[EE] Evening Poster | S (Solid Earth Sciences) | S-IT Science of the Earth's Interior & Tectonophysics

[S-IT22]Interaction and Coevolution of the Core and Mantle in the Earth and Planets

convener:Tsuyoshi Iizuka(University of Tokyo), Hidetoshi Shibuya(Department of Earth and Environmental Sciences, Faculty of Advanced Science and Technology, Kumamoto University), Taku Tsuchiya(愛媛大学地球深部ダイナミクス研究センター, 共同), Kenji Ohta(Department of Earth and Planetary Sciences, Tokyo Institute of Technology)

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Recent observational and experimental investigations have significantly advanced our understanding of the structure and constituent materials of the deep Earth. Yet, even fundamental properties intimately linked with formation and evolution of the planet, such as details of the chemical heterogeneity in the mantle and light elements dissolved in the core, remained unclear. Seismological evidence has suggested a vigorous convection in the lower mantle, whereas geochemistry has suggested the presence of stable regions there that hold ancient chemical signatures. The amounts of radioactive isotopes that act as heat sources and drive dynamic behaviors of the deep Earth are also still largely unknown. We provide an opportunity to exchange the achievements and ideas, and encourage persons who try to elucidate these unsolved issues of the core-mantle evolution using various methods, including high-pressure and high-temperature experiments, high-precision geochemical and paleomagnetic analyses, high-resolution geophysical observations, geo-neutrino observations, and large-scale numerical simulations. Since this session is co-sponsored by geomagnetism, paleomagnetism and rock magnetism division of the SGEPSS, contributions in geomagnetism and geodynamo simulation are also encouraged.

[SIT22-P31]Magnetic mineral inclusions in single zircon crystals from the Tanzawa tonalite and the river of Yangtze and Mississippi

*Shinji Yamamoto[1], Yujiro Tamura[1], Masahiko Sato[2] (1.Graduate School of Environment and Information Sciences, Yohohama National University, 2.Department of Earth and Planetary Science, University Tokyo)

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Although it is essential to understand the variations in geomagnetic field intensity through the Earth history, data are still scarce to a resolve billion year-scale geomagnetic field variation. This is mainly due to the lack of well-preserved rocks for older eras, which often results in unsuccessful paleointensity experiments. To overcome this problem, recent investigates has focused on paleointensity experiments using single silicate crystals, which often accompany magnetic mineral inclusions, such as plagioclase (Tarduno et al., 2006), quartz phenocryst (Tarduno et al., 2010), pyroxene (Muxworthy and Evans, 2012), olivine (Tarduno et al., 2012), and zircon (Tarduno et al., 2015, Sato et al., 2015; Fu et al., 2017).

Sato et al. (2015) and Sato (2018, JpGU) reported the rock-magnetic properties of the single zircon crystals sampled from the the Tanzawa tonalite (4-5 Ma) and from the Yangtze and Mississipi river. 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). During their rock-magnetic measurements, many of single zircon crystals are below the limits of the sensitivity of the magnetometers employed, but a few % zircons had values of M NRM >4 x $10^{\text{−12}}$ Am^2 And M IRM >4 x $10^{\text{−12}}$ Am^2, containing enough magnetic minerals to be measured in the DC SQUID magnetometer. The

main remanence carriers seem to be nearly pure magnetite with pseudo-single-domain grain sizes. These samples are expected to appropriate for the paleointensity study, but identification of mineral inclusions in those zircons are not yet investigated.
Here, we report mineral inclusions in zircons from 1) Tanzawa tonalite, 2) the Yangtz river, and 3) the Mississippi river, with an optical microscope, Laser-Raman microspectroscopy and SEM-EDS system. Results indicate that zircon crystals appropriate for the paleointensity study contain magnetic minerals, such as titano-magnetite and pyrrhotite. Significantly, titano-magnetite inclusions display fine exsolution lamellae indicating single- or pseudo-single-domain size. In this presentation, we will discuss on the results of rock-magnetic measurements and magnetic mineral inclusions in zircons.