Ni'ihau Hawaiian /t/>[k] allophony is driven by coronal dissimilation

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*t > k as an Austronesian change (Blust 2004)

*t to k: An Austronesian Sound Change Revisited

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Although the change of *t to k in Hawaiian has been known and commented on for over 150 years, the widespread driftlike character of this development within Austronesian as a whole has generally gone unappreciated. This paper examines 20 historically independent instances of a *t > k change in at least 43 languages. Twelve of these changes are confined to Oceanic languages, seven to languages of eastern Indonesia, and one to western Indonesia. Almost without exception, the change *t > k has followed the loss of *k. In four languages *t > k took place only word-finally, and in two others it appears to be dissimilatory. Both structural and perceptual motivations for the change are considered, and it is concluded that *t > k usually begins as free variation within an enlarged phonological space created by the loss of *k. A few instances are difficult to reconcile with this explanation, and continue to present a challenge to linguistic theory.



Consonants (Parker Jones 2018)

2

h

		Labio-			
	Bilabial	dental	Alveolar	Velar	Glottal
Nasal	m		n		
Plosive	р			k	?
Fricative		v			h
Lateral			1		

'quiver' 'naka 'maka maka 'eye' naka n m paka kaka 'strain' k 'kaka 'rinse' 'paka р 'sharp' 'vaka waka v 'laka laka 'tame' 1







Ni'ihau Hawaiian (Blust 2004)

The first careful phonetic transcriptions of Ni'ihau speech evidently were those of Newbrand (1951), who worked with a 19-year-old speaker in 1950. Newbrand (1951:106) described the Ni'ihau dialect as having "two outstanding characteristics," of which one was "the [t] allophone of the /k/ phoneme. Whether this is in free variation has not been determined; there may be a pattern in its use." If there is a pattern of t/k variation in the data Newbrand collected, it is not evident, because sequences of both kVk and tVt appear in her transcriptions of different forms, as with [ke kula] 'school' and [tetAhi] 'a, one' (116), and identical phrases are transcribed with apparently free variation, as in *ke aloha o ke Akua* 'the love of the Lord' recorded first with *ke aloha*

(125) and subsequently with *te aloha* (126). More recent observations of the Ni'ihau dialect, however, reveal a pattern that is not apparent in Newbrand's data. In general, PPN *t remained *t*, but in the sequence *tVt the first stop dissimilated to *k*, as in pre-Hawaiian *te tahi > Standard Hawaiian *kekahi* : Ni'ihau Hawaiian *ketahi* 'one', pre-Hawaiian *tatou > SH *kakou*, NH *katou* 'IPL INCL', or pre-Hawaiian *matahiti > SH *makahiki*, NH *makahiti* 'year' (Emily Hawkins, pers. comm.). The psychological reality of this pattern of dental stop dissimilation is particularly clear in the treatment of loanwords such as SH *kuke*, NH *kute* 'cook', because the borrowed form never had a *t*, and presumably acquired one only to avoid the impermissible pattern *kVk*. According to Emily Hawkins, some instances of *k* also occur in Ni'ihau speech in nondissimilatory contexts, presumably as a result of contact with the standard language.

- Historical development: PPN *t > t~k
- kVt where two follow each other
- Optionality of dissimilation
- Issue of contact with Standard Hawaiian, which has fully completed *t > k



Papa Kuhikuhi Helu 3.1 Na Hua Olelo i Hoohana ia me keKa i ${\cal T}$

Ka Puana Niihau	Ka Puana Maamau	
tataahi Ni'ihau	kāka'ahi Standard	
tataitahi	kāka'ikahi	
tala	kālā	
teteehi	kekeehi	
kapati, sabati	kapaki	
kataiaka	kakahiaka	
katou	kākou	
kikiti	kikiki	
koto	koko	
tokoleka	kokoleka	
tootoo	koʻokoʻo	
tutatuta	kūkākūkā	

• Sometimes, but not always, dissimilates to kVt



Papa Kuhikuhi Helu 3.4 Na Hua Olelo i Pela ia me ka "L" i hiki ole ke hoololi ia ke K i T

Ka Puana Niihau		Ka Puana Maamau	
laka	Niʻihau	laka	Standard
laiki		laiki	
laki		laki	
lako		lako	
leka		leka	
like		like	
likelike		likelike	
loke		loke	
luku		luku	

- /t/ > [k] also in the presence of /n/ or /l/
- Points to broader coronal dissimilation



