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# Daily simulations of urban heat load in Vienna for 2011

Brigitta Hollosi, Maja Zuvela-Aloise, and Roland Koch
Zentralanstalt für Meteorologie und Geodynamik, Wien, Austria (brigitta.hollosi@zamg.ac.at)

In this study, the dynamical urban climate model MUKLIMO_3 (horizontal resolution of 100 m) is uni-directionally coupled with the operational weather forecast model ALARO-ALADIN of the ZAMG (horizontal resolution of 4.8 km) to simulate the development of the urban heat island in Vienna on a daily basis. The aim is to evaluate the performance of the urban climate model applied for climatological studies in a weather prediction mode. The focus of the investigation is on assessment of the urban heat load during day-time.
We used the archived daily forecast data for the summer period in 2011 (April – October) as input data for the urban climate model. The high resolution simulations were initialized with vertical profiles of temperature and relative humidity and prevailing wind speed and direction in the rural area near the city in the early morning hours. The model output for hourly temperature and relative humidity has been evaluated against the monitoring data at 9 weather stations in the area of the city. Additionally, spatial gradients in temperature were evaluated by comparing the grid point values with the data collected during a mobile measuring campaign taken on a multi-vehicle bicycle tour on the 7th of July, 2011. The results show a good agreement with observations on a district scale. Particular challenge in the modeling approach is achieving robust and numerically stable model solutions for different weather situation. Therefore, we analyzed modeled wind patterns for different atmospheric conditions in the summer period. We found that during the calm hot days, due to the inhomogeneous surface and complex terrain, the local-scale temperature gradients can induce strong anomalies, which in turn could affect the circulation on a larger scale. However, these results could not be validated due to the lack of observations.
In the following years extreme hot conditions are very likely to occur more frequently and with higher intensity. Combining urban climate simulations with the operational meso-scale forecasting model may identify hot spots in urban areas and bring added value in excessive heat warning systems in the future.