

Potential and problems of K-feldspar optically stimulated luminescence dating of tsunami deposits

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In active tectonic region (e.g. the Japanese islands), quartz is often not suitable for optically stimulated luminescence (OSL) dating because of a lack of fast component and/or fading. Although OSL dating of feldspar is also disturbed due to fading and necessity of longer sunlight exposure for bleaching, stronger infrared stimulated luminescence (IRSL) relative to quartz OSL accepts for single grain OSL measurements and dating of young samples. This study was undertaken in order to confirm potentials and problems of OSL dating of K-feldspar on tsunami deposits using the 2011 Tohoku-oki tsunami deposits at Soma and Minami-soma city and Jogan tsunami deposits (A.D. 869) at Minami-soma city, Fukushima Prefecture, northeastern Japan.

Equivalent dose ratio of the conventional IRSL signal (IR_{50}) and post-IR IRSL signal ($pIRIR_{150}$) indicated both the 2011 Tohoku-oki and Jogan tsunami deposits were probably unexposed sunlight during transport processes. Although this condition was not favorable for OSL dating, single grain K-feldspar IRSL measurements of the 2011 Tohoku-oki tsunami deposits were feasible to extract the bleached grains indicating true depositional age. It is interpreted the 2011 Tohoku-oki tsunami deposits include K-feldspar grains bleached just before the tsunami transportations. On the other hand, single grain K-feldspar IRSL measurements of the Jogan tsunami deposits were only able to extract one grain showing true depositional age out of the 199 grains in five samples, and about half of the equivalent doses of K-feldspar grains exceeded 200 Gy (saturation level). The results indicated main sediment sources of Jogan tsunami deposits were different from the 2011 tsunami deposits at Minami-soma city, and therefore it caused different amounts of the K-feldspar grains bleached just before the tsunami transportations.

This study indicates it is important for estimating accurate depositional age of tsunami deposits using OSL dating to consider sediment sources and to select grains which have received sufficient sunlight exposure just before tsunami transportations.

Keywords: optically stimulated luminescence dating, post-IR IRSL dating, single grain IRSL dating, K-feldspar, tsunami deposits, Fukushima Prefecture