

## **First evidence of seismic activity on a near-shore fault south of Malta, Central Mediterranean**

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The geology of the Maltese islands is relatively young, with the oldest formations dating back only to the Tertiary period. The structural setting of the Islands is mainly influenced by two rift systems belonging to different ages and having different trends. The older rift generation creates a horst and graben structure in northern Malta. The second rift generation, in the south, including the Maghlaq Fault, is associated with the Pantelleria Rift. The Maghlaq Fault is a spectacular left-stepping normal fault running along the southern coastline of the Maltese islands, cutting the Oligo-Miocene pre to syn-rift carbonates. It is a NW – SE trending fault with a clear surface expression traceable along 4 km of the coastline, where vertical displacements of the island's Tertiary stratigraphic sequence are clearly visible and exceed 210m. These displacements have given rise to sheer, slickensided fault scarps, as well as isolating the small island of Filfla 4km offshore the southern coast. Assessment of the seismic activity related with Maghlaq fault is performed, re-evaluating and redetermining the hypocentral locations and the source parameters of both recent and older events.

The Maltese islands have been affected by a number of earthquakes in the historical past, with the majority of their hypocenters concentrating at the Sicily Channel (bordered by the Tunisian, Libyan and Sicilian coastlines), in eastern Sicily, and as far away as the Hellenic arc. Some of these earthquakes also have caused considerable damage to buildings. The Maghlaq fault is believed to be one of the master faults of the Sicily Channel Rift, being parallel to the Malta graben, which passes around 20km south of Malta and shows continuous seismic activity. Despite this relationship with the graben system, no seismic activity on the Maghlaq fault had been documented previous to 2015.

On the July 30<sup>th</sup> 2015, an earthquake was widely felt in the southern half of Malta and was approximately located just offshore the southern coast. Since then, a swarm of seismic events lasting several days, as well as other isolated events have occurred, indicating the fault to be seismically active. Investigation of the nature of the seismic events and other previous activity that may have been misclassified due to poor location capability, is performed. Such results are of utmost importance in order to reveal the implication of this newly-discovered activity on the seismic hazard to the Maltese islands and also to improve understanding of the local geodynamics, highlighting the mechanisms that contribute to both the crustal deformation and the tectonics of the upper crust. The investigation is carried out using the stations of the recently extended Malta Seismic Network and regional stations. The results are discussed in the context of the role of the Maghlaq fault in the extensional tectonics associated with the Sicily Channel Rift and the African continental margin.