Dear Editor Prof Barbara Ervens

Thank you for agreeing to handle our manuscript and for considering a revision of our manuscript. We modified and revised the manuscript to address the editor's comments. We revised the manuscript and made the requested changes in line with your suggestions. 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

Public justification (visible to the public if the article is accepted and published): **Dear Authors,**

Thank you for revising your manuscript. Both referees are satisfied with the changes. However, I have a few minor comments (see below) that I would like you to address carefully. Once these are resolved, I will be happy to accept your paper for publication in ACP. In case you are wondering about the change in editor during the review process: the previous editor decided to step down from the editorial board. As one of the executive editors, I took over to avoid any further delays.

Best regards
Barbara Ervens

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- The title could be further improved, e.g. "Spatial, Temporal, and Meteorological Impacts of the February 26, 2023 Dust Storm: Increase in Particulate Matter Concentrations Across New Mexico and West Texas"
The tile was modified as suggested.

- Please check the ACP author guidelines https://www.atmospheric-chemistry-and-physics.net/policies/guidelines_for_authors.html
1) If possible, please shorten the abstract by about 10 words
We are a bit confused according to ACP guidelines "Abstracts should have fewer than 250 words" and our abstract had 248 words

2) Pay attention to the guidelines for the concluding section. It should exceed a summary of the results.
The conclusions section was modified per the editor's comments.

On 26 February 2023, an upper-level low-pressure system with a strong jet streak aided in the mixing of strong winds to the surface, which resulted in the formation of a dust storm over portions of New Mexico and West Texas. The dust first initiated in New Mexico during the morning hours and intensified as it moved eastward into West Texas. The average wind speed at the beginning of the dust storm was 15.6 m s^{-1} and during the dust storm wind speeds reached up to 26.2 m s^{-1} with wind gusts up to 37 m s^{-1}. Similar wind speeds were measured during different dust storms across the Great Plains, yet lower wind speeds were measured during several dust storms in Arizona. Visibilities ranged from 4 km down to 0 km defining the event as a dust storm (visibility < 1 km). 11 ASOS stations reported dust storm conditions for about 5 to 120 minutes, and Lubbock ASOS reported zero visibility for 13 minutes. This dust storm had a big impact on the air quality in the area. Daily PM concentrations that exceeded the EPA daily threshold ranged from 36 ± 40 µg m^{-3} up to 69 ± 121 µg m^{-3} for $PM_{2.5}$ and 205 ± 321 µg m^{-3} up to 748 ± 2090 µg m^{-3} for PM_{10}. Nine PM stations exceeded the EPA daily threshold. High hourly $PM_{2.5}$ and PM_{10} concentrations during the dust storm reached a maximum of 518 µg m^{-3} and 9983 µg m^{-3} respectively. PM_{10}-$PM_{2.5}$ at the time of the dust, based on nine stations ranged from 96 ± 61 µg m^{-3} up to 760 ± 1000µg m^{-3}, which is approximately 6 times higher than the daily PM_{10}-$PM_{2.5}$ values and 12 times higher than monthly PM_{10}-$PM_{2.5}$ values. $PM_{2.5}/PM_{10}$ during the dust time, ranged from 0.05 ± 0.01 up to 0.09 ± 0.03, which were 3.6 times lower than the daily and monthly $PM_{2.5}/PM_{10}$ values. The PM stations in the region, especially in West Texas, are spaced and far apart meaning that higher PM concentrations than those measured could have occurred but not been reported. Dust particles were present in the air for approximately 16 hours impacting millions of citizens across eastern New Mexico and West Texas. In some locations (e.g., Lubbock), this dust storm was the strongest ever reported, as it had the highest $PM_{2.5}$ concentrations recorded since the station became operational in 2001 and the lowest visibility recorded during a dust storm since 2003. Perhaps the meteorological disturbances 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 disturbances that initiate dust events might impact the PM concentrations, as such information could be critical for prediction purposes which will help alert the public. Such information could determine whether long-term effects such as land usage and climate change will affect the frequency and intensity of dust storms in this region.

l. 14: Swap '< 10 and 2.5 µm' to '< 2.5 and 10 µm' to be consistent with order in preceding 'PM2.5 and/or PM10'

The changes were made as suggested.

l. 27: What is meant here by 'dust initiation'? DO you mean 'initiation of dust events and storms'?

The sentence was changed as we also added additional references to support it.

