

Field Forum Report

Tectonic Significance of Vertical Boundaries in the Cordillera

McCall, Idaho, USA

30 July–5 August 2006

Conveners:

Scott Giorgis, Department of Geosciences, SUNY–Geneseo, 1 College Circle, Geneseo, New York 14454, USA, giorgis@geneseo.edu

Basil Tikoff, Department of Geology and Geophysics, University of Wisconsin, Madison, Wisconsin 53706, USA, basil@geology.wisc.edu

William McClelland, Department of Geological Sciences, University of Idaho, Moscow, Idaho 83844-3022, USA, wmcclell@uidaho.edu

This GSA Field Forum gathered 27 geologists to examine a well-exposed, easily accessible vertical boundary in the Cordillera: the western Idaho shear zone (WISZ) near McCall, Idaho. The University of Idaho Field Campus in McCall, Idaho, hosted the field forum that ran from 30 July to 5 August 2006.

The conveners' opening presentations gave a broad overview of the tectonic history, general rock types, and goals of the conference. The next day, participants concentrated on the field evidence for transpressional kinematics, high contractional strains, and the Late Cretaceous timing of deformation within the WISZ. Discussion on the outcrop focused on ambiguities associated with constraining fabric or deformation age and a comparison of lithologies and structures observed in the McCall area with other areas along strike in the shear zone.

The third day began with presentations by participants with expertise in the region. Talks included mapping in Idaho, the accreted terranes west of the WISZ, the nature of the WISZ in the Salmon River gorge, and events in western Idaho geologic history that preceded movement on the WISZ as recorded north and west of McCall. These presentations gave a broader context to the rocks and relationships examined during the field conference. Field stops in the afternoon illuminated the scope of neotectonic extensional deformation and its effects on the orientation of preexisting structures. Discussion centered on the active nature of extensional faulting in Idaho.

The morning of day four was devoted to presentations by the participants concerned with vertical boundaries elsewhere

in the Cordillera (Peninsular Range shear zone and the western Nevada shear zone) and worldwide. Although similarities exist between these vertical boundaries—most are zones of high strain that record contractional to transpressional deformation—there is large variation in their tectonic interpretations. An afternoon hike into the Hazard Creek Complex, the westernmost granitic complex that intrudes the edge of the accreted terranes, sparked debate centered on the kinematics and timing of the deformation recorded by the fabrics in the Complex.

Day five began with several talks concerning new methods for analyzing fault zones. In the late morning, the group arrived at the outcrop to examine the youngest unit to intrude the WISZ: the Payette River tonalite. Exposures of high-strain tonalite were compared to the low-strain portions that preserve magmatic fabrics. Discussions on the outcrop ranged from the uncertainties associated with vorticity analysis of the Payette River tonalite to the relationship between movement on the WISZ and emplacement of the Idaho Batholith.

On the last day, the group completed a traverse of an exposed portion of the shear zone near Snowbank Mountain, ~40 miles south of McCall. The views toward Oregon encouraged participants to discuss the relationship of the WISZ in the larger context of the North American Cordilleran orogenic belt. In general, the structural style of the shear zone was relatively constant along strike, although there was some variation in lithology.

A final evening session included discussion about Idaho tectonics and about vertical boundaries in general, as well as some directions for future research. Participants agreed that the Salmon River suture zone should refer to the area of western Idaho that marks the collision of accreted terranes with North America. The WISZ, in contrast, is a mid-Cretaceous shear zone within the larger suture zone. Participants also agreed that the WISZ is a transpressional structure, which apparently records a large contractional component. Issues still needing resolution are the amount of contraction versus strike-slip recorded by the shear zone, the effect of preexisting architecture controlling the current vertical geometry, whether an earlier (strike-slip) history occurred in the region, the relationship of magma intrusion and/or transfer to deformation, and the along-strike variations and intersection of other shear zones in the WISZ. These issues are equally applicable to other vertical boundaries both within and outside the North American Cordillera. Another major issue was the role of reactivation: When and why are these zones reactivated? Vertical structural boundaries in the lithosphere that do not exclusively record strike-slip motion occur in many locations, yet are not well understood. Moreover, although vertical boundaries often occur within magmatic arcs in the North American Cordillera, they occur in other tectonic settings as well. While the field forum allowed discussion of the formation, reactivation, and tectonic significance of these structures, further work is still needed to fully understand these enigmatic structures.

Participants: Bryn Benford, Dave Blake, Kenneth Brown, Clay Conway, Keith Gray, Eric Horsman, Zeshan Ismat, Kim Johnson, Dan Jones, Richard Jones, Baird King, Todd LaMaskin, Reed Lewis, Paul Link, Karen Lund, Cathryn A. Manduca, Matthew Mookerjee, Keegan Schmidt, Josh Schwartz, Art Snoke, Caleb Stroup, Sarah Titus, Markos Tranos, and Sandra Wyld.

