

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 5

Atmos. Chem. Phys., 9, 1817-1829, 2009
www.atmos-chem-phys.net/9/1817/2009/

© Author(s) 2009. This work is distributed
under the Creative Commons Attribution 3.0 License.

HOCl chemistry in the Antarctic Stratospheric Vortex 2002, as observed with the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS)

T. von Clarmann^{1,*}, N. Glatthor¹, R. Ruhnke¹, G. P. Stiller¹, O. Kirner¹,
T. Reddmann¹, M. Höpfner¹, S. Kellmann¹, W. Kouker¹, A. Linden¹, and
B. Funke²

¹Forschungszentrum Karlsruhe and Karlsruhe University, Institut für Meteorologie
und Klimaforschung, Karlsruhe, Germany

²Instituto de Astrofísica de Andalucía, CSIC, Granada, Spain

* now also at: Univ. de Toulouse, UPS, CNRS, Laboratoire d'Aérodynamique, 14 avenue
Edouard Belin, 31400 Toulouse, France

Abstract. In the 2002 Antarctic polar vortex enhanced HOCl mixing ratios were detected by the Michelson Interferometer for Passive Atmospheric Sounding both at altitudes of around 35 km (1000 K potential temperature), where HOCl abundances are ruled by gas phase chemistry and at around 18–24 km (475–625 K), which belongs to the altitude domain where heterogeneous chlorine chemistry is relevant. At altitudes of 33 to 40 km polar vortex HOCl mixing ratios were found to be around 0.14 ppbv as long as the polar vortex was intact, centered at the pole, and thus received relatively little sunlight. This is the altitude region where in midlatitudinal and tropic atmospheres peak HOCl mixing ratios significantly above 0.2 ppbv (in terms of daily mean values) are observed. After deformation and displacement of the polar vortex in the course of a major warming, ClO-rich vortex air was more exposed to sunlight, where enhanced HO_x abundances led to largely increased HOCl mixing ratios (up to 0.3 ppbv), exceeding typical midlatitudinal and tropical amounts significantly. The HOCl increase was preceded by an increase of ClO. Model runs could reproduce these measurements only when the Stimpfle et al. (1979) rate constant for the reaction ClO+HO₂→HOCl+O₂ was used but not with the current JPL recommendation. At an altitude of 24 km, HOCl mixing ratios of up to 0.15 ppbv were detected. This HOCl enhancement, which is already visible in 18 September data, is attributed to heterogeneous chemistry, which is in agreement with observations of polar stratospheric clouds. The measurements were compared to a model run where no polar stratospheric clouds appeared during the observation period. The fact that HOCl still was produced in the model run suggests that a significant part of HOCl was generated from ClO rather than directly via heterogeneous reaction. Excess ClO, lower ClONO₂ and earlier loss of HOCl in the measurements are attributed to ongoing heterogeneous chemistry which is not reproduced by the model. On 11 October, polar vortex mean daytime mixing ratios were only 0.03 ppbv.

▣ [Final Revised Paper](#) (PDF, 7233 KB) ▣ [Discussion Paper](#) (ACPD)

Citation: von Clarmann, T., Glatthor, N., Ruhnke, R., Stiller, G. P., Kirner, O.,

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, 12 Mar 2009:
A new insight on tropospheric methane in the Tropics – first year from IASI hyperspectral infrared observations

02 | ACP, 12 Mar 2009:
HOCl chemistry in the Antarctic Stratospheric Vortex 2002, as observed with the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS)

03 | ACP, 12 Mar 2009:
Comparison of tropospheric gas-phase chemistry schemes for use within global models

Reddmann, T., Höpfner, M., Kellmann, S., Kouker, W., Linden, A., and Funke, B.: HOCl chemistry in the Antarctic Stratospheric Vortex 2002, as observed with the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS), *Atmos. Chem. Phys.*, 9, 1817-1829, 2009. [Bibtex](#) [EndNote](#) [Reference Manager](#)