The Comparison of GLD360 and EUCLID Lightning Location Systems in Europe

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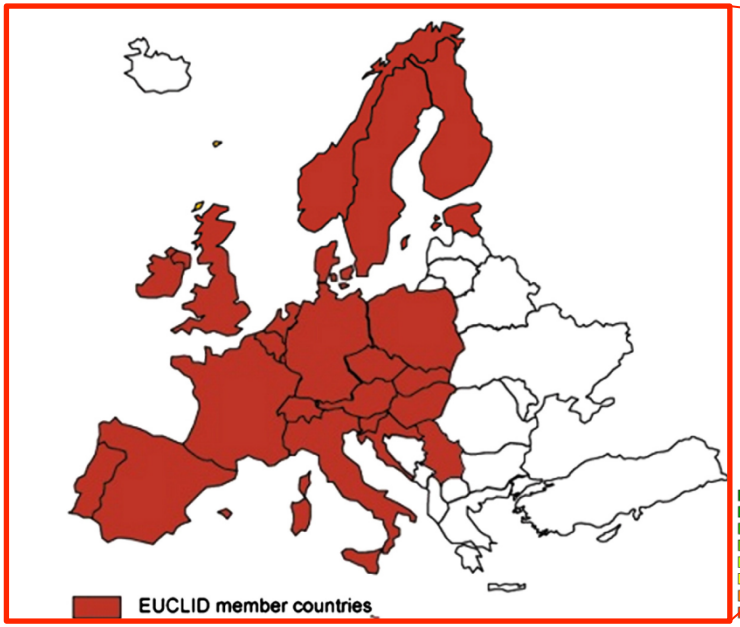
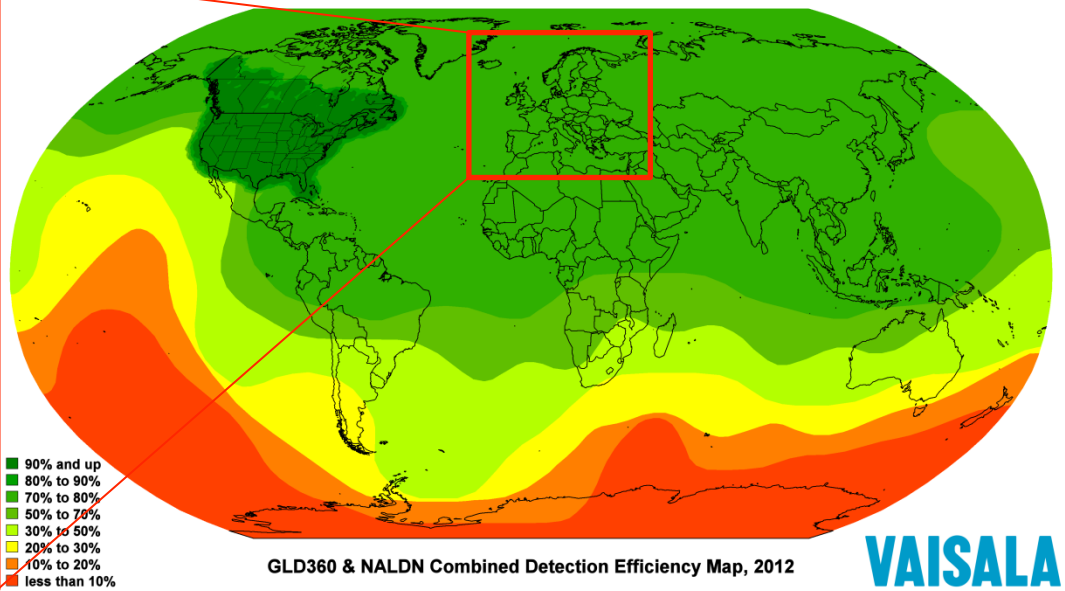
GLD360 and EUCLID lightning location systems

