

Regional-scale transfer of fallout radiocaesium in river networks impacted by the Fukushima Daiichi Nuclear Power Plant

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The Fukushima Daiichi Nuclear Power Plant accident which followed the magnitude 9.0 earthquake and tsunami on 11 March 2011 resulted in the release of Cs-134 and Cs-137 into the surrounding environment, where highly elevated levels are reported. As a result, there is considerable concern about the redistribution of these radioactive contaminants from the atmosphere to vegetation, soil and aquatic systems. This study reports on the magnitude of fluvial transfer of Cs-134 and Cs-137 through river networks located across the fallout region. Initially six nested river monitoring stations were established within the Abukuma River basin from June 2011. Subsequently, an additional 24 stations were established between October and December 2012, which included a further 12 stations within the Abukuma basin and another 12 sites monitoring the smaller coastal catchments north and south of the power plant. Combined, these 30 sites provide a regional-scale measure of fallout radiocaesium transfer by river networks. The catchment areas range from 8 to 5,172 km² and span a large range in average catchment inventories of Cs-134 (16-2030 kBq/m²) and Cs-137 (19-2380 kBq/m²) based on MEXT inventory mapping. Flow and turbidity (converted to suspended sediment concentration) were measured at each station while bulk suspended sediment samples were collected at regular intervals using time-integrated samplers to allow measurement of Cs-134 and Cs-137 activity concentrations by gamma spectrometry. Preliminary monitoring data will be presented that shows highly elevated but generally declining activity concentrations of Cs-134 and Cs-137 on suspended sediment and provides a measure of the regional-scale variability in fluvial radiocaesium fluxes. While most radiocaesium is likely to remain in the soil profile, fluvial redistribution may contaminate downstream floodplains that were subject to low fallout and deliver significant quantities of highly contaminated fine sediment to the coastal zone.

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