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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of urban land expansion on the regional meteorology and air quality of Eastern China" *by* W. Tao et al.

Anonymous Referee #1

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Atmos. Chem. Phys. Discuss., 15, C1914–C1916, 2015 Effects of urban land expansion on the regional meteorology and air quality of Eastern China" by W. Tao et al.

The paper tackles a timing issue, as efforts are spent in Europe and North America, and now China, to identify and quantify parameters for assessing quality of life in urbanised areas. Air pollution is certainly one major actor. The paper is sound and of interest for the readership of ACP and I suggest the editor to accept it for publication. A few amendments are proposed hereafter.

-Before any technical comment I invite the authors to a rigorous editing of the manuscript in all of its parts. In general the paper is hard to follow and any effort

spent to simplify it would be beneficial. There are several instances where phrasing is confusing and wording un-precise. Most notably, the introduction is a bit dispersive. I think it could be shortened to a half of its current length without loss of information. Please keep only the information that is needed for putting your work into context.

-Further, please try to keep the use of acronyms to a minimum, otherwise the flow of the text is hard to follow and readers are discouraged. If you can't reduce them, consider adding a table.

-My major doubt is about the emissions kept constant under expanding urbanization scenario (if I understood it correctly). The finding of the enhanced mixing due to additional turbulence (mechanical and thermal) diluting pollutants more effectively might not hold if the emissions rose according to the urban expansion (more households, more people, more emissions). Having at least one simulation with increased emissions would add robustness to the conclusions which are otherwise confined to the limiting assumption of constant emissions. Please comment on that.

- The authors might consider adding a sentence in the conclusion section conveying the results to a message to urban planner/policy makers so to provide scientific evidence in support of decision making.

Minor editing

1. ABSTRACT Line 15. 'response of meteorology'. Please be more specific Line 20. 'in the square of NULC'. Please clarify and try to avoid acronyms in the abstract. The abstract should be self-explanatory Line 23. 'IPR results', of what? Line 25. Unclear. 'determining the changes of the simulated vertical profiles' is that what you mean?

2. INTRODUCTION Line 18. Please add 'Britter and Hanna, 2003' to the references there.

The sentence ' To date there are 4 urban canopy schemes' is too strong and inaccurate. There exist, of course, more schemes (Di Sabatino et al., 2008; Solazzo et al., 2010;

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Harman et al., 2004; Coceal, O., Belcher 2004; just a few examples). You might say that not all of them have been implemented into regional models (possibly, not sure) or that you want to discuss only four among the most popular ones.

Pg 10303, line 1. ‘ to simulate urban climate’ or to account for the effects of urban areas to local climate? Line 14. ‘ Urban air pollution meteorology’. Please clarify

2. METHODOLOGY Line 6, pg 10306. ‘. . .and other secondary pollutants levels’

Line 7. ‘100 * 100 grid’ . you mean cells?

Line 7. ‘horizontal resolution’ . Please change to ‘horizontal grid spacing’ throughout the text. The model resolution is the scale of the resolved processes.

SECTION 3 Please add a measure of variability, like the ratio of the standard deviation of the measurements to the standard deviation of the model. PM2.5 as simulated by WRF/Chem suffers from too low variability and underestimation (as well as for many other regional air quality transport models) due to unresolved/missing processes and inaccurate inventories (Im et al., 2014; Solazzo et al., 2012). Please comment on that.

TABLE 1 There is something I don’t understand with this table. Is it about only one station? What is missing in the header? You use hourly values for the statistics (for the whole month?) and daily for the figures, right? Please specify it in the text.

Additional References for you to consider:

Britter and Hanna 2003. Flow and dispersion in urban areas. Annual Review of Fluid Mechanics, 35, pp. 469-496. doi: 10.1146/annurev.fluid.35.101101.161147

Solazzo, E., Di Sabatino, S., Aquilina, N., Dudek, A., Britter, R. Coupling Mesoscale Modelling with a Simple Urban Model: The Lisbon Case Study (2010) Boundary-Layer Meteorology, 137 (3), pp. 441-457.

Coceal, O., Belcher, S.E. A canopy model of mean winds through urban areas (2004) Quarterly Journal of the Royal Meteorological Society, 130 (599 PART B), pp. 1349-

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1372.

Di Sabatino, S., Solazzo, E., Paradisi, P., Britter, R. A simple model for spatially-averaged wind profiles within and above an urban canopy (2008) Boundary-Layer Meteorology, 127 (1), pp. 131-151

Harman, I.N., Barlow, J.F., Belcher, S.E. Scalar fluxes from urban street canyons. Part II: Model (2004) Boundary-Layer Meteorology, 113 (3), pp. 387-409.

Im, U., Bianconi, R., Solazzo, E., Kioutsioukis, I., Badia, A., Balzarini, A., Baró, R., (...), Galmarini, S. Evaluation of operational online-coupled regional air quality models over Europe and North America in the context of AQMEII phase 2. Part II: Particulate matter (2014). Atmospheric Environment.

Solazzo, E., Bianconi, R., Pirovano, G., Matthias, V., Vautard, R., Moran, M.D., Wyat Appel, K., (...), Galmarini, S. Operational model evaluation for particulate matter in Europe and North America in the context of AQMEII (2012). Atmospheric Environment, 53, pp. 75-92.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 10299, 2015.