Atmos. Chem. Phys. Discuss., 8, S6965–S6968, 2008
www.atmos-chem-phys-discuss.net/8/S6965/2008/

Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on “Comparison of cloud statistics from spaceborne lidar systems” *by* S. Berthier et al.

S. Berthier et al.

Received and published: 12 September 2008

Answer of the authors to the Interactive comment on the article "Comparison of cloud statistics from spaceborne lidar systems" by S. Berthier et al.

Question 1 : A fuller discussion of the ins-and-outs of lidar would be good.

Answer of the Author : A large bibliography yet exists on the lidar measurements and instruments. A fully description of the LITE, GLAS and CALIOP lidar instruments can be found in each of the reference furnished in the article. You can see for the LITE instrument (Winker et al., 1996), for the GLAS instrument (Palm et al., 1998), and to finish for the CALIOP instrument (Winker et al., 2002)). All of these references are yet given in the introduction.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

- Winker, D. M., Couch, R. H. and McCormick, M. P.: An overview of LITE: NASA's Lidar In Space Technology Experiment, Proc. IEEE, 84, 164-180, 1996.

- Palm, S. P. and Spinhirne, J.: The detection of clouds, aerosol and marine atmospheric boundary layer characteristics from simulated GLAS data. The 19th International Laser Radar Conference, Annapolis, Md, July 6-10, 1998.

- Winker, D. M., Pelon, J. and McCormick, M. P: The CALIPSO mission: Aerosols and cloud observation from space, Proc. ILRC 21, Bissonnette, L., Roy, G.,G.Vallee, Ed., 735-738, 2002.

——— Question 2 : Explanation of ITCZ missing.

Answer of the Author : The reviewer is right. We have added in the article, in the section 4.2.1, a short description about the ITCZ :

The Intertropical Convergence Zone (ITCZ) is an area of low pressure formed near the earth's equator at the meeting between the Northeast Trade Winds and the Southeast Trade Winds. As these winds converge, moist air is forced upward, and causes the condensation of water vapor resulting in a band of heavy precipitation around the globe. This band moves seasonally, following the solar heating, and the warmest surface temperatures: it moves toward the Southern Hemisphere from September through February and reverses from March through August.

——- Question 3 : Does equation (1) basically boil down to (variance of signal in window)/(expected noise variance) between 19-20 km?

Answer of the Author : The reviewer is right. The equation (1) boil down to (variance of signal in window)/(expected noise variance) between 19-20 km. This point will be clarified.

———

Question 4 : For each k = t (or z) fit window of various widths (2n) and plot var(Sf(k))in function of n to give Fig.1 - doesn't this depend on backscatter signal being constant vs altitude for a cloud-free atmosphere?

Answer of the Author : In this work, we have chosen a fixed value for n equal to 3, and thus the corresponding size of the windows used to process the variance is of 2n+1=7 pixels, i.e. 105 meters. This size has been judged suitable to sample clouds against the vertical. Sensitivity study has been performed in Chazette et al. (2001). The corresponding value of n, not mentioned in the article, has been added in the section 2.1.

———-

Question 5 : If this is basically just a comparison of signal vs. random noise, it is odd that variance as large as 1000*sigma**2 is required.

Answer of the Author : We want here to assess the best value for the threshold. We try to find the value of the threshold that simultaneously minimize the probability of false alarm and maximize the probability of detection. We try thus to lost the minimum of cloud structures. Like the reviewer said, it is obvious that variance as large as 1000*sigma**2 is required, but this threshold is too strong and will improve the probability of non detection.

——

Question 6 : How is cloud and aerosol discriminated between?

Answer of the Author : As explained in the article, Cloud and aerosols are discriminated using the method described in the section 2.1 :

"From all the structures identified after the first step of the algorithm, we further discriminate between clouds and aerosols. However, this operation can be quite difficult for lidar data, primarily for the case of dust aerosol that is denoted by a low Angström exponent (Grant et al, 1997). Different classification approaches has been suggested for LITE, GLAS (Palm and Spinhirne, 1998) and CALIOP (Vaughan et al., 2004; Liu et al.,

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

2004) lidar profiles. We use the LITE and GLAS prototype algorithms. The lidar signal is explained in term of the attenuated volume backscatter coefficient (Platt et al., 1998), i.e., to the calibrated, range-corrected lidar signals within each layer. The discriminator used here is based on the threshold relation given by P = beta'max . abs(dBeta/dz) > X. Beta'max is the maximum attenuated backscatter of the layer and is the maximum vertical gradient magnitude within the layer. X is an array threshold previously defined. Layers with values of P larger than X are interpreted as cloud whereas the others are classified as aerosol. After a statistical study, we determined the value of X to be 3.1010 m-3.sr-2.;

This method is one used in the processing of both CALIOP and GLAS lidar measurements. It corresponds to the references given in the text of the article, see Palm and Spinhirne, 1998, Vaughan et al., 2004, Liu et al., 2004.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 5269, 2008.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper