



# Lidar Atmospheric Sensing Experiment (LASE) Convection And Moisture EXperiment (CAMEX-3) Langley DAAC Data Set Document



## Summary:

LASE (Lidar Atmospheric Sensing Experiment) is an airborne autonomous DIAL system developed to measure water vapor and aerosol profiles. The Convection And Moisture EXperiment (CAMEX-3) campaign was based at Patrick Air Force Base, Florida from 6 August - 23 September, 1998. CAMEX-3 successfully studied Hurricanes Bonnie, Danielle, Earl and Georges. CAMEX-3 collected data for research in tropical cyclone development, tracking, intensification, and landfalling impacts using NASA-funded aircraft and surface remote sensing instrumentation.

The CAMEX-3 study yields high spatial and temporal information of hurricane structure, dynamics, and motion. The LASE instrument's purpose in this experiment is to characterize the hurricane environment using water vapor and aerosol measurements for use as input to models and assimilation schemes and to fill in sonde data voids.

More detailed information on the LASE CAMEX3 data can be found on the [LASE CAMEX3](#) and on the [CAMEX3 Project](#) Home pages.

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## 1. Data Set Overview:

### Data Set Identification:

LASE\_CAMEX3:

Lidar Atmospheric Sensing Experiment (LASE) Convection And Moisture EXperiment (CAMEX) (LASE\_CAMEX3)



## Data Set Introduction:

...

## Objective/Purpose:

The overall goal of CAMEX is to study atmospheric water vapor and precipitation processes using a unique array of aircraft, balloon, and land-based remote sensors. The first two CAMEX field studies were conducted at Wallops Island, Virginia, during 1993 and 1995.

The goal of CAMEX-3 is to provide information which could assist in decreasing the size of coastal evacuation areas and increasing the warning time for those areas.

The LASE instrument provides measurements of water vapor and aerosol profiles.

## Summary of Parameters:

Atmospheric Scattering Ratio  
Water Vapor Concentration profiles

## Discussion:

More detailed information on the LASE CAMEX3 data can be found on the [LASE CAMEX3](#) and on the [CAMEX3 Project](#) Home pages.

## Related Data Sets:

LASE\_VALIDATION  
LASE\_TARFOX  
LASE\_SGP97

## 2. Investigator(s):

### Title of Investigation:

Lidar Atmospheric Sensing Experiment (LASE)

### Investigator(s) Name, Title, and Contact Information:

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## 3. Theory of Measurements:

...

## 4. Equipment:

### Sensor/Instrument Description:

### Collection Environment:

...

### Source/Platform:



**Source/Platform Mission Objectives:**

...

**Key Variables:**

Atmospheric Scattering Ratio  
Water Vapor Concentration Profiles

**Principles of Operation:**

The LASE instrument is the first fully-engineered, autonomous DIAL (Differential Absorption Lidar) system for the measurement of water vapor, aerosols, and clouds in the troposphere. LASE uses a double-pulsed Ti:Sapphire laser for the transmitter with a 30 ns pulse length and 150 mj/pulse. The laser beam is "seeded" to operate on a selected water vapor absorption line in the 815 nm region using a laser diode with an onboard absorption reference cell. A 38 cm diameter telescope collects the back scattered signals and directs them onto two detectors and three signal digitizers with different gain settings. LASE was designed to meet the performance specifications provided by the DIAL water vapor instrument requirements, to operate autonomously, and to perform within the aircraft environmental and physical constraints. The LASE instrument was custom built and tested at NASA Langley Research Center in Hampton, VA.

