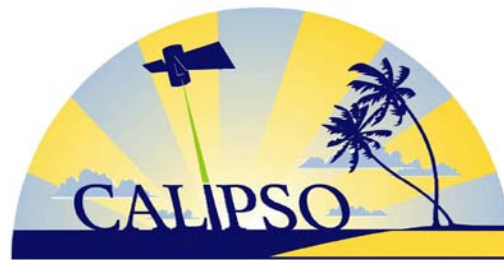


CALIPSO Expedited Products for Operational Aerosol Forecasting



Jason Tackett¹
Chip Trepte²
Mark Vaughan²
Dave Winker²

¹*Science Systems and Applications, Inc. Hampton, VA*

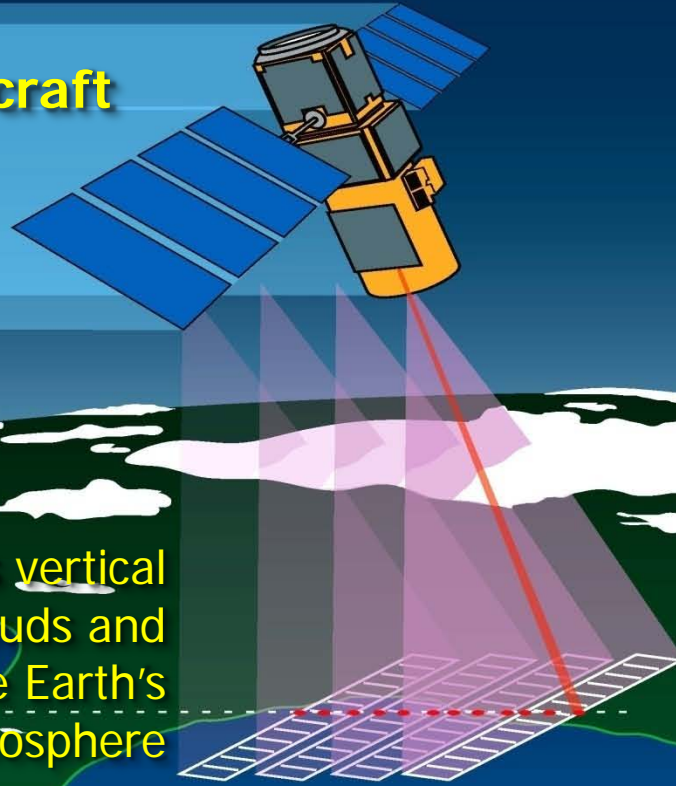
²*NASA Langley Research Center. Hampton, VA*



CALIPSO Basics

CALIPSO: a dual wavelength, polarization sensitive elastic backscatter lidar (NASA)

CALIPSO Spacecraft



CALIPSO measures vertical profiles of clouds and aerosols in the Earth's atmosphere

Resolution 532 nm:

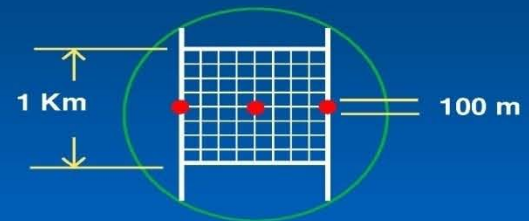
Lower troposphere

1/3 km x 30 m

Upper troposphere

1 km x 60 m

Calipso Footprint





CALIPOP Standard Data Products

Level 1B Product

- Attenuated backscatter

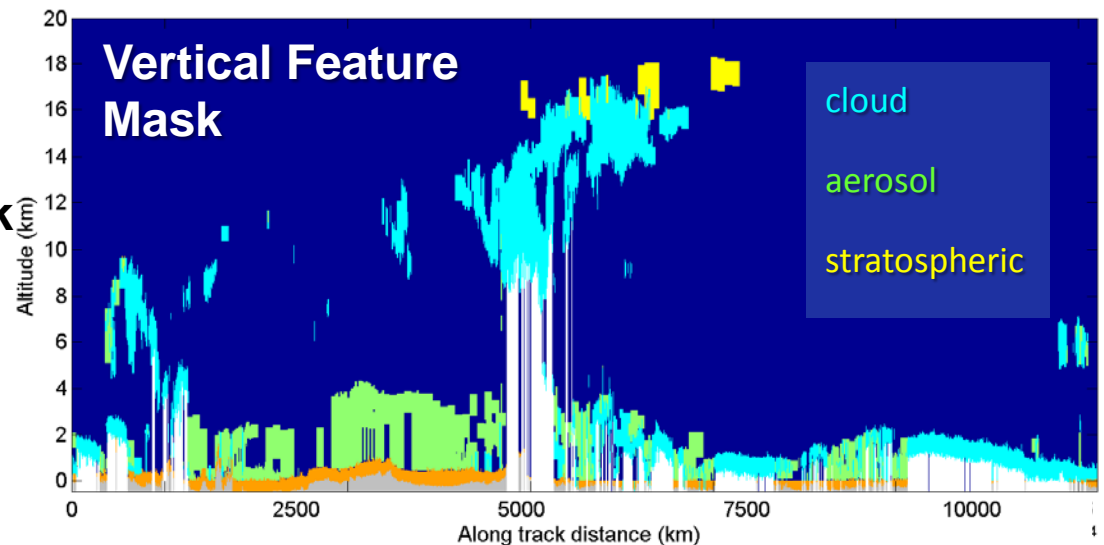
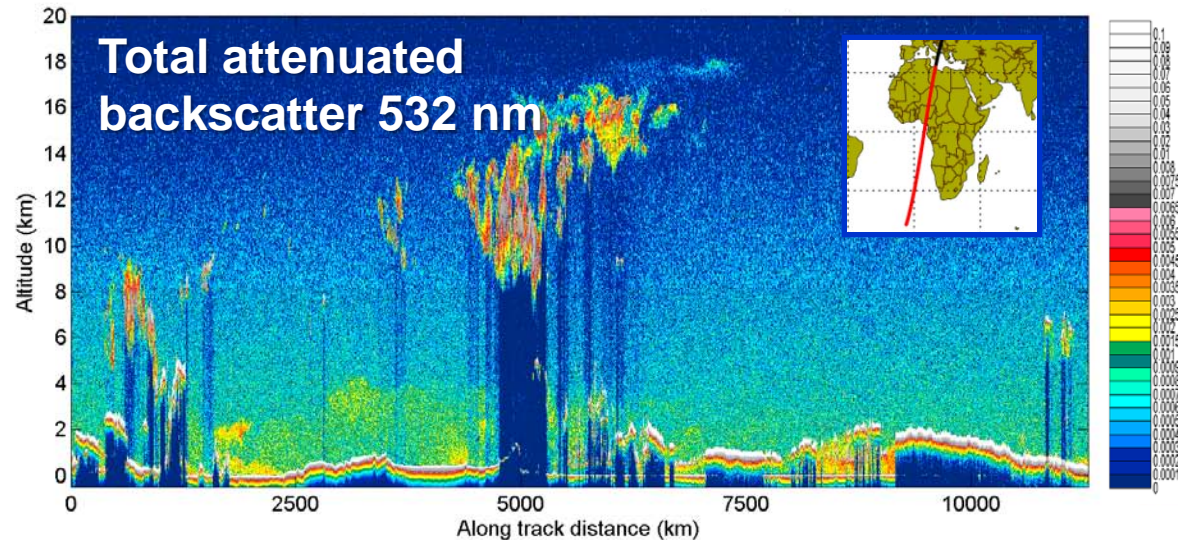
Level 2 Products

- Aerosol & cloud location
- Aerosol subtype
(dust, smoke, clean marine,...)
- Optical properties
(extinction, optical depth,...)

Available **3 days** after downlink

Due to latency in :

- GMAO meteorological data
- Post-processed ephemeris

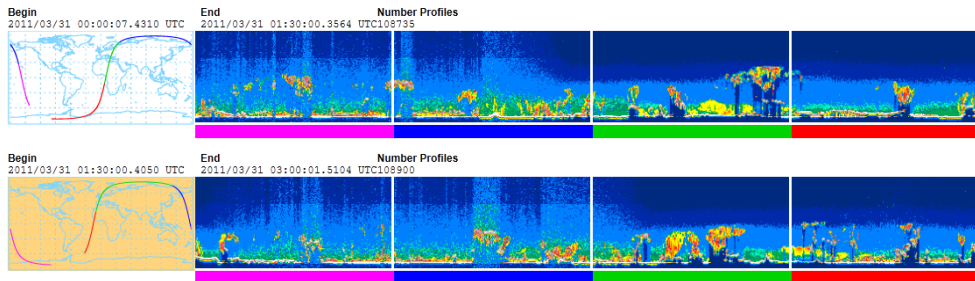




CALIPOP Expedited Products

Available **6 to 30 hours** after downlink.

- Contains all level 1B and level 2 data
- Browse images publically available
- Data available by subscription only



CALIPSO - Products - Mozilla Firefox

File Edit View History Bookmarks Tools Help

CALIPSO - Products

http://www-calipso.larc.nasa.gov/products/

NASA NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

+ ABOUT CALIPSO - PRODUCTS + OUTREACH + DOCUMENTS + RESOURCES

+ Home
+ Products Home

PRODUCTS

CALIPSO produces Level 1 and Level 2 science data products. These products are available in the CALIPSO Data Products Catalog (PC SCI 503). These products are available at the Atmospheric Science Data Center (ASDC).

