

OSL dating and tephra analysis of fluvial terrace sediments

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Estimating the geological environments associated with uplift and erosion is important for the safety assessment of the geological disposal of high-level radioactive waste in Japan. The uplift rate during the past hundred thousand years is estimated from the elevation and emergence ages of terrace surfaces which are used as geomorphologic standard. Optically stimulated luminescence (OSL) dating is effective method to determine the emergence ages because it can be applied to common mineral grains (quartz and feldspar) present in sediments. In recent years, OSL dating is generally used in the continental regions such as Europe and Australia, but the application in Japan is far behind. In particular, the application of OSL dating to fluvial sediments is still limited in Japan. We therefore report a case study of quartz OSL dating of fluvial terrace sediments, and its adequacy is considered in the correlation with intercalated marker tephra. All samples were collected from fluvial terrace sediments along Kiso River and Tsukechi River which is a tributary of the Kiso. The investigated fluvial terrace sediments are composed of laminated sand layer and pumice layer which is likely to be reworked. The pumice was identified as On-Pm1 tephra (100ka; Kobayashi et al., 1967; Takemoto et al., 1987) by mineral composition, refractive indices of volcanic glass and phenocryst minerals, and the major element composition of volcanic glass. This indicated that the fluvial terrace sediments were deposited after 100ka. The extracted quartz grains from terrace sediments were measured by conventional SAR protocol (Murray and Wintle, 2000). The obtained OSL ages are about 40~50 ka, as far as we can foresee, being underestimated because the OSL decay curves from all samples were dominant by medium component which is unsuitable for OSL dating. We thus address to isolate a fast-component which is suitable for OSL dating, and the equivalent dose derived from the fast-component OSL is discussed in the presentation. This study was conducted under a contract with METI (Ministry of Economy, Trade and Industry) as part of its R&D supporting program for developing geological disposal technology.

Keywords: OSL dating, Fluvial terrace sediments, On-Pm1