GLM Proxy Data

Monte Bateman

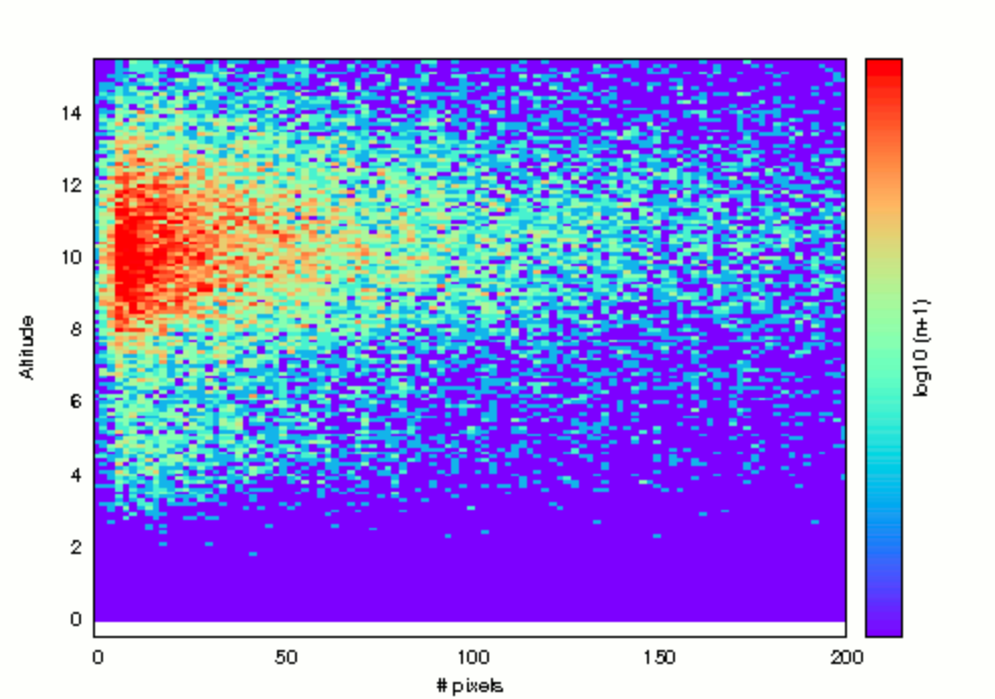
Proxy Data Creator

Introduction

- GLM is an optical instrument
- Closest analog is LIS
- LIS is LEO; has a limited time “on station” for a particular storm
- Have several ground-based, 24x7 networks; all are RF sensors
- Comparison between RF & optical characteristics of lightning?

Comparisons Showed...

- Not much in common – looking at different physics
- If flash is higher in cloud, more light gets out the top to LIS

