

Assimilatory Processes in Chuxnabán Mixe¹

Carmen Jany

California State University, San Bernardino

1. Introduction

This paper examines obstruent voicing, sonorant devoicing, and nasal place assimilation which are common to Mesoamerica and regarded as defining traits of this linguistic area (Campbell et al. 1986). In Chuxnabán Mixe, a Mexican indigenous language, these processes show irregular patterns that can only partially be explained by the phonological environment or the morphological structure of a word. For obstruent voicing and sonorant devoicing, two phonological rules based on the environment at both edges, i.e. preceding and following the affected segment, account for all examples in most instances. However, a phonetic analysis reveals that these processes are gradual often with partial voicing or devoicing, in addition to showing token variation. Similarly, an irregular pattern is observed in nasal place assimilation which generally occurs in morpheme-final position, but not always. While similar patterns have been described for a number of other Mixean languages (Bickford 1985; Crawford 1963; Dieterman 2008; Ruiz De Bravo Ahuja 1980; Romero-Méndez 2008; Schoenhals and Schoenhals 1982; Van Haitisma and Van Haitisma 1976; Wichmann 1995), there are no phonological studies explaining these assimilatory processes nor the observed irregularities. This work posits that phonological rules based on distinctive features (Chomsky and Halle 1968) can not fully account for the observed patterns in Chuxnabán Mixe and in other Mixean languages. Rather, it is argued that the irregularities represent sound change in progress, as also noted for the related Sayula Popoluca (Rhodes 2004). Ongoing sound change often remains unnoticed since shifts represent phonetic adjustments only noticeable as a cumulative effect over an extended period of time. I propose that in Chuxnabán Mixe certain assimilatory processes are still in a state of change and not yet complete. This phenomenon nicely illustrates the dinamicity of language.

Chuxnabán Mixe is a language of the Mixe-Zoquean family. It is spoken by nine hundred people in Chuxnabán, a small Mexican village. The Mixean territory is located in the north-eastern part of the southern Mexican state of Oaxaca. It is composed of two hundred and ninety communities and divided into nineteen municipalities (Torres Cisneros 1997), as shown in Figure 1. Each community speaks a different variety of Mixean, some of which are mutually unintelligible. In many cases it has yet to be determined whether a particular variety represents a distinct language or a dialect, as the documentation of Mixean languages is limited. While some linguists (INEA 1994, 1997a, 1997b, 1997c) divide Mixean in four main languages: Lowland Mixe, Midland Mixe, and Northern and Southern Highland Mixe, more recently the Ethnologue lists ten Mixean languages divided into three larger branches: Eastern Mixe with six languages and Veracruz Mixe and Western Mixe with two languages each (Lewis 2009). Chuxnabán Mixe has been identified by its speakers as Midland Mixe and corresponds

to Quetzaltepec Mixe in the Ethnologue entry. Speakers of Chuxnabán Mixe indicate that they understand Quetzaltepec Mixe and communicate with members of that community in Mixean, rather than in Spanish. Communication with Mixean speakers from more distant communities occurs in Spanish to ensure mutual comprehension.

There are only a few published grammars and dictionaries of the many Mixean varieties (De la Grasserie 1898; Hoogshagen and Hoogshagen 1997; Ruiz de Bravo Ahuja 1980; Romero-Méndez 2008; Schoenhals and Schoenhals 1982; Van Haitisma 1976); so far no grammar has been published of Chuxnabán Mixe. The data for this research were collected during two field trips in 2006 and in 2008 and during weekly sessions with a native speaker living in Los Angeles. The data consists of wordlists, narratives, and some elicited verb forms and sentences. The recordings were made on either a Mini-Disc recorder or a Solid State Edirol recorder with a head-mounted Shure microphone. Sound files were examined using Sound Forge and Praat software. Male and female speakers were recorded ranging from seventeen to eighty years of age. The examples in this paper are represented using an official orthography which was established in collaboration with community members in 2008.

