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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Basin-scale wind transport during the MILAGRO field campaign and comparison to climatology using cluster analysis" *by* B. de Foy et al.

Anonymous Referee #1

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General Comments

This paper presents an interesting analysis of the cluster analysis results for radiosonde data, surface wind measurements, and radar wind profiler measurements (above 500 m AGL) for the Mexico City area, with an emphasis on the MILAGRO campaign. To the best of my knowledge, this is a unique combination of cluster analysis results of meteorological variables. I have suggestions for the figures which may help to make the ties between the cluster analysis results and air quality stronger.

Specific Comments

(1) The map: 1) Introduce the sites on the map before discussing them. 2) Several sites are mentioned in the paper that are not shown (or labeled?) on the map. Please include all sites mentioned. 3) I suggest making the map much larger, expanding beyond the current boundaries to show more of the surrounding terrain, which is critical to the results. An inset map, showing the position of your site map within Mexico would be useful for those not familiar with the area. 4) Terrain features mentioned in the text should also be labeled on the map.

Section 3 (2) When discussing Fig. 2, where do you get the information for detailed comments about the time of day of some trends, such as the CO max takes place between 08:00 and 09:00 in the morning? What is the time zone?

Section 4 (3) Using cluster analysis to determine the how the timing of the MILAGRO campaign relates to climatology is a very nice use of cluster analysis. It is a compact way of addressing the issue. Nice job.

(4) I really like the results of the radiosonde clustering and the presentation. I think this is a very useful way to get the overview of the types of conditions measured.

(5) However when discussing Fig. 4 you say that "..we can immediately see that the strong cold cleansing winds...were mainly in 2004 and 2005 were absent in 2006." I would say it is not immediately seen, because the symbols are not clear. I suggest that you make the symbols for either ’04 or ’05 larger. The whole figure could be larger too.

(6) In the next sentence, you say that March 2003 was also dominated by the basin flush winds. I only see results by month for April 2003 and March 2006, neither of which have basin flush winds. Therefore, it is not obvious to me what you are referring to. Am I missing something?

Section 5 (7) Please state why you only show 5 of the 8 stations in the cluster wind rose figures.

Section 6 (8) I’m not sure that the phrase "...three-dimensional wind patterns..."

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is appropriate in this context.

(9) The discussion of the profiler cluster analysis is confusing regarding the T2 issue. Please rewrite so that the reader fully understands how T2 profiles were incorporated into the figure that shows wind roses for all profilers.

(10) Thank you for mentioning the terrain's influence on the profiler cluster results.

(11) The detailed explanation of the profiler cluster results is very tedious. I suggest cutting this section by at least half. You could present a more general discussion without losing any important information. The profiler clusters are addressed in Section 7.1 anyway, which is a nice context for more detailed discussion.

Section 7 (12) I think you should stick to "episode types" rather than sometimes using "episode," which implies a specific date or dates.

Figures 12 and 13 (13) These figures are a critical part of the paper, and I do not agree that the "calendar like plot" is the way to go. As is, it is too difficult to assimilate the information and relate the wind patterns to air quality. I suggest these things to try for presenting this data:

1) Use a single row for each day, so the hours line up in columns. 2) Use just 3 colors for the blocks - blue for drainage, green for southerly flow, red for northerly flow. You can still leave the cluster numbers for detail. This will hopefully give the reader an instant general view of the patterns. 3) At the end of each row, list the episode type using the codes from Table 2, and some indicator of air quality (either qualitative or quantitative, such as max ozone of the day). 4) Try plotting the profiler cluster results underneath the surface clusters for each day (just one per hour) using blue for sheared flow, green for southerly flow, and red for northerly flow (so you end up with two rows per day). Again, keep the cluster numbers for detail. This may make it easier to tie the surface with the upper-air results together, but you'll have to try it to see if it works. If it does not work because it looks too cluttered, I suggest plotting the profiler results as

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the surface results (in rows), just using one block per hour. I do not think anything is gained by showing the two blocks per hour.

I have thought about the presentation quite a bit, and I realize it is not an easy task. It would make the paper stronger if the relationships between the surface winds, winds aloft, and air quality were shown in an easier to view format, perhaps creating a smoother tie to the discussion of Table 2.

(14) In Fig. 14, why do you show only 4 of the 6 episode types? These are your results! I know you have to generalize on the missing two, but an example would be useful. The graphics are well done, but could be larger.

Section 7.1 second to last paragraph (15) Not sure what you mean in the last sentence of this paragraph "...entrainment by southerly winds aloft..."

Section 7.1 last paragraph (16) "The diurnal distribution is mainly in the mid-afternoon." The "diurnal distribution"of what?

Summary (17) I like the summary - some excellent points are made and it is a nice overview of the results.

More comments on Tables and Figures

(18) Table 1 - I suggest putting the maximum number for each row in bold font

Figures 5, 6, 7, 9, 10 (19) I really like this presentation, but the wind roses are too small. It is too hard to read the station identifiers. I suggest putting the color bar at the bottom of the figure, and make it larger too. It looks like the color bar is not evenly divided over 24 hours? Plotting on top of a few terrain contours may be helpful too, especially for the drainage clusters.

(20) Fig. 8 could be larger.

Technical Corrections

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(1) In general, the paper needs a good proof reader to correct the minor errors throughout the paper. (The following list is not a complete list of needed changes.)

(2) The introduction is a bit jumbled. There are repetitive sentences that could be eliminated, and Section 1.2 needs to be reorganized. For instance, the authors discuss a few cluster analysis papers, mention what they are doing, and then discuss some more papers, then go back to what they are doing. I suggest a more organized discussion of previous papers, ending with a brief discussion of the method used in this paper, and what is new and exciting about this paper.

(3) There are many instances of present tense verbs, when they should be past tense.

(4) There should be no colons when referring to times in UTC. "Z" should be "UTC."

(5) I suggest changing "...data was..." to "...data were..." throughout the paper.

(6) There are a couple of instances where "where" should be "were."

(7) Abstract line13 Change "...basin scale circulation..." to "...basin-scale circulation..."

(8) Section 1 line 10 Change "...campaign..." to "...campaigns..."

(9) Section 1.1 Change "...up and down-slope..." to "...up- and down-slope..."

(10) Section 1.2, first sentence Change "...been either..." to "...been used either...", or to something that makes more sense.

(11) Section 4 - Spell out what NOAA stands for.

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Interactive Comment