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STEP-UP TERRACE TONE IN ACATLÁN MIXTEC (MEXICO)

Eunice V. PIKE and Kent WISTRAND

1. Introduction

The tone system of the Acatlán dialect of Mixtec[1] (Mexico) is of special interest in that in a sequence of syllables, there may be a step-up of tone which suggests, in reverse, the 'terrace' downstep of tone described for Africa by Welmers[2]. The step-up of tone is all the more startling since another dialect of Mixtec (San Juan Coatzospan) has a system of downstepping terrace tone[3].

In the Acatlán dialect, the sequence of tones which step up is in conflict with the intonation downdrift which may occur when there is a sequence of low tones.

The contrast of the three tones high, mid, and low is as commonly defined, but there is a fourth tone which we call 'step-up' which is higher than any contiguously preceding syllable. A sequence of step-up tones is a sequence of successively higher tones. A high tone which follows the

[1] The data in this paper were gathered during the period from 1962 to 1967 on field trips to a town about nine miles from Acatlán de Osorio in the state of Puebla, México. The principal informant was Teófilo Martínez, a 47-year-old bilingual from the town of Xayacatlán de Bravo. Three towns, Xayacatlán de Bravo, San Jerónimo Xayacatlán, and Gabino Barreda, with a total of approximately 5,000 inhabitants, speak essentially the same dialect. They are approximately eight miles from each other. In general, Kent Wistrand provided the language data and is responsible for the analysis of the segmental phonemes; Eunice V. Pike is responsible for the tone analysis and presentation of the material. We wish to acknowledge our indebtedness to Miss Muriel Perkins, and Mr. and Mrs. Melvin Carson, for the use of their field notes.

[2] W.E. Welmers, Tonemic, Morphotonemics, and Tonal Morphemes, General Linguistics, 4.1–9 (1959). See also Paul Schachter, Phonetic Similarity in Tonemic Analysis with Notes on the Tone System of Akwapim Twi, Language, 37.231–38 (1961), and J.M. Stewart, The Typology of the Twi Tone System, (with comments by P. Schachter and W.E. Welmers), Bulletin of the Institute of African Studies 1.1–67 (1964).

[3] Chapter 8, of this volume.

step-up tone is level with it, but higher than a high which precedes the step-up tone.

The step-up tone is rare in basic allomorphs, but is frequent in non-basic allomorphs. It has a limited distribution in that it never occurs postpause; it follows only high tone or another step-up tone. (As a part of basic allomorphs, it occurs only in verbs of Class A, see 4.1, with the tone sequence high, step-up.)

Acatlán Mixtec has an intricate system of tone sandhi which we have divided into five subsystems. The tone sandhi which causes the step-up tone is part of two subsystems. The sequence of step-up tones which occurs when basic high tones change to step-up tones (see 5.5) is restricted for the most part to Class A morphemes. There is also a sequence of step-up tones which is caused for the most part by Class C morphemes (see 5.7).

In looking for a historical cause for the step-up tone, we note with interest that most Class C Acatlán morphemes which are followed by allomorphs of a higher level are cognate with morphemes of Ayutla[4] Mixtec whose basic allomorphs end in /ʔ/, and that it is these morphemes which (in the Ayutla dialect) cause changes in the tone of following morphemes. Since, however, in Acatlán Mixtec, a sequence of Class A morphemes may have step-up tones, and since some Class B morphemes are occasionally followed by step-up tones, we have not as yet determined with certainty the historical cause of all of the rises.

A summary of the literature and the theoretical implications of a downstep tone (and by implication of a step-up) are discussed by K.L. Pike[5]. Gleason also gives a summary of various treatments of downstep[6].

[4] Leo Pankratz and Eunice V. Pike, Phonology and Morphotonemics of Ayutla Mixtec, IJAL, 33.287–99 (1967).

[5] Kenneth L. Pike, Tagmemic and Matrix Linguistics Applied to Selected African Languages, Final Report Contract No. OE-5-14-065, U.S. Department of Health, Education, and Welfare, Office of Education, Bureau of Research, Nov. 1966, pp. vi-288, esp. pp. 133–144. (Reprinted, minus Appendix, Summer Institute of Linguistics Publications in Languages and Linguistics, Norman, Oklahoma, 1970.)

[6] H.A. Gleason Jr., Review of Malcolm Guthrie, Ed. African Language Studies I, London, 1960, and I. Richardson, The role of Tone in the Structure of Sukúma, London, 1959, Language, 37.294–308 (1961).

2. Tone contrasts

In Mixtec of the Acatlán dialect there is a contrast of three tones (high, mid, and low) as they are commonly defined. In addition, there is a fourth phenomenon, a step-up tone, which we are defining not only as higher than a contiguously preceding high, but also as higher than a contiguously preceding step-up. That is, in a sequence of step-up tones, each is higher than the preceding one. In the following example[7], there are six levels of tone: nu^{M}kí^{H}ni^{H}te^{U}si^{U} ʔí^{U}da^{U} *if he will shoot the animal day after tomorrow*. With low tone indicated by 1, mid by 2, etc., the contour is 23345 67.

A high tone also needs a special definition in that when it contiguously follows step-up tone it is level with it. In the following example, the last word has a relatively level pitch: ʔa^{M}tí^{H}i^{H} vé^{U}ʔe^{H}ne^{H} *is his house small*? The contour is 233 444. ká^{M}ka^{M} ⁿdé^{M}e^{M}te^{H} ñú^{U}u^{H} *he will walk fast in town*. The contour is 22 223 44.

Because of the inherent characteristic of the step-up tone, a sequence of step-up tones becomes higher in pitch with each succeeding syllable. In elicited sentences, the step-up tone can occur in sequence as many as five or more times. In such a phrase, the final tone is extremely high. In text, however, a sequence of more than two step-up tones is rare: ʔa^{H}ma^{H}kí^{H}ni^{H}te^{U}si^{U} tą́^{U}ą^{H} *won't he shoot the animal tomorrow*? The contour is 333345 66. ma^{L}ñé^{H}e^{H}te^{U} sa^{U}kʷą́^{H}a^{H} ʔí^{U}da^{U} *he will not skin the deer day after tomorrow*. The contour is 1334 555 67.

This sequence of syllables, each one with a higher tone than the one preceding it, is a characteristic of step-up tone phenomenon; it is not determined by the attitude of the speaker, nor is it a contour characteristic of one of the higher phonological units.

There is a structural difference between a sequence of syllables each with step-up tone, and the intonational downdrift of a sequence of low tones. One difference is that the downdrift of a sequence of low tones is a contour characteristic of a long phonological unit (higher at the beginning, lower at the end), whereas pitch of a specific syllable with step-up tone is in relation to the pitch of the syllable preceding it. Another difference is that in careful, precise speech, the downdrift of low tones in an utterance tends to be lost (i.e. it becomes level), whereas the gaps between a sequence of step-up tones tend to be greater.

[7] Word stress is indicated by ´. Tone is written: low L, mid M, high H, and step-up U.

There is a contrast of four tone levels, but because of the restricted environment in which step-up tone occurs (it follows only H or another U), the only analogous environment in which the contrast of the four tones occurs is contiguously following a high or step-up tone: kʷáᴸʔaᴸ káᴴteᴴñaᴸ *it will throw it around much*, kʷáᴸʔaᴸ káᴴteᴴñaᴹ *she will dig much,* kʷáᴸʔaᴸ káᴴteᴴñaᴴ *it will dig much*, kʷáᴸʔaᴸ kʷíᴴkoᴴñaᵁ *she will carry much*; naᴹyáᴴt̨iᴴ ʔį́ᴴįᵁ *when I'm standing near*, naᴹyáᴴt̨iᴴ ʔį́ᴴįᴴ *when the hail is near*, naᴹyáᴴt̨iᴴ ʔį́ᴴįᴹ *when the skin is near*, naᴹyáᴴt̨iᴴ ʔį́ᴴįᴸ *when salt is near*; ʔiᴹkúᴴmiᴴteᵁ ⁿdóᵁʔoᵁ *he has us,* ʔiᴹkúᴴmiᴴteᵁ ⁿdóᵁʔoᴴteᴹ *he must suffer*, ʔiᴹkúᴴmiᴴteᵁ ⁿdóᵁʔoᴹ *he has mud brick*, ʔiᴹkúᴴmiᴴteᵁ ⁿdóᵁʔoᴸ *he has the basket.*

Following are a few of the sets of words which differ only by tone: ʔį́ᴹįᴸ *skin*, ʔį́ᴹįᴹ *one* or *hail*, ʔį́ᴸįᴸ *nine* or *salt*, ʔį́ᴸįᴴ *stands*; túᴸiᴹ *will appear*, túᴴiᴹ *appears*, túᴹiᴹ *will sting*, túᴸiᴴ *stings*; šíᴹčiᴹ *time*, šíᴴčiᵁ *shakes*, šíᴸčiᴴ *bathes*, šíᴸčiᴹ *ditch*, šíᴴčiᴹ *festers*; ⁿdóᴹʔoᴹ *will suffer*, ⁿdóᴸʔoᴴ *suffers*, ⁿdóᴹʔoᴴ *we incl.*, ⁿdóᴹʔoᴸ *tail*, ⁿdóᴸʔoᴹ *mud brick*, ⁿdóᴸʔoᴸ *type of basket*; tyáᴸaᴹ *man*, tyáᴹaᴹ *will write*, tyáᴸaᴴ *writes*; ką́ᴸą̨ᴸ *will be perforated*, ką́ᴴą̨ᴸ *is perforated*, ką́ᴹą̨ᴹ *will perforate*, ką́ᴸą̨ᴴ *perforates*, kaᴸaᴹ *will be accustomed to*, ką́ᴴą̨ᴹ *is accustomed to*; kóᴸoᴸ *snake* or *there is not*, kóᴹoᴹ *will be* (*sing.*), kóᴸoᴴ *no* (*response*); kʷáᴸʔaᴸ *many* or *will hold*, kʷáᴹʔaᴹ *pretty*, kʷáᴴʔaᴸ *holds*, kʷáᴸʔaᴹ *will give* or *make*, kʷáᴴʔaᴹ *makes*, kʷáᴸʔaᴴ *red*; yóᴸʔoᴸ *will twist*, yóᴴʔoᴸ *twists*, yóᴹʔoᴸ *rope*, yóᴹʔoᴴ *you sing. fam.*, yóᴸʔoᴴ *here, this.*

3. Tone variants

Low tone has a raised allotone when it occurs between two mid or high tones, and also when after a high: teᴹniᴸšíᴹnuᴹneᴹ *and he ran*, ʔaᴹkoᴴniᴸsą́ᴴʔą̨ᴸniᴴ *didn't you go*?

