Fukushima Cs pathway in the western North Pacific

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A substantial quantity of radionuclides was released to the atmosphere and discharged into the North Pacific Ocean in the spring of 2011 during the Fukushima nuclear power plant (FNPP) accident. Here, we present analysis of Fukushima-derived cesium observed from water samples collected in the North Pacific from oceanographic transects occupied from 2012 to 2015, especially focusing on the Oyashio-Kuroshio mixed region. The horizontal and vertical distributions of observed Fukushima derived radionuclides, specifically ^{134}Cs and ^{137}Cs, were examined to investigate the spreading of the radioactive plume and to shed light on the underlying physical processes.

Radionuclide samples collected as part of the spring 2013 CLIVAR P02 at 30°N revealed that the Fukushima-derived ^{134}Cs had reached a depth of 600 m west of dateline with distinct zonal extent. Physical processes responsible for the deep ^{134}Cs penetration in the western Pacific appear to be related to specific water mass subduction pathways, such as Subtropical Mode Water (NPSTMW) and Intermediate Water (NPIW). This short subduction time scale is key to understanding the Cs pathway spreading into the mid-depth western North Pacific Ocean. Mixed layer depth (MLD) is calculated from Argo float profiles in western North Pacific to examine the interannual changes in the distinct water mass production rates.

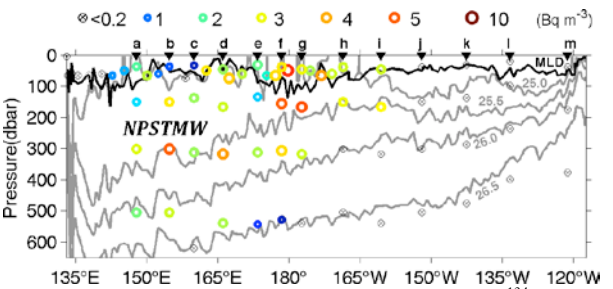

Figure 1: Colored circles represent 2013 30°N ^{134}Cs concentration in Bq/m^3. Circles with crosses indicate concentrations below the detection limit. Gray contours illustrate 25.0, 25.5, 26.0 and 26.5 σ^{θ} isopycnal surfaces. Black line denotes MLD.