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Seasonal variability of particle condensation properties in the boreal forest zone of Central Siberia

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One of the key objectives of the aerosol climatology, which describes the climatic effect of aerosols, is determination of the ability of aerosol particles act as cloud condensation nuclei (CCN) and thereby control the microphysical properties of cloud systems under appropriate atmospheric conditions. A crucial role in the formation of clouds plays aerosol particles acting as CCN. The increasing of concentration of cloud nuclei particles due to anthropogenic and natural sources leads to an increase in concentration and decrease in the size of droplets in clouds that leads to a change in the lifetime and optical properties of clouds. Apart from such indirect effect on the radiation balance, it can lead to a decrease in precipitation in thin and short-lived clouds, as well as an increase in convective mixing and increased precipitation in strong convective clouds [1].

The boreal forests of Central Siberia are a unique zone, which, on the one hand, is remote from large anthropogenic sources of pollution and can be considered close to wild nature. On the other hand, this territory is a source of volatile organic compounds (VOC) of the oxidized biogenic volatile organic carbon (BVOC), and under unfavorable weather conditions (drought, heat), rapidly spreading forest fires in Siberia make a significant contribution to the emissions of aerosol particles formed during the biomass burning. Therefore, monitoring of atmospheric parameters, in particular, microphysical optical and condensational properties of aerosol, at such background stations are of particular importance for studying the influence of long-range atmospheric transport and assessing the contributions of emissions of various origins.

The results of measurements of total concentrations of cloud condensation nuclei at eight different supersaturation values obtained at the background station ZOTTO located in the boreal forest zone of Central Siberia in the period from July 2015 to July 2016 are presented. The seasonal variability of CCN properties of particles is studied. The possibility of approximating the activation spectra of cloud condensation nuclei by an analytical function is analyzed. An analysis of the possibility of predicting the condensation activity of particles based on the obtained approximation parameters is presented.

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