



## **Observation-based estimate of the Fukushima radionuclide in the North Pacific**

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Contaminated waters from Fukushima nuclear power plant (FNPP) were discharged directly into the North Pacific Ocean in March 2011. Coastal current system in this region and time scale of the water exchange with the open ocean is not well understood, however both observational evidence and numerical model simulation results indicate relatively rapid advection of contaminants eastward into the highly energetic mixed water region in the confluence of the Kuroshio and Oyashio. Surface drifters deployed near the FNPP in early summer 2011 show trajectories crossing the North Pacific generally following the large scale ocean circulation after one year. Previously obtained cesium (Cs) samples from multiple cruises near FNPP and off shore region between 2011 and 2013 are collected and evaluated to diagnose the propagating Cs signal crossing North Pacific Ocean. In this presentation, we use radionuclides of Fukushima origin as a tracer to understand the North Pacific circulation and mixing process after two years of release. Large numbers of the observation are repeatedly took place near shore where Cs shows still relatively higher about 10-30 Bq/m<sup>3</sup> in 2013. Temperature-salinity (T-S) properties for the available hydrographic data indicate that the majority of the samples were obtained in the region where the water is highly influenced by the warm-salty Kuroshio origin water. Depth profiles of 35N section in March-May 2013 cruise of the U.S. Climate Variability and Predictability and Carbon (CLIVAR) repeat Hydrography sections are examined to track the radionuclide penetration into the subsurface ocean and the subduction pathways along isopycnal surfaces. Available large drifter datasets that accumulated over decades of field work can guide us in estimating the spread of these radionuclides. By applying an innovative statistical analysis to the drifter data, we investigate the spreading of radionuclides in the Pacific Ocean over 5-year time scales.