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Multiscale Tsunami Simulation of Tohoku Earthquake

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Multi-scale Tsunami Simulation of Tohoku Earthquake

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The recent M 9.0 Tohoku earthquake has dealt northeastJapan a great blow and the resultant tsunami waves have caused great destruction and loss of lives. We have employed state-of-the-art numerical methods to study the tsunami run-up problem by means of a high-resolution finite volume method with special focus on the inundation problem. The Riemann solver under the auspices of th GEOCLAW package is applied to the nonlinear shallow-water equations that works robustly with fine-scale seafloor bathymetry and dry states associated with the land and the buildings. Very high- resolution bottom seafloor topography near the Japanese coast, less than 100 meters , was employed in this study

We have employed the adaptive mesh refinement (AMR) method to study this multi-scale phenomenon of tsunami waves interacting with the coast. Grid sizes vary greatly by more than two-orders in magnitude allowing for multi-resolution capability. We are particularly interested in the waves coming toward the nuclear plant at Fukushima and to study the maximum height of the waves leaping over the building structures along the coast. The influences of high-resolution bathymetry on amplifying the run-up waves will be emphasized

Keywords: tsunami, riemann solver, run-up waves, adaptive mesh refinement