EUCLID



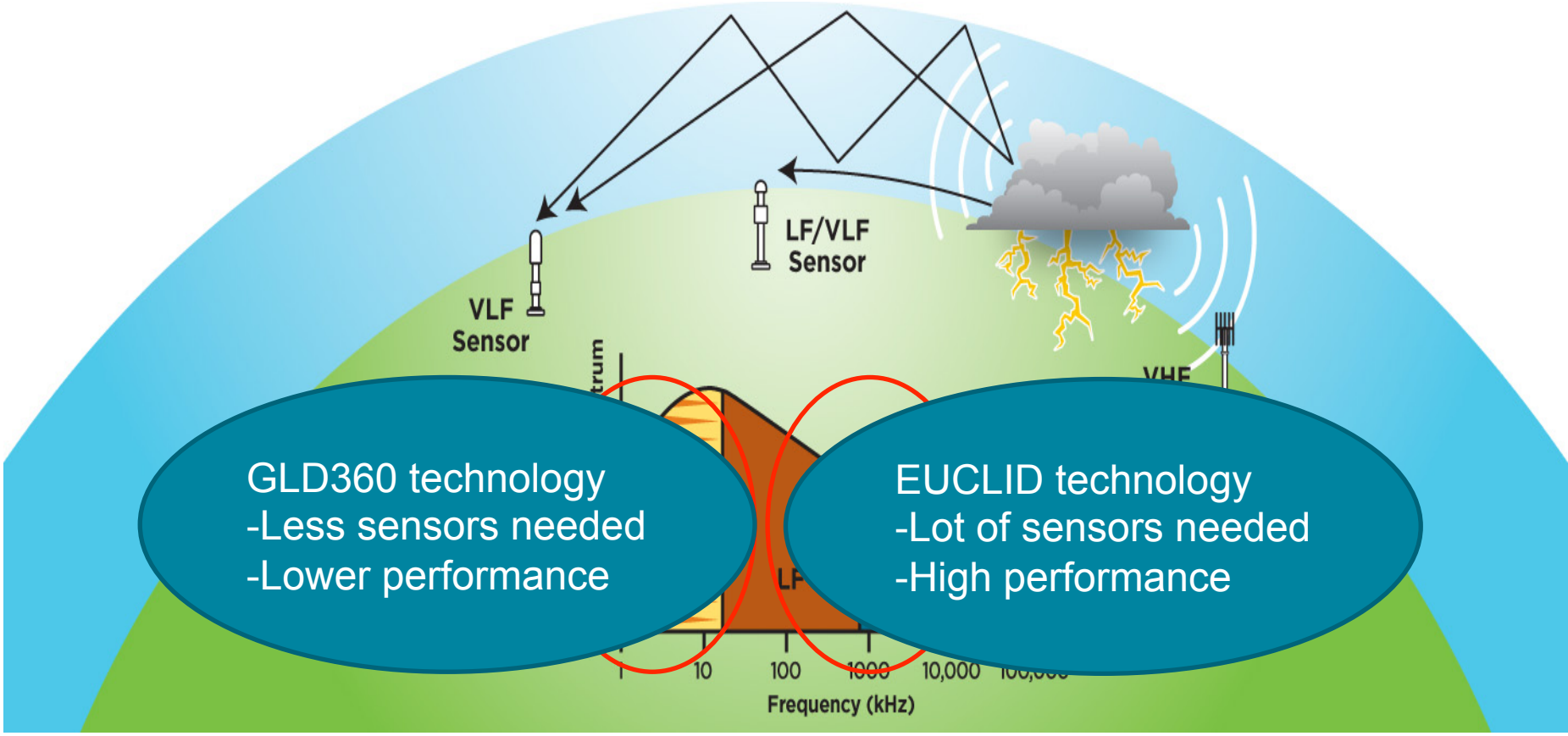
- **Eu**ropean **C**ooperation for **Li**ghtning **D**etection
- Raw sensor data from participating countries
- Centrally processed
- High performance detection efficiency
- Location accuracy some hundred meters typically

GLD360



- Vaisala owned and operated network
- Sensors installed all over the world
- Planned wide coverage
- Detection efficiency >70 %
- Location accuracy 1..5 km

GLD360 Technology is based on radio wave reflective propagation between the earth and the ionosphere



