Review for An evaluation of the U.S. EPA's correction equation for Purple Air Sensor data in smoke, dust and wintertime urban pollution events by Jaffe et al.

Overall, the paper is interesting, and nice findings are presented in it. However, I do think additional work is needed to improve the paper writing mainly to clarify some unclear points and improve the writing. I think additional work is needed on the result part, for example, expanding and showing additional figures for more locations/examples. The quality of the writing for section 2 of the dust seems different from the other parts, I highly encourage the author to improve that part, expand the explanations and also expand the discussions which seem very low. While the work on the dust is very important, I think the author should distinguish between the two dust events used as part of part 1 and part 2. When you define dust events as part of the 50 events reported it is important to note these are long-transfer dust and not local ones (as in part 1) these two types might be different (different particle sizes and concentrations).
There is a threshold for dust based on the $PM_{2.5}/PM_{10}$ ratio (Line 75), which is a value lower than 0.35 (Sugimoto et al 2016), there had been some work in the US that show these values for dust event (e.g., Tong et al., 2012; Ardon-Dryer et al., 2022). Why you did not use a threshold for the dust part? Can you show how it's different (maybe less efficient) than what you developed?

General Comments

Line 122- would be nice to see more information about the pairs, as location on a map, mainly for non-US readers who are not familiar with many of the locations you mentioned. For Supplement Table S1 please add how many parallel times (h) were used for this comparison. Also, for the AQS names, it would be efficient to separate the EPA sensors based on their name as state-county-sensor as appear on the EPA website (e.g., 04-013-4002, 06-027-1003) would be easier for readied to allocate the sensors. Please the ID of the PAS sensors. Is the location for PAS or EPA sensor make sure both are provided in the table. In Line 130, you indicated there were no differences in the pair even when the distance was up to 15 km this is a very important aspect and more information on these pairs should be provided as many of the previous studies used pairs if the distance was less than 1 km. for Lines 132- 148 it would be good to mention the period used for these analyses, as it is unclear what time point was used for each event (e.g., indicate month and years data were retrieved for)

The information in lines 149 to 154 should be incorporated in the text when you talk about each one of the events and also a map showing these sensors identified is needed.

Line 161- can you clarify what you mean by values were excluded if less than 1 $\mu g\ m^{-3}$?

The sentence in line 163 seems not in place and would need more explanation and examples, how high does RH? show examples of how much data had to be removed due to this fact.

Line 156-167 - Would be important to add information based on the data quality sections on how much data had to be removed due to each screening criteria (is case = event?). would have been efficient to show more examples not just one for dust and one for smoke. Show additional figures, and provide information in the text about the different examples so we will understand how Tables 2-3 were created.

Line 175- map needed for a non-American reader.

Line 180 – nearby- how close, map, and distance will be helpful for the reader.

Line 192 would be good to know when PAS and location are used or in this example, information could be added to table S1 so the reader will know what sensor was used for what event.

Line 211-216- the entire paragraph is unclear including fig 2 how were these calculated made, how many events were used to correlate the number of cases, did only a period of the event (e.g., smoke) was used, or sometimes data of period before or after as shown in Fig 1 were used. The R^2 values are not significant so can you clarify what statistically significant are you talking about?

Line 230- what 17 events? You said there are 50 cases, can you indicate maybe in table S1 which one had both PM sizes that were used for this analysis? Why not use the known threshold which is commonly used ($PM_{2.5}/PM_{10}$) for this comparison? Why showing uncorrected PAS values? What does the corrected PAS look like? Can you repeat this part for corrected PAS values? Can you show a fig of PAS before and after corrections?

Line 246- did you confirm the events were dust based on observation of meteorology conditions, and satellite? $PM_{2.5}/PM_{10}$ ratios? Please add more information, and add dates of these events so the reader may be able to understand what you have done for this part. I think this is one of the most interesting parts of your paper but it seems you put the least amount of effort into it.

Line 266-267 what are the units for 150-250 and 190 are these nm or $\mu g\ m^{-3}$?

Lines 285-289- show us these findings of the use of the new eq on the dust event of part one, this is a very important finding from this paper, and it seems the author barely provides information here. Also, would be nice to see exploring these sections a bit more, and show us similar to fig 1 what the dust events look like before and after using both corrections(time serious) was this one dust event or several, and when did they occur, how long they lasted?

Minor comments

Line 54 and 55 - PM2.5 the 2.5 should be lowercase ($PM_{2.5}$), there might be more of these that I missed

Table 2-P value based on which statistical test?

Fig 4- units of the axis are missing

Reference used

Sugimoto, N., Shimizu, A., Matsui, I., and Nishikawa, M.: A method for estimating the fraction of mineral dust in particulate matter using PM2:5-to-PM10 ratios, Particuology, 28, 114–120, https://doi.org/10.1016/j.partic.2015.09.005, 2016.

Tong, D. Q., Dan, M., Wang, T., and Lee, P.: Long-term dust climatology in the western United States reconstructed from routine aerosol ground monitoring, Atmos. Chem. Phys., 12, 5189–5205, https://doi.org/10.5194/acp-12-5189-2012, 2012

Ardon-Dryer, K., Kelley, M.C., Xueting, X., and Dryer, Y.: The Aerosol Research Observation Station (AEROS), Atmos. Meas. Tech., https://doi.org/10.5194/amt-2021-270, 2022.