GLM Data Archival and Research Updates at the Global Hydrology Resource Center DAAC

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The GLM Portal

- Built for GOES-R Post Launch Test (PLT) field campaign

- Complements formally published PLT datasets

- Contains lightning data not available to public
  - NLDN
  - ENTLN

- Major GHRC change – Archive fully in the cloud
  - Will support greater data access from other locations
 - Particularly other cloud-repositories

Data Supporting the GLM

- **ISS LIS updates**
  - Validated Version 1 available (June 2019) – Near real-time and non-QC
    - Quality control for Version 1 data in progress
  - Validated Version 2 science code ready for Operation Acceptance Testing in the test environment
    - Viewtime correction for solar panels
    - Viewtime correction for 1 second dropout
    - Correction of short files (< 5 min)
    - Conversion to time in file name instead of orbit number
- **NALMA updates**
  - Working to transition tasks from New Mexico Tech
    - Ingest, processing, archive, and distribution
- **RELAMPAGO updates**
  - LMA data from the RELAMPAGO campaign
  - http://dx.doi.org/10.5067/RELAMPAGO/LMA/DATA101
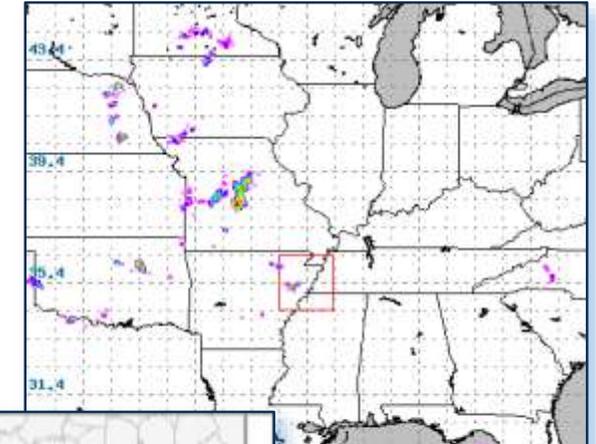
ISS LIS
Aug 31 – Sep 1, 2020
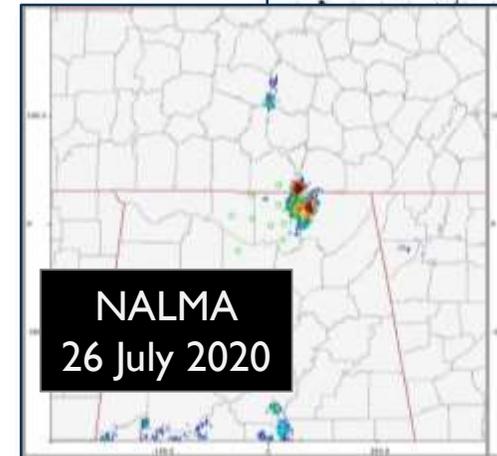
NALMA
26 July 2020
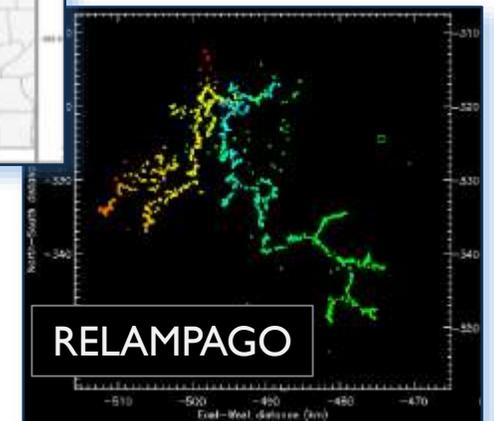
RELAMPAGO

New Data: GLM Level 2 Products

- **2019 GLM Science Meeting**
  - Question raised if GHRC could archive GLM L2 gridded products
  - Spent spring 2020 discussing issue with NASA EOSDIS
  - GHRC received go-ahead to archive and publish these data

- Main emphasis is the global, gridded GLM L2 products
  - Coordinate with NOAA and create procedure to accept data
  - Will currently work with prior data being re-processed
  - Work to archive in FY2021
  - Investigate sub-setting data recipes

