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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spectral UV measurements in Austria from 1994 to 2006:investigations of short- and long-term changes" *by* S. Simic et al.

S. Simic et al.

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First, we would like to thank the reviewer for the comprehensive and constructive remarks and suggestions that will help to improve the quality of the revised manuscript.

General Comments:

In this paper, influences of ozone, clouds and albedo on short term UV changes, as well as time series analysis is discussed using the 1994-2006 spectral UV time series of the Sonnblick observatory. Even if the method follows mostly Arola et al. 2003, the results are interesting as they represent a mountain top cite in the middle of Europe, which can be compared with results from the Arctic cite of Sodankylä and the Mediterranean cite of Thessaloniki presented in Arola et al. 2003. More discussion about similarities

and differences of results between these two papers should be added. Also results about influences of ozone, albedo and clouds on long term UV changes would have been interested to include in this paper.

Answer: More detailed discussion and comparison will be included in the revised paper

Specific comments:

1.Please discuss more about possible reasons for the significant downward trends at SZA 55.

Answer: The revised paper will include a more detailed discussion of this trend

2.Page 2406, line 16-17. Please use a reference for the exact numbers of 16% and 88%, or explain how they are obtained.

Answer: An additional reference will be provided

3.Chapter 2.1. Please tell about the harmonization of your irradiance scale over the whole measurement period. Are the irradiance scales of the two instruments comparable with each others?

Answer: Investigations of short and long term changes are only performed with the Brewer. Additional investigations, like the influence of snowline on UV irradiance or the determination of albedo, are performed with the Bentham.

4.Chapter 2.2. Please discuss the influence of studying a SZA band of 4deg (SZA 61-65).

Answer: The influence of a change of 4 degree in solar zenith angle on UV irradiance will be calculated with a RT model and included in the discussion.

5.Chapter 2.2.1. Albedo. For those who are not familiar with the determination of "snow line", please specify, where is the distance measured from; a.s.l?

Answer: The information above sea level will be included in text.

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6.Page 2409, line 22, please specify that this is true for UVA and visible wavelengths.

Answer: Yes these values were determined for the UVA and visible wavelength range. This will be mentioned in text.

7.Aerosols, Figure 3. Do you have an explanation for the high value (0.15) of 2002 compared to the other monthly means?

Answer: To answer this question we will first go back to the original data in order to identify whether the reason lie in specific weather conditions (cirrus cloudiness) and whether some "bad data" were included in the averages.

8.Page 2410, chapter 2.3. have you used measurements from the Brewer or the Bentham or a combination of both? How regular are the measurements? Do you have gaps in your time series?

Answer: Only Brewer data are used in chapter 2.3. No gap is longer than three weeks.

9.Page 2411, line 1, How much is "too few data" or "too high cloud cover"? How many months did you have to exclude from your analysis? How this affected the results?

Answer: It will be mentioned in the revised manuscript: too few data (less than five days per month) or too high cloud cover ($N > 3/8$). As solar zenith angles 45° are not present from November to February, these months had to be excluded in the analysis of SZA 45°.

10.Page 2411, line 22. As you have calculated trends for clear -sky spectra only, this should be mentioned more clearly in the results and the Abstract as well. Actually, the influence of clouds has been excluded from your analysis, and your trend is influenced only by other factors than clouds.

Answer: This will be mentioned more clearly.

11.Page 2412, line 18: Please discuss the reasons, why the influence of albedo is highest in April.

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Answer: the following text will be included: Albedo has the greatest influence on the variation of UV irradiance in April as this is the period of snow-melt, which causes the snowline (and thus the effective albedo) to change significantly on a relatively short time-scale.

12.Page 2412: Please make more clear what is the difference between results of the Table 1 and results from Figure 7. Are Table 1 results calculated from daily values and Figure 7 results from monthly means?

Answer: Yes, Table 1 results are calculated from daily values and Figure 7 results from monthly means. We will mention this more clearly.

13.Chapter 3.1. Please add more discussion about the differences/ similarities of your results and the results of Arola et al. What is the influence of different geographical location? Arctic, Mediterranean / Mountain site?

Answer: We will extend the discussion. In Sonnblick three aspects are of importance: high altitude, low turbidity and topography (with high albedo)

14.Figure 8: 324 nm and CIE is missing from the figure.

Answer: A problem has appeared producing the manuscript. Therefore part of figure 8 (324 nm and CIE) is missing and 305 and 310 nm is shown twice.

15.Chapter 3.2. Please add more discussion about the length of your time series, influence and the possibility of trend detection. Do you have lack of data during some months? Please refer also to Weatherhead et al. 1998: Weatherhead, E.C. et al.,Factors affecting the detection of trends: Statistical considerations and applications to environmental data, J. Geophys. Res., 103, 17149- 1761, 1998.

Answer: We will include a more detailed discussion on the influence of length of time series on trend detection. Lack of data see above. We will include the reference in our discussion.

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16.Chapter 3.2. Please include some discussion about possible long term effect of changing albedo and cloud conditions.

Answer: This will be done in connection with the determination of the influence of albedo, ozone on the observed trend. Some information about trend during all sky conditions will be added and some statements as to changes in cloudiness will be made.

17. Page 2415, point 4. Please add that the long term change is calculated from clear sky data.

Answer: will be added

Technical corrections: Figures 4,5 and 6: Please clarify the explanations of different lines. Page 2413: lines 1 and 2: typing mistake, please correct ozon Figure 8: 324 nm and CIE is missing from the figure

Answer: will be corrected

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 2403, 2008.