Products

- OVERVIEW

+ UPDATES

+ USERS GUIDE

+ DATA SUBSETTER WEB APP

+ LIDAR BROWSE IMAGES

+ EXPEDITED BROWSE IMAGES

+ WIDE-FIELD CAMERA IMAGES

Image above: An example of data collected by CALIPSO's lidar in June 2006. The data extends from

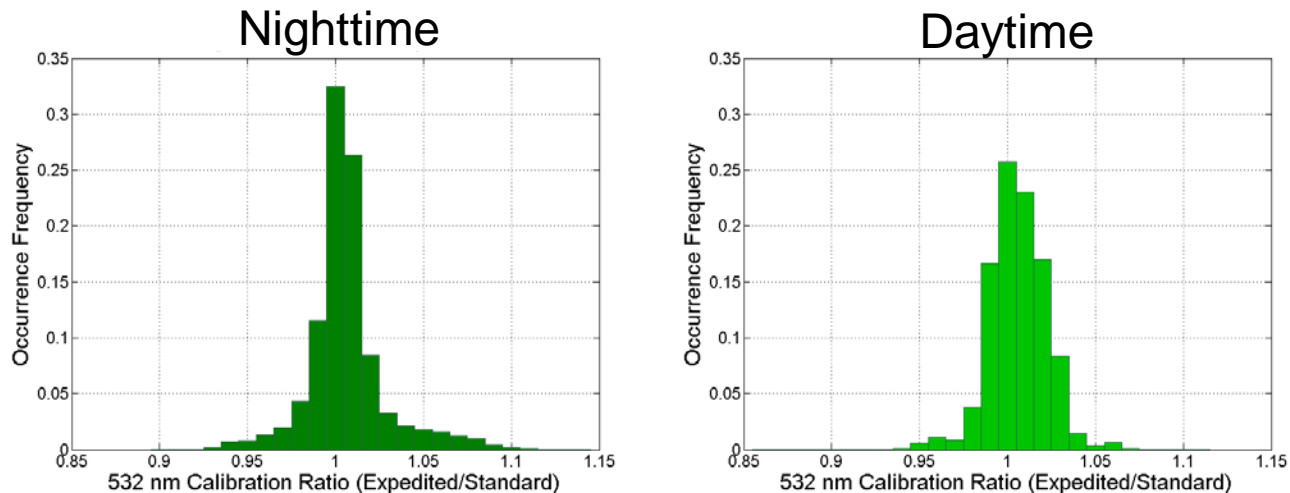


Expedited vs. Standard

Consequences on level 1B data

- **Calibration due to GMAO data latency,**
 - Mean difference < 1%.
- **Geolocation & altitude registration,**
 - 97% of altitude differences < 30 m.

532 nm Calibration Ratios (expedited/standard), 1-10 January 2011



Vaughan et al. (2010) "Adapting CALIPSO Climate Measurements for Near Real Time Analyses and Forecasting", Proceedings of the 34th International Symposium on Remote Sensing of Environment



Expedited vs. Standard

Consequences on level 2 products

▪ Layer detection

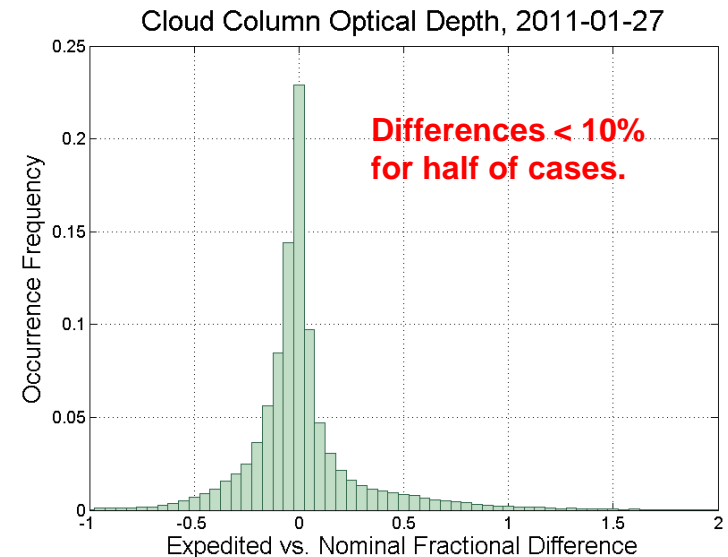
- Affects detection of faint layers; little effect on robust layers.
- ~3% difference in layer detection

▪ Layer Classification

- Aerosol or cloud classification different in 1% of layers at day, 6% at night.

▪ Optical properties

- Extinction retrievals can show large differences.





