

THE BENEFITS OF GLD360 LIGHTNING LOCATION DATA IN OPERATIONAL WEATHER FORECASTING

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VAISALA

Challenge

Limited long range severe weather detection...
... late or no warnings

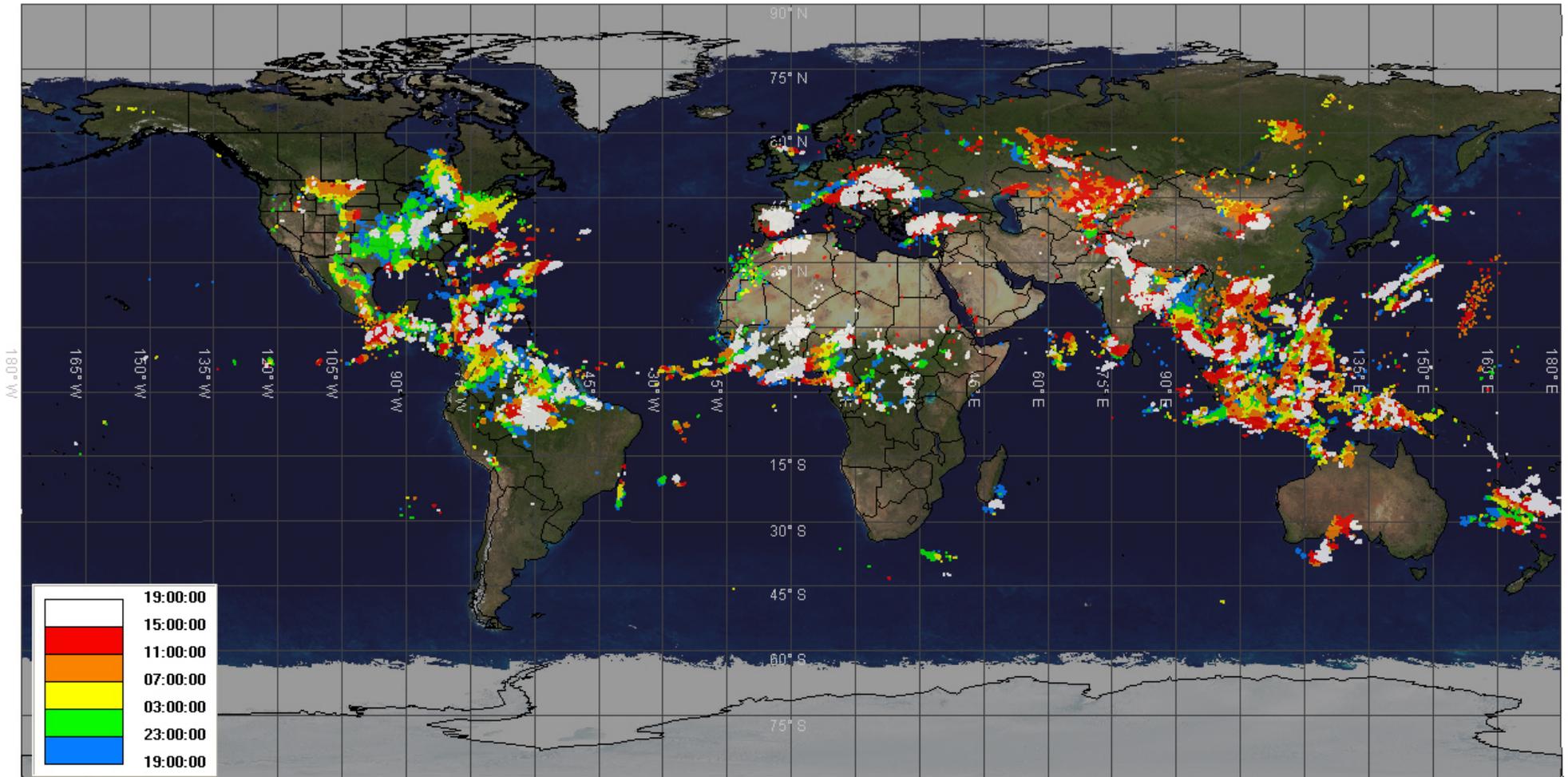
Cause

Significant weather observation gaps,
especially over the oceans.

24 hours of GLD360 data

19 UTC 26 May to 19 UTC 27 May 2010

1,902,695 lightning locations

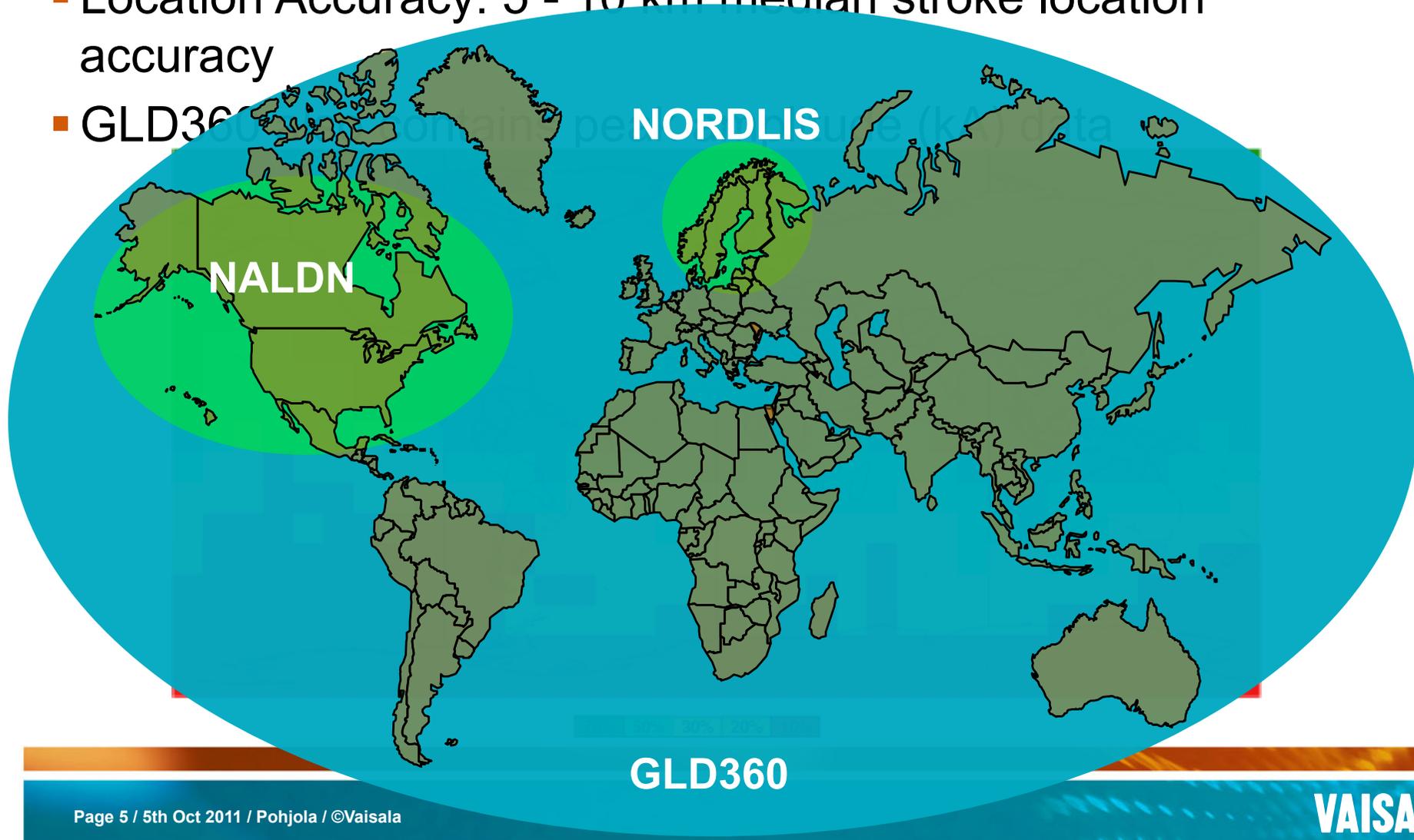


Vaisala Global Lightning Dataset GLD360

- Vaisala owned and operated lightning detection network
- Planet wide real time coverage
- Utilizes combined low frequency time-of-arrival (TOA)/ direction finding (DF) method for detecting cloud-to-ground lightning at extreme distances
- Data can be provided for customer specific area coverage

