

Register features and subtonal structure: Double downstep in Northern Toussian

Anthony Struthers-Young

May 16, 2026

Introduction

Much of the recent work presenting evidence for subtonal representations comes from tonal, not registral phenomena

- M \rightarrow L in Laal (Lionnet 2022a)
- X and H raising in Seenku (McPherson 2016)
- Polarity in Tenyidie (Meyase 2021)

Much of the recent work presenting evidence for subtonal representations comes from tonal, not registral phenomena

- M \rightarrow L in Laal (Lionnet 2022a)
- X and H raising in Seenku (McPherson 2016)
- Polarity in Tenyidie (Meyase 2021)

These languages support natural classes of tones based on shared tonal effects

Seenku plural raising—suffixation of [+raised]

- X and H are a natural class of [-raised]
- X → L
- H → S

	X	L	H	S
[upper]	-	-	+	+
[raised]	-	+	-	+

Some languages present evidence for natural classes of tonal categories based on shared registral effects

Some languages present evidence for natural classes of tonal categories based on shared registral effects

- Class of downstep triggers
 - Yala-Ikom (Armstrong 1968)
 - /H L H/ → [H L ʰH]
 - /H M H/ → [H M ʰH]

Some languages present evidence for natural classes of tonal categories based on shared registral effects

- Class of downstep triggers
 - Yala-Ikom (Armstrong 1968)
 - /H L H/ → [H L ^ˈH]
 - /H M H/ → [H M ^ˈH]
- Class of downstep targets
 - Seenku (McPherson yesterday)
 - /L S/ → [L ^ˈS]
 - /L H/ → [L H]
 - /L L/ → [L ^ˈL]
 - /L X/ → [L X]

Introduction

Register Tier Theory (Snider 1990, 2020) models these natural classes

- Natural class of downstep-triggering tones share l register feature
- Tonal categories are comprised of both tone and register features, linked to a Tonal Root Node (TRN)

(1) a. High tone



b. Low tone



c. Mid₁



d. Mid₂



Northern Toussian is Niger Congo language of Burkina Faso

Northern Toussian is Niger Congo language of Burkina Faso

- Complex tone system with three tone levels

Northern Toussian is Niger Congo language of Burkina Faso

- Complex tone system with three tone levels
- Multiple sources of downstep
 - Automatic downstep
 - Several constructions that condition non-automatic downstep

Northern Toussian is Niger Congo language of Burkina Faso

- Complex tone system with three tone levels
- Multiple sources of downstep
 - Automatic downstep
 - Several constructions that condition non-automatic downstep
- Natural classes of tones that condition registral effects
 - L and M trigger automatic downstep
 - M and H are targeted by automatic downstep

Northern Toussian is Niger Congo language of Burkina Faso

- Complex tone system with three tone levels
- Multiple sources of downstep
 - Automatic downstep
 - Several constructions that condition non-automatic downstep
- Natural classes of tones that condition registral effects
 - L and M trigger automatic downstep
 - M and H are targeted by automatic downstep

It's an ideal language for a model with subtonal representations with register features

It poses two challenges to RTT

- It has double downstep (Struthers-Young 2025a,b)
 - Lowering of the register twice at one point in the utterance
 - Contrast between H, ¹H, and ¹¹H
 - How can cumulative register lowering be modeled with RTT?

Introduction

It poses two challenges to RTT

- \uparrow H and M have different behaviors
 - In RTT, the two categories are neutralized ($\{H, l\}$)
 - How do we permit differential behavior if the two categories have the same representation?

(2) a. Mid tone



b. Downstepped H



Today, I model double downstep in Northern Toussian with a modified version of RTT

Crucial differences from standard RTT:

- Multiple register features can stack onto a single TRN
 - does not automatically delink the existing register feature

Crucial differences from standard RTT:

- Multiple register features can stack onto a single TRN
 - does not automatically delink the existing register feature
- Allows double downstep

Crucial differences from standard RTT:

- Downstep is a derived effect
 - only occurs when a l associates with a TRN; not when lexically specified

Crucial differences from standard RTT:

- Downstep is a derived effect
 - only occurs when a l associates with a TRN; not when lexically specified
- This means that lexical specification of tonal categories is separate from contextual registral effects
 - Addresses issues with the two-fold role of register features having paradigmatic and syntagmatic functions in RTT
 - Paradigmatic: defining tonal categories
 - Syntagmatic: effectuating registral shifts

