NuQuake
www.nuquake.eu

Deptartment of
Astronomy, Physics of the Earth and Meteorology
Faculty of Mathematics, Physics and Informatics
Comenius University, Bratislava

DAPEM
Comenius University
Bratislava

Physics of the Earth Seminar

Dr. Martin Käser,
J. de la Puente, C. Castro, M. Dumbser, V. Hermann
Ludwig-Maximilians-Universität München, Germany

Friday 12. 12. 2008 at **14:00** in **F1 219**, Mlynská dolina

Overview of the Discontinuous Galerkin scheme for seismic wave propagation modeling

Abstract: The simulation of seismic wave propagation in a complex 3-D model is still a great challenge. Due to geometrical constraints, i.e. model features of extremely complicated shape or small spatial extend, an appropriate small mesh spacing often has to be chosen in order to account for these features. Meshes consisting of tetrahedral elements are suitable for the discretization of such models as the tetrahedral faces can be aligned with the complex shapes of internal or external boundaries like subsurface material interfaces or free surface topography. Moreover, the transition from extremely fine to extremely coarse meshes is possible, which allows for highly flexible mesh generation with local mesh refinement where necessary or reasonable.

However, formulating a numerical scheme that achieves the solution of the underlying partial differential equation with a high order of approximation is not trivial. The ADER-Discontinuous Galerkin (ADER-DG) method provides such a numerical formulation that leads to high approximation order in space and time on unstructured meshes. Furthermore, the acoustic, elastic, viscoelastic, anisotropic, and poroelastic material can be handled. To reduce the computational cost of the scheme, p-adaptation and local time stepping techniques have been introduced. To validate the scheme a profound accuracy analysis has been carried out and a number of code validation exercises have been performed. Recent developments concern the implementation of convolutional perfectly matched layer boundary conditions and the treatment of dynamic rupture processes based on a linear slip weakening friction law.