River Tsunami and Safety of Population and Facilities Along the River Course

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The risk of anthropogenic disasters due to the dam failures caused by natural or artificial reasons grows with the increasing number and scale of hydraulic facilities. The appearing wave transfers large energy far away but it is not taken into account at risk assessment; as a result the protective constructions often do not correspond to maximum severity level. The aim of this Project was to eliminate this inadequacy. The study of the break wave was carried out at the experimental tank allowing simulation of collapse of the lock and propagation of break wave. Waveform was detected by means of string wave gauges and video camera. The experiments were carried out at various values of level drop, length of storage pool, water level behind lock. The model of surface soliton was used to describe propagation of break wave. In this case wave form and motion depend on Ursell parameter. It was demonstrated that at the initial disturbance with U0>8 the wave parts into several solitons with linear magnitude decay from front to rear one. The slope and velocity of leading wave gives its momentum and energy allowing forecasting its impact on the constructions downstream. It was demonstrated that velocity of soliton propagation is 15 to 25 % higher than speed of shallow water waves that must be taken into account in design of alarm systems. It was found that at U0>30 (corresponding to real reservoirs) the parameters of leading wave weakly depend on the length of initial disturbance, thus calculations for various dams can be unified. It was also shown that at partial runout of wave to the bank the most part of wave energy still propagates along river course. The obtained results can be used for forecasting of risks at the existing as well as in process of new design of such facilities.

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