

# ***Interactive comment on “Short- and long-term variability of spectral solar UV irradiance at Thessaloniki, Greece: effects of changes in aerosols, total ozone and clouds” by I. Fountoulakis et al.***

## **Anonymous Referee #1**

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### General comments

The manuscript by Fountoulakis et al. analyzes changes in solar spectral UV irradiance at 307.5, 324, and 350 nm at Thessaloniki from measurements of two Brewer spectrophotometers. The observed changes are then interpreted in terms of changes in aerosols and total ozone column at this site. The paper is well written, provides a comprehensive overview of the context and methodologies, is well referenced (in particular the introduction), and presents new data from this important site. I recommend publishing the manuscript in ACP, provided that my specific comments below are

C11253

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addressed.

### Specific comments

P35756, L6: I believe that Zerefos et al., (2012) did not conclude that the observed “slowdown or even a turning point in the upward UV-B trends after 2006” was “mainly due to a corresponding turning point in the negative trends of aerosols.” For example, Figure 1 of Zerefos et al., (2012) does not indicate that the negative trend in AOD has slowed down after 2006. The lowest value is in 2011 at the end of the time series. Please double-check this assertion and modify, if appropriate.

P35758, L13: A 1-sigma uncertainty of 5% seems high. Please double-check that this is indeed 1-sigma.

P35759, L27: 60 Hz? Was the temporal resolution really this high, i.e., 60 samples per second? Or was it 1/60 Hz, i.e. one sample every minute?

P35762, L10: As far as I understand, the “magnitude of trends” (i.e., the regression slope) is not affected by autocorrelation, only the significance of the trend is. Please double-check.

P35762, L28: I assume the daily anomalies were calculated by subtracting from each data point the average of all data points from different years but with the same day-of-year as the data point in question. Perhaps this could be clarified by adding “for that day” after “climatological value”. In the following line, change: “Then using the daily anomalies we derived monthly mean anomalies” to “Monthly mean anomalies were calculated by averaging the daily anomalies for months with at least 10 . . .”

P35763, L15: Was the assertion that “yearly mean anomalies are not autocorrelated” confirmed with a statistical test or is this an assumption?

P35764, L12-17: The description of trends that are significant and trends that are not is rather convoluted. Please simplify the language! Perhaps enumerate the conditions for which trends are significant and mention that for all other conditions, trends are not

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significant.

P35767, L22: According to this line, the turning point analysis was based on the analysis of yearly mean anomalies. However, in section 3.1 (P35762, L18ff), it is stated that “the methodology of Yang et al. (2006) was applied on the monthly mean anomalies.” So was the analysis based on yearly or monthly data?

P35769, L10: Delete “extremely”. (E(307.5) was lower in 1997 and 1998 and even in 2010, the anomaly was less than 5% - hardly “extreme”.)

Figure 5: AOD anomalies have a large spike in 1999. Why is there no corresponding spike of opposite sign in E(350) and E(307.5)? Is there perhaps something wrong in the AOD dataset for that year?

Caption Figure 5: Mention that data shown in Figure 5 are based on clear-sky data. (Otherwise, the small decrease in E(350) after 2006 that occurs despite decreasing AODs could be explained by an increase in clouds).

Technical corrections

P35760, Eq. (1) and line 17: Please use either “a” or “alpha” in “alpha(lambda, theta\_0)

P35763, L3: Remove dash in “multi-linear” to be consistent with later spelling of this word.

P35768, L17: Delete “all”

P35770, L8: Replace “ensure data of superior quality” with “increase the confidence in the accuracy of the spectral measurements”.

P35770, L15: Replace “higher” with “larger”

Throughout the paper, including the references, replace “Hader” with “Häder”

Figures 3 and 4: Labels on x-axis in Figure 3 are upper case while they are lower case in Figure 4. Please harmonize. Also in Figure 4, replace “automn” with “autumn”. In

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addition, it is a bit confusing that errors bars are 1 sigma while the caption discusses significance at the 95% level. Consider using 2 sigma error bars such that significance becomes visually better apparent.

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 35753, 2015.

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