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Validation of an Adaptive Triangular Discontinuous Galerkin Shallow Water Model for the 2011 Tohoku Tsunami

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We apply a tsunami simulation framework, which is based on depth-integrated hydrodynamic model equations, to the 2011 Tohoku tsunami event. While this model has been previously validated for analytic test cases and laboratory experiments, here it is applied to earthquake sources which are based on seismic inversion. Simulated wave heights and runup at the coast are compared to actual measurements.

The discretization is based on a second-order Runge-Kutta discontinuous Galerkin (RKDG) scheme on triangular grids and features a robust wetting and drying scheme for the simulation of inundation events at the coast. Adaptive mesh refinement enables the efficient computation of large domains, while at the same time it allows for high local resolution and geometric accuracy.

This work is part of the ASCETE (Advanced Simulation of Coupled Earthquake and Tsunami Events) project, which aims at an improved understanding of the coupling between the earthquake and the generated tsunami event. In this course, a coupled simulation framework has been developed which couples physics-based rupture generation with the presented hydrodynamic tsunami propagation and inundation model.