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Detailed Microseismicity Analysis of the Central Ionian Islands

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The Central Ionian Islands, namely Kefalonia and Lefkada, consists the most seismically active area in the Mediterranean. The main tectonic characteristic is the dextral strike slip motion caused by the Kefalonia Transform Fault Zone (KTFZ) (Scordilis et al., 1985) along which strong earthquakes occur regularly for the past 600 years at least. Since 2003 four strong earthquakes (M_W > 6.0) occurred in the area, both in Kefalonia (26/1/2014 and 3/2/2014) and Lefkada (14/8/2003 and 17/11/2015) and their aftershock sequences were adequately recorded and located since a local seismological network has been installed the day after the 2003 main shock (Karakostas *et al*., 2004), whereas the last one of them was recorded by an adequate number of permanent seismic stations, since the network was substantially improved since 2003. A permanent dense seismic network is in operation since mid-2014 (Hellenic Unified Seismological Network), resulted to microseismicity monitoring sufficient to reveal the complex faulting properties of the area. From September 2016 to December 2018 all recorded earthquakes in the area are manually picked and then located resulting in a adequately accurate earthquake catalog comprising about 13000 events (Fig. 1), most of them along the Kefalonia Transform Fault.

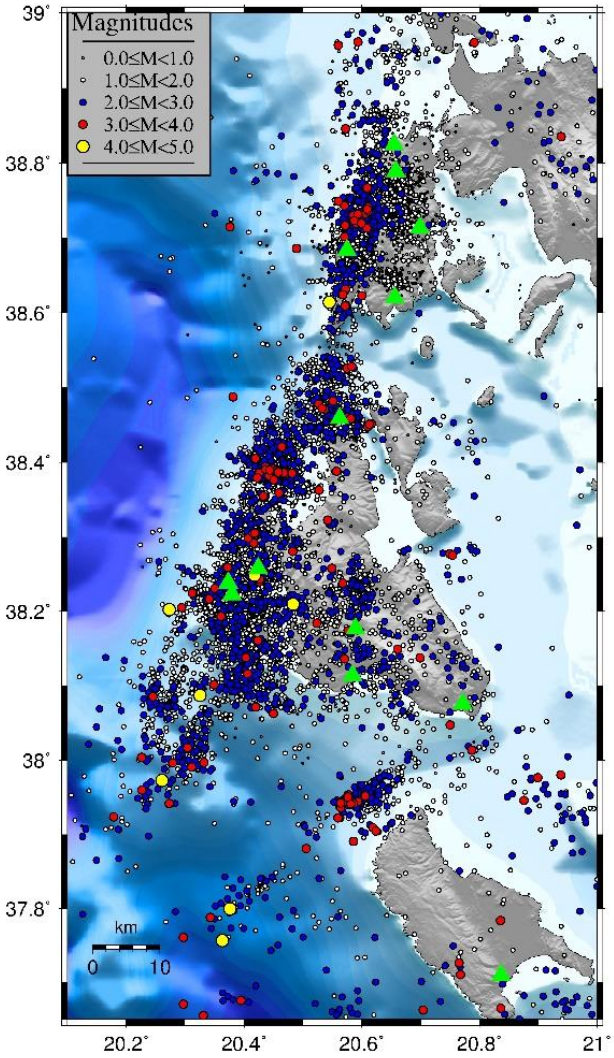

Figure 1. Located seismicity in the Ionian Islands from September 2016 to December 2018. Green triangles indicate the stations of HUSN in the area used in the manual picking and relocation.

The earthquakes are relocated using a recent 1D velocity model (Papadimitriou *et al*., 2017) considering station time delays by an iterative procedure (Karakostas and Papadimitriou, 2010) in order to account for the lateral crustal variations. The Double – Difference method is then applied and a cross – correlation algorithm (Waldhauser and Ellsworth, 2000, Schaff and Waldhauser, 2005) is implemented. The resulting spatial distribution is examined using strike parallel and strike normal cross sections detailing the major seismically active structures as well as the adjacent minor faults along the

KTFZ. Benefiting from the azimuthal coverage of the seismic network focal mechanisms are calculated using moment tensor inversion (Sokos and Zahradnik, 2008) or first motion polarities (Reasenberg and Oppenheimer, 1985) in order to determine the rupture properties of the active structures in the area and, along with the relocated seismicity, reveal the kinematic properties of the faults.

Seismicity on Lefkada Island is observed along the main fault zone as well as on several conjugate structures where mostly microseismicity is manifested with focal depths ranging from 5 to 15 km. In Kefalonia Island the seismicity follows more complex patterns. In its northern part and in the gulf of Myrtos seismicity reveals the existence of step overs between the two islands, in accordance with Karakostas *et al*., (2015), whereas along the Paliki Peninsula seismicity patterns appear more scattered, revealing small structures following the trend of the KTFZ with focal depths ranging from 5 to 18 km. In the offshore area South of Kefalonia several M_L >4.0 were recorded and the resulting seismic activity is manifested by small clusters that follow the main fault zone at focal depths reaching about 20 km. In the area between Zakynhtos and Kefalonia a seismic excitation over a two month period led to the mapping of a well – defined cluster striking NE – SW with focal depths ranging between 15 and 20 km. The results contribute to the precise mapping of smaller active seismic sources, that are capable of producing light to moderate earthquakes and should be taken into account in seismic hazard assessment.

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