

Interactive comment on “Total column water vapor retrieval for GOME-2 visible blue observations” by Ka Lok Chan et al.

Christian Borger

christian.borger@mpic.de

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Chan et al. present a very interesting TCWV retrieval for GOME-2 which not only makes use of the H₂O absorption in the blue spectral range, but also applies an iterative a priori water vapour profile approach. The authors are probably aware that Borger et al. (2020) developed a very similar approach. I have a few comments/questions that can hopefully help to further improve the overall high quality of the paper:

1. One great advantage of using the blue spectral range compared to the red spectral range is the higher sensitivity for the near-surface layers over ocean. Did the authors also consider to compare their TCWV data set to microwave satellite sensors? For instance SSMI/SSMIS are widely considered as reference measurements for TCWV

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retrievals over ocean because they can measure under all-sky conditions. It would be very important to see how good the TCWV from GOME-2 can match the TCWV from SSMI/SSMIS.

2. A similar question is related to the use of AERONET data as reference. As the authors mention it themselves, TCWV from AERONET is potentially affected by biases. Have the authors had a look at TCWV from ground-based GPS measurements from SuomiNet or IGS? In comparison to AERONET, these GPS networks can conduct TCWV retrievals for all-sky conditions at a very high accuracy and provide continuous time series of TCWV for their measurement stations (e.g. SuomiNet TCWV data are available every 30 min). Such a comparison would further improve the confidence of the new retrieval.

3. It is kind of surprising to see that the GOME-2 TCWV retrieval uses HITEMP2010 / HITRAN2012 as H₂O cross-section, whereas Wang et al. (2019) (for OMI) and Borger et al. (2020) (for TROPOMI) found a significantly better agreement to reference measurements by using HITRAN2008. The use of HITRAN2008 over HITRAN2012 is also supported by the LP-DOAS results in Lampel et al. (2015) (see Table 8 in their paper). What is the rationale for still using HITRAN2012?

4. Although it is very reasonable to use ERA-Interim for the statistical analysis, isn't there potentially the risk that the data quality of the ERA-Interim water vapour profiles can vary a lot e.g. depending on which measurement data have been used during the data assimilation process? At least this was one of the reasons for Borger et al. (2020) to only use water vapour profiles from a consistent measurement data set (COSMIC in this case) for setting up their iterative a priori water vapour profile retrieval scheme.

References

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