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Bottom Sediments of Arctic Lakes as Indicators of Mercury Biogeochemical Migration

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Studies of dated cores of bottom sediments from Arctic lakes to determine flows and the history of sedimentation of heavy metals have been carried out since the beginning of the 90s. This is largely due to the need to understand the spatial and temporal trends of pollution in the Arctic and the ways of influencing wildlife and people, especially in a changing climate. Arctic lakes are sensitive indicators of global changes in the environment and climate, as well as the effects of regional and transboundary transport of pollutants. Bottom sediments of Arctic lakes that are not subject to direct anthropogenic influences are a kind of paleoclimatic and paleogeochemical archives that contain information about biogeochemical processes on the catchment and in the reservoir itself, informatively reflect environmental changes.

Arctic mercury is of particular interest. Besides the fact that this metal is an element of the first hazard class, it is a global pollutant. Unfortunately, the published data on mercury in the bottom sediments of Arctic lakes are much less than for other heavy metals. To some extent, this is due to analytical problems in determining low mercury levels.

The aim of the research is to assess the dynamics of sedimentation of mercury and identify a possible anthropogenic contribution to the period of industrial activity.

The results of research of mercury distribution in sediments are presented for cores from five Arctic lakes – NARY_1-2 (Malozemelskaya tundra), NARY_2-4 and 9-1 (Lovetsky Island, the mouth of the Pechora River), Langtibejto (Yamal Peninsula) and Gol'tsovoe (Gydan Peninsula). Sedimentation rates were estimated using 210Pb and 137Cs geochronology. Chemical composition, granulometry and loss on ignition were determined layer by layer for all sediment cores.

The layer-by-layer analysis of all cores of bottom sediments showed that the distribution of mercury differs significantly from the distribution of other elements by a significantly stronger enrichment of the surface layers. The nature of this distribution in column NARY1_2 coincides with both the beginning of the industrial period (end of the 19th century) and the beginning of the work of the Norilsk industrial complex.

Enrichment of the surface layer of sediments can be caused not only by transboundary transport of mercury, but also by an increased content of organic matter in the upper horizons of

sediments.

The nature of the distribution of mercury along the length of the columns and the distribution over fractions with different particle sizes showed that the finest fraction does not always determine the total concentration in the slice. At the same time, large particles (> 0.2 mm) with a high mercury concentration are present in the columns.

The data obtained show that, unlike other elements, the studied lakes are conditionally background for mercury.

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