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Spatial distribution of biogenic sulphur compounds in the Arctic aerosol collected during the AREX 2011 and 2012 Oceania ship cruises

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The sea area between Norway and Svalbard Islands (Norwegian and Greenland Seas) is a critical site to study the effects of the climate change on the high-latitude Northern-Hemisphere regions. In particular, changes in extension and/or in the persistence of annual sea-ice, availability of nutrients and trace-elements in the biological-active marine layers and sea surface temperatures could affect the marine primary productivity and the emission into the atmosphere of dimethylsulphide (DMS), produced by phytoplankton metabolic processes. This volatile compound is oxidised in the atmosphere mainly to sulphuric acid and Methanesulphonic acid (MSA), which undergo gas-to-particle processes and form secondary sub-micrometric aerosol particles. In this way, they play a relevant role as cloud concentration nuclei (CCN), therefore controlling the climate through scattering/absorption of solar irradiation and changes in cloud coverage (and so affecting albedo). Here, we report the spatial distribution of MSA and H2SO4 measured on 12-h aerosol samples (PM10) collected during two summer cruises of the Oceania ship (AREX 2011 and 2012 oceanographic cruises). The samples were collected on Teflon filters along several marine transects starting from Tromso (Norway) to Svalbard Island and along the Western side of Svalbard Islands. S-compounds distribution was also compared with the organic carbon (OC) aerosol fraction, determined by a EC/OC thermo-optical analyser, and with the atmospheric concentration of selected carboxylic acids (measured by ion chromatography).
Preliminary results on the AREX 2011 aerosol samples show two sharp maxima of non-sea-salt sulphate and MSA in June, in phase one with each other, while lower contribution of biogenic emission are recorded in the filters collected in July. Besides, no clear trend along coastal to open-sea transects is evident. Higher MSA concentrations (up to 120 ng/m3) were measured near the Norwegian coast, along the Tromso-Svalbard route, and in the south-west coastal areas of the Svalbard Island, while the lowest values (few ng/m3) were found in the open-sea at north-west of the Islands.
The Particulate Organic Matter (POM) fraction, reconstructed by the OC measurements, covers about 33% of the PM10 mass, so constituting a major component of the marine Arctic aerosol collected in this area.