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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Validation of stratospheric water vapour measurements from the airborne microwave radiometer AMSOS" *by* S. C. Müller et al.

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Thank you for the detailed comments. We will try to address to all your points of criticism except for the minor comments, which We will apply in the final revision.

The one figure which is missing ... showing latitudinal variation of MLS water vapor alongside the AMSOS data...

This is a good point for judging the quality of the AMSOS dataset. The plots can be temporary found at http://www.iapmw.unibe.ch/research/projects/AMSOS/ACPDPaper/. We can show latitudinal variations of the AMSOS dataset compared to the AURA/MLS dataset for mission 8 (November 2005) and 9 (late October 2006) and additional for mission 5 (September 2002) with the MIPAS dataset. When looking

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at the plots one should always keep in mind that the AMSOS dataset has a dry bias than the others. The latitudinal variations are visible and are similar to the satellite datasets. In mission 5 the AMSOS dataset changes quite fast between 30°N and 50°N between the polar and tropical region, seen in the values of 5 ppm extending down to 25 km respectively 40 km, while in the MIPAS data this change is continously between 20°N and 60°N. Mission 9, which shows also an arctic-tropic crosssection, both datasets provide a rapid change between typical arctic and tropical profiles between 40°N and 45°N with an upward movement of the stratospheric water vapour maximum. Also a very dry mesospheric part in the arctic is seen in both. Mission 8 was a flight campaign from the mid-latitudes to the tropics with less expected latitudinal variations than the other examples. Nevertheless in the mid-latitudinal part both captured a drop of water vapour at 25 km altitude. in the tropics the MLS data show an enhanced water vapour layer at 20 km which is nost seen in the AMSOS data. At 40 km the AMSOS dataset shows more structured variations. This might be due to the selection of all Aura/MLS profiles between 0°E and 120°E in longitude.

On pg. 1643 line 6, it sounds like AMSOS measurements need to be convolved to compare to MIAWARA ...

What we did was exactly a convolution of the AMSOS profile with the averaging kernels of the MIAWARA instrument. In case of the AMSOS-MIAWARA comparison We would say it is at the limit if we have to apply the averaging kernels or not. We fully agree that the resolutions are not as different as comparing AMSOS with a limb sounding or a high resolution in-situ balloon sounding instrument. But still the resolution of the AMSOS instrument is 10-30% better dependent on altitude than the one from MIAWARA and we think one can handle it in this way.

The method used to avoid problems with averaging kernels near the tropopause...

and further down

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Figure 9 - The discussion of this figure focuses primarily on the structure at 90 hPa, which is due to the use of a constant hygropause

The structure at 30 hPa is a consequence of the peak at 90 hPa. If we calculate the difference of two profiles, where one has a shift in hygropause level, the difference profile below will have a negative slope and above a positive.

We fully agree with the point by using different apriori profiles, one for each typical regions, arctic, mid-latitude and tropical, the retrieval would be improved around the hygropause. Tests with an arctic apriori profile for arctic regions have shown the same behaviour around the hygropause. Since the retrieval is largely dependent on the apriori information, the use of different apriori profiles would make our whole dataset inconsistent and would lead to a split in different subdatasets each for one of the apriori profiles.

We think that an important point of this dataset is to have a consistent dataset with latitudinal coverage from the tropics to the North Pole and thus our choice to use only one apriori profile.

I do not think I have ever seen a SAGE II water vapor profile shown up to 1 hPa...

Data have been downloaded from the official database where they are available up to 1 hPa. But your are right that at these altitudes the given uncertainty is large.

Figure 10 - I have serious objections to this figure...

We agree that there is not enough statistical material for most of the instruments we compared with, for a clear convincing statement about this figure. We were not aware of this dependency of the SAGE II data on HALOE. We have downloaded data from the respective databases.

Figure 12 - I am not sure whether comparison with single-level FISH and FLASH...

We agree with you that it is difficult to compare a point measurement with a smeared measurement with a much lower altitude resolution. But even under these circum-

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stances the in-situ measurements fit within the error bars. It is correct to argue that the for a given value for an overall comparison one should include all measurements. The in-situ measurements, which were excluded in the 3.3% difference value, are still at the border of the 2σ error. About similar variations we can say that the correlation coefficients AMSOS-FLASH is 0.63 and AMSOS-FISH is 0.52.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 1635, 2008.