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Distribution of I-129 in the terrestrial environment after the Fukushima Daiichi Nuclear Power Plant accident

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A significant amount of radioactive material was released into the environment after the accident at the Fukushima Daiichi Nuclear Power Plant (FDNPP) on March 11, 2011, with atmospheric emissions commencing on March 12 and peaking during March 15–16 and 20–22 (TEPCO, 2012). Anthropogenic sources such as nuclear-fuel reprocessing plants had already increased the I-129 level in the environment above its natural background (I-129/I-127 = 1.5 × 10 $^{-12}$; e.g., [1]). Total amounts of radionuclides discharged into the atmosphere were estimated to be 8.1 GBq for I-129 ($T_{1/2}$ = 1.57 × 10^7y) [2] and 120 –200 PBq for I-131 ($T_{1/2}$ = 8.02 d) [3] released from the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident. Although the accident-derived I-131 in soil extinguished in a few months, the long-lived I-129 can be used as a tracer to retrospectively infer the level of I-131. We mentioned at AMS-15, the I-129/ I-131 atomic ratio in 5-cm-long surface soils of Fukushima area for reconstruction of the I-131 deposition using the long-lived I-129, average ratio of I-129/ I-131 was estimated to be 26.0 ± 5.7 corrected to the time of earthquake, on March 11, 2011[4]. Several years were passed, I-129 released into the environment exists through repeated deposition and resuspension. We investigated the concentration of I-129 and isotopic ratio of I-129/ I-127 in river water in Fukushima Prefecture, the sampling was conducted at five sites on the Niida-River, once per year, from 2014 to 2020. Sample measurements were performed using AMS at the MALT, The University of Tokyo [5] until 2015 and at UTTAC, The University of Tsukuba [6] thereafter. As a results, the I-129 concentrations were in the range (0.35-2.8) × 10^8 atoms L^{-1} and the I-129/ I-127 ratio was (0.51-4.6) × 10^{-8}. Generally, values are high at the earliest sampling time and appear to have stabilized since then.

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Student Submission

No

Primary author: Mrs MATSUMURA, Masumi (University of Tsukuba)

Co-authors: Dr SASA, Kimikazu (University of Tsukuba); Dr MATSUNAKA, Tetsuya (Kanazawa University); Mr TOMITA, Ryohei (Japan Atomic Energy Agency); Mr TAKAHASHI, Tsutomu (University of Tsukuba); Dr MATSUZAKI, Hiroyuki (The University of Tokyo); Dr SUEKI, Keisuke (University of Tsukuba)

Presenter: Dr SASA, Kimikazu (University of Tsukuba)

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