CLOUD – AEROSOL LIDAR AND INFRARED PATHFINDER SATELLITE

Aeronautics And Space Science

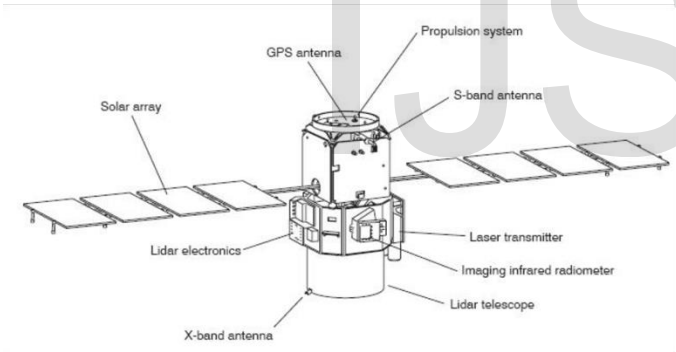
Tannay Kumar, Vivek Chaudhary

Abstract— These CALIPSO (Cloud-Aerosol LIDAR and Infrared Pathfinder Satellite Observations) is a mission dedicated to studying how clouds and aerosols impact the Earth's climate. Scientists are using data from CALIPSO to construct 3D models of the atmosphere that improve our ability to predict future climate change. CALIPSO's LIDAR can also be used to measure particles below the ocean surface, inlcluding phytoplankton.

Index Terms - CALIPSO, NASA, ESSP, Satelite, Lidar, Aerosol and Aeronautics.

1 INTRODUCTION

CALIPSO, also known as PICASSO-CENA (Pathfinder Instruments for Cloud and Aerosol Spaceborne Observations), this is a satellite science mission, a collaborative NASA/CNES project in the ESSP (Earth System Science Pathfinder) program of NASA. other project partners are algorithm development, etc.



The CALIPSO satellite carries the first polarization lidar in orbit, along with infrared and visible passive imagers, and flies as part of the Afternoon Constellation (A-train). The acquisition of observations which are simultaneous and coincident with observations from other instruments of the A- train will allow numerous synergies to be realized from combining CALIPSO observations with observations from other platforms. In particular, cloud observations from the CALIPSO lidar and the Cloud Sat radar will complement each other, together encompassing the variety of clouds found in the atmosphere, from thin cirrus to deep convective clouds. This paper will present an overview of theCALIPSO mission, including initial results.

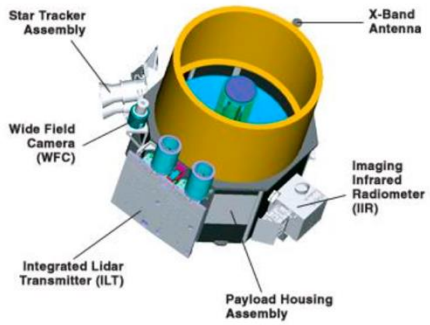
2 DETAILS OF THE SATELITE

ACRONYM	CALIPSO
FULL NAME	Cloud Aerosol Lidar & Infrared Pathfinder Satellite
SATALITE DESCRIPTION	
MASSAT LAUNCH	635 kg Dry Mas 607 kg
POWER	560 W
DATA ACCESS LINK	https://eosweb.larc.nasa.gov/project/calipso/calipso_tabel
ORBIT	Sun synchronous Altitude 689 km
ECT	13:30 asc
SPACE AGENCY	NASA, CNES
STATUS	Operational
LAUNCH	26 Apr 2006 EOL
LAST UPDATE	2019 – 06 - 11

Author: Tannay Kumar {[Student]}
Jamnabai Narsee international school
Independent Researcher
Mumbai, India
kumartannay@gmail.com

3 Instrument Description

The instruments are designed to operate autonomously and continuously, although the WFC acquires data only under daylight conditions. Science Data are downlinked using an X- band transmitter system which is part of the payload.



CALIOP is a two-wavelength polarization-sensitive lidar that provides high-resolution vertical profiles of aerosols and clouds. CALIOP utilizes three receiver channels: one measuring the 1064 nm backscatter intensity and two channels measuring orthogonally polarized components of the 532 nm backscattered signal. Dual 14-bit digitizers on each channel provide an effective 22-bit dynamic range. The receiver telescope is 1 meter in diameter. A redundant laser transmitter is included in the payload. An active boresight system is employed to maintain co-alignment between the transmitter and the receiver. Ball Aerospace, Corp , developed the instrument. The WFC is a modified version of the commercial off-the-shelf Ball Aerosopace CT-633 star tracker camera. It is a fixed, nadir- viewing imager with a single spectral channel covering the 620- 270 nm region, selected to match band 1 of the MODIS instrument on Aqua. A three-channel IIR is provided by CNES with algorithm development performed by the Institute Pierre Simon Laplace (IPSL) in Paris. The IIR a nadir-viewing, non-scanning imager having a 64 km by 64 km swath with a pixel size of 1 km. The CALIOP beam is nominally aligned with the centre of the IIR image. The instrument uses a single microbolometer detector array, with a rotating filter wheel providing measurements at three channels in the thermal infrared window region at 8.7 mm, 10.5 mm, and 12.0 mm. These wavelengths were selected to optimize joint CALIOP/IIR retrievals of cirrus cloud emissivity and particle size.

4 Conclusion

My observation on this research is that the CALIPSO will provide us global 3-D perspectives on Earth's aerosols and clouds that will answer questions about how they form, evolve and affect our weather, climate and air quality. CALIPSO employs innovative measurement technologies that will probe Earth's atmosphere as never before. In partnership with the satellites in the A-Train, CALIPSO fuels discoveries that will improve our air quality and climate forecasts, while helping public policy makers and business leaders make more informed, long-term environmental decisions about public health and the economy.

References

2004ESASP.561..941W Page 941, http://articles.adsabs.harvard.edu//full/2004ESASP.561..941W/0000941.000.html.

"CALIPSO." CALIPSO - an Overview | ScienceDirect Topics, https://www.sciencedirect.com/topics/earth-and- planetary-sciences/calipso.

CALIPSO - EoPortal Directory - Satellite Missions, https://earth.esa.int/web/eoportal/satellite- missions/c-missions/calipso.

"CALIPSO Data and Information." NASA, NASA, https://eosweb.larc.nasa.gov/project/calipso/calipso_table.

"Programs." Ball, https://www.ball.com/aerospace/programs/calipso.

Thorsen, Tyler J., et al. "Comparison of the CALIPSO Satellite and Ground-Based Observations of Cirrus Clouds at the ARM TWP Sites." AGU Journals, John Wiley & Sons, Ltd, 10 Nov. 2011, https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2011 JD015970.

Winker, David. "Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations." NASA, NASA, https://www-calipso.larc.nasa.gov/.

Winker, David M. “Overview of the CALIPSO Mission and CALIOP Data Processing Algorithms.” Overview of the CALIPSO Mission and CALIOP Data Processing Algorithms: Journal of Atmospheric and Oceanic Technology: Vol 26, No 11,

https://journals.ametsoc.org/doi/full/10.1175/2009JTECHA12 81.1.