

Isotopic characteristics of groundwater in the Kanto plain

Takeshi Hayashi[1], Youhei Uchida[2], Akinobu Miyakoshi[1], Yasuo Sakura[3]

[1] Sci and Tech, Chiba Univ, [2] Hydrogeology, G.S.J., [3] Dept. Earth Sci., Chiba Univ.

The Kanto Plain is the most largest groundwater basin in Japan. Exploitations of groundwater for water resource are advanced in whole part of the plain, and these exploitations with large groundwater pumping have involved decrease of groundwater level and land subsidence in various part of the plain. Therefore, many hydrological studies about groundwater flow and chemical components of it have been examined for the purpose of exploitation and appropriate use of it. But, the hydrological studies about isotopic composition of groundwater are very little. In the Kanto plain and peripheral mountainous area, isotopic composition of oxygen and hydrogen of river water and spring water has regional difference because of continental effect and elevation effect of rainfall (Mizota and Kusakabe, 1994; Yasuhara et al., 2001). Thus, it is prospected that the isotopic composition of oxygen and hydrogen of groundwater have same regional difference with spring and available tracer for analysis of groundwater flow system.

There are many observation wells for groundwater level and land subsidence in the Kanto plain, and it is possible to understand the aspect of groundwater whole part of the plain using these wells. The purpose of this study is to clarify the configuration of groundwater flow whole part of the Kanto plain, using distribution of chemical components and isotopic composition of oxygen and hydrogen of groundwater that had collected from these observation wells, along with distribution of hydraulic potential and subsurface temperature.

From the result, isotopic composition of oxygen and hydrogen of groundwater are from -6.4 to -10.5 per mil and -41.1 to -76.2 per mil respectively, and d-value (slope: 8) are from 4.1 to 17.7. This result is according to the isotopic composition of spring water (Yasuhara et al., 2001). From the horizontal distribution of isotopic composition of groundwater, it shows the regional difference, which is similar to it of spring water; it is lower in Gunma, Tochigi and Saitama prefecture and higher in Ibaraki and Chiba prefecture. Though, it is especially low in the Nakagawa lowland, central part of the plain. It is estimated that these distribution is caused by continental effect of rainfall, which is origin of groundwater. From the vertical distribution of isotope composition of groundwater, it is low in Nakagawa lowland in all depths, on the contrary, it decrease with the depth in peripheral part of the plain. These isotopic changes with depth suggest the difference of elevation of groundwater recharge area.

It is estimated that the subsurface distribution of isotopic composition is formed with regional groundwater flow. Thus, it is suggested that the isotopic composition of oxygen and hydrogen of groundwater is very available tracer for analysis of groundwater flow in large study area such as the Kanto plain. It is estimated that the Nakagawa lowland is discharge area of regional groundwater flow system, because the isotopic composition in this area is evidently different from the surrounding area in same depth.