

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 #1

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general comments

The authors describe one measurement of long-range transport into the Arctic. According to the POLARCAT website, there have been at least 4 more flights with lofted aerosol layers (probably from long-range transport) during the campaign. Why are these data not presented in this paper? Additional data of other flights could significantly improve the relevance of this paper.

The paper could be improved if it were written more carefully. There are numerous imprecise figures, formulas, formulations, and conclusions.

The paper could be improved if the authors compare their results to the existing litera-

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ture concerning long-range transport of aerosols and concerning the optical properties of different aerosol types.

specific comments

There is no general information on the measurement campaign. Instead, the authors cite a paper 'in preparation'. This is not acceptable.

The authors use the so called pseudo color ratio for the description of the size of the aerosol particles in different layers. This quantity is not suitable for this purpose because it depends not only on the particle size but also on the aerosol amount and on height. Due to the use of this unusual quantity, the results of this paper are not comparable to the results of any other lidar observation. The definition of this pseudo color ratio is even different from the definition of the attenuated color ratio that is obtained from the CALIPSO standard retrievals. The authors must show profiles of the color ratio (as defined in equation 8).

The derived depolarization profiles are doubtful. Freudenthaler et al. [2009] present a detailed analysis of systematic errors of depolarization ratio measurements. The authors should first discuss the influence of all possible error sources on their measurements. The Rayleigh depolarization ratio of 1.5% cannot be applied if narrow interference filters are implemented in the lidar. Unfortunately, this paper provides no information about the filters. The depolarization profiles in Figure 5 are smaller than the assumed value for molecular scattering in the range above 3.5 km height. Depolarization values below the molecular value can be observed only in optically thick layers of spherical scatterers (e.g., water clouds). According to Figure 3, there were no such layers.

I am wondering why the CALIPSO team and its data center are not mentioned in the acknowledgements.

technical corrections

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Is the name of the 4th author written correctly?

Abbreviations of measurement campaigns and instruments are not explained.

There is no reference for the CALIOP instrument

There is no reference or detailed explanation of the aircraft lidar.

page 27795, line 23: There is a link to Fig.11 which should be Figure 1

page 27796, line 27: There is a link to “Annexe I” instead of Appendix A

In page 27811, all formulas include the height dependence (z), but on page 27812 the term (z) disappeared.

page 27811, line 11: ‘at range lambda’ means ‘at range z ’

Figure 1: legends and isolines are not explained

Figure 2: meaning of the colored lines is not explained

Figure 4: altitude axes are different.

figure 5: legend differs from the ones in figure 4, e.g., 70.655 N versus 70.5N.

left figure with frame, right figure without frame

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

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