Papa Kuhikuhi Helu 3.3 Na Hua Olelo i Pela ia me ka "N" i hiki ole ke hoololi ia ke K i T

Ka Puana Niihau		Ka Puana Maamau	
iniki inikiniki inika nakii naku nakunaku nakulu noke	Niʻihau	ʻiniki ʻinikiniki ʻīnika nākiʻi naku nakunaku nakulu noke	Standard
nuku nukee		nuku nūke'e	

- /t/ > [k] also in the presence of /n/ or /l/
- Points to broader coronal dissimilation



Papa Kuhikuhi 3.2 Na Hua Olelo i Hiki ole ke Hoololi i
a keKiT

Ka Puana Niihau	Ka Puana Maamau	
kanake Ni'ihau	kanakē Standard	
kanaka	kānaka	
kalaka	kalaka	
kaliki waiu	kāliki waiū	
kakani	kakani	
kakini	kākini	
laikini	laikini	
lokeloke	lokeloke	
kolekole	kolekole	
pakalaki	pakalaki	
pukalaki	pūkalakī	

- /t/ > [k] also in the presence of /n/ or /l/
- Points to broader coronal dissimilation



Papa Kuhikuhi Helu 3.7 Na Hua Olelo Papalua me na Manao Okoa

Ka Puana Niihau		Ka Puana Maamau	
kula	Niʻihau	kula Standard	
tula		kula	
kali		kali	
tali		kali	
kena		kena	
tena		kēnā	
tela		kēlā	

 Some phonemic pairs differentiate what were previously homophones (and still are in Standard)



Eia ae kekahi mau hua olelo Niihau i hoohana nui ia ma Niihau. Ma ka hoololi ana i ka hua leka *k* a me ka *t*, e laa hoi me "kali" a me "tali," a okoa hoi ko laua manao kekahi. O ka manao nui o "kali," ua like no kona manao me "alia." A ina komo mai ka *t* ma kahi o ke *k*, okoa kona manao. O ka manao no keia hua olelo i pela ia me ka *t*, pili no i ka mai o ka wahine. A oia ke kumu, aole hiki ke hoololi wale aku no i na hua leka *k* a pau i *t* no ka okoa o ka manao o kekahi hua olelo mai kekahi hua olelo aku.

By exchanging [k] and [t], such as in *kali* and *tali*, one also changes the word's meaning. The meaning of *kali* is "to wait". And if you use [t], the meaning is different: this word with a [t] means the female genitalia. This is the reason that you can't just exchange all [k] and [t], since the meaning of one word might be different from another.

• Some phonemic pairs differentiate what were previously homophones (and still are in Standard)

L1 speaker intuitions – Elama Kanahele



TV interview, 12/20/1997 *Mānaleo TV*

"Kātou, lākou – in such words, you can't change the [k]. Yeah, in *lākou* you've got to keep it as [k]. *Mākou* you can pronounce as *mātou*, just as we pronounce *kākou* as *kātou*. But you can't just change all of your [k] to [t], it sounds very odd if you try to do that!"

Summary so far:

- Let's assume it's underlyingly /t/ for Niihau speakers
- Some sort of coronal dissimilation going on (Blust, Wong)
 - Preference for kVt over tVk?
 - Inconsistent: sometimes kekahi, sometimes ketahi (indef. art.); sometimes ke aloha, sometimes te aloha (God) Newbrand (1951)
- Maybe foot or PWd boundary blocks operation?
- Definitely style shifting to Standard complicating things
- Wouldn't it be nice if we had a big chunk of single-speaker, singlestyle, "pure" Niihau data to try to uncover patterns?

Present data source: Aloha Niihau

- Close word-for-word transcriptions of recorded interviews of Elama Kanahele
- Single speaker, single style (presumably)
- <t> and <k> distinguished in orthography, but otherwise typical Niihau orthography that doesn't mark /?/ or long vowels



Present data source: Aloha Niihau

- What I did:
 - 'Corrected' a couple contractions for ease of searching certain lexemes for t vs. k
 - Stripped punctuation
 - Removed words with non-native phonotactics
- 2,991 <t>
- 1,354 <k>

Lo'a ta ohana, na lakou ta mahele Kalikimaka. Ka tala, hoi ia lakou, tala lulu. Hele mai i Tauai nei. Lo'a ta ohana hele kotua e tuai i ta mea ai. Tuai i ta mea ai, a o ta *pastry*, pia ta mea hope loa. Ta Uila¹ e holo ai, no ta paina'ku, a lakou, tau i ta palaoa, oia mau ano. Ketahi manawa, ta soloata, hala pau loa. He aha'ku ia ta lakou mea e ohi ai. O ta pipi, na Lopikana e haawi hootahi pipi Kalikimaka, hootahi pipi no ka Nu Ia. Ketahi manawa, hele mai tuu papa, he luna e? Hele lakou nana pipi, a "Pipi hea? Ta pipi, nohea?" "O, tii katou i ta pipi o Taununui." "O. Oia. Ehia kanaka hele?" "Eha. Eha paha outou hele." To'u papa ta mea walaau. Kute maoli no.

