

Weathering characteristics within the zone of precariously balanced rocks in Southern California: a probabilistic approach to analyzing corestone-saprock development

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Abstract

The development of dilatational volumetric strain in saprock from plutonic corestone near strike-slip faults, such as the Elsinore and San Jacinto faults in southern California, may be related to ground shaking during earthquakes. The saprock formation process has previously been considered isovolumetric, but we have measured positive volumetric strain at many locations in Southern California. Dilatational strain of saprock is determined by comparison of elemental mass balance relationships and rock density and porosity measurements, through a quantifiable, probabilistic analysis, in order to distinguish the effects of chemical weathering from those of volumetric change. Previous studies have measured dilatational strain in saprock at locations proximal to the Elsinore fault zone. Here, volumetric strain is measured at a series of 4 sites located in the vicinity of precariously balanced rocks, where regions of minimal ground motion acceleration are inferred to exist. This is done in order to establish a background level of volumetric strain for saprock in Southern California. Results indicate a range of 0 to 15% dilatational strain in areas 13 to 16 km from active faults, compared to 26% at a distance of ~3.5 km. These preliminary results suggest a possible correlation between increased volumetric strain in saprock formation and earthquake ground motion from adjacent faults, demanding further study of this potential relationship.