Vaisala GLD360 performance results

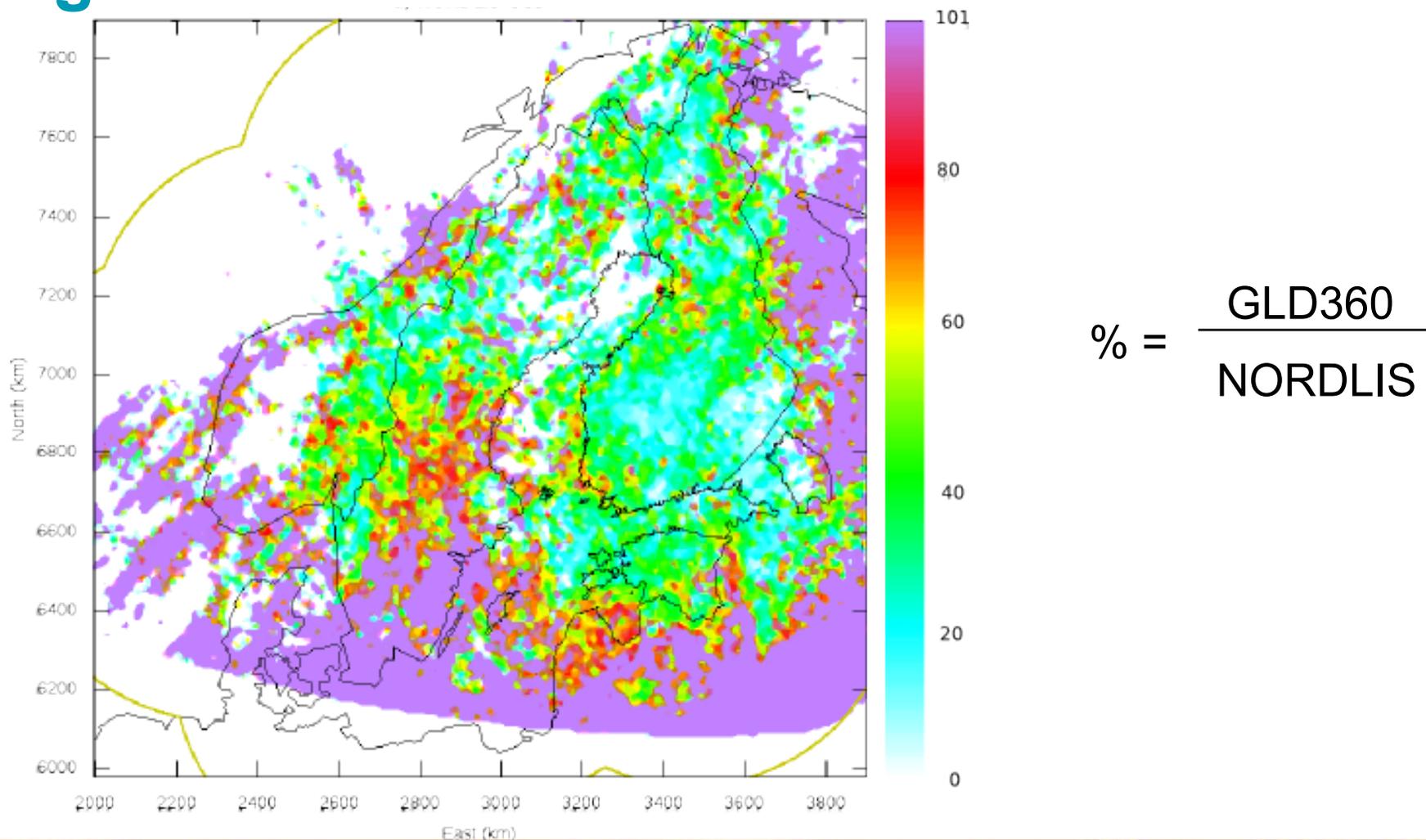
- Detection Efficiency: 70% CG with nearly uniform coverage
- Location Accuracy: 5 - 10 km median stroke location accuracy
- GLD360



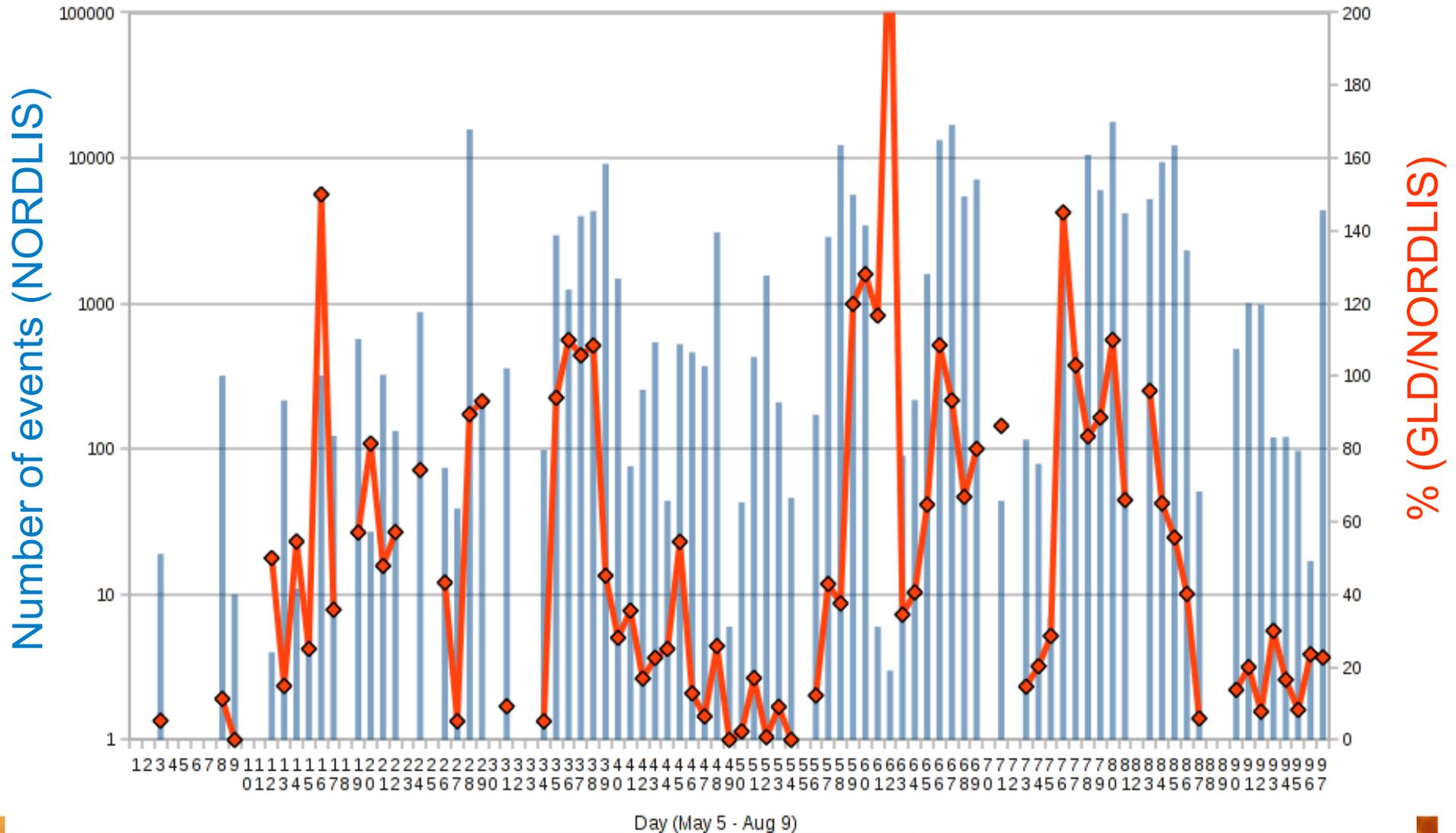
Validating the accuracy of the GLD360 data

