

AUTHORS REPLY

Manuscript Title: Development of an operational modeling system for urban heat islands: an application to Athens, Greece (doi: 10.5194/nhessd-1-4963-2013).

Referee: Dieter Scherer

GENERAL REPLY

The authors would like to thank Dr. Dieter Scherer for commenting on the manuscript, allowing us to improve its scientific and presentation value.

Following, we provide a point-by-point response to the submitted comments.

RESPONSES TO REFEREE'S COMMENTS

- 1. Referee:** Best (2005), also cited in this manuscript, has already discussed the question of “Representing urban areas within operational numerical weather prediction models”. The authors are asked to check again the correctness of their statement that “... modeling of the UHI has yet to be realized in the operational context...” (p4966, 117-18), e.g. by checking all references to that paper. In addition, the study presented here seems to be in a pre-operational status. Otherwise, the operational use should be mentioned. This would also offer the possibility to extend the study by using a longer time period.

Response to the referee: We agree with the referee that our statement considering the operational modeling of heat islands could be thought to be rather unfair for similar previous studies. Therefore, we have removed the corresponding sentence from the manuscript.

Indeed, the presented study could be considered to be in a pre-operational status. As highlighted in the Acknowledgements, the modeling system was developed in the context of an ESA-funded project, focusing on heat islands. Within this context, it has been implemented operationally, on a daily basis, in the summer of 2010 (as reported in the manuscript). We believe that this supports the term “operational”. Although it has not been implemented for a longer time period, it is a modeling system that could be utilized in the context of operational weather forecasting activities. Actually, this is the key purpose of the paper as already highlighted in the manuscript’s Introduction.

- 2. Referee:** The authors write “... there appear to be no significant differences in the modeling system’s performance...” (p4974, 18-9). Has the significance been checked by statistical analysis? If not then the term “significant” should be removed since this is a subjective assessment. Please check the entire manuscript for this kind of error.

Response to the referee: We agree with the referee that the use of term “significant” could be considered to be subjective. Therefore, we have replaced this term with the term “great”, which reflects better the actual meaning of our statement. Further, we have gone through the entire manuscript and revised accordingly similar statements, where appropriate. These revisions will be available in the final version of the manuscript.

3. **Referee:** The authors use two biometeorological indices (DI and AWBGT) in their study. Why had they chosen these particular indices? There are newer (and probably better) ones like the UTCI. The authors mention that heat stress conditions also depend on wind speed, but none of the chosen indices do consider wind speed. They do not mention one of the most important variables, i.e. the mean radiant temperature, at all. I would recommend to discuss this part more detailedly, also because NHSS is a journal dedicated to natural hazards.

Response to the referee: We agree with the referee that the chosen biometeorological indices are simple, not reflecting the state-of-the-art in the assessment of thermal comfort and stress. However, they have been selected as they could be easily validated, given the available observational data. Thermo-physiologically significant indices, such as UTCI or PET, could have been computed but they could not have been verified due to unavailability of the necessary observational data. For instance, both UTCI and PET require as input parameters wind speed and solar radiation, which were not available in the employed observational dataset.

Considering the above information, we have revised the respective part of the manuscript to provide a more sound discussion on thermal comfort and stress, justifying the selection of two simple indices instead of more complex ones. This revision will be available in the final version of the manuscript.

4. **Referee:** The authors conclude that "...The two thermal comfort indices are simulated adequately well...". What does adequate mean in this context? How is it determined?

5.

Response to the referee: The adverb "adequately" has been used to characterize the overall performance of the modeling system in terms of simulating the two biometeorological indices. We believe that its use has been already justified in the relevant discussion included in the manuscript.

6. **Referee:** Please use K instead of °C for temperature differences (e.g. biases).

Response to the referee: We agree with the referee that K could be used instead of °C for reporting temperature differences. However, we believe that this makes no real difference in the reporting of results.

7. **Referee:** Equations (4) and (5) are not correct. All expressions need to have proper physical units. For instance, the term $(T_a - 14.5)$ is wrong since T_a is given in °C and 14.5 is dimensionless.

Response to the referee: We do not believe that Eqs. (3) and (4), for DI and AWBGT respectively, need to be revised. Both equations are widely referenced in the literature and should be, thus, considered to be correct.

Eq. (3), for DI, is the one proposed by Giles et al. (1990) and used, for instance, in the studies of Paliatsos and Nastos (1999), Giannaros and Melas (2012) and Matzarakis and Mayer (1991), to mention a few. However, we believe that this should have been clarified in the manuscript. Therefore, we have added the reference to the paper of Giles et al. (1990) to justify the use of Eq. (3).

Eq. (4), for AWBGT, is the one, as already referenced in the manuscript, recently proposed by Steeneveld et al. (2011).

References

Giannaros TM, Melas D (2012) Study of the urban heat island in a coastal Mediterranean city: The case study of Thessaloniki, Greece. *Atmos Res* 118: 103-120.

Matzarakis A, Mayer H (1991) The extreme heat wave in Athens in July 1987 from the point of view of human biometeorology. *Atmos Environ* 25B: 203-211.

Paliatsos AG, Nastos P (1999) Relation between air pollution episodes and discomfort index in the greater Athens area. *Global Nest: The Int J* 1: 91-97.