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Source Mechanisms of the Recent Rhodes-Dodecanese Islands Earthquakes and Historical Tsunami Simulations in the eastern Mediterranean

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This study deals with the source mechanisms and rupture histories of the recent earthquakes (M_w >5.0) occurred in the Rhodes-Dodecanese islands that are actively deforming regions in the eastern Mediterranean. We have analyzed 9 recent earthquakes using the teleseismic P- and SH- body-waveform inversion methods of Nábélek (1984) and Yagi and Kikuchi (2000) to improve our understanding of the geometry of active faulting and ongoing deformational processes. Further, we have simulated the historical 1481 Rhodes earthquake sequences (M∼7.5) that created tsunami waves along the Mediterranean coasts as reported at verified catalogues. We have obtained tsunami wave heights as well as their distribution function as illustrative examples depicting the characteristics of tsunami propagation, and effects of coastal topography and of near-shore amplification. For simulation of tsunami generation, we have used the nonlinear shallow-water mathematical models (TUNAMI-N2 and NAMI DANCE) with a given arbitrarily shaped GEBCO–BODC bathymetry data. The characteristics of active tectonics of the region can be summarized as: [1] Earthquake source parameters indicate shallow seismic activity and sinistral transtensional regime consisting of the Ptolemeus, Pliny and Strabo deep-sea depressions at the western part of the Rhodes island, [2] However, towards the east, it is observed that dominant source mechanisms are strike-slip faulting with deeper centroid depths, [3] Also, obtained T-axes directions indicate E-W and NW-SE extension, [4] Earthquake slip distribu-

tions imply simple rupture with a short source duration (STF) on the fault plane for the Rhodes earthquakes, and [5] Furthermore, numerical tsunami simulations present that the damaging historical tsunamis (e.g: 1303 and 1481) in the eastern Hellenic arc are able to threaten the coastal plains of the Turkey, Cyprus-Levantine, and Nile Delta regions as confirmed by our simulations, and thus special care should be considered in the evaluation of the tsunami risk assessment of the region.

References:

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