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A study of Cs-137 and Sr-90 distribution in the soil and vegetation cover of elementary landscape-geochemical systems in the zone of the East Ural Radioactive Trace

Elena Korobova¹, Sergey Romanov², Oleg Tarasov³, Vladimir Baranchukov¹, Victor Berezkin¹, Denis Dolgushin¹, Lyudmila Mikhailovskaya⁴, Makar Modorov⁴, and Vitaly Lukyanov⁵

¹Vernadsky Institute of Geochemistry and Analytical Chemistry, Russian Academy of Sciences, Moscow, Russian Federation (korobova@geokhi.ru)

²Unitary Enterprise "Geoinformation systems", National Academy of Sciences of Belarus, Minsk, Republic of Belarus

³Federal State Unitary Enterprise "Mayak Production Association", State Enterprise "Rosatom", Ozersk, Russian Federation

⁴Institute of Plant and Animal Ecology, Russian Academy of Sciences Ural Branch, Ekaterinburg, Russian Federation

⁵National Research Center "Kurchatov Institute", Moscow, Russian Federation

The first results of a detailed study of ¹³⁷Cs and ⁹⁰Sr distribution in elementary landscape-geochemical system (the top-slope-closing depression type, ELGS) are presented on the example of test sites located in the head zone of the East Ural Radioactive Trace formed during the Kyshtym accident in 1957. Field measurements were performed using modified Violinist-III field gamma-spectrometer [1] and the Kolibri spectrometric complex [2]; laboratory determination of ¹³⁷Cs was made by Canberra gamma-spectrometer (HPGe detector). Field measurements were carried out along cross-sections and in a grid manner with a step of 1 and 5 m accompanied by a theodolite survey and soil core sampling at the selected points. The instrumental layer-by-layer determination of ⁹⁰Sr activity in soil samples performed in field conditions by [2] was compared with the radiochemical measurement of the same samples in fractions of less than and more than 1 mm. The correlation between the obtained instrumental and radiochemical values for ⁹⁰Sr activity equaled to $r = 0.962$ ($n = 50$). Spatial distribution of both ¹³⁷Cs and ⁹⁰Sr manifested itself in an specifically organized polycentric structure. Against the absence of a pronounced tendency for unidirectional redistribution of radionuclides from the top to the bottom, there was an ordered cyclic change in the activity of both ¹³⁷Cs and ⁹⁰Sr, which in our opinion reflected the unified mechanism of redistribution of substances in ELGS, where the relief is the main controller of water migration. Measurement of ⁹⁰Sr activity in selected meadow plants proved an important role of species in radionuclide accumulation at the ELGS level: the maximum amount of ⁹⁰Sr was found in nettle (*Urtica dioica*, 86 ± 19 kBq/kg dw, $n = 9$), the minimum - in bluegrass (*Poa sp.*, 13.8 ± 1.2 kBq/kg dw, $n = 19$). The revealed features of spatial structure of ¹³⁷Cs and ⁹⁰Sr are believed to mark the general tendencies of substances redistribution in ELGS, which seems important for studying soil formation, environmental monitoring and optimization of soil fertilizing.

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