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Atmospheric Chemistry and Physics Discussions

Interactive comment on "How much of the global aerosol optical depth is found in the boundary layer and free troposphere?" *by* Quentin Bourgeois et al.

Anonymous Referee #1

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Review of : How much of the global aerosol optical depth is found in the boundary layer and free troposphere

Quentin Bourgeois, Annica M. L. Ekman, Jean-Baptiste Renard, Radovan Krejci, Abhay Devasthale, Frida A.-M. Bender, Ilona Riipinen, Gwenaël Berthet, and Jason L. Tackett

The authors describe a large set of CALIPSO data used to better estimate the aerosol concentration within the free troposphere (away from sources) and within the boundary layer. This manuscript is of interest for the scientific community but need major revisions before submission to ACP.

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Discussion paper

MAJOR COMMENTS :

1. The large set of data is always express by years i.e. from 2007-2015. However, it would be useful for the reader to have the numbers of profiles used for each season and each location (Land vs Ocean) and also for each type of particles retrieved by the CALIPSO algorithm. It would increase the confidence for each percentage and value given within this paper.

2. The authors state page 7 that AOD correspond to aerosol mass concentration. From my point of view this statement should be made earlier in the paper to avoid any misunderstanding. As an example, the mass concentration of polluted aerosol is not important while their number concentrations are tremendous.

3. The authors are claiming to compare the CALIPSO data set with airborne in-situ measurements (LOAC). However, the coincident measurements correspond to 1 flight (corresponding to 10 lines in the paper) and therefore are not really relevant for this paper. The CALIPSO data could be compared to ground-based LIDAR measurements all over the world and to in-situ measurements from all the airborne campaigns (such as DISCOVER-AQ, HIPPO, AMMA, etc. . .). This comparison would provide much more information than what one flight with one instrument could provide.

MINOR COMMENTS :

Page 4 – L 12 : What does “clear air” refers to ? I didn’t understand why you choose the 2.46km threshold.

Page 5 L 5 : not well said : the influence of the accuracy of the estimated BL height Page 6 L16 AOD over instead of AOD pver.

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