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Comment on acp-2021-616

Anonymous Referee #2

Referee comment on "Variability and trends in surface solar spectral ultraviolet irradiance in Italy: on the influence of geopotential height and lower-stratospheric ozone" by Ilias Fountoulakis et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-616-RC2, 2021

Anonymous Referee comments on "Variability and trends of the surface solar spectral ultraviolet irradiance in Italy: a possible influence of lower and upper stratospheric ozone trends" by Fountoulakis et al.

General comments:
The manuscript studies if atmospheric dynamics plays a role in total ozone and UV irradiance anomalies by analysing correlation between geopotential height (GPH) and total ozone and UV irradiance in Italy. Correlations between three different sites are also studied as well as trends in analysed parameters. The subject is interesting and important regarding possible changes in the future in the atmospheric dynamics due to the climate change. The manuscript is well written and easy to follow, except the Summary and Conclusions which should be changed to be more reader friendly. I enjoyed especially the Introduction which covers in a nice way the background of this study. However, I think the manuscript lack of explanation related to the effect of the dynamic: Why is there such a strong anticorrelation between tropopause height and total ozone? Is the stratosphere, which includes the "ozone layer", somehow smaller when the tropopause is high-> less ozone, or what is the reason? I am not totally convinced about the conclusion that the influence of lower and upper stratospheric ozone trends is seen in the variability of surface UV irradiance. The manuscript would benefit of radiative transfer calculations to confirm the conclusion. The same applies to the explanations for differences in trends between SZA 45deg and 67deg.

It is not clear how the UV time series of Rome have been homogenized. Was the UV scale adjusted to that provided by the QASUME and the IOS instruments during the comparisons? And how was the UV calibration performed before 2003?

Based on the results, would it be possible to give the range (in %) in which total ozone and UV can vary due to changes in dynamics?

I think that after the revision of the manuscript the paper is worth to be published in ACP.

Specific comments:

l. 181: Please explain why you chose 250 hPa and 850 hPa,and not some other GPH.
l. 187-191: This doesn't belong to Data and Methodology. Please move to an appropriate place.
l. 359: SZA decreases -> SZA increases ?

Fig.2. In some plots you can not really use the linear correlation analysis. E.g., (h), (i), (f).

Supplement: I don't understand the sentence: " As also shown in Figure A1 (panels d-f) GPH at 250 hPa is strongly anti-correlated with GPH at 850 hPa.". To me, the Figure shows positive correlation, not anti-correlation.

Technical comments:
I didn't find the Appendix. I found the Supplement yes, but not the Appendix.