Vaisala's New Global Lightning Dataset GLD360

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Vaisala Global Lightning Dataset GLD360

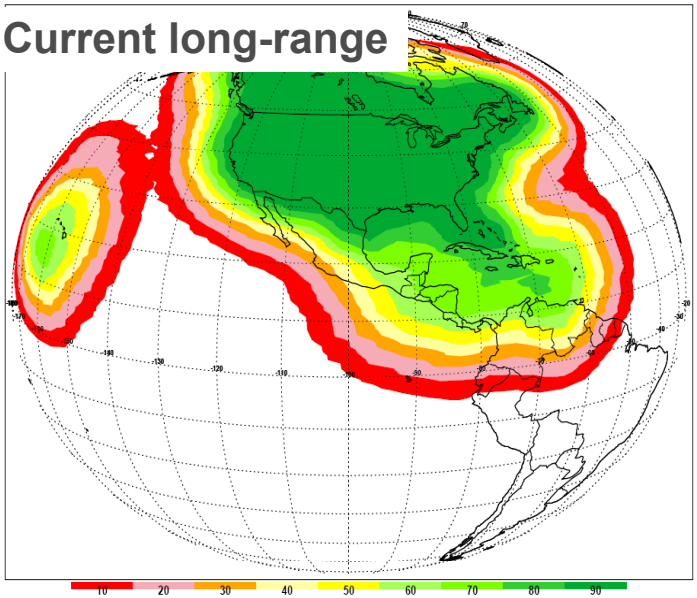
Schedule

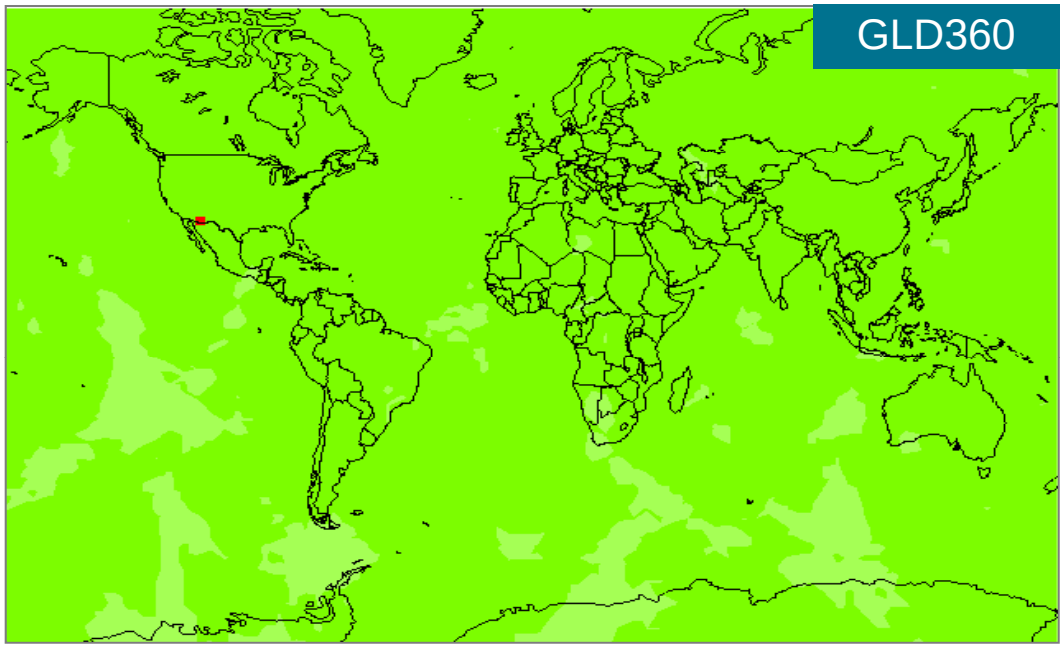
- **GLD360**
- **Validation**
- **Applications**
- **Demonstration**

What is Vaisala Global Lightning Dataset GLD360?

- Vaisala owned and operated lightning detection network
- Planet wide coverage
- Utilizes a revolutionary combined method of both
  --time-of-arrival (TOA) and
  --direction finding (DF)
  to detect cloud-to-ground lightning at extreme distances

