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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparison of Optimal Estimation HDO/H_2O Retrievals from AIRS with ORACLES measurements" *by* R. L. Herman et al.

Anonymous Referee #4

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1 General Comments

This paper presents comparisons of the atmospheric Deuterium content of water vapour retrieved from AIRS with in situ measurements made during NASA's 5-year ORACLES field mission, using the WISPER system. The authors present an introduction into the campaign and aircraft measurements used in the validation of AIRS, along with an overview of the retrieval algorithm. Details are also given on the validation approach and the vertical information content of the AIRS retrieval. This study is of value as it extends and complements the catalogue of stable water vapour isotopologue measurements from satellites, which are vital for furthering our understanding of atmospheric moisture pathways. I would recommend this for publication, however,

would like to see a few minor points addressed.

2 Specific Comments

- Lines 92-93: Is AMSU used in the retrieval in any way? Not sure you really need to include its introduction here as you are not using the golf ball configuration (9xAIRs + 1xAMSU IFOV).
- Line 116: The reference for WISPER, if still in preparation are there any additional technical reports etc that could also be added?
- Table 1: Why are there some large discrepancies between the number of collocations and others have lower or no reduction in matchups when the tighter lat/lon constraint is applied? Maybe some additional information for context in the table header would be useful for readers unfamiliar with the ORACLES campaign.
- Line 222-223: Do you get 1 DOF between 750-350 hPa?
- Line 239: Is the DOF threshold for a sub-column between 750-350 hPa?
- Line 240: Where does the cloud optical depth information come from? Is it a retrieval output? Is there any uncertainty information associated with the cloud information, if so is it propagated?
- Figures23: A little colour/shading would be useful to help distinguish land/ocean. It is difficult to see the aircraft track through the AIRS IFOV markers. How many aircraft profiles are each subfigure?
- Figure 4: Subfigure headings are missing (a,b)

- Line 288: Little or no difference to a priori between 800 hPa-surface, is AIRS really adding anything here in the PBL? Is the averaging kernel not setting the difference between $(x - x_a)$ residual to/or close to zero?
- Section 5: Is this a description of the a posteriori error? When you say you are characterising the error budget I would expect some account of the collocation/representativeness uncertainty due to the mismatch with the aircraft. I think you might just need to change the wording on line 305 to make this clearer

3 Technical Comments

beginitemize

Line 206: in situ – should be in italics

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