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Atmospheric Measurement Techniques Discussions

Interactive comment on "Greenhouse gas profiling by infrared-laser and microwave occultation: retrieval algorithm and demonstration results from end-to-end simulations" *by* V. Proschek et al.

Anonymous Referee #1

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The paper of Proscheck et al is related to a planned satellite project with to LEO platforms in orbit. One platform serves as emitter for microwaves and infrared laser beams, the second platform receives this signals, observing Earth's atmosphere in occultation geometry, e.g. measuring the signals in transmission. The planned algorithm evaluates first the thermodynamic state of the atmosphere from the microwave occultation, which is utilized in the GHG retrieval from the IR occultation measurement. This paper in detail describes the IR part of the algorithm, including an error description and the results of a simulated retrieval. CO_2 VMRs can be retrieved with an error of 1–2%, the other discussed species (H_2O, CH_4, O_3) with 1–3%.

This is a well structured, quite complete analysis and description of the method. Especially the utilisation and combination of different lines for dedicated altitude ranges (for H_2O) and for different isotopes is (for CO_2) is interesting.

Nevertheless, there are a few minor remarks or requests:

- page 2278: Here is stated, that the current stude will handle only cloud-free scene. Here it would be interesting, who realistic this assumption is, e.g. how many cloud-free scenes are roughly expected (which will not be that much in occultation).
- page 2279: second paragraph: A sentence about the expected regional distribution and the number of events of the planned configuration would be appreciated here.
- page 2280: For the simulations, also an aerosol free atmosphere is assumed, which is never the case. Therefore, I would expect at least a qualitative statement somewhere in the paper, which errors are expected for a background aerosol loading. Or the other way around: at which point the assumption of no aerosol is important for this study.
- page 2308: For O_3, it is stated that ozone profiling is possible starting 10-15km, depending on latitude. However, looking at the result in Fig.9 b,d,c), I saw reasonable profile starting at 12km for SAW, 14km for STD, and at least 16km for TRO. Therefore, this examples leads to reasonable ozone profiles rather start at 12-16km.
- page 2304ff, last paragraph / page 2326, Fig.7: From Fig. 7c, I would conclude, that $H_2O(4)$ gives almost no additional information, because the $H_2O(3)$ already covers 8-10km with smaller errors. Can you comment on this?

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