

Hydrogeological and hydrogeochemical aspects of tectonic zone in the central Kanto plain, Japan

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In the Kanto plain, the largest Quaternary groundwater basin in Japan, water samples were obtained from 144 water supply boreholes with pumps installed to characterize the groundwater system. The spatial variation in chloride (Cl^-) concentration indicates that in its central part there exists groundwater with high Cl^- concentrations of more than 100 mg/l (up to 216 mg/l) between 150 m and 430 m depth below ground surface. This 8 km wide, 35 km long Cl^- -rich area, spreading from the northwest to the southeast, corresponds with the so-called Motoarakawa tectonic zone bounded by the faults on its long sides. We have found the Cl^- -rich groundwater is also characterized by low dD, low d^{18}O , high d^{13}C , low ^{14}C , high ^4He , and high $^3\text{He}/^4\text{He}$ values. Both the chemical and isotopic evidence strongly suggests the Motoarakawa tectonic zone divides the regional groundwater system in the Kanto plain into three distinct hydrologic subareas. Two faults bordering the tectonic zone act as barriers to the southward and northeastward regional movements of groundwater. The groundwater in the Motoarakawa tectonic zone has been put under an isolated hydrologic environment for a long period of time with respect to the active regional groundwater system, resulting in groundwater with highly-evolved water chemistry and unique isotopic characteristics. Its groundwater is assumed to have been recharged by either precipitation under cooler climate condition than the present, or groundwater and/or river water originated from precipitation on high altitude areas around the Kanto plain. Pore water (formation water) squeezed out of the adjacent aquitards and/or ascent of deep-seated groundwater may be another possible sources of water and Cl^- for the tectonic zone groundwater.