Advanced Numerical Models For Simulating Tsunami Waves And Runup (Advances in Coastal & Ocean Engineering)

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This review volume is divided into two parts. The first part includes five review papers on various numerical models. Pedersen provides a brief but thorough review of the theoretical background for depth-integrated wave equations, which are employed to simulate tsunami runup. LeVeque and George describe high-resolution finite volume methods for solving the nonlinear shallow water equations. The focus of their discussion is on the applications of these methods to tsunami runup.

In recent years, several advanced 3D numerical models have been introduced to the field of coastal engineering to calculate breaking waves and wave structure interactions. These models are still under development and are at different stages of maturity. Rogers and Dalrymple discuss the Smooth Particles Hydrodynamics (SPH) method, which is a meshless method. Wu and Liu present their Large Eddy Simulation (LES) model for simulating the landslide-generated waves. Finally, Frandsen introduces the lattice Boltzmann method with the consideration of a free surface.

The second part of the review volume contains the descriptions of the benchmark problems with eleven extended abstracts submitted by the workshop participants. All these papers are compared with their numerical results with benchmark solutions.

Contents: Modeling Runup with Depth-Integrated Equation Models (G Pedersen); High-Resolution Finite Volume Methods for the Shallow Water Equations with Bathymetry and Dry States (R J LeVeque & D L George); SPH Modeling of Tsunami Waves (B D Rogers & R A Dalrymple); A Large Eddy Simulation Model for Tsunami and Runup Generated by Landslides (T-R Wu & P L-F Liu); Free-Surface Lattice Boltzmann Modeling in Single Phase Flows (J B Frandsen); Benchmark Problems (P L-F Liu et al.); Tsunami Runup onto a Plane Beach (Z Kowalik et al.); Nonlinear Evolution of Long Waves over a Sloping Beach (U Kâno lu); Amplitude Evolution and Runup of Long Waves, Comparison of Experimental and Numerical Data on a 3D Complex Topography (A C Yalciner et al.); Numerical Simulations of Tsunami Runup onto a Three-Dimensional Beach with Shallow Water Equations (X Wang et al.); 3D Numerical Simulation of Tsunami Runup onto a Complex Beach (T Kakinuma); Evaluating Wave Propagation and Inundation Characteristics of the Most Tsunami Model over a Complex 3D Beach (A Chawla et al.); Tsunami Generation and Runup Due to a 2D Landslide (Z Kowalik et al.); Boussinesq Modeling of Landslide-Generated Waves and Tsunami Runup (O Nwogu); Numerical Simulation of Tsunami Runup onto a Complex Beach with a Boundary-Fitting Cell System (H Yasuda); A 1D Lattice Boltzmann Model Applied to Tsunami Runup onto a Plane Beach (J B Frandsen); A Lagrangian Model Applied to Runup Problems (G Pedersen); Appendix: Phase-Averaged Towed PIV Measurements for Regular Head Waves in a Model Ship Towing Tank (J Longo et al.).

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