CALIPSO Mission Report

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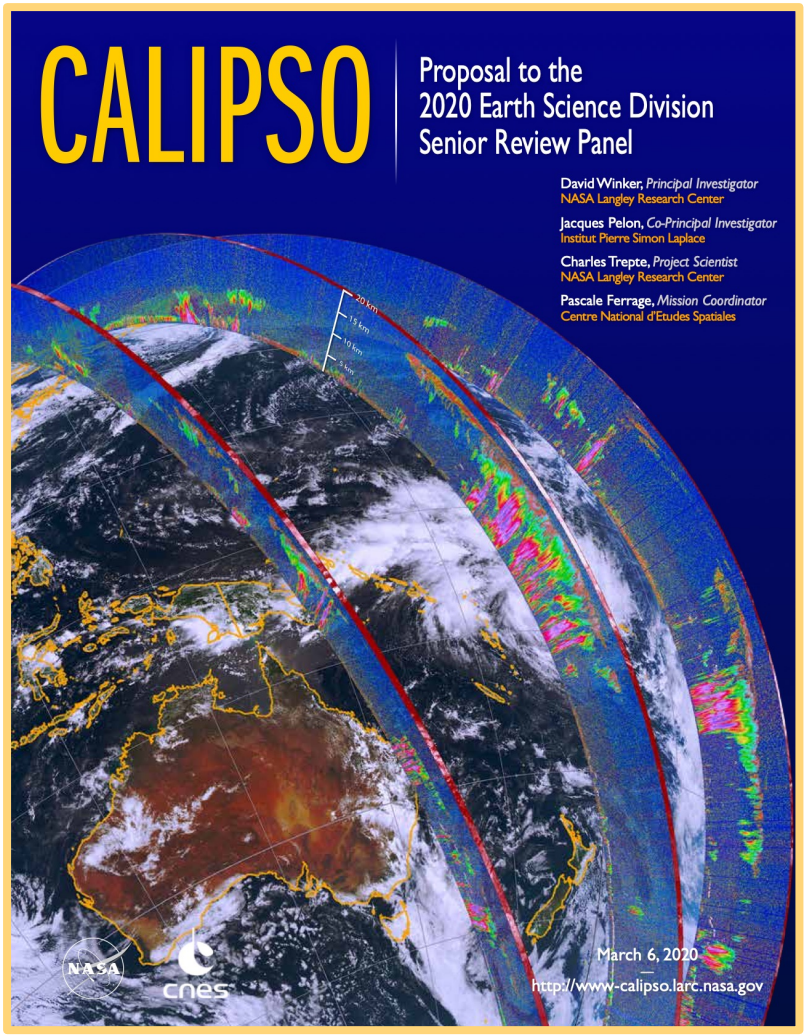
CALIPSO-CloudSat Status Report
September 12, 2022

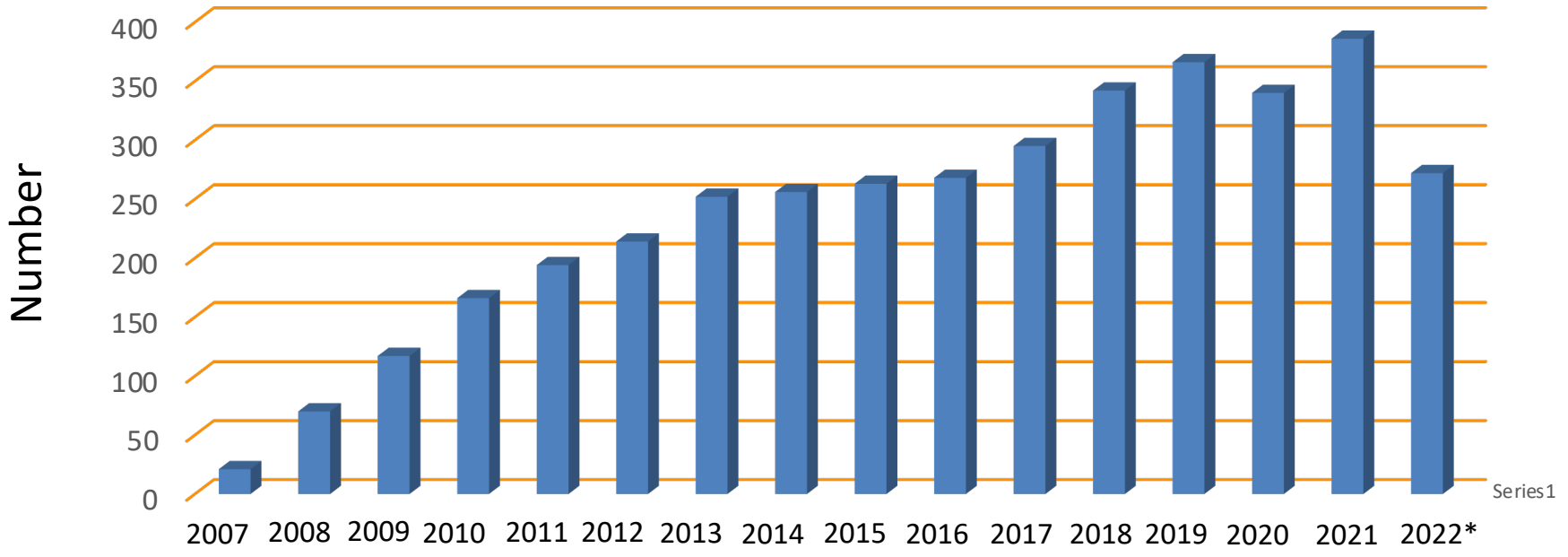
>16 Years on Orbit (and Counting)