Background on Northern Toussian

Double downstep in Northern Toussian

Analysis

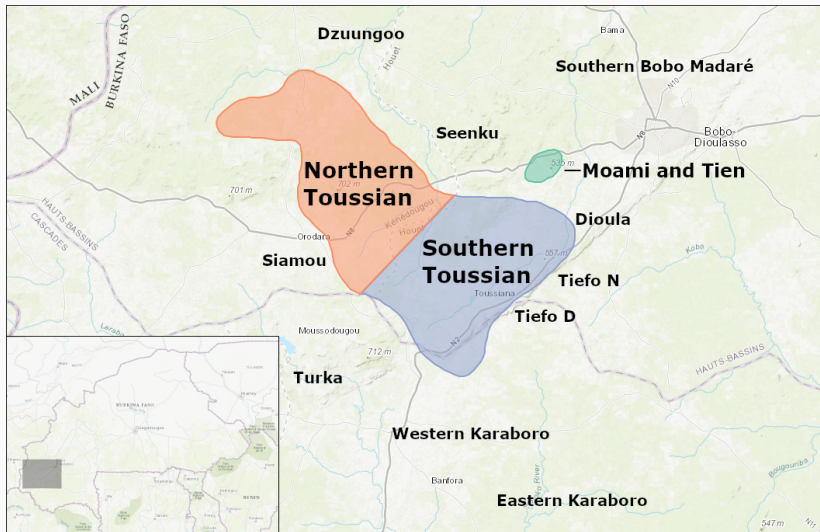
Implications on tonal representation

Background on Northern Toussian

Niger Congo language of Burkina Faso

- Precise classification uncertain
- Associated with Gur and Senoufo languages because of structural similarities
 - (Vestigial) suffixal noun class system
 - SAuxOVX word order

Toussian languages



Tonal inventory

(3)	H	<i>jí</i>	‘year’
	M	<i>jī</i>	‘laughter’
	L	<i>jì</i>	‘hair’
<hr/>			
	HM	<i>dē̃˦˥</i>	‘dream (N)’
	HL	<i>dē̃˥</i>	‘stone’
	LH	<i>bǒ</i>	‘father’
<hr/>			
	HLH	<i>bē̃˥˦</i>	‘again’
	LHL	<i>sǎ̃˥</i>	‘compartment’
	LHM	<i>lě̃˥˦</i>	‘maternal uncles’

Automatic downstep in Northern Toussian

- (4) a. /L M/ → [L ʰM]
pē à ʰnōŋ fī
husband COND person insult
‘If the husband insults the person’
- b. /L H/ → [L ʰH]
sú à ʰbú já
father COND leopard watch
‘If father watches the leopard’
- c. /M H/ → [M ʰH]
sú pē ʰjá
father husband watch
‘father watched the husband’

Double downstep in Northern Toussian

Double downstep in Northern Toussian arises from two instances of non-automatic downstep

- Prosodically-conditioned downstep
- Grammatical tone

Double downstep in Northern Toussian

When both effects target the same syllable, the registral lowering is cumulative, resulting in double downstep

Prosodic boundary downstep

Prosodic boundary downstep

/M M/ → [M †M] in some some (5a), but not all (5b) contexts

- Downstep never found in parallel /H H/ or /L L/ contexts

- (5) a. nōŋ †pē já
person husband watch
‘The person insulted the husband’
- b. sú pē-nō bwō fī
father husband-PL 10 insult
‘The father insulted ten husbands’

Constructions with downstep

(6)

N + PostP	nōŋ ʼsē	‘with the person’
PossN + N	nōŋ ʼbjē	‘person’s calabash’
S + V	kēj ʼfī	‘The wife insulted’
S + OV	kēj ʼnōŋ fī	‘The wife insulted the person’
VP + X	kà bē [ʼkūr rǒ] _x	‘Carry it in the village!’

Constructions without downstep

(7)	N	ɲīnē	' <i>Pterocarpus erinaceus</i> '
	N + Suffix	sínɲān-nō	'frying pans'
	N + Adj	nōŋ pər	'small person'
	N + Det	nōŋ mē	'that person'
	O + V	nōŋ fī	'insult the person!'
	Part + V	sú pō ʒē	'when father sweeps...'

