

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

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

Department of Radioecology

Abstract

We have developed the advanced environmental transfer and dose assessment model (AdvETDAM) for radionuclides released from the first Japanese commercial nuclear fuel reprocessing plant located in Rokkasho. The AdvETDAM consists of an atmospheric dispersion model with a meteorological model (MM5), a terrestrial transfer model, an aquatic transfer model for Lakes Obuchi and Takahoko, which are brackish lakes neighboring the reprocessing plant, and their catchment areas, and a coastal marine model for the Rokkasho Coast, to describe the radionuclides transfer in each target sphere.

To improve accuracy of the simulation results by the atmospheric dispersion model, three data assimilation procedures, which were designed in FY 2016, were introduced in FY 2017 into 1) a wind field generation step in the mesoscale meteorological model, 2) a mass-consistent 3D wind field generation step for a narrow area, and 3) a final step of Lagrangian particle dispersion of radionuclides. The assimilations of measured meteorological data in steps 1) and 2) were examined using limited data and found to be effective to improve accuracy of the wind field generated. Two approaches were tested for the assimilations of measured radionuclide concentrations in step 3): 3a) adjustment of plume raising height from the main stack of the reprocessing plant and 3b) adjustment of discharge rate of radionuclides from the stack. The test results using limited data showed that approach 3a) for atmospheric ^{95}Kr concentrations was not effective but 3b) for atmospheric ^3H concentrations was promising. The assimilation parameters for both approaches will be optimized by using more data in FY 2018.

For realistic simulation of ^{14}C transfer from the atmosphere to agricultural products in the terrestrial transfer model, the dynamic transfer model developed during our previous study was tested. In addition, the latest available data of topography, land use, agricultural statistics and population were compiled and stored in the data base of AdvETDAM.

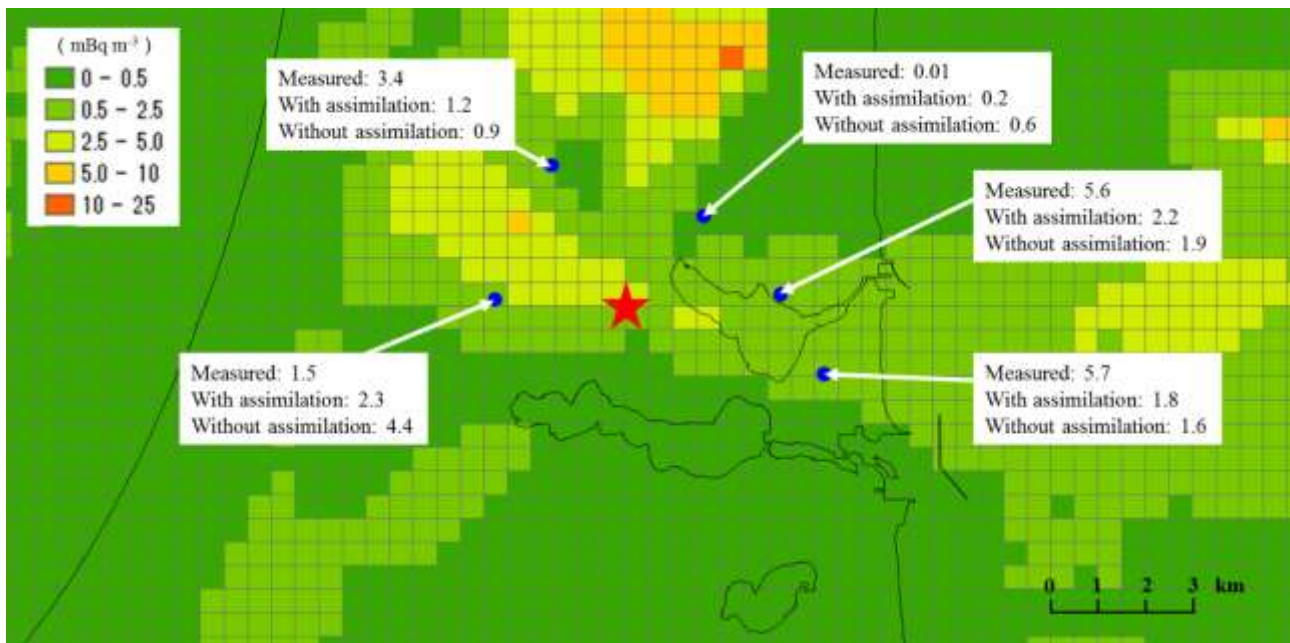


Fig. 1 Monthly atmospheric ^3H concentrations in mBq m^{-3} on September 2008 around the nuclear fuel reprocessing plant, which is denoted as a red star. The color contour map indicates atmospheric ^3H concentration simulated by the model with assimilation of measured ^3H concentration at the sampling points shown as solid circles. Numerical values of the measured and estimated ^3H concentrations with and without data assimilation are also shown for each sampling point.