- The NORDLIS data: first cloud-to-ground (CG) strokes (flashes)
- Filtered out from the NORDLIS data all positive flashes with peak current < 10 kA (Are cloud or ground flashes?)
- The comparative data set totally 97 days (May 5 – August 9 2011)
- All the comparisons in this study are relative to NORDLIS
- However, like any other LLS, the NORDLIS detection efficiency is not 100%

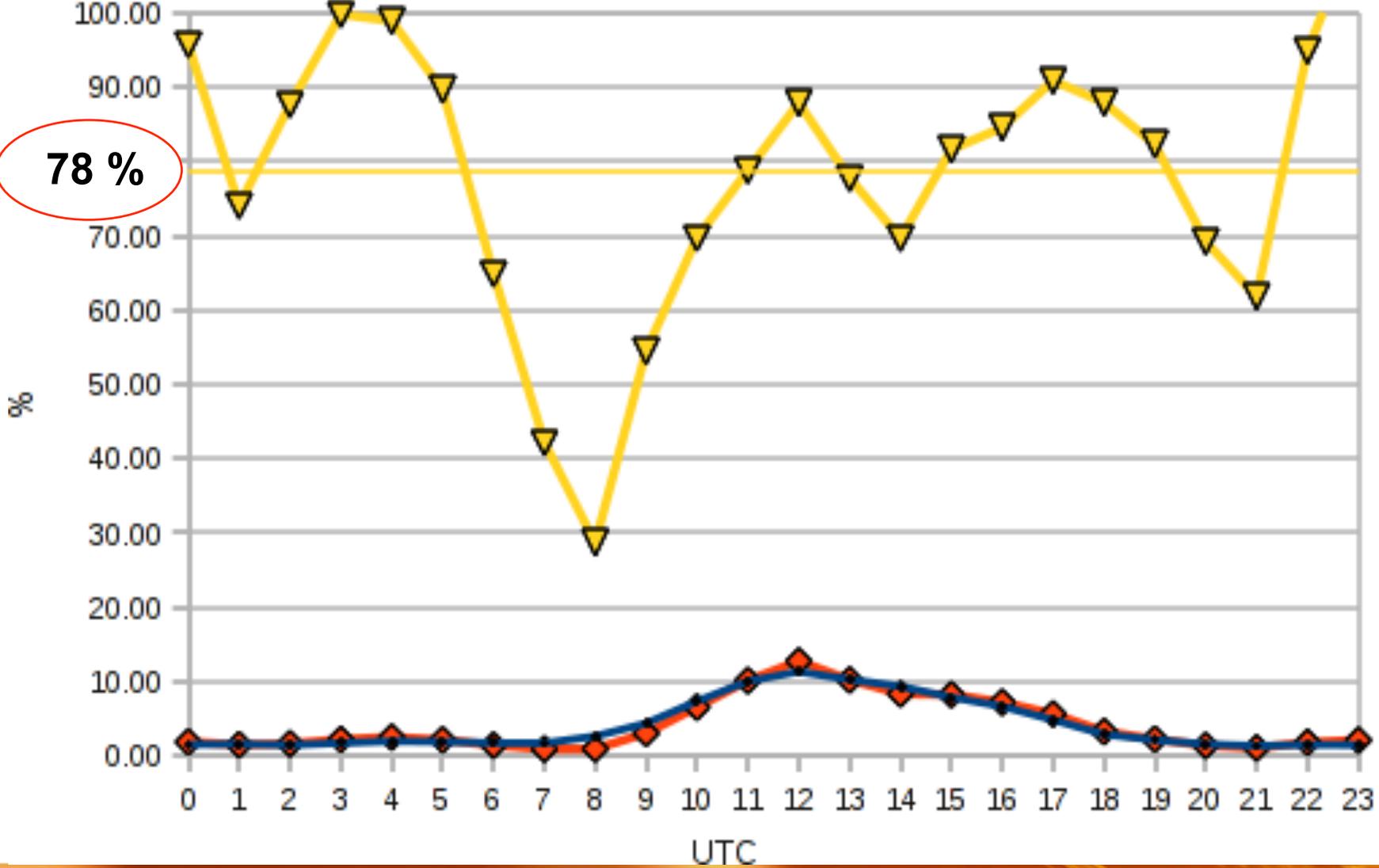
The relative detection efficiency (RDE) of GLD360 vs all NORDLIS events from May 5-Aug 9 2011



