H126-001 **Room: Ocean B** **Time: May 28 13:50-14:10**

Subsurface Thermal Environment Change due to Artificial Effects in the Tokyo Metropolitan Area, Japan

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Information on three-dimensional subsurface temperature distribution and its change were examined by measuring of temperature-depth profiles at observation wells in 2001-2002 and 2005-2006, to evaluate the effects of human activity on the subsurface thermal environment via urbanization in and around the eastern part of the Tokyo Metropolitan area.

Respectively high temperatures were observed in the central part of the Tokyo Lowland in comparison to its surrounding area. Distribution of hydraulic heads in the lowland shows a decreasing tendency from the Tokyo Bay side to the inland side in the north-south direction. However, the distribution of the high temperatures is localized, and the distribution of subsurface temperatures is not horizontally continuous. Differences between the distribution of hydraulic heads and subsurface temperatures suggest that groundwater flow in the Tokyo Lowland is not confined within an aquifer but is continued from below. In light of the hydrogeological structure of the lowland, the upper surface depth of the consolidated silt bed, which is considered the lower boundary of groundwater flow in the quaternary aquifer, is relatively shallow toward the bay. Therefore, it cannot reasonably be assumed that groundwater is continuous horizontal. At the shallow part, the Yurakucho Bed, a cohesive soil bed, lies beneath the lowland. This bet may intercept groundwater recharge from ground surface. Around the high temperature area in the central part of the lowland, it has been reported that severe land subsidence and groundwater depression had occurred due to excess pumping during the rapid postwar growth period. Hence, it is estimated that groundwater pumping had more severe influence on the central part than the surrounding area. Hydrogeological structure and groundwater pumping may have created the high temperature in the central part.

On the other hand, time series variations of subsurface temperatures were recognized in almost all of this area. A comparison between the past subsurface temperature data in 1956-1967 and the temperature-depth profiles in 2001-2002 revealed widespread decreasing temperatures of 0.1 to 0.5 degrees Celsius at the depth between 50 and 200m. In contrast, a comparison of 2001 to 2002 data and 2005 to 2006 data shows subsurface warming of less than 0.1 degrees Celsius at the shallow part (above the depth of 50m). The result of numerical analysis of temperature-depth profiles suggests that the subsurface temperature decrease was caused by induced groundwater recharge due to pumping and the subsurface warming at the shallow part was caused by surface warming due to urbanization. Moreover, the high temperature area is also shown in the past data (1956-1967), and the temperatures were higher than in the present data (2001-2006). In the 1950s-1960s, the amount of groundwater pumping may have been larger and upward groundwater flux from underneath may have been higher than at the present. The reason for temperature decrease from past to present in the central part of the lowland is may be decrease of the upward groundwater flux to compensate for the amount of pumping.

This study showed diversified human activities affect the subsurface thermal environment in many ways. Verification of longitudinal change of groundwater flow is expected to become possible by organizing and analyzing of characteristics and volume of subsurface temperature change by districts and depths.