2011 Annual Meeting & Exposition poster included with this issue!

VOL. 20, No. 12

A PUBLICATION OF THE GEOLOGICAL SOCIETY OF AMERICA

DECEMBER 2010

Geoinformatics: Transforming data to knowledge for geosciences

Inside:

- Call for Proposals: 2011 Geological Society of America Annual Meeting & Exposition, p. 12
- Penrose Conference Report: Origin and Uplift of the Sierra Nevada, California, USA, p. 18
- First Announcement and Call for Papers: 2011 GSA South-Central Section Meeting, p. 24
- Second Announcement: 2011 Joint Meeting of GSA's North-Central and Northeastern Sections, p. 26



Origin and Uplift of the Sierra Nevada, California, USA

Bridgeport, California, USA 15–20 August 2010

CONVENERS

Cathy J. Busby, Dept. of Earth Science, University of California, Santa Barbara, California 93106, USA

Keith Putirka, Dept. of Earth and Environmental Sciences, California State University, 2345 E. San Ramon Ave., MS/ MH24, Fresno, California, 93720, USA

The Sierra Nevada is an important natural laboratory for understanding a disparate array of geologic processes, including plate tectonics and associated range uplift, volcanic activity, changes in regional climate, and the assembly of plutons and batholiths. Data derived from these seemingly disparate research areas are wholly interrelated. For example, the paleodepths of pluton intrusion or roof pendant metamorphism inform estimates of the magnitude of Cenozoic range uplift, as do the timing and composition of Miocene and Pliocene volcanic rocks. Similarly, paleoclimate models are important for understanding rates of downcutting of the modern canyons that cross the Sierra Nevada. Successful models of uplift, climate change, downcutting history, and regional volcanism must explain or be consistent with geophysical observations of the crust and lithosphere as well as the age and composition of the basement rocks.

This Penrose Conference brought together researchers with a wide range of interests, including geophysics, active tectonics, structural geology, volcanism, geochemistry, batholith emplacement, stratigraphy and sedimentology, paleobotany, geomorphology, geochronology, and thermochronology, with the goal of defining clearer paths of research and potential avenues of collaboration. Much of the discussion focused on the Sierra Nevada, including (1) the nature and origin of bedrock geology; (2) geophysical observations of the crust and lithosphere; (3) geomorphologic, paleontologic, and isotopic data and theoretical models related to range uplift; and (4) volcanism and potential links to tectonic events. However, a large part of the discussion dealt with a much broader context, starting with the entire western United States and Mexico and its Pacific plate margin, and narrowing to the Great Basin and, in particular, transtensional rifting in the Walker Lane belt (Eastern California shear zone) and the Gulf of California. After all, the origin and uplift of the Sierra Nevada cannot be evaluated without debating models, for example, of (1) Laramide flat-slab–Shatsky conjugate subduction and the existence/nature of the "Nevadaplano"; (2) Paleogene slab rollback, ignimbrite flare-up, and burning of the lithospheric landbridge across what is now the Great Basin; and (3) the relative importance of edge-driven (San Andreas) versus bottom-driven (mantle flow) controls on extension, transtension, and vertical motions.

The importance of the Sierra Nevada–Walker Lane region cannot be overemphasized for understanding the processes involved in the rupturing of continental lithosphere. This is a classic plate tectonic region, from which many important concepts have developed and been exported to other parts of the world. Furthermore, the region is important for geothermal and mineral resources and has a population living on active faults (e.g., Reno–Carson City population corridor, as well as newly discovered faults in the very popular North Tahoe basin).

For all of these reasons and as a result of this conference, we are soliciting papers for a special *Geosphere* issue titled "Origin of the Sierra Nevada and Walker Lane" (to be guest edited by Keith Putirka and Cathy Busby; manuscript dead-line: 15 Jan. 2011). To the extent that work in adjacent regions is relevant, we further welcome papers related to the evolution of Baja California, the Basin and Range, and the southern Cascades across a range of disciplines, including, but not limited to, field studies, geophysics, paleobotany, petrology, and geochemistry.

Conference Details

This Penrose Conference took place 15–20 August 2010 in Bridgeport, California (population 836, elevation 6,468 ft), USA, about 25 miles north of Mono Lake. The conference kicked off with posters and a welcome party on Sunday, included two days of field trips, and ended at 1 p.m. on Friday, in time for an optional, informal post-meeting field trip.