Conditional Inference Tree

- "Provides estimates of the likelihood of the value of the response variable based on a series of binary questions about the values of predictor variables" (Tagliamonte & Baayen 2012)
- Each t or k token coded for 35 variables:
- Previous vowel
- Following vowel
- Previous consonant
- Following consonant
- Another t/k in word?
- Another t/k before within word?
- Another t/k after within word?
- A(nother) t in word?
- A(nother) t before within word?
- A(nother) t after within word?
- A(nother) k in word?
- A(nother) k before within word?

- A(nother) k after within word?
- An n in word?
- An n before within word?
- An n after within word?
- Anlin word?
- An l before within word?
- An l after within word?
- An l/n in word?
- An l/n before within word?
- An l/n after within word?
- A(nother) t/l/n within word?
- A(nother) t/l/n before within word?

- A(nother) t/l/n after within word?
- A(nother) t within foot?
- A(nother) t within PWd?
- An n within foot?
- An n within PWd?
- An l within foot?
- An l within PWd?
- An n/l within foot?
- An n/l within PWd?
- A(nother) t/l/n within foot?
- A(nother) t/l/n within PWd?

Metrical structure (Parker Jones 2010)

- My notation:
 - {foot}
 - vd>

<{'ku.la}>

<ka.{'la.ka}>

<{ |la:}><{ 'kou}>

<ka.{ $|li.ki}><{'ma.ka}>$

(5.21) Metrical-foot rules:

 $\begin{array}{l} \Sigma \rightarrow \sigma_{\rm H} \\ \Sigma \rightarrow \sigma_{\rm H} \ \sigma_{\rm L} \\ \Sigma \rightarrow \sigma_{\rm L} \ \sigma_{\rm L} \end{array}$

(5.20) **Prosodic-word rules:** $\omega \rightarrow \Sigma$ $\omega \rightarrow \sigma_L \Sigma$

Conditional Inference Tree

- Most informative split: presence of a(nother) [t] or an [l] or an [n] within the PWd domain
 - If not, next split is whether there's an [l] before it within the word
 - If not, 85.8% likely to be [t] (Node 3)
 - If so, 99.3% likely to be [k] (Node 4)
 - If so, next split is whether there's an [l] anywhere within the foot
 - If not, 67.7% likely to be [k] (Node 6)
 - If so, 95.2% likely to be [k] (Node 7)



Maximum number of splits set to 2

Some words always use /t/

- tēia (*this*): 128 /t/
- tou (*your*) to'u (*my*): 84 /t/
- hiti (can): 80 /t/
- mātou (we excl. 3+): 59 /t/
- tau (*put*) tāu (*your*) ta'u (*my*): 42 /t/

- Usually have no (immediately) surrounding coronals
- This is the 'default' situation

Some words always use /t/

• <{ ho.lo}><?o.{ to.?a}> whole: 1

 But sometimes they do have another coronal in the word

- (ta/te) tu'itu'i: 5
- (te) tāhea: 7 <te.{ taː}><{ he.a}>
- taula (rope): 7
- tū**t**ulu (*build*): 3

• Or they have another coronal in the foot or PWd

Some words always use /k/

- like (*like*): 61
- iloko (inside): 45
- akula (directional particle): 38
- <ka.{ li.ki}><{ ma.ka}>:19
- mikini (*machine*): 13
- <ka.{'la.ka}>(*truck*): 12
- kanaka (*person*): 10
- kuene (*supervise*): 12
- kani (*noise*): 6
- 'ekolu (*three*): 6
- kali (*wait*): 3
- kanikani (chattering): 4

• Often in the same PWD or foot as /l/ or /n/

Some words always use /k/

- <{ laː}><{ kou}> they (3+): 107
- <ka.{ li.ki}><{ ma.ka}> Christmas:
 19
- <{ pi.li}><{ ki.a}> problem: 6
- <{ a.la}><{ ka.?i}> *leader*: 2
- kamali'i (*child*): 37 /k/

