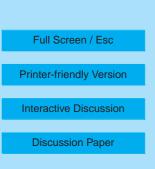**Atmospheric
Chemistry
and Physics
Discussions**

# *Interactive comment on* "The ASSET intercomparison of stratosphere and lower mesosphere humidity analyses" *by* H. E. Thornton et al.

**Anonymous Referee #2**

Received and published: 20 October 2008

This paper reports on the first experiments in assimilation MIPAS water vapour data into two weather forecast models and two CTMs. The results are rather mixed and the papers main aim is to point out the problems that still exist in such work. I believe that this paper provides some new results and illustrates the difficulties in assimilation of water vapour and can be published after some revisions and considerably improved figures. I am slightly disappointed that such a short time period has been used for the experiments but I can understand the problems of setting up such runs. Otherwise the paper is well written and fairly easy to follow.

My first larger concern is the initialisation and spin-up of the various models. It is

not clear to me how the various models were set up and over which period data was assimilated (except for ECMWF where my understanding is 18 Aug- 29 Sept.) . This should have bearing on the validity of using a month mean September for comparisons. My second concern is the legibility of the figures especially 5 and 6. I printed the paper in a format that could be considerer typical of a journal page and found it very difficult to separate the lines. Thicker lines would greatly simplify this.

Specific comments

page 13513 li 29 : Here the Errrera (2008) paper is referred to for the first time while on the next page the caveat that this a manuscript submitted to ACPD is added to the reference. This caveat should be moved/added here.

Page 13514 line 10 : Is the data assimilation scheme at all able to affect the water vapour in the case of ice particle presence. Ie can it raise the value if the decay/ relaxation is too fast?

Page 13514 line 24 : M2O should be N2O

Page 13514 line 27 : How often do outliers occur? -Can this info be obtained from the other models? Are there any indications that these cause problems?

Section 3 : Perhaps the various biases between the instruments could be collected in table to make it easier for the reader to quickly check attribution when looking at the results of the comparisons with observations.

Page 13530 lines 5-20 : I understand that the MIMOSA fields look noiser than the other analyses, but is this really noise- The authors point out that there is better agreement with the MIPAS observations for this analysis. Is there some way to prove that smoother analyses are more correct? There many speculative statements : &#8220;The Patchy structure ...... may refect the PV....&#8221;, the fact that the MIPAS data are not filtered would affect the analysis implying that the patchiness is noise - Can any of this be verified?

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Interactive Discussion

Discussion Paper

Page 13535 line 12. Is a 3 sigma rejection limit really too strict? Is not the problem that the incoming data cannot properly affect the relaxation of the water vapour in the PSC scheme?

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 13507, 2008.