ESC2016-59, 2016
35th General Assembly of the European Seismological Commission

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4–10 September 2016
Trieste

Detailed microseismicity study in the area of Florina (Greece): Evidence for fluid driven seismicity

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A local seismic network was installed and operated in the area of Florina during July 2013 – January 2014 for studying the high microseismic activity after the occurrence of an Mw=4.1 event on February 17, 2013. Data from the local network were combined with the recordings of the permanent network of the Hellenic Unified Seismological Network (HUSN). Initially, a new velocity model is defined for the broader area of Florina using the recordings of the HUSN stations. Then, relocation is performed for 1,330 local network and 423 HUSN events using the double difference technique and differential times from both catalog data and cross correlation measurements. Fault plane solutions were determined for the two largest events (Mw=3.6 and Mw=4.1) using waveform inversion technique and the HUSN stations. Moment magnitudes for the events recorded by the local network were estimated by spectral analysis. The final locations, reveal a main fault striking almost E-W and dipping to the north, associated with the largest event (Mw.=4.1) However, most of the microseismicity is comprised an almost vertical, south dipping plane, striking almost E-W and located near to the southern edge of the main rupture. This southern cluster is consisted of multiplets and is probably triggered by the Coulomb stress changes, due to the coseismic slip of the Mw=4.1 earthquake. The spatio-temporal evolution of microseismicity is well explained by diffusion curves, which is a signature of fluid induced seismicity. Interevent time distribution shows interaction between events. These characteristics are interpreted as the consequence of CO_2 emissions through faults which were used as pathways.