• Some are just preceded by /l/ within the word, but otherwise not in the same PWd as a coronal

 Some are followed somewhere in the word by a coronal

Some words always use /k/

- akā (*but*): 13 /k/
- aku (directional particle): 100 /k/
- akamai (smart): 4 /k/

- Some are lexically specified and have no apparent coronal trigger
- Though need to look more deeply into surrounding utterance environment, might be longer-distance effects on these

- kapu: 1 (all cap)
 - lei a'i me ta papale kapu put on a cap
- tapu: 11 (all tub)
 - a tau ka tapu inuna o ka tapuahi and put the tub on the hearth
- Good example of English origin affecting the choice of t/k
- Points to possible example of minimal pair based on meaning

- kope: 5
 - all instances of collocative verb **inu kope** *drink coffee*
- tope: 5
 - he tope (2) a coffee
 - ka tope the coffee
 - pakautau tope (2) coffee table
- Seems like collocation/verb different from noun? Maybe because of /n/ in **inu**?

- Te Akua: 24
 - mahalo i te Akua no na mea a pau thanks to God for everything
- Ke Atua: 1
 - mahalo i te aloha o ke Atua i ke tiai thanks to the love of God for guarding
 - t-form selected because preceding/following consonants are <k>?
- Ke Akua: 1
 - Himeni ia "Na Ke Akua Mai" "From God" was sung
 - Title of song, so <k> forms used?

- kāne: 3
 - keiti kane (2) son
 - kupuna kane (1) grandfather
- tāne: 13
 - kamalii tane (2) son
 - makua tane (4) father
 - ta'u tane ipo (4) my husband
 - tupuna tane (2) grandfather

- takahiata: 2
 - A ohana takahiata
 - Ala mai i takahiata a ohana mamua o ta hele ana i ta hana
- takahiaka: 7
 - hele mai katou a takahiaka
 - Makautau i takahiaka
 - ohana takahiaka

A he tahawai no. No kahawai. Wai tahawai. Tela wai tahawai mea holoi pa, holoi hale.

And it's indeed a stream. From a stream. Stream water. That stream water is used for cleaning dishes, cleaning the house.

kVt repair vs. tVk repair

- pākautau (*table*): 15
- kōtua (*help*): 11
- hoʻomākautau (get ready): 6
- mākautau (ready): 5

 Some kVt repair that operates across PWd boundaries

kVt repair vs. tVk repair

- kapati (sabbath): 2
- makahiti (*year*): 22
- tahakai (*beach*): 25
- kokote (near): 8

- Some more interesting examples too
- Other consonants like /h/ and /p/ may be transparent to dissimilation?
- Sometimes tVk happens?
- Sometimes kVk accepted across foot boundary?

kVt repair vs. tVk repair

teia poe moolelo e walaau ai ia laua. Ahe i <mark>katau</mark> ia iloko o ta pute. Ahe i <mark>takau</mark> ia mai la iloko o ta nupepa. Walaau oia i teia poe moolelo

It wasn't written in the book. It wasn't written down in the newspaper.

- Within-speaker, within-style, consecutive utterances, equivalent sentence structures
- Not a matter of style shifting! Not like each of these is 50% shifted
 - *tātau ungrammatical in Niihau
 - kākau would be standard style-shifted form
- And yet... tVk and kVt repair both observed

Summary

- /t/ > [k] triggered by avoidance of multiple coronals in a row
- In tVt sequences, preference for kVt (but not in all cases!)
- Dissimilation partially blocked by PWd and/or foot boundaries in some cases
- Evidence of lexical specification and minimal pairs
- Effects beyond the word level still need to be examined
 - Within-word variation not due to phonological environment
 - Definitely a stylistic aspect, but this data isn't set up to investigate that
- Provides potential "missing link" of phonetic pressure on phonological change that could help account for other historical examples of *t > k

Next steps

- Should be put in conversation with phonological theories regarding dissimilation and consonant disharmony
- Core issue, though: this is a very 'fuzzy' (pair of?) phoneme(s??)
 - Minimal pairs in both borrowings and native lexicon
 - Overall productive allophonic variation, with some lexical specification
 - Apparent evidence of optionality in output that can't be accounted for by phonological/syntactic environment or by style shifting
- What sort of phonological framework can account for this kind of variation in outputs? (And what frameworks are challenged?)
- Plenty of phonetic data from this speaker and others, can expand dataset to test phonological theories and stylistic variation

Mahalo i to outou hoolohe ana mai!