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Atmospheric Measurement Techniques Discussions

Interactive comment on "UTLS water vapour from SCIAMACHY limb measurements V3.01 (2002–2012)" *by* K. Weigel et al.

Anonymous Referee #1

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This is a very nice thorough and well written paper. I just have a few questions and suggestions.

As a general rule, I would say it is generally not a good idea to include systematic errors in retrieval calculations, since this will reduce the observed variations below the ability of the instrument to measure them. But multiplying the SNR by 1.5 will certainly not have a large effect and to some extent this must be considered as a tuning parameter in any case.

How is the vertical resolution shown in Figure 1 defined?

Presumably the reason that the vertical resolution is better than the vertical sampling (as has been mentioned by the other reviewer) is because there is information in the

spectrum. If I understand this correctly, would it be possible to show a typical spectrum and fit in the UTLS?

In Figure 2 the grey and orange lines are very difficult to see except where they are on top of the black and red lines. It would be easier to see if these lines were replaced by symbols and overplotted on the black and red lines.

What is the primary cause of non-convergence for 27% of the profiles and how does this bias the results?

Figure 3a shows a very large (off-the-scale) positive difference from 12-14km for the H2O*0.5 (12-14km) case, while the smoothed version (Figure 3b) shows a small negative difference in this region. This seems very surprising. Is there a way to explain this?

Why are saturated measurements specifically excluded for FISH but not for other comparisons?

Figure 1 shows that the measurement response is near 1 everywhere, which would seem to imply that the a priori doesn't matter. This seems inconsistent with the claim that in 3.2.1 that the reason for the better agreement with the balloons in midlatitudes is that "the a priori water vapour profile is closer to the expected real profile".

Figure 15 – It's obvious, but it would still be nice in the first sentence of 3.3.1 to explicitly say "V3.01 limb measurements and the lunar and solar occultation . . ."

Figure 17 – The text says that the annual cycle of the differences when compared to the SCIAMACHY time series is better in the mid-latitudes than at the polar latitudes. But it seems to me that the relative differences at the polar latitudes show a much smaller annual cycle. So doesn't this mean that the annual cycle is better matched at the polar latitudes?

It should be pointed out that an increase in water vapor in the tropical lower stratosphere is consistent with increasing 100 hPa tropical temperature anomalies and with

the increase observed near the stratopause in the tropics, both of which are discussed in Nedoluha et al. (“Variations in middle atmospheric water vapor from 2004 to 2013”, JGR 2013).

In several places “decent” is incorrectly used instead of “descent”.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 7953, 2015.