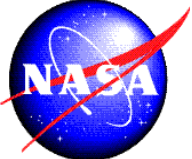


# CALIPSO Developments



***Dave Winker,  
Jason Tackett, and Chip Trepte***

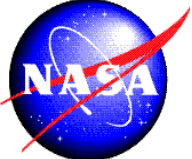


# First: **New** Search and Subset Tool



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- **CALIPSO data subsetting feature now available on ASDC website**
- **To request data subset, specify:**
  - data product
  - time period
  - region (bounding box)
- **Currently in Beta – user feedback requested**
  - Firefox, Safari only (at this point)



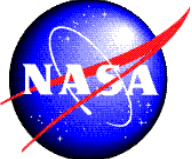
and just FYI ...



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## **CALIOP PBL product now in development**

- **PBL height to be derived from gradients in aerosol profile**
- **May also use cloud profiles for cloud-capped BL**



# NRT “Level 1.5” product



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## **Motivation:**

**verification of model aerosol estimates**

**eventual assimilation of CALIOP aerosol observations**

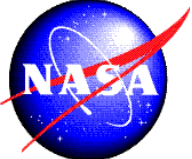
**NRT latency requirements are on the order of 5-24 hours**

**useful coverage will be less than global**

**Follow NRL (J. Campbell) approach:**

**use Level 2 VFM to cloud-clear Level 1 profiles**

**then average Level 1 profiles averaged to uniform grid**



# NRT “Level 1.5” product



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**In addition to basic Level 1 profile information, includes:**

**Uncertainty information: NSF, etc.**

**Flags indicating where cloudy profiles were removed, and how many**

**Info on aerosol type is desirable**

**Spatial resolution: 20 km x 60 m**

## **Status**

**Format, contents, and approach defined**

**Prototype data products catalog, code developed**

**Sample data file distributed to small group for feedback**

**Production: built off of current “Expedited” processing system**

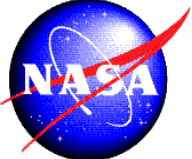
**- requires improvements to current Expedited calibration scheme**

**Define plan for producing/distributing L1.5: October 2010**

**Operational by early 2011**

## **Decisions:**

***Format (netCDF, HDF?), data delivery (ftp pull?), product size?***

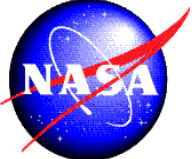


# Product Contents



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- **Metadata**
- **Static data**
  - altitude array
  - standard lidar ratios
  - Rayleigh and ozone cross-sections
- **'Column' fields**
  - Noise scale factor
  - Surface elevation
- **Profile fields**
  - attenuated backscatter: 532, 532-perpendicular, 1064
  - molecular profiles
  - met profiles: pressure, temperature
- **Current philosophy**
  - provide parameters to allow user to compute SNR, molecular backscatter
  - alternately, could include profiles of SNR, molecular (size issues?)
- **With current product definition: 34 MB/file, ~700 MB/day**



