Organic geochemical characteristic and its significance of Jurassic-Cretaceous terrestrial sediments recovered by IODP deep sea drilling

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International Ocean Discovery Program (IODP) is an international deep-sea scientific drilling program to investigate the history and dynamics of the Earth by collecting data recorded in sediments and rocks on the seafloor and monitoring the environment of the seafloor. In IODP Expedition 369, sediment samples with the following four conditions were drilled : ① sediments from the southern margin of the Tethys Sea, ② ages are Jurassic to Early-Cretaceous, ③ terrestrial sediments, ④ immature in terms of organic geochemistry with less metamorphism after burial (Huber et al, 2019). There are no examples of organic geochemical studies on such samples, and it is highly expected that organic geochemical studies on the sediment samples from Site U1515 will provide new insights into organic geochemistry. As a preliminary step to progress such a study, fundamental investigation of biomarkers of Site U1515 sediment samples was conducted in this study. Specifically, the purpose of research is to describe biomarkers, such as whether the sample contains the necessary amount of biomarkers for analysis, what specific biomarkers are included, how diverse they are, and whether the preservation (thermal maturity) of these biomarkers is suitable for research. Biomarker analysis of such unknown samples, which have not been studied, is as important as conducting field surveys in unknown areas and describing fossils there, and lays the foundation for future research.
Gas chromatography (GC) and gas chromatography-mass spectrometry (GC/MS) were performed on eight samples from the Jurassic to Early Cretaceous age sedimentary range of U1515A, and all eight samples were found to contain enough biomarkers to be useful for research. The biomarkers included were roughly divided into eight categories: n-alkanes, aliphatic hopanoids, aliphatic steroids, aromatic hydrocarbons, phenolic diterpenoids, hopanones and steroidketones, and the distribution of n-alkanes, aliphatic hopanoids, aliphatic steroids and steroidketones suggested that all eight samples were immature terrestrial sediments. The distribution of phenolic diterpenoids and n-alkane suggests paleovegetation, and terrestrial higher plants were dominant in organic matter input to the sediments in all eight samples. Among them, the plant groups that were the dominant organic matter input sources differed in each sample. As for phenolic diterpenoids, based on further comparison with previous studies (Marynowski et al., 2006), it is clear for the first time that conifers of these origins were once distributed throughout the northern and southern hemispheres during the Jurassic to at least the Early Cretaceous.

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