

Interactive comment on “A high-resolution regional emission inventory of atmospheric mercury and its comparison with multi-scale inventories: a case study of Jiangsu, China” by Hui Zhong et al.

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Main revisions and response to reviewers' comments

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Title: A high-resolution regional emission inventory of atmospheric mercury and its comparison with multi-scale inventories: a case study of Jiangsu, China

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We thank very much for the valuable comments from the reviewer, which help us im-

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prove the quality of our manuscript. The comments were carefully considered and revisions have been made in response to the comments and suggestion. The major revisions were marked in red bold in the submitted manuscript. Our responses to each comment or suggestion are provided in details as below, along with the brief description on the revision actions taken in the revised manuscript.

In this study, the authors developed a high-resolution Hg emission inventory of anthropogenic origin for 2010. The provincial inventory was compared to selected global and national inventories. Discrepancies in emission levels, speciation, and spatial distributions are evaluated. The major contribution of the study is comparison of the inventories, and identifying the effects of different approaches and data on developing the inventories. The study is relevant since there are considerable information gaps between multi-scale inventories. The differences attribute mainly to the data of different sources and levels of details. A bottom-up approach used in this study could help improve the precision of the inventory.

Response and revisions:

We appreciate the reviewer's positive remarks.

Q1. A key question is, the authors indicated that part of the data are internal data from Environmental Protection Agency of Jiangsu Province, and the internal industry reports. We would like to see more explanations on these "internal data". (Line 128-131, could you provide more information on the PSC? Any difference between PSC and published statistical data? Line 180, please explain the internal industry reports.)

Response and revisions:

Pollution Source Census (PSC) was conducted by local environmental protection agencies, in which the data for individual emission sources were collected and compiled through on-site investigation, including manufacturing technology, production level, energy consumption, fuel quality, and emission control device. Compared to the energy

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and economic statistics at sector level that were commonly used in global/national inventories, we believe the plant-by-plant PSC data could provide more detailed and accurate information on individual emission sources, particularly for power and industrial plants. Moreover, differences in total energy consumption and industrial production levels exist between the PSC data and the energy/economic statistics. For example, the coal consumption by CPP in PSC for Jiangsu 2010 was 6% larger than the provincial statistics.

Internal industry reports indicate the association commercial reports that provide the activity data of intentional Hg use. Rarely included in the national or provincial statistics, the data were collected at <http://www.askci.com/>.

We have included the information in lines 128-138, Pages 5-6 and in lines 187-188, Page 7 in the revised manuscript, respectively.

Q2. Line 78, “there are currently very few studies focusing on Hg at regional/local scales”. This is not true.

Response and revisions:

We thank the reviewer’s reminder. The sentence was revised as “there are currently very few studies on Hg emissions at regional/local scales in China”, in lines 77-78, Page 4 in the revised manuscript.

Q3. It would be interesting if at the end of the manuscript, the authors might give some discussions on the possibility of overall underestimation of mercury inventory for China, not just for the province. That is to say, the same problems in other national inventories might happen in other provinces in China.

Response and revisions:

We thank the reviewer’s important comment, and it is similar to Q1 from another reviewer. Through the comparisons between provincial and other downscaled global/national inventories, it could be found that cement and iron & steel industries

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were the two most important sectors of which the Hg emissions were significantly underestimated by previous inventories. The underestimations came mainly from the ignorance of high Hg release ratio of precalciner technology with dust recycling, and/or application of relatively low emission factors for steel production. For example, the estimation of CEM and ISP emissions by the national inventory (Zhao et al., 2015a) was 77% lower than the provincial one, and the difference accounted for 30% of the total anthropogenic Hg emissions from the provincial inventory. Compared to the provincial inventory, for example, we could thus cautiously infer that Hg emissions might also be underestimated for other regions with intensive cement and steel industries in China in previous inventories. For other big sources, e.g., power plants and industrial boilers, the Hg emissions were influenced largely by the Hg contents in coal and the application of emission control devices. Whether the emissions of those sources were underestimated or not for other parts of the country could hardly be judged unless detailed information gets available for the regions. In general, however, the method developed and demonstrated for Jiangsu in this work could be promoted to other provinces, particularly for those with intensive industrial plants. With the detailed data on individual sources sufficiently applied, the accuracy in China's Hg emission estimation can be expected to be largely improved.

We presented the discussions in lines 666-682, Page 22 at the end of the revised manuscript.

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