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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: New trends in column-integrated atmospheric water vapor – Method to harmonize and match long-term records from the FTIR network to radiosonde characteristics" *by* R. Sussmann et al.

Anonymous Referee #1

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Review on the paper: Technical Note: New trends in column-integrated atmospheric water vapor. Method to harmonize and match long-term records from the FTIR network to radiosonde characteristics by Sussmann et al.

GENERAL: Water is of enormous importance for understanding the climate system and the global change. Measurements of water are therefore important and applying the remote sensing FTIR-spectrometry is very useful.

However, the manuscript presented is a technical description of how to tune the re-

trieval of the total water valour columns in an optimized way. Therefore the authors should consider to publish the paper in a more technical oriented journal, like 'Atmospheric Measurement Techniques' (AMT).

REVIEW: The paper presents a method to retrieve and optimize the total column water density from ground-based infrared spectroscopy. The results are compared quantitatively in detail to other water column measurements. The retrieval of water vapour itself is not new, but the optimization approach is interesting, and due to the importance of water for the climate system the paper should be published. However, I have a few major concerns which need to be considered by the authors:

1. Page 4, 2.1 retrieval strategy: The authors mention that the approach suggested can be included in SFIT2. So far the chapter gives the impression that SFIT2 performs a least square fitting of the total column only. SFIT2 performs also a profile retrieval, based on optimal estimation. It has been shown that the optimal estimation method and the Phillips Tikhonov approach are very similar. This need to be discussed.

2. The ideal slope retrieved is not very important, the correlation among several datasets is the most important quantity. The spectral line parameters and line-shape description for H2O are still not perfect. Therefore retrieving a slope of 1.00 is a coincidence.

3. The authors mention that their retrieval is easily transferable to all ground-based, FTIR measurement stations of the NDACC network. This is an important point of the paper. But the harmonisation should be proven to be possible using measurements from station with different altitudes and latitudes in order to cover a range of H2O abundances and profile shapes.

4. The knowledge of the total column does not give much geophysically important information for water. The global climate change leads to a warming of the lower troposphere accompanied by a cooling of the upper troposphere and stratosphere. Therefore, what is required from a geophysical point of view is the temporal evolution of the

water vapour profile, or at least the water vapour profile at a few different altitudes, for example (i) at the ground, (ii) below the tropopause, and (iii) in the stratosphere. The retrieval gives no discussion on the concentration profile, although the information is probably there. The authors might consider to discuss the tropospheric H2O profile retrieval, with its uncertainties, and deviations compared to the sondes, as done here for the total columns. This might improve the importance of the paper enormously.

5. The discussion of the two time series is too short, and does not give any interesting results. The trends at both stations are different, which is not discussed. Since the discussion of a total water column is questionable I suggest to show just one time series without a detailed discussion, as demonstration of the large possibilities of the ground-based FTIR-spectrometry. Showing both data in this way as done in the manuscript is confusing.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 13199, 2009.