Remanent Magnetization and Emplacement Temperature of Pyroclastics of Niijima 886AD eruption

Reina Nakaoka[1]; Keiko Suzuki-Kamata[1]

[1] Earth and Planetary Sci, Kobe Univ.

The 886AD volcanic eruption of Mukaiyama volcano, Niijima was started phreatomagmatic eruption beneath shallow sea water and followed by Habushiura pyroclastic flow, Mukaiyama base surge, Omine pyroclastic cone and Mukaiyama lava successively. Habushiura pyroclastic-flow deposit is composed of several tens flow units which show various depositional facies. The existence of antidune structures at the distal end area suggests that the flowage has kept high velocity. Omine pyroclastic-cone deposit contains several ill-sorted deposits as well as well-sorted deposits.

In this study, the emplacement temperature of Habushiura pyroclastic-flow deposit and Omine pyroclastic-cone deposit were estimated by the paleomagnetic method to study the eruptional and depositional mechanism. Ten oriented lithic samples were collected from 9 locations of Habushiura pyloclastic-flow deposit and ten oriented pumice samples were collected from 10 locations of Habushiura pyloclastic-flow deposit and 2 locations of Omine pyroclastic-cone deposit, respectively. Remanent magnetizations of lithic fragments within Habushiura pyroclastic-flow deposit showed a mixture of single and two or three stable magnetic components as a result of progressive thermal demagnetization. Single component magnetizations and the high-temperature component magnetizations were scattered widely. The low-temperature component magnetizations below 350 degree Celsius show less scatter and aligned the geomagnetic field at that time, therefore, lithic fragments were emplaced at temperature between ambient temperature and 350 degree Celsius. Most of remanent magnetizations of pumice fragments within Habushiura pyroclastic-flow deposit had characteristic remanent magnetization components below 300 degree Celsius and their directions of 8 locations aligned the geomagnetic field at that time. Therefore, their emplacement temperature is estimated 300 degree Celsius. At one of the other 2 locations where are estimated that pumice fragments emplaced at the ambient temperature, lithic fragments are estimated the emplacement temperature was 300 degree Celsius. In addition, the blocking temperatures of remanent magnetizations which align the geomagnetic field at that time for four samples collected from a large pumice fragment 1.2 m in diameter with cooling joint were below 460 degree Celsius for inner part samples and 300 degree Celsius for outer part samples. It indicates that the core of the large pumice fragment emplaced at 460 degree Celsius. Remanent magnetization of pumice fragments within Omine pyroclastic-cone deposit aligned the geomagnetic field at that time below 300 degree Celsius; therefore, their emplacement temperatures are estimated at 300 degree Celsius.

Remanent magnetizations above 300 degree Celsius of pumice fragments didn't show stable remanent magnetizations unlike lithic fragments and the remanent magnetization directions had changed each demagnetization steps irregularly. These pumice fragments were reheated to 590 degree Celsius in the absence of the magnetic field and cooled in the artificial magnetic field (48500 nT) for the acquisition of thermoremanent magnetizations to know the ability of magnetization of pumice fragments. Progressive thermal demagnetization of the pumice fragments showed the remanent magnetizations had almost single component. It suggests that pumice fragments were transported and rolled with cooling and acquired remanent magnetizations with different directions. Consequently, the lithic fragments were eroded and reheated from the vent area. Pumice and lithic fragments were cooled during transportation by Habushiura pyroclastic flow and emplaced between ambient temperature and 300-350 degree Celsius. Pumice fragments within Omine pyroclastic-cone deposit were emplaced at 350 degree Celsius.