Continuity and categoriality in prosodic prominence – the case of focus marking

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One of the principal functions of prosody in German is the marking of focus. As shown by several researchers (e.g. [1], [2], [3], [5]), both intonational and articulatory differences can be attested between entities that are in focus and entities that are out of focus. Recently, studies have demonstrated that speakers do not only mark focussed vs. non-focussed constituents: Focus *types* are differentiated, meaning that prosodic prominence directly encodes discourse functions. The present study is concerned with how categorical phonological and continuous phonetic aspects work together in marking focus and how they can be integrated into a theoretical model of prosodic prominence.

The findings of [4] shows that some speakers use categorical distinctions to differentiate focus types, while others do not. However, investigating the F0 contours with continuous measures reveals that all speakers' pitch accents pattern in a similar direction: Going from broad through narrow to contrastive focus, the peaks of the pitch accents are aligned later, their onglides and target heights are higher. Another interesting finding from the same corpus is presented in the study of [5]: The differences in the articulatory modification of the vowel's opening gesture between unaccented and accented are rather weak compared to the differences found within the group of focus types that are accented: Going from broad through narrow to contrastive focus, articulatory movements become larger, longer and faster.

To investigate in more detail how the phonetics and phonology interact in the direct prosodic marking of information structure, we recorded 26 speakers both acoustically and with electromagnetic articulography involving an interactive scenario in a game-like environment yielding a data set of 2080 utterances. First analyses of the intonational patterns are shown in fig. 1 using tonal onglide as a continuous measure, i.e. the direction and magnitude of the f0 movement to the target in the accented syllable: While speaker 1 uses falling *and* rising accents and speaker 2 only uses rising accents, the direction of the modification is identical for both speakers: broad exhibits smaller onglides than narrow focus and narrow exhibits smaller onglides than contrastive focus. Fig. 2 shows the fitted F0 curves from a generalised additive mixed model through the time window of the nuclear-accented syllable (plus a padding of 5 ms before and 10 ms after). The trajectories illustrate how speakers *differ* in their realisation of intonation contours but also how they *agree* in their general trend with peaks becoming later and higher from broad through narrow to contrastive.

To explore the theoretical implications of the categorical and continuous variation for our understanding of prosodic prominence, the idea of the attractor landscape is adopted from dynamical systems theory. This framework explains categorical changes as the result of scaling a continuous parameter ([6], [7]): A small change in a continuous variable can lead to a great shift in the attractor landscape. While dynamical systems establish a useful concept of quasi-categories arising from a continuous context, they also explain multistability, i.e. the presence of more than one category, and variation around the attractors.

