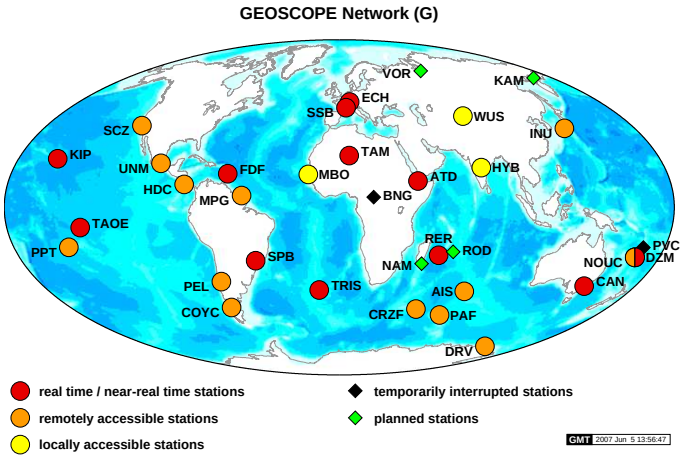
Seismology Applications (IPGP-CNRS)

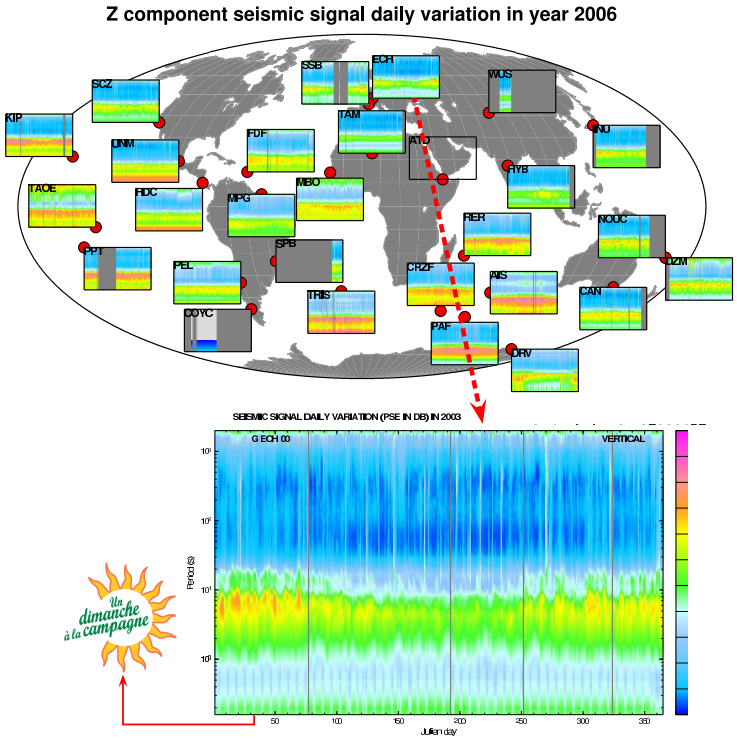
D. Weissenbach, G. Moguilny, E. Clévédé, E. Stutzmann and J.-P. Vilotte

Institut de Physique du Globe de Paris
CNRS - Institut des Grilles (France)



- GEOSCOPE archive: 25 years, $\leq$ 30 stations, $\sim$ 1TB
- $\sim$ 7600 (short) jobs: perl + FORTAN + (matlab $\rightarrow$) octave
- processing: over 1 year (GEOSCOPE data–center latencies)

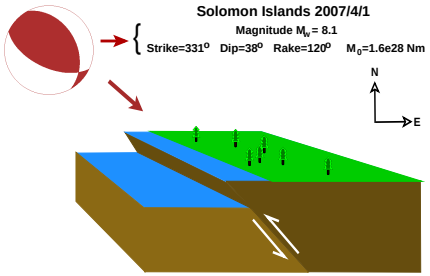
Daily noise averages analysis have been completed for all the GEOSCOPE dataset