Data

- May – Sep 2011
  - 8 525 073 strokes for GLD360 and 6 846 690 for EUCLID
- The EUCLID data
  - First cloud-to-ground (CG) *strokes*
- Like any other LLS, detection efficiency is not 100%
  - Relative performance of the systems can be calculated
- All the comparisons in this study are relative to EUCLID or vice versa
- Relieves interesting features of both networks

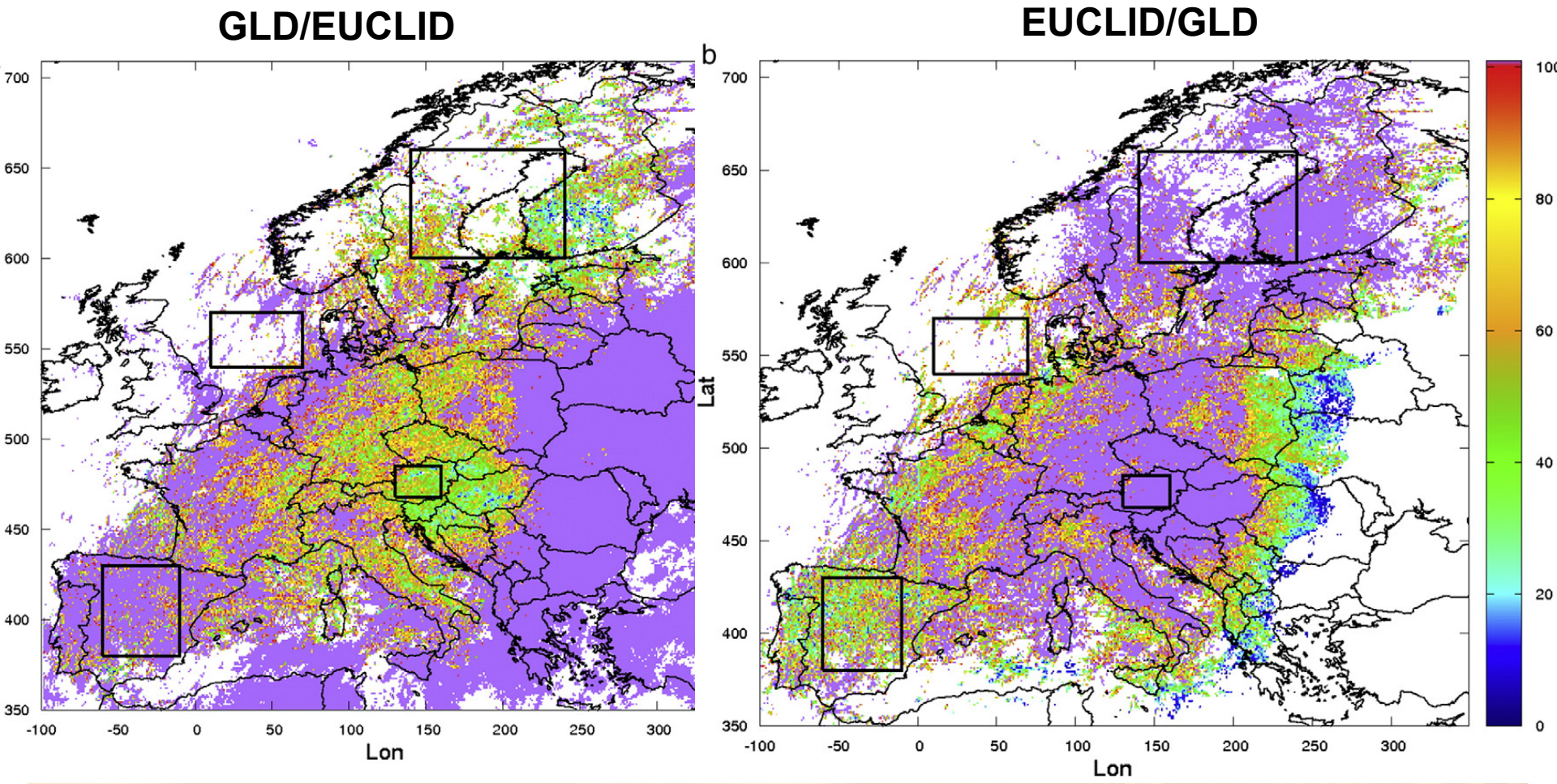
Relative detection efficiency (RDE) and relative location accuracy (RLA)

