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Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieval and validation of carbon dioxide, methane and water vapor for the Canary Islands IR-laser occultation experiment" *by* V. Proschek et al.

Anonymous Referee #4

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General comments: The manuscript is a thorough presentation of a small set of ground-based infrared-laser measurements of key greenhouse gasses, and the necessary uncertain analysis in such measurements. Section 3 focuses on the data processing and the retrieval approach. While section 4 addresses the retrieval uncertainties. This approach gives a good understanding of the strengths and limitations of the observational technique.

Specific comments: - page 3, line 73: The statement is included without any further argumentation. What about the strong wind fields observed at the Tx and Rx site? Is the statement valid at all times and all latitudes? What about the changes in the volume

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mixing ratio of H2O during the first night of observations - as given in Figure 2?

- page 7, line 217: The ECMWF resolution is given to be 14 km and 6 hours, leading to considerably variations in the volume mixing ratio of H2O. Thus the coarse ECMWF input in the signal ray tracing ought to be more significant. The iterative retrieval seems to smear out some of these effects. Why is that? Scale sizes of H2O above the boundary layer are often much smaller than the resolution of the ECMWF data.

- page 16, line 518 and line 536: The uncertainty due to water vapour is a limiting factor for the quality of the measurements of this greenhouse gas. So please expand a little on how 23 GHz measurements can mitigate the uncertainty estimates (see also your own remarks on page 19, line 643, and onwards).

- page 21, line 709 + page 22, line 735: The statements about the ACCURATE/LMIO satellite mission concept, solely based on this ground-based proof-of-concept experiment, is too far fetched. Satellite occultation observations applying this technique are several orders more complex than the presented measurements. Spatial scalability from this stationary ground-based experiment to space does not apply.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 11593, 2014.