The downstep appears to be correlated with the syntactic structure

- Elements following DPs and VPs generally downstepped

Downstep occurs following the right edge of DPs (8a) and VPs (8b)

- (8) a. N + PostP $[[\text{NP}]_{\text{DP}} \uparrow \text{P}]_{\text{P}}$
 PossN + N $[\text{NP}]_{\text{DP}} \uparrow [\text{NP}]_{\text{DP}}$
 S + V $[\text{NP}]_{\text{DP}} \uparrow [\text{V}]_{\text{VP}}$
- b. VP + X $\text{VP} \uparrow \text{AdvP}$

Elements that are not downstepped do not follow the DP (9a) or VP (9b)

- (9) a. N [NP]_{DP}
 N + Suffix [NP]_{DP}
 N + Adj [NP AdjP]_{DP}
 N + Det [NP D]_{DP}
- b. Part + V Part [V]_{VP}

Exception: DP object internal to the VP

(10) $[[\text{NP}]_{\text{DP}} \text{V}]_{\text{VP}}$

This effect cannot be accounted for in purely syntactic terms

- Only M trigger it
- Not all DPs behave identically

This reflects a syntax-prosody interaction

- Downstep is triggered when a M is at the right edge of the phonological phrase

$$(11) \quad M)_{\phi} T \rightarrow [M \downarrow T]$$

DPs and VPs constitute phonological phrases

- Exception with VP-internal DPs
- Commonly prosodified within same phonological phrase as verbs cross-linguistically
 - Niuean (Clemens 2019)
 - Kimatuumbi (Odden 1987)
 - Chitumbuka (Downing 2006)
 - Chichewa (Downing & Mtenje 2011)

Absent preverbal internal argument marking

Absent preverbal argument marking (APVA)

There is grammatical tone marking the absence of an object or oblique argument immediately before the verb

- Floating L before the verb

- (12) a. *ádámá búr já*
ádámá búr já
Adama bread watch
'Adama watched the bread'
- b. *ádámá já*
ádámá ^Ljá
Adama watch.APVA
'Adama watched'

Absent preverbal argument marking (APVA)

With certain functional particles, the APVA marker causes downstep

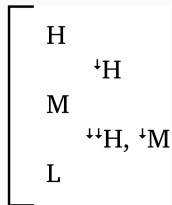
- (13) a. *sú* *ká* ¹*bwé*
 sú *ká* ①*bwé*
 father NEG cough.APVA
 ‘Father didn’t cough’
- b. *sú* *n =* ¹*bwé*
 sú *n =* ①*bwé*
 father IPFV.APVA = cough.APVA
 ‘Father is going to cough’

- We've seen two constructions that trigger non-automatic downstep
 - The prosodic boundary downstep
 - APVA marking

- We've seen two constructions that trigger non-automatic downstep
 - The prosodic boundary downstep
 - APVA marking
- When both effects target an H verb, the verb is doubly downstepped

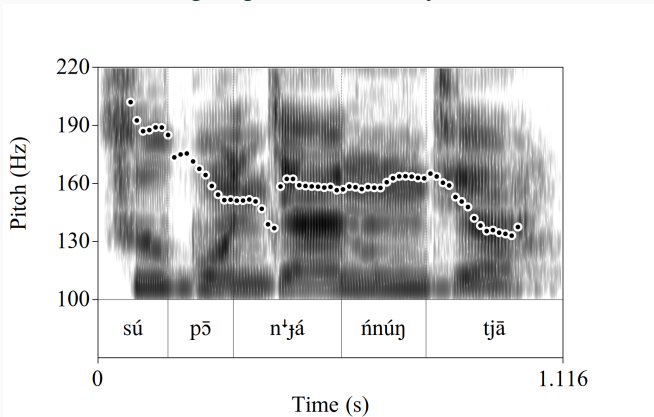
Double downstep

- A singly downstepped H has a higher pitch than a M
- A doubly downstepped H is lower than a preceding M



