

Home

Online Library ACP

- ▣ Recent Final Revised Papers
- ▣ [Volumes and Issues](#)
- ▣ Special Issues
- ▣ Library Search
- ▣ Title and Author Search

Online Library ACPD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper

Impact  
Factor  
4.865

ISI  
indexed



▣ [Volumes and Issues](#) ▣ [Contents of Issue 6](#) ▣ [Special Issue](#)

Atmos. Chem. Phys., 5, 1437-1448, 2005

[www.atmos-chem-phys.net/5/1437/2005/](http://www.atmos-chem-phys.net/5/1437/2005/)

© Author(s) 2005. This work is licensed under a Creative Commons License.

## Simulation of denitrification and ozone loss for the Arctic winter 2002/2003

J.-U. Grooß<sup>1</sup>, G. Günther<sup>1</sup>, R. Müller<sup>1</sup>, P. Konopka<sup>1</sup>, S. Bausch<sup>1</sup>, H. Schlager<sup>2</sup>, C. Voigt<sup>2</sup>, C.M. Volk<sup>3</sup>, and G. C. Toon<sup>4</sup>

<sup>1</sup>Institut für Chemie und Dynamik der Geosphäre I: Stratosphäre (ICG I), Forschungszentrum Jülich, Jülich, Germany

<sup>2</sup>Institut für Physik der Atmosphäre, DLR Oberpfaffenhofen, Germany

<sup>3</sup>Institut für Meteorologie und Geophysik, Universität Frankfurt, Germany

<sup>4</sup>Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

**Abstract.** We present simulations with the Chemical Lagrangian Model of the Stratosphere (CLaMS) for the Arctic winter 2002/2003. We integrated a Lagrangian denitrification scheme into the three-dimensional version of CLaMS that calculates the growth and sedimentation of nitric acid trihydrate (NAT) particles along individual particle trajectories. From those, we derive the HNO<sub>3</sub> downward flux resulting from different particle nucleation assumptions. The simulation results show a clear vertical redistribution of total inorganic nitrogen (TIN), with a maximum vortex average permanent removal of over 5ppb in late December between 500 and 550K and a corresponding increase of of over 2ppb below about 450K. The simulated vertical redistribution of TIN is compared with balloon observations by MkIV and in-situ observations from the high altitude aircraft Geophysica. Assuming a globally uniform NAT particle nucleation rate of  $7.8 \times 10^{-6} \text{cm}^{-3} \text{h}^{-1}$  in the model, the observed denitrification is well reproduced.

In the investigated winter 2002/2003, the denitrification has only moderate impact ( $\leq 14\%$ ) on the simulated vortex average ozone loss of about 1.1ppm near the 460K level. At higher altitudes, above 600K potential temperature, the simulations show significant ozone depletion through catalytic cycles due to the unusual early exposure of vortex air to sunlight.

▣ [Final Revised Paper](#) (PDF, 5810 KB) ▣ [Discussion Paper](#) (ACPD)

Citation: Grooß, J.-U., Günther, G., Müller, R., Konopka, P., Bausch, S., Schlager, H., Voigt, C., Volk, C.M., and Toon, G. C.: Simulation of denitrification and ozone loss for the Arctic winter 2002/2003, Atmos. Chem. Phys., 5, 1437-1448, 2005. ▣ [Bibtex](#) ▣ [EndNote](#) [Reference Manager](#)

Search ACP

Library Search

Author Search

News

- ▣ [Sister Journals AMT & GMD](#)
- ▣ [Financial Support for Authors](#)
- ▣ [Journal Impact Factor](#)
- ▣ [Public Relations & Background Information](#)

Recent Papers

01 | ACPD, 10 Feb 2009:  
Bromocarbons in the tropical marine boundary layer at the Cape Verde Observatory – measurements and modelling

02 | ACPD, 10 Feb 2009:  
Long-term study of VOCs measured with PTR-MS at a rural site in New Hampshire with urban influences

03 | ACPD, 10 Feb 2009:  
Validation of urban NO<sub>2</sub> concentrations and their diurnal and seasonal variations observed from space (SCIAMACHY and OMI)