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Biomass Burning Aerosols and the Low Visibility Events in Southeast Asia

by

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General comments:

The manuscript addresses an emerging issue for Southeast Asia which concerns the impact of biomass burning on air quality and visibility. The topic is highly relevant for publication in Atmospheric Chemistry and Physics, however major issues related to the form in which the work is structured and presented (i.e. a whole rewriting of the paper is needed), clarifications in methods and analyses need to be addressed. The overall work needs to be synthesized both in the text and in the selection of the figures presented (of the 13 figures included some of them duplicate information included in other ones. If the authors want to keep all of them, they should consider moving some of the figures to the Supplementary Materials).

Specific comments:

Language

A major rewriting of the paper is needed. Several sentences are not fluent and a grammar/ punctuation check is needed. Below are some examples:

Line 32: remove "that"

Line 33: favorite should be "favourable"

Line 41 and other parts: please be consistent with the tense you use. ….

Line 55: "put in effect", replace with "implemented"

Line 82: please check your references (e.g. Miriam is the first name)

Line 118: "the great Southeast Asia" should be replaced with something similar to "over the whole Southeast Asia". Please check also elsewhere in the paper.

Line 135: please rephrase

Line 168: "estimations" should be always replaced with "estimates"

Line 172: remove "with"

Line 178: "comparing" should be "compared". Please amend this everywhere in the paper.

Line 190-202: please rephrase and summarize. This paragraph is too repetitive and needs to be more concise.

Line 211: units, please replace also elsewhere

Line 236: "this" is missing

Line 294: "so that" is very often used incorrectly. Please check all the occurrences.

Line 343: "are occurred", should be "occurred"

Line 515: "reasons" should be "seasons". Please check also other typos.

Line 518-519: Please rephrase

Line 571-580: this section needs to be rewritten. Sentences are too long and convoluted and several grammar errors are present.

Methods:

All the introduction regarding WRF is not needed since you are using a modified version of WRF-Chem. Also you start introducing the model and have section 2.2. describing the emissions and section 2.4 discussing again the simulations. The whole method section has to be reorganized (e.g. have one section discussing the data, one on the model and one on the methods used). Please be more concise and avoid repeating the same information in different sections.

Line 123: please refer more precisely to your "targeted science questions"

Line 139: you mostly focus on visibility so please also add that.

Line 145: this is redundant information, please remove it.

Line 146: The reported time step is for chemistry or physics?

Line 165: Did you only include fire emissions? Does WRF-Chem use other anthropogenic emissions?

Line 208: this should be rephrased by saying what you used for computing visibility.

Line 213-216: please add a reference and rephrase

Line 222: please be more specific by explaining how you will use the GSOD data and to address which objectives

Line 219: add "by increasing bext"

Line 225: Here you introduce model simulations, but you have a section later discussing that. You should reorganize the methods and be more clear on the objectives you are addressing. "In order to compare with observations", what do you mean? Are you referring to a model evaluation? If so please explain in the relevant section how you will perform it.

Line 227: is there a reference you can quote for these assumptions? Or some local measurements used to estimate those parameters?

Line 225-233: this paragraph should be clarified. It is not clear how you link the discussion on fire emission composition, hygroscopic growth, etc. with your work. If it is for general overview purposes, please add it to the introduction or remove it.

Line 238-239: again this is repetition of definitions already given. Please remove this from here and elsewhere in the manuscript.

Line 268: what is the NCAR_FNL? You have not introduced that before. Please add a reference for all datasets used.

Line 267-272: this paragraph needs to be rewritten. Is there any difference between precipitation simulated with NCAR_FNL and FNL_FINN? Otherwise synthesise this result by comparing the simulations run with FNL and ERA. What does it mean "both results appear to be higher"? Please rephrase.

Line 301: LVDs and VLVDs have already been defined so avoid repetitions.

Line 332: how can you distinguish the evets caused by fires? Is it because your simulations do not include other anthropogenic emissions? Otherwise please explain how you conducted your analyses.

Line 349-362: please rephrase to remove repetitions.

Results

Line 374-384: this part should be moved to the methods. You need to define earlier how you will conduct your analyses. Also using LVD in equation 3 might be more appropriate than C(i).

Line 432: here it would be also interesting to compare with the WHO limits (i.e. the limit for annual mean $PM_{2.5}$ is $10\,\mu g\,m^{-3}$).

Line 590: Section 4 should be rewritten. The way results are presented is too repetitive and convoluted. It would be also easier for the reader to have some clear sentences summarizing the skills of different models/emissions.

Figures

Thirteen figures are really too many especially since most of them have several panels. Please select the most critical ones to summarize your findings and move the others to the supplementary material. Also some figures duplicate content shown in other, so either delete them or move to the supplements.

Figure 1: the number of vertical levels cannot be inferred from the figure, so please remove this part of the sentence from the caption. Also, the letters A-D are not easily readable. Please choose different colors.

Figure 2: $PM_{2.5}$ on the y-axis is not as subscript 2.5. It would be easier for the reader to have the whole name of the regions on top of each panel.

Figure 3: is this the yearly average of the daily means? The units can be put after "precipitation".

Figure 5: From panel (a) it is clear that the model highly underestimates observations and a scaling factor is needed. This has to be commented in the text. Could you also start both the y-axes from 0? A scatter plot might also help in quantifying the underestimation or please provide some more statistics for model evaluation.

Figure 6. What do you mean with "variation"? How did you compute it? Please also report the meaning of the color coding in the caption.

Figure 7: Please define "variation" or rephrase. Please do the same for all other figures presenting that wording.

Figure 8: (a) please rephrase saying that the size of the circles indicates the number of days and the colors refer to specific population weights. (b) Please add units on y-axes and mention in the caption the use of different scales.

Figure 9: region s1-s5 are not reported on the panels, so please remove them from the caption and simplify the caption as well. Also it is not clear why you report the results separately by region instead of on one single figure. Figure 9 is essentially identical to Figure 10 averaging on a different period, so you can have just a four panels figure with on each panel a map showing different seasons and the 5 regions together and two panels with the same for wet scavenging. Otherwise you need to move one of the two figures to the supplements.

Figure 11: this is again a repetition of Figure 7. Either you condense the information in one figure or move some of the material to the supplements. It is very hard to keep in mind so many similar figures and your key message is not delivered effectively.

Figure 12: Why do you have y-axes with negative numbers? You are displaying PM concentrations and precipitation, so your minimum value should be zero. This figure again contains information already presented (Figure 11, 7, 13), so please try and condense the figures or move them to the supplements. The captions of all figures should be also more informative on the message you want to deliver to the reader.