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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the detection of the solar signal in the tropical stratosphere" *by* G. Chiodo et al.

Anonymous Referee #2

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General comments

The paper investigates the contribution of volcanic eruption, ENSO, and QBO to the quasi-decadal variability of the stratospheric ozone and temperature in the tropics to understand possible aliasing of their response to 11-year solar variability. The authors simulated the evolution of the atmosphere during 1960-2004 with CCM WACCM 3.5 using different sets of forcings and applied modified MLR to extract the solar signal. The authors showed that the response of the temperature and ozone to solar UV variability in the stratosphere above 30 hPa is in a good agreement with previous publications, while below 30 hPa substantial part of the extracted solar signal disappears in the model run without two major volcanic eruptions. The subject of the manuscript is relevant to the ACP scope and interesting for the community, because it inspires

some reconsideration of the mechanisms responsible for the climate response to solar irradiance variability. I think the publication of the manuscript can be recommended. However, there are several issues in the manuscript (see below) and some moderate revisions would be necessary before the publication.

Specific comments

1. The number of "not shown" is overwhelming. For some cases (e.g., when the authors discuss the difference between standard and new MLR) it is not possible to follow the discussion. I suggest adding more figures or changing the text to avoid it.

2. I do not completely understand the physical meaning of the introduced time lag. I understand that the time lag is chosen on the basis of maximum correlation, but I have difficulties trying to understand what kind of physical processes can lead to 1 year time lag between UV and temperature response in the lower tropical stratosphere. It would be nice if the authors discuss not only statistics but also some physical processes.

3. Figure 1 shows the simulated tropical temperature anomalies at 50 hPa. It is interesting that the response to Pinatubo is more than 6K, which is two-three times higher than in the observations and in the results of many other CCMs. Maybe the conclusion of the paper about absence of the temperature response in LTS to solar variability in the run w/o volcanic aerosol can be simply explained by the high (low) model sensitivity to volcanic eruptions (solar UV) and this conclusion is not hold for other CCMs. It should be discussed because it can undermine the importance of the obtained results for the community.

4. I do not understand also the difference in the ozone and temperature response in the "all forcing" and "no volcanic aerosol" runs. The volcanic eruptions lead to warming and ozone decrease in TLS. If a part of the warming appears in the solar UV coefficients s a result of MLR analysis, then a part of the ozone depletion should do the same. However, it is not what we see in Figure 7. Do the authors have some explanations for this result?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 30097, 2013.