

ACG034-P05

Room:Convention Hall

Time:May 27 14:00-16:30

Transport and diagenesis of terrestrial higher plant terpenoids in suspended particles from several rivers of Hokkaido

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Marine and lacustrine sediments can be useful as geological samples from which long-time scale (more than several 100 thousands years) terrestrial environmental information is successively recorded. However, the terrigenous matter that had information of environment and ecosystem in provenance are transported from land area to ocean and lake, and deposited as allochthonous matter in marine and lacustrine sediments. During the transport and deposition processes, such matter must be chemically and morphologically altered, and also, the records for environment and ecosystem in provenance are possibly changed. Thus, it is important for reconstructing the terrestrial paleoenvironment and paleoecological aspects to examine the alteration or consistency for terrestrial records during those processes. In this study, we focus terrestrial higher plant biomarkers such as terpenoids, in which structures vary depending on taxonomical differences. We analyzed the terrestrial higher plant terpenoids (HPTs) in suspended particles from waters in six rivers (Bekanbeushi, Ishikari, Kushiro, Saru, Teshio, and Tokachi Rivers) of Hokkaido, to evaluate transport and diagenetic processes of higher plant-derived organic materials, and to examine for spread of vegetation and terrestrial environmental records from provenance to ocean.

We identified angiosperm HPTs such as betulnic acid, friedelin, oleanolic acid, and ursonic acid and gymnosperm HPTs such as dehydroabietic acid from suspended particle samples from waters in six rivers of Hokkaido. In the Bekanbeushi River, the highest concentrations of HPTs indicate that plant material is efficiently transported from the Bekanbeushi wetland because of less effect for artificial hindrance. In contrast, concentrations of the HPTs in water of the Kushiro River were much lower, which was attributed to artificial hindrance such as change of flow pathway. The ratios of gymnosperm / angiosperm based on HPT compositions were lower in the Bekanbeushi and Kushiro Rivers, which pass through wetlands, but were higher in the Ishikari and Tokachi Rivers, which flow from forests in mountains. These results indicate that low and high gymnosperm / angiosperm ratios reflect conifer-dominant vegetation in forest and herbaceous angiosperm-dominant vegetation in wetland, respectively. From these insights, we will discuss the more detailed implication for preservation of the records of the provenances such as forest and peat in lacustrine and marine sediments.

Keywords: Higher plant terpenoid (HPT), paleovegetation, terrestrial environment, transport process, early diagenetic alteration, spread of vegetation record