# Rock-magnetic properties of single zircon crystals sampled from the Yangtze River

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Geomagnetic field paleointensity data provide critical information about the thermal evolution of the Earth, and the state of the geomagnetic field has been shown to be closely related to the surface environment. While it is pivotal to understand the variations in geomagnetic field intensity throughout the history of the Earth, data are still too scarce to resolve billion-year-scale geomagnetic field variation. This is primary because of the lack of geological samples for older eras, which often result in unsuccessful paleointensity experiments.

This study focuses on a paleointensity experiment using single zircon crystal. Zircon crystals play an important role in paleomagnetic studies because they have several mineralogical advantages: (1) they commonly occur in crustal rocks, (2) precise age determinations with U-Th-Pb and (U-Th)/He analyses are possible, and (3) they have highly resilient responses to alterations and metamorphism.

Recently Sato et al. (submitted) reported the rock-magnetic properties of the single zircon crystals sampled from the Nakagawa River, which crosses the Tanzawa tonalitic pluton in central Japan. They demonstrated that the various rock-magnetic properties such as natural remanent magnetization (NRM), isothermal remanent magnetization (IRM), hysteresis parameters, and transition temperature could be measured using the standard magnetometers (SQUID magnetometer, MPMS, and AGM). Combining these rock-magnetic parameters, they proposed the sample selection criteria for paleointensity experiments using single zircon crystals.

In this study, we conducted rock-magnetic measurements for 1050 single zircon crystals sampled from the Yangtze River. Zircon crystals from the Yangtze River showed four peaks in the age distribution with the highest peak at 0.3-0.5 billion years ago, second one at 0.8 to 1.0 billion years ago, third one at 1.8-2.0 billion years ago and a minor peak at 2.5 to 2.7 billion years ago (Rino et al., 2008), and we can effectively collect the zircon crystals with crystallization ages for the last 1.0 billion years ago.

The NRM intensity ($M_{NRM}$) of the single zircon crystals varied from $10^{-13}$ to $10^{-10}$ $Am^2$, and 102 crystals (9.7%) had $M_{NRM}$ larger than 4 x $10^{-12}$ $Am^2$. For 86 zircon crystals with $M_{NRM}$ larger than 5 x $10^{-12}$ $Am^2$, low-temperature demagnetization (LTD) treatment was conducted and the memory (NRM intensity after LTD treatment, $M_{NRM-LTD}$) was measured. The $M_{NRM-LTD}$/$M_{NRM}$ values were larger than 0.45, suggesting that the zircon crystals may have stable remanent magnetization.

Now we plan to measure IRM intensity and hysteresis loop. Combining the rock-magnetic parameters for the zircon crystals, we will discuss the feasibility of the paleointensity experiment using single zircon crystals from the Yangtze River.