Fukushima and Chernobyl: similarities and differences in the behavior of radiocesium in soil-water environment

KONOPLEV A.V[1]

[1]Institute of Environmental Radioactivity, Fukushima University, Kanayagawa 1, Fukushima, Fukushima Prefecture, 960-1296 Japan, e-mail: alexeikonoplev@gmail.com

The ease with which radionuclide moves through the environment and is taken up by plants and animals is determined by its chemical forms and site-specific environmental characteristics [1]. The peculiarities in climate, geomorphology and ^{137}Cs speciation in the fallout were demonstrated to lead to differences in migration rates of ^{137}Cs in the environment and rates of its natural attenuation. It has been revealed that the Fukushima-derived ^{137}Cs is strongly bound to soil and sediment particles, which reduces potential bioavailability of this radionuclide [2]. Up to 30% of the deposited ^{137}Cs on soil of the exclusion zone were found to be incorporated in hot glassy particles ("Cs balls") insoluble in water [3]. These particles are decomposing in the environment essentially slower as compared with Chernobyl derived fuel particles [4]. Wash-off from the slopes of contaminated catchments and river transport are key long-term pathways for radionuclide dispersal from contaminated areas after the Fukushima accident. The climate conditions for the Fukushima Prefecture of Japan are characterized by higher annual precipitation (1300-1800 mm/year) with maximum rainstorm events during typhoon season. Typhoons Etou in 2015 and Hagibis in 2019 demonstrated the substantial redistribution of ^{137}Cs on river watersheds and floodplains and in some cases natural self-decontamination [5]. Steep slopes of Fukushima catchments are conducive to higher erosion and higher particulate r-Cs wash-off. Irrigation ponds in Okuma and Futaba towns demonstrated persistent behavior of ^{137}Cs similar to closed lakes in Chernobyl, its concentrations not decreasing and showing regular seasonal variations: the ^{137}Cs concentrations tend to grow in the summer and decrease in the winter.

[1] Konoplev et al. (1992) *Analyst* **117**, 1041-1047. [2] Konoplev et al. (2016) *J. Environ. Radioactivity* 151, 568-578. [3] Ikehara et al. (2018) *Environ. Sci. Technology* **52**, 6390-6398. [4] Okumura et al. (2019) *Sci. Reports* **9**: 3520. [5] Konoplev et al. (2018) *J. Environ. Radioactivity* **186**, 23-33.