Geoscientific
Model Development
Discussions

Interactive comment on "Evaluating a fire smoke simulation algorithm in the National Air Quality Forecast Capability (NAQFC) by using multiple observation data sets during the Southeast Nexus (SENEX) field campaign" by Li Pan et al.

Anonymous Referee #2

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This article conducts the evaluation the NAQFC simulations including fire smoke particulate (PM25) emission using observations from in-situ, aircraft, and satellite measurements. Several useful indicators/methodologies had been described in this article to identify the signal of fire smoke influence. This article shows valuable information on future evaluation of the impact of fire smoke emission on modeled PM25, as well as the improvement of air quality modeling. However, the manuscript may need major revision to polish its statements for reader to easily understand the message that authors want to deliver. I often found myself taking too much time trying to understand what au-

thors want to say in a paragraph and between paragraphs. This is a common problem of the writing of this manuscript. It lacks transition wording to connect idea between sentences in a paragraph as well as between paragraphs, e.g., the paragraph [lines 461-471] discussed below. I encourage lead author to work closely with co-authors to make the reading easier to deliver the value of this study.

General comments

(1) It may be just a personal preference issue, but I suggest authors to rewrite sentence started with "we will compare…." or "our simulation…" TO "this study will…", "the results show…", "the comparison between A and B indicates…".

(2) Replace current sentence using "- -" with a complete sentence, e.g., lines 339 and 408.

(3) Some description belong to figure or table caption and can be removed from main body. It may be easier to understand the main issue, e.g., Lines 323 to 328.

(4) Avoid adding a single (maybe unrelated) sentence in the middle of a paragraph to stop the flow of message, e.g., line 317 "The ASDTA is a signature identification analysis.". Do not try to clog the article with extra information. Just a few simple and focused descriptions can better deliver your message.

Specific comments:

(1) Lines 76-79:

a. The composition of HMS sources are different now from the time this manuscript submitted. To avoid confusion, please add "At the time of this study" at the beginning of the paragraph.

b. MODIS and AVHRR is sensors while GOES-12, NASA EOS Aqua, and NOAA-15 …etc. are satellites. Please spell out 15/17/18 as NOAA-##. Consider using [. ….the fire detection from "sensor" on-board "satellite". . .. ..].

(2) Lines 240-249:

a. How did authors come up with threshold values, i.e., > 20%, < 50%, and < 1? Please provide the reference of the source of the threshold.

b. Please add "ratio" to the column title of table 2, for columns 9-14.

c. My understanding of this paragraph is the ratio should be > 1.2 for EC, OC, and K, < 0.5 for NO3- and SO42-, and < 1 for soil to be classified as "influence by fire smoke". But Table 2 shows NO3- and SO42- ratios at COHU, MACA (two date), and GRSM do not satisfy the criterion, is my understanding wrong? Maybe simply spelling of conditions based on ratio values, such as ratio A > thrershold 1, ratio B < threshold 2, and ratio C >= threshold 3.

(3) Lines 312-315

a. My knowledge about ASDTA indicates the description of ASDTA is incorrect. AS-DTA uses satellite observed AOD and meteorological fields from the NCEP operational meteorology model. It does not use HYSPLIT model simulated output. Authors should verify their description with NOAA NESDIS developers of ASDTA.

b. If (a) is correct, please replace all "predicted" ASDTA products with "diagnosis" ASDTA products in manuscript.

(4) Lines 341-348 are difficult to understand. My guessing is the authors trying to explain why CMAQ can not capture the fire signal because of (a) do not have a dynamic LBC including the trans-boundary influence of fire smoke PM25 originated from fires outside modeling domain (b) plume rise scheme difference, and (c) different number of fire hotspot used. (c) May not be totally correct, in my opinion, the number of hotspot difference is attributed to difference of domain coverage where HYSPLIT domain is larger. The different model performance between CMAQ and HYSPLIT is already explained by (a), i.e., the HYSPLIT can simulate the long rang transport impact of Canadian fires because it has the fires within its domain.

C3

(5) Line 399, the first appearance of "acetonitrile" in this manuscript. Is it CH3CN? Otherwise there is no description in previous paragraphs that this chemical species can be used to identify fire signal.

(6) Lines 461-471

This paragraph show-up from nowhere and it seems to me has no connection to this study. It is more like a personal experience on the difficulty of fire smoke modeling. I do not know whether items 1-4 are concluded as a result from diagnoses of this study, from a common knowledge of the community, or simply speculation?

Since I really have trouble to comprehend the paragraph, I am going to make a bold guess and recommend authors to re-word this paragraph as

The comparison of A in this study shows [item 1]. But [item 2] of this study indicates there are other factors. It is commonly known that [item 3] can impact the results. Thus [item 4] found this study can be used to improve [item 5]. . . .etc.

(7) Color bar is needed for Figures 7a, 7b, 7d, and 7e, otherwise simple description is needed to let reader know the direction of changing color corresponds to the increase/decrease. Also, those figures are colored-shaded plot. They are not contour plot. The description of figures should be corrected in manuscript.

(8) Figures 9b. Can not see the color of circles for CH3CN concentration.

C4