

High salinity zone in river flowing through the Kushiro Wetland formed by springing-up groundwater

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The Chiruwatsunai River, one of the major natural rivers in the Kushiro Wetland, is flowing between two hilly plateau areas and discharging into the wetland. Our previous researches reveal that a lot of in-stream and riparian springs are distributed in the Chiruwatsunai River watershed. Furthermore, altitude effects of stable isotopic compositions of oxygen and deuterium and age-dating method using tritium concentration clearly imply that these springs are fed by groundwater from the regional flow system. In this research, high salinity zone in the distributary of the Chiruwatsunai River (hereinafter called "E-river") was investigated by using radioisotope Radon-222 (Rn) and major ions as indexes.

Rn, a radioactive gas generated by the decay of Ra-226 in geological strata, is often used as a target tracer to identify groundwater discharged area, because Rn is far more contained in groundwater than in surface water. E-river is about 1.1km long and the water depths range from 0.55 to 2.00m (avg. 1.36m). In this research, stream water was sampled from surface layer and lower layer near the river bed. Rn concentrations in the surface layer of E-river are almost 0Bq/L except for one sample. On the other hand, the lower layer shows higher Rn concentrations, which range from 0.35 to 2.96Bq/L (mean value of 1.77Bq/L). These results provide strong evidence that E-river is fed by springing-up groundwater from its river bed, and two-layered water environment are formed in E-river.

The electric conductivity (EC) in the lower layers in E-river varied in the range of 29.6 to 194.2 mS/m (avg. 99.6mS/m), while the average values in the surface layer is 10.5mS/m. Sodium and chloride ion are dominantly present in the lower layer of E-river, and highest chloride ion concentration in the lower layer is 719mg/L. The origin of salinity observed in E-river is not considered to be airborne salt and saltwater intrusion from Kushiro Bay, because E-river is located more than 17km far from nearest coastal area. Furthermore, rocksalt phase is not also distributed in the investigated watershed. And the section of high salinity observed in E-river is almost same as the section of high Rn concentration observed. From these results, it can be deduced that fossil seawater confined in marine stratum is discharged into E-river by springing-up groundwater. The mixing ratio of seawater into E-river is estimated to be 0.3 to 3.7% according to mass balance analysis of chloride ion. Future work is to identify the origin of salinity and springing-up groundwater in E-river by using other environmental isotopes.

Keywords: groundwater, radon, river, salinity, Kushiro Wetland