Vaisala Global Lightning Dataset GLD360

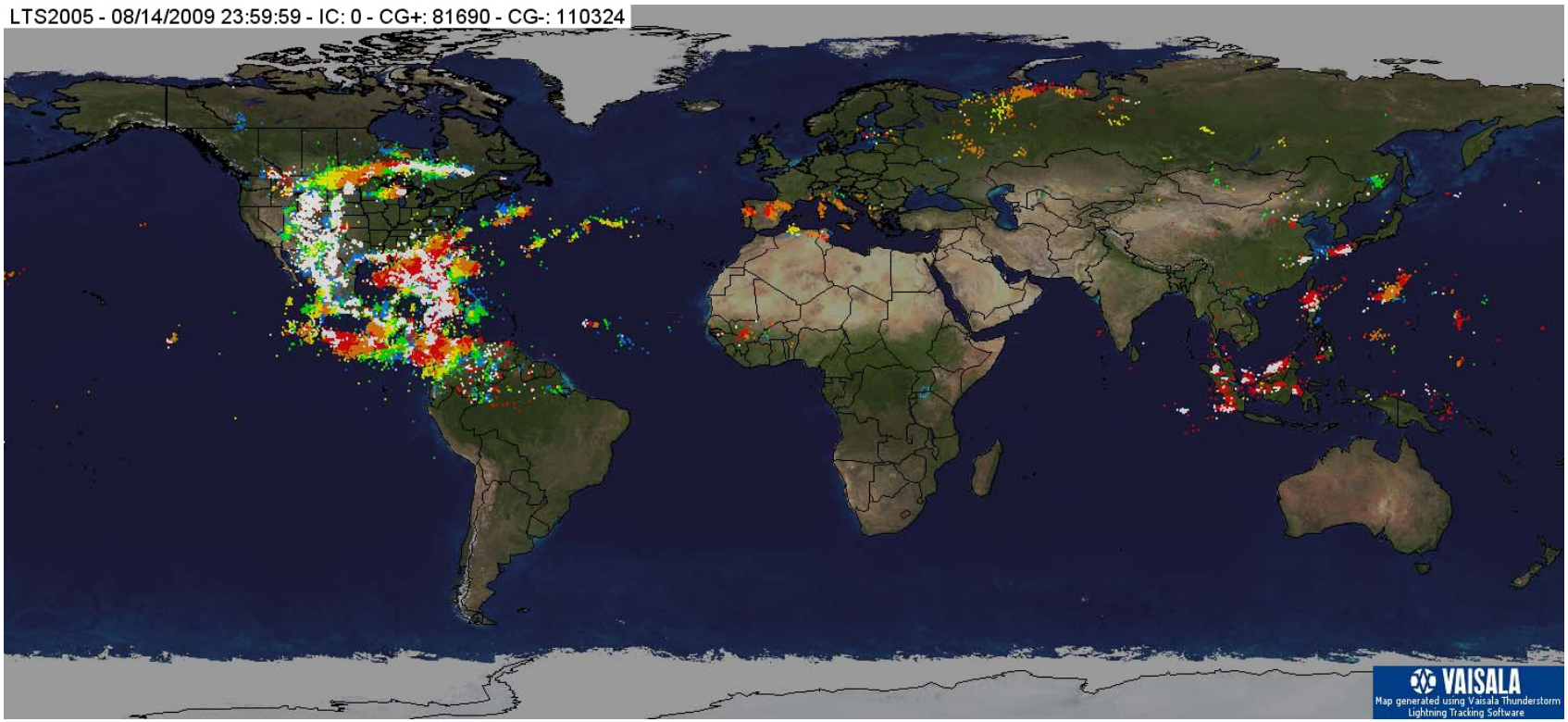




- Regional coverage
- Large day/night differences
- Variable detection efficiency

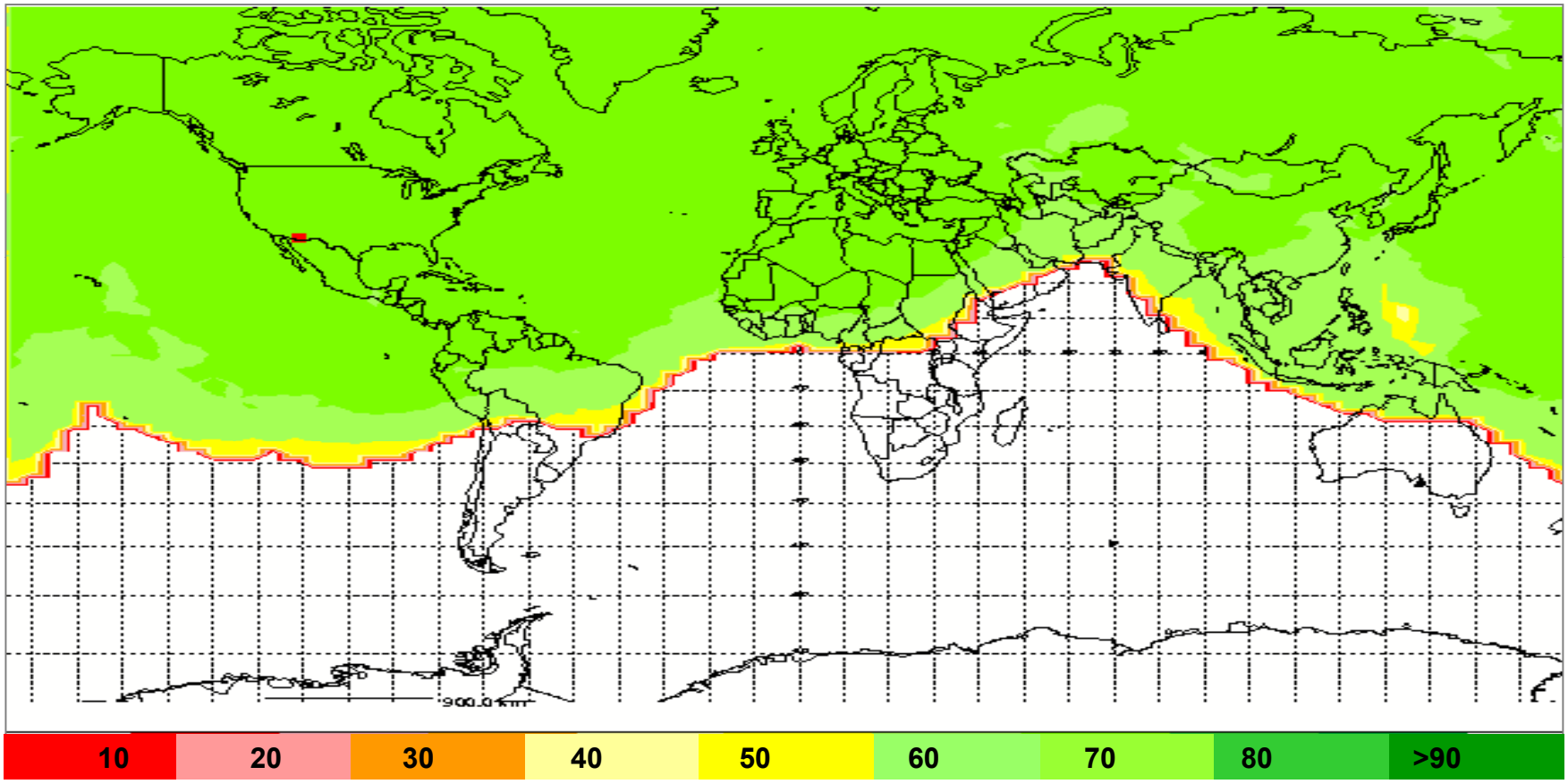
- Global coverage
- Small day/night differences
- High detection efficiency

