



Urban heat mitigation by roof surface materials during the East Asian summer monsoon

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Roof surface materials, such as green and white roofs, have attracted attention in their role in urban heat mitigation, and various studies have assessed the cooling performance of roof surface materials during hot and sunny summer seasons. However, summers in the East Asian monsoon climate region are characterized by significant fluctuations in weather events, such as dry periods, heatwaves, and rainy and cloudy days. This study investigated the efficacy of different roof surface materials for heat mitigation, considering the temperatures both at and beneath the surface of the roof covering materials during a summer monsoon in Seoul, Korea. We performed continuous observations of temperature at and beneath the surface of the roof covering materials, and manual observation of albedo and the normalized difference vegetation index (NDVI) for a white roof, two green roofs (grass [*Poa pratensis*] and sedum [*Sedum sarmentosum*]), and a reference surface. Overall, the surface temperature of the white roof was significantly lower than that of the grass and sedum roofs (1.1 and 1.3°C), whereas the temperature beneath the surface of the white roof did not differ significantly from that of the grass and sedum roofs during the summer. The degree of cloudiness significantly modified the surface temperature of the white roof compared with that of the grass and sedum roofs, which depended on plant metabolisms. It was difficult for the grass to maintain its cooling ability without adequate watering management. After considering the cooling performance and maintenance efforts for different environmental conditions, we concluded that white roof performed better in urban heat mitigation than grass and sedum during the East Asian summer monsoon. Our findings will be useful in urban heat mitigation in the region.