Summertime Precipitation and Wind Regimes in Southern Mississippi and Eastern Louisiana

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Paper published in Weather and Forecasting

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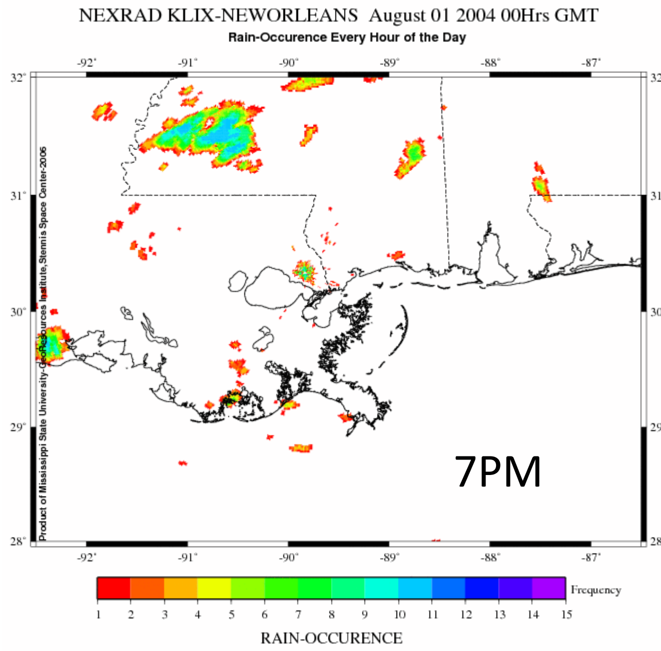
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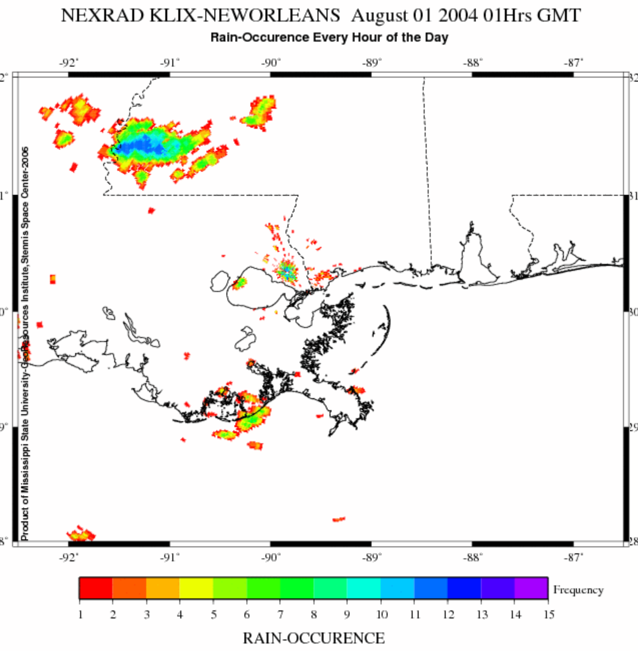
Rain-Occurence Every Hour of the Day
Product of Mississippi State University-GeoResources Institute, Stennis Space Center-2006
7PM
Frequency
RAIN-OCCURENCE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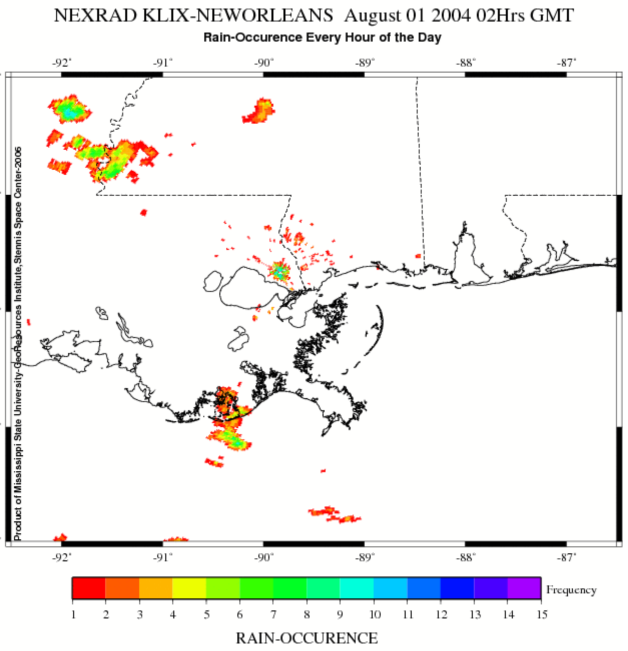
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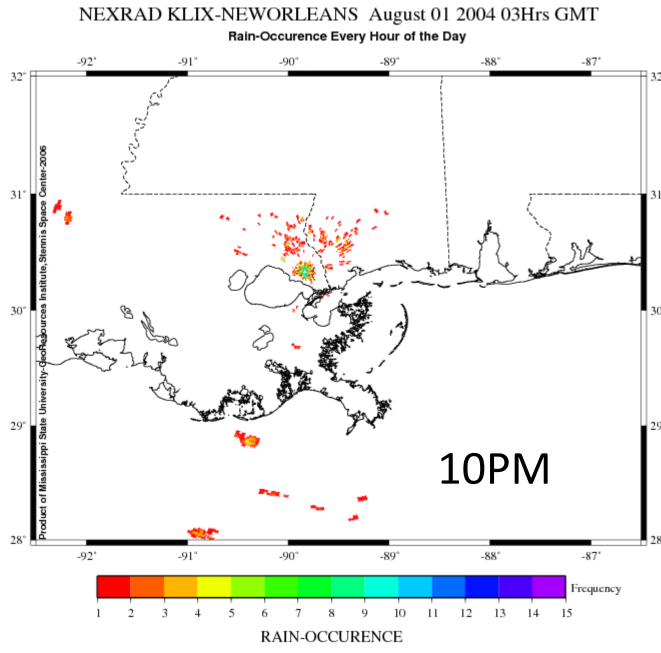
