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The role of suspended particles in rivers play in the advection of radioactive cesium released from the FDNPS accident

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Transportation process of radioactive cesium from the terrestrial environment of East Japan that has been contaminated with the released radioactive cesium from Fukushima Daiichi Nuclear Power Station (FDNPS) has been investigated. The estuarine sediments of Abkumagawa River, Edogawa River and Shinanogawa River were analyzed. Abukumagawa flows through the high-contaminated areas of Fukushima Prefecture, there is close to FDNPS. Since the river mouth faces the Pacific Ocean, it is considered a contaminated suspended particles carried in the river water is precipitated by diffusing extensively. Edogawa flows through the metropolitan area of pollution zone, the river water flows into the enclosed Tokyo Bay. Therefore, it is expected that the suspended particles carried in the river water are precipitated near the estuary without diffuse seawater. On the other hand, Shinanogawa far from FDNPS, despite its catchment area is hardly contamination, high concentration of radioactive cesium has been detected from the estuary sediment. In this study, it is possible to analyze the spatial-temporal distribution of radioactive cesium in the estuary sediments, the dynamics of the radioactive cesium that advection from land to sea has been assessed.

The concentration of radioactive cesium of 66 samples collected at Ekman sampler at 22 point of Abukuma estuary in September 2013 has been measured. Values of radioactivity were shown in a decay correction to the March 16, 2011. Radioactive cesium concentration of the dry sediment of surface layer (0-5 cm) is ^{134}Cs: 8.5-5749 (2261±1623), ^{137}Cs: 9.0-5813 (2249±1618), $^{134+137}$Cs: 17.5-11563 (4510±3240) Bq/kg, respectively. Negative correlation was observed between the concentration of radioactive cesium and water content and particle size of the sediment. Since the correlation of radioactive cesium concentrations and particle sizes are according to the inverse square law, it is suggested that radioactive cesium is adsorbed to the particle surface. As shown in the Figure, between the atoms of radioactive cesium adsorbed therein and the specific surface area of the particles showed an inverse fourth power law for the particle size. Although not yet clear detailed mechanism cesium adsorbed to the particles, it was shown that the particle size are greatly affected.

The distribution and the behavior of radioactive cesium in the sediment collected Tokyo Bay and Shinanogawa will reported by comparing with the results of Abkumagawa.

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Keywords: radioactive cesium, suspended praticle, advection, sediment, particle size