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Atmospheric
Measurement
Techniques
Discussions

Interactive comment on "Validation of six years of TES tropospheric ozone retrievals with ozonesonde measurements: implications for spatial patterns and temporal stability in the TES bias" *by* W. W. Verstraeten et al.

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General comments The validation study is centered on the discussion of the biases. The authors should consider to discuss also the expected error on the retrieval that is given by the RMS of the comparison between the retrieval and the ozonesondes.

Reply: In the revised manuscript an additional table (a new Table 1) is included (as also suggested in one of your further comments). We will also add some remarks in the revised manuscript. The RMS mainly reflects the variability of the residuals. Large

RMS in the UT is likely attributable to the high variability in upper tropospheric and lower stratospheric ozone (e.g. Logan, 1999). But also the low tropopause heights in the northern mid-latitude winter may play a role since it reduces the degrees of freedom for signal in the troposphere. Atmospheric variability may account for a significant portion of variability in the TES-sonde differences thus reducing the potential contribution from the errors in the TES measurements(Nassar et al, 2008). Logan, J. A. (1999), An analysis of ozonesonde data for the troposphere: Recommendations for testing 3-D models and development of a gridded climatology for tropospheric ozone, J. Geophys. Res., 104(D13), 16,115–16,149, doi:10.1029/1998JD100096. ———————

Moreover it would be very valuable to discuss how the TES retrieval is able to capture the natural variability observed by the sondes. It is very important if one wants to use this data to study variability and trend of tropospheric ozone.

Reply: There is clearly a linear relationship between TES and sonde measurements for the different latitudes for both the upper and lower troposphere (see also section 5, paragraph 3). For the northern mid latitude and the Arctics this is less pronounced for the LT. This linearity gives confidence to users of TES data that relative variations as observed on a global map are significant, even though biased. As such TES datasets have the capability to study variability and trends in tropospheric ozone. In the revised manuscript, an additional table is provided that summarizes the linear regression statistics for TES vs. sonde observations of ozone in LT and UT mentioned in section 5, paragraph 3. ———————

Specific comments Abtract: the authors should consider the providing also the relative biases in percent.

Reply: We included the relative biases in percentage in the revised version. ————————

Section 2: If the TES data used for this study are publicly available, the authors should mention it and provide the way to access the data.

Reply: The data are freely available at the TES website: http://tes.jpl.nasa.gov/data/. We have added this in the revised manuscript. ———————

P1246, l8: Is the interpolation performed in logarithmic scale?

Reply: Yes indeed, as indicated at page 1246 lines 4-5: “The estimate, , as well as the true state and prior are in units of log (VMR).” ———————

P1248, l13: in which unit is the RMS given?

Reply: The rms is unitless. The rms (root mean square) of the difference between observed and fit radiance normalized by the Noise Equivalent Spectral Radiance (NESR) (nW/cm2/sr/cm-1 / nW/cm2 /sr/cm-1). ———————

P1249, l20-end : It could be helpful for the reader if all the number were summarized in a Table or a Figure.

Reply: We have incorporated an additional table (new table 1) in the revised version summarizing the statistics for the TES-sonde comparisons in the lower and upper troposphere. ———————

P1250 – discussion on the UT bias: the authors should mention that the bias in the UT is also observed for other IR sounders like IASI for example (see e.g. Dufour et al., AMT, 2012)

Reply: We have added an extra sentence mentioning that bias in the UT is also observed for other IR sounders like IASI for example (see e.g. Dufour et al., AMT, 2012). ———————

Technical corrections: P1247,l22: Boxe and Worden (2010) should be replace by Boxe et al. (2010).

Reply: Thank you for noticing it. It is corrected in the revised manuscript. ———————

Fig. 2: change lunched to launched

Reply: Thank you for noticing this. We have corrected this in the revised manuscript.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 1239, 2013.