RAIN-OCCURENCE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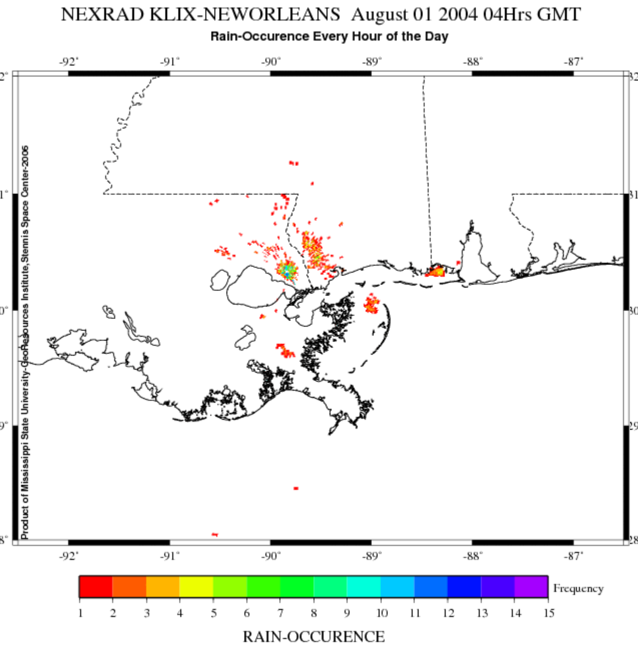
10PM
Frequency
RAIN-OCCURENCE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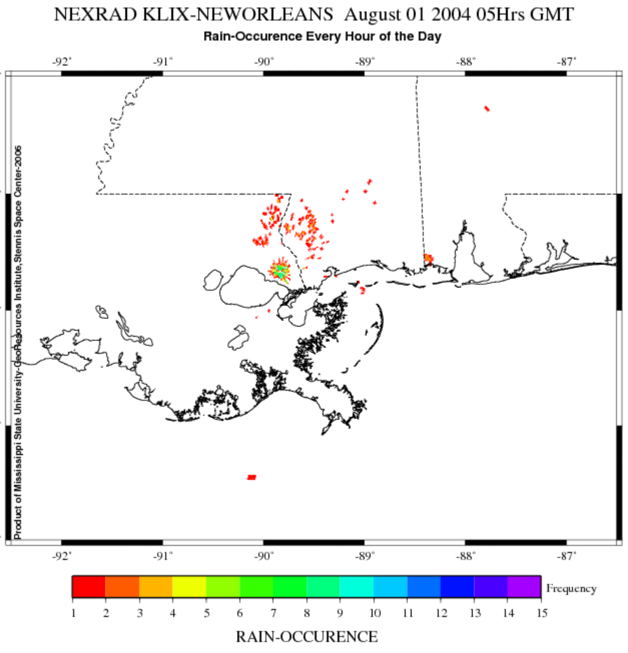
Rain-Occurence Every Hour of the Day
Frequency
RAIN-OCCURENCE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Rain-Occurence Every Hour of the Day
Frequency
RAIN-OCCURENCE

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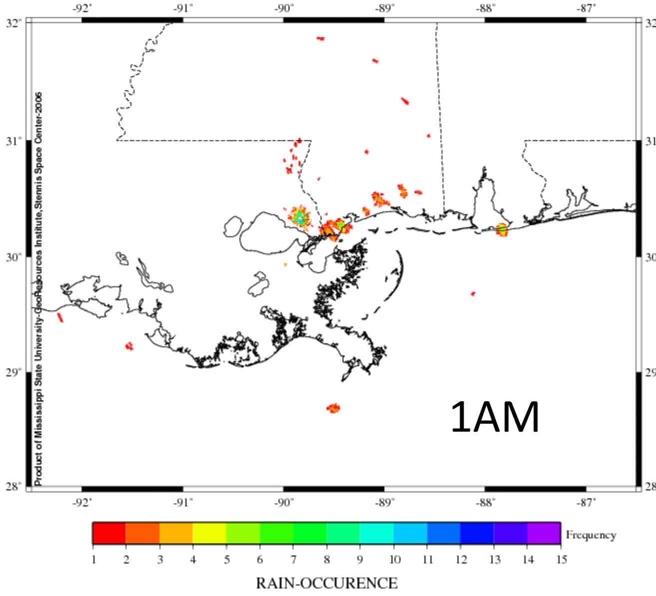
Rain-Occurence Every Hour of the Day



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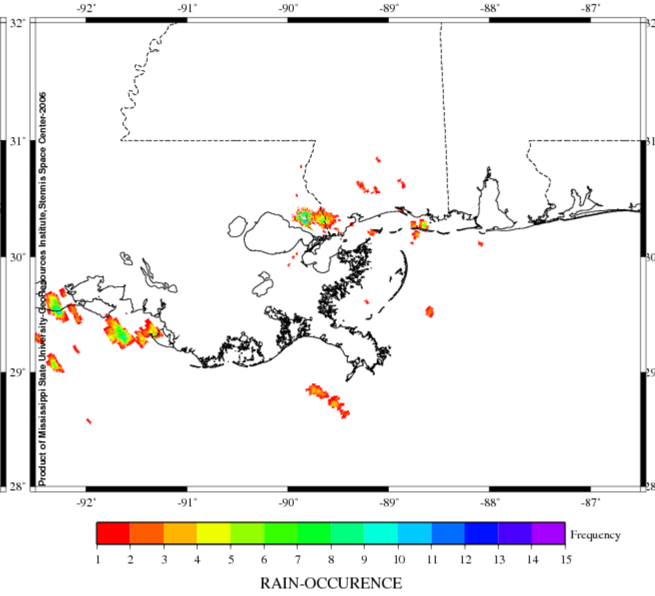

