

Interactive comment on “Sulfur dioxide emissions in China and sulfur trends in East Asia since 2000” by Z. Lu et al.

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We thank referee 1 for his/her comments. All comments were dealt with as detailed below.

"In previous work of many authors the common assumption about effectiveness of implemented policies proven often false or at least too optimistic. While the remote sensing activities and other measurements confirm the increased penetration of properly operated FGD, it would be of great interest to the readers to make a brief comment in the conclusions if that is going to continue and what has changed in the last years that the chances are emissions of SO₂ will start declining?"

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Response: This is a valid comment based on the historical situation regarding FGD usage in China. Nobody can guarantee that the present trend will continue, but there seems to be a marked change in government insistence on compliance with the total sulfur control policy. Certainly, recent satellite trends support the idea that FGD installation and operation is taking place (Li et al., 2010a). We have added a discussion about the reason for the SO₂ emission decline after 2006 and the emission trend after 2008 in the last paragraph of Sect. 6 (Summary and conclusions).

"p.8659, line 11-15; One could include here also reference to the work of remote sensing community showing such trends; few papers appeared recently and already few years ago Andreas Richter from Bremen University has been showing at the ACCENT meeting in 2007 not only NO₂ column changes but also development in SO₂. However, the latter results were never published in peer reviewed literature...proceedings from that meeting are available."

Response: Three papers [Lee et al. (2008), Li et al. (2010b), and van Donkelaar et al. (2008)] about using satellite observations to study the effects of SO₂ emission in the Asian continent on the regional environment are mentioned in the revised manuscript. We try to restrict our citations to works that are in the published, peer-reviewed literature, and unfortunately Richter and Burrows have not published their own paper on SO₂ retrievals. We believe we have cited all relevant papers on this topic.

"p.8660, line 16-17; In fact some of the referred studies do not present a single year estimate but rather no annual time series for past years."

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

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"p.8661, line 10; It would be useful to add one sentence of explanation why these regions were not included."

Response: Hong Kong, Macao and Taiwan were not included in this study because the relevant data for these regions are not available in the many Chinese government statistical reports and yearbooks used in this work. In addition, the SO₂ emissions in these three regions are too small to affect the total sulfur-related quantities in East Asia to any significant degree. Therefore, we did not include these regions in our calculation. A statement is added in the revised manuscript to explain this.

"p.8662, section 2.1.3; There is actually no comment on treatment and data sources for non-road vehicles? Suggest adding a brief discussion."

Response: SO₂ emissions from off-road mobile sources are included in our calculation. The fuel consumption in this part was estimated based on the same method described in Zhang et al. (2007). A description has been added in the revised manuscript.

"p.8662, section 2.1.3; It would be very useful to add a short discussion on how appropriate US EPA MOBILE emission factor model is for China and if there are alternatives that could offer a more representative to China set of factors."

Response: In the present work, the model used to calculate the emissions of on-road vehicles is actually a Chinese version of the MOBILE model (named "MOBILE-CHINA" in Fu et al., 2001). The inputs for the model have been specified by using test results of the Chinese fleet to ensure that the model is suitable for application in China. It has been reported to be appropriate for extensive analysis on mobile source emissions in China (Fu et al., 2001; He et al., 2005), and has already

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been applied in the NASA TRACE-P (Streets et al., 2006) and INTEX-B (Zhang et al., 2009) missions to improve the mobile source emissions from China. A discussion of this has been added in the revised manuscript.

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