

# ***Interactive comment on “Modeling of the anthropogenic heat flux and its effect on air quality over the Yangtze River Delta region, China” by M. Xie et al.***

## **Anonymous Referee #3**

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1. Is the paper scientifically sound? If "no", please give reason. Yes. This manuscript reported a numerical study of the impact of anthropogenic heat on urban meteorology and air quality as well. This study has high impact as Yangtze River Delta is one of most densely populated city in the world.

There are a lot of previous studies which study urban heat flux. However, there are few publications that carried out systematic analyses that study the change of urban circulation caused by anthropogenic heat emissions. The WRF/CHEM methodology further allows the authors to study the change in PM and surface ozone concentrations

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as well. There is an important question asked many times by scientists about whether anthropogenic heat emissions contribute to global warming. Although the answers are negative, the analysis of AH in this manuscript can enhance the understanding of the magnitude of AH emission from megacities and its impact on meteorology and atmospheric chemistry as well.

Overall, the paper is well written and the references are quite up to date.

Finally, the authors are not native English writers, there are improvements to be made in the choice of words.

2. Is it of sufficient originality and interest to merit publication after attention to matters raised under 3-9? If "no", please give reason. Yes Very few papers studied anthropogenic heat emissions and its impact on urban meteorology and regional air quality at the same time.

3. Are there any errors? No.

4. Are there any omissions? Yes (1) Section 3.3, The term "monthly averaged differences" should be defined. Is it the difference of two means or is it the mean of two difference ? (2) The sentence "Differences that are non-significant under the 95% confidence level (student t test) are masked out." Should be clarified.

5. Are any sections obscure and what additions or alternations would remove the obscurity? No

6. Could any sections be omitted or shortened? please be specific. Yes The conclusion looks too long. It could be shorten a bit, especially the first paragraph.

7. Are all the illustrations/tables necessary, clear and suitably captioned? Yes

8. Is the abstract adequate? Yes. The abstract is good.

9. Are the title and key words appropriate? If not, please suggest alternatives. Yes but I suggest to modify it to "Modeling of the anthropogenic heat flux and its effect on

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regional meteorology and air quality over the Yangtze River Delta region, China.”

Detail comments:

Abstract: It is well written.

Introduction: Line 28 of page 32370, And is a preposition. It is not appropriate to put “and” at the beginning of a sentence. There are quite a few sentences in the manuscript with the same problem. Line 10 of page 32371, delete the word “unfortunately”. Line 15 of page 32371, delete the word “Consequently”. Line 10 of page 32371, delete the word “of” after the word implementing.

Section 2. Methodology Section 2.1, page 32372 Line 7, the resolution of AH fluxes is 4km, but the domain 3 of WRF/CHEM is 9 km. How do the authors resolve this problem?

Section 3.2 Line 7 of page 32380, the word “more than 0.7” could be replaced by “higher than 0.7”. Line 5 of page 32381, the word “more solar radiation reaches to urban” could be replaced by “stronger solar radiation reaches urban”.

Section 3.3.1 Line 7 of page 32382, “Differences that are non-significant under the 95% confidence level (student t test) are masked out.” Student t test requires the data set to be normally distributed. Are the data normally distributed? Further more, it is very confusing here. In figure 6a, the monthly averaged differences are calculated grid by grid. So for one grid there is only one set of data of NONAH (T2) and one set of data ADDAH (T2). How to remove data that have insignificant differences? Line 17 of page 32382, “the adding AH fluxes” could be changed to “the addition of AH fluxes”. The comment “the addition of AH fluxes lead to an increase of SHF in both daytime and nighttime.” is not exactly correct. Figure 7 shows that the SHF is almost the same from midnight 00:00 to 05:00am. Line 11 of page 32383, “adding AH fluxes make the PBLH rise up to over 50m” could be changed to “enhanced AH fluxes increase the PBLH by more than 50m”. Line 25 of page 32383, “adding AH fluxes” could be changed to

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“enhanced AH fluxes”. Line 6 of page 32384, the word “re-established” is not a good choice of word. May be “modified”? Line 15 of page 32384, the word “ignorable” should be “ignored”?

Section 3.3.2 Line 20 of page 32384, “an significant” should be “a significant”.

Section 3.4.1 Line 24 of Page 32385, replace “venting” by “dispersion”? Line 27 of Page 32385, is the PM10 the “surface PM10”? Is it only include the PM10 of the lowest bottom layer or the integrated PBL PM10? Line 4 of Page 32386, (just a comment) a decrease of 29.3  $\mu\text{g}/\text{m}^3$  of PM10 is phenomenal. Line 26 of Page 32386, “increase of O3 causing by AH” should be replaced by “increase of O3 associated with the introduction of AH”. Furthermore, the article only shows the surface ozone. As the convection is enhanced, it is interesting to show ozone at higher levels such as at 1km altitude.

Reference section There are a few references quoted but not found in the reference list. They are Allen et. Al, 2010, Quah & Roth 2012, Ryu et. Al, 2013, Yu et. Al, 2014, Grimmer 1992.

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 32367, 2015.

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