CALIPSO and CloudSat

"Unraveling the secrets of clouds and aerosols"

Mission Objectives

CALIPSO will fly as part of the Aqua constellation (A-train) to provide observations needed to:

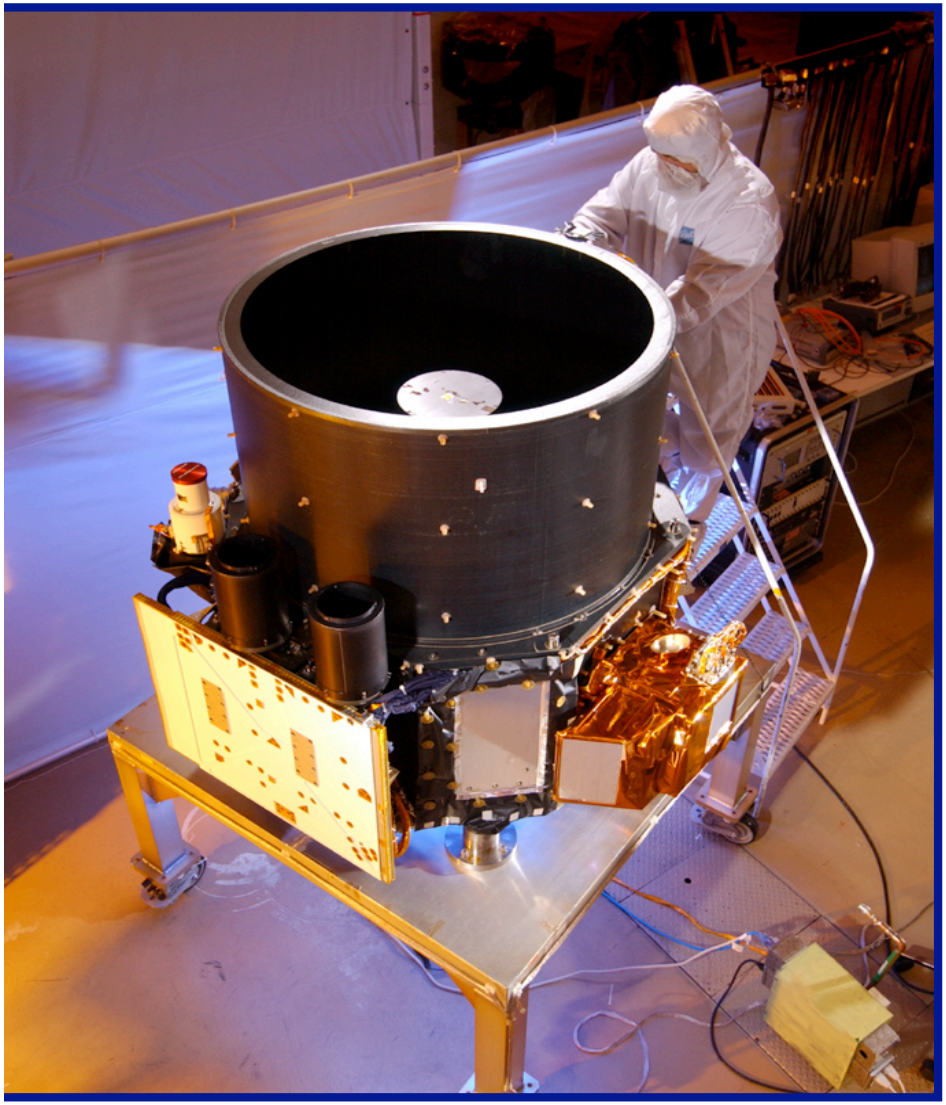
- Improve understanding of the role of aerosols and clouds in the processes that govern climate responses and feedbacks
  - Direct and indirect aerosol effects
  - Cloud forcing and feedbacks

Improve the representation of aerosols and clouds in models

- Improved predictions of climate and weather
- Improved models of atmospheric chemistry

