Dear Editor,

Thank you for agreeing to consider a revision of our manuscript “The Spatial, Temporal, and Meteorological Impact of the 26 February 2023 Dust Storm, Increase of Particulate Matter Concentrations Across New Mexico and West Texas ”. We modified and revised the manuscript to address the reviewers’ comments as well as to clarify points that they found confusing or unclear.

We would like to thank the two reviewers, Dr. Allison C. Aiken and the anonymous reviewer for their helpful comments and suggestions, and many thanks to you for your time and efforts with this revision. In line with the comments and suggestions, we revised the manuscript and made the requested additions and changes. Below are all the comments (in bold) followed by the replies. The parts that are in italics are corrections that are included in the revised version of the paper:

Sincerely,
Karin Ardon-Dryer

Review of egusphere-2024-113 by A.C. Aiken
Summary:
This manuscript describes a dust event that occurred in the desert southwestern United States. The data used includes meteorology and particulate matter (PM2.5 and PM10) from a range of available monitoring sites within New Mexico and Texas. The manuscript addresses relevant science questions within the scope of ACP, presenting data from 19 monitoring stations in NM and TX of a dust event that occurred in February 2023 and had the highest PM2.5 concentration recorded in the last 20 years at one of the sites (Lubbock, TX). Overall, the manuscript is well-written and worthy of publication in ACP. A few areas could be improved with minor revisions to highlight the importance of the results as they are presented in the current version to relate this dust event and storm within a larger context in terms of visibility, PM, and their impacts.

The authors’ presentation of the data is well-structured and clear. The scientific impact could be improved by adding additional information in a general sense on how this event relates to others in region as well as the globe in the abstract and conclusion sections. Discussing a regional or seasonal average for visibility and PM versus those during the event would further highlight the magnitude of the different conditions experienced during the event versus the “background”. Some more detail of how averages were calculated and reference periods with no dust events were selected within the methods section would be beneficial. Background conditions with no dust events are of interest and should be presented in the text as well as potentially in a table as the PM concentrations are hard to see in the figures since the event concentrations are so high in comparison. The conclusions section could be expanded as well, and more detailed suggestions are included in the comments below. For example, an interesting area to highlight would be a summary of the mass ratios for PM2.5/PM10 that were analyzed in the results section as well as a comparison of the PM data during the event versus the periods before and after the event to understand the magnitude of the impact on PM (and visibility). More details and recommendations are included below.

We would like to thank the reviewer for the suggestions, corrections, and comments.

General Comments:
Title
Clearly reflects the contents of the manuscript.

The title of the manuscript was modified per the comments from both reviewers, this is the title of the revised manuscript:
The Spatial, Temporal, and Meteorological Impact of the 26 February 2023 Dust Storm, Increase of Particulate Matter Concentrations Across New Mexico and West Texas

Abstract
Can you relate in general how this dust event and dust storm relate to others in the region and potentially globally in terms of duration, wind speeds, visibility, and PM concentrations?

Since there is a number word limitation to the one that could be used in the abstract we could not add all the information requested by the reviewer, but we did add the information required in the main section of the manuscript. Please see the track changes document it will contain the many changes and information that was added per the reviewer's comments.

It is highlighted that PM2.5 was the highest ever recorded at the Lubbock site. Could you also add to the abstract what the ratios of PM2.5/PM10 were on average during the event and storm as well as the dust storm in relation to the baseline or background and how this compares to other storms and/or regions?

Per the reviewer's comment this information was added to the abstract, since there is a limitation on the number of words that could be used in the abstract, we only summarized the important information that needed to be highlighted. Detailed information is provided in the manuscript.

These changes were added to the revised manuscript abstract:
The Southwestern portions of the United States experience dust events frequently due to the arid and semi-arid environments and close proximity to multiple deserts. On 26 February 2023, a dust event was initiated in New Mexico due to strong winds aloft mixing down to the surface. The dust intensified as it moved eastward into West Texas and developed into a dust storm (visibility < 1 km) for multiple locations. This study examined the meteorological characteristics of this dust storm using 28 meteorological stations and examined the impacts on $PM_{2.5}$ and/or PM_{10} (particulate matter with an aerodynamic diameter < 10 and 2.5 µm) concentrations using 19 air quality stations. The dust event lasted up to ~16 hours, dust storm conditions lasted from five minutes up to 120 minutes. The highest wind speed and wind gust recorded during the dust were 27.3 m s^{-1} and 37 m s^{-1} respectively. This dust had a strong impact on the air quality in the area, as very high PM values were recorded across the region, and nine of the PM stations exceeded the EPA daily threshold. The maximum hourly $PM_{2.5}$ and PM_{10} concentrations recorded were 518.4 µg m^{-3} and 9,983 µg m^{-3} respectively. These concentrations at the peak of the dust were an order of magnitude higher than the minimum hourly $PM_{2.5}$ and PM_{10} concentrations recorded on

the dust day. The highest hourly PM_{10}-$PM_{2.5}$ concentration recorded was 759.8 ± 1000.3 μg m^{-3}, while the lowest hourly $PM_{2.5}/PM_{10}$ concentration measured was 0.05 ± 0.01.

Introduction

Line 43: Recommendation to expand this paragraph on how this storm relates to others in the area. It is stated that this storm was "one of the most significant" over the last decade. Could a summary of the other storms be included to understand more of the climatology for the region? Are there other references to include to show historical comparisons for this area? Include how often they occur and last as well as available summaries/measurements of PM.

Is there a seasonality for the region and/or known occurrence in the area due to different meteorological patterns or events? There is some information on this provided in the results/paragraph Line 186 but adding a higher-level summary in the introduction would help the reader put this study within a larger context before getting into more of the details in the results section.

Per the reviewer's two Introduction comments, additional information was added to the introduction in order to provide more information on dust in the southwestern U.S., particularly over New Mexico and western Texas. As well as PM information as requested by the reviewer. The last paragraph of this introduction was modified to reflect the reviewer's comment.

These sections were added to the revised manuscript:
Dust events and storms occur across the United States (Tong et al., 2023), mainly across the southwestern portions, due to its drier and warmer conditions with low soil moisture from desert regions (Achakulwisut et al., 2017). Among the states, the most susceptible to dust events are Arizona (Nickling and Brazel, 1984; Lei et al., 2016; White et al., 2023), southern California (Bach et al., 1996; Evan, 2019; Huang et al., 2022), Utah (Hahnenberger and Nicoll, 2012; Hennen et al., 2022) and states across the Great Plains, mainly the Southern Great Plains area including New Mexico and Texas (Kandakji et al., 2020; Hennen et al., 2022; Ardon-Dryer et al., 2023b; Robinson and Ardon-Dryer, 2024). The multiple dust sources in the region, mainly cropland, contribute to the high number of dust events (Lee et al., 2012). In a recent study, Robinson and Ardon-Dryer (2024) found an average of 22 dust events annually (between 2000 to 2021) across four dust-prone regions in West Texas. Most of the dust events in the region occur in the spring to early summer months, mainly due to synoptic disturbances, while a smaller percentage of dust events are formed by convective disturbances, and rarely are dust events formed by the combinations of these two disturbances (Robinson and Ardon-Dryer, 2024).

