Survey of resistivity structure in Mt.Mihara of the Izu-Oshima Volcano by CSEM method, named ACTIVE

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Electromagnetic (EM) method is one of the most useful methods to survey volcano. This method can reveal a heterogeneous distribution of the electrical conductivity (or resistivity as its reciprocal) beneath the surface. Volcanic activity is often characterized by resistivity structure, since the resistivity is highly sensitive to existence of subsurface fluids such as pore water or melts. There has been a number of field experiments to survey resistivity structure in volcano region by EM methods. Few studies, however, concerned the temporal variation in resistivity structure, or successfully monitored volcanic activity because of its difficulty. To monitor resistivity structure, it is necessary to carry out survey by controlled source electromagnetic method (CSEM). But observation by CSEM is not easy because of difficulties in making steady source signal and receivers, and their mathematical interpretation tools. Utada et al. (2007) proposed a CSEM system, named ACTIVE, by which temporal variation of the subsurface resistivity structure in or beneath the volcanic body could be successfully monitored. The system consists of a transmitter, horizontal electric dipole (HED), which makes alternating direct current with a 50% duty cycle with the period 1sec and amplitude of approximately 0.6 A and an array of receivers, vertical induction coil, allocated at various distances which monitor induction magnetic field with 1000Hz sampling, with automatic operation. In January 2011, we applied the ACTIVE observation technique to survey resistivity structure beneath Mt. Mihara of the Izu-Oshima Volcano, Central Japan. The experiment aimed at estimating background 3-D resistivity structure, which not only helps us to recognize current status of the volcanic body, but also is necessary for accurate estimation of the sensitivity matrix and, eventually, the spatiotemporal variation of the resistivity structure. In order to accomplish this, there exist two main tasks. One is to estimate response functions between the magnetic field at each receiver site and emitted current from the transmitter in the frequency domain, and their errors. The other is development of a 3-D inversion code. We will show the result of this survey and these required techniques, such as data processing and modeling schemes.