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福島県いわき市ため池における放射性セシウム汚染土壌の堆積過程
Sedimentation processes of radioactive Cs contaminated soil in storage reservoirs in Iwaki, Fukushima prefecture

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The Great East Japan Earthquake (M 9.0) and subsequent tsunami, which occurred along the eastern coast of Japan on March 11, 2011, caused the accident in Fukushima Daiichi nuclear power plant. As a result, large amount of radionuclides were released from the nuclear power plant and caused radioactive contamination in forest, soil and reservoir. It is recognized that the cause of the contamination is mainly due to the radioactive cesium (Cs), because of the relatively long half-lives and the released amounts

The attenuation of the actual radiation dose in the evacuation-directed zones in Fukushima prefecture has been greater than that predicted form physical half-lives of ^{134}Cs and ^{137}Cs (Nuclear Regulation Authority, Japan (NRA), 2013). The radiation dose in Fukushima is related to the abundance of radioactive Cs accumulation per unit area (radioactive Cs inventory). Therefore, the attenuation of the radioactive dose were most likely attributable to (1) desorption of radioactive Cs from soils to natural water and the subsequent diffusion and/or (2) erosion and transport of the contaminated soils to downstream. The distribution coefficients (Kd) determined from 137Cs concentrations of suspended particles and the solutions in some rivers in the affected area has been reported to be 105-106 (mL/g), which indicates that radioactive Cs was hardly desorbed to the solution (Sakaguchi et al. 2015; Nagao et al. 2013). Consequently, the former scenario is more plausible to explain the monitoring results.

It has been documented that the transports of the soil particles with radioactive Cs were accompanied with the natural water current. Then, it is expected that radioactive Cs tend to accumulate in the places where the retentions of water current occur. In terrestrial environment, one of such places is strange reservoir. Aoi et al. (2014) suggested that radioactive Cs in the catchment area had been eroded and continuously deposited in the storage reservoir. Their study suggested that the reservoirs possibly play role of a sink for radioactive Cs.

Fukushima Prefecture Government (2013) investigated the 134+137Cs concentrations of the bottom sediment of 1640 reservoir in Fukushima Prefecture. The results 134+137Cs concentrations was weakly correlated with the air dose rate. On the other hand, even the space dose rate is the same in each district, the cesium concentrations of sediment varied 3-4 orders, which indicates that the functions of the storage reservoir as sinks for are depending on not only ambient air doses but also the sedimentation processes in each catchment of the reservoir.

The continuous observations of the deposition of radioactive Cs into the reservoir is essential to understand the storage function of radioactive Cs in reservoirs for the future use of the storage reservoir and for the prediction of the migration of radioactive Cs in the local terrestrial environment. The aim of the study is characterize the sedimentation processes of contaminated soils contaminated by radioactive Cs by means the sediment traps in two reservoirs in Iwaki City, Fukushima prefecture.