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Tsunami wave propagation using a high-order well-balanced finite volume scheme

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In this work we present a new numerical tool suitable for tsunami wave propagation simulations. We developed a finite volume high-order well-balanced numerical method on unstructured meshes based on the ADER-FV scheme [1].

We use the ADER-FV[2,3] scheme to solve with arbitrary accuracy in space and time the shallow water equation with non-constant bathymetry. In order to properly simulate a tsunami wave propagation we introduce the well-balanced or C-property[4] in the high-order numerical solution.

In this presentation we address two important issues that appear when one tries to solve a tsunami propagation problem. First, when small gravity waves are propagated for hundred of wave-lengths, the accuracy in space and time of the numerical method is fundamental to preserve the amplitude. In this presentation we study the propagation of small perturbations over long distances, relating the order of accuracy, the mesh dimension and the wave amplitude. Second, as we deal with high-order schemes we can naturally use polynomial representation of the bathymetry. Here we try to understand the influence of the bathymetry representation in the final solution.

[1] C. E. Castro et al. “ADER scheme on unstructured meshes for shallow water: simulation of tsunami waves”, submitted
[2] E. F. Toro et al. “Towards very high order godunov schemes”. In E. F. Toro, editor, Godunov methods; Theory and applications, pages 907–940, Oxford, 2001. Kluwer Academic Plenum
Publishers.
[3] E. F. Toro and V. A. Titarev. “Solution of the generalized Riemann problem for advection-reaction equations”. Proc. Roy. Soc. London, pages 271–281, 2002.
[4] A. Bermúdez and M. E. Vázquez. “Upwind methods for hyperbolic conservation laws with source terms”. Computer and Fluids, 23(8):1049–1071, 1994.