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EFFICIENT NUMERICAL METHODS FOR SEISMOLOGY AND GEOPHYSICAL EXPLORATION TRACK NUMBER 1200

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ABSTRACT

The objective of this mini-symposium is to report on recent advances on the numerical solution to problems related to seismic wave propagation phenomena. In particular, applications to seismology, geophysical exploration and digital rock physics will be considered. There will be two sessions respectively addressing direct and inverse problems.

The session on direct problems will deal with new techniques for the numerical simulation of seismic wave problems in harmonic and time domain. We will particularly consider numerical methods for simulation in complex media : very heterogeneous media or media requiring the coupling between different physics, such as conducting poroelastic media where both seismic and electromagnetic wave can propagate. Regarding time-harmonic wave problems, we will focus on the issue of numerical pollution and how Trefftz methods, Ultra Weak Variational Formulations (UWVF), or Hybridizable Discontinuous Galerkin method can contribute to its limitation. In time domain, we will concentrate on local-time stepping methods, allowing to use explicit time schemes with different time steps and on locally implicit methods involving explicit time schemes in the regions of the mesh composed of the coarsest cells. We will have a particular focus on space-time Trefftz methods, which naturally handle local-time stepping and explicit-implicit coupling.

The session on inverse problems will be the opportunity to present the recent research for the characterization of the Earth's sub-surface. Waves are used to probe the Earth at local (exploration) as well as planetary (regional) scales. While the two scales have differences (data sparsity, wavelength investigated), they both share a common reconstruction methodology based upon waveform tomography/inversion. We will consider the most recent progresses in terms of data acquisition (e.g., optic fiber, dual-sensors), the subsequent new techniques for imaging (e.g., minimization algorithm), that lead to improved sub-surface resolution. The seismic inverse problem represents the perfect extension of the first session, as a compromise between resolution and computational cost is fundamental for the recovery of complex, large, 3D geophysical media.