



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
4.927

ISI
indexed



Volumes and Issues Contents of Issue 24 Special Issue

Atmos. Chem. Phys., 9, 9433-9447, 2009

www.atmos-chem-phys.net/9/9433/2009/

© Author(s) 2009. This work is distributed

under the Creative Commons Attribution 3.0 License.

H₂¹⁶O and HDO measurements with IASI /MetOp

H. Herbin^{1,*}, D. Hurtmans¹, C. Clerbaux^{1,2}, L. Clarisse^{1,**}, and P.-F. Coheur^{1,**}

¹Spectroscopie de l'Atmosphère, Service de Chimie Quantique et de Photophysique, Université Libre de Bruxelles, Brussels, Belgium

²UPMC Univ. Paris 06; Université Versailles St-Quentin; CNRS/INSU, LATMOS-IPSL, Paris, France

* now at: Laboratoire d'Optique Atmosphérique, Université des Sciences et Technologies de Lille, 59655 Villeneuve d'Ascq cedex, France

** respectively Research Associate and Scientific Research Worker with the F.N.R.S., Belgium

Abstract. In this paper we analyze distributions of water vapour isotopologues in the troposphere using infrared spectra recorded by the Infrared Atmospheric Sounding Interferometer (IASI), which operates onboard the Metop satellite in nadir geometry. The simultaneous uncorrelated retrievals of H₂¹⁶O and HDO are performed on radiance measurements using a line-by-line radiative transfer model and an inversion procedure based on the Optimal Estimation Method (OEM). The characterizations of the retrieved products in terms of vertical sensitivity and error budgets show that IASI measurements contain up to 6 independent pieces of information on the vertical distribution of H₂¹⁶O and up to 3.5 for HDO from the surface up to the upper troposphere (0–20 km). Although the purpose of the paper is not validation, a restricted comparison with sonde measurements shows that the retrieved H₂¹⁶O profiles capture the seasonal/latitudinal variations of the water content, with good accuracy in the lowest layer but with larger uncertainties higher in the free and upper troposphere. Our results then demonstrate the ability of the IASI instrument to monitor atmospheric isotopologic water vapour distributions and to provide information on the partitioning of HDO as compared to H₂¹⁶O. The derivation of the δ_D is challenging and associated with large errors in the uncorrelated retrieval approach chosen here. As a result averaging on the vertical to produce a column-averaged δ_D is required to produce meaningful results for geophysical interpretation. As a case study, we analyse concentration distributions and spatio-temporal variations of H₂¹⁶O and δ_D during the October 2007 Krosa super-typhoon over South-East Asia. We show that individual δ_D have uncertainties of 37‰ for the vertically averaged values. Using the latter, we suggest that the typhoon produces a so-called amount-effect, where the δ_D is negatively correlated to the water amounts as a result of intense depletion of the deuterated species.

Final Revised Paper (PDF, 9009 KB) Discussion Paper (ACPD)

Citation: Herbin, H., Hurtmans, D., Clerbaux, C., Clarisse, L., and



Search ACP

Library Search

Author Search

News

Sister Journals AMT & GMD

Public Relations & Background Information

Recent Papers

01 | ACPD, 23 Dec 2009: Airborne measurements of aerosol optical properties related to early spring transport of mid-latitude sources into the Arctic

02 | ACPD, 23 Dec 2009: Organic aerosol components observed in worldwide datasets from aerosol mass spectrometry

03 | ACPD, 23 Dec 2009: Optimal estimation of the surface fluxes of methyl chloride using a 3-D global chemical transport model

Coneur, P.-F.: H₂¹⁶O and HDO measurements with IASI/MetOp, Atmos. Chem. Phys., 9, 9433-9447, 2009. [Bibtex](#) [EndNote](#) [Reference Manager](#)