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Performance Comparison between Different Lightning Datasets during CHUVA Campaign

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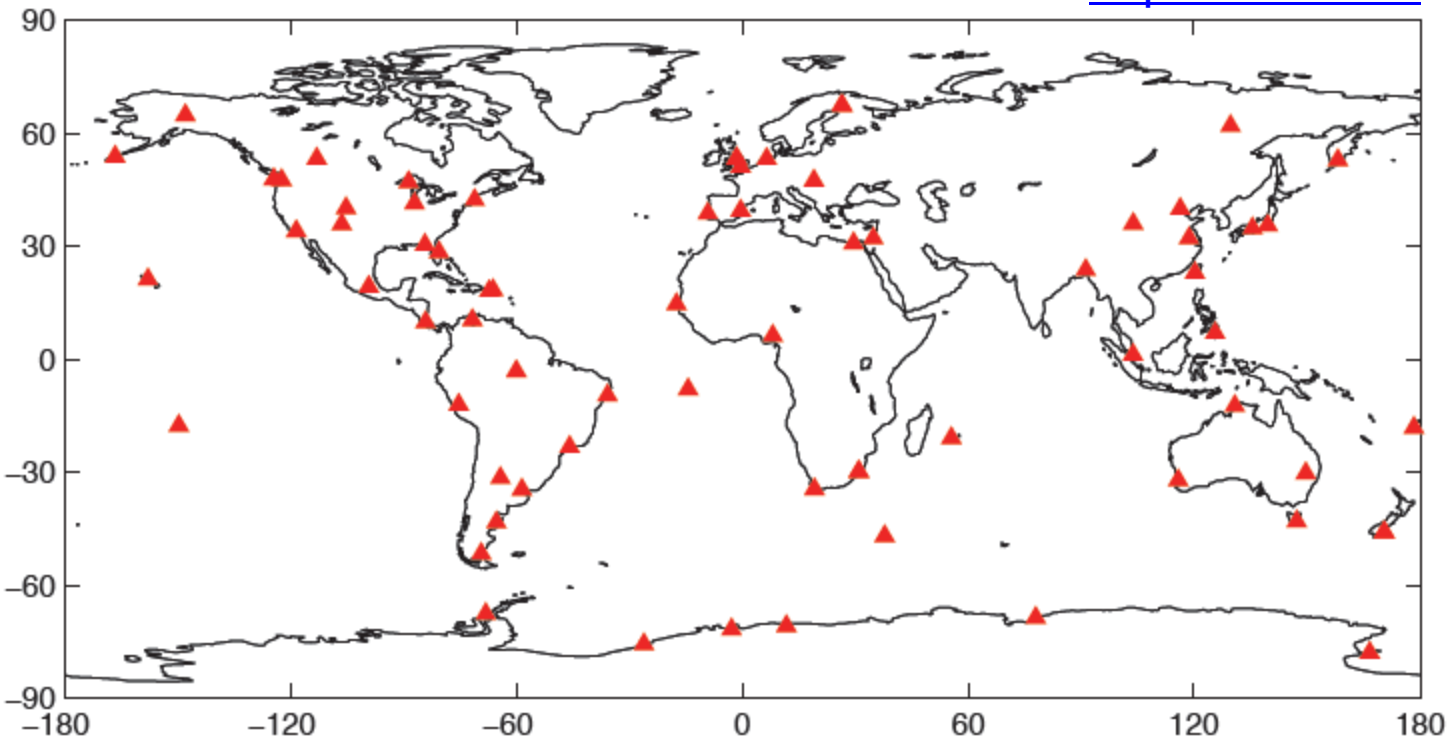
Outline

- Introduction
  - WWLLN
  - CHUVA Region
- Background results
- Comparison results
  - Location Accuracy
  - Detection Efficiency
  - Peak Current and Energy
- Conclusions

