Estimating UV-B radiation on empirical base in Central European region

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Within this study an empirical model for estimating daily values of ultraviolet B (UV-B) radiation was developed. It is based on measurements conducted at eight Austrian stations during 2000 and 2002. As input the proposed model requires daily global radiation, daily extraterrestrial radiation, information about column of stratospheric ozone and altitude of a station. The model performance was verified at several stations (differing in latitude and with altitudinal gradient over 3000 m) in Austria and Czech Republic. It has been also tested under different weather conditions including clear and cloudy days and varying ozone concentrations. During the verification satisfactory results were obtained: the coefficient of determination (R^2) varied within the interval of 0.97-0.99 with a mean bias error (MBE) ranging from -2.5% to 2.0% and a root mean square error (RMSE) from 9.3% to 17.7%. The results of the model at Hradec Králove station were also compared with the data from the Solar Radiation Database (SoDa), which are available on the internet as results of interpolation from a network of ground UV-B radiation measurements. Significantly better explanation of measured data variability was achieved by using the empirical model.

After verification of the model it was used for assessment of an episode of stratospheric ozone reduction during July 2005 (stratospheric ozone amount was reduced by 12.5%). Based on daily global radiation from 88 Czech weather stations the model allowed rather precise and spatial explicit determination of increased UVB dose during this period. For example on 30^{th} July 2005 the daily UV-B radiation at 88 stations increased approximately by 323 J m^{-2} day^{-1} on average. In addition, the analysis of spatial variability of UV-B radiation during this period was conducted using ArcInfo GIS software. Results of the case study show one of the possible applications of the empirical UVB model.

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