Dimethyl sulfide and dimethylsulfoniopropionate profiles in sea ice during winter in the Weddell Sea

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This study presents profiles of the organic sulphur components dimethylsulfide (DMS) and dimethylsulfoniopropionate (DMSP) in sea ice cores collected during the AWECS (Antarctic Winter Ecosytem Climate Study) cruise on RV Polarstern (ANT29-6) in the Weddell Sea.

DMS is a semi-volatile sulfur component and under discussion to be climate active, as its oxidation products might act as cloud condensation nuclei - thus cooling the atmosphere. It is produced by enzymatic cleavage of the precursor DMSP, which is synthesized by various types of phytoplankton and serves for example as compatible solute and cryoprotectant. Due to the physico-chemical conditions given, i.e. the high salinity and the icy matrix, sea ice as habitat favors production of high levels of DMSP by the inhabiting microalgae. DMSP and DMS are frequently found in high concentrations in sea ice during spring and summer. The aim of this study was to investigate DMS(P) levels in winter sea ice as data for the winter season is yet scarce, but is of importance for global budgeting.

Preliminary results of our study show that DMS(P) production in sea ice in the Weddell Sea is also significant during winter. This stands in contrast to previous measurements in Arctic winter sea ice (CFL-IPY cruise in the Circumpolar Flaw Lead Polynya), where DMS(P) concentrations were very low. Possible explanations for the differences between DMS(P) levels in the Arctic and Antarctic might be the different snow cover and thus insulation, light regimes and also microbial community structure within the ice. DMS(P) levels were generally correlated with chlorophyll a concentrations, although the details are complex and seem to be influenced by species composition and species specific DMSP/Chla ratios. The DMS profiles mirrored the permeability of the sea ice following DMSP in the impermeable areas while showing losses to the ice surface and ice-water interface in the more permeable regions. Winter DMS(P) profiles are furthermore compared to data collected during the following spring cruise of RV Polarstern (ANT29-7) in the Weddell Sea.