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Investigation of radionuclide distribution in soil particles in different landscapes

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Russian and foreign publications have been analyzed for understanding the role of micro- and nano- particles in distribution and migration of technogenic elements in soils in different landscape conditions.
A technique for application of various fractionation methods to separate and study -particles of different size down to micro- and nano-level has been developed. The dry sit method on the first stage of particle separation is recommend to be followed by the membrane filtration method. For obtaining more comprehensive information, combinations of fractionation technique should be chosen taking into account that (1) the efficiency of particles' separation using subsequent technique would be higher than using the preceding one; (2) separation methods should preferably be based on different principles (separation according size, density, charge etc.); (3) initial fractionation should separate particles according to their size, that makes possible to create an even scale for various samples.
A study of distribution and balance of technogenic radionuclides' in soil particles of the size intervals 1.0—0.25, 0.25-0.1, 0.1-0.05, 0.05-0.01, 0.01-0.005, 0.005-0.001 and <0.001 mm in the Yenisey flood plain landscapes proved a significant role of both the particle size and the portion of contaminated fraction in contribution to the total radionuclide inventory in the soil layers. Contribution of the silt particles (0,05-0,01 mm) to Cs-137 contamination ranged from 26 to 33,8%, 45% maximum due to "optimal" combination of both factors. Clay fraction was responsible for approximately 30% of Cs-137 contained in soil horizons due to higher sorption capacity. Relatively high correlation between the activity of 152,154Eu and 60 and the content of silt and clay allowed suggesting their incorporation mainly in clay fraction.
Selected experimental plots near the Kola NPP (northern taiga) were used to compare soil particles (fractions 140-71; 71-40 and < 40 μm) in their ability to concentrate technogenic radionuclides and heavy metals. Maximum radioactivity found in soil litter appeared to be related to the Chernobyl contamination. Concentration of s-137 was higher in small size fractions.
Obtained results were considered to be useful for understanding of radionuclide migration in the environment and decision making on radioecological monitoring, rehabilitation and landuse in the contaminated areas.