Multiple Deformation Mechanisms Operating at Seismogenic Depths: Tectonic Pseudotachylyte and Associated Deformation From the Central Sierra Nevada, California

Mitchell R. Prante
Utah State University

James P. Evans
Utah State University

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Multiple deformation mechanisms operating at seismogenic depths: Tectonic pseudotachylyte and associated deformation from the central Sierra Nevada, California

Mitchell Prante and James Evans, Utah State University, Logan, UT

The GLF and GPF zones often exhibit cross-cutting relationships with pseudotachylyte. Cross-cutting relationships between pseudotachylyte and fault rocks are consistent with temperatures between 300-500 °C (Passchier and Trouw, 2005). Pseudotachylyte clasts have been measured and analysis shows that some pseudotachylyte formation occurred post-frictional alteration, suggesting the possibility that some H₂O was present during pseudotachylyte formation.

Conclusions

1) Well preserved tectonic pseudotachylyte from the GLF and GPF provide convincing evidence for ancient seismogenic activity (Kirkpatrick et al., 2008, 2012), and multiple generations of pseudotachylyte in a single sample suggest many multiple earthquakes along the same section of the fault.

2) Clasts in cataclasite and pseudotachylyte have similar ranges in size and shape characteristics.

3) Pseudotachylyte tends to have a lower clast to matrix ratio than cataclasite from the fault zones.

4) Alteration and precipitation of hydrothermal minerals is consistent with temperature conditions between 170-320 °C.

5) Cross-cutting relationships suggest that some pseudotachylyte formation occurred post-hydrothermal alteration, suggesting the possibility that some H₂O was present during pseudotachylyte formation.

6) Crystal-plastic deformation suggests deformation temperatures between 300-500 °C; however, it is not clear if this deformation occurred pre-, syn-, or post pseudotachylyte formation.