

This study explores the contributions of fires to air quality in Asia Pacific through isolating fire-specific PM_{2.5} using data-driven method. A comparative analysis of total PM_{2.5} and fire-specific PM_{2.5} variations, along with their effects on public health is conducted. The obvious decline in total PM_{2.5}, coupled with a gradual increase in the proportion of fire-specific PM_{2.5}, suggests that measures to reduce fires may be a crucial yet under-recognized option for improving air quality and preventing related premature deaths in the future. The authors also reveal differences in spatial distributions of total and fire-specific PM_{2.5}. Total PM_{2.5} is mainly concentrated in densely populated areas, while relatively high fire-specific PM_{2.5} disproportionately affect poor populations. These conclusions indicated that the contributions of fires to air quality and health impact are becoming increasingly significant and warrant more attention when developing air pollution standards and control measurements in Asia Pacific. Overall, this study is well-structured, clearly presented, and the results are meaningful. However, some issues still need to be addressed before it can be published:

1. Line 28, Line 34: The full names of abbreviations should be given when their first appearance. What do “VPD” and “PM” stand for?
2. Figures: it is recommended to increase the resolution of the figures to enhance clarity and to enlarge the font sizes of annotations and icons within the figures.
3. Figure 1: Authors conducted the analysis with several sub-regions in the study, like EA, CA, ESA and NA. However, there are no figures or descriptions indicating the specific areas of each sub-region. It is necessary to add a sub-figure in Figure 1 providing this information.
4. Line 116-117: Please provide the references regarding the validation of the reliability of MODIS AOD, especially concerning the study regions in this manuscript.
5. In 2.2 Method: There appears to be a lack of information regarding how the authors align the resolutions of the input and output dataset of machine learning method,

considering that the resolutions of different dataset are quite distinct.

6. Figure 4: The line colors in Figure 4 (c) and (d) are somewhat difficult to distinguish, especially since the colors for CA and EA are quite similar, and the two datasets are also close in value, making it hard to interpret. Besides, the figure caption should provide more information about each sub-figures to make the figure stand out of the texts.

7. Line 294: GDP data are included in the machine learning method to estimate the counterfactual $PM_{2.5}$ that is absence of fire influence, however there is no any information describing the data source in the Section 2.

8. Figure 7 and Figure 8: The original isolated fire-specific $PM_{2.5}$ appears to be corresponded to site data shown in Figure 7. However, it is unclear how the authors calculate the fire-specific $PM_{2.5}$ values in each area presented in Figure 8?

9. Line 395-396: “The number of annual premature deaths due to $PM_{2.5}$ ”, does “ $PM_{2.5}$ ” here mean fire-specific $PM_{2.5}$ or total $PM_{2.5}$?

10. Line 486-489: Authors should provide some evidence or references supporting the claim of decline in anthropogenic fire alongside increase in wildfires in Asia Pacific. If not, this statement should be omitted to maintain accuracy and credibility.