NASA / WINKER

CALIPSO Instrument Payload



LIDAR

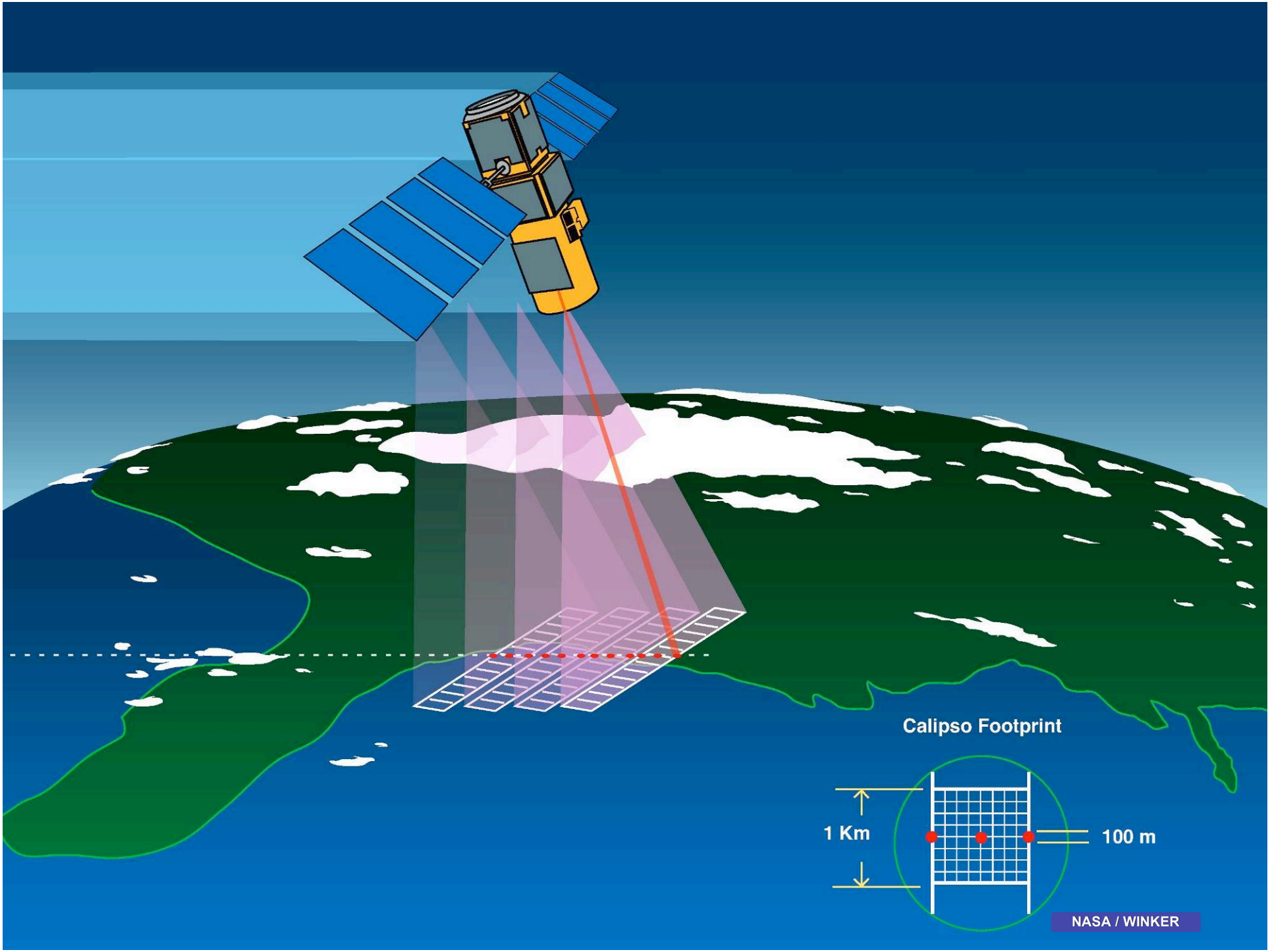
Laser	Nd: YAG, 2x110 mJ
Wavelength	532 nm, 1064 nm
Repetition rate	20.25 Hz
Receiver telescope	1.0 m diameter
Polarization	532 $\parallel$ and $\perp$
Footprint/FOV	100 m / 130 μrad
Vertical resolution	30 - 60 m
Horizontal resolution	333 m
Lin. dynamic range	22 bits

Wide-Field Camera (WFC)

