IODP Exp.318 U1357A コアへの化合物レベル放射性炭素年代測定の適用
Application of compound-specific radiocarbon dating to IODP Exp.318 U1357A core

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Radiocarbon (¹⁴C) dating of Antarctic margin sediments is difficult, because these sediments generally lack calcareous foraminifera. Moreover, the sediments are subjected to contamination of relict organic matter eroded from the Antarctic continent (e.g. Ohkouchi et al., 2003), leading to older radiocarbon ages of bulk sedimentary organic matter. Compound-specific (CS) ¹⁴C dating targets short-chain (C₁⁴, C₁₆ and C₁₈) fatty acids isolated from sediments. These compounds are derived from various organisms, but they are little contained in relict organic matter because the decomposition rate is relatively fast (Ohkouchi et al., 2003). Therefore, CS ¹⁴C dating is unaffected by relict organic matter from Antarctic continent (Ohkouchi and Eglinton, 2008) and can provide accurate age. The aim of this study is establishment of accurate age model of U1357A core using CS ¹⁴C dating. U1357A core (66o24.7991’S, 140o25.5008’E; 1014.9 m water depth; 186.6 m core length) was drilled at Adelie Basin located on the continental shelf off Wilkes Land, Antarctica during Integrated Ocean Drilling Program (IODP) Expedition 318 by D/V JOIDES Resolution (Expedition 318 Scientists, 2011). Lithology of this core is diatom ooze with lamination. We measured CS ¹⁴C ages from 13 samples. Target compound is mainly C₁₆:₀ fatty acid. In some samples, C₁₆:₁ fatty acid and cyclopheophorbide a were used for CS ¹⁴C dating. Samples were processed chemically using the protocol of Ohkouchi et al. (in review). Purification of target fatty acids uses high performance liquid chromatography - evaporative light scattering detector (HPLC-ELSD) system in JAMSTEC. Purification of CO₂ and graphitization were undertaken by dedicated high vacuum line of University of Tokyo (Yokoyama et al., 2010), and the measurement of ¹⁴C was conducted by Accelerator Mass Spectrometry (AMS) at University of Tokyo (Matsuzaki et al., 2007). ¹⁴C ages were calibrated using CALIB 6.02 and the Marine09 calibration curve (Reimer et al., 2009) with a reservoir age of 1144 +/- 120 years (Hall et al., 2010). We successfully obtained 13 CS ¹⁴C ages. CS ¹⁴C ages showed the deepest samples is last glacial period (21,957 +/- 260 cal. BP) and other samples are Holocene (9,663 +/- 190 cal. BP to modern). This suggests that; i) there is hiatus between 176.65 meters below seafloor (mbsf) and 181.66 mbsf of this core, ii) this core has a continuous record of the past ~10,000 years.

Keywords: compound-specific radiocarbon dating, Southern Ocean, Adelie Basin, Holocene, IODP