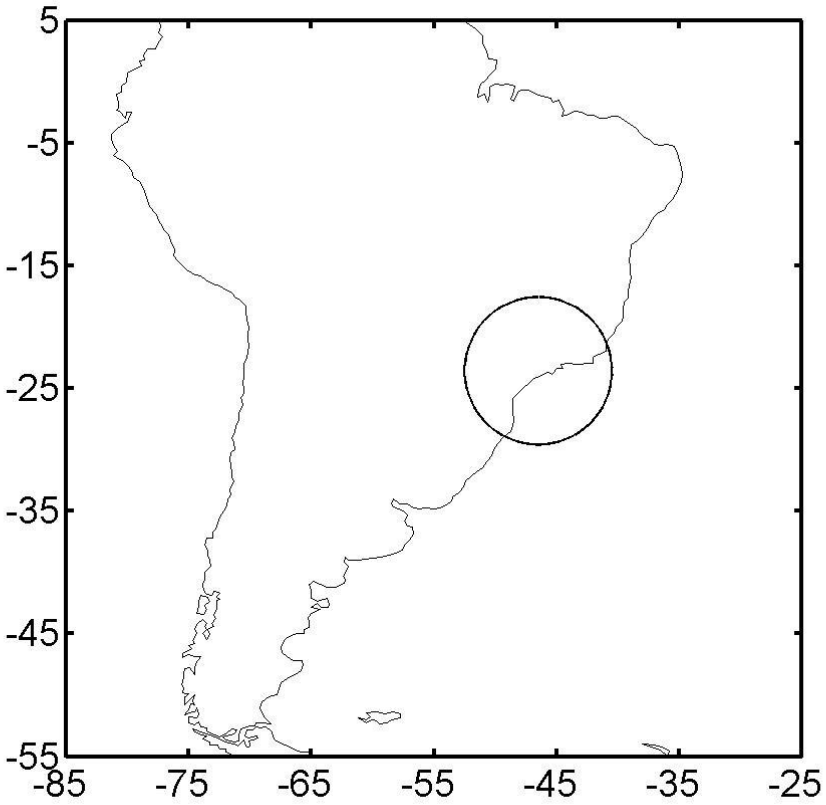
World Wide Lightning Location Network (WWLLN)

- 64 stations
- VLF radio waves from lightning
- Time Of Group Arrival (TOGA)

http://wwlln.net/



CHUVA Region



- Center: São Paulo (-23.56, -46.49)
- Radius: 666 km

Background results

- From Nov. 1 2011 to Mar. 30 2012:
- BrazilDat (BTLN) detected 11.8 *10^6 strokes, 11.2% (88.8%) is observed over ocean (land), and 18.5% (81.5%) is Cloud-to-Ground (In-Cloud) strokes.
- WWLLN detected 0.65*10^6 strokes, 21.3% (78.7%) is observed over ocean (land).

