

Contributions of the Geomagnetic Observations to Probes and Activity Monitoring of Volcanoes

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The island arc of Japan is located at subduction zones where the Pacific plate and the Phillipine Sea plate subduct beneath the Eurasia plate. Therefore, not only frequent large earthquakes but also very intensive igneous activities have been observed along the subduction zones, and volcanic front have been formed along the subduction zones. Such volcanic phenomena were caused by fluids released from the subducting slab, which are thought to have a strong influence on the generation of melt and magma transport. Under such circumstances, investigations on structures of volcanoes and monitoring of volcanic activities are very important for not only pure volcanology but also mitigation of volcanic hazards.

Geoelectromagnetic methods have contributed much to such volcanic researches mentioned above. For instance, local changes in the geomagnetic fields, which were generated by thermal changes in volcanoes, were observed in association with eruptions of Mt. Mihara in Oshima Island, Unzen volcano, Aso volcano, etc., and provided us very important information on understanding process of volcanic activities related with eruptions. Therefore, the results of these researches show that monitoring local geomagnetic changes around a volcano becomes one of the very important methods to monitor volcanic activities. Moreover, recently, some heliborne magnetic surveys above very near surface of a volcano, as well as geomagnetic continuous observation at some sites on the ground of a volcano, have been made to reveal a temporal change in the magnetization structure in a volcano which might be generated by thermal changes in a volcano associated with volcanic activities. To detect temporal changes in geomagnetic anomalies associated with volcanic activities, regional and global secular changes in the geomagnetic fields should be clearly defined.

On the other hand, geoelectromagnetic methods have been also adopted to obtain an image of volcanic structure as an electrical resistivity (electrical conductivity) structure or a magnetization structure. For many cases of active volcanoes, and such as Mt. Kusatsu-shirane, Mt. Fuji, etc., electrical resistivity structures were revealed, in some cases, including magma supply system beneath volcanoes. In this kind of research, geomagnetic data are indispensable.

The researches using geoelectromagnetic methods mentioned above need high quality geomagnetic data having very broad spectral data set of time variations from much shorter periods to much longer periods which were produced for 100 years and will be produced for next 100 years by the Kakioka Observatory.

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