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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-term solar UV radiation reconstructed by Artificial Neural Networks (ANN)" *by* U. Feister et al.

Anonymous Referee #3

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General comment

This paper gives a relevant contribution to the problem of reconstruction of UV climatology of the past decades using the Artificial Neural Network (ANN) approach. In the introduction the advantages of this "black box" approach are well described for the benefit of readers not particularly expert in the complex deterministic modelling of radiative transfer. The recent use of the ANN approach to compute UV irradiation at ground has in fact the great appeal of "simplicity" once the model is properly trained it learns how to solve the complex system of multiple interactions affecting UV solar radiation through the atmosphere. It is also worth to mention the emphasis given to the biological applications of these type of exercises as documented by the use of the daily totals of erythema UV radiation as predictand Moreover this study covers another interesting

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item that is the analysis of the small-scale spatial characteristics of solar and other atmospheric parameters. Considering these two main evidences provided by this paper a revision on the title should be worth of consideration by the authors: a possible alternative title could sound as "Small-scale spatial characteristics of solar radiation and Long-term solar UV radiation reconstruction by Artificial Neural Network". I recommend publication of this paper in ACP after minor changes that are listed hereafter.

Specific comments

In the Introduction I'ld suggest to motivate the choice of use the daily totals of erythema UV radiation as principal predictand.

Harmonize the energy units in all the figures: avoid possible confusion in using alternatively Jcm-2 and Jm-2: I'ld recommend the use of kJm-2.

Fig 2 shows differences in the values of daily erythemal doses derived from values computed on the base of Brewer data and Bentham&Spectro derived measurements. These latter appear to overestimate the daily ERY dose. In the text (pag 460 line 15) it is only mentioned the value of this uncertainty but no attempts to explain it is done. Is this due to differences in the instruments readings or to the procedure of temporal data integration between two Brewer readings, as more likely?

Fig 3 does not appear essential

Fig 4 shows daily erythemal doses measured at Potsdam as compared to Lindenberg but it is not clear whether data came from Bentham or Spectro measurements or from Brewer based data. Even more relevant (and worth to be cited in the text) appear the differences between the two close locations (70 km) that is still evident also after the normalization with the global irradiation (Fig 5). For Fig 4 I estimate that Lindenberg values are about 8.5% higher than Postadm at least at higher irradiances around 4 kJm-2. How is this explained? Potsdam has certainly an urban atmosphere while Lindenberg has a more rural one.

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8, S505–S507, 2008

Fig 9. Is there any particular reason to use in this figure the letter H for daily erythemal irradiation while in other figure is used ERY? Moreover to me it is not clear wich data have been used for reconstructed daily ery doses: which ANN version (# 6?)?? Was the bias already removed?

Fig 11 and Fig 12 appear to conflict concerning the reconstructed values in the 1890-1950 and 1950-2003 period. In fig 11 the first period seems to be characterized by a higher average value than the second one which is just the opposite of what came out form fig 12. This differences cannot due to the different integration time used in the two figures. Please clarify this relevant point.

Fig 14 and Fig 15: according to which ANN version have been reconstructed the ERY doses in locations which have likely different type of meteorological data available? Is Fig 14 essential or its information can be integrated in Fig 15?

Tab. 3 Please clarify the meaning of “gain of information” referred in this table legend.

Harmonize in the text the way to refer to RMS or rms.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 453, 2008.