

## Project Abstract

Paleoseismic data, in the form of precariously balanced rocks (PBRs), provide validation of ground motions on the time scale necessary to evaluate CyberShake results and constrain National Seismic Hazard Maps. Investigation by Bell et al. (1998) suggests that PBR shapes and stability have not changed significantly over the last 10,000 years. If true, locations of PBRs constrain the level of ground motions during the Holocene. This important finding warrants investigation by dating additional PBRs. Selection of the most appropriate PBRs for analysis is critical for success. Our goal for 2007 is to identify and date PBRs with the simplest history, greatest significance for validating ground motion, and greatest chance of yielding interpretable age results. In 2006 we identified the most promising PBR sites. In summer 2007 we sampled 4 different PBRs to develop constraints on the length of time they have been precariously balanced, and an understanding of how they became precarious. We sampled three rocks near Perris and one rock near Benton Road. These rocks constrain ground motions from earthquakes on the San Jacinto and Elsinore faults (Brune et al., 2006). Two of the Perris rocks were toppled in conjunction with our sampling to measure their stability (see Purvance et al., 2007). Our sampling strategy was to collect 5-6 samples per PBR: 1 on top, 3 on the sides, 1 on the pedestal, and 1 on the ground surface. The samples will be analyzed for cosmogenic nuclides, with initial efforts focused on the Benton Road PBR and the toppled "Perris3" PBR judged to have the most post exposure modification. We will develop a model of their temporal evolution within the context of landscape exhumation and erosion, lateral erosion and ground motion. Interpretation of dates will be complex. It will be important to date soils for cross-checking of ages. Where permitted, excavations will be made to describe the degree of soil development on the landscape adjacent to the PBR sites. Soils will be described and sampled according to established criteria (Soil Survey Staff, 1951, 1999; Birkeland, 1999). Characterization of soils will allow determination of periods of stability and sedimentation within the adjacent landscape. Degree of soil development will be compared to soil chronosequences in San Timoteo badlands, Anza, and Cajon Pass to provide estimate of soil age. Soils were described in a small, open basin downslope of Perris3 PBR. Degree of soil development was very minimal, suggesting young deposition (less than ~ 5 ka). This site is an open basin, and therefore not ideal to evaluate soil age, but the implication is that erosion of the outcrops has been ongoing. Soils will be described on the broad surface west of Perris PBR sites to provide minimum ages for the duration of the stability of this surface, and establish timing of initial erosion and exhumation of the PBRs. Additional sampling will help to constrain timing of exhumation of Van Buren and Benton Road PBRs. In both places, the PBR is part of an extremely old landscape, with minimal additional deposition.