THE TRICHONIS LAKE SEISMOGENIC ZONE (W. GREECE). DETAILED INVESTIGATION DERIVED BY RELOCATION OF THE LOCALLY RECORDED APRIL-JUNE 2007 SWARM AND INVERSION OF FOCAL MECHANISMS

I. Kassaras[1], V. Kapetanidis[1], G. Kaviris[1], A. Karakonstantis[1], A. Moshou[2], P. Papadimitriou[1], N. Voulgaris[1], K. Makropoulos[1], G. Papadopoulos[3]

1 - Department of Geophysics-Geothermics, University of Athens, 15784 Athens, Greece
2 - Institute of Geodynamics, National Observatory of Athens, Lofos Nymfon, 11810 Athens, Greece
3 - Earthquake Planning & Protection Organization, Seismotectonics Dept., 32 Xanthou Str. 15451 Athens Greece

kassaras@geol.uoa.gr

On April 10, 2007, three moderate earthquakes with Mw=5.0-5.2 occurred in the area of Trichonis Lake (W. Greece). On April 11, a local network comprising of 12 3-component seismological stations was installed. The network operated until July 2007, recording an intense seismic sequence. Approximately 2000 aftershocks were recorded by at least three stations and located with Hypoinverse. An optimum velocity model which minimized location errors was derived, yielding 1650 confident hypocentral solutions in terms of uncertainty and misfit. Relocation of aftershocks was performed using both catalogue and waveform cross-correlation traveltime data. The double difference technique was applied and the HypoDD algorithm was modified for that purpose. Waveform similarity between events that form multiplets was exploited to improve arrival times. The analysis resulted 5 multiplets containing a total of 1096 correlated events with focal depths in the range of 2-14 km. The spatial distribution of the relocated aftershocks reveals the activation of two antithetic faults intersecting at 6 km depth, both striking NW-SE and dipping NW and SE, respectively. Moreover, the deepest segment of a third fault striking NW-SE and dipping SW was also activated.

Focal mechanisms of the largest events were determined by regional waveform modeling. P-wave first motion polarity data from the local temporary network were employed to constrain 140 high quality fault plane solutions. The types of the obtained focal mechanisms are predominantly normal and strike-slip, however some earthquakes exhibit reverse faulting. Events located in the southernmost part of the area are related to two normal antithetic faults striking N130° and N320°, respectively. Extrapolation of aftershock seismicity at the surface reveals that those faults are located along the northern margin and south of the southern margin of the lake, respectively. To the east focal mechanisms show dextral strike-slip faulting along NW-SE direction, dipping SW. The most complex deformation pattern is observed at the central and northern parts of the NE dipping seismogenic zone, where sinistral strike-slip and reverse faulting is observed, respectively. Sinistral strike-slip faulting is observed near the inferred intersection with the eastern antithetic plane, at depths 6-9 km. Reverse faulting is observed at 5-7.5 km depth, with the shallower part coinciding with the termination of the seismic activity towards the NW. Inversion of focal mechanism data showed that the averaged directions of P and T axes are rather uniform, ranging N290˚-N320˚ and N190˚-N230˚, compatible with the overall strike of Hellenides. On the contrary, in the central and northern parts of the NE dipping zone, the stress field appears reverse with P and T axes ranging between N210˚-N230˚ and N120˚-N130˚, respectively. They are related to anticlockwise rotation beneath the central part of the lake and compressional kinematics at the northernmost termination of the seismogenic zone, possibly related to a barrier or an asperity zone due to conjugate faults.