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Phrase-final glottals in Tlachichilco Tepehua

James K. Watters

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1 Introduction

The Totonac-Tepehua language family, as its name suggests, consists of two branches of languages and dialects: Totonac and Tepehua. Throughout the language family one of the phonological features of special interest in both phonology as well as morphosyntax is the form and funciton of laryngealization, manifest as laryngealized vowels, ejectives, and glottal stops. This paper will present alternative understandings of the glottal stop that occurs at the end of phonological phrases in the Tlachichilco variant of Tepehua, argue for one of two possible analyses, and discuss some of the wider implications.

In Tlachichilco Tepehua, all words that end with a glottal stop in phrase-final position are preceded by a perceptually short, stressed vowel ((1a), (2a), and (3a)). When not found in phrase-final position, the vowel is long and the glottal stop is absent ((1b), (2b), and (3b)).

(1) a. kimaka? "my hand"
b. kimakaak'an "our hand"

(2) a. maaqamaay haaka yuu čaana? "s/he likes bananas that are ripe"
b. maaqamaay čaanaa haaka "s/he likes ripe bananas"

(3) a. kamina? "s/he will come"
b. kaminaača "s/he will come (then/already)"

There are two possible analyses. The first, followed by Herzog (1974) and Smythe Kung (2007) for Huehuetla Tepehua and by MacKay and Trechsel (forthcoming) for Pisaflores Tepehua, is to include the phrase-final glottal stop as part of the lexical representation, and posit a rule that deletes the glottal stop when occurring phrase-medially, with concomitant lengthening of the vowel. I will call this the underlying (final) glottal analysis:

(4) V? --> VV / _ (|) C

This paper argues for the other analysis in Tlachichilco Tepehua: a rule of phrase-final glottal stop insertion following a long (and, thus, stressed) vowel, with perceptual shorten-

ing of the vowel. I presented this as a post-lexical rule in earlier work Watters (1988:538) (operating at the same level as rules that optionally delete final short vowels phrase-medially). The rule can be stated as in (5):

(5) VV --> VVʔ / _]ɸ

That is, this glottal stop serves to mark the boundary of a phonological phrase, as has been reported for some other languages (see Blevins 2008) As we'll see, such an account is most similar to that given by Teresa McFarland for phrase-final laryngeals in Filomena Mata Totonac (2009). A survey of several of these languages in Hyman (1988) show that morphosyntactic and pragmatic constraints often play a role in determing where phrase-final glottals will be inserted. In Tlachichilco Tepehua, such glottal-insertion is a purely phonological process. More recently, Hyman (2008) has presented instances from Tikar (Bantoid) and Grassfields Bantu languags in which lexical forms that end in glottal stop only display the glottal stop in phrase-final position; phrase-medially the glottal stop is lost or changed to another consonant, just as the underlying glottal analysis would have it for Tepehua. However, in the cases discussed by Hyman, the evidence clearly shows that the phrase-final glottal stop is a diachronic reflex of an earlier oral consonant and/or results from the loss of a final vowel. In Tlachichilco Tepehua there is no evidence of an earlier segmental source for these phrase-final glottal stops.

I'll present two types of evidence for the glottal insertion analysis. The first concerns the distribution of glottal stop and long vowels in Tlachichilco Tepehua: if we were to assume the underlying glottal stop analysis, we would have to assume two asymmetries in the underlying or lexical representations, as I will try to show.

Second, in these forms the relevant vowel displays features of a long vowel in the language regardless of position: it is clearly long when phrase-medial, with the less-centralized vowel quality characteristic of long vowels; and, when phrase-final, although it is perceptually short preceding the glottal stop, the vowel maintains the formant characteristics of longp vowels and displays a temporally long wave-form but with laryngeal features.

