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Long-term variability and impact on human health of biologically active UV radiation in Moscow

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Measurements of erythemally weighted UV irradiance (Qer) have been performed at the Meteorological Observatory of Moscow State University since 1999 with the UVB-1 YES pyranometers. These types of devices are broadband with a spectral sensitivity curve close to the action spectrum of erythema. Main uncertainties of UVB-1 YES measurements include the difference in spectral curves of the instrument and the action spectrum of erythema, as well as the deviation from the cosine law. These uncertainties were taken into account in the database of Qer measurements (Chubarova, 2008. Additional corrections of UVB-1 measurements at low ambient temperatures have been made.

We analyze interannual, seasonal and diurnal Qer changes over the time period 1999-2012. In addition, the comparisons with the results of UV reconstruction model (Chubarova, 2008) are made. This model allows us to evaluate relative changes in Qer due to variations in total ozone, effective cloud amount transmission, aerosol and cloud optical thickness since 1968.

It is important to note that the main reason for UV irradiance monitoring development is the strong influence of UV irradiance on the biosphere and especially on human health mainly on human skin (CIE, 1993, CIE, 2006) and eyes (Oriowo, M. et al., 2001). Based on the detailed studies we have shown the possibility of utilizing UVB-1 pyranometers for measuring the eye-damage UV radiation. Parallel measurements by the Bentham DTM-300 spectrometer and the UVB-1 YES pyranometer at the Innsbruck Medical University (Austria) have provided us the calibration factor in eye-damage units for this broadband instrument.

Influence of main geophysical factors on different types of UV irradiance is estimated by means the RAF ideology (Booth, Madronich, 1994). We discuss the responses of different types of biologically active UV radiation to the impact of various atmospheric factors. The UV conditions (deficiency, optimum, excess for human) are analyzed according to the developed classification for Moscow.

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