

Study on migration of particulate organic matter in the Kushiro River using radiocarbon and stable carbon isotopes

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Knowledge of organic carbon dynamics in river basins is necessary to study the role of rivers in global biogeochemical cycles and ecosystem in coastal marine environment. The recent studies have pointed out an importance of snowmelt and rainfall on the transport of particulate organic matter (POM) in river systems. Therefore, it is important to understand the sources of POM, its transport behavior and controlling factors. Carbon isotopic compositions of POM are useful tools as tracers of the sources and behavior of POM in river systems. The objective of this study is to elucidate the transport behavior of POM from wetland to coastal ocean, because wetland is an extremely important carbon pool in terrestrial environment.

River water samples were collected at a fix station near Iwaboki observatory during spring to summer in 2004-2009. The station is located at the southern end of the Kushiro Wetland in eastern Hokkaido, Japan. Suspended solids were concentrated by single-bowl continuous-flow centrifugation and then freeze-dried. Aliquots of powdered samples after 1M HCl treatment were measured for C and N using an elemental analyzer. Stable carbon isotopic ratios were analyzed sub-samples of CO₂ gas generated during graphite production using a mass spectrometer. Radiocarbon of organic matter was determined using accelerator mass spectrometer at the NIES and JAEA. Radiocarbon values were reported as Delta¹⁴C corrected for sample delta¹³C.

The Delta¹⁴C and delta¹³C of particulate organic matter in suspended solids from the Kushiro River ranged from -76 to +6 permil and -29.0 to -27.8 permil, respectively. In order to understand the transport processes of particulate organic matter, we discussed relationship between the water level and carbon isotopes. The Delta¹⁴C value in April 2004, 2005 and August 2009 is higher than the other samples. The above sampling date corresponds to higher water level with spring snowmelt and long rainy period. On the other hand, delta¹³C value decreased with increasing water level. These results indicate that when the water level increases, the contribution of organic matter in the surface soil increases at the Kushiro Wetland area.

Keywords: river water, POM, suspended solids, coastal marine sediments, terrestrial organic matter, land-ocean interaction