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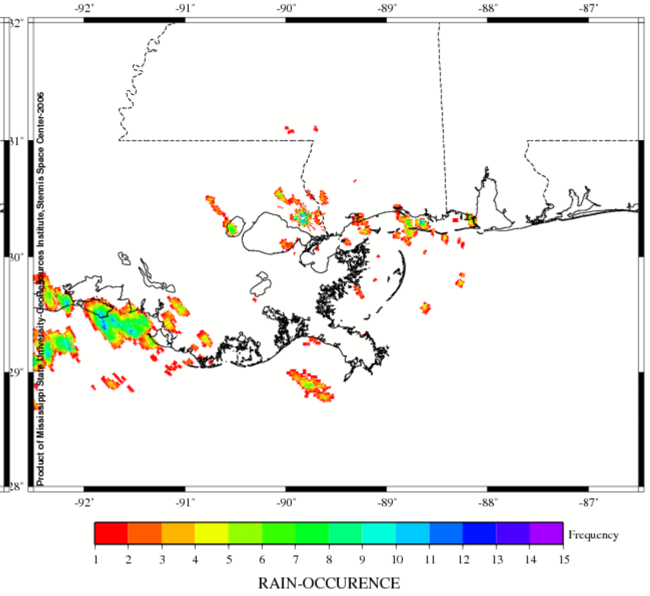

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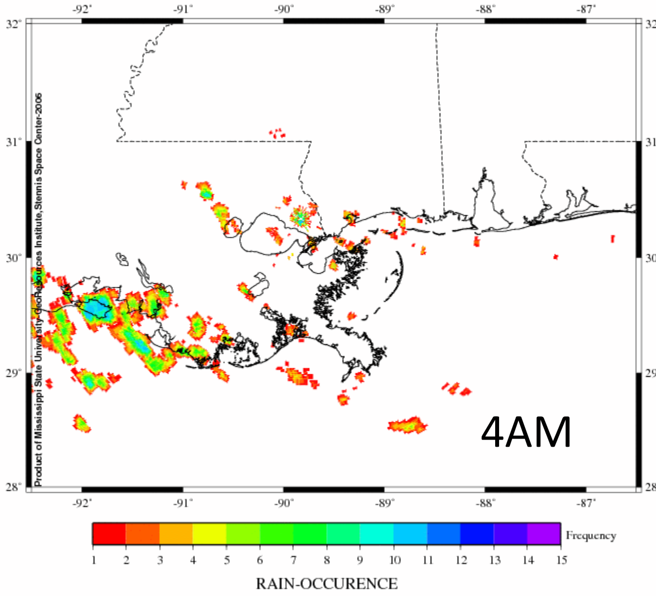

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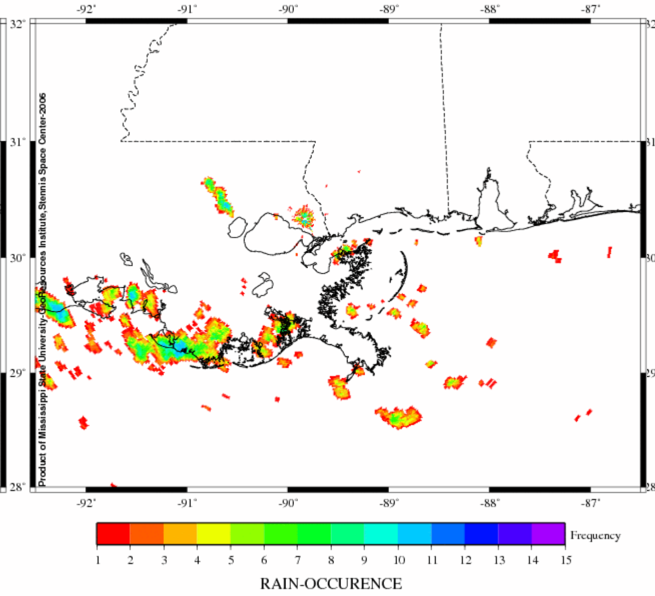

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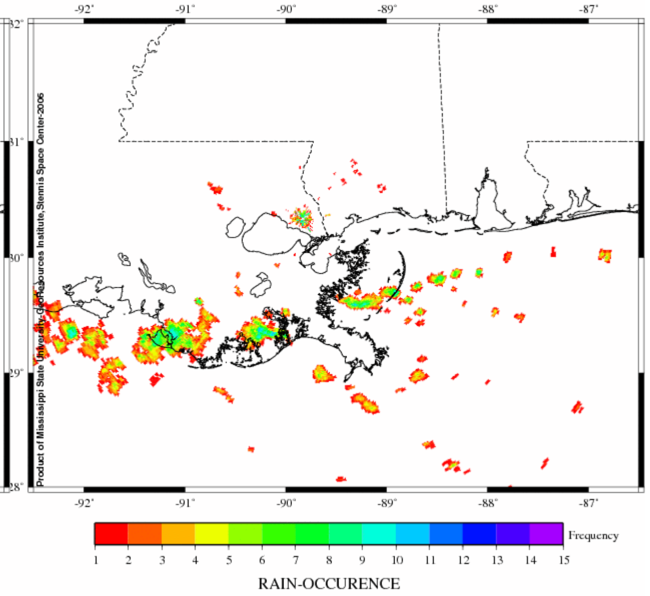

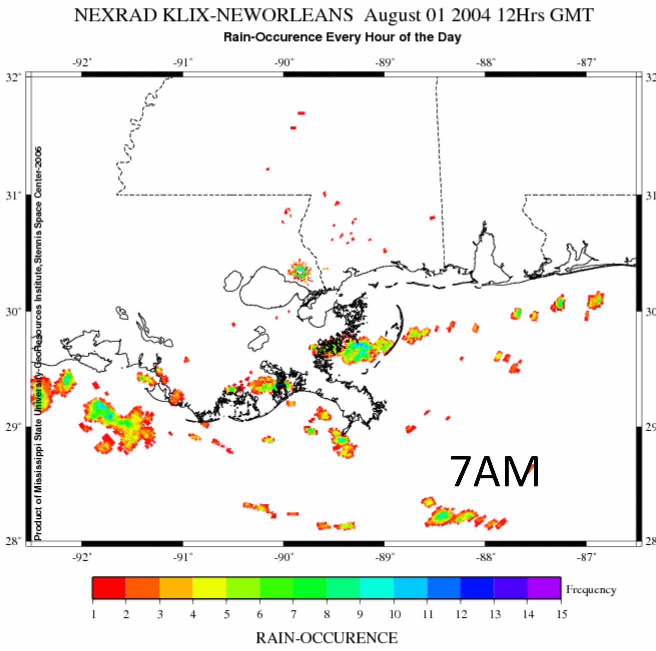
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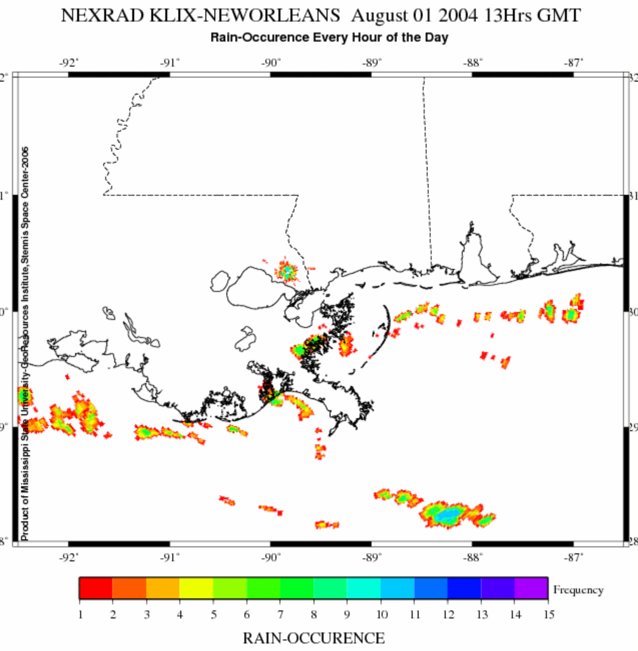
Rain-Occurence Every Hour of the Day
Product of Mississippi State University-GeoResources Institute,Stennis Space Center-2006
7AM
Frequency
