Dynamics of Fukushima-derived Radiocesium in the System of River – Estuary – Ocean: Potential tracer in the Pacific Ocean

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It is urgent to reveal the environmental translocation of radionuclides, deposited on the land, derived from Fukushima Daiichi Nuclear Power Plant (FDNPP) disaster. The dynamics and transport of radiocesium were carried out in the brackish water of Matsukawa-ura Lagoon, Fukushima, Japan, as a model area for the system of river – estuary – ocean.

Samples of surface sediment, sinking particles, suspended particles and water were collected in the study area from September 2013 to March 2015. The radiocesium distribution in surface sediments shows seasonal differences in the lagoon, with the interpretation that surface sediments were re-suspended and then re-sedimented by tidal pumping; total sinking particle flux and particulate Cs-137 export flux in the mouth were larger than those in the inner lagoon, suggesting that re-suspension in the lagoon and transport to the open ocean of particles are important natural purifying processes for radiocesium in the Matsukawa-ura brackish system. In the water samples, dissolved Cs dominates in brackish water and the ratio of dissolved Cs-137 to total Cs-137 increases with salinity gradient. The enrichment behavior of dissolved Cs-137 in the brackish water could be attributable to the leaching occuring from fine particles with salinity increase. Therefore, particle desorption/offshore seawater dilution is another natural purifying process of radiocesium in brackish water. Quantification of the submarine groundwater discharge (SGD) flux to the ocean using the Cs-137 budget, stable and radio isotopes (O-18, Ra, respectively) will be presented. Moreover, the results indicate that radiocesium will be an effective tracer to examine water mass mixing and transport in the wide north Pacific, considering its significant and consistent input from the coast area along the east north Japan.