EUCLID: 15 years of high resolution lightning observations over Europe

Stéphane Pédeboy
Centro Alti Studi per la Difesa (CASD) – ROMA – ITALY
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What is EUCLID?

- **EUCLID (EUropean Cooperation for Lightning Detection)** is a European cooperation among national LLS.

- Started in 2001 with 6 countries it has grown over the years to 27 countries nowadays.

- A total of 149 Vaisala’s technology sensors (2014/12) are concentrated as one seamless network.
  - LS700X: **101**
  - IMPACT: **41**
  - LPATS: **7**

www.euclid.org
Missions and goals

• Establish a united network covering the greater part of the European continent on a cooperation basis.

• Benefit the members by delivering an extended lightning data coverage to neighboring regions for their services or internal usage.

• Have a common European forum for discussion, maintenance, technical solutions, and network optimization.

• Provide services on wide areas (multinational) to different customers.

• Support research and scientific projects that will lead directly to new applications of lightning data.
Technology

• Each sensor detects the electromagnetic signal emitted by the lightning return stroke in the LF bandwidth:
  – Sensors are time synchronized using GPS Satellite signals
  – Sensors measures angle bearing, time of arrival and waveform parameters (rise time, decay time and peak)
    • CG return strokes
    • CC vertical discharges
  – Send data in real time simultaneously to two redundant lightning analyzers

• Each lightning analyzer uses the a combined TOA and MDF technology (IMPACT)
  – Corrects angle and time measurements from systematical errors
  – Computes the stroke parameters (time, position, peak current intensity, polarity)
  – Groups consistent return strokes in flashes (based on distance and time)
  – Estimate the theoretical location error for each strokes (SMA and CHI²)

• The resulting data are sent to the Euclid service operational center.
  – This leads to a complete picture of lightning activity in real time.
  – All lightning data collected is archived as well for post-storm analysis.
Sensors and coverage

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Quality control

• The European LLS is permanently monitored by ALDIS (Austria)
  – Real time monitoring (in addition to the national LLS operators)
  – Data quality control with monthly report
  – Angle and time measurement corrections
    • Used by EUCLID and shared with all the national LLS operators.
  – Overall performances control (LA and DE)
    • Gaisberg Tower
    • Mobile High speed video and E-Field measurements

• The services platform is permanently monitored by Météorage (France)
  – Real time monitoring of the services
  – Consistency checks on the lightning database
  – Engineer on duty 24h/24 – 7d/7
EUCLID contribute to several science projects:

– EUROSPRITE campaigns (since 2004)
– HyMeX (HYdrological cycle in Mediterranean EXperiment)
– Estofex (European Storm Forecast Experiment)
– Several EPFL research projects
– Several ZAMG research projects (e.g. 3pclim, HAREN, EDHIT)
Conclusion

• EUCLID is a European cooperation among 27 countries covering the almost complete EUROPE started 15 years ago and constantly improving.

• EUCLID provides homogenous high resolution data permanently scientifically controlled against ground truth data.

• EUCLID is the historical lightning data provider whose data have been used in quite a number of scientific projects