**LASE System Parameters**

**LASE H2O DIAL PARAMETERS  
TRANSMITTER**

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ENERGY	150 MJ (ON & OFF)
LINEWIDTH	0.25 PM
REP. RATE	5 HZ
WAVELENGTH	813-818 NM
BEAM DIVERGENCE	0.60 MR
PULSE WIDTH	50 NS
AIRCRAFT ALTITUDE	16-21 KM
AIRCRAFT VELOCITY	200 M/S

**RECEIVER**

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AREA (EFFECTIVE)	0.11 M <sup>2</sup>
FIELD OF VIEW	1.1 MR
FILTER BANDWIDTH (delta lambda FWHM)	0.4 NM (DAY), 1.0 NM (NIGHT)
OPTICAL TRANSMITTANCE (TOTAL)	29% (DAY), 49% (NIGHT)
DETECTOR EFFICIENCY	80% APD (SI)
NOISE EQ. POWER	2.5 X 10 <sup>-14</sup> W/HZ <sup>12</sup> (AT 1.6 MHZ)
EXCESS NOISE FACTOR (APD)	2.5

**Sensor/Instrument Measurement Geometry:**

[LASE System Block Diagram.](#)

**Manufacturer of Sensor/Instrument:**

...

**Sensor/Instrument:**

Differential Absorption Lidar ([DIAL concept diagram](#)).

**Calibration:****Specifications:**

...

**Tolerance:**

...

**Frequency of Calibration:**

...

**Other Calibration Information:**

...

## **5. Data Acquisition Methods:**

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## **6. Observations:**

**Data Notes:**

...

**Field Notes:**

...

## **7. Data Description:**

**Spatial Characteristics:**

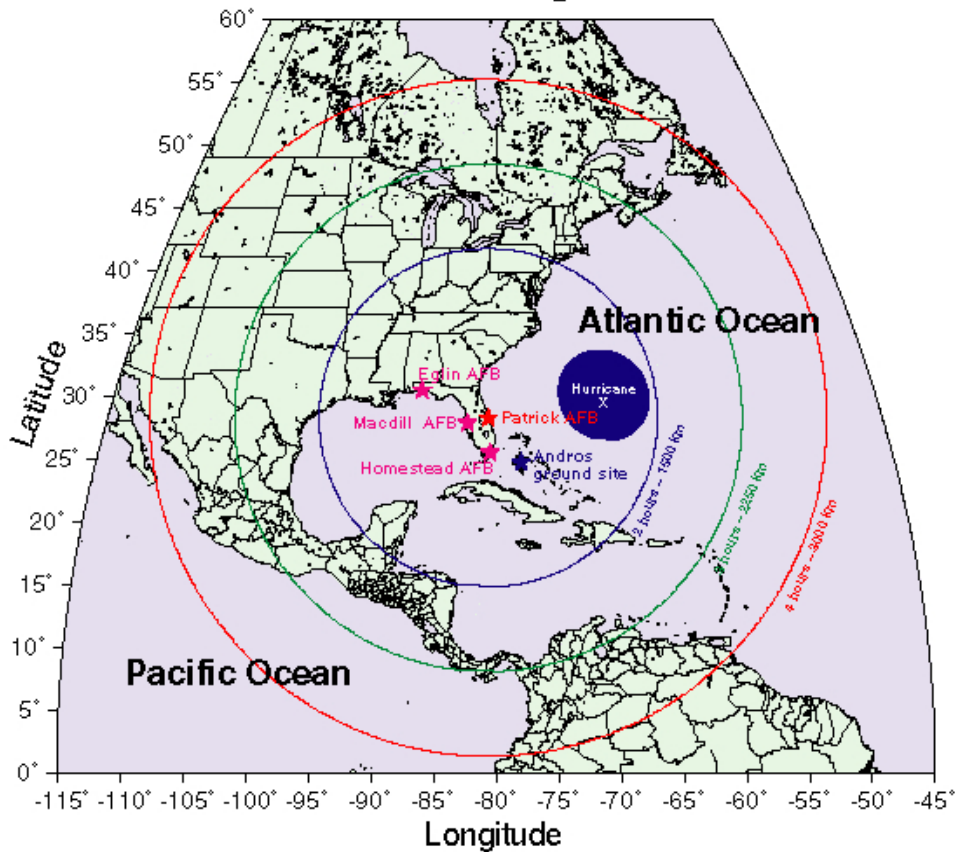
**Spatial Coverage:**

western Atlantic Ocean

**Spatial Coverage Map:**



# CAMEX3 Flight Area



## Spatial Resolution:

Point Measurements

## Projection:

...