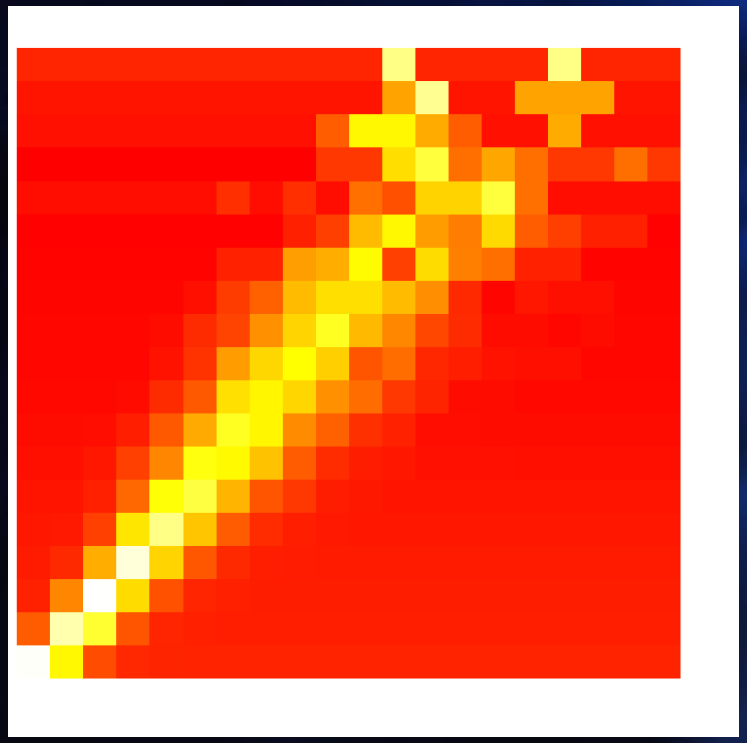


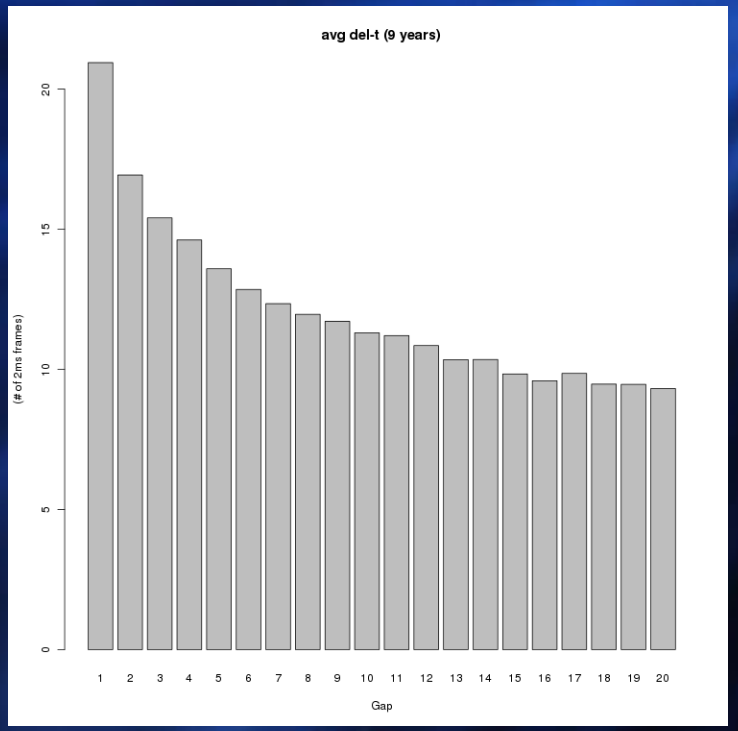
Needed to know...

- How to generate “realistic looking” lightning pixels?
- What is the temporal and spatial distribution of pixels that LIS sees?
- Have a catalog of lightning size, shape and time statistics

What we learned about LIS flashes

- mostly round
- some seasonal dependence
- inter-stroke interval gets successively shorter
- Can gen proxy flashes that match what LIS sees.





Proxy Performance (1)

