H-tone is not always H-tone

A register tone account of Macuiltianguis Zapotec

Eva Zimmermann
Leipzig University

January 14, 2016
OCP 13, Budapest

UNIVERSITÄT LEIPZIG

Main Claim

- ◆ the assumption of **(sub-)tonal features** predicts that the same surface tones may have different (underspecified) phonological representations
- ◆ the **asymmetric behaviour of H-tones** in Macuiltianguis Zapotec follows under such an account:
  - more complex [+Upper,+raised] can only associate locally and to a single TBU
  - underspecified [+raised] can associate non-locally and changes the tone of all TBU's associated to one [±Upper]
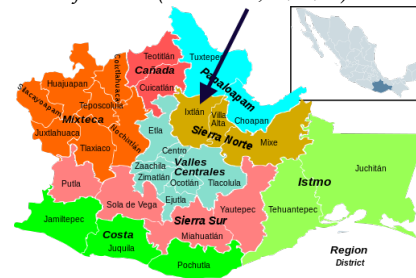

Theoretical background: tonal features

(1) *Tonal features (Yip, 1989; Snider, 1990; Hyman, 1992)*

Extra high	High	Mid	Low
+r	-r	+r	-r
|	|	|	|
+U	+U	-U	-U

- ◆ register [±Upper] divides pitch range of voice in half; [±raised] subdivides register (Yip, 1980; Pulleyblank, 1986)
- ◆ arguments:
  - restrictions for contour tones (e.g. only contours in one ±U register)
  - processes between non-contiguous tones possible (e.g. Ewe: (−U,+h) becomes (+U,+h) after (+U,−h); (Odden, 1995))
  - register shift (e.g. upstep in Krachi (Snider, 1990))
  - **same surface tones may have different underlying representation** (e.g. Snider, 1998; Picanço, 2005)

Structure of the talk

Different H-tones in Macuiltianguis Zapotec

Macuiltianguis Zapotec (=MZ)

- ◆ an Otomanguean language spoken in Oaxaca, Mexico
- ◆ data based on Broadwell and Zhang (1999); Broadwell (2000); Foreman (2006), and especially Broadwell et al. (2011)

(2) *State of Oaxaca (Wikimedia, 07/01/16)*

Tone in Macuiltianguis Zapotec (=MZ)

- ◆ three level tones high (=H, á), mid (=M, a), and low (=L, à), and a downstepped H (=ꜜá)
- ◆ tone sequences HL and LH on long vowels; **TBU=μ**

(3) *Tone in MZ (Foreman, 2006, 40)*

íjːá	'rock'	ijːa	'rain'
bélːá	'fish'	bèlːà	'snake'
beːlia	'cave'	bêːlia	'star'
dăː	'bean'	dâː	'lard'

Morphological H-association I: Potential prefix

- ◆ the prefix /gú–/ Potential causes an **additional H** on the following TBU (4)
- ◆ taken to be **morpheme-specific**

(4) *Potential (Broadwell et al., 2011, 4+8)*

	UNDERLYING	SURFACE
a.	gú-di-bìθːà-nà-nà	gú-dí-bìθːà-nà-nà
	Pot-Caus-wet-3SgS-3SgO	'S/he will wet it'
b.	gú-sìːgáʔ-nà-nà	gú-sîːgáʔ-nà-nà
	Pot- push-3SgS-3SgO	'S/he will push it'
c.	gú-tùːbí-já-nà	gú-tûːbí-já-nà
	Pot-roll-1SgS-3SgO	'I will roll it'
d.	gú-làpːá-nà-nà	gú-lápːꜜá-ná-nà
	Pot-clean.up-3SgS-3SgO	'S/he will clean it up'

Morphological H-association II: 1.Sg formation

◆ an additional H is realized on the verb base:

- on a **vowel followed by** /ʔ/,
  be-tsɪ̀ːga**a**ʔ-jà-nà   be-tsɪ̀ːg**á**ʔ-jà-nà
  Com-get.dirty-1SgS-3SgO   'I dirtied it'

- on the **leftmost L-toned** TBU if there is no such vowel,
  be-bɪ̀θ:à-jà-nà   be-b**í**θ:à-jà-nà
  Com-wet-1SgS-3SgO   'I wetted it'

