

Horonobe URL Project - Calibration of groundwater flow model based on the shape of saline water/freshwater interface

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Japan Atomic Energy Agency is constructing a deep underground research laboratory (URL) at Horonobe Hokkaido, Japan. Hydrogeochemical investigations in 10 deep boreholes have been conducted in about 3km by 3km area centered on the URL site (URL area). In the URL area, the geology mainly consists of Miocene to Pliocene diatomaceous argillaceous formations, and the groundwater chemistries are classified into three types: deep saline water (old connate seawater), shallow meteoric fresh water, and mixture of the two. The spatial distribution of these water types is currently interpreted through a scenario of the intrusion of meteoric fresh water into deep saline water that resulted in a saline water/freshwater interface inland more than 10km away from the coastline. The salinity distributions in the boreholes are generally consistent with electrical resistivity distributions obtained by MT/AMT (audio-frequency magnetotelluric) survey.

In this study, the time evolution of saline water/freshwater interface during the intrusion of fresh water from the land surface into deep saline water in the past 200ka was simulated for a 3D site-scale model, in which the geometries of surface topography, geologic formations, and a major fault were embedded. As a result, it was shown that, by optimizing hydraulic parameters, the simulation well reproduced the shape of saline water / freshwater interface identified by the deep boreholes and the electrical resistivity tomography. In the conference, we will present our recent findings obtained from the simulation.