Season - dependent and source-influenced aerosol in Northern Siberia, Russian Arctic.

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Aerosol may serve as a tracer of arctic pollution, allowing a link to climate response if its major characteristics relating to natural and anthropogeneous sources are defined. It has been shown that BC and sulfates are the most important aerosol constituents measured in the Arctic boundary layer; these species demonstrate similar seasonal variations with a peak during winter to early spring and a minimum in summer.

Long - time gap in consistent aerosol observations in the Russian Arctic strongly limits the assessment of air pollution and climate impacts. On-line monitoring, sampling, and analyses of atmospheric aerosols were carried out at the Tiksi Hydrometeorological Observatory, Northern Siberia, during one year from September 2014 to 2015. Physico-chemical characterization combining aethalometry, thermo-optical analysis, and analytical chemistry was used in order to identify the seasonal variability of aerosols and to link their composition to possible sources, as well as to characterize the differences in aerosol chemical composition between natural background conditions and BC-pollution episodes. The present study reports the first results from the Tiksi Observatory on season-dependent and source-influenced characteristics of aerosol species, such as carbon fractions (OC, EC), inorganic and organic functionalities of chemical compounds, sulfates, nitrates and other ion components, and elements. In addition, data obtained by individual particles analysis provide insight into micromarkers of combustion sources.

Aerosol at the Tiksi Observatory is found to be originated from natural marine, biogenic, and continental sources as well as influenced by local residential activity and regional pollution. Characterization of aerosols during OC and BC-pollution episodes, combined with analysis of the wind direction, atmosphere stability, and air mass trajectories, allows for the identification of the sources which are responsible for the emission of hazardous compounds. The Tiksi Observatory, surrounded by the Arctic Ocean from one side, and by urban area and industrialized continent from the other side, is more affected volcanic emissions) and anthropogenic sources in comparison with other arctic stations. Developing strategies for controlling and reducing Arctic air pollution should take into account the local sources and long-range transport contributing to arctic aerosol in Northern Siberia.

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