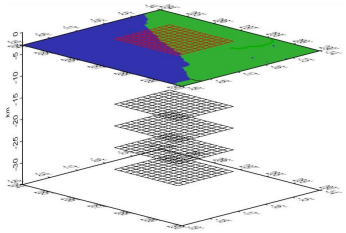


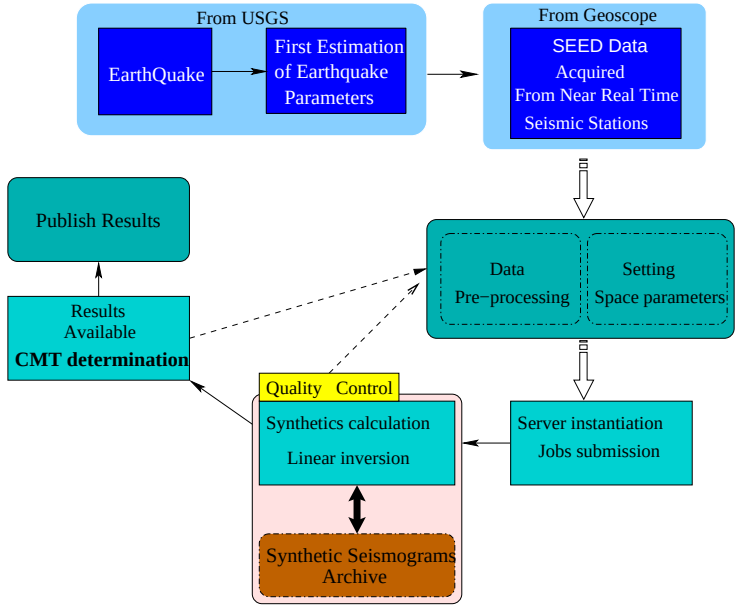
Next step:

compute hourly averages; incorporate as data annotations.

Earthquake CMT determination

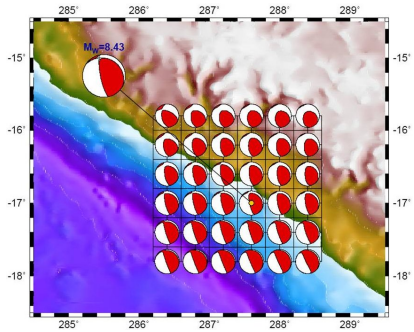




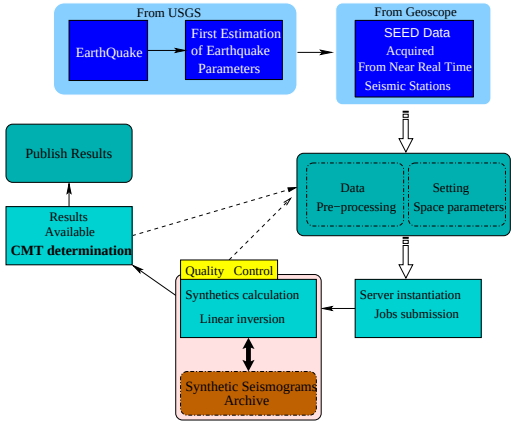


- 3D space grid (earthquake location) $\times$ 1D time grid (source duration) $\sim$ 1800 points
- Process: 600 CPU-hours.
- Gridified in 2004 ($\rightarrow$ 48h restitution time) since then continuously optimized ($\rightarrow$ 8h).
- Extensive job submission on VO CEs; each running job requests grid points until final completion.

For each grid point, 6 Green functions computed per component for each station.



gCMT application perspectives



Speed-up of CMT-solution process

Green function computation: 80% of CPU time.

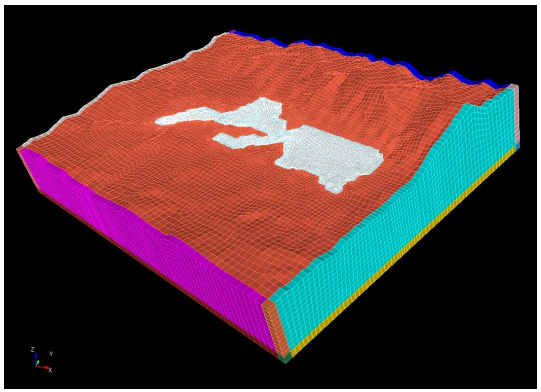
- definition of a global spatial grid for the Earth upper lithosphere;
- construction of a synthetic Green functions archive;
- construction of an associated MetaData base.

