

Chemostratigraphy and paleoenvironmental reconstruction of the Ediacaran-Cambrian section in Khubsugul Group, northern Mongolia

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According to the fossil record, the early evolution of multicellular animals occurred during the late Ediacaran and early Cambrian. However, detailed timing and process of the evolution are unclear partially due to the scarceness of fossil record and appropriate research site. Moreover, paleoenvironmental reconstruction of marine environment during the Ediacaran-Cambrian and its relationship with the early animal evolution are still unclear on the global scale. This study focuses on the Khubsugul Group in northern Mongolia as a prospective research site for paleontological and paleoenvironmental studies.

Ediacaran and Cambrian Khubsugul Group consists of three formations: Ongoluk, Khesen and Erkhelnur Formations in upward sequence. Recent fossil discovery of “Doushantuo-type” microfossils from the group as well as the occurrence of relatively large-sized trace fossils from the coeval formations of adjacent Dabkhan terrane also implies that the Khubsugul Group is potentially important for future paleontological study. Nevertheless, very few geochronological or paleoenvironmental studies have been done for the Khubsugul Group. Therefore, carbon isotope and geochemical analyses of this group, the former for the correlation of the group, and the latter for the marine environmental study have been conducted.

New $\delta^{13}\text{C}$ data from the Ongoluk and Khesen Formations showed two negative excursions, one in the upper part of Ongoluk Formation and the other in the upper part of Khesen Formation. The Ediacaran-Cambrian boundary could be assigned to either of the two horizons in the group considering the world-wide existence of a conspicuous negative excursion (BACE excursion) at the boundary.

The results of total sulfur (TS) and total organic carbon (TOC) analysis both showed high concentrations in the calcareous shale in the lower part of the Khesen Formation. This result could be explained by either of the two scenarios: one is that the redox variation had driven the changes in TS and TOC, and the other is related to the biotic activity. The former, redox variation scenario stands on the understanding that carbonate rocks would record high TS and TOC values if the seawater is anoxic and record low values if oxic. The measured values may indicate that the seawater changed to relatively anoxic during the deposition of the Khesen Formation. The latter, biotic scenario is inferred from the result that increase of TS and TOC coincides with the increase of siliciclastic components and concentrations of metal elements (aluminium, iron, manganese, vanadium, thorium, and molybdenum). According to these increases, a scenario can be proposed that the terrestrial weathering and input of siliciclastics and other metal elements into the marine environment during this period promoted enhanced production by marine organisms.

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