

The authors presented a new perspective to derive hourly PM_{2.5} concentrations from Himawari-8 satellite in China by combining different AI methods. This study is overall good, and the results are generally well presented. However, I still have some concerns and suggestions for the authors to improve the manuscript.

Major comments:

My first concern is that the authors used all the data samples collected at the same locations having ground-based measurements using the cross-validation method, but the PM_{2.5} predictions are not evaluated at locations where ground-based measurements are unavailable. Thus, I suggest adding an additional validation to test the spatial prediction ability of your model based on the monitoring stations using the cross-validation method.

My other concern is that the purpose of this study is to derive hourly PM_{2.5} concentrations from geostationary satellites. However, the spatial analysis is performed on a monthly scale (Section 4.3), which will largely reduce the sense of the current study. Thus, it is suggested to add more analysis on PM diurnal variations across China.

Minor comments:

Introduction:

The authors are suggested to update the literature by summarizing more recent studies on PM_{2.5} estimations using sun-synchronous and geostationary orbit satellites, especially those focusing on the whole of China. Below references may help you found more information on various recent studies to help enrich your study.

<https://doi.org/10.1016/j.rse.2020.112136>

<https://doi.org/10.5194/acp-21-7863-2021>

Data:

Section 2.2: Line 15, Reference for Himawari-8 aerosol algorithm is needed.

<https://doi.org/10.2151/jmsj.2018-039>

Line 17: Below references provide a more comprehensive evaluation of Himawari-8 aerosol products in China.

<https://doi.org/10.1016/j.scitotenv.2019.07.326>

<https://doi.org/10.1016/j.atmosenv.2018.11.024>

Section 2.3: Reference for ERA5 reanalysis is needed.

Method:

References for these traditional ML or DL methods are needed, e.g.,

Friedman, J.: Greedy function approximation: a gradient boosting machine, *Ann. Stat.*, 29, 1189–1232, 2001.

Breiman, L.: Random forests, *Mach. Learn.*, 45, 5–32, 2001.

Results and discussion:

Lines 5-9: It is not clear to me how to determine the weight coefficients, and could you add more descriptions?

Section 4.2.2: How about the accuracy of PM2.5 estimations for different hours?

Page 11, Lines 12-15, Page 12, and Page 13, Lines 1-4: May move to a new separate Discussion section.

How about your model compared with those developed in previous studies using the Himawari-8 AOD products in China?