- **Relative detection efficiency** means the ratio between the located and actually occurred strokes

$$RDE = Number\ of\ GLD\ strokes / Number\ of\ EUCLID\ strokes$$

- The **relative location accuracy** indicates how precisely the occurrence point of lightning can be determined in a certain time window (0,1 ms)

Relative detection efficiency of GLD360 and EUCLID



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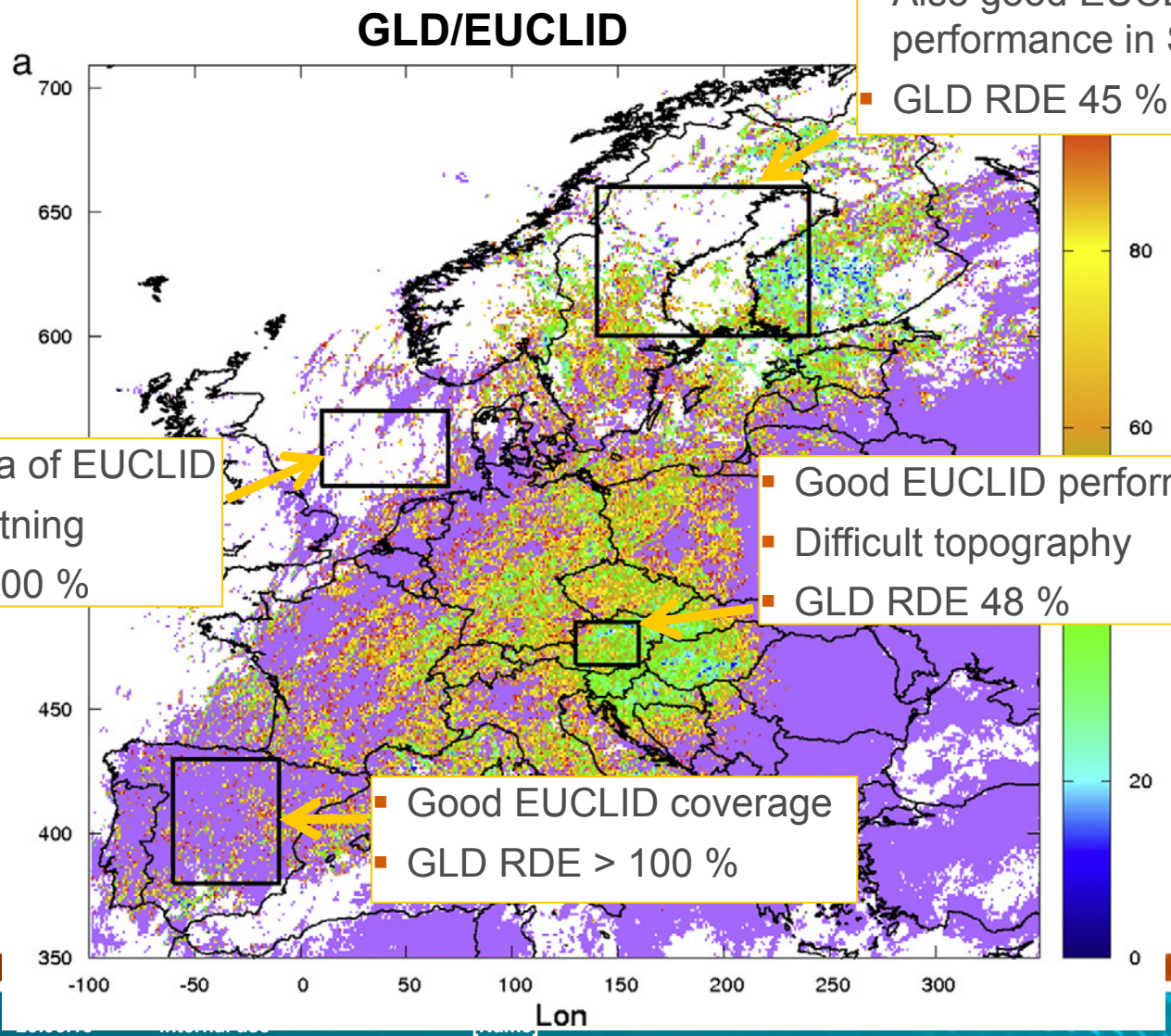
Relative detection efficiency in Austria, North Sea, Scandinavia and Spain



