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High-resolution lithostratigrphy and organic carbon isotope stratigraphy of the lowest Triassic pelagic sequence in the Mino Terrane, central Japan

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The largest mass extinction in the Phanerozoic occurred at the end of the Permian with global loss of nearly 90% marine species (Erwin, 1994). So many studies have been conducted on the Permian/Triassic (P/T) boundary in shallow-marine sequences deposited around the supercontinent Pangea, and various hypotheses for the extinction have been proposed. However, causes of the P/T boundary event haven't been clarified yet.

Recently, it was proposed that not only at the P/T boundary, but also during longer period ranging from the P/T boundary to the beginning of the middle Triassic experienced continuous environmental instability characterized by large amplitude carbon isotopic oscillations that suggests a casual relationship between unusual carbon cycle and delayed biotic recovery (Payne *et al*., 2004). However, the record of carbon isotopic excursions came from bulk sample analysis of shallow-marine carbonates deposited in tropical Tethys ocean and consisted of composite date of several lithostratigraphic sections. So the record might have suffered from the biological, diagenetic, sedimentary environmental effects as well as uncertainty in stratigraphic correlation. To confirm whether the data really reflects the carbon isotopic record of atmosphere plus ocean surface water at least, it is important to obtain continuous carbon isotopic data from pelagic region in the superocean Panthalassa, and compare it with the shallow marine Tethyan record.

Jurassic accretionary complex in Japan includes Permo-Triassic pelagic sedimentary

sequence deposited on the deep sea floor of Panthalassa, which are considered to record global environmental changes (Isozaki, 1997). However, consecutive lithostratigraphy from the latest Permian to the early Triassic of such a pelagic sequence has never been reconstructed because the pelagic sequence were intensely faulted and folded during the accretionary process and especially black shale unit, which is considered to have accumulated during the earliest Triassic, became the slip horizon (decollement).

In this study, we carried out detailed geological research of the Jurrassic accretionary complex of Mino Terrane exposed along Kiso River, Inuyama, central Japan to reconstruct the consecutive lithostratigraphy of the lower Triassic pelagic sequence. In the study area, Jurassic accretionary complex is composed of the lowest Triassic black shale, dolostone, and siliceous mudstone, the middle Triassic-lower Jurassic bedded chert and the middle-upper Jurassic clastic rocks (Matsuda and Isozaki, 1991). However, their exact stratigraphic relationship and thicknesses have never been clarified in detail because the sequence is extensively faulted and folded. We reconstructed the consecutive lithostratigraphy of the sequence by making a detailed lithological distribution map to identify fault bounded blocks, constructing columnar sections for individual blocks and correlating the columnar sections to construct a continuous composite columnar section. The lithostratigraphy of the composite column is about 12m-thick and composed of 14 lithological units. Radiolarian index fossils of the late early Triassic (Spathian) and the early middle Triassic (Anisian) were found from red siliceous mudstone unit and bedded gray chert unit respectively (Yao and Kuwahara, 1997). Although index fossils older than Spathian have never been reported from the study area, lower black shale unit is considered as corresponding to the earliest Triassic black shale judging from its lithology and thickness (Yamakita *et al*., 1999).

Carbon isotopic analysis of total organic carbon (TOC) in this lower Triassic pelagic sediments was conducted to reconstruct continuous carbon isotopic record covering the entire early Triassic and examine whether pelagic organic carbon isotopic record also exhibits large amplitude fluctuations throughout the early Triassic similar to shallow marine carbonates reported by Payne *et al*. (2004). One hundred fifteen samples taken from the sequence were treated with hydrochloric acid to remove carbonates and subject to carbon isotopic measurement using an on-line elemental analyzer / isotope ratio mass spectrometry (EA/IRMS) system. The result suggests that general trend and amplitude of the obtained carbon isotopic record is similar although shorter scale large amplitude oscillations are also present. It is likely early Triassic shallow marine carbon isotopic record of Payne *et al*. (2004) represents global signal, which makes it possible to make detailed correlation between shallow marine record of Tethys and pelagic record of Panthalassa.