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Organization of radio-ecological monitoring of the areas of the Russian Federation contaminated due to the accident at the Chernobyl NPP (on example of the Bryansk region)

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A severe accident at the Chernobyl NPP on April 26th, 1986 has led to radioactive contamination of many regions of the former USSR, now belonging to the Ukraine, the Republic of Belarus and the Russian Federation. Both natural and arable ecosystems have been subjected to fallout of radioactive isotopes. However both the distribution of radionuclides that define radioecological situation has depended not only on the initial contamination density but also on the landscape geochemical features of the areas controlling biogenic and abiogenic factors of radionuclide migration. To study and monitor peculiarities of migration of the most radioecologically significant radionuclides of Cs-137 and Sr-90 in different natural landscapes the Russian Scientific and Practical Experimental Center of the former State Chernobyl Committee has organized in 1992 a network of experimental plots in the most contaminated western part of the Bryansk region. It included 19 plots 100 m x 100 m in size which characterized 8 meadow and 11 forested catenas in the basin of the Iput' river. Cs-137 contamination level of the plots varied in 1992 from 740 kBq/m2 to 1850 kBq/m2. Although the study site has been located in the remote zone and the contamination was of condensation type the sampling performed at 11 plots registered some refractory radionuclides (144Ce, 154Eu, 238,239,240Pu and 90Sr) that proved the presence of fuel particles in fallout as far as 200 km from the damaged reactors. The sampling and monitoring scheme was organized to determine: the isotopic composition and contamination density of the plots; 2) estimation of radionuclide vertical and lateral migration; 3) evaluation of radionuclide inventories in different soil horizons; 4) calculation of radionuclide transfer in soil-plant system. Radiation measurements included field gamma-spectrometry using collimated gamma spectrometer “Corad” developed in the Kurchatov Institute and laboratory spectrometry the soil and plant samples by Canberra with HP-Ge detector. To evaluate 137Cs and 90Sr mobility a sequential extraction of radionuclides has been performed in the selected soil in radiochemical laboratory. Obtained data has been compared with the results of air-gamma survey of the area carried out by SSC AEROGEOFIZIKA (grid size: 100 m x100 m) and the data of RPA "TYPHOON” on contamination density of settlements. A comparison of these data with that of the experimental plots at different scales proved the selected monitoring scheme to be suitable for extrapolation of the obtained experimental data on radionuclide contamination the settlement and regional scale.