- **CALIPSO is in its Golden Years**
- Payload and spacecraft have performed well beyond expectations
- Mission has been successful beyond ‘our wildest imagination’
- Combined CALIPSO-CloudSat measurements are transformative in advancing knowledge on clouds and aerosols and their roles in climate, weather and air quality
- C-C moved out of A-Train in Sep 2018
- Happy to be resuming coordinated CALIPSO-CloudSat observations



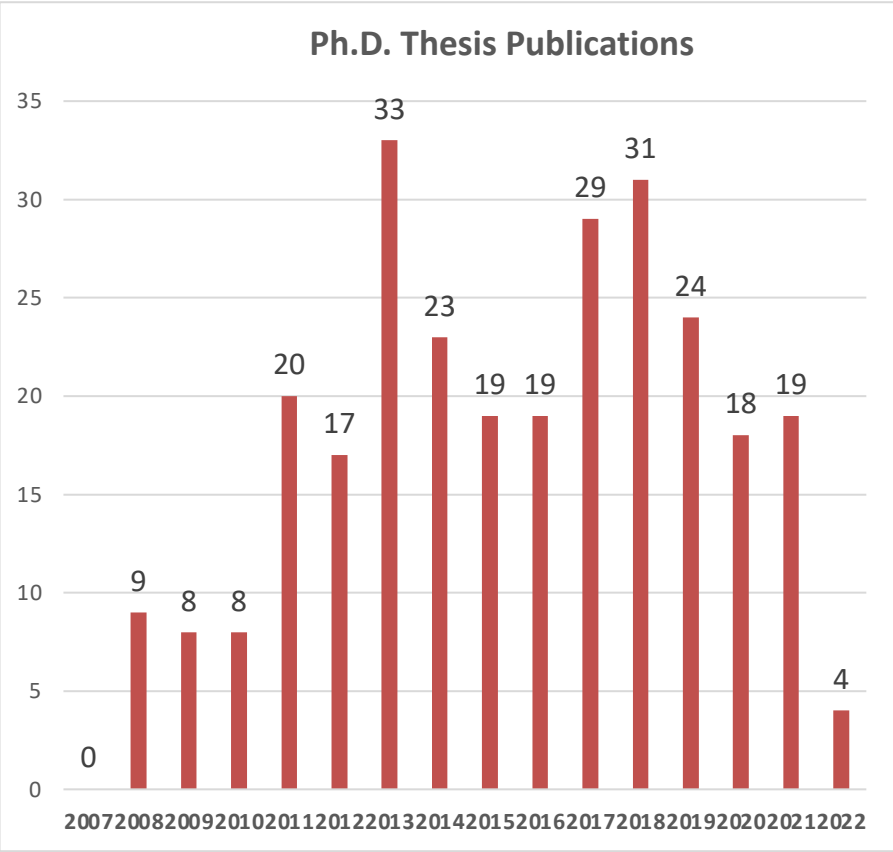
CALIPSO Extended Mission Proposal submitted to NASA on February 29, 2020. Image of combined CALIPSO-CloudSat profile observations for January 16, 2020

