GOES-R AWG Product Val Tool Development

Monte Bateman
Universities Space Research Association

Douglas Mach
University of Alabama in Huntsville

Steve Goodman
NOAA/GOES-R System Program

Rich Blakeslee & Bill Koshak
NASA/Marshall Space Flight Center

Goals Summary

The goal of GLM validation is to ensure that GLM products (events, groups, flashes) are adequately detected, accurately located in space and time, with proper latency. To accomplish this, we have developed various val tool types:

- ► GLM proxy creation tool
- ► LCFA performance validation tool
- ► GLM validation tool

These tools require many truth datasets: ground, air-borne, and satellite.

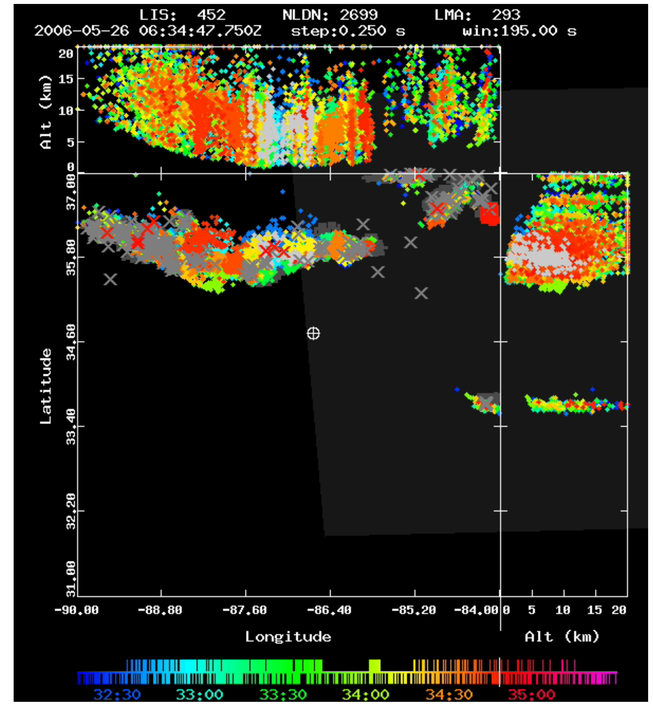
Our coordinated efforts will allow us to verify and validate the GLM, based on several different available sources of lightning data. The val tools will involve both "shallow and deep dive" investigations.

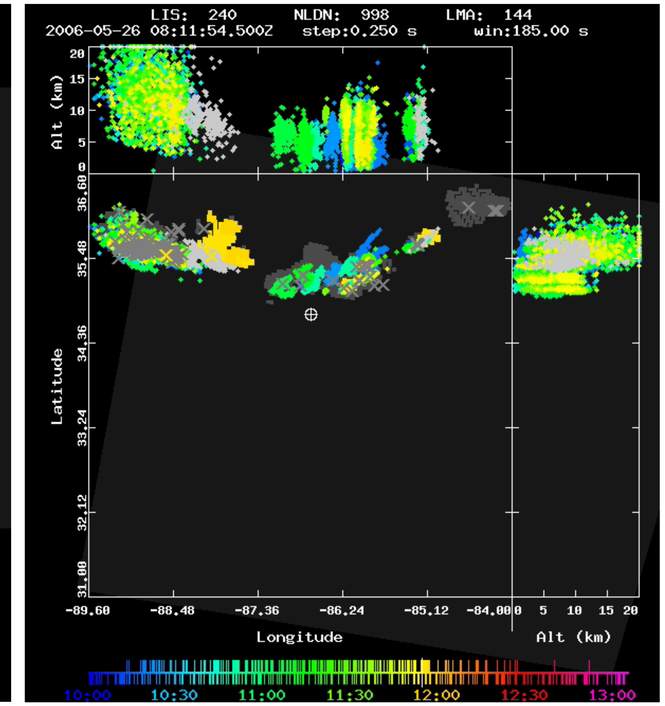
GLM Products

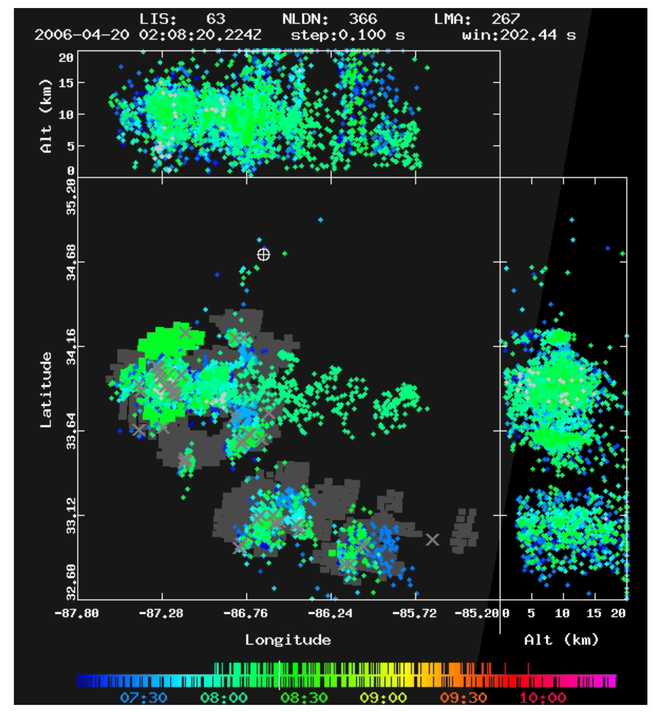
Event: The occurrence of a single pixel exceeding the background threshold during a single frame

