Contribution ID : **118** Type : **Oral Presentation**

Re-circulation of FNPP1 derived radiocaesium observed in winter 2015/2016 at coastal region in Japan

Tuesday, 27 September 2016 13:40 (0:20)

Content

Fukushima Dai-ichi Nuclear Power Plant (FNPP1) accident in March 2011 released 15-18 PBq of 137Cs (and same amount of 134Cs) (Aoyama et al., 2015) into the North Pacific Ocean as direct discharge of liquid contaminated water and atmospheric deposition. Basin scale observations in the North Pacific Ocean have revealed that the FNPP1 derived radiocaesium has been transported eastward as a speed of a few km per day along surface currents (Aoyama et al., 2015) and relatively rapid southward transport due to subduction of mode waters in the North Pacific Ocean (Aoyama et al., 2016). Although the main part of subducted radiocaesium will be expected back to western North Pacific along sub tropical gyre in a few decades time scale, behaviors of radiocaesium in shallower layers is not understood well. We conducted enhanced surface water sampling at more than 80 stations both in coastal regions at Japan Seas side and Pacific Ocean side of Japan in winter 2015/2016 to reveal behaviors of re-circulation of FNPP1 derived radiocasium in sub-surface/surface layers after five years from the FNPP1 accident in 2011. The volume of samples ranged from a few liter to ten liter and radiocesium in the sample seawater was extracted as ammonium phosphomolybdate (AMP)/ Cs compound (Aoyama et al., 2008). The AMP/Cs compound was measured using ultra-low-background gamma-ray detectors in Low Level Radioactivity Laboratory, Kanazawa University because total amount of 134Cs in the sample was expected to be only a few mBq and those of 137Cs was expected to be around a few to 20 mBq. In the surface layer at coastal region of Japan, 137Cs activity ranged from 1.39+- 0.08 Bq m-3 to 2.00 +- 0.11 Bq m-3 while 134Cs activity ranged from below detection limit (less than ca. 0.2 Bq m-3) to 0.38 +- 0.06 Bq m-3, respectively. A maximum activity of 137Cs in surface water was observed very close to Pacific side of western part of Japan except coastal region of Fukushima which is still affected by leaking fron FNPP1 accident of which release rate of 137Cs is around few Gbq day-1. In Japan sea side, 137Cs activity ranged from 1.63 +- 0.10 to 1.83 +- 0.10 Bq m-3. In the more south of Japan, 137Cs activity ranged from 1.39 +- 0.08 to 1.67 +- 0.10 Bq m-3. These results imply that a small part of FNPP1 derived radiocaesium in the North Pacific Ocean already re-circulate through in sub-surface layer in several year time scale and already reached to Japanese coast. 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.

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Session Classification : Applications

Track Classification : Applications