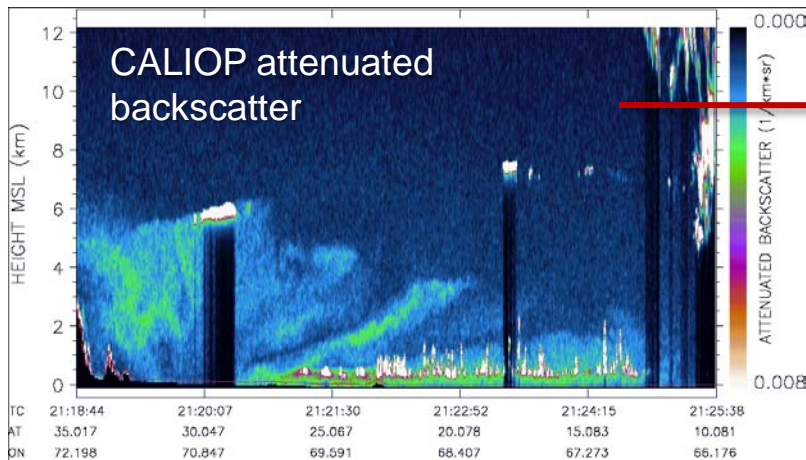
CALIPOP for Aerosol Forecasting

Goal for operational aerosol forecasters:

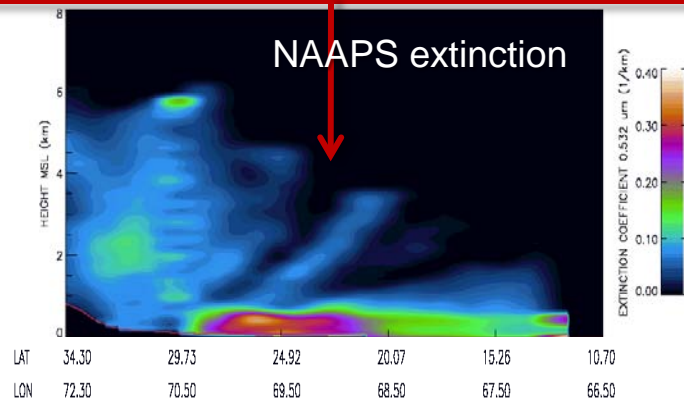
Use CALIOP expedited data for assimilation and quality assessment.

Requirements:

- Available ASAP
- Small filesize
- Cloud-cleared
- High signal-to-noise
- Uncertainty estimates



Naval Research Lab NAAPS model assimilating cloud-cleared CALIOP level 1 data



Campbell et al., 2010: "CALIOP aerosol subset processing for global aerosol transport model data assimilation", *IEEE J. Sel. Top. Appl.*, **3**, 203–214.

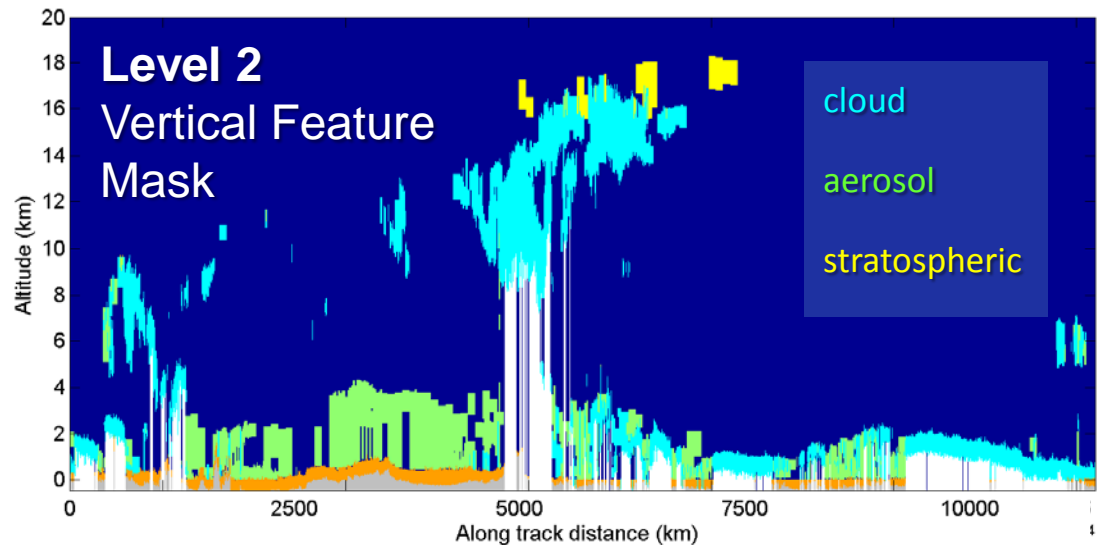
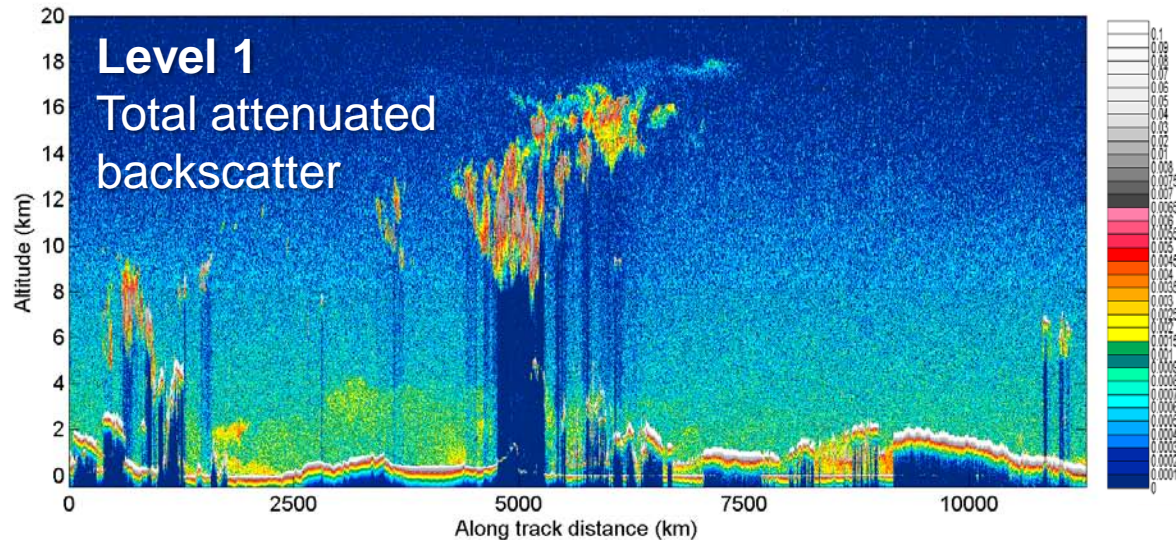