There is a general drift downward whereby, in relaxed speech, each low tone is usually lower than a preceding low: saᴸniᴸsą́ᴸʔą̨ᴸneᴸ níᴸnuᴸ *he has gone downstream.*

A mid tone has a wide range of allotones. (1) When between low tone and pause, mid tone is just slightly above low: ⁿǰíᴸkaᴹ *chest*. (2) When between two low tones, mid tone has a lowered allotone: niᴸsíᴹvuᴸ *you sing. fam. blow*. (3) In the tone sequence mid-mid-low, the mid preceding low has a raised allotone: ʔįᴹįᴹ díᴹtaᴸ *one tortilla*, ñúᴹʔuᴹ váᴸʔaᴹ *a good fire*. (There is, of course, contrast between the raised mid and

high: ʔi̱^{M}i̱^{M} yo^{M}ʔo^{L} *one rope*, ʔi̱^{M}i̱^{M} to^{H}ʔo^{L} *one stranger*.) (4) When the sequence mid-mid occurs prepause, the mid tone which is prepause fluctuates to a slightly raised pitch: ké^{M}e^{M} *will come out of*. (There is, of course, a contrast between the raised mid and high: kú^{M}nu^{M} *will weave*, kú^{M}nu^{H} *is weaving*.) (5) When following a step-up tone, a mid tone has a wide range of fluctuation. If there is a sequence of several step-up tones preceding the mid, then the mid allotone is higher than when only one step-up tone is preceding it: ma^{L}sí^{H}di^{H} dé^{U}ʔe^{M}ma^{M} *that son is not irritable* (the contour is 133 433) versus ko^{H}yó^{U} ʔi^{U}ni^{U}te^{M} *you're not afraid of him* (the contour is 34564).

A high tone has various allotones. (1) A high tone which occurs between low tone and pause is just slightly above mid tone: ^{n}dá^{M}ʔa^{L}ni^{H} *your sing. polite hand* versus lé^{M}ʔe^{L}ši^{M} *my rooster*. (2) When preceding a low or mid tone, a high tone has a raised allotone. There is, of course, contrast between a raised high and step-up: ma^{L}kú^{H}ši^{H}te^{H}ma^{L} *the man will not eat* versus ma^{L}kú^{H}ši^{Hn}do^{U}ma^{L} *the respected man will not eat*; ma^{L}kú^{H}ši^{H}si^{M} *the animal will not eat* versus ta^{L}kú^{H}či^{U}si^{M} *the animal has not yet moved*. (3) When the sequence high-high occurs prepause, the high which is prepause fluctuates to a slightly raised pitch: ká^{M}ni^{H}ne *he beats*. There is, of course, contrast between a raised high and step-up: ʔi^{M}ku^{H}mi^{Hn}da^{H} *we incl. have* versus ʔi^{M}ku^{H}mi^{Hn}da^{U} *you pl. fam. have*.) (4) When following step-up tone, high tone is approximately the same height as the step-up tone. The pitch of the high tone varies, therefore, in accordance with the pitch of the step-up tone.

In a sequence of step-up tones, each step-up tone is higher than the preceding one: na^{M}dá^{H}ña^{H}te^{U} wé^{U}i^{U} *when he will loose the bull* (the contour is 2334 56). The pitch interval between a sequence of step-up tones tends to lessen as the number in the sequence increases.

4. Morpheme classification

4.1. Each morpheme is a member of Class A, B, or C. The class of a morpheme is determined by the way it causes[8], or does not cause, tones of a following morpheme to be changed (see 5).

A morpheme of Class A, except for the changes described in 5.5,

[8] For footnote, see next page.

never causes[9] a following morpheme to change tone. Therefore, the allomorph which follows a Class A morpheme with final low tone is assumed to be the basic one.

When a Class B allomorph causes a following morpheme to change tone, except for the changes described in 5.5, the contiguous syllable of the resultant allomorph never has a higher tone than the Class B allomorph which causes the change.

When a Class C allomorph (other than those with LH or MH) causes a following morpheme to change tone, the contiguous syllable of the resultant allomorph usually has a higher tone than that of the final syllable of the Class C allomorph. (For exceptions, see 5.5, rules 10, 11, 13.)

Comparing the three classes we see that a sequence of stepped-up levels of tone is usually caused by Class C morphemes.

A class is not determined by any characteristic observable in isolation, since homophonous forms can belong to two, or even three different classes. For example, ʔi̱^{M}i̱^{M} (C) *hail*, ʔi̱^{M}i̱^{M} (B) *one*; ka^{M}te^{M} (A) *to throw out*, ka^{M}te^{M} (B) *to dig*; ko^{M}ko^{M} (C) *to swallow*, ko^{M}ko^{M} (B) *to burn*; ka^{M}di^{M} (A) *to obstruct*, ka^{M}di^{M} (B) *to ring*, ka^{M}di^{M} (C) *thoroughly dry*.

Class A morphemes are the most numerous. They occur with six patterns in disyllabic basic allomorphs (LL, HL, MM, LH, MH, HU), and with two monosyllabic basic allomorphs (L, H). Examples of Class A basic allomorphs: ku^{L}ʔi^{L} *woman's sister*, to^{H}ʔo^{L} *stranger*, ku^{M}ʔi^{M} *will be sick*, va^{L}ʔna^{H} *sleepiness*, ^{m}be^{M}lu^{H} *hat*, da^{H}te^{U} *is being shorn*, ka^{L} *more*, ni^{H} *you sing. polite*.

Nonbasic Class A allomorphs occur with M, U, HH, UL, UH, or UU. They occur as a result of tone sandhi as in the following examples. M: va^{L}ʔa^{M} (B) *good* + ka^{L} (A) (rule 5)[10] *more* > va^{L}ʔa^{M}ka^{M} *very good*. U: k^{w}i^{L}ta^{H} (A) *will be weak* + ni^{H} (A) (rule 16) *you sing. polite* >

[8] Among the speakers of Acatlán Mixtec, there are some differences of morpheme classification. For example, many speakers use sa^{L}ʔnu^{H} *old* as belonging to Class B, whereas a few people use it as belonging to Class A. The pronoun ^{n}zya^{L} *you pl. polite* is used by most as belonging to Class A, but by some as belonging to Class C. Some speakers use certain LH (B) verbs and modifiers as belonging to Class III, while others use them as belonging to Class II. Examples in which Class II varies with Class III: ka^{L}ʔnu^{H} *large*, ʔi̱^{L}i̱^{H} *standing*, ši^{L}ši^{H} *eating*.

[9] There is one exception. The Class A proclitics ña^{L} *thing* and te^{L} *liquid* cause a modifier LL (A) to become HL. Example: ña^{L} (A) *thing* + vi^{L}di^{L} (A) *sweet* > ña^{L}vi^{H}di^{L} *a sweet thing*.

[10] In order to facilitate the understanding of the examples, we have placed the number of the pertinent rule beside the morpheme that is changed.

$k^{w}í^{L}ta^{H}ni^{U}$ *you will be weak.* HH: $kú^{L}mi^{L}$ (C I) *four* + $yá^{M}vi^{M}$ (A I) (rule 14) *gravehole* > $kú^{L}mi^{L}$ $yá^{H}vi^{H}$ *four graveholes.* UL: $tí^{M}i^{M}$ (B) *will grab* + ni^{H} (A) *you sing. polite* + $tó^{H}ʔo^{L}$ (A) (rule 16) *stranger* > $tí^{M}i^{M}ni^{H}$ $tó^{U}ʔo^{L}$ *grab the stranger.* UH: $^{n}dú^{M}ku^{M}$ (C I) *will look for* + te^{M} (C) (rule 12) *third pers. masc. fam.* + $yá^{M}vi^{M}$ (A I) (rule 15) *gravehole* > $^{n}dú^{M}ku^{M}te^{H}$ $yá^{U}vi^{H}$ *he'll look for the gravehole.* UU: da^{M} (C) *causative* + $čá^{L}ʔma^{L}$ (C I) (rule 6) *will be crushed* + si^{M} (C) (rule 12) *animal pronoun* + $^{m}bé^{M}lu^{H}$ (A) (rule 16) *hat* > $da^{M}čá^{H}ʔma^{L}si^{H}$ $^{m}bé^{U}lu^{U}$ *the animal will crush the hat.*

Class A allomorphs with tones H, MH, HL, or HU are sometimes basic and sometimes nonbasic.

Class B morphemes (except for verbs with HM) are either level in tone or have a tone pattern in which the second syllable is higher than the first. Basic allomorphs occur with M, LM, LH, MM, or HM. Examples: tu^{M} *again*; $ví^{L}ši^{M}$ *cold*, $^{n}zí^{L}ʔi^{M}$ *will enter*; $ší^{L}ka^{H}$ *walking*, $ká^{L}ʔnu^{H}$ *large*; $vé^{M}ʔe^{M}$ *house*, $ká^{M}ka^{M}$ *will walk*; $^{n}zí^{H}ʔi^{M}$ *entering.*

Nonbasic Class B allomorphs occur with H, U, MH, HH, HU, UH, or UM. They occur as a result of tone sandhi as in the following examples. H: $dú^{M}ka^{H}$ (B III) *thus* + ni^{M} (B) (rule 14) *just* > $dú^{M}ka^{H}ni^{H}$ *just thus.* U: $né^{L}či^{L}$ (C I) *person* + $ʔi^{L}kú^{H}mi^{H}$ (C) *has* + tu^{M} (B) (rule 15) *again* > $né^{L}či^{L}$ $ʔi^{L}kú^{H}mi^{H}tu^{U}$ *the person who has (it) again.* MH: na^{M} (B) *as* + $ká^{L}ʔnu^{H}$ (B II) (rule 10) *large* > $na^{M}ká^{M}ʔnu^{H}$ *as large as.* HH: $kú^{L}mi^{L}$ (C I) *four* + $vé^{M}ʔe^{M}$ (B I) (rule 14) *house* > $kú^{L}mi^{L}$ $vé^{H}ʔe^{H}$ *four houses.* UH: $né^{L}či^{L}$ (C I) *person* + $ʔi^{L}kú^{H}mi^{H}$ (C) *has* + $ví^{M}či^{M}$ (B I) (rule 15) *now* > $né^{L}či^{L}$ $ʔi^{L}kú^{H}mi^{H}$ $ví^{U}či^{H}$ *the person who has (it) now.* UM: ni^{L} (A) *past tense marker* + $ší^{M}ni^{M}$ (A I) (rule 1) *see* + te^{M} (C) *third pers. masc. fam.* + $ʔí^{M}i^{M}$ (C I) (rule 14) *hail* + $ví^{L}ši^{M}$ (B) (rule 9) *cold* > $ni^{L}ší^{M}ni^{L}te^{M}$ $ʔí^{H}i^{H}$ $ví^{U}ši^{M}$ *he saw the cold hail.*

The pattern HM when part of Class B morphemes is sometimes with basic and sometimes with nonbasic allomorphs.

