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KUKI-CHIN UTTERANCE-FINAL PARTICLES[*]

1. INTRODUCTION

(1) South Central Tibeto-Burman (=Kuki-Chin) subgrouping (Peterson 2017):

> A. Northwestern (=Old Kuki: Monsang, Anal, etc.)
> B. Central
>> i. Core Central (Hakha Lai, Mizo, etc.)
>> ii. Maraic
> C. Peripheral
>> i. Northeastern (Tedim, Sizang, Vaiphei, etc.)
>> ii. Southeastern
>>> a. Cho (Daai)
>>> b. Hyow/Asho
>> iii. Southwestern (Khomic: Khumi, Mro-Khimi, Lemi, Rengmitca, etc.)

- generally assumed prevalence of utterance-final (sentence-final) particles in SEA languages (Goddard 2005, Enfield 2005, Vittrant and Watkins, to appear): closed-class elements typically encoding illocutionary force, *evidentiality, aspects of speaker attitude or stance*

- while many descriptions of South Central languages have made use of notions like *particle* and *final particle*, they have rarely had much to say about elements in these latter categories

goals of the talk:

- look at some high-frequency utterance-final particles in selected languages, concentrating on ones related to the non-illocutionary force distinctions

- assess these phenomena across SC as a whole

- provide outlines of a framework for the future study of such elements for individual languages

2. FURTHER PRELIMINARIES

-what is the exact distribution (sentence, utterance, phrase, intonation unit)?
-what constitutes an utterance -*final* particle?
-must every sentence contain one (and only one)?
-utterance-final particle *complex* or *zone* rather than a single position?

(2) Phrase- or IU-final, Khumi:

nay^{11}b'lö^1 thang^{11}bë^1=te^5 sam^{1}rüng^1 ka^1-müng^5 ca^{10} jew^1=nö^3
then nightingale=EVID chili NR-ripe eat.IRR come=NR
'Then a nightingale came to eat red chilis.' (1.75)

(3) Not sentence-final, but utterance- or IU-final, Khumi:

ng^1='e^1
INTERJ=AFFIRM
'Yeah.' (45:160)

(4) Multiple occurrences of the same particle within a sentence, Khumi:

[a^{1}reng^6 a^{1}ju^1=ba^1] [kay^1=ba^1] [vay^{11}ci^1=lö^1=ba^1] [a^{1}reng^6 a^{1}ju^1 khang^1-nö^3=ba^1]
king.GEN wife=BA 1s=BA before=TOP=BA king.GEN wife become-NR=BA
'…"I am the king's wife. Before I became the king's wife."' (24:116b.)

(5) Particle sequences, Khumi:

a. =c'=bä^4:

ke=nö^3=c'=bä^4 nö^3 pë^1=te^5
bite-NR=CONF=BÄ QUOT say=EVID
'"(But) they'll bite us!" they said.' (18.129)

b. =bä^4=ö^1:

m phre^6-lä^3-yå^3=bä^4=ö^1 vay^1=lö^1 håy^3-phro^{11}phra^5=bo^3=bä^4
INTERJ happen-NEG-PERS=BÄ=INF now=TOP good-little.by.little=REAL=BÄ
'Yes, nothing has happened. Now they've gotten better, little by little.' (45.7)

c. =c'=ö^1:

våy^4-täng^3=c'=ö^1
return-AGAIN=CONF=INF
'Of course I'll go back.' (41.11)

d. =bä^4=h'=lö^1:

kuy^{1}ti^1 (am'iw 'a' åni)am^1'å^4=nö^{3}a^{1}nö^3 am^1'å^4-phriw^1-vuy^3=bo^3=bä^4=h'=lö^1…
banana (false starts) golden=NR like golden-AUGVCL-PFV=REAL=BÄ=DEIC=TOP
'It (rice crop) has become golden-colored like bananas.' (45.51)

3. EVIDENTIALS

3.1. HEARSAY EVIDENTIAL

(6) Hyow =*tî*:

ûy-tsɔ̂=ní lú-ák í-hníʔ-tsán-êy-hnɔ̂ʔ=tî
dog-DIM=FOC CLS-one 3A-DL-bring.up.II-MID-ULT=REPORTED.EVID
'The two brought up a puppy.' (Zakaria 2017:122)

