

Estimation of erosion and uplifting by geochemical character of the Neogene siliceous rock in Horonobe, northern Hokkaido

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To evaluate long-term stability of the geological environment, being forecast the change for about 100,000 years in the future is of importance at the research for geological disposal of High-Level Radioactive Waste. About the impact of the uplift, subsidence, and erosion to the geological environment, the change of deep rock mass depth and the change of meteoric water infiltrative amount for deep rock mass are thought. The estimation method of erosion and uplifting by the mineralogical and the organic geochemical characters of the Neogene siliceous rock (Wakkanai and Koitai Formations) is researched in Horonobe.

As a result of the drilling survey (HDB-1 to 11 except 7), the transformational change of silica minerals (opal A to opal CT) was recognized around horizon of Wakkanai Formation / Koitai Formation boundary. The palaeo-geothermal gradient of the URL construction site was assumed to be about 3.5°C/100 m. An assuming that the surface temperature was 15°C, the burial depth of transforming to opal CT is about 860 m. The amount of the erosion can be estimated by the difference between the burial depth of transforming to opal CT about 860 m and the present depth of opal A / opal CT boundary. The amount of the erosion in each borehole point is estimated to be about 420 to 820 m. It is thought that Yuchi Formation / Sarabetsu Formation boundary is above 860 m from Wakkanai Formation / Koitai Formation boundary. The age of Yuchi Formation / Sarabetsu Formation boundary in this region is presumed to be about 1.3 million years (Oka and Igarashi, 1997). It is thought that the erosion in this region started from about 1.3 million years. Therefore, the average uplift rate in each borehole point is thought about 0.45 m/ky, and it is thought about 0.66 m/ky in the maximum.

Sterane decreased and sterane augmented from shallow part to deeper part as a result of the biomarker analysis of each core sample (HDB-3 to 8 except 7) (Takahashi et al., 2003, 2004). The present depth of each core sample was converted into maximum palaeo-geothermal temperature based on the present depth of opal A / opal CT boundary and the palaeo-geothermal gradient. As a result, positive significant correlation was recognized between the palaeo-geothermal temperature and the sterane / sterene ratio. The sterane / sterene ratio is effective to presume the palaeo-geothermal temperature. Presuming the maximum burial depth of each level of Wakkanai and Koitai Formations in high resolution becomes possible by comparison of the sterane / sterene ratio with the palaeo-geothermal temperature. Moreover, it is thought that a time and spatial distribution of the uplift and the erosion can be done by the grid sampling.