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Peculiarities of the river pollution during the passage of high floods due to the removal of contaminants from the floodplain water bodies

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When analyzing the consequences of the passage of high floods, as a rule, only the hydrological consequences such as evaluation of possible flooding areas with the duration of high levels standing water and the expected flow velocities are considered. However, surface water bodies, including rivers, are very often the main sources of not only industrial but also of drinking water. In this case, the water quality evaluation and the estimation of the content of polluting substances in water are of primary importance. If the intensity of pollution sources is not connected with the flow rate in the river, it is natural to expect the reduction of the content of pollutants with increasing flow rate.

However, the situation changes drastically, if the intensity of pollutants input in watercourse increases with increasing flow rate. Most typically, such a situation arises in case of flooding polluted natural or technogenic water bodies located in the floodplain areas of rivers. The flooding inundated ponds leads to removal of the pollutants from them, to the significant pollution of the main watercourse and consequently to the substantial restriction of its use for drinking purposes, and in some cases, for technical water supply.
To effectively parry arising emergency, spatially-temporal evaluation of the extent of contamination zones depending on the scenario of the passage of high floods is required. It should be noted, that the mechanisms of the washout of the polluted floodplain water bodies are not trivial, especially if there is a significant difference in the densities of water in the river and in the floodplain water bodies under consideration.

In this case it is necessary to ensure the coupling of the mechanisms of the pollutants removal with the mechanisms of their propagation in the river. In the present paper we consider the solution of this problem using the example of sustainable functioning of the drinking water intake in the Kirov district at the Vyatka river. The problem is solved numerically by coupling the hydrodynamic models in 1, 2 and 3-dimensional formulations.