Milankovitch Cycles Detected in the middle Triassic Bedded Chert in Inuyama Area, and its Relation with Deep Sea Redox Changes

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The Permian-Triassic mass extinction is known as the largest mass extinction event in the Phanerozoic, and the Early to Middle Triassic period is characterized by the interval of delayed biotic and environmental recovery. One of the main cause of the delayed recovery is considered to have been long-lasted anoxia of deep ocean (Superanoxia; Isozaki, 1997). However, the reality of long-lasting anoxia, its maintaining mechanism, and details of the recovery process during the middle Triassic are largely unknown. In this study, we established high-resolution and continuous reconstruction of the middle Triassic bedded chert sequence that deposited in the middle of Panthalassa, and explored the possibility of the Milankovitch cycle origin of the sedimentary rhythms observed in the bedded chert sequence so as to establish the cyclostratigraphic framework for the sequence. We also examined the temporal change in the redox condition of the bottom water based on the lamina preservation index and abundance of redox sensitive trace elements in order to reconstruct the detailed recovery process from long-lasted anoxia. The middle Triassic pelagic sequence in Inuyama area consists of bedded chert with periodical change in color. The sequence is divided into lower gray chert (lower Anisian), lower red chert (lower-middle Anisian), upper grey chert (middle-upper Anisian), and upper red chert (upper Anisian-Ladinian) units, in ascending order. The radiolarian biostratigraphy has been already established for the sequence by Sugiyama (1997). We examined cyclicities of chert and shale bed thicknesses using wavelet and foulie spectral analyses. The results of spectrum analyses of chert and shale bed thickness revealed ca. 5 beds, 20 beds, and 200 beds cyclicities that corresponds to 0.1 Myr, 0.4 Myr and 3.5 Myr eccentricity cycles, respectively. These results support the idea that the cyclicities observed in middle Triassic bedded chert sequence are driven by Milankovitch cycle. We also reconstructed the bottom-water redox condition by the lamina preservation index based on the observation of the soft-X ray radiographs and by the trace metal abundance measured by the X-ray fluorescence. We will discuss the relationship between long Milankovitch cycles and the bottom-water oxygenation changes in middle Triassic super-ocean Panthalassa.