This manuscript reports an important finding of growth in NO_x emissions from power plants in China. It is surprising that increase of power plant emissions was not limited to Inner Mongolia and northern China, but it occurred across China. Increase of NO_2 columns over R1 region (east China) in Figure 12 is striking, considering the fact that it covers a large area. The emission inventory developed in this study is an important database and world be used widely. The method of evaluation of the inventory and discussions on the results are sound. I have some suggestions and questions for improvement of the manuscript before it is published at ACP

.

(1) *Size of figures*

I had to zoom in the plots (4x) to see the details. It was very stressful to examine Figures 2, 6, 7, and 8. In addition, it might be good to add min. and max. in Figures 2 and 6.

Response: We have redrawn all figures in the revised manuscript to make them more visible. Min and max values have been added in Fig. 2 and Fig. 6.

(2) *Geographic location*

More information on geographic location would be helpful. Northeast, north, east, east coast, southeast, southwest China and inland of south China in this manuscript and other publications on China are sometimes confusing. Names of province (e.g., Jilin and Liaoning as northeast China) or latitude and longitude will be useful. One of the plots in Figures 2, 6, 7, and 8 can be used to include this information.

Response: Geographical locations were clarified in Fig. 2 as suggested.

(3) *Figure 3*

It might be good to point out where these rather isolated power plants are located. Are most of them located in Inner Mongolia or northern China that have more satellite samples? In Figure 3(b), there are points that indicate large underestimation of the emission: OMI NO_2 columns are ~$6.5x10^{15}$molecules cm^{-2} and GEOS-Chem columns are 2-4 $x10^{15}$molecules cm^{-2}. Can these errors be discussed more?

Response: In the revised manuscript, locations of all power plants in Fig. 3 were colored by the regions defined in Fig. 2. 70% of those plants were located in Inner Mongolia and North China.

Those points with significant low bias were located in North China, where NO_x emissions from industries (e.g., iron, steel, and cement works) and vehicles were possibly underestimated. We have discussed it in the revised manuscript.

(4) *Increase in other anthropogenic sources*

Discussions on Figures 7 and 8 are interesting. However, because the increase in other anthropogenic sources between 2005 and 2007 is estimated to be larger than *that in a power plant sector according to Table 1, I am not sure if the increase in NO_2 columns between 2005 and 2007 can be explained mainly by new power plants. It is still convincing that Figures 10 and 12 demonstrates the increase of power plant emissions.*

Response: In the revised manuscript, we quantified the contributions of power plant emissions to NO_2 columns in China, by comparing the results from two GEOS-Chem runs (with and without power plant emissions). We found that the share of power plant pollution was increased in Inner Mongolia and Southwest China during 2005-2007, where power plants dominated the increase of NO_x emissions. The share of power plant pollution remained stable in other regions because emissions from other sectors also grew fast (see Fig. 11 of revised manuscript).

(5) *Figure 9*
This plot is given to explain summer time enhancement of OMI NO_2 columns in northeast China between 2005 and 2007. Are the changes in several factors in Figure 9 applied to the other areas beside northeast China? Please clarify this. Regarding biomass burning, did it occur in June-August 2007?

Response: In other regions, the enhancement of OMI NO_2 summer columns during 2005–2007 was comparable with the increase of anthropogenic NO_x emissions. We have clarified this in the revised manuscript. And the June-August average biomass burning emissions were used in Fig. 9.

(6) *Figure 10*
Can the locations of these power plants be indicated in a map?

Response: We have revised Figure 10 to show the locations of these power plants. We have deleted one plant (from six to five) for the purpose of cartography. We believe it will not impact the conclusion.

(7) *Figure 12*
There is a typing error in the caption (Fig. 11 instead of Fig. 12).

Response: Corrected.

(8) *Sensitivity of satellite retrievals to the a priori NO_2 profiles*
Showing the results from this sensitivity test will be important. But I suggest the authors to mention the uncertainties in this analysis. I believe that the nested runs represent NO_2 profiles over power plant area better than the coarse resolution runs. In reality, however, within a nested grid that represents a power plant source, there could be large variability in NO_2 profiles. Aircraft observations of power plant plumes in Ryerson et al. (2001) (Figure 2) indicate that fresh power plant plumes would not be laterally mixed within a GEOS-Chem model nested grid. Vertical distributions of

pollutants released near surface as a function of downstream distances are shown in Weil et al. (2004) (Figure 3). Assuming weak wind (~1 m s^{-1}) and 30 min. turbulence mixing (turnover) time, it will show a vertically well-mixed profile at ~5.3 km downstream distance. With strong wind of ~10 m s^{-1} and 30 min. turbulence mixing time, it will have a vertically well-mixed profile at ~53 km downstream distance. Thus, NO_2 decreasing with height at Shangdu (Figure. 13) may not be always realistic. The impact of the updated power plant emissions on the satellite retrievals should be examined more carefully with the a priori NO_2 profiles from atmospheric chemistry models adopting various (finer) horizontal resolutions and observational data.

Response: We thank the reviewer for this insightful comment. In the revised manuscript, we discussed the uncertainties in this sensitivity analysis. We agree that the horizontal resolution of the nested GEOS-Chem model is still too coarse to simulate the revolution of the power plant plumes with the downstream distance, especially for isolated plants. A chemistry transport model (CTM) at finer resolution would be more capable for studies on the revolution of the power plant plumes and their impacts on the satellite retrievals. In this work, we only provide a glance into the impact of the new power plant emissions and the spatial resolution of the a priori NO_2 profiles on the satellite retrievals over the power plants. We will investigate this issue by using high-resolution models in our future work.

References

Ryerson and coauthors, 2001: Observations of ozone formation in power plant plumes and implications for ozone control strategies, Science, 292, 719, DOI: 10.1126/science.1058113.

Weil and coauthors, 2004: The use of large-eddy simulations in Lagrangian particle dispersion models, J. Atmos. Sci., 61, 2877-2887.