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Middle-Late Quaternary geodynamics of Crete, Southern Aegean, and seismotectonic implications

Riccardo Caputo (1), Stefano Catalano (2), Carmelo Monaco (2), Giuseppe Romagnoli (2), Giuseppe Tortorici (2), and Luigi Tortorici (2)

(1) University of Ferrara, Dept. Earth Sciences, Ferrara, Italy (rcaputo@unife.it), (2) University of Catania, Dept. Earth Sciences, Catania, Italy

In order to characterize and quantify the superficial deformation occurred during Middle-Late Quaternary in the Southern Aegean, we have systematicaly analyzed the major tectonic structures affecting Crete Island. They typically consist of 10 to 30 km-long dip-slip normal faults, separating carbonate and/or metamorphic massifs, in the footwall block, from loose to poorly consolidated alluvial and colluvial materials within the hanging-wall. All these faults show clear evidences of recent re-activations and trend parallel to two principal directions: WNW-ESE and NNE-SSW. Based on all available data for both onland and offshore structures (morphological and structural mapping, satellite imagery and airphotographs remote sensing as well as the analysis of seismic profiles and the investigation of marine terraces and Holocene raised notches along the island coasts), for each fault we estimate and constrain some of the principal seismotectonic parameters and particularly the fault kinematics, the cumulative amount of slip and the slip-rate. Summing up the contribution to crustal extension provided by the two major fault sets (ca. E-W and ca. N-S) we calculate both radial and tangential (i.e. perpendicular and parallel to the Hellenic Arc, respectively) long-term strain-rates. A comparison of these geologically-based values with those obtained from GPS measurements show a good agreement, therefore suggesting that the present-day crustal deformation is probably active since Middle Quaternary and mainly associated with the seismic activity of upper crustal normal fault characterized by frequent shallow moderate-to strong (Mmax = 7.0) seismic events seldom alternating with stronger (Mmax = 7.5) earthquakes occurring along blind low-angle thrust planes affecting deeper and more external sectors of the accretionary wedge.