

Research of submarine groundwater discharge using ^{222}Rn in Nanao West Bay

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Biological production is more active in coast areas than in open sea because large amount of nutrients from terrestrial areas are carried by rivers. On the other hand, contribution of nutrients from groundwater to coast areas is also important, but identification of submarine groundwater discharge (SGD) is tedious work. Many scientists have been using ^{222}Rn to specify the contribution of groundwater. ^{222}Rn is a daughter nuclide of ^{226}Ra , water-soluble and noble gas. The sedimentary layer is rich in ^{238}U and ^{226}Ra which belong among Uranium series, so the concentration of ^{222}Rn is higher in groundwater than surface water. ^{222}Rn is lost in surface water because of diffusion to atmosphere. Moreover ^{222}Rn has a half-life of 3.83 days and is used to specify the contribution of groundwater with short residence time. In this study, research was carried out at Nanao West Bay, which is located at the Noto Peninsula and is the semi-closed feature, to identify the presence of SGD by measuring ^{222}Rn concentration. Surface and bottom sea waters were collected at 11 sites in May and November 2017. Water quality such as salinity, water temperature, dissolved oxygen was determined by Conductivity Temperature Depth profiler. The six liter of sea water samples was measured for ^{222}Rn concentration by electronic Rn detector (RAD 7: Durrige) after the sample collection. Figure 1 shows ^{222}Rn concentration in the bottom sea water in November 2017. The concentration of ^{222}Rn ranged from 30.4 to 78.2 Bq/m^3 and was higher in the center-east area of Nanao West Bay. Figure 2 shows ^{222}Rn concentration as a function of salinity. The solid line indicates the mixing between river water and seawater outside the bay and dashed line indicates the mixing between groundwater and seawater outside the bay. The higher ^{222}Rn concentration collected at three sites is plotted at the closed area of dashed line. The results suggest that SGD is observed at the center-east area of Nanao West Bay.

Keywords: SGD, radon-222, groundwater, Nanao West bay

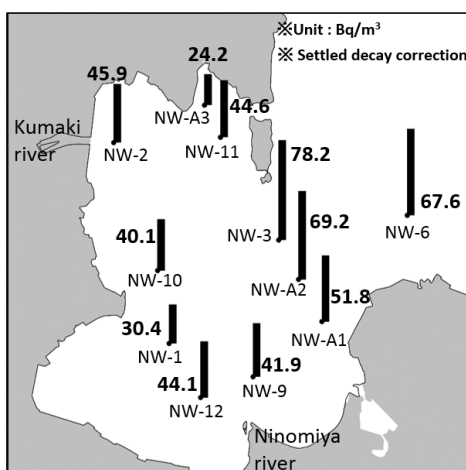


Figure 1

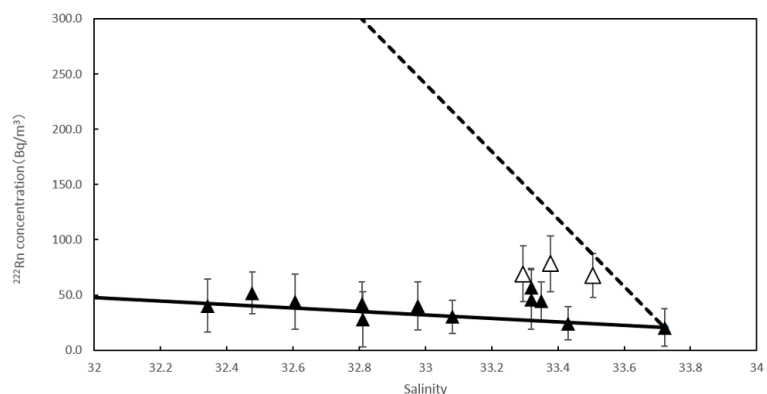


Figure 2