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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The 'urban meteorology island': a multi-model ensemble analysis" *by* Jan Karlický et al.

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We would like to thank to Anonymous Referee 3 for all comments, suggestions and corrections in his review of our manuscript. We addressed all and below our point-by-point responses follow:

Referee's Comment #1: The fact that the results are achieved using a horizontal resolution of 9 km within the models needs to be mentioned more clearly in the abstract and conclusions.

Author's response: We agree with the reviewer, information about the horizontal resolution will be added to the abstract and conclusion. This is although a relatively coarse resolution, but the cities examined cover usually one or more model grid-boxes com-

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pletely, moreover in the RegCM model, fractional urban land-use is considered which enables to include the effect of even minor urban areas.

Referee's Comment #2: The authors should also motivate why they have chosen the various combinations of physical schemes and possibly list some of the main physical characteristics of the respective schemes to improve readability.

Author's response: In general, the choosing of two models and various combinations of physical schemes is motivated by providing a very robust estimation of investigated changes. Considering the fact that we are interested mainly in local urban induced changes, we tested nearly all available schemes of urban canopies, boundary layer (connected with schemes of surface layer) and convection (for WRF model), and schemes of boundary layer, convection and microphysics (for RegCM). Convection parameterization can have potential effects on vertical transport of heat and moisture from the urban boundary layer while the model treatment of microphysics marks the hydrological budget over cities that influences the precipitation, latent heat release etc. The selection of different combination of model schemes is further based on their availability and restrictions in their different combinations.

Referee's Comment #3: Regarding the presentation of the urban results in section 3.2, a selection of those models who performed best in the overall evaluation would make much more sense.

Author's response: The general evaluation of model results in section 3.1 describes overall biases of temperature and precipitation, extended by comparison with station data for other variables. However, it does not serve as a validation of any urban-induced change, thus it does not tell us much about the accuracy of such changes. Moreover, it is not easy to say, which model is the best, from an overall view. E.g. simulations with the BEP+BEM urban model make higher biases in winter max/min temperature, but on the other hand, the wind speed is closer to reality (Fig. 4 and 5). Our study intends to provide a physical ensemble of the different components of UMI therefore, we present

urban-induced changes of all simulations and/or averaged ones.

Referee's Comment #4: What aspects of the study have been surprising for the authors?

Author's response: Over the fact that the horizontal resolution is still relatively coarse (9 km), urban-induced changes (not only UHI) are clearly visible and mostly statistically significant. Especially the urban alteration of cloud cover and sub-grid scale precipitation in summer (Fig. 11 and 12), which are also described in observation-based studies. Further, the great influence of microphysics scheme (namely Nogherotto scheme in RegCM) on overall temperature and precipitation.

Referee's Comment #5: Can the authors also give a recommendation for the combination of physical packages using either WRF or RegCM?

Author's response: For our experiments with WRF that follow this study, we used the WU1L82C5 combination, e.i. SLUCM urban model, BouLac PBL and Eta SFC scheme, together with Grell-3D convection, as a less computational demanding compromise to BEP+BEM urban model, which needs more model levels. In terms of the RegCM model, probably the RUS simulation (UW PBL scheme, Tiedtke convection and SUBBEX microphysics scheme) makes the lowest biases in our domain.

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