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Understanding the transport characteristics of chemical compounds derived from a natural uranium deposit near the lake

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The geologic stability should be guaranteed to store radioactive waste for the long term until radioactive hazards are naturally disposed of as much as possible. The stability determination can be secured by confirming the uranium compounds' long-term transport in advance using the reactive numerical model or the precisely controlled test with similar environmental conditions. However, previous studies still have faced a limit in time and space to the interpretation of the transport mechanism because the input variables for the modeling and the experiment have uncertainty. Therefore, understanding the transport mechanism of radioactive compounds in nature conditions for the long-term past geologic time is necessary. The present study conducted groundwater sampling near the uranium-bearing coaly slates and data analysis. High radioactive concentrations were detected in the surface layer of the study area, and uranium concentrations were monitored broadly in deep and shallow groundwater. In addition, after the precipitation event, the uranium concentration in the lake was also observed and represented the varied concentration ranges depending on the groundwater sampling depths. Determined by portable noble gas analysis equipment (GE-MIMS), the noble gas compositions in the groundwater exhibited a similar ratio to the calculated air-saturated water, and the groundwater age represented young. Therefore, it can be assumed that uranium compounds originated from the upper uranium-bearing coal strata could be transported to the groundwater by the precipitation events and flow into the lake. Additional study is necessary to understand the specific transport of the uranium compounds for the natural analogue, and this result can be utilized as the fundamental data.

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