Geophysical Research Abstracts, Vol. 8, 04413, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04413

Unstructured mesh modelling of tsunami propagation in Indian Ocean

D.V. Sein (1), J.Schröter (1), D.V. Sidorenko (1), S. Harig (1), E. Taguchi (1)
(1) Alfred Wegener Institute (dsein@awi-bremerhaven.de)

Peculiar properties of tsunami wave propagation and transformation i.e. small wave length in comparison with propagation area, inundation processes and wave energy dissipation in coastal zone could be a forcible argument for use models based on unstructured meshes. Furthermore relatively small wave period does not allow large time steps which makes the use of implicit models for real time forecasting inefficient especially in Indian Ocean where the travel time from the rapture zone to the Indonesian coast could be less then 1 hour. Three different models based on nonlinear shallow water equations and unstructured mesh approach were developed and examined on their ability to simulate tsunami wave propagation as well as its transformation and run-up in costal zone. First two are explicit (1) and implicit (2) finite element models with nonconforming momentum balance equations discretization and linear basis functions for sea surface height basis functions (similar to the B-grid in finite difference methods). Third one (3) use a finite volume approach (so-called C-grid). All the models where run for different test cases including the tests of wave propagation speed, run-up and land overflow processes. Indonesian tsunami (26.12.2004) was simulated and results were compared with available observational data. It was concluded that models (1) and (2) have more accurate wave propagation speed representation but this advantage is negligible for the time scales needed for tsunami forecasting in Indian Ocean. An implicit model will not be used for the real time forecasting but is welcome for different scenarios simulation. Finite volume model represents more accurately and naturally the inundation processes and could be the best candidate for tsunami early warning system.