Groundwater recharge estimated from stable isotopic ratios of hydrogen and oxygen in Chugoku region,Japan

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The purpose of this study is to estimate the ratio of groundwater recharge from stable isotopic ratios of hydrogen and oxygen in the Takahashi, Okayama prefecture and the Hino basin, Tottori prefecture. Samples of precipitation and river waters were collected from December in 2002 to November in 2003, and isotopic ratios of hydrogen and oxygen of precipitation and river waters were analyzed.

Temporal variations of dD and d18O for precipitation were large, ranging from -21 to -69 for dD, -4.4 to -9.8 for d18O. But those of river waters were uniform, ranging from -41 to -54, -6.6 to -9.4, respectively. dD and d18O for river waters trend to have lower values around the lower Takahashi and higher values around Chugoku Mountains.

The hydrogen and oxygen isotopic altitude effects of river waters in this region were calculated at -1.5 per mille dD /100m, -0.34 per mille d18O /100m. These were general values compared with ones in other reports in Japan.

The d-parameter(d=dD - 8d18O) of river waters in the two basins trends to become higher continuously from the Inland Sea of Japan(Setonaikai) side to the Sea of Japan side, ranging from 7 to 22. This distribution of d-parameter suggests that the meteoric waters in this region are dominated by differing contribution of air masses formed in the different conditions, especially the velocity of evaporation due to the differences of relative humidity in air masses.

Judging from the d-parameter, the ratio of precipitation from December to March in river waters in winter was ranging from 0% to 56% and its ratio in summer was ranging from 0% to 35%. The ratios of precipitation from December to March in river waters in summer around Chugoku Mountains were very large, ranging from 18% to 35%.

This suggests that precipitation in winter, especially snow, is contributed largely to the groundwater recharge around Chugoku Mountains.