LATEST PLEISTOCENE SLIP RATES ALONG THE SAN BERNARDINO STRAND OF THE SAN ANDREAS FAULT

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Preliminary results from three sites along the San Bernardino strand of the San Andreas fault suggest that the latest Pleistocene slip rate decreases southeastward from a previously published rate of ~ 25 mm/yr in Cajon Pass to a rate in the mid-teens (mm/yr) at two sites along the central portion of the San Bernardino strand.

At Plunge Creek, the slip rate is measured from the correlation of a southeast-facing truncated channel edge southwest of the fault with a southeast-facing terrace riser northeast of the fault. The two landforms are separated 270 m from each other along the fault. Three radiocarbon dates on detrital charcoal from the base of the colluvial wedge on the incised terrace constrain the age of initial incision of the riser to ~ 32 ka. (A fourth date is slightly older). The upstream channel may have initially incised farther southeast than its present location followed by widening of the channel over time. The maximum possible offset since initial incision is 540 m. Using a trapezoidal-shaped probability density function for the offset, with a plateau from 270-500 m and limiting offsets of 120 m and 540 m yields a slip rate of 11 mm/yr (95% confidence interval [CI] of 4-18 mm/yr).

At Badger Canyon, an alluvial fan offset 110-210 m with an age of ~13.3 ka (OSL) or ~ 14.8 ka (C-14) yields a slip rate of 13 mm/yr (95% CI: 7-20 mm/yr). An older fan offset 300-400 m at the same site yields a slip rate of 14 mm/yr (95% CI:11-18 mm/yr) using the 27.5 ka C-14 age or 18 mm/yr (95% CI: 14-23 mm/yr) using the OSL age of ~ 20 ka. A riser incised into this fan is offset 280 m and yields a slip rate of 13 mm/yr (95% CI: 11.1-17 mm/yr) based on two ~23 ka C-14 dates on detrital charcoal that bracket the age of incision.

These data suggest that slip transfers from the Mojave section of the San Andreas fault to the northern San Jacinto fault zone in the vicinity of Cajon Pass, where the two fault zones parallel each other and are only 2.5 km apart for a distance of ~ 16 km along strike. Within this proposed transfer zone, an offset landslide at Pitman Canyon with a Be-10 age of 33.7 ka on exposed boulders yields a San Andreas fault slip rate of 19 mm/yr (range 13-28 mm/yr). This rate is intermediate between the ~ 25 mm/yr rate a few km to the northwest at Cajon Creek and the rates in the mid-teens (mm/yr) to the southeast at Badger Canyon and Plunge Creek.