RAIN-OCCURENCE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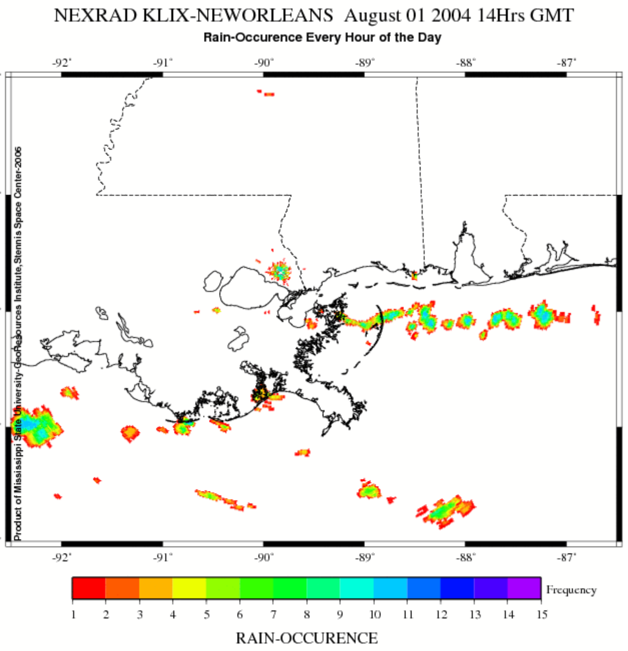
Product of Mississippi State University-GeoResources Institute,Stennis Space Center-2006
Frequency
RAIN-OCCURENCE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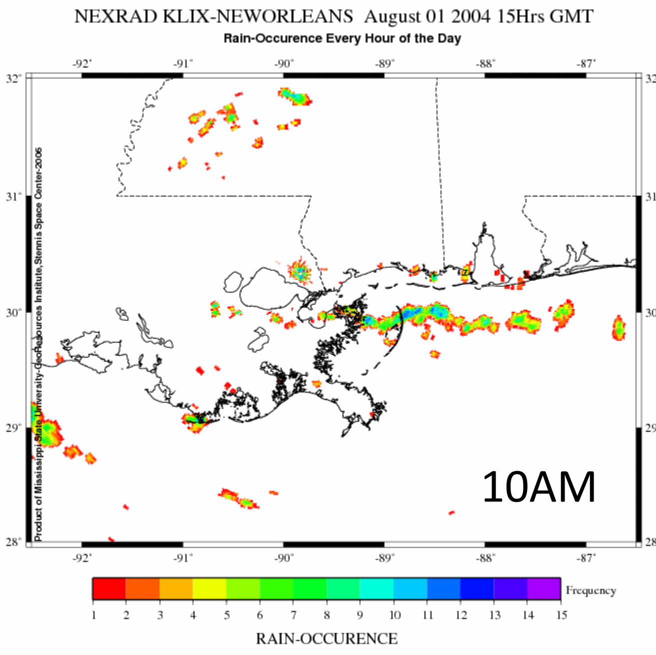
Frequency
RAIN-OCCURENCE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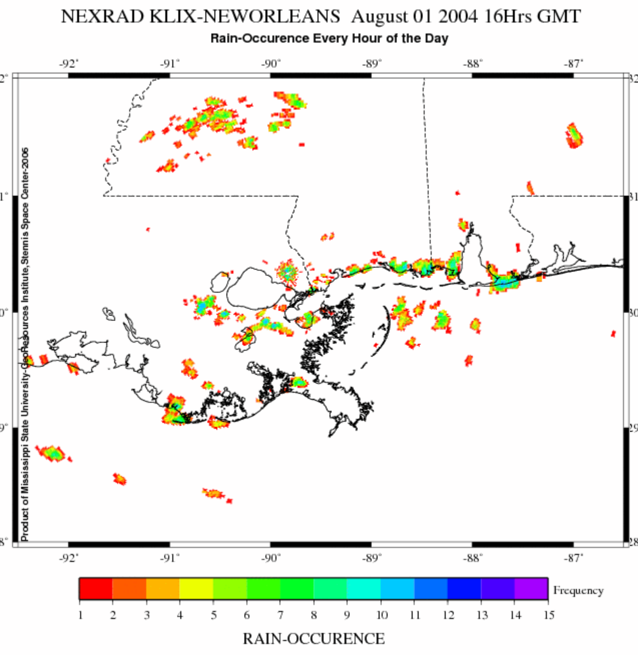
Product of Mississippi State University-GeoResources Institute,Stennis Space Center-2006
10AM
Frequency
RAIN-OCCURENCE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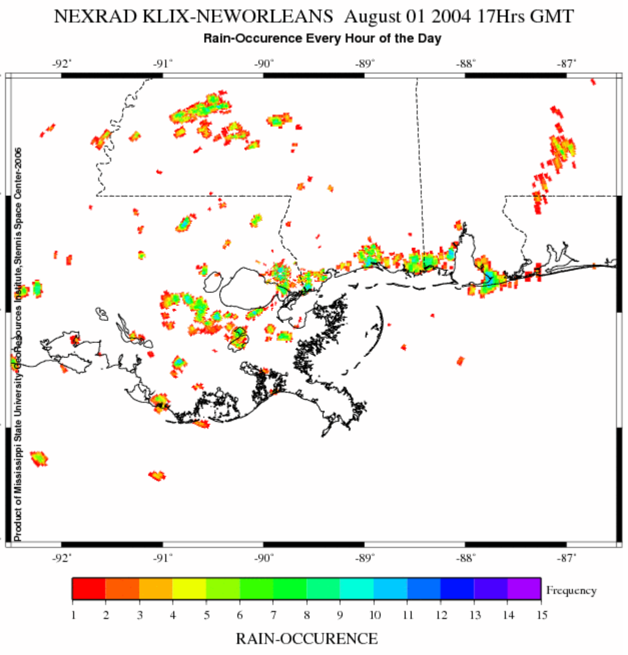
Frequency
