LIGHTNING DATA

At the GHRC DAAC

lightning.nsstc.nasa.gov

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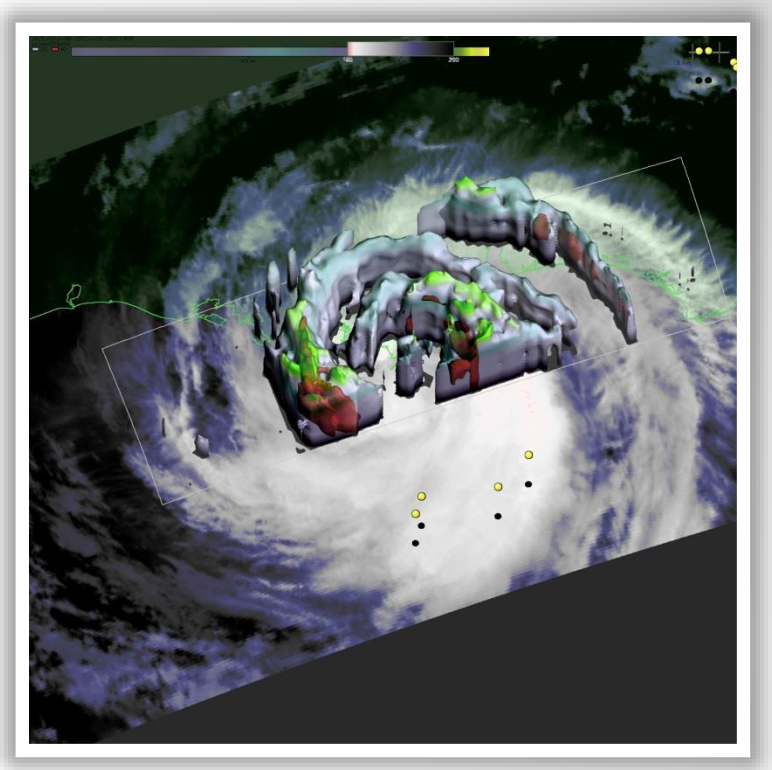
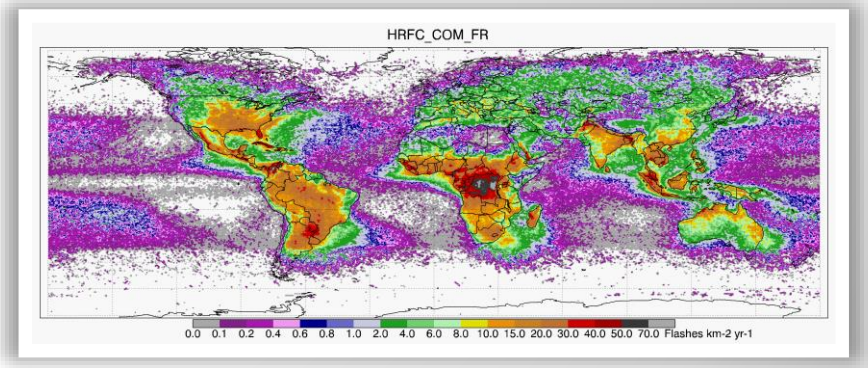
What we serve
Lightning Data

- Responsible for the ingest, archive, product generation, reprocessing and distribution of data from the TRMM Lightning Imaging Sensor, plus ancillary lightning data sets utilized by the LIS SCF scientists, since January 1998. A second LIS instrument will fly on the SpaceX rocket to the International Space Station in February 2016.
- Ancillary data –
  - National Lightning Detection Network, electric field mill data from the Kennedy Space Center, global infrared data and ground based radar data
- Precursor satellite instruments -
  - Optical Transient Detector in operation on Microlab-1 from 1995 to 2000
  - Operational Linescan Sensor on Defense Meteorological satellites from 1973 to 1995





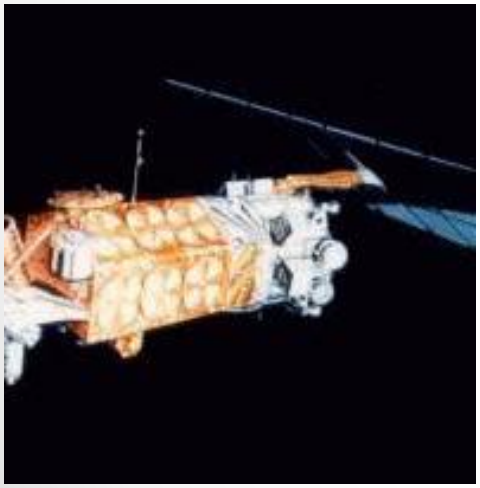
GHRC is recognized as the National Lightning Archive

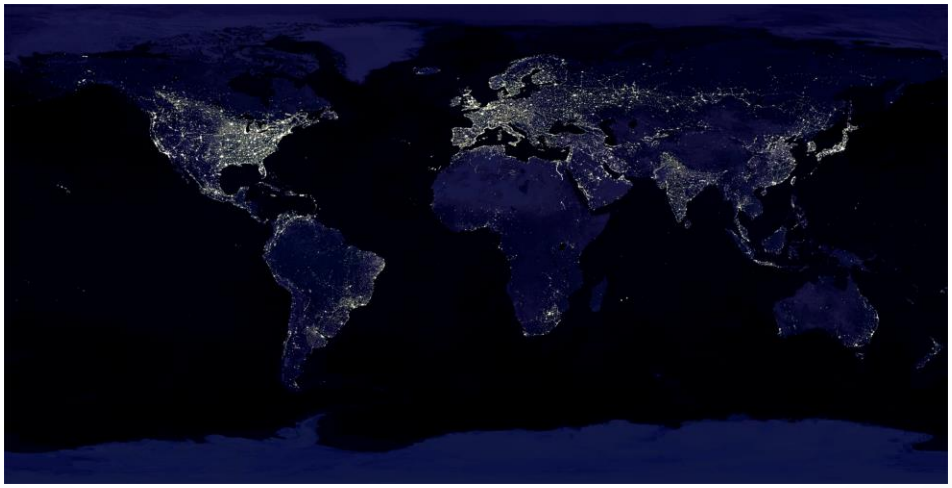
Topics

- MSFC Lightning Data History
- Space Based Sensor Overview
- Ground Based Sensor Overview
- Data Set Listing
- Recent Accomplishments
- Near Term Plans
  - Going to the ISS!
  - Data Preservation
- Tools
  - LIS Interactive Browse
  - Global Lightning Mapper (GLM) Validation

