

Interactive comment on “Changes of regional meteorology induced by anthropogenic heat and their impacts on air quality in South China” by Min Xie et al.

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General comments: This is a nice paper on using numerical modeling to address some important issues related to urban effects on the atmosphere. The paper is well written as a whole and easy to follow. The main idea is to analyze the relative importance of anthropogenic heat contribution to atmospheric patterns and its consequent effects on air pollution dispersion. Although the contribution seems to be small compared to other effects, it is clear that it is very important to correctly consider the AH sources during simulations, especially over very large urban areas. I consider the paper suitable for publication, after the verification of some small features, as listed in the specific comments below.

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Thanks for the constructive and the affirmative comments.

Specific Comments and technical corrections: Abstract: insert the acronym for boundary layer height before using it (see lines 23 and 26).

Thanks for the constructive comment. In the new revised manuscript, the acronym 'PBLH' is inserted after the words 'planetary boundary layer height' on line 26.

Page 2, lines 49-50 (and 201). Indicate which reference correspond to Zhang et al 2009. There are two different references with the same year.

Yes, there are two different references with the same year for 'Zhang et al., 2009' in the original manuscript. In the new revised manuscript, they are cited as 'Zhang et al., 2009a' and 'Zhang et al., 2009b', respectively. 'Zhang et al., 2009' on lines 49-50 of the original manuscript is changed to 'Zhang et al., 2009a' in the revised manuscript (lines 48-49). 'Zhang et al., 2009a' is written by Zhang D. L. et al. in 2009, which is listed on lines 887-888 in References of the revised manuscript. 'Zhang et al., 2009' on line 201 of the original manuscript is changed to 'Zhang et al., 2009b' in the revised manuscript (lines 205-206). This paper is written by Zhang Q. et al. in 2009, which is listed on lines 889-891 in References of the revised manuscript.

Page 5, line 172-173, the authors mention that the model domain has a resolution of 27 km x 27 km. Actually, this refers to the grid spacing, as you mention on line 175. Resolution has another meaning and it is related to the feature that you are able to represent in the model.

Thanks for the constructive comment. The words 'with the grid resolution of 27km × 27km' on lines 172-173 of the original manuscript are replaced by the words 'with the grid spacing of 27km'. Please see line 179 in the new revised manuscript.

The resolution of Fig 1 is to low. It would be better if the authors could improve it.

Thanks for the constructive comment. Fig. 1 is replaced by a new high quality figure, with the improved resolution of 600 dpi. Please see lines 212-217 in the new revised manuscript.

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Page 6, lines 190-191. In the same way, the sentence “the resolution of 30-sec” should be changed by “30 arc seconds grid spacing”. Please, consider the same issue on lines 199 and 204.

According to the suggestion, the sentence “the resolution of 30-sec” on lines 190-191 of the original manuscript is changed to “30 arc seconds grid spacing”, the words “with $0.25^\circ \times 0.25^\circ$ resolution” on line 199 of the original manuscript is revised to “with 0.25° grid spacing”, and the words “with the spatial resolution of $1^\circ \times 1^\circ$ ” on line 204 of the original manuscript is replaced by “with the grid spacing of 1° ”. Please see lines 194-195, lines 203-204, and line 208 in the new revised manuscript.

Page 8, lines 263-264 (and 278) the authors cited the reference Chen et al 2012a. However, there is just one reference by Chen et al in 2012, as you can see in the reference list.

Sorry for this clerical mistake. The references cited on lines 263-264 of the original manuscript (“Chen et al. (2012; 2014a)”) should be “Chen et al. (2012; 2014a)”. We change the relevant words, and revise the related label of the papers in the reference list as well. Please see lines 276-277, and lines 751-755 of the new revised manuscript.

Page 8, line 266. Correct the figure number. The correct is 2f, instead of 4f. In the comparisons of Grd-AH against Fix-AH it would be useful for the readers to have a special view of the Fix-AH contributions. The values are fixed, but they certainly are heterogeneous around the domain. A figure similar to Fig. 2 would be nice.

Sorry for this clerical mistake. The figure number “4f” on line 266 of the original manuscript is replaced by “2f”. Please see line 279 of the new revised manuscript.

We agree that “the comparisons of Grd-AH against Fix-AH would be useful for the readers to have a special view of the Fix-AH contributions”. So, Fig. 1b that is similar to Fig. 2 and some words are added to illustrate and compare the heterogeneity of AH distribution in Grd-AH and Fix-AH. Please see lines 212-217 and lines 288-295.

In page 16, section 3.3.3. The authors mention that the air near to the surface becomes dryer. It should be considered that the regions where RH is lower correspond mostly to

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the regions where Temperature is higher. Therefore, it not necessarily means that the air is actually drier. I believe that this whole paragraph should be better explained.

We agree that "the regions where RH is lower mostly correspond to the regions where temperature is higher", and RH2 is not the appropriate factor to explain whether the surface becomes dryer. So, in the new revised manuscript, we use the changes of water vapor mixing ratio at 2m between Grd-AH and Non-AH (Grd-AH minus Non-AH) to explain the effect of AH on surface moisture. We believe that the new figures (Fig. 6a and b) and new paragraph (lines 465-470) in the revised manuscript can better illustrate the phenomenon that the air near the surface becomes dryer.

Page 19, line 503. The correct statement is "atmospheric conditions" instead of "meteorology conditions".

According to the suggestion, the words "meteorology conditions" in "Since adding AH changes the meteorology conditions" on line 503 of the original manuscript are changed to "atmospheric conditions". Please see line 534 of the new revised manuscript.

Page 25, line 652. The authors said that ". . . strong upward air flower. . ." Is that right?

Sorry for this clerical mistake. The words "strong upward air flower" on line 652 of the original manuscript are revised to "strong upward air flow". Please see line 683 of the new revised manuscript.

References: Indicate in the list which references corresponds to Chen et al 2014 a and b. The same for Liu et al 2013 a and b, Wang et al 2009 a and b.

Two different references for 'Chen et al., 2014' are indicated as "Chen et al., 2014a" for the paper written by Chen, B., Dong, L., Shi, G. Y., et al. and "Chen et al., 2014b" for the paper written by Chen, B., Yang, S., Xu, X. D., et al., respectively. Please see lines 751-755 of the new revised manuscript. Meanwhile, the words "Chen et al., 2012a; 2014" on line 278 of the original manuscript are changed to "Chen et al., 2012; 2014a". Please see line 289 of the new revised manuscript.

Two different references for "Liu et al., 2013" are indicated as "Liu et al., 2013a" for the paper written by Liu, M., et al. and "Liu et al., 2013b" for the paper written by Liu, Q., et al., respectively. Please see lines 813-818 of the new revised manuscript. Meanwhile, the words "Liu et al., 2013" on line 164 of the original manuscript are revised to "Liu et al., 2013b" on line 171 of the new revised manuscript. The words "Following the work of Liu et al. (2013)" are replaced by "Following the work of Liu et al. (2013b)" on line 190 of the new revised manuscript.

Two different references for "Wang et al., 2009" are indicated as "Wang et al., 2009a" for the paper written by Wang T., et al. and "Wang et al., 2009b" for the paper written by Wang X. M., et al., respectively. Please see lines 861-866 of the new revised manuscript.

Word Bank Group, 2015, cited on page 3, is not correctly cited in the reference list.

In the reference list of revised manuscript, the cited document is corrected as "World Bank Group: East Asia's changing urban landscape: measuring a decade of spatial growth, World Bank, Washington Dc, 2015.". Please see lines 870-871 of the new revised manuscript.

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