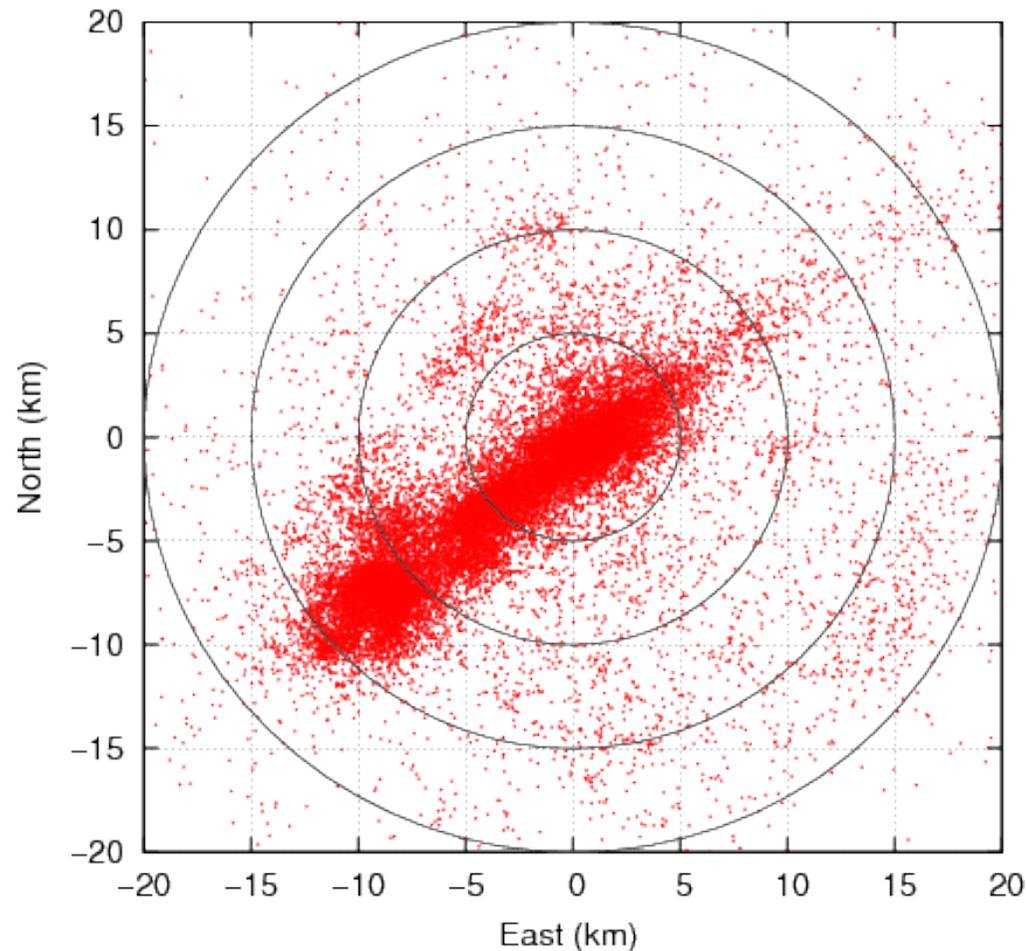
Day-to-day variation of the GLD360 relative detection efficiency (RDE) May 5 - Aug 9, 2011



Hourly distribution of located GLD360 events and NORDLIS strokes May 5 - Aug 9, 2011

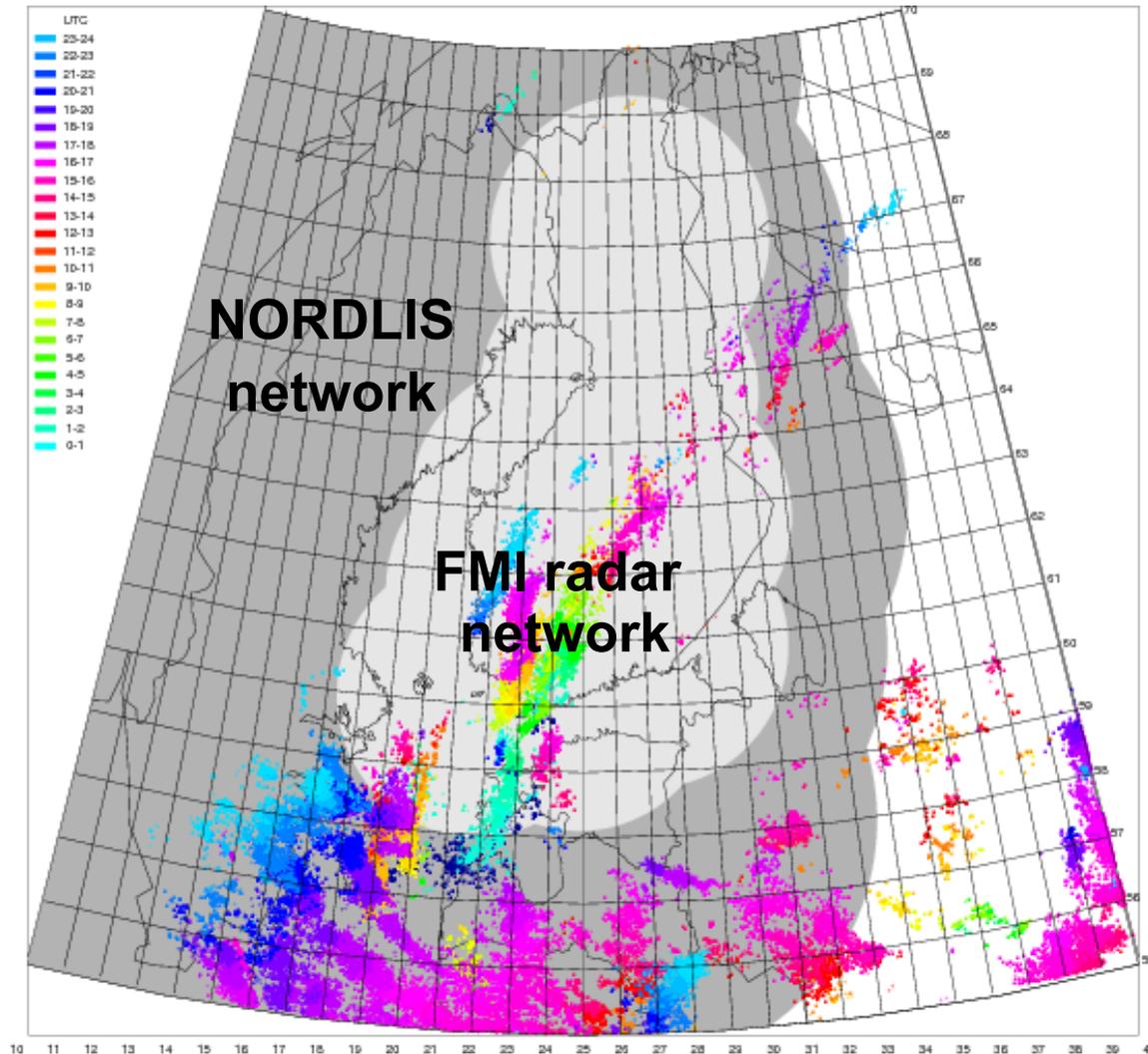


Spatial differences of temporally matched GLD360 (red) and NORDLIS (origin) lightning locations



