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武蔵野台地における地質条件を反映した地下の熱伝導率と地下水流動の検討
Geothermal property and groundwater flow estimated from the lithology in the late Pleistocene terrace area, Tokyo, Japan

船引 彩子 [1*], 高野洋一 [1], 竹村 貴人 [1], 濱本 昌一郎 [2], 小松 登志子 [2]
FUNABIKI, Ayako[1*], TAKANO Yoichi[1], TAKEMURA, Takato[1], HAMAMOTO, Shoichiro[2], KOMATSU, Toshiko[2]

[1] 日本大学文理学部, [2] 埼玉大学大学院理工学研究科
[1]College of Humanities and Sciences, Nihon University, [2]Graduate School of Science and Engineering, Saitama University

Introduction

The ground source heat pump (GSHP) is a highly efficient and renewable energy technology for space heating and cooling, with benefits including energy conservation and reduction in greenhouse gases emission. After the Great Japan Earthquake and following nuclear disasters, GSHP is getting noticed by media and some local governments are introducing GSHP.

On the other hand, the GSHP installation under the ground might enhance pollutions in geo- heat environment or change groundwater flow due to thermal disturbance released from GSHP. In this study, the effect of the GSHP was estimated based on the 3D geological model in the Su Tokyo.

Geological model

The Tokyo metropolitan area is surrounded by the Late Pleistocene terraces called Musashino uplands. These areas are densely populated residential area. The Shimosueyohi surface is one of these terraces, which was formed along the Tama River, during the last deglacial period.

The CRE-NUCHS-1 core (Funabiki et al., 2011) was obtained from this area to know the lithology, heat transfer coefficiency and chemical characteristics of the sediments. In this study, we collected borehole data logs within 5km square surrounding the core site, and created the 3 dimensional geological model. The lithology of this area consists of the Pleistocene Kazusa Group, terrace gravels, and volcanic ash layer called Kanto loam, in ascending order. The terrace gravel layer is located mainly beneath the Kanda, Kitazawa, and Karasuyama Rivers. These rivers flow parallel with the Tama River. At the center of the terraces, Kanto loam covered the Kazusa Group without terrace gravel.

Geothemal disturbance and groundwater flow

Using the geological model, heat transfer coefficiency and groundwater flow velocity was calculated. In areas with thick terrace gravels, the heat transfer coefficient is high and groundwater flow is relatively fast. Since the terrace gravel is located at relatively shallower level (8-20m in depth), its thickness is one of the elements to affect the geothermal disturbance and groundwater flow in this area.

Acknowledgement

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Reference

Funabiki et al., (2011) Sedimentary facies and physical properties of the sediment core CRE-NUCHS-1 in Setagaya district, Tokyo, central Japan. Abstracts (Section B) for 2011 joint annual meeting of Japan Association of Mineralogical Sciences and the Geological Society of Japan.

キーワード: 地下熱汚染, 地下水, 熱伝導率, 段丘礫層
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