



Environmental Geochemistry of the Volga Delta

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River deltas presently draw high attention due to their location in the lowermost parts of river basins, which quite often determines environmental problems in deltaic water streams and bodies. In the Caspian area of the most interest is a mouth area of the Volga River which is characterized by a wide variety of water subjects with different morphology, hydrodynamical regime, lithology of sediments, biota, etc. Technogenic geochemical impact on aquatic systems is different as well: from local contamination within the delta to the regional influence of pollutant sources scattered upstream. Multiple sources of contamination in the middle and low course of the Volga River caused an impression of a heavy pollution of aquatic systems in the Volga delta.

The long-term environmental geochemical research showed that in general Volga delta is not contaminated and is characterized mainly by background values of chemical elements in sediments of aquatic systems. Rather low pollutant levels in sediments of the Volga delta can be explained in a large extent by accumulation of technogenic substances in sediments of huge water reservoirs in the middle and low course of the river. Bottom sediments of these reservoirs are characterized by distinct geochemical anomalies of Pb, Cd, Zn, and other heavy metals (HM). Aquatic systems of the Volga delta show high spatial-temporal variability of geochemical conditions, which is caused by different hydrodynamics, variations in water run-off, and local peculiarities of aquatic systems. In general this mouth area presents a complicated landscape-geochemical system, which includes areas of HM transit and accumulation. Favorable circumstances can determine within the area formation of geochemical barriers and complex barrier zones with a consequent accumulation of various substances brought by the river run-off. Spatial analysis of HM distribution in bottom sediments allowed revealing a presence of two geochemical barrier zones within the near-shore area. The first zone is located adjacent to the channel mouths, leaving to the marine border of the delta, the second zone is put forward aside the sea on 20-30 km to the beginning of area of river and sea waters mixing.

Content of dissolved and suspended forms of heavy metals in river waters as a rule widely varies. It is determined by both chemical properties of metals and external factors of migration. In general suspended form is prevailing for heavy metals transported by water streams. For some metals the share is as high as 99% of the total metal content. Volga River is characterized by very low turbidity, which determines higher share of dissolved forms of heavy metals in water of the Volga delta. In some samples contents of Cu, Pb and Cd in suspended matter exceed global background values. The fact indicates possible occurrence of technogenic pollution in these aquatic systems. Study of seasonal dynamics of heavy metals in water and suspended matter revealed flooding as a period of predominant input of these pollutants from the upper basin to the Volga delta.