

FIELD FORUM REPORT

Structure and Neotectonic Evolution of Northern Owens Valley and the Volcanic Tableland, California

13–19 September 2009 • Bishop, California, USA

CONVENERS:

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This GSA Field Forum was held in Bishop, California, and the surrounding regions of northern Owens Valley, USA, on 13–19 September 2009. Owens Valley is one of the most tectonically active transtensional basins in the United States. Superb exposure, rapid deformation, and the presence of the ca. 758,000 year old Bishop Tuff as a key marker horizon make this an ideal area for investigating the structure and neotectonic evolution of an actively forming, continental transtensional basin. Moreover, the distributed nature of faulting, particularly in the exposure of Bishop Tuff, known as the Volcanic Tableland, makes this an ideal natural laboratory for studies of fault growth, scaling, interaction, and linkage. The past two decades have seen a virtual explosion of this research, and lessons from northern Owens Valley have proven relevant to other evolving fault populations around the world.

We organized this Field Forum to gather investigators from diverse disciplines to share results and explore the relationships between long-term deformation, geodetic measurements, seismicity, fault growth and interaction, geochronology, and extensional and transtensional basin development. Our goals for the field forum were to (1) consolidate recent research in northern Owens Valley, (2) elevate the level of understanding of the structure and neotectonics of northern Owens Valley and the Eastern California shear zone–Walker Lane region, (3) foster collaboration between researchers working in the area and elsewhere, and (4) spark new ideas and stimulate new investigations.

The overall approach of the forum was to begin in an area where fundamental processes of fault evolution are easily elucidated. Therefore, we chose to focus first on the extensional faulting across the Volcanic Tableland, where displacement distributions along faults are well preserved. General concepts of fault growth, interaction, and linkage provided the underlying framework for discussion of large evolving fault systems.

The first and last days of the week were reserved for travel to and from eastern California. Thus, a total of 5 full days were spent in the field.

The general itinerary for the Field Forum is summarized as follows:

- **Monday began with a general overview** of the regional fault architecture of the northern Owens Valley from an overlook on the side of the valley west of Bishop. We then headed toward the Volcanic Tableland. By visiting key exposures at the lower end of the Owens River Gorge, the group was introduced to the eruptive and emplacement processes of the Bishop Tuff and the collapse of Long Valley caldera. Fault zone deformation was then examined in cross section along an exposure of tuff and volcanoclastic sedimentary strata known as Chalk Bluff.
- **On Tuesday**, we proceeded onto the plateau area of Volcanic Tableland to examine along-strike displacement distributions. This included a discussion of the various studies that have utilized faults exposed here for determining displacement-length scaling relations and unraveling patterns of fault interaction and linkage. The day concluded with travel around the Tableland to look at typical displacement gradients across a range of fault scales and spatial patterns. From the vantage point of the Tableland, we viewed and discussed larger nearby fault systems, such as the Fish Slough fault and the White Mountains fault along the eastern margin of Owens Valley.
- **Wednesday morning** was spent following an incised Pleistocene channel across overlapping faults and up a relay ramp; we were able to unravel the relative timing of activity on the faults and relate channel slope and fault-related knickpoints to the evolution of fault linkage. In the afternoon, we traveled east to the White Mountains fault and looked at evidence of normal and oblique (right-lateral) slip, and discussed temporal variations in the kinematics and rate of faulting there.
- **On Thursday morning** we looked at a succession of terraces along the Owens River, south of the Volcanic Tableland. An assessment of distributed strain was made by summing fault displacements across these post-Bishop Tuff geomorphic surfaces. The remainder of the day focused on the Round Valley fault, which marks the western margin of Owens Valley and is a major segment of the Sierra Nevada frontal fault system. We looked at localities in the vicinity of Pine Creek and Elderberry Canyon and had a lively discussion about constraining the dip of this important range-front system.
- **Friday was our last field day.** From Bishop, we headed south to the area surrounding the Big Pine volcanic field. In

the Red Mountain area, we looked at displacements of several volcanic units, including Fish Springs cinder cone, and discussed the strain budget for northern Owens Valley. We concluded the Field Forum by visiting the Poverty Hills, which has been interpreted as either a manifestation of a restraining bend along the Owens Valley fault or a landslide block derived from Inyo Range.

