

## Spatial and temporal variation in submarine groundwater discharge (SGD) on a beach scale in a temperate coastal island: a multi-tracer approach

\*Mitsuyo Saito<sup>1</sup>, Shin-ichi Onodera<sup>2</sup>, Yusuke Tomozawa<sup>2</sup>, Kazuyoshi Asai<sup>3</sup>

1. Graduate School of Environmental and Life Science, Okayama University, 2. Graduate School of Integrated Arts and Sciences, Hiroshima University, 3. Geo Science Laboratory

Submarine groundwater discharge (SGD) is defined as subsurface water flow from the seabed to the coastal sea and ocean. Because groundwater often contains higher nutrients than river water, SGD delivers comparatively large quantities of nutrients to coastal ecosystems. However, there are few studies to examine the spatial relation between SGD and coastal ecosystem such as seagrasses and seaweeds. In the present research, we aimed to examine the spatial and temporal variation in SGD on a beach scale in a temperate coastal island.

The study areas are located on Ikuchijima Island in Seto Inland Sea, southern Japan. The regional climate is mild, with an annual mean precipitation of 1,100 mm and temperature of 15.6 °C. The whole island is characterized by steep slopes and is widely covered by citrus farms with more than 40% of the island. The previous researches confirmed that SGD can rival or even exceed surface runoff in this island. However, the spatial and temporal variation in SGD on a beach scale was not well examined. We installed piezometers in two beach sites (Gohonmatsu: IKG and Miyabara: IKM) and measured water pressure, water temperature, electric conductivity (EC), and radon (<sup>222</sup>Rn) concentration in pore water in July and December 2018, and January 2019. In January 2019, SF6 (sulfur hexafluoride) concentration was measured to estimate residence time of pore water. Before the field campaign in July 2018, the study area had an extreme rainfall event. IKG has steeper backland topography than IKM. There is no surface water inflow to IKG, while a small channel inflow to IKM. Main bottom material is sand in both beaches, however, the western part of IKG is covered by coarse gravels. Large spatial variation in hydraulic potential, water temperature, EC and <sup>222</sup>Rn concentration in pore water were confirmed in both beaches, with larger variation range in IKG. EC was totally lower and <sup>222</sup>Rn was higher in IKG than IKM. These results suggest that higher rate in fresh-SGD in IKG than IKM. In addition, significant low EC and high <sup>222</sup>Rn concentration were confirmed in the western part of IKG in July 2018.

Keywords: Submarine groundwater discharge (SGD), Beach scale, Spatial and temporal variation