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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Airborne measurements of aerosol optical properties related to early spring transport of mid-latitude sources into the Arctic" *by* R. Adam de Villiers et al.

Anonymous Referee #3

Received and published: 23 February 2010

De Villiers et al. present some new data on aerosols from an aircraft campaign in the Arctic. The data are interesting, and show different aerosol optical properties for plumes originating from different sources. The paper is suitable for publication, but some issues should be addressed.

MAJOR

* Some new terminology is introduced: pseudo colour ratio and pseudo depolarization ratio. It is not clear that such new terminology is actually needed. It would not be hard to perform retrievals on the data (e.g., convert attenuated backscatter ratios to cross-sections using the Klett inversion) to obtain more well-known (non-"pseudo") and more

widely-used parameters. In any event, the definitions of any new parameters should be stated up front and compared to the standard forms, rather than relegating them to the Appendices.

* Along the same lines as the above, on the bottom of page 27797, it would be better to use the more standard "particle depolarization ratio", i.e., with the molecular contribution taken out. Mixing the molecular returns with the particle returns leads to a lot of confusion in this paper (such as one encounters on the first line of page 27798). A standard definition of the particle depolarization ratio should be used.

* Table 1: This table of lidar parameters is very sparse. More detail on the instrument should be given, or better yet a reference to the relevant instrument paper.

* The CALIPSO data are provided in one massive table. This is not really a very helpful format, as it is very difficult to extract anything meaningful from it. A scatter plot (or some such thing) of the relevant fields would be much more useful.

MINOR

* The bottom panel of Figure 1 isn't very useful. Why not replace the bottom panel with what is in Figure 2? That would provide the added benefit of introducing the horizontal flight pattern in the bottom panel to go along with the vertical flight pattern in the figure above.

* Figure 2 should include a colour scale for the wind speed contours.

* Some adjustments to the writing style would improve the readability of the paper. Figures are often introduced following after they are discussed. This forces the reader to backtrack and re-read earlier paragraphs. I think it would be better to say "Figure X shows such and such." and follow with the meaningful commentary instead of the other way around.

* Pg. 27795, lines 13-14: "Subsidence of dryer air from the mid- troposphere occurred in this region where the 290-300 K isentropic surfaces are tiled". This sentence need

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to be substantiated or removed. What evidence is there for subsidence as opposed to advective transport?

* Pg. 27797, line 27: The text says 69.7 deg N, whereas Figure 4 says 69.59 deg N.

* Figure 4, and most line plots thereafter: It is difficult to distinguish the blue and black lines. A better choice of colours would be helpful.

* Figure 6: What is on the y-axis for the flight track data?

* Pg. 27798, line 12: Spelling mistake. Should be "proportional".

* Pg. 27800, lines 23-25: "- the lidar aerosol layers are mostly related to either biomass burning or urban/industrial sources considering the good correlation between aerosol and CO concentration". I think that this statement needs a supporting reference.

* Pg. 27801, line 26: "... fraction of particles being in the lower troposphere of a given region..." This pertains to the altitude range that is assumed to provide aerosol sources for transport in FLEXPART. I assume that you mean the boundary layer, and "lower troposphere" seems to cover more than that. Please provide the actual range of altitudes.

* Pg. 27802, line 21: Grammar: "This took place 3.5 days because of..."

* Pg. 27809, line 23: "means" rather than "mean"

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 27791, 2009.

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