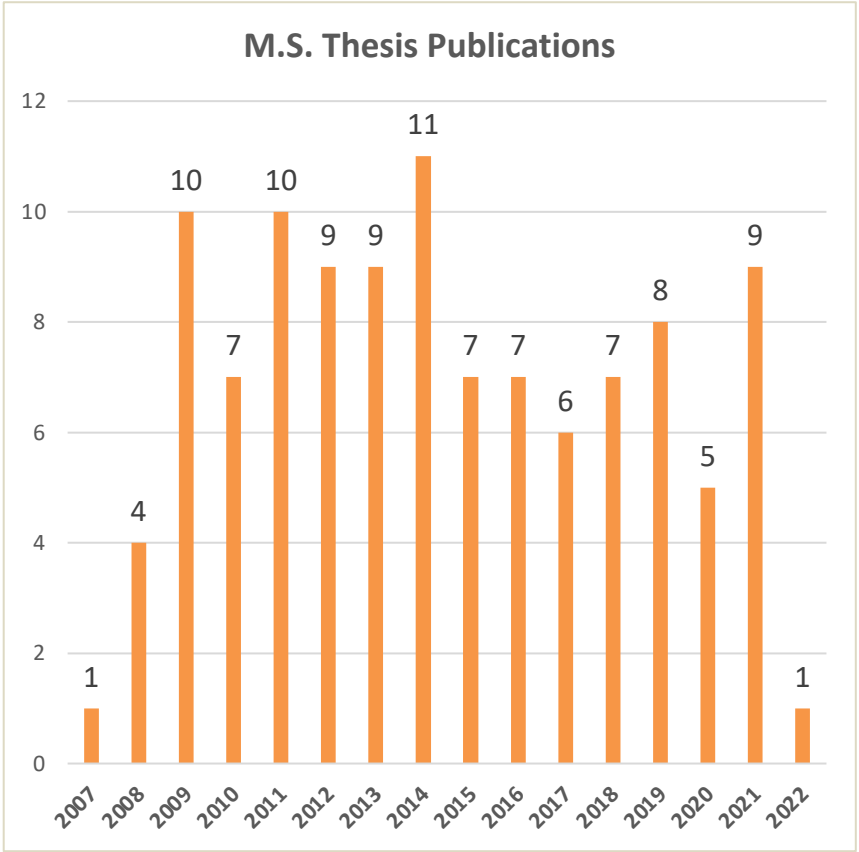
Publications Citing CALIPSO Data

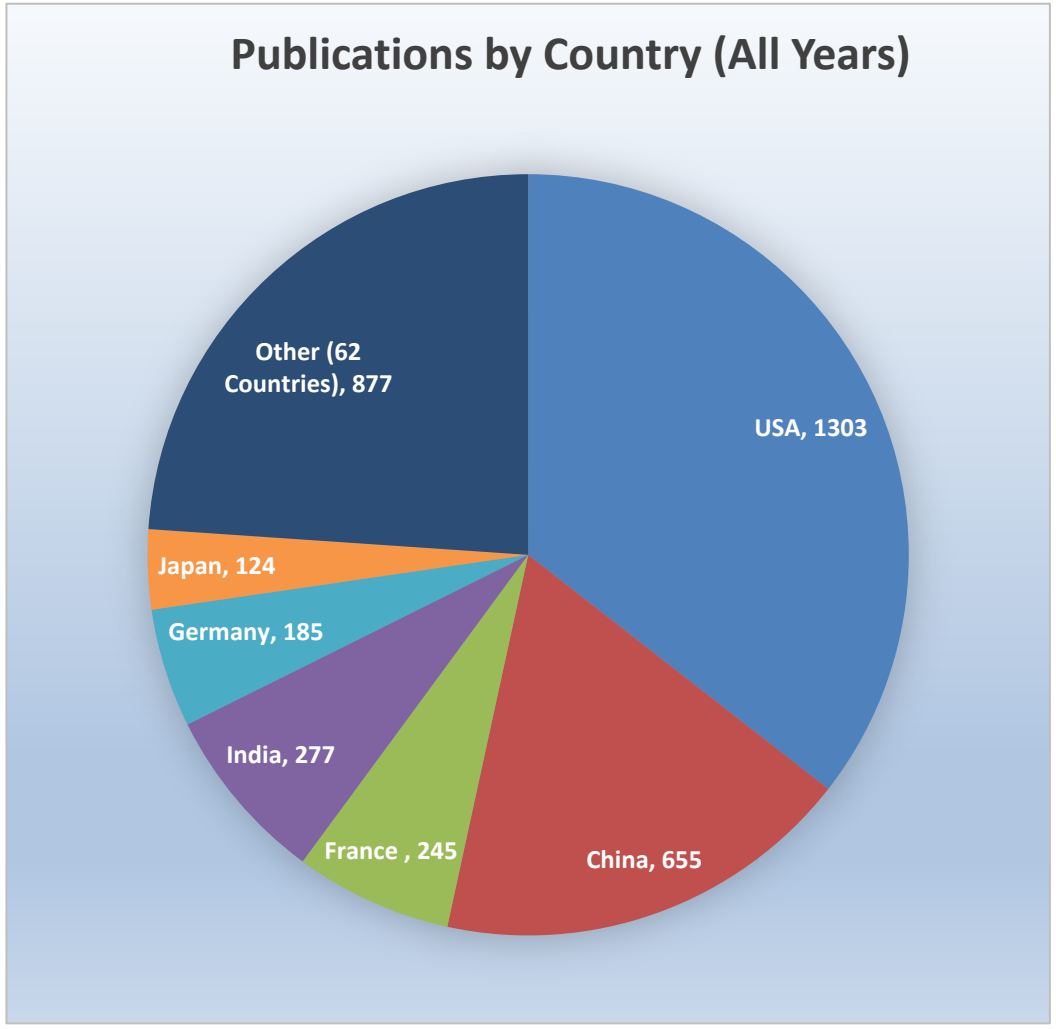


- 3822 total publications referencing CALIPSO data products
- Includes 2022 publications *in press*

Academic Interests with CALIPSO Data







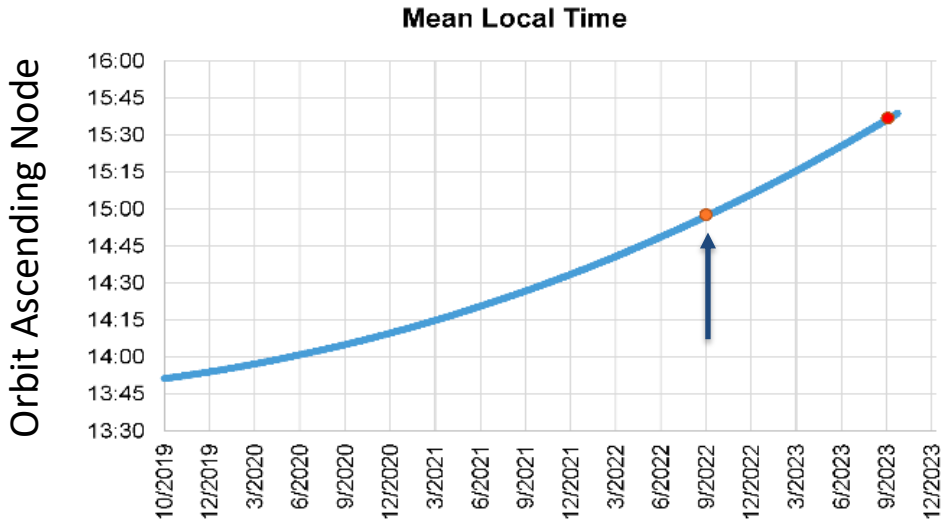
Other Countries
UK
Sweden
Canada
Australia
South Korea
Italy
Greece
Netherlands
Norway
Israel
Spain
Finland
