EGU22-5683
https://doi.org/10.5194/egusphere-egu22-5683
EGU General Assembly 2022

Halogens in sub-Antarctic ice cores modulated by wind forcing, sea ice and primary productivity

Delia Segato[1,2], Elizabeth R. Thomas[3], Amy King[3], Dieter Tetzner[3,4], Dorothea Elisabeth Moser[3,4], Clara Turetta[1,2], Alfonso Saiz-Lopez[5], Bradley Markle[6], Joel Pedro[7,8], and Andrea Spolaor[1,2]

[1]Department of Environmental Sciences, Informatics and Statistics, Ca' Foscari University of Venice, 155 Via Torino, 30172 Venezia-Mestre, Italy

[2]CNR-Institute of Polar Sciences, 155 Via Torino, 30172 Venezia-Mestre, Italy

[3]Ice Dynamics and Paleoclimate, British Antarctic Survey, Cambridge, CB3 0ET, UK

[4]Department of Earth Sciences, University of Cambridge, Cambridge, UK

[5]Department of Atmospheric Chemistry and Climate, Institute of Physical Chemistry Rocasolano, CSIC, Madrid, Spain

[6]Institute of Arctic and Alpine Research, Department of Geological Sciences, University of Colorado, Boulder, CO, USA

[7]Australian Antarctic Division, Kingston, TAS, Australia

[8]Australian Antarctic Program Partnership, University of Tasmania, Hobart, TAS, Australia

Over the last four decades, the Southern Ocean has been characterized by now-persistent stronger westerly winds, with consequences for the Antarctic region climate, including variations in sea ice extent and primary productivity. Here we present the first ever bromine, sodium and iodine records, tracers of sea salt aerosols, sea ice and primary productivity, from five sub-Antarctic ice cores, retrieved from Bouvet, Young, Peter I and Mount Siple Island and Mertz glacier. The aim of the study is (1) to assess if halogens deposited in sub-Antarctic regions are influenced by recent changes in wind forcing and (2) to better understand the underlying processes of halogens emission from ocean/sea ice, their transport and deposition over the Antarctic region.

The trends of sodium and bromine, emitted and transported with sea salt aerosols, suggest that wind strengthening leads to more halogens deposited in the sub-Antarctic. Also, we find that bromine is depleted with respect to the bromine-to-sodium sea-water ratio at all sites, indicating that bromine species are sustained in the marine boundary layer by halogen chemistry and are less prone to be deposited. Iodine records show a positive correlation with marginal sea ice and primary productivity variability, suggesting that iodine species emitted at the edge are deposited more efficiently than bromine species.