Geophysical Research Abstracts
Vol. 18, EGU2016-4680-2, 2016
EGU General Assembly 2016

Relocation of the Mw 6.4 July 1, 2009 earthquake to the south of Crete and modeling of its associated small tsunami

Gian Maria Bocchini (1), Gerassimos A. Papadopoulos (1), Tatiana Novikova (1), Vassilis K. Karastathis (1), Aggelos Mouzakiotis (1), and Nikolaos Voulgaris (2)

(1) Institute of Geodynamics, National Observatory of Athens, P.O. Box 20048 GR, 11810, Athens, Greece. (bocchini@noa.gr), (2) Faculty of Geology and Geoenvironment, National & Kapodistrian University of Athens, 15784, Athens, Greece

On July 1, 2009 (09:30 UTC) a Mw6.4 earthquake ruptured south of Crete Island triggering a small tsunami. Eyewitness reported the tsunami from Myrtos and Arvi Port, in the SE coast of Crete, and in Chrisi islet. In Arvi 4 or 5 wave arrivals were reported after a withdrawal of the sea of about 1 m. The sea disturbance lasted for about 1 h. The earthquake occurred as the result of the subduction of the oceanic African Plate beneath the continental Eurasian Plate along the Hellenic Subduction Zone (HSZ). South of Crete the Nubia-Aegean convergence rate ($\sim$3.5 cm/yr) is partially accommodated by low-angle ($\sim$20-25°) thrust faults at 20-40km depths and by steeper (>30°) reverse-faults at shallower depths. The area of interest has been struck by large magnitude earthquakes in historical times that in some cases triggered damaging tsunamis (e.g AD 1303). Routine earthquake locations performed by NOA do not provide good quality hypocenters for the area under investigation given the poor azimuthal coverage and the low density of the seismic stations. The 2009 earthquake, given its tsunamigenic nature, has been identified as a key event to study the central segment of the HSZ. We performed the relocation of the 2009 mainshock along with the seismicity of the area (ML>=3, period 2008-2015) using the NLLoc algorithm and testing several 1D velocity models available for the area and a 2D velocity model obtained from a published N-S seismic refraction profile across Crete. The hypocenters obtained from NLLoc have been subsequently relocated with HypoDD algorithm using catalog phase data. The results from the various relocation procedures showed a shallow hypocentral depth (12-17km) of the 2009 event and its likely intraplate nature. A set of hypocentral solutions were selected on the basis of minimum RMS and smaller errors with the aim to perform tsunami simulations with varying source parameters. Two different fault dips were used to discriminate between the intraplate (dip 32°) and the interplate (dip $\sim$20°) nature of the event. Okada dislocation modeling for the NNE dipping fault plane from the CMT Harvard solution was selected to run the tsunami simulations. The comparison of synthetic and observed tsunami wave heights provided an additional tool to constrain the best hypocentral solution.
This research is a contribution to the EU-FP7 ITN research project ZIP (Zooming In between Plates, grant agreement no: 604713, 2013 and ASTARTE (Assessment, Strategy And Risk Reduction for Tsunamis in Europe), grant agreement no: 603839, 2013.