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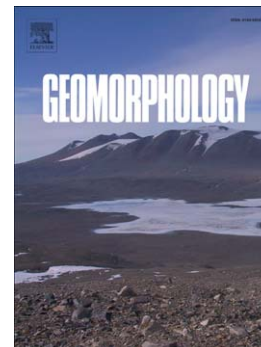
Decadal-scale coastal cliff retreat in southern and central California

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## Decadal-scale coastal cliff retreat in southern and central California

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Airborne LiDAR data collected in 1998 and 2009-2010 were used to measure coastal cliff erosion and retreat between the Mexico/California border and Bodega Head, California. Cliff erosion was detected along 44% of the 595 km of shoreline evaluated, while the remaining cliffs were relatively stable. The mean cliff top retreat rate was 0.12 m/yr, while mean retreat averaged over the entire cliff face was 0.04 m/yr. The maximum cliff top and face retreat rates were 4.2 and 3.8 m/yr, respectively. Historical (~1930's to 1998) and recent retreat rates were significantly inversely correlated for areas with large historical or recent cliff retreat, such that locations with elevated historical retreat had low levels of recent retreat and locations with elevated recent retreat were preceded by low rates of historical retreat. The strength of this inverse correlation increased with cliff change magnitudes up to  $r^2$  of 0.91 for cliff top retreat rates greater than 2.9 m/yr. Mean recent retreat rates were 48-74% lower than mean historical retreat rates. Although beaches can protect cliffs against wave-driven erosion, cliffs fronted by beaches retreated 49% more than cliffs without beaches. On average, unarmored cliff faces

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