SEMINARIO DE ANÁLISIS NUMÉRICO Y MODELACIÓN MATEMÁTICA.

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FV-ADER method for tsunami wave propagation

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Lugar:

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Resumen

In this presentation we show a modern numerical scheme based on the ADER (Arbitrary DERrivative Riemann problem) approach where we implement a high-order finite volume method on unstructured meshes to solve the non-linear shallow water equation in the context of tsunami wave propagation. This equation is commonly used to simulate the behaviour of tsunami waves where small amplitude waves, compared to the physical scale of the problem, need to be propagated over long distances considering a real bathymetry. In order to accurately propagate such waves its necessary to be able to preserve steady-state conditions in the presence of non-constant bathymetry or geometrical sources. One of the main problems on using the finite volume method for tsunami waves is the balance between the numerical fluxes and the numerical sources. This balance is obtained naturally in the continuous partial differential equation but is not straight-forward in the discrete level. During the last years numbers of publication have been presented in order to solve this problem, however most of them work only on structured grids or are accurate up to second order only. Here we show how to satisfy the *well-balanced* property at discrete level considering unstructured meshes and high-order accuracy in space and time. We asses, the numerical method with a convergence test, a steady-state test with exact solution, and a numerical simulation of a real tsunami events. This numerical method can be easily implemented to run on parallel architectures following the mesh decomposition approach using MPI. In the future, we are considering the implementation of these type of numerical methods on graphic card units where due to its highly parallel architecture the computational time can be reduced.

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