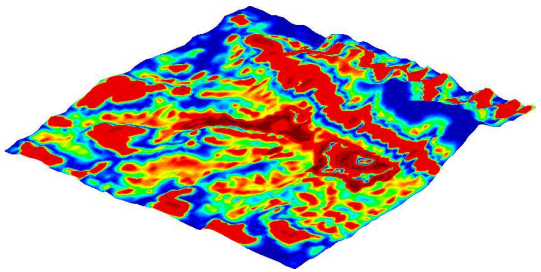
Re-engineer and optimize workflow

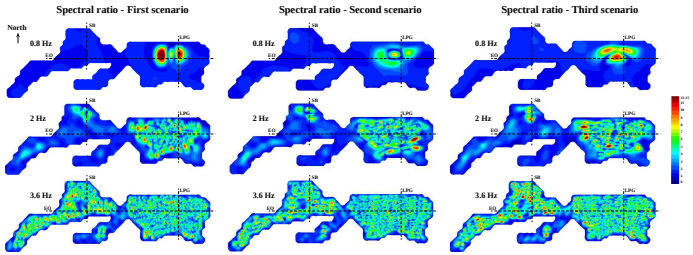
- an improved modular design based on data center and Grid services with well defined interfaces;
- to improve interface between external data center and the EGEE Grid infrastructure;
- data center annotation services for results propagation.

SEMUM3D: simulation of elastic wave propagation

- Seismic response simulation of complex geological structures: sedimentary basins.
- Spectral Element code in Fortran 90: domain decomposition (METIS + MPI).
- Unstructured mesh: Cubit software (Sandia National Laboratory).
- Test on EGEE Grid with gLite:
  few MPI sites open to ESR VO;
  fewer follows the TCG MPI recommandations (MPI-START wrapper usefull);
  bad restitution time even when few CPUs required.



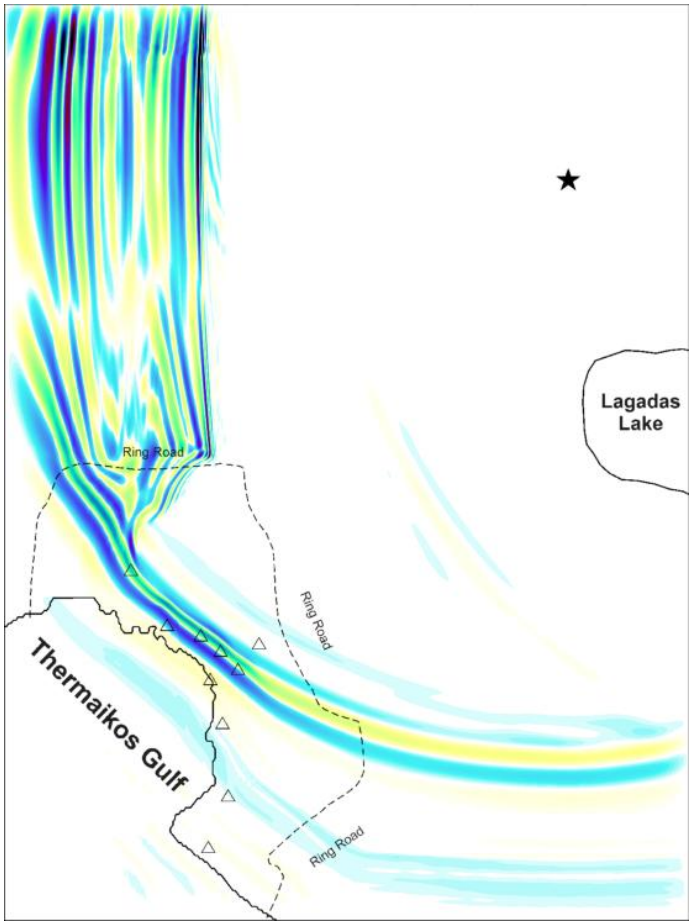




Other related applications

Synthetic seismograms for ground motion simulation of Thessaloniki, Greece (Skarlatoudis et al.)

- 3D-4th order staggered Finite Difference code (Moczo et al., 2002): Fortran 90 code + MPI.
- 20 GB memory and 57 CPU hours on small grid enabled cluster with 10 AMD processors.
- Workflow on top of gLite middleware on the HellasGrid e-infrastructure.
- Consistancy tests between Grid and other computational infrastructures.
- Target: large simulations (70-80GB, ~ 100 CPUs).



Conclusions and Remarks

- Grid infrastructures: new capacities for *on demand* or routine data processing and analysis processes IF interfaced with the community's data centers.
- Grid infrastructures for parallel simulations ?
  restitution time still to be improved and sites must improve published information; what about interconnects?
- Some key issues:
  - interfaces and services between seismological data centers and Grid infrastructures: must take into account European and International organizations of the community for data storage and distribution with well defined format standards (data and metaData);
  - Earth Sciences VO must run through NGI and EGI organization levels.
- **Part of these problems are adressed in the new Data infrastructure proposal** EKIDNA.