

Luminescence dating of fluvial terrace deposits in the Tokachi Plain

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Luminescence signals must be fully bleached prior to deposition to accurately estimate the depositional age. Incomplete bleaching is common in fluvial sediments because of the light attenuation through the water column. Thus, it is necessary to investigate the degree of bleaching or calculate ages by isolating a population of grains that were fully bleached prior to deposition. Few previous studies have applied luminescence dating to fluvial terrace deposits in Japan, and the degree of bleaching of fluvial terrace deposits is not fully examined. Luminescence dating of fluvial terrace deposits in the middle reach of Japanese rivers may reveal fluvial responses to climate changes during the Pleistocene and also contribute to estimation of uplift rate based on fluvial terraces. In this study, post-IR IRSL dating was performed on fluvial terrace deposits in the Tokachi Plain, Hokkaido, and examined the degree of bleaching by comparing ages of different luminescence signals and by comparing the equivalent doses of different grain sizes. Luminescence dating of a granite cobble was also conducted and compared the ages of sand grains.

Samples for luminescence dating were obtained from terraces that formed during the last glacial period and MIS 6. Post-IR IRSL_{50/150} (pIRIR_{50/150}) and post-IR IRSL_{50/225} (pIRIR_{50/225}) dating of sand-sized K-rich feldspar grains were performed. Comparison of equivalent doses obtained from different grain sizes suggests that the pIRIR_{50/150} and pIRIR_{50/225} signals were fully bleached prior to deposition. However, the fading-corrected pIRIR_{50/150} and pIRIR_{50/225} ages are 10–25 kyr older than the fading-corrected IRSL_{50/150} ages. pIRIR ages might overestimate the depositional ages because of residual doses.

L_n/T_n values of IRSL_{50/225} of the granite cobble are similar for the uppermost two slices, indicating that the signal was fully bleached prior to deposition. In the fading test, the values of prompt measurements were considerably high and might not reproduce the fading of signals in the field. Similar problem in fading test was reported in a previous study, but its cause has not been well understood. Fading rates were calculated by omitting the values of prompt measurements. Fading-corrected IRSL_{50/225} ages are consistent with IRSL_{50/150} of sand-sized grains, which indicates that the sand-sized grains were fully bleached prior to deposition. However, the variability of K-rich feldspar grains in the granite results in the large uncertainty of internal dose rates and the age (± 20 kyr).

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