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Hydrothermal system at Kuchi-erabu-jima volcano, inferred from surface temperature and self-potential distribution

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The hydrothermal system at Kuchi-erabu-jima volcano, which induces phreatic eruptions frequently, is investigated by means of the surface temperature and self potential observations. The surface temperature measurement was conducted on March 11, 2008. The observation was operated by the airplane which has a hole on the floor for aerial photo of vertical direction. The portable infrared thermal camera (AVIO TVS-620) was fixed on the hole to face the ground perpendicularly using the stand designed for this survey. The airplane kept the constant speed and height during the measurement over the volcano. The respective thermal images with suitable condition were combined considering the horizontal orientation, vertical angle and the position. The resultant image represents the overall surface temperature distribution at the selected field. The temperature anomalies up to 40^{o}C at maximum are observed widely on and around Shin-dake and Furu-dake craters. The similar observation was also conducted at Satsuma-iwojima volcano, which is active volcano showing the persistent high temperature gas discharge at the summit crater. The total amount of the gas discharge is one order of magnitude larger than that of the Kuchi-erabu-jima volcano. The comparison of two volcano shows that the area of surface temperature anomaly of Kuchi-erabu-jima volcano is quite smaller than that of Satsuma-iwojima volcano, and the temperature of kuchi-erabu-jima volcano is sufficiently low. The self potential observation was conducted on November 26-29, 2009. The result indicates that the distribution at western mountainside has the positive correlation with topography, contradicting to the terrain effect. The anomaly reaches 300mV at the summit. The self potential at eastern mountainside has not correlation with topography and shows the flat distribution. This eastern flat distribution is probably related to the subsurface low resistive altered layers. The wide ranging positive anomaly at western mountainside suggests the active hydrothermal circulation within the mountain edifice.

Keywords: surface temperature, self potential, hydrothermal system, numerical simulation