

OPTIMALLY COMBINING OZONE FROM TROPOSPHERIC EMISSION SPECTROMETER (TES) AND OZONE MONITORING INSTRUMENT (OMI) DATA

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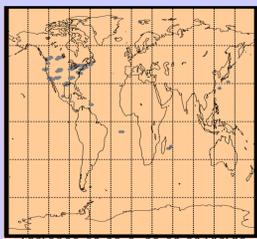


TES website: <http://tes.jpl.nasa.gov>



PART 2: VALIDATION

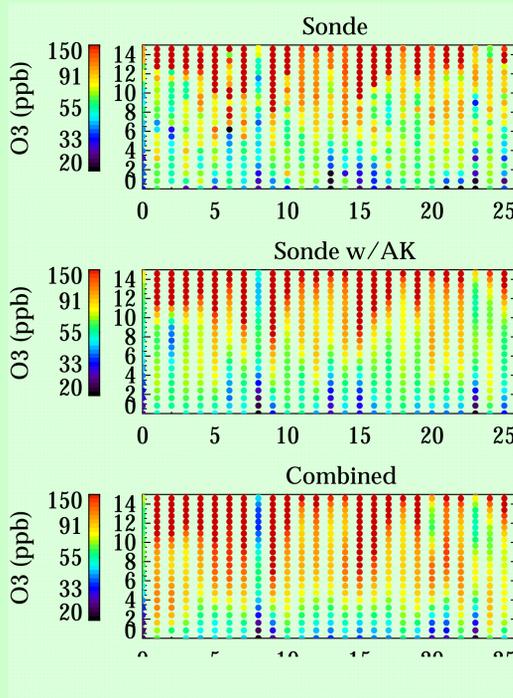
SONDE TESTSET



We now statistically compare TES/OMI combined results with matching sondes. 55 total matching sonde/targets were found within 300 km and 9 hours for May, July, and August, 2006. Sonde/target locations shown at left.

The sonde data are from the IONS (Intercontinental Chemical Transport Experiment - Ozonesonde Network Study), WOUDC (World Ozone and Ultraviolet Data Center), GMD (Global Monitoring Division of the Earth System Research Laboratory) and SHADOZ (Southern Hemisphere Additional Ozonesonde) archives. The full set of comparisons are described in Nassar et al, JGR - Aura Special Issue, 2008 (pre-print available at <http://tes.jpl.nasa.gov/docLinks/DOCUMENTS>).

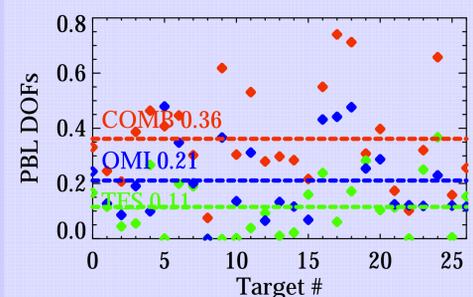
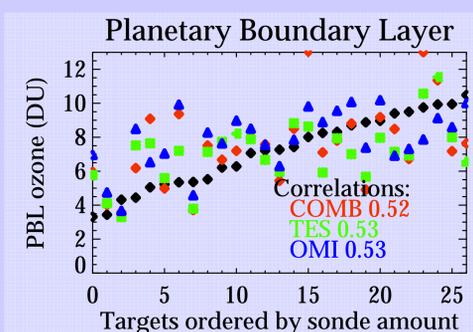
RESULTS COMPARED TO SONDES



Results for 34 sondes. The sonde value (top) is smoothed by the combined averaging kernel (middle). The OMI/TES combined result is shown at bottom.

THE PLANETARY BOUNDARY LAYER

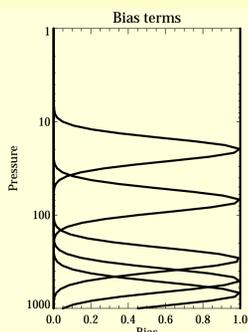
- Dynamic part of the atmosphere
- Gap in current global measurement record



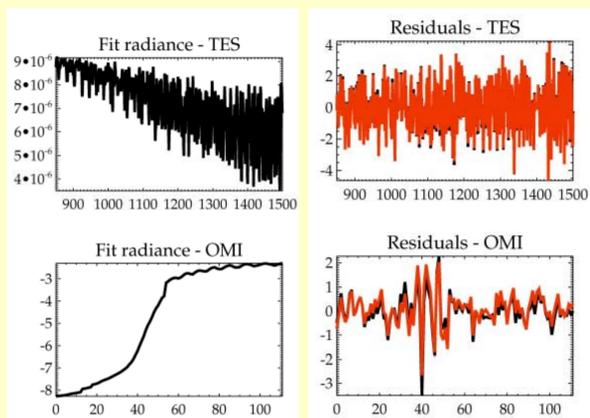
TES, OMI, and the combined retrieval were compared to sondes for partial columns between the surface and 200 hPa above the surface, with a cutoff for degrees of freedom. In this case, the averaging kernel was *not* applied to the sonde; comparisons were made between the actual sonde values and retrieved values.

- Both the OMI profile retrieval and TES show sensitivity to the planetary boundary layer (PBL)
- Combined retrievals show a dramatic increase in the degrees of freedom
- Combined retrieval using linear update method shows marked improvement in sensitivity but not in errors over individual retrievals
- Unfitted biases and/or systematic errors remain in the combined linear retrieval

BIAS TERMS and RADIANCES



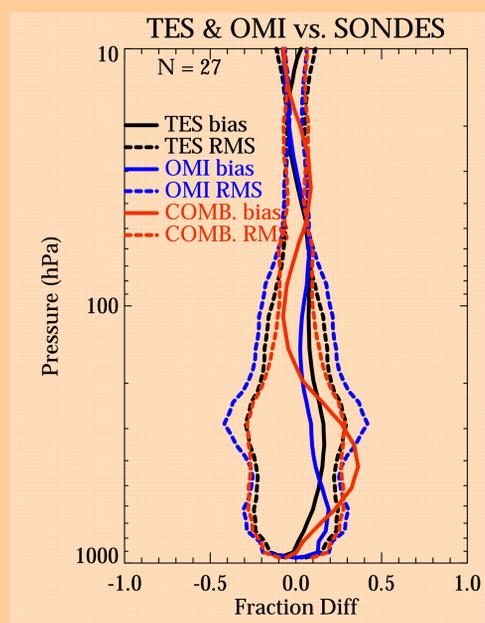
As seen in the characterization section, the bias between TES and OMI must be mitigated. It is mitigated through a constant bias plus a set of biases which peak at particular pressures



Radiances for TES and OMI, left. Radiance residuals before (black) and after (red) the retrieval, right. Although OMI has less radiance points, the Jacobian per frequency is much stronger than TES, resulting in more total degrees of freedom, although less in the troposphere.

On average the combined retrieval results in a slight improvement for TES and

STATISTICAL RESULTS



Above shows comparisons between TES, OMI, and the combined retrieval and sondes with averaging kernel applied. This analysis gives a statistical idea of the errors and sensitivities.

- Sonde testset useful for evaluation of results
- Improvement in the upper troposphere bias and RMS
- Increased bias in the mid and lower troposphere

VALIDATION CONCLUSIONS

- Improvements are seen in the upper trop, however, biases are increased in the mid troposphere compared to sondes
- Differences in retrieved cloud and temperature fields as well as spectroscopic differences may adversely affect the combined linear retrieval
- The linear retrieval is an important step forward towards joint OMI and TES retrievals, which show tremendous potential in terms of improved sensitivity