Validation for radionuclide transfer model in brackish lake, Rokkasho, Japan, adjacent to a spent nuclear fuel reprocessing plant using tritium concentration during final testing

S. Ueda*, H. Kakiuchi, H. Hasegawa, K. Kondo, and S. Hisamatsu

Department of Radioecology, Institute for Environmental Sciences

1-7, Rokkasho, Aomori 039-3212 Japan

The first commercial spent nuclear fuel reprocessing plant in Japan, located in Rokkasho, Aomori Prefecture, is now undergoing its final testing using actual spent nuclear fuels. A small amount of radionuclides is released into the surrounding environment during the testing and will be also discharged during the regular operation in future. The released radionuclides entered the brackish Lake Obuchi adjacent to the plant, through various routes: from the ocean by tides, from the river water and from the atmosphere by deposition. Radionuclides incorporated into the lake are transferred not only by physical advection and diffusion but also by biological activities. In order to evaluate the transport of radionuclides in the lake, we constructed a 3D-hydrodynamic model with the low trophic level ecosystem including a phytoplankton and zooplankton.

To validate the model using actual field data, we measured the concentration of ^{3}H in water sample around the plant collected from 2005 to 2008. The samples collected in 2006 - 2008 occasionally showed higher concentration level than the background level in 2005. The decreasing ^{3}H concentration in the lake water from a high value observed in April 2007 was simulated with the model under assumption of no further input of ^{3}H to the lake. The result agreed well with the observed temporal variation in ^{3}H concentration, and showed that the model well simulated water residence in the lake.

This work was conducted under contact with the Aomori Prefecture Government, Japan.