GHRC Lightning Data History

- Beginning in the early 1980s, the MSFC Lightning Team determined that lightning discharges are powerful enough to be viewed from space.
- This discovery led to the design and deployment of three space-based instruments.



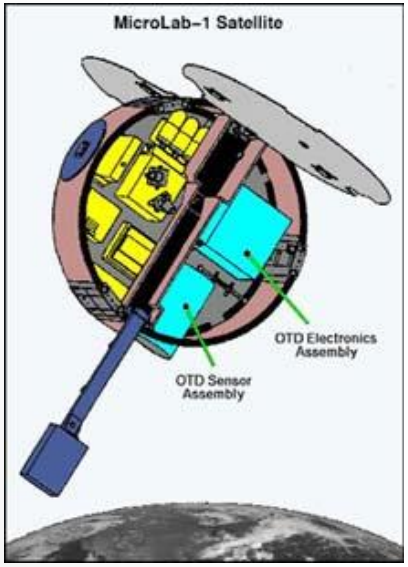


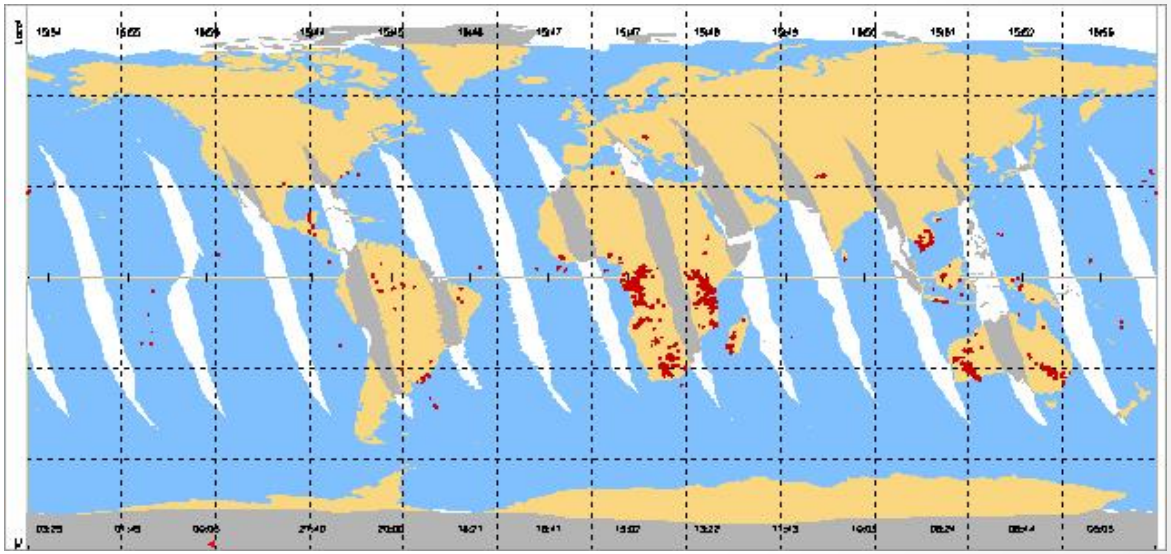
A color composite image of Earth's city lights, created with data from the Defense Meteorological Satellite Program (DMSP) Operational Linescan System.

http://lightning.nsstc.nasa.gov/ols/

MSFC Optical Transient Detector

Considered a demonstration system, the OTD was built on NASA's "better, faster, cheaper" model. It launched in April 1995 and remained in service until March 23, 2000.

