Geophysical Research Abstracts
Vol. 15, EGU2013-1916, 2013
EGU General Assembly 2013

Continuous measurements of aerosol particles in Arctic Russia and Finland

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The Arctic and northern boreal regions of Eurasia are experiencing rapid environmental changes due to pressures by human activities. The largest anthropogenic climate forcings are due to aerosol particles and greenhouse gases (GHGs). The Arctic environment is highly sensitive to changes in aerosol concentrations or composition, largely due to the high surface reflectance for the most part of the year. Concentrations of aerosols in winter and spring Arctic are affected by 'Arctic Haze', a phenomenon suggested to arise from the transport of pollutants from lower latitudes and further strengthened by the strong stratification of the Arctic wintertime atmosphere. Sources and transport patterns of aerosols into the Arctic are, however, not fully understood.

In order to monitor the changes within the Arctic region, as well as to understand the sources and feedback mechanisms, direct measurements of aerosols within the Arctic are needed. So far, direct year-round observations have been inadequate especially within the Russian side of the Arctic. This is the reason why a new climate observatory was founded in Tiksi, Russia.

Tiksi meteorological observatory in northern Siberia ($71^o\,36'$ N; $128^o\,53'$ E) on the shore of the Laptev Sea has been operating since 1930s. Recently, it was upgraded and joint in the network of the IASOA, in the framework of the International Polar Year Activity project. The project is run in collaboration between National Oceanic and Atmospheric Administration (NOAA) with the support of the National Science Foundation (NSF), Roshydromet (AARI and MGO units), government of the Republic of Sakha (Yakutia) and the Finnish Meteorological Institute (FMI).

The research activities of FMI in Tiksi include e.g. continuous long-term measurements of aerosol physical properties, which have been successfully continued since summer 2010. These, together with the FMI measurements in Pallas station in northern Finland since 1999, provide important information on the year-round Arctic aerosol concentrations and properties.

Here, we will present the annual cycle of Arctic aerosol concentrations, which is characterized by winter minimum and spring and summer maxima. We will show the most important Arctic aerosol source regions and their variability with seasons. Also, we will look the processes such as new particle formation, which takes frequently place at both the two stations and in particular in spring season.