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An analysis of regional characteristics of low-temperature earth thermal resources in Saitama prefecture

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The development of geothermal resources in Japan has been mainly intended to use the earth's heat which originated from the deep part of spa areas or volcanic areas. On the other hand, low-temperature geothermal resources (LGRs) have scarcely been used as the one of energy resources, in spite of lying huge amount of energy under the ground within about 200 meters depth in basins or plains. However, LGRs has potentials to solve the various geo-environmental problems, such as the global warming, the heat-island phenomenon. Therefore, it is necessary to use this new resource for industrial activities, agribusinesses and daily life positively.

In order to promote future use of the LGRs, it will be necessary not only to overcome each technical difficulty, but also to obtain enough information, such as groundwater flow and underground temperature distribution of the areas where the geothermal heat-pump (GHP) systems will be installed. In addition, it is very important for local governments to estimate regional characteristics of implementation effects of the GHP systems.

We estimated areal distribution of demands for cooling and heating using detailed climate conditions (air temperature, amount and duration of insolation), and also evaluated regional characteristics of implementation effects when we assume the usages of the GHP systems. Moreover, we discussed the effect on cooling and heating performance of the systems by the difference of thermal conductivities of the stratum. In this presentation, we will report reduction effects of total energy and CO₂ based on numerical simulation results which were assumed to operate the GHP systems with mean thermal conductivities derived from geological informations.

Keywords: earth thermal, low-carbon society, global warming, heat island phenomenon, thermal conductivity, simulation