

A carbon isotope stratigraphy across the Guadalupian-Lopingian boundary in a chert sequence in Japan

Yuichiro Nishikane^{1*}, Kunio Kaiho¹, Satoshi Takahashi¹, Noritoshi Suzuki¹, Kanno Mizuho¹

¹Graduate School of Science, Tohoku Univ.

The terminal Guadalupian (the Middle Permian) is marked by one of the most significant biotic crises of the Phanerozoic. Guadalupian-Lopingian (G-L) sedimentary rocks are widely distributed in accretionary complexes in Japan, but the boundary between both Series has not been well documented from these pelagic sediments. To identify the G-L boundary, we examined the conodont biostratigraphy in a pelagic chert sequence in the Gujo-hachiman section of Kuwahara et al. (1998), Gifu, southwest Japan. Our identification of conodont fossils was confirmed by Prof. Charles Henderson of Calgary University. Age-diagnostic conodonts including *Clarkina postbitteri* were found in this section. The biostratigraphic occurrences of these age-diagnostic conodonts can pinpoint the "G-L transitional zone" in the Gujo-hachiman section, by comparison with the well-studied sections in South China, including the GSSP section. The transitional zone was recognized by the first occurrence horizons of both *C. p. hongshuiensis* and *C. p. postbitteri*. The G-L boundary has been placed at the base or above the first occurrence horizon of radiolarian *Albaillella yamakitai* or *Albaillella cavitata* in previous studies in China and Japan. We detected the first occurrence horizon of *Albaillella yamakitai* at the base of the "G-L transitional zone". The conodont biostratigraphy is consistent with the radiolarian biostratigraphy in this section, which can be correlated to relevant sections in China. This result can be confirmed with the stable carbon isotope stratigraphy in the same section. Two negative shifts of $\delta^{13}\text{C}_{\text{org}}$ values were recognized in the lower part of the section. In the upper part of the section, $\delta^{13}\text{C}_{\text{org}}$ values are relatively unchanged. The lower negative shift, a 1.1 per mil drop from -29.0 to -30.1 per mil, in the "G-L transitional zone", is comparable with the shift known at the G-L boundary at the Penglaitan section, South China. This lower negative shift in our section is also correlative with that in the Kamura section where the G-L boundary is placed in the seamount-limestone sequence. The upper negative shift, a 1.8 per mil drop from -28.9 to -30.7 per mil, occurred above the "G-L transitional zone" in our section. This negative shift at the beginning of the Lopingian, however, is not detected in either the Penglaitan or Kamura sections. Biostratigraphic data indicates the Penglaitan and Kamura sections do not extend far enough into the Lopingian to capture the upper negative carbon-isotope shift.

Keywords: Guadalupian-Lopingian boundary, organic carbon isotope ratio, conodont, radiolarian, mass extinction, deep-sea chert