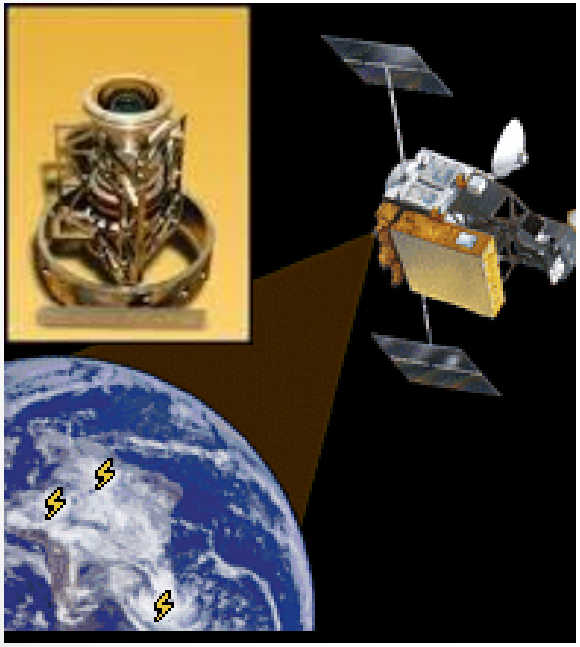


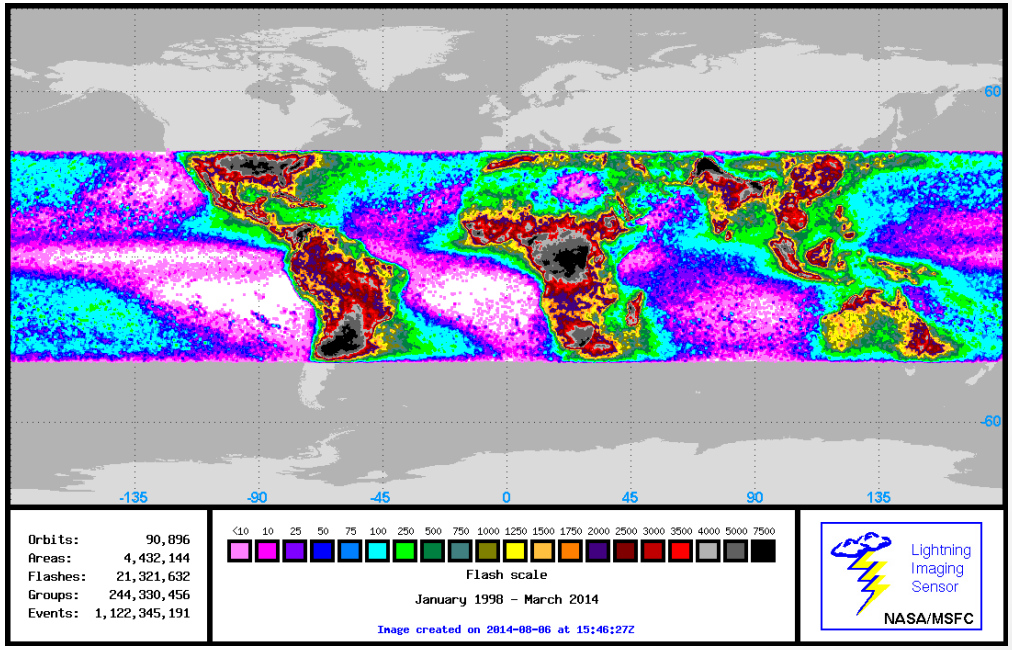


http://lightning.nsstc.nasa.gov/otd/

MSFC Lightning Imaging Sensor

In 1997, the Lightning Imaging Sensor (LIS) was launched on the Tropical Rainfall Measurement Mission (TRMM) satellite; it is still in service.





