Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01927, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01927
EGU General Assembly 2008

Iodide catalyzed bromine production from marine aerosol

S. Enami, C. D. Vecitis, J. Cheng, A. J. Colussi, and M. R. Hoffmann

W. M. Keck Laboratories, California Institute of Technology, Pasadena, California 91125, USA

Bromine critically affects atmospheric ozone at all altitudes playing a crucial role in the ozone depletion events (ODE's) observed in the polar lower troposphere during early spring. The mechanism of atmospheric bromine production from its primary seawater bromide source is, however, not fully understood. ODE's require the presence of appreciable levels of rapidly photolyzable Br_2(g) at the end of the polar winter night. Since ODE's are also observed under pristine Antarctic conditions, the conversion of marine Br^- into Br_2(g) should involve natural oxidants, such as O_3, that persist in the dark. The inertness of Br^- and Cl^- toward O_3 is somehow circumvented in sea salt. An experimental report that shows more Br_2(g) is released from sea salt than from pure NaBrexposed to O_3(g) suggests that Br^- oxidation is catalyzed by minor components. The documented enrichment of specific seawater anions such as Br^- and I^- in fine marine aerosol particles may thus be the key to halogen production. Here we show that I^- efficiently catalyses the oxidation of Br^- and Cl^-in aqueous nanodroplets exposed to ozone under conditions similar to those encountered in marine aerosols. Br^- and Cl^- are readily converted into IBr_2^- and ICl_2^- en route to Br_2(g) and Cl_2(g) in the presence of I^-. Fine sea salt aerosol particles, which are demonstrably and predictably enriched in I^- and Br^-, are thus expected to release photoactive halogen compounds into the atmosphere even in the absence of sunlight.