	Total	Ocean	CG
BTLN	11,796,769	1,322,057	2,182,727
WWLLN	653,271	138,831	NA

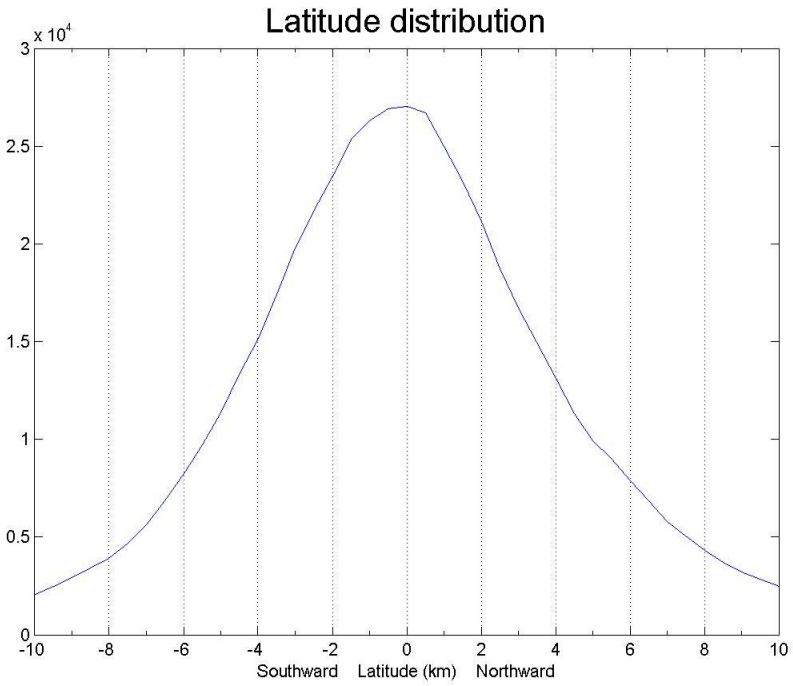
Comparison

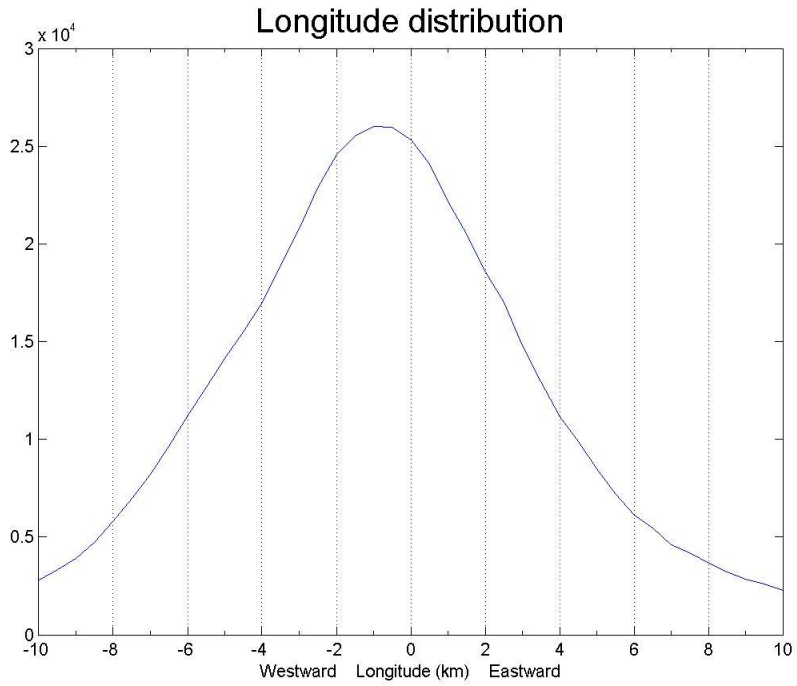
- Since BTLN has detected most strokes, we set it as a reference to compare other datasets.

- We use a 0.5° box and 2 ms time window as the matching criteria here. (Δlatitude & Δlongitude < 0.5, Δt < 2ms)

- Then, we can calculate the detection efficiency (DE) of WWLLN, especially the DE of ocean/land strokes or CG/IC strokes.