Wavelength	645 nm
Spectral bandwidth	50 nm
IFOV / Swath	125 m / 61 km

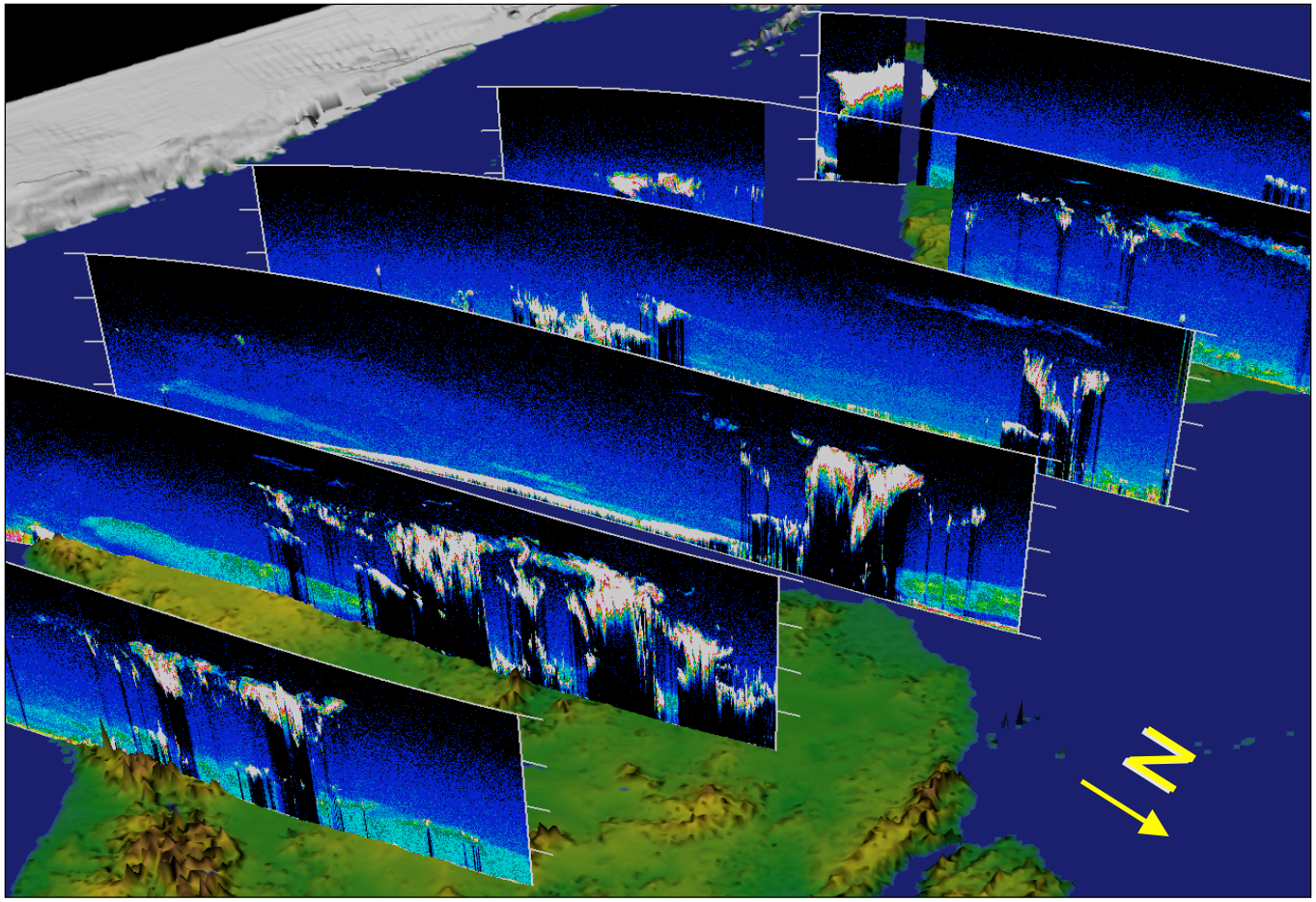
Imaging Infrared Radiometer (IIR)

Wavelength	8.65, 10.6,12.05 μm
Spectral resolution	0.6-1.0 μm
IFOV / Swath	1 km / 64 km
NETD @ 210K	0.3 K
Calibration	±1 K


