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Geoscientific Model Development Discussions

Interactive comment on "Analysis of the impact of inhomogeneous emissions in a semi-parameterized street canyon model" *by* T.-B. Ottosen et al.

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The authors have presented an interesting manuscript in which they describe the impact of an inhomogeneous emission scheme for the widely used street canyon model OSPM. After a brief theoretical description of the OSPM model and the way the inhomogeneous emissions are implemented, the updated model is tested with field data for two Scandinavian cases. Validation statistics are convincing and show that the improved model is able to better describe pollution dispersion from asymmetric emission sources in a canyon.

I can recommend publication ones my comments below are properly addressed.

Stijn Janssen

Specific comments

- P4, line 5-9: It is unclear why CO is mentioned here. CO is not discussed at all further on in the text. So clarify or remove the paragraph at all.

- P4, line 30: a multiplication factor of 4.2 is mentioned. This seems to be a very big factor to correct for a bias. Or this is a mistake, of the sever underestimation should be discussed in more detail.

- P5, line 13: Would be interesting to mention here already the differences in emission for uphill/downhill driving to have an idea about the size of the effect.

- P6, line 16: the mean value of 2.27 seems to be higher than the values in Fig. 2. Please check or clarify.

- P8, line 22: the statement "... from inside the recirculation zone..." seems to be incorrect when the recirculation zone covers the whole canyon? Please clarify.

- P9, line 3: "h0, is the initial dispersion" seems to be a strange definition. It is at least a height. The height due to the initial dispersion?

- P9, line 27: it seems more logical to me to express the criteria "f_ext is greater than zero" as a function of "Theta_street". Is this possible?

- P10, Eq 2: u_b is not defined.

- P10, Eq 9: it is unclear how the remaining parameters in the equation are defined. I believe they are completely fixed by the street geometry and the wind vector. Please mention this for the sake of clarity.

- P10, end: after those two sections 3.1.1 and 3.1.2 it is still not fully clear from the equations why the leeward receptor in a canyon receives more than the windward site. A brief discussion summarizing the principle ideas of the OSPM formula would be very

instructive. Not all readers are familiar with the Berkowicz et al paper.

- P11, Eq 10 - 12: I'm confused here. The model user defines the W_i values based on street (lanes) geometry. But if the W_i bands do not match with the dynamic L_rec, x_esc,. . . values, the limits of the sum in Eq 10 - 12 are not determined by the dynamics of the canyon flow (e.g. e_esc, x_end). This seems to be a fundamental issue in the new scheme. Or I still don't fully understand the newly proposed scheme.

- P11, line 26: Why does the integration length approaches zero for parallel wind? Can you make this visual in a figure?

- P14, line 15-17: It seems to me a poor argument that the bad performance is due to a previous calibration. Is this something that can be solved for this study?

- P14, line 22: Nothing is mentioned about the mismatch at 100° and 250-360°. In general, this case Jagtvej is rather poorly discussed compared to the first one. Some more discussion about model performance would be welcome.

- P14, line 24: Please give a short introduction and motivation (1-2 lines) why the theoretical calculations are added to the analysis.

- Fig 5: An additional schematic figure comparable to Figure 5 but for another recirculation zone would be very useful to understand the general principles of OSPM. Not all readers will be familiar with the Berkowicz et al paper. Please also illustrate (if possible) the lengths x_start, x_end, x_esc, W. The definition of L_b in the caption is very unclear (it is the distance to the next corner, I suppose?).

- Fig 13: Complicated graph and difficult to analyse and understand. The authors could consider to only show 2 sets (e.g. 50/50 and 70/30) since the general trend for the other fractions is similar and does not add new information. Probably this will simplify the graph and result in a better interpretation.

- Fig 13, caption: the description of the setup of the theoretical exercise should be given in the text, not in the caption.

- Fig 15 and Fig 15, caption: same comments as for Fig 13. Further, it is not fully clear what the difference is between solid and dashed line. I suppose leeward and windward, but this should be mentioned explicitly in the caption.

- Table 4, caption: All definitions should be given in the text and not in the caption! Further, I notice that some of the symbols are mixed: eg. Theta and Theta_street although they refer to the same physical quantity, I suppose. Please make sure that only one consistent set of symbols is used throughout the text.

- Table 4, x_start definition. As far as I understand x_start = 0 if h_r < h_0. If so, please include in the definition.

Technical corrections

- P3, line4: Clarify "this" in ". . . of this type of model. . .". It is unclear to what model you refer.

- P3, line 22: replace "Figure 1" by "Table 1"

- P3, line 28-29: update reference to Sect. 0

- P5, line 7: "classified" or "categorized" seems to be a more appropriate term than "harmonized".

- P5, line 14-16: Sentence is difficult to understand. Please reformulate.

- P5, line 21: update reference to Sect. 0

- P9, line 1: should "receptor" not be replaced by "source" in this sentence?

- P9, line 25: "parallel" should be replaced by "perpendicular", I suppose?

- Fig 1 & 2: add the location of the data set to the caption.

Interactive comment on Geosci. Model Dev. Discuss., 8, 935, 2015.