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Atmospheric Measurement Techniques Discussions

Interactive comment on "A full-mission data set of H_2O and HDO columns from SCIAMACHY 2.3 µm reflectance measurements" *by* Andreas Schneider et al.

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Author response to review RC1 by Anonymous Referee #2

This paper evaluated the vertical column densities of H2O and HDO retrieved from SCIAMACHY for the whole mission (2003–2012) using the non-scattering retrieval mode of the Shortwave Infrared CO Retrieval (SICOR) algorithm. The SCIAMACHY results were compared against the ground-based FTIR measurements from MUSICA. Reasonably high correlation coefficients and relatively small biases for H2O and HDO were obtained at the stations. δD was calculated a posteriori from H2O and HDO, and

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generally had larger errors. A comparison between the first and second half of the mission showed that the datasets were self-consistent.

This paper also assessed the benefit of the scattering retrieval mode of SICOR using a case study where the SCIAMACHY results for cloudy scenes were compared with high-altitude ground-based data. The most significant improvement was a clear reduction of the error in δD.

In general, the paper clearly conveyed the scientific findings. The results can provide guidance for SCIAMACHY data users. The method used can be useful for current and future missions.

We thank the reviewer for the positive feedback. In the following, the individual points are quoted in italics part by part, and our response is given below. Page and line numbers in the response refer to the revised version of the manuscript.

Individual comments

(1) *Use symbols in Figure 7 to show the locations of the MUSICA stations.*

We have changed the figure and the corresponding caption accordingly (p. 12).

(2) *Over the ocean, how do SCIAMACHY H2O data compare against satellite microwave data or other references?*

We agree that a validation over the ocean would be beneficial. However, the availability of data to compare against is very limited. To our knowledge, H2O/HDO data from satellite observations using the microwave spectral range do not exist; water isotopologue retrievals are only available in the shortwave infrared and thermal infrared spectral ranges. An intercomparison with other satellite data would involve caring for different sensitivities and footprints, e. g. by using averaging kernels etc. This is outside the scope of this paper. Thus, we rely on

well-established ground data. The observations over Tenerife Island at Izaña may be representative of oceanic conditions.

(3) *Provide a conversion factor from molec cm^{-2} to mm for H2O, since the latter is commonly used in atmospheric science.*

In our manuscript we have added the following sentence stating conversion factors (p. 7 ll. 3–4):

The conversion factor to precipitable water in mm is $2.99 \cdot 10^{-22}$ mm molec^{-1} cm^2 for H2O and $3.16 \cdot 10^{-22}$ mm molec^{-1} cm^2 for HDO.

(4) *Page 18 Line 14, change "similar resolution than SCIAMACHY" to something like "a similar spectral resolution to that of SCIAMACHY".*

The sentence is changed as follows (p. 18 l. 13 ff.):

For the newly launched TROPOMI instrument, which measures in the SWIR range with a spectral resolution similar to that of SCIAMACHY but with a much better signal to noise ratio and a much higher spatial resolution, ...

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