Coso Geothermal System Field Trip Announcement

This trip affords a great, rare opportunity for access to the China Lake facility to examine geological and operational features of the second-largest geothermal field in the U.S. Not only are there fascinating features on-base, but the surrounding area on the eastern flank of the Sierra has some great geology and scenery. Likely additional stops include Red Rock Canyon State Park. Because of the distance (about 7 hours each way), we need to make this a three-day trip. Traveling by van, we plan to leave Friday at 7:30 am from the East Bay, drive down the Central Valley and cross over the Tehachapis into the Mojave, then northeast toward China Lake. We'll arrive at Red Rock Canyon at 3:30 or 4 on Friday afternoon, giving us a chance for some geologizing and/or hiking.

There are two options for overnight accommodations: camping at Red Rock Canyon State Park, or motels in Ridgecrest, just outside of China Lake. The weather at the end of March should be fine for camping.

Saturday will be spent on the China Lake Naval Air Station with our trip leader, Andrew Sabin, Ph.D. (Colorado School of Mines), soon to be director of the geothermal program at China Lake. Additional information on geothermal and geological features is presented in the attached announcement, and in greater detail in the following link: www.geothermal.org/articles/coso.pdf

On Sunday we will spend most of the morning examining other geological features of interest in the area (e.g., Fossil Falls a few miles north of China Lake, and a possible stop at Owens Lake). If you have a suggestion for a destination that could be done in several hours or less on Sunday, please indicate so in your response. We will leave at about noon on Sunday; in time to get back to the Bay Area by about 7 pm. Logistics are somewhat complex for this trip and will require advanced planning. **As a result, we would like to have email responses from all who are interested by February 25, 2008.** Payment is not necessary at this time. The Coso Geothermal Field is in the central Coso Range, which is situated in the southwestern Basin and Range physiographic province. The region is bounded by the Walker Lane on the northeast, the Garlock fault on the south, and the Sierra Nevada Range on the west. The site is approximately 160 miles north-northeast of Los Angeles, in a highly active seismic zone along the eastern margin of the Sierra Nevada. The Coso Range is within the Eastern California Shear Zone, an elongate area of oblique extension parallel to the San Andreas Fault. Along with the adjoining Walker Lane that extends into western Nevada, this zone accommodates about 20% of the interplate movement between the Pacific and North American plates.

A variety of geologic features are present, and likely stops include rhyolite domes with ash-flow fallout; explosion craters (maars) filled with later domes; hot springs, mud pots, and fumaroles; a mercury prospect with interesting alteration features; an archeological stop at an obsidian quarry; and advanced argillic alteration at Devils Kitchen, where rhyolite tuff is altered to clay and Hg minerals (alteration water is assessed to have been highly acidic, with pH ~ 2).

The Coso Geothermal Field is located within the China Lake Naval Air Weapons Station (NAWS), the third-largest operating geothermal field in the U.S. It has a capacity of 270 MW, powered by nine 30-MW turbines in four separate plants. The first plant came on-line in 1987 and the field has been operating continuously since that time.

The geothermal field is principally a liquid-dominated system. High fluid temperatures (200°-328°C) permit the use of double-flash technology for steam extraction. Production fluids are moderately saline chloride brines with total dissolved solids ranging from 7,000 ppm to 18,000 ppm. Non-condensable gases make up six percent of the gas fraction, with 98 percent of that amount being carbon dioxide. Hydrogen sulfide is in the range of <10 ppm to approximately 85 ppm.

Coso is a volcanic-hosted geothermal field. Pleistocene/Holocene rhyolite domes and tuffs form a carapace on top of the Sierran (150 Ma to 80 Ma) granitoid basement. Older intermediate to basalt composition flows and tuffs compose the remaining 88% of this volcanic field. Isotope analysis of the Pleistocene-Holocene rocks show that they have unusually low $^{40}Sr/^{39}Sr$ ratios and unusually high e-neodymium values, suggesting that the rocks

originated from fractional crystallization of an asthenospheric parent rather than from crustal contamination of a mafic parent. The significance of this observation is that sometime in the recent geologic past, there has been underplating of mafic magma derived from asthenospheric material beneath the Coso geothermal area, or mafic dikes derived from asthenospheric magma have been intruded at relatively shallow depths. These “fresh” magmas provide the heat engine for the geothermal resource.

To get entry to the base, names and social security numbers for all field trip participants are required beforehand. (Non-US citizens, if any, will require more information…it’s a military base.) The plan is to leave on Friday morning at approximately 7:30, make one or two stops en route including Red Rocks State Park, camp at Red Rocks (alternatively, motels are available in Ridgecrest, about 30 miles away), meet Saturday morning in Ridgecrest for the day-long field trip, make several short geologic stops on Sunday morning (e.g., Fossil Falls), and drive back to arrive back in the Bay Area by 6 or 7 pm Sunday.