

Interactive comment on "Variability of temperature and ozone in the upper troposphere and lower stratosphere from multi-satellite observations and reanalysis data" by Ming Shangguan et. al.

Short comments

Dear Authors

Please consider these two comments, one scientific and one regarding data citation. This is an interesting paper and I hope you will find my remarks helpful.

Thank you very much for the very useful comments. We have updated the method and citation as suggested and hope the manuscript has been considerably improved.

Kind regards,

Ming Shangguan (on behalf of all co-authors)

1) I really appreciate your discussion of the negative impacts of step-changes in the ozone observing system on ozone trends in MERRA-2. Even a cursory look at Figure 13 reveals that the discontinuity associated with the transition from MLS v2.2 to v4.2 in June 2015 is nontrivial, as you correctly point out in Section 3.4. I would like to draw your attention to the fact that it is possible and relatively simple to account for this, as well as the 2004 SBUV-to-MLS transition, precisely because these step-changes are so infrequent and well defined. In Wargan et al, 2018 (doi:10.1029/2018GL077406) we did it using an SD model simulation as a transfer function but it could also be done by including a step-function proxy in the MLR. We tried the latter approach (not shown in our paper) and the result was very similar to that obtained using the transfer function approach. I suspect the MERRA-2 panel in Figure 14 would look different if a bias correction was applied. In fact, the analysis could be extended further back to 1998.

Thank you for your suggestion. We have corrected the discontinuity associated with the transition from MLS v2.2 to v4.2 in June 2015 with a step-function proxy in the MLR. The ozone trends have been updated in Figure 15 in the revised manuscript.

2) NASA GMAO asks the users of MERRA-2 data to explicitly cite the data collections used. Note that each MERRA-2 collection has a unique doi number listed in the file specs document <https://gmao.gsfc.nasa.gov/pubs/docs/Bosilovich785.pdf> For example monthly mean pressure-levels assimilated data ("M21MNPASM" or *instM_3d_asm_Np*) could be cited as follows: Global Modeling and Assimilation Office (GMAO) (2015), MERRA-2 instM_3d_asm_Np: 3d,Monthly mean, Instantaneous, PressureLevel, Assimilation, Assimilated Meteorological Fields V5.12.4, Greenbelt, MD, USA, Goddard Earth Sciences Data and Information Services Center (GES DISC), Accessed: [Data Access Date], 10.5067/2E096JV59PK7

Thank you for the information. We have added the citation in the revised manuscript.