Atmos. Chem. Phys. Discuss., 9, C4959–C4962, 2009
www.atmos-chem-phys-discuss.net/9/C4959/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ground-based lidar measurements from Ny-Ålesund during ASTAR 2007: a statistical overview" *by* A. Hoffmann et al.

Anonymous Referee #2

Received and published: 17 September 2009

The paper of Hoffmann et al. could be interesting. It presents a description of clouds and aerosol structures during the ASTAR2007 campaign. The study has been performed in using two lidar system located at the surface on the AWIPEV research station (Spitsbergen) and the coupling with radio-sounding and back-trajectory analysis. The first lidar system is a micro-pulsed lidar and the second a Raman lidar (KARL). The exact period considered in this paper is between 1 March and 30 April, which permits to study the Arctic Haze. Both clouds and aerosols optical properties are discussed against the altitude mainly in using an approach based on case studies.

Nevertheless, this article can not be published under the present form. Numerous justifications are missing to justify the thresholds selected for cloud and aerosol classification. Uncertainties link to the thresholds should be discussed more thoroughly.

Moreover, the data base build from the ground-based experiment is interesting but it is not enough to conclude on a statistical basis. It is a specific situation as underlined by the authors themselves and thereby more a case study. The authors have to re-examine the objective of the paper.

This paper has to be more synthetic to help the reader. The actual form is rather too heavy.

P15453. The title has to be changed following the previous remark.

P15456-l5. Lidar are not necessary blinded in presence of thick aerosol or cloud layers. Could-you give a limit value in term of optical thickness for the lidar used in the frame of this paper?

P15456-l28. Could you detailed why liquid water is present at the cloud top?

P15457-l21. Dense clouds do not systematically affect the photomultiplier but lead to some difficulties to inverse the lidar signal.

P15457-l23. How do you assess the multiple-scattering effect on the data?

P15458-l7. The reference on the Vaisala radiosondes is recent. Do exist original references?

P15458-l13. It is less reliable, but of how much?

P15458-l22. Why is it complicated? Is the threshold of 0.25 important enough to define a temperature inversion? Perhaps, it will be interesting to show a temperature profile on Fig. 1.

P15460-l13. Could you justify the choice of the 3 pressures levels for the back-trajectories?

P15460-l15. How do you choose the clusters? What is the criterion? What happens if a trajectory crosses several clusters?

P15460-l25. Are the observed differences when comparing to the work of Eneroth et al. due to the weak statistical representativeness? We can see this with the differences between this work and the total ASTAR campaign (P15461-l1).

P15461-l13. How the clouds and aerosols contributions are separated in using the measurements of the KARL instrument?

P15462-l13. It is not exact, this is the inverse. Re-examine the definition of the color ratio.

P15462-l17. A reference is needed for the Angström exponent. Angström, A., The parameters of atmospheric turbidity. Tellus 16, 64-75, 1964.

P15462-l20. The uncertainties on the Angström exponent are necessary mainly with low values of extinction or backscatter coefficient (cf. Hamonou et al., 1999). Hamonou, E., P. Chazette, D. Balis, F. Dulac, X. Schneider, E. Galani, G. Ancellet, and A. Papayannis, Characterization of the vertical structure of Saharan dust export to the Mediterranean basin, J. Geophys. Res., 104, 22257– 22270, 1999.

P15463-l1. It is not true for both the cloud top and thickness when lidar is located on the surface.

P15463-l6. Another reference for the MPL is Spinhirne et al. (1993). Spinhirne, J. D., Micro pulse lidar, IEEE Trans. Geosci. Remote Sens., 31, 48– 55, 1993.

P15463-l15. For the first interval, close to the surface, do you consider the overlap factor as very important for the MPL? An assessment of the overlap factor could be found in Chazette (2003). Chazette, P., The monsoon aerosol extinction properties at Goa during INDOEX as measured with lidar, J. Geophys. Res., 108, doi10.1029/2002JD002074, 2003.

P15462-l15. How do you define the thresholds to detect the clouds on the lidar profiles? A sensitivity study is necessary to fixe the value.

P15464-l1. The first sentence is not clear.

P15466-l10. In your discussion on the cloud fraction, you can also consider the reference of Berthier et al. (2008). Berthier, S., Chazette, P., Pelon, J., and Baum, B. (2008), Comparison of cloud statistics from spaceborne lidar systems, Atmos. Chem. Phys., 8, 6965–6977.

P15466-l24. What is the overlap factor of the KARL system? What is the initial reference?

P15467-l1. On the Figure 6, are the points with VD > 2% and BSR > 10 biased by the multiple scattering?

P15468-l1. How do you justify the threshold? With a sensitivity study?

P15468-l4&5. The sentence is not clear.

P15469-l7. This is a description but what is the scientific interest? Can such observations lead to specific parameterization?

P15469-l18. (sub-title 4.1) If C4 is considered to be medium in term of VD, why C7 and C8 are not in the same class?

P15470-l28. Why do you choose LR = 18 sr? Add the unity.

P15473-l18. The aerosol layer is close to 6 km and this layer is not included in the interval in Figure 13 (except in “all points”). It is then difficult to distinguish the aerosol layer from the cloud layers.

P15473-l25. How the aerosol parameters have been retrieved? It is not clear.

The conclusion could be reduced.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 15453, 2009.