

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](#)

Atmos. Chem. Phys., 7, 1629-1643, 2007

[www.atmos-chem-phys.net/7/1629/2007/](http://www.atmos-chem-phys.net/7/1629/2007/)

© Author(s) 2007. This work is licensed under a Creative Commons License.

## The global impact of supersaturation in a coupled chemistry-climate model

A. Gettelman and D. E. Kinnison

National Center for Atmospheric Research, Boulder, CO, USA

**Abstract.** Ice supersaturation is important for understanding condensation in the upper troposphere. Many general circulation models however do not permit supersaturation. In this study, a coupled chemistry climate model, the Whole Atmosphere Community Climate Model (WACCM), is modified to include supersaturation for the ice phase. Rather than a study of a detailed parameterization of supersaturation, the study is intended as a sensitivity experiment, to understand the potential impact of supersaturation, and of expected changes to stratospheric water vapor, on climate and chemistry. High clouds decrease and water vapor in the stratosphere increases at a similar rate to the prescribed supersaturation (20% supersaturation increases water vapor by nearly 20%). The stratospheric Brewer-Dobson circulation slows at high southern latitudes, consistent with slight changes in temperature likely induced by changes to cloud radiative forcing. The cloud changes also cause an increase in the seasonal cycle of near tropopause temperatures, increasing them in boreal summer over boreal winter. There are also impacts on chemistry, with small increases in ozone in the tropical lower stratosphere driven by enhanced production. The radiative impact of changing water vapor is dominated by the reduction in cloud forcing associated with fewer clouds ( $\sim +0.6 \text{ Wm}^{-2}$ ) with a small component likely from the radiative effect (greenhouse trapping) of the extra water vapor ( $\sim +0.2 \text{ Wm}^{-2}$ ), consistent with previous work. Representing supersaturation is thus important, and changes to supersaturation resulting from changes in aerosol loading for example, might have a modest impact on global radiative forcing, mostly through changes to clouds. There is no evidence of a strong impact of water vapor on tropical tropopause temperatures.

▣ [Final Revised Paper](#) (PDF, 543 KB) ▣ [Discussion Paper](#) (ACPD)

Citation: Gettelman, A. and Kinnison, D. E.: The global impact of supersaturation in a coupled chemistry-climate model, Atmos. Chem. Phys., 7, 1629-1643, 2007. ▣ [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 | ACP, 19 Feb 2009:  
Increasing ozone in marine boundary layer inflow at the west coasts of North America and Europe

02 | ACP, 18 Feb 2009:  
Monte Carlo simulations of two-component drop growth by stochastic coalescence

03 | ACP, 18 Feb 2009:  
Laboratory investigation of photochemical oxidation of organic aerosol from wood fires 1: measurement and simulation of organic aerosol evolution