

Interactive comment on “Impact of biomass burning on haze pollution in the Yangtze River Delta, China: a case study in summer 2011” by Z. Cheng et al.

Anonymous Referee #3

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The authors are taking advantages of an open biomass burning episode observed at five stations in the Yangtze River Delta area in China to study the processes leading to such an episode and its impact on PM 2.5, organic carbon, and elementary carbon loads. Based on observations first, the study is then completed by HYSPLIT back-trajectory analyses and an air quality modeling study which both help in understanding the regional origins of the pollution observed at each station.

The manuscript contains interesting findings and the scientific contents match the ACP standard. However, some points in the manuscript, listed below, remain unclear and need to be addressed before this article deserved to be publish in ACP. Technical or

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spelling issues are also listed below.

Comments:

Abstract:

In the abstract, the sentence L 11 starting with “Daily minimum mixing...” is not corresponding to any point discuss in the paper. It should be remove or alternatively, the authors should discuss the low mixing depth values within the text.

Introduction:

p. 30690, L16-27: Please be more precise with the time scale of the numbers and percentages your giving in this section. Are the values corresponding to decadal mean, annual mean, monthly mean ? This information will be important when discussing your data.

p. 30691, L1-3: A reference is needed here to support this statement.

Other studies on biomass burning episodes in China using modeling approach to identify source regions need to be mention in the introduction (e.g., Fu et al. 2012; Wang et al. 2007). A short paragraph must be added here in which similar studies could be used to put this study in context.

Materials and methods:

p. 30692, L. 13: “Soil was... “. I’m not sure to understand what the term “Soil” is used for. Can you clarify this terminology ?

p. 30692, L. 15-16: The sentence “The trace elements...” is unclear and need to be reword.

P 30693, L. 14: Please add words to clarify that you are now writing about your study. (e.g., “In this study, non-soil...”)

Section 2.4: WRF/CMAQ model:

(i) References are needed for the WRF and CMAQ models. (ii) p. 30963, L. 26. “... while the WRF domain was a 12 km extension in four directions.” This sentence is

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unclear and need to be clarify. Are the WRF and CMAQ domains different ? (iii) How are distributed the fourteen vertical levels ? How many of them are representing the boundary layer ? (iv) The authors referred to a paper by Fu et al. (2013) in which “the detail model configuration and parameters” are given. However, the Fu et al.(2013) paper is describing an emission inventory and no mention of a modeling study (at least involving WRF/CMAQ) is done in it. Please replace this reference by the correct one or alternatively, insert a description of the model configuration and set-up in the text. (v) Whatever the way the point (iv) is addressed, a brief description of the aerosol scheme used in the simulations is necessary (e.g., modal or sectional approach, organic carbon specific treatment ?)

Results and Discussion:

p. 30694, Were the five stations set-up for a specific field campaign or are they measuring continuously all over the years ? If long-term measurements are available, it would be great to compare the haze episode daily average with the daily average over the entire year.

p. 30695, L. 23: Please mention that you now move to observations from an other instrument/technique. Are PM 2.5 observations from the filters in agreement with these from TEOM ?

p. 30696, L. 2-4: The sentence starting with “The increase in OM, ...” Why were the meteorological conditions responsible for the secondary aerosols formation enhancement ? More explanations are needed here such as a reference to support this statement.

p. 30696, L. 13-24: Are all the informations given regarding the overall stations ? If yes, please mention it in the text.

p. 30696, L. 19-20: “...increased more rapidly...” This expression doesn’t sound scientifically rigorous, please reword.

p. 30696, L. 22-24: Sulfate and Nitrate aerosols are anthropogenic pollution markers.