- **GLM Field Campaign Data**
  - Developed by Doug Mach – recently approved for public release
  - Beta level GLM validation data (11 GLM-focused flights)
  - Superior accuracy compared to the originally available algorithm
 - http://dx.doi.org/10.5067/GOESRPLT/GLM/DATA101
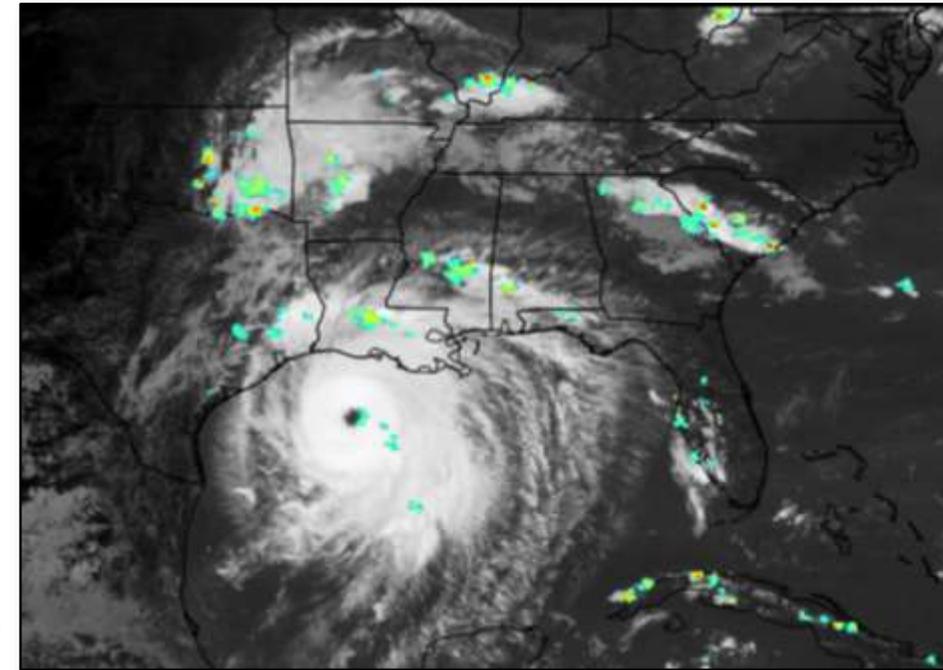
Hurricane Laura, 2010 UTC, 26 August 2020

New Data: GLM-CIERRA

- **CIERRA – Cluster Integrity, Exception Resolution and Reclustering Algorithm [Peterson 2019]**
  - Built upon Peterson's earlier work with OTD and LIS
  - Utilizes the GLM's Lightning Cluster Filter Algorithm (LCFA)
  - Identifies where LCFA flags degraded flashes (exceeding real-time requirement thresholds)
  - Reconstructs a flash from multiple degraded flashes
  - Provides a clearer view of the extent and count in flashes
  - Accepted for archival at GHRC initially for 2018-2019: http://dx.doi.org/10.5067/GLM/CIERRA/DATA101
  - Developing plan for ongoing data production

- **Developing option for LIS and OTD**
 - Will also be archived at GHRC when ready