http://lightning.nsstc.nasa.gov/lis/

Thunderstorms over the Sahara Desert

Thunderstorms over a very dry part of the Sahara Desert, seen by TRMM on 6 August 2014.

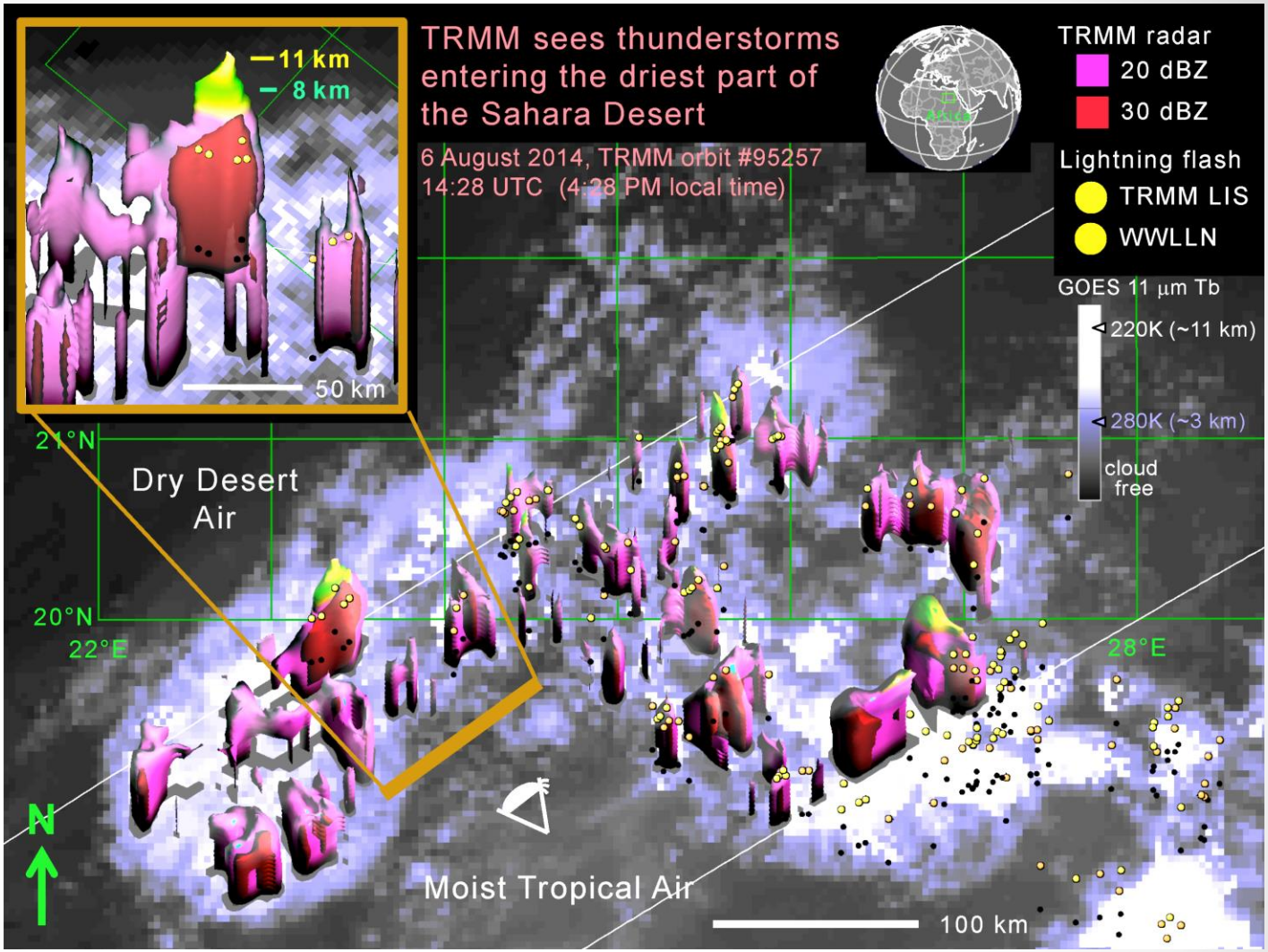
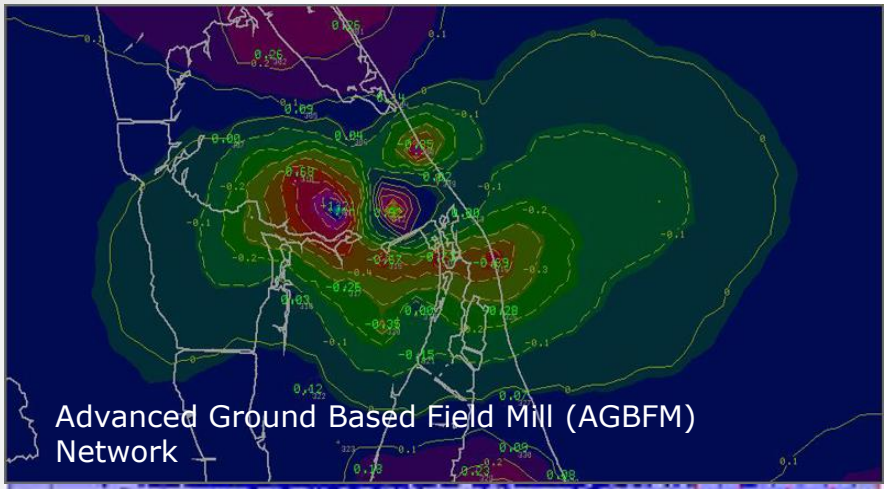
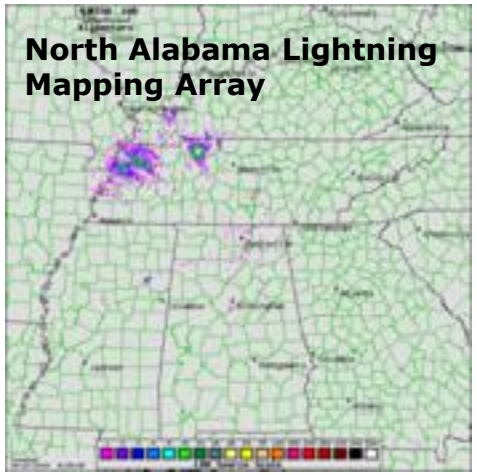