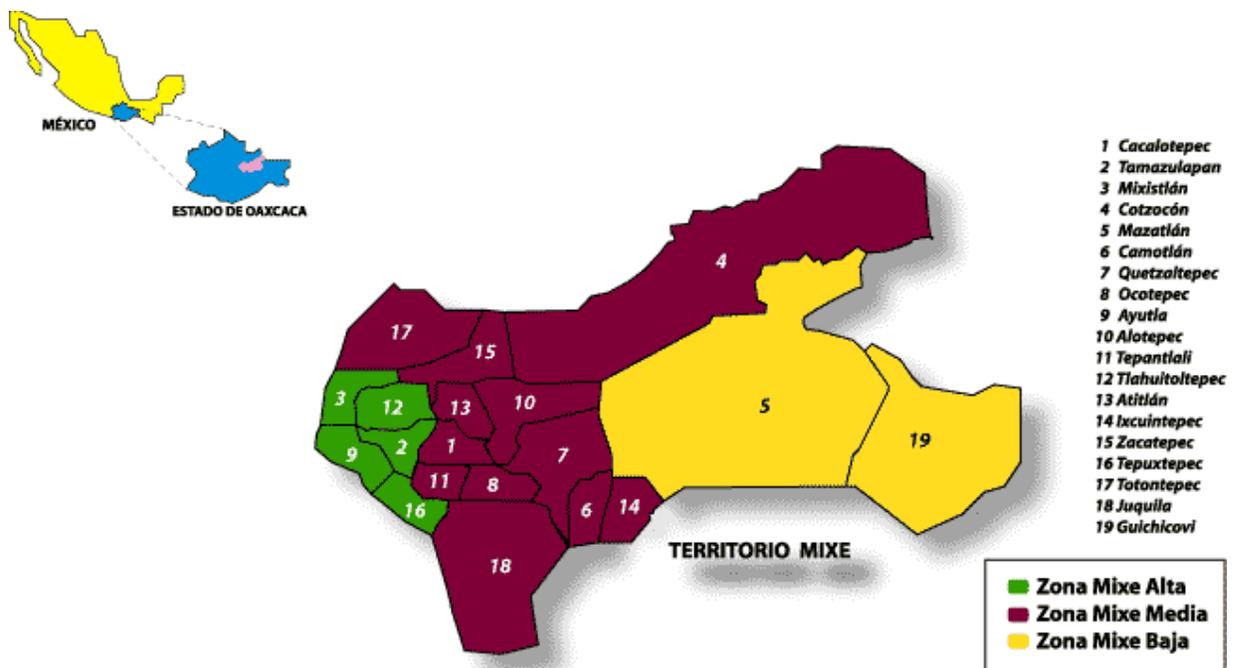


Figure 1: The Mixean Territory
 Source: <http://www.redindigena.net/ser/pueblomixe/mapa.html>

The following sections describe the Chuxnabán Mixe phoneme inventory, obstruent voicing and sonorant devoicing patterns, and nasal place assimilation.

2. Chuxnabán Mixe Phoneme Inventory

The Mixean languages have a relatively simple consonant system that varies little from language to language. In Chuxnabán Mixe, there are eleven consonantal phonemes: seven obstruents /p, t, k, ʔ, x, h, ts/ and four sonorants /n, m, w, y/, in addition to eight phonemes /b, d, g, f, s, r, r, l/ occurring in Spanish loans. The consonants are summarized in Table 1. Corresponding symbols in the practical orthography, if different from the symbols used in the International Phonetic Alphabet (IPA), are included in angled brackets. Phonemes from Spanish loans are in parentheses.

	Bilabial	Alveolar	Postalveolar	Palatal	Velar	Glottal
Plosives	p/(b)	t/(d)			k/(g)	ʔ <'>
Nasals	m	n				
Fricatives	(f)	(s)	ʃ <x>			h <j>
Affricates		ts	(tʃ <ch>)			
<i>Rhotic</i>		(r)/(r)				
<i>Lateral</i>		(l)				
Glides	w			j <y>		

Table 1. Chuxnabán Mixe Consonant Inventory with Phonemes from Spanish Loans

All consonants can also be palatalized. Palatalization acts as a suprasegmental process affecting consonants and adjacent vowels (Dieterman 2008). It can be either phoneme-induced or morpheme-induced. One of the affricates, /ch/ [tʃ], generally results from morpheme-induced palatalization and is often not treated as a separate phoneme in descriptions of other Mixean varieties. It has been included in the phoneme chart here for two reasons: (1) while morpheme-induced suprasegmental palatalization of other consonants manifests by having an onglide and an offglide, this is not always the case for /ch/ and (2) in Chuxnabán Mixe /ch/ cannot be traced back to phoneme- or morpheme-induced palatalization in all instances.

While the consonant system is fairly simple with almost no variation among the different Mixean languages, these languages vary greatly in their complex vowel systems (Suslak 2003). For instance, Totontepec Mixe has nine phonemic vowels (Schoenhals and Schoenhals 1982), but only six are reported for Coatlán Mixe (Hoogshagen and Hoogshagen 1959, 1997) and for San José El Paraíso Mixe (Van Haitsma and Van Haitsma 1976), the same as for Chuxnabán Mixe. All Mixean languages, including Chuxnabán Mixe, show a phonemic vowel length distinction and a phonemic phonation contrast between plain, aspirated, and creaky (glottalized and interrupted) vowels. This results in the following syllable nuclei: V, VV, VʔV, VVH, Vʔ, with the latter two having a laryngeal segment in the final portion of the vowel

blocking obstruent voicing of a following segment, as will be discussed in the next section. Moreover, a typologically rare three-way phonemic vowel length contrast has been noted for two Mixean varieties: Coatlán Mixe (Hoogshagen 1959) and San José El Paraíso Mixe (Van Haitsma 1976). Such a contrast has not been confirmed for Chuxnabán Mixe (Jany 2006, 2007). Table 2 summarizes the vowel qualities found in Chuxnabán Mixe. Corresponding symbols used in the orthography, if different from the IPA symbols, are included in angled brackets.

i	(ɣ <ü>)	ĩ <ë>	u
e	(ø <ö>)		o
	(æ <ä>)	a	

Table 2. Chuxnabán Mixe Vowel Inventory

Three of the vowel qualities, [æ, ø, ɣ], generally do not show a phonemic contrast since they stem from suprasegmental palatalization or from interdialectal borrowing. Two of these vowels, [ø] and [ɣ], always occur in palatalized environments, mostly in stem alternations of verbs. The third marginal vowel [æ] shows some variation between speakers and tokens of the same word. For example, some instances of *maqjtsk* ‘two’ have pronunciations closer to [a], while others are pronounced with [æ], even by the same speaker. As a result, these marginal three vowels are included in parentheses in Table 2.

