

## ***Interactive comment on “Impact of open crop residual burning on air quality over Central Eastern China during the Mount Tai Experiment 2006 (MTX2006)” by K. Yamaji et al.***

### **Anonymous Referee #1**

Received and published: 2 December 2009

#### General comments:

In this study, the influences of open crop residual burning on the air quality over the Central Eastern China (CEC) in June 2006, the period of so-called the Mount Tai Experiment 2006 (MTX2006), were investigated using numerical simulation. In comparison with previous studies of MTX2006, the major difference in the module design of this study is that the emission of open crop residual burning was schemed into a daily gridded emission inventory upon an annual emission inventory in terms of provincial districts of China, the land cover gridded database and the MODIS fire (hotspot) database. The simulation approximately reproduced the day-to-day variations of O<sub>3</sub>,

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Interactive Discussion

Discussion Paper

Interactive  
Comment

CO, BC and OC observed at the top of Mt. Tai, well reflected the polluted episode of 5-7 June, but failed in capturing the polluted episode of 12-13 June. Some new results were obtained, such as the contribution of the open crop residual burning to the observed O<sub>3</sub>, CO, BC and OC at the top of Mt. Tai. However, I have several concerns on these results.

One of my major concerns is about the uncertainty and confidence of the simulation results. Although authors discussed the reasons for the discrepancies between the simulation results and the observations, almost all discussions are very vague without evidence. For example, authors raised several reasons for the failure of the model in capturing the polluted episode of 12-13 June, such as the inaccuracy of emission information, the ability of the model to reproduce the polluted episode due to the vertical and horizontal resolutions, the ability to simulate boundary layer evolution, and the boundary conditions (Page 22120-22121). But they did not provide any further information on these points. This leaves a question that, to what extent, the comparisons of the model simulation and the observation at the top of Mt. Tai about the first polluted episode and the monthly-averaged results are meaningful. As mentioned by the authors, the model is insufficient to reproduce “atmospheric phenomena” relevant to an isolated mountain such as Mt. Tai (Line 23-25 Page 22120). The confidence of the comparisons sounds very low.

Another major concern is the application of observations at the top of Mt. Tai in the comparison with the simulation to investigate the “impact of open crop residual burning on air quality over the CEC during MTX2006” (the title of this paper). The top of Mt. Tai is a very special place within CEC. Observations there cannot reflect the general air mass characteristics of the CEC. Without a comparison with an observation at a ground site, the impact is difficult to be properly investigated.

In addition, the abstract and text are tedious. There are several repeats. Many descriptions are difficult to follow. Words and grammars need to be checked carefully. I list some specific comments and technique corrections for reference.

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For these reasons, I recommend the reject. I am sorry I cannot be more positive.

Specific comments:

1. Abstract (page 22105-22106): Geographical location of CEC in latitude and longitude is necessary.
2. Abstract (page22105-22106): It needs to mention that observation results at the top of Mt. Tai are applied in the comparison with simulation. The geographical position and altitude of Mt. Tai need to be shown.
3. Introduction: Also in the following descriptions, names of provinces of China and geographic regions such as CEC and the North China Plain are used. It is very difficult for readers who are not familiar with the district divisions of China to follow descriptions including these names.
4. Line 2 - Line 4 page 22110: Reasons for the adjustments in this study need to be addressed more clearly because this is the base of this study. The descriptions here sound that the adjustments still have a lot of problems. Readers need to know these uncertainties in order to correctly understand the results of this study. By the way, readers who are not familiar with the district divisions of China cannot understand the geographic positions of the provinces from the names.
5. Line 25 page 22112 - line 9 page 22113: Details of allocating the annual emissions in province level into daily gridded database are necessary. How were the data of land cover, population distributions and etc. applied in the inventory preparation? How was the normalization of 5-day fire data conducted? Does the data processing have any influence on the simulated daily results which are investigated in this study?
6. Section 3 (page 22114 - 22115): As mentioned in the major comments, the confidence of the model design and the comparisons of simulation results with the observations at the top of Mt. Tai need to be addressed. The sensitivity experiments are not for the evaluation of the model ability.

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7. Line 17 page 22116: The reason of using the simulated results at about 1000 m to compare with the observations at the top of Mt. Tai (the altitude is 1533m) is necessary.
8. Line 26 page 22116 - Line 4 page 22117: Are these results stated according to the simulation?
9. Line 3-Line 11 page 22118: It is very difficult to follow these descriptions.
10. Line 8 - line 11 page 22120: Authors here attribute the reason for the discrepancies between the simulation and the observation to the inaccuracy of emission data. But if the model cannot properly simulate the upward flow along the slope, which took the pollutants to the top (authors have mentioned that the model cannot reproduce the local weather conditions and also report in the next paragraph that the model often failed in simulating the upslope motion of polluted air mass), evidences are necessary to show that the discrepancies are not caused by the poor ability of the model.
11. Line 23 page 22120 - Line 1 page 22121: These descriptions sound that comparisons of the simulation results with the observations at the top of Mt. Tai in this study are not appropriate.
12. Line 4 - line 9 page 22121: Several reasons are raised without clarifying which one should be responsible for the discrepancies between the simulation and the observation. This makes the meaning of the following descriptions about the inter-comparisons between model experiments very questionable.
- 13 Line 16 - line 20 page 22123: The discussion is very vague.
- 14 Line 29 page 22123 – Line 2 page 22124: How did the smooth hotspots and total biomass burning emissions cause the differences between the model simulations? This is very important for the comparisons of the model experiments.
15. Subsection 4.2.3 page 22125: This part could be largely simplified because of the lack of open crop residual burning.

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Technical corrections:

16. Some improper words or inputting errors:

“was”: line 19 page 22108

“NOCECwashighestinJunex”: Line 21 page 22113

“and that mean that ..”:Line27 page 22118

“direct differences”: line 20 page 22121

“. and overlooked some small-scale burning.”: Line 29 page 22123

“The last 10 days of June was not a hotspot”: line 9 page 22125

17. Some references are not in the requested form.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 22103, 2009.

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