# Profile fields (alpha product)



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**Samples\_Averaged**

**Total\_Attenuated\_Backscatter\_532\_Mean**

**Total\_Attenuated\_Backscatter\_532\_Median**

**Total\_Attenuated\_Backscatter\_532\_StDev**

**Perpendicular\_Attenuated\_Backscatter\_532\_Mean**

**Perpendicular\_Attenuated\_Backscatter\_532\_Median**

**Perpendicular\_Attenuated\_Backscatter\_532\_StDev**

**Attenuated\_Backscatter\_1064\_Mean**

**Attenuated\_Backscatter\_1064\_Median**

**Attenuated\_Backscatter\_1064\_StDev**

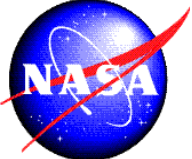
**Molecular\_Number\_Density**

**Ozone\_Number\_Density**

**Temperature**

**Pressure**

**L2\_Feature\_Type**



## L2\_Feature\_Type Flag (profile)

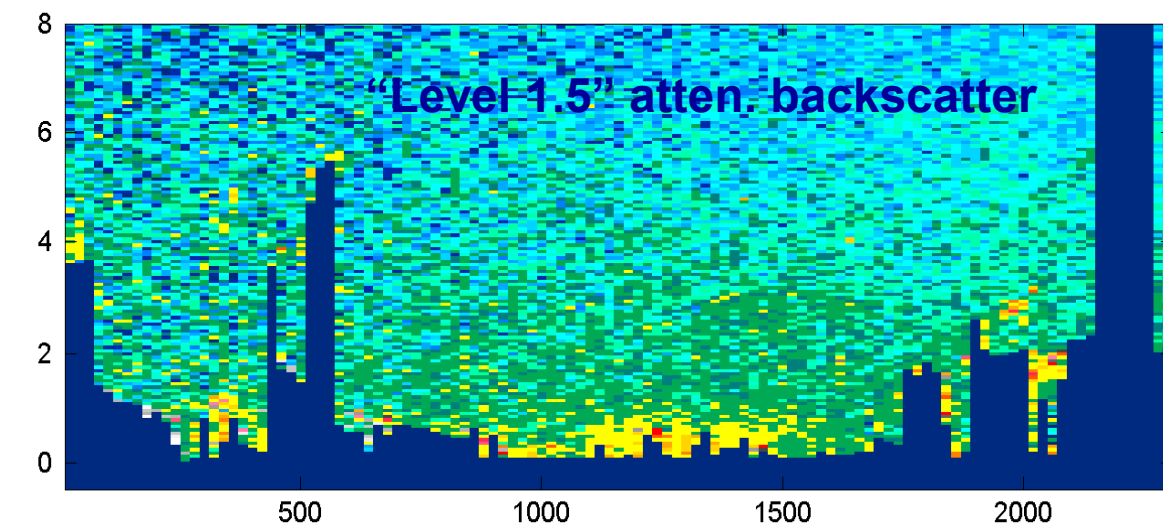
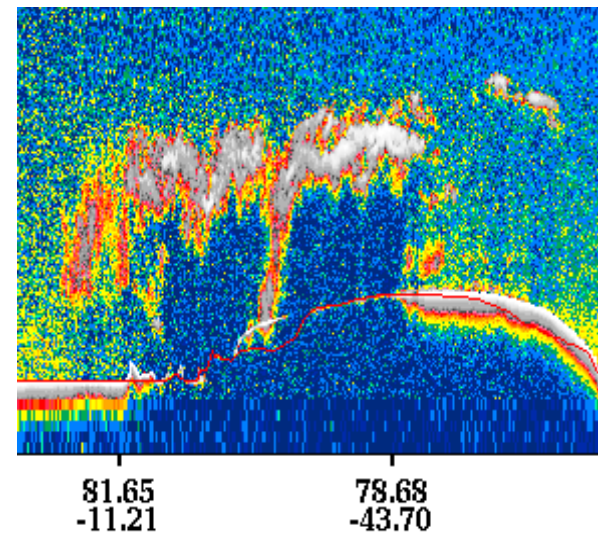
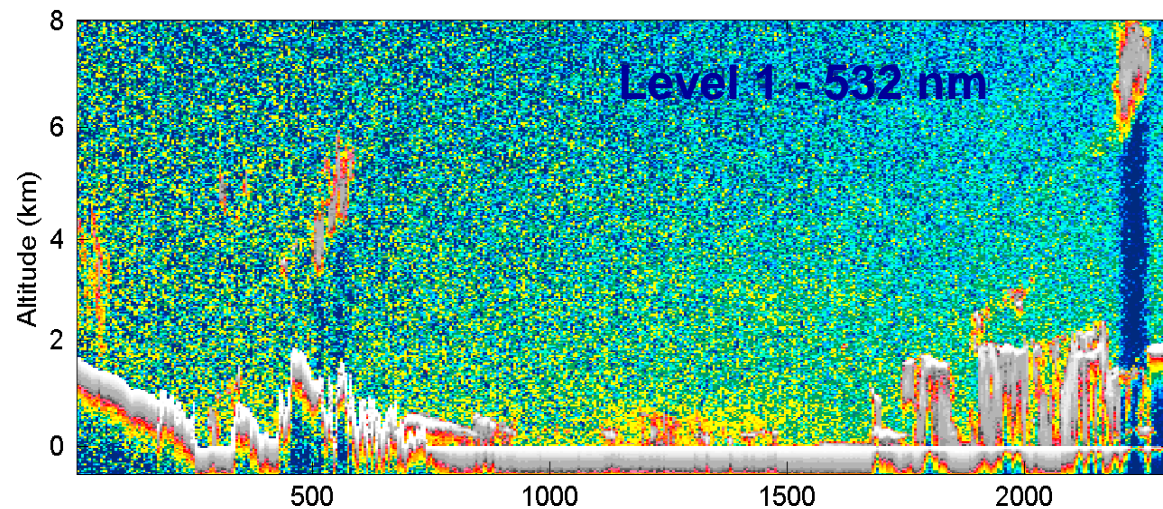