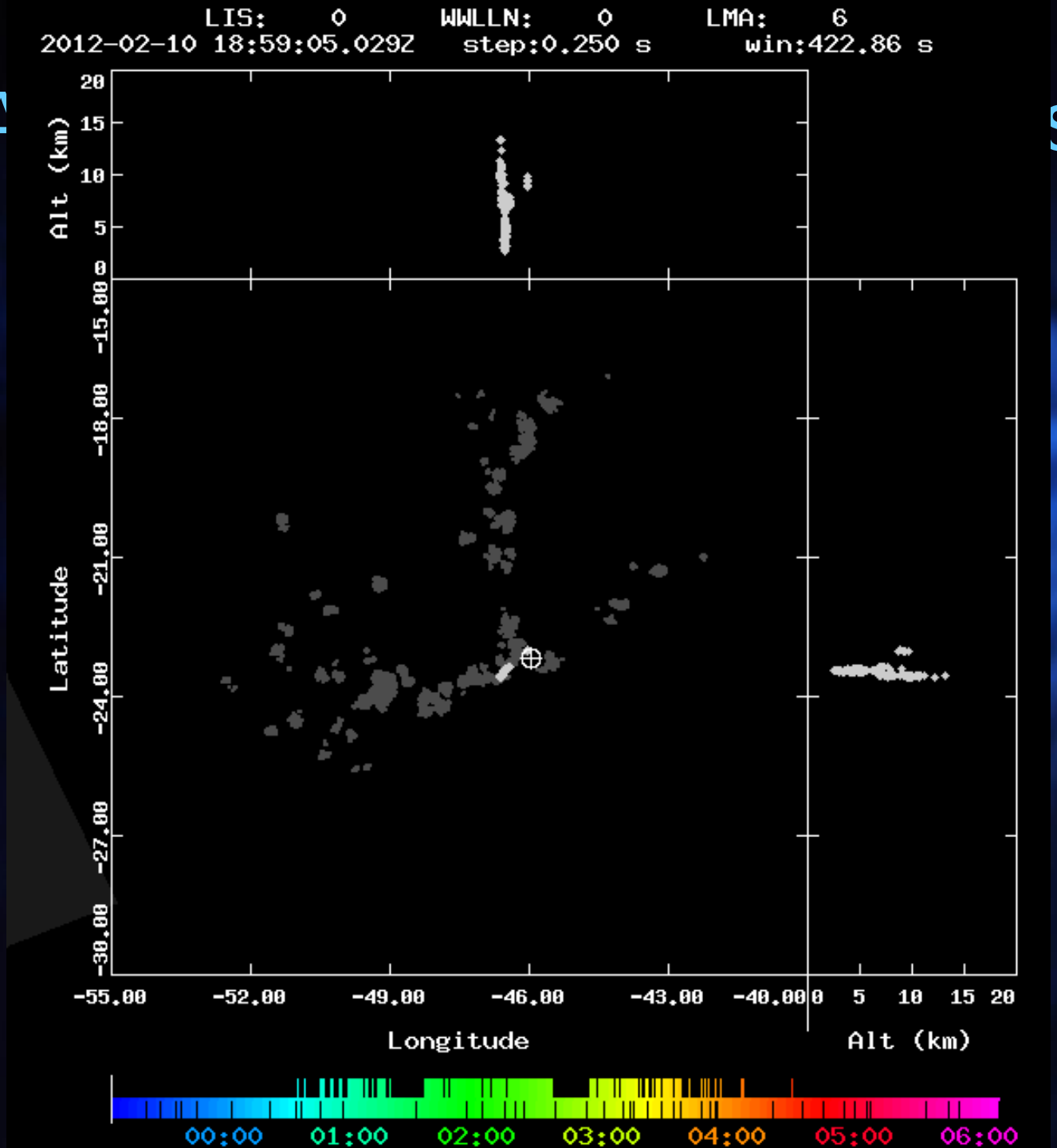
- How well does it work?
- Generated several cases of proxy GLM pixels
- Sent to LCFA
- Compared clustered output with the original
- Possible outcomes:
  Correct/Merged/Split = 85/15/0
- Very good performance

Proxy Performance (2)

- Information content?
- Using Chris Schultz's (M.S. Thesis) Lightning Jump cases, gen. “proxy flashes”
- Dan Proch (M.S. Thesis) tuned a similar LJ algorithm for use with the proxy flashes
- Worked equally well as Schultz's LMA algorithm, and better in a few cases

Caution...

- Care must me taken in using ground-based network data
- WWLLN: Detection efficiency is uniform and low (about 10%)
- ENTLN: Detection efficiency is sporadic in time and non-uniform spatially


LIS: 0 WWLLN: 0 LMA: 6
2012-02-10 18:59:05.029Z step:0.250 s win:422.86 s
Alt (km)
20
15
10
5
0
Latitude
-15.00
-18.00
-21.00
-24.00
-27.00
-30.00
-55.00
-52.00
-49.00
-46.00
-43.00
-40.00
Longitude
0 5 10 15 20
Alt (km)
00:00 01:00 02:00 03:00 04:00 05:00 06:00

Results from CHUVA

- Previous analysis done with NALMA (12 yrs)
- CHUVA: Comparison of LIS with SPLMA
- Statistics (shape, size, DE, location, FR, timing, etc.) compared favorably with NALMA
- This is important – Brazil is in a very different climate, geography, topography and latitude from NALMA.
- CHUVA data confirm previous analysis used for proxy.
- We can now use SPLMA data to generate Southern Hemisphere GLM proxy data and to qualify other proxy datasets created during the CHUVA campaign.