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Effectiveness of an unprecedented decontamination program on river sediment and radioactive contaminant fluxes

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In the current context of raising concerns related to nuclear accidents and warfare, the lessons learnt from the Fukushima accident in 2011 are of particular interest. Indeed, the Japanese authorities implemented an ambitious decontamination program, which strongly differs from the strategy adopted in Chernobyl where the most contaminated area remains closed to the population nowadays. However, the impact of this strategy on the dispersion of radioactive contaminant fluxes across mountainous landscapes exposed to typhoons remains to be quantified. Based on the unique combination of river monitoring and modelling in a catchment representative of the most impacted area in Japan, we could demonstrate for the first time that decontamination only led to a decrease of 17% of the radionuclide fluxes in the river system. Furthermore, we calculated that 67% of the initial radiocesium remains stored in forests and may contribute to radiocesium dispersion in river systems in response to future erosive events. As the current research was conducted in an area representative of the 1,117 km²-area where remediation was completed early in 2017, it raises questions about the overall sustainability and cost-benefit effectiveness of such a remediation program that generated 9,100,000 m³ of waste for a cost of ~12 billion USD. Only a limited proportion of the initial population returned to their hometown (~30% by 2019), which remains a major challenge for the future of this region, although the primary goal of authorities to decrease the radiation dose rates in the inhabited areas was achieved.