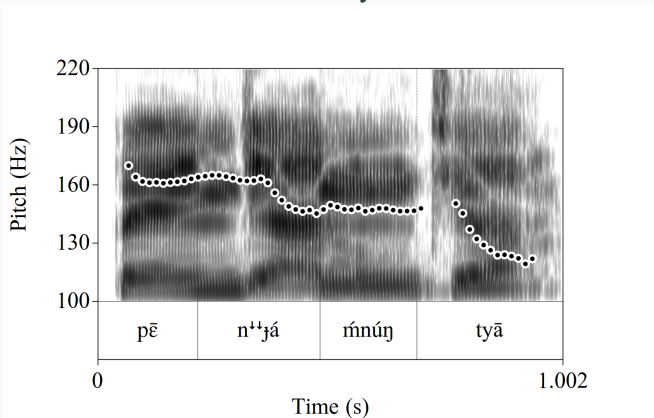
Double downstep

- (14) *sú* *p̄* *nʰjá* *m̄ = núŋ* *tjā*
(*sú*) (*p̄* n = [Ⓛ]*já*) ((*m̄* = *núŋ*) *tjā*)
father IS IPFV.APVA = watch.APVA 1SG = mother place
'When father is going to watch at my mother's house'



Double downstep

- (15) $p\bar{e}$ $n^{++}j\acute{a}$ $m' = n\acute{u}\eta$ $tj\bar{a}$
($p\bar{e}$) ($n = \textcircled{L}j\acute{a}$) (($m' = n\acute{u}\eta$) ($tj\bar{a}$)
husband IPFV.APVA = watch.APVA 1SG = mother place
'The husband watched at my mother's house'



Analysis

Introduction

Preliminaries:

- Same formal structures as RTT
 - Tone features
 - Register features
 - Tonal Root Node
 - These features define lexical tonal categories

(16) a. High tone



b. Low tone



c. Mid₁



d. Mid₂



Preliminaries:

- In Northern Toussian, both M and L condition automatic downstep
 - Each are lexically specified for a l register feature

(17) Northern Toussian tonal categories

a. High tone



b. Mid tone



c. Low tone



Desiderata:

- Mechanism for double downstep
- A way to distinguish at least five phonetic tone heights

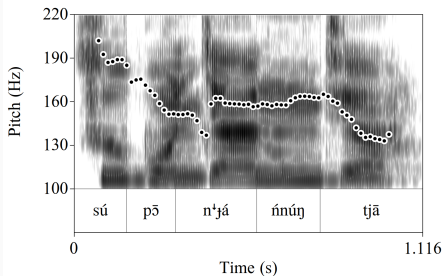
H	
	↑H
M	
	↑↑H, ↑M
L	

Double downstep

Desiderata:

- No neutralization of ⁺H and M
 - ⁺H does not trigger prosodic boundary downstep, as does M

(18) *sú* *pō* *n'já* *m' = núŋ* *tjá*
(*sú*) (*pō* n = [Ⓛ]*já*) ((*m' = núŋ*) *tjá*)
father IS IPFV.APVA = watch.APVA 1SG = mother place
'When father is going to watch at my mother's house'



Solution: Stacking of register features

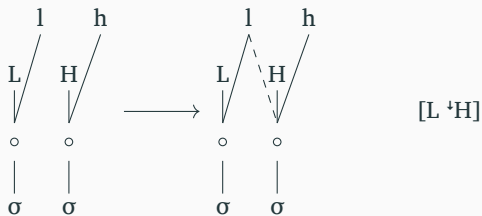
- Each additional l register feature associated with a tonal category causes downstep
 - Derived effect

Solution: Stacking of register features

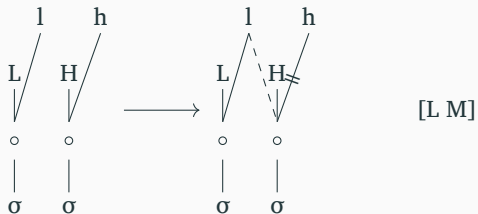
- Each additional l register feature associated with a tonal category causes downstep
 - Derived effect
- Does not necessarily delink existing register feature
 - When delinking does occur, it results in changes in phonological category (e.g., H → M)

Analysis

(19) a. Automatic downstep



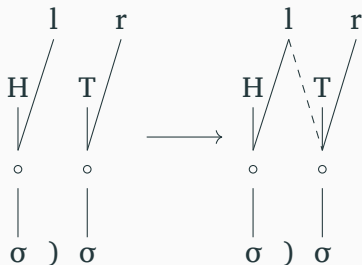
b. H → M lowering



Prosodic boundary downstep

- Spreading of l register feature of a Mid tone when positioned at the right edge of a phonological phrase

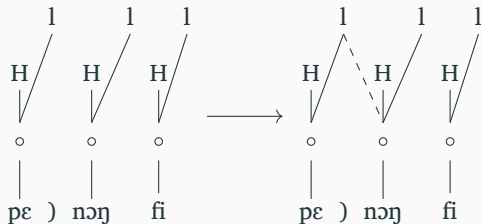
(20)



Prosodic boundary downstep

- (21) a. (pē) (nōŋ fi) → pē ˈnōŋ fi
husband person insult
'The husband insulted the person'

b.