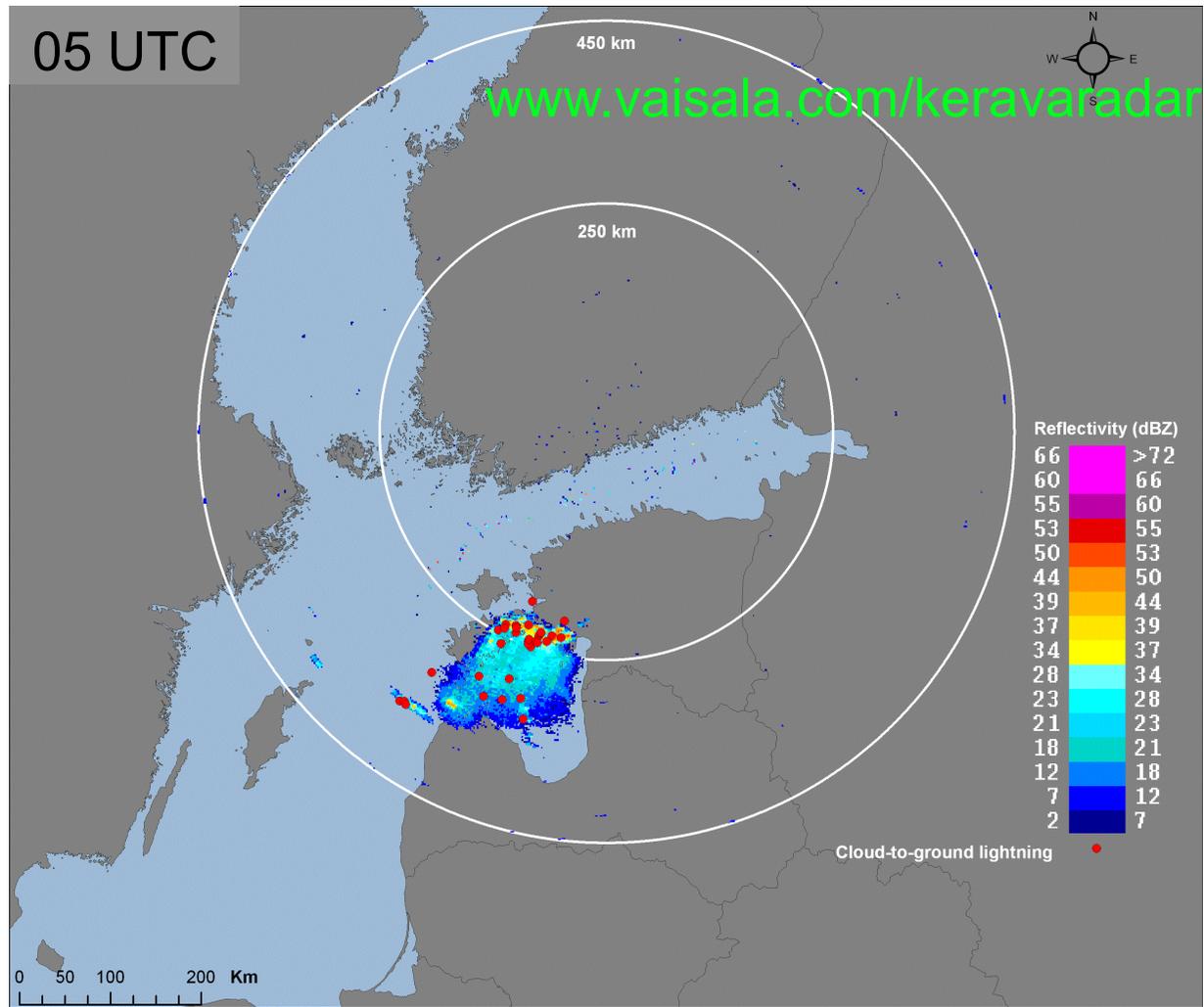
- Mean location difference is 9.4 km (median 7.5 km)
- 15% of the events within 2 km, 37% within 5 km, and 90% within 16 km.
- Southwest-Northeast oriented pattern, do to network design?

GLD lightning locations on July 21, 2011



- The colors shows the UTC hour of the lightning activity

Weather radar data combined with the lightning strokes of 15 min accumulation



Conclusions

- GLD360 performance results similar compared to NALDN
 - > 70 % RDE (78 %)
 - 5 to 10 km median location accuracy (7,5 km)
- GLD360 shows potential to provide high performance lightning location data globally
- Can be used to replace or enlarge regional lightning location networks
- Gives enormous improvement in lead time of forecasting severe storms with weather radar
- Combining lightning data and weather radar data shows potential for many future applications, i.e. storm life cycle

Backup slides

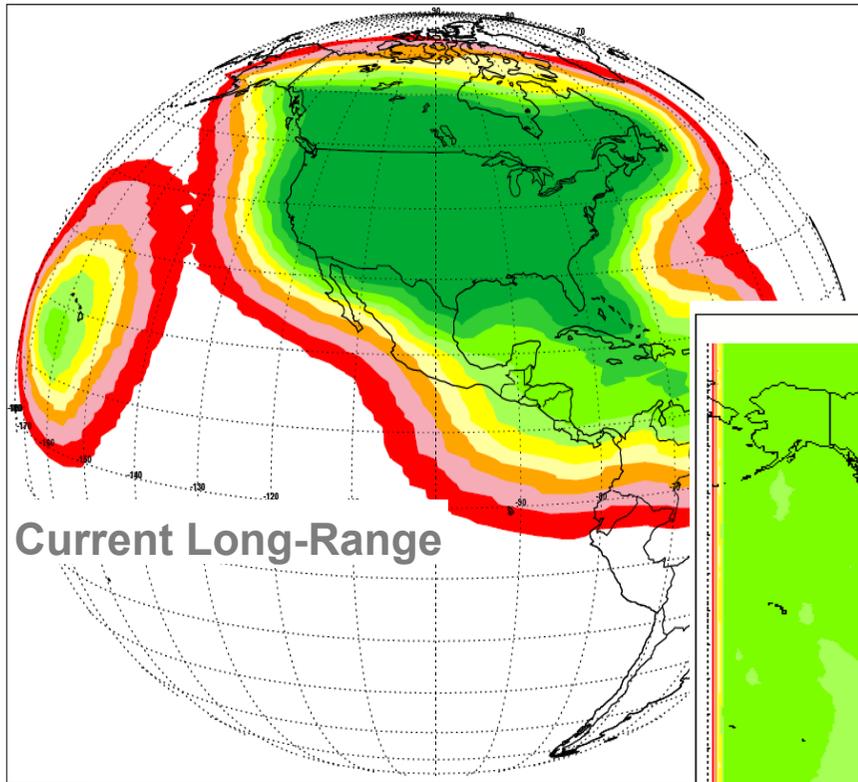
Global Network Competitive Summary, 2010

Network	CG lightning flash DE	Median CG stroke LA	Coverage area	Polarity	Peak Current	Cloud flash DE
Vaisala GLD360	~70%	5-10 km	World	Yes	Yes	5%
WSI's GLN	Claim >80%	Claim 1 km	World	No	No	-
UKMet ATDnet	Day-Night Variable Best is ~60% over Europe, decreasing performance with distance from Europe	Best is 5 km (mean) over Europe, decreasing performance with distance from Europe	Europe focused, Coverage extends from west Carib east through India	No	No	No
WWLLN	~ 30% for strokes > 30 kA Day-Night Variable	~15 km	World	No	No	No
Weatherbug	xx	xx	xx	xx	xx	xx

