EGEE MAKES RAPID EARTHQUAKE ANALYSIS POSSIBLE

Using the advanced grid infrastructure of the Enabling Grids for E-sciencE (EGEE) project, researchers at the *Institut de Physique du Globe de Paris* (IPGP), France, were able to analyse the large Indonesian earthquake, which struck on 28 March 2005, within 30 hours of it occurring. Although less severe than the one in December 2004, which caused a tsunami wave in the Indian Ocean, over 1000 people were killed in this second major earthquake.

The analysis showed that the March earthquake was not a belated aftershock of the December one, although they are intricately linked. The March earthquake was probably triggered by the one in December, but happened in a different part of the fault line further south, and the mechanisms of the two earthquakes were different. Although the basic geometry of the region is known, the strength of the earthquake was astonishing.

Understanding the exact parameters of when, where and how an earthquake occurs brings researchers closer to comprehending why earthquakes happen. This may make it possible to predict when and where earthquakes will happen in the future and to assess the potential impact they could have on specific regions. Rapid analysis is particularly important for the relief efforts after a major earthquake, where those in charge need to have accurate information about the epicentre, magnitude and mechanism of the earthquake.

The innovative seismic software application allows researchers at IPGP to rapidly determine the mechanism and the central coordinates of strong to major earthquakes (measuring more than 5.5 on the Richter scale) around the world. For each spatial position – latitude, longitude and depth – synthetic seismograms are computed. For each of these, a linear inversion using different Earth models is performed for various source durations. The best solution is then determined by a statistical analysis of the whole set of solutions.

This method is particularly suited for the quick grid-on-demand determination of major earthquake mechanisms, since it allows the easy handling of a large number of jobs on the distributed computing elements of a grid. Therefore, a systematic and rapid determination of earthquake parameters, such as magnitude, centre and orientation, can be preformed using data transmitted within 24 hours after the earthquake.

“Using the EGEE grid infrastructure, we could find a solution for the characteristics of the earthquake in a reasonable time,” said Eric Clevede, IPGP, who developed the analysis software. “Looking at the mere calculation time, it would have taken us at least 100 hours on our local machines, whereas we did it in about 10 hours on the grid. Being able to use this infrastructure therefore saved us at least a factor of 10 in time.”

Data from the stations of the French seismic sensor network GEOSCOPE were transmitted to the IPGP within 12 hours after the earthquake. Thanks to the EGEE grid, the best of the 30,000 solutions could be found within 30 hours after the earthquake took place. This best solution was later confirmed by comparing it with results from other analysis methods.

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The Enabling Grids for E-sciencE (EGEE) project has developed an international computing Grid infrastructure which provides scientists with access to major computing resources world-wide. To date, the EGEE project has established a broad portfolio of applications across a wide range of industrial and academic sectors including High Energy Physics, Life Sciences, Earth Sciences, Astroparticle Physics and Computational Chemistry. There are over 20 different applications now running on EGEE.

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Note to Editors:

1. The Enabling Grids for E-sciencE (EGEE) project is funded by the European Commission. For more information see: http://public.eu-egee.org/ ;

2. The *Institut de Physique du Globe de Paris* (or IPGP) is a research institute dedicated to the study of the Earth as a system. Its statute is that of a University since 1990 (décret n° 90-269). It is on the protection of National Education Secretary (M.E.N.) and Research Secretary. For more information see: http://www.ipgp.jussieu.fr/index3.html ;

3. The GEOSCOPE programme was launched in 1982 by the National Institute of Sciences of the Universe (INSU) at the French National Centre of Scientific Research (CNRS). It was the first to undertake the establishment of a worldwide network of three component seismic stations with digital recording in a very broad frequency band to study the earth's internal structure and the mechanisms involved in the generation of earthquakes. For more information see: http://geoscope.ipgp.jussieu.fr/ ;

4. For more information about EGEE in general, contact Joanne Barnett, EGEE External Relations Officer, telephone: +31 20 530 4488 or email: barnett@terena.nl ;

5. For more information about the applications running on EGEE, contact Vincent Breton, EGEE Applications Manager, telephone: +33 4 7340 7219 or email: Breton@clermont.in2p3.fr ;

6. For about the Earthquake application, contact Eric Clevede, telephone: +33 1 4427 2413 or email clevede@ipgp.jussieu.fr .