Fluid flows inferred from microseismic events associated with injection test in Okuaizu Geothermal Field

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In the Okuaizu geothermal field (Yanaizu, Fukushima Prefecture), a recharge water injection test has been carried out to stabilize the steam production since 2015. In order to avoid cooling of the geothermal reservoir by the water injection and to obtain a larger recharge effect, it is important to grasp and anticipate the flows of the injected water. On the other hand, subsurface structures are generally complicated, especially within the brittle region. Therefore, it is difficult to predict the flows with a simple homogeneous model because the following phenomena are expected in real cases; selective flows passing through a highly permeable region such as a fracture zone as well as creation of a new flow path by shearing. In the shearing, the mechanism of its creation (e.g., reduction of effective stress due to in-flow into fractures, propagation of stress change, stress accumulation due to thermal change) is hard to identify, which is essential information to expect new flow paths.

In the Okuaizu geothermal field, a microseismic monitoring network has been established as part of the JOGMEC project named "Geothermal Reservoir Evaluation and Management Technology" since fiscal year 2015. In this study, we use the seismic record to estimate the subsurface fluid flows associated with the injection test. We investigate factors of the creation of microseismicity associated with the injection test by using elastic wave velocity changes in fractures estimated by seismic scattering analysis as well as pressure and temperature information.

Keywords: Microseismic monitoring, Scattering analysis, Geothermal reservoir