The air quality across West Texas and New Mexico is good overall (Zanobetti and Schwartz, 2009; Kelley et al. 2020). Anthropogenic pollution such as industrial facilities and transportation emissions, which can lead to Ozone, can be found mainly in the two large urban cities of El Paso, Texas, and Albuquerque, New Mexico (Gaffney et al., 1997; Chen et al., 2012; Kavouras et al., 2015; Craig et al., 2020; Karle et al., 2020; Van Pelt et al 2020; Huang et al., 2023). The entire area is impacted by dust events and dust storms which lead to an increase in PM and degradation of the air quality (Tong et al., 2012; Stout, 2015; Herrera-Molina et al., 2021; Kelley and Ardon-Dryer, 2021; Ardon-Dryer et al., 2023b; Albuquerque-Bernalillo County, 2024). In Sunland Park, *New Mexico, Li et al. (2005) found during dust events that $PM_{2.5}$ and PM_{10} hourly concentrations were 170 $\mu g\ m^{-3}$ and 2346 $\mu g\ m^{-3}$, respectively, while daily averages were 12 $\pm$ 8 $\mu g\ m^{-3}$ and 68.5 $\pm$ 72 $\mu g\ m^{-3}$, respectively.*

Kelley et al. (2020) analyzed $PM_{2.5}$ concentrations in Lubbock, Texas over 17 years (2001 – 2018) and found that the majority of the hourly $PM_{2.5}$ concentrations were lower than 10 $\mu g\ m^{-3}$ (80%), but there were several days with high PM including 15 April 2003 and 15 December 2003 that had $PM_{2.5}$ hourly values of 433 and 486 $\mu g\ m^{-3}$, respectively. Rivera Rivera et al. (2009) also examined the impact of these two dust storms in El Paso and found on 15 April 2003 hourly PM_{10} concentrations of 4724 $\mu g\ m^{-3}$ with a daily PM_{10} concentration of 375 $\mu g\ m^{-3}$, while the hourly PM_{10} concentrations on 15 December 2003, was >1200 $\mu g\ m^{-3}$. Daily PM_{10} concentrations on 15 December 2003, for another site in Texas, was >160 $\mu g\ m^{-3}$ (Tong et al., 2012). Yin et al. (2005) examined hourly $PM_{2.5}$ and PM_{10} measurements from different stations across New Mexico and Texas during the same dust storm (15 December 2003). They found hourly PM_{10} concentrations in New Mexico >700 $\mu g\ m^{-3}$, while $PM_{2.5}$ hourly concentrations ranged from 12 up to 36 $\mu g\ m^{-3}$ (Yin et al., 2005). Both of these dust storms were caused by synoptic disturbances. In Lubbock Texas, it was found that $PM_{2.5}$ daily concentrations during synoptic dust events had slightly higher $PM_{2.5}$ average concentrations compared to convective dust events. Ardon-Dryer and Kelley (2022) also found that synoptic dust events had higher $PM_{2.5}$ and PM_{10} daily concentrations compared to convective dust events, but short-term observation (based on 10 minutes) showed that convective have much higher PM concentrations. The impact of $PM_{2.5}/PM_{10}$ and PM_{10}-$PM_{2.5}$ values during, dust events in the region, were examined but only by a handful of studies. In New Mexico, $PM_{2.5}/PM_{10}$ values ranged from 0.05 up to 0.58, and the $PM_{2.5}/PM_{10}$ ratio was extremely low (0.079 up to 0.093) during dust events (Li et al., 2005). Measurements of daily $PM_{2.5}$ and PM_{10} using multiple Interagency Monitoring of Protected Visual Environments (IMPROVE) stations in New Mexico and Texas also found a significant drop in the $PM_{2.5}/PM_{10}$ ratio during dust events, with daily means that ranged from 0.22 to 0.24 during dust events (Tong et al., 2012).

The dust storm of 26 February 2023 was one the strongest and significant dust storms that occurred in this region over the last two decades. This study aimed to understand the meteorological conditions that initiated this dust storm and those measured during it using multiple meteorological stations across New Mexico and Texas, capturing its Spatial and Temporal changes. The impact this dust storm had on air quality over the two states was of interest to understand if and how significant its impact on PM concentrations in the region was and to evaluate its similarity to previous dust events in this region.

Methods

Add details of how the average daily values for PM were calculated. Was the dust event excluded or included and why? How much would those averages change if you did the opposite?

The daily averages were calculated for each station based on hourly measurements from midnight to 23:00 LT. Since the dust happens on the 26th this is the day that represents the day with dust described in this paper, but we also present concentrations during the time of the dust (which are based on PM increase). Per the reviewer's comments, we made different calculations including only the dime of dust, the peak of dust which is reported hourly maximum, daily concentrations, and as well per some of the following comments by the reviewers monthly average and average for every day during the same month.

This information on that calculation was added to the methods section.:

Calculations of the daily average were made for each day based on hourly measurements from midnight to 23:00 local time (LT).

If the dust event was included in the daily averages should the day before and after be included to assess how much the daily average changed during the day of the event?

The main reason for using the daily average (midnight to 23:00) was based on the fact that in order to compare to other studies and to examine air quality aspects, based on EPA and WHO, daily values need to be calculated. We do not think that just showing the day before or the day after would have been enough therefore we added more information to the revised manuscript per several of the reviewers' comments about this topic. We first provided the PM concentration during the time of dust and compared that to the daily average, since the dust did not last 24 hours in any of the locations examined. Next, we examine the daily average for each one of the days during the month (as suggested by the reviewer in the following comment). We added a figure to the supplant that shows these daily changes. Most figures highlight the impact of the examined dust event compared to the additional days of the month, but it should be noted that there was additional dust events during that month, but they were not as strong as the one presented in this study.

This information was added to the revised manuscript:
To examine the impact of the 26 February 2023 dust event on the overall PM concentrations, daily PM concentrations were calculated, for each PM sensor, for each day during February 2023 (shown in Fig. S2). The daily average for February 26 seems high (for most sensors) compared to the other February day's daily average, it also seems to have much higher SD values compared to manty of the other days. The lowest impact seems to be in the Albuquerque stations, perhaps since the area is also impacted by anthropogenic pollution. The southern part of New Mexico and many of the stations in West Texas seem to have had a bigger impact on this dust event, as daily values for the dust day (February 26) were on average 12 times higher compared to the overall daily $PM_{2.5}$ *concentrations and 27.5 times higher compared to the* PM_{10} *daily concentrations. These differences could have been higher, but it seems there were additional pollution events (other dust events, as indicated above) in some of the locations, which increased the daily PM concentration for some days in some of the stations. Observations of daily* $PM_{2.5}$ *concentrations from the different Albuquerque PM stations show that the dust was not as strong as it was for other locations such as South New Mexico and West Texas. Next, the monthly* $PM_{2.5}$ *and* PM_{10} *concentrations for the entire February month were calculated (for each sensor), without February 26 PM concentrations (Table S4). The monthly* $PM_{2.5}$ *and* PM_{10} *concentrations were on average 4.0 and 9.3 times lower, for* $PM_{2.5}$ *and* PM_{10} *concentrations respectively, compared to the daily concentrations measured on February 26. The monthly PM concentrations were 13.6 and 26.7 times lower compared to the* $PM_{2.5}$ *and* PM_{10} *concentrations (respectively) measured during the time of the dust, and 26.4 and 104.9 times lower (for* $PM_{2.5}$ *and* PM_{10} *concentrations, respectively) compared to the PM*

concentrations at the peak of the dust. These large differences between the concentrations of $PM_{2.5}$ and PM_{10} during the dust to those over the month indicate that while the background PM across the region might be low (except for Albuquerque) dust events in this region can have a significant impact on both $PM_{2.5}$ and PM_{10} concentrations in the region which will impact on the air quality wellbeing and peoples health.

