

## ***Interactive comment on “Local and regional contributions to fine particulate matter in the 18 cities of Sichuan Basin, southwestern China” by Xue Qiao et al.***

### **Anonymous Referee #3**

Received and published: 5 March 2019

General Comments: The manuscript presents a good example of using CMAQ model to study sources contribution of air pollutants, specifically fine particulate matter, in Sichuan basin, one of China's economic development zones. The authors carried out modelling studies with updated photochemical mechanism and aerosol module. The modelling results are well-organized with clear conclusions, which provide potential policy guidance for Chinese government agencies in terms of measures in pollution control. Two of the highlights are:

1, “All the above suggest that it would be more efficient to control the SIA (particularly SO<sub>4</sub>2-) and its precursors than PPM in order to reduce the transport of air pollutants

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within and into the basin” in lines 293 – 295

2 , “All the above suggest that joint effect (it should be joint measures in reviewer's mind) should be made by neighbor cities and provinces to reduce PM<sub>2.5</sub> pollution for the entire SCB” in Line 314 and 315.

Maybe the author can also strengthen how much/little Sichuan or Chongqing governments can achieve by just reducing the pollution sources alone based on the modelling results. Overall, the manuscript deserves publication in ACP after handling reviewers' comments and making some minor revisions/corrections.

Specific Comments:

1, This paper is designed to be published in “Special Issue: Regional transport and transformation of air pollution in eastern China”. Could the authors address the relevance of this manuscript to the special topic, since SCB is in not in eastern China? Air pollutants generated in eastern China can be transported to SCB, as the modelling results have shown, which could be used to elegantly linking two distinct areas.

2, There seems to be too much educational material in the second paragraph of the introduction section. The authors explained some other models that the current study did not use in long words. Although it is important to compare the advantage of CMAQ model to these models mentioned, it seems to be slightly distracting. On the other hand, Sichuan Basin is surrounded by mountains in all directions, as the authors have mentioned. There is little discussion or explanation about how the topography will prevent the transport of air pollutants between SCB and other areas. This may deserve some words in the manuscript as one of the reviewers has criticized the manuscript as “quite short”.

3, The modeling study is for the period between November of 2014 to August 2015, which include two winter seasons and one summer season, in addition to one spring season. Can the authors address the following questions: a) Why this period? Is the

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length of period the longest that CMAQ model or the supercomputing resources can handle? b) Why the spring season was not discussed? Is there a lacking of spring data or the results in spring are not as interesting as summer and winter? c) Is statistical significance the same to include two winter seasons but only one summer season? How biased it could be when averaging the trend?

4, Part (b) of Figure 1 seems to be very crowded. Can the font of these city names be smaller but still readable? Can the size of dots representing those cities with SCB corresponds to its population of economic activity? Can the dots representing cities outside of SCB or beyond of the discussion be limited to several large industrial cities? Disregard this comment if this figure is directly generated by CMAQ model and not easy to achieve these visual advantages.

5, In the end of the first paragraph in the introduction section, the authors mentioned the average measured PM<sub>2.5</sub> concentration is six times of WHO guideline. If there are available data, can the authors present the data of the national average or somewhere else (which is suitable to serve as a benchmark comparison parameter) so that readers can understand the relative magnitude of SCB to the whole country or another region?

6, There are a lot of exceptions for Suining, can authors generally address the reason with slightly more details? Is it the least developed area or some other reasons?

7, Why there are no space separating multiple citations in the parenthesis throughout the manuscript?

Technical corrections: 1, Part of line 34 of Abstract should be corrected to: ... (SIA, including ammonium (NH<sub>4</sub><sup>+</sup>), nitrate (NO<sub>3</sub><sup>-</sup>), and Sulfate (SO<sub>4</sub><sup>2-</sup>)). . . , similarly, part of line 124 should be corrected to: ... (SIA, including NH<sub>4</sub><sup>+</sup>, NO<sub>3</sub><sup>-</sup>, and SO<sub>4</sub><sup>2-</sup>). . . , there is no reason to explain only one of the three items/ions for the second time and do it incorrectly. Authors are courteously reminded here that ammonia = NH<sub>3</sub> and ammonium = NH<sub>4</sub><sup>+</sup>. It is better not to challenge the long established chemical nomenclature, as the authors seem to get it right in line 163.

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2, The manuscript describe the resolution as  $0.1 \times 0.1^\circ$ . Is it more accurate to use it as  $0.1^\circ \times 0.1^\circ$  as used in the companion paper?

3, Line 50, recommend changing to "... but fewer studies have been conducted compared with other developed regions..." Or "...but insufficient studies have been conducted..."

4, Line 53, recommend changing "16 other cities" to "16 less populated cities" or something similar

5, Line 185, please get rid of the first word "were" or change it to "that were", otherwise the whole sentence doesn't make sense in grammar.

6, Line 192, can "statistical measures" be replaced by "statistical metrics", as used in the companion paper?

7, Line 226, can authors define "city center"? Is it the most populated place in the city or the central point (modeling domain) of that city?

8, Line 331, can authors specify "severe events"? Should it only mean severe air pollution events?

9, Table 2, the width of the second and fifth columns, "Number of grid cells" can be optimized to read better. For example, it can be changed to "No. of grid cells" to make it fit the space better without sacrificing the unambiguity. 10, Table S2 and S3 do not fit to a letter paper after print out. Please check if this would be resolved automatically during publication.

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