CALIPSO Final Data Product Status

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CALIPSO/CloudSat 2025 Science Program Review

19 February 2025

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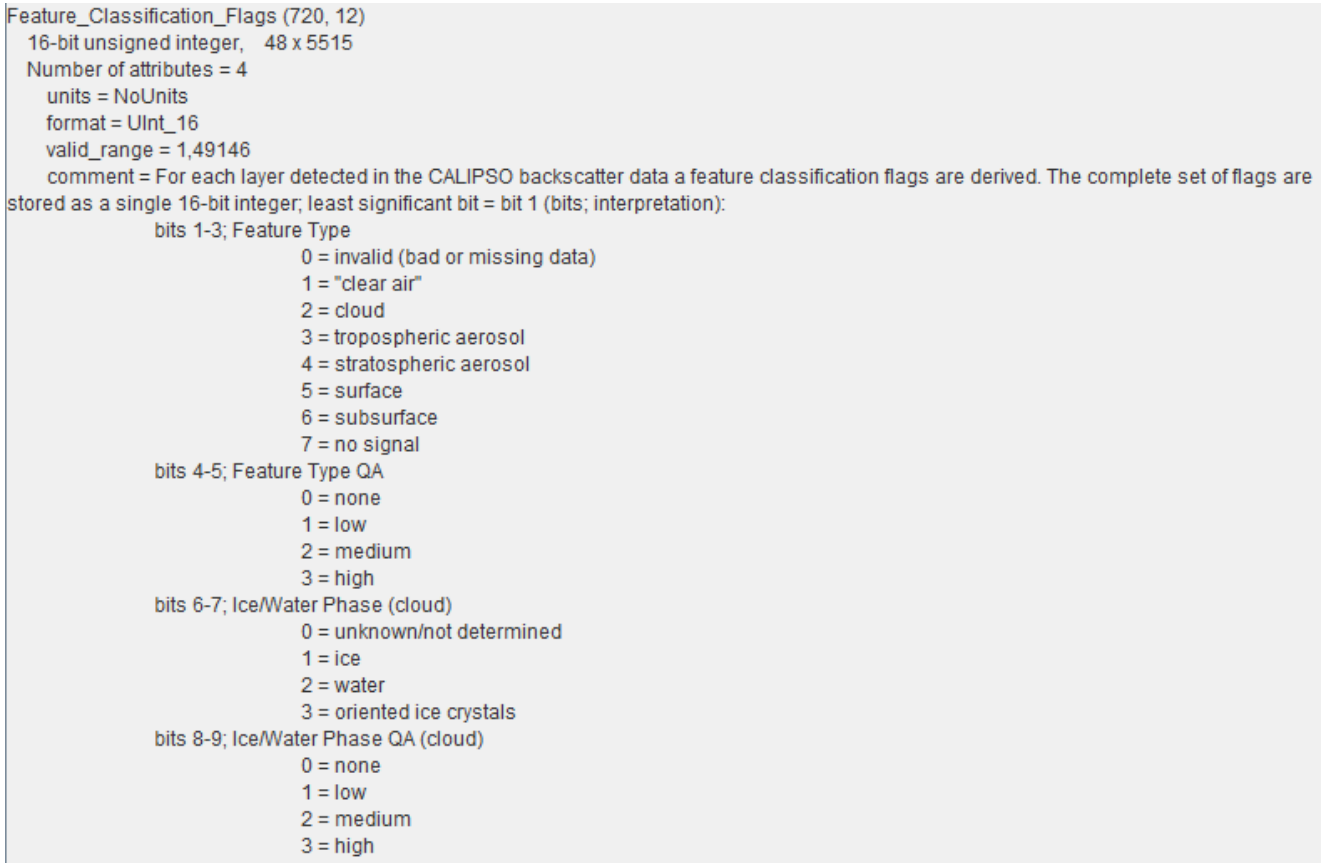
- Final Data Products
- Processing Status
- Archival of Data
- Websites
- Browse Images

Reformatting of Data Products

- Updating format of all final CALIPSO data products
  - Units to follow NetCDF Climate and Forecast (CF) Metadata* conventions
  - HDF Dimensions to allow HDF to netCDF conversion using COTS software
  - Comments to make the data products more self documenting

