

Transport processes of suspended solids in the Kumaki River inferred from atmospheric radionuclides

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The Kumaki River, which drains into the Nanao Bay, is in the central part of the Noto Peninsula. Over recent years, the vegetation in the catchment area of the Kumaki River has changed, and the areas of unmanaged forest and cultivated areas have progressively increased because of plantation activities and decreasing and aging population. These anthropogenic catchment environmental changes may affect the erosion and transport of clastic materials and particulate organic matter to the lower reaches and coastal areas. It is therefore important to clarify the transport processes of these materials to achieve proper management and prediction of environmental changes in river watersheds and coastal areas.

To investigate the transport processes of suspended solids (SS) in the Kumaki River, the atmospheric radionuclides ($^{210}\text{Pb}_{\text{ex}}$, ^7Be , and ^{137}Cs) of SS samples were observed. The SS samples were obtained with a continuous centrifuge of the river water (100 L) collected at the three sampling points (upstream, midstream, and downstream) in Kumaki River every month since April 2016. The concentrations of atmospheric radionuclides in SS samples were measured with a Ge detector. The water discharge was also measured based on cross-sectional profiles of water depth and the flow velocity with a leveling rod and a flow meter at each sampling point.

The $^7\text{Be}/^{210}\text{Pb}_{\text{ex}}$ activity ratio of SS sample, which is related to the residence time of these radionuclides in the catchment area, showed clear positive correlation with the water discharge and it was high during winter season with higher precipitation in each sampling point. This result indicates that SS was transported in a shorter time scale during rainfall event and winter season. On the other hand, $^7\text{Be}/^{210}\text{Pb}_{\text{ex}}$ ratio exceptionally decreased during heavy rainfall events with the higher water discharge over the threshold value, implying that older stored sediment and subsurface soil were eroded and transported under these conditions. Temporal and spatial changes in ^{137}Cs concentration and $^{137}\text{Cs}/^{210}\text{Pb}_{\text{ex}}$ ratio of SS sample showed different fluctuation in each sampling point, suggesting that changes in discharge amount and source of SS were affected by the subcatchment-scale local hydrological environments and land use conditions.

Keywords: suspended solids, river catchment area, atmospheric radionuclides