



## **Relationship between surface roughness and age of deposits in debris flow fans, Eastern Owens Valley, CA**

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The episodic nature of debris flows result in deposits of variable ages on the debris flow fan surface. This study maps the variable ages of fan deposits (called geomorphic units here) of four debris flow fans of south-eastern Owens Valley, California, USA from aerial photographs and field surveys. It then assesses the relationships between the age of the deposits, and their surface roughness and particle sizes. The deposits of different ages have different characteristics and are distinguished on the basis of different soil development, varnish accumulation, desert pavement development and surficial topography. The four fans typically have 4 geomorphic units on their surface. Numerical dates of the geomorphic units were obtained with the aid of varnish microlamination dating techniques. High resolution digital elevation data (5 cm planimetric resolution), were generated from a terrestrial laser scanner for each geomorphic unit (16 geomorphic units in total). The elevation data was then used in quantifying surface roughness. Particle sizes were also measured at each geomorphic unit where 50 particles were measured within a rectangular box (1.24 m by 1.00 m). We find that (i) the age of the oldest deposits range from 11,100 to 12,350 years BP (before present), second oldest deposits are around 7300-9500 years BP, third oldest deposits are around 4000 to 6000 years BP and the active deposits are essentially modern to several hundred years old, (ii) the oldest deposits have maximum surface roughness while the youngest deposits have comparatively less surface roughness, (iii) the average particle sizes of the deposits range from 3.15 cm to 22.04 cm with high variability (standard deviation ranging from 2.75 to 10.50) observed in all geomorphic units. Study of relationships between the variables brings out (i) an insignificant relationship between the surface roughness and age of deposits, (ii) an insignificant relationship between particle size variability and age of deposits within fan or between the four fans. It is likely that the differences in surface roughness and particle sizes identified in eastern Owens Valley reflect differences in source location, particle availability, and stored sediment in the feeder channels.