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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spatial distribution and temporal trend of ozone pollution in China observed with the OMI satellite instrument, 2005–2017" *by* Lu Shen et al.

Anonymous Referee #2

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This is a nice study that explores the potential of OMI observations of tropospheric ozone to detect the ozone pollution over China. While it's unrealistic to use OMI data to capture the day-to-day variability of ozone pollution, the authors show extreme ozone pollution may be detectable by aggregating long-term observations using statistical methods. Overall I think this is an important study to the field, which opens up the possibility to use satellite observations to detect surface ozone pollution, but I think the authors overpromise the value of satellite data. I have several major concerns:

1. My major concern is that the authors seem to overpromise the value of OMI data for characterizing the spatial and temporal trend of ground-level ozone. The title and the

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abstract leave me an impression that OMI satellite data can capture the spatial distribution and the long-term trend in ground-level ozone, but the results only suggest OMI may be able to detect high ozone pollution and capture the large-scale or latitudinal variations. I suggest the authors consider revising the title, otherwise it'd be misleading to readers. The authors need to be more careful with the wording. I think this work would actually be much more valuable if the authors can clarify the limitations of OMI data, which will also be useful for preparation of next-generation satellites.

2. Is the point process model you used to predict ozone exceedance probability site specific? If so, how can you apply this method widely to areas without ground-based sites (as you promised in the conclusion)? The authors present the surface ozone pollution and exceedance probability only at ground-based sites, but why not show the distribution across China? For example, MEE network mainly consists of urban sites. Can you use OMI data to tell the spatial patterns of ozone pollution over rural/remote areas? If not, what's the added value of OMI data to existing ground-based network?

3. Figure 5: While OMI data may be able to detect the sign of the change in ground-level ozone, the magnitude of the change is less convincing to me. The authors suggest a 0.67 ppb /year increase in mean ozone over China, which seems to be lower than previous studies. The point process model is trained with ground-based observations in 2013-2017, but it's unknown how the model performs for early years 2005 - 2009. I'd suggest the authors use available long-term ground-based ozone observations to verify the long-term change. I understand long-term ground-based observations are not generally available over China, but since the OMI data are global, it's possible to extend the analysis to wider regions (e.g. Hong Kong, Japan) where long-term sites are available for evaluation.

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