Geophysical Research Abstracts,
Vol. 11, EGU2009-6185, 2009
EGU General Assembly 2009

Measurements to understand the role of the sub Arctic environment on boundary layer ozone, gaseous mercury and bromine oxide concentrations

S Netcheva (1), J Bottenheim (1), R Staebler (1), A Steffen (1), N Bobrowski (2), and J Moores (1)

(1) Environment Canada, Science and Technology Branch, Toronto, M3H5T4, Canada (stoyka.netcheva@ec.gc.ca), (2) Istituto Nazionale di Geofisica e Vulcanologia Sez. Palermo Via Ugo La Malfa, 153, 90146 Palermo, Italy

Marine Boundary Layer spring time ozone (O3) and Gaseous Elemental Mercury (GEM) depletion episodes in Polar Regions and the role played by reactive halogen species have been studied for several years. Understanding of the photochemistry involved has improved significantly in the last few years, but many questions remain. The key in filling many gaps of information is in conducting systematic measurements over freezing and thawing surfaces of big water basins in Polar Regions where depletion episodes are thought to originate. Regardless of extensive research in the field, data sets collected over the ice are limited due to logistics and engineering challenges. The fast changing Arctic environment with its potential implications for climate change and human and ecosystem health demand urgent development of a predictive capability that could only be achieved by complete quantitative understanding of these phenomena.

The Out On The Ice (OOTI) mini atmospheric chemistry laboratory was developed in 2004 specifically to permit collecting data at remote locations in an autonomous way. The system is battery powered, easily transported by snowmobile and quickly deployed at a target location. The equipment has undergone multiple engineering and instrumentation improvements. In its current version, it conducts fully automated measurements of O3, GEM and carbon dioxide (CO2) simultaneously at two levels: right above a surface of interest and at 2.5 meters. This is accomplished by utilizing two identical sets of instruments (2B for O3 and Gardis for GEM), or by continuous valve switching (CO2). A vertical profile of bromine oxide is determined by scanning the collecting optics of a Differential Optical Absorption Spectrometer through different elevation angles. Furthermore a full set of meteorological data is acquired in parallel with the chemical measurements in order to evaluate environmental and air mass transport contributions.

We will present results from data collected over the ice of the south east part of Hudson Bay near the town of Kuujjurapik/Whapmagoostui, Quebec, Canada between February 17 and March 13, 2008. The study was part of the “Impact of combined iodine and bromine release on the Arctic atmosphere” (COBRA) campaign. Air-surface interactions were studied over ice, fresh snow, open and freezing water and freshly grown frost flowers. The results of O3, GEM and BrO measurements and their relation to the character of the underlying surface and ambient air conditions will be discussed.

This work is part of the OASIS-CANADA program, funded by the Canadian Federal Program Office of the International Polar Year