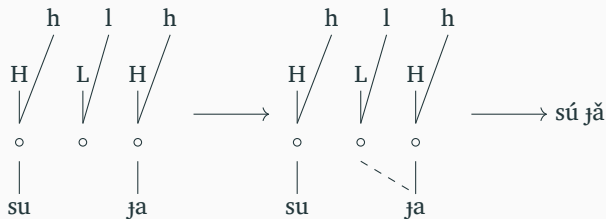
Analysis

The APVA marker is a floating Low tone ($\{L, l\}$)

- Without any the auxiliary markers, it associates with the TBU of the verb

(22) a. $sú$ $jǎ$
 $sú$ $\textcircled{L}já$
father watch.APVA
'Father watched'

b.

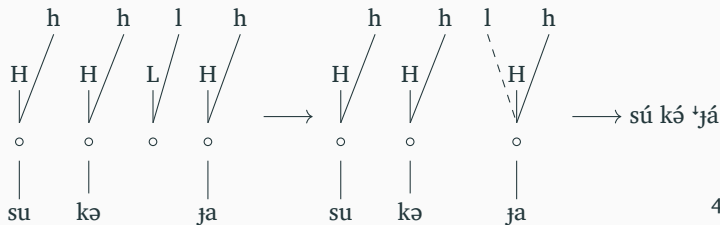


APVA downstep

- Association of l of APVA marker
- Concomitant deletion of L tone feature and TRN (c.f., stray erasure)

(23) a. *sú kə ʔjá*
sú kə [Ⓛ]ʔjá
father NEG watch.APVA
'Father did not watch'

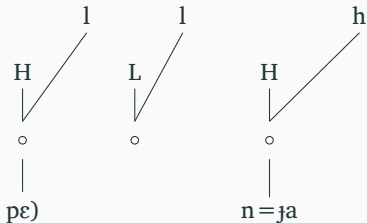
b.



Derivation of double downstep

- Lexical tones

(24)



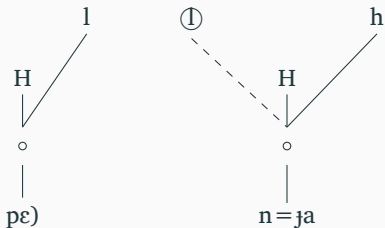
husband APVA IPFV = watch

'The husband is going to watch'

Derivation of double downstep

- Association of l and deletion of L of APVA marker

(25)



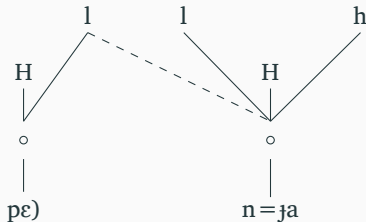
husband APVA IPFV = watch

‘The husband is going to watch’

Derivation of double downstep

- Prosodic boundary effect

(26)



[pɛ n⁺ja]

husband APVA IPFV = watch

‘The husband is going to watch’

Stacking of register features

- Permits double downstep through association of two 1 register features with the TRN of the verb
 - One from the APVA marker
 - The other through the prosodic boundary effect
- Maintains a distinction between registral effects and assimilatory tonal changes

Stacking of register features

- Allows wider range of phonetic surface pitches
- Avoids neutralization
 - Maintains a distinction of lexical tones and derived downstepped tones

(27)	Realization	Featural representation
	H	{H, h}
	˥H	{H, h, +l}
	˥˥H	{H, h, +l, +l}
	M	{H, l}
	˥M	{H, l, +l}
	L	{L, l}

Why is downstep a derived effect?

Alternative: registral effects are purely representational

(28)	Realization	Featural representation
	H	{H, h}
	⁺ H	{H, h, l}
	⁺⁺ H	{H, h, l, l}
	M	{H, l}
	⁺ M	{H, l, l}
	L	{L, l}

Why is downstep a derived effect?