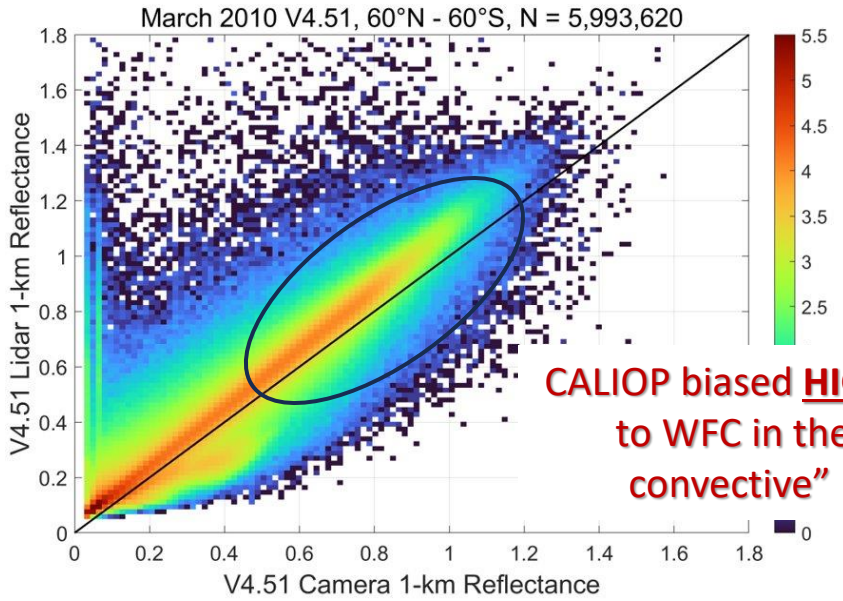


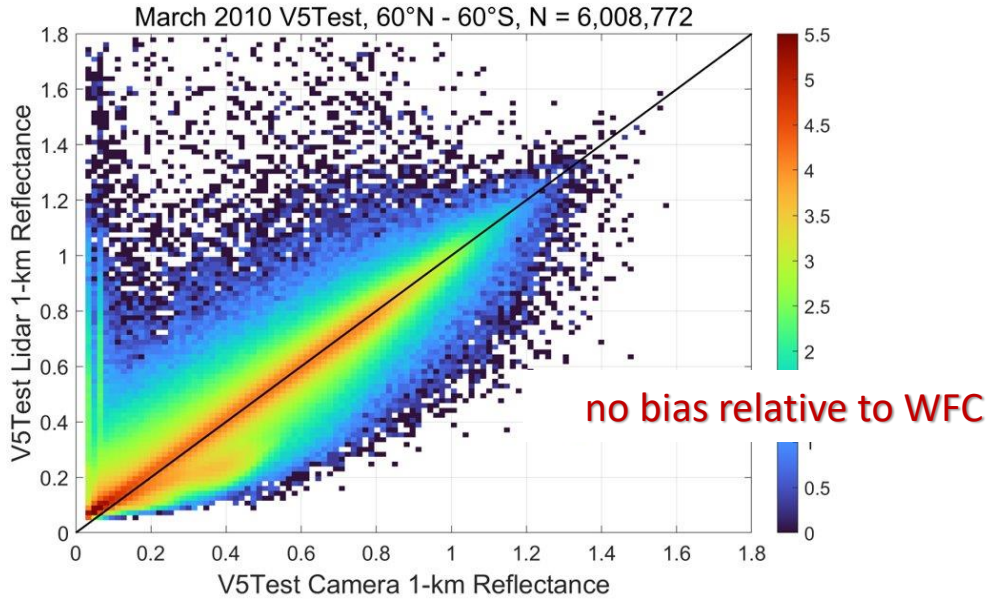
Feature_Classification_Flag SDS from V5.00 Lidar Level 2 VFM

