Geophysical Research Abstracts
Vol. 18, EGU2016-15353, 2016
EGU General Assembly 2016
© Author(s) 2016. CC Attribution 3.0 License.

Global modelling of the $ClNO_2$ production impact on tropospheric nitrogen oxides and main oxidants

Carlos Alberto Cuevas Rodríguez (1), Steven S. Brown (2), Jean-Francoise Lamarque (3), Alfonso Saiz-Lopez (1), Douglas E. Kinnison (3), Felipe Lopez-Hilfiker (4), Joel A. Thornton (4), Lyatt Jaegle (4), Dorothy Fibiger (2), Erin E. McDuffie (2), Amy P. Sullivan (5), Rodney J. Weber (6), and Jack Dibb (7)

(1) Instituto de Química Física Rocasolano. Consejo Superior de Investigaciones Científicas (CSIC), Estructura, Energía y Reactividad Química, Madrid, Spain (ccuevas@iqfr.csic.es), (2) NOAA Earth System Research Laboratory, Chemical Sciences Division, Boulder, CO USA, (3) Atmospheric Chemistry Observations and Modelling, NCAR, Boulder, CO 80301, USA., (4) Department of Atmospheric Sciences, University of Washington, Seattle, WA USA, (5) Department of Atmospheric Science, Colorado State University, Fort Collins, CO, USA, (6) School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, GA, USA, (7) Institute for the Study of Earth, Oceans and Space, University of New Hampshire, Durham, NH, USA

Heterogeneous uptake of dinitrogen pentoxide, N2O5, to aerosol is one of the most important reactions controlling the global budget of nitrogen oxides, with subsequent impacts on oxidants such as ozone and hydroxyl radical. Most chemistry global models assume that this uptake proceeds through hydrolysis to produce nitric acid, effectively a terminal sink for nitrogen oxides. However, recent field studies have shown that the yield of nitryl chloride, $ClNO_2$, from N2O5 uptake is significant in many locations. Because $ClNO_2$ photolyzes subsequent to its nighttime production to recycle NO_2 and produce atomic chlorine, a potent oxidant, the impact of heterogeneous N2O5 uptake and the role of $ClNO_2$ on the scale distribution of oxidants need to be re-assessed. Here we present global simulations using the chemistry-climate model CAM-Chem, including a state of the art halogen chemistry scheme and different assumptions for the magnitude and spatial distribution of $ClNO_2$ yields from N2O5. The model shows a significant effect of $ClNO_2$ production on tropospheric ozone, hydroxyl radical and peroxyacyl nitrates (PAN) during northern hemisphere late winter and early spring. Simulations are compared to observations from recent field campaigns, including $ClNO_2$ and N2O5 from the Wintertime INvestigation of Transport, Emissions and Reactivity (WINTER) study on the NSF / NCAR C-130 aircraft on the U.S. East Coast in February and March of 2015.