

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

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To grasp migration of radiocesium (Cs) in soil is an important issue after the accident of Fukushima Dai-ichi nuclear power plant, Japan. The soil organic matter (SOM) is one of the components to affect Cs transport. There are two possible cases for SOM-induced Cs transport. First, SOMs in solution carry Cs to deeper soil layer. Second, SOMs sorbed on the soil solid surface inhibit Cs fixation, resulting in enhancement of Cs mobility. Cs concentrations in soil water are also one of important factors to affect Cs transport. In this study, we experimented effects of organic matters, dissolved organic matter (DOM), humic acid (HA) and fulvic acid (FA), on the Cs transport in the soil by laboratory column experiment using different concentrations of Cs solution.

Soil sample was collected at an abandonment forest in Iitate, Fukushima, Japan. Dissolved organic matter was extracted from a litter from university forest in Chichibu, Saitama. Two Cs solutions are used, high (30mg/L) and low (1000Bq/L) concentration. High concentration solution was stable CsCl solution, and low one was extracted from organic soils in Iitate. The acrylic plastic column having a diameter of 3-cm and a length of 7-cm was used for the experiment. Two different treatments were applied for the repacked soil (control and organic adsorbed soil columns). The control soil column was prepared by repacking air dry soil sample up to 5cm of height. The organic adsorbed soil column was prepared by flowing dissolved organic matter for 24 hours to the control soil column. In the column experiment, Cs or Cs-DOM mixed solutions were applied under a constant ponding depth. Effluent Cs concentration was measured. After the transport experiments, the column was sliced in 1-cm interval and the soil at each section was used for the sequential extraction of Cs.

As a result of preliminary column transport experiment where high concentration Cs solution was applied to the 10cm long soil column, Cs accumulated within surface 4cm thick layer, while Cs mixed with DOM solution could move into 10-cm deep soil layer. Sequential extraction suggested most of Cs at deeper layer was complexed with organic matter.

Keywords: Fukushima, cesium, dissolved organic matter, humic acids, fulvic acids