Observation for the groundwater inflow to the lagoons connected to Lake Biwa

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There are more than 20 lagoons around Lake Biwa which were originally a part of the lake. These lagoons are regarded to have important functions as settling ponds of inflowing loads from the catchments to Lake Biwa, refuges for shallow water ecosystems and so on. Because these lagoons are connected to Lake Biwa, evaluation of nutrient budget is important for the nutrient cycle in the lake. Groundwater inflow is one of the potential nutrient paths from a catchment to water environments. Some researchers have pointed out the presence of lacustrine groundwater discharge (LGD) in littoral area of Lake Biwa. However, it has not been evaluated for the lagoons around the lake. In the present research, we aimed to examine the groundwater inflow to the lagoons connected to Lake Biwa using the multi-tracer method.

The field campaign was conducted in December 2017 for two lagoons (Noda-Numa and Hasu-Ike) located on northeastern shore of Lake Biwa. The volume of inflow and outflow, water temperature, electric conductivity, chlorophyll-a and radon (^{222}Rn) concentration were measured in these lagoons. ^{222}Rn is a radioactive element of uranium (^{238}U) series with 3.8 day of half-life. ^{222}Rn is a useful tracer of groundwater discharge because it generally enriched in groundwater than surface water. Water samples were collected at the inlet, outlet and near the center of the lagoons and natural springs and groundwater wells around the lagoons. Also bottom sediment samples were collected in the lagoons. These samples have been analyzed for nutrients (nitrogen, phosphorus and silicate) and stable isotope ratios of oxygen and hydrogen (δ^{18}O and δD) for water.
δ^{18}O and δD for water were plotted on the different meteoric lines between Noda-Numa an Hasu-Ike. This result suggests these water are originated from different watersheds with different groundwater flow systems. Besides, these values were lower at the inlet than the center and outlet of the lagoons and was lowest in the groundwater around the lagoons. These results suggest the presence of groundwater inflow to these lagoons and the signal decreased from the inlet to the outlet.

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