Numerical study of radionuclide dispersion in Chernobyl Cooling Pond

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Three-dimensional model of radionuclide dispersion (THREETOX) was applied to simulate fate of ^{137}Cs in the Cooling Pond of the Chernobyl Nuclear Power Plant (NPP). The length of Chernobyl Cooling Pond (CCP) is 11.5 km, the maximum width is 2.2 km, the capacity is 0.16 km^3. The water level in the CCP is supported by the permanent pumping of water from Pripyat River to compensate the losses due to seepage and evaporation. The currents in the CCP are driven by releases of hot water from the NPP, by the cooled water intake to it and by the wind. The CCP was heavy contaminated during the Chernobyl accident in April-May, 1986. Till today the levels of ^{137}Cs and ^{90}Sr concentrations in the bottom deposition are rather high. The measurements revealed redistribution and accumulation of the radionuclide in deepest parts of the cooling pond. The modelling studies of the radionuclide fate in the CPP are stimulated now by the needs to have assessments of the radionuclide re-distributions after Chernobyl NPP shut down and resulting shut down of the water pumping from the river. The simulation of the radionuclide fate in the CCP during 1986-1992 was provided on the basis of the initial atmospheric fallout data. The reasonable agreement between measured and simulated data is reached for the radionuclide concentration in the water and bed. Both cohesive sediments and radionuclides are accumulated with higher rate in deepest parts of the cooling pond. Spatial distribution of ^{137}Cs in the bed since mid of 1987 correlates well with the fine sediment distribution and does not correlate with initial fallout data. The analysis of the efficiency of the chosen mud transport model is provided treating the radionuclide as a tracer.