RAIN-OCCURENCE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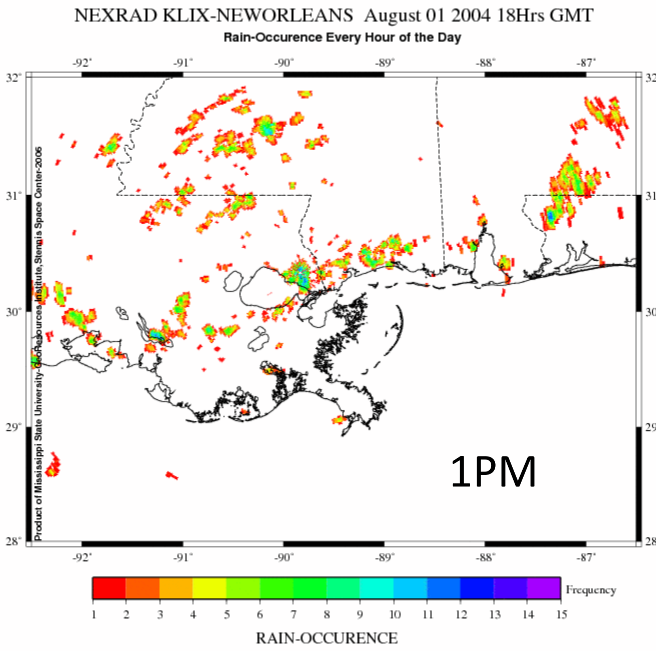
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Product of Mississippi State University-GeoResources Institute, Stennis Space Center-2006
-92° -91° -90° -89° -88° -87°
32° 31° 30° 29° 28°
1PM
Frequency
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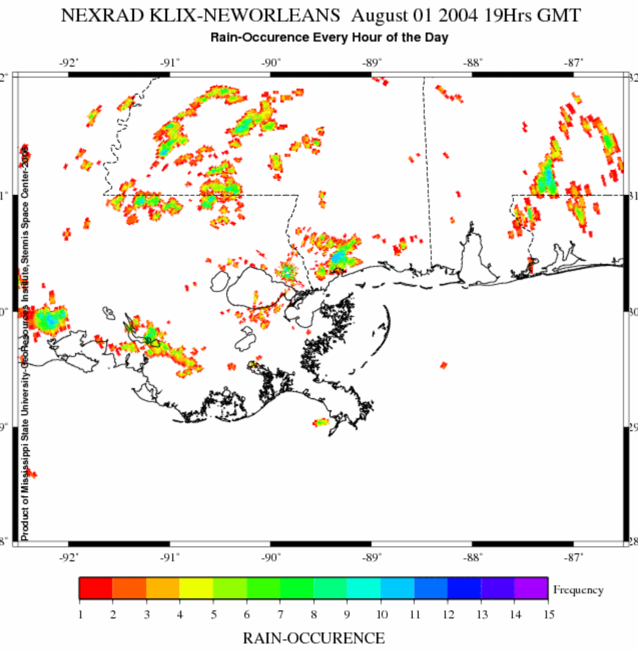
RAIN-OCCURENCE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Product of Mississippi State University-GeoResources Institute, Stennis Space Center-2006
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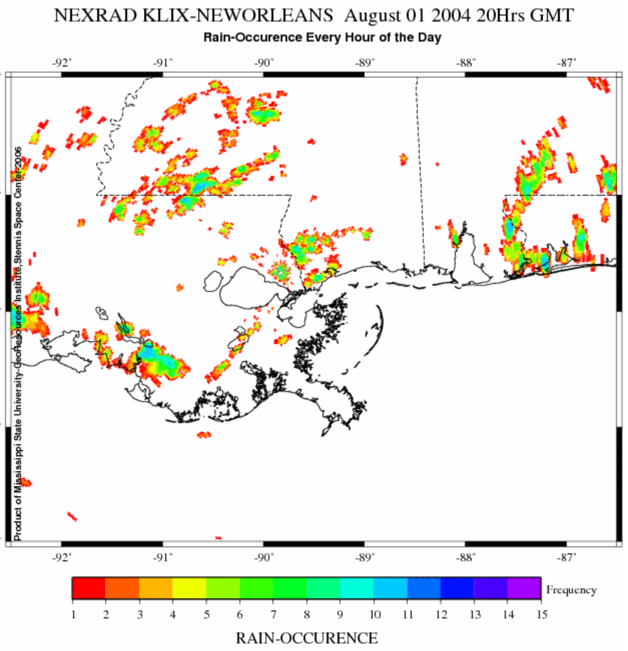
32° 31° 30° 29° 28°
Frequency
