



Urban heat island phenomenon and related meteorological effects over central Europe: a multi-model assesment

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With higher resolution, more details of land-surface are resolved. This is especially true for the urban areas, which in high resolution can occupy significant part of a single gridbox, if not being even bigger in case of large cities or megacities. Moreover, the role of cities will increase in future, as the population within the urban areas is growing faster, with the estimate for Europe of about 84% living in urban areas.

For the purpose of qualifying and quantifying the impact of cities and, in general, urban surfaces on climate, we extended the surface parameterization in regional climate model RegCM4 with the Single Layer Urban Canopy Model (SLUCM) used under the BATS surface scheme including the SUBBATS subgrid treatment. Additionally, RegCM4 comes with the CLM4.5 surface model including the CLM-urban submodel, which we also use in this study.

We examine the urban land-surface effects, mainly the urban heat island (UHI) for the area of central Europe for the period of 2001-2010 using the above mentioned model configurations: RegCM4/BATS/SLUCM and RegCM4/CLM4.5/CLMU. Moreover, the results will be compared to a more sophisticated multi-layer urban canopy treatment in WRF model, which we run for selected periods within the decade.

In general, the two approaches with RegCM provide very similar results, with the CLMU producing more intense UHI (up to 3 K). Results further show a statistically impact on boundary layer height (ZPBL, increase), precipitation (decrease), humidity (decrease) etc. All model setup-ups are compared and validated using EOBS data.