Rend. Online Soc. Geol. It., Vol. 21 (2012), pp. 778-779.

Seismicity and Focal Mechanisms at the Calabro-Lucanian boundary along the Apennine chain (southern Italy)

SEBASTIANO D'AMICO (*), ANNA GERVASI (**), IGNAZIO GUERRA (°), GIANCARLO NERI (°°), BARBARA ORECCHIO (°°), DEBORA PRESTI (°°) & CRISTINA TOTARO (°°)

Key words: *Calabro-Lucanian region, earthquake location, focal mechanisms.*

The Calabro-Lucanian boundary is a complex geological zone marking the transition between the highly seismogenic tectonic domains of Southern Apennines and the Calabrian Arc. Historical catalogues include earthquakes with macroseismic effects up to VII-VIII MCS (CPTI WORKING GROUP, 2004) and paleoseismological investigations suggested that earthquakes of magnitude between 6.5 and 7 may have occurred in this area, between the 6th and the 15th century (MICHETTI *et alii*, 2000). More recently, on 9 September 1998, an earthquake of moment magnitude M5.6 occurred at the north-western margin of the Pollino massif (GUERRA *et alii*, 2005; ARRIGO *et alii*, 2006) and since the second half of 2010 the same region was interested by a noteworthy seismic activity characterized by several swarms with thousands of events with a maximum magnitude of 3.6.

We have investigated the seismicity occurring in the last decades at the Calabro-Lucanian boundary with the main purpose of improving the accuracy of seismogenic fault detection. Data and recordings relative to earthquakes shallower than 30 km which occurred between January 1981 and December 2011 have been collected from the Italian national catalogs and databases (http://www.ingv.it) and from the databases of University of Calabria, including permanent and temporary seismic networks operating in the region (BARBERI *et alii*, 2004; http://www.ldeo.columbia.edu/res/pi/catscan/). We located the earthquakes using both linearized (SimulPS, EVANS *et alii* 1994) and non-linear (Bayloc, PRESTI *et alii*, 2004 and 2008) earthquake location algorithms and the three-dimensional crustal velocity models developed for this region (BARBERI *et alii*, 2004; ORECCHIO *et alii*, 2011).

We also estimated the focal mechanisms for some dozen of earthquakes with local magnitudes greater than 3.0 which occurred in the study region in the last decade. We applied the Cut And Paste (CAP) method (ZHAO & HELMBERGER, 1994; ZHU & HELMBERGER, 1996), that allows the determination of source depth, moment magnitude and focal mechanism using a grid search technique. Waveform modeling has been used to estimate faulting parameters of small to moderate size earthquakes. The capacity of CAP method to obtain high quality results for the investigated dataset has been accurately verified by comparisons with different methods and by several tests related to seismic network geometry, velocity model and earthquake location uncertainties (D'AMICO *et alii*, 2011).

A joint analysis of the results of the present study with others geophysical and geological information available from the literature has been performed with the purpose of better understanding the dynamic processes leading to the generation of the individual seismic phases and of improving the available seismotectonic knowledge of the study region.

(*) Department of Physics, University of Malta

(**) Istituto Nazionale di Geofisica e Vulcanologia, Roma

(°) Department of Physics, University of Calabria, Rende (CS)

(°°) Earth Sciences Department, University of Messina, Messina

REFERENCES

ARRIGO G., ROUMELIOTI Z., BENETATOS C.H., KIRATZI A., BOTTARI A., NERI G., TERMINI D., GORINI A. & MARCUCCI S. (2006) - *A Source Study of the 9 September 1998 (Mw 5.6) Castelluccio Earthquake in Southern Italy using Teleseismic and Strong Motion Data*. Nat. Hazard, **37**, 245-262.

BARBERI G., COSENTINO M.T., GERVASI A., GUERRA I., NERI G. & ORECCHIO B. (2004). *Crustal seismic tomography in the Calabrian Arc region, south Italy*. Phys. Earth Planet. Inter., **147**, 297-314.

CPTI WORKING GROUP (2004) - *Catalogo Parametrico dei Terremoti Italiani, versione 2004 (CPTI04)*. INGV, Bologna, http://emidius.mi.ingv.it/CPTI/.

D'AMICO S., ORECCHIO B., PRESTI D., GERVASI A., ZHU L., GERVASI A., NERI G. & HERRMANN R. B. (2011). *Testing the stability of moment tensor solutions for small earthquakes in the Calabrian-Peloritan arc region (southern Italy)*. Boll. Geof. Teor. Appl. **52** (2), 283-298.

EVANS J.R., EBERHART-PHILLIPS D. & THURBER C.H. (1994). *User's manual for simulps12 for imaging Vp and Vp/Vs: a derivative of the "Thurber" tomographic inversion simul3 for local earthquakes and explosions*. Open File Report, USGS, Menlo Park, 94-431.

GUERRA I., HARABAGLIA P., GERVASI A. & ROSA A.B. (2005). *The 1998-1999 Pollino (Southern Apennines, Italy) seismic crisis: tomography of a sequence*. Ann. Geophys. **48** (6), 995-1007.

MICHETTI A. M., FERRELI L., ESPOSITO E., PORFIDO S., BLUMETTI A. M., VITTORI E., SERVA, L., & ROBERTS, G. P. (2000) - *Ground effects during the 9 September 1998, Mw = 5.6, Lauria earthquake and seismic potential of the ''aseismic'' Pollino region in Southern Italy*. Seism. Res. Lett., **71**, 31–46.

ORECCHIO B., PRESTI D., TOTARO C., GUERRA I. & NERI G. (2011). *Imaging the velocity structure of the Calabrian Arc region (South Italy) through the integration of different seismological data*. Boll. Geof. Teor. Appl. **52** (4), 625–638.

PRESTI D., TROISE C. & DE NATALE G. (2004) - *Probabilistic location of seismic sequences in heterogeneous media*. Bull. Seismol. Soc. Am., **94**, 2239–2253.

PRESTI D., ORECCHIO B., FALCONE G. & NERI G. (2008) - *Linear versus nonlinear earthquake location and seismogenic fault detection in the southern Tyrrhenian Sea. Italy.* Geophys. J. Int., **172**, 607–618.

ZHAO L.S., HELMBERGER D. (1994). *Source estimation from broad-band regional seismograms.* Bull. Seism. Soc. Am. **85**, 590–605.

ZHU L. & HELMBERGER D. (1996) - *Advancement in source estimation technique using broadband regional seismograms.* Bull. Seism. Soc. Am., **86**, 1634-1641.