Remote sensing of two exceptional winter aerosol pollution events and representativeness of ground-based measurements

by A. Baron, P. Chazette and J. Totems

Authors response to the referee #5 and Editor

Dear Editor,

Please find hereafter our response to your comments. We appreciate the time you invested in the review.

Kind regards,

Alexandre

2. Please make the requested modifications shown in section 5.3 of the annotated document.

Concerning the manuscript, I made the corrections you asked in section 5.3 and updated the few links to figures that were obsolete.

1. In the new Figure 14, it seems that the group of points in previous Figure 14 with PM values between 40 and 50 µg m-3 and AECs below 0.4 km-1, have disappeared in the new Figure 14, where the new/extended dataset seems to now fit very well, and also to provide a very similar slope to that of the two major pollution events. Please, explain how this was achieved. In fact, the third dataset has been extended, from 05-08/10/2016 to 03-10/12/2016, thus the group of points would be expected to be enriched (more days/points) but also to include the previous (05-08/12) group of points.

Also, relevant with this change, please correct the caption of figure 14 referring to the third dataset, i.e. blue crosses, and modify the third sentence referring to the time period.

It is true that we have more points than in the previous version but no points have been removed. Here is the explanation of what has changed with the points between 40 and 50 µg m-3 and AECs below 0.4 km-1 that were in the previous version of figure 14:

We pointed out in the last response that these points which looked really uncorrelated were indeed points corresponding to times where the PBL was very shallow (see the time-series of the bottom panel of the figure 1).

As a consequence, we think that the corresponding AEC of these points were under-evaluated because taken in the entrainment layer or above the PBL, and thus no more surface-correlated. The enhancement of the lidar inversion permitted to retrieve AEC lower in the PBL (300 m to 250 m AMSL). And it appears that the maxima of the AEC found in the PBL for these profiles were found lower in altitudes and larger in AEC values.

To conclude, these points are still there in the new version and one can relies on the correspondence with PM2.5 to be sure of that. The only change is on the shift in AEC that has been permitted by an inversion of the lidar signal lower in altitude (one can see the difference in the times-series of figure 1 and figure 2).

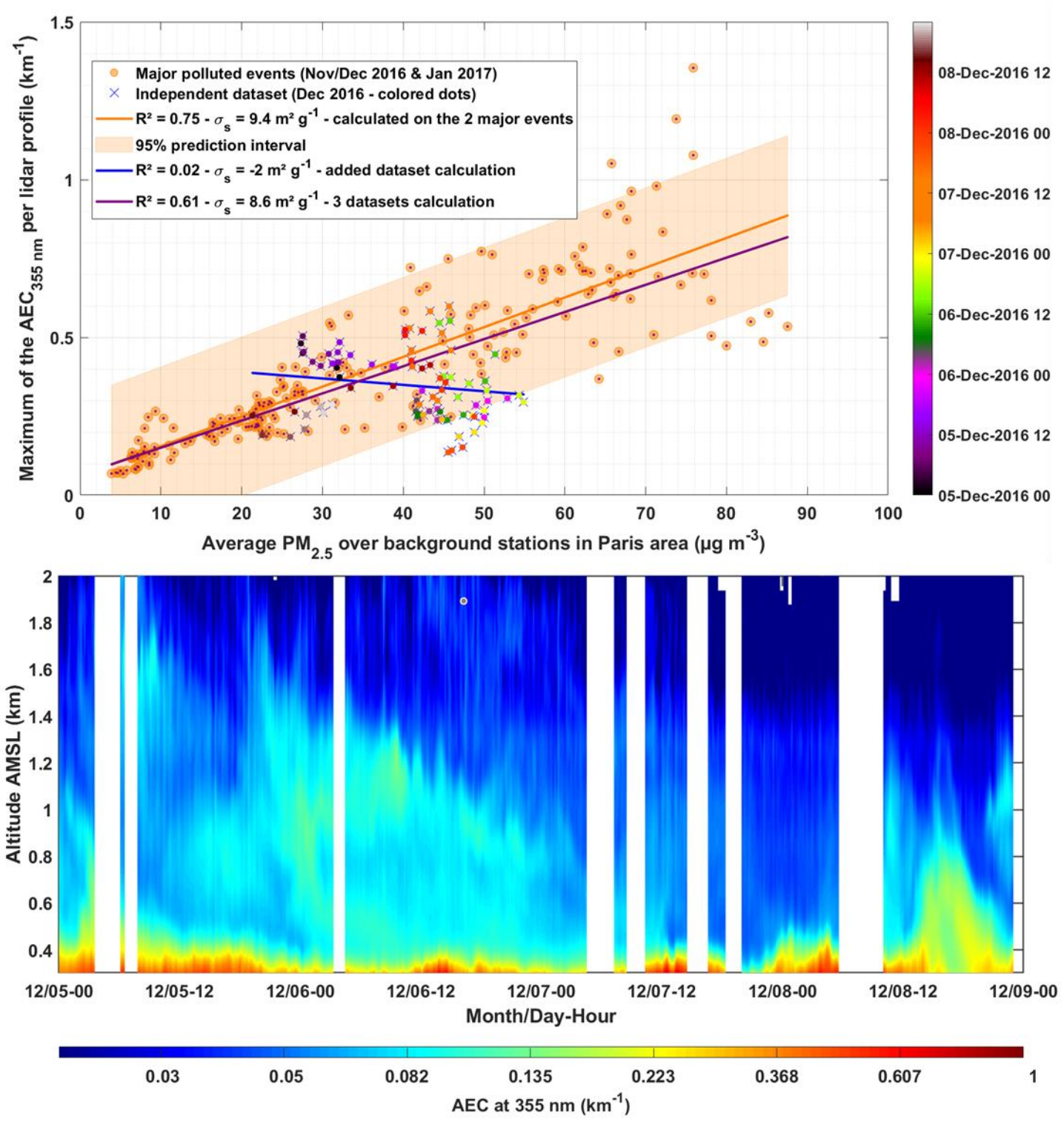
Major polluted events (Nov/Dec 2016 & Jan 2017)
Independent dataset (Dec 2016 - colored dots)
R² = 0.75 - σs = 9.4 m² g-1 - calculated on the 2 major events
95% prediction interval
R² = 0.02 - σs = -2 m² g-1 - added dataset calculation
R² = 0.61 - σs = 8.6 m² g-1 - 3 datasets calculation
Maximum of the AEC355 nm per lidar profile (km-1)
Average PM2.5 over background stations in Paris area (µg m-3)
08-Dec-2016 12
08-Dec-2016 00
07-Dec-2016 12
07-Dec-2016 00
06-Dec-2016 12
06-Dec-2016 00
05-Dec-2016 12
05-Dec-2016 00
Altitude AMSL (km)
12/05-00
12/05-12
12/06-00
12/06-12
12/07-00
12/07-12
12/08-00
12/08-12
12/09-00
Month/Day-Hour
0.03
0.05
0.082
0.135
0.223
0.368
0.607
1
AEC at 355 nm (km-1)