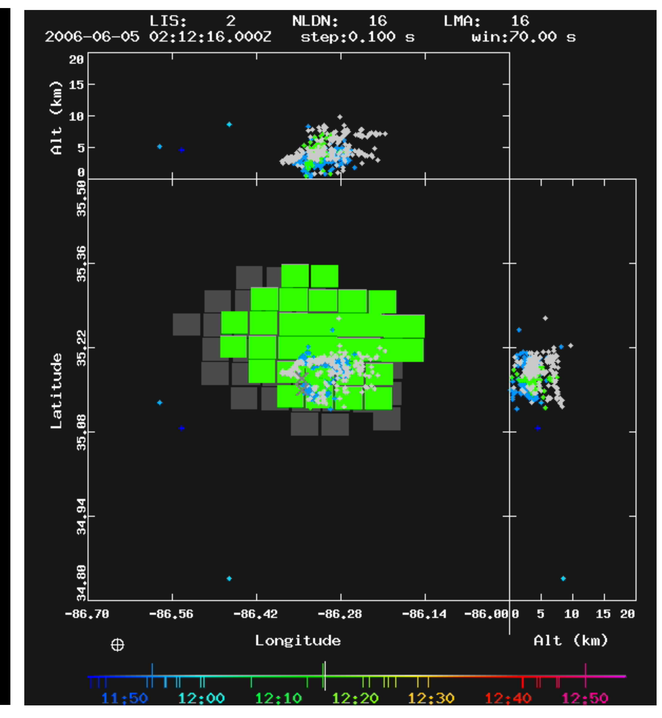
Group: Two or more adjacent events in the same time frame

Flash: A set of groups sequentially separated in time by no more than 330 ms and in space by no more than 16.5 km









Basic Val Tools: Definitions

GLM Proxy Creation Tool: A tool used to create simulated GLM data (level 1b).

LCFA Performance Validation Tool: A tool that validates the performance of the Lightning Cluster/Filter Algorithm (LCFA). The LCFA tool clusters level 1b events into level 2 products.

GLM Validation Tool: A tool that validates the end-to-end performance of the GLM using either simulated (lab, proxy) or actual GLM data.

Routine Val Tools

Lightning Monitoring Tool (LMT) will monitor the following:

- ► **Instrument Health/Operation:** by ingesting housekeeping and other meta-data on a continuous basis.
- ► **Instrument Degradation:** using periodic reports on DCC analyses (and others) that flag instrument degradation.
- ► **Individual Pixel Sensitivity:** using periodic reports on pixel fidelity
- ► **GLM Products:** using truth data and the VaLiD tool:
  - ► Display any problem with the LCFA by monitoring flags (metadata) in the L2 stream that communicate problems (time, space and overflow) in the clustering process
  - ► Will routinely report on lightning product statistics and assess reasonableness
  - ► Compare GLM to other available data (e.g., clouds, other lightning data) to verify that GLM is seeing lightning where expected (and vice-versa)
- ► **INR:** using periodic reports on IR background (ABI, GLM)
- ► **INR:** using periodic reports from laser beacon analyses
- ► **INR:** using lightning NLDN/LMA ground truth at night (if needed).

Pre-validation of Algorithms

Proxy data have been used for pre-validation of algorithms:

- ► **Lightning Cluster-Filter Algorithm (LCFA):** the LCFA is the tool that turns L1B pixels into L2 events, groups, and flashes. We have tools that assess the LCFA performance with proxy data. The LCFA has performed well and it produces realistic, reasonable results.
- ► **Lightning Jump Algorithm:** the LJA has been tested with proxy data; preliminary results are very good
- ► **Cell Tracking Algorithm:** proxy data are being used to pre-validate the GLM cell-tracking algorithm

VaLiD = *Va*lidate *Li*ghtning *D*etection

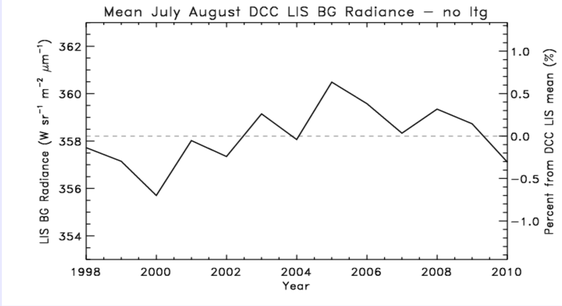
"Shallow Dive" Mode

- ► Ingest data from multiple sources
  - ► Ground: NLDN, WWLLN, ENTLN, various LMA
  - ► Space: LIS (if available)
- ► Ca plot some/all these data with GLM data (as desired by the operator)
- ► Will show lightning totals and trends
- ► Can click on the live map and trigger:

"Deep Dive" Mode

- ► Will be able to look at individual events, groups and flashes to assess resiliency, accuracy and speed
- ► Plot products, LMA data and/or other available/selected data (NLDN, WTLN, WWLLN, etc.)
- ► Will give a flash-by-flash assessment of the inter-system comparison of all lightning detection systems
- ► Will be able to assess flash detection efficiency

Long-term LIS radiance stability



Yearly trend of mean LIS BG DCC radiance for each combined July and August from 1998-2010. Plotted are mean yearly radiance value and % departure from the mean. The dashed line shows the mean yearly radiance over the period (358.2 W sr W sr^{-1} m^{-2} μm^{-1}). This stability shows that we can leverage GLM with existing LIS data to acheive a very long historical trending dataset.