

Interactive comment on “A feasibility study for the retrieval of the total column precipitable water vapor from satellite observations in the blue spectral range” by T. Wagner et al.

Anonymous Referee #1

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General Comments:

In the paper by Wagner et al. an interesting new approach to derive total column water vapour from measurements in the blue spectral range (around 440 nm) is described. This method complements already existing retrievals for other wavelength ranges and especially allows to derive water vapour information from sensors like OMI, which do not measure in the red, NIR or MW region. I recommend publication in AMT after some corrections suggested below.

One general deficiency of the work is in my opinion that no VCDs are calculated (only

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SCDs). Since the AMFs depend on the spectral region, it is difficult to (quantitatively) judge upon the differences between the retrieval results based on SCDs alone. In this context, I would like to have some more quantitative information about potential systematic errors of the new (VCD) product related to e.g. insufficient knowledge of atmospheric conditions. However, as already mentioned in the title, the paper by Wagner et al. is only a feasibility study, therefore it would be sufficient to give some estimates here.

Specific Comments:

1. list of advantages of new method on p. 3645/3646:
 - Many of the advantages mentioned here are supported by plots/text later in the paper. Maybe one should mention this.
 - The statement that *'the retrieved H₂O data sets are more consistent, especially across land-ocean boundaries'* should be justified a bit more. How 'inconsistent' are the current red/NIR retrievals over land/ocean boundaries, i.e. how large is the typical systematic error of these retrievals and how does it compare to the uncertainties of the new method?
2. p. 3647, l. 5:
Current HITRAN version is HITRAN2008 (with some updates). Why has HITRAN2004 be used?
3. p. 3647, l. 11:
A polynomial degree of 5 seems quite high for a 20 nm spectral region. Doesn't this interfere e.g. with ozone structures which also look quite smooth there (as shown in Fig. 2)?

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4. p. 3648, l. 14/15:

'Here we calculate AMFs to explore the measurement sensitivity for various measurement conditions.'

As I interpret eq. (1) and the later discussion, a higher AMF corresponds to a higher sensitivity. Maybe one should mention this here. This would also be the place to give an estimate for the uncertainties of the VCDs resulting from the radiative transfer calculations / AMFs (see also general comments).

5. Section 4.1, Fig. 5:

Is Greenland really a representative region for a comparison? As shown in Fig. 3, the surface albedo is very high there. Wouldn't it be better – if possible – to choose a different set of orbits where the overlap region between GOME-2 and OMI is over land but not over ice/snow?

6. Section 4.2 / Fig. 9:

Please explain how the maps of the daily data have been generated. Have they been gridded/averaged at regions where more than one measurement is available (e.g. at higher latitudes)?

Technical Corrections:

1. Acknowledgements:

I assume 'ERS-2' should be replaced by 'METOP'.

2. Table 1:

- In the caption italic text is mentioned whereas in the table there is only roman text (also for the red spectral range).
- Replace 'AMF' by 'AMFs' in caption (two times).

3. Table 2:
'DSCDs' should probably read 'SCDs'.
4. Fig. 2:
I suggest to include plots of the complete measured spectra in Fig. 2, not only the fit results and residuals. This could maybe also help to justify the need for a polynomial of degree 5 (see above).
5. Fig. 4:
Please provide the unit for the shown H₂O profiles.

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