COMPARISON OF THE UNITED STATES PRECISION LIGHTNING NETWORK™ (USPLN™) AND THE CLOUD-TO-GROUND LIGHTNING SURVEILLANCE SYSTEM (CGLSS)

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Introduction and Background

- USPLN Stroke DE vs. CGLSS
- 12.33%
- 15 June 2010
- Network was sensitive to sensor outages which impacted 7
- Used for total lightning detection at KSC/CCAFS

Data and Methodology

- **Data Sources**
  - CGLSS-II stroke data: 45 WS and NASA Spaceport Radar Data Archives
  - USPLN stroke data: WSI
  - 4DLSS: NASA Spaceport Weather Data Archives
  - 95% confidence CGLSS-II location errors
- **Sensor Outages**
  - LE VAR LE VAR
  - Zero 1.410 0.125 1.190 0.294 0.682 0.284
  - 1.981
  - 1.672 1.564 0.749 0.291

- **USPLN Stroke DE:** CGLSS sensor outages occurred
- **USPLN Stroke DE:** Derived Stroke DE curves by calculating DE
- **USPLN Stroke DE:** Derived Stroke DE curves by calculating DE
- **USPLN Stroke DE:** Held steady for each stroke rate and plotted stroke DE versus CGLSS-II stroke rate to view a possible relationship

Future Work

- Additional Study Options
  - Additional stroke-stroke comparative studies
  - Other local networks (NASA Spaceport Radar Data Archives)

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Selected References


USPLN 95% Confidence Stroke Location Error (km)

- **Case Studies:** 4DLSS Classification Results
- Class 5 September 2009 15 June 2010
- True CGLSS
- Corrected CGLSS
- Missclassified CGLSS
- Phantom
- Unclassified
- Total Strokes
- 34 154 100 0.060 0.080 0.100 0.120
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- 34 154 100 0.060 0.080 0.100 0.120

- **Radar Analysis:** Classified “Phantom” Strokes
- Dataset for stroke DE and location accuracy analyses
- WEATHER STATION INTEGRATION (WSI 2010)
- Time-Correlated USPLN Florida Sensor Locations
- Distance: ≤ 15 km between both stroke locations
- Stratified into the following sub-periods:

<table>
<thead>
<tr>
<th>Sub-Period</th>
<th>Dates</th>
<th>Defining Events</th>
</tr>
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</table>
| | 1 Aug 2010 – 30 Jun 2010 | 1 Aug 2010: CGLSS-II vendor configuration software reset

- **USPLN Stroke DE:** Derived Stroke DE curves by calculating DE
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- **USPLN Stroke DE:** Peak current variation
- **USPLN Stroke DE:** Previous studies had shown a relationship between stroke DE and stroke peak current
- **Method 2:** discrete plots
- **Pitted-Dahl characteristics:** Derived Stroke DE curves by calculating DE
- **Stroke rate variation:** Did the USPLN performance change with little or without lightning activity?
- **Derived CGLSS-II stroke rates:** (strokes km/h) ever when zero sensor outages occurred
- **Determined USPLN stroke DE for each stroke rate and plotted stroke DE versus CGLSS-II stroke rate to view a possible relationship

Discussion

- **USPLN Strengths**
  - Clear improvement in performance recently, highlighted by strong performance metrics in sub-period III
  - Excellent detection of strong current strokes

Selected References