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

Volumes and Issues | Contents of Issue 3

Atmos. Chem. Phys., 9, 995-1016, 2009
www.atmos-chem-phys.net/9/995/2009/

The ASSET intercomparison of stratosphere and lower mesosphere humidity analyses

H. E. Thornton[1], D. R. Jackson[1], S. Bekki[2], N. Bormann[3], Q. Errera[4], A. J. Geer[3], W. A. Lahoz[5], and S. Rharmili[2]
[1]Met Office, UK
[2]UPMC Univ Paris 06; CNRS; SA-IPSL, France
[3]European Centre for Medium-Range Weather Forecasts, UK
[4]Insitut d'Aéronomie Spatiale de Begique, BIRA-IASB, Belgium
[5]Norsk Institutt for Luftforskning, Norway

Abstract. This paper presents results from the first detailed intercomparison of stratosphere-lower mesosphere water vapour analyses; it builds on earlier results from the EU funded framework V "Assimilation of ENVISAT Data" (ASSET) project. Stratospheric water vapour plays an important role in many key atmospheric processes and therefore an improved understanding of its daily variability is desirable. With the availability of high resolution, good quality Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) water vapour profiles, the ability of four different atmospheric models to assimilate these data is tested. MIPAS data have been assimilated over September 2003 into the models of the European Centre for Medium Range Weather Forecasts (ECMWF), the Belgian Institute for Space and Aeronomy (BIRA-IASB), the French Service d'Aéronomie (SA-IPSL) and the UK Met Office. The resultant middle atmosphere humidity analyses are compared against independent satellite data from the Halogen Occultation Experiment (HALOE), the Polar Ozone and Aerosol Measurement (POAM III) and the Stratospheric Aerosol and Gas Experiment (SAGE II). The MIPAS water vapour profiles are generally well assimilated in the ECMWF, BIRA-IASB and SA systems, producing stratosphere-mesosphere water vapour fields where the main features compare favourably with the independent observations. However, the models are less capable of assimilating the MIPAS data where water vapour values are locally extreme or in regions of strong humidity gradients, such as the southern hemisphere lower stratosphere polar vortex. Differences in the analyses can be attributed to the choice of humidity control variable, how the background error covariance matrix is generated, the model resolution and its complexity, the degree of quality control of the observations and the use of observations near the model boundaries. Due to the poor performance of the Met Office analyses the results are not included in the intercomparison, but are discussed separately. The Met Office results highlight the pitfalls in humidity assimilation, and provide lessons that should be learnt by developers of stratospheric humidity assimilation systems. In particular, they underline the importance of the background error covariances in generating a realistic troposphere to mesosphere water vapour analysis.

Final Revised Paper (PDF, 8923 KB) Discussion Paper (ACPD)

Citation: Thornton, H. E., Jackson, D. R., Bekki, S., Bormann, N., Errera, Q., Geer, A. J., Lahoz, W. A., and Rharmili, S.: The ASSET intercomparison of stratosphere and lower mesosphere humidity analyses, Atmos. Chem. Phys., 9, 995-1016, 2009. Bibtex EndNote Reference Manager