GL03162-2 of 2

# LONG VALLEY
# PRE-DRILLING DATA SYNTHESIS AND REVIEW (PDDR)
# NEWSLETTER
# SEPT – OCT – NOV 1986

**Project Description**

The DOE Geosciences Program under the Office of Basic Energy Sciences and the DOE Geothermal Technology Division (GTD) are jointly supporting an integrated review of all data, including a great deal of new data, from the Long Valley caldera. The work, which began in mid-FY86, is being coordinated by LBL and will lead to a more complete and more accurate geologic model for the caldera to be used as needed in the formulation of drilling plans in the various programs. DOE's interest in drilling is related to both the Continental Scientific Drilling Program (CSDP), and the Magma Energy Program. The U.S. Geological Survey is also actively involved in the review through their many on-going scientific studies under the Earthquake and Volcanic Hazards Program and the agency is a CSDP participant with interests in resources and geological hazards. NSF, through DOSECC, supports CSDP science of all types.

The PDDR will concentrate on the integration of the large amount of existing data some of which has not yet been fully processed/interpreted. The PDDR project will not collect new data, but some new data will be acquired in FY86 and FY87 under a number of other new or continuing projects funded by DOE/BES, DOE/GTD, and the USGS. These data will be incorporated, insofar as possible.

The active participants in the data review have been organized into three study groups: (1) Seismology, (2) Electromagnetic and Potential Field Geophysics, and (3) Geology, Hydrogeology and Geochemistry. Each study group has held one meeting to discuss plans and progress. A second round of study group meetings will be held in

January or February 1987 followed by a major symposium, open to the scientific community, planned for March 17 and 18 in Berkeley.

**Drilling Related Activities**

1. Early in 1986, Unocal Geothermal Division, Santa Rosa, California completed a geothermal exploration hole (well 44-16) in the west moat area, a half mile east of the Inyo Crater Lakes. The results from this hole are on open file at LBL. For more information, contact Norman Goldstein (415-486-5961 or FTS 451-5961). A simplified stratigraphic section is as follows:

| | |
|---|---|
| Moat andesites and basalts | 0–1240′ |
| Early rhyolites (Qer) | 1240–3000′ |
| Bishop Tuff (Qbt) | 3000–3850′ |
| Tertiary volcanics (Tv) | |
| $\sim$ 2 m.y. (K-Ar) | 3850–5360′ |
| Calc-silicate hornfels (Pzms) and subordinate marble and quartzite. | 5360–5900′ TD |

   The highest temperatures, 230 ° C, were encountered in the Qbt. A large temperature reversal of $\sim$ 94 ° C occurs at 4000′ and correlates with a lost circulation zone in the Tv. Temperature reversals have been observed in other Long Valley holes, but none is as pronounced. Members of the Hydrogeology-Geochemistry Study Group are analyzing the data.

2. In a cooperative effort involving LBL, SNL, LANL and the USGS, a fluid sample of close to 1 liter was obtained from the Shady Rest corehole by means of a commercial flow-through, down-hole sampler. Due to the high temperatures in the hole, over 200 ° C, several failures involving O-rings and seals occurred before a sample could finally be collected. The sample is being analyzed at LBL.

3. On the basis of the Shady Rest and Unocal 44-16 results, LBL and USGS are still considering a proposal to DOE/OBES for another hydrogeologic corehole in the west moat area. In September, Hal Wollenberg (LBL) and Mike Sorey (USGS)

discussed with representatives of the California Energy Commission (CEC) the city of Mammoth Lakes and Mono County the possibility of a jointly-funded hole that would serve the purposes of both the DOE program and the CEC-Mammoth Lakes search for a source geothermal water for a district heating system.

### Vertical Deformation Studies

Researchers at LBL have been analyzing the vertical deformation data collected by the U.S. Geological Survey using a variety of numerical techniques. Leveling data from 1982, 1983, 1984 and 1985, relative to 1975, have been inverted by means of an extremal inversion technique, which makes no assumptions regarding the cause of the deformation, and by means of linearized least-squares inversion for dilating volume elements such as rectangular blocks and triaxial ellipsoidal models. Considering the non-uniqueness of the problem, the results from the different analyses are in reasonably good agreement with each other and with earlier studies that assumed inflation of a spherical magma chamber. Extremal inversion places the top of the inflation zone at a depth shallower than 11 km. Least-squares inversions put the top of the source deeper than 5 km, with the sources centered close to 10 km. A paper by Don Vasco on the 1983-1975 deformation appeared recently in the *Journal of Geophysics* (J. Geophys., 1985, v. 57, p. 178–183).

### Recent Meetings

1. The Seismology Study Group met on 26 September at the USGS, Menlo Park to review the status and preliminary results of the on-going studies. A brief report on the meeting was issued to the attendees. A revised meeting report can be obtained by writing or calling Norman Goldstein (415-486-5961 or FTS 451-5961).
2. Steve Park (U.C. Riverside) visited Berkeley on 13–14 November to present a talk on his preliminary 3-D resistivity model developed from the 54 stations of MT data

provided by Chevron. The data indicate a rather shallow, arcuate conductive zone that runs from the west moat into the south moat area. The conductor more-or-less follows highway 395. In one model the top of the conductor match as the conductive Paleozoic metasediments found in the Mammoth #1 hole near Casa Diablo at a depth of 1350 m. Additional 3D models will be run to pin down the shallow conductor and to see whether a deeper conductor may also be present. The resistivity log from the Unocal 44-16 hole may help constrain the MT model.

**Personnel Notes**

1. Edi Kissling returned to Zurich at the beginning of October after a two-month stay at the USGS Menlo Park. Edi completed a 3-D geotomographic inversion of P-wave travel time data using, as his data base, arrivals from over 10,000 local earthquakes around Long Valley.
2. Chris Sanders joined the USGS Menlo Park in early October with a post-doctorate appointment funded in part by DOE. Chris will be analyzing local earthquakes recorded by means of the USGS's 19-station, 3-component arrays between June and early November 1984. Chris will try to confirm and delineate shear wave shadow zones beneath Long Valley.

**Long Valley Symposium**

The Long Valley Caldera Symposium is scheduled 17 and 18th of March 1987 at LBL. Presentations will be given by members of the three study groups, with the focus on integrating and synthesizing the results into models for the present-day caldera. The Symposium will be open to all interested scientists, and notices of the Symposium will be placed in technical news publications.