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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol Climatology over Nile Delta based on MODIS, MISR and OMI satellite data" *by* H. S. Marey et al.

Anonymous Referee #1

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Marey et al. show results of an aerosol climatology that they derived from several satellite instruments by using several years of measurements. Their results show that two distinct episodes with enhanced aerosol concentrations are found. These episodes are found repeatedly in every year. One episode is due to the "black cloud" event which occurs every fall and the other episode due to desert storms that have their maxima in spring. Their study focuses on the microphysical properties of the aerosols present during these pollution events.

The paper is well written and shows interesting results which are significant and appropriate to be published in ACP. My list of comments seems to be quite long. However, these are a lot of small issues for clarification and to improve the readability of the figures.

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Interactive Discussion
Discussion Paper

Abstract:
P10449, L1: Why since 1999? Did these pollution events not occur before or were their simply no measurements available before 1999?
P10449, L3: As described later, the desert dust is a different pollution event than the "black clouds" that occurs in spring and is of natural origin. In the abstract it sounds like that dust is also contributing to the black cloud events.
P10449, L12-14: How high? Up to which altitudes are the dust layers found?
-Generally, I would suggest emphasizing in the abstract a bit more that data sets are used to get which information (e.g. AOD for deriving aerosol climatologies, CALIPSO for getting information on in which altitude are certain types of particles found).
-When using AOD how do you differentiate between carbonaceous and dust aerosols?

Introduction:
P10451, L13: What do you mean with spring wind events? Are these characterized by increased wind speeds or by a change of wind direction? What are the meteorological conditions behind these spring wind events?
P10451, L18: "There are seasonal sources. . .." Did you not just in the sentence before show that there is a seasonal cycle describing the concentrations found in different seasons?
P10451, L20: Why since 1999? Did this event not occur earlier or were earlier no measurements available?
P10451-P10452: You describe very nicely the health effects of black clouds. However, you do not say anything about the health effects concerning dust storms. Which effects do they have? Though they are a natural pollution event, there must be also some health effects or damage due to these.
P10452, l3-4: This needs some more clarification. How does that work? Do the particles not serve as CCN and produce more clouds and thus also more rain?
P10453, L20: How can one relate from fire counts to the source? Please clarify.

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P10453, L8: This should be clarified a bit more. Why are you looking at the microphysical properties? Why is it important to know them? Are you using the microphysical properties to differentiate between dust and biomass burning compounds? Which properties are you exactly looking at?
P10453, L17: It should already in the introduction clearly be differentiated that deserts cause natural air pollution while biomass burning and the black clouds cause anthropogenic pollution.

Results:
P10457, L5-9: Which time period of precipitation data was considered? For what purpose is the precipitation data used?
P10457, L1-5: Please give some more details here. From where were the trajectories started and over which time period were they calculated?
P10458, L3-5: Are year to year variations not the same like inter-annual variations. Do you mean here that you see a trend? I indeed can see a slight decrease in max in the years 2007 to 2009.
P10458, L6: How do you know that the dust season is in April and the black clouds in autumn? Though you already describe in the introduction it would be worth to repeat it here once again.
L10458, L19-end of paragraph: This is not clear. Please clarify what the connection between AOD and precipitation is and why?
P10458, L25: This sentence is not clear, I suggest rephrasing.
P10458, L27-29: This sentence is also not clear. Sounds like that photochemical processes lead to low wind speeds. That makes no sense and I guess this is not what you mean. You rather mean that these processes act at the same time.
P10459, L5-7: Is that not simply due to the fact that there is more rain in winter than in summer in these regions?
P10459, L10-12: This does not really explain why you get differences between Terra and Aqua. I agree that these differences are not significant, but still there must be an

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explanation why these are found.
P10459, L23-end of paragraph: It is not clear from the text that data sets from different stations are used. In the figure captions, however, it is well explained.
L23-end of paragraph: This should also be more clarified. It seems you split the data set to get two entire years. Is that correct?
P10460, L3: Why is the AOD at 1020 nm higher? Is the following sentence giving the explanation? If yes, this should be said more clearly.
P10461, L2: Should not also the transport pattern play a role?
P10461, L8: Up to which altitudes are the dust aerosols found? What is the reason that the aerosols during the black cloud events stay in the planetary boundary layer?
P10461, L14-23: Can it be that the descriptions of the two panels are mixed up? Otherwise one would get the aerosol layers in the upper panel below the surface.
Lxx: A general question, how do you differentiate between clouds and aerosol?
P10462, L23: How does the NAO affect the flow pattern? Does this really help to mention here? I would suggest adding some more details on this relationship.
P10462, L28 and following lines: It is not really clear which additional information you gain from size and shape of the particles.
P10463, L27: add "(dust)" and "black cloud" after natural and anthropogenic, respectively.
P10463, L23: This is not clearly explained. How do you get information about the aerosol type from the microphysical properties?

Discussion and Conclusion:
P10464, L20: Which regions (lat/lon) are defined as Nile delta and Western desert?
P10465, L9-11: Why is it like this?
P10465, L21: You already have known that and the measurements corroborate this.
P10465, L16-20: Why can large particles be related to dust? What are the typical characteristics of dust or carbonaceous particles?
P10465, L9-end of paragraph: These are also quite important results and could be

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mentioned also in the abstract.

Figures:
Figure 1: Mark the Nile delta in the map.
Figure 2: add titles to the Figures for (a) Nile delta and (b) Western desert.
Figure 3: add titles as for figure 2.
Figure 4: It would be maybe helpful and more clearly if the symbols would be connected with lines.
Figure 5: I think the figure would be more clearly if it would be shown in two figures, one showing the daily UVAI and one showing the monthly UVAI. Caption: Are both data sets from OMI?
Figure 6: Please mark Cairo more clearly on the maps. The location of the Nile Delta is here somewhat different than it was described before in the text. In the text you said it is the area around 30 to 32 E and 30 to 32 N. It would also increase the readability of the figures if titles with the dates above the figures would be added.
Figure 9: The legend reads in both figures AOD fraction. It would be good to make it more visible also in the figure that one is for shape and one for size. Also here it would good to add titles to the figures with the regions ((a) Nile delta and (c) Cairo). Is figure b also showing a climatology? If yes, that should be added to the caption.

Technical corrections:
P10450, L7: . . ...10 yr period from (insert "period from")
P10450, L8: . . ...observed in the AOD. . .. . ..(insert "in the AOD") **P10454, L13:** Are the numbers/plus-minus signs correct?
P10456, L23-25: The komma should be after the coordinates and it should read "where the. . ..".
P10458, L24: plotted is written twice, skip one.
P10460, L18: "data sets" instead of "datasets".
P10461, L16 and 17: "latitude" instead of "lat".

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P10465, L20: Thus, this result . . .. . .(insert this).
P10465, L23: “black cloud” (small letters and in quotations as done before) instead of “Black Cloud”
P10466, L4: skip “the” before fall.
P10466, L11: skip “the” before fall.
P10466, L13-14: These two sentences should be one or the first one needs to be rephrased.
Figure 6 caption: "CALIPSO" instead of "calypso".

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