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Can their concentrations increased be linked to an anthropogenic influence, in addition to the biomass burning described in the paper ?

p. 30696-30697: The sentence starting by “The map show...” should be rewrite since 28 and 29 May maps are not shown in Fig. 4.

p. 30698, L. 2: “The mixing depth of Nanjing site during...” Is is the mean value along the period ? If it is, please mention it.

p. 30698, L6-10: The statement given here that the (very) low increase in wind speed would enhance the horizontal dispersion and the result in the temporary reduction of PM concentrations should be support by a reference to a relevant study or remove. Also, the visibility in Nanjing is anti-correlated with the relative humidity during phase I but also during phase II. Does this mean that the pollution doesn’t impact the visibility in Nanjing as much as at the other sites ? Why would that be ? This should be discuss in the text.

p. 30698, L. 16-17: Regarding back-trajectories on Fig. 7. Informations on the back-trajectories time scale and the altitude would be useful. Over how days are plotted the back-trajectories ? Are the back-trajectories staying in the boundary layer ? Several back-trajectories, especially on May 31 are coming from over the ocean. How this is influencing the observations ? Also, Fig. 7 would be clearer if the regions presented in Fig 1a were highlighted in it. This would be especially useful when one will confront the results presented in Fig. 9 with the back-trajectories.

P30700, L. 4-8: The correlation coefficient between the observed and simulated PM 2.5 concentrations would be very useful, in addition to normalised mean bias, to support the statement “Figure 8 compared the modeled and measured . . . as measurements.”. The authors should add it in Fig. 8 or, alternatively, in a separate table.

p. 30700, L. 13-14: Conversely, the model is simulating PM 2.5 peaks while observations are flat. This is particulary true for Ningbo (on 4, 5 and 7 June) and Suzhou (2 and 4

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June). Is this also due to the uncertainties in the biomass burning emissions ? Using the modeling approach presented later in this paper, is it possible to identify the origins of these “fake” contributions ?

p. 30700, L. 15-17: It is claimed here that “the simulated meteorological fields and other anthropogenic emissions have been verified at other sites”. This should be moved to the beginning of the paragraph and completed with more information, i.e., a table with numbers, a figure with time series, or a reference to a paper which is providing such comparisons.

p. 30700, L. 24-25: The sentence “Another reason...of supporting data.” is senseless and needs to be reworded.

Fu, J. S., Hsu, N. C., Gao, Y., Huang, K., Li, C., Lin, N.-H., and Tsay, S.-C.: Evaluating the influences of biomass burning during 2006 BASE-ASIA: a regional chemical transport modeling, *Atmos. Chem. Phys.*, 12, 3837-3855, doi:10.5194/acp-12-3837-2012, 2012.

Qiaoqiao Wang, Min Shao, Ying Liu, Kuster William, Goldan Paul, Xiaohua Li, Yuan Liu, Sihua Lu, Impact of biomass burning on urban air quality estimated by organic tracers: Guangzhou and Beijing as cases, *Atmospheric Environment*, Volume 41, Issue 37, December 2007, Pages 8380-8390, ISSN 1352-2310, <http://dx.doi.org/10.1016/j.atmosenv.2007.06.048>.

Technical review:

Abstract:

L. 14, “air model simulation”, do you mean “air quality model simulations ?”

Section 2:

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p. 30692, L. 3 replace “TOEM” by “TEOM”

p. 30692, L. 13 “measurements”

p. 30694, L. 11 replace “... and an additional five runs dropped biomass emissions...” by “... and five additional runs in which biomass burning emissions were dropped...”
Are they dropped to zero ? If yes, mention it.

p. 30694, L. 15 Instead of “grids”, you probably mean “grid cells” here ?

Section 3:

p. 30695, L. 12 replace “...measured the average concentrations of PM2.5 and PM10 of...” by “...measured PM2.5 and PM10 average concentrations of...”

p. 30697, L. 20: replace Table 2 by Table 1.

p. 30698, L. 17: Replace “... fires under high cloud cover...” by “...fires due to high cloud cover...”

p. 30698, L. 19: Switch “Nanjing” and “the four other sites”.

p. 30699, L. 1: replace “for five sites” by “for the five sites”.

p. 30699, L. 12: The expression “...which is well understood...” should be replaced.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 13, 30687, 2013.

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