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Variation of Geomagnetic Total Intensity at Meakandake Volcano after the Eruptions in 2008

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This study reports on the geomagnetic total intensity change at Meakandake volcano and its relations with volcanic activity after eruptions in 2008.

Meakandake volcano is located in eastern Hokkaido and is a volcanic complex which consists of eight volcanoes, such as Ponmachineshiri, Nakamachineshiri, Akanfuji and so on. Ponmachineshiri has been active in recent years and minor phreatic eruptions repeatedly occurred in 1988, 1996, 1998, 2006 and 2008.

Kakioka Magnetic Observatory, Japan Meteorological Agency has carried out a repeat observation of the geomagnetic total intensity in one or two times a year since 1992 for the purpose of detecting geomagnetic field changes accompanying the volcanic activity of Meakandake volcano. Twelve repeat stations were installed on the east side of summit crators' edge and south slope of Ponmachineshiri in 1992 and since then we have improved the repeat station network step by step. About thirty stations are used recently. A continuous station of the geomagnetic total intensity (MEA) was installed on the south slope of Ponmachineshiri on October 16, 2003 in order to improve the time resolution of the observation. Then, a new continuous station (ME2) was installed between the 96-1 crater of Ponmachineshiri and MEA on September 28, 2013. The geomagnetic intensities are acquired every 5-minutes at MEA and ME2.

A significant decrease of the geomagnetic total intensity was observed at Meakandake volcano in July, 2013 and continues up to now (January, 2014). The total intensity varied with the eruptive activity in 2008, and no remarkable change of the total intensity was seen for thirty months from January 2011 to June, 2013. There has been no significant variations in volcano-tectonic earthquakes, tremors, volcanic smoke and tectonic deformation at Meakandake volcano since July, 2013 (Volcanic Observations and Information Center, Sapporo District Meteorological Observatory, JMA), which differs from the situation at the 2008 eruptions when significant variations of the total intensity and the other tectonic measurements were observed.

It is assumed that the decrease of the geomagnetic total intensity at Meakandake volcano in 2013 is due to the thermal demagnetization accompanying heating of the inside of the volcanic body. A source of the thermal demagnetization was estimated beneath the southern slope of the 96-1 crater at Ponmachineshiri by using geomagnetic total intensity changes at repeat stations for about 3 months from June to September, 2013. This source location is almost the same as that of the demagnetization in 2008. And it is inside the focal area of migrating volcanic tremors which occurred on November 16, 2008 reported by Ogiso and Yomogida (2012). We used MaGCAP-V (Seismology and Volcanology Research Department, Meteorological Research Institute, JMA, 2013) as a support software for the modelling of the demagnetization source.

It is indicated that the position of the thermal demagnetization source has not changed for last four months, because the difference of the geomagnetic total intensities at two continuous stations (MEA and ME2) has been almost constant since the end of September, 2013.

Only the geomagnetic total intensity detects a possible on-going heating process inside the Ponmachineshiri which commenced in July 2013. This case strongly suggests that the observation of the geomagnetic field is important to monitor heating or cooling of the volcanic body. The observation with two or more continuous stations is effective in order to monitor the source position of the thermal demagnetization. In addition, Hashimoto *et al.* (2009) suggested a possibility of the volcanic eruption prediction at Meakandake volcano, because a decrease of the geomagnetic total intensity was observed two days before the eruption on November 18, 2008 when the amplitude of the volcanic tremors had been increased.

Keywords: Meakandake, geomagnetic total intensity, volcano, eruption, thermal demagnetization