2 Vowel length and constricted glottis in Tlachichilco Tepehua

All languages in the Totonac-Tepehua family, if not synchronically limited to three vowel positions, clearly had only three vowel positions until recently: /i/, /a/ and /u/. There is a contrast between long and short vowels (although minimal pairs are rather uncommon).[1]

(6) a. k'atsaa-ɬ
know-PFV
"s/he knew it"

b. k'atsa-ɬ
feel-PFV
"s/he felt it"

(7)

ʃqan	"fly"
ʃqaan	"corn leaf"

(8) a. ki-laqts'i-ɬ
1obj-see-PFV
"s/he saw me"

b. kii-laqts'i-ɬ
RET-see-PFV
"s/he went and saw it and returned"

(9) a. taʃtu-ɬ
exit-pfv
"s/he went out"

b. tanuː-ɬ
enter-PFV
"s/he went in"

Furthermore, throughout the language family, there is laryngealization or glottalization. In most Totonac varieties, this laryngeal component is found toward the end of the syllable; in all three Tepehua variants, however, it is realized early in the syllable, often in the form of ejectives, sometimes as implosives. In addition to distinguishing lexical items, such glottalization is also one marker of second person subject:[2]

[1]The following abbrevations are used:COM = comitative, FUT = future, IPFV = imperfective, IRR = irrealis, NMLZ = nominalizer/nominalization, PFV = perfective, PL = plural, PRF = perfect, PST = past, RET = return, SBJ = subject.

[2]In Pisaflores, /p'/ and /t'/ are most often realized phonetically as implosives rather than as ejectives. The same is reported for Huehuetla by Smythe Kung (2007)

(10) a. ɬtata-y
sleep-IPFV
"s/he sleeps"

b. ɬt'at'a-y
sleep(SBJ)-IPFV
"you(sg.) sleep"

In addition to the constricted glottis in ejectives such as those in (10), a full glottal stop is found intervocalically in many forms:

(11)

ˈʃtaʔati	petate (mat)
ɬpoʔoɬ	flattened (e.g. a ball)

However, in TT, the glottal stop is never found in syllable-final position except at the end of a phonological phrase--the phenomenon that this paper is meant to address.

3 Phrase-final constraint

There is a general constraint in TT against phrases ending in a voiced vowel:

(12) *V [+voice] /_]ɸ

When a phrase ends in a short (and, therefore, unstressed) vowel, that vowel must be voiceless. For final CV syllables in which the onset is a voiceless consonant, this is straightforward:

(13) mintạ̥
min-ta
come-PRF
"s/he is coming"

(14) stapụ̥
stapu
"bean(s)"

When a phrase ends in a short vowel and the onset of the syllable is a voiced consonant, preceded by a voiceless consonant, the entire syllable is devoiced:

(15) a. hikm̥i̥
hikmi
"fire"

b. p'aʃn̥i̥
p'aʃni
"pig"

c. paʃɸi̥
paʃ-wi
bathe-1plsbj
"We (INCL) bathed."

There are words in Tlachichilco Tepehua that sound like they end in a voiced vowel, but are actually /h/-final. Word-final /h/ is often inaudible when phrase-final, but is clearly audible when followed by an affix or clitic or elsewhere phrase-medially, as shown in the following minimal pairs found throughout the language family:

(16) kin-kukuh
1poss-sand
"my sand"

(17) kin-kukuh-k'an
1poss-sand-plposs
"our sand"

Compare:

(18) kin-kuku̥
1poss-uncle
"my uncle"

(19) kin-kuku-k'an
1poss-uncle-plposs
"our uncle"

Words that are borrowed from Spanish that end in an unstressed vowel have phonetic characteristics of Tepehua words ending in a Vh sequence when in phrase-final position.[3] This is no doubt why such borrowed forms manifest the presence of an epenthesized final /h/ -- a process that applies at the word-level rather than at the phrase-level. [4]

(20) chiitaj
tʃiːtah
machete

(21) moliinoj
moliːnoh
molino

[3]This is similar to the kind of listener-induced sound change discussed in Ohala 1981. The listener faithfully copies the phonetic form and then misapplies the rule that reconstructs a final /h/ for words with final voiced short vowels.

[4]Some speakers consistently write the final /h/ (orthographic j) phrase-finally as well as phrase-medially. Others only write it phrase-medially.

(22) kumpaarej
kumpaːreh
compadre

(23) presidenciaj
presidensiah
presidencia

Because of the presence of a final /h/ (orthographic j), all these forms meet the constraint in (12).

