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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Projections of air pollutant emissions and its impacts on regional air quality in China in 2020" *by* J. Xing et al.

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Xing et al. presented their projections of air pollutant emissions in 2020 under a series of scenarios based upon their emission estimates in 2005, and further assessed the impacts on air quality using a number of sensitivity tests with CMAQ. It is an interesting and important piece of work given the worldwide increasing attentions on the rising emissions in China and their potentially significant impacts on international air quality. However, it seems that some important information for the readers to justify the results is missing. A major issue is the ambiguous descriptions of the emission inventory used in current study and the CMAQ model setup. And I suggest that the large uncertainties in current emission estimates in China (e.g. Fu et al., 2007; Fu et al., 2009; Zhang et al., 2009), due to various factors, need to be kept in mind and addressed in

the paper when projected emission changes and the consequences are discussed. It would be nice if such uncertainties can be addressed in a similar manner as that in the well-known IPCC report, which is extremely helpful and important for identifying key uncertain aspects and future research priorities.

Specifically, I would like to request the authors to address the following issues:

1. More descriptions of the inventory in 2005 is desirable since it is a 'base' of the emission projections and its data quality is supposed to be better than other existing inventories, according to the authors' claim that previous emission projections 'suffered from poor data availability and were too optimistic'. I suggest the authors add a part 'current emission estimations' before Sect. 2.4 'Future emissions estimations', giving more detailed information on the 2005 base inventory, elaborating the advantages of their inventory over others. More detailed information in need includes:

(1)Have the emission inventory used in current work been evaluated in chemical transport modeling studies before?

(2)What are the uncertainties in the emission estimates, in terms of both total amount and spatial distribution? Uncertainties for some of the species have been suggested to be substantial (up to more than 100%) according to Zhang et al. (2009): e.g. $\pm$31% (NOx), $\pm$68% (NMVOC), $\pm$70% (CO), $\pm$132% (PM10), $\pm$130% (PM2.5). What are the impacts of these uncertainties on the emission projections?

(3)What are the advantages of this inventory, e.g. in terms of 'availability' of data, data quality, methodology, compared to other ones available in literature, e.g. Zhang et al. (2009) and all references therein?

2. More descriptions of the model setup and model validation are needed before any credible model projections can be generated.

(1) The underlying uncertainties in the emissions need to be addressed here in the modeling as well, e.g. through sensitivity tests, as those used for assessing impacts

in the paper, especially when the uncertainties might be larger than the trends, which often happen to be the case in China. Otherwise, it is hard to know if the projected trends make sense or not.

(2) What are the resolutions of emission inventory and the meteorology inputs in the model? The resolution of the model (grids) is high (36x36km with a 12x12km nested domain), but do the emission and meteorology inputs have consistent resolutions? The emission inventory seems to be compiled on a province level (Figure 4); how is it regrid into the model resolution to reflect the hot spots, say, urban centers?

(3) Has this current model formulation been evaluated against any observation? Although the authors mentioned that in sect. 3.1, CMAQ as a model has been implemented before in China, but those previous studies were using different emission inventories with different resolutions for different regions. Some of the previous studies actually encountered problems of the inaccurate emission inventories, especially VOCs and PM (Fu et al., 2009). Does the model in this study have the same problem?

(4) What are the emission input species for aerosols, e.g. OC, EC, PM? The authors only mentioned PM10 in emission inventory (2.4.3). So does the emission inventory have all the aerosol species used in CMAQ?

3. Suggestions on Figures

Other than the bar plots in current form (Figures 6,7,8), I suggest the authors also consider spatial distribution of the responses on a map, which I feel might be more straightforward and interesting to the readers.

4. Typos

None of the references in Sect. 3.1 can be found in the reference list. Please correct.

References

Fu JS et al., 2009, Modeling Regional/Urban Ozone and Particulate Matter in Beijing,

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Zhang et al., 2009, Asian emissions in 2006 for the NASA INTEX-B mission, Atmos. Chem. Phys., 9, 5131–5153.

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