Nine of the 31 speakers were women, and 20 out of the 68 participants were "youngsters" (under the age of 40 years), including 12 students and four postdoctoral researchers. Convener Keith Putirka compiled an abstract volume, which he distributed to the participants both digitally and in print. The captive audience was never a thirsty one, thanks to the organizing efforts of student participant Chad Carlson, under the mentorship of John Wakabayshi, and this facilitated many hours of spirited debates over posters, extending until midnight on most evenings. The 37 poster presenters each gave a 3-minute "pitch" to the group (with summary slide) on the first day, and we scheduled 15 minutes of discussion for every 25-minute talk, as well as interspersed group discussion sessions. These group discussions mainly focused on (1) regional and Sierran geophysics, Sierran tectonics, and regional magmatism; (2) the Walker Lane-Eastern California Shear Zone-Northern Basin and Range: Future work with GeoPRISMS?;



Participants at Mono Lake; photo by Robert Hildebrand.

and (3) erosion, the sedimentary record, active tectonics, and landscape evolution.

Field Trips

Convener Cathy Busby compiled and edited a 68-page informal field guide, using text, figures, and references made by the following trip leaders: Graham Andrews, Cathy Busby, Chad Carlson, Jeanette Hagan, Christopher Henry, Angela Jayko, David John, Bruce Pauly, Christopher Pluhar, Keith Putirka, and David Wagner.

On Tuesday, the group hiked the Sierra Nevada crest at Sonora Pass, examining the ca. 10.5 Ma landslide and "andesite flood lava" fill of the newly recognized Sierra Crest graben (Busby, Hagan, Wagner, and Andrews), and the group was introduced to the magnetostratigraphy and chemistry of these distinctive lava flows (Pluhar and Putirka). In the early afternoon, Henry led us to a Sierran paleochannel filled with Oligocene ignimbrites erupted in central Nevada for discussions of paleolandscapes and the nature of the "Nevadaplano." At the end of the day, we examined Sierran range-front faults and discussed their controls on ca. 11–9 Ma high-K arc volcanism within a pullapart basin that shows paleomagnetic evidence for dextral vertical axis rotations (Busby, Putirka, Pluhar, and Hagan). This indicates that transtensional rifting was in full swing in this region by 11 Ma.

On Thursday, Pluhar and Carlson showed us the distinctive eruptive products of the Little Walker caldera and demonstrated further paleomagnetic evidence of dextral block rotations of these widespread strata within the Walker Lane belt. Most of the afternoon, led by John, was spent in the large, longlived Miocene magmatic center of the famous Bodie and Aurora gold and silver mining district. The day ended with views and discussions of the Mono Basin–Long Valley areas, including volcanism, structure, landscapes, and climate change (Jayko and Pauly).

Presentations

Space does not permit a summary of all of the talks and posters, and we expect that many of the results presented at the meeting will appear in the special issue of *Geosphere*. Instead, we highlight some of the controversies and questions raised.

The legacy of subduction was debated on the big-picture scale, including the fate of the purported subducted Shatsky Rise conjugate (now below the eastern seaboard, or under Wyoming?) and the nature of the upper plate damage zone left in its wake. The nature, thickness, and evolution of the crust under the Sierra Nevada, Great Valley, and Great Basin were also debated at length. New geophysical imaging of the Cretaceous Sierra Nevada batholith suggests that a mafic residue remains only under the western foothills, and a "delamination Moho" extends as far north as Lake Tahoe (meaning that the crust rests on asthenosphere); does this indicate root removal under the entire eastern Sierra, similar to that proposed for the southern Sierra-Isabella anomaly, or did it never exist there, as suggested by xenolith studies on Cenozoic volcanic rocks? When and how did delamination (or lithosphere thinning) occur in the central and northern Sierra Nevada? Petrologic and geologic arguments were made for a wide variety of controls on Cenozoic magmatism, including "Ancestral Cascades arc" subduction, the onset of transtensional rifting, the migration of the Mendocino triple junction, and lithosphere degradation through root removal versus extension.