As mentioned above, palatalization in Chuxnabán Mixe, as in other Mixean languages (Dieterman 2008; Hoogshagen and Hoogshagen 1997; Romero-Méndez 2008; Schoenhals and Schoenhals 1982; Van Haitsma and Van Haitsma 1976), is a suprasegmental process affecting not only the palatalized consonant, but adjacent vowels as well. This is perceived as an onglide and an offglide. Furthermore, it is manifested by a change in the formant structure of adjacent vowels lowering F1 and raising F2. The latter indicates fronting. One exception is the palatalized palatal glide /y/, because it does not undergo any changes with morpheme-induced palatalization (Dieterman 2008; Jany 2006). Suprasegmental palatalization is either phoneme-induced or morpheme-induced. Phoneme-induced palatalization occurs in compounding, as in the following examples.

(1) Phoneme-induced Palatalization in Compounding

- (a) *teky* ‘leg’ + *tu’uk* ‘one’ -> *tekychu’uk* ‘one-legged’
- (b) *kachy* ‘rib’ + *paajk* ‘bone’ -> *kachypyaajk* ‘rib bone’
- (c) *tëy* ‘truth’ + *kaapxp* ‘to speak’ -> *tëykyapxp* ‘to tell the truth’

Morpheme-induced palatalization occurs with the 3rd person possessive prefix *y-*, as shown in the following examples.

(2) Morpheme-induced Palatalization with Possessive Prefix *y-*

- | | | | | |
|-----|-----------|---|----------------------|----------------------------------|
| (a) | <i>y-</i> | + | <i>noky</i> ‘paper’ | -> <i>nyöky</i> ‘his/her paper’ |
| (b) | <i>y-</i> | + | <i>tëëjk</i> ‘house’ | -> <i>chëëjk</i> ‘his/her house’ |

The phoneme /*y*/ is clearly distinct from morpheme-induced palatalization. This is apparent because it does not palatalize the person prefixes *n-* and *m-*. However, the third person prefix *y-* palatalizes a following root-initial nasal. This is illustrated in the following examples.

(3) Phoneme /*y*/

n- ‘1st person’ + *yä’än* ‘tongue’ -> *nyä’än* ‘my tongue’ [njæ’æn]

(4) Morpheme /*y*/

y- ‘3rd person’ + *niixuy* ‘shirt’ -> *nyixuy* ‘his shirt’ [ni:’zuj]

In addition, the two processes are different phonetically as one can also cause voicing of the following segment, but the other can’t. This will be discussed in the following section.

3. Voicing and Devoicing Patterns

In Chuxnabán Mixe all obstruent phonemes are voiceless, while all sonorant phonemes are voiced. However, obstruents have voiced allophones and sonorants have voiceless allophones. The conditioning factors for these allophones are discussed below.

3.1 Obstruent Voicing

Obstruent voicing occurs after nasals and glides, except word-finally, and intervocalically, except after aspirated and glottalized vowels. This is shown in the examples below.

(5) Obstruent Voicing before/after Nasals & Glides Word-medially

- | | | | |
|-----|-------------------|---------------|---------------------|
| (a) | <i>chowpëch</i> | [’tʃowbɪtʃ] | ‘expensive’ |
| (b) | <i>tëygyaapxp</i> | [tɪj’gja:pʃp] | ‘to tell the truth’ |
| (c) | <i>ankëëxp</i> | [aŋ’gi:ʃp̚] | ‘above’ |

- (d) *puuypyaajk* [pu:j^hbi:^hk] ‘femur’
 (e) *poopniij* [po:b^hni:^h] ‘white chili’
 (f) *atsēmtsu’uch* [adzim^h’dzu^hutʃ] ‘pork meat’
- (6) Obstruent Voicing after Nasals Word-initially
- (a) *nxax* [ˈnɤaʃ] ‘my fish’
 (b) *ntëëjk* [ndi:^hk] ‘my house’
- (7) Obstruent Voicing in Intervocalic Position
- (a) *axux* [a^hzuʃ] ‘garlic’
 (b) *pojënë* [ˈpoɦini] ‘fast’
 (c) *wa’akoo’ëp* [wa^ha^hgo:^hip] ‘to stop walking’

Voicing does not occur word-finally and after glottalized or aspirated vowel nuclei. Moreover, obstruent clusters and geminates are not voiced. This is illustrated below.

