# Hydrochemical evolution process at the Horonobe area, northern part of Japan

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Japan Atomic Energy Agency (JAEA) has been conducted R&D program for geological disposal of high-level radioactive waste. The Horonobe URL which is operated by JAEA is one of the generic purpose-built URL in Japan. The Horonobe URL site lies on the eastern margin of a Neogene-Quaternary sedimentary basin. The basin contains (from oldest to youngest) Wakkanai, Koetoi and Yuchi formations. Oomagari thrust fault (O.F.) distributes at the central part of the area with NNW-SSE trend. Reconstruction of hydrogeological and hydrochemical properties around the URL site in geological time-scale is a key components of the R&D program. Previous studies indicates that groundwater in the area is mainly Na-Cl type of groundwater originated from fossil seawater which is trapped during the sedimentation. However, salinity of groundwater is less than seawater. This study aims to reveal the dilution process of groundwater based on existing hydrochemical data (Cl, $\delta^{18}O$ and $\delta D$) obtained from surface-based boreholes drilled at the Horonobe area.

We identified three characteristics of hydrochemistry as follows; 1) Cl concentration reached a plateau at arbitrary depth in each boreholes, 2) Maximum concentration of Cl in east side of O.F. was approx. 5,000 mg/L and approx. 10,000 mg/L in west side of O.F. Especially, the area that Yuchi formation was distributed reaches at 15,000 mg/L, 3) $\delta^{18}O_{SMOW}$ and $\delta D_{SMOW}$ in groundwater were 0 ‰~5 ‰ and -30 ‰~-20 ‰ respectively regardless of Cl concentration. These findings suggest mixing of groundwater with heavier $\delta^{18}O$, $\delta D$ and less salinity in east side of O.F. Source of the less salinity groundwater is now unknown. However, degradation of gas hydrate will be one of the possible source of less salinity groundwater. Because there are many gas-shows in the Horonobe area, and previous studies show that water come from degradation of gas hydrate has low salinity and heavier $\delta^{18}O$, $\delta D$.