Geophysical Research Abstracts
Vol. 14, EGU2012-12880, 2012
EGU General Assembly 2012

Application of an urban climate model to several Austrian cities located in complex topography

J. Nemec (1), M. Zuvela-Aloise (1), and M. Kossmann (2)

(1) Zentralanstalt für Meteorologie und Geodynamik (ZAMG), Vienna, Austria (Johanna.Nemec@zamg.ac.at), (2) Deutscher Wetterdienst (DWD), Offenbach, Germany

Beside urban morphology, the topography surrounding a city plays a major role in the distribution and intensity of urban heat stress. We applied the dynamical urban climate model MUKLIMO_3 to investigate the spatial distribution of heat stress in different Austrian cities, namely Graz, Linz, Salzburg and Klagenfurt. The model simulates the atmospheric circulation based on high resolution topography and land use data for potential weather situations with extreme thermal conditions. The "cuboid method" is used to perform climatological analysis based on observational time series in order to derive climate change indices over longer time periods.
The four selected cities differ in population (90 – 260.000 inhabitants), geographic location (north, south and east of the Alps), urban structure and surrounding topography as well as water bodies. Graz is located at the eastern boundaries of the Alps and is surrounded by mountainous topography to the north and west, while Klagenfurt is located at the eastern lakeside of Wörthersee. Large industrial areas can be found in Linz, while Salzburg is characterized by centrally located green areas. However, land use patterns are to be taken with caution since they very much rely on the quality of provided data sets.
In general, the simulated number of summer days with MUKLIMO_3 agrees well with those derived from long term climate observations at the airport stations, which are located outside the city centres. At the stations in the city center, the model results mostly overestimate the number of summer days indicating a possible systematic failure. Unfortunately, there are very few high quality climate observations over long periods from the densely build city centres, which constrict the model validation. Further, we find strong temperature gradients between the urban areas and the surrounding mountains provoking the build-up of valley circulations particularly during night time. The urban climate simulations bring significant improvement in describing the thermal structure of the city area when compared to the existing high-resolution climate model simulations. However, the small scale structure of the urban heat distribution strongly depend on the resolution of the land use data. Results for the city of Linz, which is small in size, show a very compact and strong heat island which is probably a consequence of the coarse resolution land use data. In Graz we find a more diverse temperature distribution resulting from the precise information about the urban structure. Therefore we stress the importance of the appropriate quality of the land use data for the realistic model application.