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
RAIN-OCCURENCE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Frequency
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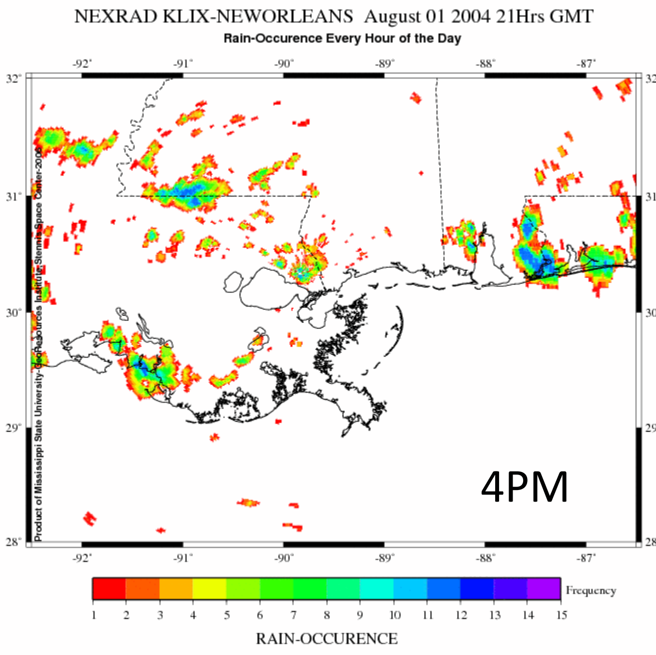
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4PM
Frequency
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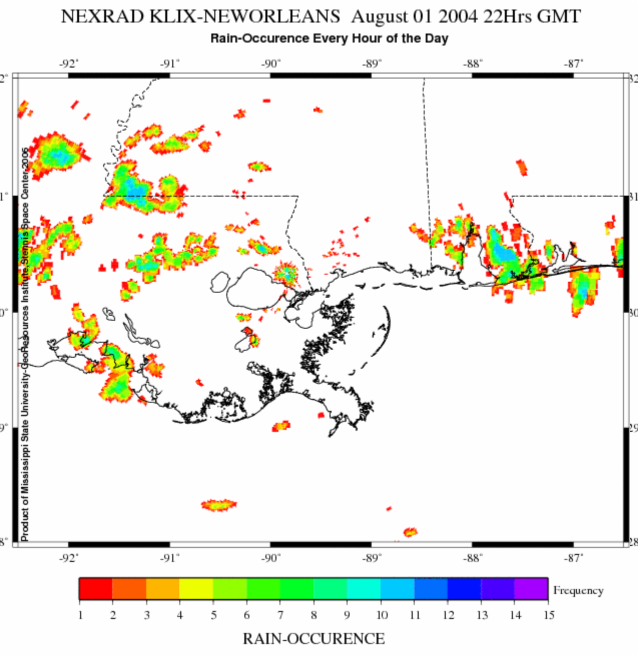
RAIN-OCCURENCE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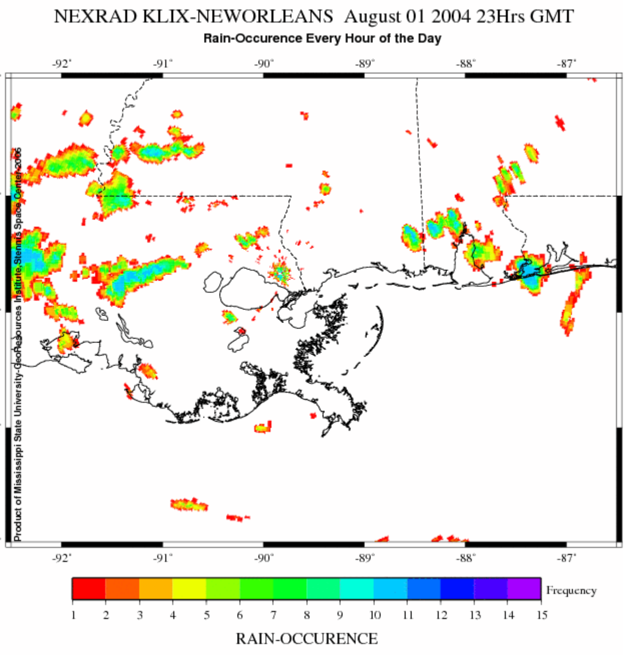
Frequency
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
RAIN-OCCURENCE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Product of Mississippi State University-GeoResources Institute, Stennis Space Center-2006
