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Optimization of the fault plane and coseismic slip from tide-gauge data for the 2nd May 2020 Ierapetra, Crete, Earthquake (Mw 6.6) and the associated tsunami

Enrico Baglione[1,2], Alessandro Amato[1], Beatriz Brizuela[1], Hafize Basak Bayraktar[1], Stefano Lorito[1], Alessio Piatanesi[1], Fabrizio Romano[1], Roberto Tonini[1], Manuela Volpe[1], and Roberto Basili[1]
[1]INGV, Sezione Roma 1, Roma , Italy
[2]OGS, Trieste, Italy

We present a tsunami source solution for the 2nd May 2020, Mw 6.6 earthquake that occurred about 80 km offshore south of Crete on the shallow portion of the Hellenic Arc Subduction Zone (HASZ). This earthquake generated a small local tsunami recorded by the Ierapetra tide gauge on Crete island's southern coast. We used these single-marigram data to constrain the main features of the causative rupture. We modelled synthetic tsunami waveforms and measured their misfits with the observed data for each set of source parameters, scanned systematically around the values constrained by some of the available moment tensors.

In the attempts to discriminate between the two auxiliary fault planes of the moment tensor solutions, our results identify a shallow highly-dipping back-thrust fault as the source of this earthquake with the lower misfit. However, a rupture on a lower angle fault, possibly a splay fault of the subduction interface, with a sinistral component due to the oblique convergence on this segment of the HASZ, cannot be ruled out.

These results are relevant in the framework of the tsunami hazard assessments and Tsunami Early Warning Systems. In these frameworks, in addition to the subduction interface and possible ruptures on splay faults, other rupture types, such as those on secondary structures of the considered subduction system, cannot be excluded a priori. This circumstance bears important consequences because, as well as splay faulting, back thrust faulting might enhance the tsunamigenic potential where the subduction itself is less tsunamigenic due to the oblique convergence.