

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 9](#)

Atmos. Chem. Phys., 7, 2413-2433, 2007
www.atmos-chem-phys.net/7/2413/2007/

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

Development of the adjoint of GEOS-Chem

D. K. Henze, A. Hakami, and J. H. Seinfeld
California Institute of Technology, Pasadena, CA, USA

Abstract. We present the adjoint of the global chemical transport model GEOS-Chem, focusing on the chemical and thermodynamic relationships between sulfate – ammonium – nitrate aerosols and their gas-phase precursors. The adjoint model is constructed from a combination of manually and automatically derived discrete adjoint algorithms and numerical solutions to continuous adjoint equations. Explicit inclusion of the processes that govern secondary formation of inorganic aerosol is shown to afford efficient calculation of model sensitivities such as the dependence of sulfate and nitrate aerosol concentrations on emissions of SO_x , NO_x , and NH_3 . The accuracy of the adjoint model is extensively verified by comparing adjoint to finite difference sensitivities, which are shown to agree within acceptable tolerances. We explore the robustness of these results, noting how discontinuities in the advection routine hinder, but do not entirely preclude, the use of such comparisons for validation of the adjoint model. The potential for inverse modeling using the adjoint of GEOS-Chem is assessed in a data assimilation framework using simulated observations, demonstrating the feasibility of exploiting gas- and aerosol-phase measurements for optimizing emission inventories of aerosol precursors.

[Final Revised Paper](#) (PDF, 7837 KB) [Discussion Paper](#) (ACPD)

Citation: Henze, D. K., Hakami, A., and Seinfeld, J. H.: Development of the adjoint of GEOS-Chem, Atmos. Chem. Phys., 7, 2413-2433, 2007. [Bibtex](#) [EndNote](#) [Reference Manager](#)

Copernicus Publications
The Innovative Open Access Publisher

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, 09 Dec 2008:
Saharan dust levels in
Greece and received
inhalation doses

02 | ACPD, 09 Dec 2008:
Global distribution and
radiative forcing of soil dust
aerosols in the Last Glacial
Maximum simulated by the
aerosol climate model

03 | ACP, 09 Dec 2008:
Characterization of the size-
segregated water-soluble
inorganic ions at eight
Canadian rural sites