EMS Annual Meeting Abstracts
Vol. 16, EMS2019-420, 2019

Evaluation of human thermal sensation in a green-urban area of Athens, Greece. Modeling against mobile measurements.

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Global warming, by means of heat waves, is expected to affect the human activities in the densely populated areas. This is the case of Athens mega city, the capital of Greece, which faces the most pronounced urbanization impact related to urban morbidity and mortality, mostly during heat waves events. Thus, adaptation and mitigation measures should be scheduled towards the resilience of the Athenians. It is well known that green spaces within urban built environments could be beneficial for human thermal comfort at the micro-scale, especially during summer period at moderate climates, by effectively reducing heat stress.
The objective of this study is to evaluate the human thermal sensation in a green-urban area of Athens during a summer day by using a 3D microscale climate model and utilizing mobile meteorological measurements. In order to assess the biometeorological conditions over the study area, the ENVI-met (V3.1) model was applied, which is a three-dimensional, prognostic, microscale model for the calculation of meteorological conditions and distribution of air pollutants. The experimental micro-measurements of air temperature, humidity, wind speed, globe temperature and global solar radiation were conducted in two routes on July 12, 2017, from 15:00 to 17:00 and from 21:00 to 23:00 Athens local time (UTC+3:00). The meteorological parameters were recorded every 5s, using the appropriate sensors mounted on a cargo bicycle at 1.5m height. Furthermore, these densely carried out bicycle measurements were used to validate the high spatiotemporal simulations of thermal comfort (72h starting at 06:00 on July 11, 2017), derived by the model ENVI-met. Regarding the human thermal sensation, the human thermal index Physiologically Equivalent Temperature (PET) was estimated with respect to both model's simulations and experimental micro-measurements. The spatial distributions of the thermal index regarding the two bicycle routes for the study green-urban area were illustrated using ArcGIS 10.2.
The in situ measurements along with the model's output results reveal the thermal comfort regime of the selected area and the ability of the model to evaluate the micrometeorological conditions, under different mitigation scenarios. In this point, we could mention the limitations of the validation procedure, due to different spatial resolution of experimental measurements against gridded simulations by the model.