

Using Precariously Balanced Rocks to Assess Seismic Hazard in the Pajarito Fault System

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Abstract

Precariously balanced rocks, also known as hoodoos act as natural seismometers. Zones of these fragile features sometimes exist in seismically active areas, but studies have shown that they are not present in the vicinity of historically large earthquakes. This suggests that these rocks can effectively be used to put upper bounds on the ground motion that has occurred in these zones during their lifetime. In the Pueblo and Rendija Canyons of the Pajarito fault system located in Northern New Mexico, over 60 precariously balanced rocks were recorded. The presence of dark desert varnish on many of these features suggests that they have been in place for at least thousands of years. A probabilistic assessment of the structural stability of rigid blocks subjected to earthquake motion will allow these rocks to be used for evaluation of the seismic risk near the site of Los Alamos National Lab's new chemistry and metallurgy research building. A MATLAB code was developed to model the response of these features to seismic loading, and a probabilistic failure analysis was performed to understand the usefulness of these features as indicators of low seismic risk as a function of their aspect ratio.