Vaisala Global Lightning Dataset GLD360



July GLD360 coverage

Detection efficiency



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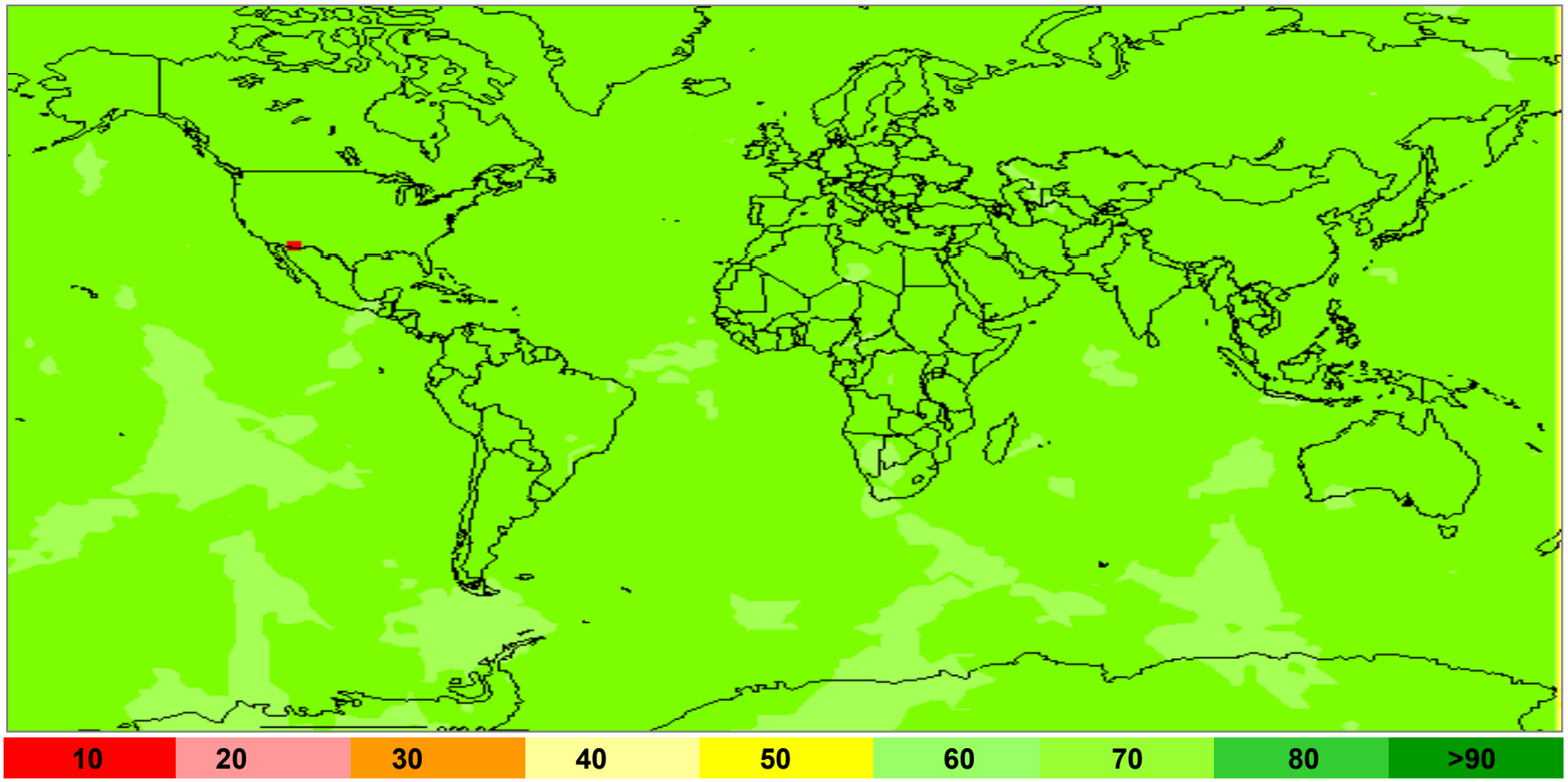
Vaisala GLD360 - January 2010

Nearly uniform, global, high detection efficiency



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Performance and validation

Vaisala GLD360 performance results

- Detection Efficiency: 70% CG with nearly uniform coverage
- Location Accuracy: 5 to 10 km median stroke location accuracy
- GLD360 contains peak amplitude (kA)

  --Unlike any other long-range dataset
- GLD360 contains polarity (+ or -)

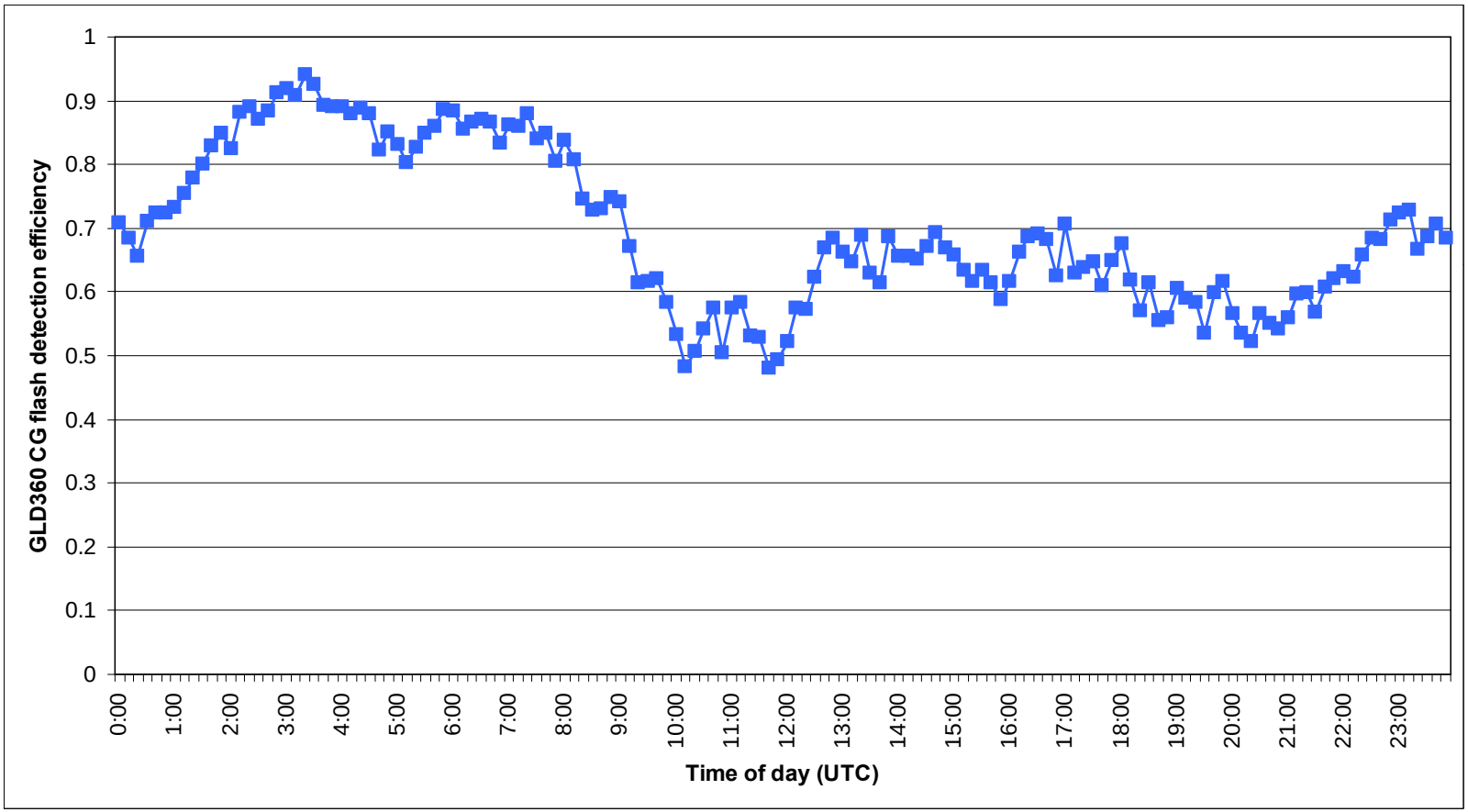
  --Unlike any other long-range dataset
- Cloud flash detection efficiency: 5 to 10%

