

Chemical and isotopic compositions of groundwaters in central part of Toyama City, Japan

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Chemical and isotopic (D, ¹⁸O) compositions of 50 shallow groundwater and 6 river water samples in the central part of Toyama City were analyzed to examine their water quality, origins and water flow in order to obtain baseline geochemical data for application of groundwater to geothermal heat pump (Geo-HP). The isotopic results show that the groundwaters are of meteoric origin and a mixture of a big river waters (Joganji River) and precipitation. The chemical and water temperatures of shallower groundwaters are of a Ca-HCO₃ type and 10 to 15°C for most of samples and a part of them (close to Jintsu River and Kureha hill) is of Na-HCO₃ type and 10°C, respectively, which may be reflected by Kureha active fault. The δD and δ¹⁸O values of groundwaters are -70.1 to -49.2 ‰ and -11.6 to -8.6 ‰, respectively. Those of two river waters are -66.9 to -62.0 ‰ and -10.3 to -9.4 ‰ for the Jintsu River and -66.5 to -64.8 ‰ and -11.1 to -10.9 ‰ for the Joganji River. The δ¹⁸O values of precipitation in this area are -12.8 to -6.5 ‰. These results suggest that the shallow groundwaters in the study area are largely affected by infiltration of the Joganji River and precipitation. In the coastal area, the δ¹⁸O values of groundwaters are lower than those of other area. This may be due to infiltration of precipitation which fall on the slope of Tateyama Mountains (3,000 m altitude). For the safety use of Geo-HP, scaling components such as Fe and CaCO₃ are discussed by calculation of their saturation indices. This result shows that open-type Geo-HP can be applied to most area but only closed-type Geo-HP can be used in some part due to scaling of Fe-hydroxide.