Calipso Footprint
1 Km
100 m
NASA / WINKER

CALIPSO Adds the 3rd Dimension

Multiple Orbits of LITE Observations over Africa and South America

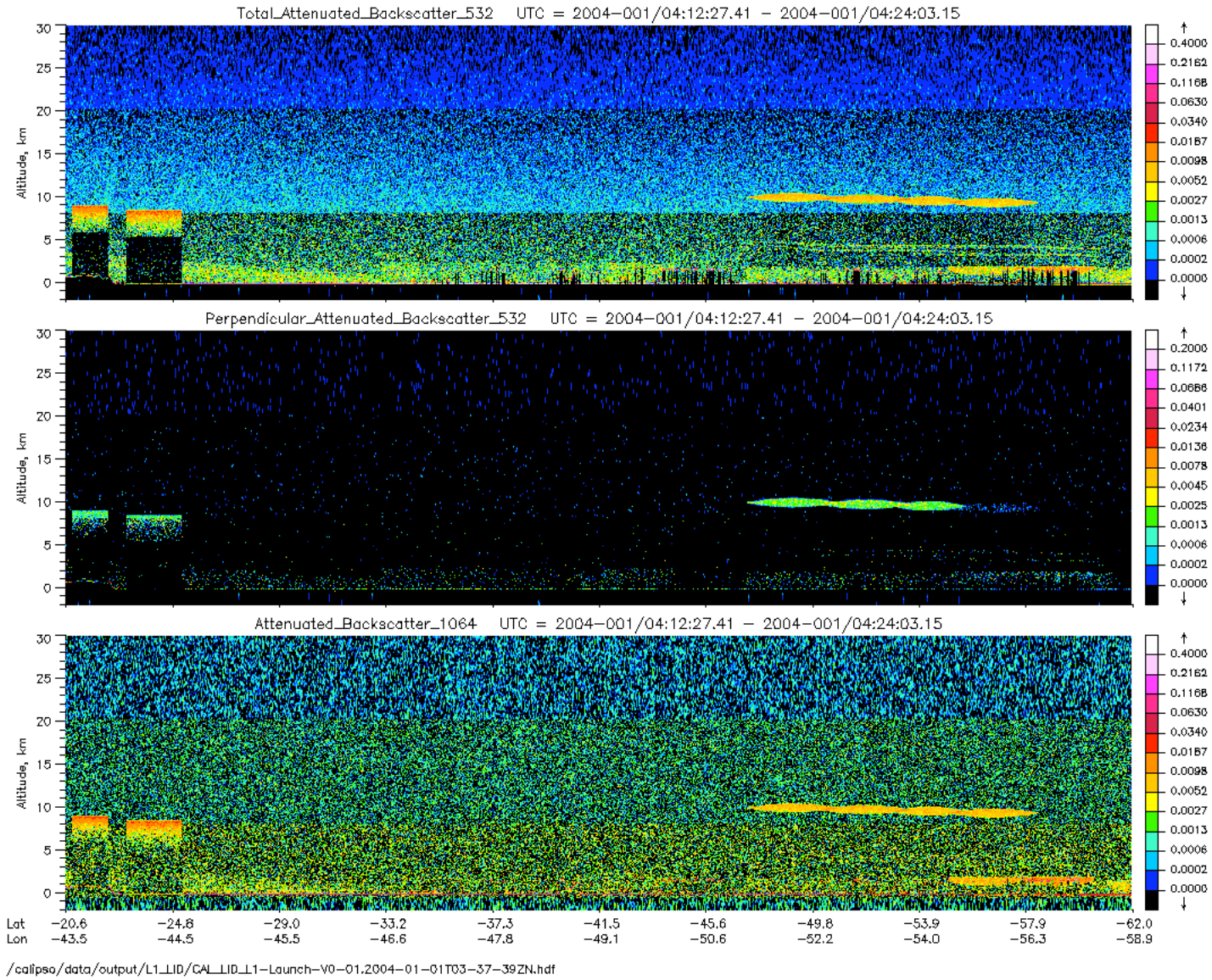


LITE: Lidar In-space Technology Experiment, was flown on the Space Shuttle STS-64 in 1994. It was the first atmospheric lidar in space.

CALIPSO Lidar Level 2 Data Products

Data Product	Product Name	Primary Parameters	Maximum Altitude	Resolution	
				vertical	horizontal
DP 1.1	Level 1B Profiles	$532^{\perp+\parallel}$, $532^{\perp}$, 1064 attenuated backscatter	40 km	Full Resolution	
DP 2.1A	Cloud and Aerosol Layer Product	Cloud: base and top height, optical depth, I/W phase, IWP	20 km	30 m	1/3, 1, 5 km
		Aerosol: base and top height, optical depth, avg depolarization and color ratio, aerosol type	30 km	30 m	5 km
DP 2.1B	Aerosol Profile Product	532/1064 nm backscatter, extinction, depolarization	30 km	120 m	40 km
DP 2.1C	Cloud Profile Product	532 nm backscatter, extinction, depolarization, IWC	20 km	60 m	5 km
DP 2.1D	Vertical Feature Mask	cloud mask, ice/water phase aerosol mask, type	20 km	Full Resolution	

