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The role of upper-plate faulting along the actively converging Hellenic Subduction zone south of Crete, Greece, explored using in-situ 36Cl exposure dating on wave-cut platforms.

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Active extension within convergent margins results in spatially-variable uplift that overprints the regional uplift contribution linked to the subduction zone. The activity of these extensional faults can be examined using deformed marine terraces which record spatial variations in uplift and allow us to calculate the slip rates of active faults to contribute toward seismic hazard analysis. The South Central Crete Fault (SCCF), a south-dipping normal fault which trends approximately E-W along the south of Crete, has a sequence of deformed palaeoshorelines and associated terraces in its hangingwall. We examine 17 serial sections across these palaeoshorelines, map palaeoshorelines along strike and provide new 36Cl cosmogenic exposure ages to constrain palaeoshorelines' ages. We exploit the fact that (a) preservation of lithophagid borings in limestones from wave-cut platforms proves minimal erosion facilitating 36Cl dating, and (b) that sea-level highstands not evenly spaced in time will produce palaeoshorelines that are not evenly-spaced in elevation given a constant uplift rate. This allows us to develop a synchronous correlation method for palaeoshoreline age determination supported by absolute ages. Palaeoshorelines are tilted along the strike of the segmented faults due to displacement gradients. We have dated palaeoshorelines to 76, 100 and 125 ka sea-level highstands. Together these show that differential uplift values exist along strike of the hangingwall and also over the tip and along an adjacent footwall which has been uplifted by a combination of upper plate faults and subduction-related activity. The data also allow us to infer the ages of undated footwall palaeoshorelines, with inferred ages back to 500-900 ka, to derive slip-rates across the SCCF. Uplift rates for both the hangingwall of the SCCF and the adjacent footwall vary significantly but can be shown to have been temporally constant throughout the Late Quaternary. We discuss this in terms of the complexity uplift in the upper-plate of subduction systems.