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Assessment of lead, cadmium, copper and mercury concentration in water of lower Volga-river

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The Volga-river is the main waterway of the European territory of Russia. Its waters flow through densely populated urbanized region included in to the river watershed of 1360 thousand km², which experience a high level of anthropogenic load. Toxic substances of anthropogenic origin, including heavy metals, wasted out in the environment and enter to the river waters.

Additionally to national monitoring measurements, systematic observations are made by the Yu. A. Izrael Institute of Global Climate and Ecology in the lower Volga River (south of Astrakhan). In this work, we evaluate the level of surface water pollution by lead, cadmium, copper, and mercury for the period 2015-2019.

Surface water sampling was carried out simultaneously at four selected points of significantly remote water bodies of the river Volga catchment area - river Bystraya, river Koklyuy and two branch of the river Buzan (Obzhorov site and Lotus kultuk).The sampling were in the hydrological phases - winter low-water season, high water peak, high water fall, summer low-water season, autumn low-water season. Water samples were preserved with nitric acid and analyzed by atomic absorption spectrometry with electrothermal.

An analysis of the data obtained over a five-year period showed that the average concentrations and standard deviations calculated from the full data set were 1.1 µg/l and 72% for Pb, 3.4 µg/l and 32% for Cu, 5.4 µg /l and 100% for Cd, 1.5 µg / l and 140% for Hg. Variability of concentration is decreases according to the order: Hg> Cd> Pb> Cu, the content of copper and lead in the waters of the lower Volga is most stable in space and time during the period under consideration. The maximum average concentration are characteristic for the river Bystraya - 3.8 µg/l Pb in the winter low-water seasons and 5.7 µg/l Cu in the autumn low-water seasons.

Water pollution of the Volga by Hg and Cd is unstable across the delta region and time. The highest concentration of these trace elements was found in the waters of the river Bystraya. The maximum concentration of cadmium was observed during the winter low-water season, to be around 55 µg/l and mercury - around 28 µg/l , during the high water fall period.

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