CENTRE NATIONAL D'ETUDES SPATIALES

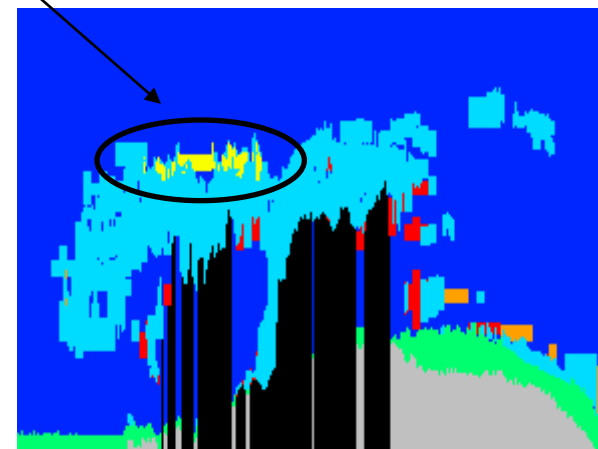
- 0 = invalid (bad or missing data)**
- 1 = totally attenuated**
- 2 = surface**
- 3 = subsurface**
- 4 = cloud**
- 5 = clean marine**
- 6 = dust**
- 7 = polluted continental**
- 8 = clean continental**
- 9 = polluted dust**
- 10 = smoke/biomass burning**
- 11 = cloud-cleared clean marine**
- 12 = cloud-cleared dust**
- 13 = cloud-cleared polluted continental**
- 14 = cloud-cleared clean continental**
- 15 = cloud-cleared polluted dust**
- 16 = cloud-cleared smoke/biomass burning**
- 17 = "clear air"**
- 18 = cloud-cleared "clear air"**

