

## ***Interactive comment on “Inverse modeling of SO<sub>2</sub> and NO<sub>x</sub> emissions over China using multi-sensor satellite data: 2. Downscaling techniques for air quality analysis and forecasts” by Yi Wang et al.***

### **Anonymous Referee #1**

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#### General comments:

The paper presented dynamic concentration downscaling and emission downscaling methods for air quality analysis and forecasts. Using the inverse modeling posterior results for October 2013 over China from a companion paper, they applied the downscaling methods to generate both analysis and forecast surface SO<sub>2</sub> and NO<sub>2</sub> concentrations for November 2013 over China. The results are quite impressive. The paper is well organized, and the overall presentation is very clear.

#### Specific comments:

Lines 19-20: It is an understatement or even a misleading statement to say that the  
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joint assimilation of SO<sub>2</sub> and NO<sub>x</sub> is to save computational time.

Line 193: What is the height of the lowest layer?

Lines 297-8: Does "monthly variation(s)" refer to the temporal variation within the month? Please clarify.

Lines 341-2 : Do the authors believe that the negative NMB implies CGS effect? Would 43.4% NMB imply that MIX-DDC-PRI avoided the CGS effect?

Line 351: In what sense is the spatial distribution worse than the original coarse resolution simulations?

Figure 6: How many ratios have been tested here? Showing the actual data points instead of smooth lines will be better.

Figure 11: Can the separate NMSEs of SO<sub>2</sub> and NO<sub>2</sub> be shown as well? It would be helpful for the readers to understand the model behavior.

Figure 13. "Expected" is misleading as no one would expect the models can achieve such perfect results.

Technical correction:

Line 27: Add "(NL)" after Nighttime light. Line 286: "is use" -> is used.

Line 327: "excepted" -> expected

Line 391: Duplicate "Northern China".

Line 397: MIX-DDC-POS should be MIX-DE-POS.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-880>, 2019.

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