Basic allomorphs of Class C morphemes occur with L, M, LL, ML, MM, or HL. Examples: $ši^{L}$ *with*; na^{M} *when*; $yú^{L}u^{L}$ *stone*, $dí^{L}ta^{L}$ *tortilla*; $^{n}zí^{M}ki^{L}$ *seed*, $dí^{M}ko^{L}$ *to sell*; $yú^{M}u^{M}$ *hard*, $sá^{M}a^{M}$ *new*; $čó^{H}ʔo^{L}$ *being boiled*, $^{n}zí^{H}i^{L}$ *being scorched.*

Nonbasic Class C allomorphs occur with H, U, HH, UL, UM, or UH. They occur as a result of tone sandhi as in the following examples. H: te^{L} (A) *personifier* + $ʔi^{L}kú^{H}mi^{H}$ (C) *has* + $ši^{L}$ (C) (rule 11) *with* > $te^{L}ʔi^{L}kú^{H}mi^{H}ši^{H}$ *the one who has (a thing).* U: $ʔi^{L}kú^{H}mi^{H}$ (C) (rule 2) *has* + te^{M} (C) (rule 12) *third pers. masc. fam.* > $ʔi^{M}kú^{H}mi^{H}te^{U}$ *he has.*

HH: ma^{L} (C) *negative* + kó^{M}ko^{M} (C I) (rule 14) *will swallow* + te^{M} (C) (rule 12) *third pers. masc. fam.* + ña^{L} (A) (rule 7) *thing pronoun* > ma^{L}kó^{H}ko^{H}te^{U}ña^{U} *he will not swallow it*. UL: ní^{H}ʔi^{L} (C) *succeeds in* + te^{M} (C) (rule 12) *third pers. masc. fam.* + kʷá^{H}ʔa^{L} (C) (rule 16) *fits in* + te^{M} (C) (rule 12) *third pers. masc. fam.* > ní^{H}ʔi^{L}te^{H} kʷá^{U}ʔa^{L}te^{H} *he succeeds in fitting in*. UM: ʔi^{L}kú^{H}mi^{H} (C) (rule 2) *has* + ^{n}da^{L} (C) (rule 11) *we incl.* + ^{n}zí^{M}ki^{L} (C) (rule 15) *seed* > ʔi^{M}kú^{H}mi^{Hn}da^{H} ^{n}zí^{U}ki^{M} *we have seed*. UH: ʔi^{L}kú^{H}mi^{H} (C) (rule 2) *has* + ^{n}da^{L} (C) (rule 11) *we incl.* + dí^{M}ʔi^{M} (C I) (rule 15) *mother* > ʔi^{M}kú^{H}mi^{Hn}da^{H} dí^{U}ʔi^{H} *we have a mother*.

Class C allomorphs with tones L, M, LL, or HL are sometimes basic and sometimes nonbasic.

4.2. There is another classification (Classes I, II, III) which cuts across Classes A, B, and C, but which affects only those morphemes whose basic allomorphs have the tone patterns LL, MM, or LH.

Morphemes which in the basic allomorph have the tone pattern LL are divided again into Class I versus II. They are divided in accordance with the tone patterns which occur in the nonbasic allomorphs. A morpheme with LL (I) has nonbasic allomorphs with ML, HL, or UL (see chart 2, col. 2), whereas a morpheme with LL (II) has nonbasic allomorphs with MM or HH (see col. 6). Some morphemes with LL (I) are Class A, and some are Class C, but morphemes with LL (II) are all Class C.

A morpheme MM (I) has nonbasic allomorphs with HH or UH (see col. 12), whereas a morpheme MM (II) has nonbasic allomorphs with HH or LL (see col. 9). Some morphemes with MM (I) are Class A, some Class B, and some Class C, but MM (II) morphemes are all Class C.

Morphemes with the tone pattern LH in the basic allomorph are divided into three classes. Class LH (I) – all Class A – is separated from LH (II or III) by the type of allomorph. Specifically LH (I) has nonbasic allomorphs with HU or UU (see col. 4). LH (II or III) have nonbasic allomorphs with LL, MM, HH, MH, or HU (see chart 1, and chart 2, col. 7).

In a sequence of two morphemes, the Class I versus II is divided into classes in accordance with the allomorph of the second morpheme, whereas the Class II versus III is divided into classes in accordance with the allomorphs of the first morpheme.

Morphemes with LH (II) differ from those with LH (III) in that a LH (III), but not LH (II), is changed to LL, MM, or HH when preceding

Chart 1
SUBSYSTEM 3, Regressive Change.

First Morpheme, basic or nonbasic allomorph	Second Morpheme, basic allomorph	
	L (C), H (A), LH (III)	LH (II), HL(verb), HM, HU
LH (II)	LL	LH
(III)	LL	LL
MH (II)	MM	MH
(III)	MM	MM
HU (II)	HH	HU
(III)	HH	HH
Covered by rules	3	4

The pertinent class and tones of the first morpheme (nonbasic as well as basic allomorphs) are listed in the rows at the left. The tones, and class if pertinent, of the second morpheme (basic allomorphs only) are listed in the columns at the top. The cells contain the sandhi tones of the first morpheme which occur when preceding a morpheme of the type specified for that column.

LL (II), LH (II), HL, H, M, or HU (see rule 4). Morphemes with LH (I) are all Class A; morphemes with LH (II) and LH (III) are all Class B.

4.3. There is an overlap between phonological and grammatical classification. In our data, basic allomorphs with the tone sequence MH are all Class A nouns. Those with the tone sequences HM are all Class B verbs. Those with HU are all Class A verbs. Except for LH, modifiers are composed of tone sequences whose basic allomorphs have only the tones L or M.

In monosyllabic basic allomorphs, no pronoun is Class B. Any pronoun or particle which has H is Class A.

Nouns are never Class II or III (they are only Class I), but verbs and modifiers may also be Class I. All MM (II) and LH (III) are modifiers. All LL (II) are verbs.

Other tone patterns do not seem to be restricted to any particular grammatical class.

Chart 2
SUBSYSTEM 4, Progressive Change.

First Morpheme, basic or nonbasic allomorph	Second Morpheme, basic allomorph												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	(A) L	(I) LL	LM	(I) LH	(C) L	(II) LL	(II,III) LH	(C) M	(II) MM	(B) M	ML	(I) MM	MH
Final M (B)	M*	ML			M	MM	MH	L					
Final H or U (B)	H*	HL			H	HH	HU		HH	H	HM	HH	HU
Final L (C)	H	HL	HM	HU				H	LL	H	HM	HH	HU
Final M (C)	H	HL	HM	HU	M	MM	MH	H		H	HM	HH	HU
LH or HM (C)	H*	HL			M	MM	MH			H	HM	HH	HU
H or U (C) or combination	U	UL	UM	UU	H	HH	HU	U	HH	U	UM	UH	UU
Covered by rules	5,6,7		8,9		10,11			12	13	14,15			

The pertinent class and tones of the first morpheme (nonbasic as well as basic allomorphs) are listed in the rows at the left. The tones, and class if pertinent, of the second morpheme (basic allomorphs only) are listed in the numbered columns at the top. The cells contain the sandhi tones of the second morpheme which occur when following a morpheme of the type specified for that row. If the cell is blank, the basic allomorph occurs there.

* If the second morpheme is not followed by M or H.

5. Tone sandhi

There is a system of tone sandhi whereby the tones of one morpheme affect the tones of another morpheme[11]. The domain of influence of one tone upon another is restricted to contiguous morphemes, but it is not restricted to contiguous syllables. The domain of the influence is the same when the two morphemes are parts of one word, as it is when they are parts of two words, but the domain of influence does not extend beyond pause.

There are five subsystems of tone sandhi: (1) A subsystem (5.1) in which a following morpheme affects a preceding Class A morpheme. (2) A subsystem (5.2) in which the tone of the allomorph is dependent upon its place postpause versus nonpostpause. This subsystem is restricted to morphemes with LL (II), and LH (II,III). (3) A subsystem (5.3) in which Class B morphemes with basic LH (II,III) are affected by a following morpheme. (4) A subsystem (5.4) in which Class B and Class C morphemes cause the tones of following morphemes to change. This is the most extensive subsystem. (5) A subsystem (5.5) in which a morpheme-initial H becomes U when contiguously following a morpheme-final H or U.

In an utterance, the tone-sandhi influence of one morpheme upon another progresses from left to right morpheme by morpheme. Descriptively, however, when two contiguous morphemes are under consideration, a regressive change (5.1, 5.3) takes place first, then a progressive change takes place. If the first morpheme is changed either regressively (5.1, 5.3), or progressively (5.2, 5.4), it is the allomorph which occurs as a result of that change which has influence upon the second morpheme (5.4, 5.5).

