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Estimation of groundwater retention time by Carbon-14 in the sedimentary rocks at the Horonobe study site

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Dissolved inorganic carbon (DIC), $\delta^{13}\text{C}$ and $^{14}\text{C}/^{12}\text{C}$ ratio in sedimentary rocks were measured to understand the residence time of groundwater at Horonobe area, Japan. Siliceous mudstone of Wakkanai Formation and diatomaceous mudstone of Koetoi Formation containing fossil water and methane gas are distributed at the study area. Groundwater samples were collected at 140m and 250m depth. Groundwater samples were enough to overflow. After NaOH and SrCl_2 were added to the samples to induce SrCO_3 precipitation, the precipitated SrCO_3 was converted to CO_2 by reacting with phosphoric acid in a vacuum line. All samples were analyzed by an Accelerator Mass Spectrometer (JAEA-AMS-TONO).

Measured values of DIC, $\delta^{13}\text{C}$, $^{14}\text{C}/^{12}\text{C}$ in the groundwater samples were from 430 to 690 mg/L, from +19.3 to +21.8 permil and from 0.39 to 1.04 pMC (percent Modern Carbon), respectively. If all ^{14}C in samples were originated from CO_2 in the air, large quantities of air contact with the sample. This shows that; ^{14}C in the samples are not contamination. As a result of simply calculation, the ^{14}C ages were about 40,000 year BP. However, ^{14}C activity is diluted by non-active carbon ('dead carbon') from various carbon sources which are carbonates or organics. Thus, it is necessary to clarify the isotopic attenuation by dead carbon and process of isotopic fractionation in this area and to correct the ^{14}C ages.

Keywords: groundwater, retention time, isotope, ^{14}C