

## Effects of the sea bed conditions on the spatial expansion of the heat derived from submarine groundwater discharge

\*Makoto Yamada<sup>1</sup>, Ryo Sugimoto<sup>2</sup>, Hisami Honda<sup>3</sup>

1. Faculty of Economics, Ryukoku University, 2. Faculty of Marine Biosciences, Fukui Prefectural University, 3. Research Institute for Humanity and Nature

Submarine groundwater discharge (SGD) originating from terrestrial groundwater carries various substances with water as a carrier from the land to the sea. It is pointed out that the submarine groundwater discharge(SGD) originating from terrestrial groundwater supplies not only various substances with water as a carrier from the land to the sea but also supplies thermal energy from the land to the sea area. Generally, it is said that the form of outflow differs depending on the state of the seabed. For example, under sea bed conditions like rocky, SGD often spurt out. On the other hand, under sea bed conditions such as covered with sediments, SGD often seeps out. Finally, since the SGD flows into the sea, in the long term, regardless of the sea bed conditions, the substances contained in the SGD flow into the sea. However, depending on the flow rate, the thermal energy derived from the SGD may be lost before it flows into the sea. In other words, there is a possibility that the sea bed conditions which strongly influences the influx velocity of the SGD can strongly influence the spatial spread of the heat derived from the SGD at the coastal area. In this study, in order to examine how the spatial spread of the heat derived from the SGD differs depending on the sea bed conditions, the temperature distribution of the sea bed and surrounding seawater was investigated in three areas (Wakasa area, Obama city, Fukui Pref.; Hiji-machi, Oita Pref.; Yuza-machi, Yamagata Pref.) with different sea bed conditions. The state of the sea bed is covered with sediments in the Wakasa area, Yuza-machi is sedimented thinly on the rocky area, and Hiji-machi is a sediment-free rocky place.

The observation results are as follows. In the Wakasa area, the influence of heat from the SGD on the temperature of the sea bed and sea water was not observed at all. In Yuza-machi, although it is a narrow spatial range, the influence of heat from the SGD on the temperature of the sea bed and sea water around the SGD discharge point was observed. In Hiji-machi, the influence of temperature was strongly observed only at the SGD discharge point on the seabed, but there was no spatial spread of influence. On the other hand, as for the temperature of the sea water, there was a spatial spread of the influence of the heat derived from the SGD. In this way, it became clear that the spatial extent of the influence of the heat derived from the SGD greatly varies depending on the state of the sea bed. In the presentation, we will discuss in detail the reasons for these differences.

Keywords: submarine groundwater discharge, heat derived from SGD, sea bed conditions