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Hydrogeological Characteristics of Fractured Rocks around the In-DEBS Test Borehole at the Underground Research Facility (KURT)

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In the concept of the deep geological disposal of radioactive wastes, canisters including high-level wastes are surrounded by engineered barrier, mainly composed of bentonite, and emplaced in disposal holes drilled in deep intact rocks. The heat from the high-level radioactive wastes and groundwater inflow can influence on the robustness of the canister and engineered barrier, and will be possible to fail the canister. Therefore, thermal-hydrological-mechanical (T-H-M) modeling for the condition of the disposal holes is necessary to secure the safety of the deep geological disposal. In order to understand the T-H-M coupling phenomena at the subsurface field condition, "In-DEBS (In-Situ Demonstration of Engineered Barrier System)" has been designed and implemented in the underground research facility, KURT (KAERI Underground Research Tunnel) in Korea. For selecting a suitable position of In-DEBS test and obtaining hydrological data to be used in T-H-M modeling as well as groundwater flow simulation around the test site, the fractured rock aquifer including the research modules of KURT was investigated through the in-situ tests at six boreholes. From the measured data and results of hydraulic tests, the range of hydraulic conductivity of each interval in the boreholes is about 10^{-7}–10^{-8} m/s and that of influx is about 10^{-4}–10^{-1} L/min for NX boreholes, which is expected to be equal to about 0.1–40 L/min for the In-DEBS test borehole (diameter of 860 mm). The test position was determined by the data and availability of some equipment for installing In-DEBS in the test borehole. The mapping for the wall of test borehole and the measurements of groundwater influx at the leaking locations was carried out. These hydrological data in the test site will be used as input of the T-H-M modeling for simulating In-DEBS test.