5.1. Class A morphemes may be changed by regressive sandhi.

Rule 1. When a disyllabic Class A allomorphic with a level pitch sequence precedes tones M or H, the second tone of the morpheme becomes L. That is, MM, HH, UH become ML, HL, UL respectively. ví^{M}u^{M}

[11] In this paper, we have not discussed three-syllable morphemes. For example, ka^{L}nú^{H}u^{H} (C) *on purpose*, ?á^{M}n$_{}$zi^{M}vi^{M} (C) *heaven*, sa^{M}kwá^{M}a^{M} (C) *deer*. We have not discussed tone sandhi changes within certain frozen combinations of morphemes, for example: di^{L}ni^{L}ñú^{L}u^{H} *Totoltepec*, di^{L}ta^{L}n$_{}$dú^{L}či^{H} *bean tamale*, ka^{M}?a^{L}yú^{L}i^{H} *mouth of a river branch*. Nor have we discussed numerous complex verb stems such as či^{M}n$_{}$dú^{M}?u^{M} (C) *to cause to lie*, da^{M}na^{M}k^{M}w^{M}i^{M}ty^{L}a (A) *to disperse*, ku^{M}si^{M}ki^{M}di^{L} (A) *to become infested*. Furthermore, the sandhi which occurs between a few of the verb prefixes and following stems needs additional study, e.g., nu^{H} *conditional marker*, ni^{L} *hortatory marker*, di^{L} *specifier*, ši^{H} *pluralizer*.

(A I) (rule 1) *corn plant* + $k^{w}á^{M}ti^{M}$ (C II) *small pl.* > $ví^{M}u^{L}$ $k^{w}á^{M}ti^{M}$ *small corn plants*; $sá^{M}ku^{M}$ (A I) (rule 1) *few* + te^{M} (C) *third pers. masc. fam.* > $sá^{M}ku^{L}te^{M}$ *few of them*; $ʔí^{M}tu^{M}$ (A I) (rule 1) *cornfield* + ni^{H} (A) *you sing. polite* > $ʔí^{M}tu^{L}ni^{H}$ *your cornfield*; ma^{L} (C) *negative* + $kú^{M}ni^{M}$ (A I) (rule 14 then rule 1) *will see* + $ña^{M}$ *third pers. fam.* > $ma^{L}kú^{H}ni^{L}ña^{M}$ *she will not see*; $ma^{L}di^{L}$ (C I) *negative specifier* + $ʔi^{M}$ ni^{M} (C I) (rule 14) *all over* + $kú^{M}tu^{M}$ (C II) (rule 13) *just* + $ñú^{M}u^{M}$ (A I) (rule 15 then rule 1) *town* + $k^{w}á^{M}ti^{M}$ (C II) *small pl.* > $ma^{L}di^{L}$ $ʔi^{H}ni^{H}$ $kú^{H}tu^{H}$ $ñú^{U}u^{L}$ $k^{w}á^{M}ti^{M}$ *not all over the small towns.*

5.2. The tone sequences LL and LH may change when postpause.

Rule 2. Basic LL (II) morphemes (all Class C) become MM when postpause. Basic LH (II, III) – but not LH (I) – become MH when postpause. $ña^{L}$ (A) *thing* + $^{n}dá^{L}ta^{L}$ (C II) (remains unchanged) *tears* + si^{M} (C) (rule 12) *animal pronoun* > $na^{L n}da^{L}ta^{L}si^{H}$ *what the animal tears*, but $^{n}dá^{L}ta^{L}$ (C II) (rule 2) *tears* + si^{M} (C) (rule 12) *animal pronoun* + a^{L} (A) (rule 7) *thing pronoun* > $^{n}dá^{M}ta^{M}si^{H}a^{U}$ *the animal tears it*; te^{L} (A) *he* + $sá^{L}ʔnu^{H}$ (B II) (remains unchanged) *old* > $te^{L}sá^{L}ʔnu^{H}$ *the old man*, but $sá^{L}ʔnu^{H}$ (B II) (rule 2) *old* + te^{M} (C) *third pers. masc. fam.* > $śa^{M}ʔnu^{H}te^{M}$ *he is old*.

5.3. Morphemes with a basic LH (II or III) are changed regressively in certain environments. The way the allomorphs are changed and the environments in which they change are depicted on chart 1.

Rule 3. The allomorphs LH (basic), MH (nonbasic), and HU (nonbasic) of Classes II and III become LL, MM, HH respectively when preceding L (C), H (A), or LH (III). See chart 1, col. 1.

Examples: $^{n}dá^{M}ʔa^{L}$ (C) *hand* + $ká^{L}ʔnu^{H}$ (B II) (rule 3) *large* + ni^{H} (A) *you sing. polite* > $^{n}dá^{M}ʔa^{L}$ $ká^{L}ʔnu^{L}ni^{H}$ *your large hand*; $kí^{M}si^{L}$ (C) *animal* + $ká^{L}ni^{H}$ (B II) (rule 3) *beating* + $^{n}da^{L}$ (C) *we incl.* > $kí^{M}si^{L}$ $ká^{L}ni^{L n}da^{L}$ *the animal that we are beating*; $tú^{M}u^{M}$ (A I) *lane* + $ká^{L}ni^{H}$ (B II) (rule 3) *long* + $yú^{L}kạ^{H}$ (B III) *that* > $tú^{M}u^{M}$ $ká^{L}ni^{L}$ $yú^{L}kạ^{H}$ *that long lane*; $yó^{L}ʔo^{H}$ (B III) (rule 2 then rule 3) *this, here* + $yú^{L}kạ^{H}$ (B III) (rule 10) *that, there* > $yó^{M}ʔo^{M}$ $yú^{M}kạ^{H}$ *here and there*; $dá^{M n}du^{M}$ (C I) *then* + $vé^{M}ʔe^{M}$ (B I) (rule 14) *house* + $ná^{L}ʔnu^{H}$ (B II) (rule 11 then rule 3) *large pl.* + ma^{L} (C) (rule 11) *previously referred to* > $dá^{M n}du^{M}$ $vé^{H}ʔe^{H}$ $ná^{H}ʔnu^{H}ma^{H}$ *then those large houses* ... (In the last example, the change in the tones of $ná^{L}ʔnu^{H}$ *large pl.* from LH to HU, rule 11, is obscured by the regressive lowering of the final syllable to H when preceding ma^{L} (C) *previously referred to*, rule 3.)

Rule 4. Allomorphs of Class III (but not Class II) with tone patterns LH (basic), MH (nonbasic), and HU (nonbasic) become LL[12], MM, and HH respectively when preceding LH (II) HL (verb but not noun), HM, or HU. See chart 1, col. 2.

Examples: ña^{L}(A) *thing* + yú^{L}ką^{H} (III) (rule 4) *there* + ^{n}dú^{L}u^{H} (B II) *is* + a^{L} (A) (rule 6) *thing* > ña^{L}yú^{L}ką^{L} ^{n}dú^{L}a^{H} [13] *that's it*; ma^{L}di^{L} (C I) *negative specifier* + dó^{L}ˀo^{H} (B III) (rule 4) *thus* + ką́^{H}ˀą^{L} (A) *speaks* + te^{M} (C) *third pers. masc. fam.* > ma^{L}di^{L}dó^{L}ˀo^{L} ką́^{H}ˀą^{L}te^{M} *he doesn't speak thus*; ma^{L}di^{L} (C I) *negative specifier* + k^{w}į́^{M}si^{L} (C) (rule 14) *only* + ni^{M} (B) (rule 14) *just* + dó^{L}ˀo^{H} (B III) (rule 11 then rule 4) *thus* + ^{n}dó^{H}o^{M} (B) (rule 16) *remains* + te^{M} (C) (rule 12) *third pers. masc. fam.* > ma^{L}di^{L}k^{w}į́^{H}si^{M}ni^{H} dó^{H}ˀo^{H} ^{n}dó^{U}o^{M}te^{L} *he doesn't just remain thus*.

5.4. The way in which Class B and Class C morphemes cause certain morphemes which follow them contiguously to change is depicted on chart 2. The specific rules by which the first of two morphemes causes the second to change are stated below. To make the examples easier to follow, beside each morpheme which changes is placed the number of the rule which applies to the change.

Rule 5. When following a Class B with a final tone M, then L (A), if not followed by M or H, and an LL (I) become M and ML respectively. See chart 2, col. 1 and 2.

Examples: ˀį́^{M}į^{M} (B I) *one* + dí^{L}ta^{L} (C I) (rule 5) *tortilla* > ˀį́^{M}į^{M} dí^{M}ta^{L} *one tortilla*; kú^{L}di^{M} (B) *will get dirty* + ve^{L} (A) (rule 5) *infant pronoun* > kú^{L}di^{M}ve^{M} *the baby will get dirty*, but kú^{L}di^{M} (B) *will get dirty* + ve^{L} (A) (does not change, rule 5) *infant pronoun* + tą́^{M}ą^{M} (A I) *tomorrow* > kú^{L}di^{M}ve^{L} tą́^{M}ą^{M} *the baby will get dirty tomorrow*.

Rule 6. When following a Class B with final tone H or U, or when following a Class C allomorph which has an L or M for at least one of its tones, then LL (I) becomes HL. In the same environment, L (A) becomes H, but after a Class B morpheme, or a Class C with LH or MH, it

[12] Sequences LHH, MHH, HUH when the final H is part of the morpheme ni^{M} (B) *quite* or te^{M} (B) *and* become LLL, MMM‘ HHH in these environments. For example, dú^{L}ką^{H} (B III) (rule 2 then rule 4) *thus* + ni^{M} (B) (footnote 12) *quite* + ki^{L}da^{H} (B II) (rule 10) *does* > dú^{M}ką^{M}ni^{M} kí^{M}da^{H} *doing quite thus*.

[13] Fusion of the verb stem with a following pronoun subject which has canonical shape V, or of a pronoun subject with a following pronoun object which has canonical shape V, is prevalent but not discussed in this paper.

comes H, but after a Class B morpheme, or a Class C with LH or MH, it becomes H only if not followed by M or H. See chart 2, col. 1 and 2.

Examples: ká^{L}ni^{H} (B II) (rule 2) *beats* + ne^{L} (A) (rule 6) *third pers. polite* > ká^{M}ni^{H}ne^{H} *he beats* (but in the following example, ne^{L} (A) does not change: ká^{M}ni^{H}ne^{L}te^{M} *he beats him*); ʔi̱^{L}i̱^{H} (B II) (rule 2) *stands* + ^{n}dá^{L}a^{L} (A I) (rule 6) *straight* > ʔi̱^{M}i̱^{H} ^{n}dá^{H}a^{L} *stands straight*; k^{w}á^{L}ʔa^{L} (C I) *many* + kú^{L}ʔi^{L} (A I) (rule 6) *sister* > k^{w}á^{L}ʔa^{L} kú^{H}ʔi^{L} *many sisters*.

Rule 7. When following a Class C which has no tone lower than H, then L (A) and an LL (I) become U and UL respectively. See chart 2, col. 1 and 2.

