

Volcanic geothermal systems and distributions of shallow ground temperature and shallow soil gas

Sachio Ehara[1]; Yasuhiro Fujimitsu[1]; Koichiro Fukuoka[2]; Kohtaro Araragi[1]

[1] Earth Resources Eng., Kyushu Univ.; [2] West JEC

It is very important to know the internal temperature distribution in order to clarify the hydrothermal system in the volcano. However, the deep temperature data in the volcano are generally limited. In such a case, the shallow ground temperature and shallow soil gas data may be effective, even though we obtain only the shallow information from such data.

Shallow ground(1m or 70cm depth) temperatures have been measured at many volcanoes. As a result, it is known that the shallow ground temperature decrease lineary with altitude in case of no geothermal anomaly. The shallow ground temperature anomalies are detected only near or in the regions of geothermal activity.

Shallow ground temperature anomalies have been detected repeatedly for longer than forty years at the central part of Merapi volcano, Indonesia, even though the surface geothermal manifestations have not been seen there. Geothermal numerical modeling showed that such shallow ground temperature anomalies are connected with the continuously uprising magma and gas.

We measured the shallow ground temperatures and shallow soil gas(CO₂) at Merapi volcano and also Merbabu volcano which is adjacent to north of Merapi volcano. We detected also anomalous shallow ground temperatures but we could not detect any soil gas content anomalies at Merapi volcano.

Shallow ground temperatures decreased lineary with altitude at Merbabu volcano. We detected no ground temperature anomalies on the flank of Merbabu volcano. Shallow soil gas content(CO₂) increased with altitude at the lower altitude but decreased with altitude at the higher altitude. We have no recent magmatic activity at Merbabu volcano and also we have no geothermal surface manifestatios. It is difficult to understand such distribution of shallow soil gas content at present.

We believe that shallow ground temperature and shallow soil gas content must be connected with the uprising geothermal fluids or volcanic gas supplied from below. We have a plan to increase such data in order to clarify the hydrothermal system in the volcano.