Summertime Precipitation and Wind Regimes in Southern Mississippi and Eastern Louisiana

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Hard copies available at workshop

Electronic version will be in dropbox
Goal
Determine summertime precipitation and wind regimes in southern Mississippi and southeast Louisiana

Procedure
Composite wind and radar data
- Monthly averages
- Hourly averages
- Quality control (remove days with large-scale influences from fronts, low pressure systems, tropical systems)

- Understand variations from averages
  - Histogram plots and percentile plots
  - Linear regression analysis
  - Multiple regression analysis
Monthly composites of convective rain pixels for 2003 – 2005
102 of 276 days (no synoptic forcing)

7AM – 11AM

3PM – 7PM

JUNE

JULY

AUGUST

0 20 40 60 80 100 120 140 160

total radar pixels ≥ 30 dBZ
Wind composite for sea breeze days, June.
Wind composite for sea breeze days, July.
## My P-value interpretation

<table>
<thead>
<tr>
<th>P value range</th>
<th>Evidence that two datasets are different</th>
<th>Tabular symbol used</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 0.15</td>
<td>No difference</td>
<td></td>
</tr>
<tr>
<td>0.05 to 0.15</td>
<td>Suggestive, but inconclusive</td>
<td>^</td>
</tr>
<tr>
<td>0.01 to 0.05</td>
<td>Moderately convincing</td>
<td>*</td>
</tr>
<tr>
<td>0.001-0.01</td>
<td>Convincing</td>
<td>**</td>
</tr>
<tr>
<td>&lt; 0.001</td>
<td>Very convincing</td>
<td>***</td>
</tr>
</tbody>
</table>
Inshore/coastal rain coverage (NE sector 4)

Offshore rain coverage (SE sector 2)

Much more daytime inshore rain coverage in July versus June

Even though coverage is small, more daytime offshore rain in July versus June

Even though coverage is small, more nighttime inshore rain in August versus June

Much more nighttime and morning offshore rain coverage in August versus June
Stepwise Multiple Regression Analysis:

Upper-air quantities correlated against Areal Precipitation Coverage
(yellow > 99% significant level)

<table>
<thead>
<tr>
<th>SE sector (2)</th>
<th>NE sector (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land</strong></td>
<td><strong>Water</strong></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$R^2 = 4%$</td>
<td>$R^2 = 29%$</td>
</tr>
<tr>
<td>850-mb Wind direction = 0.19</td>
<td>PW = 0.48</td>
</tr>
<tr>
<td>CAPE = 0.26</td>
<td>Td850 = -0.18</td>
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<tr>
<td>$R^2 = 19%$</td>
<td>$R^2 = 6%$</td>
</tr>
<tr>
<td>PW = 0.37</td>
<td>PW = 0.23</td>
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<tr>
<td>CAPE = 0.29</td>
<td>850-mb Wind direction = 0.11</td>
</tr>
<tr>
<td>T850-T500 = -0.21</td>
<td>Td850 = -0.16</td>
</tr>
<tr>
<td>Td850 = -0.18</td>
<td>T850-T500 = -0.21</td>
</tr>
<tr>
<td>Td850 = -0.16</td>
<td>Td850 = -0.18</td>
</tr>
</tbody>
</table>

**7 - 11 AM (land breeze convection)**  
**3 - 7 PM (sea breeze convection)**

For all 24 cases (Sectors 1-4, 6 four-h periods), at 90-100% significance level, PW occurs 17 times, CAPE 11 times, wind direction 3 times, Td850 5 times, and lapse rate 4 times.

KI and 700-DD were only occasionally selected in stepwise routine, and rarely >90% significant.
### Table: mm to inches Conversion

<table>
<thead>
<tr>
<th>mm</th>
<th>inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>1.2</td>
</tr>
<tr>
<td>35</td>
<td>1.4</td>
</tr>
<tr>
<td>40</td>
<td>1.6</td>
</tr>
<tr>
<td>45</td>
<td>1.8</td>
</tr>
<tr>
<td>50</td>
<td>2.0</td>
</tr>
<tr>
<td>55</td>
<td>2.2</td>
</tr>
</tbody>
</table>

### Graphs

#### a) 07-11 CDT, sec. 4
- **NE Sector Land**
  - \( r^2 = 0\% \)

#### b) 07-11 CDT, sec. 2
- **SE Sector Water**
  - \( r^2 = 9\% \)

#### c) 15-19 CDT, sec. 4
- **NE Sector Land**
  - \( r^2 = 21\% \)

#### d) 15-19 CDT, sec. 2
- **SE Sector Water**
  - \( r^2 = 5\% \)
2003 – 2005 Slidell Precipitable Water, Sea Breeze Days Only

Slidell PW(June)(00z)  Slidell PW(July)(00z)  Slidell PW(August)(00z)

(7PM)

Counts

PW(mm)

15 20 25 30 35 40 45 50 55 60 65 70

15 20 25 30 35 40 45 50 55 60 65 70

15 20 25 30 35 40 45 50 55 60 65 70

Slidell PW(June)(12z)  Slidell PW(July)(12z)  Slidell PW(August)(12z)

(7AM)

Counts

PW(mm)

15 20 25 30 35 40 45 50 55 60 65 70

15 20 25 30 35 40 45 50 55 60 65 70

15 20 25 30 35 40 45 50 55 60 65 70
2003 – 2005 Slidell CAPE, Sea Breeze Days Only

Slidell CAPE(June)(00z)  Slidell CAPE(July)(00z)  Slidell CAPE(August)(00z)

Slidell CAPE(June)(12z)  Slidell CAPE(July)(12z)  Slidell CAPE(August)(12z)
Does POP correlate to areal coverage?

Generally, yes. But error margin is still apparent.
Does K-Index correlate to areal coverage?

Theoretically, yes.

In reality, no. But it does suggest an upper bound.
Summary of SE LA and MS

- Coastal diurnal patterns follow generally expected patterns, but regional and monthly climatology provides some additional considerations
- Nocturnal and sunrise offshore convection activity and land breeze impacts may not be as well communicated to offshore interests as daytime patterns
- PW signal generally the best indicator of rainfall coverage, followed weakly by CAPE, but much variance unexplained

Future work

- Similar studies for SW LA and TX coast
- More clarification on predictive signals for coastal summertime rainfall coverage
- Expand dataset beyond three years
- This can be done much faster since software already written, and methodology is peer-reviewed
- Can current models capture these regional evolutions better?
- With competitive grant funding rates decreasing to 10%, NOAA/NWS advocates for such studies more crucial than ever