OTD Flash at 6/1/1996 14:50:50 UTC
EXTENT: 267 km   MERGED FLASHES: 5
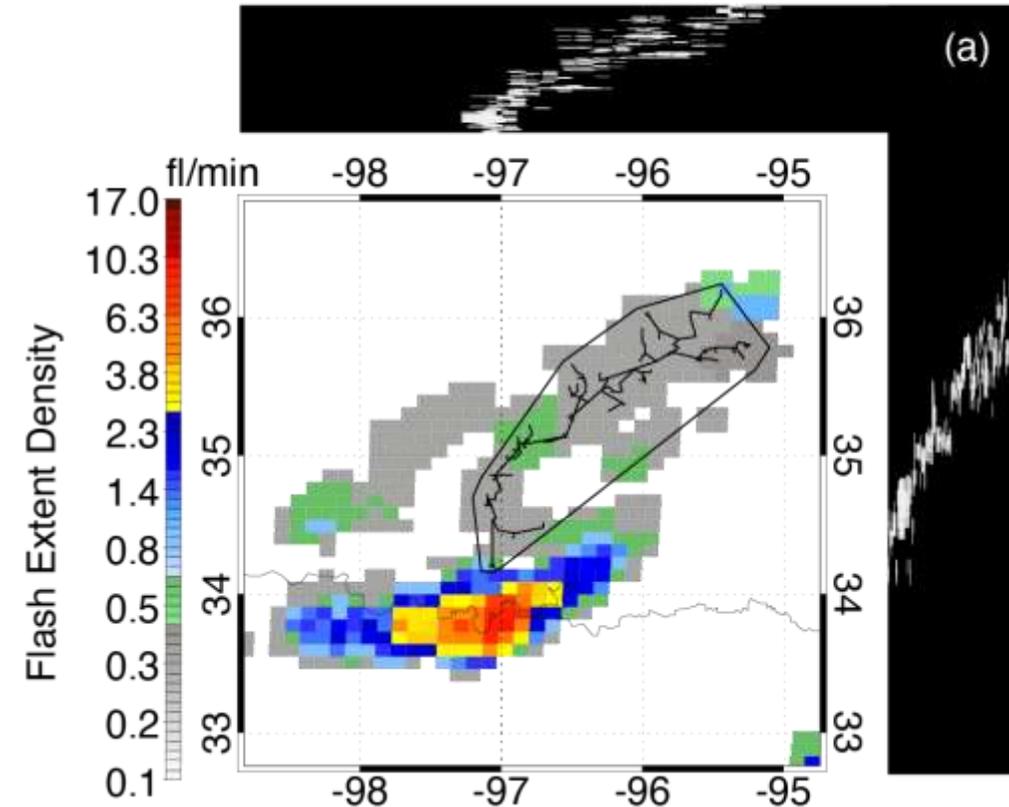
OTD-CIERRA example (courtesy Michael Peterson)
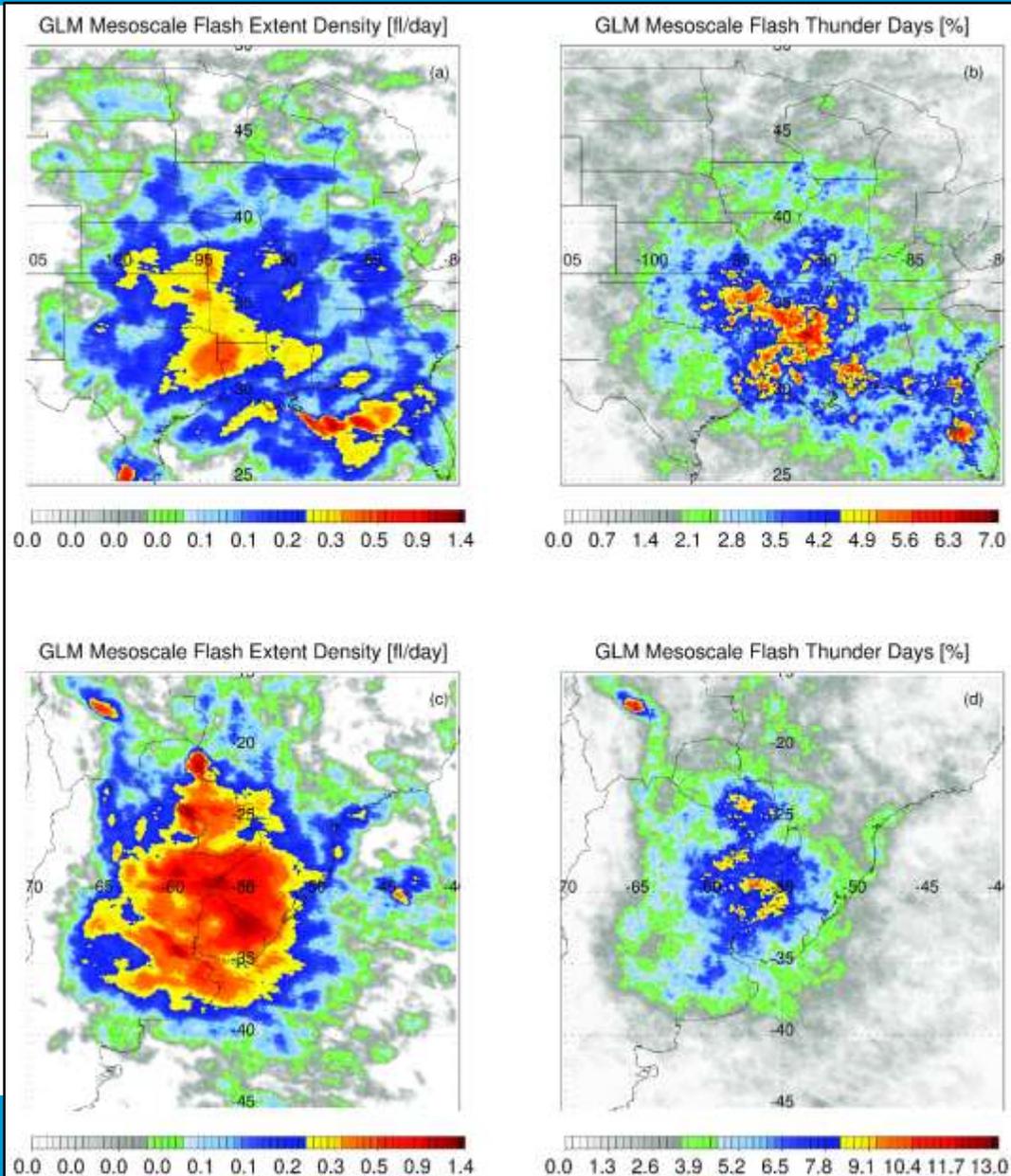
Research: GLM Flash Analysis

