ALEXANDER BIHLO, Memorial University of Newfoundland

A well-balanced meshless tsunami propagation and inundation model

We derive a universal criterion for the preservation of the lake at rest solution in general mesh-based and meshless numerical schemes for the shallow-water equations with bottom topography. The main idea is a careful mimetic design for the spatial derivative operators in the momentum flux equation that is paired with a compatible averaging rule for the water column height arising in the bottom topography source term. The resulting numerical schemes for the shallow-water equations are called well-balanced.

Based on a well-balanced RBF-FD discretization of the shallow-water equations, we develop a meshless tsunami propagation and inundation model. The moving wet-dry interface between the incoming wave and the shoreline is handled using RBF generated extrapolation, yielding a truly meshless tsunami model. Several numerical results are presented that demonstrate excellent agreement of the resulting model with standard one- and two-dimensional benchmark tests.

This is joint work with Rüdiger Brecht, Scott MacLachlan and Jörn Behrens.