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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation of upper tropospheric humidity forecasts from ECMWF using AIRS and CALIPSO data" *by* N. Lamquin et al.

Anonymous Referee #2

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Review on Lamquin et al. : Evaluation of upper tropospheric humidity forecasts from ECMWF using AIRS and CALIPSO data

The paper presents a comparison of data from the satellite-borne instruments AIRS and CALIOP in order to investigate the performance of the ECMWF model with respect to upper tropospheric humidity. I appreciate the effort taken by the authors, however I do not see really substantial conclusions being reached the way the data are analysed. A more systematic approach (like for example using statistical test to verify/falsify certain assumption) would have yielded more profound results. Also, a more critical discussion of the data that was used is lacking. In particular chapter 4.1

is not very clear. Fig. 5 is a valuable compilation of the data that should be thoroughly discussed. Instead of distinguishing a 'dry' and a 'wet mode', I'd discuss the clear and cloudy cases. In almost all cases AIRS seems to be dry biased compared to ECMWF. This might not be statistically significant except for the most interesting cases in particular the cloudy cases in the higher layers. These differences of the two dataset might be due to the data quality of the measurement. However, I do have the impression that a critical discussion of the ECMWFs new humidity scheme based on these observations is deliberately avoided. Instead, two more figures are presented, that I do not find very helpful in this context (see minor comments for more details). I suggest to rewrite that paragraph focussing on the question whether supersaturation in the model and the AIRS data are significantly correlated or not. Chapter 4.3 should be moved to the front of section 4, because the 'S-shaped' function could play an important role for such an statistical analysis. The correlation with CALIPSO in chapter 4.2 is very interesting. Here, additionaly the resemblance of the 'S-shaped' function in the upper left plot of fig. 9 with the plots in fig. 10 should be discussed. The fact that dry air may contain shallow supersaturated layers, plus the fact that the model is not always predicting the correct humidity fields, might explain the detection of clouds in 'dry' model layers.

I suggest publishing the paper after major revision as explained above that I hope do lead also to some more profound conclusions.

Minor comments:

Abstract: The last two sentences are not very clear. I suggest omitting them and explain some of the more comprehensible conclusions like e.g. that AIRS and CALIOP very often detect clouds where the humidity is high.

p 17912 l. 2: Tobin uses Goff Gratch for calcualting vapor pressure. So using Sonntag's formula is probably not the best choice. However, I certainly will not blame the authors for this inconsitency which is almost inevitable in this context, since everybody uses something else.

ACPD

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p 17912 l. 29: " accurate" is alway relative. State how accurate, or leave it away.

p 17913 l. 20: Why are old radiosonde data used and not newer one? As far as I know the Meteorological Observatory Lindenberg (use capitals) is still operating and uses better equipment (RS-92) for observing UTH these days.

p. 17916 l 17 - 27 : not clear! There is in-cloud supersaturation. However in the measurements of the cited literature, RHI always peaks at 100%. The ECMWF-curve in fig. 7 is definately more realstic than the AIRS-curve. Its smooth shape is due to its limited vertical resolution. Please, describe clearer what you were trying to say.

p 17916 l. 28: I guess you are referring to fig. 6

p 17918 l. 17: If the cloud is geometrically thick, then the humid layer is also geometrically thick and should be observed. I'd rather guess that the layer is very thin and not represented in the coarser model layers

fig. 5 all three cases (clear, low and high cloud cover) should be plotted the same way.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 17907, 2008.