



EGUsphere, referee comment RC2  
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## **Comment on egusphere-2022-18**

Anonymous Referee #2

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Referee comment on "Reduced surface fine dust under droughts over the southeastern United States during summertime: observations and CMIP6 model simulations" by Wei Li and Yuxuan Wang, EGU sphere, <https://doi.org/10.5194/egusphere-2022-18-RC2>, 2022

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Review of "Reduced surface fine dust under droughts over the southeastern United States during summertime: observations and CMIP6 model simulations" by Li and Wang

Fine surface dust in the southeastern U.S. is known to increase during summer months due to long-range transport of North African dust to the region. This manuscript investigates dust-drought relationships in the region and changes in large-scale atmospheric variability and teleconnections with drought and dust transport to the SEUS. Evaluation of global transport models against observations also elucidate the ability of models to capture these connections during severe drought periods. The manuscript is well-organized and written, and is an important contribution to the literature. I suggest publishing after minor corrections based on the comments below.

Line 97: Can the authors provide more details regarding completeness criteria for including data from these sites? How do the different sampling periods at some sites (6-day vs 3-day) affect daily interpolations? Also, additional sites come on-line during this period (2000-2019), did the authors only use sites that were operating during the entire period? Adding sites for different years could bias the results from year to year. How did the authors treat the bias between the CSN and IMPROVE dust concentrations when combining the data? (e.g., Gorham et al., 2021; Hand et al., 2012).

Line 117: From 1996 until when?

Line 134: If am I understanding correctly, under extreme drought conditions the data for each site could correspond to different days?

Line 157: The shifts in Figure S1 appear different for both CONUS (severe drought is shifted further) and for the SEUS, it is not shifted as much. Can the authors elaborate?

Line 170: I am not sure I follow the reasoning for conducting the linear regression only using the lowest for SPEI bins. It would seem that the reasoning for doing this should apply to both the west and the east. Otherwise, it appears the data points are being ignored to get the desired results.

Line 187: How did the authors determine how the southeast region defined with the box shown in Figure 1a? How did they decide on the lat/lon limits or sites to include?

Line 207: How were these particular limits chosen?

Line 207: It also helps clarity of writing to include the opposite description in the text and not just parentheses (here and other places in the manuscript and captions), such as "Regional severe drought (non-drought)...". Unless there are page limit and space issues, it causes more effort to understand than to just write it out.

Line 212: Are these droughts limited to the SEUS region mentioned above?

Line 214: How was this AOD limit chosen?

Line 259: Can the authors comment regarding the years with severe droughts that aren't associated? Such as 2000, 2007, 2019?

Line 319: Include units with 4.76.

Line 331: Typo: "unite"

Line 355: It may be less confusing to write this as that conditions that caused reduced transport of dust also correspond to period with drought conditions (so it doesn't seem that drought conditions in the SE are somehow causing less dust transport from Africa). The description in line 359-361 clarifies this but it could be misinterpreted here.

#### References:

Gorham et al., 2021, "Comparison of recent speciated PM2.5 data from collocated CSN and IMPROVE measurements", *Atmospheric Environment*, 244, 117877.

Hand et al., 2012, "Seasonal composition of remote and urban fine particulate matter in the United States", *JGR-Atmospheres*, 117, D05209.

#### Figures

Figure 1: Include JJA in the caption for part (a). Are the results shown in part (b) also for JJA?

Figure 2: Typo for part (b): "reginal". Do these results correspond to all time periods?

Figure 3: Why were only IMPROVE data used (not CSN)?

Figure 4: Type in legend of part (a): "sever". Also typo in caption: "Carrabin". Include the wavelength of AOD in the caption.

Figure 5: Are these changes based on severe droughts only in the SEUS region? What years are included in this figure?

Figure 6: Include time periods in caption.

Figure 7: Include time periods in caption.

Figure 8: Line 306 states JJA but this legend reads "all months". What is the time period? Include time period in caption. Also include that the dashed line corresponds to 1:1.

Table:

Table 1: Include time period in caption