

## ***Interactive comment on “The response of mesospheric H<sub>2</sub>O and CO to solar irradiance variability in the models and observations” by Arseniy Karagodin-Doyennel et al.***

### **Anonymous Referee #2**

Received and published: 5 October 2020

The paper is about solar signal in H<sub>2</sub>O and CO data modelled with CMAM, EMAC-L90MA, SOCOLv3, CESM1-WACCM 3.5 and measured by Aura/MLS and GOZ-CARDS. The authors extracted the signal from the modelled and measured data using MLR analysis and compared the obtained solar components. In my opinion, the obtained results are interesting and the paper should be published.

Specific comments:

It is not written in the abstract which measurements were used.

lines 123-124. It is written that “For Equation 3, cross-sections from 0.5 to 1050.0 nm in the XUV/X-ray wavelength region are used.” It is probably should be 105 nm (not

Printer-friendly version

Discussion paper



1050 nm)?

Figure 2. It is written that “While the solar RI in the CO time-series of EMAC and SOCOL agrees well with the Aura/MLS observations, CMAM overestimates and WACCM underestimates the solar variability. “ I see that the WACCM is in good agreement with the MLS data. But the data calculated with SOCOL and CMAM are not significantly different. Thus I would say that SOCOL rather overestimates the measurements.

Figure 4. The response calculated with CMAM, EMAC and WACCM for high latitudes lower than 0.2 hPa is large and significant. Why the data calculated with SOCOL do not show any significant response?

Figure 6. I would say that agreement between modelled and measured data depend on the altitude. For example, though EMAC data underestimate the measurements lower than 0.03 hPa they are in perfect agreement at 0.03 - 0.015 hPa. Please, be more specific and make comparison depending on the altitude.

Figure 6. It is written in line 275 that “Almost the same pattern is visible for absolute sensitivity values.” I do not agree with this statement. For example, at 0.03 hPa the relative values calculated with CMAM are in agreement with measurements while it is not the case for the absolute values. So, in my opinion, Figure 6b should be described separately and compared with Figure 6a.

Figure 8. It is written in lines 296-298 that “The simulated sensitivity is within the uncertainty range of the observations for all models except EMAC between 0.35 and 0.06 hPa.” - The data calculated with WACCM are not within the uncertainty range with MLS between 0.1 and 0.01 hPa.

Technical comments:

line 27. H4 - CH4

line 182-183. two Quasi-biennial oscillation (QBO) proxies of at 30 and 50 hPa (in m/s) - zonal winds at 30 and 50 hPa (in m/s) as proxies of Quasi-biennial oscillation (QBO).

lines 191-192. “they are used to calculate the solar signal per 100 units of F10.7 as a percentage of the average value for the whole period as  $(\beta/Y \bar{I}(t)) \times 100$ , where  $\bar{I}(t)$  is an averaged  $I$  for the whole period of interest (in ppmv).” - The meaning of the sentence is not clear. Please, explain the statement in more clear way.

lines 266-267. “This is the variation of solar irradiance is the largest, and it is less sensitive to thermospheric processes since there is no downwelling over the tropics. “  
- The effect of solar irradiance variability is largest in the tropics. Moreover, the H<sub>2</sub>O response is less sensitive to thermospheric processes since there is no downwelling over the tropics.

---

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-793>, 2020.

[Printer-friendly version](#)[Discussion paper](#)