Geophysical Research Abstracts
Vol. 19, EGU2017-9150, 2017
EGU General Assembly 2017

Long-term variability of UV irradiance over Northern Eurasia according to satellite measurements, ERA-INTERIM dataset and INM-RSHU chemical climate model

Nataly Chubarova (1), Anna Pastukhova (1), Ekaterina Zhdanova (1), Julia Khlestova (1), Alexei Poliukhov (1), Sergei Smyshlyaev (2), and Vener Galin (3)

(1) Moscow State University, Faculty of Geography, Moscow, Russian Federation (natalia.chubarova@gmail.com), (2) Russian State Hydrometeorological University (RSHU), Maloohtinsky prospect, 98, Sankt-Petersburg, Russia, (3) Institute of Numerical Mathematics (INM), Russian Academy of Science, Gubkin str., 8, Moscow, 119333, Russia

We present the results of long-term erythemal UV irradiance (ERY) changes over the territory of Northern Eurasia according to the ERA-INTERIM reanalysis dataset, INM-RSHU chemical climate model (CCM), and TOMS and OMI satellite data with the correction on absorbing aerosol based on the new Macv2 climatology updated from Kinne et al. (2013) over the 1979-2015 period.

We show the existence of the pronounced positive ERY trend due to ozone in spring and summer over Europe and over the central areas of Siberia (up 3% over the decade). The changes in cloud cover provide even more significant ERY increase (up to 6-8% per decade). However, over Arctic region there is a pronounced negative ERY trend probably due to the effects of melting ice on global circulation processes. The combination of ozone and cloud effects provides the enhanced increase of the overall ERY trend: up to 6-9% in spring and summer over Eastern Europe, some regions of Siberia and the Far East. In addition, based on the method described in (Chubarova, Zhdanova, 2013) we estimated changes in UV resources over Northern Eurasia since 1979. We show that for the first skin type there is a significant geographical shift of UV categories: the increase in the UV optimum area in winter, where the vitamin D generation is possible without risk of getting sunburn, and its reducing in other months due to decrease in ozone and clouds.

We also analyze the long-term UV changes simulated according to different scenarios using the INM-RSHU CCM. There is a general agreement between CCM and observational datasets, however, ERY trends due to cloudiness do not correspond sometimes in space and are smaller. We show that the positive ERY trend due to ozone is determined by the anthropogenic emissions of halogens. The variations in natural factors (solar activity and ocean surface temperature, stratospheric aerosol) only provide the increase in ERY dispersion.

References:

Kinne, S., O'Donnel D., Stier P., et al., J. Adv. Model. Earth Syst., 5, 704–740, 2013.

Chubarova N., Zhdanova Ye. Photochemistry and Photobiology. —- 2013. —- Vol. 127. —- P. 38–51.