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Coseismic stresses indicated by pseudotachylytes in the Outer Hebrides Fault Zone, UK.

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During the few seconds of earthquake slip, dynamic behaviour is predicted for stress, slip velocity, friction and temperature, amongst other properties. Fault-derived pseudotachylyte is a coseismic frictional melt and provides a unique snapshot of the rupture environment. Exhumation of ancient fault zones to seismogenic depths can reveal the structure and distribution of seismic slip as pseudotachylyte bearing fault planes. An example lies in NW Scotland along the Outer Hebrides Fault Zone (OHFZ) - this long-lived fault zone displays a suite of fault rocks developed under evolving kinematic regimes, including widespread pseudotachylyte veining which is distributed both on and away from the major faults.

This study adds data derived from the OHFZ pseudotachylytes to published datasets from well-constrained fault zones, in order to explore the use of existing methodologies on more complex faults and to compare the calculated results. Temperature, stress and pressure are calculated from individual fault veins and added to existing datasets. The results pose questions on the physical meaning of the derived trends, the distribution of seismic energy release across scattered cm-scale faults and the range of earthquake magnitudes calculated from faults across any given fault zone.