

## The submarine groundwater seepage off Uozu in Toyama Bay and their impact on the costal environments

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The fresh water discharge directly from the continental shelf into the marine environment, which links to the groundwater system of the land, has been ignored as a historical pathway for water and dissolved materials, both natural and anthropogenic, to the ocean. Here, as a model case of the groundwater discharge in the shelf, a study of the shoal seeping system from the sea floor of Toyama Bay, located in central Japan, is carried out using a chemical technique to clarify the circulation mechanism and their spatiotemporal changes. Depending upon the compositions of d18O and tritium, it was distinguishable that the spring groundwater collected from off Uozu is the precipitation that has fallen on mountains with an average altitude of 840 m, and arises from the sea floor over 10 to 20 years, after having permeated the underground. In Toyama, the average annual precipitation exceeds the total amount of evaporation from river runoff. It is possible that this difference in water quantity arises as a groundwater spring from the continental shelf decades after seeping into the soil of the land. This quantity corresponds to about a quarter of the river runoff to Toyama bay. As a result, it is concluded that nutrient-rich groundwater spring at the sea floor is significant source of nutrition, more than the river water, which inputting a massive nutrients and influencing significantly to the coastal marine ecosystem of Toyama Bay.