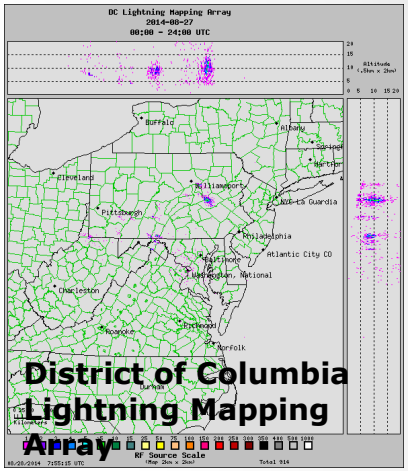
Image generated by Dr. Owen Kelley. TRMM data courtesy of NASA (via the GHRC DAAC). WWLLN (World Wide Lightning Location Network) data courtesy of Robert Holzworth (University of Washington). Global gridded 4 km infrared data courtesy of NCEP. NCEP Reanalysis provided by NOAA ESRL.

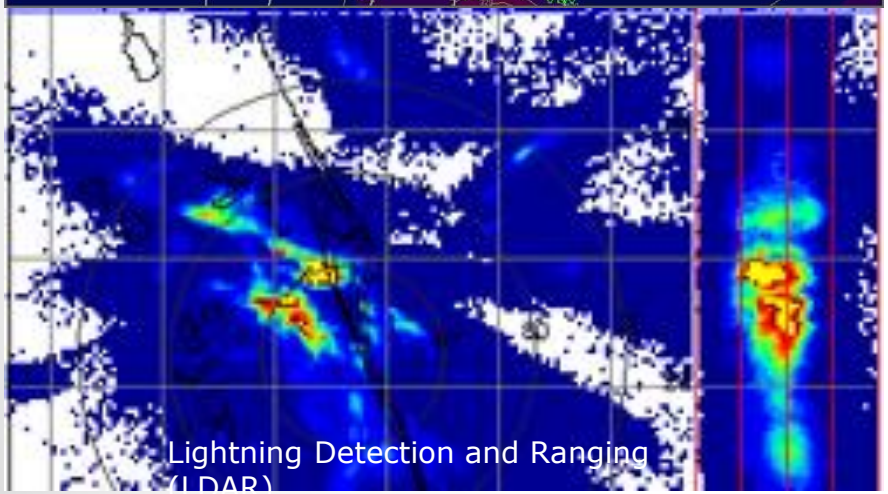
Ground Based Sensors

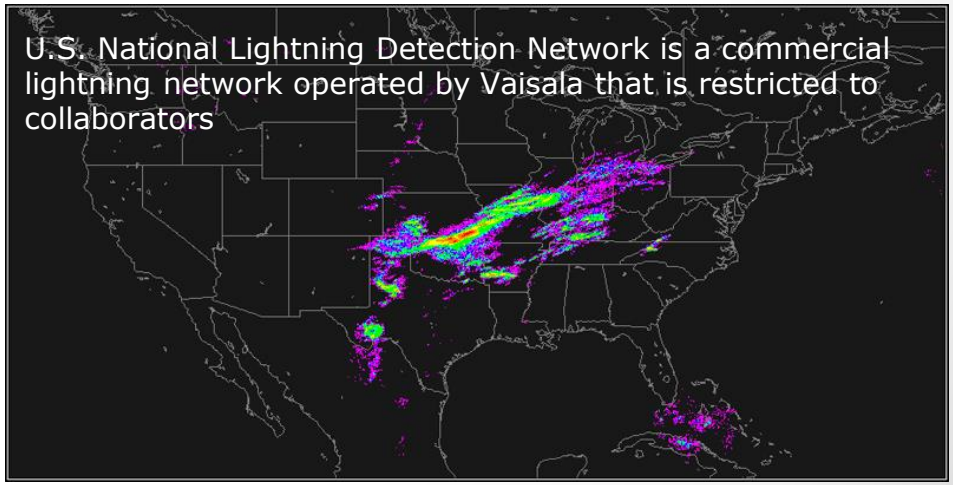
Provide Ground Truth for satellite measurements











http://lightning.nsstc.nasa.gov/validation/instruments.html

Lightning Data Sets at GHRC

Dataset Collections

Datasets are grouped by collection. Some datasets may appear in more than one collection.

Click a dataset name for a list of the files in that collection.

You searched for "lightning" in any field.

- ACES Products (2 datasets)
- CAMEX-3 Products (1 dataset)
- CAMEX-4 Products (2 datasets)
- GPM-GV MC3E Products (2 datasets)
- GRIP Products (1 dataset)
- Lightning Products (34 datasets)
- Lightning from Satellites (16 datasets)
- NAMMA Products (2 datasets)
- TCSP Products (1 dataset)

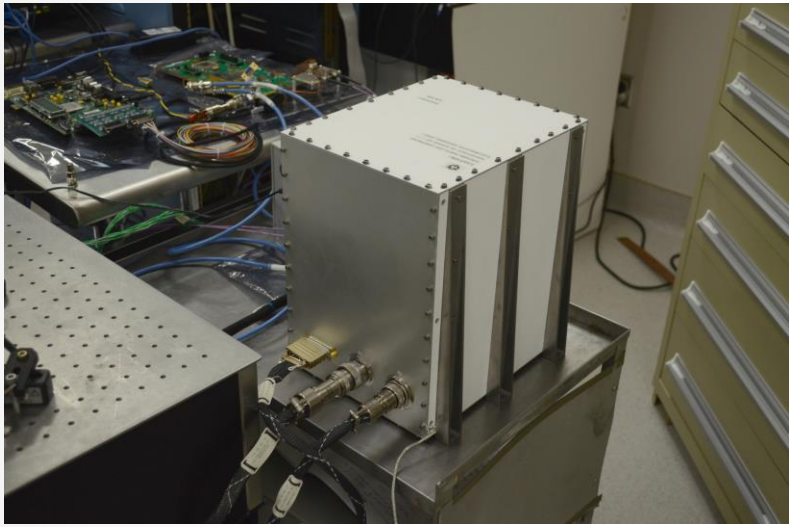
Clear all | Add to cart | Show cart | New search

Recent Accomplishments

- Legacy LIS processing code migrated from IRIX to LINUX (version 4.3)
  - Scientific quality control procedures
  - Aging hardware retired
- North Alabama Lightning Mapping Array (LMA) software ported to GHRC production servers.
  - District of Columbia LMA will be ported soon.
- Lightning web pages revamped and migrated to the GHRC production servers.
  - LIS Housekeeping pages http://lightning.nsstc.nasa.gov/lishk/
  - Interactive browse
- Adding more ancillary data sets
  - Earth Networks Global Lightning Network (ENGLN)
  - World Wide Lightning Location Network (WWLLN)
  - New Mexico LMA
  - Kennedy Space Center LDAR II

Near Term Plans

February 19, 2016 – the LIS flight spare (ILIS) is scheduled to launch on a commercial SpaceX H5 rocket to the International Space Station

