394

OXIDATION OF GEM TO GAS-PHASE DIVALENT MERCURY IN THE ARCTIC AND ANTARCTIC TROPOSPHERE: THE ROLE OF THE SPRINGTIME HALOGEN CHEMISTRY

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Studies carried out in the arctic environment have highlighted that the Arctic is generating the highest levels of reactive gaseous mercury ever recorded in the atmosphere. Atmospheric mercury measurements performed at the Italian Antarctic Research Station (74 41'42'' South, 164 07'23''East) (2000/2001) showed as high RGM concentrations (10.5 to 334 pg m-3) as those found in some industrial environments. Previously, the presence of this form of mercury in the troposphere was related almost exclusively to anthropogenic sources but, in the Antarctic environment, it was hypothesised that the high RGM levels observed were due to in-situ gas phase oxidation of Hg0. Researches carried out in the Arctic showed springtime mercury depletion events (MDEs) which is the main mechanism driving the mercury deposition and its input to the snow/ice pack and marine environment. This phenomena, first noted in the Arctic, has been also observed in Antarctica. The observations carried out at Ny-Alesund, (78 54'N, 11 53'E) during a spring campaign (2003) showed that Hg0 concentrations dropped similarly to ozone levels, whereas RGM followed an opposite trend. Sharp increase in RGM concentrations up to 220 pg m-3 were observed. The findings suggest that the depletion of Hg0 is photochemically driven by oxidation of boundary-layer Hg0 by reactive halogens (apparently, BrO radicals) creating a rapidly depositing species of oxidized gaseous mercury in the Arctic environment. The mechanism of the oxidation reaction is still unclear. This study focuses on the atmospheric conversion of Hg0 to RGM which appears to deposit within minutes/hours in the Arctic and Antarctic regions