- Collaboration with Michael Peterson at Los Alamos National Laboratory

- Use Peterson (2019) GLM-CIERRA product

- GLM-CIERRA offers opportunity to leverage GLM's tremendous field of view

- Investigate megaflashes
  - Defined at >= 100 km in extent

- Questions to ask:
  - Where and when do megaflashes occur?
  - How often do they occur?
  - Is there a level of predictability?
  - How can these answers impact lightning safety?
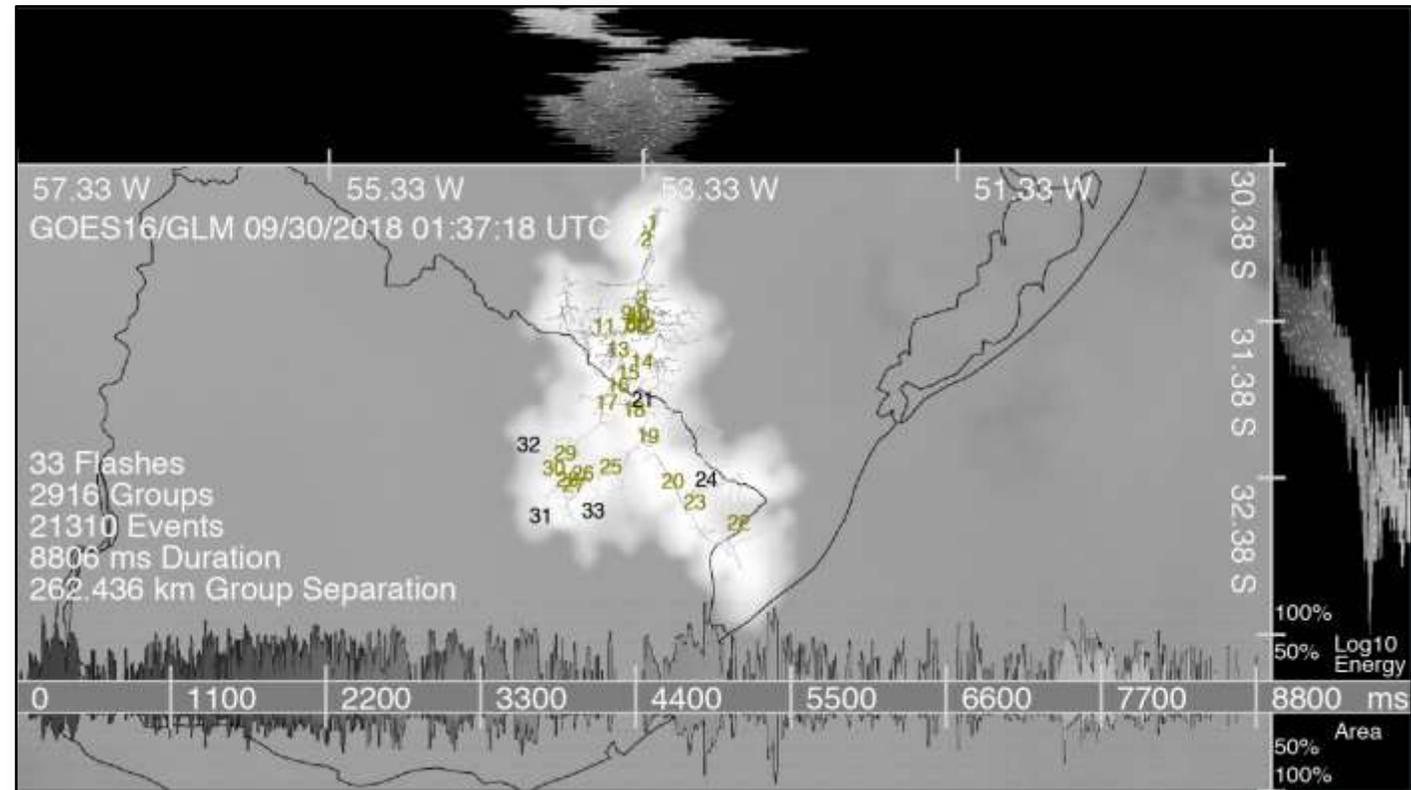
A single flash in South America that the Lightning Cluster Filter Algorithm split into 33 separate flashes.

