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High uplift-transients indicate clusters of mega-earthquakes in Eastern Mediterranean during the last 50 kyr

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The Hellenic subduction margin in the Eastern Mediterranean has generated devastating historical earthquakes and tsunamis with poorly known recurrence intervals. Here we show that the earthquake-related uplift pattern on Crete has been more variable and complex than previously thought. Using radiocarbon dates and field observations of paleoshorelines we identify strong uplift transients along the entire island with time-averaged rates varying between 0 and 7 mm/yr. High uplift-rates since the demise of the Minoan civilisation were confined to western Crete, where up to 10m of coastal uplift resulted from at least one great earthquake. Similar earthquakes produced rapid uplift between $\sim$10 and 20 kyr B.P. in eastern and western Crete, with the absence of uplifted Late Holocene paleoshorelines in the east being due to seismic quiescence rather than aseismic uplift, as previously suggested. Numerical modelling conditioned by our new uplift-data indicates that great-earthquakes occurred on major reverse faults in the upper-plate, with the plate-interface contributing little to the uplift. In contrast to most convergent margins great earthquakes along the Hellenic margin were strongly clustered in time with recurrence intervals of 100s of years to 10s of thousands of years, reflecting temporal variations in slip partitioning between the subduction-interface and upper-plate faults.