

## ***Interactive comment on “Evaluating the effects of China’s pollution control on inter-annual trends and uncertainties of atmospheric mercury emissions” by Y. Zhao et al.***

**Y. Zhao et al.**

yuzhao@nju.edu.cn

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Title: Evaluating the effects of China’s pollution control on inter-annual trends and uncertainties of atmospheric mercury emissions

Authors: Yu Zhao, Hui Zhong, Jie Zhang, Chris P. Nielsen

We thank very much for the valuable comments from reviewer 2, which help us improve the quality of our manuscript. Following is our point-by-point responses to those comments and corresponding revisions.

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### Reviewer #2

1. I think this paper provides some new insights on mercury emissions to the atmosphere from China and the authors describe in detail the challenges and solutions to the challenges faced when obtaining accurate emissions estimates. Some of the language of the paper is making it difficult to interpret the findings, such as the author’s statement on line 26 of page 26804: “This is attributed mainly to swiftly increased penetration of advanced manufacturing and pollutant control technologies.” Are the authors saying that the Hg emission factors are coming down because more industrial facilities are adopting pollution control technologies? The manuscript could benefit from editing for English language correctness.

Response and revisions:

We thank the reviewer’s comment and fully acknowledge the language problems in the original draft. The manuscript has been carefully edited, and the language has been improved by a native English speaker. We have tried our best to remove grammar errors and to make the text clear.

In lines 43-45 of the revised manuscript, we have added a sentence “the unclear operational status and relatively small sample sizes of field measurements of those processes have resulted in lower but highly varied emission factors”, to explain why the increased use of advanced manufacturing and pollutant control technologies led to bigger uncertainties of emission estimation.

2. I do however, wonder if the detailed treatment of the topic might be better off in a more suitable journal.

Response and revisions:

We thank the reviewer’s comment. In the revised main text, we have shortened the description on technical details, and have moved original Figures 3, 7 and 9 that stress technical details to Supplement (Figures S1, S3, and S4 in the revised Supplement,

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respectively). That we must describe technology developments across so many sectors gives rise to technical density, but this is inherent in a study that seeks to examine globally important environmental effects of diverse processes throughout China's enormous economy. We have also stressed that this work improves understanding of China's atmospheric Hg emissions in following issues:

1) The comprehensive analysis on sector, spatial distribution and inter-annual trends of Hg emissions for China, with detailed information on the application of technology by sector within the country integrated.

As stressed by AMAP/UNEP (2013), research on the application of technology, both industrial processes employed and technology applied to reduce emissions of Hg in different industries and more importantly in different countries, is a future need and priority to improve the estimate of Hg emissions (lines 69-71 in Section 1 of the revised manuscript). That is also part of reason that we conduct such an extremely detailed analysis of China, as noted by the reviewer.

2) Benefits of recent energy conservation and emission control measures on abatement of China's recent and future Hg emissions, even though the measures are not specifically designed for Hg control.

This work tracks the recent and future possible changes in emission control and emission factors for key industrial sources based on newly developed methods of emission estimate, and reveals that Hg emissions in China have and will be constrained through the national policies of emission control. The growth in energy consumption and industrial production should not be assumed to be a proxy for growth in Chinese Hg emissions. Continuing to believe this will lead to overestimates of China's Hg emission growth and its contribution to atmospheric concentrations and deposition at global scale (lines 523-545 in Section 4.2 of the revised manuscript).

3) Quantitative analysis of uncertainty in Hg emissions, with most significant parameters contributing to the uncertainty identified.

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As stressed in AMAP/UNEP (2013), there were very few countries quantifying uncertainties in relation to their national emissions reporting, particularly for developing countries. In this work, therefore, a database for Hg emission factors with uncertainties estimated for all the anthropogenic sources is developed, combining the latest results from domestic measurements. Uncertainties in Hg emissions by sector, species and year are then systematically quantified for the country. In particular, we reveal that the uncertainties of China's Hg emissions are enhanced over time and analyze the reasons for that.

References:

AMAP/UNEP, 2013. Technical Background Report for the Global Mercury Assessment 2013. Arctic Monitoring and Assessment Programme, Oslo, Norway/UNEP Chemicals Branch, Geneva, Switzerland, 263 pp.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 26803, 2014.

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