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Towards operational tsunami modeling with adaptive triangular discontinuous Galerkin schemes

Stefan Vater and Jörn Behrens

Universität Hamburg, CEN - Center for Earth System Research and Sustainability, Hamburg, Germany
(stefan.vater@zmaw.de)

We present a tsunami simulation framework, which is based on depth-integrated hydrodynamic model equations. The governing equations are discretized on an adaptive triangular mesh with a Runge-Kutta discontinuous Galerkin (RKDG) scheme. This approach allows for high local resolution and geometric accuracy, while maintaining the opportunity to simulate large spatial domains.

While the specific components of the modelling framework have been numerically validated, in this study the applicability of the tsunami model to realistic scenarios is considered. We compute well-known benchmark problems and compare simulation results to recent tsunami events.

Special interest is given to the near-shore characteristics of the flow. For this purpose a new mass-conservative well-balanced inundation scheme is applied, which enables a stable computation of wetting and drying processes during the arrival of the tsunami at the coast. The dynamically adaptive mesh is generated by the grid library amatos, which is based on a conforming tree based refinement strategy.

This work is part of the ASCETE (Advanced Simulation of Coupled Earthquake and Tsunami Events) project, which aims to better understand the generation of tsunami events. In this course, a simulation framework has been developed which couples physics-based rupture generation with hydrodynamic tsunami propagation and inundation.