The OGS experience in rapid determination of source parameters and ShakeMaps for NE Italy

A. Saraò*, P.L. Bragato* and D. Pesaresi**
asarao@inogs.it

*) Istituto Nazionale di Oceanografia e Geofisica Sperimentale, OGS, Trieste, Italy  
*) Istituto Nazionale di Geofisica e Vulcanologia, INGV, Rome, Italy.

The seismicity of NE Italy

Seismicity of North-East Italy demarcates the boundary between the Adria microplate and the Eurasian plate. The actual state of stress is a consequence of the Adria microplates progressive motion and its anti-clockwise rotation with respect to the Eurasian plate. The seismotectonic characteristics of the region are not homogeneous, and the contemporary seismic deformation pattern is quite complex, being the results of the superimposition of several distinct strain fields related to different Alpine phases. The last severe earthquake was the 1976 Ms=6.5 Friuli earthquake, which caused lot of damage and hundreds of casualties.

The seismic network of NE Italy

OGS manages an integrated seismic network designed to monitor regional seismic activity of North-East Italy (NI) and surroundings. The network includes 11 digital broadband seismometers and 27 short period stations. Waveforms and parametric data are exchanged in real time with the local Civil Defence agencies, the INGV, the Earth Science Department of the University of Trieste, the Zentralanstalt fur Meteorologie und Geodynamik (ZAMG) in Vienna, and the Agencija Republike Slovenije za Okolje (ARSO) in Ljubljana, in order to support emergency management and seismological studies in the whole Alps–Dinarides junction zone. The Antelope software suite from BRTT has been chosen as the common basis for real time data exchange, rapid location of earthquakes and alerting.

Automatic moment tensor solutions

We implemented, tested and tuned for NE Italy the TDMT_INV code (Dreger, 2001). Several tests, using synthetic and real data, have been performed to check the sensitivity of solutions to the NI broadband network geometry, to the number of stations employed as well as to the 1D velocity models used. Our tests revealed that the best double couple and the Mw are quite robust and that one or two-station solutions can be effective in many cases. At date, the automatic procedures are active for the earthquakes located in NE Italy and surroundings, starting from Ms=3.7.

ShakeMap

ShakeMap software (Wald et al., 2006) customized for Italy by INGV is installed at OGS and efforts have been made for ensuring the coherency with the maps of ground-motions computed at other Italian data centers for the same earthquake. Protocols for parametric data exchange are under development.

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