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TITLE: Iodine-129 in Seawater Offshore Fukushima: Distribution, Inorganic Speciation, Sources, and Budget

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ABSTRACT:

The Fukushima nuclear accident in March 2011 has released a large amount of radioactive pollutants to the environment. Of the pollutants, iodine-129 is a long-lived radionuclide and will remain in the environment for millions of years. This work first report levels and inorganic speciation of (¹²⁹I) in seawater depth profiles collected offshore Fukushima in June 2011. Significantly elevated (¹²⁹I) concentrations in surface water were observed with the highest (¹²⁹I)/(¹²⁷I) atomic ratio of 2.2×10^{-9} in the surface seawater 40 km offshore Fukushima. Iodide was found as the dominant species of (¹²⁹I), while stable (¹²⁷I) was mainly in iodate form, reflecting the fact that the major source of (¹²⁹I) is the direct liquid discharges from the Fukushima NPP. The amount of (¹²⁹I) directly discharged from the Fukushima Dai-ichi nuclear power plant to the sea was estimated to be 2.35 GBq, and about 1.09 GBq of (¹²⁹I) released to the atmosphere from the accident was deposited in the sea offshore Fukushima. A total release of 8.06 GBq (or 1.2 kg) of (¹²⁹I) from the Fukushima accident was estimated. These Fukushima-derived (¹²⁹I) data provide necessary information for the investigation of water circulation and geochemical cycle of iodine in the northwestern Pacific Ocean in the future.

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