There are other instances where the basic inflectional morphology might seem to require a final voiced short vowel. For example, the imperfective suffix, -ya, can follow the devoicing pattern found in (15) when in an environment that licenses such devoicing. Thus, in (24), below, the alternate forms of the imperfective suffix are voiceless but overt: -ya (the underlying form), -'a, and, in (25), -a.[5] when it's followed by a suffix. However, when it follows a verb stem that ends in a voiced segment and there is no following suffix, there is a word-level process that removes what would be the offending segment. Thus, in forms such as (26) , the null form of the suffix occurs and the phrase-final constraint is not challenged. (In a derivational model, this would be the result of a rule deleting word-final short vowels when they are preceded by a voiced consonant; see Watters 1980)

(24) paːstak-yạ̥ OR paːstak-'ạ̥
think-IPFV
"s/he thinks"

(25) min-aː-w
come-IPFV-1plsbj
"we come"

(26) min-0
come-IPFV
"s/he comes"

What happens when the phrase ends in a form with a final (underlying) long vowel? If we follow the "inserted glottal stop" analysis, the constraint is satisfied by the glottal-insertion rule, (5). If we follow the "underlying glottal" analysis, the question is moot--long vowels never occur in phrase-final position. This brings us to the distributional anomaly that I think is an inevitable complication if we assume the underlying glottal analysis.

First consider the glottal insertion analysis. No extra stipulations need to be made regarding the shape of underlying or input forms from the lexicon. There is a general rule that doesn't allow /ʔ/ in syllable-final position -- something that must be noted in any account. Otherwise, only rule (5) is required.

For the underlying glottal analysis, the constraint against syllable-final /ʔ/ requires an exception clause: /ʔ/ cannot occur in syllable-final position except at the end of words. Furthermore, a restriction on the distribution of long vowels has to be added, specifically,

[5]The /a/ in minaaw is lengthened following a regular rule of vowel-lengthening preceding a suffix.

no long vowels may occur at the end of words. Then the rule (4) applies, giving an output in which syllable-final /ʔ/ is only found phrase-finally and long vowels are only restricted from occurring in phrase-final position.

In summary, the glottal-insertion analysis allows for a simpler account of the distribution of /ʔ/ and long vowels.

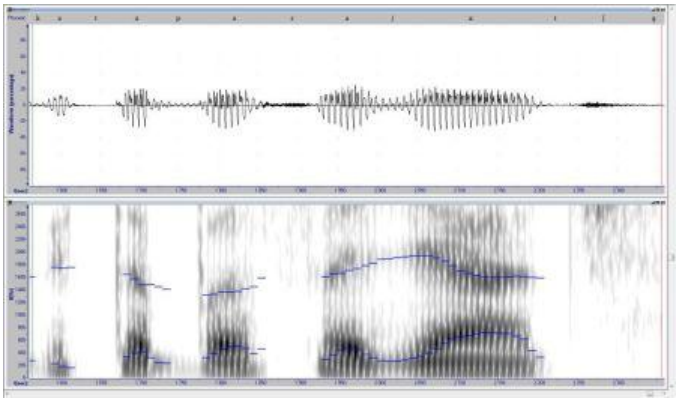
4 Features: acoustics and length

Further evidence for the glottal-insertion analysis, i.e. an analysis that these phrase-final glottals are underlyingly long vowels in phrase-final position, comes from the features of the final vowel itself.

The long-short vowel distinction in TT is accompanied by a slight but noticeable distinction in vowel position, the short vowels tending to be more centralized than their long counterparts.[6] This is somewhat more noticeable with the /a/ vs. /aa/ distinction: the first formant for /aa/ is typically between 500-800 hertz, whereas the first formant for short /a/ is usually between 400-600 hertz. This can be seen in the token in (27) and (28), a form that everyone agrees has a short /a/ in each of the first four syllables and a long /aa/ in the fifth syllable. The final voiced syllable is the future tense suffix, with primary stress (see Watters (1980), followed by the clitic, =cha, so in this case the long vowel is not phrase-final.

(27) ka-tapasa-ya:=tʃa
IRR-happen-FUT=already
"it will happen (soon)"

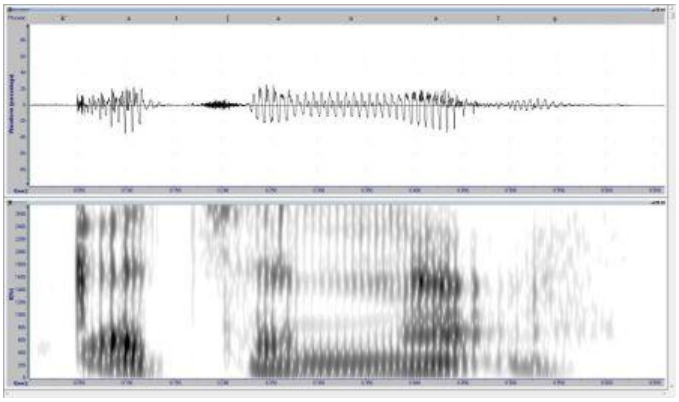
(28)