*https://cfconventions.org/cf-conventions/cf-conventions.html

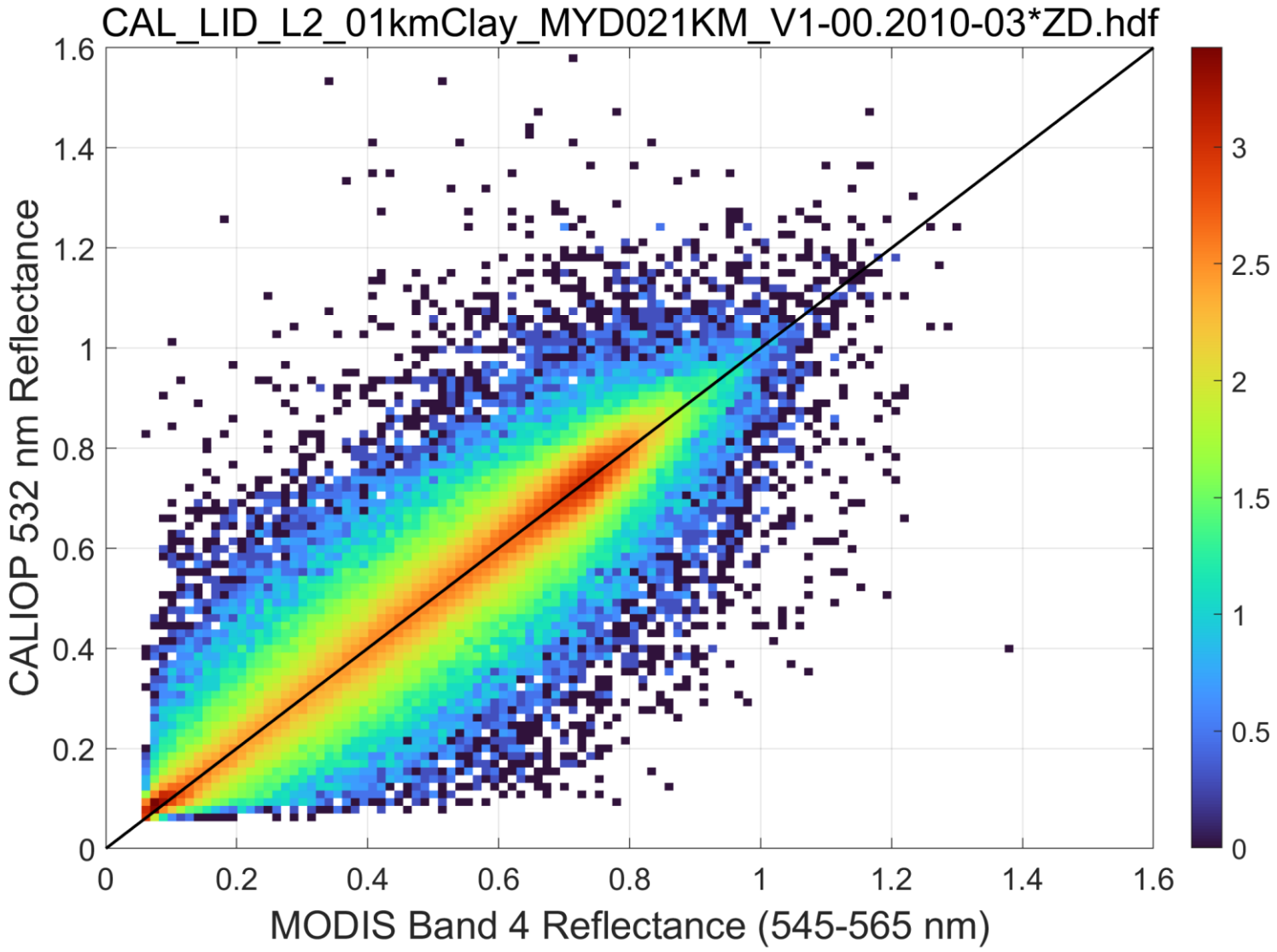
CALIOP Level 1

- Refinement of the Daytime Polarization Gain Ratio (PGR)
  - Daytime cirrus cloud PGR estimates computed for V4.51 showed substantial divergence from what was expected after Oct 2022 that was addressed/corrected for V5.00
- Corrected/improved energy normalization for low energy shots
- Updated CALIOP column reflectances for the 532nm channels
  - Single calibration coefficient estimated to convert lidar background to reflectance, but V5.00 now uses a time varying calibration coefficient