GLD360 validation
Background information

- **Time period: 18 April – 18 May 2009**
- **Region: CONUS**
- **GLD360 cloud-to-ground (CG) stroke defined as having a peak current ≥|7| kA**
- **Matching Criteria: GLD360 CG stroke within 200 microseconds and 60 km of NLDN CG stroke**
- **1,406,000 matched GLD360 and NLDN CG strokes**

GLD360 validation

Median CG flash detection DE by time of day



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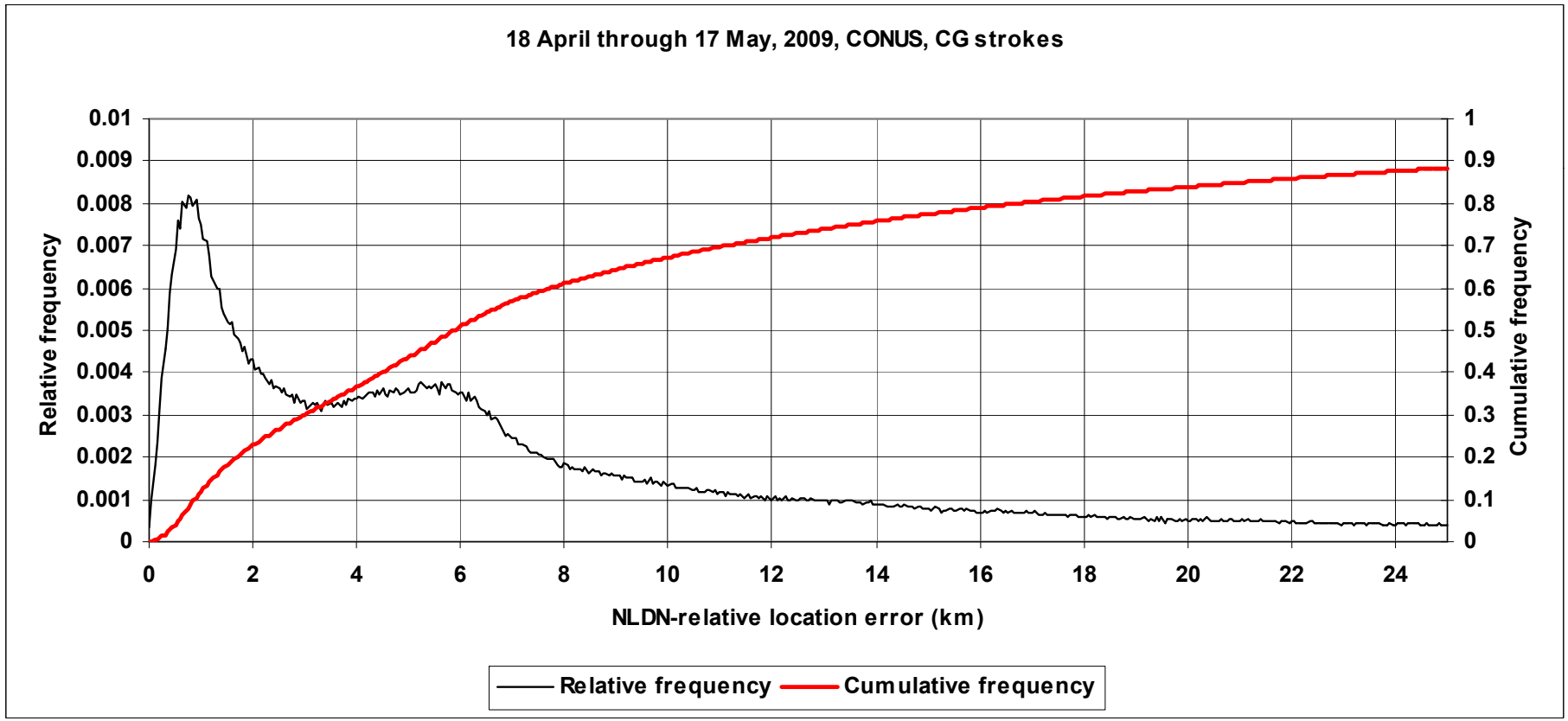
GLD360 validation
Location accuracy