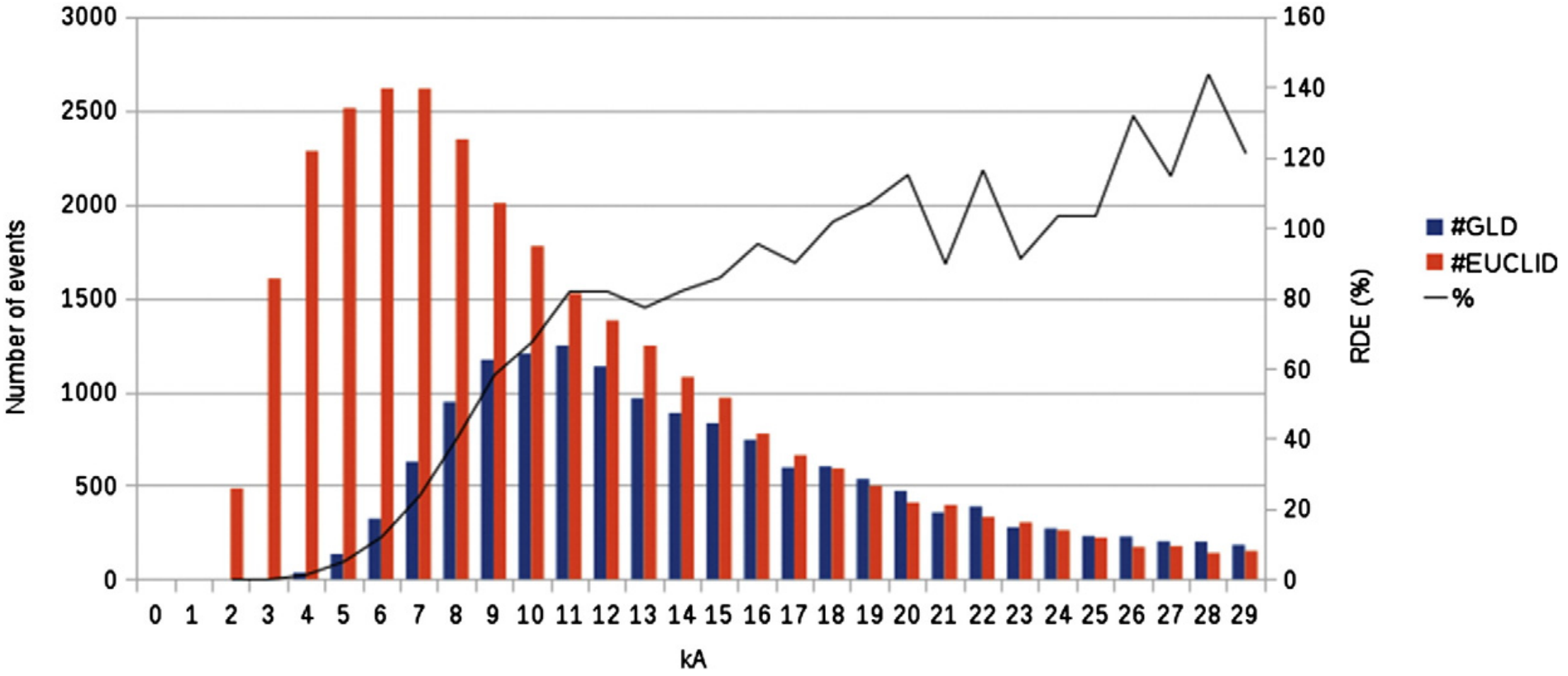
- Also good EUCLID performance in Scandinavia
- GLD RDE 45 %

