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Preliminary data analysis from the IPY autonomous surface ozone monitoring network in Dronning Maud Land, Antarctica

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In sharp contrast with stratospheric ozone, the detailed climatology of tropospheric ozone over Antarctica is relatively understudied, partly due the difficulty in establishing long-term measurements in this remote part of our World. The scarcity of year-round surface ozone data is closely tied to that of manned research stations, often confined to coastal Antarctica, with the exception of the South Pole and more recent Concordia continental stations on the East Antarctic Plateau. Current long-term datasets (eg South Pole, Neumayer, Sanae, Halley) reveal similar annual seasonal behaviour: ∼30 ppbv winter maximum, and 10-15 ppbv summer minimum. Coastal stations also show well-recognised Ozone Depletion Events (ODE), phenomena which have been observed both in Arctic and Antarctic regions, when near-zero ozone concentrations are measured during the springtime polar sunrise; this ozone loss process is believed to involve rapid photo-catalytic chemistry of Bromine/Iodine species on aerosols and/or frost flowers over open sea-ice leads.

The ozone monitoring network presented in this study was proposed as part of the International Polar Year (IPY) to fill in the gap in our knowledge of the regional and climatological extent of ODE, and to probe the snow pack photochemistry impact on the overlying boundary layer oxidative capacity over the Antarctic Plateau.

Between December 2007 and January 2009, a network of ten low-powered autonomous surface ozone monitors was deployed along the Weddell Sea coast and up the Dronning Maud Land (DML) plateau. The study region covers ∼800km of the South-eastern Weddell Sea coastline. Four sites were located on ice shelves to study the effect of long fetched ODE. Other sites were deployed on a transect between the ice shelf bound coastal zone and up to 2400 m altitude on the DML Plateau, towards the Kohnen station operated by the Alfred Wegener Institute. This North-to-South transect roughly follows the Stancombe-Wills ice stream, an area of katabatic flow funnelling. It should allow us to gauge the effect of Antarctic Eastern Plateau outflow and the impact of (eg NOx) emissions from the continental snow pack on in-situ surface ozone production, in an area removed from ozone depleting oceanic halogen precursors.

We present preliminary data from the network, and put it in the context of existing long term surface ozone measurements carried out from manned monitoring stations in the DML region.