Now consider the utterance in (29) and (30) by the same speaker. The verb again ends in the future tense suffix but this time, rather than followed by the clitic, =cha, it's in phrase-final position. Again, we find the first formant is slightly higher--a feature of the acoustic signal of the final vowel that suggests it is a long /a:/ rather than a short /a/:

[6] Aschmann reported for Totonac of Zapotitlán that "the long vowels have a tendency to be produced at a lower tongue position than their corresponding short vowels. This is most noticeable with the vowels /a/ and /a:/" (1946:35)

(29) k'atʃanaʔa̱
k-ʔatʃan-aː
1sub-be.happy-fut
"I will be happy"

(30) 

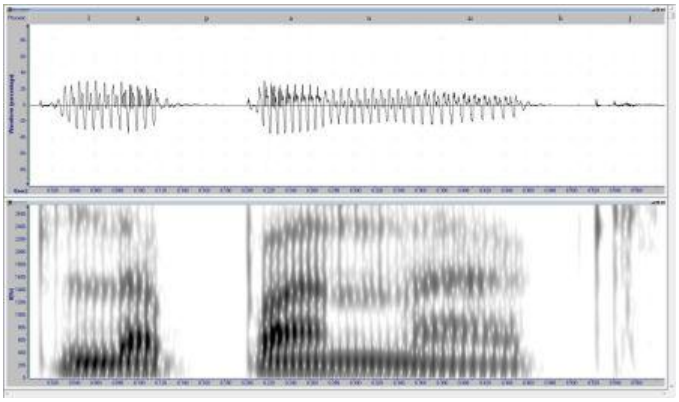
The position of F1 for the pre-glottal vowel looks like the F1 associated with long vowels. This supports the claim that what we have here is, in fact, a long vowel--even though it is perceptually short due to the insertion of the glottal stop at the end of the phrase.

There are two complicating factors that weaken this particular argument for the glottal-insertion analysis. The first mitigating factor is the simple fact that the scattering of F1 across samples of long and short /a/ from different speakers does not show a fully consistent distinction in vowel height. There is considerable overlap in the readings of F1 between the long and short versions of the vowels and, as one might expect, a fair amount of variation among speakers and between utterances of the same speaker.

Second, all such final vowels are stressed and a typical phonetic feature of Tepehua stress is heightened pitch. Preceding the phrase-final glottal the pitch is raised even more noticeably due to the glottal constriction. (Likewise, there are typically spikes in the pitch contour immediately following ejectives.) It has been shown that a higher F0 can result in an increase in F1 (see, for example, Syrdal and Steele 1985 and Chládková et al (2009)). Indeed, when we look at samples in which a syllable with a short /a/ is stressed and an adjacent syllable with a long /a:/ is unstressed, the difference in F1, which is already slight, is often leveled:

(31) la'panaːki
person

(32)



In (32), while the short /a/ of the first syllable does display the expected lower F1, the short /a/ of the second syllable--stressed, with higher pitch--displays an F1 closer to the long, unstressed /a:/ in the final voiced syllable. The higher pitch in stressed syllables and from adjacent glottal constriction somewhat mitigate my argument that vowels preceding phrase-final glottals are underlyingly long vowels simply because they display formant features characteristc of long vowels.

However, looking again at (29), we see another feature that suggests the final vowel is lexically a long vowel: the persistance of the vowel beyond the constriction of the glottis, in a voiceless form. Such a persistance or rearticulation of the vowel after the glottal stop, is found regularly in phrase-final position and is salient enough that native speakers often write such forms as a VʔV sequence, a point I'll return to. This suggests that the phrase-final vowel is--contrary to the analyst's perception--not a simple short vowel but rather has the duration expected of a stressed long vowel, interrupted by a constricted glottis.

In summary, we can say the phonetic facts are consistent with the inserted glottal stop analyis. There are two acoustic cues that support treating the phrase-final vowel-glottal stop sequence as an underlyingly long vowel: the formant features are consistent with those we expect of a long vowel and the duration of the vowel--though interrupted by a constricted glottis--is also what we would expect of a long stressed vowel.

