

Topographic Responses to Rapid Uplift and Erosion in the Transverse Ranges, Southern California

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The central Transverse Ranges are largely crystalline basement blocks that appear to have been uplifted and exhumed rapidly over the last several million years, adjacent to the large bend in the San Andreas fault zone in southern California. Maximum elevations reach more than 3000 m in the eastern San Gabriel and southeastern San Bernardino Mountains. Topographic relief and hillslope angles are measurable aspects of the response of the landscape to tectonic and erosional processes, and, in this area, are generally correlated with lithology, uplift rate, and elevation. The steepest slopes are in the highest eastern San Gabriel and southeastern San Bernardino Mountains, but steep slopes also occur along the most of southern margins of both the San Gabriels and San Bernadinos where the Tertiary and Quaternary sedimentary rock units that make up the western San Gabriels, and western Transverse Ranges support only moderate slopes and lower elevations.

Hillslope measurements have been made in the Transverse Ranges from several digital elevation models (DEM) at different spatial scales from 15 m to 270 m. The slope distribution depends strongly on the spatial scale or window size used. Larger window sizes smooth the topography and reduce both the average slope and the slope variance. In this area, the pattern of slopes tends to remain the same at all spatial scales. Slopes at similar scales are highly correlated. The same window size or spatial scale must be used to quantitatively compare slopes measured from different DEM's. The USGS/DMA 3-arc second DEM slopes in this area do not match slopes measured from higher resolution DEM's at a 270 m or smaller scale. The USGS 30-m DEM slopes match slopes from a 5-m grid TOPSAR DEM almost exactly at spatial scales greater than 30 m, and reasonably well at 30 m. Regression between the slopes obtained at different spatial scales allows an empirical estimate of the slope that would be measured at other scales. * Work performed under contract to NASA.

- 1. 1996 Spring Meeting
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