A series of presentations focused on the importance of Sierra Nevada microplate as a natural laboratory for collecting "real-time" data on an active rift, including GPS coverage, earthquake data, microseismicity and strain field analysis, and heat flow data. Advances in studies of active tectonics were also highlighted, including LiDAR imaging and surface dating, combined with detailed mapping and trenching of active faults; furthermore, the rich Quaternary stratigraphic and structural record of the lacustrine rift basins was demonstrated by geophysical imaging from boats and compared with the marine record in the Gulf of California. All attendees agreed on the importance of gaining a better time-integrated view of tectonic processes along the "future plate boundary" through studies of the stratigraphic and structural architecture of Neogene basins. These basins are poorly known, perhaps in part due to inadequate funding for fieldbased studies relative to instrumentation-based studies, but also due to the fact that volcanic stratigraphy is a relatively new and rapidly evolving field. Knowledge of volcanic stratigraphy and structure is also important for geothermal exploration, and the role of fluids and volatiles in the development of the rift was identified as a topic deserving further investigation.

Concluding Remarks

We were very pleased with the commitment all the participants showed by arriving at the very beginning of the conference and staying until the very last hour, especially because this was a conference nearly everyone drove to, so "playing hooky" would have been easy. We felt the discussions were very lively and highly inclusive; we believe that a spirit of collaboration was fostered by the meeting. Everyone agreed that the time is ripe to mount a large, multi-investigator collaboration across a wide range of disciplines in order to understand this developing plate margin and its larger context. Several of us are now involved in exploring this possibility under the umbrella of the U.S. National Science Foundation MARGINS/GeoPRISMS Rift Initiation and Evolution initiative.

Participants: Colin Amos, Graham Andrews, George Bergantz, Glen Biasi, Elwood Brooks, Cathy Busby, Lesley Butcher, Dante Canil, Wenrong Cao, Chad Carlson, Patricia Cashman, Elizabeth Cassel, Robinson Cecil, Alan Chapman, Diane Clemens-Knott, Joseph Colgan, Michael Cosca, Brian Cousens, Diane Erwin, James Faulds, Jay Goldfarb, Bernard Guest, Jeanette Hagan, William Hammond, Christopher Henry, Robert Hildebrand, Nicholas Hinz, William Hirt, Ann Hislop, Eugene Humphreys, Raymond Ingersoll, Angela Jayko, David John, Craig Jones, Christopher Kemp, Graham Kent, Lenny Kouwenberg, John Lee, John Louie, Elizabeth Lovelock, Stephen Martel, Devin McPhillips, Valbone Memeti, Elizabeth Miller, Eldridge Moores, Elisabeth Nadin, Ian Norton, Bruce Pauly, Bill Peppin, Fred Phillips, Christopher Pluhar, Keith Putirka, Paul Riley, Charles Rogers, Jason Saleeby, Zorka Saleeby, Brandon Schmandt, Christopher Slack, Kenneth Smith, Greg Stock, Arthur Sylvester, James Trexler, Nicholas Van Buer, David Wagner, John Wakabayashi, Brian Wernicke, George Zandt.

Stable & Cosmogenic Isotope science

ine inside

Isotopes are the key to knowledge about our past, present and our future. Our isotope analysis services can help you untook the answers to ecological, geological and environmental history.

We provide carbon, nitrogen, supplur, oxygen and hydrogen stable isotope analysis, "Be, "AI, "Cs and "Pb dating, and other **discounts** for volume submissions.

Cur analysis is backed by world-leading scientists whose research spans climate, environmental protection and sustainability, geology, and hydrocarbons, and is supported by expert technicians.

Contact Us

To intervision about benefiting from the experiment of the ONE Science Stable tompe Laboratory and Patter Radiocarbon Laboratory please shall

www.gns.cri.nz/nic/stableisotopes www.rafterradiocarbon.co.nz

or Email us at:

stableisotopes@gns.cri.nz radiocarbon@gns.cri.nz

unlock a moment in time

Rafter Radiocarbon dating services

When you seek knowledge of "a rooment et time" Rafter Radiocarbon can provide the answers. We offer world-leading research scientists whose research spans. climate, environmental protection and sustainability, archiesology, and geology, supported by expert technicians and moders equipment including a **new AMS**. We have worked with clients world-wide for over 50 years and we are a regular participant in the international Radiocarbon intercompanisons.

Contact us for a FREE consultation on applicability and sampling

Location

National lootope Centre 30 Gradefield Foad Lower Hult 5010 PO Box 31312 Lower Hult 5040 New Zenizod T +68-4-570 1444 F +04-4-570 4657

