10 Years of Volcanic Activities after the 1995 Phreatic Eruption of Kuju Volcano, central Kyushu, Japan

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The first phreatic eruption occurred on October 11, 1995(Volume of the erupted material is 2000 ton) and the second one occurred in the middle of December, 1995(Volume of the erupted material is 5000 ton). After that, steam discharge from the central part of the volcano has been continuing without obvious changes of surface activities, although an earthquake swarm activity and a small inflation event of the central part occurred during March to May in 1996.

Volcanic steam was discharged mainly from new craters during the first two years after the first eruption. However, the steam discharge from the new craters became weaker and weaker. In the end of 2004, most of the steam (about 90%) activity stopped except b craters. On the other hand, the steam discharge from the pre-existing fumaroles became stronger and stronger. Therefore in the end of 2004, most of steam are discharged from the pre-existing fumaroles. Total steam discharge rate from the central part of the volcano is still larger than that before the 1995 phreatic eruption.

A large amount of steam discharge after the phreatic eruption cooled the interior of the volvano. As the results, several physical properties of the volcano have changed very clearly. For example, surface temperatures at the fumarolic field decreased quickly. Magnetization of the volcano shows the quick coolig of the interior of the volcano.

Quick cooling of the volcano was induced by the sudden decrease of the internal pressure of the volcano accompanying with the phreatic eruption. A large amount of cold grounwater flowed into the central part of the volcano. Heated groundwater became steam and was discharged from the surface. Such a process was simulated numerically. As a result, temperature decrease was interpreted quantitavely. Changes of groundwater flow pattern were monitored by repeat gravity measurements.

Shallow seismic activity in the central part of the volcano also showed an interesting change. Before the phreatic eruption the seismic activity was low (one to two events/day). After the phreatic eruption, the seismic activity increased relatively quickly (several event/day) and after that began to decrease (one to two events/day). These processes are interpreted in terms of pressure change of the fluid reservoir after the phreatic eruption. Recently deeper seismic activity is increasing, although, basically, the deep activity is much lower than the shallow one. The increase of the deep seismic activity may be originated in the cooling of the volcano because the deeper part became brittle from ductile state.

As mentioned above, after the 1995 phreatic eruption, a large amount of cold groundwater cooled the volcano and therefore several physical properties changed. Such a phenomenon may be a very rare case. The cooling of the volcano will change in the future. We think that it is very important to detect such a change in order to predict the next eruption.