CALIPSO Sample Data



On-board Averaging Scheme

112.0 km
97.0 km

High Altitude Background Region

80.0 km
65.0 km

High Altitude Baseline Region

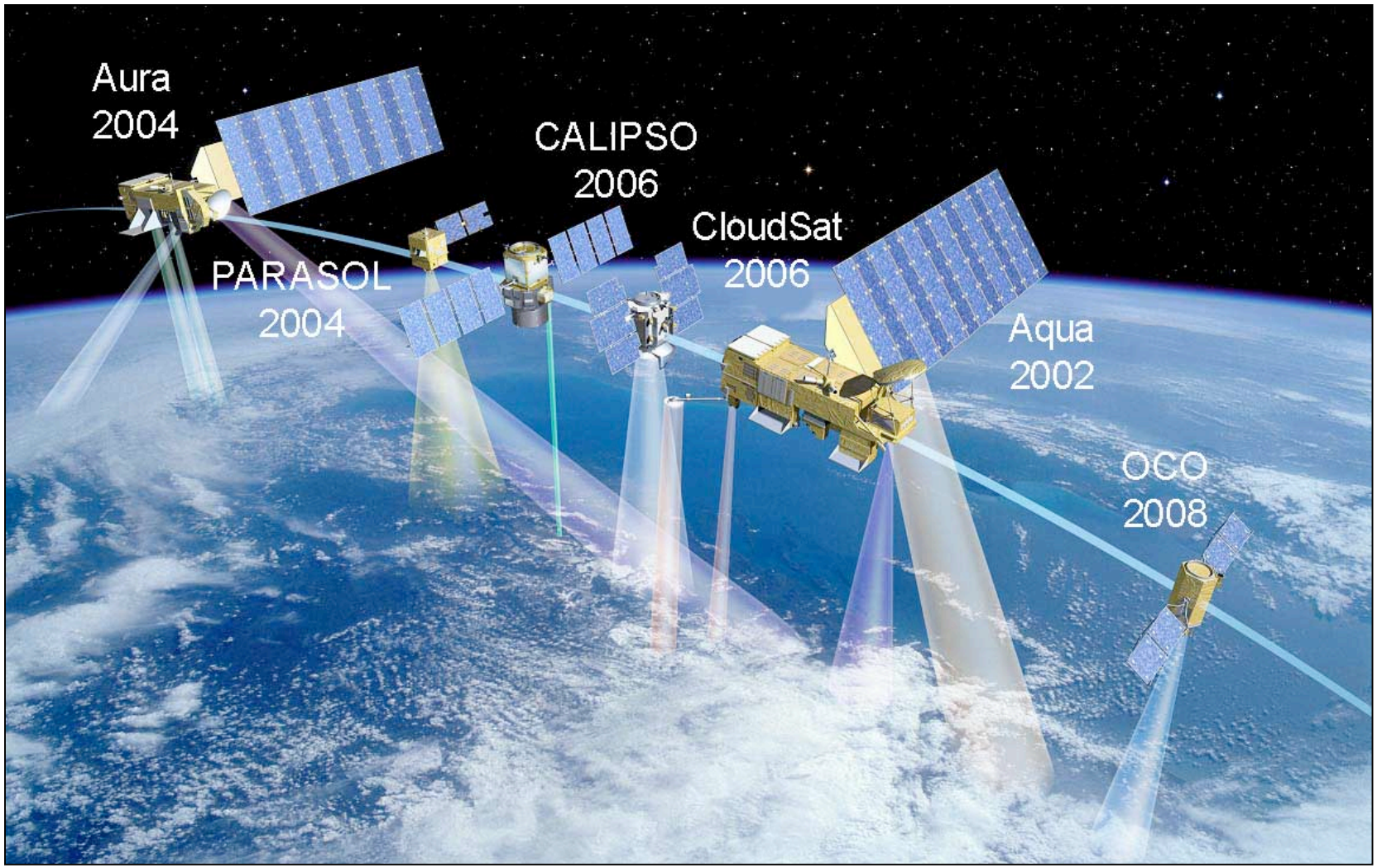
Backscatter Region

	Horizontal Resolution, km	532 nm Vertical Resolution, m	1064 nm Vertical Resolution, m
40.0 km	5.0	300.0	-----
30.1 km	1.67	180.0	180.0
20.2 km	1.0	60.0	60.0
8.2 km	0.33	30.0	60.0
-0.5 km	0.33	300.0	300.0
-2.0 km			

