Marine osmium isotope record in the Upper Triassic deep-sea deposits from Japan: the Middle to Upper Norian transition

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In contrast to a single mass extinction event at the Triassic-Jurassic boundary, extinctions in major pelagic groups, such as radiolarians and conodonts, occurred stepwise during the latest 15 Myr of the Triassic. Although a marked decline of diversity began at the end of the middle Norian on these pelagic fauna, the cause of this extinction has been still uncertain. In order to reconstruct global environmental changes in the Panthalassa Ocean during the Middle to Late Norian, we examined a stratigraphic profile of the marine osmium isotope compositions ($^{187}Os/^{188}Os$) from the Triassic bedded chert succession of the Mino Belt, central Japan. Os isotope compositions of the seawater reflect relative balance among the riverine ($^{187}Os/^{188}Os \approx 1.4$), hydrothermal, and extraterrestrial ($^{187}Os/^{188}Os \approx 0.12$–$0.13$) influxes to the global ocean reservoir [1]. Given these distinctive $^{187}Os/^{188}Os$ compositions and the relatively short residence time of Os in the ocean (several tens of thousand years), marine $^{187}Os/^{188}Os$ compositions are highly sensitive to the changes of these influxes. Os isotope compositions of the bedded cherts show a gradual increase from ~0.5 to ~0.7 during the Middle Norian. Two negative Os isotope excursions are observed within a ~2 m stratigraphic interval between the Middle and Upper Norian. The onset of the first negative Os isotope excursion (~0.126) is almost equivalent to the base of the *E. bidentata* conodont zone in the late Middle Norian. This Os isotope excursion interval exhibits both elevated Os contents (~3.1 ppb) and low Re/Os ratios (~0.03), suggesting a significant input of an extraterrestrial Os into the deep-sea sediments [2]. The second negative Os isotope excursion occurred in the early Late Norian and the isotopic composition shifted to unradiogenic from ~0.7 to ~0.4. However, it is still difficult to specify the cause for this second excursion and an additional research is needed.

[1] Peucker-Ehrenbrink & Ravizza (2000) *Terra Nova* **12**, 205-219. [2] Sato *et al*. (2013) *Nat. Commun*. **4**, 2455.