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Os isotopic composition of Early Cretaceous seawater reconstructed from umber deposit in the Japanese accretionary complex

MOEI YANO[1,2], KAZUTAKA YASUKAWA[2], KOICHIRO FUJINAGA[1,2], JUNICHIRO OHTA[1,2], YUSUKE KUWAHARA[3], KEN NAKAYAMA[4], KENTARO NAKAMURA[1,2] AND YASUHIRO KATO[1,3]

[1]Ocean Resources Research Center for Next Generation, Chiba Institute of Technology

[2]Frontier Research Center for Energy and Resources, School of Engineering, The University of Tokyo

[3]Department of Systems Innovation, School of Engineering, The University of Tokyo

[4]Center for Advanced Marine Core Research, Kochi University

Presenting Author: moei.yano@p.chibakoudai.jp

The Japanese accretionary complexes are composed of various rocks ranging from oceanic basalts to trench-fill turbidites, comprising the oceanic plate stratigraphy. They include umbers (strata-bound Fe-Mn deposits), cherts, and pelagic clays, which have been studied to reconstruct the paleoenvironment in pelagic realms from geochemical approaches (e.g., bulk chemistry, isotopic analyses).

The marine osmium (Os) isotopic composition is controlled by the relative balance of riverine, hydrothermal, and cosmic dust flux [1]. Therefore, the reconstruction of Os isotopic ratios of past seawater can provide information on the relative changes in these fluxes and the paleoenvironmental factors that produced them.

Here, we aim to reconstruct seawater Os isotopic compositions of the Early Cretaceous, using the Yokonami umber collected from Kochi, Southwest Japan. Umber is originated from precipitation of Fe–Mn oxyhydroxides derived from seafloor hydrothermal activity at a mid-oceanic ridge. Since Fe–Mn oxyhydroxides efficiently adsorb elements in seawater, including Os, umber is considered to retain the Os isotopic ratio of seawater at the time of deposition. The depositional age of the Yokonami umber is estimated to be the Early Cretaceous (late Valanginian) based on radiolarian biostratigraphy of the accompanied red chert[2].

In the presentation, we discuss the origin and depositional setting of the Yokonami umber based on whole-rock chemical composition data. We will also show the Early Cretaceous seawater Os isotopic ratios and discuss its implications for the long-term trend of seawater Os isotopic variations during the Phanerozoic.

[1] Peucker-Ehrenbrink & Ravizza (2000) Terra Nova, 12, 205-219

[2] Matsumoto et al. (1988) Modern Geology, 12, 197-224.