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The deposition period of Ohachidaira pyroclastic flow of the Taisetsu volcano estimated from the paleomagnetic study

YASUDA, Yuki[1*], SATO, Eiichi[2], WADA, Keiji[3], SUZUKI-KAMATA, Keiko[1]

[1]Graduate School of Science, Kobe Univ., [2]Kobe Univ., [3]Hokkaido Univ. of Education

Ohachidaira caldera, about 2km in diameter, is located on the summit area of Taisetsu volcano, central Hokkaido. Caldera-forming pyroclastic flows (hereinafter referred to as Ohachidaira pyroclastic flow) erupted about 30 ka (Katsui et al., 1979). Most of Ohachidaira pyroclastic-flow deposits are exposed at north-west to north-east and south-west of this caldera and form the pyroclastic plateau. Those pyroclastic flows consist of pumices, scorias, and banded pumices as essential materials and are classified into two types based on modal analysis and chemical compositions of volcanic glasses of pumice (Wakasa et al., 2006; Sato and Wada, 2011).

There are two different opinions for the activity of Ohachidaira pyroclastic flow in previous works. Katsui and Ito (1976) and Wakasa et al. (2005, 2006) suggested that those pyroclastic flows erupted within a short period of time. However, Metsugi (1985 MS) suggested that those pyroclastic flows erupted not within a short period of time, but within some length of time because of the erosional gap and the loam layer within the pyroclastic flows. Sato and Wada (2011) has the same opinion because of welded part of pyroclastic flow contained in the pyroclastic flows. This study tries to estimate the deposition period of Ohachidaira pyroclastic flow using the progressive thermal demagnetization method that is used for inferring thermal histories and paleomagnetic directions of pyroclastic deposits.

Samples for remanent magnetization measurement were collected from 10 sites. We collected essential materials and welded tuff as samples from 6 sites of non-welded tuff and 4 sites of welded tuff respectively. Individual specimens, 25mm in diameter and 25mm long, were prepared from samples in the laboratory. Most of samples have a single component of remanent magnetization. A site mean direction from each site has a 95% confidence interval less than 10 degrees. This fact suggests that the site mean directions from all sites represent paleomagnetic directions at the deposition time of each pyroclastic flow. The paleomagnetic directions at 10 sites are divided into two directions. While the magnetization of 4 sites has normal polarity and an easterly direction in declination, the magnetization of 6 sites has normal polarity and a westerly direction in declination. The two directions have little difference in inclination, but have a difference of about 45 degrees in declination. However, three 95% confidence intervals of four sites whose magnetization has normal polarity and an easterly direction in declination and the other 95% confidence interval don't overlap each other. They have a difference of about 15 degrees in inclination. According to the figure of the geomagnetic secular variation for the last 11.6 ka in Japan (Hyodo and Minemoto, 1996), it took several thousand years to change the declination about 45 degrees when the rate of geomagnetic secular variation was slow and several hundred years when the rate was fast. The two types of pyroclastic flows are associated with the two paleomagnetic directions.

As explained above, it is suggested that Ohachidaira pyroclasitc flow took at least several hundred years to deposit having some dormant periods. Additionally, it is clear that the two types of pyroclasitc flows erupted at intervals.

Keywords: paleomagnetism, pyroclastic flow, deposition period, geomagnetic secular variation, caldera, Taisetsu volcano