Geophysical Research Abstracts
Vol. 14, EGU2012-2686, 2012
EGU General Assembly 2012

Features of ODEs derived from an autonomous surface ozone network in coastal Antarctica

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In 2008, a network of 10 autonomous ozone monitors was established around Dronning Maud Land, Antarctica, along 800 km of the coastal perimeter and with a transect running ∼450 km up onto the polar plateau. The monitors ran for a full year. The aim of the network was to explore variability of ozone at the different sites, and the contrasting influences of O_3 production (arising from snowpack photochemistry) and O_3 destruction driven by halogen chemistry.

While ozone depletion events have been much studied at single coastal locations, and even from within a large ozone depleted air mass over the Arctic Ocean, a different approach is required to gain information on their spatial extent. The autonomous network provided an opportunity to map the movement, and thereby the size, of ozone-depleted air masses. Here we present results from the network, focusing particularly on activity during springtime. In many cases the same ODE appeared at several (in some cases, all) of the coastal sites, the arrival and departure of the depleted air mass being offset in time. In some instances a severe ODE was evident at a single coastal site only. We explore the meteorological conditions operative during the ODEs as a means of accounting for these observations, and estimate the size of the depleted air masses. Further, we use our data to explore how far inland ODEs can penetrate to address why these are thus far seen as coastal phenomena only. An awareness of the variability in ODEs, spatially as well as temporally, will be necessary for trend studies using coastal polar surface ozone measurements.