September 3, 2010

Dear the Anonymous Referee #1,

Thanks for your valuable comments on our manuscript..

The paper entitled "Trend and characteristics of atmospheric emissions of Hg, As, and Se from coal combustion in China, 1980~2007" by Hezhong Tian, et al. (**acp-2010-484**) has been revised carefully according to your review reports and the request from the editor. In addition, we have tried to improve our English language, e.g. the use of the articles.

By now, all the corrections and responses have been incorporated into the new revised paper published on the online library APCD.

The detailed responses and corrections were listed as follows. If further responses should be made, please don't hesitate to let us know.

We do appreciate your valuable comments on our manuscript.

Yours Sincerely

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Detailed list of responses and modifications

Tiltle: Trend and characteristics of atmospheric emissions of Hg, As, and Se from coal combustion in China, 1980~2007

Corresponding Author: Hezhong TIAN

Manuscript number: acp-2010-484

No.	Page*	Line*	In the old version	In the new version	Relevant reviewer
1	2	20	Henan (33.63t), Shanxi (21.14t), Guizhou (19.48t) and Hebei (19.35t);	Henan (33.63t), Shanxi (21.14t), ***Guizhou (19.48t), and Hebei (19.35t)***;	author
2	2	22	(141.21t), Hebei (138.54t) and Inner Mongolia (127.49t)	(141.21t), ***Hebei (138.54t), and Inner Mongolia (127.49t)***	author
3	2	24	(175.44t), Anhui (168.89t) and Hubei (163.96t).	(175.44t), ***Anhui (168.89t), and Hubei (163.96t)***.	author
4	2	25	ranked at the top five largest Hg, As, and Se emission sources are: Shandong, Hebei,	***rank*** at the top five largest Hg, As, and Se emission sources are: Shandong, Hebei,	author
5	3	20	both total and wet due to high emissions from coal combustion is found	both total and wet due to high ***emissions*** from coal combustion is found	author
6	5	7	$E_{i,j} = C_{i,j} F_{i,j} EF_{i,j} (1 - P_{i,j})$	$E_{i,j} = C_{i,j} F_{i,j} EF_{i,j} (1 - P_{DC(i,j)})(1 - P_{FGD(i,j)})$	Referee #2 (No.1)
7	5	11-13	*C* is the averaged Hg, As, or Se content of coal as consumed in one province; *F* is the amount of coal consumption; *EF* is the fraction of Hg, As, or Se released into the atmosphere; *P* is the fraction of Hg, As, or Se removed by the existing air pollution control devices (APCD);	*C* is the averaged Hg, As, or Se content of coal as consumed in one province; *F* is the amount of coal consumption; ***EF is the fraction of Hg, As, or Se released from coal combustion; P_{DC} and P_{FGD} are the fraction of Hg, As, or Se removed by the existing dust collectors and FGD devices, respectively;***	Referee #2 (No.2)
8	6	3-4	As a result, the national averaged Hg content in coal as produced in China is estimated at about 0.180 mg/kg.	As a result, ***the national production-weighted averaged Hg content in coal as produced in China is estimated at about 0.185 mg/kg.***	Referee #2 (No.4)
9	6	13-14	Consequently, the national averaged As content of coal as produced in China is estimated at about 6.138 mg/kg.	Consequently, ***the national production-weighted averaged As content in coal as produced in China is estimated at about 4.853 mg/kg.***	Referee #2 (No.4)
10	6	23-24	Consequently, the national	Consequently, ***the national***	Referee #2