- Boundary area of EUCLID
- Not much lightning
- GLD RDE > 100 %

- Good EUCLID performance
- Difficult topography
- GLD RDE 48 %

- Good EUCLID coverage
- GLD RDE > 100 %

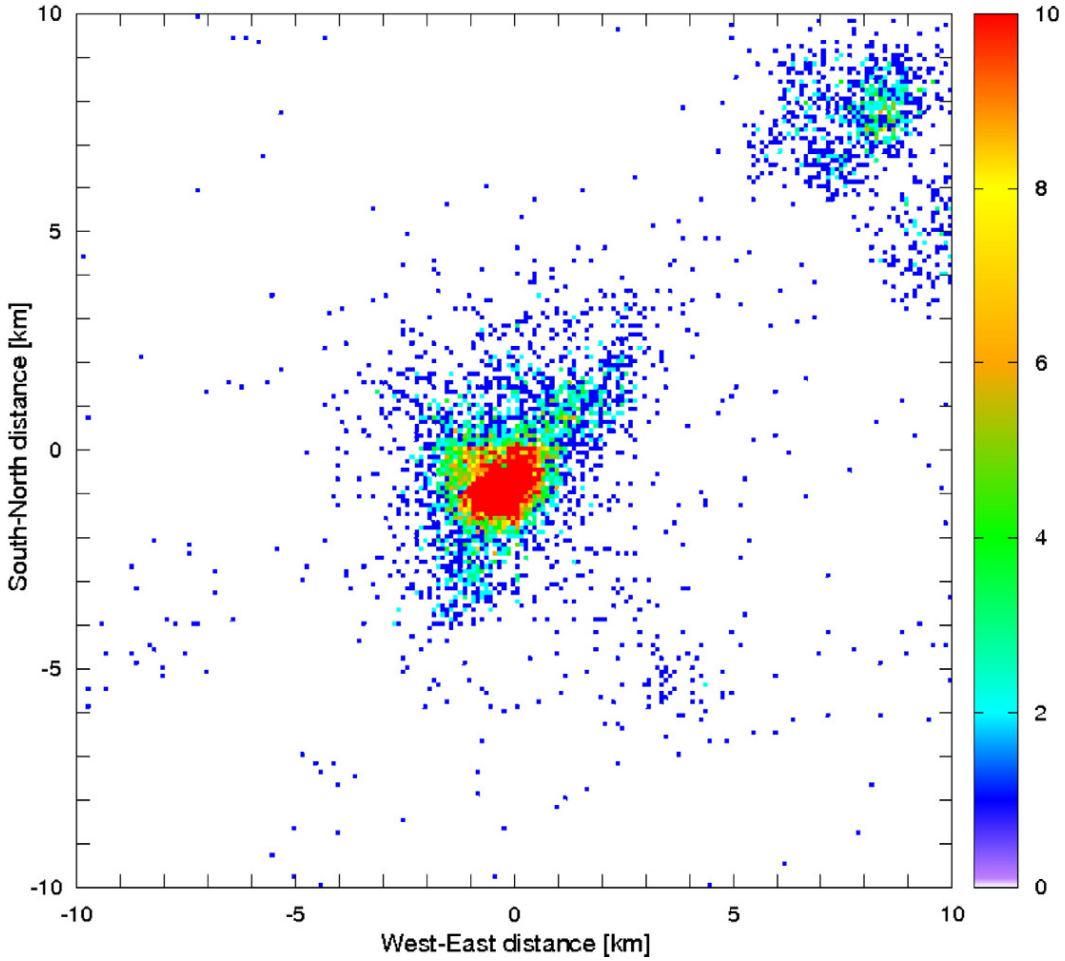
Relative detection efficiency of GLD360 and peak currents in Austria in July 2011



Relative location accuracy; EUCLID at the origin

- Corresponding strokes in July 2011 in Austria
- Time window of 0.1 ms
- The total number of temporally common events is 9418

  - Mean RLA 3,8 km
  - Median RLA 1,5 km



Conclusions

- Single value for the relative cloud-to-ground stroke detection effiency (RDE) cannot be given because of the large variation
  - EUCLID detects more in the areas where the sensor density is large
  - GLD detects more in the areas where sensor density is small
- Quick drop of EUCLID RDE in boundary areas maybe even more dramatic than anticipated before
- In Austria in July 2011 GLD360 relative detection efficiency for cloud-to-ground ***strokes*** is 48 %
  - This reveals that Vaisala claimed 70 % absolute detection efficiency for cloud-to-ground ***flashes*** is relevant in Europe
- The mean and median relative location accuracies are 3,8 km and 1,5 km, respectively

