Geophysical Research Abstracts
Vol. 15, EGU2013-8894, 2013
EGU General Assembly 2013

The atmospheric HCHO budget at coastal East and West Antarctica: Impact of photochemical productions and snow emissions

Michel Legrand, Susanne Preunkert, Guillaume Pépy, and Bruno Jourdain

CNRS / UJF – Grenoble 1, Laboratoire de Glaciologie et Géophysique de l'Environnement (LGGE) UMR 5183, Grenoble, France, St Martin d'Heres, France (preunkert@lgge.obs.ujf-grenoble.fr)

HCHO year-round records are now available at three coastal Antarctic sites, Neumayer and Halley in the Weddell Sea region and Dumont d'Urville in Terre Adélie, revealing a similar seasonal pattern with winter minima and summer maxima. However, absolute values significantly differ from site to site, during summer and winter. Monthly summer means exceed 450 pptv at NM, whereas a HCHO maximum of 130 pptv is observed at HA. Summer HCHO levels at DDU are similar to those at HA although higher levels were expected in relation with a methane oxidation being promoted by a 5 times higher level of OH at DDU than at HA. On the other hand, to match observations at NM and HA, snow emissions have to be considered whereas photochemical HCHO sources and sinks alone seem to explain observations at DDU.

With the aim to draw a more comprehensive picture of the HCHO budget at coastal Antarctica we reexamine and discuss the three records using 0-D and 2-D calculations. In summer, the gas phase photochemistry is at all sites dominated by the CH_4 oxidation, well before the oxidation of DMS and light alkenes. The CH_4 oxidation chemistry is some three times more efficient in producing HCHO at DDU than at the two other sites because of more rich oxidant air masses coming from the Antarctic plateau reach DDU. The halogen chemistry, even being more important in relation with much sea-ice at HA and NM than at DDU, remains a weak HCHO sink. HCHO snow emissions represent an important contribution at the two Weddell Sea sites whereas they contribute only weakly at DDU.

Although they are probably of similar strength around the three sites, the far thinner atmospheric boundary layer at HA (and even more at NM) compared to DDU permit an efficient accumulation of HCHO emitted by this surface source.

In addition these coastal Antarctic data sets will be opposed to HCHO mixing ratios and snow fluxes obtained at inland Antarctica (Dome C) within the framework of the OPALE (Oxidant Production over Antarctic Land and its Export) project.