Geophysical Research Abstracts
Vol. 12, EGU2010-3172, 2010
EGU General Assembly 2010

Long-range atmospheric transport of heavy metals from industrial regions of Ural and Norilsk to siberian environment

Anna Vinogradova, Leonid Maksimenkov, and Fedor Pogarskii

A.M. Obukhov Institute of Atmospheric Physics, Russian Academy of Sciences, Russia, Moscow, e-mail: anvinograd@yandex.ru

The main idea of the work is to analyze atmospheric transport of heavy metals (Ni, Cu, Pb) from the industries of the region of Norilsk, and the Ural over the territory of Siberia. The basic data were 5-days air mass trajectories from the sources calculated for every day of January, April, July, and October during 28 years from 1981 to 2008. NCEP/NCAR Reanalysis Data Files and HYSPLIT 4 model were used. Spatial, seasonal and long-term variations in heavy metal (HM) concentrations in surface air and precipitations, as well as in fluxes of these elements onto the surface were studied. The obtained results (presented as maps) may be used as assessment of anthropogenic influence of the sources under investigation on the environment of remote and hard-to-reach areas.

The HM air concentrations and fluxes onto the surface depend on surface properties and precipitation regime, and experience great seasonal and spatial variations. The maximal air concentrations are in cold seasons, whereas the maximal fluxes onto the surface occur in warm period. In comparison anthropogenic loadings at different places the cleanest air does not guarantees the minimal vertical fluxes.

The pollution trends (modulo) caused only by the transformation of air circulation processes are quite comparable with the contributions of source-emissions' changes. The main result is the decreasing of Siberian environment pollution through the atmosphere from regarded sources during the last years.

At a distance about 2000 km from a large source under investigation its atmospheric emissions form only the background levels of HM in the surface environment, and the real pollution levels are determined by local anthropogenic sources (with less emissions) if they exist. So, for the Lake Baikal the HM inputs from our distant sources through atmosphere to the water surface are insignificant in comparison with the flowing rivers' ones, and lake water pollution occurs mainly due to rivers' pollution. However, annual HM fluxes from Ural and Norilsk regions through atmosphere on the territories of basins of large Siberian Rivers – Ob, Yenisei or Lena – are quite comparable with HM's fluxes carrying away in river's water to the Arctic Ocean.

Thus, the long-range atmospheric transport of heavy metals from Ural and Norilsk regions must be taken into account as one of the processes forming compositions of surface water objects and soils, as well as of food chains in different ecosystems of Siberia.