(7) Rengmitca =*ti*:

angreng c'pa=nö=lö n'åj-p'aj maj=pö sa-pö-'ö=ti
rich son=LOC=TOP mother-father fire=FOC make$_B$-BEN-NEG=EVID
'The rich son, his parents didn't make a fire for him.' (72.9)

3.2. OTHER ELEMENTS WITH EVIDENTIAL NUANCES

(8)   Lai =*taa* (sudden realization of something, often based on visual evidence):
       …alee   rimnampaa=ni'   a-ka-hlen-hoy-tsang=kaw=hii<u>=taa</u>
       alas   stinker=ERG   3SS-1SO-deceive-REGR-PERF=AFFIRM=DEIC<u>=TAA</u>
       '… "Alas! The stinker has tricked me again!"…' (VLP.14)

(9)   ahman=kaw=hii<u>=taa</u>
       true=AFFIRM=DEIC<u>=TAA</u>
       ' "Look, it is true!" ' (NGTN.13)

(10)   aa   ma'-hii-hii   bia-law   a-sii=hii<u>=taa</u>
       interj   DEM-DEM-DEM   word-NEG   3sS-COP=DEIC<u>=TAA</u>
       ' "Ah, this isn't going to work!" ' (TL.24)

(*Note*: there are other attestations of =*taa* which don't seem to have exactly this sense; ultimately, it may be best compared with the inferential marker in Daai, seen below, and perhaps is relatable to Zakaria's (2017:390ff.) *deductive* marker in Hyow.)

(11)   Hyow =*nu* (sensory evidential inolving visual evidence):
       èy=lâ=tsæ̂   nílúp   nűng-khə́ʔ<u>=nú</u>   tîng…
       ANAPH.DEM=ERG=TOP   like.this   be.able-FACT<u>=SS.EVID</u>   QT
       'They will say, "He is really able (to do the job) like this."…' (Zakaria 2017:487)

(12)   Daai (So-Hartmann 2009:293-298)
       mirative: *-in*
       direct experience: *vanikba*/=*kba* (based on sensory evidence;
                                                all examples appear to be exclamatory)
       inferential: *lek*
       hearsay: *mjoh*

4. UTTERANCE/SENTENCE-FINAL DEICTIC ELEMENTS

(13)   Lai (Barnes 1998:55-56):
       a. ka-vok   an-fiar<u>=khi'</u>
           1S-pig   3PS-steal<u>=YONDER</u>
           'Look! They're stealing my pig!'

       b. ka-vok   an-fiar<u>=hi'</u>
           1S-pig   3PS-steal<u>=HERE</u>
           'Help! They're stealing my pig here!'

       c. na-faa=lee=ni'   ka-vok   an-fiar<u>=kha'</u>
           2S-child=PL=ERG   1S-pig   3PS-steal<u>=NEAR.LISTENER</u>
           'Your kids stole my pig!'

(14) Khumi:
   a. A: a¹ray²=ü¹   a¹ray²ray²ray² khew¹¹khu¹ no⁴=nö³ khëng¹-cang²=he¹
       INTERJ=EMOT INTERJ   knee   hurt=NR   look-try=DEIC
       'Ow! Ouch, ouch, ouch! Look at me, how my knee hurts.' (48.215)

   b. B: ew¹khung¹⁰   a⁵   khëng¹-cang²=ho¹
       entryroom.LOC   chicken   look-try=DEIC
       'Got to the entryway and look at the chickens' (48.216)

(15) Rengmitca:
   åk-la=ö   löw   hng   ng'waj kaj   khüj-thuk=la
   pig-male=VOC   run.away INTERJ now   1S   fall-DOWNWARDS=TOP

   nang   t'-dü-köm=tu=ti
   2S   NR-die-IRR=DEIC=EVID
   ' "Hey pig, run away! If I now fall on you, you'll die!" he said.' (164.64)

(16) Lai (Barnes 1998:55):
   ka-vok   an-fiar=tsu'
   1S.POSS-pig   3PS-steal=THERE.NOT VISIBLE
   'They are stealing my pig!'
   (noises from the sty alert the speaker to the unseen theft) (Barnes 1998:55)

- the use of deictic elements in this way may have nuances of evidentiality or other categories frequently associated with utterance-final particles

- they may occur internal to utterance-final particle complexes in specific languages

