Paleoenvironmental changes across the Permian/Triassic boundary sections in the Mino Belt, central Japan

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The ca. 251 Ma Permian/Triassic boundary (PTB) records the largest biotic catastrophe in the Phanerozoic. A considerable amount of work for the PTB event has been done on the Tethyan platforms and peri -Pangean shelves, and some possible causes have been proposed to explain the extinction event: oceanic anoxia, meteorite impact, flood basalt volcanism and global warming. Sano et al. (2010, 2012) reported the stratigraphic variations of TOC, $\delta^{13}C_{org}$ and the number of Permian radiolarian species in the PTB siliceous rock section of the Mino Belt, central Japan, and inferred that a reducing condition in the deep Panthalassic Ocean at the PTB. In this study, we examined the geochemical and mineral compositions of the exactly the same sections of Sano et al. (2010, 2012).
The study sections, namely NF1212F and NF195, consist of Upper Permian chert (Changshingian) and Lower Triassic (Induan) black claystone intermittently with thin chert beds. A total 81 clatstone samples were obtained from the NF1212F and NF195 sections. Powder x-ray diffraction (XRD) analysis shows that the claystones below the PTB contained quartz, magnetite, illite and chlorite, while all the claystone above the boundary only contained quartz and illite. The results of XRF and ICP-MS analysis revealed that redox-sensitive trace-element (vanadium [V], chromium [Cr], molybdenum [Mo], and uranium [U]) increase in the uppermost Permian chert beds. The increasing trend in Mo/U ratio from 150 cm to 25 cm below the PTB indicates shift from anoxic to euxinic conditions. This trend suggests that strong reducing conditions developed just before the end-Permian mass extinction.

Keywords: Permian/ Triassic boundary, bedded chert, Mino belt, Panthalassic ocean, ocean anoxia