Location Accuracy





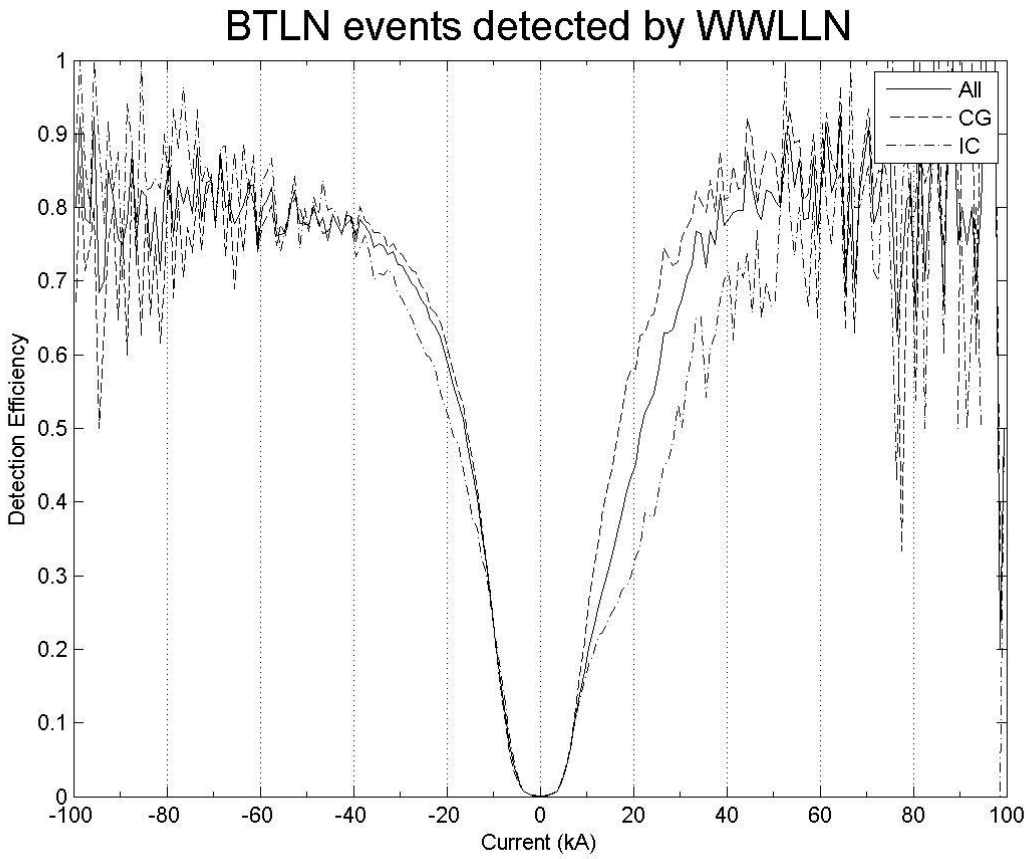
- The location accuracy of WWLLN is within 1km in median, and within ~4 km on average.

Detection Efficiency (DE)

- Set BTLN as reference,
- The DE of CG strokes is 14.8% for WWLLN.
- 4.4% of BTLN's strokes were detected by WWLLN.
- 7.9% of BTLN's ocean strokes were detected by WWLLN, about 2 times over land.

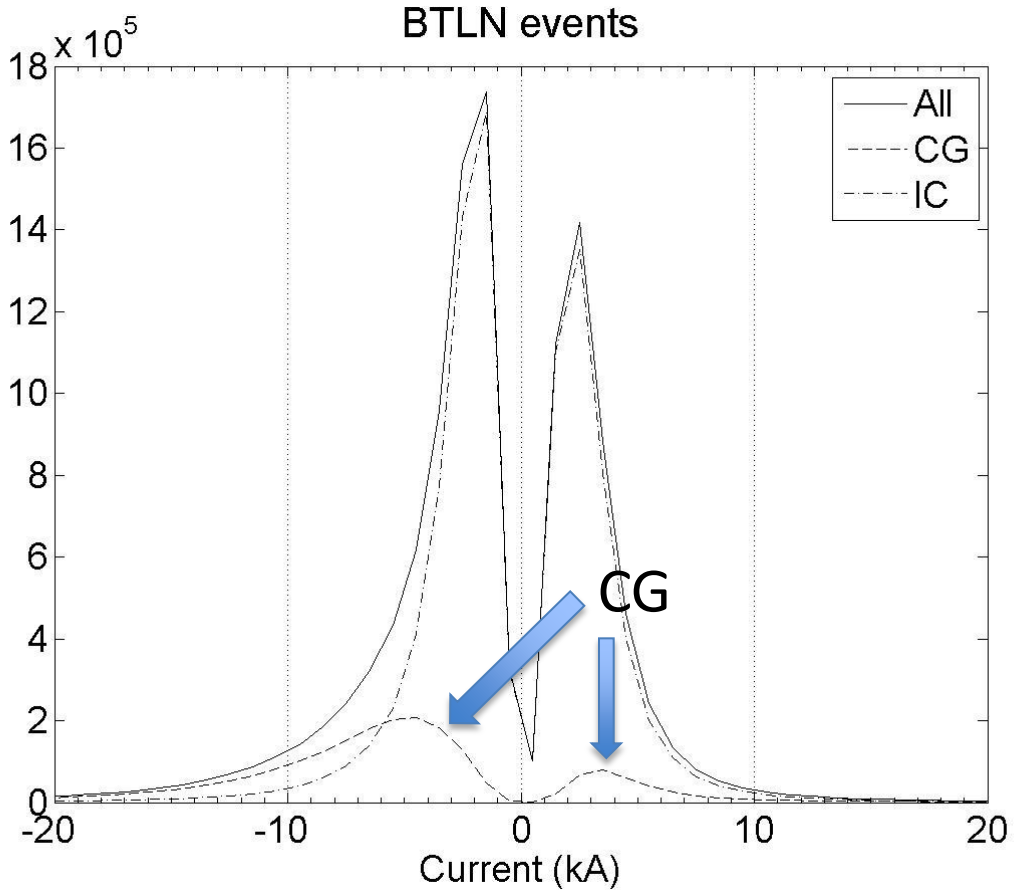
	Total	Ocean	Land	CG	IC
WWLLN	4.4%	7.9%	4.0%	14.8%	2.1%

