Geophysical Research Abstracts
Vol. 17, EGU2015-6101, 2015
EGU General Assembly 2015

Sensitivity study of the UHI in the city of Szeged (Hungary) to different offline simulation set-ups using SURFEX/TEB

Gabriella Zsebeházi (1), Rafiq Hamdi (2), and Gabriella Szépszó (1)

(1) Hungarian Meteorological Service, Budapest, Hungary (zsebehazi.g@met.hu), (2) Royal Meteorological Institute, Brussels, Belgium

Urbanised areas modify the local climate due to the physical properties of surface subjects and their morphology. The urban effect on local climate and regional climate change interact, resulting in more serious climate change impacts (e.g., more heatwave events) over cities. Majority of people are now living in cities and thus, affected by these enhanced changes. Therefore, targeted adaptation and mitigation strategies in cities are of high importance.

Regional climate models (RCMs) are sufficient tools for estimating future climate change of an area in detail, although most of them cannot represent the urban climate characteristics, because their spatial resolution is too coarse (in general 10-50 km) and they do not use a specific urban parametrization over urbanized areas. To describe the interactions between the urban surface and atmosphere on few km spatial scale, we use the externalised SURFEX land surface scheme including the TEB urban canopy model in offline mode (i.e. the interaction is only one-way). The driving atmospheric conditions highly influence the impact results, thus the good quality of these data is particularly essential. The overall aim of our research is to understand the behaviour of the impact model and its interaction with the forcing coming from the atmospheric model in order to reduce the biases, which can lead to qualified impact studies of climate change over urban areas.

As a preliminary test, several short (few-day) 1 km resolution simulations are carried out over a domain covering a Hungarian town, Szeged, which is located at the flat southern part of Hungary. The atmospheric forcing is provided by ALARO (a new version of the limited-area model of the ARPEGE-IFS system running at the Royal Meteorological Institute of Belgium) applied over Hungary. The focal point of our investigations is the ability of SURFEX to simulate the diurnal evolution and spatial pattern of urban heat island (UHI). Different offline simulation set-ups have been tested:

1. Atmospheric forcing at 4km and 10km resolutions;
2. Atmospheric forcing prepared with and without TEB;
3. Coupling of forcings on 3h and 1h temporal frequencies;
4. Different forcing levels on 50m, 40m, 30m, 20m, 10m;
5. Different computation method of 2m temperature using CANOPY, Paulson, and Geleyn schemes.

Finally, some outcomes are also compared to the results obtained using ALADIN-Climate RCM (adapted and used at the Hungarian Meteorological Service on 10 km resolution) as driving atmospheric model. The presentation is dedicated to show the results and main conclusions of our studies.