Fukushima Dai-ichi and the Ocean: 10 years of study and insight Abstract Submission Form : Entry # 24

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Session

Consequences for the ocean

Abstract Title (English, limited to 300 characters)

Released strontium-90 from the Fukushima Daiichi Nuclear Power Plant to the Sea

Abstract (English, limited to 2000 characters)

The March 2011 earthquake and tsunami resulted in significant damage to the Fukushima Daiichi Nuclear Power Plant (FDNPP) and the subsequent release of radionuclides into the ocean. Strontium-90 (Sr-90) could be used as a good tracer for the leakage of contaminated water from the reactor and treated water storage tank. Sr-90 activity ranged from 0.9 to 29.1 mBq/L, with detectable FDNPP site-derived Cs-134 in the coastal region in May 2013. This indicated that release of Sr-90 from the power plant was ongoing, as was that of Cs-134 and Cs137. Sr-90 activities measured at open ocean sites corresponded to background derived from atmospheric nuclear weapons testing fallout. The FDNPP site-derived Sr-90/Cs-137 activity ratios in seawater were much higher than those in the direct discharge event in March 2011, in river input, and in seabed sediment; those ratios showed large variability, ranging from 0.16 to 0.64 despite a short sampling period. This FDNPP site-derived Sr-90/Cs-137 activity ratio suggests that these radionuclides were mainly derived from stagnant water in the reactor and turbine buildings of the FDNPP, while a different source with a low Sr-90/Cs-137 activity ratio could contribute to and produce the temporal variability of the Sr-90/Cs-137 activity ratio in coastal water. Tth release rate of Sr-90 from the power plant was estimated as 9.6 ± 6.1 GBq/day in May 2013. In 2014, The heterogeneous distribution and high Sr-90 concentration (>100 mBq /L) in the vicinity of FDNPP was observed, which also indicates direct release from the reactor. After construction of ocean-side water shielding wall in December 2015, Sr-90 concentration andSr-90/Cs-137 ratio in seawater was sharply decreased, but Cs-137 was still high. Release rate of Cs-137 to the sea is reduced by decontamination effort, but Cs-137 source from other than the reactor must be identified.