- (8) No Obstruent Voicing Word-finally
- (a) *maank* [ma:ŋk^h] ‘son’
- (9) No Obstruent Voicing after Glottalized or Aspirated Vowel Nuclei
- (a) *jyüüka’të* [hju:^hg^ha^hti] ‘they lived’
 (b) *naajkëmëch* [ˈna:^hkimitʃ] ‘we descend’
- (10) No Obstruent Voicing in Consonant Clusters or Geminates
- (a) *tuktuujk* [tuk^htu:^hk^h] ‘eight’
 (b) *jappëk* [ˈhap:^hik^h] ‘there’

Voicing in compound words depends on the phonological structure of the compound rather than on the phonological structure of the words of which it is composed. This becomes apparent in compounds with vowel-initial words. In Chuxnabán Mixe, as in other Mixean languages, vowel-initial words generally add an initial glottal stop to avoid onsetless syllables. It is obligatorily inserted in compounding where two adjacent vowels would occur otherwise, and when a prefix vowel-final is added to a vowel-initial word. However, the glottal stop is omitted in compounds which would result in one of the following sequences (1) C + Glottal or (2) Glottal + C. Therefore, word-final obstruents which become word-medial in compounding are voiced between vowels and before or after nasals or glides, unless they occur in a consonant cluster with obstruents. This is shown below.

(11) Obstruent Voicing in Compounds

- | | | | | | | | |
|-----|----------------------|---|---------------------|----|-------------------|---------------|--------------|
| (a) | <i>xook</i> ‘wet’ | + | <i>nik</i> ‘shadow’ | -> | <i>xooknik</i> | [s:g'nik] | ‘humid’ |
| (b) | <i>pa'ak</i> ‘sweet’ | + | <i>'uujs</i> ‘herb’ | -> | <i>pa'akuujts</i> | [pa'ag'u:hts] | ‘sweet herb’ |

In *pa'akuujts* ‘sweet herb’ the initial glottal stop does no longer occur in *'uujs* ‘herb’ when it is the second word in a compound. As a result, the previous obstruent, in this case /k/, is voiced.

The voicing pattern in Chuxnabán Mixe can be explained with one phonological rule. Voiceless obstruents are voiced if they occur between two voiced segments:

[-sonorant] [-voice] -> [+voice] / [+voice] _____ [+voice]

Word-edges, aspirated vowels VVH, and glottalized vowels V^ʔ are regarded as voiceless environments, while interrupted vowels act as a voiced segment. This can be explained with the laryngeal timing of breathiness and glottalization in these vowel nuclei. In breathy and in glottalized vowels breathiness or creakiness occurs in the last portion of the vowel, hence creating a voiceless environment on the right edge of the nucleus, while in interrupted vowels V^ʔV creakiness occurs in the middle portion of the vowel leaving a voiced environment on the right edge of the nucleus.

Palatalized consonants are affected by and trigger voicing of adjacent segments in the same way as non-palatalized consonants, i.e. only voiced consonants can cause voicing. However, in Chuxnabán Mixe there are two different palatalization processes, phoneme-induced palatalization and morpheme-induced palatalization. These behave differently and have different phonetic outcomes. Phoneme-induced palatalization occurs in compounds word-medially. If a word ending in the palatal glide precedes another word in a compound, the first segment of the second word is palatalized and voiced, as in the following example.

(12) Obstruent Voicing in Phoneme-induced Palatalization

- | | | | | |
|-----|--------------------|---------------------|----|-----------------|
| (a) | <i>puuypyaajk</i> | ‘femur’ | -> | [pu:j'bjɑ:hk] |
| (b) | <i>je'eykyëxp</i> | ‘s/he sent’ | -> | [he'ej'gji:ʂp̄] |
| (c) | <i>tëygyaapxp</i> | ‘to tell the truth’ | -> | [tj'gja:pʂp] |
| (d) | <i>monypyu'uts</i> | ‘fair yellow’ | -> | [moŋ'bjɯ'uts] |

This can be explained by the fact that word-medial palatalization creates an onglide and an offglide. However, if the palatalized consonant is an affricate, which does not trigger an onglide, no voicing occurs, as shown below.

(13) No Obstruent Voicing in Phoneme-induced Palatalization

- (a) *kachyaaajk* ‘rib’ → [katʃ^hpja:^hk]

Moreover, if the palatalization process results in a new affricate, no voicing occurs.

(14) No Obstruent Voicing in Phoneme-induced Palatalization

- (a) *teky* ‘leg’ + *tu’uk* ‘one’ → *tekychu’uk* ‘one-legged’ → [tejkⁱtʃu^ʔuk^h]

Phonetically, this process is different from morpheme-induced palatalization which does never cause voicing at word-edges.

(15) No Obstruent Voicing in Morpheme-induced Palatalization

- (a) *y-* + *pak-* → *pyak* ‘his dove’ → [pⁱak^h]

The lack of voicing in morpheme-induced palatalization can be explained by metathesis #yCV → #CyV, hence leaving a voiceless environment to the left.

In addition, clitics do not cause voicing of obstruents when these occur in a voiced environment, as in the following example.

