

Interactive comment on “Impact of urban canopy meteorological forcing on aerosol concentrations” by Peter Huszar et al.

Peter Huszar et al.

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Author response to the Referee #2's comments on manuscript “Impact of urban canopy meteorological forcing on aerosol concentrations” - acp-2018-415 by Peter Huszar et al.

We would like to thank to Referee #2 for the reviewing our manuscript and for all the comments, corrections and suggestions. We will consider all of them and our point-by-point responses follow.

Referee #2 comments:

Specific comment: The CLM4.5 surface model included in the calculations is based on "the canyon representation of urban areas, described by building height and street

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width". These are quite detailed input data and also their impact is important in the lower scale than 10 km x 10 km used in the model simulations, I suppose also that the availability of such data is rather limited. Please give the source of the data as well as discuss their representativeness in the 10 km resolution. The same questions (source of data, representativeness) arise from the way how "anthropogenic heat from air conditioning and heating" is calculated on-line in CLM4.5.

Authors response: As written in the manuscript, the urban morphology parameters are obtained from LandScan2004 global 2D data (Jackson et al., 2010) which defines 132 regional categories (the world is divided into 33 regions with similarities in urban characteristics and each category is subdivided into 4 subcategories representing different urban intensities - tall building district (TBD), high density (HD), medium density (MD), and low density (LD)). For each bottom category, average building heights (H), urban canyon height-to-width ratios (H:W), and fraction of pervious surface (e.g., vegetation), roof area, and impervious surfaces (e.g., roads and sidewalks) are defined, among other parameters. Jackson et al. provide all of the data sources from which these data were compiled. We checked the data for particular cities over the domain and they are within the range of the typical urban geometry represented by central European cities (see Huszar et al., 2014 for a few values representative for Prague, Czech Republic). Urban landunit within CLM4.5 is represented as fraction in percentages of three (of the four in Jackson et al.) urban intensity (HD, MD and LD). This gives a reasonable description of urban coverage even at 10 km resolution and even small cities well below 10 km in diameter are accounted for. Of course, within the model gridbox and within one urban intensity, urban parameters do not vary in space, however we consider this variation within the uncertainty range of other inputs like boundary conditions or physical parameterization etc. Regarding the anthropogenic heat release, it is calculated from the heat conduction equation with a interior boundary conditions represented by interior temperature of the building. To this anthropogenic heat flux, another heat flux is added that accounts for the waste heat from air heating/conditioning. It is parameterized directly from the amount of energy required to keep the internal

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building temperature between a prescribed maximum and minimum values, assuming 50% efficiency of the heating/cooling systems, see Oleson et al. (2008) for detailed description.

Changes in the manuscript: We included some more detailed description (in Section 2.1.1) of how the urban parameters are obtained for the region in focus including their representativeness using chosen resolution.

Technical comments: p. 2, l. 14: "regional" instead of "regionals" Authors's response: corrected.

p. 3, l. 16: "how" instead of "the how"; Authors's response: corrected.

p. 4, l. 27: should be (Dickinson et al., 1993); Authors's response: corrected.

p. 5, l. 32-33: please give the references in parentheses; Authors's response: corrected.

p. 6, l. 7: should be (CH₄); Authors's response: corrected.

p.7, l. 26: should be "Therefore". In this sentence please remove "respectively"; Authors's response: corrected.

p. 7, l. 29: should be "In Fig. 1"; Authors's response: corrected.

p. 7, l. 31: should be "for both cities"; Authors's response: corrected.

p. 8, l. 6: please use "7-8 pm" instead of "19-20 pm". Please correct throughout the MS; Authors's response: corrected.

p. 8, l. 26: should be "all aerosol types"; Authors's response: corrected.

p. 8, l. 27: please remove "as well"; Authors's response: corrected.

p. 8, l. 29: should be "for each component"; Authors's response: corrected.

p. 9, l. 5: should be "Po Valley in Northern Italy or in Southern Poland"; Authors's

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response: corrected.

p. 9, l. 7: should be "Northern Italy". Please correct throughout the MS; Authors's response: corrected.

p. 9, l. 10: "is increasing" instead of "increased"; Authors's response: corrected.

p. 9, l. 13: "of wide" instead of wide"; Authors's response: corrected to There is a domain-wide ...

p. 10, l. 17: please add "respectively" in the end of the sentence; Authors's response: corrected.

p. 10, l. 21: "Fig. 7"; Authors's response: corrected.

p. 10, l. 21-23: please clarify the sentence starting with "In the chosen..."; Authors's response: The sentence was corrected to be more clear.

p. 12, l. 34-35: should be "...has also this large positive maximum, reaching..."; Authors's response: corrected.

p. 14, l. 33: "In areas..." instead of "Areas...". Authors's response: corrected.

References: Oleson, K.W., Bonan, G.B., Feddesma, J., and Vertenstein, M. 2008. An urban parameterization for a global climate model. 2. Sensitivity to input parameters and the simulated urban heat island in offline simulations. *J. Appl. Meteor. Clim.* 47:1061- 1076.

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