5. MARKERS OF SPEAKER ATTITUDE OR STANCE

5.1. MARKERS OF AFFIRMATION/CONFIRMATION

(17)   Lai =*kaw*:
   …thoong ka-tha'y=kaw   a-tii   an-tii
   noise   1SS-hear=AFFIRM 3SS-say   3PS-say
   '…"I certainly did hear the noise," she said, they say.' (MRH.57)

(18)   ee   a- ṭhaa=kaw
   INTERJ   3SS-good=AFFIRM
   '"Okay, that's certainly good."…' (TL.40)

(19)   Khumi =*cö⁴*:
   uh   ne³=yö¹   kay¹   p'nö³=cö⁴
   INTERJ elder.sister=EMOT   1S   know=CONF
   ' "Oh, elder sister, I certainly know…" '

(20)   A: h'ni³- rë¹to¹⁰   jew¹   kha¹⁰   h'ni¹   khu¹¹mi¹=håy¹ avung⁴=te⁵=bä⁴
      this- Bandarban.LOC   come time.LOC DEM   person=COM meet=EVID=BÄ

hu¹³   (village name)='ë¹
SUPERDIST   name1=GEN
'This-, he said, when you came to Bandarban you met this person from way over there in (name1).'

B: kay¹=håy¹=a¹
  1S=COM=INTERR
  'With me?

A: öng¹
  yeah
  'Yeah.'

B: may¹ni³ khu¹¹mi¹ aw ng¹ ng¹ ng¹ (village.name)=nö³ avung⁴=cö⁴
  which   person oh yeah yeah yeah name1.GEN=NR   meet=CONF
  'Which person? Oh, yeah, yeah, yeah. The one from (name1). Sure, I met with him.' (41.202-205)

(21) Rengmitca =*ca*:
   kek_D kek_D-döklangaj=ca   klen=pö ke_B-'ö=dökla ngaj-'ö
   go go-SEQ want=AFFIRM once=FOC go-NEG=SEQ want-NEG
   'If he goes regularly, he'll want to (go). If he doesn't go even once, he won't want to.' (351.21)

(22) Khumi =*'e¹*:
   lå¹-üng¹   pyå⁴-thay¹²-lä³=ö¹   k'ni¹¹-nay³-nö³=håy¹
   swidden-ELAB(=house) manage-POT-NEG=EMOT rain-NR=COM

   ti=nö³=håy¹='e¹
   etc.=NR=COM=AFFIRM
   'They sure won't be able to finish the field (work) with it raining and all.' (41.163)

5.2. KHUMI =BÄ⁴

5.2.1. *Mirative-like usage*

(23) ah h'ni³=lö¹ acë⁵='ë¹ k'lay¹ lu⁴phe¹ a¹tång²=bä⁴…
   INTERJ DEM=TOP 1PINCL=GEN monkey skull resemble=BÄ
   '"Oh, this one looks like our monkey skulls!"…' (18.61)

(24) nay¹¹b'lö¹   rång⁴-nö³=cë⁵-cë⁵=bä⁴   n'-pë¹=b'lö¹…
   then   wither-NR=COLL-COLL=BÄ QUOT-say=SEQ
   'Then she said, "They're all withered!"…' (7.39)

(25) m'nö³ nay³='ë¹⁰ h'ni³ a⁵=lö¹   lä⁴-ngay³=bä⁴   nö³=te⁵
   how thus=REAS DEM chicken=TOP run.away-DESID.NEG=BÄ QUOT=EVID
   '"What's going on? These chickens don't want to run away!" she said.' (34.227)

5.2.2. Answering a content question

(26) B: hu^{13} tlöyng^3=ma^6 s'dang^2-p'lang^2=lö^1 m'nö^3=lew^1 a^{1}taa^4
         SUPERDIST top=ABL.GEN   news-ELAB=TOP   how=QUEST   grandfather

         (name1)-cë^5=ma^6=nö^3 hu^{13} (name2)=ma^6=nö^3
         name1-COLL=ABL.GEN=NR   SUPERDIST   name2=ABL.GEN=NR
         'How is the news from way over there on top? From grandfather (name1)'s
         people, from way over there in (name2)?'