			averaged Se content of coal as produced in China is estimated at 4.073 mg/kg.	***production-weighted averaged Se content of coal as produced in China is estimated at 3.248 mg/kg.***	(No.4)
11	6	25-28	In addition, we assume that the averaged content of Hg, As, and Se of raw coal as produced did not change during the period of this study.	***From the literatures cited above, we did not find any distinct variation in trace elements content in coal samples reported among different years. Therefore, we assume that the averaged content of Hg, As, and Se of raw coal as produced did not change during the period of this study.***	Referee #2 (No.3)
12	7	6	areas to consumption areas, leading to remarkable difference between the trace element content in coal as produced and consumed in one province.	areas to consumption areas, leading to remarkable ***variation*** between the trace element content	author
13	7	17	Table 1 presents the calculated results of the weighted averaged Hg, As, and Se content of	Table 1 presents the calculated results of ***the weighted averaged content of Hg, As, and Se in*** raw coal	author
14	7	24-25	Consequently, the national averaged Hg, As, and Se content of raw coal as consumed in China is far lower than that of raw coal as produced.	Consequently, the national ***consumption-weighted*** averaged Hg, As, and Se content of raw coal as consumed in China is ***much*** lower than that of raw coal as produced.	Referee #2 (No.4) & Author
15	9	21	Coal consumption data by sector and type of coal products are provincial-level data compiled	Coal consumption data by sector and type of coal products ***is*** provincial-level data compiled	author
16	9	30	Although the use of cleaner high-quality energy such as Hydro-power, natural gas, wind	Although the use of cleaner high-quality energy such as ***hydro-power***, natural gas, wind	author
17	11	18-20	In this study, we apply these time-varying provincial-level technology data for our emission inventory calculations.	In this study, ***we compile and apply the time-varying provincial-level technology data (Wang, 1999, 2010; Jiang et al., 2005; Zhang, 2005; Streets et al., 2005; NDRC, 2008)*** for our emission inventory calculations.	Referee #2 (No.5)

				Some references were added to tell about the data sources of the time-varying provincial-level technology data	
18	12	4	consumption, total emissions of Hg, As, and Se in China have been growing steadily during	consumption, ***the*** total emissions of Hg, As, and Se in China have been growing steadily	author
19	13-14	31-6		***Further, we can find in Fig.5 that the growth rate of coal used in the power plants and industry in 2004 are close to those in 2003, and the growth rate of Hg are comparable between the two years. However, the growth rates of As and Se significantly decrease in 2004. This can be explained by the comprehensive effects of the difference in elements content in coal as consumed deduced from different inter-provinces coal flow matrix between 2003 and 2004 as mentioned before, the difference in allocation pattern of coal used in the power and industry among 30 provinces, as well as the difference in reduction efficiency of different dust collectors and FGD between Hg and the other two elements (see Table 3).*** One paragragh was added to explain why the difference of the growth rate of Hg and the other two elements between 2003 and 2004.	Referee #2 (No.6)
20	15	28	the largest ***contributors*** is the Central and Southern Region,	the largest ***contributor*** is the Central and Southern Region, a little different from Hg and Se.	author
21	16	18-23	The surplus emissions (including industrial sector, residential sector and other use) are distributed to each grid by applying the weighted factors	***Normally, most grids are composed of part or whole of several counties. The emissions from industrial sector are firstly divided into***	Referee #2 (No.7)

			(population, GDP, et al).	***each county with the proportion of industrial GDP in one province, and then allocated to each grid according to the share of each county-area in one grid. Whereas, the emissions from residential and other use sectors are firstly divided into each county with the proportion of populations in one province, and then allocated to each grid with the share of each county-area in one grid.*** One sentence was added to explain how the surplus emissions are distributed.	
22	25	3-6		***Wang Z.X. Status Quo and Prospect of Environment Protection of China's Elect ric Power. Electric Power. 32(10), 46-51, 1999 (In Chinese with abstract in English).*** ***Wang Z.X. Fly ash emission and control from coal-fired power plants in China. China Electric Enterprises Management. 1, 28-31, 2010 (In Chinese).*** Two references were added.	Referee #2 (No.5) & Author
23	26	1-2		***Zhang Q. L. Study on enhancing coal fired industrial boiler operation efficiency and saving energy measure. Clean Coal Technol., 11(2):5-10, 2005 (In Chinese with abstract in English).*** One reference was added.	Referee #2 (No.5) & Author
24	27	Table 1		***The item and value in last line of Table 1 was recalculated and revised.*** ***Modified from the arithmetic means to the provincial coal production and consumption-weighted average as the national averages.***	Referee #2 (No.4) & Author
25			Comments:	We have noted that the speciation	Refree

			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.	and removal efficiency of Hg, As, Se by WFGD are very sensitive with the coal properties, such as the Cl content in coal, and the air pollution control devices(ACPD) configuration, such as with/without SCR. We thanks the valuable suggestions of the anonymous referee #2. By now, it is not available for the detailed coal consumption data by different coal types in each province and economic sectors, and the field test data for removal efficiency of different types coal is still very limited. In our future research work, we are planning to do more field tests on different types of coal and APCD configuration for different coal-fired boilers, and collect more detailed coal consumption data in each province.so as to develop more reliable emission inventories.	#2 (No.8)

* The page and the line are based on the new uploaded version of the paper.