Examples: ma^{L} (C) *negative* + čí^{M}tu^{M} (C II) (rule 13, footnote 14) *will be filled* + kó^{L}ʔo^{L} (C I) (rule 7) *plate* > ma^{L}čí^{H}tu^{H} kó^{U}ʔo^{L} *the plate will not be filled*; ʔa^{M} (C) *interrogative* + dá^{M}ña^{M} (C I) (rule 14) *will loose* + ka^{L} (A) (rule 7) *more* + te^{M} (C) *third pers. masc. fam.* + si^{M} (C) (rule 12) *animal pronoun* > ʔa^{M}dá^{H}ña^{H}ka^{U}te^{M}si^{H} *will he loose the animal any more*?

Rule 8. When following a Class C allomorph which has an L or M for its final tone, then LM becomes HM, and an LH (I) becomes HU. See chart 2, col. 3 and 4.

Examples: k^{w}á^{L}ʔa^{L} (C I) *many* + dé^{L}ʔe^{M} (B) (rule 8) *child* > k^{w}á^{L}ʔa^{L} dé^{H}ʔe^{M} *many children*; dí^{M}ʔi^{M} (C I) *mother* + ^{n}zí^{L}ku^{M} (B) (rule 8) *will sew* > dí^{M}ʔi^{M} ^{n}zí^{H}ku^{M} *the mother who will sew*; kó^{L}o^{L} (C I) *there is not* + yá^{L}a^{H} (A I) (rule 8) *tongue* + si^{M} (C) *animal pronoun* > kó^{L}o^{L} yá^{H}a^{U}si^{M} *the animal has no tongue*; ^{n}dyá^{M}či^{M} (C I) *will blow away* + yá^{L}ka^{H} (A I) (rule 8) *dust* > ^{n}dyá^{M}či^{M} yá^{H}ka^{U} *the dust will blow away*.

Rule 9. When following a Class C allomorph which has no tone lower than H, then LM becomes UM, and an LH (I) becomes UU. See chart 2, col. 3 and 4.

Examples: na^{M} (C) *when* + kí^{M}ni^{M} (C I) (rule 14) *will shoot* + dé^{L}ʔe^{M} (B) (rule 9) *son* > na^{M}kí^{H}ni^{H} dé^{U}ʔe^{M} *when the son will shoot*; ʔa^{M} (C) *interrogative* + ví^{M}da^{M} (C I) (rule 14) *wet* + yá^{L}a^{H} (A I) (rule 9) *tongue* + ña^{M} (C) *third pers. fem. fam.* > ʔa^{M}ví^{H}da^{H} yá^{U}a^{U}ña^{M} *is the girl's tongue wet*?

Rule 10. When following a final tone M of Class B or Class C, or when following a Class C with LH or MH, then an L (C) becomes M, an LL (II) becomes MM, and an LH (II, III) becomes MH. See chart 2, col. 5, 6, 7.

Examples: ʔá^{M}na^{M} (A I) (rule 1) *who* + ^{n}dá^{M}ši^{M} (B I) *will loose* + ši^{L} (C) (rule 10) *with* + ^{n}da^{L} (C) (rule 10) *we incl.* > ʔá^{M}na^{L} ^{n}dá^{M}ši^{M}ši^{M}^{n}da^{M}

the person who will loose us; kʷíᴹkoᴹ (C I) *will carry* + ⁿdaᴸ (C) (rule 10) *we incl.* > kʷíᴹkoᴹⁿdaᴹ *we will carry*; dóᴹkoᴹ (B I) *but* + táᴸʔviᴸ (C II) (rule 10) *breaking* + teᴹ (C) (rule 12) *third pers. masc. fam.* + aᴸ (A) (rule 7) *thing pronoun* > dóᴹkoᴹ táᴹʔviᴹteᴴaᵁ *but he is breaking it*; díᴹʔiᴹ (C I) *mother* + šíᴸšiᴴ (B II) (rule 10) *eating* > díᴹʔiᴹ šíᴹšiᴴ *the mother who is eating*; teᴹ (B) *and* + dóᴸʔoᴴ (B III) (rule 10 then rule 3) *thus* + kúᴸnuᴴ (B II) (rule 10) *deep* + ñaᴸ (A) (rule 6) *thing pronoun* > teᴹdóᴹʔoᴹ kúᴹnuᴴñaᴴ *and it is this deep.*

Rule 11. When following a Class B with a final tone H or U, or a Class C allomorph which has no tone lower than H, then L (C) becomes H, an LL (II) becomes HH, and an LH (II, III) becomes HU. See chart 2, col. 5, 6, 7.

Examples: ñaᴹʔaᴸ (C) *woman* + káᴹkaᴹ (B I) (rule 14) *will walk* + yóᴸʔoᴴ (B III) (rule 11 then rule 3) *here* + šiᴸ (C) (rule 11) *with* + yúᴸkaᴴ (B III) (rule 11) *there* > ñaᴹʔaᴸ káᴴkaᴴ yóᴴʔoᴴ šiᴴyúᴴkaᵁ *the woman who will walk from here to there*; néᴸčiᴸ (C I) *person* + šíᴸnuᴴ (B II) *running* + šíᴸkoᴸ (C II) (rule 11) *carrying* > néᴸčiᴸ šíᴸnuᴴ šíᴴkoᴴ *the person who carries (something) on the run*; ⁿdáᴹʔaᴸ (C) *hand* + nuᴹ (C) (rule 12) *tree pronoun* + náᴸniᴴ (B II) (rule 11) *long pl.* > ⁿdáᴹʔaᴸnuᴴ náᴴniᵁ *its long leaves*; néᴸčiᴸ (C I) *person* + ʔíᴸiᴴ (B II) *standing* + šíᴸšiᴴ (B II) (rule 11) *eating* > néᴸčiᴸ ʔíᴸiᴴ šíᴴšiᵁ *the person who eats standing up*; teᴸ (A) *personifier* + kíᴸdaᴴ (B II) *doing* + káᴸʔnuᴴ (B II) (rule 11 then rule 3) *large* + dúᴸkaᴴ (B III) (rule 11) *thus* > teᴸkíᴸdaᴴ káᴴʔnuᴴ dúᴴkaᵁ *the one who celebrates thus.*

Rule 12. A monosyllabic M (C) is sometimes L, sometimes H, and at times U. It becomes L when following M (B); it becomes H when following L or M (C); it becomes U when following an allomorph (C) which has no tone lower than H. See chart 2, col. 8.

Examples: máᴸniᴸ (C I) *loved* + teᴹ (C) (rule 12) *third pers. masc. fam.* > máᴸniᴸteᴴ *he is loved*; díᴹʔiᴹ (C I) *mother* + teᴹ (C) (rule 12) *third pers. masc. fam.* > díᴹʔiᴹteᴹ *his mother*; máᴸniᴸ (C I) *loved* + teᴹ (C) (rule 12) *third pers. masc. fam.* + núᴸuᴸ (C I) (rule 7) *by* + díᴹʔiᴹ (C I) (rule 14) *mother* + teᴹ (C) (rule 12) *third pers. masc. fam.* > máᴸniᴸteᴴ núᵁuᴸ díᴴʔiᴴteᵁ *he is loved by his mother.*

Rule 13. When following a Class C allomorph which ends in L, then MM (II)[14] becomes LL. When following a Class B allomorph which ends in H or U, or a Class C allomorph which has no tone lower than H, then MM (II) becomes HH. See chart 2, col. 9.

[14] For footnote, see next page.

Examples: tú^{M}tu̱^{L} (C) *firewood* + k^{w}á^{M}ti^{M} (C II) (rule 13) *small pl.* > tú^{M}tu̱^{L} k^{w}á^{L}ti^{L} *small firewood*; ší^{L}ka^{H} (B II) (rule 2) *walks* + ^{n}dé^{M}e^{M} (C II) (rule 13) *fast* + ^{n}zya^{L} (A) (rule 7) *you pl. polite* > ší^{M}ka^{H} ^{n}dé^{H}e^{H} ^{n}zya^{U} *you walk fast.*

Rule 14. When following any Class B with a final H or U, and when following a Class C allomorph which has L or M for at least one tone, then an M (B) becomes H, an ML becomes HM, an MM (I) becomes HH, an MH becomes HU. See chart 2, col. 10, 11, 12, 13.

Examples: kó^{L}o^{L} (C I) *there is not* + ni^{M} (B) (rule 14) *not even* + ʔi̱^{M}i̱^{M} (B I) (rule 14) *one* + ^{m}bé^{M}lu^{H} (A) (rule 14) *hat* > kó^{L}o^{L} ni^{H}ʔi̱^{H}i̱^{H} ^{m}bé^{H}lu^{U} *there isn't even one hat*; ^{n}dó^{L}ʔo^{H} (B II) (rule 2) *is suffering* + čé^{M}lu^{L} (C) (rule 14) *calf* > ^{n}dó^{M}ʔo^{H} čé^{H}lu^{M} *the calf is suffering*; sá^{M}a^{M} (C II) *new* + ná^{M}ma^{M} (A I) (rule 14) *wall* > sá^{M}a^{M} ná^{H}ma^{H} *the wall is new*; ma^{L} (C) *negative* + ná^{L}ni^{H} (B II) *long pl.* + čí̱^{M}i̱^{H} (A) (rule 14) *fingernails* + i^{L} (A) *my* > ma^{L}ná^{L}ni^{H} čí̱^{H}i̱^{U}i̱^{L} *my fingernails are not long.*

Rule 15. When following a Class C allomorph which has no tone lower than H, then M (B) becomes U, an ML becomes UM, an MM (I) becomes UH, and MH becomes UU. See chart 2, col. 10, 11, 12, 13.

