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Thermal Study on Temporal Long-wave Radiation Shift of Outdoor in Urban Residential Area of Seoul

You Jin Kwon (1) and Dongkun Lee (2)

(1) SEOUL NATIONAL UNIVERSITY, Interdisciplinary Program in Landscape Architecture, Korea, Republic Of (eugeneugene.kwon@gmail.com), (2) Department of Landscape Architecture and Rural System Engineering, Seoul National University

In the metropolitan area, there are many shadows due to dense high-rise buildings. If there is a lot of shadows, the short-wave radiation reaching the surface or space will be reduced due to the decrease in solar radiation, which will solve the heat island effect of the city (J.Loveday, et al., 2017, FanhuaKong, et al., 2016). There are many active pedestrians those who are vulnerable to heat during the day time particularly in the high-rise building residential area in Seoul. Therefore, shadows that block solar radiation are important in urban residential areas. However, there is a shaded space that even makes pedestrian feel hot or cool during summer in urban.

Longwave radiation is the heat energy emitted from all objects and is distinguished from shortwave radiation, which is greatly influenced by solar radiation. It can be formed in hot areas due to the influence of attributes, albedo and sky view factor (Grimmond, 1991).

Studies on longwave radiation have been mainly focused on the large scale as the space atmosphere or the Earth's atmosphere. However, mitigating Urban Heat Island(UHI) effect is not only about solving the condition of above the atmosphere but also about eye-level thermal condition. This thermal comfort is the thermal condition felt by pedestrians or visitors in the neighborhood scale. Therefore, we need to know the temporal changes in longwave radiation in the neighborhood scale of urban space.

Space with dense buildings and high population effect the UHI in neighboring cities. Most of the high-rise buildings (45m) are being rebuilt in the higher-rise buildings (around 100m) in Seoul. It is expected that the rebuilding volume will increase and the longwave radiation emission will be further increased under this condition. Therefore, there is need to see how or which shadows reduce relative longwave radiation under urban residential area.

In order to investigate the different shade, we chose to see longwave radiation temporal trend under the vegetation shade during day and night. The survey was held at three representative high-rise building residential areas in Seoul using CNR4, a net radiation measuring equipment. Data was collected by each second measurement of net radiation, longwave radiation, temperature, wind speed and albedo. As a result of the study, the temporal change of the radiation under tree shadow of the building shows that the radiation is decreased at 16 o'clock. And longwave radiation below the building shadows without trees is increased at 16 o'clock. As a result, we found that the tree contributes to reduce the longwave radiation under building shade.

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