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“Fossil earthquakes” found surprisingly abundant in Sierra Nevada

El Cerrito, CA -- Rocks formed only under the extreme heat and friction during earthquakes, called pseudotachylytes, may be more abundant than previously reported, according to new research focused on eight faults found in the Sierra Nevada. Geologists have previously debated whether these rocks are rarely produced based on an apparent absence in the rock record, most likely brought about by the difficulty in identifying them. Only a small fraction of the energy released in an earthquake is consumed by seismic waves, the formation of pseudotachylytes reveals the importance of the heat generated by the earthquake process.

The research will appear in the February issue of the peer-reviewed Bulletin of the Seismological Society of America.

Pseudotachylytes form by frictional melting during co-seismic faulting at significant depths in the crust. They are not easy to identify, requiring evidence that the fault rock has passed through a melt phase. They are generated by frictional heating of the slip surface, the melting of which may account for a significant proportion of energy released during an earthquake.

Past surveys of the Sierra Nevada, which reported an absence of pseudotachylytes, have focused on the geometry and mechanics of the faults rather than the geological details of the rock types and composition. However, the authors of this study report an abundance of pseudotachylytes throughout the area. The pseudotachylytes they describe range from easily identified to impossible to identify from field data alone. The authors suggest further study of pseudotachylytes will ultimately reveal more about energy partitioning during earthquakes.

BSSA: Volume 99:1, “Pseudotachylytes; rarely generated, rarely preserved or rarely reported?”