

# Improvement of the Advanced Environmental Transfer and Dose Assessment Model for Radionuclides Released from the Nuclear Fuel Reprocessing Plant in Rokkasho

Koichi ABE, Kazuhiro OSHIMA, Shinji UEDA, Yuichi TAKAKU, Shun'ichi HISAMATSU

*Department of Radioecology*

## Abstract

In FY 2019, four approaches were used to improve the advanced environmental transfer and dose assessment model (AdvETDAM) for radionuclides released from the nuclear fuel reprocessing plant in Rokkasho: 1) implementing functions for probabilistic evaluations with uncertainty of simulation results; 2) introducing dynamic models of  $^3\text{H}$  transfer from the atmosphere to agricultural products; 3) preparing a design to introduce temporal variation to the coefficient of Cs transfer from soil to pasture grass; and 4) verifying the model. Approach 1) was based on the design developed in FY 2018 that referred to the level 3 probabilistic risk assessment for nuclear power plants. The classification of meteorological conditions, parameters of atmospheric dispersions and terrestrial transfers were decided for the functional assessment, and each of the functions was validated. Approach 2) was based on the compartment models developed in previous studies at IES and the design developed in FY 2018. To verify the introduced models,  $^3\text{H}$  concentrations in agricultural plants were calculated. These concentrations were close to those of previous models using only specific radioactivity at the harvest time, because only the introduction of dynamic models can estimate hydrogen transfer by respiration and root absorption of the plants. Approach 3) was based on previous studies at IES. The calculation procedure of the existing model using a constant coefficient was confirmed, and a test program to calculate Cs concentration in pasture grass using a temporal variation coefficient was developed. Finally, in approach 4), the calculation results of excess  $^3\text{H}$  concentrations in agricultural and livestock products and the atmosphere for 2013 were compared to measured concentrations. These calculated concentrations were the same or smaller than the corresponding measurement errors.

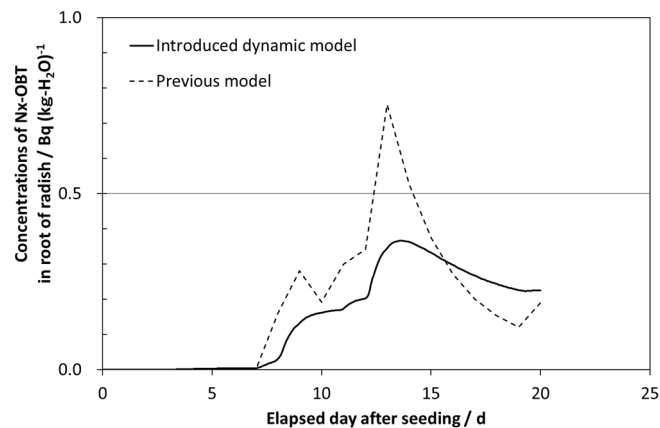


Fig. 1 Calculation results of Nx-OBT (Non-exchangeable Organically Bound Tritium) concentrations in root of radish. The introduced dynamic model that was used was based on the compartment model of radish in previous studies at IES and a previous model based on specific radioactivity was also used. Calculated  $^3\text{H}$  concentrations in root of radish that had been grown in a land plot located 5 km north of the main stack of the reprocessing plant were used along with the data for the atmosphere and soil water conditions of the plot. The assumed period of radish cultivation was 20 days starting from August 2, 2007.