## Grid Description:

...

## Temporal Characteristics:

### Temporal Coverage:

08/21/1998 to 09/23/1998

### Temporal Coverage Map:

...

### Temporal Resolution:

3 Seconds

## Data Characteristics:

### Parameter/Variable:

...

### Variable Description/Definition:

...



**Unit of Measurement:**

...

**Data Source:**

...

**Data Range:**

...

**Sample Data Record:**

...

**8. Data Organization:****Data Granularity:**

The LASE data are organized into granules by flight number and parameter.

A general description of data granularity as it applies to the IMS appears in the [EOSDIS Glossary](#).

**Data Format:**

The data are stored in ASCII formatted files following the [GTE Data Archive Format](#).

**9. Data Manipulations:****Formulae:****Derivation Techniques and Algorithms:**

...

**Data Processing Sequence:****Processing Steps:**

...

**Processing Changes:**

...

**Calculations:****Special Corrections/Adjustments:**

...

**Calculated Variables:**

...

**Graphs and Plots:**

Images are available from the [LASE CAMEX3 web pages](#).

**10. Errors:****Sources of Error:**

...



## Quality Assessment:

### Data Validation by Source:

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### Confidence Level/Accuracy Judgement:

...

### Measurement Error for Parameters:

...

### Additional Quality Assessments:

...

### Data Verification by Data Center:

The Langley DAAC performs an inspection process on data received by the data producer via ftp. The DAAC checks to see if the data transfer completed and the data were delivered in their entirety. An inspection software was developed by the DAAC to make sure every granule is readable. The code also checks to see if every data value falls within the range specified by the data producer. This same code extracts the metadata required for ingesting the data into the IMS. If any discrepancies are found, the data producer is contacted. The discrepancies are corrected before the data are archived at the DAAC.

## 11. Notes:

### Limitations of the Data:

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### Known Problems with the Data:

...

### Usage Guidance:

...

### Any Other Relevant Information about the Study:

...

## 12. Application of the Data Set:

...

## 13. Future Modifications and Plans:

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## 14. Software:

### Software Description:

Currently, there is one sample read program which works with all LASE data sets, read\_lase.c. It is written in ANSI C. This program has been tested on the following computers and operating systems:

Computer	Operating System
Sun Sparc	Solaris 2.5
Sun4	SunOS 4.1.3
SGI Origin 2000	IRIX 6.4
HP 9000/735	HP-UX 10.10



This program is written as an example of how to read in the LASE data. As delivered, it reads in and writes to the screen the file header information followed by each profile's header and data.

## Software Access:

The software can be obtained through the Langley DAAC. Please refer to the contact information below. The software can also be obtained at the same time the user is ordering this data set.

## 15. Data Access:

### Data Center Identification and Contact Information:

Langley DAAC User and Data Services Office  
NASA Langley Research Center  
Mail Stop 157D  
Hampton, Virginia 23681-2199  
USA  
Telephone: (757) 864-8656  
FAX: (757) 864-8807  
E-mail: [support-asdc@earthdata.nasa.gov](mailto:support-asdc@earthdata.nasa.gov)

### Procedures for Obtaining Data:

The CAMEX3 data is available by FTP through the [Langley Web Ordering Tool](#).

### Data Center Status/Plans:

The Langley DAAC will continue to archive this data.

## 16. Output Products and Availability:

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## 17. References:

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## 18. Glossary of Terms:

[EOSDIS Glossary](#).

## 19. List of Acronyms:

[EOSDIS Acronyms](#).

## 20. Document Information:

- **Document Creation Date:** June 1999
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- **Document ID:**
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