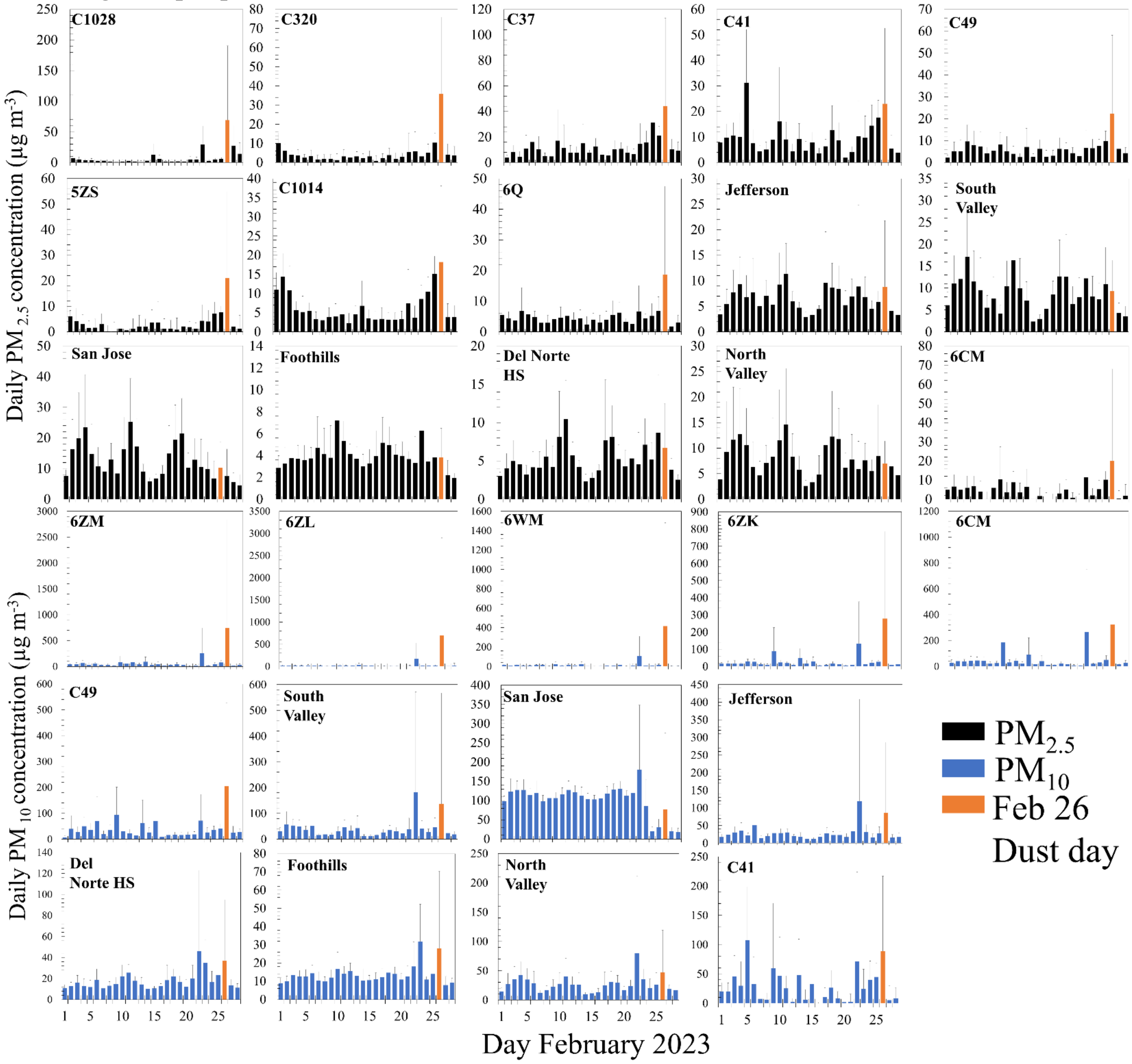

Figure S2. Changes in a daily average of $PM_{2.5}$ (black) and PM_{10} (blue) every day during February 2023 with SD values for each day. The daily average for February 26 is presented in orange.

When concentration ratios are calculated for the event versus the period before – how was the period before defined? How would it compare to an average after the event – do the concentrations return to the previous values or is there a significant difference or lag in time before the values return to the pre-event concentrations?

Per the reviewer's comment, we provided in the revised manuscript additional explanation and calculation. First, one difference was between the peak of the dust to the concentration right before the dust arrived at the station. We also examined the difference between the concentration at the peak of the dust to the minimum concentrations recorded during the dust day by each of the stations. We also provide an examination of the daily average concentration during the dust day to other days during this month and to a monthly average concentration (excluding the dust day from that calculation).

This information was added to the revised manuscript:

The duration when dust particles were in the air based on an increase in PM values was similar to the duration based on visibility, mentioned in section 3.2. These durations based on PM values varied, some stations had an increase in PM values for a duration of 2 hours, while others for up to 12 hours. Despite the reduced visibility to 1.6 km during the dust event at the Albuquerque ASOS (ABQ), most of the PM stations in the area witnessed a small increase in $PM_{2.5}$ *but a more significant increase in* PM_{10} *concentrations (as can be seen in Fig. 5 and Table S4). A spatial impact of the dust was also observed in Albuquerque, as stations in the southern part of Albuquerque had higher PM concentrations (with a stronger increase) compared to those located in the northern part of Albuquerque. When calculating the increased ratio of PM, which is indicated by the ratio of PM concentrations at the peak of the dust compared to the PM concentrations right before the dust, results showed an increase in PM across the region, even across Albuquerque.* $PM_{2.5}$ *concentrations during the dust event were on average 12.8 times higher compared to the time before the dust event (ratios vary from 3.0 up to 36.3), while* PM_{10} *concentrations during the dust event were on average 216.9 times higher compared to before the dust event (ratios vary from 11.3 up to 1426.1). When we examined the same ratio aspect for the lowest PM concentrations recorded on February 26 (shown in Table S4) the differences were much higher,* $PM_{2.5}$ *and* PM_{10} *concentrations at the peak of the dust were higher by more than an order of magnitude (on average) than the minimum daily PM concentration recorded on the same day.*

Would it be possible to look at a longer background period such as a week or a month to establish a "background" for the data?

Per the reviewer's comment, we provided in the revised manuscript a comparison between the dust time and day for the entire month of February 2023 as well as all daily averages measured during this month by each of the stations. This information was added to the supplemental section as a table (Table S3) and also as a figure. The information was added for both PM concentrations but also the meteorological information, as well as described in the following comment.

Results

Would it be possible to calculate background values for visibility and PM over a longer time period and to discuss what those values are for a month or the season?

Per the reviewer's comment, we downloaded again the ASOS data from the entire month of February 2023, and the PM data (as mentioned in previous comments). In the process, we found additional ASOS stations that could be used to highlight the findings of our work, and we added them to the revised manuscript which explains the changes performed to the figures. Following this reviewer, we calculated the monthly wind speed and visibility values excluding the February

23 dust events to highlight the impact of these dust events on these parameters. This information was added to the supplemental section (Table S3).

This information was added to the revised manuscript:

These wind speeds and wind gusts measured during the dust events were 3.2 times higher than the average wind speed and wind gust recorded in the month of February 2023 (shown in Table S3). The difference was much stronger for the strongest recorded wind speed and wind gust, up to 5.9 times and 8.3 times (respectively) compared to the month of February. These big differences indicate how strong this dust event was. But looking at the overall meteorological conditions during this month, it seems that there were additional dust events during that month (e.g., February 9 and 22), but were not as strong as the one reported here (data not shown). Perhaps if these dust times had been removed from the monthly analysis the difference between the meteorological conditions would have been stronger.

