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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Transport of aerosol to the Arctic: analysis of CALIOP and French aircraft data during the spring 2008 POLARCAT campaign" *by* G. Ancellet et al.

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Answer to reviewer 2Âă:

The new manuscript with the modified text hightlighted in red is given in the supplementary document. The answers to the reviewer questions are given herafter.

"When you are talking about R(z) can you show an example of how it was calculated to make it more understandable. Probably to include a table with the general parameters of the lidar will help to make it more understandable as well."

This is described in details in a previous paper discussing aerosol Lagrangian study

for a specific day of the campaign. It is said in 2.2.1. Two sentences were added to explain this more clearly at the end of the first paragraph and the beginning of the third paragraph.

"Pag.5728, Para.5-10 add here the dates from where to where you are making the division."

This was added in the sentence describing the differences between the two subsets.

"Pag.5729, Para.20-25 "high correlation is nevertheless observed between lidar backscatter ratio and aerosol particle concentration, as expected" Give here the percentage of the correlation between both measurements".

The value of the correlation coefficient is 0.55 with a significant percentage (> 0.99). This result is now given in the new version of the text. An even better agreement is expected if we add the time delay between the lidar measurements 150 m below the aircraft and the in-situ measurements by using the vertical velocity.

"Pag.5734, "Assessment of the 1064 CALIOP calibration" have to be rewritten, the explanation is somehow confused, please add more details about the effect of the cirrus clouds in the CR after apply the recalibration you are proposed here."

We agree that it is a very important question which was also raised by reviewer 1. We added more explanations about the calibration infrared channel used in the Version 3 CALIOP data which were used in this paper. As explained in the answer to reviewer 1, we have modified section 3.2 and the conclusion addressing two different angles of this question: 1) First to discuss more the fact that a change of the 1064 nm lidar calibration implies an impact on cirrus clouds color ratio selected for the calibration criteria of the Version 3 (V3) Caliop level 1 data set 2) Second to recall that out approach based on the expected aerosol color ratio implies that the 532 nm is unbiased. If it is not really the case as discussed in our analysis of the comparison between the airborne lidar and CALIOP 532 nm scattering ratios in section 3.3 then the proposed correction of

1064 nm signal can be reduced significantly. A 5% error in a 532 nm scattering ratio of 1.1 implies a 40% error on the 1064 nm total attenuated backscatter assuming an aerosol color ratio of 0.5. This is added in section 3.2 which is now entitled “Impact of the 1064 nm calibration on the aerosol color ratio” to reflect the limit of our approach for discussing this calibration. We did not look at the impact of cirrus color ratio because there are only few of them (11 values with only two for nighttime conditions) for the campaign area and time period. It is added in the paper that our correction based on the expected aerosol color ratio implies a positive bias of 40% i.e. a value higher than the expected 20-30% uncertainty on this calibration. It is also stated that this may be modified if there is a correction of a 5% underestimate of the 532 nm channel. Such an underestimate is possible considering the results of section 3.3 showing a bias of -8% between CALIOP and the airborne lidar. In section 3.3 this bias is attributed to sampling differences but possibly also to the 532 nm calibration uncertainties. The conclusion is also modified to keep open the range of the correction needed for the 1064 nm channel. In a future study it would be useful to conduct the kind of analysis proposed in this paper with the new V4 calibrated backscatter data.

"Pag.5741, Para.10-15 Change “serosol” for aerosol." done

"Pag.5761, Add the Regression line to the figure 7, it is mention in the caption but is not include in the graph." done

"Pag.5763, Fig. 9 Change the scale for the aerosol color ratio LNG, use the same that for CALIOP and how is mention in the text." Yes we agree it is better to use the same relative unit instead of percentage. The two figures were modified accordingly.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/14/C3615/2014/acpd-14-C3615-2014-supplement.pdf

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