

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: This is a very interesting paper of high relevance for the UV community and beyond. However, the description of the used physical quantities is often unclear and need to improved significantly for publication. Particularly, the term variability is used in different ways and it can be often only guessed what quantity is meant. In the abstract it is probably the maximum range of values that is due to a given factor, in the text it is often referred to the standard deviation. It is recommend to clearly define the quantity mathematically and give an equation. In the text a reference to this

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equation can be done.

Answer: The quantities (e.g. variability) used in this study will be better defined by using equations.

The abstract should be rewritten, because it does not yet contain the most interesting information. One of the most interesting information is that there are significant negative trends of UV irradiance at Sonnblick that cannot be attributed to ozone changes. More hints are given in the specific comments. The language should be improved. Sentences like Variability caused by albedo is maximum 32% are not understandable and the reader have to guess what the authors mean.

Answer: The abstract will be extended and the information of the negative trends of UV irradiance will be included in the revised manuscript.

Specific comments: Page 2404, line 16: The term intensity is ambiguous. Which physical quantity is meant? Irradiance? Radiance? Actinic flux?

Answer - new text: UV irradiance reaching the earth surface

Page 2404, line 25: the citation of Kerr et.al., 2003 and Bais et.al. 2007 is not correct. The cover of these books contain an instruction on the right citation (e.g. Bais and Lubin et.al.)

Answer - new text: (Kerr and Seckmeyer et al., 2003; Bais and Lubin et al., 2007)

Page 2405, line 8: a reference to Seckmeyer et.al. 2008 should be included (the first author is coauthoring this publication) because it shows a comparison of the measured values of the Sonnblick station with other stations in Europe and also shows the natural variability

Answer: The reference will be included

Page 2407, line 19: replace model calculations of the by model calculations based on the Or is something different meant?

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Answer - new text: model calculations based on

Page 2407, line 24: the term daily climatology is unclear. It is suggested to provide an equation.

Answer: The term daily climatology will be explained in detail in the revised manuscript and an equation will be provided.

Page 2407, line 27: replace quotient by ratio. Correct the expression also in following text, where it is used several times

Answer: quotient will be replaced by ratio in the revised manuscript

Page 2408, line 16: why is the high variability reduced by averaging? Is this done of ozone only or also for other variables? In any case, please justify. If the averaging is more widely used, it would have serious implications for the results presented in this paper.

Answer: Averaging was used only for ozone. Interdiurnal variations of total column ozone can be as high as 30 % of the daily mean during late winter and spring and up to 10 % during summer and fall. As these fluctuations do not represent climatological changes a moving-average filter was used.

Page 2408, line 25: the results shown in Fig. 1 are very interesting. It is suggested to report about it in the abstract.

Answer: The enhancement of irradiance with decreasing snowline will be mentioned in the abstract

Page 2409, line 3: a reference to Wuttke et.al. 2006 may be given, who investigated this effect for conditions in Antarctica

Answer: The reference will be included

Page 2409, line 7: a definition of effective albedo and references (e.g. Schwander

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et.al.) should be given.

Answer: The definition of effective albedo will given in the revised manuscript.

Page 2409, line 23: replace well comparable by consistent

Answer: will be corrected

Page 2410, line 12: what is some defined UV-B and UV-A wavelength intervals

Answer new text: the dependence of UV irradiance at several wavelengths (305 nm, 315 nm, 370 nm) on cloud amount.

Page 2410, line 21: rephrase (English) Page 2411, line 20: replace spectrums by spectra

Answer: will be corrected

Page 2411, line 22: the use of clear sky spectra for trend detection is very problematic. First of all there is no clear definition what is a clear sky spectrum. Secondly by selecting clear sky data, an artificial trend may be created, just by the selection criteria. At least there should be a more critical discussion of these difficulties.

Answer: Selection criteria was the cloud fraction. We used data with a cloud fraction equal or lower than $3/8$. We will look whether the partitioning of $0/8$, $1/8$, $2/8$ and $3/8$ has changed throughout the period.

Page 2412, line 17: in the literature much higher influences of clouds have been reported (reductions of more than 99%). Why do the data not show higher reductions? Averaging? High altitude station?

Answer: Clouds in high mountains have a smaller optical depth. Additionally, due to the high albedo at Sonnblick, attenuation of UV irradiance due to clouds becomes smaller. An additional reference showing these effects will be provided in the revised manuscript.

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Page 2413, line 21: rephrase less negative

Answer: The English will be improved

Pages 2414 and 2415: much of the information given in the summary should go into the abstract (e.g. point 2, 3 and parts of point 4)

Answer: The abstract will be extended

Page 2415, line 13: a very essential fact is not repeated here (and should be contained in the abstract): the downward trends cannot be attributed to an increase in ozone. This fact is mentioned in the text, but it should be additionally shown by a graph or a table.

Answer: Time series of total ozone measurements will be shown

Page 2420, the term enhancement is not clear. Please explain in the figure caption that it is the ratio of 8230

Answer: The term enhancement will be explained in the figure caption

Page 2421, equation (1) does not refer to the calculation of the effective albedo. Please provide an additional correct equation

Answer: Will be corrected to equation (2)

Page 2423, please insert that the calculation is for cloudless skies only

Answer: Figure caption will be corrected

Page 2424, the figures might be too small and the numbers are difficult to read. The term normalized intensity is not clear. Please provide a definition

Answer: Figures and numbers will be enlarged and the term normalized intensity will be defined

Page 2425, replace governing by dominating

Answer: Will be corrected

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Page 2427, CIE is not a defined quantity. Probably it is meant erythemally weighted irradiance according to CIE

Answer: We will use the term erythemally weighted irradiance according to CIE

Page 2428, the figure says 305 and 310 nm whereas the text refers to 324 nm and CIE

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.

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

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