically basic.

A diachronic approach might offer an explanation to why L tones appear on morphological complex stems, and toneless specification goes with basic stems. However, this paper focuses on a synchronic account of stem properties and suffixation patterns and hypothesizes that the determining factor is whether stems have a linked tone or are toneless. Stems with L tones stand out since identifying underlying L tones is more accessible in Nuer compared to other tones. This is because L tones are not subject to tone sandhi in certain syntactic positions but tend to induce sandhi processes on surrounding syllables. They contrast with other tones, which undergo dissimilation and tonal polarity. This is an indication that L tones are marked in Nuer.

In an OT analysis, I showed that allomorphy between suffixation and non-concatenative forms could be analyzed with general faithfulness and markedness constraints determining whether the output gets stem-internal marking or suffixation. The main idea of the analysis is that non-concatenative inflection arises through bidirectional defectiveness, i.e. when both the stem and the suffix are defective. In Nuer, defective stems are toneless, and the suffix allomorphs are also defective in that they lack a tone or a segment. Whenever a stem has a linked tone, it prefers the suffix allomorph. This is because non-concatenative marking on complex stems would involve changing stem properties in the input, and such operations violate faithfulness constraints in Nuer.

The OT analysis used an input allomorph set, as standard OT is not sufficient to account for such allomorphy as in Nuer. An alternative approach could be to let constraints refer directly to morphological structure, e.g. in an approach like Realization OT. The disadvantage of this is that the modules of phonology and morphology are not kept separate, and constraints are language-specific, while in this approach, OT constraints remain universal, and only the input with the morphological material is language specific.

On the issue of tonal polarity, I showed that it is an epiphenomenon of an OCP constraint. It is fairly low ranked in Nuer as tonal polarity is restricted to toneless syllables in the oblique case constructions. That is, tonal polarity is triggered by an underspecified floating tone marking this case form (T_{obl}). The tone links to a syllable as a floating /L/ or /H/ tone dissimilating with the surrounding tones. The allotones of the /H/ tone are many in Nuer and depend on phonation, underlying tones, and vowel length: Breathy short vowels are realized as [H], long, breathy syllables and L-toned syllables are realized as [LH] or [M]; and toneless syllables with modal voice are realized with [M] or

[HL]. The abundance of surface tone realizations sheds light on how tonal polarity works in more complex tone languages such as Nuer.

This study showed that L-toned nouns get FSC in the singular forms of the oblique case, regardless of whether they have FSC in the nominative case. This was accounted for by adding the floating H tone prefix in all L-toned inflected stems. The H tone links leftward to a L-toned or toneless syllable of prepositions and possessum nouns preceding the possessor nouns. This is considered a morphological phenomenon rather than a phonological one and can be considered part of a hybrid case marking system: Suffixation and non-concatenative forms are dependent case marking in Nuer where the possessor noun is marked for case. Configurations such L#^{H}L-H/ or /L#^{H}L/, where the floating H tone prefix links to the possessum noun or preposition before a possessor noun: [M#L-H] or [M#L], can be interpreted as head marking in the oblique case. Following this hypothesis, Nuer has a mix of dependent case marking and head marking that manifests on L-toned possessum nouns. Similar patterns are observed in other languages related to Nuer: In Shilluk, a H tone pattern is found in the plural of the head-marking form referred to as pertensive, which is possessive or genitive marking on the possessed item (Remijsen and Ayoker, 2019). Dinka is also a language with both head-marking and dependent-marking, as nouns are segmentally and tonally marked when modified in the DP (head marking), while it also has dependent case marking (Andersen, 2002). Furthermore, this /H/ tone on the possessor noun might be particular to the Ethiopian Jikany dialect, as other Nuer dialects rapport on [L#L] patterns in the same possessive constructions where this dialect has [M#L] or [LH#L]. A dialectal comparison is needed to establish the differences, however, it is possible that this tonal head marking is unique to Ethiopian Jikany and absent in other Nuer dialects.

Although inflection in Nuer remains extremely irregular compared to other languages, this paper aimed to show that there are subpatterns that relate to tonal specifications. Further research will show whether these patterns apply on a larger scale and to what degree it is prone to exceptions.
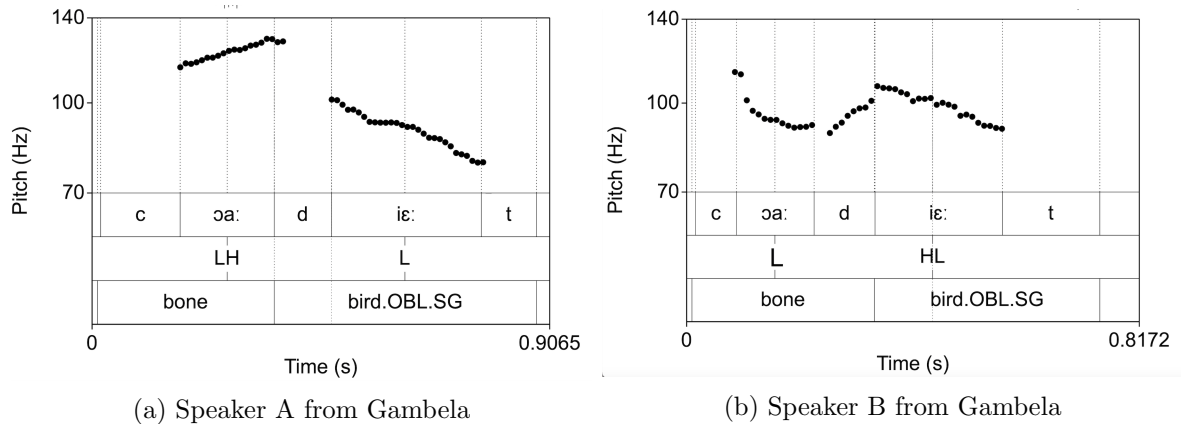
9 Appendix

(a) Speaker A from Gambela

(b) Speaker B from Gambela

Figure 1: Two tonal realizations of 'the bone of the bird'

(85)   LH#L: Speaker A (Gambela)
c̋ǎ: dìɛːt
bone bird\OBL.SG
'the bone of the bird'

(86)   L#HL: Speaker B (Gambela)
c̏ǒ̀: dîɛːt
bone bird\OBL.SG
'the bone of the bird'

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