    A: a^{1}ti^3 s'dang^2=pö^1 thay^{12}-lä^3=bä^4
         what   news=FOC   hear-NEG=BÄ

         no^{4}so^1=lö^1 håy^3-råy^4=bä^4=ö^1
         sickness=TOP   good-PERS=BÄ=INF
         'I haven't heard any news. Everyone is well.' (41.108-110)

5.2.3. Providing relevant newsworthy information

(27) B: …hu^2=wa^1 ni^3=mö^3 üm^1 ha^1-rë^1 a^{1}lay^4 kha^{10}
         DIST=LOC   3S=FGD   house   one-COUNT   rent   time.LOC

         åm^2=nö^3=kh'lö^1 håy^3=nö^3
         stay=NR=COND   good.IRR-NR
         '…if he took a house there [in the market] and stayed there, it would be good.'

    A: a^{1}lay^4=bä^4=ö^1
         rent=BÄ=INF
         'He's rented one.' (41.180-181)

5.2.4. Correcting a mistaken assumption

(28) A: ng^1 h'ni^3 h'ni^3 (name1)=a^1
         yeah   this   this   name1.LOC=INTERR
         'Yes, this one [a letter] to (name1)?"

    B: kenan-   (name2)   (name2)   ma^{1}sto^1=bä^4 itihas=bä^4…
         clerk-   name2   name2   teacher.LOC=BÄ   history=BÄ
         'The clerk—(no), to (name2), (name2), the history teacher…' (41.72-73)

(29) …k'ni^{11}nay^3=nö^3 ning^{13}ci^2=pö^1 hi^2=ma^1 rë^{1}to^{10} jew^1 kha^{10}
         rain=NR   so.much=also PROX=ABL   Bandarban.LOC   come   time.LOC

         prang^4 ay^1=ö^1 kay^1 rë^{1}to^1=ma^1 våy^4 kha^{10} cit'kewng^2=bä^4
         uncle.in.law uncle=INF   1S   Bandarban=ABL return   time.LOC   Chittagong.LOC=BÄ
         'It rained so much when I came to Bandarban from here, uncle-in-law, I mean, when I
         returned to Chittagong from Bandarban.' (45.60)

5.2.5. Marking an abrupt topic shift (cf. by the way)

(30) A and B have talked for several turns about the weeding back home. Suddenly A says:

h'ni³ j'vay³ kha¹⁰ nang¹ fun³ pang²=nö³
DEM recently time.LOC 2S.LOC phone do=NR

h'ni³ fon numbar t'ko¹²-lä¹=bä⁴
DEM phone number go-NEG=BÄ
'Recently I called you but this phone number didn't work.' (41.171)

(31) lew¹¹hu¹ a¹ci⁵=tew² håy¹play²-b'lö¹=bä⁴ a¹cë⁵ khu¹¹mi⁶ a¹ci⁵ ne¹²-lä³
Mru story=COP well-SEQ=BÄ 1PINCL Khumi.GEN story correct-NEG
'Actually it's a Mru story. It's not one of our Khumi stories.' (21.20)

5.3. OTHER STANCE MARKING

5.3.1. Lai =’ee (lament, sentimentality)

(32) moo ka-faa=’oo tia’ khan an-tii=’ii
INTERJ 1SPOSS-child=VOC QUOT DEM.OBL 3PS-say=AND

a- ṭap-lengmang khoykaa=da’ na-’um-hngaa=’ee khoykaa=hen
3SS-cry-ITER where=QUEST 2SS-stay-SUBJ=’EE where=INDEF.QUEST

na-sii tia’ khan a- ṭap-lengmang an-tii
2SS-COP QUOT DEM.OBL 3SS-cry-ITER 3SS-say
'"Oh, my child," she said, and kept crying, "Where can you be? Whereever else might you be?" she said, and kept crying, they say.' (MK)

(33) ma’khan a-fanuu tsuu a-thii-kaw=’ee an-tii
then 3SPOSS-daughter DEM 3S-die-AFFIRM=’EE 3PS-say
'Then, her daughter truly died, they say.' (NHNF.19)

5.3.2. Lai =’aay (dismay, reproach):

(34) …a-nuupii=ni’ tsun a-faa tsuu a-thii=’aay
3sposs-wife=erg dem.obl 3sposs.child dem 3sS-die=’aay
"…his wife said, about the baby, 'Oh my gosh, it's dead!'" (TL)

