

Cs-134 and Cs-137 radioactivity of riverine suspended solids in the Abukuma River after the heavy rain in June 2012

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About 15 PBq of both Cs-134 and Cs-137 was released from the Fukushima Daiichi Nuclear Power Plant (NPP) after the 2011 Tohoku earthquake and tsunami. Surface deposition pattern of Cs-134 and Cs-137 occurred at Fukushima, Tochigi and Gunma Prefecture by a combination with wind direction and precipitation. It is important to elucidate the short-term to long-term impacts of the Fukushima Daiichi NPP accident on ecosystems of river watershed environments. This study was conducted to investigate transport of Cs-134 and Cs-137 in the Abukuma River running through Fukushima and Miyagi Prefecture in Japan, 15 months after the Fukushima Dai-ichi NPP accident. Field experiments were carried out at Shirakawa (upper), Motomiya, Data (middle) and Iwanuma (lower) during June 19-21, 2012. We also carried out the research at the Uta, Niida, Natsui and Same Rivers. Typhoon Guchol struck Japan on June 20. Fukushima Prefecture had rainfall of 77-136 mm during June 19-21. The suspended particles were separated using continuous centrifugation. The radioactivity of Cs-134 and Cs-137 was measured with gamma-ray spectrometry after drying them by freeze-dry method.

Total radioactivity of Cs-134 and Cs-137 in river waters was 0.091-3.83 Bq/l in high flow conditions by heavy rain. The particulate fractions of Cs-134 and Cs-137 were 77-89% at the normal flow condition, but were close to 100% after the typhoon. The radioactivity of Cs-134 and Cs-137 increased from 500 Bq/kg-ss in the upper site (Shirakawa) to 3470 Bq/kg-ss in the lower site (Iwanuma). The Cs-137 radioactivity was 3200 Bq/ kg-ss in the Uta River, 42440 Bq/ kg-ss in the Niida, 850 Bq/ kg-ss in the Natsui River and 550 Bq/ kg-ss in the Same River. These results indicate that the input of radiocesium associated with suspended particles from the watershed to the river water is controlled by the accumulation of radiocesium on the ground surface in the river watershed and transport processes of suspended solids in the river systems.

Keywords: river water, radioesium, particulate forms, migration, heavy rain event