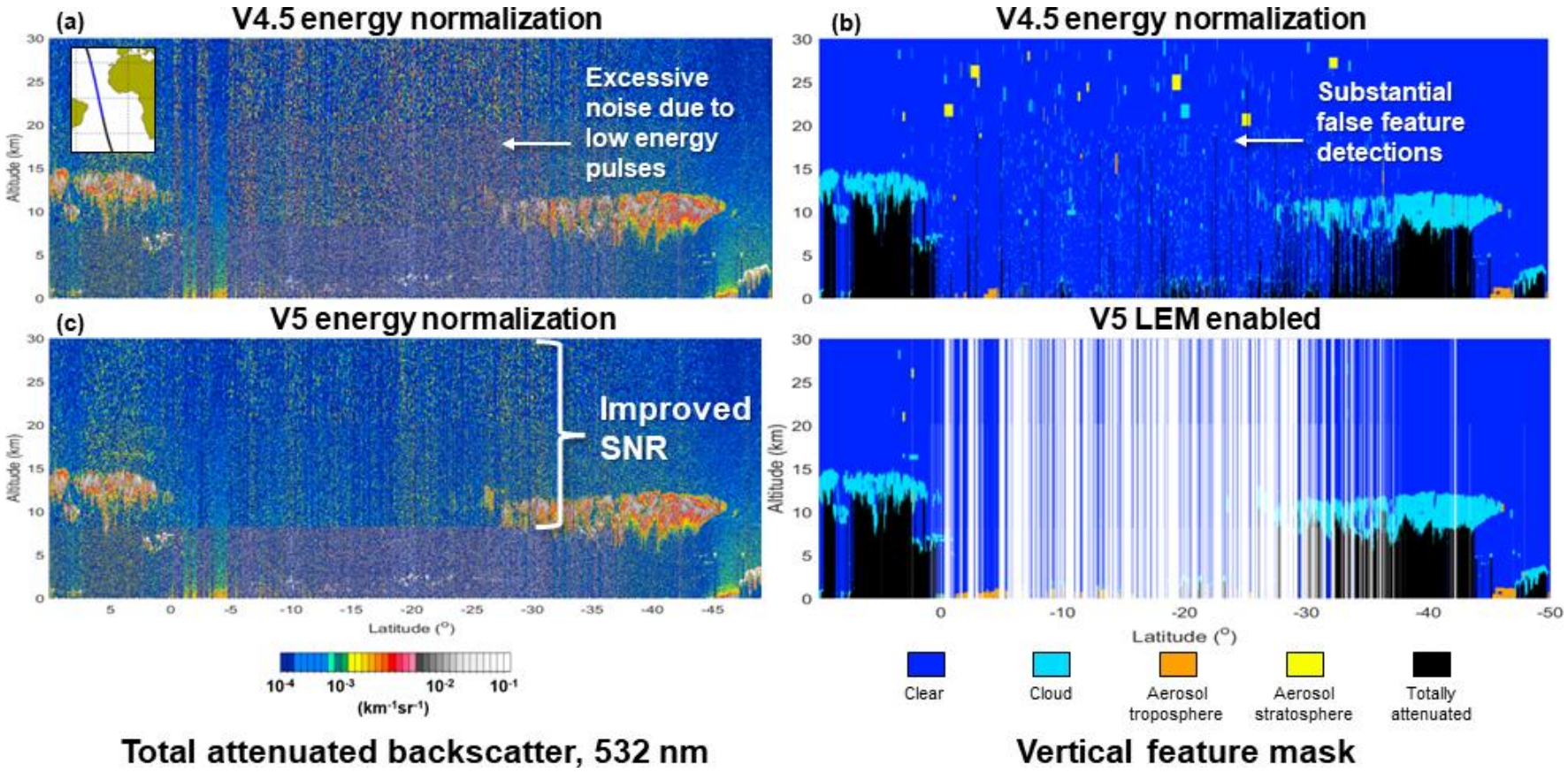


CALIOP Level 1



CALIOP Level 2

- Low Energy Shot Mitigation
  - Algorithm that detects and rejects profiles containing excessive low energy pulses
  - Data segments contaminated by excessive low energy pulses are excluded from Level 2 processing
  - Level 2 data products will contain LEM flags to indicate to user what was removed
  - Same algorithm applied for V4.51 CALIOP Level 1B calibration