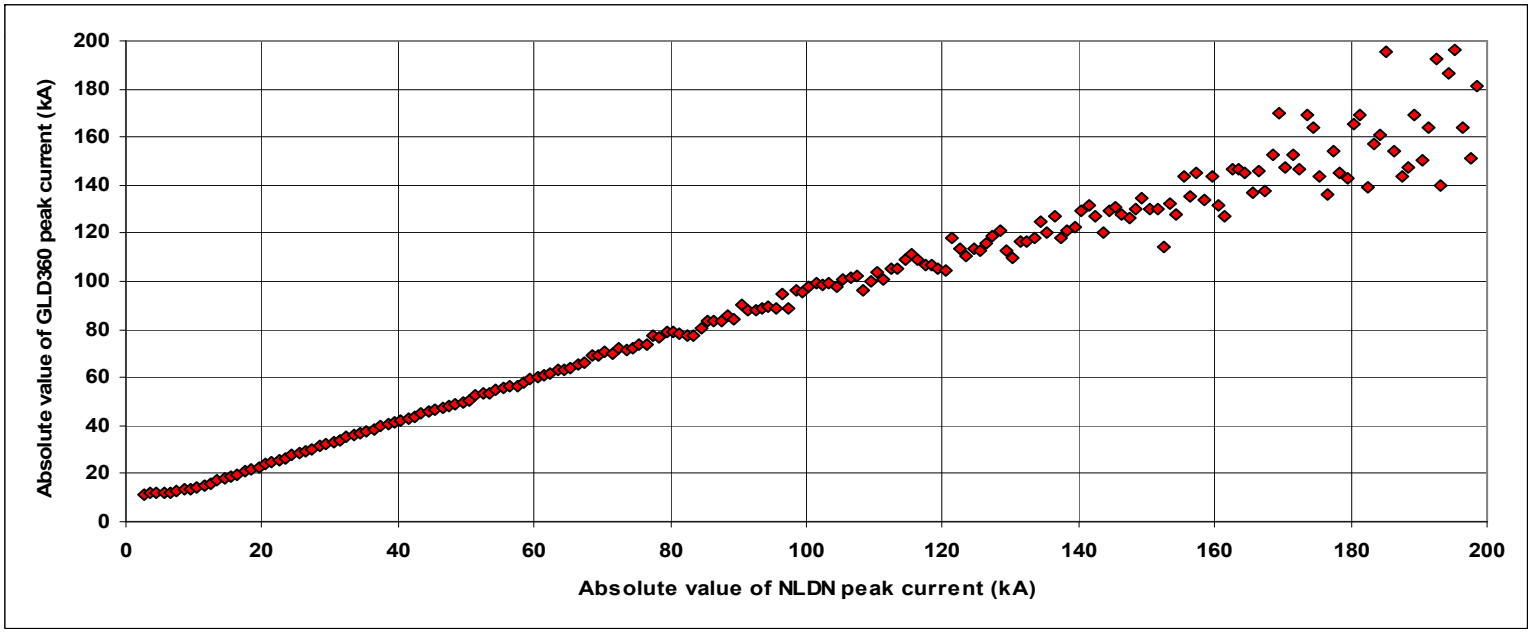
- 5.9 km median location accuracy



GLD360 validation

CG stroke peak current and polarity

- 0.98 correlation coefficient between NLDN and GLD360 estimated peak currents
- 86% of GLD360 CG strokes had correct polarity



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Vaisala GLD360 validation
Cloud flashes

- GLD360 cloud defined as having a peak current <|7| kA
- Evaluated from 18 April – 2 May 2009
- Cloud flash detection efficiency using Vaisala NLDN as ground truth: 5 to 10%

Vaisala GLD360 performance results

- NO other long range lightning network or lightning satellite can provide everything from Vaisala's GLD360

  --Satellite doesn't have same scale

  --GLDN outperforms other ground-based long-range systems by a factor of five for detection efficiency and a factor of two for location accuracy

  --Peak current and polarity not available with other networks

Vaisala GLD360 performance results

- The sun never sets on GLD360
  --Minimal difference due to day-night variations

- Short range networks can't provide this performance at this scale
  --Vaisala-produced national or large regional networks will continue to provide locally higher performance

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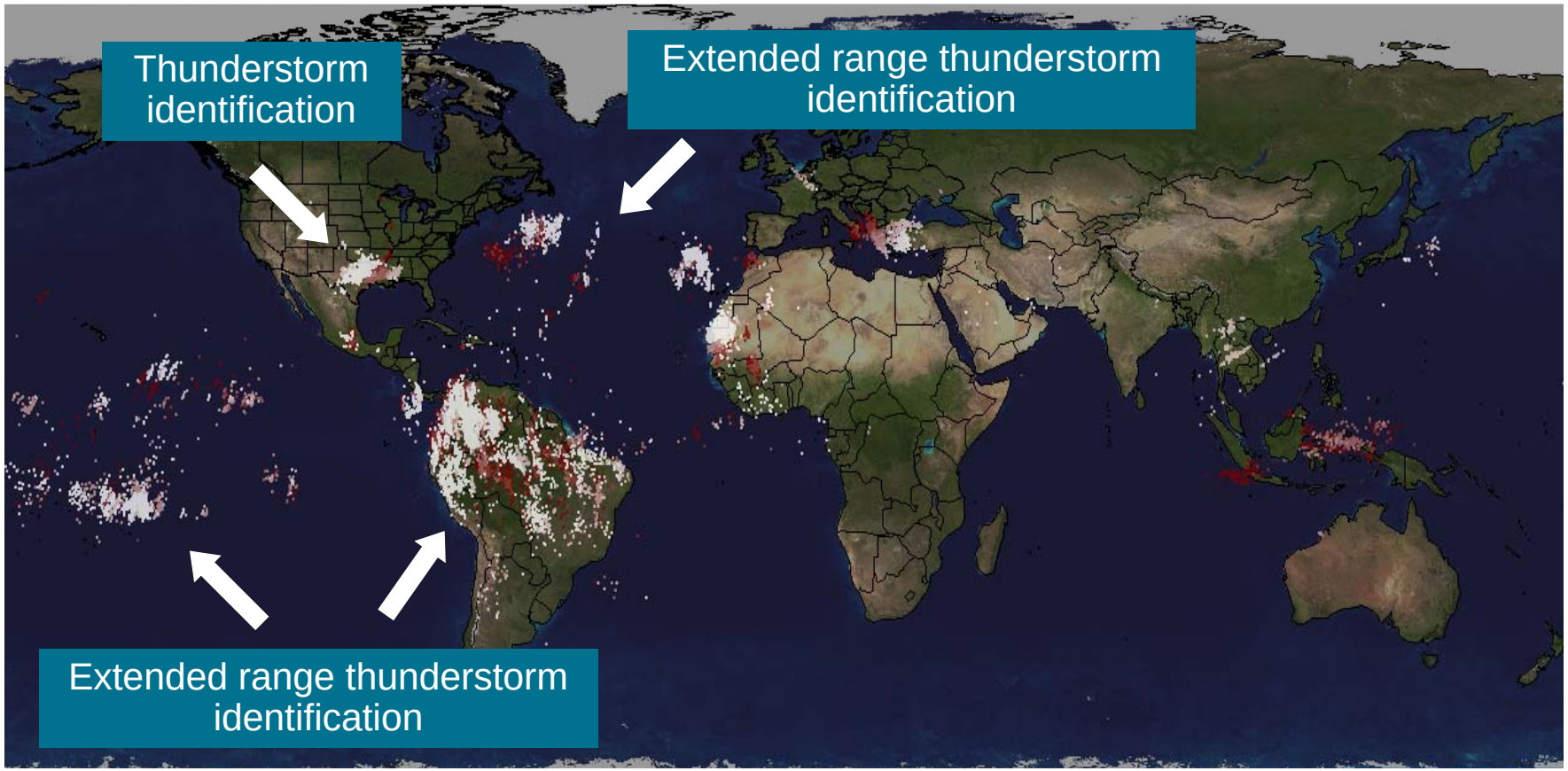
Thunderstorm identification

