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Geomagnetic Total Force Observation, Self Potential and VLF-MT Survey around the Oana Crater, Azuma Volcano

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The Oana crater of which the diameter is about 200m is located in the geothermal fumaroles zone at southeast slope of Mt. Issaikyo, Azuma Volcano. In the recent years, a new 300m height fumarole named W-6 appeared inside the crater on November, 2008, and volcanic micro-tremors were observed after an interval of five years in 2010. It seems the volcanic activity of Azuma Volcano has been gradually activated.

In order to monitoring hydrothermal activity beneath the Azuma volcano, a repeat measurement of the geomagnetic total force with 12 observation points has been carried out near the Oana crater since 2003 by the volcanological center of Sendai district meteorological observatory cooperated with Kakioka magnetic observatory. Continuous secular variations in the geomagnetic total force have been observed within a 500m radius area from the center of the crater. Since the variation pattern is increasing at northern and decreasing at southern area of the crater, it suggests that the demagnetization has been progressing beneath the crater. Annual change rate of geomagnetic total force at each observation point is almost constant from started observation year, the maximum change of total intensity amounted to under -20 nT at southern side observation point of the crater. As the demagnetization occurred at geothermal active zone, we think it is a thermal demagnetization caused by hydrothermal activity.

On the other hand, according to the geodetic observation, a pressure source is estimated about 500m under the Oana crater. The pressure source is regarded as a hydrothermal reservoir, and we suppose the pressure of the reservoir depends on a balance of hydrothermal fluid supplements from magma and discharge to the surface. And the depth of pressure source and demagnetization source is almost the same. We suppose the thermal demagnetization is progressing at surrounded area of the reservoir.

Further, we measured self-potential (SP) distribution in 2009 around the Oana crater to detect a SP anomaly caused by hydrothermal convection system. As the results, the observed SP distribution is very flat, so the relation of the SP and the hydrothermal convection system is not clear. We also surveyed surface resistivity structure by VLF-MT method around the SP measured area in 2010. It is found that the resistivity is very low around the Jodo-Daira to the Oana crater.

Keywords: Azuma Volcano, geomagnetic total force, hydrothermal reservoir, thermal demagnetization, self-potential, resistivity