

Interactive comment on “Trends in the surface UV radiation at the Polish Polar Station, Hornsund, Svalbard (77°00' N, 15°33' E), based on the homogenized time series of broad-band measurements (1996–2016) and reconstructed data (1983–1995)” by Janusz W. Krzyścin and Piotr Sobolewski

Anonymous Referee #2

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The paper presents and analyses one of the longest time series of erythemally weighted UV data for the Arctic, based on UV-measurements and reconstructed data. The authors have utilized methods for homogenizing UV-measurements, and applied multivariate regression tools to develop models for surface albedo, cloud optical depth, as well as having validated the models against measurements. The work is scientific

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ally relevant and interesting, as it covers a period before and after the implementation of international climate initiatives, for a pristine location.

General comments: The use of sunshine duration and snow depth data for reconstructing long term time series of UV have also been used by other authors, e.g. Lindfors et al. I miss a more extensive reference list. The calibration constants shown in Figure 2, shows that the instrument used in the period after 2004 has been quite stable, considering the harsh environment. The older instrument shows very high annual drift (factor 2.5 over 5 years). I miss some uncertainty estimates for the measurements series and reconstructed time series. A reference to Fig5.b is missing in the paper. Figure 5b: If I have understood correctly, the curves in Figure 5b are showing the yearly deviation (residuals) from the mean for the whole period, which means that the two curves labelled “Observed” and “Model” are showing the relative differences in yearly UV doses from their respective means. It would be interesting discussing the differences between real UV observations and modelled UV data. The curve labelled “Observed” is in fact a combination of reconstructed, and measured with gaps complemented with reconstructed UV data, for the whole period 1983-2016. A distinction would be appropriate, e.g. by changing the legend “Observed” to “Combined Observed and Modelled”, or adding a curve with UV observations alone. Otherwise, one may think the two curves were completely independent on each other. It would also be informative for a reader to see the fractions of the monthly or yearly doses that actually were based on measurements (and not substituted with modelled data). Furthermore (figure 5b), it appears strange that the two curves labelled “Observed” and “Model” are distinctively different for periods where UV observation are missing (1983-1995 and 2002-2004), considering that both are modelled, taking the same input parameters. An explanation would be helpful for the reader.

Minor comments: Page 1, line 27: “The ozone hole over the Arctic was observed only once in 2011”. Even though the ozone layer was record low in the Arctic in 2011, large negative anomalies in total ozone has happened before and after 2011, e.g. in

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winter 2016/17, see e.g. “State of the Climate 2016”, section J: page S151-S154. http://www.ametsoc.net/sotc2016/Ch05_Arctic.pdf Please, consider a reformulation.

Page 2, line 29-31: “During the two years of its operation. . .”. A reader may first believe the instrument was operating only for two years. The meaning is likely rather “During 2006 and 2007 the instrument was calibrated. . .”.

Page 3 line 4: “Biometer” is normally associated with another brand of erythemal UV radiometers; the Solar Light Co. UV-Biometer. Please, consider using the wording UV-radiometer instead, for all instances of “biometer”.

Page 3 line 18, There should likely be a comma instead of a dot (.) after “>32 cm”.

Section 5 Results and section 6 Discussion and Conclusion: Please, consider restructuring, or moving overlapping information. Example: page 6 lines 1-5 is restated on page 7 lines 4-9. Information on page 6-13 could be moved to the materials sections. Information on page 6 lines 17-24 could be moved to the Discussions section.

Page 7 line 14: Belsk should probably be Hornsund. Page 14, legend to Figure 3d: “Monthly doses” are probably monthly mean daily doses.

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