Combination of numerical methods for simulation of seismic wave propagation in models with localized complexities

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To accurately simulate seismic wave propagation and ground motion it is necessary to account for a wide range of complexities in the Earth structure its surface topography. Thin layering, fluid-filled microsturcutes, destructed fault zones etc. leads to anisotropic, viscoelstic models on meso- and macroscopic scale. Simulation of wave propagation in such models requires the use of the advanced computationally intense computational techniques. However, zones with complex physical properties are typically localized in space, thus it is reasonable to implement advanced approaches only locally, where they are needed, whereas to use the computationally efficient technique such as standard staggered grid scheme in the main part of the model. We present an ongoing research on combination of the different numerical techniques in one algorithm to make it flexible and able to account the complex physical properties of the media but be computationally cheap. In particular, to account for the small scale heterogeneities a local time-space mesh refinement is used, to deal with anisotropy a partially staggered grid scheme (Lebedev scheme) is applied locally, to account the free-surface topography discontinuous Galerkin method is utilized in the upper part of the model.