(35) …an-thal-le’ an-lii=pool khaa tsaaytsim-tee=ni’ khan
3P-bow-AND 3P-string=COLL DEM mouse-DIM=ERG DEM

a-rak-’ay-di’=’ii an-hmang-khaw-tii-law=’aay
3sS-PERF-eat₁-DISTR-CONN 3PS-use₁-able₁-no longer-NEG=’AAY
'…the little mouse had eaten their bows and strings, and they weren't able to use them any more.' (PL.28)

5.3.3. Khumi =ba^1 (sympathy, concern)

(36) A: …üng^1=ma^4　　våy^4-ngay^3　　nay^3=cë^5　　a^{1}ti^3=pö^1　　thuy^3=’a^1
　　　　house=GOAL　　return-DESID　　QUOT=COLL　　what=FOC　　say=INTERR
　　　　'…Did she say anything (about) wanting to return home?'

　　　B: ngay^3　　ang^1-pë^1=ba^1…
　　　　want　　1S-say=BA
　　　　'She told me she wants to.' (45.132-133)

(37)　…ning^{13}ci^2　　a^{1}le^{1}seng^1-rö^3=nö^3　　a^{1}baa^1
　　　so.much　　be.problem-INCEPT=NR　　INTERJ
　　　'…it really would have been a problem, gosh.' (45.154)

5.4. REGISTER MARKING

5.4.1. Lai =’ee (politeness)

(38)　ma'　　tsaa=’a'　　tsun　　nan-nuu　　tsaa=’a'　　hin　　tshangrew
　　　dem　　sake=LOC　　DEM.OBL　　2P-mother　　sake=LOC　　DEM.OBL　　rice.cake

　　　pakhat　tsiaw　nan-pho’r-laay　　’ii　　ma'　hii　ṭhaa-tee　a-phor-khaw-mii
　　　one　　each　2PS-carry-IRR　　　and　　DEM　DEM　good-ADV　3sS-carry-POT-NR

　　　tsuu　　mii-fel　　mii-ṭhaa　　mii-ding　　zu’m-’ook　　thlaak-mii
　　　DEM　　person-dutiful　　person-good　person-straight　believe-PURP　possible-nr

　　　minung　　nan-sii　　tii　　khaa　aa-hngal-lay=’ee　　tia'　khan
　　　person　　2PS-COP　　say　　DEM　3sSREFL-know-IRR=’EE　QUOT　DEM

　　　a-ø-tsa’-hnaa=’ee　　tii　　a-sii
　　　3sS-3O-say-PO=’EE　　say　　3sS-COP
　　　' "So, each of you carry a rice cake for your mother. And the one who carries it well, it
　　　will be known that he is a dutiful, good, honest, trustworthy person," it's said."

(39)　aye’!　　kayma'　　ka-sii=’ee　　tia'　a-tii　　an-tii
　　　interj　　1s　　1sS-COP=’EE　　QUOT　3sS-say　　3PS-say
　　　'"Oh dear! It's me," she said, they say.' (MRH.52)

5.4.2. Khumi =ö^1 (informality, casualness):

(40)　a. lå^1　　lå^1=pö^1　　pyå^4-thay^{12}-lä^3=ö^1　　liw^{1}ngo^1=wö^1
　　　　field　　field=FOC　　finish-POT-NEG=INF　　nephew.in.law=INF

　　　vay^{1}nöyng^1　　m’nay^3=mo^4　kay^{1}cë^5　　a^{1}vang^2=pö^1　　pyå^{12}-lä^3
　　　this.year　　why=QUEST　　1P.EXCL.GEN　village.GEN=FOC　　finish-NEG
　　　'We can't finish weeding the fields this year, nephew-in-law, for whatever
　　　reason, also our village's (fields) we can't finish.' (45.4)

(41)   b.   A: tuy^1=mö^3 tuy^1=a^1 krö^6-lä^3-ra^{10}=pö^1=ö^1
                  water=FGD   water=LOC   take.care.of-NEG-REAS.LOC=FOC=<u>INF</u>

                  tuy^1 håy^{12}-lä^3-ra^{10}=pö^1=ö^1
                  water   good-NEG-REA.LOC=FOC=<u>INF</u>
                  'The water, they aren't taking care of the water, that's why. Because the
                  water isn't good.'

