

Multi-tracers approaching to groundwater and surface water interaction in Ono basin surrounded by steep mountains, Japan

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Mountainous headwaters and lower stream alluvial plains are important as water recharge and discharge areas from the view point of groundwater flow system. Especially, groundwater and surface water interaction is one of the most important processes to understand the total groundwater flow system from the mountain to the alluvial plain.

We performed tracer approach and hydrometric investigations in a basin with an area 948 square km surrounded by steep mountains with an altitude from 250m to 2060m, collected 258 groundwater samples and 112 surface water samples along four streams flowing in the basin. Also, Stable isotopes ratios of oxygen-18 (¹⁸O) and deuterium (D) and strontium (Sr) were determined on all water samples.

The ¹⁸O and D show distinctive values for each sub-basin, due to different average recharge altitudes among four sub-basins. Also, Sr isotope ratio shows the same trend as ¹⁸O and D, due to different geological covers in the recharge areas among four sub-basins.

The ¹⁸O, D and Sr isotope values of groundwater along some rivers in the middle stream region of the basin show close values as the rivers, and suggesting that direct recharge from the river to the shallow groundwater is predominant in that region. Also, a decreasing trend of discharge rate of the stream along the flow supports this idea of the groundwater and surface water interaction in the basin.

Keywords: Groundwater flow system, Circulatory system of groundwater and surface water, Hydrogen and oxygen isotope ratio, Sr isotopic composition, Multi tracers approach