Introducing CALIOP Level 1.5

CALIOP level 1.5 expedited is a cloud-cleared, coarsely averaged level 1B product

Features screened

- clouds
- overcast
- surface





Introducing CALIOP Level 1.5

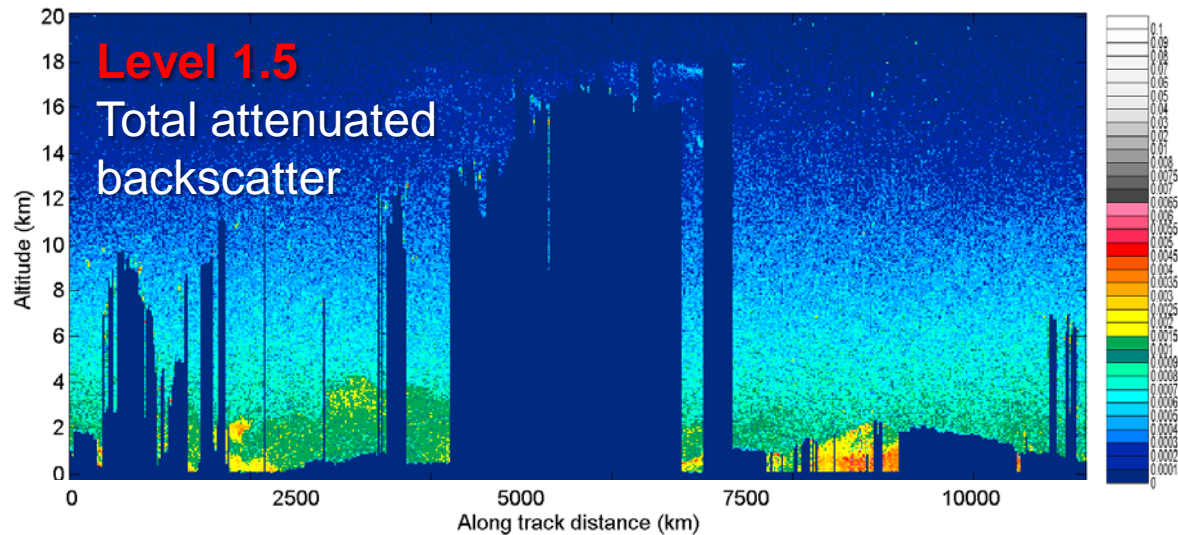
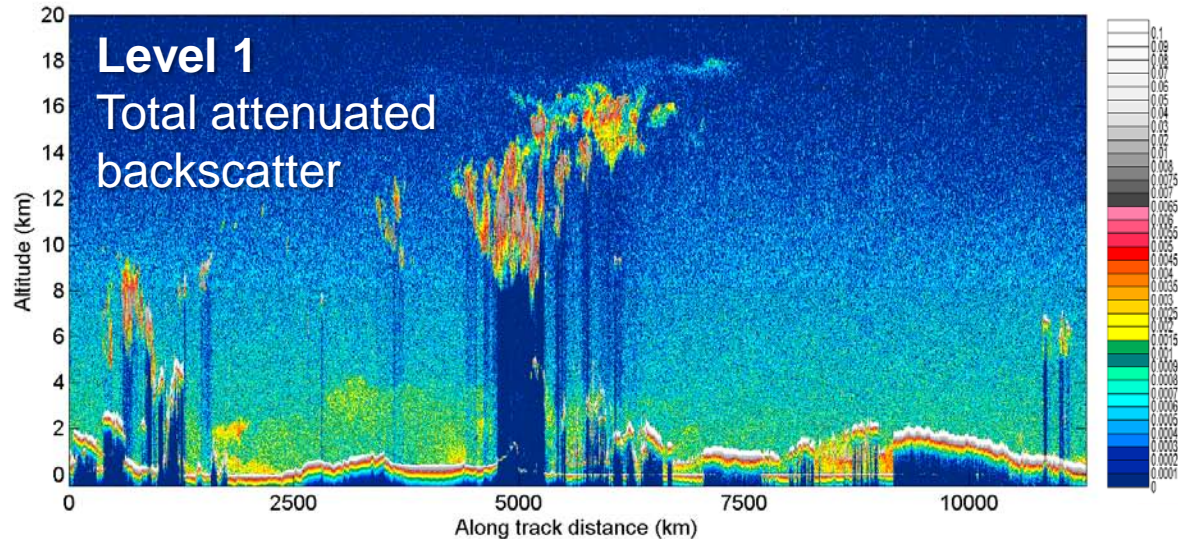
CALIOP level 1.5 expedited is a cloud-cleared, coarsely averaged level 1B product