The Field Forum benefited from having a diverse group of participants, which included researchers from academia, industry, and federal agencies. Students, both graduate and undergraduate, played an active role and contributed greatly. In addition to the discussions held in the field, many of the participants shared results of their research via evening poster sessions and short talks. The exchange of ideas and the recognition of the different perspectives of the geomorphologists, volcanologists, geochronologists, geophysicists, and structural geologists attending the forum were particularly instructive. The overarching goals of the Field Forum were achieved, and several specific remaining issues were identified for further study.

A special issue of the GSA journal *Lithosphere* titled "Structure and Neotectonic Evolution of Northern Owens Valley and the Volcanic Tableland, California" is in preparation. The special issue is being developed following a new model whereby accepted articles are published in regular journal issues as they are completed. The papers are designated as special issue

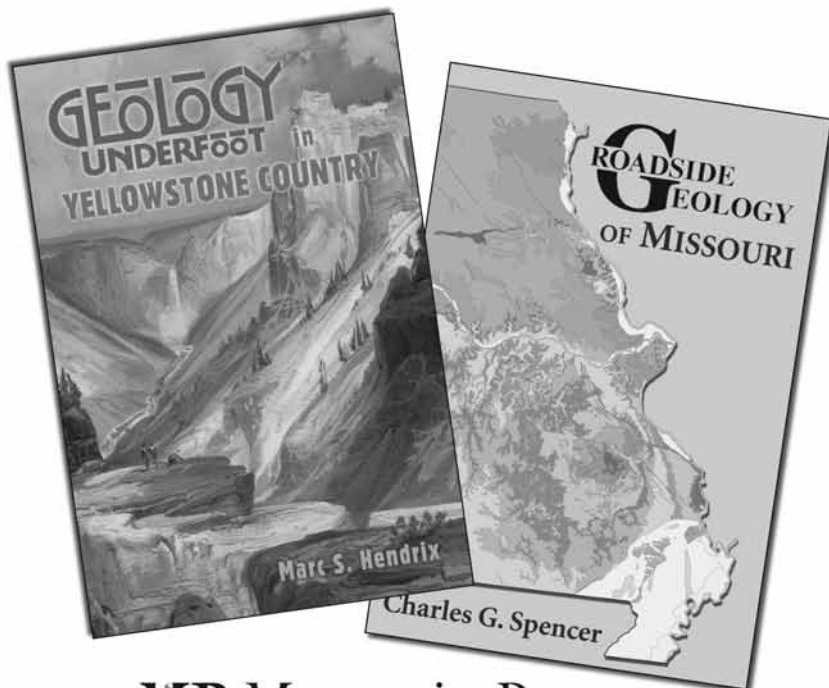
papers when they are published and will be assembled into an online special issue.

Acknowledgments: The University of California White Mountain Research Station provided a venue for evening discussions and presentations.



Participants: Guleed Ali (15), Callan Bentley (7), Kim Bishop (11), Douglas Burbank (17), Nancye Dawers (3), David Ferrill (24), Kurt Frankel (8), Douglas Goff (13), Wes Hildreth (14), Simon Kattenhorn (19), Eric Kirby (5), Jeff Lee (9), Peter Lovely (12), Lisa Majkowski (18), Margaret Mangan (10), Alan Morris (2), Thomas Neely (21), Fred Phillips (23), Robert Phinney (20), Jeffrey Schaffer (1), Gregor Schoenborn (6), Dave Stockton (22), Markos Tranos (16), John Weber (4).

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