



Detailed study of ^{137}Cs distribution in soil-litter-moss cover within the undisturbed woodland test site in the Chernobyl abandoned zone, Russia

Denis Dolgushin, Elena Korobova, Vladimir Baranchukov, and Nikolay Dogadkin
Vernadsky Institute of Geochemistry and Analytical Chemistry, Laboratory of biogeochemistry of environment, Moscow, Russian Federation (dolgushin25@gmail.com)

Cs-137 distribution was studied in the regular grid and in landscape cross-sections characterizing the ELGS system (top-slope-closing depression) in the “Vyshkov-2” test site located in the Chernobyl abandoned zone, the Bryansk region, Russia. The test site (70×100 m) located on the Iput’ river terrace in a pine forest formed on sod-podzolic soils is characterized by a pronounced elevation gradient (ca 4.5 m). In 1986 the level of ^{137}Cs contamination of the area varied from 1480 kBq/m² to 1850 kBq/m². The distribution of ^{137}Cs was studied in the topsoil, soil, moss and litter cover in a grid manner with a step of 10 m and along cross-sections with 1 m step. To assess the influence of water regime on radiocaesium migration moisture content was also determined in the studied objects. The data showed that the major part of ^{137}Cs is now fixed in the soil layer 2-10 cm thick while the highest activity of radiocaesium is found at a depth of 2-8 cm that can be explained mainly by the burial of the initially contaminated layer under the annual leaf fall. In the ELGS system the content of ^{137}Cs in the top soil layer (0-2 cm) determined in laboratory conditions by Canberra gamma-spectrometer with HPGe detector correlated with the surface Cs-137 activity measured by field gamma-spectrometer Violinist III ($r=0.643$, $n=15$). Cs-137 activity in the green part of moss samples correlated with the radionuclide activity in soil layer samples 4-6 cm deep ($r=0.627$, $n=15$). In the moss samples the highest correlation was observed between the green and rhizoid moss parts ($r_{0.01}=0.718$, $n=60$, along cross-sections), ($r_{0.05}=0.858$, $n=20$, in regular grid). Correlation between radiocaesium activity of the green part of mosses and the underlain litter samples was lower, but also significant ($r_{0.01}=0.617$, $n=60$, along cross-sections), ($r_{0.05}=0.481$, $n=20$, in regular grid). Cs-137 activity in the rhizoid part of moss and in litter were also positively linked, but to a lower degree ($r_{0.01}=0.402$, $n=60$). Studies performed in 2015-2019 confirmed our earlier finding that radiocaesium had not moved in unidirectional manner down the slope to the closing depression, but formed a more complex polycentric structure in ELGS.

The study was financially supported by the Russian Foundation for Basic Research (grant # 19-05-00816).