Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

AHW27-06 Room:102A Time:May 22 10:24-10:39

Effects of groundwater development on subsurface temperature distribution in the northern Kanto Plain

Akinobu Miyakoshi[1*], Takeshi Hayashi[2]

[1]Geological Survey of Japan, AIST, [2]Faculty of Education and Human Studies, Akita University

Since 1999, our group has been conducting a survey to evaluate the subsurface temperature environment in the Kanto Plain, Japan. Takahashi (1967) pointed out that high temperatures have been observed beneath the northern Kanto Plain. High temperature area has been also observed in our study (Miyakoshi et al., 2003). However, the reason why the high temperature area is formed has not been explained. Taken in the light of the progression of land subsidence caused by groundwater development in this area, the distribution of subsurface temperature is considered to be affected by groundwater flow change caused by effects of groundwater pumping. To make clear a distribution of subsurface temperatures and its change in the northern plain, we conducted the measurement of temperature-depth profiles at 66 observation wells in Gunma and Tochigi Prefectures in 2011. This paper provides the evaluation result of observed data in 30 wells in the eastern part of Gunma prefecture and the southern part of Tochigi prefecture.

High temperature area was observed in the lowland along the Tone River and the Watarasegawa River. At the depth of 100m, relative low temperatures were found in the central part of this area. Wells close to rivers showed especially low temperature. Low hydraulic heads are observed at the depth from 100 to 200 m in this area. The distribution of hydraulic heads suggests that groundwater flow concentrates to the part of low heads. This accords the main depth of groundwater development in this area. It suggests that low temperatures were formed by induced groundwater recharge caused by groundwater pumping. In contrast, thermal gradients increase at the depth of low heads in the high temperature area. The distribution of thermal gradients shows effects of upward groundwater flow toward the part of low heads. Accordingly, distribution of subsurface temperatures is considered to be affected by not only regional groundwater flow system but also groundwater flow change caused by groundwater development in the north of Kanto Plain.

Keywords: groundwater development, subsurface temperature, grounwater flow, urbanization, Kanto Plain