- and on the **rightmost M-toned** TBU if there is no L-toned TBU.
  be-ʃatt**a**-jà-nà   be-ʃatt**á**-já-nà
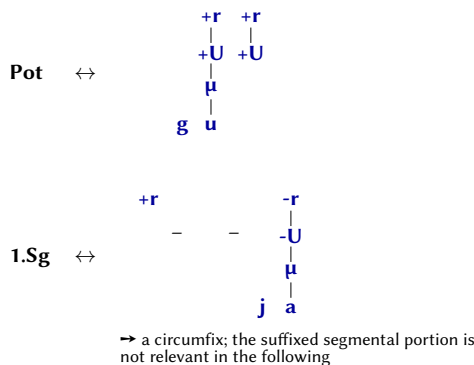 Com-iron-1SgS-3SgO   'I ironed it'

1.Sg formation

(5)   *1.Singular (Broadwell et al., 2011, 6+7)*

	Underlying	Surface
a.	be-tsɪ̀ːg**a**ʔ-jà-nà Com-get.dirty-1SgS-3SgO	be-tsɪ̀ːg**á**ʔ-jà-nà 'I dirtied it'
	be-ʃ**u**ʔní-jà-nà Com-wrinkle-1SgS-3SgO	be-ʃ**ú**ʔní-já-nà 'I wrinkled it'
b.	be-b**ì**θ:à-jà-nà Com-wet-1SgS-3SgO	be-b**í**θ:à-jà-nà 'I wetted it'
	be-di-g**à**si-jà-nà Com-Caus-be.scared-1SgS-3SgO	be-di-g**á**si-ja-nà 'I scared it'
	be-detʃ:**ù**-jà-nà Com-fold-1SgS-3SgO	be-detʃ:**ú**-já-nà 'I folded it'
	be-t**ù**:bí-jà-nà Com-roll-1SgS-3SgO	be-t**ú**:ˈbí-já-nà 'I rolled it'
c.	be-ʃat:**a**-jà-nà Com-iron-1SgS-3SgO	be-ʃat:**á**-já-nà 'I ironed it'
	be-neː**si**-jà-nà Com-submerge-1SgS-3SgO	be-neː**sí**-já-nà 'I submerged it'

H-association II: 1.Sg formation

(6)   *Abstract Summary*
  a.   *To glottalized V*
    LL.Mʔ   →   LL.**H**ʔ
    LL.Hʔ   →   LL.**H**ʔ
    Mʔ.H   →   **H**ʔ.H
  b.   *Else to leftmost L*
    L.M   →   **H**.M
    M.L   →   M.**H**
    L.L   →   **H**.L
    LL.M   →   **HH**.M
    LL.H   →   **HH**.ˈH
  c.   *Else to rightmost M*
    M.M   →   M.**H**

Two different High tones?

(7)   *Two different High tones*

Root	1.Sg	Pot (after /gu−/)
tù:bí	tú:ˈbí	tû:bí
sì:gáʔ	sì:gáʔ	sî:gáʔ

◆ the Pot-H and 1Sg-H apparently show an asymmetry in the **locality** of their association and their choice of **TBU**

(8)   *The riddle*

An OT-analysis for MZ
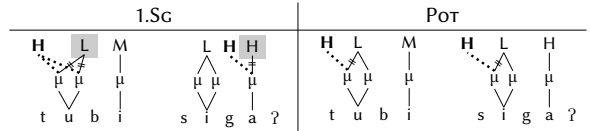
Assumption: tonal features

◆ three tones specified with two tone features [±Upper] and [±raised]
◆ underspecified tones (9-b) interpreted with a default [−raised] value

(9)   *Tone in MZ*

	L	M	H
a.	-r | -U	-r | +U	+r | +U
b.	-U	+U	

◆ H and M are a natural class: both spread root-finally to an adjacent TBU (=phonological spreading of [+U])

Assumption: Representation of floating High tones

(10)   *Two different morphological (floating) H-tones*

Pot   ↔

1.Sg   ↔

➙ a circumfix; the suffixed segmental portion is not relevant in the following

---

Theoretical background: Coloured Containment-based OT
(van Oostendorp, 2006; Trommer, 2011; Zimmermann, 2014; Trommer and Zimmermann, 2014)

(11)   *Containment (Prince and Smolensky, 1993/2004)*
  Every element of the phonological input representation is contained in the output.

