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Assessment of human thermal bioclimatic conditions in complex micro environments within the Athens University Campus, Greece

Iliana D. Polychroni and Panagiotis T. Nastos

Laboratory of Climatology and Atmospheric Environment, Faculty of Geology and Geoenviroment, National and Kapodistrian University of Athens, University Campus, GR 15784 Athens, Greece (nastos@geol.uoa.gr)

The objective of this research is to assess and analyze the bioclimatic conditions in human thermal bioclimatic conditions in the Athens University Campus (AUC) using urban micro models such as RayMan and SkyHelios. The quantification of human thermal sensation in such a place was considered of great significance due to the great gathering of student body and members of University. The quantification of the bioclimatic conditions was succeeded by the estimation of the Physiologically Equivalent Temperature (PET), which is a bio-climatological index based on the human energy balance. We made field measurements of air temperature, relative humidity, wind speed and total solar irradiance, for different sites of the examined micro urban environment, in order to calculate PET, during January-July 2013. Additionally, the calculations were done by different sky view factors, and compared to a reference site (Meteorological station of Laboratory of Climatology and Atmospheric Environment, University of Athens). The global radiation was transferred to the examined sites with the RayMan model, which considers the sky view factors for the adaptation of the radiation fluxes to simple and complex environments. Digital elevation models (DEM) along with datasets concerning urban obstacles (OBS), such as trees, and heights of buildings constructed a database, which was used in order to estimate the bioclimatic conditions in urban micro scale.

The findings revealed significant differences in PET quantification, even in very close sites, which differs in sky view factor and buildings' orientation and height. Besides, this study highlights the beneficial impact of trees and green cover in a complex environment, indicating that planting of trees among other actions could be the solution of mitigating strong/extreme heat stress, improving the quality of living in cities.