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Aerosol properties of the Siberian air shed: YAK-AEROSIB aircraft campaign 2012

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The role of Siberia is of great importance to understand the climate change due to it covers about 10% of Earth's land surface. It extends longitudinally and latitudinally for several thousands of kilometres, so its ecosystems are represented by steppes, different types of forest, wetlands, tundra and arctic deserts. In spite of this importance, precise and integrative observational data on the composition of Siberian air shed is still lacking. One of the goals of the YAK-AEROSIB Project is to fill up this gap. Measurements of aerosol size distribution during the previous YAK-AEROSIB airborne campaigns were carried out with a poor size resolution (Paris et al., 2009), so it did not allow an unambiguous interpretation of the aerosol vertical distribution to be done. In this paper we present new aerosol size distribution data obtained during summer 2012 campaign with upgraded aerosol instrumentation sufficient to enable measurements to be carried in a wide size range with a good resolution. This campaign has been conducted on July 31^{st} and August 1^{st}, 2012 using a chartered TU-134 operated by IAO SB RAS. It consisted of five flights, connecting Novosibirsk and Yakutsk and back. Flights were performed in the tropospheric layer up to 8.5 km. Another distinctive feature of this campaign was that numerous wildfires spread through a vast territory of Siberia in July-August those filled its troposphere with smoke. Total number concentration of particles exceeded 1.2×10^5 cm^{-3} when aircraft crossed a fresh plume over burning forest in Krasnoyarsk region. Data obtained in smoke plumes showed that the number size distribution of particles in fresh plumes was wider than in aged ones ranging from a few nanometers to tens of microns. In the clean upper troposphere several episodes of nucleation events were revealed when a distinct nucleation mode was observed in the distribution.

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