Strong winds are very important for the initiation of dust events and/or storms, which are generally caused by a synoptic or convective meteorological disturbance (Kelley and Ardon-Dryer, 2021; Robinson and Ardon-Dryer et al., 2024; Sandhu et al., 2024).

l. 64: 68.5 ± 72 should be rounded to 69 ± 72. Make sure to use the same number of significant digits also at other places in the manuscript.
The changes were made as suggested throughout the manuscript.

l. 85: How do you define 'significant' in this context? If it doesn't add quantitative and/or statistically relevant information here, I suggest removing the word.
The words "and significance" were removed from the sentence as suggested by the editor.

l. 126: Where in Table S2 can the reader see the resolution of the instruments?
The sentence was modified to reflect this comment.
Each FEM instrument had a different resolution depending on the operated unit, some units ranged from 0.1 up to 10,0000 µg m^{-3} (T640, 2024), or -15 up to 10,0000 µg m^{-3} (BAM 1022, 2024), others had an upper limit of 5,0000 µg m^{-3} (R & P Model 2025; EPA, 2024), see Table 2 for information on instrument used at each location.

l. 127/128: Is there a '0' too much in 10,0000 and 5,0000, or do you indeed mean one hundred thousand and fifty thousand?
We thank the editor for catching this error we modified the numbers to reflect the correct ones.

l. 152/3: "Only the initialization hours and no forecast were hours used in this study." This is unclear. Please clarify this sentence.
The sentence was modified to reflect this comment
Only the initialization hours were hours used in this study.

l. 174: To me, it seems unusual to call 18:00 'early to mid afternoon' – or is it a different time zone you are referring to? Please clarify.
We thank the editor for finding this mistake, the hours were removed from the sentence.
The right exit region (Fig. 2B) of the nearly 51-62 m s^{-1} (100-120 knot) 500 mb jet streak, associated with the upper low, entered the Chihuahuan Desert region of Mexico, Texas, and New Mexico around early to mid-afternoon.

l. 205 (Fig 2 caption): 'when the dust started', 'when the dust intensified across west Texas' – please rephrase using 'dust event' or 'dust storm'.
The caption was modified to reflect the editor's comment.
Figure 2. 500 mb geopotential heights (m), wind speed (kt, shaded), wind barbs (kt), and temperature (°C) for 26 February 2023 at 18:00 UTC, 12:00 central time, when the dust event started (A) and 27 at 00:00 UTC, 18:00 central time, when the dust event intensified and turned into a dust storm across west Texas (B) and surface wind barbs (mph) and dew point temperature (°C, shaded) for February 26 at 18:00 UTC, 12:00 central time (C) and 27 at 00:00 UTC, 18:00 central time (D).

l. 228: 'started' might fit better here than 'initiated'

The changes were made as suggested.

l. 238/9: 5:36 ± 3:31 hours – can this be indeed said with this accuracy?
These numbers were calculated based on the observation times, per the editor's comment the number was modified.
On average the dust across all stations lasted for 5:30 ± 3:30 hours since some…….

l. 336: "The duration when dust particles were in the air based on an increase in PM values was similar to the duration based on visibility". This sentence is not fully clear. What do you mean by 'duration'? Is it a fixed, quantitative term that can be derived based on PM concentrations and visibility?
The sentence was modified to reflect the editor's comment
The duration of dust particles in the air was based on the time from the first increase in PM to the decrease in PM values. This duration was similar to the duration of reduction of visibility, mentioned in section 3.2.

l. 375 ff: What is the reasoning for a polynomial fit? Why would you expect a better (?) correlation than just by assuming a linear relationship between PM and wind speed? Some explanation for choice of this fit would be appreciated.
We believe this information is provided later in the paragraph. While the normal aspect will be to look at linear regression because the increase in some stations was so high we examined also other regression tests to try to find which can help explain the changes in wind speed and PM value.

This information is provided in lines 384-388: *Other regression models were also examined, to potentially find a better regression value between wind speed and PM values. The Polynomial regression (with 2nd-degree polynomial) presented much higher R^2 values compared to a linear regression. With R^2 values that ranged from 0.37 up to 0.9 for $PM_{2.5}$ and from 0.18 up to 0.9 for PM_{10}. 73.3% of the $PM_{2.5}$ stations and 84.6% of the PM_{10} stations had $R^2 \geq 0.5$ (see R^2 values in Table S4).*

l. 442/3: "These high hourly concentrations are imported as studies,…" – What do you mean by 'imported'? Please clarify.
The sentence was modified to reflect the editor's comment
It is important to have hourly concentration measurements, as studies during dust events from this region (El Paso and Lubbock) have shown that maximum daily PM concentrations can lead to significant increases in hospitalizations on the day of dust and the following days.

l. 451: I assume you mean the difference between PM2.5 and PM10 by (PM10-PM2.5). It might be easier to read in the subsequent text if you defined a parameter for it, e.g. dPM or deltaPM = PM10 – PM2.5

We thank the editor for the suggestion, but we do not want to confuse the reader, based on the literature and papers that use this ratio the term PM10-PM2.5 is commonly used. We do not want to start using a different term that is not commonly used which might raise questions and concerns for the readers.

Supplement: Please add the table captions to the tables.
Table captions were added to the Excel file in each tab for each of the tables.