Abstract

For two decades, researchers are aware of the importance of wave dispersion and breaking in numerical modeling of tsunamis. More recent models can address either one of the two processes. We developed a numerical model that includes both wave dispersion and breaking using an alternate theoretical and numerical formulation. The depth-integrated model describes the weakly dispersive waves though non-hydrostatic pressure. The momentum conserved advection scheme mimics flow discontinuities associated with breaking waves as bores and hydraulic jumps. Among the existing dispersive wave models, the present model utilizes the simplest dispersive term, which allows a straightforward implementation of a grid refinement scheme in the finite difference model. The validity of the resulting model, NEOWAVE, has been confirmed by the 2009 Benchmark Challenge at the Inundation Science and Engineering Cooperative Workshop sponsored by the National Science Foundation. NEOWAVE with a grid-nesting scheme is further applied to reconstruct the 2009 Samoa Islands Tsunami for demonstration and validation.