Preservation of the Seismic Cycle in a Continental Low-Angle Normal Fault: West Salton Detachment Fault, USA

Mitchell R. Prante  
Utah State University

Susanne U. Janecke  
Utah State University

James P. Evans  
Utah State University

Follow this and additional works at: https://digitalcommons.usu.edu/geology_pres

Part of the Geology Commons

Recommended Citation
Preservation of the seismic cycle from a continental low-angle normal fault: West Salton detachment fault, USA

Mitchell Prante, Susanne Janecke, James Evans, Utah State University, Logan UT

Importance of pseudotachylyte from LANFs
- Tectonic pseudotachylyte (rapidly quenched frictional melt formed during earthquakes) has been documented along faults from a variety of protoliths and tectonic settings (Sibson, 1973; Sibson and Teu, 2006; Lin, 2008; Kirkpatrick et al., 2009; and many others).
- Pseudotachylyte is the only convincing evidence for ancient seismicity from fault zones exhumed from the seismogenic zone (e.g., Cowan, 1999).
- Identification of pseudotachylyte along exhumed LANFs is an effective test of the hypothesis that LANFs are seismically active in the brittle crust.

Field locality and tectonic setting

Evidence for low-angle slip
1) Sub-parallelism between the WSDF and Cretaceous Santa Rosa shear zone (Ct, D) suggests reactivation of low-angle thrust during extension.
2) WSDF cross-cuts Tertiary conglomerate in the hanging wall, at a low-angle (< 30°).

Fault zone model

Conclusions
1) Previous work along the WSDF documents slip at a low-angle (Schultejann, 1984; Axs and Fleischer, 1998; Steely et al., 2000; Dorsey et al., 2012)
2) Well preserved tectonic pseudotachylyte (frictional melt) in the footwall and hanging wall of the WSDF is consistent with seismicity along a LANF (Kairouz et al., 2003; Janecke et al., 2008).
3) Pervasive brittle deformation associated with the WSDF and reworking of pseudotachylyte suggests that melt formed in the brittle crust.
4) Thick accumulations of pseudotachylyte, multiple generations of cataclastic rocks and brittle reworking of pseudotachylyte is consistent with multiple seismic events along the detachment.
5) These conclusions have important implications regarding the seismic potential of LANFs and fault mechanics.