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Urban aerosol pollution assessment in Russian largest cities

Elizaveta Malinina (1), Natalia Chubarova (1), and Mikhail Sviridenkov (2)

(1) Lomonosov Moscow State University, Geographical, Meteorology and Climatology, Moscow, Russian Federation (malininaep@gmail.com), (2) A. M. Obukhov Institute of Atmospheric Physics RAS, Moscow, Russia

We assessed the aerosol pollution in 51 Russian largest cities, which are located in different climatic zones with various level of urban pollution using the aerosol optical thickness (AOT) at 550 nm from MODIS data with a spatial resolution $1^\circ \times 1^\circ$during the warm period of 2000-2013. For better understanding of MODIS radiometers quality of AOT data over Russia the comparisons between AERONET data and MODIS data were fulfilled. They showed a good quality of the MODIS data and its possibility to detect an urban pollution from space. As a characteristic of urban aerosol pollution we used the difference between AOT in the city and the background value of AOT in the nearby region. The research showed, that urban aerosol pollution in Russian cities varied from 0.01 to 0.08.

Besides, more precise assessment of urban aerosol pollution in Moscow was done basing on the AERONET network data in two sites at Moscow University Meteorological Observatory (MO) and at the Zvenigorod Scientific Station (ZSS). For the assessment the simultaneous measurements at these two sites during the period from September 2006 till July 2013 were taken. The average AOT difference in the visible spectrum (wavelength: 500 nm) between MO and ZSS, which could be used as pollution characteristic, is about 0.02. These results are similar to similar research, which had been made earlier for a shorter period. The difference between AOT at these two sites is the largest in winter and is about 0.03.

In order to assess the dominating aerosol components in different cities we used the data of Russian network on emissions and concentrations of the main pollutants over the 1988-2011 period. For each city we evaluated the ratio of sulfur dioxide to nitrogen dioxide emissions and its trends to assess the dominating aerosol properties and temporal variability.

As a result, the radiative forcing of urban aerosol pollution for different cities was evaluated. Depending on the location, the size and the level of aerosol pollution of city the radiative forcing varied from -4.1 W/m2 to -0.4W/m2.