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Sulfur isotope of sulfate profiles in the pelagic Panthalassic deep sea at the end-Permian

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Japanese accretionary complexes contain Panthalassic deep-water sediments. These pelagic deep-water sediments record environmental changes in the central Panthalassa Ocean during the Permian-Triassic transition which is associated with the most severe mass extinction known to date. This study presents sulfide-sulfur isotopic records from a continuous deep-water Permian?Triassic boundary section located in northeast Japan (the Akkamori section-2). The data demonstrate a 10 permil rise in sulfide-sulfur isotope ratios at the end-Permian followed by a sharp drop (return to pre-rise values). Such large sulfur isotopic swings have also been reported in carbonate-associated sulfates from the end-Permian mass extinction horizon in the shallow Paleotethys. These sulfur isotopic swings suggest the accumulation of H2S followed by a massive release of 32S-enriched sulfur to the shallow ocean environment at the end of the Permian at least encompassing central pelagic Panthalassa and shallow Paleotethys environments. This widespread sulfur isotopic event is therefore likely to be a global phenomenon. The end-Permian sulfur isotopic drop coincides with a reported demise among radiolarian fossils, the onset of carbonaceous black claystone deposition, and a negative excursion in organic carbon isotopes. These facts can be connected to one another by our proposed hypothesis, as follows. (1) Panthalassic euxinic deep-water bodies increased in volume to push the chemocline upward in the Changhsingian. Such expansion of anoxic water mass provide an increase in the consumption of sulfate by sulfur reduce bacteria and sulfate-poor ocean, result an increase in sulfur isotope of oceanic sulfate. (2) The euxinic deep waters caused the chemocline to rise to a very shallow water depth, while oxidation and re-reduction of sulfide (sulfur disproportionation) were accelerated. Such oxygen-poor shallow-water conditions can explain the coincidence of this sulfur isotopic drop, the radiolarian collapse, and the increase in the proportion of undecomposed organic matter in sediments. This expanded euxinic deep water might represent one of the causes of the end-Permian mass extinction in the central Panthalassa.

Keywords: Mass extinction, Panthalassa, Pelagic deep sea, Permian, Triassic, Sulfur isotope