Marine Os isotopic variation in the global warming period from Late Paleocene to Early Eocene

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The period from Late Paleocene to Early Eocene is well known to have been the warmest in the Cenozoic. Here we report a marine Os isotope record during the warming period, which was reconstructed from the Mineoka umbers. The Mineoka umbers immediately overlying ~52.8 Ma tholeiitic basalts occur in the Tertiary accretionary complex of central Japan. The associated tholeiitic basalts exhibit typical normal mid-ocean ridge basalt (N-MORB)-type geochemical signatures and are interpreted to be a remnant of Tertiary oceanic crust. The Mineoka umbers are ancient counterparts of MOR metalliferous sediments that are plume fall-out ferromanganese precipitates scavenging various seawater-derived elements including P, V, Y, REEs, and Os. Their $^{187}Os/^{188}Os$ ratios vary from 0.47 to 0.54 as initial values, exhibiting a relatively wide range probably due to a large change in the marine $^{187}Os/^{188}Os$ ratio during ~1 Myr umber deposition. The marine $^{187}Os/^{188}Os$ ratio during umber deposition was significantly higher than that of the prior period (post-late Paleocene thermal maximum; ~0.38 as $^{187}Os/^{188}Os$). This was probably caused by an increase in the chemical weathering rate of continental crust due to the long duration of unusually warm climate during the early Eocene climatic optimum. Alternatively, the decline of North Atlantic rifting and volcanism may have decreased the influx of unradiogenic Os to the global ocean, and consequently led to a rapid increase in the marine $^{187}Os/^{188}Os$ ratio during this interval.