Quantative estimation of iron-bearing mineral change in Taiwan Chelungpu-fault using rock-magnetic methods

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High magnetic susceptibility values were observed within three fault zones, FZB1136, FZB1194 and FZB1243, discovered in the hole B of the Taiwan Chelungpu-fault Drilling Project (TCDP) (Hirono et al., 2006). Rock-magnetic analyses on samples from FZB1194 and FZB1243 revealed that the black material (BM) disk was characterized by newly formed ferrimagnetic minerals due to thermal decomposition of paramagnetic minerals during fault activity (Mishima et al., 2006).

To estimate the amount of formed ferrimagnetic minerals and decomposed paramagnetic minerals, we performed additional magnetic measurements on the samples from three fault zones. Magnetic susceptibility measurements were performed with a Kappabridge KLY-3 susceptometer using discrete samples, which yields more accurate values than pass-through measurements with loop or point sensors. Magnetic hysteresis measurements were performed with a MicroMag alternating gradient force magnetometer (AGM) at Kyoto University.

Ferrimagnetic components saturating below 200 mT were observed in the M-H curves of BM disk samples and some of black gouge samples. On the other hand, dominance of paramagnetic minerals were inferred from the nearly linear M-H behavior of surrounding rock samples.

We adopted the paramagnetic susceptibility (chipara) and saturation magnetization (Ms) after paramagnetic slope correction to estimate the contents of paramagnetic and ferrimagnetic minerals, respectively.

Decrease in chipara and increase in Ms were observed within the black gouge of FZB1136. Increase in Ms were also observed within the BM disk and some black gouge samples of FZB1194 and FZB1243, but no significant decrease in chipara were observed within these zones.

Suppose that newly formed ferrimagnetic minerals were magnetite or maghemite, increase in Ms corresponds to increase of 0.2 wt% in ferrimagnetic minerals. Decrease in $para$ within FZB1136 corresponds to decrease of 4-13 wt% in paramagnetic minerals, and does not balance to the amount in newly formed ferrimagnetic minerals.