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Interaction of a 3D finite-difference application for computing synthetic waveforms with the Grid infrastructure

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The aim of this study is to shed some light into the ground motion properties of Thessaloniki in 3 dimensions. Using a computer code that implements a 3D - 4th order staggered-grid velocity-stress finite-difference (FD) scheme (Moczo et al., 2002) full 3-dimensional synthetics of ground motion have been computed. The studying grid covers an area of 63 km2 with a depth of 12 km, which is translated in approximately 47x108 nodes. The execution of the 3D FD code is very demanding in terms of CPU power and computer memory and for the previous grid the memory demands reach the 20 GB and the time of computations is approximately 30 hours in a 4-processor machine.

3. Impact

The Grid Infrastructure could significantly contribute in minimizing the execution time of the code and eliminating the high cost investment for number crunching machines, which can be prohibitive for small working groups. So far we have developed a workflow on top of basic gLite utilities and have performed a series of test runs using coarse models to check that our results on the Grid match the ones obtained from other computational infrastructures. The evolution of the present work involves computation of synthetic waveforms for a larger studying area and for higher accuracy on the computational domain. Our imminent target is thus to successfully run computational models that require approximately 70-80 GB of accumulative computer memory and ~100 CPUs. The result from this first phase of test runs will determine our next steps and whether we will attempt to run even higher precision models.

4. Conclusions / Future plans

The final goal is to obtain 3D synthetic waveforms that will be representative of the expected ground motion for the city of Thessaloniki and if possible to minimize uncertainties in the available structural models.

Provide a set of generic keywords that define your contribution (e.g. Data Management, Workflows, High Energy Physics)

Earth Sciences, seismology

1. Short overview

Thessaloniki is lying across Thermaikos gulf in the Northern part of Greece. Its moderate earthquake activity is controlled by a significant number of active faults, striking in close distances from the city (Papazachos et al, 2001). The city's geographical position and financial importance imposes the need for a thorough and complete study of the structure and the expected ground motions.

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