

Paleomagnetic study of Holocene lava flow age at Nakadake volcano in Aso caldera, Kyushu Japan: Contribution to establish the Eruption history

*Chisato Anai¹, Nobutatsu Mochizuki², Yasuo Miyabuchi³, Mitsuru Utsugi¹, Hidetoshi Shibuya², Takahiro Ohkura¹

1. Aso Volcanological Laboratory, Institute for Geothermal Sciences, Graduate School of Science, Kyoto University, 2. Earth and Environmental Science, Division of Natural Science, Faculty of Advanced Science and Technology, Kumamoto University, 3. Center for Water Cycle, Marine Environment and Disaster Management, Kumamoto University

Nakadake volcano, which is the only active central cone inside the Aso caldera (Kyushu), is one of the most active volcanoes in Japan. It became active from ca. 22-21 ka, and has formed an old edifice (22-21 ka), a young edifice (around 5 ka) and a still younger pyroclastic cone (until present). The lava flows from the young edifice spread on the flank of the cone several times around 5 ka. These lava flows have been used to reconstruct the eruptive history of Nakadake volcano at those ages, but the chemical composition and lithology of these lavas cannot be used to distinguish each other because of their similarity, so that it is actually very difficult to establish the stratigraphy of those volcanic activities. A paleomagnetic study should contribute for the case because a paleo secular variation (PSV) record is high resolution age detector. Lava units may be distinguished by PSV, if they are separated more than about 50 years. Thus, we try a paleomagnetic study of these lava flows to unravel the correlation of those lava flows. This study is expected to contribute not only to the volcanology and volcanic geology but also to the disaster prevention and disaster risk reduction.

The samples collected from 14 lava flows and 6 agglutinates layers (welded scoria-fall deposits) were used for paleomagnetic and rock-magnetic measurements. These samples, from visual inspection, seemed to be influenced chemical alteration of their surface by sulfides of volcanic gas. To check the effect of the chemical alteration on the lavas and agglutinates, thermomagnetic analyses were made on chip samples from the top (surface of rock) and bottom (inside of rock) of the collected paleomagnetic cores. The thermomagnetic analyses indicate that the core top and bottom are approximately the same, in spite of different color, and the carrier of magnetization of each core is either titanium rich (x is about 0.6) or poor (x is about 0.1 to 0.2) titanomagnetites. The natural remanent magnetization of each sample shows a simple, single vector component in alternating field demagnetization experiments, which well defines the primary component. Site mean directions can be categorized into three different direction groups. These data suggest that the eruption producing lava flows and/or agglutinates occurred at three different ages. Furthermore, the paleomagnetic directions of two groups are not consistent with the directions of the eruptive ages of Nakadake young edifice assigned from the present stratigraphy. Comparing these directions with the paleomagnetic secular variation curve which drew from basaltic volcanoes in Aso central cones, these direction ages assigned to the age around 5 ka, 4.5ka, 3.5 ka, respectively.

Keywords: paleomagnetic secular variation curve, Aso Nakadake