24 hours of GLD360

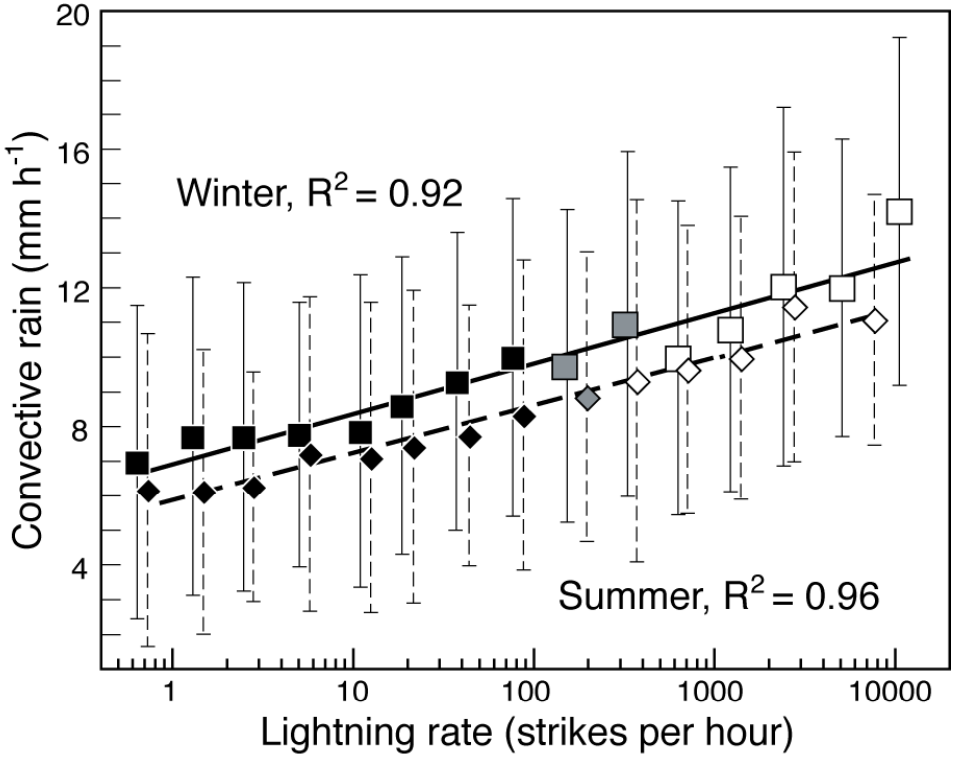


Lightning vs. convective rainfall

The relationship between lightning rate and rainfall intensity is the key to:

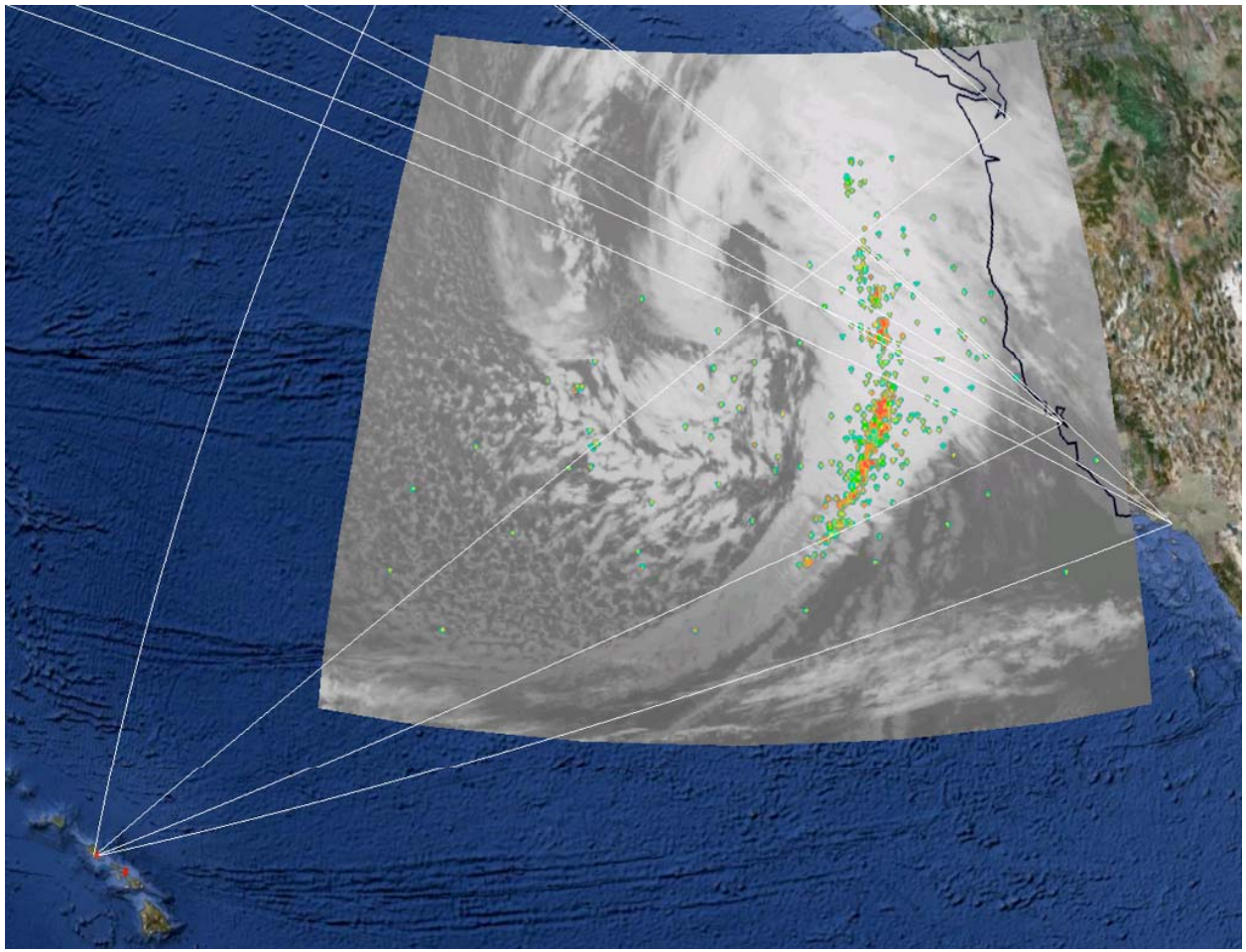
- **Use of lightning data in numerical weather prediction models**
- **Produce useful proxy products from GLD360 for many applications**

