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The Importance of Sea Ice for Halocarbon and Mercury Chemistry

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Sea ice is thought of as being a barrier for the transportation of dissolved gases between the ocean and the atmosphere. However, sea ice as a source of gases has not been considered to any larger extent. The gaseous fluxes of halocarbons and mercury in polar waters are poorly known, particularly in regards to the role of sea ice. The fluxes are predicted to change in accordance with changes in the biological processes and by melting of sea ice resulting in more open water. The ice is a habitat for a number of autotrophic and heterotrophic organisms. It is a highly variable ecosystem governed by salinity, temperature, limitation in nutrients as well as light conditions. Sea ice is also a barrier to light transmission, and, therefore, ice algae must be physiologically adapted to low light conditions. It has been shown that their photosynthetic systems are saturated at relatively low light intensities, and have high photosynthetic efficiencies. A consequence of such high activity is an increase in pH as well as a depletion of inorganic carbon.

We have measured the distribution of halocarbons and mercury in sea ice and snow during expeditions to the Amundsen Sea, Antarctica, with the Swedish icebreaker Oden. Our results indicate sea ice as a source of halocarbons, in particular iodinated compounds. For the latter ones the contribution to the atmosphere is in the same order of magnitude as that of seawater.

The importance of irradiance for the distribution of dissolved gaseous mercury in ice cores was also studied. The difference in concentrations of volatile mercury was significantly altered due to different light conditions. This indicates that photo reduction of oxidized mercury is occurring in ice, possibly in the aqueous fractions, brine, within the ice structure.

Please list some keywords

halocarbons, mercury, gaseous fluxes, Amundsen Sea, Antarctica, photo reduction of oxidized mercury

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