

Simultaneous observation of the land-ocean connection along the coast of Akahama Otsuchi: Detection of submarine groundwater discharge

*Hisami Honda¹, Yuji Miyashita², Hideki Hamamoto³, Jun Shoji⁴, Ryo Sugimoto⁵, Tomohiko Kawamura⁶, Osamu Tominaga⁵, Makoto Yamada⁷, Makoto Taniguchi¹

1. Research Institute for Humanity and Nature, 2. Hot Springs Research Institute of Kanagawa Prefecture, 3. Center for Environmental Science in Saitama, 4. Hiroshima University, 5. Faculty of Marine Biosciences, Fukui Prefectural University, 6. International Coastal Research Center, AORI, UTokyo, 7. Faculty of Economics, Ryukoku University

Submarine groundwater discharge (SGD) in the coastal area has been reported throughout the world. It is important to describe the influence on the coastal ecosystem caused by changes in the physical environment such as water temperature, salinity, and any disturbance in the balance of nutrients due to groundwater flow through the seabed. In Akahama Otsuchi, Iwate there are south-flowing groundwater wells near the coastline, likely draining to the bottom of the coastal area. We observed the bottom water temperature and salinity with CTD profilers to detect the presence of SGD in the shallow coastal area around Akahama. Field observations were conducted on February 8, 2017 and October 4, 2017. We measured 37 points in the southeastern area of the well in February, 72 points in the southeastern and southwestern areas in October. We also sampled the bottom water at six points and measured the concentration of radon-222 as a groundwater tracer in October. The temperature of the bottom water was 7.84 to 8.4 °C, and the salinity was 30.79 to 33.91 in February. A slight increase in water temperature was observed around the point where salinity was lowest. The temperature of the bottom water was 17.24 to 18.5 °C, and the salinity was 33.76 to 33.89 in October. We could not distinguish differences in temperature and salinity of the bottom water. However, there were points with high radon concentrations in the southeast and southwest area. The higher radon concentrations were obtained near the point where the salinity was lowest in February. This suggested the influence of groundwater discharge. In this study, we attempted to detect groundwater discharge utilizing the difference between temperature and salinity of groundwater and sea water, but it was difficult to specify the groundwater discharge area using only CTD observation. It is necessary to carry out more detailed observations (e.g. visual observation and measurement of water temperature and electric conductivity under the seafloor) in the future, based on the groundwater discharge locations suggested by this study.

Keywords: Submarine groundwater discharge, Water temperature, Salinity, Radon-222, Otsuchi Bay