Reconstruction of paleo-tsunami by organic geochemical analyses of peat sediments from the Akkeshi area, eastern Hokkaido, Japan

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Tsunami deposit is characterized by mixture of marine sand, microfossils of marine origins such as diatom and dinocyst, and terrestrial soils eroded by huge tsunami. The identification of paleo-tsunami deposits is difficult because their records may be erased by erosion and disturbance including bioturbation during the post-depositional processes as well as various sediment types even in the vicinity. Recently, geochemical signals of tsunami deposit were noticed, and for instance, the dinosterol, which is typical coastal biomarker derived from dinoflagellate, could be found in the deposits of the tsunami of the northeastern Japan in 2011 (Shinozaki et al., 2015). In the present study, we performed organic geochemical analyses such as biomarker and kerogen of the peat sediment core from the Akkeshi area, eastern Hokkaido, Japan to examine the sedimentological and geochemical features of the paleo-tsunami deposit.

We analyzed the sediment core collected from the Akkeshi town, eastern Hokkaido, Japan during 2016. The sediment core mainly comprises the peats, intercalated with some sand layers (at most several 10 cm thick), which are presumed to be the layers deposited by the paleo-tsunami. The ages are roughly determined by the tephra layers intercalated. For the biomarker analysis, the extractions of freeze-dried sediments were fractionated using silica-gel column and analyzed by GC-MS. The kerogen was separated from minerals by HCl and HF treatments, and observed under transmitted and fluorescent light microscopes.

The averaged chain length (ACL) and aquatic plant-derived alkane ratios (P*aq*) of *n*-alkanes are almost similar between the paleo-tsunami and peat layers of the Akkeshi sediment core. These results indicates that the ACL and Paq values reflect paleovegetation rather than tsunami events. The carbon preferential index (CPI) of *n*-alkanes is used as a diagenetic indicator, and the values in the tsunami layers are significantly lower than those of peat layers. This result suggests that the deposits containing diagenetic compounds were possibly supplied. In steroid biomarkers, C27 and C29 steroids are known to be derived from eukaryotic algae, mainly marine algae, and terrestrial plant, respectively, so that the C27/C29 steroid ratio is commonly used as marine *versus* terrestrial contribution in deposited organic matter. The C27/C29 sterol ratios range below 5 %, and are nearly constant throughout the peat and tsunami layers. The stanols could be detected in all samples of the Akkeshi core. The stanol conversion reaction from biosterol is thought to occur by microbial reduction (hydrogenation) in the sediment–water interface and anoxic water column of marine and lacustrine environments. The C27 stanol is not biosynthesized compound, but C29 stanol is synthesized by a part taxa of terrestrial plant as minor component. Therefore, the stanol/sterol ratio can be used as redox indicator. We found that the C27 stanol/sterol ratios are clearly higher than those of C29 in the tsunami layers. The higher C27 stanol/sterol ratios suggest the contribution of marine compounds deposited under more reduced condition in the tsunami layer. In kerogen analysis, the marine dinocyst could be identified in the tsunami layer, although the dinoflagellate-derived biomarkers such as dinosterol could not be detected. Also, we pointed out that more reddish pollens were found in the tsunami layer, and such sporomorph may be reworked

component. From these results, it is suggested that the organic geochemical indicators are applicable to reconstruction and evaluation of paleo-tsunami deposit, although more examination is necessary.

Keywords: Paleo-tsunami, biomarker, kerogen, tsunami sediment, Hokkaido