5 Nahuatl phrase-final glottal

It turns out that an analysis of phrase-final glottal stops as a rule of glottal-insertion parallels what has been reported for neighboring varieties of Náhuatl--the most important contact language for Tepehua prior to the Spanish conquest.

For Isthmus Náhuat, Wolgemuth commented that, "Glottal closure is a junctural feature. It occurs 1) preceding syllable-initial vowels and 2) followiong vowels before silence. It is phonetically similar but not identical to /ʔ/" (1969:2)

For Huasteca Náhuatl--the variety that borders the Tepehua region--Beller and Beller have noted that,

> Although glottal stop /'/ is a phoneme, most occurrences are predictable. It occurs before all vowel-initial words and between any two vowels that have a morpheme break between them. It also occurs final in a phonological phrase. (1979:204)

Karen Dakin tells me that dialects of Náhuatl that do not include /ʔ/ in their phonological

inventory, have vowel-final phonological phrases that are closed by a phonetic glottal stop. She says that

> the glottal consonant in "Classical" Nahuatl was described as a stop, but cross dialectally, a dialect will have either a glottal stop or a fricative as the realization of the glottal phoneme... In the cases where it is a fricative (h), there then tends to be a phrase final glottal stop inserted -- you always hear it when eliciting absolutive nouns that end in -tli or -li, for example.(p.c.)

That is, in those varieties of Nahuatl where /h/ rather than /ʔ/ is in the phonological inventory, a phrase-final glottal stop is inserted. The fact that Náhuatl, and more specifically, the variety that shares the Huasteca region with Tepehua, manifests the insertion of a phrase-final glottal stop provides support for the glottal-insertion analysis in Tepehua. Whether Tepehua and certain varieties of Totonac (see below) influenced Huasteca Náhuatl or, perhaps more likely, the other way around, this phrase-level phenomenon could be a stylistic feature of the region.

6 Psychological reality

A relevant question to ask in this context is, what evidence is there for native speaker judgment regarding phrase-final glottals? For example, would a speaker, if writing the language, recognize the final glottal stop--suggesting it is "phonemic" in some sense-- or would the phrase-final glottal be ignored. It turns out that most Tepehuas that have learned to write their language, including a representation of glottal stop, do write the phrase-final glottal. But this does not necessarily support the underlying glottal stop analysis.

Over the last three decades there have been attempts to encourage the writing of TT by speakers in the different communities, both formally in early education and informally, outside the classroom. The practical orthography used in both settings does not mark most instances of vowel length. For speakers of TT that have learned to write their language with some fluency, including the glottal stop, they will typically mark the presence of these phrase-final glottal stop, as well. Often they do this by writing a phrase-final sequence of vowel-glottal-vowel, reflecting the voiceless rearticulation of the vowel after the glottal stop mentioned in 4:

(33) ixt'altana'a (written)
ʔiʃ-t'aː-ɬtan-aː (underlying)
PST-COM--walk-NMLZ
"his/her companion"

(34) chaqa'a (written)
tʃaqaː (underlying)
"house"

The underlying forms are best analyzed as ending in a long vowel, even though native speakers are likely to write them as in (33) and (34). Such writing neutralized the contrast with words whose underlying form end in sequences of vowel-glottal-vowel:

(35) jatsi'i (written)
hatsiʔi
girl

(36) uch'o'o (written)
ʔu-tʃ'oʔo
eat(tr)-again(2sbj)
"you ate it again."

However, the difference between the final long vowel (VV) in forms such as (33) and (34) vs. the underlying vowel-glottal-vowel sequence in (35) and (36)is manifest when the stems are in non-final position:

(37) ixt'altanan (written)
ʔiʃ-t'aː-ɬtan-aː-n
3poss-COM--walk-NMLZ-PL
"his/her companions"

(38) chaqan (written)
tʃaqaː-n
house-PL
"houses"

(39) jatsi'in
hatsiʔi-n
girl-PL
"girls"

(40) uch'o'ocha
ʔu-tʃ'oʔo=tʃa
eat(tr)-again(2sbj)=already
"you already ate it again."

The plural forms in each of the first two, (37) and (38), shows the plural suffix, -n, is added to a long vowel; in (39) the plural suffix is added to a final VʔV sequence and in (40) the clitic is also clearly added to a VʔV sequence.