Pessi, A. and S. Businger, 2008: *J. Appl. Meteor*. 48, 833–848.



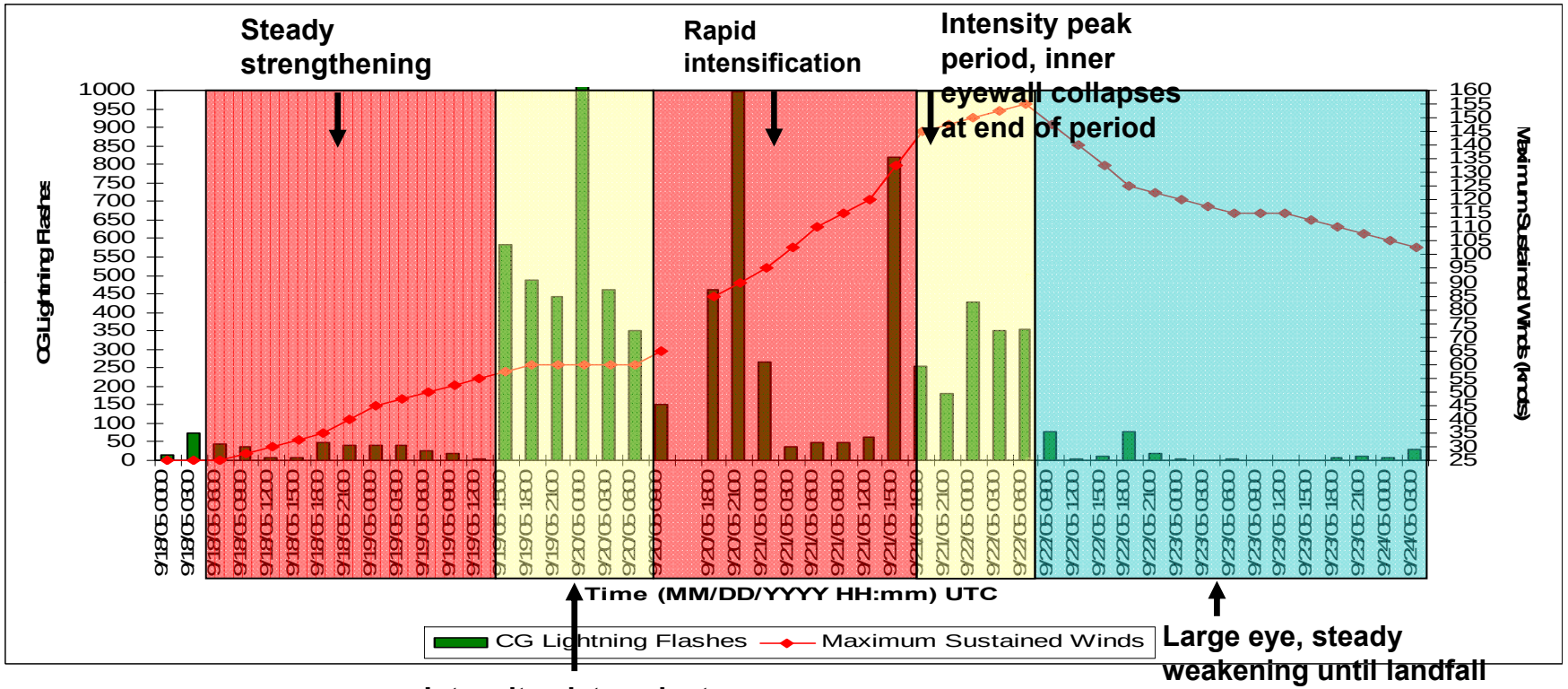
Radar reflectivity product

Lightning-derived reflectivity with airline flight tracks overlaid on IR satellite image



