Maximum potential of green infrastructure to reduce human heat stress on urban conversion areas

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Abstract
Based on the validated version 4.0 BETA of the ENVI-met model, numerical simulations were carried out for five different sized conversion areas in the city of Stuttgart (Southwest Germany) on the heat wave day 4 August 2003. Human heat stress is primarily quantified by the physiologically equivalent temperature (PET). Additional background information is provided by both near-surface air temperature (Ta) and mean radiant temperature (Tmrt). The simulations concern five urban land use scenarios. Related to differences of simulation results between a scenario that only consists of asphalt surfaces and a green infrastructure scenario only showing grasslands and trees, the resulting ΔTa, ΔTmrt and ΔPET values are interpreted as maximum potential of green infrastructure to reduce human heat stress on the conversion areas. To achieve a higher reliability for urban planning, the results are averaged over the period 10-16 CET. Besides mean absolute values for each conversion area whose magnitudes depend on the meteorological conditions on the simulation day, the results include mean relative ΔTa, ΔTmrt and ΔPET values. As verified by additional simulations for a current typical summer day, they can be regarded as representative for summer in Central Europe. Averaged over the five building areas mean ΔTa amounts to 1.1 °C (4 %), mean ΔTmrt to 17.6 °C (26 %) and mean ΔPET to 7.5 °C (16%).

Keywords: *ENVI-met, maximum potential of green infrastructure, human thermal comfort, PET (physiologically equivalent temperature)*

Biography
Prof. Mayer is currently a retired professor at the Chair of Environmental Meteorology, Albert-Ludwigs-University of Freiburg (Germany), which emerged from the Meteorological Institute at this University in 2015. His major research interests are in the fields of environmental meteorology, especially urban climatology, urban meteorology, urban air pollution and urban human-biometeorology, as well as in forest meteorology.