Review of "Growth in NOx emissions from power plants in China: bottom-up estimates and satellite observations" by Wang et al.

This manuscript reports an important finding of growth in NOx 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 would 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.

(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.

(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 $\sim 6.5 \times 10^{15}$ molecules cm^{-2}

and GEOS-Chem columns are 2-4x10^{15} molecules cm^{-2}. Can these errors be discussed more?

(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.

(5) Figure 9

The 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?

(6) Figure 10

Can the locations of these power plants be indicated in a map?

(7) Figure 12

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

(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 profile 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.

(Reference)

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.