Features screened

- clouds
- overcast
- surface

Resolution

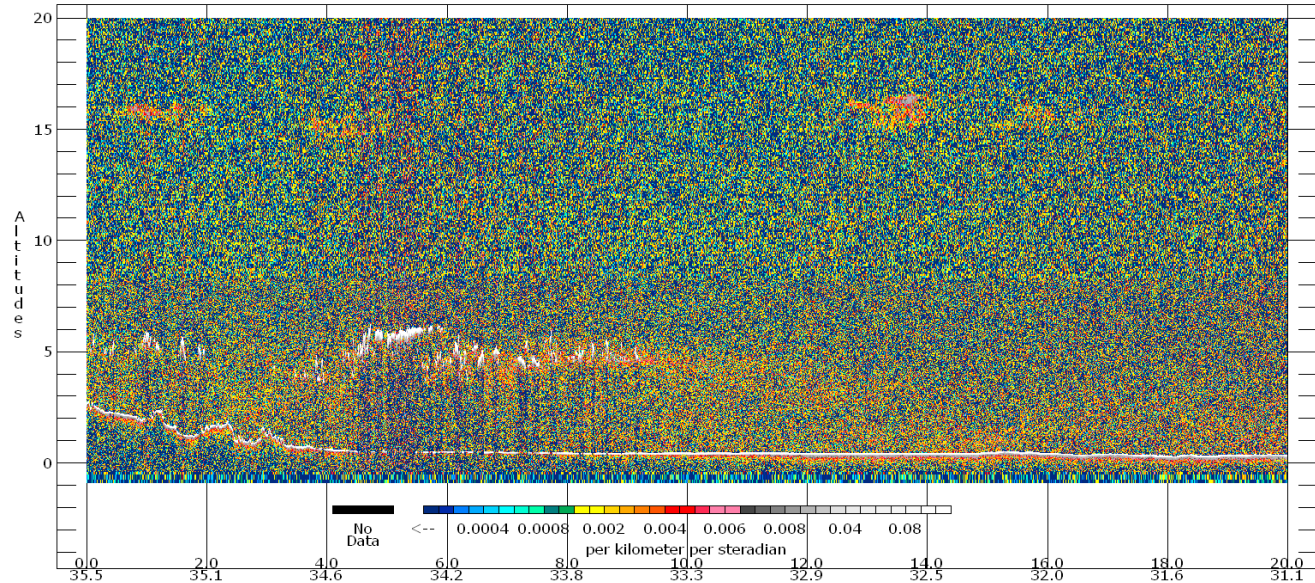
- 20 km horizontal
- 60 m vertical
- Altitudes: -0.5 to 20 km