Switzerland
Taiwan
Pakistan
South Africa
Iran
Belgium
Russia
Brazil
New Zealand
Poland
Puerto Rico
Portugal
Denmark
Argentina
Austria
Cyprus
Thailand
Turkey
UAE
Saudi Arabia

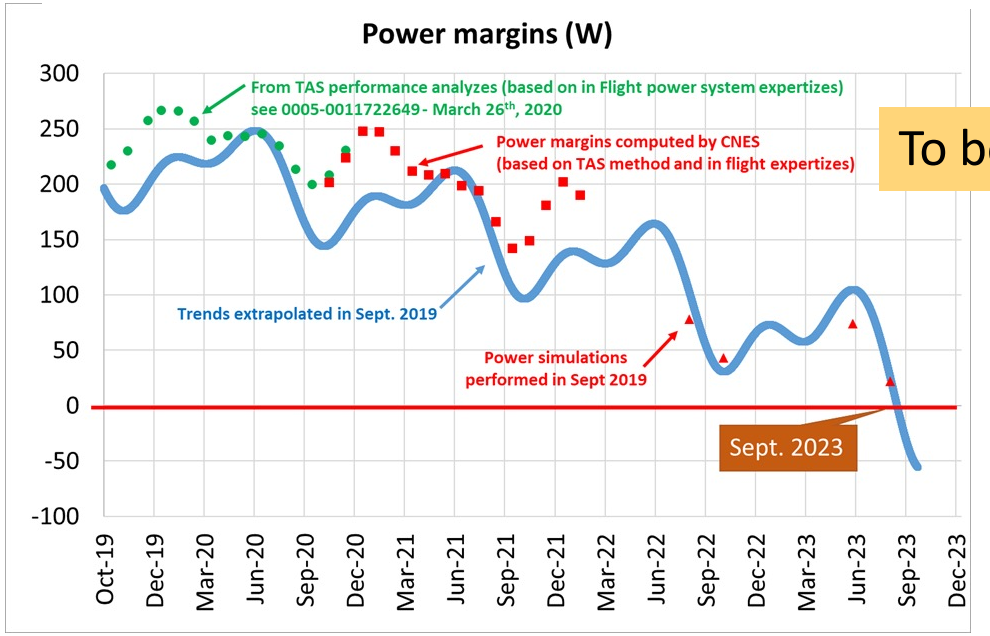
Nigeria
Cuba
Serbia
Malaysia
Senegal
Chile
Cameroon
Lithuania
Ireland
Nepal
Czech Republic
Iraq
Kyrgyzstan
Philippines
Vietnam
Algeria
New Caledonia
Romania
Kuwait
Korea
Netal
People's Republic of China

