

Interactive comment on “A full-mission data set of H₂O and HDO columns from SCIAMACHY 2.3 μm reflectance measurements” by Andreas Schneider et al.

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Author response to review RC2 by Anonymous Referee #1

This study presents the retrievals of columnar water vapor isotopes (H₂O and HDO) from the SCIAMACHY. Using an algorithm that was developed to retrieve H₂O/HDO along with CO, authors implement additional spectral range to the algorithm and apply it to the satellite’s entire mission period. Ground-based measurements at several sites are used for validating retrieved H₂O/HDO columnar concentration and depletion. The study also explores the potential benefit by jointly retrieving cloud height and scatter-

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ing optical depth. They demonstrate that the inclusion of cloud scattering can correct biases in H₂O/HDO retrievals at an elevated site. This study addresses an important topic. It fall into the scope of AMT journal. Retrieval approach and validation efforts are well designed and well presented. The results are sufficiently discussed. I have only a few comments, but none of them I believe is major.

We thank the reviewer for the positive review. The specific comments are responded to below. Page and line numbers in the response refer to the revised version of the manuscript.

Specific comments

P6, L15: Here an area with radius of 800 km surrounded the site is used to sample the satellite data, which is a substantially large area. While it is mentioned in the paper to “include a sufficient amount of measurements”, it may need some additional justifications on how such a big area can well represent the site.

Considering a validation of individual measurements, the reviewer is right that the comparison between a MUSICA measurement and a SCIAMACHY observation within an 800 km radius around the ground site may be dominated by representation errors. A single MUSICA measurement cannot estimate the SCIAMACHY observation due to the high variability of atmospheric water vapour. However, the low precision of individual SCIAMACHY observations additionally requires a temporal averaging of both SCIAMACHY and MUSICA data. Therefore, according to our results, representation errors appear to cancel out to a large extend. Thus we have added the following sentence to our manuscript (p. 6 ll. 19–21):

Even though water vapour may change substantially over small distances, the results suggest that representation errors due to the large spatial collocation area average out in the monthly medians and their statistics.

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P9, L19: Can the author explain more on how the degradation “especially plays a role for difficult measurement geometries”? And what does the mean by the “difficult measurement geometries”?

Difficult measurement conditions are high solar zenith angles and low surface albedos, as stated in the previous paragraph in the manuscript (p.9 ll.11–12 in the discussed version). We have added a reference to that and a sentence elaborating on why the degradation especially plays a role for these (p. 9 ll. 16–19 in the updated manuscript):

The latter is attributed to the degradation of the instrument which especially plays a role for difficult measurement conditions as described above. Low sun and low albedo result in low signal to noise ratio and thus higher error sensitivity. Outside polar latitudes easier measurement conditions can make up for the degradation.

P15, L14: “increases somewhat” -> “increases slightly”

Changed (p.15 l. 14).

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-489, 2018.

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