FLUID INCLUSIONS IN MINERALS FROM THE VC-2A CORE HOLE OF CSDP AT THE VALLES CALDERA, NEW MEXICO

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VC-2A is the second core hole of the Continental Scientific Drilling Program, Valles caldera. It penetrates the vapor zone and the top of the liquid-dominated hydrothermal system beneath the acid sulfate alteration zone of Sulphur Springs, which is located on the western edge of the resurgent dome inside the caldera.

The fluid inclusions in hydrothermal quartz, fluorite, and calcite, and those in quartz phenocrysts in the welded tuff have been studied microthermometrically (Fig. 1). The homogenization temperatures (Th) of fluid inclusions in quartz and fluorite from the shallow vapor zone indicate that these minerals were precipitated from boiling fluid in a hot-water-dominated regime early in the history of the system. Relatively high Th data at shallow depths indicate that considerable erosion apparently followed deposition of the hydrothermal minerals, accompanied by a drop in the water table. Minimum Th of secondary inclusions from several depths above the present water level fit a boiling point curve adjusted to 100°C at 20 m below the present ground surface. Temperatures defining this curve are several tens of degrees higher than those of the present thermal profile.

However, Th for secondary inclusions in core samples from below the present water table fit the present thermal profile.

Because a caldera lake was present ∿0.5 Ma ago, the water table in the Sulphur Springs area was probably higher than the present one. When the southwestern wall of the caldera collapsed, the caldera lake was drained. This presumably caused a sudden drop in the water table and the hydrothermal system, preventing minerals from trapping liquids above the dropping water table. The vacant interval of Th between the boiling point curve and the present thermal profile above the present water level was produced by the vapor zone cooling precesses (Fig. 1).

Fig. 1 Th-depth diagram of VC-2A.
         Open symbol : primary inclusion,
         Solid symbol : secondary inclusion.