



Abstract ID : 168

Spatial variability of major ions in surface snow of East Antarctica

Content

Climate proxies in ice cores from low accumulation rate areas, such as the East Antarctic Plateau, show high variability in space and time. Whereas the temporal variations are a source of valuable information on past climate conditions, spatial variability reduces the integrity of the proxy's interpretation, as it adds non-climatic noise to the proxy record. For stable water isotopes, it has been shown that spatial variability is relevant from the metre scale representing stratigraphic noise to the kilometre scale representing topographic effects (1, 2, 3). However, the level of variability of major ions and its potential effect on the proxy record is not well studied.

We here analysed major ions (fluoride, MSA, chloride, bromide, sulfate, nitrate, sodium, ammonium, potassium, magnesium and calcium) along a 50 m long and 4 m deep trench wall at Kohnen Station in Dronning Maud Land, Antarctica (EDML drilling site, 0°04E 75°00 S, 2892 m.a.s.l.) and a 115 km transect between Kohnen Station and B31 (firn core drilling site, 0°04E 75°00 S, 2892 m.a.s.l.). Along the transect, at each of the 43 locations, ten samples of the upper metre in three or four depth intervals were collected. At sixteen sites ten 1 m samples in three depth intervals were extracted using a specifically designed sampling tool (4) to allow surface snow samples in a reasonable time and amount. All samples were analysed by Ion chromatography and mean concentrations for each location were calculated. Our sampling scheme increases the representativeness of local ion concentrations so that the influence of topography changes on snow chemistry along the transect can be described.

References:

- (1) Laepple, T., Hörhold M., Münch, T., Freitag, J., Wegner, A. and Kipfstuhl, S.: Layering of surface snow and firn at Kohnen Station, Antarctica: Noise or seasonal signal?, *J. Geophys. Res. Earth Surf.*, 121, doi:10.1002/2016JF003919, 2016
- (2) Münch, T., Kipfstuhl, S., Freitag, J., Meyer, H., and Laepple, T.: Regional climate signal vs. local noise: a two-dimensional view of water isotopes in Antarctic firn at Kohnen Station, Dronning Maud Land, *Clim. Past*, 12, 1565–1581, <https://doi.org/10.5194/cp-12-1565-2016>, 2016
- (3) Dallmayr, R., Freitag, J., Laepple, T., Wilhelms, F., Jansen, D., Behrens, M., Hörhold, M.: Topographic effect creates non-climatic variations in ice-core based temperature records of the last millennium, *Earth and Space Science Open Archive*, 17, 10.1002/essoar.10508113.1, <https://doi.org/10.1002/essoar.10508113.1>, 2021
- (4) Dallmayr, R., Freitag, J., Hörhold, M., Laepple, T., Lemburg, J., Della-Lunga, D., Wilhelms, F.: A dual-tube sampling technique for snowpack studies. *Journal of Glaciology* 1–7, <https://doi.org/10.1017/jog.2020.85>, 2020

Primary authors: BEHRENS, Melanie (Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany); DALLMAYR, Rémi (Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany); FREITAG, Johannes (Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany); LAEPPLE, Thomas (Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Potsdam, Germany); MÜNCH, Thomas (Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Potsdam, Germany); TWARLOH, Birthe (Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany); HÖRHOLD, Maria (Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany)

Presenter: BEHRENS, Melanie (Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany)

Track Classification: Holocene and last 2000 year climate forcings and variability