Examples: ší^{L}ka^{H} (B II) (rule 2) *walks* + nú^{M}u^{M} (B I) (rule 14) *about* + tí^{M}i^{M} (C II) (rule 13) *small* + tu^{M} (B) (rule 15) *again* > ší^{M}ka^{H} nú^{H}u^{H} tí^{H}i^{H}tu^{U} *walks about awhile again*; k^{w}ą́^{L}ʔą^{L} (A) *goes* + mí^{M}i^{M} (C I) *alone* + si^{M} (C) (rule 12) *animal pronoun* + tá^{M}ši^{M} (C I) (rule 15) *to chase* + si^{M} (C) (rule 12) *animal pronoun* + kó^{M}či^{M} (A I) (rule 15) *pig* > k^{w}ą́^{L}ʔą^{L} mí^{M}i^{M}si^{H} tá^{U}ši^{H}si^{U} kó^{U}či^{H} *he chases pigs all by himself*; ší^{L}o^{L} (C I) *will sour* + si^{M} (C) (rule 12) *fruit pronoun* + ʔí^{M}da^{H} (A) (rule 15) *day after tomorrow* > ší^{L}o^{L}si^{H} ʔí^{U}da^{U} *the fruit will sour day after tomorrow.*

5.5. There may be a progressive change of basic H to U.

Rule 16. The initial tone H of a basic allomorph (of any morpheme class) becomes U when it contiguously follows H or U (of any morpheme class).

Examples: ší^{L}ni^{H} (A) (rule 2) *sees* + ni^{H} (A) (rule 16) *you sing. polite* > ší^{M}ni^{H}ni^{U} *you see*; ve^{M}ʔe^{M} (B I) *house* + ni^{H} (A) *you sing. polite* + ^{n}zí^{H}ʔi^{M} (B) (rule 16) *are entering* + ni^{H} (A) *you sing. polite* > vé^{M}ʔe^{M}ni^{H} ^{n}zí^{U}ʔi^{M}ni^{H} *you are entering your house*; ko^{H} (A) *negative* + ką́^{H}ʔą^{L} (A) (rule 16) *speaks* + ne^{L} (A) *third pers. polite* > ko^{H}ká^{U}ʔa^{L}ne^{L} *he does not speak*; ma^{L} (C) *negative* + sa^{L} (C) (meaning not determined) +

[14] There is an exception in that when following ma^{L} (C) *negative* and ʔa^{M} *interrogative*, then MM (II) becomes HH. For example, ma^{L} (C) *negative* + ti^{M}i̱^{M} (C II) *small* > ma^{L}ti^{H}i̱^{H} *not small;* ʔa^{M} (C) *interrogative* + ti^{M}i̱^{M} (C II) *small* > ʔa^{M}ti^{H}i̱^{H} *is it small?*

ká^{M}ni^{M} (B I) (rule 14) *will beat* + ni^{H} (A) (rule 16) *you sing. polite* + mé^{H}e^{L} (A) (rule 16) *baby* > ma^{L}sa^{L}ká^{H}ni^{H}ni^{U} mé^{U}e^{L} *don't beat the baby*; ko^{H} (A) *negative* + yú^{H}ʔi^{U} (A) (rule 16) *fears* + ni^{H} (A) (rule 16) *you sing. polite* > ko^{H}yú^{U}ʔi^{U}ni^{U} *you do not fear.*

5.6. The tone sandhi is so extensive that some morphemes, specifically those whose basic allomorphs are LL (C), MM (A), and LH (B), have as many as six allomorphs which are differentiated by tone. Those with basic allomorph LL (A) or L (A) have four allomorphs; all the rest have three.

By way of illustration, we are giving examples of the six allomorphs of ñú^{M}ʔu^{M} (A I) *fire*.

MM: ñú^{M}ʔu^{M} *fire* + vá^{L}ʔa^{M} (A) *good* > ñú^{M}ʔu^{M} vá^{L}ʔa^{M} *a good fire*. ML: ñú^{M}ʔu^{M} (rule 1) *fire* + ní^{H}ʔi^{M} (B) *flaring* > ñú^{M}ʔu^{L} ní^{H}ʔi^{M} *a flaring fire*. HH: ma^{L}di^{L} (C I) *negative specifier* + ñú^{M}ʔu^{M} (rule 14) *fire* > ma^{L}di^{L} ñú^{H}ʔu^{H} *not a fire*. HL: ma^{L}di^{L} (C I) *negative specifier* + ñú^{M}ʔu^{M} (rule 14 then rule 1) *fire* + tí^{M}i^{M} (C II) *small* > ma^{L}di^{L} ñú^{H}ʔu^{L} tí^{M}i^{M} *not a small fire*. UH: ni^{L} (A) *completive marker* + ^{n}dú^{M}ku^{M} (C I) *to seek* + ña^{M} (C) (rule 12) *third pers. fem. fam.* + ñú^{M}ʔu^{M} (rule 14) *fire* > ni^{Ln}dú^{M}ku^{M}ña^{H} ñú^{U}ʔu^{H} *she sought for a fire*. UL: ni^{L} (A) *completive marker* + ^{n}dú^{M}ku^{M} (C I) *to seek* + ña^{M} (C) (rule 12) *third pers. fem. fam.* + ñú^{M}ʔu^{M} (rule 14 then rule 1) *fire* + ní^{H}ʔi^{M} (B) *flaring* > ní^{Ln}dú^{M}ku^{M}ña^{H} ñú^{U}ʔu^{L} ní^{H}ʔi^{M} *she sought for a flaring fire*.

A Class B morpheme with the tone pattern LH has six allomorphs differentiated by tone. By way of illustration, we are giving examples of the six allomorphs of sa^{L}ʔnu^{H} (B II) *old*.

LH: sa^{L} (A) *continuative marker* + sá^{L}ʔnu^{H} *old* + ne^{L} (A) (rule 6) *third pers. polite* > sa^{L}sá^{L}ʔnu^{H}ne^{H} *they are old now*. MH: sá^{L}ʔnu^{H} (rule 2) *old* + ne^{L} (A) (rule 6) *third pers. polite* > sá^{M}ʔnu^{H}ne^{H} *they are old*. HU: mí^{M}i^{M} (C I) *alone* + vé^{M}ʔe^{M} (B I) (rule 14) *house* + sá^{L}ʔnu^{H} (rule 11) *old* > mí^{M}i^{M} vé^{H}ʔe^{H} sá^{H}ʔnu^{U} *just the old house*. LL: sa^{L} (A) *continuative marker* + sá^{L}ʔnu^{H} (rule 3) *old* + ^{n}da^{L} (C) *we incl.* > sa^{L}sá^{L}ʔnu^{Ln}da^{L} *we are now old*. MM: dó^{M}ko^{M} (B I) *but* + sá^{L}ʔnu^{H} (rule 10 then rule 3) *old* + ^{n}da^{L} (C) (rule 10) *we incl.* > dó^{M}ko^{M} sá^{M}ʔnu^{Mn}da^{M} *but we are old*. HH: mí^{M}i^{M} (C I) *alone* + vé^{M}ʔe^{M} (B I) (rule 14) *house* + sá^{L}ʔnu^{H} (rule 11 then rule 3) *old* + yú^{L}kᵱ^{H} (B III) (rule 11) *that* > mí^{M}i^{M} vé^{H}ʔe^{H} sá^{H}ʔnu^{H} yú^{H}kᵱ^{U} *just that old house*.

A morpheme with L (A) has four allomorphs; they are illustrated by na^{L} (A) *thing pronoun*.

L: ʔúᴸiᴸ (A) *two* + ñaᴸ *thing pronoun* > ʔúᴸiᴸñaᴸ *two of them*. M: ʔi̱ᴹi̱ᴹ (B) *one* + ñaᴸ (rule 5) *thing pronoun* > ʔi̱ᴹi̱ᴹñaᴹ *one of them*. H: káᴸniᴴ (B II) (rule 2) *long* + ñaᴸ (rule 6) *thing pronoun* > káᴹniᴴñaᴴ *it is long*. U: táᴸʔviᴸ (C II) (rule 2) *breaks* + teᴹ (C) (rule 12) *third pers. masc. fam.* + ñaᴸ (rule 7) *thing pronoun* > táᴹʔviᴹteᴴñaᵁ *he is breaking it*.

5.7. Since the step-up terrace tone is of interest in reference to theory of phonology, we are giving examples of the terracing as it occurs when various morpheme classes and sandhi rules are involved.

When rule 16 applies to a sequence of Class A morphemes, the tone steps up with terraces of one syllable: koᴴ (A) *negative* + číᴴtuᵁ (A) (rule 16) *kisses* + waᴴ (A) (rule 16) *so* + niᴴ (A) (rule 16) *you sing. polite* + méᴴeᴸ (A) (rule 16) *baby* > koᴴčíᵁtuᵁwaᵁniᵁ méᵁeᴸ *you don't kiss the baby so much*. The contour is 34567 81. The sequence of five U tones is actualized as five different levels of pitch.

When rule 11 applies to a sequence of LH (B) morphemes, the tone rises with terraces of two or more syllables: káᴸnaᴴ (B II) (rule 2) *coming forth* + máᴹⁿguᴹ (B I) (rule 14) *mango* + náᴸʔnuᴴ (B II) (rule 11) *large pl.* + kúᴸuᴴ (B II) (rule 11) *being seen* + tuᴹ (rule 14) *habitually* + yúᴸkąᴴ (B III) (rule 11) *there* > káᴹnaᴴ máᴴⁿguᴴ náᴴʔnuᵁ kúᴴuᵁtuᴴ yúᴴkąᵁ *the large mangos usually seen there are starting to grow*. The contour is 23 33 34 45 556.

When rule 15 applies to a sequence of MM (C I) morphemes, the tone rises with terraces of two syllables: maᴸ (C) *negative* + kóᴹkoᴹ (C I) (rule 14) *will swallow* + yúᴹaᴹ (C I) (rule 15) *father* + díᴹʔiᴹ (C I) (rule 15) *mother* + míᴹiᴹ (C I) (rule 15) *specifier* + teᴹ (C) (rule 12) *third pers. masc. fam.* + ʔi̱ᴹi̱ᴹ (C I) (rule 15) *hail* > maᴸkóᴴkoᴴ yúᵁaᴴ díᵁʔiᴴ míᵁiᴴteᵁ ʔi̱ᵁi̱ᴴ *his parents will not swallow the hail*. The contour is 133 44 55 667 88.

When there is a mixture of MM (B or C) and LH (B) morphemes, there is a step-up of tone: ʔaᴹ (C) *interrogative* + tíᴹiᴹ (C II) (rule 13, footnote 14) *small* + véᴹʔeᴹ (B I) (rule 15) *house* + ʂi̱ᴸi̱ᴴ (B II) (rule 11) *buys* + sáᴹaᴹ (C II) (rule 13) *new* + teᴹ (C) (rule 12) *third pers. masc. fam.* + núᴸuᴸ (C I) (rule 7) *from* + niᴴ (A) (rule 6) *you sing. polite* > ʔaᴹtíᴴiᴴ véᵁʔeᴴ ʂi̱ᴴi̱ᵁ sáᴴaᴴteᵁ núᵁuᴸniᴴ *is the new house that he is buying from you small*? The contour is 233 44 45 556 713.

