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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Trend and characteristics of atmospheric emissions of Hg, As, and Se from coal combustion in China, 1980–2007" *by* H. Z. Tian et al.

Anonymous Referee #1

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Coal combustion is a major anthropogenic emission source of volatile trace metals Hg, As and Se. Development of an emission inventory of Hg, As and Se is of great significance for China as both the largest producer and consumer of coal in the world. The study conducted by Tian and coauthors provides a comprehensive inventory of Hg, As, and Se emissions with the details of economic sectoral contribution, temporal trend, and spatial distribution. In particular, within the reviewer's knowledge this paper is one of a limited number of studies on As and Se emissions.

Reliability and accuracy of such an emission inventory rely on data certainties of coal activities, metal contents in coal, and emission factors. Tian and coauthors determined

the mean Hg, As and Se contents in coal consumed in individual provinces based on literature reports on the metal contents in coal produced in individual provinces and statistics of inter-province coal flows. They also considered the dependence of Hg, As, and Se emission factors on the type of air pollution control devices and varying application rates of these devices over the time period of the study. Such efforts have made this inventory study more reliable and complete compared to others previously reported.

The reviewer believes that the paper is of the interest of the journal of Atmospheric Chemistry and Physics and recommends publishing this paper with minor revisions in response to the following questions and comments.

1. Equation (1) needs be revised to represent multiple APCDs operated in series.

2. Page 5, line 9: EF is the fraction of Hg, As, or Se released "from coal combustion" instead of "into the atmosphere".

3. Page 6, para.4: Is any justification for such an assumption that Hg, As and Se content in coal didn't change over the period of study.

4. Table 1 and relevant text: The national averages of Hg, As and Se contents in coal are estimated as the arithmetic means over the 30 provinces. They are misleading. Consider to use the provincial coal production- and consumption-weighted averages as the national averages.

5. Pages.10-11, emission factors: It's not clear of what percentages of different control devices are employed for power plants and industrial boilers, and the data source(s). In addition, it's mentioned in the paper that "we apply these time-varying provincial-level technology data for our emission inventory calculations". However, such data are not provided/described in the paper.

6. Figure 5: The growth rates of coal used in the power generation and industry in 2004 are close to those in 2003. We also see the annual growth rates of Hg are com-

parable between these two years. However, the growth rates of As and Se significantly decreased in 2004. Please explain why. 7. Page 16, 1st para., “The surplus emissions are distributed to each grid by applying the weighted factors (population, GDP, et.al)”: More detail is needed regarding what factors are used and how they are weighted for allocating the emissions to each grid.

8. Table 3: The Hg, As, and Se removal rates by various control devices such as wet FGD highly depend on the speciation of these metals in the flue gas (elemental vs. oxidized forms). Oxidized metals can be easily removed in WFGD compared to elemental forms. Coal properties such as Cl content impact the metal speciation in the flue gas, and thus the metal removal rate in WFGD. We suggest that in the future research the authors employ the EF of WFGD specific to the type of coal in each province rather than the same average for all the provinces.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20729, 2010.