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Reconstruction of daily erythemal UV radiation values for the last century – the benefit of modelled ozone data

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Solar UV radiation plays a major role for the Earth's biosphere and air chemistry. Erythemal UV radiation (UV_{ER}) affects the human skin and the immune system. Overexposure to UV radiation from the sun or from artificial sources is a considerable public health concern. There is increasing evidence that it suppresses the immune system and triggers premature skin ageing, as well as melanoma and non-melanoma skin cancer in humans. Long-term UV_{ER} records are necessary to investigate these relationships, but those time series are scarce.

A significant decline in atmospheric column ozone was observed in the past decades, and a recovery of the stratospheric ozone layer is anticipated by the middle of the 21st century. We combined long-term ground-based measurements of different meteorological variables with daily values of modeled ozone data for the past to reconstruct time series of daily totals of UV_{ER} at the Meteorological Observatory Potsdam, Germany. Artificial neural networks were trained with measured UV_{ER}, sunshine duration, the day of year, measured and modeled total column ozone, as well as the minimum solar zenith angle in order to find a suitable model. This method was already successfully tested in the framework of the COST–Action 726 (Long term changes and climatology of UV radiation over Europe) and in the international SCOUT-O_3 Project (Stratospheric-Climate Links with Emphasis on the Upper Troposphere and Lower Stratosphere) (*Feister et al.* 2008, *Junk et al.* 2007). After intensive model validations this model was used to reconstruct daily totals of UV_{ER} for the period from 1901 to 1999. Results will be presented as monthly and annual totals of UV_{ER}. A strong increase in the annual totals of UV_{ER} from the beginning of the reconstructed time series up to the mid 1950s is followed by a less pronounced decrease between 1955 and 1990. Additionally, trend analyses of the long-term variations of the reconstructed, new UV_{ER} data set will be presented.

References:

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