ENHANCED PRODUCTION OF ATMOSPHERIC IODINE IN ANTARCTICA

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ABSTRACT

Halogen compounds play a significant role in Earth's environments. Reactive halogens are involed in ozone depletion event both in Troposphere and Stratosphere, perturbation of HOx/NOx cycle, formation of cloud condensation nuclei(CCN), and mercury depletion event. Although the high concentration of atmospheric iodine compounds in the boundary layer of Antarctica was observed by ground-based and satellite borne observation, the mechanisms and sources are not well understood. In this work, the oxidation of iodide and subsequent release of atmospheric iodine both in the presence and absence of irradiation was investigated. The oxidation of iodide (I^-) to tri-iodide (I_3^-) and the following production of iodine molecule (I_2) were greatly enhanced in ice phase compared to those in aqueous solution. The outdoor experiments conducted under ambient environments of the Antarctic region (King George Island, 62°13′S 58°47′W, sea level) also sconfirmed the enhanced oxidation of iodide in ice phase. The freeze concentration of iodide, proton, and oxygen in ice grain boundaries is regareded as the major driving force for the enhanced oxidation of iodide and the following production of iodine molecule in atmosphere. These results suggest the unknown production pathway of the atmospheric iodine compounds in fronzen environments.