Ever since Sapir reported on the insights given by the spelling practices of native speakers in five languages he worked with, there has been a general agreement with his assessment of such spellings: "I have come to the practical realization that what the naive speaker hears is not phonetic elements but phonemes" ([1933]1949:47)[7]

[7]Over the intervening 75 years, the status of the "phoneme" has become problematic and more attention given to "underlying" or "lexical" forms (the "input" forms in OT) that may be more abstract. For data such as these, some might transfer Sapir's observations to something like lexical phonology and see these forms of

If we follow the concept of "phoneme" assumed at that time, these written forms are, indeed, reflecting phonemic rather than phonetic elements. However, I would argue that the phrase-final glottal stop is often written by Tepehua speakers simply because it is very salient to them and not because these spellings reflect the "underlying" representation. Once they have learned to write glottal stops and final voiceless segments, they often write the form of the /VʔV/ sequences in phrase-final position -- a phonemic representation in the classic sense. No doubt the tendency for native speakers to spell phrase-final stressed vowels this way represents some level of "psychological reality," but it does not help us decide between the glottal-insertion and the underlying glottal analyses.

7 Final glottal in Filomena Mata Totonac

Very relevant to our concerns here, is a recent study of the closely related language, Filomena Mata Totonac. It was noted earlier that phrases in Tlachichilco Tepehua can never end in a plain vowel. Interestingly, for FM Totonac, McFarland shows that

> Plain consonants are prohibited at the right edge of a phrasal boundary in FM Totonac.... FM Totonac has a postlexical process of glottal feature epenthesis at the right edge of words preceding a pause.

McFarland speculates that "the glottal stop is being lost as a phoneme in FM Totonac, and is being relegated to a role primarily as a marker of prosodic boundaries" (2009:28). Unlike Tepehua, McFarland says that "Except for a handful of lexical items, glottal stops and spread or constricted glottis features attached to consonants are limited to prosodic boundaries in FM Totonac, either at the left edge (preceding vowel-initial roots or prefixes) or at the right edge (prepausally)." (2009:49)

Regarding final vowels in FM Totonac, McFarland notes that "An epenthetic glottal stop also appears in citation form and pre-pausally, separating the two mora of a final long vowel"; and, similarly, that,"Final long vowels are glottalized, with the second mora of the vowel devoiced," and provides examples such as the following:

(41)

čiškú'u̯	"man"
stá'a̯	"s/he sells it"

(42)

nána'a̯	"mother"
qoolú'u̯	"old man"

Note these forms in FM Totonac are the same as the phonetic manifestation of the forms

writing as evidence that the vowel-with-glottal reflects the underlying or lexical form. ..However, as anyone who has experience in teaching the writing of a previously unwritten language to a native speaker can attest, often neither the "lexical" - "post-lexical" distnction nor the traditional "phonemic" vs. "nonphonemic" distinction correspond to the major dividing line in terms of the speaker's awareness of the sound system. Some allophonic distinctions can be more salient than certain phonemic distinctions. In both Tlachichilco Tepehua and Huehuetla Tepehua, the allophonic distinction between [β] and [w] seem to be more obvious for native speakers than phonemic distinctions in vowel length, for which the difference can be rather subtle.

in Tlachichilco Tepehua discussed above in 6. McFarland analyzes these forms as having underlying final long vowels with an epenthetic glottal stop when in phrase-final position, as I argue for in Tlachichilco Tepehua.

8 Implications

Whether one assumes the underlying glottal stop or the inserted glottal stop analysis has direct implications for analysis of lexical items as well as some suffixes in Tepehua. Here I will only focus on the shape of the future tense suffix, -yaa (if we assume an underlying long vowel) or -ya? (f we assume an underlying final glottal stop). This is of special interest because the other branch of the language family--the Totonac languages--have a future tense prefix, na-, but no future tense suffix. It's quite clear that the Tepehua future tense suffix has developed from the ProtoTotonac-Tepehua imperfective suffix, -ya.

8.1 Morphological analysis

In the Totonac branch of the language family, the future tense is marked by the prefix, -na, as in the following examples from the Highland variant:

(43) a. na-k-taʃtu-y
FUT-1sbj-exit-IPFV
"I will go out."

