Orbitally-paced biogeochemical cycles recorded in the Triassic bedded chert sequence from the Mino Belt, central Japan

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Bedded chert sequences in the Jurassic accretionary complexes of Southwest Japan consist of the rhythmic alterations of chert and shale beds whose thickness variations have been interpreted as recording astronomical cycles. However, recent critical cyclostratigraphic examinations from Japan require identification of driving force for their sedimentary rhythms. In this study, geochemical analyses using X-ray fluorescence spectrometry (XRF) were performed on the Triassic (Anisian-early Carnian) bedded chert sequence in the Mino Belt, central Japan. Remarkable behaviors of redox sensitive elements in the black shales suggest that the oceanic anoxic events developed frequently in the Anisian, despite the fact that the Anisian was the time of the recovery stage from the Permian/Triassic boundary Superanoxia. Cyclic oscillations of the biogenic apatite abundances have maximum values after the OAEs. These observations might represent the high planktonic diversification in the early Middle Triassic that triggered the Mesozoic Marine Revolution. A spectral analysis of major element data revealed that the time-series fluctuations in the chemical weathering intensity were controlled by the Milankovitch cycles and probably affected the oceanic redox condition during the Triassic. Amplitude modulations extracted from the chemical weathering intensity in the Triassic suggest that the climate experienced a transition from a grand astronomical cycle world to a relatively short cycle world in the early Ladinian. This paper proposed that a mechanism for the transition was resulted in organic carbon burial during the Early to Middle Triassic anoxic events and consumption of atmospheric CO_2 by intensified chemical weathering.

