

Interactive comment on “An observation-based approach to identify local natural dust events from routine aerosol ground monitoring” by D. Q. Tong et al.

Anonymous Referee #1

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General Comments

This paper contributes useful information to air quality in the US wilderness and national parks using IMPROVE aerosol data. There are several claims that need to be addressed in order for this paper to be finalized. The method presented shouldn't be called “new” but does provide a good demonstration of using hierarchical cluster analysis with this dataset. I don't see a strong use of satellite observations to make statements about remote sensing since the authors only used three “rare” events that were exceptionally strong and show up clearly from the satellites. This paper would be improved by using more information from satellite such as AOD or brightness tem-

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perature difference products. Rather than refer to the Exception Events Rule (EER), this method is more useful to Regional Haze Rule regulations protecting visibility in the federal Class I areas. To use this for the EER, this method should be applied to the CSN aerosol dataset.

Specific Comments

Page 3 Line 67: “Change” and “...studied” Lines 92-93: The statement saying “but not chemical composition (Kavouras et al., 2007)” is not entirely true. The paper uses the IMPROVE derived definitions of fine soil (FS) and coarse mass (CM) to specify the days to analyze. Recall that FS is a linear equation as a function of Al, Si, Ca, Fe and Ti based on Malm et al. (1994, 2000a, 2000b).

Page 4 Line 97: How do you define “local”? Does it mean everything else other than transcontinental? Lines 101-107: This statement is true assuming that there is an IMPROVE sampling location close to a regulatory monitoring station otherwise it would be difficult to use the data in a EER demonstration. The paper would have been more useful to tackle the problem using speciated data from the CSN since those stations are within the areas of regulatory monitoring. Line 124: “United States.”

Page 5 Line 145: “North American” Lines 142-144: How did you pick the 0.35 ratio? How sensitive are the analysis results to this ratio?

Page 6 Line 162: The Chow et al. 2003 paper was derived from PM10 samples in San Joaquin Valley. Since this study focuses on PM2.5, there may be some variations in the chemistry of the different size modes. Line 170: The reference should be Taylor and McLennan (1985) Line 183: How do you define a “small region”? Since the IMPROVE stations are separated by large distances on the order of 100s of kilometers, the impacts at the receptor site can be from multiple smaller regions. In an integrated 24-hour sample, you get a mixture from one or more regions and not all local. Even in the areas in the Chihuahuan Desert, impacts are from dry lake and river bed sources in Mexico 100 or more kilometers, in addition to rangeland sources, and nearby fugitive

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dust sources.

Page 7 Line 212: "United States"

Page 8 Line 218: "(CSN)" Line 242: "2007" Lines 244-245: What about the dust sources in Kansas and Texas?

Page 9 Line 269: Those events in 2003, 2005, and 2007 are great examples to work with but why just look at 3 "rare" cases? It's not clear the utility of the remote sensing imagery in this paper other than to highlight some of the worst events. I am an advocate for using such imagery but it hasn't been leveraged to help in the analysis to identify local versus transported dust events. I bring this up since it is mentioned again in the Conclusion section about using satellite data.

Page 12 Line 375: The authors should include the word "generated" in the description "wind [generated] emissions" to be more concise. Line 376: "setting"

Page 14 Line 424: Should be "Salt Creek site"

Page 15 Line 447: Remove the statement that this method is new.

Page 16 Line 488: "Great Basin Desert"

Page 17 Line 499: Why a threshold of 40 ug/m³ and ration of 0.2? Why not use 0.35? Line 500: The authors need to quantify "reasonably effective" and include the analysis in the paper. Line 518: I don't see a clear picture of a "reasonable procedure" to use remote sensing data in this paper. There are methods that have been published to "pinpoint" sources but I don't see how this paper fits into that category. For example, Lee et al. (2009) identified sources in the Chihuahuan Desert based on MODIS imagery and RiveraRivera et al. (2010) used a combination of AVHRR and GOES imagery to construct a database of windblown source locations.

Page 23 Top of left-most column, should be "BIBE" for Big Bend and also needs to be corrected in figure caption.

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Page 24 and 25 Please identify the percentiles shown in the box plots.

Page 26 I will be good to get rid of negative PM_{2.5}/PM₁₀ ratios on the plot scale. Page 27 In figures 6 and 7 the authors need to define abbreviations in the legend.

References

Lee, J.A., T.E. Gil, K.R. Mulligan, M. Dominguez Acosta, A.E. Perez (2009). Land use/land cover and point sources of the 15 December 2003 dust storm in southwestern North America. *Geomorphology* 105: 18-27

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