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CLIVASH2k: sodium and sulphate in Antarctic ice cores spanning the past 2000 years

Content

CLIVASH2k (Climate variability in Antarctica and Southern Hemisphere in the past 2000 years) is the PAGES2k working group. We initiated a data call (Thomas et al. in prep.) in 2020 aiming to combine the ice core records from Antarctica to be used in atmospheric and sea-ice variability reconstructions over the past two millennia – a crucial period of understanding and distinguishing the natural and anthropogenically induced climate variability.

Here we present composite records of sodium and sulfate concentrations and fluxes for Antarctic ice core records spanning the past 2000 years. Sodium and sulfate allow for distinction between sea salt and non-sea salt ions through open water or sea ice source of marine ions in ice cores is still under discussion.

The records were selected from the CLIVASH2k database consisting of 118 individual ice core records. 24 records cover the past 2000 years' time frame. The stacked records are based on 6 to 10 records (depending on the parameter) spanning the full 2k interval in annual resolution with the least number of gaps.

Stack sodium concentration record demonstrates steady negative anomaly up to ~1100 AD with a later increasing trend up until ~1900 AD, when the trend changes to negative with a slope and amplitude bigger than any preceding change over the past 2k. No significant imprint of Medieval Climate Anomaly or Little Ice Age is seen in the data, the trends do not coincide with the Southern Annular Mode reconstructed index. However, a longer trend at 0-1800 AD is similar to marine sediment core IODP U1357B record of diatom abundance – *Thalassiosira antarctica*, an indicator of early autumn sea ice growth. We argue whether it is possible to reconstruct changes in the seasonality of sea ice rather than annual sea ice extent using marine ions concentration from ice core samples.

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