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Mass balance of radiocaesium derived from Fukushima accident and estimation of latest fluxes among atmosphere, land and ocean

Michio Aoyama¹, Daisuke Tsumune², Yayoi Inomata³, and Yutaka Tateda⁴

¹Univ. of Tsukuba, Center for Research in Isotopes and Environmental Dynamics, Tsukuba, Japan

(michio.aoyama@ied.tsukuba.ac.jp)

²Environmental Science Research Laboratory, Central Research Institute of Electric Power Industry

(tsumune@criepi.denken.or.jp)

³Institute of Nature and Environmental Technology, Kanazawa University (yinomata@se.kanazawa-u.ac.jp)

⁴Environmental Science Research Laboratory, Central Research Institute of Electric Power Industry

(tateda@criepi.denken.or.jp)

Regarding with amount of movement of ¹³⁷Cs from domain to domain for several years after the accident, we also evaluated that the amount of ¹³⁷Cs transported by the rivers might be 40 TBq which is corresponding to less than 1.3 % of deposited ¹³⁷Cs. For resuspension, the annual deposition of ¹³⁷Cs at Okuma during the period from 2014 to 2018 means that 4 TBq year⁻¹ to 10 TBq year⁻¹ should be amount of resuspension from land to atmosphere and this amount correspond to 0.1 % to 0.3 % of total deposition of ¹³⁷Cs on land in Japan. The ¹³⁷Cs activity concentration at 56N canal in 2016-2018 correspond to ¹³⁷Cs discharge of 0.73 TBq year⁻¹ to 1.0 TBq year⁻¹ from FNPP1 site to open water. The integrated amount of FNPP1 derived ¹³⁷Cs that entered the Sea of Japan, SOJ, until 2017 was 0.27 ± 0.02 PBq, which is 6.4 % of the estimated total amount of FNPP1-derived ¹³⁷Cs in the STMW in the North Pacific. The integrated amount of FNPP1-derived ¹³⁷Cs that returned to the North Pacific Ocean through the Tsugaru Strait from SOJ was 0.11 ± 0.01 PBq, 42 % of the total amount of FNPP1-derived ¹³⁷Cs transported to the SOJ. As a result of decontamination works, 134 TBq of ¹³⁷Cs was removed from surface soil until February 2019 which correspond to 4 % of deposited ¹³⁷Cs on land in Japan. Therefore, the largest transport amount of ¹³⁷Cs was 270 ± 2 TBq from STMW in the North Pacific to SOJ until 2017, and the second largest was decontamination work by which work about 134 TBq was removed from surface soil on land until Feb. 2019. Fluvial transport by rivers contributed about 40 TBq since June 2011 until 2016.