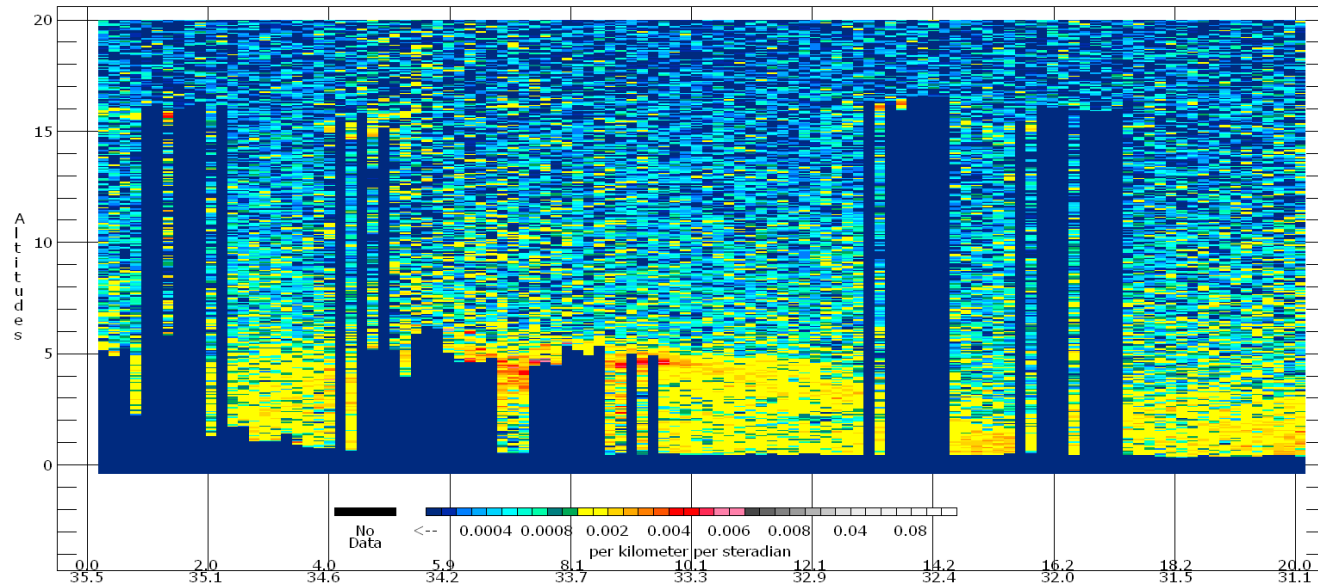


Introducing CALIOP Level 1.5

Level 1B Attenuated Backscatter
1 km horizontal averaging



Level 1.5 Attenuated Backscatter
20 km horizontal averaging



Vaughan et al. (2010)



Introducing CALIOP Level 1.5

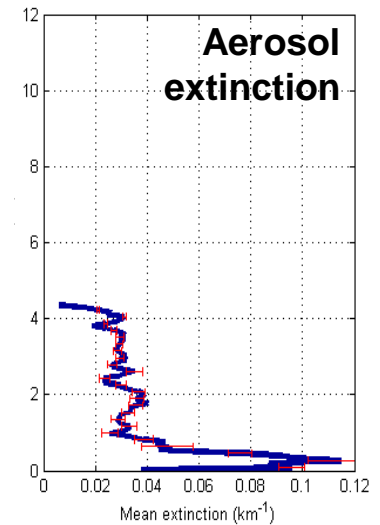
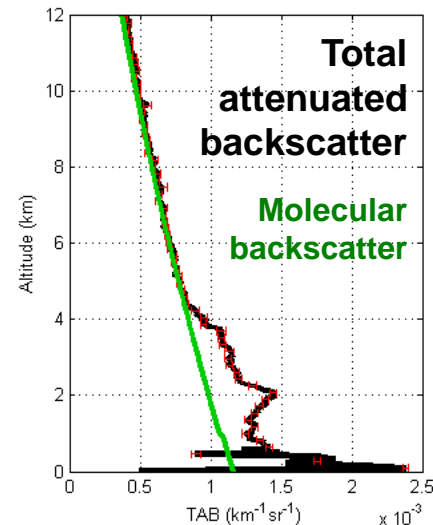
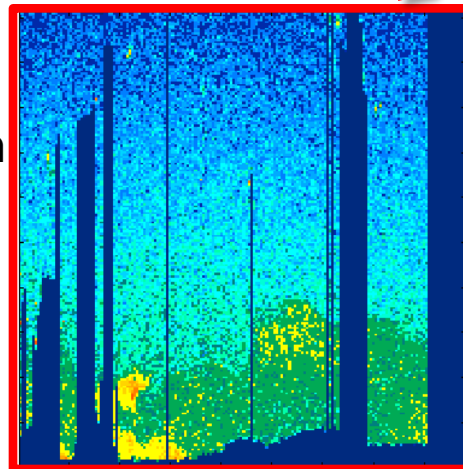
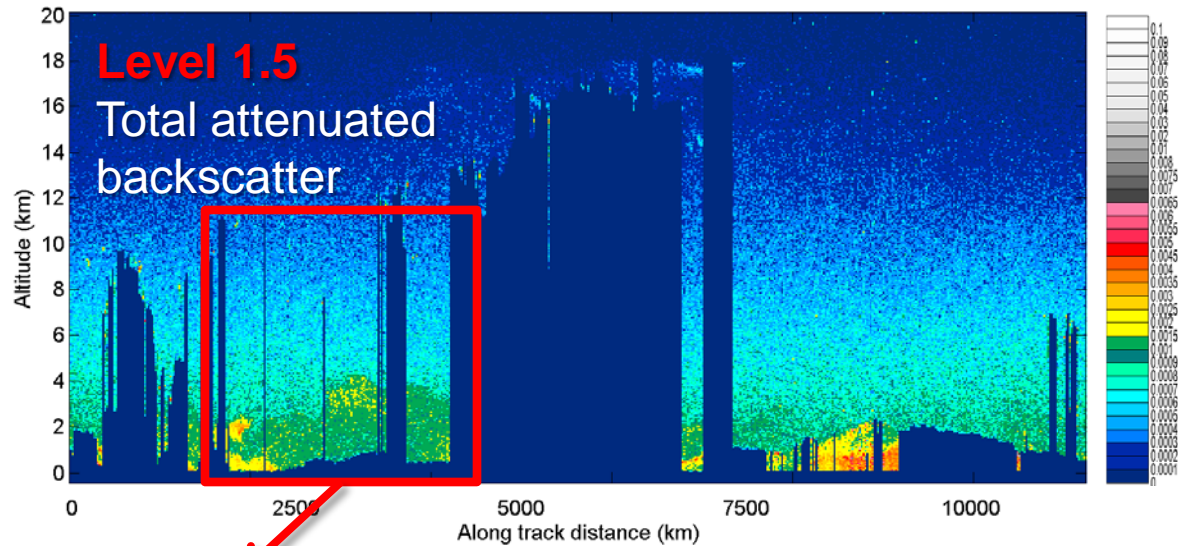
CALIOP level 1.5 expedited is a cloud-cleared, coarsely averaged level 1B product

