

Interactive comment on “The representation of solar cycle signals in stratospheric ozone – Part 1: A comparison of satellite observations” by A. Maycock et al.

Anonymous Referee #1

Received and published: 29 February 2016

The paper compares the solar cycle signal in several stratospheric ozone data sets. It is obviously the first part of a two part paper that forms the basis of a model assessment study (to follow). It is also related to the upcoming CMIP6 ozone forcing paper. The paper goes relatively deep into the comparison of data products, and I must stress that I am not an expert on these products. In my view, the comparison of different product or product versions with respect to solar cycle signals is a worthwhile task and the conclusions are strong but interesting. One focus of the paper is on the seasonality, which (according to the authors) should be captured by any potential climate model forcing data set, but also the general altitude-latitude structure. The authors conclude that there are considerable differences between data sets in this respect. The paper

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is well written, albeit quite technical at times. It is scientifically sound. In my view the paper is publishable after minor revisions.

1. My main comments concerns how the outline of the paper and its position amongst the other paper (Part 2, CMIP6): If the assessment of data sets for use as forcings in CMIP6 is the main topic, then perhaps it should be made more clear at the beginning, which properties such a data set should have and which not and how such a data set is (or might be) generated. Will some smoothed satellite-based data set be used and then extended forward and backward? Will an existing model simulation or ensemble be used? Or will an ozone data set be generated purely statistically? Perhaps a few words on that would help, otherwise the paper is in danger of being misunderstood. The starting point (and recommendation) of the paper is that in any case a realistic solar-cycle imprint should be in, and the conclusion (in the abstract) is that satellite-based ozone data sets alone will not be good enough to get that signal. I find that interesting and well demonstrated in the analysis. However, I would like to know a little bit more about other effects, although this is not the topic of the paper: Obviously ozone depleting substances should be in such a data set. It is also clear that climatic influences such as SSTs should be excluded because the coupled models will generate their own SSTs. What about the QBO, should it be in or out? How will volcanic eruptions be specified in CMIP6? This sounds a bit off topic, but it might help the reader to position the paper amongst the other two upcoming papers before the focus then goes entirely towards the many data sets and the solar cycle imprint. Also, it would help to assess the relevance of the uncertainties found against other uncertainties. Once the position of the paper is made clear, I can agree with most of the paper.

2. Temperature used for conversion: It is often not clear how temperatures were used to convert number densities to mixing ratio. In which cases were daily profiles used, in which monthly, or even just a climatology? In which cases were zonally averaged temperatures used, in which the full 3D fields? Perhaps add a table.

3. Regression models: Perhaps it is common practice to write the model in this way. I

am still surprised that no lags are used. Also, the volcanic term is basically Pinatubo, so perhaps it might be better just to cut that period out.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2015-882, 2016.

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