



Representation of urban effects in a high resolution GEM model simulation for Krakow agglomeration

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The aim of the study is to reproduce features of an Urban Heat Island (UHI) over Krakow agglomeration with the GEM model run at 1km horizontal resolution. Urban processes in the GEM model are represented with the use of the TEB (Town Energy Balance) parameterization (Masson, 2000, Lemonsu et al., 2009). Preliminary modelling results for Central Europe at 5km horizontal resolution showed positive temperature anomaly over larger cities and a decrease of mean wind speed as compared to a reference scenario without the urban scheme (Struzewska and Kaminski, 2012).

The GEM model was run on a global variable resolution grid with a uniform grid (~15km) over Europe to provided boundary conditions for a regional run at 5 km resolution. Results from the regional simulation were used to drive a 1 km resolution simulation on a target grid centered over Krakow and extending ~60 km from the city. Land cover data for Karkow agglomeration was prepared based on available GIS information. Separate vector layers were prepared for the agglomeration and surrounding areas.

Two types of model scenarios will be presented; a reference run - without urban effects and several 2-day simulations with the TEB parameterization. In the TEB parameterization values of anthropogenic heat fluxes are predefined for each urban landuse category, separately for traffic and industrial sources. A sensitivity study will be undertaken to analyze changes of the surface temperature due to anthropogenic heat flux variations. Also, vertical structure of urban boundary layer produced by the model will be shown. Model results will be evaluated against meteorological observations from Balice synoptic station and two urban stations from a monitoring network of the Mazovia Voivodship Inspectorate for Environmental Protection. The possible impact of Krakow agglomeration on meteorological parameters will be presented in terms of the differences between reference and "urban scenario" simulations.