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Two recent seismological applications implemented on the EGI Infrastructure

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This work presents two applications that were implemented with the EGI: (1) We use data from an industrial seismic network made up of 2320 short-period sensors installed on the seafloor above an oil reservoir. We perform 24,210,360 cross-correlations between each unique pair of sensors, a 3-month long computation. Using cross-correlations, it is possible to recover the impulse function of the medium between each sensor pair. With good enough sensor coverage, one can produce high-resolution images of the subsurface; this is called ambient noise surface-wave tomography. Using 6.5 hours of noise data from the Valhall network, we implement two types of tomographic imaging; we are also able to extract the local azimuthal anisotropy. (2) As datasets grow in size, it becomes necessary to implement automated detection algorithms to produce complete event catalogs. We perform a matched-filter search that uses a template, made up of seismic waveforms recorded at several stations, to search for other events in time that originate from the same source as the template. This search calculates the correlation coefficients between the template event and the seismic dataset every tenth of a second. The dataset we use covers 10 seismic stations, recording at 100 Hz, over a two and a half year time period. Given the thousands of template events to analyze as well as the scalar nature of the processing, this analysis takes full advantage of the EGI and was computed in under three weeks.

Wider impact and conclusions

First, the implementation on grid infrastructure is of high interest for the seismology community.
The data management solution and job submission strategy based on a native implementation with onboard glite tools will be a demonstration for researchers with the same class of application.

Description of work

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Primary authors: Mr MORDET, Aurelien (Institut de Physique du Globe de Paris 1, rue Jussieu - 75238 Paris - FRANCE); Dr WEISSENBACH, David (http://www.upmc.fr/); Mr FRANK, William (Sismologie, Institut de Physique du Globe de Paris)

Presenter: Mr FRANK, William (Sismologie, Institut de Physique du Globe de Paris)

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