

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 #1

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This paper focuses on the evaluation of the HMS-BlueSky-SMOKE-CMAQ fire emissions and smoke plume prediction system and is based on using multiple observational data sets. The results show that the system may capture most of the observed fire signals but missed fires that do not have satellite-detected visible smoke plumes. The paper also provides methods to filter out fire signals by using observational data.

The generation of fire emissions and smoke plume prediction system could help in the prediction of smoke impacts in advanced air quality modeling and forecast systems. This topic is important. However, at present, the manuscript has a number of concerns,

C1

the first of which is the grammar and precision of the text. Further, the manuscript, at present, is overly long and laborious, and at times reads more like a user's manual. It should focus on the actual scientific developmental issues and evaluation steps. Further, it uses “qualitative evaluation” not “quantitative”, aimed primarily at timing. This is a real shortcoming.

Main Comments: 1. The manuscript should have undergone a bit more editing before submission. A few specific grammatical issues are laid out below.

2. HMS hot spots data may miss lots of small fires (e.g. prescribed burns) in the Southeast. Emissions from prescribed burning accounts for about 50% of the total fire emissions according to 2014 NEI. The uncertainty of this data set may be larger than the original thought. Even including multiple satellites, compared the usual resolution (500m~2km) of those satellites with the size of small fires, satellites' resolution is still not fine enough. Ground-based data sets could be considered. Many states have permit authorization systems to manage the local prescribed burnings.

2. Is there any record of the fires (prescribed fires and wildfires) during the SENEX campaign period instead of the satellite-detected hotspots and smoke? The ground-based records may be useful to find the difference between satellite-detected information and the truth. From the IMPROVE data analysis, five fire events were observed at four IMPROVE sites. What about the true situation?

3. Line 366-367, HMS did not show any hotspots or smoke plume. This doesn't mean there was no fire. Small fires could be present.

4. All the analysis in the paper related to fire are based on HMS hotspots and smoke plume. These satellite-based observations may lead to large uncertainties in the simulations because of the missing of small fires and the limitations in satellite retrievals.

In the Abstract, It says the systems are similar. . . how dissimilar?

Awkward “both initiating fire emissions and evaluating model simulations”

C2

They keep referring to uncertainties. Do they mean uncertainties or biases? They should try to better understand if there are identifiable biases.

Watch how you use “Therefore”.

You are developing a system to predict fire impacts, but you call them “unpredictable”. Seems contradictory. Awkward “Due to the large uncertainties of fire emissions and smoke simulations” Should be “Due to the large uncertainties in the estimates of fire emissions and simulated smoke impacts.” There is no uncertainty in the emissions themselves (just the estimates).

Awkward “capturing capacity” should be capability.

Unnecessary “In this section we introduce the NAQFC Fire modeling system used in the study.” (Actually, the whole paragraph should be shortened to one sentence that actually adds information.)

The paragraph starting with the NOAA NEDIS . . . is poorly constructed and suggests that much more effort is required in editing the manuscript for submission. MODIS –Terra and Aqua: This means something only to people who know the link between MODIS and Terra and Aqua. Further, what is listed is a combination of either the satellite or the instrument. What is the date supposed to mean? What is the association between HMS and a satellite?

Do they mean “analyses” in “data analyst process manually”

The sentence beginning on line 82 is both long, and needs some punctuation. The prepositional phrase is ambiguous to where it refers.

The reader does not need to know the specific file names developed. This goes in supplemental, if not just reference to a user’s manual.

“over eastern US” needs an article.

Line 192: it should be “concentrations”.

C3

Line 207. They say that the general lack of large fires made the evaluation difficult. This should be considered in how this paper is laid out, and the general viability for publication.

Line 215: Needs punctuation.

Line 217: To what does “That” refer? The model perspective?

The use CMAQ 4.7.01. This is getting pretty dated. Any guidance on how using the older version impacts simulations?

Using K has limitations in terms of identifying fires, as it is also present in dust. To what degree did this impact the evaluation?

Line 448: “kin”?

“MACA” is not an IMPROVE site. It is the abbreviation used to refer to Mammoth Cave” (Ditto for other IMPROVE sites).

Line 451: The sentence starting (2) Analysis. . . is very awkward.

In summary, the article could, potentially, be a solid contribution to the literature, but at present is not ready for publication or further detailed review. There is too much editing to be done to the manuscript for this round to be viewed as final. The manuscript should be more focused and concise. There should be more quantitative evaluation, if only to show the direction of the necessary steps forward.

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2017-207>, 2017.

C4