1. **No deletion**: unrealized elements are not integrated under the highest prosodic node (=Stray Erasure, McCarthy, 1979; Steriade, 1982; Itô, 1988)
   ➙ for tone: unassociated high has no effect on adjacent tones (in the languages under discussion); unassociated low may cause downstep

(12)   *Marking conventions: phonetically unrealized elements*

| Phonological structure	Phonetic interpretation
	[tù:bi]

Theoretical background: Coloured Containment-based OT

2. **No deletion of association lines**: they can only be marked as 'phonetically invisible' (=not interpreted)

(13) *Marking conventions: different types of association lines*

Morphological association lines		Epenthetic association lines	
phonetically visible:	phonetically invisible:	phonetically visible:	phonetically invisible:
a.	b.	c.	d.

(14) *Marking conventions: phonetically unrealized elements II*

a. [tú:bi]   b. [tû:bi]
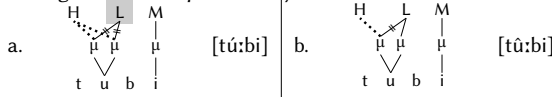
➡ Constraints: sensitive to only the phonetically visible or all structure
(='constraint cloning' Trommer, 2011; Trommer and Zimmermann, 2014)

Theoretical background: Coloured Containment-based OT

3. All morphemes have a **'colour'** (=affiliation); epenthetic elements are colourless

(15) *Marking conventions: morphological colours*

a. [tù:bi]   ➡ two underlying tones
b. [tù:bi]   ➡ insertion of an epenthetic M

Tonal overwriting in containment

◆ in correspondence-theoretic OT, realization of underlyingly unassociated elements ensured by, for example, *FLOAT (Wolf, 2007)

◆ in containment-theory, constraints like (16-a) ensure that all elements are integrated into the prosodic structure (via *some* association line)

(16) a. ±U TO μ
      Assign a violation mark for every [±U] that is not associated to a μ.

  b. $*^U\mu^U$
      Assign a violation mark for every μ that is phonetically visibly associated to more than one feature [±U].

  c. MAX[±U]
      Assign a violation mark for every phonetically invisible [±U].

Overwriting: Pᴏᴛ-H

(17)

	±U TO μ	$*^U\mu^U$	MAX[±U]	MAX[±R]
a.	*!		*	*
b.		*!		
☞ c.			*	*

Preferred realization site for a high tone

◆ the 1.Sɢ-H showed a preference for being realized on a vowel followed by /ʔ/

◆ a standard case of consonant-tone interaction (Lee, 2008; Tang, 2008)

(18) *–CG/H
      Assign a violation mark for every phonetically visible vowel not followed by a [+cg]-sound that is associated to [+r].

Theoretical background: Locality of association under containment

◆ phonetically visible association lines can not cross (Goldsmith, 1976); but a **phonetically invisible one might be 'crossed'**

◆ penalized by a markedness constraint *CROSS (20-a): ensures preference for **local association**

◆ the 'crossed' element remains invisible: a violation of HAVE-❖

(19)

	*CROSS	*HAVE-❖	MAX-❖
☞ a.			*
b.	*!	*!	**
c.	*!*	*!*	***

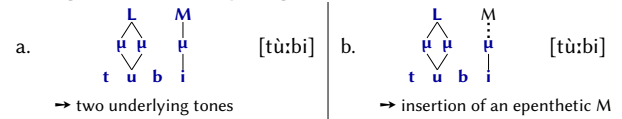## No non-local realization (=line-crossing) for the Pot-H

◆ the preference for a /Vʔ/ landing site for H's has **no effect for the Pot-H** since *CROSS[U–μ] is high-ranked

(20) a. *CROSS[U–μ]
      Assign a violation mark for every instance of crossing association lines linking features [±U] with μ's.

      Assign a violation mark for every pair of features [U]₁ followed by [U]₂ on tier [±Upper] if [U]₁ is associated to μ₂ and [U]₂ to μ₁ if μ₁ precedes μ₂ on the moraic tier.

Only local realization for the Pᴏᴛ-H

(21)

	±U TO μ	*CROSS[U–μ]	*–CG/H	MAX[±U]	MAX[±R]
☞ a.			*	*	*
b.		*!		**	**

Non-local realization possible for the 1.Sg-H

◆ the 1.Sg-H, however, is only a [+r] and since *Cross[r–U] is lower-ranked, the preference for /Vʔ/ is visible on the surface

(22) a. *Cross[r–U]
Assign a violation mark for every instance of crossing association lines linking features [±r] with features [±U].
Assign a violation mark for every pair of features [r]₁ followed by [r]₂ on tier [±raised] if [r]₁ is associated to [U]₂ and [r]₂ to [U]₁ if [U]₁ precedes [U]₂ on tier [±Upper].

   b. ±r to ±U
Assign a violation mark for every [±r] that is not associated to a [±U].