- Conceptual issue: downstep is typically a contextual effect
- Maintaining a distinction between paradigmatic and syntagmatic effects of register features is desirable

Why is downstep a derived effect?

- Formal issue: ambiguous representations in languages with both upstep and downstep
- {H h l}
 - downstepped High—{H, h} + l
 - upstepped Mid—{H, l} + h

Implications on tonal representation

Implications on tonal representation

Current debate: whether register features are necessarily part of tonal representation (Lionnet 2025; shortly)

Implications on tonal representation

They play a two-fold role in RTT: defines paradigmatic and syntagmatic relations

This is problematic for some languages

- Languages where registral effects are orthogonal to tone
 - Paicî (Lionnet 2022b)
 - Pukur (Rochant 2023)

This is problematic for some languages

- Languages where registral effects are orthogonal to tone
 - Paicî (Lionnet 2022b)
 - Pukur (Rochant 2023)
- Toneless languages with contrastive downstep
 - Drubea and Numèè (Lionnet 2025)

Implications on tonal representation

Do we want register features to be part of the representation of tonal categories?

- I.e., both linked to a TRN

(29) Representing a M

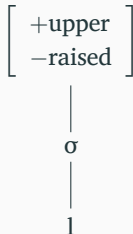
a.



b.



c.



Implications on tonal representation

Answer, based on Northern Toussian:

Implications on tonal representation

Answer, based on Northern Toussian:

- For some languages, yes

Answer, based on Northern Toussian:

- For some languages, yes
 - TRNs allow natural classes of tones with shared registral effects

Answer, based on Northern Toussian:

- For some languages, yes
 - TRNs allow natural classes of tones with shared registral effects
 - Explains why sets of tones act similarly in being the triggers/targets of downstep

Do all tonal systems have TRNs?

- Perhaps not
- Tonal structure might be emergent (McPherson yesterday)
 - Some languages have highly articulated subtonal featural geometry
 - Others have flatter structures

Áwnicé!

References

- Armstrong, Robert. 1968. **Yala (Ikom): A terraced-level language with three tones.** *Journal of West African Languages* 5. 49–58.
- Clemens, Lauren. 2019. **Prosodic Noun Incorporation: The Relationship between Prosody and Argument Structure in Niuean.** *Syntax* 22(4). 337–377.
- Downing, Laura J. 2006. **Prosody and syntax of focus in Chitumbuka.** *ZAS Papers in Linguistics* 43. 55–79.
- Downing, Laura J. & Al Mtenje. 2011. **Prosodic phrasing of Chichewa relative clauses.** *Journal of African Languages and Linguistics* 32(1).

- Lionnet, Florian. 2022a. **The features and geometry of tone in Laal.** *Phonology* 39(2). 251–292.
- Lionnet, Florian. 2022b. **Tone and downstep in Paicî (Oceanic, New Caledonia).** *Phonological Data and Analysis* 4(1).
- Lionnet, Florian. 2025. **Tonal languages without tone: downstep in Drubea and Numèè (Oceanic, New Caledonia).** *Phonology* 42. e23.
- McPherson, Laura. 2016. **Tone features revisited: Evidence from Seenku.** In Doris L. Payne, Mokaya Bosire & Sara Pacchiarotti (eds.), *Diversity in African Languages*, 5–22. Berlin: Language Science Press.
- Meyase, Savio M. 2021. **Polarity in a four-level tone language: tone features in Tenyidie.** *Phonology* 38(1). 123–146.

- Odden, David. 1987. **Kimatuumbi phrasal phonology.**
Phonology Yearbook 4(1). 13–36.
- Rochant, Neige. 2023. ***A Bilectal Grammar of Baga Pukur: an Atlantic Language of Guinea.*** Université de la Sorbonne nouvelle - Paris III dissertation.
- Snider, Keith L. 1990. **Tonal Upstep in Krachi: Evidence for a Register Tier.** *Language* 66(3). 453.
- Snider, Keith L. 2020. ***The geometry and features of tone.***
Second edition (SIL International Publications in Linguistics 153).
Dallas, Texas: SIL International. 173 pp.
- Struthers-Young, Anthony. 2025a. ***A grammar of Northern Toussian.*** San Diego: University of California San Diego dissertation.

Struthers-Young, Anthony. 2025b. **Double downstep in Northern Toussian: implications on tonal representation.** *Natural Language & Linguistic Theory* 43. 2969–3025.