Sensitivity analyses of sediment and ^{137}Cs behaviors in reservoirs during rainfall events

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Investigations and simulations are important to understand sediment and radioactive cesium migration in reservoirs contaminated by the accident at the Fukushima Dai-ichi Nuclear Power Plant. In the previous study, we presented one- and two-dimensional simulations of sediment and radioactive cesium migration in the Ogaki Dam reservoir located in the middle reach of the Ukedo River and found that the reservoir played an important role to delay and buffer the movement of radioactive cesium in heavy rainfall events and that the buffer effect depended on particle sizes of suspended sediment and the water level in the reservoir. In this study, to understand the sensitivity of intensity and duration of flood events to discharges of sediment and radioactive cesium during flood events, we performed sensitivity analyses by using the FLESCOT code, a three-dimensional finite volume model developed by the Pacific Northwest National Laboratory. It considers turbulent water flow and transports of multi-size sediment and radioactive cesium both in dissolved and particulate forms. The results showed that the discharge proportions depended on sediment size, event intensity and event duration. The proportions of sediment/^{137}Cs discharges increase, as event duration is shorter/heavier. The silt component is a main carrier of radioactive cesium in larger events, while the clay-sorbed and dissolved forms are dominant in smaller events. In heavier events, resuspention of bed sediment took place.

Keywords: Fukushima Daiichi NPP, Reservoir, Sensitivity analysis, FLESCOT, Cesium, Sediment

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