Displaced rocks as an indicator of ground motion during the 4 July 2019 M6.4 Ridgecrest earthquake

Fragile geologic features, including rocks or rock formations displaced or toppled during earthquakes, provide insight into spatial extent and intensity of strong ground shaking. This study focuses on displaced rocks, or individual rock clasts displaced and disturbed during the July 4, 2019 M6.4 Ridgecrest, California earthquake. The goal of this study is to use these data as a primary input for models of near-fault strong ground motion. In the fall of 2019, we collected measurements of jumping rocks at 170 sites in orthogonal transects along the southern 8 km portion of rupture. Displaced rocks were identified primarily based on the presence of perishable, empty soil sockets on the nearby ground surface. We developed a rubric and GIS routine to measure, locate, and describe jumping rock measurements in the field. At each measurement site, we recorded clast dimensions, displacement type, magnitude and azimuth, substrate type, slope gradient and aspect, and location relative to the surface rupture trace. With these data, we intend to explore the limits of these perishable data when estimating intensity of ground shaking. We compare the azimuth of rock displacement with that of permanent horizontal displacement along with accounting for the influence of slope aspect and angle. We use the intensity equation developed by Clark (1972) and further employed by Michael et. al (2002). Additional work will focus on the influence of geomorphology on rock displacement.
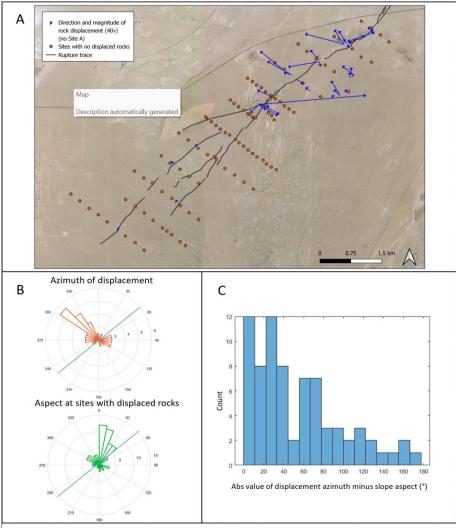

Figure: Displaced rock data from the 2019 **M***6.4 Ridgecrest earthquake. A: Rock motion vectors in mapping area. B: Rose diagrams of rock displacement azimuth and slope aspect at rock measurement sites. C: Histogram of degree difference between displacement direction and slope aspect. Measurements are in sixteen bins.*