(16) No Obstruent Voicing with Clitics

- (a) *kachy* ‘basket’ + = *ën* Locative → *kachën* ‘in the basket’ → [katʃⁱn]
 (b) *nepyny* ‘blood’ + = *ochy* ‘a lot of’ → *nepynyöchy* ‘a lot of blood’
 → [neⁱpⁱnøtʃ]

While the above described processes apply to most instances, there are several irregular patterns observed, as well as partial voicing. This will be discussed in Section 3.3 together with the irregularities found in the sonorant devoicing processes described below.

3.2 Sonorant Devoicing

Sonorant phonemes are voiced in Chuxnabán Mixe, but they devoice word-finally in clusters and word-initially before obstruents. This is shown in the following examples.

(17) Sonorant Devoicing Word-finally and Word-initially

- (a) *kaajpn* ‘village’ → [ka:^hp_̃n]
 (b) *a’chmp* ‘custard apple’ → [a_̃tʃm_̃p̃]
 (c) *njot* ‘my stomach’ → [n_̃hot^h]

The same voicing assimilation rules apply as with obstruent voicing: word-edges are regarded as voiceless environments, and devoicing occurs between two voiceless segments. The following three rules best describe sonorant devoicing:

1. [+son, -syllabic] -> [-voice] / [-voice] ____ [-voice]
2. [+son, -syllabic] -> [-voice] / [-voice] ____ #
3. [+son, -syllabic] -> [-voice] / # __ [-voice, + cont, - strid]

Glides do not occur in a voiceless environment; therefore they are never devoiced. Palatalized and non-palatalized nasals are equally affected by the devoicing rules, as in the example below.

(18) Sonorant Devoicing with Palatalized Nasals

- (a) *pixyny* ‘cotton’ -> [pʲɪʃnʲ]

Sonorant devoicing does not occur in consonant clusters resulting from compounding, as in the following example.

(19) No Sonorant Devoicing in Compounding

- (a) *kaajpn* ‘village’ + *kopk* ‘summit’ -> *kaajpnkopk* ‘capital’ -> [ka:hpnkopk]

Moreover, while the vowels of clitics do not cause voicing, they prevent final devoicing.

(19) No Sonorant Devoicing with Certain Clitics (same as example 16)

- (a) *kachy* ‘basket’ + = *ën* ‘in’ -> *kachën* ‘in the basket’ -> [ˈkatʃin]
- (b) *nepyny* ‘blood’ + = *ochy* ‘a lot of’ -> *nepynyöchy* ‘a lot of blood’
-> [neˈpʲjɒtʃ]

No examples were found where laryngeal timing is essential in the devoicing process. The same as with obstruent voicing, there is some token variation, and partial devoicing can be observed. These irregularities are discussed below.

3.3 Irregular Patterns in Voicing and Devoicing

Two phonological rules could account for most voicing and devoicing patterns observed in Chuxnabán Mixe: (1) voiceless obstruents are voiced if they occur between two voiced segments and (2) voiced non-syllabic sonorants are devoiced if they occur between two voiceless segments. Word-edges, aspirated vowels, and glottalized vowels are regarded as voiceless environments, while interrupted vowels act as voiced

segments. In fact, the two processes could be explained using one simple rule whereby consonants voice or devoice depending on their environment at both edges:

C → [α voice] / [α voice] _____ [α voice]

However, this rule poses problems in strings of three or more consonants which occur mostly in compounding. Certain words may suggest rule ordering (i.e. voicing occurs before devoicing), but the reverse order (devoicing before voicing) may apply in other instances. This is shown in the following example.

(20) Rule Ordering: Voicing before Devoicing

(a) *poxm* 'spider' + *ta'aky* 'to spin' → *poxmta'aky* 'spiderweb' → [poʂm'daʔajkʰ]

Hence, voicing seems to be only progressive and not regressive, and there is no devoicing in word-medial position. Moreover, there is some token and speaker variation. The following two examples have been observed with and without obstruent voicing and sonorant devoicing respectively.

(21) Token Variation

(a) *kaajpnkopk* 'capital' → [ka:^hpnkopk]/[ka:^hpngopk]
(b) *njot* 'my stomach' → [nhot^h]/[nɰot^h]

This variation could also be triggered by careful speech whereby assimilation takes place in fast-paced or regular speech, but not in careful speech. In addition to speaker and token variation, an acoustic study reveals partial voicing and devoicing, thus obscuring these patterns even further. Partial voicing is illustrated in the spectrograms in Figures 2 and 3.

Other researchers have noticed similar irregular patterns for other Mixean varieties (Bickford 1985; Crawford 1963; Dieterman 2008; Ruiz De Bravo Ahuja 1980; Schoenhals and Schoenhals 1982; Van Haitsma and Van Haitsma 1976; Wichmann 1995). Van Haitsma (1976) mentions occasional word-final voicing of obstruents after long and interrupted vowels, in certain word-final clusters, and in cases where stem-final /w/ is dropped before /p/. Word-final voicing has not been observed in Chuxnabán Mixe.

