

Isochron burial dating of paleosols within the Whitewater Fan, northern Coachella Valley, California

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Remnant alluvial fan surfaces are ubiquitous features across the San Geronio Pass (SGP), distinguished by their perched location 50-150 m above the active channels and dark red, >1.5m thick soil horizons. Their potential utility in constraining long-term slip rates along the southern San Andreas fault is widely recognized, but their age is still debated. This study focuses on one of these surfaces – the upper surface of the Whitewater Fan (aka Whitewater Hill) – which has been uplifted and deformed between the Banning and Garnet Hill strands of the San Andreas Fault in the northern Coachella Valley, CA.

Mapping of the Whitewater Hill area in summer 2015 revealed at least 2 buried paleosols (>70 m below the surficial red soil) defining a long-term record of alluvial fan development. These paleosols can be used as piercing points to develop long-term slip rates along this section of the San Andreas fault system if their ages can be determined. We collected a total of 18 samples from both buried paleosols for cosmogenic ^{10}Be - ^{26}Al isochron burial dating. This technique derives its power from sampling multiple cobbles from a narrow depth range, each of which has experienced the same postburial history. The presence of the paleosols (albeit truncated) indicates unambiguous subaerial exposure and subsequent burial. If each cobble has a different exposure history prior to burial, then the samples will define a line on a plot of ^{26}Al relative to ^{10}Be , with a slope equal to the ratio of the two nuclides at production. Burial shuts off surficial nuclide production and leads to decay of ^{26}Al ($t_{1/2}$ ca. 0.7 My) relative to ^{10}Be ($t_{1/2}$ ca. 1.4 My). This differential decay causes the slope of the line to decrease in a predictable manner with increasing burial age. Since all clasts have experienced the same postburial history, this method is less sensitive to effects of surface deflation than methods using near-surface clasts. Be and Al were extracted at the Purdue Rare Isotope Measurement (PRIME) Lab and analyzed by Accelerator Mass Spectrometry (AMS). A paleosol exposed in the east wall of Whitewater Wash yielded 11 cobbles with enough quartz for analysis, while only 3 of 7 cobbles collected from a paleosol exposed in a small drainage to the west of the main wash yielded enough quartz of high enough purity (low enough total Al concentration) for analyses. Results suggest systematic complexities that are currently being evaluated to shed light on fan depositional processes and ages.