Hong Kong
Iceland
Lanzhou
Slovenia
Tunisia
Guangxi
Belarus
Georgia
Georgia
Guangxi
Helsinki
Hungary
Republic of Korea
Bangladesh
Jiangsu
Quzhou
Rowanda
Shanxi

Platform Status

- The Spacecraft continues to satisfy all operational requirements.
- A small, sudden loss of a solar array string in July is thought to have been caused by impact of micrometeorite. Assessment is ongoing.
- Fuel reserves are mostly depleted; only 1 collision avoidance maneuver remains available
- CALIPSO is flying in the C-Train orbit ~687 km and is drifting eastward to later mean local times (MLT) of the ascending node
- The increasing MLT yields less illumination on solar panels, and hence, less power with time
- After Sep 2023 the mission will have *insufficient* power to continue science observations
- **Decommissioning Review planned for late September 2023**

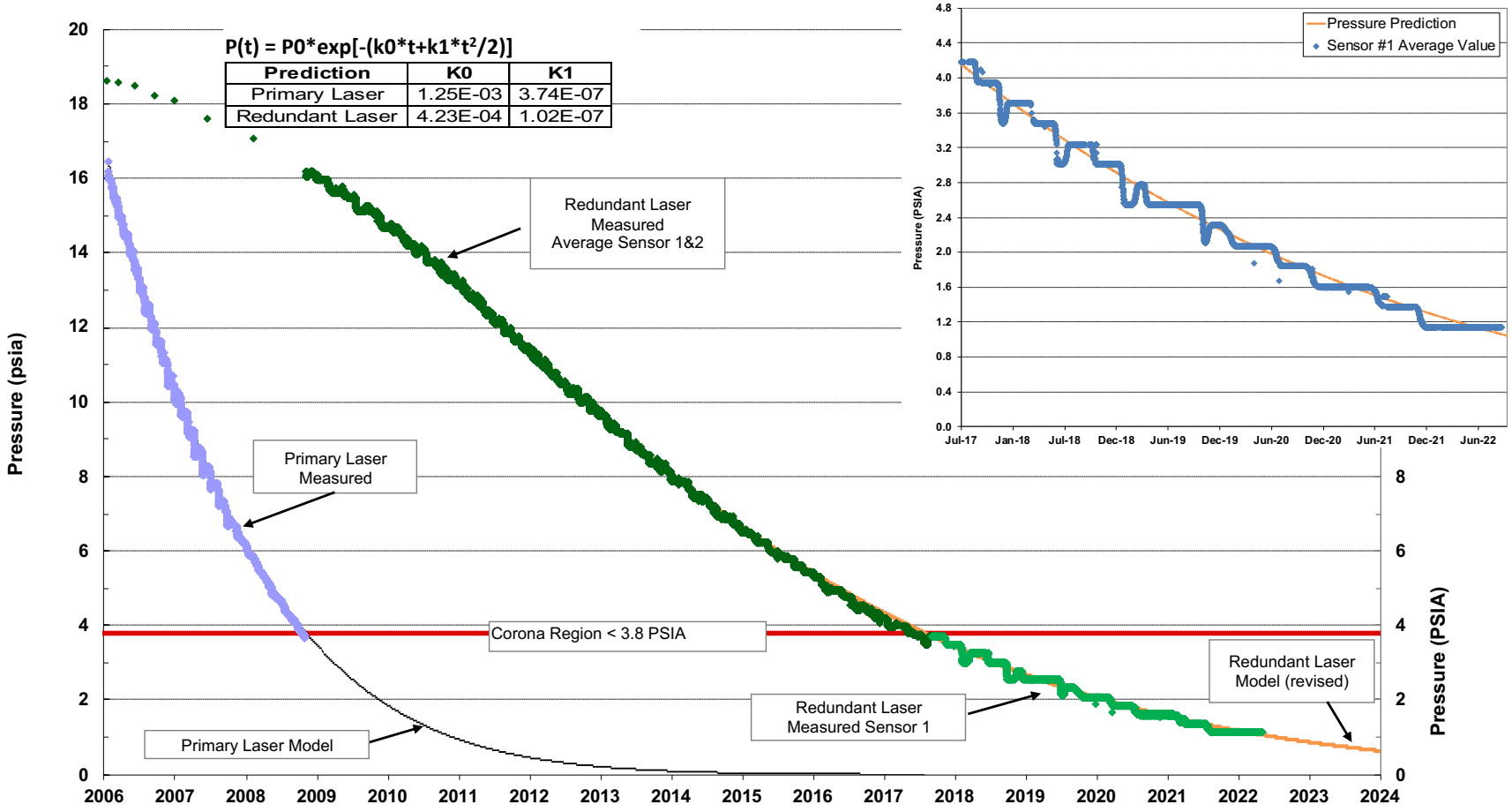




To be updated

Laser Canister Pressure

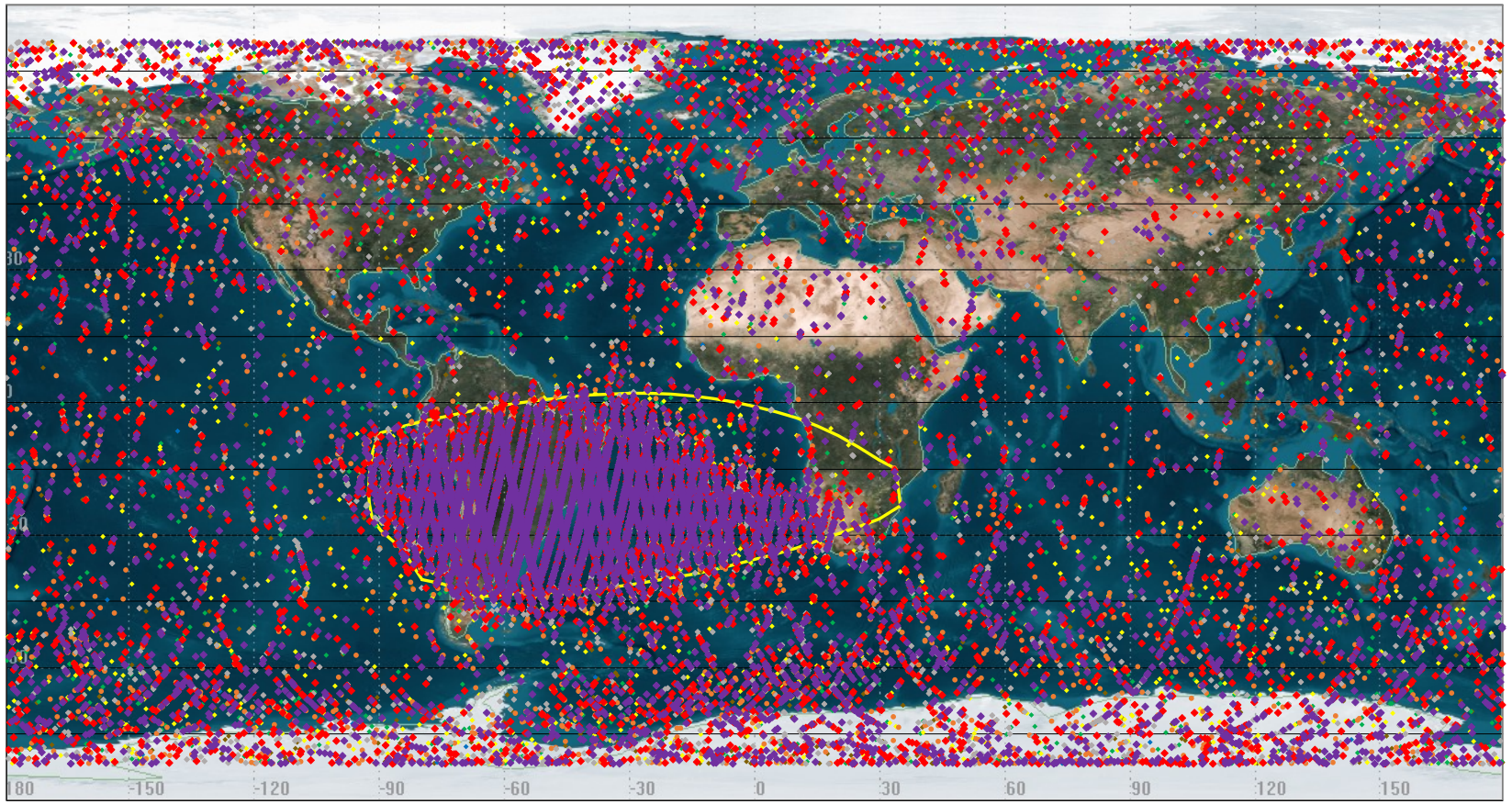
- Pressure within the Backup laser canister continues to decrease exponentially.
- Current pressure < 1 psi and is far below the theoretical Paschen curve (threshold for corona).