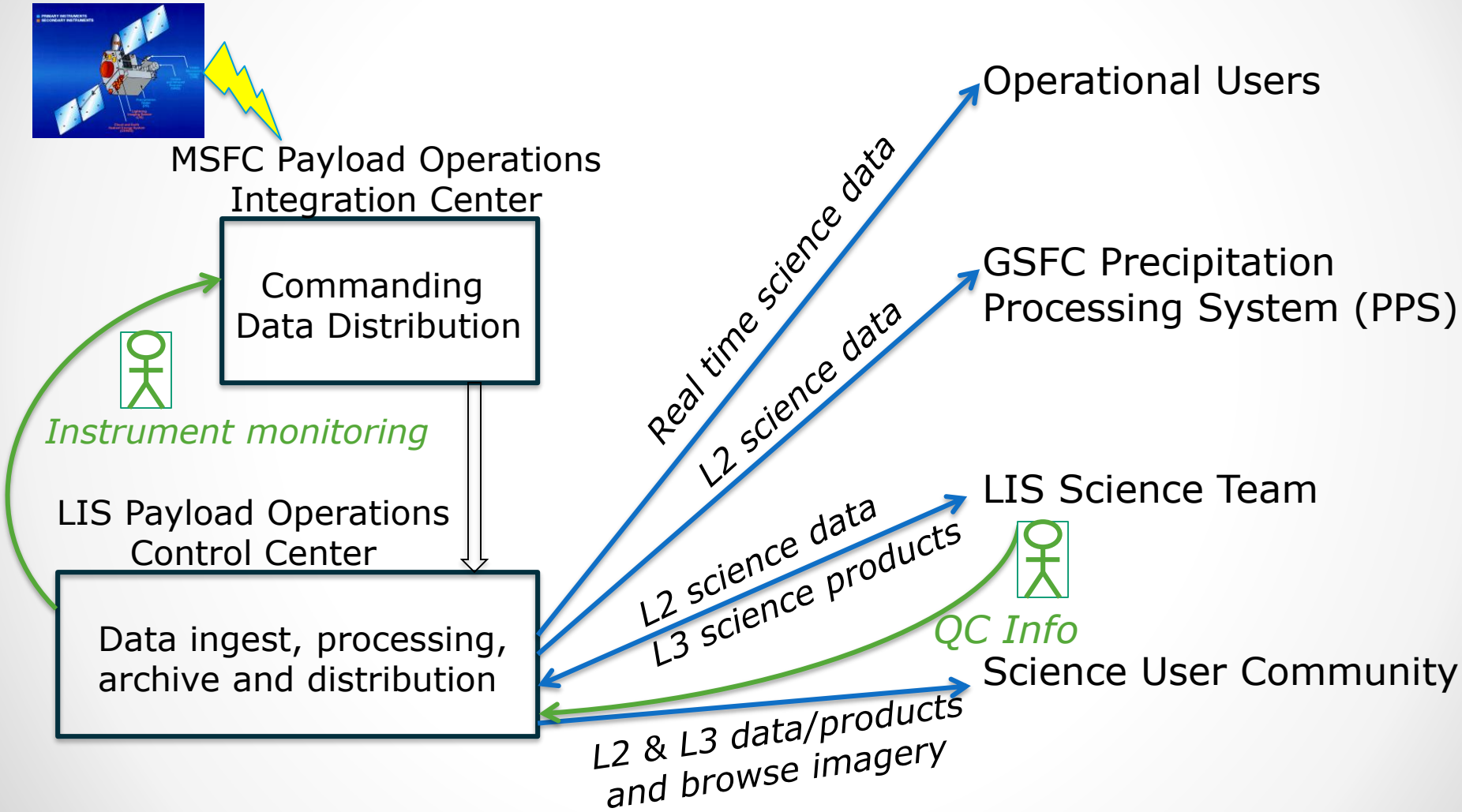


Electronics assembly housing the power supply and Real-Time Event Processor (RTEP)

Sensor unit housing the charge-coupled device

Photos provided by Mike Stewart, LIS SCF

ILIS to LIS Payload Operations Control Center Data Flow

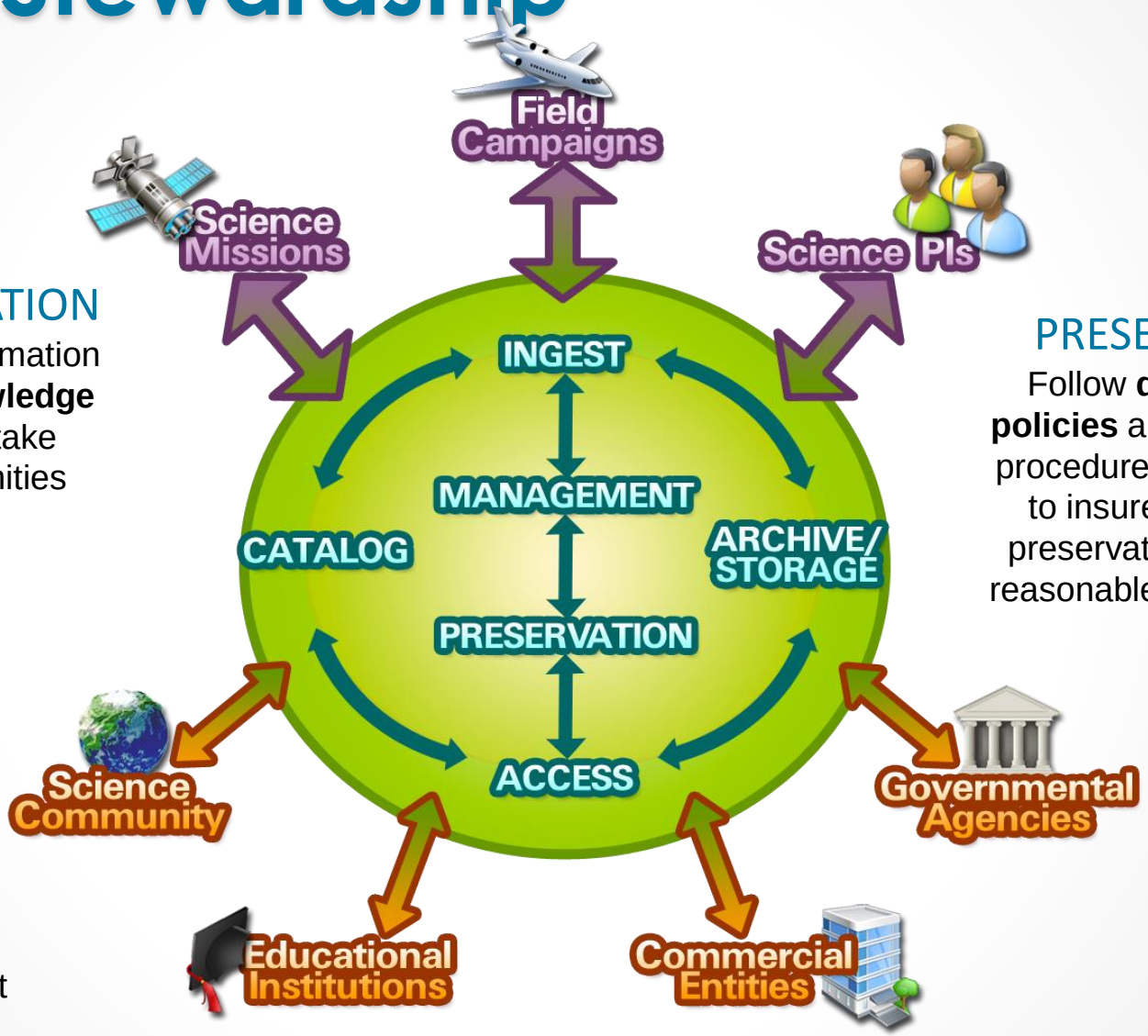


What we do
Data Stewardship

DOCUMENTATION
Capture this information to **create a knowledge base** for our stake holder communities

