



The influence of urban area opacity on biologically active UV-B irradiance

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The study of UV irradiance changes in urban area is an essential problem due to the significant effect of UV irradiance on human health which can be positive (vitamin D synthesis) and negative (erythema, skin cancer, eye damage). According to the results of several experiments within the Moscow megacity we studied the effects of urban area opacity on the different types of biologically active UV-B irradiance on the base of a specially developed mobile photometric complex and additional measurements of the urban opacity by Nikon Fisheye Converter FC-E8. We analyzed both the level of erythemally-active irradiance and the UV eye damaging radiation using the broadband UVB-1 YES pyranometer calibrated against ultraviolet spectroradiometer Bentham DTM-300 of the Medical University of Innsbruck (courtesy of Dr. M.Blumthaler). In order to estimate the effects of the urban opacity the measurements were normalized on similar measurements at the Meteorological Observatory of Moscow State University with zero opacity. This ratio is defined as an urban radiative transmittance (URT). Different atmospheric conditions were considered. In cloudy conditions the effect of opacity on URT is much less than that in conditions when the sun disk is open from clouds. We revealed some spectral features in transmittance of biologically active UV-B irradiance which is characterized by higher URT variations in overcast cloudy conditions due to more intensive scattering and smaller direct solar radiation component. In the absence of cloudiness the effect of opacity was studied for open and screening solar disk conditions. We obtained much higher URT in UVB spectral region compared with that for total solar irradiance for screening solar disk conditions with a significant URT dependence on the opacity only in UVB spectral region. No URT dependence was obtained for total solar irradiance in these conditions. Some model calculations were fulfilled to match the experimental results.