            B: mm… h'nay^3=c'=ö^1…
                  yeah   thus=CONF=<u>INF</u>
                  'Yeah, that's surely it…' (45:14-15)

6. UTTERANCE-FINAL *TOPIC MARKER* USAGE

(42)   a. Rengmitca:
       uh   nang   jöm-p'-haj-cåt-dök<u>=la</u>=ti   thuj-pö
       INTERJ 2S   fly-MAL-APP-motion.away-REAL<u>=TOP</u>=EVID say-BEN
       ' "Huh! You'll fly away with them on me!" he said to him.' (165.79)

       b. Khumi:
       h'ni^3=cë^5 våy^4=nö^3 lo^2=m'të^2 ci^6-lä^3-råy^4<u>=lö^1</u>
       DEM=COLL   return=NR   month=even   pass-NEG-PERS<u>=TOP</u>

       kay^1 m'nö^3 pe^1-råy^4=mo^4
       1S   why   give-PERS=QUEST
       'Not even a month has passed since they returned! Why would I have given
       (money to him) already?' (45.172)

(Also occurs in Mru; similar phenomena involving information status markers noted for
Hyow.)

7. CONCLUDING OBSERVATIONS

- major categories found in the SC final particle complex:
        -evidentials
        -deictic elements
        -stance/register marking (certainty, newsworthiness/unexpectedness,
                                speaker attitude, formality/informality/politeness)
        -final topic marker

- non-discrete nature of the phenomena

- conversation data crucial; narrative can also be of (more limited) use due to
  occurrence of directly quoted discourse internal to narrative

- tonal considerations

REFERENCES

BARNES, JOHNATHAN. 1998. Tsuu khaa tii hlaʔ: Deixis, demonstratives and discourse darticles in Lai Chin. *LTBA* 21.1:53-86.

CHHANGTE, LALNUNTHANGI. 1993. *Mizo Syntax*. University of Oregon Ph.D. dissertation.

DELANCEY, SCOTT. 1997. Mirativity: The grammatical marking of unexpected information. *Linguistic typology* 1:33-52.

DUBOIS, JOHN W. 2007. The stance triangle. 139-182 in Robert Englebretsen, ed. *Stancetaking in discourse: Subjectivity, evaluation, interaction*. Amsterdam: Benjamins.

ENFIELD, N. J. 2005. Areal linguistics and mainland Southeast Asia. Annual review of Anthropology 34:181-206.

GODDARD, CLIFF. 2005. T*he languages of East and Southeast Asia: An introduction*. Oxford: Oxford University Press.

HENDERSON, E.J.A. 1965. *Tiddim Chin: A descriptive analysis of two texts*. Oxford: Oxford University Press.

MITHUN, MARIANNE. 1987. Is basic word order universal? 15-61 in Doris L. Payne, ed. *Pragmatics of word order flexibility*. Amsterdam: Benjamins.

MORTENSEN, DAVID. 2003. Post-verbal modifiers in Tangkhul. UC Berkeley Ms.

PETERSON, DAVID A. 2017. On Kuki-Chin subgrouping. 189-209 in Picus S. Ding and Jamin Pelkey, eds. *Sociohistorical linguistics in Southeast Asia: New horizons for Tibeto-Burman studies in honor of David Bradley*. Leiden: Brill.

PETERSON, DAVID A. To appear. Bangladesh Khumi. 12-55 in Alice Vittrant and Justin Watkins, eds. *The mainland Southeast Asia linguistic area*. Berlin: Mouton.

SO-HARTMANN, HELGA. 2009. *A descriptive grammar of Daai Chin*. STEDT monograph 7, UC Berkeley.

STERN, THEODORE. 1963. A provisional sketch of Sizang (Siyin) Chin. *Asia Major* 10.2:222-278.

WU, RUEY-JIUAN REGINA. 2004. *Stance in talk: A conversation analysis of Mandarin final particles*. Amsterdam: Benjamins.

VITTRANT, ALICE and WATKINS, JUSTIN, eds. To appear. *The mainland Southeast Asia linguistic area*. Berlin: Mouton.

ZAKARIA, MUHAMMAD. 2017. *A grammar of Hyow*. Nanyang Technological University Ph.D. thesis.