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Radiative and temperature effects of aerosol simulated by the COSMO-Ru model for different atmospheric conditions and their testing against ground-based measurements and accurate RT simulations

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We use the operational Russian COSMO-Ru weather forecast model (Ritter and and Geleyn, 1991) with different aerosol input data for the evaluation of radiative and temperature effects of aerosol in different atmospheric conditions. Various aerosol datasets were utilized including Tegen climatology (Tegen et al., 1997), updated Macv2 climatology (Kinne et al., 2013), Tanre climatology (Tanre et al., 1984) as well as the MACC data (Morcrette et al., 2009). For clear sky conditions we compare the radiative effects from the COSMO-Ru model over Moscow (55.7N, 37.5E) and Lindenberg/Falkenberg sites (52.2N, 14.1E) with the results obtained using long-term aerosol measurements.
Additional tests of the COSMO RT code were performed against (FC05)-SW model (Tarasova T.A. and Fomin B.A., 2007). The overestimation of about 5-8% of COSMO RT code was obtained. The study of aerosol effect on temperature at 2 meters has revealed the sensitivity of about 0.7-1.1 degree C per 100 W/m2 change in shortwave net radiation due to aerosol variations.
We also discuss the radiative impact of urban aerosol properties according to the long-term AERONET measurements in Moscow and Moscow suburb as well as long-term aerosol trends over Moscow from the measurements and Macv2 dataset.

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