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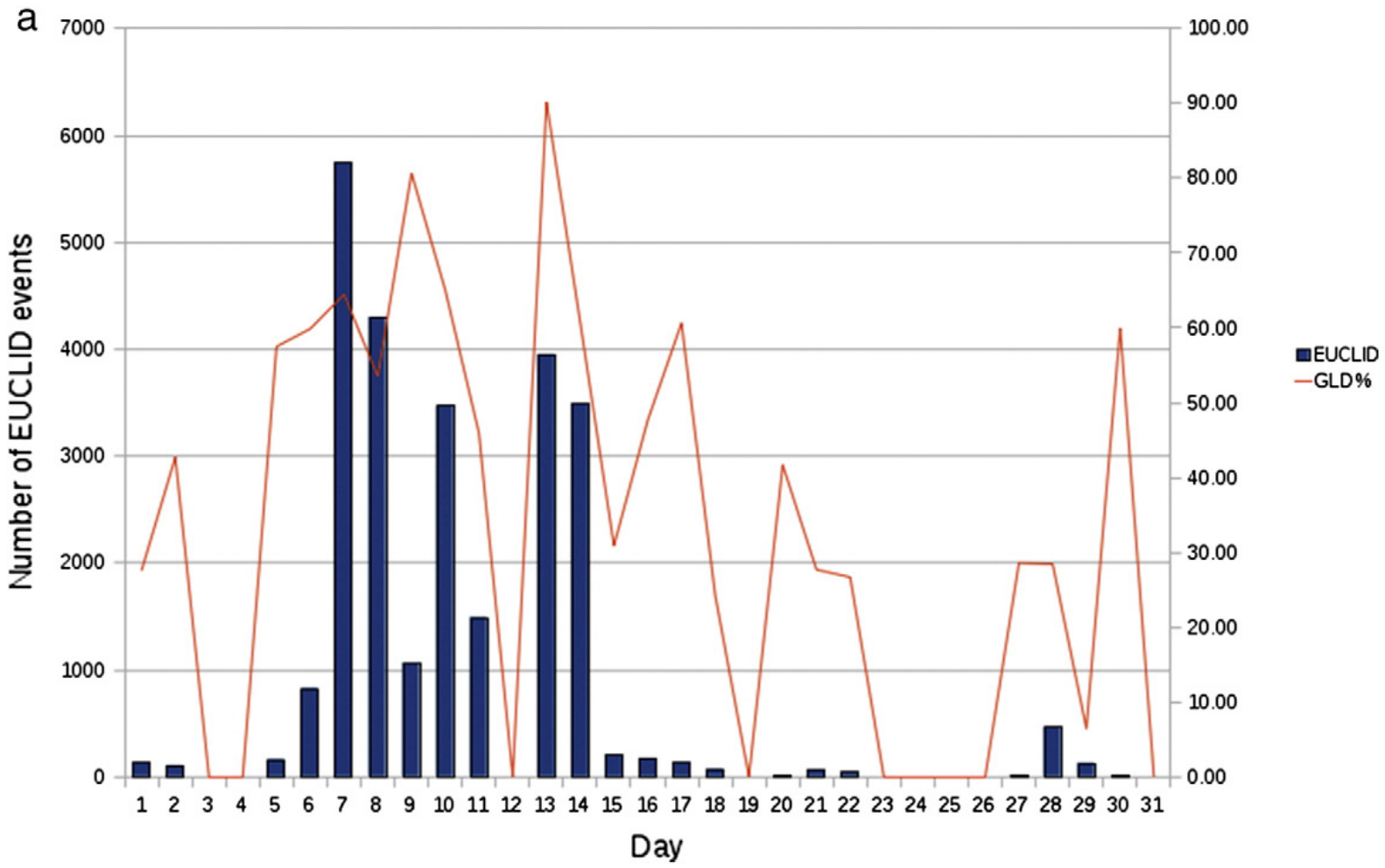
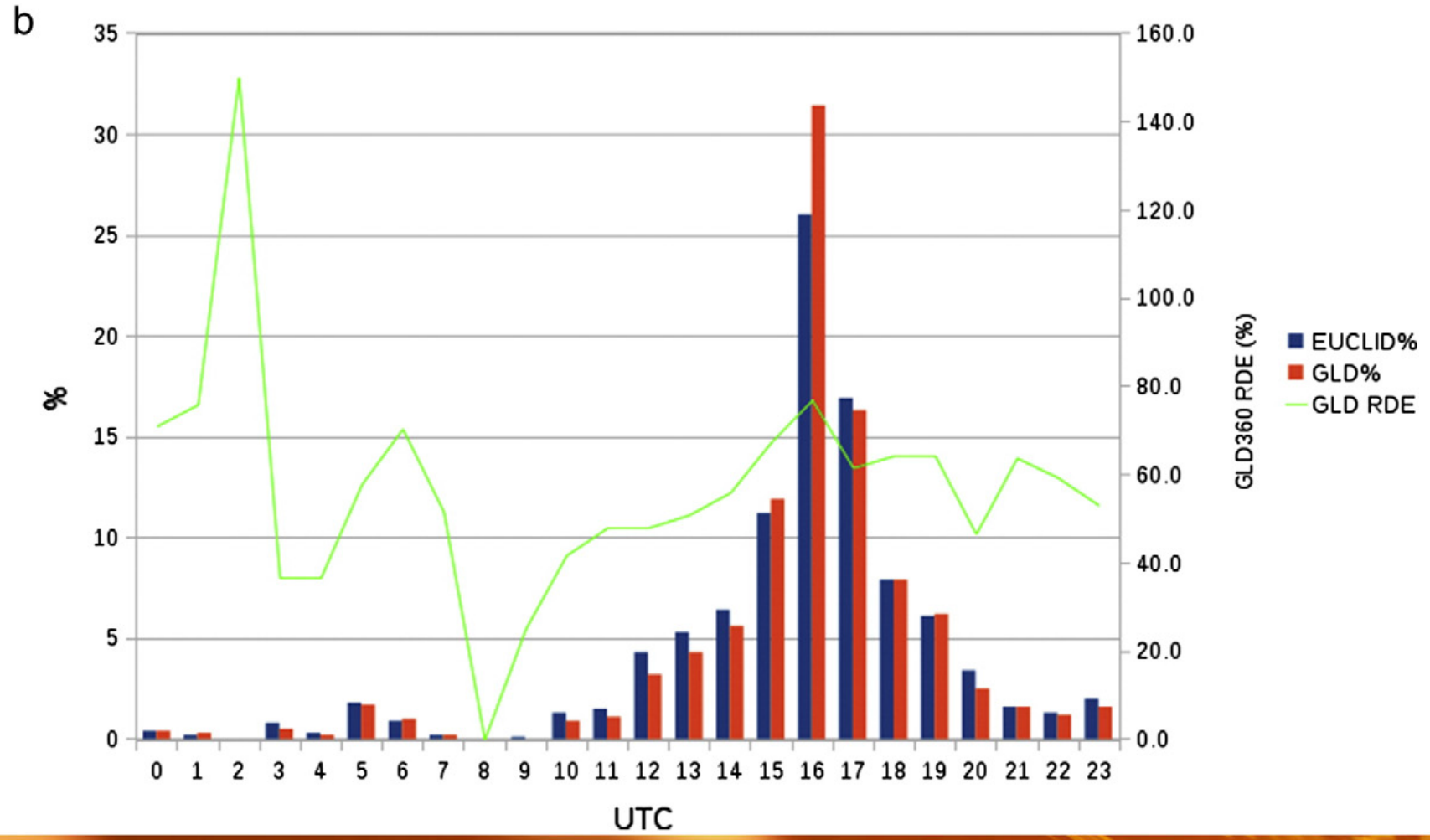
GLD and EUCLID day-to-day variation of located lightning in Austria in July 2011



Average hour-to-hour variation of located lightning in Austria in July 2011



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