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Comment

Interactive comment on “Intercomparison methods for satellite measurements of atmospheric composition: application to tropospheric ozone from TES and OMI” by L. Zhang et al.

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Anonymous Referee #1 Comments and Suggestions

1. This study uses an in situ, CTM, and averaging kernel smoothing method to validate and intercompare satellite retrievals of TES and OMI ozone. This paper is well-written and quantitatively reports three useful techniques for the validation and global intercomparison of atmospheric trace gases. A recommend publishing this paper in a timely fashion. My comments and suggestions are shown below.

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Response: We thank the reviewer for the helpful comments. We have addressed all of them in the revised manuscript. Please see the itemized responses below.

2. In the Abstract, page 1419, line 12 – Applying a full year (2006) of TES and OMI data to GEOS-Chem produces a mean positive biases of 5.3 ppbv for TES and 2.8 ppbv for OMI at 500 hPa relative to in situ data from ozonesondes. What is the root cause of these biases produced from GEOS-Chem?

Response: We now state “We apply the three methods to a full year (2006) of TES and OMI data. Comparison with in situ data from ozonesondes shows mean positive biases of 5.3 parts per billion volume (ppbv) (10%) for TES and 2.8 ppbv (5%) for OMI at 500 hPa”.

3. In relation to the last sentence in the Abstract, page 1419, line 20 – I suggest clarifying what ‘the combination of possible factors’ are that contribute to GEOS-Chem underestimating tropospheric ozone in the tropics.

Response: We now state “GEOS-Chem underestimates tropospheric ozone in the tropics due to possible underestimates of biomass burning, soil and lightning emissions.”

4. Page 1421, line 21 – I suggest putting the word ‘or’ before the phrase ‘averaging kernels,’ contained in parentheses.

Response: We now state “(often measured by averaging kernel matrices)”.

5. Page 1421, line 24 – sentence should read “This was recently applied: : :”

Response: We state “Kopacz et al. (2010) used the GEOS-Chem CTM to test the consistency of multiple satellite CO datasets. Here we investigate the theoretical basis of the method with satellite retrievals of tropospheric ozone.”

6. Page 1422, line 12 – please state what ‘different information’ is provided using the three methods for validation and intercomparison.

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Response: We state “We show how the different methods provide different intercomparisons”. Details of the three methods are discussed in section 4.

7. Page 1422, line 17 ‘on board’ should be ‘onboard’.

Response: We changed “on board” to “on”.

8. Page 1433, line 6 – What is meant exactly by the statement ! “We have adjusted the TES and OMI data for the mean positive biases of 5.3 and 2.8 ppbv, respectively as revealed by the ozonesonde comparisons”?

Response: We now state “We have subtracted from the TES and OMI data the global mean positive biases of 5.3 and 2.8 ppbv respectively, as revealed by the ozonesonde comparisons ”.

9. It appears that several factors may contribute to GEOS-Chem underestimations of ozone (page 1433, line 12). Yet, given the range of uncertainty for those factors that are not well-parameterized by GEOS-Chem (i.e., at present), is it possible to quantify which process(es) may contribute the most at specified regions around the globe to this underestimation of ozone by GEOS-Chem?

Response: Further investigation is needed to quantify these factors, and will be a separate study. Also following Review 2’s suggestion, we now state in the end of this section “Further investigation of these model errors is warranted but is beyond the scope of this paper.”

10. Page 1434, line 1 ! What additional parameterization may be needed to better simulate stratospheric-tropospheric exchange of ozone in GEOS-Chem?

Response: We think this is also a separate study.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 1417, 2010.

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