V032-031 Room: C310 Time: May 28 15:15-15:30

Quick cooling of a volcano after a phreatic eruption-A case study of 1995 phreatic eruption of Kuju volcano, central Kyushu,Japan-

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Kuju volcano began to erupt on 11 October,1995 from the new craters about 300m south of the pre-existing fumarolic field. It erupted again in the middle of December of the year. After that, huge heat and mass discharges from the new craters and the pre-existing fumarolic field have been continuing. The eruption is phreatic one and there have been no magmatic activity at the surface even though the vesiculated glass shards were detected from the ash.

Changes in surface temperature:An infrared imagery apparatus and an infrared radiation thermometer were used to monitor the surface temperarutes of the new craters and the pre-existing fumaroles after the 1995 eruption. As a result, it became clear that all the observed temperatures have been decreasing after the eruption.

Estimation of the mass of the cooling heat source: We estimated the total steam discharge from the new craters and the pre-existing fumarolic field by integrating the observed steam discharge rates after the eruption.As a reult, we obtained a value of 59.0MT as a total discharge of water.If we assume that the shape of the magma is spherical and the contribution of magmatic water is 30%, the radius of the heat source is several hundreds meter.

Changes in subsurface temperature: The subsurface temperature was monitored by the magnetic measurements(Tanaka et al.,1999 ,Sakanaka et al., 2001). The following changes are recognized in the geomagnetic field.

(1)Linear changes of the total magnetic intensity were observed.
(2)The magnetic intensity at the northern part decreased but that at the southern part increased.
(3)Magnetic changes during the four years after the eruption are very large, to more than 160nT.

Based on the above data, the position and the intensity of the source magnetic moment can be determined.The location of the magnetic source model estimated is not in the new crater zone but in the pre-existing fumarolic field. The source of the magnetic change lies at a depth of 500m.A spherical magnetized body of radius 200m is obtained assuming the magnetization of 2A/m for the early two years data.

Cooling heat source and crustal deformation: The estimated spherical cooling heat source is several hundreds meter in diameter. It is very large but we could not detect any large crustal inflation before and after the eruption.Then we think that the cooling heat source is not the newly intruded magma but the pre-existed subsurfeace hot rock body.

Repeat gravity changes: Repeat gravity measurements around the new craters and the pre-existing fumarolic field have been conducted after the first eruption. Gravity values around the new craters and the pre-existing fumarolic field decreased rapidly during two months after the first eruption and thereafter gradually decreased. The average daily net mass decrease rates during the first two months and the later period(January 1996 to November 1998) were estimated at 55,000 tons/day and 2,800 tons/day,respectively.

Changes in the hydrological state:Steam discharge rates and the net mass changes around the new craters and the pre-existing fumarolic field were estimated as mentioned above.Based on the data, we estimated the rate of the recharged water from the surrounding regions after the eruption(in the later period) is 14,200 tons/day.On the other hand we estimated the recharged water before the eruption is about 1000-2000 tons/day,It shows that the cold water recharge rate after the eruption is about ten times larger than that before the eruption.Therefore the subsurface hot rock body was cooled much more quickly by the large amount of the cold recharge water after the eruption.