INSPECTION OF THE DIKE POSITION BY TOTAL INTENSITY DATA IN THE 2000 ERUPTION OF MIYAKEJIMA VOLCANO

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Several remarkable magnetic changes were observed before and during the 2000 eruption of Miyake-jima volcano, such as the precursory changes since 1996, those prior to and associated with the formation of a sinkhole in the summit, those associated with the tilt-step events, the enormous ones during the caldera formation and so on. However, any significant total intensity change was observed at stations well distributed on the island at the time of the magma intrusion started on June 26. An exception was that a 3-components flux-gate magnetometer operated by NIED at a station on the western slope of the volcano (MKA) recorded a large amount of changes up to 200 nT. Ueda et al. (2006, in print) showed that the said magnetic changes could be explained by the piezomagnetic effect due to an intrusive dike in the NW-SE direction emerged beneath around MKA. This is the 3rd example of the piezomagnetic change due to dike intrusion, i.e. in the cases of 1986 Izu-Oshima a nd 2002 Mt. Etna eruption. These three observations indicate that magnetic data strongly constrain the position of an intrusive dike.

Ueda et al.'s (2006) piezomagnetic calculation is based on the mechanical model inferred from tiltmeter and GPS data (Ueda et al., 2005). This model consists of three intrusive dikes and a contractive one, which reproduced the deformation data in three time periods from 18:30, June 26 to 6:00, June 27. The magnetic changes at MKA were ascribed to the dike in the second time period (19:00-01:00). On the other hand, Fujita et al. (2002) searched for a single opening dike plus a shrinking Mogi source to best fit the tilt change at each one hour interval from 18h, June 26 to 01h, June 27. From 21h to 24h, mostly E-W oriented dikes intruded in the southern part of the volcano toward Tsubota area, which were not well represented by Ueda et al.'s (2005) model. Our problem is that the total intensity at Tairo-Ike (TAR) gradually decreased from June 26 to July 10 by about 10 nT in contrast to other stations which showed no variations. However, even a dike close to TAR by Fujita et al. (2002) cannot fully explain the observation in terms of thermal-magnetic nor piezomagnetic effect. Two other possibilities are the gradual extention of an intrusive dike to a shallower depth and/or the piezomagnetic effect due to the shrinkage of the magma reservoir which feeded magma to dikes.