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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Assessment of upper tropospheric and stratospheric water vapour and ozone in reanalyses as part of S-RIP" *by* Sean M. Davis et al.

Anonymous Referee #2

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This kind of paper is hard to review. It provides a summary of ozone and water vapour information in current reanalyses data sets, with an emphasis on the stratosphere. I guess the main conclusion of the paper was known before it was written: use the ozone and water vapour data with care and do not use for trend studies. However, it is nice to have some of the issues illustrated with figures in a comparative way. Therefore, there is no reason why the paper should not be published, however some explanations might require some clarifications. I will detail my questions below:

P3, l22: I do not know what this statement means. All systems try to model the microphysics of water as good as they can, jet the results differ, because small differences

in the treatment of water can have large effects?

P2, l30: This sentence is confusing. It tries to make two points in one sentence: Heating rate calculations and photochemistry. Which ozone is used when and where?

P6, l3: This relates to the comment regarding P2, l30. I guess a clear discussion in the beginning would be fine. Alternatively, a corresponding sentence for each system. Which ozone and water vapour is used in the radiation (heating rates) and what is done for the chemistry (actinic fluxes, if required).

P7, l9: See above.

P7, l34: was should read has.

P9, l6: I am not sure why the stratospheric temperature bias changes the humidity product. Ice clouds in Antarctica.

P11, l2: This sentence is not very clear. Which mean? What tendency? (For people in the know it will be clear, but . . .)

P11, l28: If I understand correctly, profiles (ozone and water vapour) are processed as described a few lines above on pressure levels and a common grid. However, TCO is calculated from model level data. Why not use the "ready made" products? Do some systems not provide their columns? How do you deal with orography?

P12/13: I appreciate that the authors would like to compare the reanalyses systems with another data source. However the data used is neither independent nor in a fundamental form. Instead, merged data sets are utilised. Nothing wrong with this, but presumably other equally valid products exist and I am not sure why the data sets mentioned have been chosen . . . (I am also not very happy with the use of multi-instrument means without an appreciate of the spread, when comparing to the reanalyses systems.)

Instead of focusing on the text, I will now briefly comment on a smal number of figures

(my assumption being, that readers will be most interested in the graphical presentation of system differences). Given the large range in water vapour products and the small number of systems that provide it, I will not comment on the water vapour related figures (the figures are a health warning in themselves):

Figure 3 and 4: I struggle to combine the information in both figures. For example JRA-25: In Figure 3 JRA-25 has a low bias with respect to SBUV everywhere. In Figure 4 JRA-25 has a positive bias from around 100 hPa to just below 10 hPa. Assuming that the largest column contribution stems from this region, I do not understand the consistency of the results. (Maybe I have over-read the explanation in the text . . .)

Figure 7: I find this figure hard to understand. Presumably, by using equivalent latitudes, the differences in more than one variable are highlighted. PV will have been derived from very different dynamical cores and afterwards ozone has been mapped to it. Therefore, differences will arise from more than one change in the assimilation system and how PV has been derived (e.g. treatment of temperature, dynamical variables and ozone itself, etc.). Therefore, I am not entirely sure what the message on a global scale is . . . apart from they all look different.

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