Fukushima Dai-ichi and the Ocean: 10 years of study and insight Abstract Submission Form : Entry # 35

Name

Kazuyuki Sakuma

Affiliation

Sector of Fukushima Research and Development, Japan Atomic Energy Agency (JAEA)

Email

sakuma.kazuyuki@jaea.go.jp

Country

Japan

Additional Authors (names only)

Michio Aoyama, Takahiro Nakanishi, Hiroshi Kurikami, Masahiko Machida, Susumu Yamada, Ayako Iwata

Session

Consequences for the ocean

Abstract Title (English, limited to 300 characters)

Estimation of particulate and dissolved 137Cs discharge from rivers to the ocean near the Fukushima Dai-ichi Nuclear Power Plant using a simple model

Abstract (English)

JAEA has performed systematic investigations and simulations for the 137Cs migration on terrestrial land since the Fukushima Dai-ichi Nuclear Power Plant (FDNPP) accident to provide various scientific information for the local governments and residents [1].
MERCURY is one of the models developed to simply predict 137Cs discharge from rivers to the ocean for understanding of 137Cs migration from seawater and sediment to the ecosystem and for estimating 137Cs discharge under heavy rainfall immediately. Compared to a watershed model (GETFLOWS) we have used [2], it does not need simulation time and data such as 3D hydrogeological information. It is composed of a tank model, relationships between water discharge and suspended solids load, and two-component exponential models for river water 137Cs concentration. We checked simulation results between MERCURY and GETFLOWS in the Ohta River during 2013-2014 [2] and these were comparable. Using the model, we estimated 137Cs discharge to the ocean from 14 rivers in coastal regions from immediately after FDNPP accident to 2017 [3]. This study reported the impact on the ocean from the initial 137Cs discharge from rivers can be limited because the 137Cs discharge from the 14 rivers (29 TBq) was two orders of magnitude smaller than the direct release from FDNPP and atmospheric deposition into the ocean. However, it has recently reported 137Cs discharge from rivers is one of the sources of 137Cs in seawater in the coastal areas [4]. The aim of this study is to simulate the 137Cs discharge from rivers to the ocean to consider the effect of rivers on the ocean.
Using the MERCURY, 137Cs discharge to the ocean from five rivers near FDNPP in 2018 and 2019 was estimated to be 0.23 and 0.81 TBq. 137Cs discharge in 2019 was larger than in 2018 due to the two huge typhoons in October

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2019, Hagibis and Bualoi. Although the model has some limitations such as underestimating the 137Cs discharge during a heavy rainfall due to lack of modeling dependence of 137Cs concentration on sediment size, it can quickly evaluate the effect of 137Cs discharge from rivers to the coastal area near FDNPP.

[1]Nagao et al., 2020. JAEA-Research 2020-007. [2]Sakuma et al., 2018. J. Environ. Radioact. 184–185, 53–62. [3]Sakuma et al., 2019. J. Environ. Radioact. 208–209, 106041. [4]Aoyama et al., 2020. The Oceanographic Society of Japan. Annual Meeting