

***Interactive comment on* “The urban canopy meteorological forcing and its impact on ozone and PM_{2.5}: role of the vertical turbulent transport” by Peter Huszar et al.**

Anonymous Referee #1

Received and published: 26 July 2019

COMMENTS TO THE EDITOR: The manuscript “The urban canopy meteorological forcing and its impact on ozone and PM_{2.5}: role of the vertical turbulent transport” has been reviewed in great detail. The reviewer recognizes the great work carried out by the authors and the potential of the manuscript. However, although the manuscript is well-structured it is not very well-written. Statements are often not link to each other and just reported as “dot sentences” but without dots. The terminology used by the authors, mainly when referring to wind engineering and urban physics aspects, is not adequate and also inexact. Moreover, grammar errors (e.g. singular/plural and/or verb tenses) have been found throughout the whole manuscript. Figures are clear and consistent to the body text but the font size of the labels is often too small and unreadable. From

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a scientific and methodological point of view, the manuscript has a great potential and the reviewer believes that it will be an important contribution for the whole scientific community, but the text should be largely improved, and the text made more fluent both for an expert and a non-expert audience. In conclusion, the reviewer's opinion about this manuscript is that it is not suitable to be published in the present form and an extensive work should be done to make the text understandable, unambiguous and scientifically robust for the audience.

COMMENTS TO THE AUTHORS: The manuscript "The urban canopy meteorological forcing and its impact on ozone and PM_{2.5}: role of the vertical turbulent transport" has been reviewed in great detail. The reviewer recognizes the great work carried out by the authors and the potential of the manuscript. However, although the manuscript is well-structured it is not very well-written. Statements are often not link to each other and just reported as "dot sentences" but without dots. The terminology used by the authors, mainly when referring to wind engineering and urban physics aspects, is not adequate and also inexact. Moreover, grammar errors (e.g. singular/plural and/or verb tenses) have been found throughout the whole manuscript. Figures are clear and consistent to the body text but the font size of the labels is often too small and unreadable. From a scientific and methodological point of view, the manuscript has a great potential and the reviewer believes that it will be an important contribution for the whole scientific community, but the text should be largely improved, and the text made much more fluent both for an expert (e.g. a reviewer) and a non-expert audience. In conclusion, the reviewer's opinion about this manuscript is that it is not suitable to be published in the present form and an extensive work should be done to make the text understandable, unambiguous and scientifically robust for the audience. In order to help the authors in improving the manuscript the reviewer provided them with some comments/suggestions related to the main sections. However, the reviewer suggests to the authors to write again the manuscript and take care to the aspects raised below.

Abstract: In general this section is very detailed but also too long to be an abstract.

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Furthermore, although the scope of the manuscript is well highlighted in the first lines, it is not mentioned at all what the knowledge gap in the literature is. Therefore, the reviewer suggests to the authors to add one line about the “knowledge gap” and try to take out from this section some less important details however already included in other sections. Another important comment related to this section and to the whole manuscript as well is about the use of the terminology that can be inappropriate and ambiguous for the wind engineering and urban physics community to which this document is also addressed. Definitions as for example “urban meteorological changes”, “model experiments”, “urban canopy meteorological forcing” are not commonly used. The reviewer’s suggestion is to revise the whole document carefully and check in the literature the terminology usually adopted by publications dealing with similar topics. At lines 3-5: The sentence “From an air quality ... an important role too” is inexact and unclear. The wind, from the analytical point of view, can be decomposed into the “mean” and the “fluctuating” components which is also the turbulent part. An increased turbulence belong to a decreased mean wind speed. Furthermore, the reviewer does not understand what the authors mean by “wind stilling”. Please rephrase and make the sentence clearer for a reader. At line 6: what do the authors mean with “urban surfaces”? Do you mean urban city/area/environment? If so, please rephrase here otherwise try to explain exactly what you mean. Apply this comment throughout the whole manuscript whenever needed. At line 11: please replace “the sensitivity to model grid resolution” with “the sensitivity of the numerical model to the grid resolution” At line 11: what do the authors mean with “model experiments are performed”? Experiments can be performed, experimental models can be used, but model experiments is no sense. It would be better to rephrase here to make the sentence unambiguous for a reader. At line 12: the definition “urban canopy meteorological forcing” is not wrong but probably may be defined better and in accordance with the literature. It is well-known that obstacles composing cities (as buildings, bridges, trees, etc.) largely affect the wind flow field inside the urban canopy layer (UCL) and many papers published in the last 30 years confirmed that the logarithmic profile (representative of neutral stability

