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学位記授与の日付	令和４年９月３０日
学位記授与の要件	学位規則第４条第１項該当
学 位 論 文 題 目	Detecting Urban 3D Structure and Its Impact on Land Surface Temperature Using Open-Source Satellite Data オープンソースの衛星データによる都市の立体構造検出と地表面温度に与える影響
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論　文　内　容　の　要　旨

impact of buildings on urban environment. Later, studies that use the vertical three-dimensional (3D) approach keeps increasing. Building height has been used as an indicator in vertical 3D approach, it is necessary for urban planning, urban monitoring, and disaster assessment. Despite its importance, building height data are relatively hard to obtain due to high operational cost for retrieving it and high computational complexity to extract it.

Urban thermal environment is often described with land surface temperature in urban climate study. Studies have examined the relationship between building height and land surface temperature and the results are inconsistent. Some studies found that high buildings tend to increase land surface temperature, but other studies found that they tend to decrease land surface temperature. It is worth to be investigated further how building height affect land surface temperature.

To address the issue of building height data limitation and inconsistent findings of its impact, this study aims to (1) examine a simpler alternative method to produce digital building height models, (2) to examine the applicability of the extracted digital building height models in the analysis of urban land surface temperature, and (3) to analyze the impact of building height on land surface temperature.

AW3D30 (ALOS World 3D 30 m) and SRTM (Shuttle Radar Topographic Mission), were used to calculate the digital building height models. The result was then compared with the reference data from airborne light detection and ranging to examine the accuracy. Landsat 5 and 8 data were used to calculate the land surface temperature. The impact of building height on land surface temperature was examined using correlation and regression analysis. The study areas include Tokyo, Beijing, Jakarta, New York, Los Angeles, and Chicago.

The result showed that there is a good agreement between the building height models derived from this study and the reference data. Although it does not produce an accurate building height model, the result is still usable and practical for the application of urban climate study. By analyzing the derived building height model and land surface temperature, building height was found to have a negative

relationship with land surface temperature regardless of the urban area. There are factors that might affect the phenomenon, such as ratio between street surfaces versus wall surfaces, the existence of green spaces in high building complexes, buildings' shades, building's surface material, and wind corridor.

In summary, I utilized the simplicity of extracting building height models from two open satellite products and showed reasonable results. Up until the research was carried out, only one study has tried to estimate building height using those data. Furthermore, no other study has applied it to urban climate research, which is the originality of this study. In addition, the results confirmed that higher buildings tend to have lower land surface temperature. Practically, the findings could add some consideration for urban planner and policy makers.