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Assessment of thermal sensation in complex urban micro environments, utilizing meteorological measurements from sensors mounted on a cargo bicycle

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The human thermal comfort in an urban area is directly affected by the meteorological parameters, such as air temperature, relative humidity, solar radiation and wind speed, which are modified by the micro-environments established within the urban structure, taking extreme values in specific cases. The assessment of human thermal comfort in complex urban environments with high attendance, such as university campuses, where outdoor activities are imposed daily, is a challenge for research focusing on adaptation and mitigation of thermal stress.

The objective of this study is to examine the biometeorological conditions in public open areas, such as the University campuses in Athens, Greece (AUC) and Kent, UK (KUC), so that to interpret the human thermal perception in micro environments of high attendance with different climate characteristics.

The experimental measurements of air temperature, relative, humidity, wind speed, globe temperature and solar global radiation were conducted every 5s on July 6, 2015 (KUC) and July 13, 2015 (AUC), using the appropriate sensors mounted on a cargo bicycle at 1.5m height. The routes carried out at noon lasted approximately one hour, in order to quantify the maximum thermal burden. To this purpose, the human thermal index Physiologically Equivalent Temperature (PET) was estimated by the application of RayMan model.

The findings revealed significant differentiations in human thermal burden between the two examined University campuses based mainly on their specific climatic characteristics, which however are modified further by the built environment, trees and green cover, by means of sky view factor and shade effects, having direct impact on mean radiant temperature which is a main driver of heat stress configuration.