

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., 3, 1981-1990, 2003

www.atmos-chem-phys.net/3/1981/2003/

© Author(s) 2003. This work is licensed under a Creative Commons License.

Impact of large solar zenith angles on lower stratospheric dynamical and chemical processes in a coupled chemistry-climate model

D. Lamago^{1,*}, M. Dameris¹, C. Schnadt¹, V. Eyring¹, and C. Brühl²

¹Institut für Physik der Atmosphäre, DLR-Oberpfaffenhofen, D-82234 Wessling, Germany

²Max-Planck-Institut für Chemie, D-55020 Mainz, Germany

*now at: ZWE FRM-II and Institut für Experimentalphysik E21, TU-München, D-85748 Garching, Germany

Abstract. Actinic fluxes at large solar zenith angles (SZAs) are important for atmospheric chemistry, especially under twilight conditions in polar winter and spring. The results of a sensitivity experiment employing the fully coupled 3D chemistry-climate model ECHAM4.L39(DLR)/CHEM have been analysed to quantify the impact of SZAs larger than 87.5° on dynamical and chemical processes in the lower stratosphere, in particular their influence on the ozone layer.

Although the actinic fluxes at SZAs larger than 87.5° are small, ozone concentrations are significantly affected because daytime photolytic ozone destruction is switched on earlier, especially at the end of polar night the conversion of Cl₂ and Cl₂O₂ into ClO in the lower stratosphere. Comparing climatological mean ozone column values of a simulation considering SZAs up to 93° with those of the sensitivity run with SZAs confined to 87.5° total ozone is reduced by about 20% in the polar Southern Hemisphere, i.e., the ozone hole is "deeper" if twilight conditions are considered in the model because there is about 4 weeks more time for ozone destruction. This causes an additional cooling of the polar lower stratosphere (50 hPa) up to -4 K with obvious consequences for chemical processes. In the Northern Hemisphere the impact of large SZAs cannot be determined on the basis of climatological mean values due to the pronounced dynamic variability of the stratosphere in winter and spring. This study clearly shows the necessity of considering large SZAs for the calculation of photolysis rates in atmospheric models.

[Final Revised Paper](#) (PDF, 460 KB) [Discussion Paper](#) (ACPD)

Citation: Lamago, D., Dameris, M., Schnadt, C., Eyring, V., and Brühl, C.: Impact of large solar zenith angles on lower stratospheric dynamical and chemical processes in a coupled chemistry-climate model, Atmos. Chem. Phys., 3, 1981-1990, 2003. [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, 11 Mar 2009: Measurements of Pollution In The Troposphere (MOPITT) validation through 2006

02 | ACP, 11 Mar 2009: Air-sea fluxes of biogenic bromine from the tropical and North Atlantic Ocean

03 | ACPD, 10 Mar 2009: Characterization of organic ambient aerosol during MIRAGE 2006 on three platforms

04 | ACPD, 10 Mar 2009: Regional differences in