Comparisons of original and improved physiologically equivalent temperatures based on a thermal perception dataset in hot and humid region

Yung-Chang Chen (1), Tzu-Ping Lin (2), Shing-Ru Yang (2), Charles C.-K. Chou (1), Andreas Matzarakis (3,4)

(1) Academia SINICA, Research Center for Environmental Changes, Taipei, Taiwan, Province Of China (ycchen0422@gate.sinica.edu.tw), (2) Department of Architecture, National Cheng Kung University, Tainan, Taiwan, (3) Research Centre Human Biometeorology, Deutscher Wetterdienst, Freiburg, Germany, (4) Chair of Environmental Meteorology, Albert-Ludwigs-University Freiburg, Freiburg, Germany

Physiologically equivalent temperature (PET) has been applied to different researched fields associated with the human biometeorology in several decades. A modified version of the PET (mPET_V1) has been proved by sensitivity tests of the human biometeorological variables to be able to contribute more sensitive feedback on humid in hot conditions and clothing terms. Another further modified version of the PET (mPET_v2) can further realize the estimations of the thermal sensation in humid-cold conditions according to sensitivity tests of the human biometeorological variables. The effectiveness of the modifications for PET should be further investigated with a real dataset of the thermally environmental variables and thermal sensation.

Therefore, this study aims to compare the three different kinds of PET based on a thermal perception dataset which has investigated totally 2071 questionnaires of the thermal sensations, actual micro thermally environmental variables, and clothing behaviors in Taiwan during 2011 to 2014.

The preliminary results show that the r-square (r^2) of the linear regression between mPET_v2 and mean thermal sensation vote (MTSV) is 0.941slightly better than respectively the r^2 equal to 0.939 of the mPET_v1 and MTSV and the r^2 equal to 0.894 of the PET and MTSV. The correlation coefficient of the mPET_v2 and observation clothing insulation (Icl_ob) is slightly less than the mPET_v1 and Icl_ob, but still greater than the PET and Icl_ob. Related to mean humid sensation vote, mPET_v2 has similar performance comparing to mPET_v1. Overall, mPET_v2 is proved by the thermal perception dataset from Taiwan as a comprehensive thermal indicator.

Keywords: physiologically equivalent temperature, thermal index, thermal conditions, humid-hot regions