Downtrend in Sylheti Phrasal Tones

Tulika Gogoi, Amalesh Gope

This study investigates the nature of the f0 downtrend in Sylheti, an Indo-Aryan tonal language that notably exhibits both lexical and phrasal tones (Gogoi, 2024), an uncommon combination offering valuable insight into the interaction between tonal and intonational phonology. The focus is on understanding how f0 downtrend, defined as the gradual lowering of fundamental frequency across an utterance, manifests in Sylheti's intonational structure and whether it reflects a phonological process rather than a phonetic one. Specifically, the research examines how phrasal tones marking Accentual Phrases (APs) behave across Intonational Phrases (IPs), and whether the downward f0 slope they exhibit can be systematically modeled.

Two core research questions guide the study: (i) how the overarching f0 downtrend across IPs shapes the surface realization of phrasal tones in Sylheti, and (ii) how the resulting peak-by-peak descent can be mathematically and statistically modeled. A controlled production experiment was conducted with five native Sylheti speakers reading 11 scripted neutral declarative sentences of varying syllable lengths (8–11 syllables). The data were manually annotated using Praat (Boersma and Weenink, 2012), and syllable-wise f0 values were extracted with ProsodyPro (Xu, 2013). These pitch values were then analyzed both visually and statistically.

Despite variations in pitch range among speakers, a high degree of consistency was observed in their pitch contours, indicating that each speaker maintained a characteristic pattern of repeated APs. Across sentences, the initial peak (P_1) consistently appeared as the highest, with subsequent peaks (P_2, P_3) showing a clear stepwise decline in height. This peak-by-peak f0 descent was consistent across sentences of different lengths and syllabic structures, suggesting that the downtrend is not influenced by utterance length but is instead phonologically driven.

Crucially, the study finds that the underlying lexical tones in Sylheti do not directly affect the f0 peaks of the phrasal tones. Rather, lexical tones modulate the scaling of L* pitch accents, which in turn influences the shape of the interpolation lines between tonal targets. Additionally, scaling changes induced by IP-medial H-tone roots do not modify the phonological specification of the phrasal tones; they only affect the vertical positioning of the pitch trajectory between low and high targets. These findings reinforce the idea that the observed downtrend is not a byproduct of articulatory or phonetic processes (i.e., declination), but rather a phonologically governed intonational feature.

Two modeling approaches were tested: one based on a downstep ratio and another using a final lowering constant, as proposed by Liberman and Pierrehumbert (1984). The final lowering constant model proved to be more accurate, achieving a strong correlation ($R^2 = 0.98$) between predicted and observed peak values, compared to the downstep ratio model ($R^2 = 0.75$). The study demonstrates that f0 downtrend in Sylheti neutral declaratives is phonological. Despite being a tonal language, Sylheti employs phrasal tones whose surface realizations follow predictable, mathematically modellable downstep patterns. These results contribute to a broader typological understanding of how lexical and intonational tone systems can interact within a single language.