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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sulfur dioxide and primary carbonaceous aerosol emissions in China and India, 1996–2010" *by* Z. Lu and D. G. Streets

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We thank referee #1 for his/her positive comments. All comments were dealt with as detailed below, and we have highlighted all the changes in the revised manuscript.

"Page 20271, line 10-11: As a matter of fact the Monte Carlo method has been in use for a while and was also recommended by IPCC in their 1996 guidelines. I think this particular sentence could be deleted."

Response: We agree with the reviewer that it is not accurate to use "recently" to describe when the Monte Carlo approach was introduced to the field. However, to give a general background of the approach, we think it is still necessary to

keep this sentence. Instead, we changed “Recently” to “In the past two decades” to be more accurate.

"Page 20273, line 15: 'fine PM' does not necessarily have a uniform definition, i.e., in some regions is typically referred to PM2.5, in others even PM10, while here to PM1; suggest to add explicit statement."

Response: We have made changes in the revised manuscript to reflect this comment.

"Page 20295, line 22-27: In such comparisons one would need to verify if the assumptions about the reduction efficiency are the same as otherwise penetration rates are not comparable. Are reduction efficiencies in the compared studies similar?"

Response: We thank the reviewer for pointing this out. In the revised manuscript, instead of comparing the FGD penetration or the reduction efficiency, we compared the net emission factors of power plants between the GAINS model and our results.

"Page as above, line 25: 'real situation', What makes the authors believe that this time they describe real situation? Several previous studies, also their own, did not quite nail it."

Response: We agree with the reviewer that the usage of “real situation” is not precise and is omitted in the revised manuscript.

"Page 20304, line 21-24: It might be worth adding that some of these parameterizations and so associated uncertainties do not change much over time while others do."

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Response: We thank the reviewer for the suggestion, and a discussion about the possible influence of these parameters to AMF over time is added in the revised manuscript.

"Several pages and graphs where discussion of trends is carried out, specifically for BC/OC: I am a bit puzzled by small or virtually invisible effect on BC of introduction of coal briquettes which are first claimed to reduce emissions but then in Table 1 the residential coal in China does not seem to decline at all but grows, is it owing to some industrial use? But then which is the industrial coal source that grows? In general, I miss few lines of discussion where the industrial use of coal in small and large boilers as well as in brick kilns is briefly discussed, pointing to lack of measurement data and large uncertainties. The second issue is coke manufacturing where a dramatic change in manufacturing technology is claimed assuming that by 2010 all traditional coke manufacturing plants are gone [strong assumption which i guess is backed up by existing laws but i wonder if there is published evidence on enforcement]. Assuming such a big change and presumably much lower emission factors for the new process assumed [although i am not aware of any actual BC/OC measurement on a Chinese coke plant] I am a bit surprised not seeing any change in the industrial emissions of BC; was the contribution of coke small in the first place?"

Response: Generally, the small or even invisible effect of technology improvements on BC/OC emissions in China after 2000 is caused by the dramatic increase of activity rates. For residential coal combustion, although the introduction of coal briquettes reduced the net emission factor of BC (from 65 g/GJ in 2000 to 53 g/GJ in 2010, Table S3 in the Supplement), the residential coal consumption increased from 2549 PJ to 3940 PJ based on IEA Energy Statistics and fast-track statistics, and it makes the BC emissions from residential coal combustion grow.

For coke manufacturing, we estimate the shares of the mechanized and the

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indigenous (i.e., traditional) coking facilities by using the coke productions of these two manufacturing technologies, which are reported annually in the China Industry Economy Statistical Yearbook (National Bureau of Statistics, 1997-2010). Based on the official statistics, the shares of indigenous coke production were continuously decreasing from about 50% in 1996 to 0% in 2010. As the reviewer presumed, such a big change in technology distribution caused a dramatic change in the BC/OC emission factor (although contains large uncertainties). However, the coke production in China was rapidly increasing during 2000−2010 (292% growth), and it partially counteracts the effect of reducing emission factor. In addition, the 197% increase of industrial coal consumption during 2000−2010 (Fig. 1a) also makes the effect of technology improvements invisible.

We have added some discussion in Sect. 3.1.2 and Sect. 3.2 to reflect this comment.

"Page 20270, line 14: consider changing 'monthly fractions' to 'monthly temporal distribution'?"

Response: We changed "monthly fractions" to "monthly temporal distributions" throughout the revised manuscript.

"Page 20281, line 29: 'bonds' or rather 'bounds'?"

Response: In the revised manuscript, "bonds" is changed to "bounds".

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 20267, 2011.