The above described irregularities point to a sound change in progress where this type of variation would be expected. Furthermore, partial voicing and devoicing confirms the idea of a gradual change.

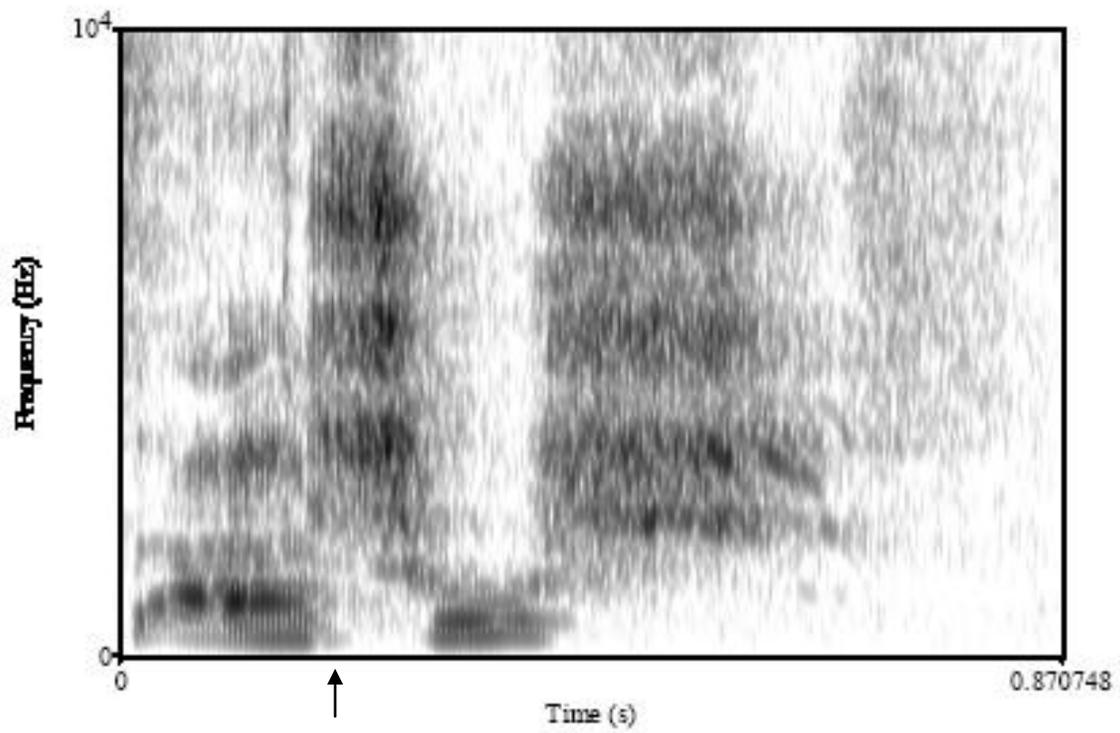


Figure 2: Partial voicing in *axux* 'garlic'

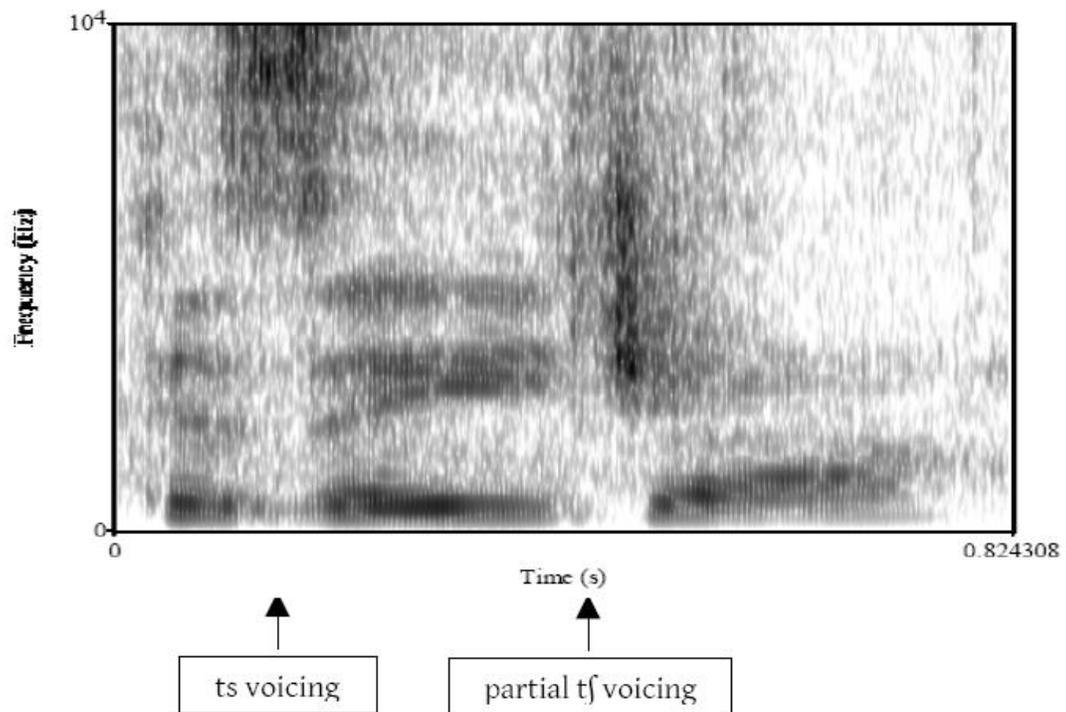


Figure 3: Partial voicing in *këtseychaa* 'chicken egg'

