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Biogeochemical factors for determining radiocesium level in biota of the Pacific coast of eastern Japan

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Biogeochemical factors were examined by application of dynamic compartment model including food chain transfer for determining radiocesium levels in coastal marine biota after the accident on March 2011 of the Fukushima Dai-ichi Nuclear Power Plant (1FNPP). For reconstruction of the ^{137}Cs levels in coastal waters, simulation was carried out by Regional Ocean Model System (ROMS) with the sources inputs of initial direct leaked radioactivity, atmospheric input, and continuous release. Though the radioecological kinetic in some biota are not yet understood e.g. demersal fish and rockfish, spatio-temporal ^{137}Cs levels in macro algae, bivalve, and plaice (species of well-clarified Cs transfer mechanism) were reconstructed by simulation using biological dynamic transfer model. Deficit in computed output was understood as originated from uncertainty of initial source, however was considered as not being geochemically substantial to total radioactivity of ^{137}Cs introduced to ocean. In contrast, correction by fitting of simulated seawater levels to measured concentrations in seawater, was understood as being indispensable to reconstruct radiocesium level in biota, especially inhabiting close to coastal waters near 1FNPP. By spatio-temporal simulation analyses, the controlling factors were derived as follows. 1) Initial seawater level at where the organism exposed determined the maximum radiocesium level in organism; 2) specific metabolism primarily regulated the radiocesium depuration in organism; 3) food chain transfer flux secondary controlled depuration by radiocesum level in food organism that was govern by geochemical distribution of contaminant; 4) annual generation changes accelerated long term depuration by entering of the new year class born after 2012 by reduction of the average level in biota population.