Next, the monthly $PM_{2.5}$ and PM_{10} concentrations for the entire February month were calculated (for each sensor), without February 26 PM concentrations (Table S4). The monthly $PM_{2.5}$ and PM_{10} concentrations were on average 4.0 and 9.3 times lower, for $PM_{2.5}$ and PM_{10} concentrations respectively, compared to the daily concentrations measured on February 26. The monthly PM concentrations were 13.6 and 26.7 times lower compared to the $PM_{2.5}$ and PM_{10} concentrations (respectively) measured during the time of the dust, and 26.4 and 104.9 times lower (for $PM_{2.5}$ and PM_{10} concentrations, respectively) compared to the PM concentrations at the peak of the dust. These large differences between the concentrations of $PM_{2.5}$ and PM_{10} during the dust to those over the month indicate that while the background PM across the region might be low (except for Albuquerque) dust events in this region can have a significant impact on both $PM_{2.5}$ and PM_{10} concentrations in the region which will impact on the air quality wellbeing and peoples health.

It looks like visibility may be more stable than PM, but it's not easy to tell from the figures in the main text what a non-dust period looks like in terms of PM.

We believe the review came to this conclusion since the original PM figure aims to keep all the scales of PM at the same level. Per the reviewer's comment, we modified the PM figure to highlight the impact of PM in each station and figure.

This is the new figure in the revised manuscript

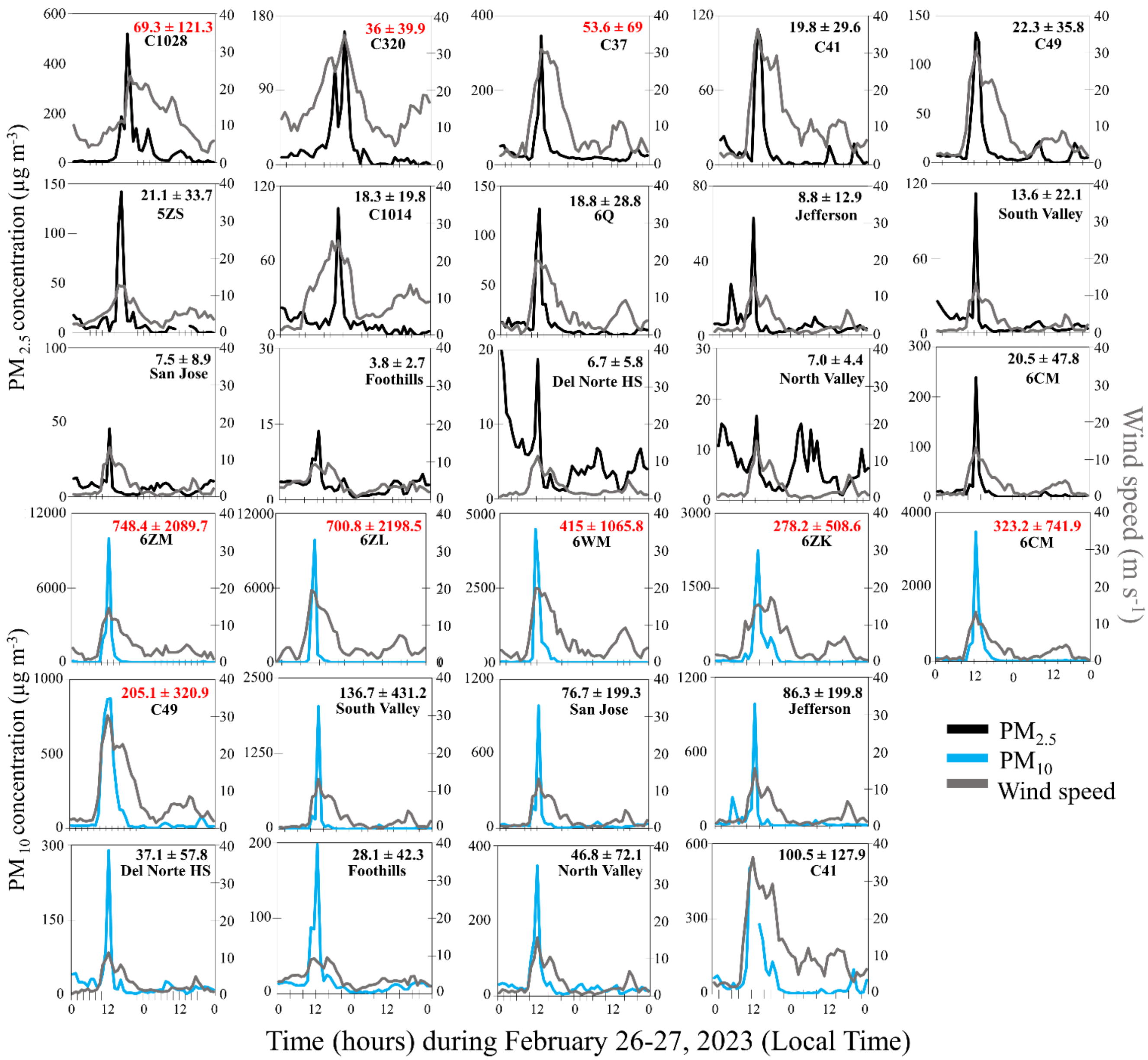

Figure 5. Changes in $PM_{2.5}$ (black) and PM_{10} (blue) with wind speeds (grey) measured during the dust storm. The name of the station and daily average ± SD values for February 26 are presented in black. daily average ± SD values for stations that exceeded the EPA daily standards are presented in red.

If a month is too long, even a week would show a longer period to give an idea of PM and ratios between the size cuts for the region. Ideally, you could look at all the station averages as well as an average for all the data presented. For example, there look to be two main areas where the sites have both PM10 and PM2.5. How similar/different are the concentrations and ratios at those two sites and what might be the reasons for those differences that warrant further investigation.

Per the reviewer's comment, we downloaded again the PM data from the entire month of February 2023 (as mentioned in previous comments). We did not want to combine data between stations as each reflects a different location, they were also far from each other. Per this comment, we added a new table to the supplement that provides the ratio and values of $PM_{2.5}/PM_{10}$ and PM_{10}-$PM_{2.5}$. Below is a picture of that table it can be found in the supplement file.

Table S5. Measurements of PM_{10}-$PM_{2.5}$ and $PM_{2.5}/PM_{10}$ during the 26 February dust storm and the month of February 2023.

PM	Location	Station ID	PM_{10}-$PM_{2.5}$ (µg m -3)				$PM_{2.5}/PM_{10}$ (µg m -3)			
			Daily (02/26) average Average ± SD	Average during time of dust Average ± SD	Max Peak of dust	Monthly average (without 02/26) Average ± SD	Daily (02/26) average Average ± SD	Average during time of dust Average ± SD	Min Peak of dust	Monthly average (without 02/26) Average ± SD
Stations with PM_{10} & $PM^{2.5}$	El Paso	C49	101 ± 218	451.7 ± 325.4	870.5	28.7 ± 20.7	0.25 ± 0.16	0.09 ± 0.0	0.02	0.19 ± 0.08
	El Paso	C41	49.6 ± 88.3	186.6 ± 146.1	503	22.4 ± 20.3	0.26 ± 0.35	0.07 ± 0.0	0.03	0.43 ± 0.24
	Anthony	6CM	159 ± 508	759.8 ± ####	3236	40.7 ± 53.5	0.24 ± 0.24	0.05 ± 0.0	0.03	0.10 ± 0.08
	Albuquerque	Del Norte HS	19.9 ± 39.8	114.0 ± 106.2	270.9	12.3 ± 7.2	0.28 ± 0.12	0.09 ± 0.4	0.06	0.31 ± 0.07
	Albuquerque	Foothills	15 ± 29.5	95.9 ± 61.3	183.9	9.1 ± 3.8	0.26 ± 0.10	0.08 ± 0.3	0.07	0.31 ± 0.07
	Albuquerque	Jefferson	44.4 ± 135	309.6 ± 409.2	922.7	20.8 ± 19.5	0.25 ± 0.10	0.08 ± 0.3	0.06	0.27 ± 0.07
	Albuquerque	North Valley	26 ± 50.9	161.2 ± 115.4	330.2	18.4 ± 12.7	0.3 ± 0.14	0.06 ± 0.2	0.05	0.32 ± 0.08
	Albuquerque	San Jose	41.7 ± 137	279.2 ± 374.0	942.7	90.4 ± 35.2	0.27 ± 0.12	0.06 ± 0.3	0.05	0.14 ± 0.08
	Albuquerque	South Valley	71.1 ± 298	518.4 ± 848.0	2030.9	28.7 ± 30.1	0.24 ± 0.12	0.07 ± 0.3	0.05	0.27 ± 0.08

Could you add a table to the main text that shows the background values for visibility and PM versus the event average and the peak during the event?

