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AHW30-P03 Room:Convention Hall Time:May 22 18:15-19:30

Estimating the groundwater contribution into a river situated in the alluvial fan of the Tedori River

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Groundwater resources should be managed from the viewpoint of sustainable water use, and on the other hand, protection of biodiversity is also important. Water cycle in alluvial fans provides benefit to human activities as well as aquatic biodiversity, and hence it is required to understand the interactions between surface water and groundwater in alluvial fan areas. In this study, groundwater contribution into the Yasumaru River, a small river situated in the base of the alluvial fan of the Tedori River, was illustrated with radon (^{222}Rn), water temperature and electrical conductivity (EC) of the river water.

Water flowing in the Yasumaru River and groundwater in wells around the Yasumaru River were sampled five times (May, July, September, November and December) in 2012, at the points shown in Fig. 1. Water temperature and EC were measured in situ, and ^{222}Rn concentration was determined by analyzing toluene-extracted samples with a liquid scintillation counter.

Distributions of the measured temperature, EC and ^{222}Rn are shown in Fig. 2. In general, concentration of ^{222}Rn is usually mentioned as an indicator of groundwater. Zones with raised ^{222}Rn concentrations in river water are compatible with areas where groundwater discharge occurs.

In the upstream part of the Yasumaru River, the uppermost point with ^{222}Rn of $>$ 1.0 Bq/L varied with the seasons, Y28 in July and Y24 in November, which suggests that the upper end of the area of groundwater discharge could flactuate. The mobility of the groundwater-discharge area seemed to be related to irrigation in paddy fields around the upstream part, because July is in the irrigation period and November is in the non-irrigation period. Additionally, the fact that ^{222}Rn was higher than 1.0 Bq/L at Y28 in December is not contradictory to the suggestion about the irrigation-groundwater relationship, because the paddy fields were waterlogged by much snowfall and rainfall.

In the downstream part, ^{222}Rn concentrations were drastically changed with the seasons, due to open/close condition of the floodgate lying between the upstream and downstream parts. Zones with higher EC were found, which was likely caused by inflow of high-EC effluents from the surrounding area. In addition, because the downstream area is situated in a residential area, rainwater collected by drainage ditches could come directly into the river.

Fractions of groundwater contribution into the Yasumaru River were estimated by the measured ^{222}Rn concentrations and water temperatures. The maximum fractions of groundwater contribution (in May, July, September, November and December, respectively) calculated by ^{222}Rn were 6.1%, 11.7%, 12.9%, 7.2% and 25.5% for the upstream part, and 28.0%, 22.0%, 43.6%, 25.0% and 29.4% for the downstream part. Meanwhile, those calculated by water temperature were 15.6% in July and 60.3% in December for the upstream, and 42.7% in July and 61.6% in December for the downstream. The lower values of the contribution estimated by ^{222}Rn were likely caused by underestimation due to decrease of ^{222}Rn by sublimation and radioactive decay. Similarly, the estimation of groundwater contribution by water temperature had a fear of under-/over- estimation due to insolation and thermal equilibration with the air.

Keywords: radon, radioisotopes, environmental isotopes, water temperature, groundwater discharge, multifunctionality in agriculture

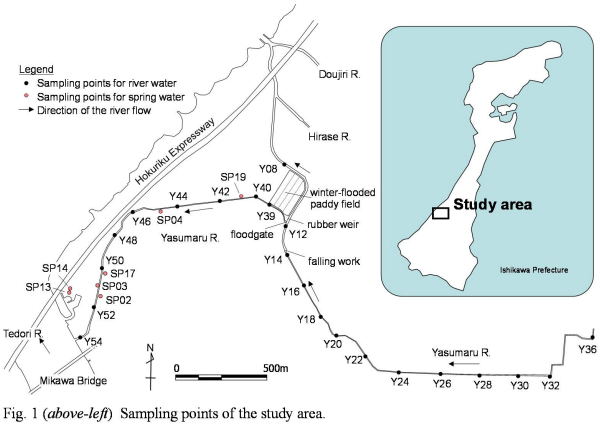

Fig. 1 (*above-left*) Sampling points of the study area.

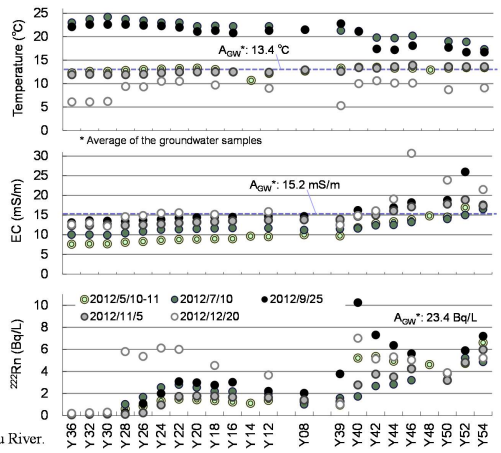

Fig. 2 (*right*) Distributions of water temperature, EC and ^{222}Rn concentration along with the Yasumaru River.