PRESERVATION
Follow **documented policies** and **engineered** procedures at every step to insure information preservation against all reasonable contingencies

PROVENANCE
Make the preserved data/information available to all our stakeholder communities with traceability to support authenticity



GHRC serves as NASA's Earth science data stewards for scientific, educational, commercial and governmental communities, with a focus on data for the global hydrologic cycle

LIS Data Preservation

- Reference NASA Earth Science Data Preservation Content Specification (423-SPEC-01), dated October 2011.
  - Working with ESDIS and ESDSWG Data Preservation teams to learn best practices for documentation preservation and to resolve issues.
  - Working with science teams to obtain end of mission algorithms, updated algorithm theoretical basis documents (ATBDs), updated reader software and final dataset release notes.
- Archive to include: Mission data, validation data, field campaign data and documentation.
  - Currently have off-site tape archive of most data. Looking into Cloud Storage as we migrate away from tape. Documentation is collocated on-line with data.
  - Most GHRC data sets have landing pages and digital object identifiers (DOIs); will add DOIs to LIS data when we reprocess.
  - AMSR-E was our Data Provenance pilot project.

What we do
Knowledge Augmentation Services

DATA DISCOVERY

Develop new tools for data discovery, curation and aggregation, new ways to visualize information

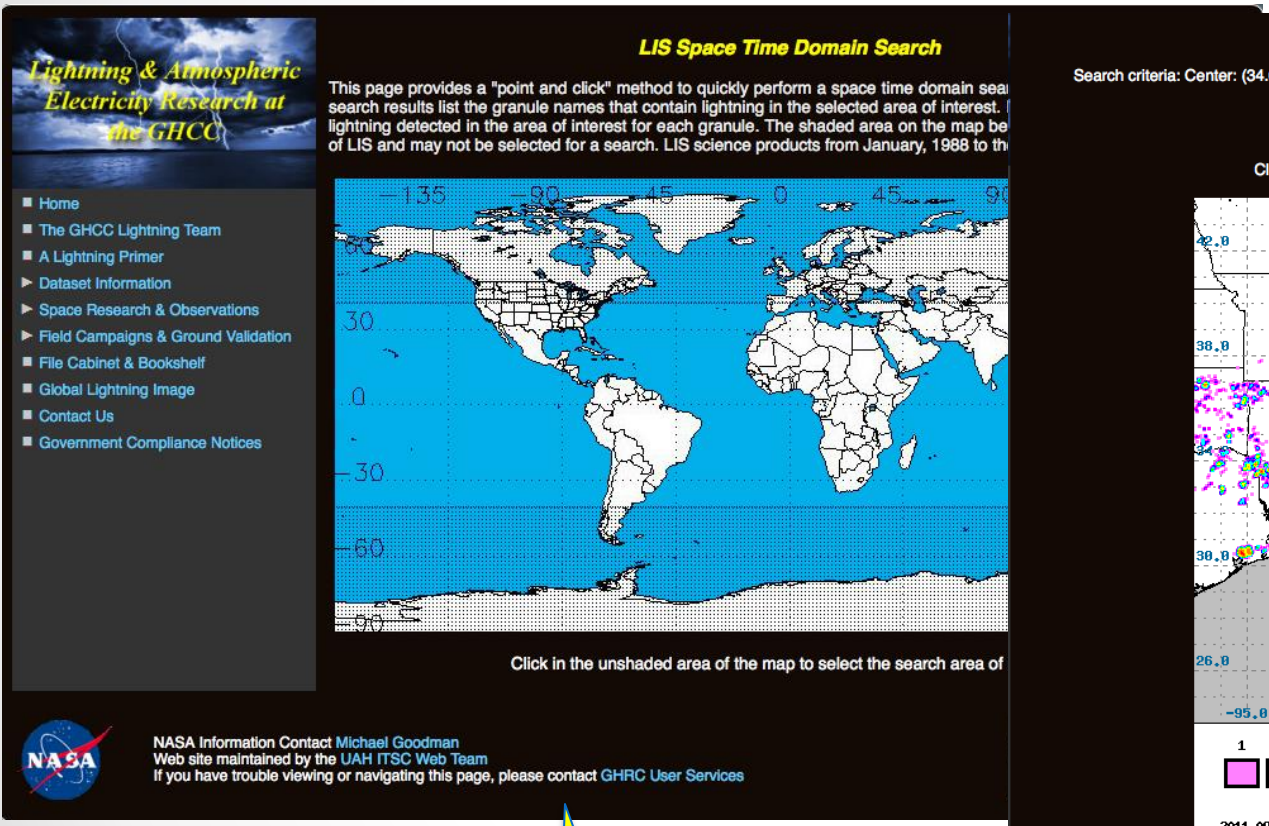
DATA USE

Develop new tools for access, analysis and visualization
Investigate and incorporate emerging technologies such as Big Data