The information requested by the reviewer for both PM and visibility was added to the revised manuscript as a supplemental table. Table S3 provides a comparison to the monthly meteorological conditions (wind speed and visibility), Table S4 provides a comparison to the monthly PM concentration and Table S5 provides a comparison to the monthly $PM_{2.5}/PM_{10}$ and PM_{10}-$PM_{2.5}$ concentration. Since these two are big for the Word document they are provided as pictures below. The table can be found in the supplement file.

Table S3. Meteorological parameters measured by ASOS stations during the dust event. Duration of the dust storm (DS) reported only for stations that reported visibility below 1 km. Bold numbers represent stations with visibilities < 1 km therefore DS.

	Station ID	Start Time of dust (local time) first VIS <10 km	End Time (local time) of dust first VIS >10 km	Duration of Dust Event (hour) VIS <10 km	Wind Speed at Start (m s-1)	Wind Gust at Start (m s-1)	Max Wind Speed During Dust Event (m s-1)	Max Wind Gust During Dust Event (m s^{-1})	Lowest Recorded Visibility (km)*	Duration of DS	Wind Speed during dust Average ± SD (m s-1)	Visibility during dust times Average ± SD (m s-1)	Wind Gust during dust Average ± SD (m s-1)	Wind Speed during Feb 2023 (excluding dust times) Average ± SD (m s-1)	Visibility during Feb 2023 (excluding dust times) Average ± SD (m s-1)
New Mexico	0E0	12:55	14:35	1:40	18.5	26.7	18.5	26.7	2.4		15.9 ± 1.7	3.5 ± 0.9	22.1 ± 3.2	4.7 ± 3.3	15.5 ± 2.6
	ABQ	10:21	13:20	2:59	17.0	22.1	23.6	33.4	1.6		15.7 ± 3.9	7.6 ± 4.0	22.4 ± 5.6	4.0 ± 2.8	15.6 ± 2.3
	ALM	11:55	18:15	6:20	18.5	25.2	20.0	26.2	**0.4**	0:20	14.4 ± 3.4	3.9 ± 2.1	19.9 ± 4.1	4.4 ± 2.4	16.0 ± 0.9
	ATS	13:15	15:55	2:40	20.6	30.3	24.7	31.9	2.8		21.7 ± 1.5	6.5 ± 2.6	28.9 ± 2.2	6.1 ± 4.1	15.7 ± 2.2
	CNM	13:35	16:05	2:30	20.0	24.7	23.1	31.9	4.0		19.4 ± 1.9	7.4 ± 2.2	25.3 ± 3.4	5.5 ± 3.8	15.9 ± 1.4
	CVN	12:25	18:15	5:50	15.4	19.5	25.7	31.9	**0.4**	1:10	20.7 ± 2.3	3.1 ± 2.9	25.5 ± 2.9	6.7 ± 3.8	15.7 ± 1.8
	DMN	10:00	12:20	2:20	13.4	19.0	22.1	30.3	**0.4**	0:30	15.2 ± 2.4	9.2 ± 5.4	21.0 ± 3.2	4.8 ± 3.2	15.9 ± 1.4
	HMN	12:17	18:44	6:27	21.1	29.3	25.2	29.3	**0.8**	0:09	16.8 ± 4.2	3.8 ± 2.2	23.1 ± 4.5	4.8 ± 2.9	16.0 ± 0.9
	LRU	10:55	16:35	5:40	18.0	24.7	23.6	31.9	1.2		19.7 ± 2.1	4.9 ± 2.3	26.8 ± 2.3	4.7 ± 3.2	16.0 ± 0.8
	ROW	12:45	18:33	5:48	19.5	24.2	25.7	35.0	**0.8**	0:10	17.2 ± 4.4	6.1 ± 4.0	23.9 ± 5.9	4.5 ± 3.2	15.9 ± 0.9
	SRR	12:55	15:55	3:00	25.7	33.4	25.7	33.4	1.2		13.4 ± 5.6	3.2 ± 1.7	20.9 ± 7.9	6.0 ± 3.9	15.5 ± 2.5
	TCC	12:30	16:45	4:15	19.5	27.8	27.2	37.0	**0.8**	0:20	20.3 ± 2.4	6.4 ± 4.2	27.6 ± 4.0	6.2 ± 4.1	15.9 ± 1.5
Texas	AMA	14:50	22:38	7:48	18.5	22.1	25.2	33.4	1.2		18.2 ± 2.5	4.7 ± 3.0	25.1 ± 3.7	6.7 ± 3.3	15.9 ± 1.4
	BIF	11:55	17:55	6:00	17.0	21.1	17.0	26.7	3.2		14.3 ± 2.1	4.6 ± 1.7	21.9 ± 2.3	4.9 ± 3.7	15.5 ± 1.6
	BPG	16:35	23:55	7:20	14.4	20.6	16.5	21.1	2.4		11.9 ± 3.1	6.3 ± 4.1	16.8 ± 2.6	5.8 ± 3.1	15.3 ± 2.6
	E11	16:15	19:15	3:00	18.0	23.6	18.5	25.2	1.5		16.3 ± 1.8	6.7 ± 1.5	22.8 ± 1.7	5.0 ± 2.7	15.7 ± 2.2
	ELP	11:10	14:15	3:05	17.0	21.6	20.6	31.4	2.4		17.3 ± 2.0	5.6 ± 2.5	23.6 ± 3.1	4.4 ± 3.2	16.0 ± 0.9
	GNC	15:50	22:50	7:00	14.4	18.5	19.5	25.7	1.6		14.3 ± 2.9	6.5 ± 4.3	20.5 ± 3.8	5.0 ± 2.9	15.8 ± 1.9
	HRX	14:55	21:55	7:00	17.0	23.1	26.2	30.3	**0.4**	1:20	19.0 ± 3.1	3.2 ± 2.3	25.3 ± 3.5	6.3 ± 3.6	15.9 ± 1.1
	INK	14:53	19:25	4:32	15.4	24.7	23.1	31.9	**0.8**	0:05	18.4 ± 2.3	3.3 ± 1.9	24.7 ± 3.8	4.6 ± 2.9	15.7 ± 1.9
	LBB	14:53	3:20	12:27	14.9	21.1	25.7	33.9	**0.0**	1:55	17.7 ± 2.8	4.8 ± 2.7	23.1 ± 4.2	6.4 ± 3.5	15.4 ± 2.4
	LLN	14:35	4:55	14:20	14.4	18.5	25.7	31.4	**0.4**	2:00	16.3 ± 3.1	3.9 ± 2.6	22.0 ± 4.2	6.7 ± 3.6	15.2 ± 2.6
	LUV	12:35	3:55	15:20	13.4	17.0	20.0	24.7	**0.8**	1:00	14.5 ± 2.1	5.0 ± 3.0	19.0 ± 2.9	6.0 ± 3.1	15.4 ± 2.6
	MAF	17:00	20:25	3:25	12.3	15.9	20.6	28.8	2.0		15.6 ± 2.6	6.4 ± 2.6	20.9 ± 3.4	5.3 ± 3.0	14.0 ± 3.1
	MDD	18:35	19:55	1:20	17.5	22.6	17.5	22.6	3.2		15.3 ± 1.5	5.6 ± 2.1	19.9 ± 1.9	5.1 ± 2.6	15.6 ± 2.1
	ODD	17:15	20:00	2:45	14.9	23.1	18.5	25.7	2.0		15.2 ± 1.9	5.5 ± 2.7	21.2 ± 2.8	5.1 ± 2.8	15.0 ± 3.0
	PEQ	13:55	19:35	5:40	14.4	20.6	20.0	25.7	1.2		16.3 ± 2.3	5.8 ± 4.4	22.0 ± 2.2	4.7 ± 3.1	15.8 ± 1.4
	VHN	12:15	18:35	6:20	12.9	20.6	17.5	25.7	1.6		14.5 ± 2.0	6.2 ± 3.8	20.4 ± 2.5	4.4 ± 2.2	16.0 ± 1.1

