CATCH Workshop
Guyancourt, France

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Science Themes: • How physical, chemical, biological, and ecological changes in sea ice and snow impact atmospheric chemistry , • How atmosphere-ocean interactions determine atmospheric chemistry, • Feedbacks between climate change and atmospheric chemistry that are determined by changes in the cryosphere, • How aerosols are formed and processed in cold regions, • How aerosols in cold regions act as cloud precursors and impact cloud properties, • How background composition/chemistry (trace gases and aerosols) in cold regions influences the fate of pollution (joint objective with PACES), • How do physical processes in atmosphere (e.g. mixing, nucleation) and snow (e.g. metamorphism, radiative transfer) contribute to biogeochemical cycling of trace gases as well as particle formation and transport?

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Applied for Travel Support

Abstract Title:

Intrinsic chemical reaction between iron oxide and iodide in ice and its environmental impacts

Abstract

It is known that the chemical processes taking place in ice phase is different from that in aqueous water. This difference between two phases might control the mobility, bioavailability, toxicity, and the environmental fate of organic and inorganic species. In general, most chemical reactions slow down as the reaction temperature decreases. However, various redox chemical processes are accelerated when the solution is solidified. Iron(Fe) is one of the most important trace elements for living species and the limiting component to control primary production in HNLC(High Nutrient and Low chlorophyll) regions including Southern Ocean. Consequently, this stimulated primary production by bioavailable iron can absorb atmospheric CO2 and then affect climate change. Most of the iron in environment is existed as iron oxide or (oxy)hydroxides form and they are not directly bioavailable for living organisms. Dissolution of iron oxides increases their bioavailability. The chemical fate of active halogen compounds in the polar atmosphere controls ozone and mercury depletion events, oxidizing capacity, and dimethyl sulfide(DMS) oxidation to form CCN (cloud-condensation nuclei). The sources and mechanisms of iodine species in polar atmosphere are not well understood compared to those of chlorine and bromine. In this work, we studied the reductive dissolution of iron oxide particles to produce bio-available $Fe(II)_{aq}$ and simultaneous oxidation of I^- (iodide) to produce I_3^- (tri-iodide) in ice phase under UV irradiation or dark condition. The reductive dissolution of iron oxide and oxidation of iodide was markedly enhanced in ice phase regardless of presence or absence of light. The detailed experimental conditions and mechanism will be discussed in the presentation.