Detection Efficiency (DE)



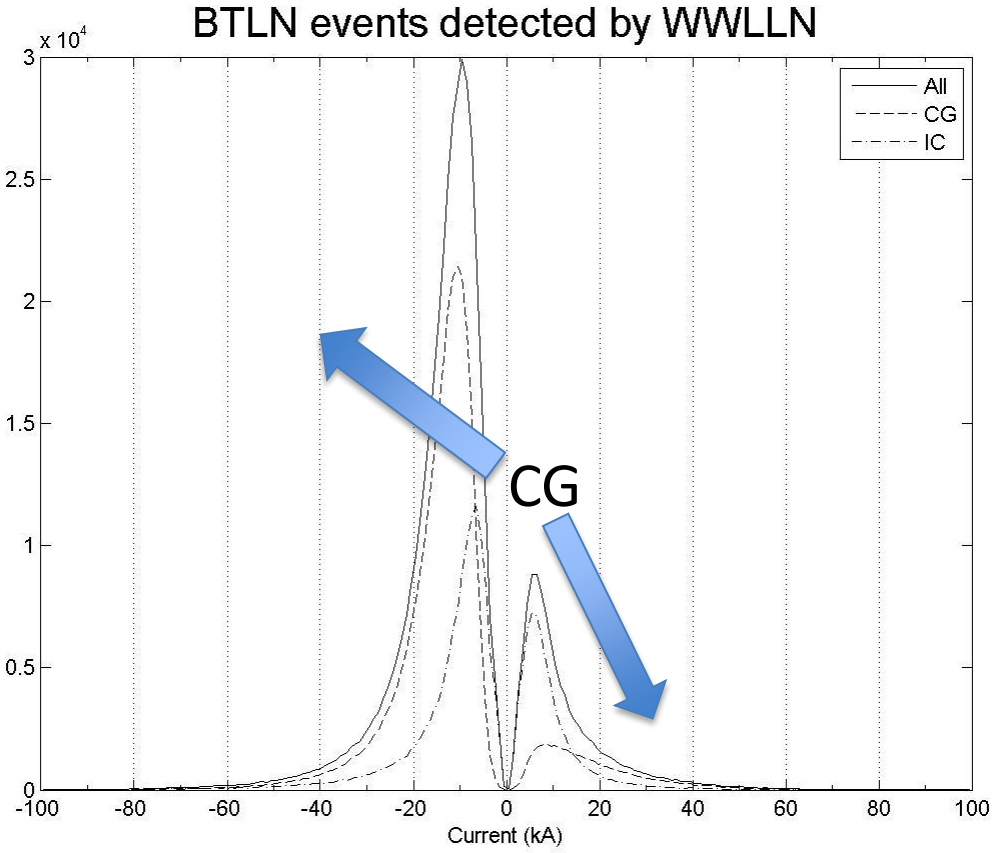
- ~60% when > 20kA; ~80% when > 40 kA.

