Urban climate model MUKLIMO_3 in prediction mode – evaluation of model performance based on the case study of Vienna

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To reduce negative health impacts of extreme heat load in urban areas is the application of early warning systems that use weather forecast models to predict forthcoming heat events of utmost importance. In the state-of-the-art operational heat warning systems the meteorological information relies on the weather forecast from the regional numerical models and monitoring stations that do not include details of urban structure. In this study, the dynamical urban climate model MUKLIMO_3 (horizontal resolution of 100 – 200 m) is initialized with the vertical profiles from the archived daily forecast data of the ZAMG from the hydrostatic ALARO numerical weather prediction model run at 0600 UTC 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, so far applied only for climatological studies, in a weather prediction mode using the summer period 2011-2015 as a test period. The focus of the investigation is on assessment of the urban heat load during the day-time. The model output has been evaluated against the monitoring data at the weather stations in the area of the city. The model results for daily maximum temperature show good agreement with the observations, especially at the urban and suburban stations where the mean bias is low. The results are highly dependent on the input data from the meso-scale model that leads to larger deviation from observations if the prediction is not representative for the given day. This study can be used to support urban planning strategies and to improve existing practices to alert decision-makers and the public to impending dangers of excessive heat.