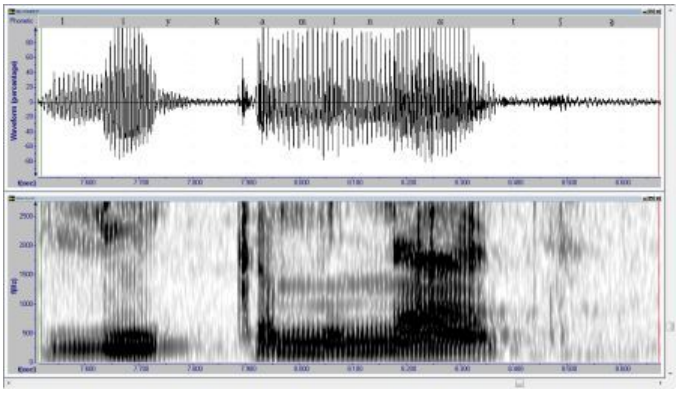
b. na-taʃtu-qoːʔ-y
FUT-exit-3pl-IPFV
"They will go out."

The future tense prefix is not found in any of the three Tepehua varieties. Instead, in addition to the imperfective suffix, -ya, there is also a future tense suffix -yaa (-yaʔ). For both suffixes, the y is lost following a voiceless consonant. Following a nasal, the imperfective suffix is null (allowing the verb to conform to the constraint given in (12), above). The future tense suffix maintains its vowel in any context, appearing with a long /aa/ when not phrase-final and as a perceptually short /a/ closed by glottal stop when at the end of a phonological phrase:[8]

(44) liy ka-min-aː=tʃa
tomorrow IRR-come-FUT=already
"tomorrow (already) s/he will come"

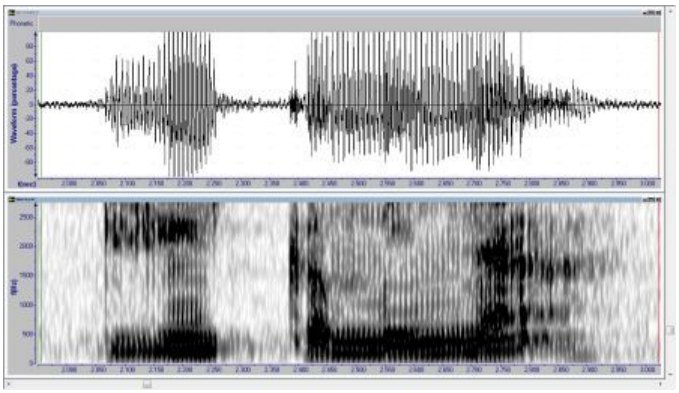
[8]The y is replaced by glottalization if the preceding consonant is a stop, e.g., paːstak-'a "s/he thinks."

(45)



(46) liy ka-min-a?
tomorrow IRR-come-FUT
"tomorrow s/he will come"

(47)



I have argued here for the glottal-insertion analysis, which, assumes the future tense suffix is -yaa., with -ya? the ouput of the rule. In Herzog (1974) and Smythe Kung (2007)--both of whom assume the underlying glottal analysis--the lexical or underlying form of the future tense suffix is considered to be -ya?. However, in MacKay and Trechsel (forthcoming) a futher level of analysis is given for the identical forms in Pisaflores Tepehua: the final glottal stop is presented as the future tense marker, preceded by the imperfective, -ya (forthcoming:24). That is, their gloss for (46) would, instead be

(48) ɬii ka-min-a-?
tomorrow IRR-come-IPFV-FUT
"s/he will com tomorrow"

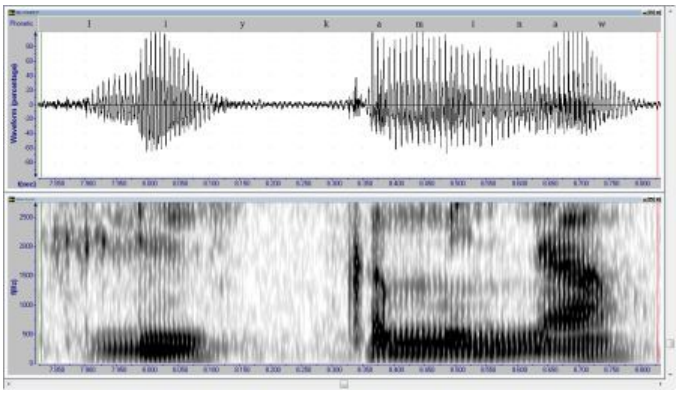
This analysis has to follow the same glottal-deletion and vowel-lengthening processes to get the form in (46) (a form that is the same in all three Tepehua variants). As a result, the segment that MacKay and Trechsel analyze as the future tense suffix is completely lost in such forms, yet the verb retains a future tense reading presumably through displaced contrast, i.e., the presense of the lengthened vowel. Such an analysis seems unnecessarily complex.

