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Fate and transport of ^{137}Cs in aquatic ecosystems

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Abstract

In recent years, considerable interest has arisen with regard to the fate and transport of long-lived radionuclides such as iodine-131 (131I), cesium-134 (134Cs) and cesium-137 (137Cs) in aquatic environments mainly due to nuclear reactor operations, especially after the Fukushima Nuclear Power Plant incident in March 2011. Long-lived 137Cs is an important indicator of radioactive pollution in aquatic environments. The transport and fate of anthropogenic 137Cs is related to the chemical properties of ionic Cs (Cs+), which generally dictates a high degree of mobility and bioavailability of this radionuclide. The transport of 137Cs and its partitioning between abiotic and biotic components of aquatic ecosystems are complex processes that are considerably affected by a number of factors, including the mineralogical composition of suspended and bottom sediments and the characteristic geochemistry of water. These factors influence the sorption and desorption kinetics of 137Cs and the transport of particulate 137Cs. Nevertheless, substantial evidence suggests that direct biological 137Cs accumulation from the aquatic environment occurs readily in micro-organisms and plants, whereas 137Cs accumulation by higher animals results predominantly from the consumption of contaminated foodstuffs. The evidence discussed in this work indicates that 137Cs is continuously re-circulated in biological systems for many years following a pulse of contamination. Possible remediation methods for the contaminated aquatic systems are also discussed. This review provides guidelines for future work and plans for the study of the fate and transport of 137Cs in the aquatic environment in the wake of the Fukushima Nuclear Power Plant disaster of 2011.

Biography

Muhammad Aqeel Ashraf has completed his Ph.D. at the age of 28 years from University of Malaya, Malaysia and postdoctoral studies from Tokyo Institute of Technology, Japan. He is Assistant Professor of Environmental Geology at University of Malaya. He has published more than 46 papers in reputed journals and serving as an editorial board member of repute.