

Migration behavior of Cs-134 and Cs-137 derived from the Fukushima Daiichi NPP in river systems from Fukushima Prefecture

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Nuclear accident at the Fukushima Daiichi Nuclear Power Plant (NPP) was occurred after the 2011 Tohoku Earthquake and Tsunami. About 15 PBq of radionuclides was released from the Fukushima Daiichi NPP due to vent and hydrogen explosion. The MEXT reported total surface deposition of Cs-134 and Cs-137 inside 80 km zone of Fukushima Daiichi NPP. The surface deposition reveals significance external radioactivity in a northwest zone from the NPP, about 20 km in wide and 50 to 70 km in length. River systems may play important role in dispersion of radionuclides in watershed environment. Therefore the short and long-term dispersion of radioactive cesium (Cs) has to monitor at upstream and downstream, and assesses the impact of radioactive pollution on living species in terrestrial and coastal marine environments. The aim of this study is to describe spatial distribution of radioactivity of Cs-134 and Cs-137 in river systems in Fukushima Prefecture during May to December in 2011.

The 20 L of river water samples were collected at monitoring stations in five river systems, Abukuma River, Uta River, Niita River, Natsui River and Same River in May, July, September and December in 2011. Watershed area is 5400 km² for the Abukuma River, but other rivers has small watershed from 106 to 749 km². The Cs-134 and Cs-137 were separated by coprecipitation with AMP and measured by gamma-ray spectrometry using low BKG Ge detector at LLRL and Ogoya URL of Kanazawa University for 1-3 days.

The radioactivity of Cs-137 ranges from 0.23 Bq/kg to 4.18 Bq/kg in May 20, from 0.064 to 1.54 Bq/kg in July 12-13 and from 0.02 to 0.79 Bq/kg in September 13-14. The variation pattern is in consistent with spatial distribution of Cs-134 and Cs-137 in surface soil in Fukushima Prefecture. All of the samples indicate Cs-134/Cs-137 ratio is about 1.0 so that radiocesium in surface waters transported to all of the stations. The radioactivity of Cs-137 decreases at each monitoring station during May-September except for the downstream of Abukuma River. In this study, we will describe the spatial and temporal variations in of Cs-134 and Cs-137 in the river systems in addition with the December data, and discuss with the factors controlling the variations of radiocesium in river watershed environments.

Keywords: Cs-137, river water, migration, Fukushima NPP accident