

Significance of submarine groundwater discharge on material transportation from land to ocean: under long term climate change and environmental accident.

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Under the enhancement of climate change, it is very important to understand how materials are exchanged between land and ocean through the marginal seas, especially in the Western Pacific Ocean. This is reflected in the GEOTRACES theme “continental run off” that focuses on understanding the geochemical elements/isotopes and their transport from the land to the open ocean. Submarine groundwater discharge (SGD) is one kind of this “continental run off”, as the key pathway of water, nutrients and other land originated materials via groundwater table from land to the ocean. SGD flux is a current topic of research, and a key parameter in coastal marine systems undergoing climate change. Two examples will be given in this presentation. 1) Toyama, central Japan, with fluxes about 1/4 of the river runoff, is an ideal area to study SGD flux considering the need for a rapid response to climate change and the existence of prior research on SGD. A three-decade case study of temporal variations of the groundwater table shows the responses and implications for submarine groundwater discharge with increased rainfall but reduced snow fall. 2) Transport of Fukushima-derived radiocesium into the coastal ocean via submarine groundwater discharge. The measured ¹³⁷Cs activity in pore water samples and the overlying water in the largest lagoon near Fukushima Daiichi Nuclear Power Plant were higher than the average lagoon brackish water. This indicates that a significant amount of radiocesium in the sediment has desorbed into pore water, then diffused to the lagoon water and transport to open ocean. A calculation of Fukushima-derived radiocesium discharged from the land to coastal ocean was about 1.5 times previous estimates.