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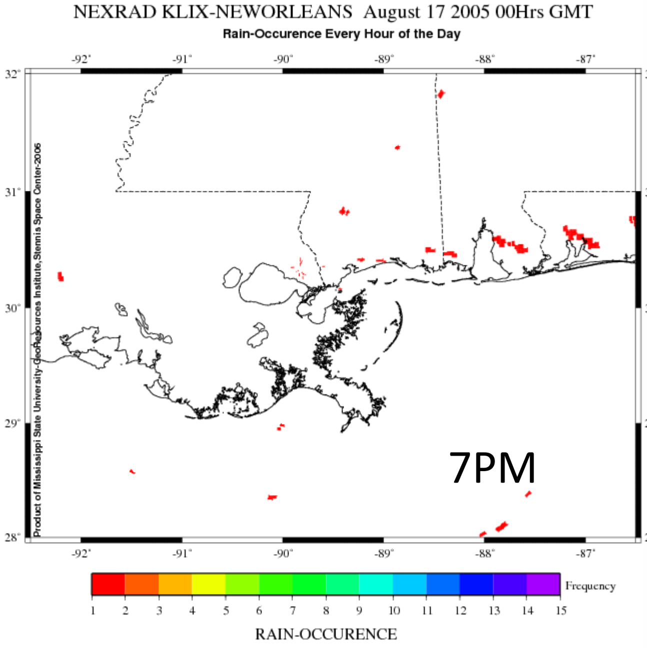
32° 31° 30° 29° 28°
Frequency
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
RAIN-OCCURENCE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Rain-Occurence Every Hour of the Day
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7PM
Frequency
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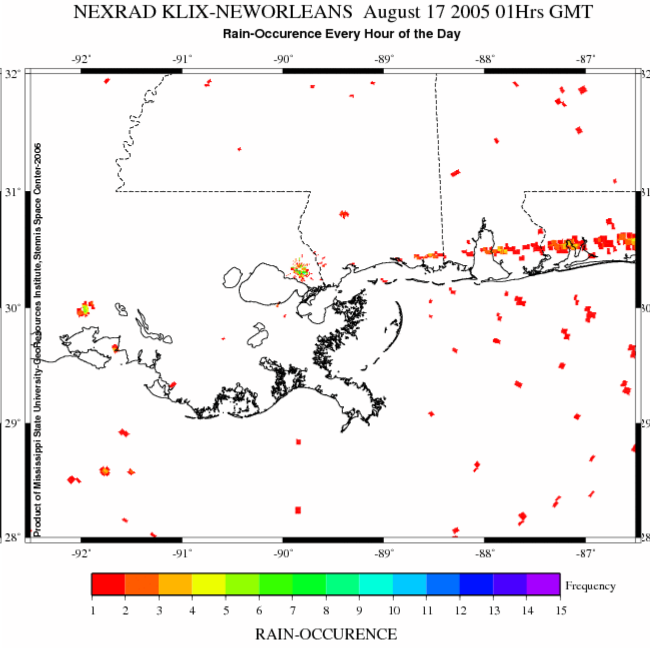
RAIN-OCCURENCE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Frequency
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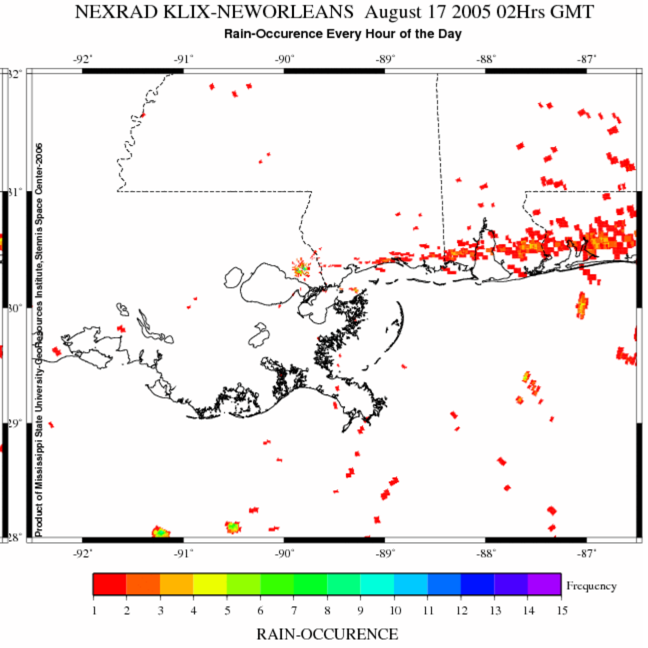
