

International Conference on Fast Reactors and Related Fuel Cycles: Next Generation Nuclear Systems for Sustainable Development (FR17)



Contribution ID: 193

Type: POSTER

SIBYLLA CODE: ASSESSMENT OF WATER BODIES CONTAMINATION AND DOSES RECEIVED BY POPULATION DUE TO RADIOACTIVITY DISCHARGES INTO THE HYDROSPHERE

Tuesday, June 27, 2017 5:30 PM (1h 30m)

SIBYLLA code is intended for calculation of the radionuclides content in water and bottom sediments of water bodies undergoing radioactive contamination during normal operating conditions or accidents at the nuclear facilities. Also SIBYLLA enables to calculate the doses resulted from use of the water-bodies including water-supply. The code contains set of models for water bodies of different types (lakes, rivers, water-reservoirs, etc). SIBYLLA can be used for radiation safety assessment of nuclear facility on the all stages of its lifecycle: design, operation, decommissioning.

Wide range of sources of radioactive contamination and pathways to the water-bodies can be taken into account – fallouts from the atmosphere, discharges, leakages, wash-out from contaminated catchments, waters of contaminated tributaries.

Internal and external exposure doses received by population are estimated. SIBYLLA takes into account consumption of drinking water, fish, agricultural products that can be contaminated due to watering of cattle or use of contaminated irrigated lands or flood-lands. It also takes into account inhalation of tritium, swimming, fishing, being at irrigated lands, flood-lands or in the vicinity of water-bodies.

SIBYLLA models main processes that determine the migration of radioactivity in water-bodies: radioactive decay; advection and dispersion; sorption and desorption on suspended particles and bed sediments; deposition and resuspension of sediments; diffusion on the water – bottom interface, etc.

The results of code validation against experimental data are presented in the paper. The validation is performed against data on radioactive contamination of eight water-bodies of three different types: the Kiev water-reservoir, a river and three lakes contaminated in the result of Chernobyl accident; the Tygish lake situated on the axis of East Ural Radioactive Trace; the Techa river; the Tom river influenced by discharges of Siberian Chemical Combine. It is shown that in 52 % of cases calculated and observed data differed less than in 1.5 times; in 95 % of cases less than in 3 times; in 100% of cases less than in 10 times. The main reason of discrepancies is uncertainty of input data.

The quality of the SIBYLLA code is confirmed by expert council for software accreditation of ROSTECH-NADZOR (Federal Environmental, Industrial and Nuclear Supervision Service of Russia), where SIBYLLA is certified in 2016.

Country/Int. Organization

Russian Federation

Primary author: Dr KRYLOV, Alexey (Nuclear Safety Institute of Russian Academy of Sciences)

Co-authors: Dr NOSSOV, Andrey (Nuclear Safety Institute of the Russian Academy of Sciences); Dr KAZAKOV, Sergey (Nuclear Safety Institute of the Russian Academy of Sciences)

Presenter: Dr KRYLOV, Alexey (Nuclear Safety Institute of Russian Academy of Sciences)

Session Classification: Poster Session 1

Track Classification: Track 4. Fuel Cycle: Sustainability, Environmental Considerations and Waste Management Issues