Geophysical Research Abstracts
Vol. 17, EGU2015-7463, 2015
EGU General Assembly 2015

Earthquake Source Mechanisms, Coseismic Costal Uplifts and Tsunamigenesis in the Eastern Hellenic Arc and Trench

Ioanna Triantafyllou and Gerassimos Papadopoulos
Institute of Geodynamics, National Observatory of Athens, Greece (ioannatriantafyllou@yahoo.gr)

The eastern segment of the Hellenic Arc and Trench (HA-T) is tectonically characterized by interplate seismic activity with mainly thrust mechanism. Large earthquakes and tsunamis are known from both the historical and geological record particularly in Rhodes Isl. (Greece). Geological observations have indicated that eastern Rhodes has systematically uplifted during the Holocene with uplift amplitude increasing from S to N with average velocity ranging from 0 at south to 1 mm/yr at the NE side of the island. In order to better understand why some large earthquakes caused tsunamis while others did not, we examined the source mechanisms and the submarine setting of historical and instrumental earthquakes occurring in the area of Rhodes. Historical sources maintain direct evidence that three, large earthquakes caused coseismic uplift with permanent sea retreat in the city of Rhodes at the NE side of the island at 227 BC, AD 142 and 12 October 1856. The average historical coseismic uplift was found around 0.7 mm/yr which is close to the geological average. We examined original documentary sources and found that these earthquakes were non-tsunamigenic, thus revising previous thoughts. We suggested that the ones of 227 BC and AD 142, both with magnitude M$\sim$7, were crustal earthquakes having their epicenters offshore but close to Rhodes city, that is in shallow water domain. The 1856 earthquake of M$\sim$7.5 very likely was of intermediate focal depth, quite similar to that of 26 June 1926, therefore it was not capable to produce a tsunami. Another set of earthquakes includes the large events of AD 1303, 1481, 1609 and 1741. It is documented from historical sources and/or geological observations that all of them caused powerful tsunamis. However, no evidence for coseismic uplift was found in Rhodes Isl. Therefore, we suggested that these earthquakes had their epicenters offshore away from the island. The 1303 earthquake was a very large event (M$\sim$8) that ruptured under deep water along the Hellenic Trench between Crete and Rhodes. We suggested that the 1481, 1609 and 1741 earthquakes, all being of M$\sim$7, had their sources in or close to the Rhodes Abyssal Plain (RAP) to the east of Rhodes. The only crustal and large (M7.2), instrumental earthquake in the area occurred on 25 April 1957 with focal mechanism that likely involved mainly thrust component. Neither coseismic uplift in Rhodes nor tsunami were reported which is consistent with the source situated offshore away of NE Rhodes but in shallow water domain. We concluded that in the eastern HA-T the tsunamigenesis is controlled not only by the earthquake source properties but also by the event setting in the bathymetric regime. This work is funded by the project ASTARTE - Assessment, Strategy And Risk Reduction for Tsunamis in Europe - FP7-ENV2013 6.4-3, Grant 603839.