

Observation for the spatial variation of lacustrine groundwater discharge (LGD) in the northern basin of Lake Biwa by multi-layer measurement of radon (^{222}Rn)

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Primary productivity in freshwater lakes and reservoirs are usually controlled by phosphorus (P). Lacustrine groundwater discharge (LGD), direct discharge of subsurface water to lake, is regarded as a potential nutrient paths, including phosphorus from a catchment to lake water environment. Some researchers have pointed out the presence of LGD into Lake Biwa, however, its spatial variation including deep groundwater discharge from offshore lake bed has not been well examined. In the present research, we aimed to observe the spatial variation in LGD to the northern basin of Lake Biwa by multi-layer measurement of radon (^{222}Rn).

The field campaigns were conducted several times from 2017 to 2019. ^{222}Rn is a radioactive element of uranium (^{238}U) series with 3.8 day of half-life. ^{222}Rn is a powerful tracer of groundwater discharge because it generally enriched in groundwater than surface water. To examine the spatial variation in LGD, ^{222}Rn concentration in lake water was measured in eastern and western transects with different depths (5m, 10m, 20m, and 60m). At each station, ^{222}Rn was measured in different depths (surface, intermediate, and bottom) to observe both of shallow and deep groundwater discharge.

^{222}Rn concentration was totally higher in the bottom than surface layer at each station. It suggests LGD from lake bed. The highest ^{222}Rn was observed in the bottom layer at 20m-deep station on the eastern transect in some periods. This result suggests LGD from offshore lake bed via deep groundwater discharge.

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