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Study of fallouts in the bottom sediments of Chernobyl Nuclear Power Plant cooling pond

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This work reports studies of fuel fallouts from bottom sediments of the Chernobyl NPP cooling pond. We took samples to a 30 cm depth at cooling pond different locations for gamma spectrometrical and radiochemical study. The measurement results show that over 80% of the radionuclide activity is located at a depth of 10-20 cm. The Am-241 activity is 6-8% compared to Cs-137, while in usual Chernobyl fuel fallouts, this value is 2-3%. The Sr-90 activity is 40-50% compared to Cs-137 in studied samples. The fixed activities Eu-155 and Eu-154 allow us to determine the burnout of fuel depositions in cooling pond bottom sediments. Activation radionuclides Co-60 and Nb-94 were detected in studied samples. Analysis of the Co-60 and Nb-94 ratios showed that, most likely, these are fallouts from the first accident explosion of the 4th unit of the Chernobyl nuclear power plant. Precipitation at a depth of 0-10 cm is mainly associated with the deposition of aerosol fallout in subsequent years. Radionuclide ratios in the cooling pond bottom sediments at the 10-20 cm depth correlate with radionuclide ratios in soils near the Shelter after the installation of Second Confinement. The fallout of the cooling pond also contains a component associated with the fallout in the post-variance period. Moreover, its vertical migration correlates with the vertical migration of aerosol fallout in 30-km zone Chernobyl NPP soils. The following results show the studied radioisotope activities at a depth of 10-15 cm: Am-241 684 Bq/sample, Am-243 1.6 Bq/sample, Eu-154 28.5 Bq/sample, Eu-155 4.31 Bq/sample, Cs-137 10260 Bq/sample, Nb-94 2.0 Bq/sample, Co-60 1.75 Bq/sample, Sr-90 4500 Bq/sample. The obtained results are discussed. Acknowledgments: The reported study was funded by RFBR, project number 19-05-50095.

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