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Interactive Comment

Interactive comment on "Regional climate model assessment of the urban land-surface forcing over central Europe" *by* P. Huszar et al.

Anonymous Referee #1

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A regional climate model (RegCM4.2) is used to analyse the influence of urban areas on the regional climate. An increase of temperature and a decrease of precipitation are found. A simple urban canopy model (SLUCM) was used to represent the urban surface in the model. The results show wide-spread temperature increase over Europe due to cities but localized decrease in precipitation due to reduced atmospheric humidity which in turn is due to reduced evaporation over cities.

This is an interesting study which presents results on a European scale and not just for one city. In this it deserves publication.

My major concern with this study is the physical explanation of the results. I do not understand why the results relating to temperature and turbulence (temperature and

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mixing-layer height) show a wide-spread increase all over Europe while the results related to the water budget (evaporation, absolute humidity and precipitation) only show a localized decrease over the cities. This needs a proper explanation in the manuscript.

A related point is the urban cool island which is mentioned in the introduction (18543, 18). It would have been interesting to see whether the model is able to reproduce this feature or if this is lost in the overall warming produced by the model. The only hint is given in Fig. 12 which shows this effect in the measured data but it is not reproduced in the model. Fig. 12 has to be discussed in this respect.

The results for wind are mainly inconclusive. Most parts of the results did not pass the statistical significance test. What remains is an increase in summer nights and a decrease in winter nights over the cities. Once again, no convincing physical explanation is given. Local secondary flow circulations driven by urban heat islands (this is what the authors assume that it could be the reason) are usually small-scale and are most likely not resolved on a 10 by 10 km grid. The winter-time nocturnal decrease is not interpreted at all. A possible explanation could be quite different and is once again related to the simulated temperature response. A night-time cooling in winter leads to a stronger thermal stability of the PBL and thus to reduced 10 m winds. Likewise a night-time warming in summer leads to a less stable PBL and thus to an increase of 10 m winds.

The only vertical profiles from the simulation are shown in Fig. 9. They show the destabilization of the atmosphere during day and night in summer. This should lead to more thermal convection and more convective precipitation. It would be interesting to learn whether there is a shift in the model from large-scale precipitation to more convective precipitation in summer. In this context the abilities and effectiveness of the convection parameterization in the RegCM4.2 model have to be discussed.

The given points above are just a few examples. There are more interesting features in the simulations which are not addressed. Without a thorough discussion of the possible

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physical explanation of the modelled urban impact on all the presented variables, a publication of the study cannot be recommended.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 18541, 2014.

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