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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Five blind men and an elephant: can NASA Aura measurements quantify the stratosphere-troposphere exchange of ozone flux?" *by* Q. Tang and M. J. Prather

Anonymous Referee #1

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In this manuscript the authors examine ozone measurements from four Aura instruments (HIRDLS, MLS, TES and OMI) during several troposphere folding events using chemistry transport model as a common intercomparison platform. The study aims to test whether instantaneous measurements from these instruments can be used to quantify the stratosphere-troposphere ozone exchange. However this work is also instructive for general understanding of these satellite data, demonstrating well it's deficiencies and limitations that are important not only for study of isolated events, but should also be kept in mind when working with averaged data. This paper clearly warrants publication in the ACP with some revisions.

Throughout the paper you discuss the problems arising when applying satellite operators for nadir-view instruments. However, applying satellite operators essentially mimics the instrument retrieval process. So smearing and skewing of the model profile when satellite operators are applied actually hints on the extent to which the true atmospheric profile might be different from this TES retrieval. And given the AK profiles shown, this is not surprising - there's too little information coming from UT. So your choice to work with CTM profiles not processed with TES operators is justified in terms of preserving the UT information vital for this study. But this choice should not be based on keeping the TES-model biases low (if these were decreased by applying TES operators, would you then choose to work with processed profiles, despite UT region smeared to virtually loss of relevant information?). As possible solution to the high biases caused by applying TES operator in the UT, you suggest to redo the TES retrieval using modeled profiles as a-priory. This would definitely improve the correspondence between modeled and TES profiles, relaxing TES retrievals towards the model. But this would not change the fact that little information is coming from the UT region in the TES retrievals discussed here. Ideally, only retrievals with sufficient sensitivity to the region of interest should be used, especially in case studies. But given the scarcity of observed TF events demonstrated here, and apparently typically low sensitivity to UT in TES ozone retrievals, finding suitable data appears to be a matter of luck.

Technical remarks Figure 2: Please add the UTC time to the plots themselves. Figures 3, 4 and A1-A7: titles with sensor names for plots c, e, g, i would be really helpful.

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