-11.0 km
-18.5 km

Low Altitude Baseline Region

The Next Leap Forward: The A-Train

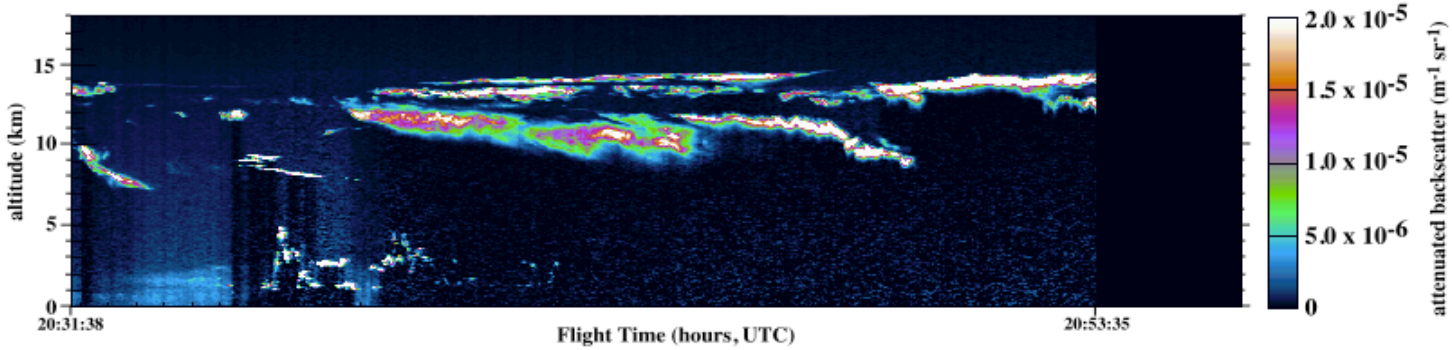


The A-train provides an unprecedented view of clouds and aerosols and parameters that control them.