* Bold values represent Visibility < 10 km

Table S4. Measurements of $PM_{2.5}$ and PM_{10} during the 26 February dust storm and the month of February 2023. Bold numbers represent significant R^2 values.

PM	Location	Station ID	PM values average during time of dust (μg m^{-3})				R^2 for hourly wind speed & PM *		Daily (02/26) average (μg m^{-3})		Feb Monthly average (μg m^{-3}) without 02/26
			Average ± SD	Max Peak of dust	Number of hours with high PM	Increase ratio of PM+	Linear reg.	Polynomial reg.	Daily Min	Average ± SD	Average ± SD
$PM_{2.5}$	Amarillo	C320	93.7 ± 42.4	161.0	6	8.05	0.41	**0.57**	9.0	36 ± 39.9	3.8 ± 2.3
	Lubbock	C1028	153.9 ± 134.7	518.4	12	22.6	0.15	0.18	3.9	69.3 ± 121.3	5.8 ± 7.3
	Odessa	C1014	74.5 ± 38.9	102.0	2	3.9	0.28	**0.51**	5.0	18.3 ± 19.8	5.8 ± 3.6
	El Paso	C37	147.6 ± 113.8	346.2	5	17.2	0.25	0.4	14.0	53.6 ± 69	10.9 ± 6.0
	Hobbs	5ZS	99.7 ± 47.1	142.0	3	11.8	0.47	**0.77**	2.0	21.1 ± 33.7	2.5 ± 2.0
	Las Cruces	6Q	107.0 ± 28.3	127.0	2	21.2	0.37	**0.7**	2.0	18.8 ± 28.8	4.4 ± 1.4
	El Paso	C49	79.2 ± 46.8	132.6	4	4.42	0.47	**0.88**	3.2	22.3 ± 35.8	5.5 ± 2.2
	El Paso	C41	76.8 ± 35.5	109.0	4	36.3	0.27	**0.71**	0.0	19.8 ± 29.6	9.1 ± 5.9
	Anthony	6CM	104.3 ± 117.1	239.0	3	11.8	0.34	**0.79**	0.0	20.5 ± 47.8	4.2 ± 3.4
	Albuquerque	Del Norte HS	9.6 ± 6.2	18.7	4	3.2	0.02	**0.73**	1.1	6.7 ± 5.8	5.1 ± 2.0
	Albuquerque	Foothills	8.4 ± 4.0	13.6	4	3.8	0.22	0.23	0.6	3.8 ± 2.7	4.0 ± 1.1
	Albuquerque	Jefferson	23.0 ± 26.6	62.8	4	9	0.16	**0.8**	1.1	8.8 ± 12.9	6.4 ± 2.3
	Albuquerque	North Valley	9.6 ± 4.9	16.6	4	3	0.01	0.49	1.9	7 ± 4.4	7.9 ± 3.2
	Albuquerque	San Jose	18.3 ± 18.3	45.6	4	7.7	0.14	**0.9**	1.3	7.5 ± 8.9	12.6 ± 5.7
	Albuquerque	South Valley	37.4 ± 50.0	112.3	4	9.9	0.14	**0.9**	1.0	13.6 ± 22.1	8.7 ± 3.9
PM_{10}	El Paso	C49	461.4 ± 371.5	999.4	10	44.4	**0.6**	**0.86**	9.9	205.1 ± 320.9	34.3 ± 22.0
	El Paso	C41	204.1 ± 168.5	572.0	10	11.9	0.4	**0.73**	6.0	88.4 ± 114.6	26.9 ± 25.4
	Chaparral	6ZK	577.1 ± 643.0	2254.0	11	93.9	0.35	0.44	2.0	278.2 ± 508.6	24.3 ± 27.2
	Desert View	6ZM	1752.6 ± #####	9983.0	10	1426.1	0.4	**0.72**	2.0	748.4 ± 2089.7	48.8 ± 46.6
	Las Cruces	6ZL	2353.7 ± #####	9868.0	7	704.9	0.36	**0.7**	2.0	700.8 ± 2198.5	21.4 ± 31.2
	Anthony	6CM	803.1 ± #####	3475.0	9	119.8	**0.52**	**0.87**	2.0	323.2 ± 741.9	44.9 ± 55.9
	Las Cruces	6WM	1212.1 ± #####	4469.0	8	235.2	0.42	**0.67**	0.0	415 ± 1065.8	13.7 ± 19.7
	Albuquerque	Del Norte HS	123.6 ± 112.3	289.6	4	13.3	0.33	**0.9**	4.2	37.1 ± 57.8	17.4 ± 8.0
	Albuquerque	Foothills	104.3 ± 65.2	197.5	4	11.3	0.33	0.37	2.9	28.1 ± 42.3	13.1 ± 4.4
	Albuquerque	Jefferson	332.5 ± 435.8	985.5	4	25.5	0.3	**0.87**	4.3	76.7 ± 199.3	27.1 ± 20.4
	Albuquerque	North Valley	170.8 ± 120.3	346.8	4	15.9	**0.5**	**0.86**	4.6	86.3 ± 199.8	26.3 ± 13.8
	Albuquerque	San Jose	357.1 ± 421.8	988.3	4	45.1	0.36	**0.88**	5.6	46.8 ± 72.1	103.0 ± 38.1
	Albuquerque	South Valley	469.5 ± 822.8	2143.2	6	72.4	0.31	**0.86**	5.0	136.7 ± 431.2	37.4 ± 31.8

+ Increase the ratio of PM representing the ratio between the peak of dust to PM measurements right before dust made it to the station

* Bold values represent cases with R^2 values > 0.05.

Table S5. Measurements of PM_{10}-$PM_{2.5}$ and $PM_{2.5}/PM_{10}$ during the 26 February dust storm and the month of February 2023.