Preference for glottalized V in the 1.Sg: second TBU

(23)

	±r to ±U	*Cross[U–μ]	*-cg/H	Max[±r]	*Cross[r–U]
a.	*!			*	
b.			*!	*	
☞ c.				**	*

Non-local association of the 1.Sg-H II: preference for overwriting an L

◆ if [+r] overwrites an underlying low tone, a change of the [-U] to [+U] is implied (=*(-U,+r) is an illicit feature combination in MZ)

◆ this implies a violation of Dep[±U] but allows to avoid a violation of DepAL(U–μ) (24-b) that only penalizes epenthetic associations between underlying elements
(=unavoidable if [+r] is realized on a mid tone)

(24) a. Dep[±U]
Assign a violation mark for every colourless [±U].

   b. DepAL(U–μ)
Assign a violation mark for every colourless association line between a morphologically coloured [±U] and a morphologically coloured μ.

Non-local association of the 1.Sg-H II: preference for overwriting an L

(25)

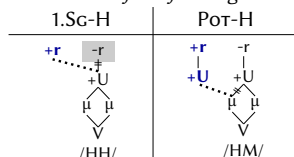|	±r to ±U	DepAL(r–U)	Dep[±U]	Max[±r]	*Cross[r–U]
a.		*!		*	
☞ b.			*	**	*

Non-local association of the 1.Sg-H III: rightmost M

◆ that the second M is overwritten in MM bases follows from Align constraint preferring M's in initial position

(26) InitM
Assign a violation mark for every phonetically visible M (+U,–r) that is not associated to the leftmost vowel of the stem.

Preference for initial M's: overwriting of second M

(27)

	±r to ±U	InitM	Max[±r]	*Cross[r–U]
a.		*!	*	
☞ b.			**	*

The Vː-asymmetry between 1.Sg-H and Pot-H

◆ two tones on a single V are dispreferred (28)
◆ the two moras of a long V are associated to a single feature [±U]
  1.Sg association of a new [+r] changes the tone specification for both TBU's
  Pot association of a new [+U–+r] changes only the first tone of a long V since it associates to a TBU on its own

(28) *Cont_V
Assign a violation mark for every phonetically visible V associated to two different tones.

(29) *Association of the floating H-tones to M: TBU-asymmetry*

The Vː-asymmetry between 1.Sg-H and Pot-H

◆ for L-tones, the asymmetry mainly follows from DepAL(U–μ): if [+r] is realized, an epenthetic [+U] needs to be inserted and the constraint is irrelevant; a contour can hence be avoided

(30) DepAL(U–μ)
Assign a violation mark for every colourless association line between a morphologically coloured [±U] and a morphologically coloured μ.

Vː-Asymmetry: Contour creation for the Pᴏᴛ-H

(31)

Vː-Asymmetry: Complete overwriting for the 1.Sɢ-H

(32)

Summary: Analysis for MZ

Asymmetry of 1.Sɢ-H and Pᴏᴛ-H follows from their **different specification**:

◆ the tonal feature [+r] can associate 'across' other [±r] specifications to reach a preferred TBU; the more complex [+U,+r] cannot

◆ realization of [+r] overwrites the tone specification of both μ's of a long Vːthat are associated to a single [±U]; the more complex [+U,+r] associates to a TBU on its own

Summary: The ranking for MZ

(33)

◆ (tested with the help of OTHelp (Staubs et al., 2010))

Further implications

Non-local association of H in Sierra Juárez Zapotec
Bickmore and Broadwell (1998); Tejada (2012)

◆ difference to MZ: 1.Ps-H realized on **stressed** syllable (usually initially)

◆ in incorporated N-V structures, the H surfaces on the first (34-c), the second (34-d), or both stems (34-e)

