Lightning Studies at

Florida State University

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Florida is the lightning capital of USA
Objectives

Determine local forcings for thunderstorms and associated cloud-to-ground lightning

- Sea Breezes
- River Breezes
- Lakes
- Urban Effects
- Shape of the Coastline
- Topography

“Lightning Alley”
Data Used

Detection Efficiency:
~80%

Location Accuracy:
~500 m
Focus on Florida and Northern Gulf Coast

- Sea breeze is important
- Limited to warm season
  - May to September
  - No large-scale synoptic forcing
Daytime (a) and nocturnal (b) lightning flash densities for the northern Gulf Coast and the state of Florida

(After Lericos et al. 2002)

(After Smith et al. 2005)
Climatology – Flow Regimes

Florida Panhandle flow regime days

Example of hourly flash amounts

- Flow regimes based on morning radiosondes
- Morning selected to prevent contamination with afternoon convection
Climatology – Flow Regimes

The effect on flash density with flow regime

Calm Flow  Easterly Flow  Westerly Flow
Forecasting Lightning

Florida Power and Light Corp. domains

Separating days of lightning activity into quartiles

BROWARD DOMAIN

<table>
<thead>
<tr>
<th>Lightning Quartile</th>
<th>Number of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>1 to 9 flashes</td>
</tr>
<tr>
<td>Q2</td>
<td>10 to 47 flashes</td>
</tr>
<tr>
<td>Q3</td>
<td>48 to 143 flashes</td>
</tr>
<tr>
<td>Q4</td>
<td>&gt;143 flashes</td>
</tr>
</tbody>
</table>

1 to 9 flashes | 10 to 47 flashes | 48 to 143 flashes | >143 flashes |
Forecasting Lightning

Decision tree for Broward County flash amount forecasts

BROWARD DOMAIN

Q3/Q4 model

Prob ($\geq 48$ flashes)

< 0.52415

Prob ($< 10$ flashes)

Q1 model

$\geq 0.30983$

Q1

< 0.30983

Q2

Q4 model

$\geq 0.52415$

Prob ($> 143$ flashes)

$< 0.37292$

Q3

$\geq 0.37292$

Q4
Verification of Broward County flash amount forecasts

BROWARD DOMAIN

Cross-Validated Hit Rate

Year Tested

Model
Persistence
Current Lightning Work

Forecasting lightning probability in the Southwest

Objectives

- Use 18Z model data
- Use topography
- Create AWIPS tool
  - Forecast maps
  - Show initiation for non-boundary forced events

Initiation (1st 10% from initiation Time at 1800 UTC) S, SE flow
Current Lightning Work

Objectives

- Investigate cessation characteristics
- Develop cessation guideline and test
  - Develop with principle component analysis
  - Test with cross validation technique
Collaborators