

Groundwater evolution processes in the sedimentary formation at the Horonobe, northern Hokkaido, Japan.

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Hydro-geochemical properties of groundwater have been characterized for the sedimentary formation at the Horonobe northern Hokkaido, Japan. In the Horonobe, Undergrond Research Laboratory (URL) has been constructed in order to develop the methodology for the characterization of geological environment.

JAEA has already carried out chemical and isotopic analyses of more than 180 water samples. The groundwaters investigated are divided into two types; Na – HCO₃ ions dominate water in the shallower part of the sedimentary formations and Na-Cl ions dominate saline water in the deeper part of the sedimentary formations. The water-rock interaction and mixing are considered to be dominant evolution process of the groundwater.

However, the deep groundwaters have unusual high δD and low Cl concentration of -20 to -30 ‰ and 5,000 to 6,000 mg/L, respectively. These features can not be explained by a simple mixing model of sea water and local meteoric water.

The enrichment factor (ΔD) is defined as the difference in δD values between calculated and observed ones based on their Cl concentration during simple dilution of sea water and local meteoric water. The ΔD increases from 0 to 45 ‰ at depth below -500 m, where opal A changed to opal CT. At this depth, the H₂O⁺ contents in the rocks decreases by 2 wt%. The formation of deep ground waters during diagenesis will be discussed, based on these results.