Deep penetration of Fukushima-derived radiocesium in the North Pacific Ocean revealed by hydrographic surveys along trans-basin sections

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The Fukushima Dai-ichi Nuclear Power Plant accident on 11th March 2011 resulted in a large amount of radiocesium (^{137}Cs or ^{134}Cs) release into the North Pacific Ocean. The released radiocesium into coastal area of Japan has been transported eastward between about 40°N and 50°N along a surface current. In the lower latitude, subtropical area concentration of Fukushima-derived radiocesium in surface seawater was low because of blocking of its southward spreading by the Kuroshio Extension. However, hydrographic surveys along meridional sections revealed that the radiocesium had been conveyed southward and spread over the subtropical area though subsurface layer due to formation and subduction of the subtropical mode water (STMW) and central mode water (CMW) denser than STMW. By January/February 2012, Fukushima-derived ^{134}Cs (less than 20 Bq/m^3) had been transported to 20°N along 149°E and 165°E sections in the STMW layer (200-300m depth). Along 138°E section, however, the subsurface ^{134}Cs maximum had not been observed by April 2012. In June 2012 between 30°N and 40°N along 165°E section the Fukushima-derived ^{134}C had been penetrated deeper into about 600m depth due to the subduction of the denser CMW. According to a survey along 30°N zonal section in the subtropical area in May 2013 the deeper penetration of ^{134}C was observed between 148°E and 178°E. A survey along 47°N section in summer 2014 revealed that the penetration of Fukushima-derived ^{134}Cs was restricted to about 200m depth. This work partially supported by Grant-in-Aid for Scientific Research on Innovative Areas, the Ministry of Education, Culture, Sports, Science and Technology Japan (KAKENHI), No. #24110005.