RECONCILING PRECARIOUSLY BALANCED ROCKS WITH LARGE EARTHQUAKES ON THE SAN ANDREAS FAULT SYSTEM IN S. CALIFORNIA

Lisa Grant Ludwig, University of California, Irvine, CA, USA
James N. Brune, University of Nevada, Reno NV , USA

The San Andreas (SA) and San Jacinto (SJ) faults accommodate most of plate boundary motion in southern California near San Bernardino SB), and paleoseismological data show these faults ruptured about once a century for the past several millennia, including a large earthquake in A.D. 1812. The resulting seismic hazard in the city of San Bernardino (Pop. > 200k) is estimated to be very high. However, groups of precariously balanced rocks (PBRs), susceptible to toppling by earthquakes, and usually not found near active faults, exist 7-10 km from the junction of the SA and SJ faults just north of San Bernardino. They have experienced shaking from numerous large surface rupturing earthquakes, including the 1812 earthquake, without being toppled. The survival of these rocks suggests that the junction of the SA and SJ faults, a complex trans-tensional step-over, has consequent relatively low ground motions, and that past ruptures have initiated, stopped at, or passed through this step-over, and that this complex behavior might be the typical rupture pattern for the largest earthquakes on the SA-SJ fault system. The large 1812 M~7.5 historic earthquake, previously interpreted as having ruptured only the SA fault, may have passed from the SA fault onto the SJ fault, explaining both the lack of evidence for rupture on the SA fault near SB (Plunge Creek) and the PBR evidence for lack of intense recent shaking in the region. This example suggests that future development of seismic hazard maps and fault rupture modeling may have to take into account such local complexities, and that PBRs may play an important role in constraining associated ground motion and damage.