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A long-term rock uplift rate for eastern Crete from exposure dating of marine terraces

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Abstract

The island of Crete in the forearc of the Hellenic subduction zone has a rugged topography with a relief exceeding 2 km. Rock uplift rates of 2-4 mm/a were estimated previously from raised Late Holocene shorelines (Lambeck, 1995) but may not be representative on longer timescales, because earthquakes with up to 9 m of coseismic uplift have recently affected Crete (Stiros, 2001). Here we use marine terraces near Kato Zakros to quantify the long-term rock uplift rate for eastern Crete. Our field investigations and topographic profiles document a flight of at least 15 marine bedrock terraces carved into limestone bedrock. Age constraints for the terraces were obtained by ^{36}Cl exposure dating of bedrock samples and ^{10}Be dating of sandstone cobbles found on some terraces. Our results suggest that the terraces T4 and T5 at elevations of 68 and 76 m, respectively, formed during sea level highstands associated with marine isotope stage 5e, i.e. $\sim$125 ka ago. Correlating the other terraces (T1 to T11) to a sea-level curve for the Red Sea (Siddall et al., 2003) indicates an uplift rate of 0.5-0.6 mm/a during the last 400 ka; significantly lower than previous estimates based on the elevation of Late Holocene shorelines.

References

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