Benefits of GLD360 in operational weather forecasting

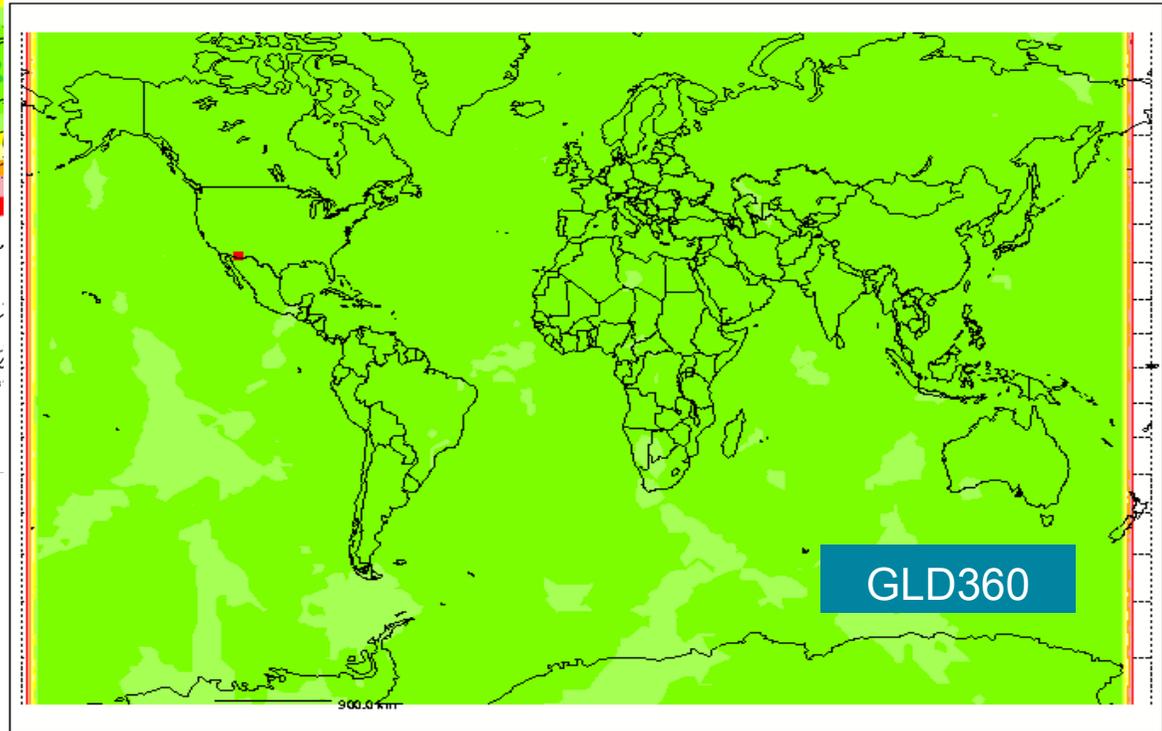
- Unlimited coverage of lightning location data (cloud to ground)
- Enlarge the coverage of the national lightning detection network and weather radar network in severe weather detection
 - More lead time
 - Local lightning detection network not needed
- Combining lightning and weather radar data to predict growth and decay of convective storms

Vaisala Global Lightning Dataset GLD360

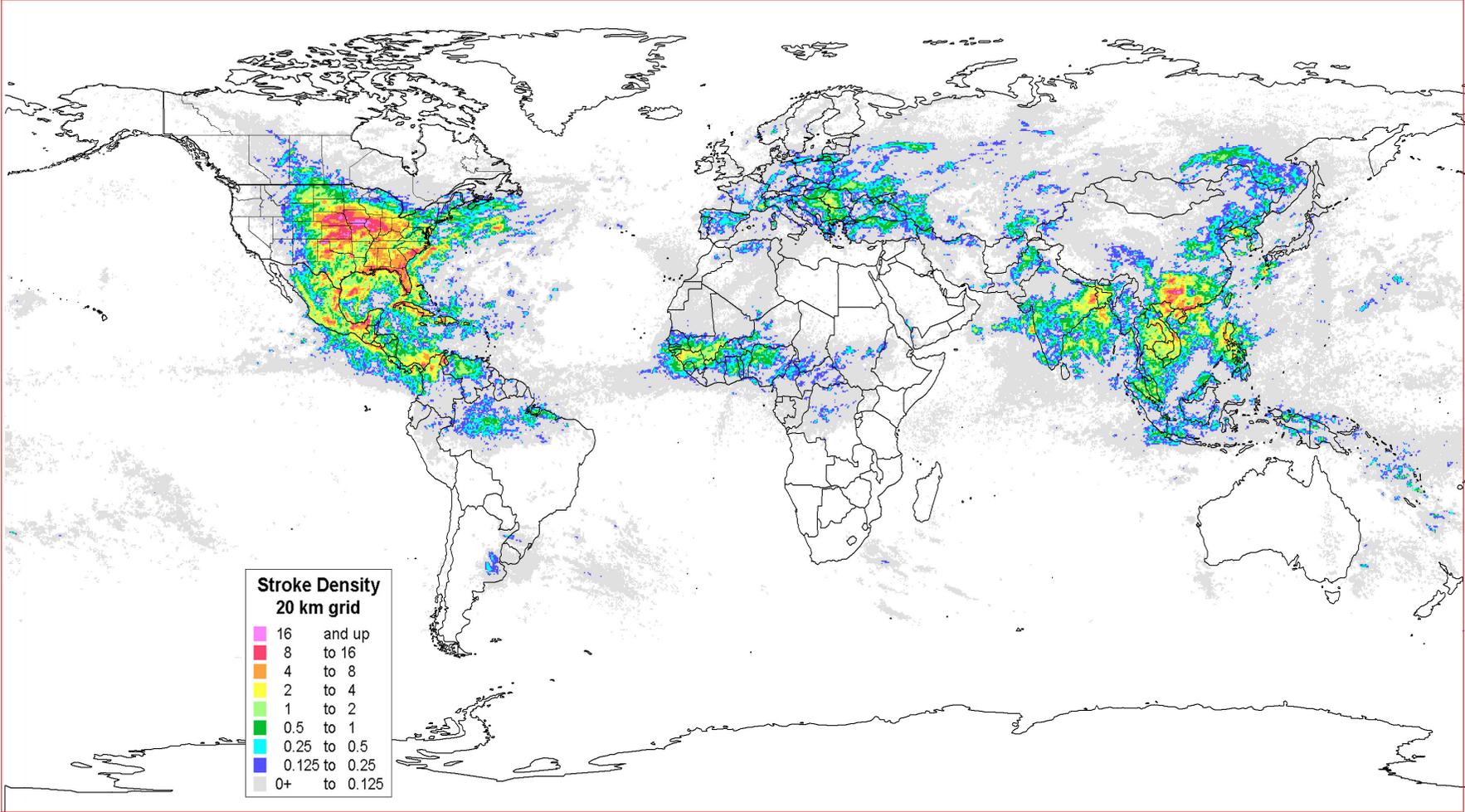


Global Coverage.

Better Performance (day/night, DE+reach).



