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HEAVY METALS EXTERNAL LOAD ON THE WATER OBJECTS:
PROBLEMS AND MODELING

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The removal of chemicals from the catchment and the external load on the reservoir or watercourse are the main causes of their pollution. Mathematical modeling methods are one of the promising areas of research on the ecological state of the water bodies. At the same time, the mathematical approximation of the removal pollutants processes in dissolved form and in the form adsorbed on soil erosion products is complicated by the lack of observational data on the flows of matter from the catchment area and the assessment of water quality and the bottom soil chemical composition. In addition, the large spatial variability of the underlying catchment area, namely the heterogeneity of the soil composition, significantly complicates the optimization of algorithms for evaluating sorption/desorption processes. On the other hand, the situation is aggravated by the discrepancy between the characteristic time of individual processes – sorption/desorption of heavy metals in the underlying surface of the catchment and the formation of water and solid runoff in the catchment. That is, algorithms that significantly generalize the processes of sorption/desorption of matter should correspond to time-generalized models of matter flows from the catchment. Institute of Limnology of the Russian Academy of Sciences has developed a modeling system for the external heavy metals load on the water object. This system makes it possible to evaluate the removal of dissolved forms and heavy metal products adsorbed on the surface into a water body. The system is based on a model of soil erosion and an external load model, has a balanced basis, takes into account the processes of sorption/desorption in the soil layer, the retention of plant roots in the catchment and the transformation of the flow of heavy metal solutions in a water object due to the unconservativeness of the latter. As a result, the calculation results make it possible to determine guidelines for optimizing economic activity in the catchment aimed at reducing the load.

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