Geophysical Research Abstracts
Vol. 12, EGU2010-6873, 2010
EGU General Assembly 2010

Microstructures from the San Andreas Fault Observatory at Depth (SAFOD) Phase 3 Cores

Joseph Clancy White (1) and Lori A. Kennedy (2)

(1) Department of Geology, University of New Brunswick, Fredericton, Canada (clancy@unb.ca), (2) Department of Earth and Ocean Sciences, University of British Columbia, Vancouver, Canada (lkennedy@eos.ubc.ca)

Core retrieved from SAFOD Phase 3 drilling has been examined in three locations: (1) with the Salinian Terrane near its contact with the presumed Great Valley sequence (Hole E-Run 1-Section 4 & 6); (2) proximal to the '10480' fault zone with which are associated casing deformation and seismic aftershocks indicative of active faulting (Hole G-Run-1-Section 2 & Hole G-Run 2-Section 3); and (3) adjacent to the '10830' fault zone in the centre of the damage zone identified in Phase 2 drilling (Hole G-Run 4-Section 2). The sampling locations translate to an across-strike distance from outside the damage to its centre of approximately 125 metres, and a change in current depth from 2610 m to 2685m. The Salinian Terrane material (E14, E16) comprises coarse-grained quartz and perthitic feldspar clasts that locally form slightly foliated cataclasite. The matrix is commonly chloritic with very fine-grained aggregates and zones of quartz and/or feldspar. There are both corroded clasts, particularly of quartz, and globular infillings of calcite with sutured contacts. Foliated siltstone-shale cataclasites (G12, G23) at the edge of the damage zone close to the '10480' fault zone exhibit brecciation and cataclasis at different scales; deformation is episodic as there are distinct overprinting relationships. The fine-grained matrix exhibits a strong SPO of phyllosilicates and cryptocrystalline quartz (<5μm). The quartz is introduced as fine stringer veins that are progressively incorporated into the overall fabric. Similar thing calcite veins form parallel to the cataclastic foliation, suggestive of fault parallel hydraulic fracture. Coarser grained phyllosilicate zones develop C-S type fabrics with dextral displacement sense. Oxidation within deformation bands is variable, though very well developed in the late, coarse fragment cataclasites. The latter zones can exhibit well-rounded clasts separated by thin foliae of a pressure solution foliation. Sheared siltstone/sandstone from within central portion of the damage zone approximately 7m across strike from the '10830' fault zone extensive evidence of fluid-rock interaction. Grains commonly have overgrowths, and there are well-developed pressure solution foliae. Quartz grains commonly 'float' in a calcite matrix. The fine-grained matrix itself has a strong foliation. The optical microstructures described here are examined in detail by electron microscopy.