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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A Multi-sensor Upper Tropospheric Ozone Product (MUTOP) based on TES ozone and GOES water vapor: validation with ozonesondes" *by* J. L. Moody et al.

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Review of "A Multi-sensor Upper Tropospheric Ozone Product (MUTOP) based on TES ozone and GOES water vapor: validation with ozonesondes" by J. L. Moody, S. R. Felker, A. J. Wimmers, et al.

This paper provides an ozonesonde comparison/validation of MUTOP upper-tropospheric ozone measurements and is a follow-up to the recent Felker et al. [2011] ACP paper which discusses the MUTOP algorithm. The MUTOP algorithm involves a linear regression model which combines TES profile ozone (as the dependent variable) with additional regression input coming from (as the independent variables) GOES measured water vapor and potential vorticity calculated from the GFS operational forecast model. The ultimate goal of the MUTOP algorithm is to produce high-resolution and high quality fields of upper tropospheric ozone on a daily/hourly basis.

The MUTOP measurements of upper tropospheric ozone in this paper (and previous Felker et al. [2011] paper) were calculated for the INTEX-B campaign over the region of the eastern Pacific/western US during several days in spring 2006 (i.e., mid-May to mid-April of 2006). These papers indicate that the method is useful for extending scientific analysis of upper tropospheric ozone beyond the limited spatial and temporal coverage of TES daily nadir measurements. The pattern structures in derived MUTOP maps originate from the properties of GOES water vapor and model forecast PV.

An underlying assumption with the MUTOP method is that ozone is correlated with water vapor and PV and can be regressed with these variables to derive high resolution ozone maps despite these two variables themselves being correlated. This may cause some concern for those accustomed to regression modeling involving several variables. However, the authors infer and are probably correct that it is the inverse correlation between PV and water vapor that explains much of the success with the MUTOP method. The MUTOP algorithm seems to work well for the INTEX-B case study as attested to the ozonesonde comparisons in this paper. As the authors suggest, given a different region and different time of year the MUTOP regression coefficients would need to be recalculated to be useful. It is likely that the MUTOP method will not work so well for regions away from the dynamical wind jets including the tropics.

The paper references Doughty et al. [2011] in terms of climatology, but Doughty et al. [2011] was not about climatology but instead it was a very similar case study paper based on the same INTEX-B April-May 2006 campaign. The main difference between these two papers is that Doughty et al. [2011] used a data assimilation method to derive tropospheric ozone profile information whereas the present paper uses a much simpler regression technique. The GMAO data assimilation used by Doughty et al. included GEOS-Chem modeled tropospheric ozone which requires emission inventories and is not easy to implement. The present regression method is far simpler to apply than data

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assimilation for such studies and appears to work just about as well for tropospheric ozone. The authors might want to include some of this discussion in their paper to strengthen support for the MUTOP measurements.

An overall conclusion one can make is that the MUTOP method appears to be applicable to a range of specific case studies such as field campaigns (here, INTEX-B) to improve the spatial and temporal coverage of tropospheric ozone not possible from original TES measurements. Despite limitations as the authors mention, the MUTOP method appears as a viable method.

The paper is well written with few typos - Page 30503, line 5: Should be "As shown in Fig. 3..." The paper appears as publishable with only minor changes.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 30487, 2011.

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