CSEM monitoring in Izu-Oshima volcano, Japan

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SUMMARY

Izu-Oshima volcano is one of the most active volcanos in Japan. The most recent eruption occurred in 1986, and the next event is expected in the near future. A monitoring of the volcanic activity is important to catch a precursory signal for mitigation of the volcanic disaster. A CSEM monitoring is carried on in Izu-Oshima caldera in order to detect the electrical conductivity change beneath the central cone. Two cables were deployed at south and east in the caldera floor to inject the electrical current into the ground. The length of south and west cables is 650 m and 1,700m, respectively. Five receivers, vertical induction coils, were installed on the rim of the central cone. The measurements are done by injecting a 50% duty cycle alternating current of one-second period for one hour every night. Data analysis and some three-dimensional modeling reveals that the electrical conductivity model beneath Izu-Oshima caldera, which is the two-layer structure with a 1 Wm conductive column beneath the central cone. The top unsaturated layer is as resistive as 200 Wm and the bottom saturated layer is 50 Wm. Running spectrum at five stations shows that every in-phase of the response function between an injection current and observed vertical magnetic field is almost stable, and out-of-phase has a remarkable annual change with the same polarity in all of sites. This change cannot be explained by the volcanic activity, but by a change of elevation of the boundary of the top and bottom layer beneath the caldera. It indicates it may be due to the annual variation of precipitation. If the conductive column rises up, that is, the volcanic fluid approaches to the surface before the next event, the changes of the response must show the opposite polarity of the in-phase data at some stations.

Keywords: Izu-Oshima volcano, CSEM monitoring, annual variation