Figures

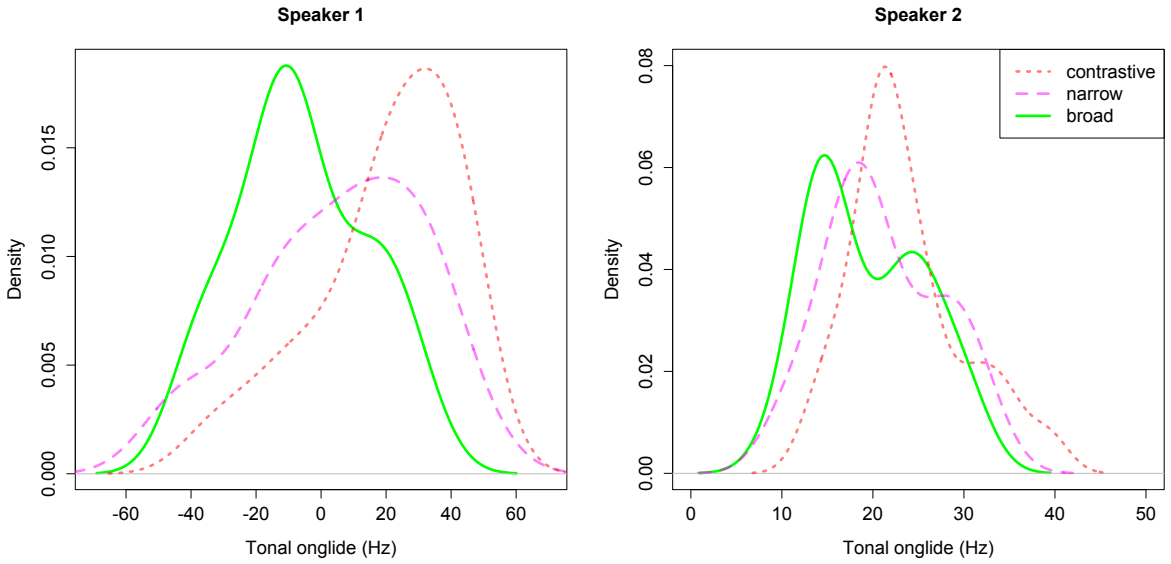

Fig. 1: Distributions of tonal onglides of all target words for two speakers (positive values indicate rising onglides, falling values indicate falling onglides)

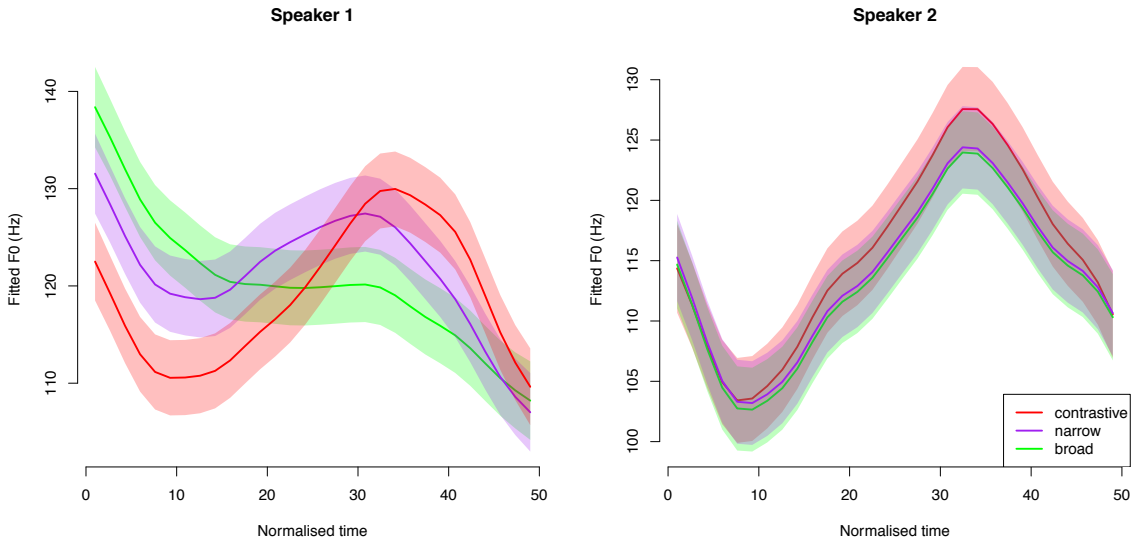

Fig. 2: Fitted F0 values from a generalised additive mixed model through the nuclear-accented syllable for two speakers (plus 5 ms before and 10 ms after)

References

[1] Féry, C. & F. Kügler (2008). Pitch accent scaling on given, new and focused constituents in German. Journal of Phonetics 36:4, 680-703.

[2] Cho, T. (2006). Manifestation of prosodic structure in articulation: Evidence from lip kinematics in English. In L. Goldstein, D. H. Whalen, C. T. Best: Laboratory phonology 8, Berlin/New York: Mouton de Gruyter, 519-548.

[3] Harrington, J., J. Fletcher & M.E. Beckman (2000). Manner and place conflicts in the articulation of accent in Australian English. In M. Broe (Ed.), Papers in laboratory phonology 5. Cambridge: Cambridge University Press, 40-55.

[4] Grice, M., S. Ritter, H. Niemann & T. Roettger (2017). Integrating the discreteness and continuity of intonational categories. Journal of Phonetics 64, 90-107.

[5] Mücke, D. & M. Grice (2014). The effect of focus marking on supralaryngeal articulation – Is it mediated by accentuation? Journal of Phonetics 44, 47-61.

[6] Gafos, A. I. & S. Benus (2006). Dynamics of Phonological Cognition. Cognitive Science, 30, 905-943.

[7] Browman, C. & L. Goldstein (1995). In R. F. Port and T. van Gelder (Eds.): Mind in Motion: Explorations in the Dynamics of Cognition. Cambridge: The MIT Press, 175-193.