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Atmospheric Measurement Techniques Discussions

Interactive comment on "Remote sensing of water vapour profiles in the framework of the Total Carbon Column Observing Network (TCCON)" *by* M. Schneider et al.

Anonymous Referee #1

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The paper describes the retrieval of H2O from ground-based solar absorption spectra recorded in the near-infrared spectral region. The spectral region and resolution has been chosen to agree with the TCCON (Total Carbon Column Observing Network) requirements. Since the TCCON measurements, concentrating on the long-lived greenhouse gases CO2 and CH4, are expected to be performed on the longer time-scale, the analysis method presented in this paper gives the opportunity to obtain H2O also on long time scales.

MAJOR COMMENT: The article by itself is a demonstration of principle. Why this is

certainly interesting in the context of the TCCON network the possibility that H2O can be measured using this technique has been demonstrated several times by the same author for other wavelengths, and also in the near infrared spectral region. To me the article is a subset of the three articles by Schneider et al.

1. Schneider, M.; Hase, F. & Blumenstock, T. Water vapour profiles by ground-based FTIR spectroscopy: study for an optimised retrieval and its validation Atmos. Chem. Phys., 2006, 6, 811-830

2. Schneider, M.; Romero, P. M.; Hase, F.; Blumenstock, T.; Cuevas, E. & Ramos, R. Quality assessment of Izaña's upper-air water vapour measurement techniques: FTIR, Cimel, MFRSR, GPS, and Vaisala RS92 Atmos. Meas. Tech. Discuss., 2009, 2, 1625 - 1662.

3. M. Schneider, G. C. Toon, J.-F. Blavier, F. Hase, and T. Leblanc H2O and δD profiles remotely-sensed from ground in different spectral infrared regions, Atmos. Meas. Tech. Discuss., 3, 3105-3132, 2010

The only difference in this article is the resolution, which is set to 0.02 cm-1, according to the TCCON requirements. The conclusions drawn (broadening of the averaging kernels, slightly lower altitude resolution) are straightforward and to my opinion do not require a separate paper. Therefore I recommend to merge this paper with the one from 2010, which is still under discussion.

FURTHER COMMENTS: The authors do not mention if they completely abide the TCCON regulations or if there are some deviations. E.g.: in publication (1) absolute calibrated spectra were used. Is this also the case in this publication?

The authors mention that the speed dependent Voigt line shape is used for the forward modeling of the spectra. The authors should mention where the additional parameters for this line shape come from. Have they been published? If not they should be noted in this publication.

What are the assumptions on the apriori knowledge, i.e. the apriori profile and the Sa matrix?

The article completely misses any error discussion on the profiles. It is not clear how the authors arrive at the error figures which are given in figure 6 and 7. What about systematic influences of wrong temperature profiles, wrong spectroscopy and so on.

Why do the authors choose the micro-windows as given in the publication, why not others. Since this is a critical issue, a more thorough investigation of the choice of the microseconds would be certainly beneficial to the TCCON community.

Are the AVK dependent on the water vapor content of the atmosphere and if so, how strong.

Are the sondes smoothed by the typical AVK or are those AVK individually calculated for the profiles which are compared to the sondes?

The authors mention the strong variability of the H2O content of the atmosphere (15% in 3 hours) but use sondes which are started 1 h apart from the measurement. Even in 15 min the variability is larger in the water vapor profile than the assumed noise on the measurement. Could the authors please comment on this.

The large gradient and the large range of the water vapor content in the atmosphere are always a challenge for methods measuring water vapor (2). How does the described method cope with this issues?

How is the correlation to a time series of sonde measurements? A few matching profiles are certainly not enough to support the claims made by the authors.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 3987, 2010.