

福島第一原発事故で放出された放射性セシウムの移流に果す河川水中の懸濁粒子の役割

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

石田 真展^{1*}; 山敷 庸亮²; 関口 秀雄³; 原口 強³; 東 良慶⁴; 山崎 秀夫¹

ISHIDA, Masanobu^{1*}; YAMASHIKI, Yosuke²; SEKIGUCHI, Hideo³; HARAGUCHI, Tsuyoshi³; AZUMA, Ryokei⁴; YAMAZAKI, Hideo¹

¹ 近畿大院総合理工, ² 京大院総合生存学館, ³ 大阪市大院理, ⁴ 京大防災研

¹Graduate School of Science and Engineering, Kinki University, ²Graduate School of Advanced Integrated Studies in Human Survivability, Kyoto University, ³Graduate School of Science, Osaka City University, ⁴Disaster Prevention Research Institute, Kyoto University

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 Abukumagawa 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 ¹³⁴Cs: 8.5-5749 (2261±1623), ¹³⁷Cs: 9.0-5813 (2249±1618), ¹³⁴⁺¹³⁷Cs: 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 Abukumagawa.

Acknowledgment: This work was supported by KAKENHI Grant-in-Aid for Scientific Research (B) No. 24310014.

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