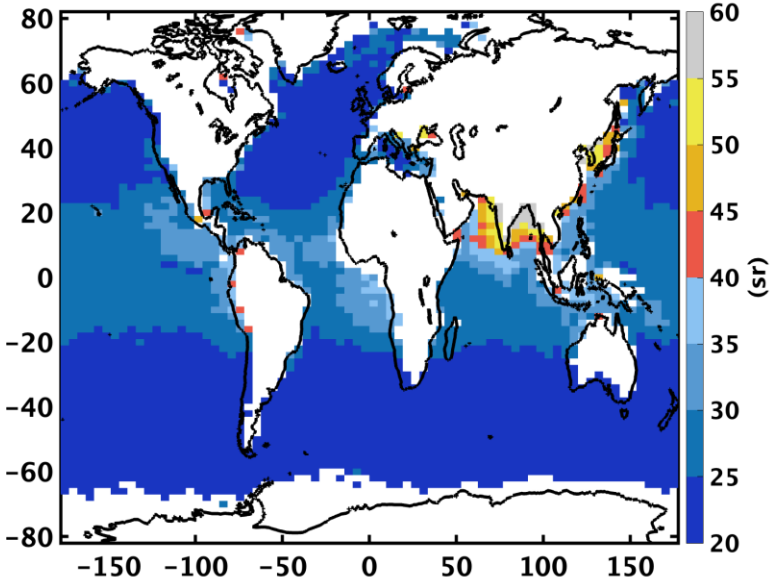


Tackett et al (2025, in prep): Mitigating Impacts of Low Energy Laser Pulses on CALIOP Data Products

CALIOP Level 2

- Update Lidar Ratio assignment for Marine and Dusty Marine species
  - Transition from using single global constants of lidar ratio for Marine (23.0) and Dusty Marine (37.0) to spatially and seasonally maps

constrained retrievals from CALIOP + MODIS



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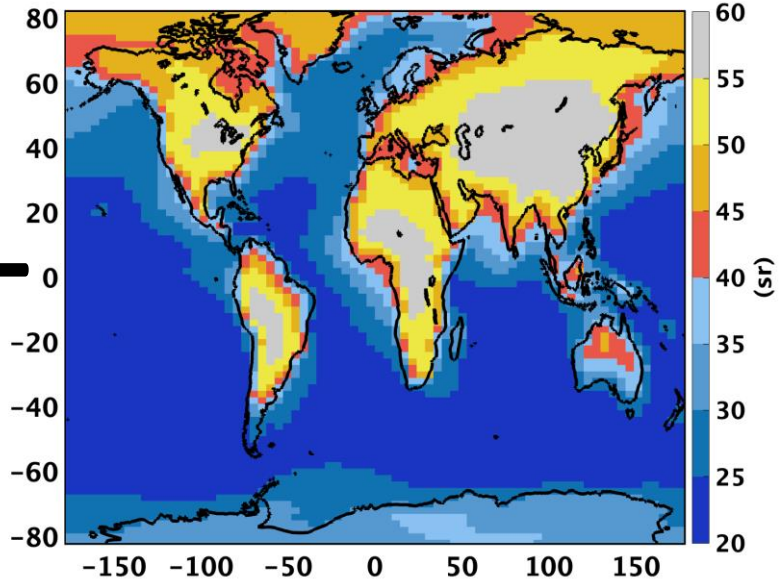
approximations based on GOCART sea salt volume fraction



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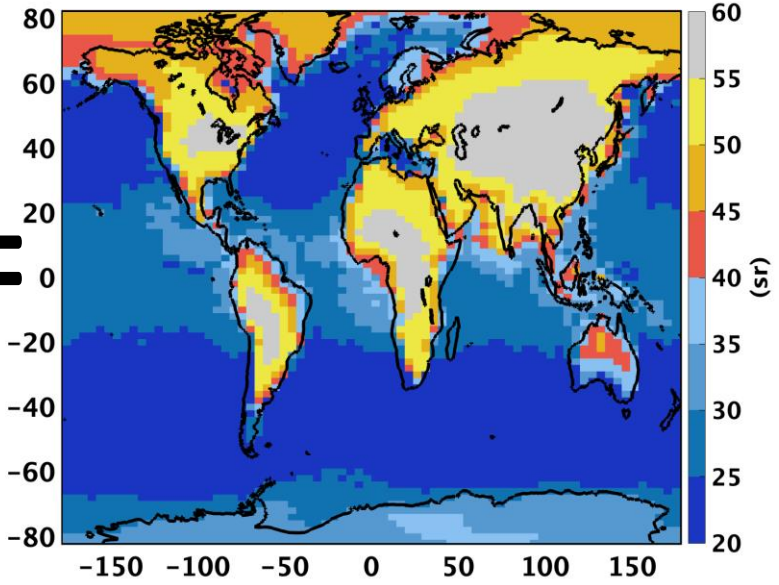
hybrid map of marine aerosol lidar ratios



