A modelling approach to describe the vertical distribution of radiocaesium in the Fukushima forest soils

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In 2011 the FDNPP accident caused a contamination with different radionuclides of various Japanese continental ecosystems from which forests represent 75% of the area and might become a secondary source of contamination for adjacent ecosystems. Five years after, the contamination of the environment results mainly from ^{134}Cs and ^{137}Cs (rCs) due to their radioactive periods. A French project (AMORAD) is in progress since 2013 with the objective to improve our understanding and modelling of radionuclides dispersion in the environment. For forests, the modelling takes into account the biogeochemical recycling of rCs and relies on sites monitoring located in the Kawamata area. To date, soils and trees were sampled in November 2013 and November 2014 in three forest stands: two different ages Japanese cedar stands and a mixed deciduous stand.

We present here the synthesis of the results obtained on the distribution of rCs in the different layers (litter, fragmented organic layer and 20 cm deep soil cores). At the forest stand scale, almost 3 years after the accident, more than 90 % of the initial deposit was present in the topsoil whereas 10 % remained in the trees biomass. Close to 70% of the rCs inventory is located in the organic layer and the surface mineral layer (0-3 cm). A modelling approach, based on kinetic degradation of organic layers and the fractionation of rCs associated to solid material in soluble and non-soluble pools, successfully described the evolution of the distribution between 2013 and 2014.

For the next few years, the model predicts that the 0-3 cm soil layer will remain the most contaminated compartment in the forest.