All Laser Energy Drop Locations

August 17 – September 01, 2022

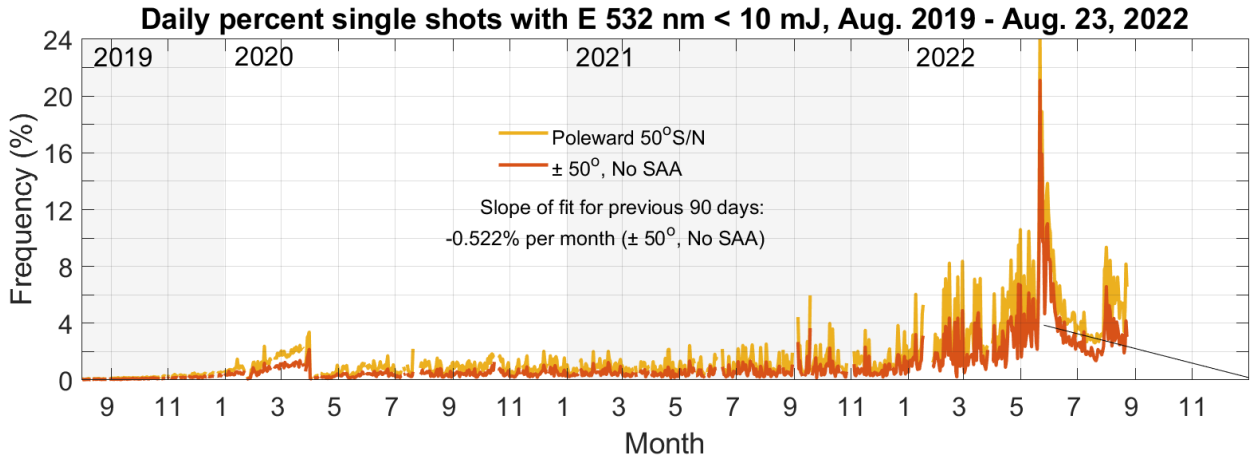
- Low laser energy shots most frequent in South Atlantic Anomaly region.
- For past couple of years, most shots in SAA are severely compromised.
- Outside the SAA, low energy shots widely distributed, but with preference to high latitude radiation belts.
- New Lidar CALIOP level 1 data record (4.5) applies a mitigation strategy that seeks to reduce the impact of low laser energy shots in sample averages.

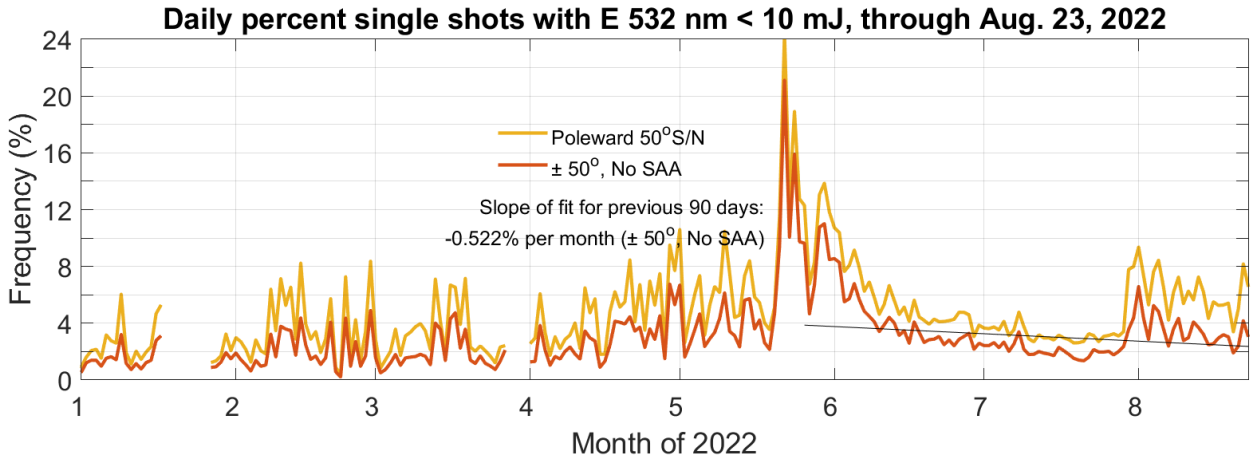


Date Range	Total	E<1 (mJ)	1<E<2 (mJ)	2<E<5 (mJ)	5<E<10 (mJ)	10<E<20 (mJ)	20<E<30 (mJ)	30<E<40 (mJ)	E>40 (mJ)	MAX (mJ)
08/17-09/01/22	24805	1061	126	1176	1793	2881	3386	5551	8831	44.7