Features screened

- clouds
- surface
- overcast

Resolution

- 20 km horizontal
- 60 m vertical
- Altitudes: -0.5 to 20 km





CALIPOP Level 1.5 Expedited

Primary data

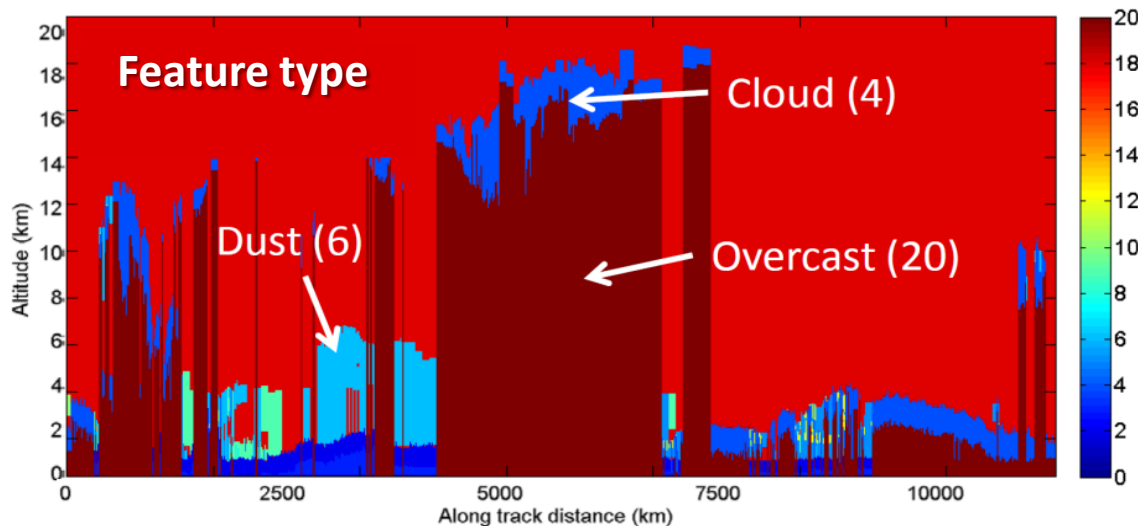
- Basic statistics and uncertainties reported:
 - Attenuated backscatter 532 nm (total & perp.)
 - Aerosol extinction 532 nm
- Molecular model attenuated backscatter
- Feature type

Granule size

- Each full orbit granule ~48 MB
 - Need 1,200 MB to generate.

Availability

- Accessible via ftp site after creation





Accessing Level 1.5 Expedited

- **Currently, level 1.5 is available by subscription only**
 - Contact Chip Trepte for access:
Charles.R.Trepte@nasa.gov

- **Created in forward processing* as a beta product**

- ***Six months of level 1.5 (November 2010 – present) available**

- **We plan to request feedback from users around October**
 - How useful is the product for aerosol forecasting?
 - Are the quantities provided complete?

- **For level 1.5 algorithm questions, please contact**
Jason.L.Tackett@nasa.gov