MULTI-GPU SIMULATION OF TSUNAMIS GENERATED BY SUBMARINE LANDSLIDES

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The numerical solution of the two-layer shallow water system is useful to simulate several phenomena related to geophysical flows, such as the steady exchange of two different flows, as occurs in the Strait of Gibraltar, or tsunamis generated by submarine landslides. However, very efficient parallel solvers are required to perform these simulations in real domains in order to obtain results in reasonable times.
In this work we present a multi-GPU approach of a two-layer Savage-Hutter type model introduced by E. D. Fernández-Nieto et al (JCP, 2008) for the simulation of
tsunamis caused by underwater landslides in structured meshes. An implementation which uses CUDA and MPI to exploit the potential of a GPU cluster is described. In order to increase efficiency, this implementation overlaps MPI communications with GPU computation and memory transfers between CPU and GPU, reaching a scalability close to linear. We also show some applications of the numerical scheme in real scenarios. A simulation of a paleotsunami occurred in the Alboran Sea is presented, along with a study of its impact, focusing on a rrival times, wave height and inland advance.