II I-Math School on Numerical Solutions of PDE
Málaga, February 8–12, 2010

High-order numerical solution in geophysical applications: Tsunami and Earthquake.

Cristóbal E. Castro-[1]

Computational methods for wave propagation found application on several physical areas of interest. We are concerned with numerical method for solving hyperbolic equations with arbitrary high order of accuracy in space and time while general enough to be used on different equations without introducing any ad-hoc procedure.

We use finite volumes (FV) and discontinuous Galerkin (DG) numerical methods together with the Arbitrary accuracy DErivatives Riemann problem method (ADER) [1,2] for linear and non-linear hyperbolic balance laws in 2 and 3 spatial dimensions and unstructured meshes.

In this talk we present numerical results of two hyperbolic equations that represent well known geophysical problems. One is the linear seismic wave equation in its velocity-stress formulation where we consider problems like variable material, dynamic rupture and non-conforming meshes. We solve this equation using the ADER-DG [3,4] numerical method. The second equation is the non-linear shallow water equation where we combine the high-order solution and the well-balance property to accurate simulate tsunami wave propagation[5]. Moreover we present a local time step approach that can improve computational time[6]. This equation is solved using the ADER-FV numerical method.

References

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[1]KlimaCampus, University of Hamburg, Germany
Geophysics, LMU München, Germany