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Climate-active aerosol components in the Siberian Arctic, by data from new-developed research aerosol station on island Bely

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Black carbon is a short - living climate forcer, it plays a significant role especially in the Arctic environment due to heating the atmosphere and changing the radiation balance while depositing on snow and ice. Analysis of black carbon (BC) in the Arctic atmosphere shows a contribution of anthropogenic combustion of fossil fuels and natural wildfires to the Arctic atmosphere chemistry as well as of the main characteristics of Arctic aerosol pollution. Presently, assessments of the environment and climate change in the Siberian Arctic are strongly complicated by an existing lack of knowledge about emission sources, quantity, and composition of the aerosol pollution defining the impacts on an Arctic ecosystem.

Research aerosol station is firstly installed on island Bely located in Kara sea, Siberian Arctic. It takes place on the pathway of air mass from the Northern Siberia region of high anthropogenic and gas flaring activity to the Arctic. Presently, assessments of the environment and climate change in this region are strongly complicated by an existing lack of knowledge about emission sources, quantity and composition of the aerosol pollution defining the impacts on an Arctic ecosystem. Aethalometer and aerosol sampling system is continuously operated on the aerosol station in order to analyze black carbon and chemical characteristics including ionic and elemental composition. Annual BC trend obtained from august 2019 to September 2020 shows the typical Arctic aerosol tendency of a seasonal variability, disturbed by episodes of large-scale emission transportation.

Unprecedented high BC is observed in September 2020 at the research aerosol station on the island Bely. The BC concentrations early in September were exceeded 20 times the arctic background. They are found to be even higher than the highest arctic haze concentrations observed in December 2019. Monthly averaged black carbon concentration in September 2020 exceeded 3 times that one in previous summer months. Such strong event is a result of large-scale air mass transportation from Eurasian continent in the period of strong wildfires in western Siberia, namely in Krasnoyarsk Kray and Yakutia, where around one million hectares of forest were burned out in August 2020.

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