Title:
Spatiotemporal properties of the 2011 Oichalia seismic swarm, SW Peloponese, Greece

Speaker:
I. Kassaras

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Authors:
Kassaras, I. 1; Ganas, A. 2; Karakostantis, A. 1; Kapetanidis, V. 2; Kouskouna, V. 1; Chouliaras, G. 2; Moshou, A. 2; Mitropoulou, V. 1; Argyrakis, P. 2; Lekkas, E. 1; Makropoulos, K. 2 - 1 University of Athens, Geophysics-Geothermics, Greece; 2 National Observatory of Athens, Institute of Geodynamics, Greece

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Abstract:
During the time period August - December 2011, a seismic swarm took place in the area of Oichalia, north Messinia province, at the southern part of Peloponese. The largest earthquakes occurred in 14/8/2011 (Mw=4.8) and 10/10/2011 (Mw=4.7), followed by a large number of aftershocks. The shallow seismic sequence composed of over 1700 events and was studied using data from local temporary and regional permanent seismic stations to investigate the fault geometry, stress field, evolution of seismicity and seismic properties. Data were analyzed in terms of manual arrival-time picking and the earthquakes were located with the HYPOINVERSE algorithm, using a custom local velocity model, calculated with an iterative error minimization procedure. Hypocentral solutions were further improved by applying the double-difference algorithm (HypoDD). Focal mechanisms were obtained by both regional moment tensor inversion and P-wave first motion polarities. The relocated seismicity forms a band as narrow as 3 km (measured approximately E-W) beneath the central part of the surface rupture, less than half as wide as that from catalogue locations, with an average depth of 8.7 km. Both spatial distribution of the seismicity and focal mechanisms show that the re-activated fault is a dip-slip normal fault trending NNW-SSE and dipping ~50° WSW. The average T axes orientation is N70° E. The above observations are compatible with the orientation of ground cracks observed in situ surveys. The temporal distribution of the swarm follows a NNW to SSE direction with time, towards a large seismogenic zone, which was last activated on September 13, 1986, with an Mw=6.0 earthquake. Migration of seismicity may be related to ascension of hydrothermal fluids as evidenced by local seismic tomography results.