PM	Location	Station ID	PM_{10}-$PM_{2.5}$ (µg m -3)				$PM_{2.5}/PM_{10}$ (µg m -3)			
			Daily (02/26) average Average ± SD	Average during time of dust Average ± SD	Max Peak of dust	Monthly average (without 02/26) Average ± SD	Daily (02/26) average Average ± SD	Average during time of dust Average ± SD	Min Peak of dust	Monthly average (without 02/26) Average ± SD
Stations with PM_{10} & $PM_{2.5}$	El Paso	C49	101 ± 218	451.7 ± 325.4	870.5	28.7 ± 20.7	0.25 ± 0.16	0.09 ± 0.0	0.02	0.19 ± 0.08
	El Paso	C41	49.6 ± 88.3	186.6 ± 146.1	503	22.4 ± 20.3	0.26 ± 0.35	0.07 ± 0.0	0.03	0.43 ± 0.24
	Anthony	6CM	159 ± 508	759.8 ± ####	3236	40.7 ± 53.5	0.24 ± 0.24	0.05 ± 0.0	0.03	0.10 ± 0.08
	Albuquerque	Del Norte HS	19.9 ± 39.8	114.0 ± 106.2	270.9	12.3 ± 7.2	0.28 ± 0.12	0.09 ± 0.4	0.06	0.31 ± 0.07
	Albuquerque	Foothills	15 ± 29.5	95.9 ± 61.3	183.9	9.1 ± 3.8	0.26 ± 0.10	0.08 ± 0.3	0.07	0.31 ± 0.07
	Albuquerque	Jefferson	44.4 ± 135	309.6 ± 409.2	922.7	20.8 ± 19.5	0.25 ± 0.10	0.08 ± 0.3	0.06	0.27 ± 0.07
	Albuquerque	North Valley	26 ± 50.9	161.2 ± 115.4	330.2	18.4 ± 12.7	0.3 ± 0.14	0.06 ± 0.2	0.05	0.32 ± 0.08
	Albuquerque	San Jose	41.7 ± 137	279.2 ± 374.0	942.7	90.4 ± 35.2	0.27 ± 0.12	0.06 ± 0.3	0.05	0.14 ± 0.08
	Albuquerque	South Valley	71.1 ± 298	518.4 ± 848.0	2030.9	28.7 ± 30.1	0.24 ± 0.12	0.07 ± 0.3	0.05	0.27 ± 0.08

Consider moving the figures within S4 that contain the differences and ratios between PM10 and PM2.5 into the main text and expanding the discussion.

The figure was moved to the main manuscript per the reviewer's comment, we also added more discussion on the matter and also comparison between our findings to those of other papers.

This information was added to the revised manuscript:

The hourly PM_{10}-$PM_{2.5}$ values from this study were higher, for most stations, compared to values measured in three different dust events in Lubbock Texas, perhaps because this dust event was stronger (Ardon-Dryer and Kelley, 2022). The PM_{10}-$PM_{2.5}$ values were higher than those reported in the Rocky Mountains (Reynold et al., 2016) and Utah (Hahnenberger and Nicoll, 2012). Similar ranges of PM_{10}-$PM_{2.5}$ values were measured during dust storms in Israel (Krasnov et al., 2016). The daily values were lower compared to those measured in Israel, although the values at the peak of the dust were in the same range (Ardon-Dryer and Levin, 2014). However, the peak PM_{10}-$PM_{2.5}$ values were lower compared to the average PM_{10}-$PM_{2.5}$ values measured during multiple dust storms in China (Shao and Mao, 2016). Daily PM_{10}-$PM_{2.5}$ values in this dust event (for some of the stations) were in a similar range to those measured by Tong et al (2012), who examined multiple dust events in the same area as the one in this study.

Observations based on $PM_{2.5}/PM_{10}$ were also performed. The $PM_{2.5}/PM_{10}$ ratio is an important indicator used to characterize the underlying atmospheric processes within the local environment, which allows for the identification of the source of the particles (Yu and Wang, 2010). Higher $PM_{2.5}/PM_{10}$ ratios (> 0.6) are generally associated with anthropogenic pollution, while lower ratios are associated with dust events (Jugder et al., 2014; Sugimoto et al., 2016; Jaafari et al., 2018; Fan et al., 2021; Ardon-Dryer et al., 2022b). $PM_{2.5}/PM_{10}$ values across the nine sensors decreased during the dust event mainly between 11:00 to 18:00 LT (Fig. 6). $PM_{2.5}/PM_{10}$ values across the nine stations ranged from 0.03 to 0.13 with an average of 0.07 ± 0.02 across all stations and times. These ratios were lower compared to the values reported by Tong et al. (2012), which were 0.22-0.24, for this area combined with multiple dust events. Since Tong et al. (2012)

$PM_{2.5}/PM_{10}$ values were based on daily values calculations of daily values for each sensor were made (Table S5). The daily $PM_{2.5}/PM_{10}$ values were in the same range (and even slightly higher, 0.24 -0.3) as those in Tong et al. (2012). However, observations of these ratios during the time of dust (which were shorter than the duration of the day, as discussed above) were lower, with the average $PM_{2.5}/PM_{10}$ value of 0.07 (values across all stations ranged from 0.05 to 0.09). These values were similar to those measured by Li et al. (2005) during dust events in the El Paso region. The hourly $PM_{2.5}/PM_{10}$ values at the peak of the dust were lower compared to those measured at the peak in multiple dust storms in Utah (Hahnenberger and Nicoll, 2012; Nicoll et al., 2020). In Washington state, a similar range of daily $PM_{2.5}/PM_{10}$ values was measured (Claiborn et al., 2000). The daily $PM_{2.5}/PM_{10}$ values were in a similar range to those measured during dust events around the world (Alghamdi et al., 2015; Malaguti et al., 2015; Sugimoto et al., 2016; Jaafari et al., 2018).

Would it be possible to extend the PM2.5/PM10 ratio figure beyond the day of the event to look at that ratio in a broader context?

We did not want to confuse the reader with observations over a longer period, mainly as previous days during the month experienced dust. We wanted the focus to be on these dust events. We believe the extension of the figure allows us to see how the ratio of $PM_{2.5}/PM_{10}$ and PM_{10}-$PM_{2.5}$ changes over time during the day of dust and the information we added about the monthly values provided allows us to get a broader context of the ratio of the dust event presented. Yet we do provide additional information as the average of $PM_{2.5}/PM_{10}$ and PM_{10}-$PM_{2.5}$ during the time of dust, as well as the hourly peak, daily average as well as monthly average which show how different these ratios were compared to those measured during the dust.

This information was added to the revised manuscript:

Daily PM_{10}-$PM_{2.5}$ for February 26 were lower (3.8 up to 7.3 times, average of 5.8) compared to the PM_{10}-$PM_{2.5}$ calculated during the time of dust (Table S5). Also, PM_{10}-$PM_{2.5}$ at the peak of the dust was 16.6 times higher compared to the daily values. Calculations based on PM_{10}-$PM_{2.5}$ for each station for February showed that most stations had a low impact of coarse particles (except for San Jose and 6CM, which had higher monthly PM_{10}-$PM_{2.5}$ values, most likely due to the other dust events earlier that month). Both the PM_{10}-$PM_{2.5}$ values during the time of dust were higher (3.1 to 18.7 times, 11.9 on average) than the PM_{10}-$PM_{2.5}$ monthly values.

Observations of the monthly $PM_{2.5}/PM_{10}$ values for February (without the February 26 day, shown in Table S5), ranged from 0.1 ± 0.08 (for 6CM) up to 0.43 ± 0.24 (for C41). Most of the stations had lower monthly values compared to the daily $PM_{2.5}/PM_{10}$ values, some stations had similar values of ~1. The February 26 daily $PM_{2.5}/PM_{10}$ values were on average 3.6 times lower than the monthly values while the $PM_{2.5}/PM_{10}$ values at the peak of the dust were on average 6.2 times lower. The difference was slightly higher when monthly $PM_{2.5}/PM_{10}$ values were calculated without all the other suspected dust events (as mentioned in section 3.2).

Are the range of values that are all < 0.6 representatives of the region during no dust events or just the hours before the event as shown?

