

Reconstruction of Permian-Triassic ocean redox conditions based on laminae preservation and pyrite framboids from the pelagic Panthalassic Ocean

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Widespread oceanic anoxia has been implicated as an important factor in the Permian -Triassic mass extinction and the delayed recovery of Early Triassic marine ecosystems. This study investigates the composite columnar section of the deep-sea Permian-Triassic boundary section preserved in the accretionary complex in Northeast Japan. This columnar section consists of the Upper Permian bedded chert and siliceous claystone, and overlying the end-Permian to earliest Triassic black claystone. The mass extinction horizon places in the base of the black claystone, and top of the reconstructed black claystone corresponds to 226.7 kilo year after the extinction event based on sedimentation rate estimated by Takahashi et al. (2014). The careful observation of polished cross sections identified thinly laminated structures in the end-Permian to earliest Triassic claystone interval. Our observation on the polished specimen revealed small and well sorted framboids (average diameters are 4 μm and their standard deviations are 1.1 μm) suggesting that sulfidic water column prevailed during the end Permian mass extinction and subsequent time interval corresponding to the overlying 30 cm. Well preserved laminae occur within the same stratigraphic interval, suggesting stagnant benthos activity due to anoxic bottom water condition under sulfidic water column. On the other hand, well preserved laminae appear again in the overlying earliest Triassic horizon, but size of pyrite framboids are not so small (average diameters are more than 7 μm), suggesting anoxic but non-sulfidic water column condition. These facts indicate water column sulfidic episodes sustained for less than 50 kilo years in the pelagic Panthalassa.

Keywords: Permian, Triassic, Mass extinction, Pelagic deep sea, Pyrite Framboids