

## ***Interactive comment on “Remote sensing of exceptional winter aerosol pollution events and representativeness of the surface – column relationship over Paris metropolitan area” by Alexandre Baron et al.***

### **Anonymous Referee #3**

Received and published: 25 September 2019

Please refer also to my previous comment on the fact that "surface - column relationship is touched in the paper but not the main topic". I believe that the data collected are very valuable, but my major objection is with the scope of the paper, as explained therein. The paper as it stands raises the reader's expectations a bit too much.

Detailed suggestions follow below:

#### **MAJOR COMMENTS:**

- 1) I suggest to modify the title and abstract as explained in my previous referee com-

C1

ment (21 August). This is the major objection I have to the paper as it stands now.

- 2) Another statement that I think could be reviewed on the basis of the above is on page 3, lines 6-7.

- 3) Angstrom exponent, page 4, lines 25-28. A few points should be clarified in my opinion: (a) when you say "constant" do you mean constant with height or with time? (b) is the Angstrom exponent an instantaneous value or a daily average? (c) the last sentence is unclear (what assumption and what has the horizontal advection to do with it?).

- 4) Spatial averages, page 8, lines 15-16: I suppose that the way the spatial average is done is limits it to the available ground stations, which means a coarse spatial sampling and a limited overall area. Please mention these caveats in the text.

#### **MINOR COMMENTS:**

- 5) Abstract, line 12: replace "continuously" with "during two 5-day periods" as the lidar was not operated continuously from 1 November to 31 January (see text).

- 6) Abstract, line 13: delete "submicron" (at this wavelength the lidar is also sensitive to supermicron particles) and add "thought to be" before "mainly" (you have no direct measurement of aerosol type/origin).

- 7) Abstract, line 15: explain the method used to determine the circular area and measure its diameter.

- 8) Abstract, line 17: explain what other information you have to say that the event covered all of Western Europe.

- 9) Abstract, lines 17 and 18: explain where exactly the values of 121 and 156 have been observed. Explain what is the value after the +/- sign (experimental error? variability in time? standard deviation of measurements at different stations?). You give the AEC of the second episode: why not give also the AEC of the first episode?

C2

- 10) Abstract, line 20: the sentence about weather conditions is vague, I suggest to be more specific and describe which type of weather conditions you are referring to.
- 11) Page 3, lines 8-9: "the most severe winter APEs above the Paris area": specify over which period of time they are the most severe (e.g. "from year Y to nowadays").
- 12) Page 4, line 20: "downgraded" → "integrated"
- 13) Page 5, line 6: "sources of uncertainties" → "uncertainties for our lidar system" (it helps to know that Royer et al is not a generic paper but one that details the uncertainties for this specific lidar).
- 14) Page 8, line 19: specify over which time period the 136 (27) values are valid (is it the 11 years in Figure 2?).
- 15) Page 8, lines 21-24: the judgment on pollution could be worded differently, relating to the actual data that are shown. "winter 2016/2017 stands out with a large number of threshold exceedances", "2015/16 and 2017/18 had few threshold exceedances".
- 16) Page 8, line 23: I suggest to omit "despite the increasingly coercing political measures to improve air quality".
- 17) Page 8, line 24: expand better on the link between pollution levels and anticyclonic conditions.
- 18) Page 8, lines 29-31: make dates consistent with dates in the abstract, please.
- 19) Page 9, line 1: next to meteorological patterns add "see section 3.2"
- 20) Table 2, caption: add "in winter" after "decade"; explain if the max/min value is instantaneous, hourly, daily, etc. In the table, I would suggest to group the event by winter and not year (e.g. 2007/2008 instead of 2007): this would be coherent with Fig. 2.
- 21) Figure 3, caption: wind velocity and direction at which altitude level? surface?

C3

- 22) Page 12, line 7: add "single" before "grid point" and give lat/lon of the grid point centre.
- 23) Fig. 4, x-axis: Month-Day-Hours is confusing; I suggest Day/Month HH:MM. In the caption you should also mention the wind rose.
- 24) Page 13, line 8: "clear" → "aerosol-free".
- 25) Page 13, line 19: state in the paper that you have chosen to keep the data associated with the middle and high altitude clouds and why. Even better, they could be displayed in a different colour for easy identification.
- 26) Page 15, line 7: are you referring to particle size? I suggest to specify "particle size" after "smaller aerosol"
- 27) Page 15, line 18: if I have understood your reasoning, then the following sentence could be added for more clarity at the end of this line: "We therefore do not believe that the influence of RH on LR is significant".
- 28) Page 15, line 28: "shows that the CALIOP and CATS spaceborne observations may be complementary" → "shows the CALIOP and CATS tracks".
- 29) Page 19, line 3: add "surface" before "PM".
- 30) Page 23, line 10: add "over Paris" after "decade".

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-464>, 2019.

C4