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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ground-based water vapour soundings by microwave radiometry and Raman lidar on Jungfraujoch (Swiss Alps)" *by* D. Gerber et al.

Anonymous Referee #2

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The authors present a method for combining raman lidar measurements with microwave measurements to get a single water vapor profile from the ground to 60 km. This is an interesting idea not only because it is intrinsically appealing to have such a continuous profile, but also because, in order to retrieve the stratospheric water correctly, one needs to know the attenuation of the signal by the troposphere. There are, however, some serious issues which the manuscript needs to address:

4839 lines 15-22: The difference in peak altitudes is quite large considering that the average latitude of the HALOE measurement is not that far south of the AMSOS measurements. My guess is that even the HALOE profile for 50-60N has a higher peak than the AMSOS, which would invalidate the claim that this is a latitudinal effect. The

authors should certainly make this comparison if they continue to wish to make the claim that the difference is caused by latitudinal differences.

4840 lines 16-18: I think the authors are trying to say that the peak moves up and down a lot so there is no consistent ”peak altitude”, but I might certainly imagine that with enough averaging there might be changes in the profile shape with season. IŠd just drop this sentence.

4841 lines 22-24: Given that the entire lidar profile seems to be calibrated according to the MeteoSuisse ground measurements, it seems likely to me that the dominant contribution to the variation in the column is probably this calibration term, and not the actual lidar measurements. Please clarify whether this is or is not the case.

4841 line28-4841 line 3: These 2 sentences are a bit confusing. I think all the authors are trying to say is that, because the lidar is only measuring up to 5500m it is not getting the total tropospheric column because the tropopause altitude is above this. If so, please just say that. Also, do the authors have a value for the tropopause height at this time?

4843 line 6: 15km? What is filling the gap from 15 to 20 km?

4844 line 21: It would be very interesting to see a quantification of how realistic variations in the tropopause water vapor profile with the total column constrained would affect the retrieval. My guess is that this will not have a significant effect.

Table 2: It is completely unclear from the text how the authors derived the water vapor values from 6.0 to 17.5 km. The authors mention the effect of the a priori profile, but how did they derive this a priori? Is there some functional form used here? If so, what is it? What happens at 12.5km? Presumably this is the tropopause, but where does this tropopause value come from? It certainly doesnŠt make sense to show results at 0.5 km increments in the upper troposphere when there arenŠt really any measurements there.

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4847 line 23-25: The authors mention that there method is better than simple interpolation, and I certainly agree that their model looks not unreasonable, but once again IŠm not sure how the a priori is derived.

Typos, grammatical corrections, minor comments:

4837 line 5: ”details” should be ”detail”

4838 line 14: sentences should never end in ”for”

4838 line 21: ”cycles” should be ”circles”

Figure 1: It is not clear what the gray range refers to. There can only be one ”1999 HALOE monthly mean for the corresponding month”, so what is meant by minimal and maximal? Same applies to Figure 2.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 4833, 2003.