

Fukushima Dai-ichi and the Ocean: 10 years of study and insight Abstract Submission Form : Entry # 41

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Session

Consequences for the ocean

Abstract Title (English, limited to 300 characters)

Levels and temporal variation of Fukushima-derived radionuclides in NW Pacific

Abstract (English)

To understand the transport of radioactive pollutants released from the FDNPP accident in the northwest Pacific and their potential impact, 10 monitoring cruises were implemented by the Third Institute of Oceanography, MNR, China from 2011-2015.

In May-June 2011, monitoring results showed that elevated activities of ^{137}Cs , ^{134}Cs and ^{90}Sr were found in the surface seawater of the northwest Pacific. The highest activity for ^{137}Cs (826 Bq/m³), was observed at the station 615 km from Fukushima. Similar activity levels of ^{134}Cs were found in surface seawater samples. The highest activity of ^{90}Sr in seawater samples was 31 Bq/m³.

In May-June 2012, it was observed that the activities of the artificial radionuclides ^{137}Cs , ^{134}Cs and ^{90}Sr in the seawater of the northwest Pacific decreased with time. ^{134}Cs was found in 63.7% of the samples while 32.9% of the ^{137}Cs data were higher than the highest value measured before the FDNPP accident (3.4 Bq/m³). ^{134}Cs was measured as far south as 21°N and as far east as 152°E. From the surface water to the deep water, the activities of ^{137}Cs and ^{134}Cs increased with increasing depth. At a depth of 200 m, both ^{137}Cs and ^{134}Cs had the highest values. ^{134}Cs was found at a depth of 200 m in the station which is 550 km away from the southernmost point of Taiwan Island. The formation and subduction of Subtropical Mode Water (STMW) is a reasonable explanation for this observation. The STMW is formed and penetrates to a depth of approximately 400 m (25.6 $\delta\theta$) south of the Kuroshio Extension between 30°N and 35°N in late winter before spreading to the nearly subtropical front through advection over the Kuroshio recirculation region. The radioactive contaminants are injected into the deep water (300-400 m) and transported to approximately 20°N along subsurface isopycnals (25.0-25.6 $\delta\theta$). Based on an analysis of potential vorticity, depth, salinity, temperature, potential density and time scale, it has been shown that only

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the seawater at a depth of 200 m at that station near Taiwan Island represents STMW.

Temporal variation showed that by 2015 ^{134}Cs and ^{137}Cs levels in the Northwest Pacific had decreased with time by several orders of magnitude following the 2011 FDNPP accident. The ten cruises also confirmed a similar level of radioactivity decreases in marine organisms.