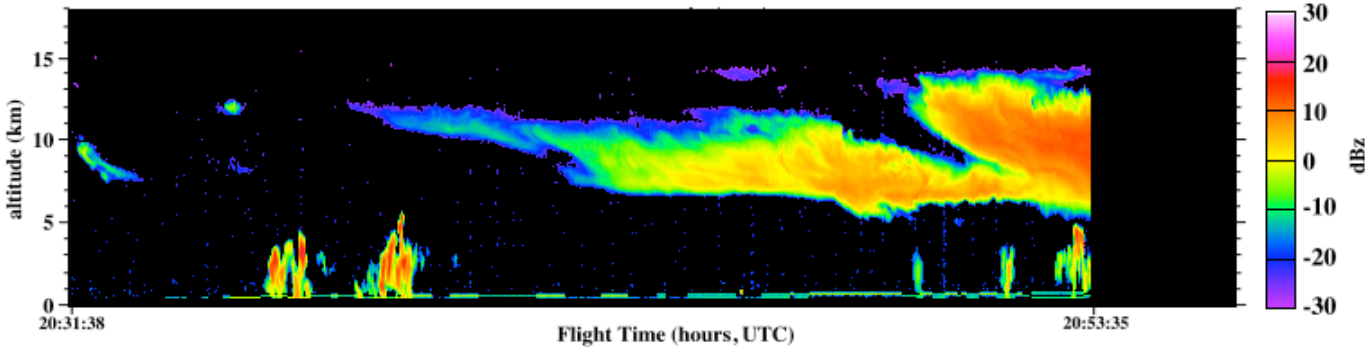
Combing CALIPSO and CloudSat

Reveals the Full Vertical Structure of Clouds and Aerosols

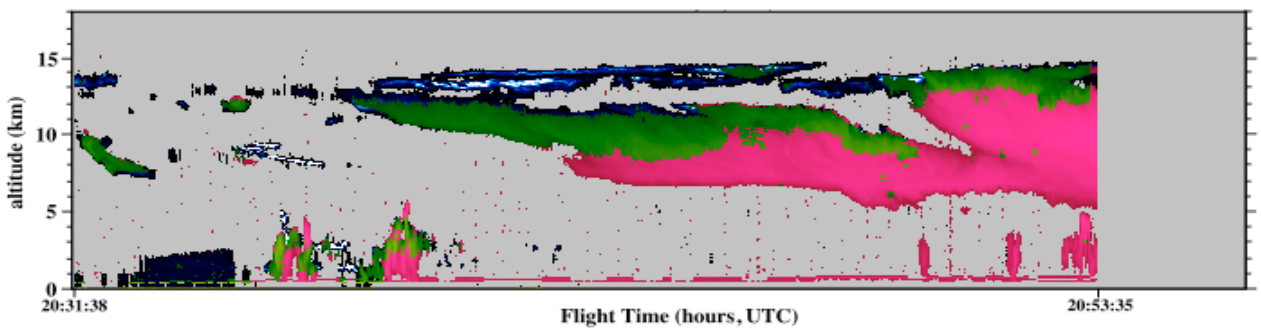
Cloud Physics Lidar



Cloud Profiling Radar

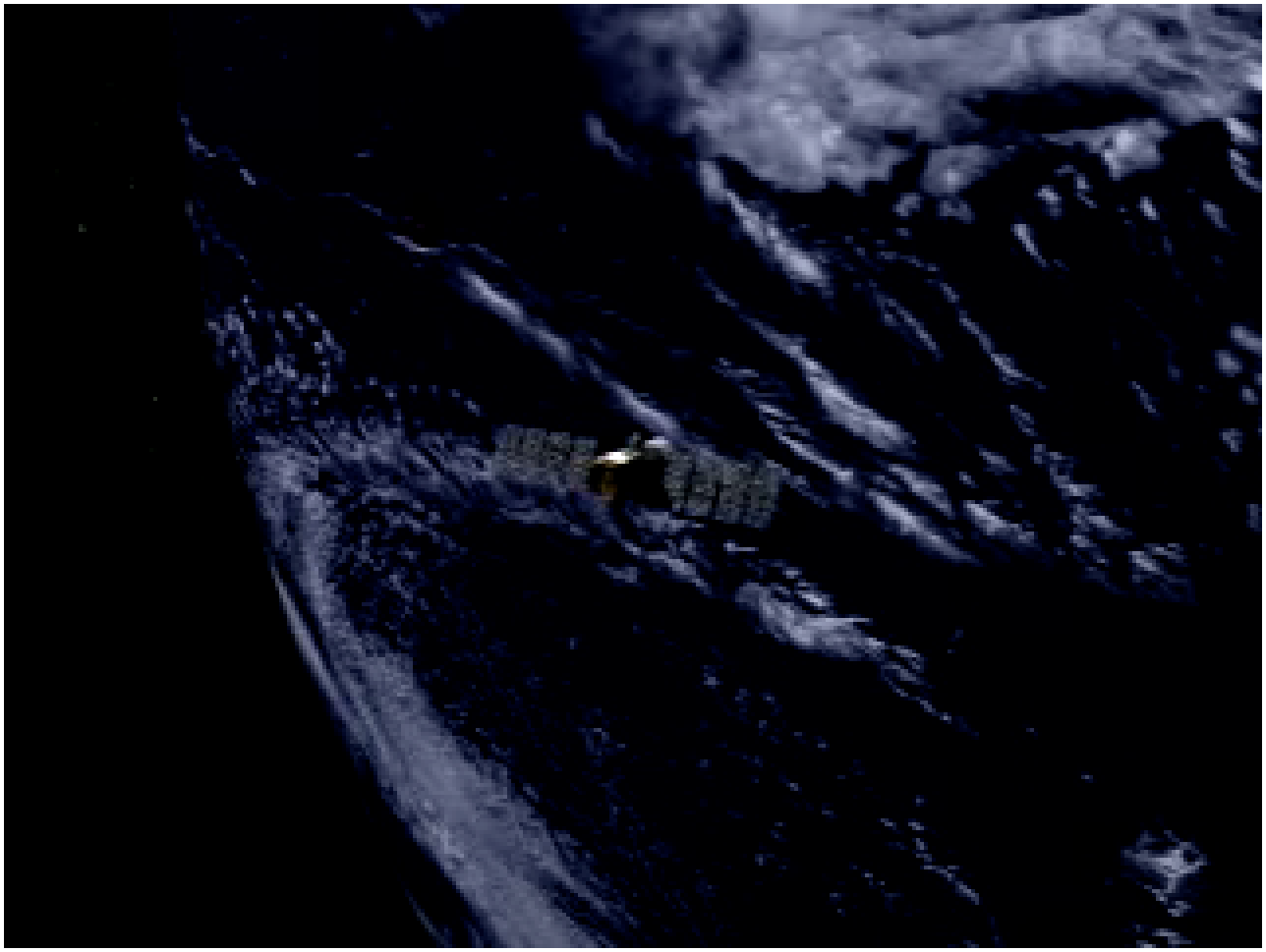


Combined Data Sets



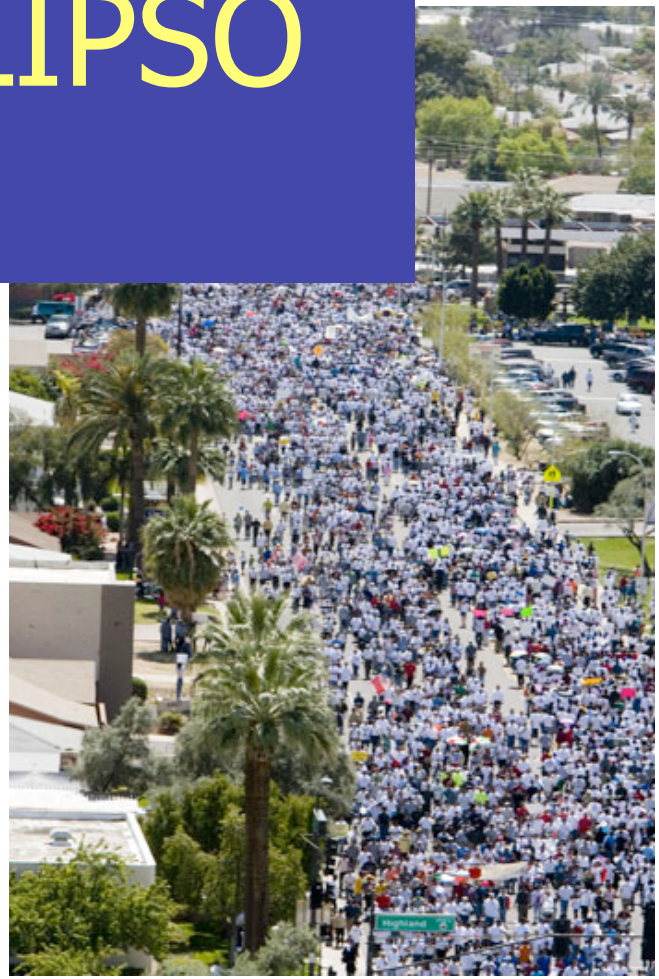
Data from CRYSTAL-FACE field campaign, July 2002.

CALIPSO Animation



A World of Unrest

Launch CALIPSO Now !



Launch Week Celebration

Final Preparations

CALIPSO/CloudSat Launched
28 April 2006 3:02 PDT

FINALLY!!!!

Oh! What a Sight !

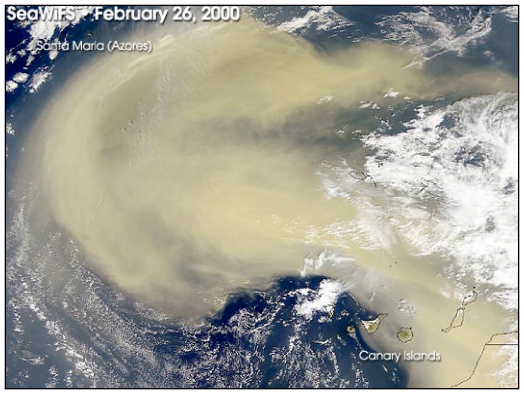
Schedule of Activities

Instrument checkout begins	May 10
Lidar first light	May 30
Data processing system checkout	early June
Initial data assessment	mid June
HSRL comparisons	June - August
ER-2 comparisons	July 20 - Aug 10
Payload Commissioning Review	early August
Science Team meeting	October
Initial Data Release	Nov/Dec
Fall 2006 AGU Session	Dec

CALIPSO is ….

A satellite mission developed by NASA and the French Space Agency CNES.

- CALIPSO will employ an innovative set of instruments to study the role that aerosols and clouds play in regulating Earth's weather, climate and air quality.
- CALIPSO will collect information on the vertical structure of clouds and aerosols unavailable from other Earth observing satellites.
- Observations from CALIPSO will improve our understanding of the human impact on the atmosphere.



CALIPSO
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www.nasa.gov/calipso