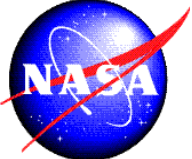


# Construction of NRT profiles



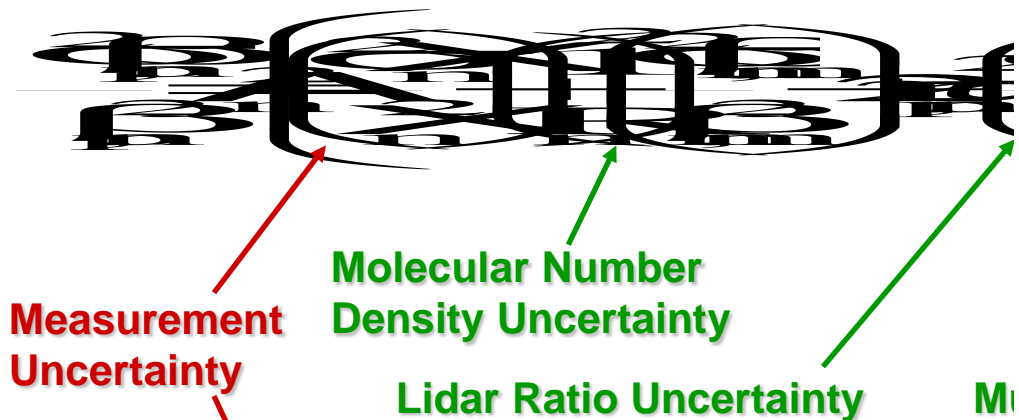
cloud artifacts





# Extinction Uncertainty Estimates in Version 3

## Uncertainty in Particulate Backscatter Coefficient



**Measurement Uncertainty**

**Molecular Number Density Uncertainty**

**Lidar Ratio Uncertainty** **M**

Includes errors due to

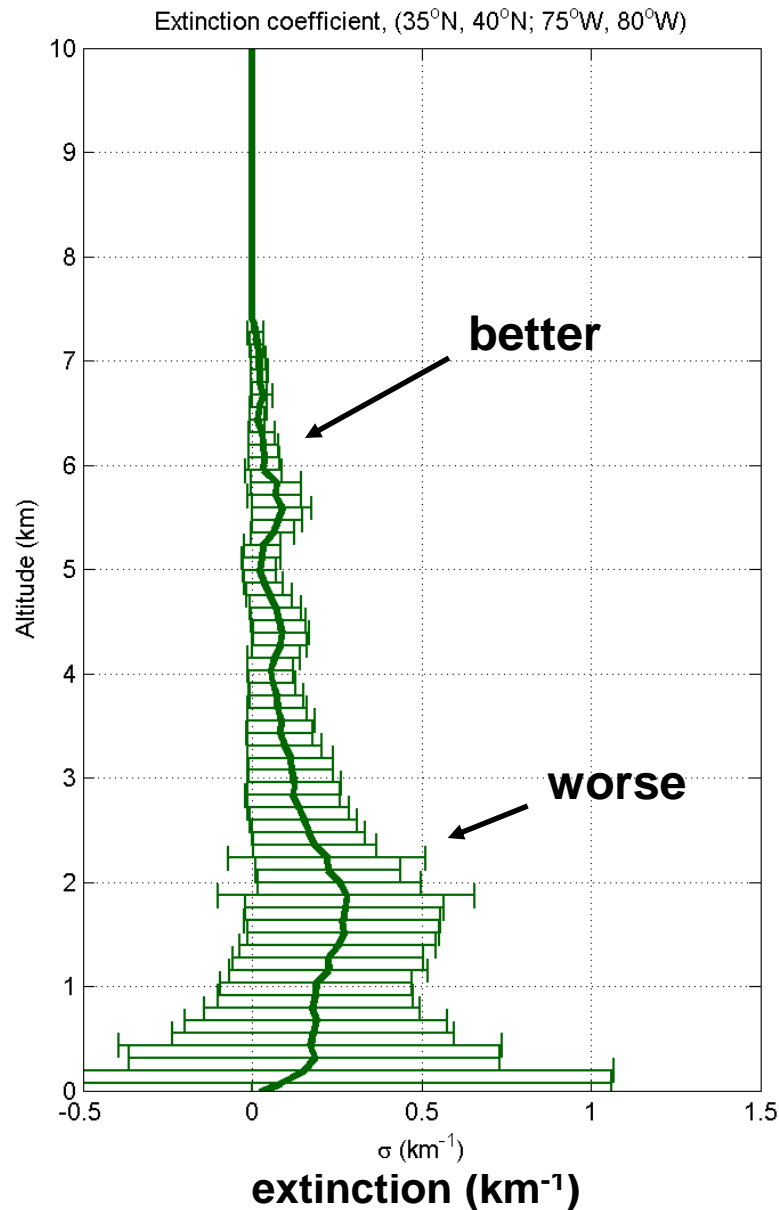
- ⇨ **Calibration**
- ⇨ **SNR**
- ⇨ molecular density (again)
- ⇨ offset calculations
- ⇨ polarization gain ratio
- ⇨ polarization cross-talk
- ⇨ ranging

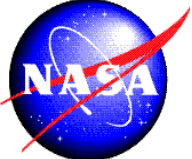
### LEGEND

- S** = lidar ratio
- R** = scattering ratio
- T** = transmittance
- m** = molecular
- P** = measured data

$$\eta = \frac{P}{m}$$

$$\sigma_n = \sigma_h \frac{I_h^2 \cdot P_h}{C_{hh}^2}$$





# Possible Metrics for Lidar Profiles



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- **Surface/near-surface aerosol extinction**
- **Mean upper troposphere extinction**
- **“Mean-height”**
  - Height where half of AOD is above, half below
  - Or: 66% below, 95% below, etc.
- **Aerosol scale height**
  - Scale height of best-fit exponential
  - H. Yu et al. (JGR, 2010) for one choice
- **The last two characterize profile, normalize out AOD differences**
- **Fit exponential, or more sophisticated function**
  - $\beta' = a e^{-z/h}$
  - Compare statistics of fit parameters: bias, RMSE of  $a$ ,  $h$ , etc.

