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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Inverse modeling of black carbon emissions over China using ensemble data assimilation" *by* P. Wang et al.

Anonymous Referee #1

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General comments:

This paper uses an ensemble optimal interpolation (EnOI) data assimilation technique to reduce emission bias of black carbon (BC) in China. The bottom-up emission inventories in China are associated with large uncertainties. The authors demonstrated that using the EnOI approach can considerably bring the model prediction closer to observed BC concentration. The manuscript is well organized and the results are clearly presented. The findings presented here provide a reliable alternative to predict BC variations in China in the absence of accurate emission inventories. Hence, I recommend publishing this manuscript after the following comments being satisfactorily addressed.

Specific comments: 1. While inverse modeling can provide a simplified solution, the

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processes contributing to the model bias go beyond emission. Therefore, emission inversing is likely to lump up uncertainties from other processes into emission. 2. There are a number of formulas given but not all variables are explicitly denoted. Suggest a throughout checking of the manuscript on this matter. For instance, Eq. 10 and 12. 3. P20858, L22-24, how was the subset of assimilation or verification sites chosen from CAWNET? 4. P20858, L26: "city's average elevation" is confusing. May choose another term, such as above ground level. 5. P20859, L3: [at] a 5min time [interval]. 6. L5: [the] optical absorption. 7. L13-14: How representative is the monthly mean to the actual daily and hourly variability? It may be useful to provide some measures, such as standard deviation, from at least observations to gauge the robustness of this choice. 8. P20860, L12: [than] Scheme A. I wonder how the RMSE from Scheme B compared to that from A. 9. P20861-P20863: The observed BC concentrations are five-fold of the model prediction (5.2 vs 1.1 ug/m3). An increase of emission by 1.8 times will reduce the mode bias by 50%. Why is that?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 20851, 2015.