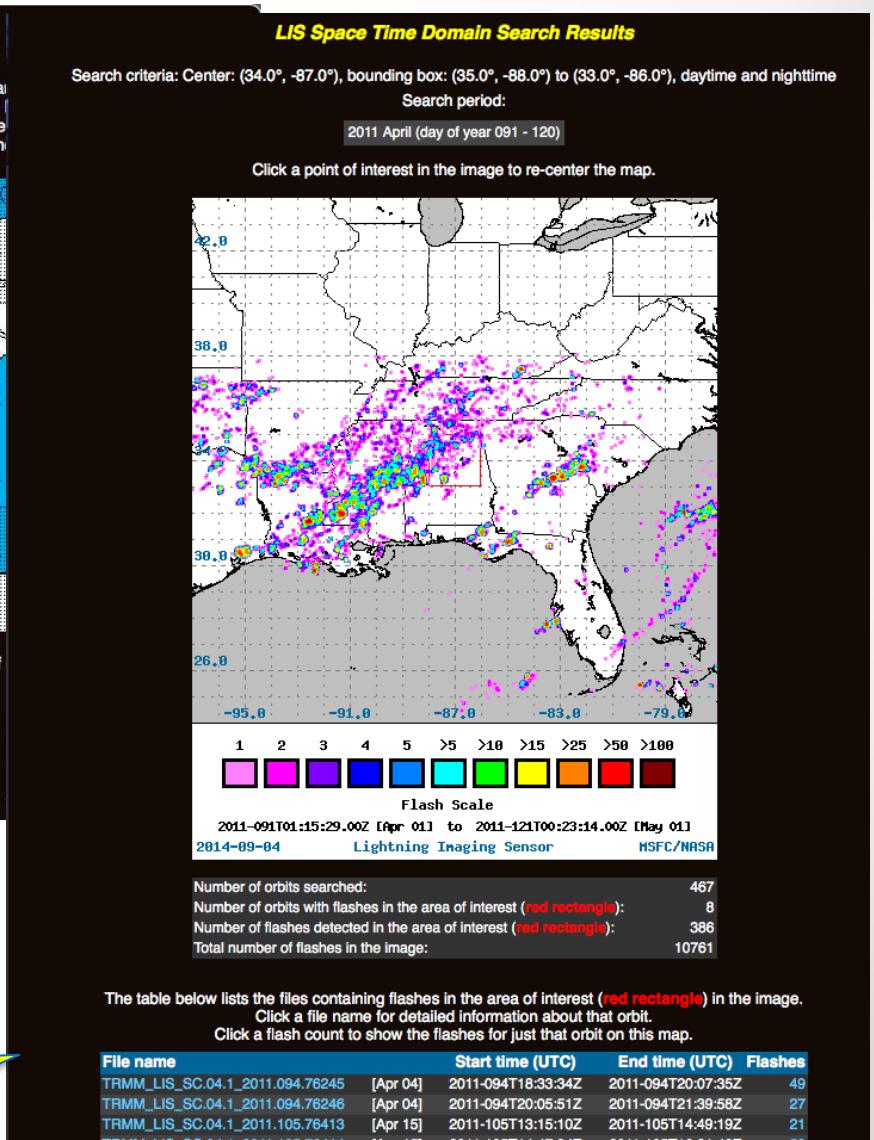
GHRC provides knowledge augmentation services encompassing tools, infrastructure, user support, and expertise to our stakeholders

LIS Space Time Domain Search Tool

Also known as LIS Interactive Browse this page provides a "point and click" method to quickly perform a space time domain search of LIS science products.



Search and Select page
http://lightning.nsstc.nasa.gov/lisib/lissearch.html



Search Results Page

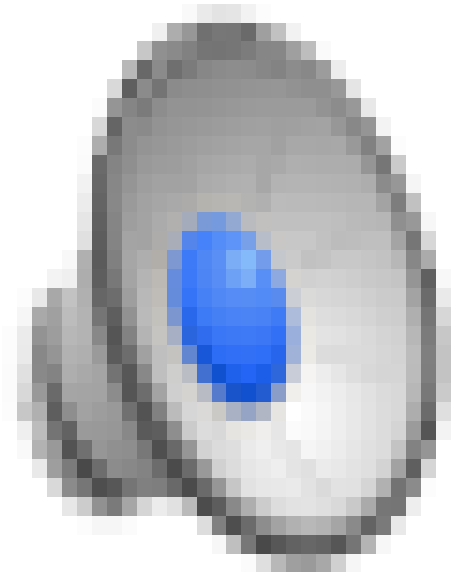
GHRC Global Hydrology Resource Center

GLM Validation Tool

Working closely with the LIS SCF, GHRC is developing a tool to help validate the Geostationary Lightning Mapper (GLM) instrument, scheduled to launch on GOES-R in 2016.

- Leverages and extends the Collaborative WorkBench, another NASA CMAC (Computational Modeling Algorithms and Cyberinfrastructure) funded project
- Will use GHRC real time flash rate datasets, such as Earth Networks Total Lightning Network™, the National Lightning Detection Network (NLDN) and Vaisala's Global Lightning Dataset (GLD360) that have been ingested into a GIS database
- Will display thematic layers of each dataset; perform real time analysis of discrepancies between GLM and ground based sensors; display interactive statistics, histograms, animations and perform spatial-temporal subsetting.

GLM Prototype Validation Tool Demonstration – Manil Maskey



Discussion

Thank You for your attention!

Questions for UWG Consideration:

- What other ancillary data might enhance the collection of lightning datasets?
- What is your preferred data format?
- What additional data tools and services are needed for the lightning data sets?
- Which conferences does the lightning community attend and should the DAAC consider attending those conferences?
- How might we better promote ourselves as the National Lightning Archive?

Please contact **GHRC User Services** for any help or questions ghrcdaac@itsc.uah.edu