Unfortunately, there are not enough studies or information to make a conclusion or generalize these values. We are unsure if this average is representative of the entire area as we only examined month-long data with a focus on one dust event. And all sensors were concentrated over several locations, and not spread enough, so we are unsure if they are representative of the entire area. While the monthly average does show lower values compared to 0.6, the low monthly values could likely be driven by the number of dust events that occurred during that month. We did however observe daily values above 0.6. mainly in sensors that were located in large urban areas. That information was added to the revised manuscript:

Most of the stations had lower monthly values compared to the daily $PM_{2.5}/PM_{10}$ values, some stations had similar values of ~1.

Conclusion

It's very interesting that the PM2.5 fraction is so low during the event, much lower than dust events in other areas. This should be mentioned here as well as in the results.

Per this reviewer's comments, we added more information to the revised manuscript that discusses this aspect. We found that the values were similar to previous studies, so we added that information as well as a comparison to other locations to the revised manuscript:

Observations based on $PM_{2.5}/PM_{10}$ were also performed. The $PM_{2.5}/PM_{10}$ ratio is an important indicator used to characterize the underlying atmospheric processes within the local environment, which allows for the identification of the source of the particles (Yu and Wang, 2010). Higher $PM_{2.5}/PM_{10}$ ratios (> 0.6) are generally associated with anthropogenic pollution, while lower ratios are associated with dust events (Jugder et al., 2014; Sugimoto et al., 2016; Jaafari et al., 2018; Fan et al., 2021; Ardon-Dryer et al., 2022b). $PM_{2.5}/PM_{10}$ values across the nine sensors decreased during the dust event mainly between 11:00 to 18:00 LT (Fig. 6). $PM_{2.5}/PM_{10}$ values across the nine stations ranged from 0.03 to 0.13 with an average of 0.07 ± 0.02 across all stations and times. These ratios were lower compared to the values reported by Tong et al. (2012), which were 0.22-0.24, for this area combined with multiple dust events. Since Tong et al. (2012) $PM_{2.5}/PM_{10}$ values were based on daily values calculations of daily values for each sensor were made (Table S5). The daily $PM_{2.5}/PM_{10}$ values were in the same range (and even slightly higher, 0.24 -0.3) as those in Tong et al. (2012). However, observations of these ratios during the time of dust (which were shorter than the duration of the day, as discussed above) were lower, with the average $PM_{2.5}/PM_{10}$ value of 0.07 (values across all stations ranged from 0.05 to 0.09). These values were similar to those measured by Li et al. (2005) during dust events in the El Paso region. The hourly $PM_{2.5}/PM_{10}$ values at the peak of the dust were lower compared to those measured at the peak in multiple dust storms in Utah (Hahnenberger and Nicoll, 2012; Nicoll et al., 2020). In Washington state, a similar range of daily $PM_{2.5}/PM_{10}$ values was measured (Claiborn et al., 2000). The daily $PM_{2.5}/PM_{10}$ values were in a similar range to those measured during dust events around the world (Alghamdi et al., 2015; Malaguti et al., 2015; Sugimoto et al., 2016; Jaafari et al., 2018).

Is it known if this is a regional signature or is this not well-characterized since most sites don't have PM10 and PM2.5?

Unfortunately, we cannot indicate this conclusion since there are only a handful of sensors that had both PM_{10} and $PM_{2.5}$ measurements at the same site. And there have not been many measurements with both PM_{10} and $PM_{2.5}$ measurements during dust in this region. We added more information to the revised manuscript per the reviewer's comments:

It seems that in some of the locations, the contribution of coarse particles was more crucial than those of fine particles as shown by the low $PM_{2.5}$ and high PM_{10} concentrations, and by the high PM_{10}-$PM_{2.5}$ values and low $PM_{2.5}/PM_{10}$ ratios (at least for the stations that had measurements for both $PM_{2.5}$ and PM_{10}). However, several of the stations showed higher $PM_{2.5}$ concentrations during the dust events, even 5 times higher (as C1028, in Lubbock). This location and many of the others only contain measurements of $PM_{2.5}$ leading to speculation if the lower contribution for $PM_{2.5}$ would be across the region or just in sites examined (the majority of them were in an urban site). Additional studies are needed during dust events and dust storms across the region to provide measurements for both PM_{10} and $PM_{2.5}$. Additional measurements of particle size distribution are important, as such information will give critical knowledge related to health impact (inhalation of particles into the respiratory system), as well as on radiation and perhaps on cloud formation and precipitation processes.

What might the implications be to human health, atmospheric transport and potentially climate for dust events like these versus those that have a higher PM2.5/PM10 ratio – or – is there so much total mass that the PM2.5 fraction is not to be overlooked? How do the storms referenced in the results with ratios > 0.6 relate to this storm in terms of PM concentrations?

We believe the request by the reviewer is beyond the scope of this study, as this study focuses on one single dust event. We believe what the reviewer is asking is a comparison between multiple dust events that will show different ratio values, which we could not provide for this study. According to the literature, dust events should not have a ratio <0.6, these rations will represent anthropogenic pollution, but as indicated additional studies are needed as there is not much information on the topic especially in this region.

This information was added to the revised manuscript to reflect this comment:

This location and many of the others only contain measurements of $PM_{2.5}$ leading to speculation if the lower contribution for $PM_{2.5}$ would be across the region or just in sites examined (the majority of them were in an urban site). Additional studies are needed during dust events and dust storms across the region to provide measurements for both PM_{10} and $PM_{2.5}$. Additional measurements of particle size distribution are important, as such information will give critical knowledge related to health impact (inhalation of particles into the respiratory system), as well as on radiation and perhaps on cloud formation and precipitation processes.

If a lot is not known about what meteorological conditions and seasons result in observed dust events and storms for this region, perhaps the conclusions should include a future work section that discusses what is known versus what needs more research, and whether this can

be done with the existing observations or what might improve data collections to further the state-of-the-science for the scientific community to understand dust events in the southwestern US as they are now and might change in the future.

Per the reviewer's comment, we added information on the meteorological condition's aspect. Since we did not want to extend the conclusion section too long and beyond the scope of the work, we added one aspect related to the meteorological conditions. But in the main manuscript, we added more ideas for future work.

This information was added to the revised manuscript

This location and many of the others only contain measurements of $PM_{2.5}$ leading to speculation if the lower contribution for $PM_{2.5}$ would be across the region or just in sites examined (the majority of them were in an urban site). Additional studies are needed during dust events and dust storms across the region to provide measurements for both PM_{10} and $PM_{2.5}$. Additional measurements of particle size distribution are important, as such information will give critical knowledge related to health impact (inhalation of particles into the respiratory system), as well as on radiation and perhaps on cloud formation and precipitation processes.

Perhaps the meteorological conditions that initiated the dust for Lubbock (synoptic with convective) led to these high PM concentrations. Additional studies across the region are needed to understand how meteorological conditions that initiate dust events might impact the PM concentrations, as such information could be critical for prediction purposes which will help alert the public.

Specific comments:
Lines 151 and 334: Was the period "16 hours" or 18 that was stated in the abstract?

We thank the reviewer for finding this mistake the numbers were corrected to 16

Line 274: type-o - replace "tru exsposure" with "true exposure"

We thank the reviewer for finding this mistake, correction was made.

Tables S3 and S4 – State in the table header or footer what the bold data signifies.

This information was added to the revised manuscript to reflect the reviewer's comment, in the title and also under the table, sown in previous comments (pictures of Tables)

These are the new titles of these tables
Table S3. Meteorological parameters measured by ASOS stations during the dust event. Duration of the dust storm (DS) reported only for stations that reported visibility below 1 km. Bold numbers represent stations with visibilities < 1 km therefore DS.

Table S4. Measurements of $PM_{2.5}$ and PM_{10} during the 26 February dust storm and the month of February 2023. Bold numbers represent significant R^2 values.