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Arctic Ozone depletion in 2015/16 and comparison with previous winters

W. Feng (1), M.P. Chipperfield (1), J.M.C. Plane (2), S.S. Dhomse (1), T. Kovacs (2), D.R. Marsh (3), D. Kinnison (3), P.T. Verronen (4), M. Andersson (4), and F. Goutail (5)

(1) NCAS, School of Earth and Environment, University of Leeds, Leeds, United Kingdom (w.feng@leeds.ac.uk;M.Chipperfield@leeds.ac.uk;S.S.Dhomse@leeds.ac.uk), (2) School of Chemistry, University of Leeds, Leeds, United Kingdom (J.M.C.Plane@leeds.ac.uk;takovacs@gmail.com), (3) National Centre for Atmospheric Research, Boulder, USA (marsh@ucar.edu;dkin@ucar.edu), (4) Finnish Meteorological Institute, Helsinki, Finland(pekka.verronen@fmi.fi;monika.andersson@fmi.fi), (5) LATMOS/CNRS, Guyancourt, France(florence.goutail@latmos.ipsl.fr)

Three-dimensional chemical transport models (CTMs) and coupled chemistry-climate models (CCMs) have been widely used to study the dynamical and chemical processes which control polar ozone depletion. Despite generally good agreement between modelled and observed loss, there are still some uncertainties in our understanding and limitations of the models. For example, the accuracy of modelled springtime ozone loss depends critically on the transport, chemistry and treatment of polar stratospheric clouds (PSCs). There is also increasing evidence that descent of NO_x from the mesosphere can impact ozone at high latitudes, even in the absence of halogen-catalysed loss. CCMs used for future predictions need to accurately include these processes.

At the time of writing (late February 2016) the current Arctic winter has been cold with extensive PSC activity. The local maximum modelled O_3 loss is currently $\sim$50% (www.see.leeds.ac.uk/tomcat), which is similar to that from previous cold years with record ozone depletion (e.g. 2010/11). This is interesting in its own right, but will also provide new meteorological conditions under which to test modelled loss against observations.

We will present results from the TOMCAT/SLIMCAT off-line 3-D CTM and the NCAR Whole Atmosphere Community Climate Model (WACCM), which we have recently extended by including mesospheric ion chemistry. Both models are forced or nudged by the ECMWF ERA-Interim 4D-var reanalyses. First we will focus on the cold Arctic winter/spring 2015/16 and quantify the amount of chemical ozone loss using both models and satellite observations. Then we will investigate the chorine activation and denitrification as well as mesospheric NO_x/HO_x impact on stratospheric ozone. Other sensitivities experiments will be also discussed.