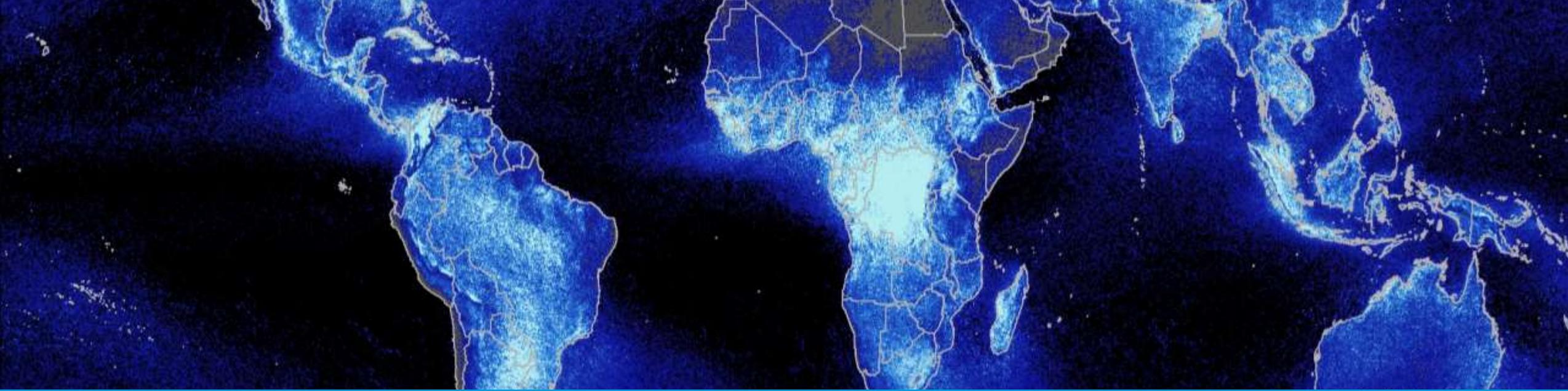*Image courtesy of Dr. Michael Peterson*

GLM Mesoscale Flash Extent Density [fl/day]
GLM Mesoscale Flash Thunder Days [%]
GLM Mesoscale Flash Extent Density [fl/day]
GLM Mesoscale Flash Thunder Days [%]

Flash extent density of flashes per day exceeding 100 km in 2018-2019 (left column) for the eastern two-thirds of the U.S. (top) and southeast South America (bottom). The right column shows the percentage of thunderstorm days with flashes exceeding 100 km.

Image courtesy of Dr. Michael Peterson

- GLM-CIERRA covers GOES-16 for 2018-2019
- 718 million flashes analyzed
  - Top 1% (7.1 million) are 45.8 km in extent or greater
  - 1,800 flashes exceed 300 km in extent
    - Averages to 2.5 flashes exceeding 300 km in extent per day
    - Previous WMO record of 321 km (Now 709 km)
    - October has the most with 319
    - July has the least with 16
    - (Needs further investigation for hemisphere differences)

THANK YOU!

QUESTIONS?