

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

### **Anonymous Referee #2**

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#### General comments:

The paper describes the validation of airborne water vapour UTLS profiles retrieved by an optimal estimation method. The profiles can be downloaded from a web site very easily and quickly, and cover a large latitudinal (from the tropics to the polar regions) and temporal range. Data are validated against a set of instruments and different comparisons are properly performed using averaging kernels information to take in account the vertical resolution of the instruments.

Section 3.2/3.3 For comparison with satellite data, the matching criteria of 10 h and 500km radius can cause some problems in presence of strong PV gradients (polar

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regions) where the profiles can be generated by different air masses. In this cases it would be preferable to use a more stringent matching criteria (see also detailed comments). A minor issue is the use of SAGE, HALOE, and Odin\_SMR profiles for comparisons. In these cases only 2 coincidence where found and, as also the authors reported, they do not issue statistical information. For this reason they could be removed from the comparison.

Section 3.7 An analogue treatment could be reserved to DIAL data in presence of cirrus cloud. If the authors think that the corresponding profiles are influenced by cloud they could remove them from the validation dataset (see also detailed comments).

In general, the manuscript is well-written and uses an adequate number of references The font used for some figures (4 and 7) is probably too small.

Detailed and minor comments:

p. 1637, l. 2. Add name of instruments for in-situ sensors from balloon or aircraft.

p. 1637, l. 12. Possibly add reference for balloon soundings.

p. 1638, l. 1. It would be better if you write Upper Troposphere-Lower Stratosphere instead of UTLS.

p. 1638, l. 18. Use capital letters for Accousto-Optical Spectrometer (AOS).

p. 1639 l. 4. "the Atmospheric" instead of "theAtmospheric".

p. 1640. I think it will be better if you could be more precise about the number of retrieved points for each profile. You can also evidence the retrieved point positions on figure 2d. In this way it will be possible to evaluate if 4-6 independent point is a good result or not.

p.1640, l. 15. If I remember correctly, ERA 40 provides profiles for relative humidity and specific humidity over pressure levels and not mixing ratio profiles for H<sub>2</sub>O. Which field do you use to obtain water mixing ratio profiles?

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p. 1640, l. 23. How do you link the US-Standard Atmosphere with the ERA40 profile? Are they very similar in the last point of ERA40 profile-first point of US-Standard Atmosphere profile?

p. 1642, l. 15. In formula 4) it will be preferable if you add some suffix in order to specify if the single elements are referred to higher resolution instrument or to lower resolution instrument.

p. 1644, l. 17-18. 550 km radius and 10 h for matching criteria is applied at all latitudes? In polar regions (as in figures 6 b), c), e) g)) do the profiles originate from same air masses? Possibly it will be better to use a more stringent criteria and split in two parts (depending on latitude) the comparison (as you did in figure 9).

p. 1648 l. 18-20. If I understand well, all the last three cases in figure 11 are in presence of cirrus clouds. What happens to your results and to DIAL results in this case? Are they still good? If not, I think it will be better to remove them from the graph and just say that for these regions the comparison was not performed because of the presence of the cirrus clouds.

p.1649, l. 4-5. Looking at figure 12a), it seems that FISH has more measurements points than FLASH (part of the flight from 10 to 50 degrees of longitude). Possibly it would be preferable to compare your results separately with the two instruments.

p. 1665. in figure 7b) (SAGE) in the legend is not present 2 sigma.

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