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Patterns of landslide density in the Santa Susanna Mountains, California, in response to strong ground motion during the 1994 Northridge earthquake.

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The 1994 Northridge earthquake (Mw=6.7) triggered more than 4000 landslides in the Santa Susanna Mountains. The western edge of this east-west trending mountain range belt is located 5 km to the north of the earthquake epicentre. In the range, landslides clustered around principal ridges, with the highest failure rates on the north flank. This clustering is due to systematic variations of the ground shaking across the belt, caused by geological and topographic effects on the incoming seismic wave field. In order to study the influence of the range topography on seismic ground motion, we have used a wave-propagation code, based on the impedance operator method, to run simulations along several cross-sections of the mountain belt, assuming a homogeneous substrate. Real seismograms, sampled over a range of 0-6 Hz were used as sources and a geometrical decay of 1/R is assumed to describe the attenuation of seismic waves. Our models predict amplification of the vertical component of seismic surface acceleration along the divide of the Santa Susanna Mountains, and on the north flank, in good agreement with the observed distribution of co-seismic landslides.