*Kar et al (poster): Variable Lidar Ratios for Marine and Dusty Marine using MODIS AOD Constrained Retrievals and GOCART Model Simulations and their Impact on Level 2 CALIPSO data Products in Version 5

IIR Level 1

- No fundamental science changes to the IIR Level 1 algorithm
- Additional data that was previously un-released will be made public

- IIR Level 1 Data Products
  - Science: IIR_L1-Standard-V3-00
  - Calibration (*previously unreleased*): IIR_L1_CAL-Standard-V3-00
  - Calibration Correction (*new*): IIR_L1_COR-Standard-V3-00

IIR Level 2

- Enhance ice crystal concentrations using CALIOP extinction profiles
- Updated surface emissivity and look-up tables
- Improvements to the IIR Cloud/Aerosol Discrimination (CAD) algorithm
- Use V5.00 CALIOP Level 2 as input

- IIR Level 2 Data Products
  - IIR_L2_Track-Standard-V5-00
  - IIR_L2_Swath-Standard-V5-00

WFC Level 1

- No fundamental science changes to the algorithm
- Additional data that was previously un-released will be made public
- June 2006 to April 2020

- Science
  - CAL_WFC_L1_IIR-Standard-V4-00; same grid to facilitate WFC data in IIR retrievals
  - CAL_WFC_L1_1Km-Standard-V4-00
  - CAL_WFC_L1_125m-Standard-V4-00
- Calibration (*previously unreleased*); orderable from ASDC only
  - CAL_WFC_L1_Cal-Standard-V4-00
- Assembler (*previously unreleased*); orderable from ASDC only
  - CAL_WFC_L1_Asm-Standard-V4-00

CALIOP and IIR Level 3

- Minor code changes, use new Level 1 and Level 2 products as input
  - CAL_LID_L3_Tropospheric_APro_AllSky-Standard-V5-00
  - CAL_LID_L3_Tropospheric_APro_CloudFree-Standard-V5-00
  - CAL_LID_L3_Tropospheric_APro_CloudySkyOpaque-Standard-V5-00
  - CAL_LID_L3_Tropospheric_APro_CloudySkyTransparent-Standard-V5-00
  - CAL_LID_L3_Stratospheric_APro-Standard-V2-00
  - CAL_LID_L3_Ice_Cloud-Standard-V2-00
  - CAL_LID_L3_Cloud_Occurrence-Standard-V2-00
  - CAL_LID_L3_GEWEX_Cloud-Standard-V2-00
  - CAL_IIR_L3_GEWEX_Cloud-Standard-V2-00
- Due to the low energy shots previous versions of these data products only went through 2017. These data products will be for the full mission (June 2006 – June 2023)

Planned Core Final Data Products

Data Products	Development	Processed	Archived	Release Date
V1.00 CALIOP Level 0			Orderable from ASDC only	Spring 2024
V3.00 IIR Level 1				Summer 2025
V4.00 WFC Level 1				Summer 2025
V5.00 CALIOP Level 1			On-Going	Summer 2025
V5.00 CALIOP Level 2	NLT March 3rd, 2025	~ 10 days	~ 45 days	Summer 2025
V5.00 IIR Level 2	on-going	~ 20 days	~ 10 days	Summer 2025
V3.00 CALIOP Level 3 Aerosols	on-going	~ 14 days	~ 14 days	Summer 2025
V2.00 CALIOP Level 3 Clouds	on-going	~ 21 days	~ 21 days	Summer 2025

