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Origin of the primary magnetization in the Cretaceous granitic rocks from Iritono, Abukuma

Kenichi Wakabayashi[1], # Nobutatsu Mochizuki[2], Yuhji Yamamoto[3], Hideo Tsunakawa[4]

[1] Earth and Planetary Sci., Tokyo Inst. Tech., [2] Earth and Planetary Sci.,Tokyo I.T., [3] Geological Survey of Japan, AIST, [4] Earth and Planet. Sci., TITECH

We have detected the primary component of the Iritono granitic rocks (102Ma 40Ar-39Ar age) in Abukuma. From the low-temperature magnetic properties, the optical microscopic observations and the EPMA analyses, its magnetic carriers are probably magnetites in plagioclase.

The primary component is isolated from natural remanent magnetization (NRM). Two components are observed for most sampling sites: the high coercivity or blocking temperature component, called the high Bc/Tb component, and the low Bc/Tb one. Both components show northwesterly declinations (D=-48.8 º) and shallower inclinations than the present GAD (I=54.6 º). In particular, the high Bc/Tb components have much shallower inclinations. For example, the typical site of the high Bc/Tb component (TN09) gave an about 30 ºshallower inclination. On the other hand, the low Bc/Tb component is closer to the NW remagnetization direction (Otofuji et al., 1997, 2000), whilst some of the paleomagnetic directions seem to be affected by viscous remanent magnetization (VRM) due to the recent normal epoch. Therefore the distribution of paleomagnetic directions is interpreted to be a mixing feature of three end members: (A) an ideal component with high Bc/Tb component, (B) the NW remagnetization and (C) VRM due to the present GAD.

In order to clarify the origin of magnetizations, we performed detailed rock magnetic investigations, specially for TN09. NRM and anhysteretic remanent magnetization (ARM) intensities of TN09 samples are stronger than the others. They showed reversible Js-T curves with Tc of about 580ºC, which indicated Ti-poor titanomagnetites. Optical microscopic observations and an electron probe microanalyzer (EPMA) revealed that opaque minerals in plagioclases of TM09 are magnetites. For the identification of distribution of magnetic minerals, we performed hysteresis measurements on feldspar (plagioclase and alkali-feldspar) and biotite fractions separated from three TN09 samples by handpicking. In a Day plot, the data from feldspar fraction fall in the PSD area and adjacent areas while biotite fractions are in MD and its adjacent ones. Intensity change in saturation isothermal remanent magnetization (SIRM) given at 10K during the warming indicates that feldspar fractions contain magnetites because of an intensity drop at the Verway transition temperature. These results indicated the NRMs of TN09 samples are carried mostly by magnetites in plagioclase. Clusters of magnetites are sometimes observed in core parts of zoning structure of plagioclase. They are suggested to have acquired TRM after cooling from a temperature above Tc (580ºC) because granitic rocks are generally formed at 700-1000ºC. This primary component is considered to be the high Bc/Tb component characterized by shallow inclination in this study. The NW declination is interpreted to have been induced by the Miocene opening of Japan Sea. The shallow inclination suggests that the Abukuma pluton was produced in a low latitude and drifted northward. Although no drifting models have been proposed for the Abukuma massif so far, its drifting since 102 Ma may be elucidated by the northward motion of Izanagi plate (Engebretson et al, 1985).

There have been few Cretaceous data of paleointensity because the fresh Cretaceous volcanic rocks feasible to experiments are generally rare. Using the Iritono granitic rocks, we have determined paleointensity of the geomagnetic field in the middle of Cretaceous normal superchron. Eleven samples from the typical site of the high Bc/Tb component yielded good experimental results by the Coe's version of the Thellier method. The double heating technique of the Shaw method with low temperature demagnetization (DHT-LTD Shaw method) was also successful for three samples. As a result, the average field intensity is 56.7 +/-6.3 micro-T (N=14) and its VDM is calculated to be 13.6*10^22 Am^2.