



## **Simulation-based evaluation of evapotranspiration of rooftop greening and its effect in mitigating heat island**

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The purpose of this research was to quantify the effectiveness of rooftop greening in heat island mitigation and CO<sub>2</sub> emission reduction by using a district-scale meteorological simulation. In particular, the evaluation was performed by calculating the amount of evapotranspiration from the latent heat flux, and taking into account the necessary amount of watering. In many previous simulations, the results depended on settings of surface wetness parameterized as fixed values, such as evaporation efficiency. Actually, latent heat flux is almost a function of the amount of water alone, and thus if evaluation is carried out while directly linking the amount of water used for evapotranspiration with the latent heat flux, it is possible to derive a clear physical relationship.

The model used in this research is the coupled urban canopy/building energy model. In this model, a vertical one-dimensional local weather model is coupled with an air-conditioning load calculation model for buildings, and this makes it possible to forecast the heat load of buildings in a district, energy consumption due to air-conditioning, and temperature variation. The days subject to calculation were August 8-10, 2002, a period of consecutive fair weather summer days in Tokyo.

The results of this research showed the relationship between the temperature reduction in the case of large-scale adoption of rooftop greening and evapotranspiration under the calculation conditions of this research. The CO<sub>2</sub> reduction effect of rooftop greening was evaluated taking into account both CO<sub>2</sub> reduction due to cooling energy and CO<sub>2</sub> emissions due to watering. In addition to the standard conditions assumed in this research, calculation conditions were also assumed in which the roof insulation performance and evaporation efficiency of the rooftop greening area were varied, and the same examination was carried out as sensitivity analyses.

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