Hydrothermal activity inferred from magnetic variation in Adatara Volcano

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The activity of Numano-Taira Crater of Adatara Volcano became a little active in the summer of 1996, and it continued for several years. We have carried out a magnetic observation in the crater since 1997, and found remarkable magnetic changes associated with the activities in activating stage and declining stage. By the detail analysis of magnetic change observed at survey points in the crater, it was estimated that the cause of the magnetic change was the underground temperature variation and related thermal demagnetization. It had two features, (1) temperature variation occurred at rather shallow place, at the depth from 100m to 200m beneath the crater, (2) the heating up in activating stage took place in the southern part of crater, the cooling down in the following stage occurred in the northern part of crater, and both processes were going on in the same time. From the depth of the temperature variation and little seismicity in the activating stage, we can guess that these temperature variations were caused by an underground hydrothermal activity. It means that we can get some information about hydrothermal activity from magnetic changes observed. The flow of hot ground water is important for the mechanism of magnetic change, and also for the basic process of phreatic eruption. We estimated the shallow hydrothermal activity beneath the crater numerically by using HYDROTHERM(Ingebristen and Hayba,1994)with various assumptions, and temperature variations and surface magnetic changes were also calculated. With calculations for various cases, the following process can explain observed magnetic changes: temporary ascending of hot water from the deeper part raised temperature in the shallow place, circulation of ground water excited simultaneously, and it made effective the sinking down of cool surface water into underground. Because the knowledge is not enough for the value and distribution of permeability beneath the crater and the feature of the heat source in deep part, it is difficult to understand the phenomena definitely or quantitatively. Hydrothermal activity can cause self-potential change, ground deformation and gravity change. The numerical estimate of these associated changes will help us understand hydrothermal system more accurately.