Response to Anonymous Referee #2

Our responses follow the reviewer's comments (in bold). Since page and line numbers of the original manuscript are different in the new version, the new page and line numbers (in the version with marked changes) are also given where needed.

General comments:

This study investigates the causes of short and long-term changes in the UV irradiance record at Thessaloniki, Greece using the spectral records from two Brewer spectrophotometers. The authors use a careful strategy to unpick the relative influences of clouds, aerosol and ozone on the observed changes in the irradiance at 307.5nm, 324.0 and 350.0nm. The manuscript is clearly written and logically laid out with a good introduction and subject to the points below being addressed should be published in Atmospheric Chemistry and Physics.

Specific comments:

P35758 L9: Add "wavelength" before "step" for clarity

Answer

Done

P35759 L27: 60Hz - more likely to be 1Hz or 1/60Hz perhaps?

Answer

(P6, L22) This was a mistake. The actual frequency is 1/60 Hz (one measurement per minute). The text has been revised.

P35760 L18 et seq.: Detailing correction for differing SZAs, would be useful to quote results for specific wavelengths of interest i.e. 307.5nm, 324nm and 350nm.

Answer

(P7, L13-15) Information for 307.5, 324 and 350 nm has been added.

Fig 1. caption: (c) and (d) show monthly means of daily mean TOC and AOD, but the way the caption is phrased could be confusing. Figure labels would also benefit from enlargement.

Answer

(P7, L13-15) The caption has been revised. The fonts of labels are the same size in all figures. The size of figure 1 has been reduced to fit the discussion paper format, but it will get its original size in the printed version (see e.g., revised manuscript).

P35762 L4: "Thus, in the following the long-term..." change to "Thus in the following analysis long-term..." Also the authors state here that if a turning point exists in the 20 year record the sub-periods

would be too short to derive reliable estimates of their trends, but later in s3.4 break the time series into two portions and plot the piece-wise trend in fig 5. This seems inconsistent and should be clarified.

Answer

(P8, L18-24) The manuscript has been revised according to the suggestion of the reviewer. Additionally, we have tried to make clear at this point that, although the trends for the two sub-periods have been computed, they are discussed more qualitativeley, because the two sub-periods are too short to consider the quantitative estimates reliable.

P35762 L9 et seq.: I am not clear on how the auto-correlation affects the magnitude of any trend detected, however for consistency's sake I would expect it to be better to treat both the all sky and clear sky datasets in the same fashion.

Answer

(P8, L28) The autocorrelation affects only the significance of the trends and not their magnitude. The manuscript has been revised accordingly. Furthermore, both the clear-sky and the all-sky datasets have been treated in the same way; the autocorrelation was not removed from none of them.

P35762 L28: "climatological value" for that day of year or for the whole dataset? i.e. is the daily mean or total mean subtracted?

Answer

(P9, L15) It is the climatological value for that day. It has been clarified now.

P35763 L7: It would be useful to know aproximately how large the overall trends are at this point to assess the contribution from the QBO and solar cycle and whether they affect the significance of the overall trends.

Answer

(P9, L24) The appropriate information has been added.

P35763 L25: 5nm spectral intervals - what happened to the three selected wls? Are the 5nm spectral intervals only used to compare the two instruments ratio? Some context / explanation would help clarify for the reader at this point.

Answer

(P10, L13-21) The use of 5 nm intervals in irradiance instead of single wavelengths is now discussed in more detail.

Fig 4: Change green used for data and legend to same as on axis. Also similarly darken green used in figure 5(j) to (l) to aid readibility.

Answer

Done

P35766 L6: Is the trend of decreasing attenuation by clouds also significant? The text suggests it might be, but would need to checked from all-sky vs clear-sky ratios.

Answer

The trends in the all-sky vs clear-sky ratios have been calculated and the results are in very good agreement, almost identical with the difference between the clear-sky and the all-sky trends. The trends were found statistically insignificant. However, as it is now discussed in the manuscript (P13, L26-29), the fact that the difference between the clear-sky and the all-sky trends is similar or lower even than its 1-sigma uncertainty is a very strong indication that the estimated changes in the attenuation of the UV irradiance by clouds are not significant. Thus, a more extended discussion about the all-sky vs clear-sky ratio was not considered necessary.

P35768 L29: "A similar with this period pattern"... missing a word after similar.

Answer

(P15, L24-25) The sentence has been revised.

P35769 L10-11: "an extremely low yearly mean irradiance at 307.5nm" then in next sentence "... is still higher than mean levels in the period 1994-1998". These two statements are clearly incompatible and need correcting (probably the former).

Answer

(P16, L6) The word “extremely” has been deleted.

P35769 L13-15: This anti-correlation is not that clear from the figures shown. Pointing the reader to brief specific exmaples or highlighting on the figure may assist.

Answer

Examples were added (P15, L30 – P16, L1).

P35770 L1 et seq: An instrument may have been monitoring since 1990 but measurements from 1990 to 2014 have not been used in this study – only from 1994 onwards as the authors explained in the text. The first date should be changed and the second sentence adjusted as necessary.

Answer

Done