Oral | Symbol S (Solid Earth Sciences) | S-EM Earth's Electromagnetism

[S-EM37_30AM1]Geomagnetism, paleomagnetism and rock magnetism

Convener:*Ataru Sakuraba(Department of Earth and Planetary Science, University of Tokyo), Nobutatsu Mochizuki(Priority Organization for Innovation and Excellence, Kumamoto University), Chair:Ataru Sakuraba(Department of Earth and Planetary Science, University of Tokyo), Yuhji Yamamoto(Center for Advanced Marine Core Research, Kochi University)

Wed. Apr 30, 2014 9:00 AM - 10:45 AM 413 (4F)

This session is open to recent advances in all areas being concerned with geomagnetism, paleomagnetism, rock magnetism, and their applications to geophysical and geological issues. We welcome presentations on geodynamo, present and past geomagnetic behaviors, fundamental rock magnetic properties, and paleoclimatic changes and tectonic processes revealed by magnetic methods.

10:30 AM - 10:45 AM

[SEM37-P09_PG]Rock magnetic study of single zircon crystals sampled from river sands

3-min talk in an oral session

*Masahiko SATO[1], Shinji YAMAMOTO[2], Yuhji YAMAMOTO[3], Yoshihiro OKADA[4], Masao OHNO[1], Hideo TSUNAKAWA[4] (1.Kyushu University, 2.The University of Tokyo, 3.Center for Advanced Marine Core Research, Kochi University, 4.Tokyo Institute of Technology)

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Geomagnetic field paleointensity data provide critical information such as thermal evolution of the Earth (Stevenson et al., 1983). Also a state of geomagnetic field closely relates to a surface environment (Kulikov et al., 2007). It is pivotal to know the variation of geomagnetic field intensity throughout the history of the Earth. Until now we have not yet obtained, however, enough data to resolve billion-year-scale geomagnetic field variation (Tauxe and Yamazaki, 2007) and need to obtain more paleointensity data.In this study we focus on a paleointensity experiment using single zircon crystal. Since river sand originates in rocks widely distributed in river basin, detrital zircons in the sand have various ages (Rino et al., 2004). Therefore if the geomagnetic paleointensity can be measured using the single zircon crystal, we will probably obtain paleomagnetic data enough to resolve the long-term geomagnetic field variation.Zircon crystals used in the present study were sampled from sands of the Nakagawa River, Tanzawa Mountain. The Nakagawa River flows along bodies of tonalite, which is a representative rock of the continental crust. Using coarse-grain single zircon crystals with weight of about 0.1 mg, a suite of rock magnetic measurements were conducted: low-temperature demagnetization (LTD) and stepwise alternating field demagnetization (AFD) of saturation isothermal remanent magnetization (SIRM), and low-temperature cycle using an Magnetic Property Measurement System (MPMS).SIRM intensities of the single zircon crystals vary four orders of magnitude ranging from $1x10^{-12}$ - $2x10^{-9}$ Am^2, and especially a few percent of the grains have strong SIRM larger than $1x10^{-10}$ Am^2. The zircon crystals contain nearly pure magnetite (Fe_3O_4), and they are in both single-domain (SD) and multidomain (MD) states. The SD magnetite contained in the zircon crystals has the potential to record the paleomagnetic information. The existence of MD magnetite suggests that stepwise-demagnetization after LTD treatment is an efficient approach for paleomagnetic measurement. Taking into account the relation between SIRM intensity and thermoremanent magnetization (TRM) intensity for magnetite (e.g., Yu, 2010), TRM of single zircon crystal may be measured with a high-sensitivity magnetometer such as a SQUID magnetometer.Now we plan to sample river sand at the Mississippi River and to conduct rock

magnetic measurements of the zircon crystal collected from the sand. On the basis of the rock magnetic studies for the zircon crystals from the Nakagawa River and the Mississippi River, we will discuss the feasibility of the paleointensity experiment using single zircon crystal.