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Estimating the climate variability of the last millennium on the East Antarctic plateau

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Quantitative knowledge about the climate variability on the Antarctic continent is crucial to attribute and detect the anthropogenic influence, and to understand the past and future evolution of the Antarctic ice sheet.

Isotope records from firn and ice cores provide information about Holocene climate variability but strong non-climate effects hamper their quantitative interpretation, especially in low-accumulation regions. So far, the magnitude and time-scale dependency of both the climate signal and the noise is largely unknown. Here, we combine 16 annually-resolved firn cores spanning the last 200 years, three records covering the last millennium as well as surface snow data from the Amundsenisen region on the East Antarctic plateau. By means of a spectral correction technique we can separate the climate signal from noise and derive, for the first time, a time-scale dependent estimate of East-Antarctic temperature variability.

Our preliminary results indicate that, unlike the raw isotope data, the obtained temperature variability for our study region shows a scaling behavior with more variability on longer time scales, similar to estimates from marine SST records. The noise levels we find are in accordance with the independent surface snow sampling results from Kohnen station. An analysis of the variability in current climate models on the other hand suggests less variability on centennial time scales. The discrepancy between the model and data-based results indicates either deficiencies in the model simulations, or further unknown processes affecting the ice-core records. Our estimate of East-Antarctic climate variability thus highlights the importance of an improved understanding of Holocene climate and ice-core derived variability.