Figure 1

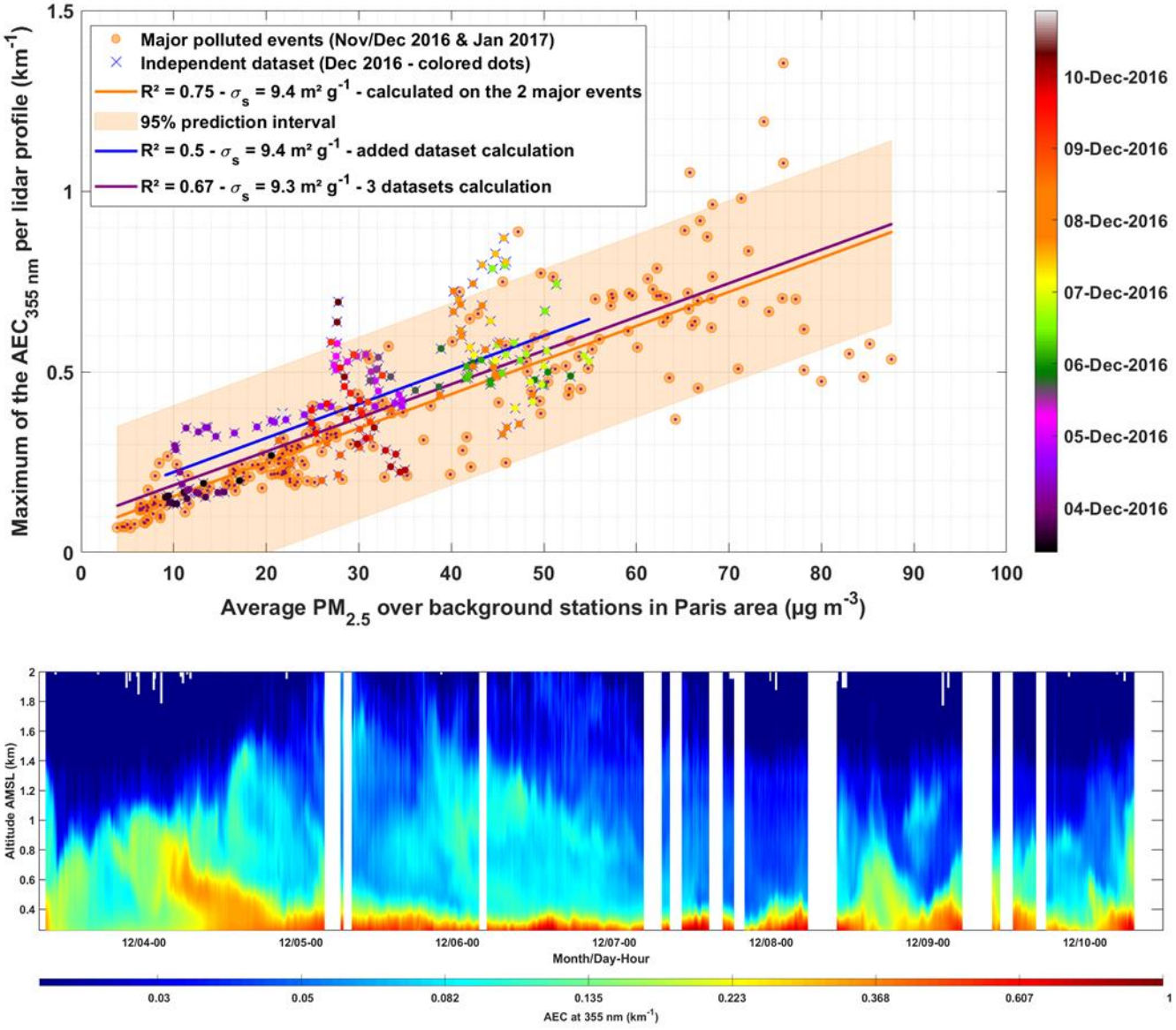

Figure 2