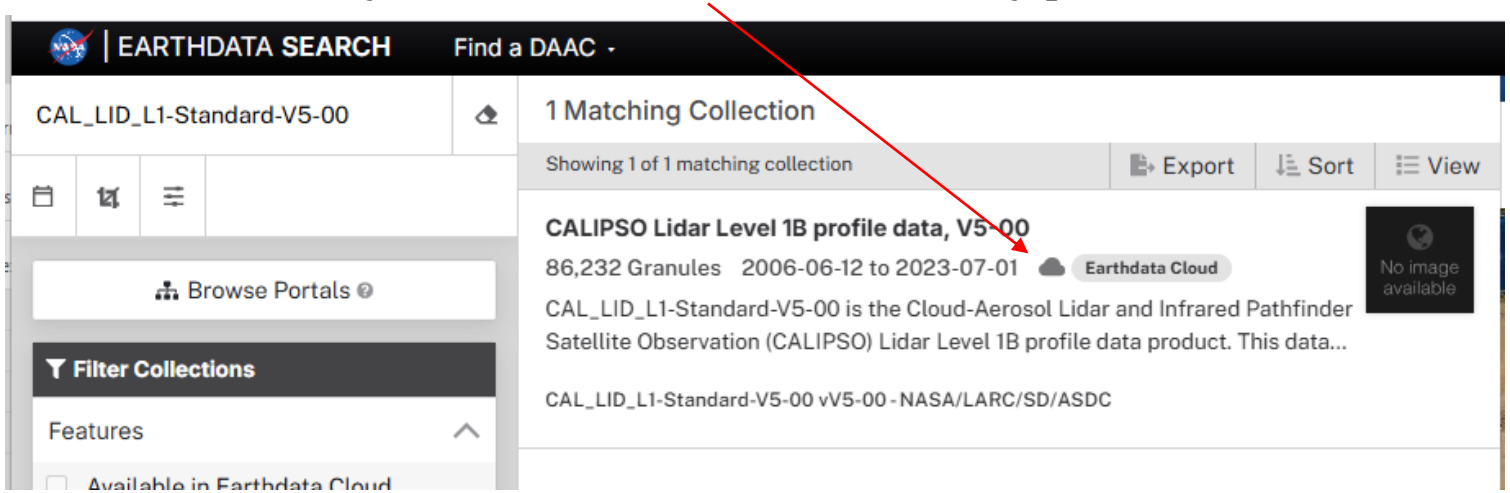
Archival means:

1) Ingest and accessible at ASDC (US)
2) Secure copy (SCP) transfer from ASDC (US) to ICARE (France); 2TB/day
3) Transfer to Cumulus S3 (Earthdata Cloud), current CALIOP Level 1 and selected CALIOP Level 2 near-term; 2TB/day

As of February 12th, 2025

Archival of Data

- The CALIPSO Data Products will continue to be archived and distributed by both the ASDC (US) and the AERIS/ICARE Data and Services Center (France).
- The CALIPSO data product catalogue, ATBD's, and data quality summaries are currently available through the ASDC CALIPSO project webpage (https://asdc.larc.nasa.gov/project/CALIPSO) and will remain so after the end of the mission.
- Final versions of all data products will be made available in the Earthdata Cloud*
  - V5.00 Lidar Level 1 currently in Earthdata Cloud, but currently private to facilitate CloudSat data transfer



https://search.earthdata.nasa.gov/search?q=CAL_LID_L1-Standard-V5

*Mahmoud et al (presentation): Expanding CALIPSO Data Visibility through the Atmospheric Data Center

Website

- CALIPSO project maintains a website (https://www-calipso.larc.nasa.gov) that provides mission content for the public and science community.
- After the completion of the project this site will be de-commissioned and relevant content will be split between ASDC and the LaRC Science Directorate.
- The LaRC Science Directorate will be responsible for and maintain a site (https://science.larc.nasa.gov/CALIPSO) that will be tailored as more of a public affairs site rather than a data content site.
- ASDC will continue to be responsible for and maintain a site (https://asdc.larc.nasa.gov/project/CALIPSO) that will publicly disseminate all data products and associated documentation.
  - Extensive online documentation currently on the CALIPSO science site, including all data descriptions and users guides, will be converted to PDFs and added to relevant data pages

Browse Images

- A final version of all standard browse images is planned that uses the final versions of the WFC L1, CALIOP L1, L2, and IIR L2 data products.
  - Updates to color bars*
- A sub-set of the images also rely on CloudSat data, so coordination between CALIPSO and CloudSat will need to be carried out to make sure data is available at NASA LaRC in time to generate and post the final release images.
- CALIPSO standard browse images are currently stored and posted on the CALIPSO science site
  - Final images will be posted at ASDC, along-side the L0-L3 CALIPSO data products, for dissemination to the public.

*Tackett et al (presentation): New colormaps for CALIOP browse imagery to improve accessibility for color vision deficiencies

Questions?