

Radiocarbon Dating of Chlorophyll in Subduction Zone Sediments: Insights into Past Tsunami Occurrences

KAORU KUBOTA¹, TOSHIYA KANAMATSU¹, KANHSI HSIUNG¹, TOSHIYA FUJIWARA¹, NAOHIKO OHKOUCHI¹, HISAMI SUGA¹, RYO NAKANISHI² AND YUSUKE YOKOYAMA^{1,3}

¹Japan Agency for Marine-Earth Science and Technology

²Kyoto University

³The University of Tokyo

By analyzing marine sediment cores containing turbidites, we can determine the recurrence rate of past submarine landslides by establishing an accurate chronology. However, sediment cores from the North Pacific generally lack foraminifera due to limited surface habitation and a shallow carbonate compensation depth, making it difficult to construct a reliable timeline. While radiocarbon dating of bulk organic carbon (Bulk-TOC) is an option, the results are typically 1,000–2,000 years older than the actual deposition age. To improve dating accuracy, chemically purifying bulk organic matter and targeting specific organic compounds synthesized by surface-dwelling organisms can provide more precise results. This study focuses on chlorophyll-a, produced by phytoplankton in the ocean's surface layer. Our findings indicate that the radiocarbon age of chlorophyll-a is approximately 200–300 years older than that of dissolved inorganic carbon in surface waters. This suggests that some fraction of chlorophyll-a is laterally transported and redeposited by bottom water currents and other processes. However, given that Bulk-TOC radiocarbon ages are several thousand years older, chlorophyll-a remains a promising tool for dating marine sediments in the Kuril Trench.

