



On the urban land-surface impact on climate in higher resolution over Central Europe

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When aiming higher resolution in dynamical downscaling the effects of land use and land use changes are playing increasing role. For the purpose of qualifying and quantifying the impact of cities and in general the urban surfaces on climate, the surface parameterization in regional climate model RegCM4 has been extended with the Single Layer Urban Canopy Model (SLUCM), which can be used both in dynamic scale within BATS scheme and in a more detailed SUBBATS scale to treat the surface on a higher resolution subgrid. A set of experiments was performed over the period of 2005-2009 over central Europe, either without considering urban surfaces and with the SLUCM treatment.

Results show a statistically significant impact of urbanized surfaces on temperature (up to 1.5 K increase in summer), on the boundary layer height (ZPBL, increases up to 50 m).

The comparison with observational data showed significant improvement in modeling the monthly surface temperatures in summer and the models better describe the diurnal temperature variation reducing the afternoon and evening bias due to the UHI development, which was not captured by the model if the urban parameterization not used.

A further important conclusion is that statistically significant impacts are modeled not only over large urbanized areas (cities), but the influence of cities is evident over rural areas as well with rather minor but more frequent urban surfaces. We show that this is the result of the combined effect of the distant influence of surrounding cities and the influence of the minor local urban surface coverage.

Future simulations with changes of land use are performed as well.