There is a further complication. As can be seen in (44), the future tense suffix has a long vowel preceding a clitic. However, it has a short vowel preceding a suffix. Preceding the same suffix, the imperfective, usually -ya, has a long /a:/. That is, there is a flip of vowel

length between the two forms, the otherwise long vowel of the future is short and the short vowel of the imperfective is lengthened:[9]

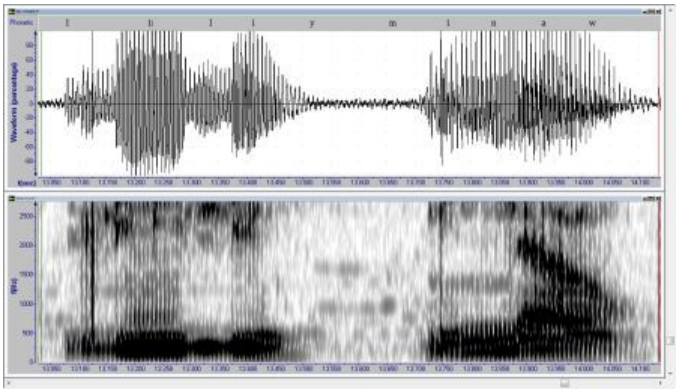
(49) ɬiy ka-min-a-w
tomorrow IRR-come-FUT-1plsbj
"tomorrow s/he will come."

(50)



(51) ɬiɬiy min-aː-w
daily come-IPFV-1plsbj
"s/he comes everyday."

(52)



The vowel-lengthening process in (51) seems to be operative throughout the language family. However, since the future tense suffix, -yaa (or -yaʔ) does not occur in Totonac the vowel-shortening process in (49) is unique to Tepehua.

It is most likely that this vowel-shortening rule functions to maintain the vowel-length difference between the imperfective and the future tense suffixes. Because the short /a/ of the imperfective is lengthened, an effective way to maintain the distinction between the

[9]For Huehuetla Tepehua, Smythe-Kung reports that the corresonding form has a long vowel in the future tense suffix:

(i) waa tz'iisin 7akminaaw
waa tz'iisin 7a-k-min-a7-w
FOC early IRR-1SUB-come-FUT-IPL.SUB
"We are going to come early."

imperfective and the future is to have a corresponding vowel-shortening rule applied to the future tense suffix. Note that this explanation is only possible if we assume the future tense suffix has an underlying long /aa/ that is shortened in forms such as (49)--and followed by an *inserted* glottal stop in forms such as (46).

8.2 Other Tepehua variants

My claims in this paper, arguing for the glottal-insertion analysis over the underlying glottal analysis have been limited to the Tlachichilco data. However, I feel confident that core of this analysis could also be applicable to the other Tepehua variants, providing a more elegant account of the facts. If so, the phrase-final glottals in all three Tepehua variants--as well as in some Totonac varieties, as McFarland (2009) has shown--would be, like the similar forms in Nahuatl, instances of a process operating at the level of the phonological phrase rather than part of the lexical or underlying form of the word.

Turning to other Tepehua varieties, in Pisaflores Tepehua the glottal stop insertion analysis would help explain the difference between two kinds of word-final glottal stops found there. As I mentioned at the the beginning, in Tlachichilco Tepehua, syllable-final glottals are only found at the end of phonological phrases. However in Pisaflores Tepehua (and, according to Smythe Kung 2007 in Huehuetla, as well), among virtually all speakers younger than 60 years of age, the uvular stop, /q/, has been replaced by /ʔ/. As a result, various forms that once ended in /q/ now end in glottal stop. So now we have two kinds of final glottals in Pisaflores and Huehuetla: the kind discussed in this paper, that alternate with a long vowel form phrase-medially and the kind of syllable-final glottal that remains even in phrase-medial position.

Clearly, for the speakers of these other two variants, there is no general constraint against syllable-final glottal stops phrase-medially. If we were to assume the underlying glottal analysis, we would have to explain why some syllable-final glottals are deleted (with compensatory lengthening of the preceding vowel) and others simply stay put.

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