(34)   *1.S intransitive H-tone (Bickmore and Broadwell, 1998, 50,52,57)*

a. gú-ʃuʔnì-luʔ   gú-ʃúʔnì-ʔàʔ
    'You will wrinkle'   'I will wrinkle'

b. gú-deʧu   gú-déʧù-ʔaʔ
    '(S/he) will fold'   'I will fold'

c. gú-kàá-ló   gú-káa-lú-áʔ
    '(S/he) will stick out his/her head'   'I will stick out my head'

d. é-dákːaʔ-latsiʔ   é-dákːaʔ-látsaʔ-aʔ
    '(S/he) will be happy'   t'I will be happy'

e. gú-ni-latsiʔ   gú-ní-látsaʔ-àʔ
    '(S/he) will seem to be'   '(S/he) will seem to be'

A tone feature analysis for Sierra Juárez Zapotec

◆ only the contours MH and HM are attested: only [+U] (associated Vː) may have two tonal features

(35)   *Tones in SJZ*

◆ the 1.Sɢ is a floating [+r] that associates to non-local TBU's under pressure of *−ʀᴀɪsᴇᴅ/Hᴅ (cf. *L/Hᴅ in de Lacy, 2002)

→ solves locality problem discussed in Bickmore and Broadwell (1998) as an argument against a circumfixation analysis (H−Σ−ʔàʔ) and for the assumption of the Morphemic Tier Hypothesis

Locality asymmetry of tone-demanding suffixes in Bora
(Seifart, 2005; Thiesen and Weber, 2012; Roe, 2014)

◆ Witotoan language, spoken in Northern Peru

◆ two tone levels H and L; H is assumed to be the default

◆ some suffixes impose Lː on the **final or penult TBU** of their base

◆ OCP: no realization of an additional L if two adjacent L's would result

(36)   *Suffixes imposing L on final or penult base σ*

a. o maˣʧʰo-ᴸtʰɛ-ʔi   ó máˣʧʰò-tʰɛ́-ʔì   (Thiesen and Weber, 2012, 77)
    I eat-go.do   'I go to eat'

b. aːnɯ-kpa-ᴸma   áːnɯ́-kpà-mà   (Roe, 2014, 92)
    cassava.shoot-slab-Soc   'with a cassava.shoot for planting'

c. maˣʧʰo-ᴸᴓmɛ   màˣʧʰó-mɛ̀   (Thiesen and Weber, 2012, 77)
    eat-An.Pʟ   'they ate'

d. imipaˣʧʰo-ᴸᴓmɛ   ímípàˣʧʰó-mɛ̀   (Thiesen and Weber, 2012, 77)
    fix-An.Pʟ   'they fix'

Locality asymmetry for tone-demanding suffixes in Bora

◆ there is a preference for L-tones to be realized on the penultimate TBU of the base (Align(L;L), stress (*−U,−ʀ/NHᴅ (de Lacy, 2002), ?)

◆ some floating L's ([−U,−r]) can reach this preferred position and others ([−r]) not

◆ (implicit: default-H already assigned to tone-less TBU's of the base (Stratal OT Trommer, 2011; Bermúdez-Otero, in preparation))

Locality asymmetry of tone-demanding suffixes in Bora

(37)   *Local association for /-ᴸtʰε/*   (38)   *Local association for /-ᴸømε/*

Non-local association: general predictions

(39)

◆ non-local association of the more complex structure: a **superset** of the structure remains phonetically invisible

◆ the 'crossed' elements are **neutralized to default** structure or take the value of the 'crossing' element (=spreading)

Summary

Summary

◆ the asymmetric behaviour of different morphological H-tones in MZ follows under the assumption of **tonal features** and underspecification

◆ **non-local association** of (non-complex) floating tone features under the pressure of higher-ranked markedness constraints is possible in a containment-based system

◆ extends the argument that phonetically identical tones may have **different phonological specification** in a tone feature account
  • two different M's in Bimoba (Snider, 1998): downstepped H vs. underlying M
  • two different L's in Mundurukú (Picanço, 2005)
  • **two different H-tones in MZ**

References

Bermúdez-Otero, Ricardo (in preparation), *Stratal Optimality Theory*, Oxford University Press, Oxford.

Bickmore, Lee and George Aaron Broadwell (1998), 'High tone docking in Sierra Juárez Zapotec', *International Journal of American Linguistics* **64**, 37–67.

Broadwell, George Aaron (2000), 'Macuiltionguis Zapotec tone paradigms', ms., SUNY Buffalo.

Broadwell, George Aaron and Jie Zhang (1999), 'Tonal alignment constraints and the nature of evaluation', Paper presented at the 73rd Annual Meeting of Linguistic Society of America, Los Angeles.

