LONG VALLEY MONITORING PROGRAM

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ON May 27, 1982, the U. S. Geological Survey released a Notice of Potential Volcanic Hazard for the Long Valley-Mono Lake region in eastern California. This hazard notice was based on four principal factors: (1) a history of recent volcanic activity that includes at least six magmatic eruptions in the last 1,000 years, (2) a 35-40 cm uplift of the resurgent dome in the west-central part of Long Valley caldera, (3) recurrent earthquake swarms beneath an area 4-10 km east of the town of Mammoth Lakes, and (4) the identification of new fumarolic activity near Casa Diablo Hot Springs.

With the release of this hazard notice, the U. S. Geological Survey embarked on an intensified program of geophysical and geological monitoring in the Long Valley area. The objectives of this program are to provide (1) short-term (days to weeks) warning of an imminent eruption and (2) a reliable data base for understanding the ongoing tectonic/volcanic processes as a basis for improved long-term assessment of eruption potential.

The major elements of the program include careful monitoring of seismicity, ground deformation, hot springs and wells, and a variety of gas emissions. Signals from 9 seismic stations in the immediate Long Valley area are telemetered to both the Seismological Laboratory at the University of Nevada, Reno, and to the U. S. Geological Survey in Menlo Park, California, where they are analyzed for earthquake hypocentral locations, magnitudes and focal parameters. Ground deformation is monitored using laser-distance-range devices, standard leveling techniques, repeated precise gravity measurements, and tilt meters. The latter provide continuous data on changes in tilt of the earth's surface at selected sites, and the signals currently are telemetered to Menlo Park and the Cascade Volcano Observatory in Vancouver, Washington, for analysis.

A few wells are instrumented for continuous monitoring of water level. Others are instrumented for monitoring hydrogen gas emission. Techniques for sampling variations in the emission of several other gases, including helium, hydrogen sulphide and sulphur dioxide, are currently being developed and tested.

Observations during the intense earthquake swarm that began on the evening of January 6, 1983, and included two magnitude-5 earthquakes, show little change in the pattern observed over the past couple of years. The deformation networks, however, did show small changes consistent with right-lateral slip on west-northwest striking faults that are essentially co-linear with the elongated distribution of earthquake hypocenters in the swarm.