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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Impact of the East Asian summer monsoon on long-term variations in the acidity of summer precipitation in Central China" *by* B. Z. Ge et al.

**Anonymous Referee #2**

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This study first analyzed the summertime precipitation acidity data from the CMA-ARMN during 1992–2006 and its spatial features using EOFs. Secondly, CMAQ modeling and SVD method were adopted to study the influence of summer monsoon and associated rainfall on precipitation acidity, particularly in central China. Finally, by modeling approach, the contribution of pollutant emission on precipitation acidity was assessed. This study conclude that the East Asian summer monsoon can significantly affect the acidity of summer precipitation in Central China, further revealing a teleconnection between the pH in Central China and the rainfall in the middle and lower



reaches of the Yangtze River (MLYR). It is also shown that at least 60% of the variation in precipitation acidity in Central China can be attributed to changes in pollutant emissions. Overall, the approach is quite comprehensive, and the results are also reasonable. This manuscript can be accepted for publication after revision. Some major comments and suggestions are listed as follows:

1. On Page 19597, Line 20, why is the emission inventory of 2000 used for MC? Same as the meteorological dataset of 2000 for EC? No explanation is given in the manuscript.
2. On Page 19598, Line 10, modeled $SO_4^{2-}$ and $NO^-$ are compared with EANET for stations Hongwen in Xiamen and Guanyinqiao in Congqin (See Table 1 and Fig. 1, and later discussion in Section 3). Why not to directly compare with observation data of CMA-ARMN? Besides, since the focused regions are the Central China and Yangtz River, comparison made for these regions would be more meaningful.
3. On Page 19602, Line 1, a typo of "SE?" It should be "SC."
4. On Page 19602, Line 24, how to define the solid (high MI) and dashed (low MI) lines? The year of 2001 and 1993 is very close to the solid and dashed lines, respectively. They are hard to be defined!
5. The concentration unit used in Table 1 is not consistent with Figs. 8, 11 and 12. The former unit is more commonly used and easier for comparison. Similar expression can be found in the contents.
6. On Page 19604, Lines 6-16, the assumption of "the differences in the simulated $SO_4^{2-}$ and $NO_3^-$ concentrations result in corresponding changes in the precipitation acidity in Central China," should be based on the linearity of former two ions with pH. Obviously, this point is not demonstrated and clarified in the manuscript.

The summer monsoon contribution of 65% is obtained based on modeled sulfate and nitrate ions, thereby, deducing a contribution of 0.22 to pH difference. Is it the average over the Central China? Then, this average contribution is used to compare with the observed pH change in Fig. 3b (a typo of Fig. 1b in manuscript). In stead of regional average, why not to directly use the grid average to compare the observed pH pointwise? Then, the range of pH changes for all points (stations) due to corresponding sulfate and nitrate can be obtained.

7. Following Comment 6, in Table 1, the bias between observed and modeled sulfate and nitrate is shown. Then, how can we evaluate the summer monsoon contribution only considering the modeled two ions?

8. On Page 19604, Lines 20-24, it is an incomplete sentence.

9. On Page 19605, Line 2, "velocity" can be replaced by "rate".

10. Heading of Section 3.3 is suggested to change to "Characteristics of modeled $SO_4^{2-}$ and $NO_3^-$ ....."

11. Many important references cited are in Chinese which would not be easily found.

12. In Table 1, one decimal digit for the mean, std and error should be enough to read.

13. Incomplete caption of Fig. 1.

14. Unit is missing in Fig. 12.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 19593, 2010.