



## **Modeling of debris flows and floods on the example of the rivers Vladimirovka and Porus**

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Every year thousand people suffer from dangerous hydrological events like floods and debris flows all over the world. The aim of this research was to calculate characteristics of these hazards such as maximum discharges of the flows, water-levels and cross-sectional areas, which are necessary for defense construction designing. The first object of our research was the river Vladimirovka, the right tributary of the river Susuya. This river is situated in Sakhalin region near Yzhno-Sakhalinsk, one of the largest cities there. Despite the fact that disastrous debris flows were observed for more than last 10 years, flash floods are much more frequent events for the territory. During the research we applied the model of unsteady water movement, which was developed in Saint Petersburg State University (Vinogradova and Nikiforovskaia, 2015). Basis of the model is the solution of an one-dimensional set of equations of Saint-Venant. For this purpose, the numerical scheme developed in Institute of Hydrodynamics from Academy of Sciences of the USSR (IH) was used. The calculations were carried out with different probability of flows like 10, 1 and 0.1 percent. Due to the fact that there is no calibration block in the model and code of roughness is a functionally dependent parameter, we conducted several numerical experiments to clarify maximum values. For estimation parameters of flood, we chose the Porus river, located in Novgorod region, in which a disastrous event occurred in April 2017. Special field measurements such as hydraulics-morphometric were carried out by LLC "NPO" Gidrotekhproekt "in 2017 according to a design specification. To sum up, this research provided characteristics of floods and debris flows, which could be used for protection of the territory.