SECOND EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING
AND SEISMOLOGY, ISTANBUL AUG. 25-29, 2014

INVESTIGATING THE POLLINO MTS. SEISMIC SEQUENCE (SOUTH ITALY) BY HIGH-RESOLUTION ANALYSIS

Cristina TOTARO[1], Leonardo SEEBER[2], Felix WALDHAUSER[3], Michael STECKLER[4], Anna GERVASI[5,6], Ignazio GUERRA[7], Barbara ORECCHIO[8] and Debora PRESTI[9]

We present an high-quality analysis of the space-time evolution of the seismic activity occurred between 2010 and 2013 in the Pollino Mts. region, in the junction area between the Calabrian Arc and the southern Apennines domains (south Italy). In this region, proposed according to paleoseismological evidences as a possible seismic gap (Michetti et al., 2000; Cinti et al., 2002) , a seismic crisis of more than 5000 thousands small to moderate earthquakes (maximum magnitude Ml 5.0) has been occurring since Spring 2010 (Totaro et al., 2013). We first obtained hi-precision hypocenter locations by applying the double-difference method and then refined them by relative timing by cross-correlation of seismograms (Waldhauser and Ellsworth, 2000; Schaff et al., 2004; Waldhauser and Schaff, 2008). Focal mechanism solutions for the sequence have been also estimated by applying the "Cut And Paste" waveform inversion method (Zhao and Helmberger, 1994; Zhu and Helmberger, 1996).
The joint evaluation of earthquake spatial and temporal distribution, information on clusters of similar earthquakes and high quality focal mechanisms plus the comparison with surface geology allow us to highlight important aspects of the mechanical behaviour of major and minor faults in the Pollino area. Spatial distribution of seismicity defines two main clusters, but the one furthest west is by far the most intense and is the main subject of our interpretation so far. The 3D pattern of hypocenters and focal mechanisms are consistent and image a NNW-striking and west-dipping fault zone between 5 and 10 km deep and 10 km along strike, with predominantly normal motion. This fault kinematics fits the overall pattern of active faults in the Mercure Basin and western Pollino area, although the strike of this currently seismogenic fault is more northerly than most faults highlighted in the area (Ghisetti and Vezzani, 1983; Brozzetti et al., 2009). The earthquake source zone exhibits significant changes along strike. Toward the north, the floor of the seismicity deepens significantly and the dip of the fault steepens. This change is abrupt; it defines a southern and northern segment of the main fault and suggests a high-angle intersection with another fault. The low dip to the west in the southern segment is highlighted primarily by the hypocenter distribution, while most of the focal mechanisms in the deeper part of this segment maintain an intermediate to steep dip. This geometry leads to the hypothesis of an intersection between the steep lower seismogenic fault and a shallow-dipping more regional detachment.

[1] Department of Physics and Earth Sciences, University of Messina, Messina, Italy, ctotaro@unime.it
[2] Lamont-Doherty Earth Observatory, Palisades, New York, USA, nano@ldeo.columbia.edu
[3] Lamont-Doherty Earth Observatory, Palisades, New York, USA, felixw@ldeo.columbia.edu
[4] Lamont-Doherty Earth Observatory, Palisades, New York, USA, steckler @ldeo.columbia.edu
[5] Istituto Nazionale di Geofisica e Vulcanologia, Centro Nazionale Terremoti, Rome, Italy, anna.gervasi@ingv.it
[6] Department of Physics, University of Calabria, Arcavacata di Rende, Cosenza, Italy
[7] Department of Physics, University of Calabria, Arcavacata di Rende, Cosenza, Italy, guerra@unical.it
[8] Department of Physics and Earth Sciences, University of Messina, Messina, Italy, orecchio@unime.it
[9] Department of Physics and Earth Sciences, University of Messina, Messina, Italy, dpresti@unime.it

REFERENCES

Brozzetti F, Lavecchia G, Mancini G, Milana G, Cardinali M (2009) Analysis of the 9 September 1998 Mw 5.6 Mercure earthquake sequence (Southern Apennines, Italy): a multidisciplinary approach. *Tectonophysics* 476 (1–2), 210–225.

Cinti F. R., Moro M., Pantosti D., Cucci L., D'Addezio G. (2002), "New constraints on the seismic history of the Castrovillari fault in the Pollino gap (Calabria, southern Italy)", *J. Seismol.* 6, 199–217

Ghisetti F, Vezzani L, (1983) Structural Map of Mount Pollino (Southern Italy). S.EL.CA, Firenze, Scale 1: 50,000.

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 the seismic potential of the "aseismic" Pollino region in southern Italy", *Seismol. Res. Lett.* 71, 31–46

Schaff DP, Bokelmann G, Ellsworth WL, Zanzerkia E, Waldhauser F, Beroza GC (2004) Optimizing correlation techniques for improved earthquake location. *Bull. Seismol. Soc. Am.,* 94, 705– 721.

Totaro C, Presti D, Billi A, Gervasi A, Orecchio B, Guerra I, Neri G (2013) The ongoing seismic sequence at the Pollino Mountains, Italy. *Seismol. Res. Lett.,* 84, 6, 955-962, doi: 10.1785/0220120194.

Waldhauser F, Ellsworth WL (2000) A double-difference earthquake location algorithm: Method and application to the northern Hayward fault. *Bull. Seismol. Soc. Am.*, 90, 1353– 1368.

Waldhauser F, Schaff DP (2008) Large-scale relocation of two decades of Northern California seismicity using cross-correlation and double-difference methods. *J. Geophys. Res*., 113, B08311, doi:10.1029/2007JB005479.

Zhao LS, Helmberger D (1994) Source estimation from broad-band regional seismograms. *Bull. Seismol. Soc. Am.*, 85, 590–605.

Zhu L, Helmberger D (1996) Advancement in source estimation technique using broadband regional seismograms. *Bull. Seismol. Soc. Am.*, 86, 1634–1641.