

Effects of Dissolved Organic Matter on Transport of Cesium in weathered granite soil

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To grasp migration of radiocesium (Cs) in forest soil has been one of the subjects since the accident of Fukushima Dai-ichi nuclear power plant, Japan. There is a possibility of organic matters in forest soil to have an effect on migration of Cs. In particular, dissolved organic matters (DOM), for example humic acids (HA) and fulvic acids (FA), may affect sorption and transport of Cs in soil. In this research, we studied effect of types of DOM on Cs transport by laboratory batch and column experiments.

Soil sample was collected at an abandonment forest in Iitate, Fukushima, Japan. DOM was extracted from a litter from forest in Chichibu, Saitama. For batch experiments, we measured amounts of organic matter and Cs adsorbed to the soil. Since adsorption of Cs to soil clay cannot complete during percolation of water/solution through soils, we tried three different extent of reaction time 1, 12, 24 hours. For column experiment Cs solution or Cs-DOM mixed solutions were applied by constant ponding depth. Cs concentration in discharge from the bottom of the column was measured. After the halt of the percolation, a portion of soil was sampled at each 2cm thick layer from 0-10cm in depth, and sequential extraction of Cs was conducted.

For batch experiment, there was almost no difference between selectivity constants for Cs with reaction time for 1 to 24 hours. However, determined selectivity constants were smaller than those reported for the equilibrium constant. Amount of HA adsorption was more than other DOMs adsorption. In addition, when Cs-HA mixed solution was reacted for 24 hours, amount of Cs adsorption increased with increase in HA adsorption.

For column experiment, Cs from CsCl solution accumulated within surface 2cm thick layer, while Cs mixed with DOM solutions could move into 10cm deep soil layer. Sequential extraction suggested most of Cs at deeper layer was complexed with organic matter.

Keywords: Fukushima, Cesium, Dissolved organic matter, Humic Acid, Fulvic Acid