

[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 10](#)

Atmos. Chem. Phys., 6, 2895-2910, 2006

[www.atmos-chem-phys.net/6/2895/2006/](http://www.atmos-chem-phys.net/6/2895/2006/)

© Author(s) 2006. This work is licensed under a Creative Commons License.

## Meteorological implementation issues in chemistry and transport models

S. E. Strahan<sup>1</sup> and B. C. Polansky<sup>2</sup><sup>1</sup>University of Maryland Baltimore County, Goddard Earth Science and Technology Center, 5523 Research Park Dr., Suite 320, Baltimore, MD, 21228, USA<sup>2</sup>Science Systems and Applications, Inc., 10210 Greenbelt Rd., Suite 600, Lanham, MD, 20706, USA

**Abstract.** Offline chemistry and transport models (CTMs) are versatile tools for studying composition and climate issues requiring multi-decadal simulations. They are computationally fast compared to coupled chemistry climate models, making them well-suited for integrating sensitivity experiments necessary for understanding model performance and interpreting results. The archived meteorological fields used by CTMs can be implemented with lower horizontal or vertical resolution than the original meteorological fields in order to shorten integration time, but the effects of these shortcuts on transport processes must be understood if the CTM is to have credibility. In this paper we present a series of sensitivity experiments on a CTM using the Lin and Rood advection scheme, each differing from another by a single feature of the wind field implementation. Transport effects arising from changes in resolution and model lid height are evaluated using process-oriented diagnostics that intercompare CH<sub>4</sub>, O<sub>3</sub>, and age tracer carried in the simulations. Some of the diagnostics used are derived from observations and are shown as a reality check for the model. Processes evaluated include tropical ascent, tropical-midlatitude exchange, poleward circulation in the upper stratosphere, and the development of the Antarctic vortex. We find that faithful representation of stratospheric transport in this CTM is possible with a full mesosphere, ~1 km resolution in the lower stratosphere, and relatively low vertical resolution (>4 km spacing) in the middle stratosphere and above, but lowering the lid from the upper to lower mesosphere leads to less realistic constituent distributions in the upper stratosphere. Ultimately, this affects the polar lower stratosphere, but the effects are greater for the Antarctic than the Arctic. The fidelity of lower stratospheric transport requires realistic tropical and high latitude mixing barriers which are produced at 2°×2.5°, but not lower resolution. At 2°×2.5° resolution, the CTM produces a vortex capable of isolating perturbed chemistry (e.g. high Cl<sub>y</sub> and low NO<sub>y</sub>) required for simulating polar ozone loss.

[Final Revised Paper](#) (PDF, 499 KB) [Discussion Paper](#) (ACPD)

Citation: Strahan, S. E. and Polansky, B. C.: Meteorological implementation issues in chemistry and transport models, Atmos. Chem. Phys., 6, 2895-2910, 2006. [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, 13 Jan 2009:  
A QBO-signal in mesospheric water vapor measurements at ALOMAR (69.29° N, 16.03° E) and in model calculations by LIMA over a solar cycle

02 | ACP, 12 Jan 2009:  
Spatial distribution of  $\Delta^{14}\text{CO}_2$  across Eurasia: measurements from the TROICA-8 expedition

03 | ACPD, 12 Jan 2009:  
Mobile mini-DOAS measurement of the emission of NO<sub>2</sub> and HCHO from Mexico City

