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Interactive comment on "The carbon emissions of Chinese cities" *by* H. Wang et al.

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We thank for the comments and suggestions from reviewer #2. Following are our brief point-by-point responses to those comments. We will also try to explain how we will revise the manuscript.

General

The paper addresses a very relevant problem of carbon emissions from Chinese cities, which is definitely within the scope of the journal. It presents new data and – taking into account limitations caused by data availability - applies a correct methodology. In majority of cases the assumptions adopted are clear. Some questions are outlined in the further part of this review. The results are interesting and as far as I know this is the first attempt to compare the emissions in China at a city level. Also comparisons with carbon emissions calculated in other studies for other cities in the world are inter-

esting. Performed regressions identify major factors contributing to carbon emissions and indicate significant relationship with city GDP and population. However, because of different structure of energy consumption in the cities, industrial emissions play a much greater role in total emissions in China than in other cities in the world. Thus proper treatment of industrial emissions in the analysis presents a major challenge. I understand that this issue could not be analyzed in more detail within the current paper but I encourage the Authors to explain how they plan to analyze industrial emissions in more detail. Also, emissions from manufacturing industries should be separated from total city emissions when comparing with other cities in the world.

Response: We agree with the comments that industrial emissions play an important role in total emissions in China than in other cities in the world. Therefore, we will try to add another section in our revised manuscript to analyze the factors, such as energy structures and industrial structures, which have great impact on the carbon emissions in China.

We also agree with the reviewer's comment that emissions from industries should separate from total city emissions when comparing with other cities in the world, because industries have significant effect on the carbon emissions from Chinese cities. In order to objectively evaluate the carbon emission levels, we divide the total per capita carbon emissions into per capita industrial and per capita non-industry emissions. We have already done this in Table 2 of section 3.4 in the original manuscript.

Other comments

1. I don't like the term "global cities" used across the paper. Better say that emissions from Chinese cities were compared with emissions from ten cities in the world as published in the paper on greenhouse gases emissions from global cities (Kennedy et al., 2009). Then use the term "ten cities in the world".

Response: All the "global cities" would be substituted with "ten cities in the world" in our revised manuscript.

2. Table 1: explain if the GDP is in PPP or in MEX (not every reader will read the supplementary material).

Response: Thanks for this suggestion. The GDP in Table 1 is in PPP. We will explain this in our revised manuscript.

3. Paper requires careful language editing. Suggestions for (some) improvements are given below.

Response: Thanks for the suggestions. We will edit the language according to the following specific suggestions. The revised manuscript will also be polished by a native English speaker to ensure the language quality.

4. Table 2: re-formulate footnote (c) so that it is clear that the assumption on 30 percent contribution of industry to total emissions is valid only for ten cities in the world used for comparison.

Response: In the revised manuscript, footnote (c) will be revised as "For lack of information, the industries are assumed to contribute 30%, which is similar to the proportion of average US level (www.state.gov/documents/organization/139999.pdf), of the total per capita carbon emissions of ten cities in the world. This assumption is valid only for the ten cities in the world used for comparison in this study."

5. Figure 2b: not : : :contribution rates but : : :contribution shares.

Response: It will be revised as "contribution shares".

6. Figure 3 – change the unit to million tons.

Response: We will change the unit to million tons in the revised manuscript.

7. 7986, from line 10: say that the average contributions of sectors to per capita emissions for all Chinese cities were 64.3% for industrial energy consumption, : : :, and 2.5% for waste processing. However, these shares are characterized by large variability due to city-specific factors.

Response: Thanks very much for the kind help. We will revise this sentence according to your suggestion.

8. 7987, 13 – 17: re-formulate, divide into two sentences.

Response: It will be divided into two sentences at the word of "However".

9. 7987, 25: intensity per unit of what?

Response: To make the sentence clearer, we will change the "emission intensity" to "emission intensity (per GDP CO2 emissions)" in our revised manuscript.

10. 7990, 1: delete "our published paper".

Response: "our published paper" will be deleted in the revised manuscript.

11. 7990, 13: say : : :excluded from this sector.

Response: The sentence will be revised according to this suggestion.

12. 7992, beginning of the page: It is not clear how the emissions form electricity production and use within the boundaries of each city were calculated. Were the emissions from the final electricity use calculated with an average carbon intensity of electricity produced in a given grid? Was it assumed that the emissions from power plants located at the city territory contribute to the average emission factor for a given grid and thus have been ignored in calculations for the city? Was the approach different? Please provide a better explanation.

Response: We will revise the last paragraph in page 7991 to make it clearer how we process the electricity related carbon emissions in this study. Here, we would like to present a brief explanation.

Yes, the emissions from the final electricity use were calculated with an average carbon intensity of electricity produced in a given grid. Because electricity consumption-related carbon emissions were calculated for all sectors in this study, we only accounted the

electricity related carbon emissions from the consumption perspective to avoid double counting. It means that emissions directly from power plants within the city were excluded from the industrial energy sector when we summed the emissions from all the sectors to calculate the total carbon emissions. We think this is more useful when we aim to make measures to reduce the carbon emissions, because power plant productions are driven by the electricity consumption.

13. 7996, 17: Comparison with other cities in the world (not mega cities).

Response: The caption will be revised as "3.4 Comparison with other cities in the world".

14. 7998, 26: key industrial processes should include mineral products industry (cement). Explain if emissions from cement production are included.

Response: Yes, emissions from cement production are absolutely included in this study. We will make it clear in this sentence.

15. Replace Section 3.5 with three sub-sections: uncertainties, conclusions, further work. Conclusions part should be expanded. Most important findings described in other parts of the paper should be put together here.

Response: Thank you for this suggestion. We will replace Section 3.5 with three subsections in our revised manuscript. The conclusions will also be expanded and include some key findings described in other parts of this paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 7985, 2012.