Geophysical Research Abstracts
Vol. 18, EGU2016-7153, 2016
EGU General Assembly 2016

Analytical solutions and numerical modeling for a dam-break problem in inclined channels

Efim Pelinovsky (1,2), Ira Didenkulova (2,3), Oleg Didenkulov (2), and Artem Rodin (2)

(1) Department of Nonlinear Geophysical Processes, Institute of Applied Physics, Nizhny Novgorod, Russia , (2) Nizhny Novgorod State Technical University n.a. R.E. Alekseev, Nizhny Novgorod, Russia, (3) Marine Systems Institute, Tallinn University of Technology, Tallinn, Estonia

Here we obtain different analytical solutions of the shallow-water equations for inviscid nonlinear waves in inclined channels. (i) The first solution describes Riemann wave moving up or down alone the channel slope. It requires the initial fluid flow, which often accompanies waves generated by landslides. This solution is valid for a finite time before the wave breaks. (ii) The second solution generalizes the classical dam-break problem for the case of a dam located in the inclined channel. In this case the cross-section of the channel influences the speed of wave propagation inside the channel, and therefore changes wave dynamics inside the channel compare to the plane beach. (iii) The third solution describes the intermediate stage of the wave front dynamics for a dam of a large height. This solution is derived with the use of generalized Carrier-Greenspan approach developed early by Didenkulova & Pelinovsky (2011) and Rybkin et al (2014).
Some of the analytical solutions are tested with the means of numerical modeling. The numerical modeling is carried out using the CLAWPACK software based on nonlinear shallow water equations. Application of the described solutions to possible laboratory experiments is discussed.