# Particle size distribution and radiocesium concentration in suspended particles within the high turbidity layer at near sea bottom off Fukushima prefecture

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The Fukushima Dai-ichi Nuclear Power Plant accident of March 2011 resulted in the release of radiocesium to the ocean. The concentration of Fukushima-derived $^{137}$Cs in pelagic fishes had been decreased drastically during two years from the accident, associated with the concentration of dissolved $^{137}$Cs due to the dispersion and dilution of seawater. The concentration of $^{137}$Cs in demersal fishes had also been decreasing for eight years, although the decreasing rates of them are slower than those of pelagic fishes. The seabed sediment in the coastal region of Fukushima revealed higher concentration of $^{137}$Cs than those observed before the accident. To elucidate the fate of Fukushima-derived radiocesium in the oceanic environment, the benthic ecosystem in the coastal region of Fukushima is the most important study area.

In this study, we focused on the high turbidity layer observed at near sea bottom as a possible source of radiocesium for the benthic organisms in the coastal region of Fukushima. Field observation was conducted in the coastal region off Fukushima and nearby prefectures during June–July 2018. The LISST-200X was used for obtaining the vertical profiles of volumetric concentration of particles and particle size frequency at 28 stations. LISST-HOLO was used concurrently at some stations shallower than 200 m to obtain holographic image of particle. To measure the concentration of $^{137}$Cs in suspended materials, large volume *in-situ* pump was deployed on the sea bottom for collecting suspended materials just above the sea bottom (ca. 80 cm above bottom) at three stations.
The volumetric concentration of particle (especially >100 $\mu$m) was increased with depth and formed a peak at pycnocline and was decreased with depth. From holography images, diatom colonies and crustacean plankton (copepod) frequently observed at this peak may represent the sub-surface chlorophyll peak was developed around pycnocline. The increase of volumetric concentration of particle were also observed at near sea bottom at some stations located around continental shelf (ca. 100–200 m depth). The particles of 10–100 $\mu$m were abundant at this high turbidity sea bottom boundary layer, on the other hands the particles within this size range were less abundant in the above water column. The holography images of particles represented variable forms including crustacean plankton (copepod), rod shape fragment and amorphous detritus at the high turbidity sea bottom boundary layer. The $^{137}$Cs concentration of suspended particle collected at near sea bottom ranged from 0.1 to 0.2 Bq g-dry$^{-1}$ and was 2 to 13 times higher than that in the sea bottom sediment at same location. These results (10–100 $\mu$m particles abundant in sea bottom boundary layer and relatively high $^{137}$Cs concentration in this particles) revealed the high turbidity layer at near sea bottom could be one of the sources for radiocesium uptake by the benthic organisms. Further studies needed to verify the role of this suspended particles not only the variability of $^{137}$Cs concentration, but also portion of organic fraction, particle size distribution, and the horizontal distribution of particles in the continental shelf area off Fukushima.

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