Energy system of subduction zone -Supercritical geothermal gnergy -

N. TSUCHIYA [1]

[1] Aramaki-aza-Aoba, 6-6-20, Aoba-ku, Sendai, Graduate School of Environmental Stidies, Tohoku University, Japan. (tsuchiya@mail.kankyo.tohoku.ac.jp)

Our research group is conducting fundamental and engineering studies of “Supercritical Geothermal Development”. The fundamental research shows a “Geothermal Frontier” under supercritical conditions, and the progress of EGS (Enhanced Geothermal System) has provided us the potentiality and possibility of access to supercritical geothermal resources (Watanabe et al., 2017).

Fracture networks and their formation mechanisms would be studied by using petrology and fluid inclusion studies in order to understand “beyond brittle” supercritical geothermal reservoir. To understand the geological properties of a supercritical geothermal reservoir, a granite − porphyry system was investigated as a natural analog（Tsuchiya et al., 2016）. Quartz veins, hydrothermal breccia veins, and glassy veins are present in Neogene granitoids, NE Japan. The glassy veins formed at 500–550 °C under lithostatic pressures, and then pressures dropped drastically.

The solubility of silica also dropped (Okamoto et al., 2017), and the quartz veins formed under hydrostatic pressures. Connections between the lithostatic and hydrostatic pressure regimes were key to the formation of the hydrothermal breccia veins, and the granite–porphyry system provides useful information for understanding supercritical geothermal reservoirs and EGS technology.

JBBP is a challenging project at the cutting-edge of a real “Geothermal Frontier” in subduction zone as an energy system.

Okamoto, A., Tanaka, H., Watanabe, N., Saishu, H., and Tsuchiya, N. (2017), Fluid Pocket Generation in Response to Heterogeneous Reactivity of a Rock Fracture Under Hydrothermal Conditions, Geophysical Research Letters, 44, 10306-10315

Tsuchiya, N., Yamada, R., and Uno, M. (2016), Supercritical geothermal reservoir revealed by a granite–porphyry system , Geothermics, 63,182-194.

Watanabe, N., Numakura, T., Sakaguchi, K.,Saishu, H.,Okamoto, A.,Ingebritsen, S. E. and Tsuchiya N. (2017), Potentially exploitable supercritical geothermal resources in the ductile crust, Nature Geoscience, 10, 140-144.