Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-1141-RC2, 2020
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Pollutant emission reductions deliver decreased $PM_{2.5}$-caused mortality across China during 2015–2017" *by* Ben Silver et al.

Anonymous Referee #1

Received and published: 17 March 2020

Summary:

In this work, the authors use a chemical transport model (WRF-Chem) to demonstrate that emission controls rather than meteorology have been driving the air-quality improvement in China in recent years. Additionally, the authors calculate the number of lives saved from China's 'Air Pollution Prevention and Control Action Plan' between 2015 and 2017. This manuscript is of good scientific and presentation quality and in a highly-relevant area of research. However, there have already been several articles published on (1) whether meteorology or emissions are driving air quality changes in China and (2) the health impacts of the stringent emissions controls in China. Overall, a

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Discussion paper

better case for the novelty of this work needs to be made in the motivation/introduction of the paper (see overall comment below). Additionally, there are several places where more detail and/or discussion is needed (see Line-by-line comments below).

General Comments:

There have already been several articles evaluating the impacts of meteorology vs emissions on changes of PM2.5 in China (e.g., https://doi.org/10.5194/acp-19-7409-2019, https://doi.org/10.1289/EHP4157) and several papers that calculated the health effects of the stringent emissions controls in China in recent years (e.g., https://doi.org/10.1289/EHP4157, https://doi.org/10.1088/1748-9326/aa8a32). Many of these papers were mentioned in the results/discussion section of this work. In the introduction, the authors should mention some of this closely-related previous work and discuss what distinguishes this work from previous studies.

Specific Comments:

Line 75: What was done to clean the dataset? Please provide more information.

Line 106-108: Suggest providing context for these NMB. For example, how do they compare to previous work? How will they impact air pollution-mortality estimates? Are these NMB calculated using the "control" simulation? Is the NMB greater if the measurements are compared with the "fixed emissions" simulation?

Line 109-112: What was the measurement/simulation bias for each year? If it does not change substantially, this would help validate the methodology used here for decoupling the impacts of emissions and meteorology on PM2.5 and O3 levels.

Line 113-117: Please provide more information here. What is meant by "interpolated model data"? Did the authors look only at the model estimates that coincided with the measurements? Please provide some information about the method that was used for the measurements data, so the reader doesn't need to look at the Silver et al, 2018, unless they are interested in a high level of detail of the methods. What method was

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used to deseasonalize the data?

Line 125: It's useful to calculate the changes in mortality based on exposure alone, but I also suggest calculating the number of PM2.5 and O3 mortalities with population/age/baseline mortality data from 2017 to provide more realistic mortality estimates for 2017. It would be useful to see if the air pollution reductions in 2017 have increased benefits due to the increased population from 2015, for example.

Line 153: How did the Chen et al, 2019 trends compare and how did their emissions scaling compare?

Line 157: Please provide more information on Guizhou and Li et al, 2018. Why do they see different trends? Did they use different emissions scaling? Did they look at different regions of China?

Line 190-191: Suggest that the authors provide more context for what is meant by a "reasonable" NMB.

Figure 2: Which color represents which region mentioned in the figure caption.

Figure 2: Suggest making the dots that don't have significant trends (i.e., the gray dots) a lighter blue or red color. Even if the trends are statistically significant the direction of the trend will still provide information.

Figure 4: I find this color scale to interpret because the mid-range yellows and greens all look similar. I suggest binning the color scale to make it easier to see how many lives are saved in each province.

Technical Corrections:

Line 157: Missing year of Guizhou. I also couldn't find this reference in the reference list.

Line 185: Should be "per year".

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Line 247: The first two papers in the reference section don't seem to be in alphabetical order.

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