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Quantification of hydrate derived authigenic carbonate of extremely 13C-depleted foraminifera from the western North Pacific sediments: Implication from the coupled 13C and 14C isotopic mass balance approach

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Recently, Uchida et al. (G-cubed, 2004) and Ohkushi et al. (G-cubed, 2005) interprete d13C variations of planktonic and benthic foraminifera found in Last Glacial sediments in off Shimokita Peninsula and Tokachi as evidence for periodic releases of methane, arising from the dissociation of methane hydrate, and its subsequent oxidation in bottom- and/or surface-water environments. According to recent observations of anomalous bottom-simulating reflections, northwest Pacific marginal sediments around Japan main islands bear large abundances of methane hydrate. In this study, analyzed piston cores (42° 21.42' N, 144° 13.36' E) at a water depth 1066-m was retrieved from the off Tokachi continental slope in the Oyashio current region, where recently is found to bear immense amounts of methane hydrate. The piston core covered past 22 ka with high-resolution. Here we showed that carbon isotope signals indicated that planktonic and benthic foraminifera in several glacial sediment layers in the core were highly depleted in d13C; both the planktonic and benthic foraminiferal d13C values ranged from about -10 L' to -2L'. Most foraminiferal tests in these horizons were brown as a result of postdepositional alteration. Foraminiferal oxygen isotopes fluctuated abnormally in the glacial sediment layers, showing small (about 0.5L') positive shifts relative to normal glacial values. We attributed the positive shifts to authigenic carbonate formation in the foraminiferal tests. In order to

decipher the relation between foraminifera carbon isotopic signal and methane release from the seafloor, we have apportioned carbon sources (methane from methane hydrate or not) of foraminiferal carbon isotopic anomalies using dual mass balance isotopic model (14C/12C and 13C/12C). It has been suggested that sulfate-dependent anaerobic methane oxidation (AOM) dominates carbon oxidation and attendant authigenic carbonate precipitation to foraminifera. To this assumption, we have quantified the relative contributions of dissolved carbon dioxide (SCO2) from oxidation of methane in anomaly foraminifera. At the layer of 17,840 years cal. age with planktonic foraminifera of dual isotopic data d13C: -8.1L’ and D14C: -847L’) , relative contribution of carbon from authigenic carbonate was 17% of total carbonate and its d13C was -48.1L’, suggesting indirect records of enhanced incorporation of d13C -depleted CO2 formed by anaerobic methane oxidation process that use 12C-enriched methane as their main source of carbon.In the conference, we discuss about what mechanism contribute to authigenic carbon precipitation in terms with carbon source with 13C-depleted foraminifera.