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Millennial-like variability in an Antarctic ice core record

Content

Past temperature reconstructions from polar ice sheets are commonly based on stable water isotope records in ice-cores. However, despite major efforts in analyzing ice cores with regard to a better understanding of the signal formation, the temperature reconstruction of the last millennium in Antarctica remains highly uncertain. Here, using a 100 km scale representative surface water isotope data set, we show that the spatial variability of local surface topography and accumulation rate anomalies influences the isotopic composition of the upper-meter snowpack. These spatial anomalies are advected into the deeper firn column and translate the non-climate effect of variability in stable water isotopes into an artificial centennial to millennial scale variability in the isotope record. We hypothesize that similar effects might be apparent at other places in Antarctica and partly explain the poor correlation of stable water isotope records from ice cores and observed temperature.

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