

Improvements to the 2B-Geoprof-Lidar Product

Qingqing Zhang and Jay Mace, Department of Atmospheric Sciences, University of Utah

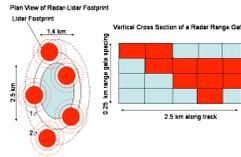
The CloudSat cloud profiling radar (CPR) and the Calipso Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP, hereafter referred as the Lidar) fly in close coordination with one another. The goal of 2B-Geoprof-Lidar algorithm is to optimally merge these two data streams to produce the most accurate quantitative description of the location of hydrometeor layers. 2B-Geoprof-Lidar combines the radar and lidar cloud masks from CloudSat products (2B-GEOPROF) and CALIPSO product (Level 2 Vertical Feature Mask) to identify the hydrometeor layer base and top heights for up to five layers in each vertical CPR profile.

Improvement and additions have been made to the 2B-Geoprof-Lidar product so as to provide a useful tool for retrieving cloud properties and using the CloudSat data. The data listed in blue below have been added to the 2B-Geoprof-Lidar data set.

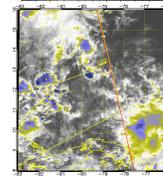
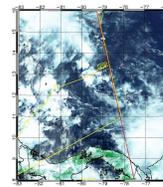
Output of 2B-Geoprof-Lidar Product

- Cloud Fraction
- Cloud Layers
- Layer Base, Layer Top
- Layer Base Flag, Layer Top Flag
- 1064 nm attenuated backscatter
- 532 nm total attenuated backscatter
- 532 nm perpendicular attenuated backscatter
- 532 nm extinction coefficient
- 532 nm total attenuated backscatter with the vertical resolution of CALIPSO Lidar Level 1B Product.

The CALIPSO lidar data (1064 nm attenuated backscatter, 532 nm total and perpendicular attenuated backscatter, and 532 nm extinction coefficient) are averaged within CloudSat footprints using a Gaussian weighting that is a function of the CloudSat point spread function and the location of the CALIPSO resolution volumes.

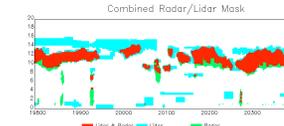
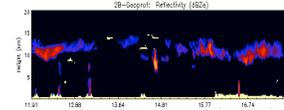


TC-4 Case, 22 July 2007

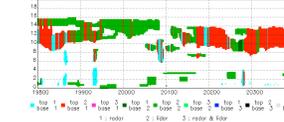


Three color composite visible and IR (color in brightness temperature in Kelvin units) MODIS imagery. Red lines illustrates the CloudSat/CALIPSO track. Yellow line illustrates the track of the NASA DCS.

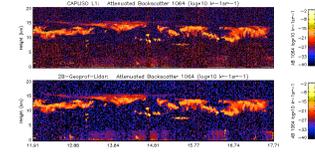
CloudSat Radar Reflectivity



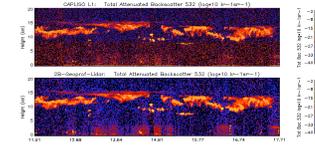
Cloud Layers From Combined Radar / Lidar Mask



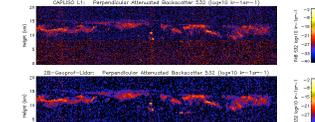
Attenuated Backscatter 1064 nm



Total Attenuated Backscatter 532 nm



Perpendicular Attenuated Backscatter 532 nm



Global Hydrometeor Occurrence Statistics

A trial web tool is under development at <http://meteo4.chpc.utah.edu:8080/grhome/occ/occ.jsp>. This tool allows the user to develop their own Level-3 descriptions of hydrometeor distributions.

The statistics were created using the 2B-GEOPROF-Lidar Cloud Fraction data. The Occurrences are initially counted from the merged data and the counts are stored in 1 x 1 degree latitude-longitude grid boxes during 1 month periods, then are averaged within 6 x 8 (or 2 x 5) degree grid boxes.

	Total Coverage (Base > 0 km, Thickness > 0 km)	Low Level Clouds (Base < 3 km, Thickness > 0 km)	Middle Level Clouds (Base 3 - 6 km, Thickness > 0 km)	High Level Clouds (Base > 6 km, Thickness > 0 km)	Very High Level Clouds (Base > 14 km, Thickness > 0 km)	Antarctic Total Coverage (Base > 0 km, Thickness > 0 km)	Arctic Total Coverage (Base > 0 km, Thickness > 0 km)
One Year (200703 - 200802)							
Spring (200703-200705)							
Summer (200706-200708)							
Fall (200709-200711)							
Winter (200712-200802)							