4. Nasal Place Assimilation

Nasal place assimilation has also been reported for a number of Mixean languages (Crawford 1963; Dieterman 2008; Schoenhals and Schoenhals 1982; Van Haitisma and Van Haitisma 1976). Van Haitisma and Van Haitisma (1976) states that nasal place assimilation occurs in words other than verbs, and that there is some speaker variation. Similarly, in Chuxnabán Mixe nasal place assimilation shows irregular patterns, including token and speaker variation. For example, the morpheme-final alveolar nasal /n/ sometimes assimilates to the following stop /p, t, k/ in place of articulation. This can be summarized as follows:

/n/ = [n] / ____ /t/
/n/ = [m] / ____ /p/
/n/ = [ŋ] / ____ /k/

or:

n -> [α place] / ____ [-sonorant, α place]

The following examples illustrate this process.

(22) Nasal Place Assimilation

- | | |
|---|--|
| (a) <i>tun</i> 'to work', but <i>tun</i> + =pë | -> <i>tumpë</i> 'worker' |
| (b) <i>miin</i> 'to come', but <i>miin</i> + -p | -> <i>miimp</i> 'I come' |
| (c) <i>wiin</i> 'eye', but <i>wiin</i> + ki'ix | -> <i>wiinki'ix</i> 'dark circles around eyes' |
| | -> [wi:ŋ'gi'iʂ] |

Generally, this process only occurs in morpheme-final position, therefore preserving the contrast found in the person prefixes *n-* '1st person' and *m-* '2nd person'. However, occasionally nasal place assimilation is also noted in this position, as in the following example.

(23) Nasal Place Assimilation Word-initially

- (a) *npa'ak* 'my sweet' [mba'ak].

Following Dieterman (2008), the alveolar nasal could be regarded as an archiphoneme in morpheme-final position, always assimilating in place of articulation to the following segment. Dieterman (2008) shows for the related Isthmus Mixe that nasal place assimilation only occurs in morpheme-final position, preserving the contrast found in the person markers *n-* and *m-* word-initially. Generally, the same occurs in Chuxnabán Mixe, but there is some variation as shown in example (23). The following examples illustrate how Dieterman's findings also apply to Chuxnabán Mixe.

(24) No Nasal Place Assimilation Word-initially

- (a) *n-* '1st person' + *pak* 'pigeon' → *npak* 'my pigeon' [nbak]
(b) *m-* '2nd person' + *tëts* 'tooth' → *mtëts* 'your tooth' [mdits]

The fact that occasionally nasal place assimilation is also noted in this position points to a sound change in progress, the same as with voicing and devoicing. Moreover, nasal place assimilation does not occur with the bilabial nasal /m/ in morpheme-final position, as shown below.

(25) No Nasal Place Assimilation Morpheme-finally with /m/

- (a) *poxm* 'spider' + *ta'aky* 'to spin' → *poxmta'aky* 'spiderweb' [poʃm'da'ajki]
(b) *atsëm* 'pig' + *tsu'uch* 'meat' → *atsëmts'uuch* 'pork meat' [adzimdzu'utʃ]
(c) *tsa'am* 'plaintain' + *kepy* 'tree' → *tsa'amkepy* 'plaintain part' [tsa'am'gepi]

5. Summary and Conclusions

Obstruent voicing, sonorant devoicing, and nasal place assimilation are common to Mesoamerica and regarded as defining traits of this linguistic area (Campbell et al. 1986). The same as in Chuxnabán Mixe, they occur in other Mixean languages. This paper has demonstrated that phonological rules alone can not explain these assimilatory processes given the irregular patterns and given the speaker and token variation. Rather, these irregularities indicate a sound change in progress where variation is expected. Sound change can be phonetically and lexically gradual. Lexical irregularities occur in token and speaker variation. Phonetic irregularities manifest in partial voicing or devoicing. Chuxnabán Mixe exhibits thus both, lexically and phonetically gradual sound change. A closer look reveals that phonemically relevant places, such as the person prefixes, are more resistant to the assimilation processes. Similar observation have been reported for the related Sayula Popoluca (Rhodes 2004). In Sayula, Rhodes notes that obstruent voicing is stress-sensitive; this has not been observed for Chuxnabán Mixe. Only sound changes that are complete can show regular patterns; the system present in Chuxnabán Mixe is clearly dynamic.