Low Laser Energy Shot Trend

- Increase spike frequency tied to increased solar activity and decreasing pressure in laser canister.
- Frequency of low energy shots erratic the past few months – no know reason.
- Presently no intent to switch to the original ‘primary’ laser until ‘Decommissioning Phase’.



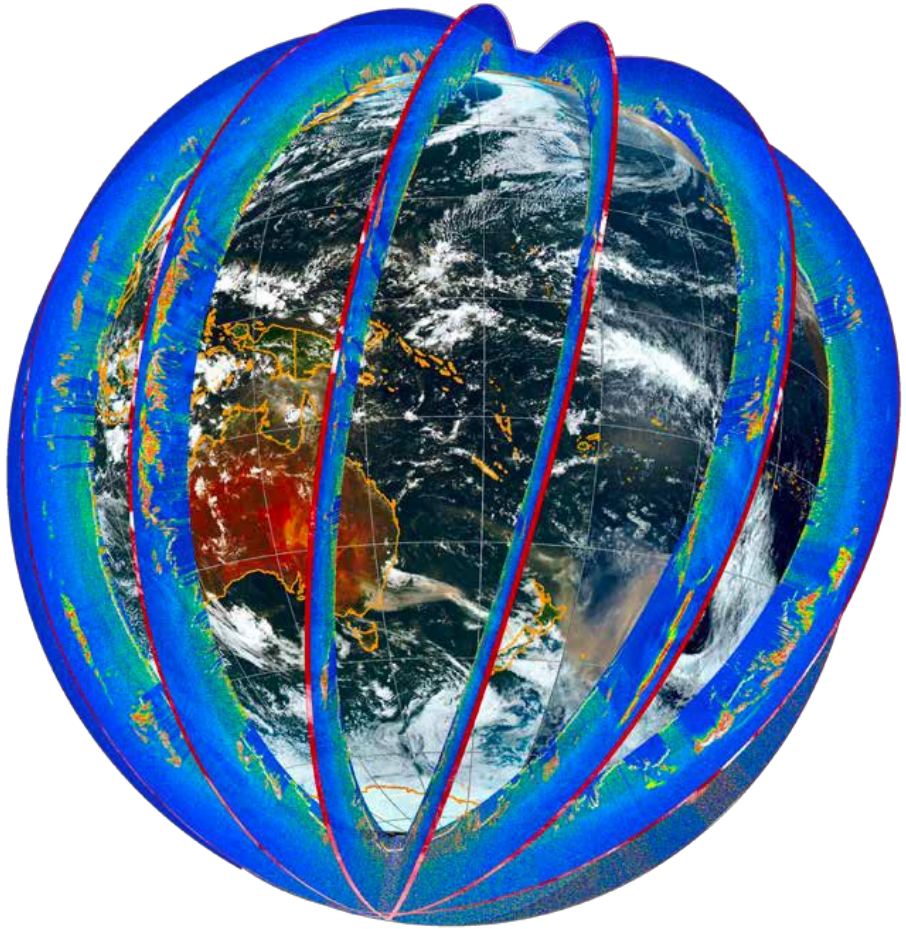


Decommissioning Phase Schedule

• Spring 2023	Recommendation to Terminate Science Operations
• September	Termination of Science Operations/Decommissioning Review
• October-November	Payload/Spacecraft Engineering Assessment Studies
• February 2024	Completion of Mission Operations Report
• TBD	Joint CALIPSO-CloudSat Science Workshop (France)
• September	Review for Algorithm Updates for Final Data Processing
• Summer 2025	Completion of Processing and Archival for all Data Products
• Summer	Completion of Science Accomplishments Report
• September	Final Statement on Completion of Mission

Summary

- CALIPSO continues to provide valuable observations with CloudSat
  - healthy publication rate using these data
- The mission is approaching its end of life
  - No fuel available for maneuvers
  - Backup laser producing low energy shots with increasing frequency
  - IIR is working very well
  - Wide field camera stopped working in April 2020
- Mission expected to end September 2023 due to reduced power availability
- Expect a 2-year end-of-mission phase to prepare final algorithms and process full data record. Also – prepare final documentation



CALIPSO is a partnership between NASA and CNES