

Paleovegetation changes reconstructed by terrestrial plant biomarker analyses in the sediments deposited across the Cenomanian/Turonian boundary in the Tomamae area, Hokkaido, Japan

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The Cretaceous is known as the extreme greenhouse period attributed to the elevated atmospheric CO₂ concentration triggered by the superplume activity. In particular, the Oceanic Anoxic Events (OAEs) caused by the occurrences of the Large Igneous Plateaus (LIPs) in several times during the mid-Cretaceous. Global environmental disturbance events have been extensively investigated in the ocean, but there have been few reports for terrestrial environmental variation during the OAE periods (e.g. Kuypers et al., 2002). In the present study, we analyzed biomarkers of terrestrial plants including lichen and fungi in the sediments deposited across the Cenomanian/Turonian boundary (CTB) from the northern Hokkaido, Japan to reconstruct paleovegetation changes and to evaluate paleoecology of individual plants during environmental disturbance event.

We analyzed sedimentary rocks across the CTB in the Saku Formation, Yezo Group, were collected from the Omagari-zawa sections of the Tomamae area, northern Hokkaido, Japan. The sediments used correspond to the OAE2 intervals (1st build-up, Trough, 2nd build-up and Plateau phases), determined by $\delta^{13}\text{C}$ stratigraphy (Omatsu et al., 2014). For the biomarker analysis, the extractions of freeze-dried sediments were fractionated using silica-gel column and analyzed by GC-MS.

By sterane and hopane ratios, we confirmed the high contribution of terrigenous matter input and low maturity of organic matter (vitrinite reflectance ca. 0.4% level; lignite to subbituminous coal rank) in the Omagari-zawa section. These results agree with those reported by Ando et al. (2017). Higher Plant Parameter (HPP) as the vegetation index of higher plants increased in the 1st build-up and 2nd build-up stages, and declined in the Trough and Plateau stages. We interpret that the coniferous vegetation has expanded under arid condition. Moreover, we analyzed the proportion of 1-methyl dibenzofuran in total methyl dibenzofurans as a lichen indicator (1- MDBF ratio), and perylene/ pyrene ratio as a fungal assemblage index. Variations in lichen and fungi vegetation tend to decrease from the 1st build-up to the 2nd build-up stage, which are resemble to those of coniferous vegetation. Thus, it is considered that the vegetation overall declined against the mid-Cretaceous environmental disturbance, especially affected by arid/humid fluctuation.

Keywords: Paleovegetation, lichen, biomarker, Yezo Group, C/T boundary, Cretaceous