Background Peak Current



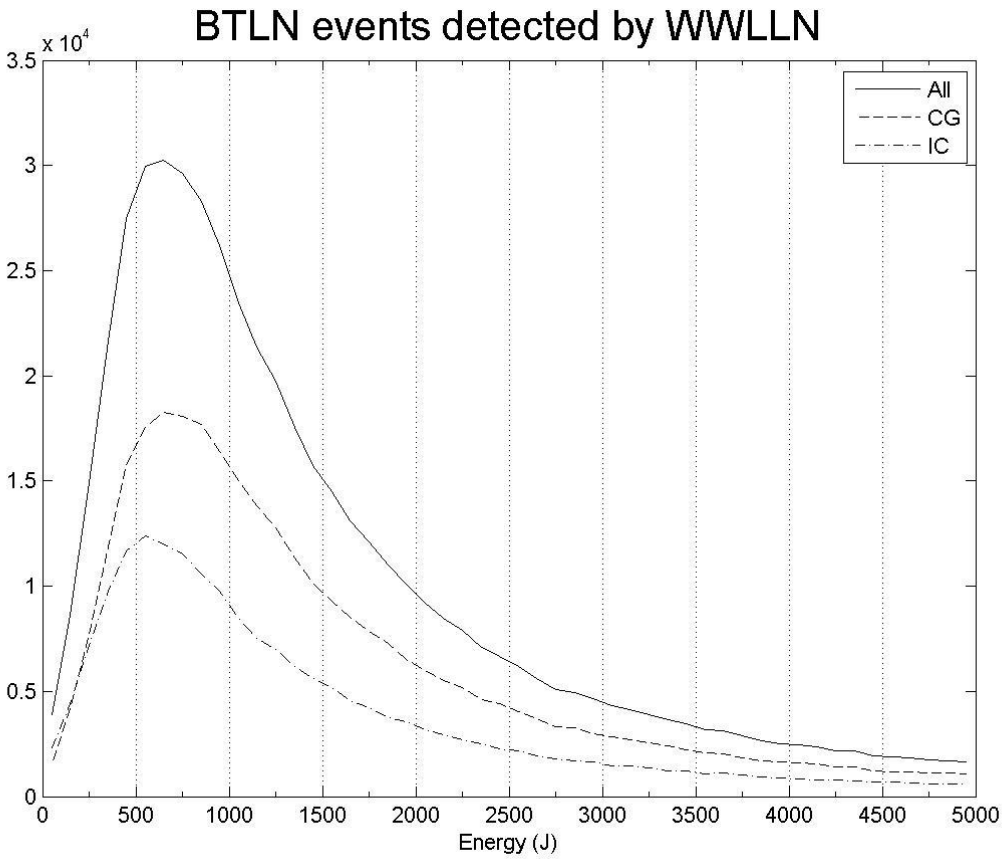
- BTLN detected more negative CG strokes than positive strokes.