By way of contrast we have included a sentence with a sequence of low tones. It is made up of all basic allomorphs: niᴸʂíᴹniᴹneᴸ ʔúᴸiᴸ kúᴸʔiᴸneᴸ *she saw her two sisters*. The following sentence has a sequence

of mid tones; all are basic allomorphs: ni^{L}šíˀ^{M}ni^{M}ne^{L} ˀi̱^{M}i̱^{M} vé^{M}ˀe^{M} ˀí^{M}du^{M} *he saw one horse house (barn).*

The following example shows a high tone raised to the fifth level and maintained there. ko^{H} (A) *negative* + šíˀ^{L}ko^{L} (C II) *carries* + mí^{M}i^{M} (C I) (rule 14) *alone* + te^{M} (C) (rule 12) *third pers. masc. fam.* + ni^{M} (B) (rule 15) *not even* + ˀi̱^{M}i̱^{M} (B I) (rule 14) *one* + ña^{L} (A) (rule 6) *thing pronoun* > ko^{H}šíˀ^{L}ko^{L} mí^{H}i^{H}te^{U} ni^{U}ˀi̱^{H}i̱^{H}na^{H} *he doesn't carry even one of them*. The contour is 311 334 5555.

6. Consonant contrasts

There are twenty-one consonant phonemes in Acatlán Mixtec. Stops: /p, t, k, k^{w}, ˀ/. Affricates: /č/. Prenasalized stops: /^{m}b, ^{n}d, ^{n}g/. Prenasalized affricates: /^{n}z, ^{n}ǰ/. Nasals: /m, n, ñ/. Voiceless fricatives: /s, š/. Voiced fricatives: /v, d/. Lateral and vibrants: /l, ř, r̃/. Semiconsonants: /w, y, h/.

The labials /p, ^{m}b, m, v (labiodental), w/ contrast as follows: pé^{Mn}ǰi^{L} *orphan*, ^{m}bé^{M}lu^{H} *hat*, mé^{H}e^{L} *baby*, vé^{L}i^{M} *I'm heavy*, ka^{M}va^{L} *boulder*, wé^{M}i^{H} *ox*. The phoneme /w/ is rare. In our data, it occurs only in: wé^{M}i^{H} *ox*, wá^{L}ˀa^{M} (alternating with vá^{L}ˀa^{M}) *good*, ˀá^{M}wa^{M} *last year*, and in words with the morpheme wa^{H} *so*.

The dentals /t, d (interdental), ^{n}d, ^{n}z, s, n, l, ř (flap), r̃ (trill)/ contrast as follows: té^{L}ˀe^{L} *plant runner*, dé^{L}ˀe^{M} *son*, ^{n}dé^{L}ˀi^{H} *dark*, ^{n}zí^{L}ˀi^{M} *to enter*, sí^{M}vi^{M} *to blow*, ne^{L}ˀí^{M}vi^{L} *people*, lé^{M}ˀe^{M} *rooster*, lí^{M}tu^{H} *a kid*, ní^{L}nu^{M} *up-river*, dí^{L}i^{L} *to singe*, ří^{M}i^{L} *sheep*, vá^{M}ve^{M}řu^{H} *apron*, ^{m}bá^{M}r̃u^{M} *bridge (of the nose)*. Both /ř/ and /r̃/ are rare; for the most part, they occur in loan words.

The alveopalatals /č, ^{n}ǰ, š, ñ, y/ contrast as follows: čí^{M}ˀi^{M} *to plant*, ^{n}ǰí^{M}či^{M} *green bean*, ší^{M}ˀi^{M} *young locust*, ñá^{L}ˀma^{L} *spongy tissue*, ñú^{M}ñu^{M} *marrow*, yú^{M}yu^{M} *a drop, dew*.

The alveopalatals /č, š/ also contrast with the sequences /sy, ty/ as in: šá^{L}vi^{H} *to get tired*, syá^{M}ka^{M} *fish*, čá^{M}a^{M} *naked*, tyá^{L}a^{M} *man*.

The contrast between /^{n}ǰ/ and /^{n}dy/ is elusive, since /^{n}ǰ/ occurs preceding /i/ and /e/, whereas /^{n}dy/ does not precede these vowels (ku^{Mn}ǰí^{M}i^{L} *to shine*, ˀi^{M}tu^{Mn}dyá^{M}a^{M} *to lean back on*). We have considered them to be in contrast because of the analogy with /č/ and /ty/.

The velars /k, k^{w}, ^{n}g, h/ and glottal stop contrast as follows: ká̱^{H}a̱^{L} *it is excavated*, k^{w}á̱^{L}a̱^{M} *yellow*, há̱^{M}a̱^{M} *yes*, ˀá^{M}na^{M} *who*; ví^{M}ko^{L} *fiesta*, šá^{M}k^{w}a^{M} *crooked*, ló^{Mn}go^{M} *vulture*, k^{w}á^{L}ˀa^{M} *to give*. The phoneme /h/

is rare. In our data, it occurs only in the words: hą́^{M}ą^{M} *yes*, hą́^{M}ą^{L} *there, that*, hó^{M}ʔlo^{M} *carnival*, hų́^{M}ų^{L} *O.K., yes.*

7. Consonant variants

The stop or affricate of the prenasalized stops and affricates /^{m}b, ^{n}d, ^{n}z, ^{n}ǰ, ^{n}g/ is usually lightly voiced, but it may fluctuate to voicelessness: ^{m}bé^{M}lu^{H} *hat*, ^{n}dó^{L}ʔo^{M} *adobe*, ^{n}zí^{H}ku^{M} *sewing*, ^{n}ǰé^{M}ʔle^{M} *cucumber*, ló^{Mn}go^{M} *vulture.*

All consonants except /ř/ are lengthened when contiguously following a stressed syllable: čé^{M}lu^{L} [tšé^{M}l·u^{L}] *calf*, yá^{L}ka^{H} [žá^{L}k·a^{H}] *dust*, ʔí^{Hn}du^{L} [ʔí^{Hn}·tu^{L}] *where*, pé^{Mn}či^{L} [pé^{Mn}·tši^{L}] *orphan.*

The voiceless stops /t, k/ may become lenis fricatives with light voicing, and /s/ may become voiced when following word-stress noncontiguously: ší^{M}ka^{H}[s/z]i^{M} *the animal walks*, ni^{L}sá^{M}te^{L}[t/d]e^{M} *the boy spits out*, ʔú^{L}i^{L}[k/g]a^{L} *two more.* (This allophone of /t/ differs from that of /d/ in that the allophone of /t/ is lenis and dental; the allophone of /d/ is fortis and interdental.)

The voiceless stop /t/ has a nasal release when preceding nasalized vowels: tą́^{M}ą^{M} [tną́^{M}ą^{M}] *tomorrow.*

The semiconsonant /y/ varies from very light to heavy friction when it is initial in a syllable, but when it contiguously follows a consonant, it is resonant: [y/ž]á^{M}a^{M} *song*, vá^{M}[y·/ž·]a^{M} *squash flower*, tyá^{L}a^{M} *man.*

8. Vowel contrasts

There are five oral and five nasal vowels: /i, e, a, o, u, į, ę, ą, ǫ, ų/. They contrast as follows: ʔí^{M}i^{M} *husband*, ʔį́^{M}į^{L} *skin*, ^{n}dú^{M}se^{H} *I am bad*, ku^{M}dú^{M}sę^{H} *I am lazy*, k^{w}á^{L}ʔa^{M} *to give*, k^{w}ą́^{L}ʔą^{L} *going*, ^{n}dí^{M}sa^{M} *true*, ^{n}dí^{L}są^{L} *sandals*, ka^{Mn}dí^{H}so^{H} *you sing. fam. believe*, ku^{M}dú^{M}sǫ^{M} *you sing. fam. are lazy*, sá^{L}ʔu^{H} *polite*, są́^{L}ʔų^{L} *fifteen*, dé^{L}ʔe^{M} *son*, dí^{M}ʔi^{M} *mother*, dó^{L}o^{L} *blanket*, dú^{L}u^{L} *to whistle*, kó^{L}ʔi^{H} *my plate*, kú^{M}ʔi^{M} *to be sick.*

There is also a contrast between a single vowel and a sequence of two, and even three like vowels: dá^{M}na^{M} *bad, mean*, dá^{M}ná^{H}a^{L} *to pay back*, kú^{M}ʔi^{M} *to be sick*, ku^{M}ʔí^{M}i^{L} *to be baptized*, ku^{M}ʔí^{H}i^{L}i^{H} *I am being baptized*, ʔį́^{M}ʔį^{H} *sweat bath house*, ʔį^{M}ʔį́^{M}į^{M} *one by one*, vé^{L}e^{M} *heavy*, mí^{M}i^{M}ve^{H} *it (baby)*, nú^{L}u^{L} *eye, face*, kó^{L}o^{L} *snake.*

9. Vowel variants

A vowel with word-stress is especially long when contiguous to a vowel without word-stress. That is, a cluster of vowels, the first of which is stressed, is considerably longer than a cluster, the first of which is nonstressed. For example, in the following words, the vowel clusters in ku^{M}ʔi^{H}i^{L} *being baptized* and ^{n}dé^{L}a^{L} *will flow out* are considerably longer than the clusters in kú^{L}ʔi^{H}i^{L} *I hurt* and tá^{L}ʔ^{n}de^{L}a^{L} *it will be cut*.

A vowel is especially short when part of a sequence of three or four vowels, none of them with word-stress: dí^{M}ko^{H}e^{H}a^{L} *I'm selling it*, ší^{H}kǫ^{L}ų^{L}ą^{H} *you fam. ask for it*.

The vowel /i/ may become voiceless, or it may actualize as a part of a long [š] when the sequence /ši/ occurs preword-stress: ši^{L}k^{w}é^{M}ʔe^{M} [š·k^{w}é^{M}ʔ·e^{M} /šIK^{w}é^{M}ʔ·e^{M}] *worthless*.

There is no contrast of a nasal versus an oral vowel following /m, n/ or /n/. A single vowel in that environment may or may not be nasalized. A sequence of two vowels following a nasal consonant is usually heavily nasalized: ni^{M}i^{L} [ni^{M}i^{L}] *corn on the cob*. Since there is no contrast, we have chosen to write them as oral vowels.

