Evaluation of sediment transport on the eastern slope of the Japan Trench using the geochemical proxies

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The 2011 Tohoku-oki earthquake was the largest earthquake(trench-type earthquake) in the history of Japan with a seismic displacement of ~50 m horizontally and ~10 m vertically. Outer rise earthquakes sometimes occur with trench earthquakes, and as a result, large-scale crustal movements are expected to happen on the eastern side of the Japan Trench. Although earthquakes of more than magnitude 6.0 have occurred on the eastern slope of the trench in recent years, there is limited evaluation of the sedimentary environment with emphasis on the eastern slope. In this study, we aimed to understand the changes in sediment transport on the eastern slope of the trench caused by earthquakes.
The core samples were collected in two periods: 16 July to August 2011 and 24 August to 4 September 2020. Radioisotopes (^{137}Cs, ^{210}Pb, ^{214}Pb) and stable isotope ratios (δ^{13}C and δ^{15}N with their contents) in the collected sediments were measured. We also compared our results with the previous studies and evaluated the changes before and after the earthquake by focusing on both the east and west slopes. High radioactive ^{137}Cs concentrations were detected in the surface layer of the sediment, which is presumably derived from the Fukushima nuclear accident. Excess ^{210}Pb concentration in the sediment surface layer was higher than that measured in the same area in the past, suggesting increased sediment transport in this area. The values of δ^{13}C and TOC/TN indicate that the organic carbon originated from marine, which suggested that lateral transport from neighboring areas contributed to the increased transport. The fact that earthquakes may have triggered enhanced material transport to the eastern slope is an important finding in transporting materials to the open ocean, where biological productivity is low.

Keywords: Eastern slope of Japan trench, 2011 Tohoku-oki earthquake, Radionuclide

