§29. Study on Development of Environmental Tritium Behavior Model Incorporating Organically bound Tritium in Plant

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The purpose of this work is to build the behavior model of tritium released to the environment at the time of in normal or an accident and to evaluate the model. The organically bound tritium (OBT) to become the accumulation part of tritium in the environment was paid attention in this study. About the case that HTO was released around nuclear fusion facilities, it is important to analyze tritium environment change in the atmosphere, groundwater, river water, soil water and a plant by the model calculation to evaluate facilities influence. This study group is constructed in a model construction group and an experiment group of tritium in the environment. At first the result of the model construction group was reported.

Using the compartment model that incorporated OBT, a behavior estimation of tritium in normal condition (non-rain) around NIFS environment (Fig. 1). Tritium measurement data (8mBq/m^3 HT in Air and 4mBq/m^3 HTO in Air) provided in NIFS in the past and a general shift parameters were used for input data. From the result of the estimate, the oxidation from HT to HTO in soil was fast and tritium which deposited on the surface of the ground exists as soil water mainly. The exchange with FWT (free water tritium) in a plant and atmospheric HTO was fast, but the accumulation as plant OBT has a smaller one column than HTO in air. In the next step, we will carry out an estimate in normal condition (at the time of the rain) with regard to deposition rate of tritium by the rain.

On the other hand, the comparison with a sophisticated and process-based model, SOLVEG and compartment model and the improvement of the compartment model were performed. We understood that a long-term change of tritium concentration in each chemical form became the same change by choosing an appropriate parameter. We examine an evaluation and the consistency of the parameter more and build a model with the validity that we can use for the influence from facilities and carry out the behavior estimation at the time of normal and accident.

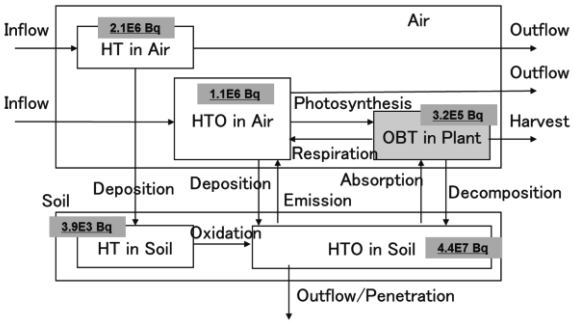

Fig. 1 Tritium inventory estimate example of the steady state (non-rain) by compartment model.

The environmental tritium measurement data were reported successively. Because pretreatment for the OBT measurement and the measurement of OBT need complicate work, there is extremely little measurement data. We continue the collection of OBT date built in a previous study and utilize OBT data of tritium released by The Fukushima Daiichi nuclear disaster as on case study.

The OBT analysis was carried out by the combustion method. The tritium concentration in the combustion water was measured using a low background liquid scintillation counter (Aloka LB-5).

Fig. 2 shows OBT result of the measurement in the cedar annual ring collected in Tamura city, Fukushima prefecture. We confirmed that influence of tritium released at the accident in an annual ring formed in 2011 was recorded. Furthermore, as a case study in the normal condition, we will measure OBT in the annual ring of the pine in the NIFS site and use it as data of the background.

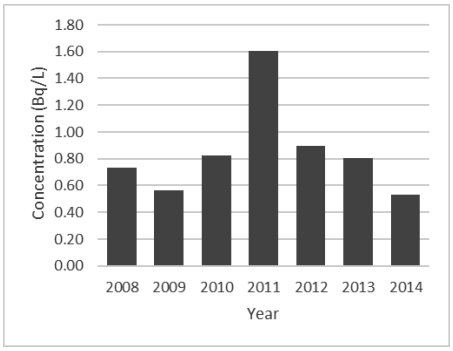

Fig. 2 OBT concentration in an annual tree ring of cedar collected in Tamura, Fukushima prefecture.

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