GLD360 in June

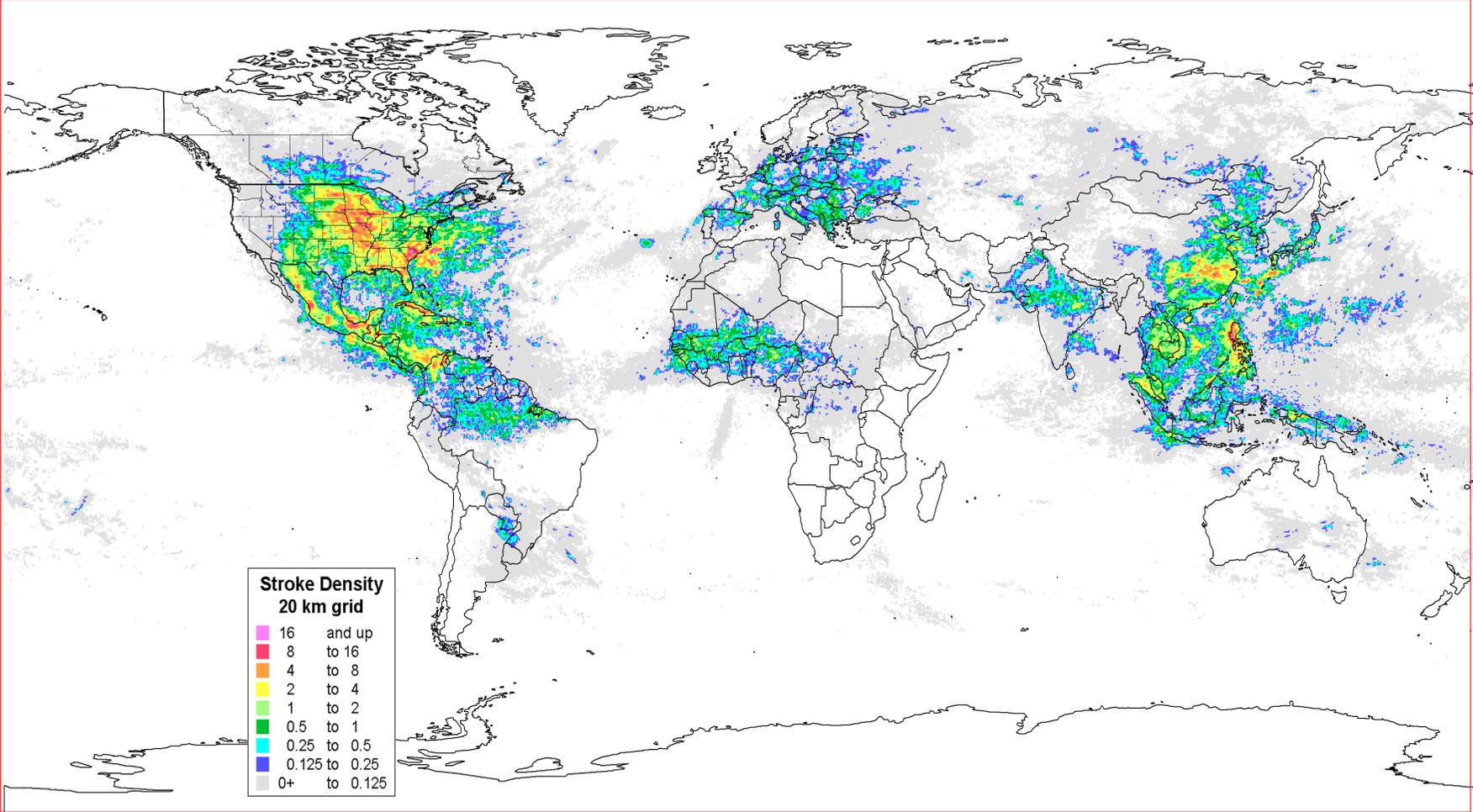


Stroke Density Map - 20 km grid

June 2010

GLD360 data

GLD360 in July 2010

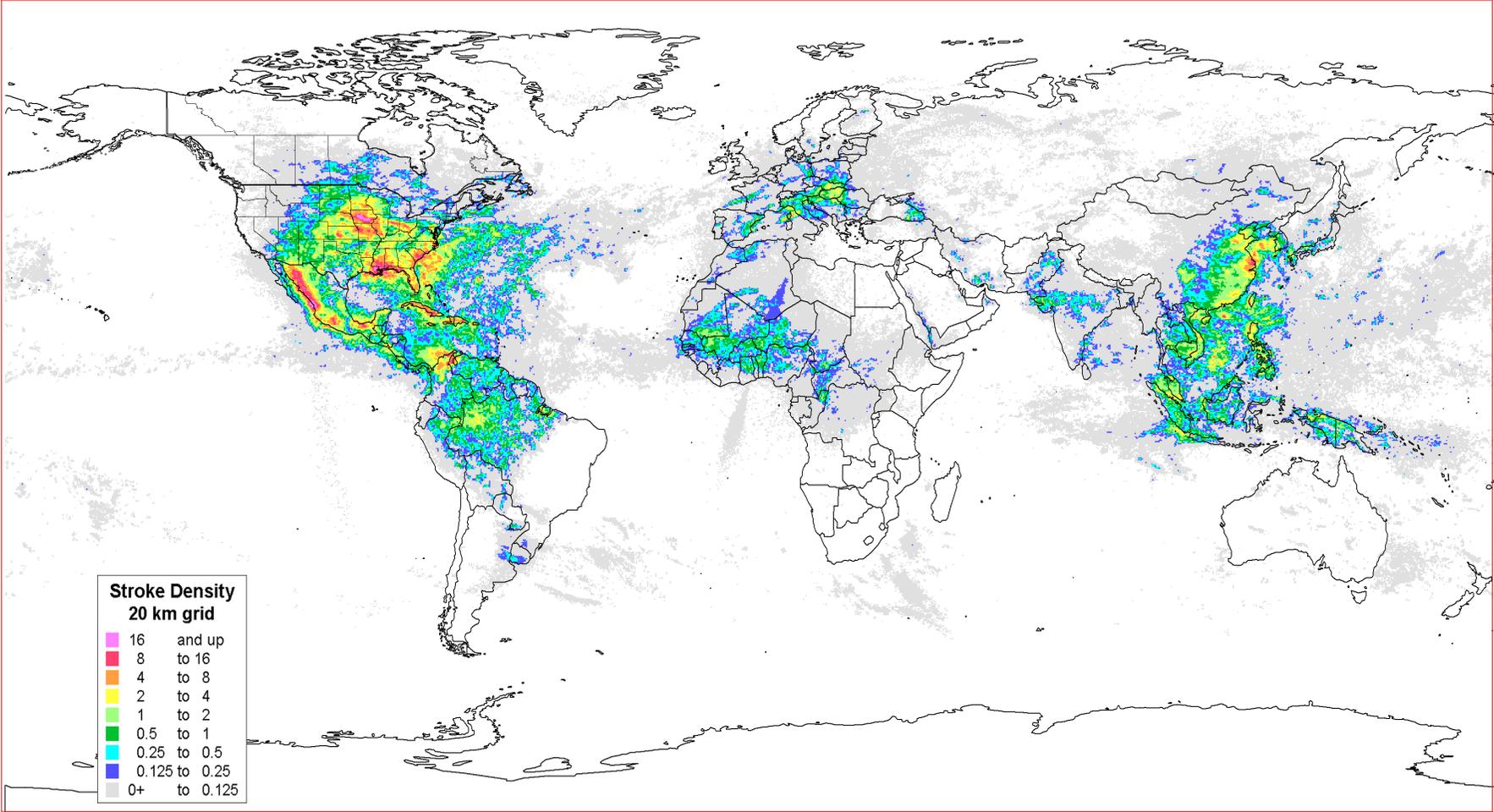


Stroke Density Map - 20 km grid

July 2010

GLD360 data

GLD 360 in August 2010

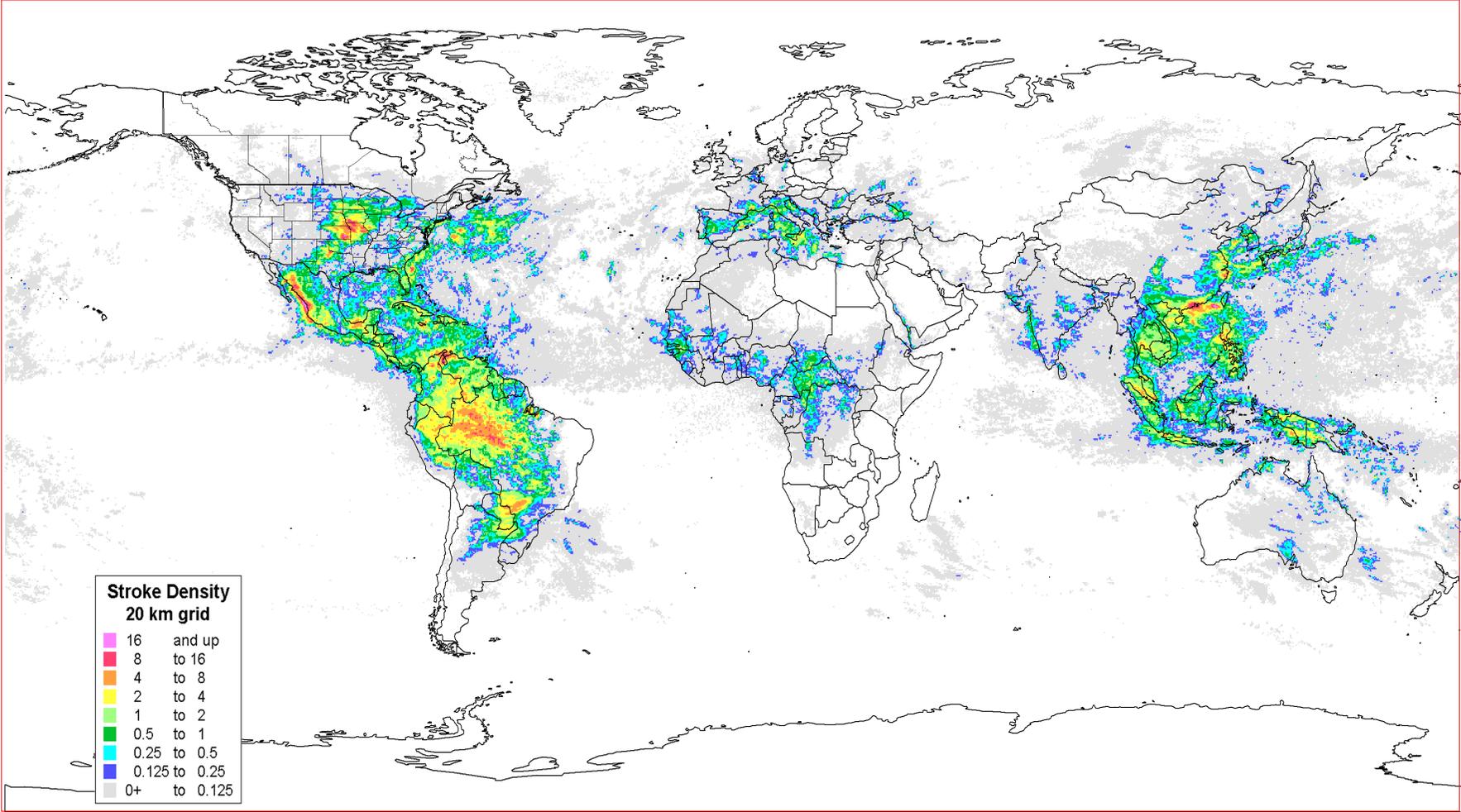


