**Atmospheric
Chemistry
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Discussions**

Interactive
Comment

Interactive comment on "Regional CO pollution in China simulated by the high-resolution nested-grid GEOS-Chem model" *by* D. Chen et al.

Anonymous Referee #1

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This manuscript describes the application of a high-resolution nested-grid GEOS-Chem simulation to simulation of carbon monoxide over China, and specifically the Beijing-Tianjin-Hebei (BTH) city cluster. The authors demonstrate the benefits of a higher resolution simulation over a region with strong emission gradients and then use this simulation to (1) examine the pollution over the BTH region in summer 2005 (showing that model underestimates can largely be attributed to excessive winds) and (2) estimate the seasonal import/export of pollution between regions in China, India and South Asia.

This study is thorough and clear. The examination of export fluxes from Asia is compelling and connects this study of urban air quality to the regional-scale. The only major issue I would raise is the lack of observational validation (see below for my sug-

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gestions).

MAJOR COMMENTS

1. The authors demonstrate the expected outcome that a higher resolution simulation will produce stronger gradients over a region with spatially varying emissions. However, they do not provide any observational evidence that this simulation is "superior" to the coarse resolution simulation. While in situ observations over the entire region may not be readily available, a number of satellite data sets (AIRS, MOPITT, TES) would provide a basis for assessing the spatial patterns in CO simulated here. I would strongly recommend that the authors consider adding such a comparison to Figures 3 and 4.

2. In order to contrast the performance of the high-resolution simulation with the standard coarse resolution, it would be helpful if the authors included the 2x2.5 results in Figure 4b. With regards to this figure, the authors suggest that the model simulates the variability in the observations (pg. 5864, line 25) but this does not seem so from the figure. I recommend that the authors include the correlation coefficient here between the modeled and observed time series for both the high-resolution and coarse resolution simulations to highlight whether the resolution improves the ability of the model to capture the variability in the observations.

MINOR COMMENTS

1. Pg 5854, line 24: grammar correction "influences of physical"

2. Pg. 5855, line 7: semantics: it is IMPOSSIBLE not just "difficult" to "simulate the variation of species concentrations at scales smaller than model resolution"

3. Pg. 5856, line 2: typo "embed" not "imbed"

4. Section 3.1: Are the emissions year-specific or a climatology? If year-specific, please indicate how the scaling was done.

5. Pg. 5860, line 19: grammar correction "characteristics of fossil fuel and biofuel

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combustion, spatially"

6. The x-axis on Figures 4 and 6 are too small.

7. Figure 4c and 4d indicate 14:00 but the text suggests that this is "daily wind speed" (pg. 5865, line 10). Please reconcile.

8. Pg. 5866, lines 15-17: This discussion of correlations between tracers seems out of place here. Perhaps it could be integrated in the following paragraph if the objective of the authors is to argue something about directional influence related to wind.

9. Pg. 5866, line 23: Given the data shown in Figure 6, "Most days" should be replaced with "All days"

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 5853, 2009.