Atmos. Chem. Phys. Discuss., 14, C6359–C6362, 2014
www.atmos-chem-phys-discuss.net/14/C6359/2014/

Atmospheric Chemistry and Physics Discussions

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

P. Huszar et al.

huszarpet@gmail.com

Received and published: 1 September 2014

Response to Special Comment of K. Trusilova

Review: *Huszar et al., Regional climate model assessment of the urban land-surface forcing over central Europe*

Dear Kristina Trusilova,

thank you for your valuable comments which improve several aspects of the paper. Below, our point-by-point response follows.

- *Comment: for the analysis of the statistical significance of the effects from the urban parameterization to the temperature, precipitation and wind you use the significance test T-test. However, the applicability of this test poses one very important criterium to the analysed data: the data MUST BE NORMALLY distributed. For the temperature data this might be fulfilled in some cases, but not for the precipitation and not for the wind. The distribution of precipitation usually has a shape of a Gamma-distribution and the distribution of the wind has the shape of a Weibull-distribution. This means the t-test IS NOT APPLICABLE to the data. That is why, for example, we see such little signal of the precipitation changes in the Figure 8.*

  Authors' response:

  It is true that the assumptions of the t-test, in their strictest form, do require normality (or, more accurately, normality of sample means), and the statistical distributions of the variables investigated are not precisely Gaussian, certainly not for precipitation or wind speed. In our test setup, however, we did not work with these variables directly, but rather applied a paired setup, thus analyzing the differences of matching values in the signals compared. As a result, the signal subjected to the significance testing was substantially closer to being Gaussian than the original series themselves, even for a variable as asymmetrical in its distribution as precipitation. Admittedly, there were still assumption violations even in the paired test setup (especially in case of precipitation, mainly due to high number of zero-zero pairs), and significance tests for precipitation and wind speed were therefore also carried out using a sign test, the results of which are now used in the manuscript. Nevertheless, it can be mentioned that differences between the spatial patterns of statistical significance obtained by t-test and by sign test were generally quite small (likely due to asymptotic behavior of the t-test for large samples, such as ours). In the revised manuscript, the use of paired t-test setup is now explicitly mentioned in the methods description; sign test is now used for

assessment of statistical significance in case of precipitation and wind speed.

- *Comment: please discuss how your findings differ to those of Trusilova et al (2008).*

  Authors' response:

  Thank You for pointing our attention to this study, which we missed during the revision of past studies dealing with the topic. This is a very relevant paper similar to ours, which is now cited in the revised manuscript. Furthermore, we compared our results for temperature and precipitation to their results. It is found that our model reduces the diurnal temperature range due to urban coverage less than in Trusilova et al. (2008) but the summer precipitation reduction is bit higher (20–30%) than their results suggest.

- *Question: how many wall/roof/road layers were used for the simulations? how thick were these layers? How the inner building temperature is treated in the simulations? This infomation may be useful for explaining the daytime urban cooling if, for example, the building walls are set too thik and the model does not "warm" it enough quickly during the day producing the phase-offset in the diurnal temperature curve.*

  Authors' response:

  In the revised manuscript, we included the number of roof/wall/road levels and their thickness: roof – each 5 cm thick, wall –each 5 cm thick, road – 5 cm, 25 cm, 50 cm and 75 cm thick. The inner building temperature was set to a constant value of 298 K. We think, that the modelled phase-offset of the diurnal temperature curve is caused by the reduced heating within urban canyons due to enhanced shadowing during morning hours, however when the sun is high enough (i.e. the solar angle is small) this shadowing becomes also small, the intensive warming of urban surfaces (road and wall) starts and the UHI begins to develop.

References

TRUSILOVA, K., JUNG, M., CHURKINA, G., KARSTENS, U., HEIMANN, M., and CLAUSSEN, M. (2008) Urbanization Impacts on the Climate in Europe: Numerical Experiments by the PSU–NCAR Mesoscale Model (MM5) - Journal of Applied Meteorology and Climatology, 47, 1442-1455.

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