Stroke Density Map - 20 km grid

August 2010

GLD360 data

GLD360 in September 2010

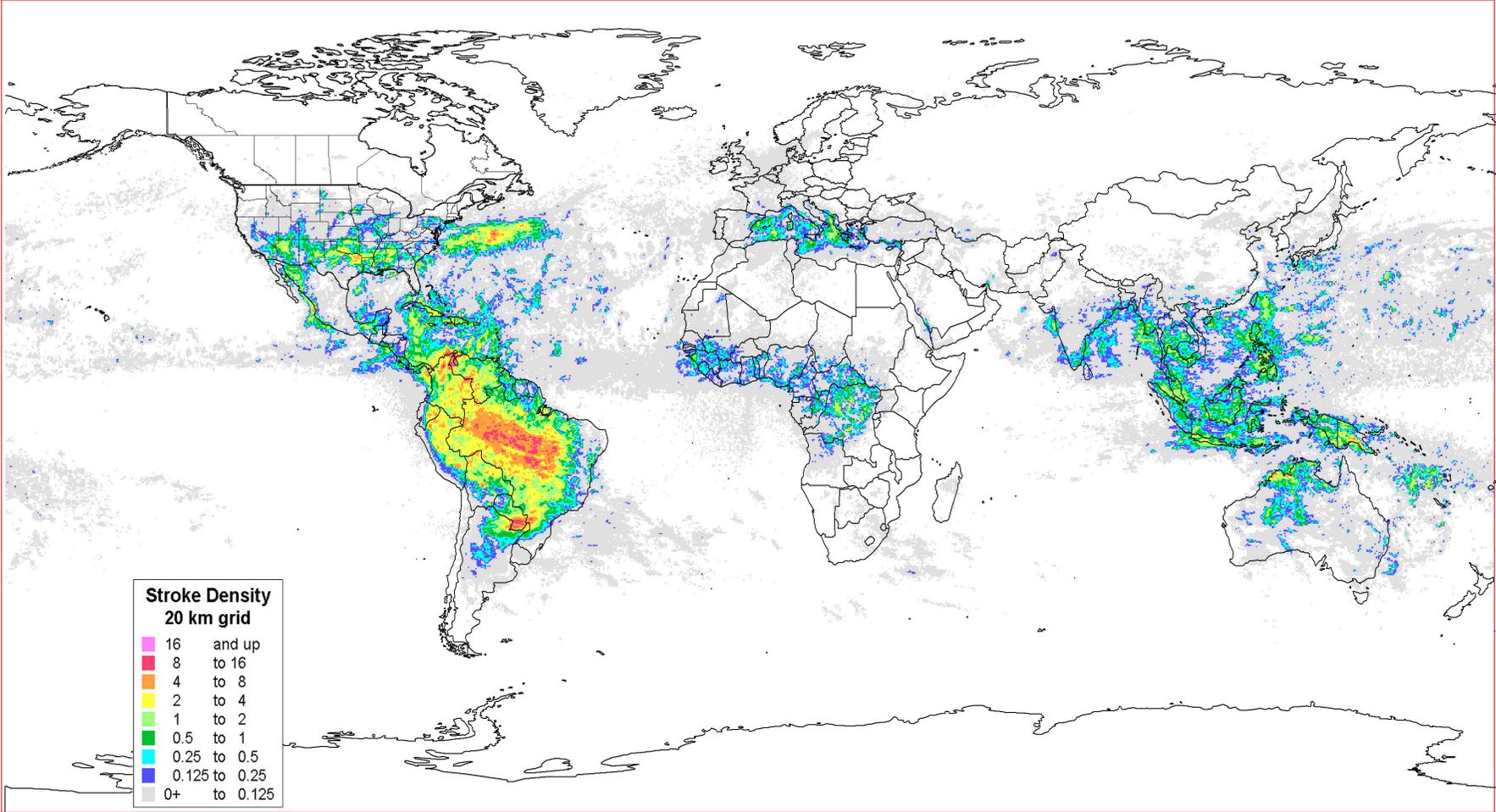


Stroke Density Map - 20 km grid

September 2010

GLD360 data

GLD360 in October 2010



Stroke Density Map - 20 km grid

October 2010

GLD360 data