WWLLN Peak Current



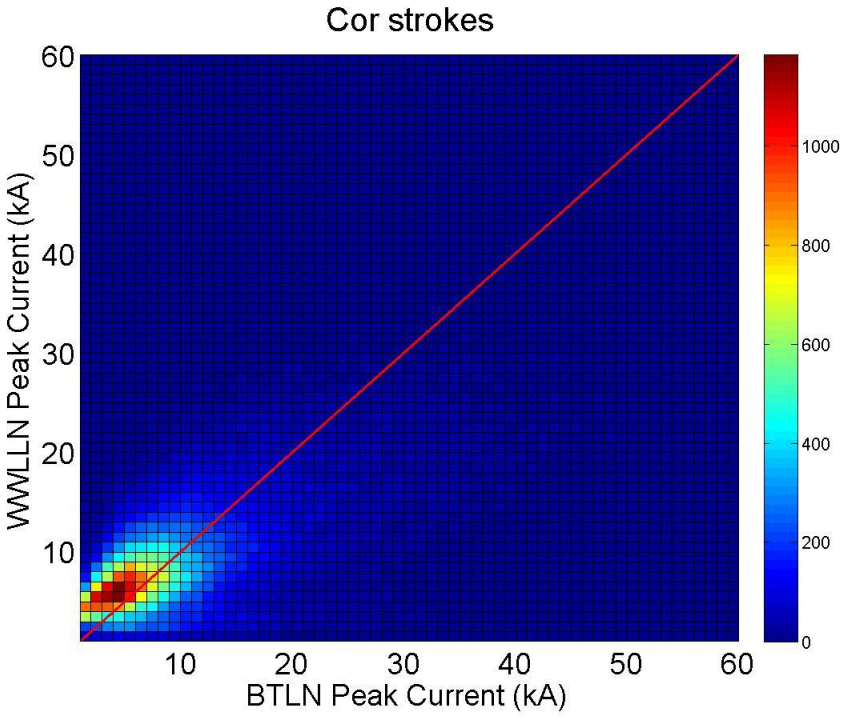
- WWLLN also detected more negative than positive current strokes.

Energy Distribution

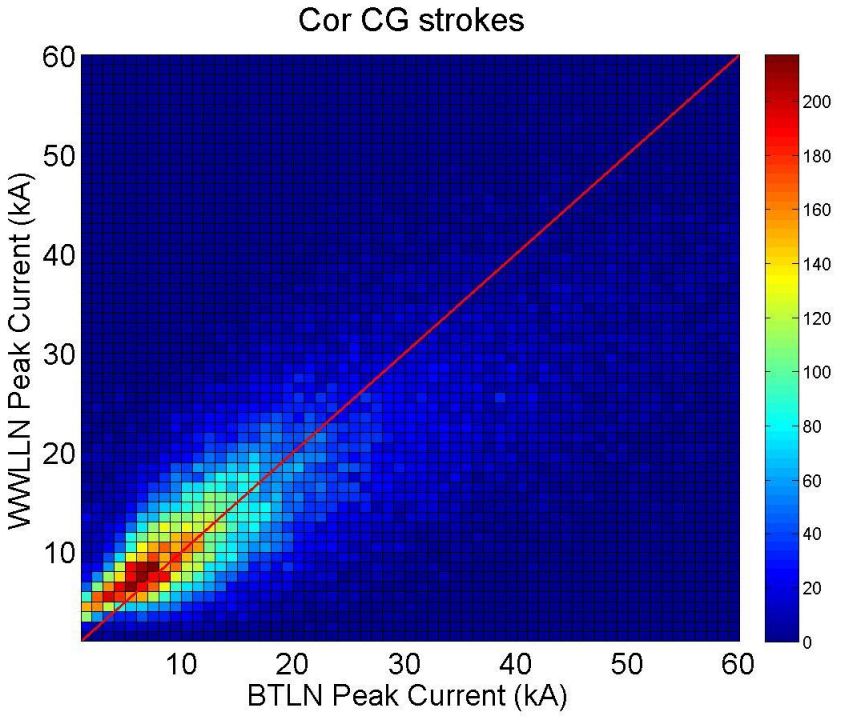


Energy vs Peak Current

$E=99.01*|I|^{1.05}$



$E=42.47*|I|^{1.32}$



Conclusions

Compared to BTLN:

- WWLLN has a ~15% CG detection efficiency in CHUVA region.
- The strokes detected by WWLLN is about 2 times over ocean than over land.
- The location accuracy of WWLLN is within 4 km on average.
- The peak energy has a nice fitting relationship with peak current in CHUVA region.

Thank you!

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