Broadwell, George Aaron, John Foreman and Lee Bickmore (2011), 'Floating H tones and the tonology of Macuiltianguis Zapotec', SSILA 2008.

de Lacy, Paul (2002), 'The interaction of tone and stress in optimality theory', *Phonology* **19**, 1–32.

Foreman, John Olen (2006), The Morphosyntax of Subjects in Macuiltianguis Zapotec, PhD thesis, UC Los Angeles.

Goldsmith, John A. (1976), Autosegmental Phonology, PhD thesis, MIT.

Hyman, Larry M. (1992), Register tones and tonal geometry, *in* H.van der Hulst and K.Snider, eds, 'The phonology of tone: the representation of tonal register', Mouton de Gruyter, pp. 75–108.

Itô, Junko (1988), *Syllable Theory in Prosodic Phonology*, New York: Garland Publishing.

Lee, Seunghun (2008), Consonant-Tone interaction in Optimality Theory, PhD thesis, Rutgers University.

McCarthy, J. (1979), Formal Problems in Semitic Phonology and Morphology, PhD thesis, MIT.

Odden, David (1995), Tone: African languages, *in* J. A.Goldsmith, ed., 'Handbook of Phonological Theory', Oxford: Blackwell, pp. 444–475.

Picanço, Gessiane Lobato (2005), Mundurukú: Phonetics, Phonology, Synchrony, Diachrony, PhD thesis, University of British Columbia.

Prince, Alan and Paul Smolensky (1993/2004), *Optimality Theory: Constraint Interaction in Generative Grammar*, Blackwell, [first circulated as Prince & Smolensky (1993) Technical reports of the Rutgers University Center of Cognitive Science].

Pulleyblank, Douglas (1986), *Tone in Lexical Phonology*, Reidel, Dordrecht.

Roe, Amy (2014), The phonetics and phonology of Bora tone, PhD thesis, University of North Dakota.

Seifart, Frank (2005), The structure and use of shape-based noun classes in Miraña (North West Amazon), PhD thesis, Radboud Universiteit Nijmegen.

Snider, Keith L. (1990), 'Tonal upstep in Krachi: Evidence for a register tone', *Language* **66**, 453–474.

Snider, Keith L. (1998), 'Phonetic realisation of downstep in Bimoba', *Phonology* **15**, 77–101.

Staubs, Robert, Michael Becker, Christopher Potts, Patrick Pratt, John McCarthy and Joe Pater (2010), 'OT-Help 2.0. software package.', Amherst, MA: University of Massachusetts Amherst.

Steriade, Donca (1982), Greek prosodies and the nature of syllabification, PhD thesis, MIT.

Tang, Katrina (2008), The Phonology and Phonetics of Consonant-Tone Interaction, PhD thesis, UC Los Angeles.

Tejada, Laura (2012), Tone gestures and constraint interaction in Sierra Juarez Zapotec, PhD thesis, University of Southern California.

Thiesen, Wesley and David Weber (2012), *A grammar of Bora with special attention to tone*, SIL international, Dallas, Texas.

Trommer, Jochen (2011), 'Phonological aspects of Western Nilotic mutation morphology', Habil. University of Leipzig.

Trommer, Jochen and Eva Zimmermann (2014), 'Generalised mora affixation and quantity-manipulating morphology', *Phonology* **31**, 463–510.

van Oostendorp, Marc (2006), 'A theory of morphosyntactic colours', Ms., Meertens Institute, Amsterdam, available online at http://egg.auf.net/06/docs/Hdt

Wikimedia, Commons (07/01/16), 'Oaxaca regions and districts', https://commons.wikimedia.org/wiki/File:Oaxaca_regions_and_districts.svg.

Wolf, Matthew (2007), For an autosegmental theory of mutation, *in* L.Bateman, M.O'Keefe, E.Reilly, and A.Werle, eds, 'UMOP 32: Papers in Optimality Theory III', GLSA, Amherst, MA, pp. 315–404.

Yip, Moira (1980), The tonal phonology of Chinese, PhD thesis, MIT.

Yip, Moira (1989), 'Contour tones', *Phonology* **6**, 149–174.

Zimmermann, Eva (2014), A phonological account of morphological length, PhD thesis, Leipzig University.

Eva.Zimmermann@uni-leipzig.de