[JJ] Evening Poster | S (Solid Earth Sciences) | S-GL Geology

[S-GL30]Geochronology and Isotope Geology

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Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Reliable reconstruction of geohistory is of primary importance to better envision the present and future of the Earth. Geochronology and isotope geology play major roles in the reconstruction. This session offers an opportunity to present the results of fundamental studies, including the developments / improvements of analytical methods and age calibration, as well as applications to the Earth and planetary materials. We particularly focus on: (1) radiometric dating, bio-stratigraphy, magneto-stratigraphy and stable isotopic time series that provide the age information, (2) radioisotopes and stable isotopes widely employed for analyzing the Earth and planetary systems and (3) hypothesis and numerical modeling that utilize / assimilate the age and isotopic data. We also welcome contributions that integrate a variety of relevant disciplines.

[SGL30-P08]Thermal history along the Mozumi-Sukenobu fault (Atotsugawa fault zone), central Japan, based on zircon fission-track thermochronometry

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Quantitative evaluation of thermal production and transfer along fault zones bring significant findings to understand stress on a fault plane during an earthquake, thermal budget and structure of the crust, and tectonic history. However, thermal anomaly along a fault zone can be derived from various mechanisms, such as, uplift and subsidence due to fault displacements, frictional heating associated with fault slips, and migration of thermal fluids along fault zones (Tagami, 2012, Tectonophys.). Thus, it is desirable to evaluate the temperature and spatio-temporal range of the each factor. The Atotsugawa fault zone is one of the most active fault zones in the Japanese Islands, having a right-lateral slip rate of 2-3 mm/yr (Iso et al., 1980, Geogr. Rev. Jpn.; HERP, 2004, http://www.jishin.go.jp/main/chousa/katsudansou_pdf/47_atotsugawa.pdf). The Mozumi-Sukenobu fault is a branch of the Atotsugawa fault zone. A research tunnel was excavated across the Mozumi-Sukenobu fault, where bedrocks can be observed over ~480 m including the two major crush zones (Ito et al., 1998, Chikyu Monthly Special). In this study, zircon fission-track (FT) thermochronometry was applied to rock samples collected from the research tunnel in order to evaluate thermal anomalies across the Mozumi-Sukenobu fault. Fourteen samples were collected from sand and mud stones of the lower Cretaceous Tetori Group. We obtained FT ages of 110.3-73.3 Ma and FT lengths of 7.1-9.0 μm in average. The FT data have no clear correlation with a degree of fracturing of the rocks (Tanaka, 2007, In “Geodynamics of Atotsugawa Fault System”), indicating that annealing of the FTs were not derived from the frictional heating of the fault slips. Based on the zircon FT data, thermal inverse analyses were carried out by using HeFTy ver. 1.9.3 (Ketcham, 2005). Except for the two samples, MSF-6 and -9, the samples generally produce cooling paths with the last cooling of ~30-20 Ma, which is significantly younger than the apparent FT ages. Igneous rocks formed during the opening of the Sea of Japan are distributed around the study area (e.g., Takahashi &Shuto, 1999, Jour. Geol. Soc. Jpn.), suggesting a reheating associated with the magmatism. However, considering the depth of the research tunnel, zircon FTs are difficult to be annealed only by thermal diffusion of the pyroclastic rocks at the land surface (c.f. Matsuzaki et

al., 2004, Jour. Jpn. Soc. Eng. Geol.). Although the sample rocks contain pyrite indicating alteration due to thermal fluids, there is no clear evidence that the thermal anomalies detected by the zircon FT analyses are attributable to the thermal fluids. Further investigations are desirable to determine the heat sources. The major future works are as below: 1) reconstruction of the background thermal history of the Tetori Group, 2) semi-quantitative estimation of the heating duration by comparison with the zircon (U-Th)/He ages whose closure temperature is higher (lower) than that of zircon FT system for shorter (longer) heating duration (Tagami &Farley, in prep.), and 3) more precise evaluation of the temperature and spatial distribution of the reheating event by using other thermochronometers, such as, apatite FT and biotite K-Ar systems.