Rita - time series

Image courtesy of the National Hurricane Center



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GLD360 demonstration site

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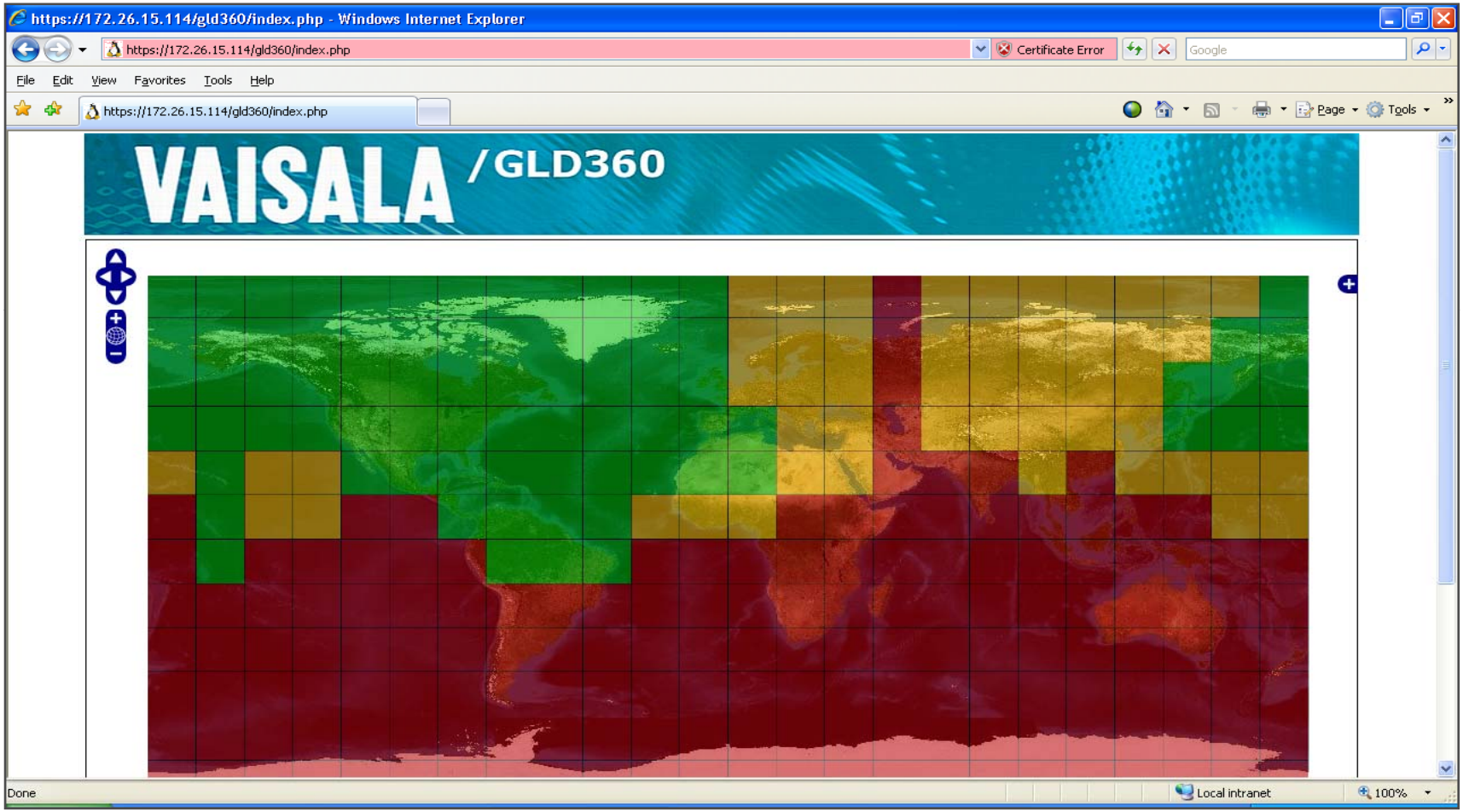

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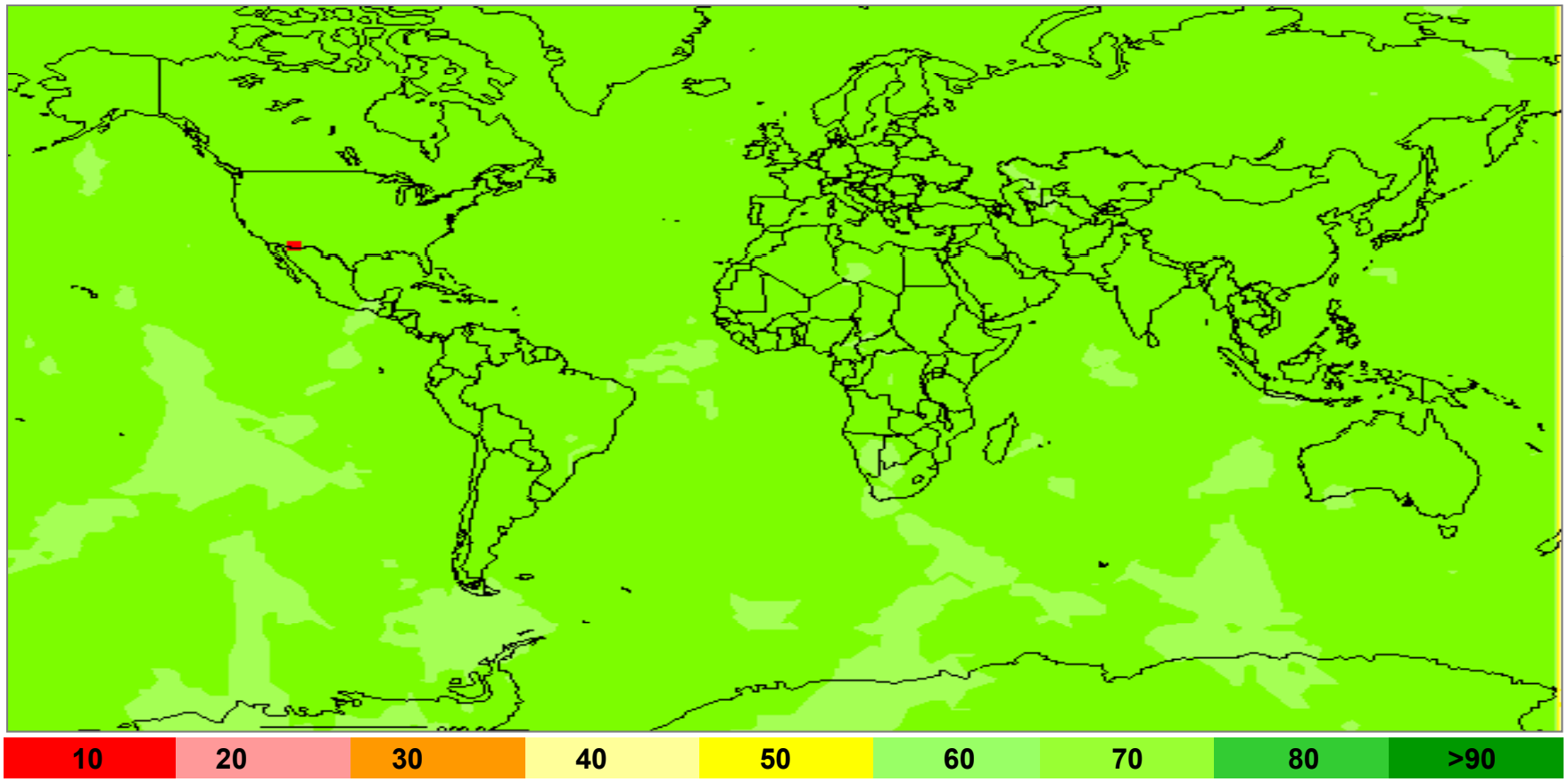

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2010 ILDC/ILMC

ILDC · 21st International Lightning Detection Conference

ILMC · 3rd International Lightning Meteorology Conference

19 - 22 April

Buena Vista Palace

Orlando, Florida

www.vaisala.com/ildc