This work intends to advance the study of Mixean languages manifesting similar patterns and to lay the ground for future phonological analyses of this and other Mesoamerican languages. Further studies are needed to fully understand these assimilatory processes and what influences their variation. For example, more affixes and clitics need to be studied and the factors impacting full versus partial voicing or devoicing need to be analyzed. Furthermore, an exemplar model could be applied examining the paths of change by analyzing the frequency of occurrence of the observed patterns. Moreover, an optimality theory approach ranking the identified constraints may shed some further light on these processes.

6. References

- Bickford, Albert J. 1985. 'Fortis/lenis consonants in Guichicovi Mixe: a preliminary acoustic study.' *Work Papers of the Summer Institute of Linguistics*, University of North Dakota 29: 195-207.
- Campbell, Lyle, Terrence Kaufman, Thomas C. Smith-Stark. 1986. 'Meso-America as Linguistic Area'. *Language*, Vol. 62, No. 3. 530-570.
- Chomsky, Noam and Morris Halle. 1968. *The Sound Pattern of English*. MIT Press.
- Crawford, John Chapman. 1963. *Totontepec Mixe Phonotagmemics*. Summer Institute of Linguistics, No. 8. University of Oklahoma.
- De La Grasserie, Raoul. 1898 (reprint 1968). *Langue Zoque et Langue Mixe: Grammaire, Dictionnaire*. Bibliothèque Linguistique Américaine, Tome XXII. Paris. (Reprint: Kraus, Nendeln, Liechtenstein).
- Dieterman, Julia. 2008. *Secondary palatalization in Isthmus Mixe: a phonetic and phonological account*. Summer Institute of Linguistics, Dallas, Texas.
- Hoogshagen, Searle. 1959. Three contrastive vowel lengths in Mixe. *Zeitschrift für Phonetik und allgemeine Sprachwissenschaft* 12: 111-15.
- Hoogshagen Noordsy, Searle And Hilda Halloran Hoogshagen. 1997. *Diccionario Mixe de Coatlán Oaxaca*. Summer Institute of Linguistics. 2nd edition (1st edition 1993). Mexico.
- INEA (Instituto Nacional para la Educación del los Adultos). 1994. *Ayuk Ja'jy Y'ayuujk. Libro del Adulto, Población Mixe (Parte Baja)*. http://cdi.gob.mx/index.php?id_seccion=519.
- INEA (Instituto Nacional para la Educación del los Adultos). 1997. *Ayuk Ja'jy Y'ayuujk. Libro del Adulto, Población Mixe (Parte Alta)*. http://cdi.gob.mx/index.php?id_seccion=519.
- INEA (Instituto Nacional para la Educación del los Adultos). 1997. *Instructivo del Alfabetizador. Población Mixe, Oaxaca*. http://cdi.gob.mx/index.php?id_seccion=519.
- Jany, Carmen. 2006. Vowel Length and Phonation Contrasts in Chuxnabán Mixe. *Santa Barbara Papers in Linguistics 18: Proceedings from the 9th Annual Workshop on Native American Languages*. University of California, Santa Barbara.
- Jany, Carmen. 2007. Phonemic versus phonetic correlates of vowel length in Chuxnabán Mixe. *Berkeley Linguistic Society Proceedings 33S: Languages of Mexico and Central America*. University of California, Berkeley.
- Ladefoged, Peter And Ian Maddieson. 1996. *The Sounds of the World's Languages*. Blackwell, Malden, MA.
- Rhodes, Richard A. 2004. *Ongoing Sound Change in Sayula Popoluca*. Draft paper from 42nd CAIL, Boston, MA.
- Romero-Méndez, Rodrigo. 2008. *A Referenc Grammar of Ayutla Mixe (Tukyo'm Ayuujk)*. Dissertation, SUNY Buffalo.
- Ruiz De Bravo Ahuja, Gloria. 1980. *Mixe Tlahuitoltepec, Oaxaca*. Archivo de Lenguas Indígenas de México.
- Schoenhals, Alvin and Louise C. Schoenhals 1982. *Vocabulario Mixe de Totontepec*. Summer Institute of Linguistics. 2nd edition (1st edition 1965). Hidalgo, Mexico.

- Suslak, Dan. 2003. The Story of ö: Orthography and Cultural Politics in the Mixe Highlands. *Pragmatics* 13:4. 551-563.
- Torres Cisneros, Gustavo. 1997. *Mixes*. Comisión Nacional para el Desarrollo de los Pueblos Indígenas. <http://www.cdi.gob.mx>. Last accessed July 1, 2010.
- Van Haitisma, Julia Dieterman and Willard Van Haitisma. 1976. *A Hierarchical Sketch of Mixe as spoken in San José El Paraíso*. Summer Institute of Linguistics, No. 44. Mexico.
- Wichmann, Søren. 1995. *The Relationship among Mixe-Zoquean Languages of Mexico*. University of Utah Press, Salt Lake City.

¹ This work was in part supported by a Pilot Project Grant (PPG0044) from the Endangered Languages Documentation Programme (ELDP) of the Hans Rausing Endangered Languages Project at SOAS, University of London. The author also wishes to express gratitude to the Mixe community in Chuxnabán, in particular to the speakers who shared their knowledge and provided the data for this study.