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Depth distribution of radiocesium in Fukushima paddy fields three years after the accident

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Rice paddy fields located in the vicinity of the Fukushima Dai-Ichi Nuclear Power Plant (FDNPP) were contaminated by radioactive fallout from the March 2011 accident. Although many studies have investigated the fate of radiocesium in soil in the months following the accident, the potential migration of radiocesium in rice paddy fields requires further examination after major typhoons occurred in this region in 2011 and 2013. Further investigations are also required because paddy fields are typically comprised of Andosols, a soil type in which radiocesium has been known to potentially migrate deeper in the depth profile. To investigate the depth migration of radiocesium we collected soil cores in 10 paddy fields located less than 20 km from the FDNPP in November 2013. The maximum depth penetration of 137Cs was attributed to field maintenance (e.g. grass cutting) (97% of 137Cs in the upper 5-cm) and farming operations (tillage/cultivation – 83% of 137Cs in the upper 5-cm). The low migration observed in undisturbed paddy fields could be attributed to the presence of phyllosilicates that were detected by X-ray diffraction in Andosols. As radiocesium is mainly located in the uppermost soil layers, we recommend the rapid removal of these upper layers (e.g. the top 5 cm) to reduce radiocesium export during erosive events such as the major typhoons known to impact the region. Further research is required to thoroughly understand the impacts of erosion on the transfer and migration of radiocesium throughout the Fukushima Prefecture.