

# ***Interactive comment on “Estimating daily full-coverage and high-accuracy 5-km ambient particulate matters across China: considering their precursors and chemical compositions” by Yuan Wang et al.***

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This study presents an admirable, solid work of estimating PM concentrations using data sources other than conventional AOD products. The manuscript is clearly well-written and easy to follow. From my humble view, I am only concerned with the high-resolution use of the coarse-resolution GEOS-FP datasets (further explained below). If this can be properly justified, I believe it will be a very nice paper.

The authors explained that it is reasonable to estimate PM concentrations using

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datasets of chemical precursors and species. But because the high-resolution TROPOMI only provides chemical precursors, the authors employed the coarse-resolution GEOS-FP for chemical species. However, using coarse-resolution datasets as MAJOR predictors (also confirmed by their relatively high ranks shown in Figure 6) for high-resolution PM mapping inevitably introduced uncertainties rather than more valuable information. This is simply because we typically do not have accurate, high-resolution emission inventories to drive a data assimilation system like GEOS-FP. The authors should justify this issue. Otherwise it would be possible to doubt the significance of this study. In other words, because GEOS-FP provides PM species data and thereby can provide total PM data at a coarse resolution via some sort of add-up, is it really necessary to do a big load of modeling (correlating) work to derive PM concentrations with a plausible high resolution but associated inevitable uncertainties?

Other minor issues:

The GEOS-FP provides more than described variables for use. Why do you choose the column mass density variable rather than others, say surface concentration variables?

Line 279-280, because you are modeling on the same dependent variable (i.e. PM concentrations), RMSE is comparable though you can choose not to describe for conciseness.

Line 314, larger => smaller?

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