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Transport of radiocesium in the Niida River, Fukuhsima Prefecture in 2011-2014

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Surface deposition of ^{134}Cs and ^{137}Cs reveals considerable external radioactivity above 3000k Bq/m^2 in a zone extending northwest from the NPP after the Fukushima Daiichi Nuclear Power Plant (NPP) accident. Therefore, it is important to elucidate the short-term to long-term impacts of the accident on ecosystems of river watershed environments. This study investigated the transport of ^{134}Cs and ^{137}Cs in a small river, Niida River running through IIdate Viledge, in Fukushima Prefecture, Japan at normal and high flow conditions during 2011-2014.

Field experiments were conducted at a fixed station (Kinouchi bridge) in the lower Niida River during the period of May 2011-December 2014. The 20 L of surface river water samples were collected at the station using buckets. The radioactivity of ^{134}Cs and ^{137}Cs in the river waters before and after the filtration was measured with gamma-ray spectrometry using ammonium molybdophosphate (AMP)/Cs compound method.

Total radioactivity of ^{137}Cs (dissolved and particulate phases) in the river waters ranged from 0.11 to 4.18 Bq/L during May 2011-December 2014. Highest value was found in May 2011. Total ^{137}Cs radioactivity indicates the decreasing trend with increasing time at normal flow condition. However the higher radioactivity was observed after rain events. The ^{137}Cs radioactivity increased by 1.83 Bq/L after the heavy rain event by Typhoon Guchol in June 2012, and 1.68 Bq/L by Typhoon Jelawat in October 2012.

Percentage of ^{137}Cs associated with riverine suspended solids was 47-48% at normal flow condition in July and September 2011, but after December 2011 ranged from 75 to 93% at normal flow condition and 86-91% at high flow condition due to rain events. The radioactivity of particulate phase of ^{137}Cs ranged from 20 to 42 Bq/g-riverine suspended solids. Rain events are mainly contributed to the transport of radiocesium in the Niida River.

Keywords: Cs-134, Cs-137, rain event, riverine suspended solids