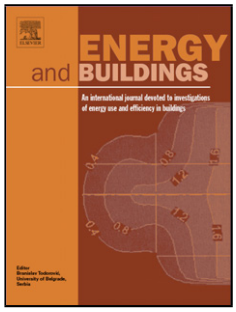

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Surface Temperature Analysis of an Extensive Green Roof for the Mitigation of Urban Heat Island in Southern Mediterranean Climate

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Highlights

- An experimental analysis of a green roof surface temperature was conducted
- Dark traditional roof reached a peak of 74.3 °C and a daily excursion of 51.5 °C
- Vegetated roof was able to halve summer daily temperature excursions
- Limited surface temperature variation in the whole year were found
- Winter thermal performances were not penalized by the temperature reduction

Abstract

Green roofs have recently been regarded as useful tools to mitigate the Urban Heat Island (UHI) phenomenon, being capable of substantially reducing the roof surface temperature. In this context the paper aims to present an extensive analysis of the surface temperature of an experimental green roof located in southern Italy. The surface thermal performance of both green and traditional roof was analysed in a very concise manner through proper defined indexes. The results of the analysis showed how the traditional roof in June reached a peak of 74.3 °C with a daily excursion of 51.5 °C whereas green roofs were able to produce a surface temperature from 0.57 to 0.63 times lower. The results also showed that in winter the vegetated roof could significantly reduce the daily temperature excursion compared to the reference membrane, indicating a reduction of the heat losses of the indoor spaces toward the external environment. Finally, a statistical comparison in terms of probability density distributions revealed that the dynamic thermal behaviour of the three different green layerings in both seasons was remarkably similar, proving the ability of vegetated roofs to maintain limited temperature variation in the whole year, thus containing heat losses in winter and overheating in summer.

Nomenclature

ETR	external temperature ratio
f	relative frequency
f_d	probability density distribution
m	number of classes
n	number of observation
STR	surface temperature reduction
T	temperature [°C]