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Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrievals of Tropospheric Ozone Profiles from the Synergic Observation of AIRS and OMI: Methodology and Validation" *by* Dejian Fu et al.

Anonymous Referee #1

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I find the manuscript well written and of good scientific significance. I would like to make few suggestions that in my opinion could strengthen the content of the manuscript. These pertain essentially section 3 which could greatly benefit from a better elucidation of some of the key aspects of a retrieval method development, such as its resilience to clouds, global yield, dependence from the a priori, sources of uncertainty. Please read below.

1) Equation 3). The author did not expand on the yWˆTW term, specifically how it is built and the role it plays in the retrieval convergence.

2) Page 6, point 5 and 6. Are near real time model data used in the scheme or an

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offline climatology built on these sources? What does "estimated from MOZART" really means?

3) Equation 4, page 7. Is the epsilon term simply the instrument noise? How is the cross-state term exactly built? Hence, in equation (6), what are the terms entering the S_epsilon matrix? How are S_cs and A_sc built? Does this retrieval scheme take into account for the radiative transfer model uncertainty as well in the measurement error covariance?

4) Page 9. Can the author describe the "species retrieval quality"? How is the effective cloud optical depth computed and what's its uncertainty? Is this uncertainty taken into account in the retrieval scheme? How is the cloud fraction computed? Is this an independent computation and if not, what's its uncertainty and is it factored in the retrieval scheme anywhere? For example, is its error covariance gaussian?

5) Page 9. Only daytime scenes are included. Does this mean that this retrieval scheme only applies to day time scenes in general? Can the authors specify this aspect? Also, is the retrieval scheme only applicable to cases with effective OMI cloud fraction less then 30%? If so, what is the overall global yield of the proposed retrieval scheme? Figure 3 is somehow ambiguous. Restricting the applicability of the retrieval to scenes that are less than 30% cloudy does not seem to correspond to what is displayed in figure 3, where the retrieval acceptance yield seems to be in reality 100% globally. What day was used for this figure exactly? Are those multiple days overlapped?

6) Equation 7. The term GS_erGˆT was not included in the earlier equations.

7) Typo. Line 20. AIRS+OMI, not AIR+OMI.

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