Numerical simulation of sediment-bound ^{137}Cs deposition on a floodplain of the Abukuma River

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The radionuclides released by the Fukushima Dai-ichi Nuclear Power Plant accident in 2011 have been transported and redistributed in the natural environment by several physical factors (e.g., wind, surface water flow, and sediment transport). A better understanding of the fate of such radionuclides is key to assessing their future impact on the environment. This study presents numerical simulations of sediment-bound radiocesium (^{137}Cs) transport and deposition in the Abukuma River, Japan. We numerically simulated the transport, deposition, and re-entrainment of ^{137}Cs contaminants associated with suspended sediment transport. The model was validated by field measurements of radiocesium deposition on a floodplain of the Abukuma River. The numerical model reasonably reproduced the observed depositional pattern of ^{137}Cs on the floodplain (Fig. 1). The results show that repetition of several flood events is an important factor in controlling radiocesium deposition on the floodplain. A moderate flood event could cause either deposition or re-entrainment of radiocesium, whereas, a large flood event may re-entrain the previously deposited radiocesium, and deposit newly transported radiocesium on the floodplain.

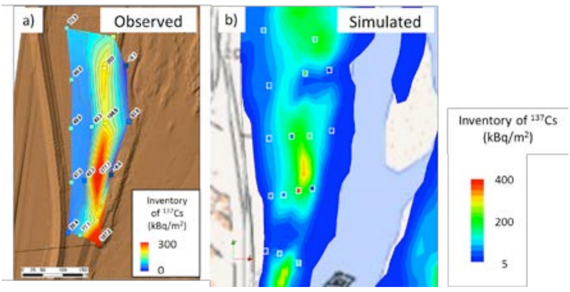

Figure 1. Depositional pattern of ^{137}Cs on a floodplain of the Abukuma River: a)observation and b)simulation.