FLUID AND HEAT FLOW IN LONG VALLEY CALDERA, CALIFORNIA.

HURTER, S. and PRIBNOW, D.Joint Geoscientific Research GGA, Hannover, Germany

The present-day thermal regime of the Long Valley Caldera seems to be characterized by temperatures unaffected by magma activity at depth, except for local spots with high temperatures at shallow depths, such as measured in some boreholes in the west moat, and at the southern and south-eastern edge of the resurgent dome. Our 2-D models of heat conduction suggest that the present-day thermal field is an inherited feature of the past hydrothermal cooling of the caldera. This agrees with the low temperatures observed in the recently deepened Long Valley Exploration Well, partially funded by the International Continental Drilling Progra (ICDP). The recent magmatic activity has not yet reached the surface, except for local sites of channeled fluid flow from great depths. This hypothesis is presently examined with three-dimensional numerical simulations of time dependent fluid and heat transport. The 3-D model geometry encompasses the area of the caldera, a region of 42 x 28 km with a depth extent of 8.4 km. The upper surface is the topography. The geological material includes post-caldera volcanic rocks and sedimentary deposits lumped together, the underlying Bishop Tuff and the basement made up of Mesozoic metavolcanic and metasedimentary rocks. Generally, the thermal conductivity increases with depth, from 1.1 to 3.7 W/m/K, while the permeability decreases from 10e-15 to 10e-17 m2. Faults cut through the rock matrix and are treated as a porous medium with enhanced permeability (10e-12 m2).