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conditions) does not hold anymore in this layer. It means that the “local-scale forcing effects” on the wind flow inside this layer are mainly caused the “obstacles” than inflow conditions (the so-called “large-scale forcing effects”) imposed in the numerical model (for example by the nest of cascading models). Please refer to this comment also to modify the title, eventually. At line 17: “near the surface”, to which surface are the author referring to? Please be more specific. At line 20: the definition “urban meteorological changes” is not widely used in the wind engineering and urban physics field. The meteorological changes happening at the scale of cities and/or urban districts can be included, according to the size of cities and districts, into the “microscale” and/or “local scale”. Introduction At lines 4-5, p2: The sentence “Urbanization ... (Folberth et al., 2015)” is not clear, please rephrase and be more specific. The reference can help the reader in better understanding the meaning but the current manuscript (and all sentences) should stand alone. At lines 5-8, p2: the reviewer probably understood the intention of the authors and what they mean by this sentence but only after reading that few times. It would be better to rephrase here and make the sentence a bit more fluent. At line 9, p2: if the authors write “First of all” at line 5, the reader supposes that a second point follows soon and they would never expect an indentation when explaining the second aspect (“secondly”). Indentation here is not needed at all. From line 12 to line 20, p2: this piece of text is very confused for the reviewer and it would also be unclear for a reader. Sentences, are not well-written in English and not very well-linked one to each other. Please rephrase and give to the whole piece of text a logical meaning. At line 21, p2: the sentence “Meteorological conditions are, thus, strongly perturbed over urbanized areas” states a concept very well-known since decades and assessed by many publications published in literature. You should cite or at least refer to the most important publications dealing with “urban canopy and boundary layers wind flow modeling”. At line 22, p2: what do the authors mean with “urban induced modifications”? At line 25, p2: again, please correct the expression “urban meteorological forcing”. Moreover, what do the authors mean with “elements”? Please be specific and unambiguous. At line 29, p2: please replace “the main contributor” with

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“the main contribution is given by”.

Experimental setup: The reviewer does not understand why the authors have titled here “Experimental setup” but they actually described different numerical models adopted to simulate. If this section, as well the next one, refer to numerical simulations there is no sense to talk about “experimental setup”. Please remove also the subtitle “Models”.

RegCM4: At line 15, p5: please replace “Internation . . . ” with “International . . .”. At line 20, p5: what do the authors mean with “processes”? Please explain or be more specific and unambiguous. At line 20, p5: please as first time use the full name and the acronym in brackets “University of Washington (UW)”. At line 23, p5: if more than two please replace “between” with “among”. At line 29, p5: what do the authors mean with “landcover processes”? Please explain or be more specific and unambiguous. At lines 30-31, p5: what do the authors mean with “classical canyon representation of urban geometry”? At lines 3-4, p6: the sentence “Within the urban canyon, momentum fluxes are calculated using a roughness lengths and displacement height typical for the canyon environment” is grammatically wrong and scientifically inexact. How do you calculate the momentum fluxes using the roughness length and the displacement height? Moreover, both the roughness length and the displacement are characteristics of rough terrain or surfaces and not necessarily only of “canyons”. At lines 4-5, p6: it is important here to show some governing equations to make clear for a reader the numerical model used.

Experimental setup and data: The title is wrong since the authors in this section are talking about numerical simulations and not experimental tests. Therefore, it is wrong to use refer to an “experimental setup”. Moreover, to which “data” are the authors referring to? This is another error since they are not describing “results” or/and “databases” for example, for which commonly the word “data” are adopted. Similar errors have been repeated systematically throughout the whole section. Just some examples have been stressed by the reviewer below. The section should be probably re-written from scratch. At line 15, p7: Please change “model experiments” with “experiments”. More-

over, please add one extra space between “resolution” and “(size ...”. Moreover, if referring to computational grids, as it seems to be, please use a correct and proper terminology and replace “gridboxes” with “computational grids”. Please, apply this comment throughout the whole document whenever necessary. At line 16, p7: what do the authors mean with these numbers in brackets? This is not clear at all. Please add an extra space before each bracket. At line 16, p7: please rephrase the portion of the sentence “Each domain is centered over Prague”; make this concept clearer for a reader. At line 17, p7: what do the authors mean with “projection parameters”? At line 17, p7: the sentence “Accordingly, the three domain is denoted ...” is grammatically wrong. Please rephrase here. At line 18, p7: what do the authors mean with “The regional climate model simulations were performed over 23 vertical levels”? Please provide the reader with more details about the simulations performed to let him understand what you mean with “23 vertical levels”. At line 19, p7: the sentence “For the higher resolution ones” is wrong if the authors are referring to the grid having the “highest resolution”. Please rephrase here and make it clearer for a reader. Similar errors have been found also after line 19 but not reported extensively here.

Result: The main title and two sub-titles have been used here without any reason. Please use the title to provide the reader with a “general picture” of the corresponding section. In this specific case the subtitle “Model validation” is too vague. You need to say what really has been done in this section. Conversely, the second subtitle “Model Climate” is completely useless. Once again, the terminology is not correctly and properly used and it may cause a large number of misunderstandings. The reviewer does not understand why the authors switch continuously terminology to describe the same things. What do the authors mean with “observational data”? Do they mean “model climate” or what? And what do they mean with “simulated model results”? Another problem of this section concerns the “description” of results. The authors have provided the reader with a lot of observations without any reasonable explanation for these. The usage of an improper terminology makes this section unclear for a reader.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-486>, 2019.

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