

Variability of the content of submicron aerosol and soot in the near-ground air layer in West Siberia

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Important role of atmospheric aerosol in radiation processes in the atmosphere determines the necessity of the study of the peculiarities of temporal variability of aerosol characteristics in situ. The peculiarities of year-to-year and seasonal variability of the mass concentrations of the dry matter of submicron aerosol, soot and relative content of soot in aerosol particles are considered in the paper on the basis of regular every-hour measurements carried out in 1997–2004. Soot (crystal carbon) is the main absorbing component of the aerosol composition in the short-wave range. The data arrays of annual mean, monthly mean and daily mean aerosol characteristics as well as their rms deviations and variation coefficients are analyzed. The events of forest, peatbog and vegetation fires are often observed in West Siberia in warm season. The subarrays of aerosol characteristics excluding the fire events are additionally considered in order to estimate the effect of forest fire smokes on the aerosol composition. Analysis of the 8-year series of data free of the effect of fires has shown that there are no stable trends of annual mean and seasonal mean aerosol characteristics. In general, annual mean values of the aerosol parameters vary within the limits 18–23 mg/m³ for the aerosol concentration, 1.4–1.8 mg/m³ for soot and 7–11% for the relative content of soot. Annual behaviors of the parameters under consideration has well pronounced winter maximum and summer minimum. The decrease of the relative content of soot in particles has been considered as an information sign of the effect of forest fires, that is explained by the determining role of the processes of pyrolysis at the stages of formation of smoke aerosol. The effect of fires on the content of aerosol and soot was observed during all years of measurements, except of 1998. The data of 1997 (smoke haze, September–October), 1999 and 2003 undergo the greatest effect. The increase of annual mean values of the aerosol concentration due to fires relatively to the “background” conditions during these years is 1.6, 1.2 and 1.4 times, respectively. The greatest “disturbing” effect of fires was observed in springs and autumns. Seasonal mean values of the mass concentrations of aerosol increased in this time, in average, by 1.6 and 1.9 times, respectively. The work was supported in part by Russian Foundation for Basic Research (grant No. 03–05–64787).