Word-final nasalized vowels are optionally followed by a lenis velar closure: ʔi^{L}[i^{L}/in^{L}] *nine*, ku^{M}du^{M}s[e^{H}/e ^{H}] *I am lazy*, ka^{L}[a^{M}/a ^{M}] *to get accustomed to*, cu^{M}[u^{M}/u ^{M}] *work*.

When following /k/, a word-final /i/ may actualize as a syllabic velar nasal: ʔi^{M}ki^{L} [ʔi^{M}k·i^{L}/ʔi^{M}k· ^{L}] *squash*.

10. Distribution of phonemes

10.1. There are certain restrictions in the distribution of consonants in relation to vowels.

Except that a nasalized vowel may follow /d/, nasalized vowels do not follow voiced consonants: dą́^{L}ʔą^{L} *language*.

Nasal vowels follow any voiceless consonant: ká^{L}ką^{L} *to ask*, ší^{H}kę^{L} *I am asking*, są́^{L}ʔą^{L} *went and returned*, šį́^{M}į^{H} *buying*, šą́^{M}ą^{M} *place*, čį́^{M}ʔą^{M} *curse*.

The distribution of the alveopalatal consonants /č, y, ñ, ^{n}ǰ/ and the dental /^{n}z/ is nonsymmetrical in relation to a contiguously following /i/.

The alveopalatal consonants /ñ/ and /y/ only rarely precede /i/:

kú^{M}ʔñi^{H} *I irrigate*, kú^{M}yi^{H} *I am industrious*, ñá^{M}a^{L} *dark (as at night)*, yá^{M}a^{M} *song*.

But for the one word, ^{n}ǰé^{M}ʔle^{M} *wild cucumber*, in our data, /^{n}ǰ/ occurs only before /i/: ^{n}ǰí^{M}či^{M} *green bean*; /^{n}z/ occurs only before /i/: ^{n}zí^{L}ku^{M} *to sew*; /č/ usually occurs before /i/, but it also occurs before other vowels: čá^{M}a^{M} *naked*, čá^{L}ʔma^{L} *to be crushed*, čé^{M}le^{H} *scissors*, čé^{M}lu^{L} *calf*, čó^{L}ʔo^{L} *to be cooked*, čų́^{M}ų^{M} *job*, čų́^{M}ʔų^{M} *to comb*.

10.2. Consonant clusters of two consonants are composed of: (1) /ʔ/ followed by a voiced consonant, (2) a consonant followed by /y/, (3) /st/.

In our data, there is one consonant cluster of three consonants, /ʔ^{n}dy/: ví^{L}ʔ^{n}dya^{L} *prickly pear*, dí^{L}ʔ^{n}dya^{H} *stingy*.

A consonant cluster in which the first consonant is a glottal stop occurs only stem-medial. The second consonant may be any voiced consonant but /d/: ká^{M}ʔvi^{M} *to read*, dá^{M}ʔma^{L} *sheet*, vá^{L}ʔna^{H} *sleep*, dá^{L}ʔ^{n}de^{L} *thick coen cake*, ^{m}bé^{H}ʔla^{L} *big*, ř̃ú^{M}ʔ^{m}bu^{L} *type of bird*, ř̃ó^{L}ʔ^{n}go^{L} *joint*, kú^{M}ʔyu^{L} *little owl*, kú^{M}ʔñu^{M} *to irrigate*, ko^{L}yá^{L}ʔ^{n}ǰi^{L} *rainbow*, ká^{M}ʔ^{n}zi^{M} *to explode*.

There are the following sequences of consonant plus /y/: /ty, dy, ^{n}dy sy, ^{n}zy, my/: tyá^{M}ku^{M} *to hear*, dyé^{M}ʔe^{M} *rust*, ^{n}dyá^{M}a^{H} *is worth*, syá^{M}ka^{M} *fish*, ^{n}zyó^{M}ʔo^{H} *you pl. fam.*, si^{L}myá^{M}ʔa^{L} *Satan*.

Consonant clusters with the sequence /st/ occur in the three morphemes stó^{M}ʔo^{M} *owner, lord*, stą́^{L}ʔą^{H} *one another*, the morpheme stą^{H}ą^{L} *also* as in yú^{L}ʔu^{L}stą^{H}ą^{L} *I also*.

10.3. Vowel clusters may be composed either of geminate vowels or of diverse vowels: si^{L}kí^{L}i^{H} *bottle*, ké^{M}e^{M} *will come out of*, ká^{L}a^{M} *iron*, kó^{L}o^{L} *snake*, kú^{M}u^{M} *will happen*, šį́^{M}į^{H} *buying*, ką̌^{L}ą^{M} *to become accustomed to*, ñé^{M}e^{M} *to skin*, ñú^{M}u^{M} *town*, ká^{M}i^{L} *will cough*, dí^{L}a^{M} *skirt*, ʔí^{M}u^{M} *empty*, ^{n}dé^{L}a^{L} *mesquite tree pod*, té^{M}i^{M} *burro saddle*, ^{n}dú^{L}a^{L} *will crack*, ^{n}dú^{M}i^{M} *daytime*, tú^{M}i^{M} *will sting*, yú^{M}e^{H} *my father*, kʷį́^{L}ų^{M} *swelling*.

There are clusters of three vowels: ^{n}dú^{H}i^{L}a^{L} *both of them*, tú^{H}i^{M}a^{L} *she appears*, šį́^{H}ų^{M}ą^{M} *it swells up*, ^{n}zyá^{M}a^{H}i^{L} *I arrive*, kʷį́^{M}ų^{M}ą^{H} *you sing. fam. will buy it*, ku^{M}ʔí^{H}i^{L}i^{H} *I am baptized*, dí^{M}ko^{H}e^{H}a^{L} *I am selling it*, da^{M}ná^{H}u^{L}a^{H} *you sing. fam. pay her*, ší^{H}kǫ^{L}ų^{L}ą^{H} *you sing. fam. ask for it*.

Occasionally there is a cluster of four vowels: da^{M}dá^{H}a^{L}i^{H}a^{L} *I heat it*, ^{n}zí^{M}da^{H} ví^{H}i^{M}i^{H}a^{L} *I repair it*, da^{M}ku^{H}ʔí^{U}i^{L}i^{H}a^{M} *I baptize her*.

11. Syllable

A syllable has one vowel as a nucleus. The predominant syllable type is CV, but a nucleus may also be preceded by two or three consonants: tá^{M}ta^{M} *seed*, stó^{M}ʔo^{M} *owner*, vʃ^{M}ʔ^{n}dya^{L} *prickly pear*.

The syllable type V does not occur word initially. It follows a syllable with a consonantal onset (té^{M}i^{M} *saddle*) or another syllable of type V (k^{w}i̯^{M}u̯^{M}a̯^{H} *you sing. fam. will buy it*).

An utterance may be segmented into syllables: (1) between a vowel and following consonant, lú^{M}su^{M} *fox*, ^{n}dá^{L}ʔvi^{H} *poor*, tó^{H}ʔo^{L} *stranger*, ší^{H}tya^{L} *spreading*; (2) between vowels which are of different quality, dí^{L}a^{M} *skirt*, ^{n}dú^{M}i^{M} *daytime*; (3) between a sequence of two different tones, yá^{L}a^{H} *tongue*, ši̯^{M}i̯^{H} *buying*, ku^{M}ʔí^{H}i^{L}i^{H} *I am being baptized*; (4) in the middle of a phonetically long stressed vocoid, tí^{M}i^{M} *little*, kó^{L}o^{L} *snake*.

12. Stress

There are two types of stress: word-stress and phrase-stress.

Each phonological word has a syllable with word-stress. Any consonant, except /ř/ which contiguously follows a syllable with word-stress may be lengthened. The consonant is usually lengthened when part of a prepause word; it is frequently not lengthened when not part of a prepause word. The lengthened consonant is more prominent in slow speech than it is in fast speech: dí^{M}vi^{M} [ɖí^{M}v·i^{M}] *that very one*, tú^{M}tu^{M} [tú^{M}t·u^{M}] *paper*, lú^{M}su^{M} [lú^{M}s·u^{M}] *fox*, ká^{M}ʔ^{n}zi^{M} [ká^{M}ʔ.^{n}dzi^{M}] *to explode*, ló^{Mn}go^{M} [ló^{Mn}·go^{M}] *vulture*.

If the syllable with word-stress is followed by a type V syllable, or by a syllable beginning with /ř/, then the vowel of the stressed syllable is lengthened: dí^{L}a^{M} [ɖí·^{L}a^{M}] *skirt*, ʔó^{M}ř a^{H} [ʔó·^{M}ř a^{H}] *sun*. Word-stress never occurs on the last syllable of a word.

There is a correlation between the phonological and grammatical hierarchies in that in two-syllable stems, it is the stem-medial consonant which is long, the first syllable which has word-stress. Because mor-

phemes may precede and/or follow the stem, stress placement is not predictable in a phonological word.

Examples with contrastive stress placement: dáMkaMniH *you mix*, daMkáMniH *I cause to spring forth*; náMnaMniH *you go up*, naMnáMniH *when I go up*; kuMníMniM *I will listen*, kúMniLniH *you will want*; keMtáMtuLteM *the boy will rest*, ⁿdáMtaMsiHaU *the animal tears it*.

Every utterance has at least two syllables, and the syllable which precedes pause has phrase-stress. Phrase-stress has about the same intensity as word-stress; therefore, when a two-syllable word is said in isolation, the two syllables have about equal intensity, since the first syllable has word-stress and the second has phrase-stress. (In the following examples, we have marked phrase-stress with ^.) ⁿdúMkûM *create*, táMtâM *seed*, túMtûM *paper*.

When a word with more than two syllables occurs prepause, it will have nonstress, word-stress, and phrase-stress: káMniHneLsîM *they beat the animal*, čiMkáMniMneLnûM *they will set up the wood thing*, niLsíMsâM *hardened*, niLkąLʔąLneLšiLⁿdâL *they spoke to us*, kʷąLʔįL ⁿdúMkiH siLʔíMnaLšîM *I'm going to look for my dog*, dáMⁿduM ʔíHkuH niLšíLʔiLnâL *then yesterday he died*.

Summer Institute of Linguistics