RAIN-OCCURENCE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Frequency
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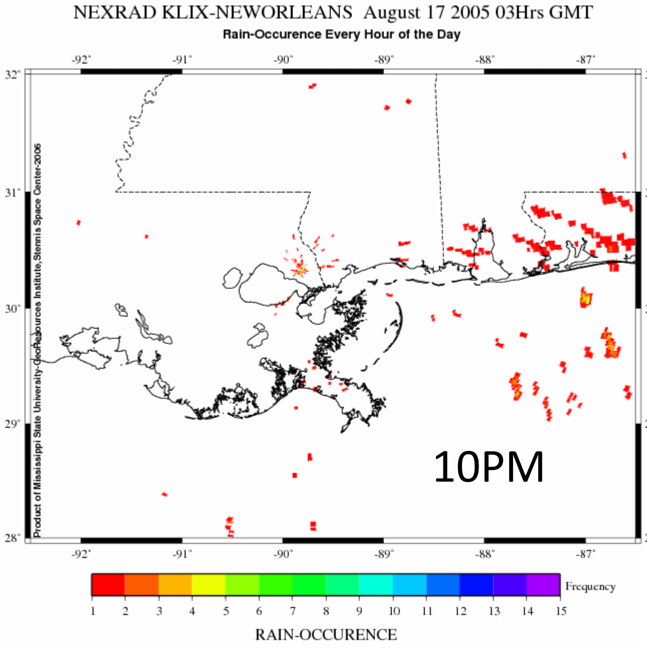
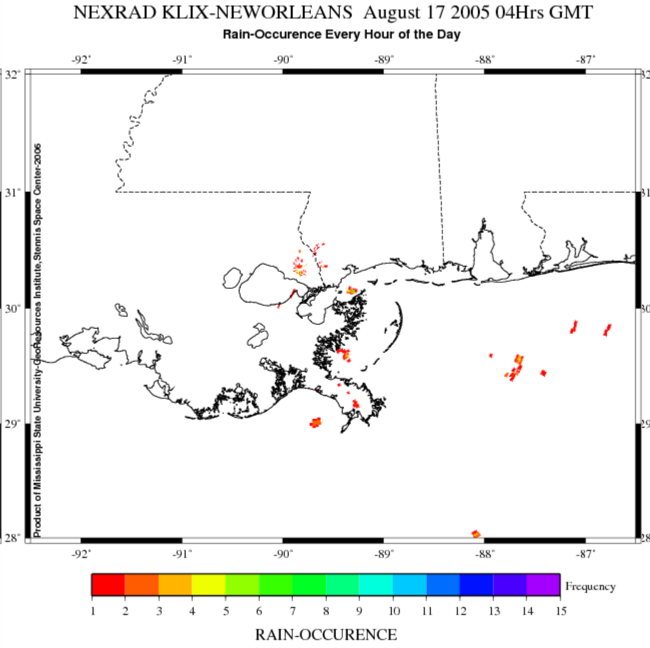
RAIN-OCCURENCE


NEXRAD KLIX-NEWORLEANS August 17 2005 03Hrs GMT
Rain-Occurence Every Hour of the Day
Product of Mississippi State University-GeoResources Institute,Stennis Space Center-2006
10PM
Frequency
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
RAIN-OCCURENCE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Frequency
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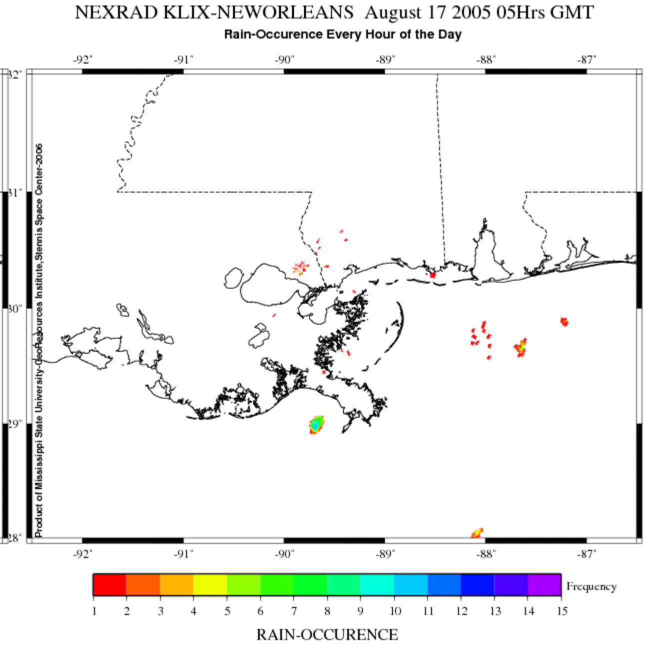
RAIN-OCCURENCE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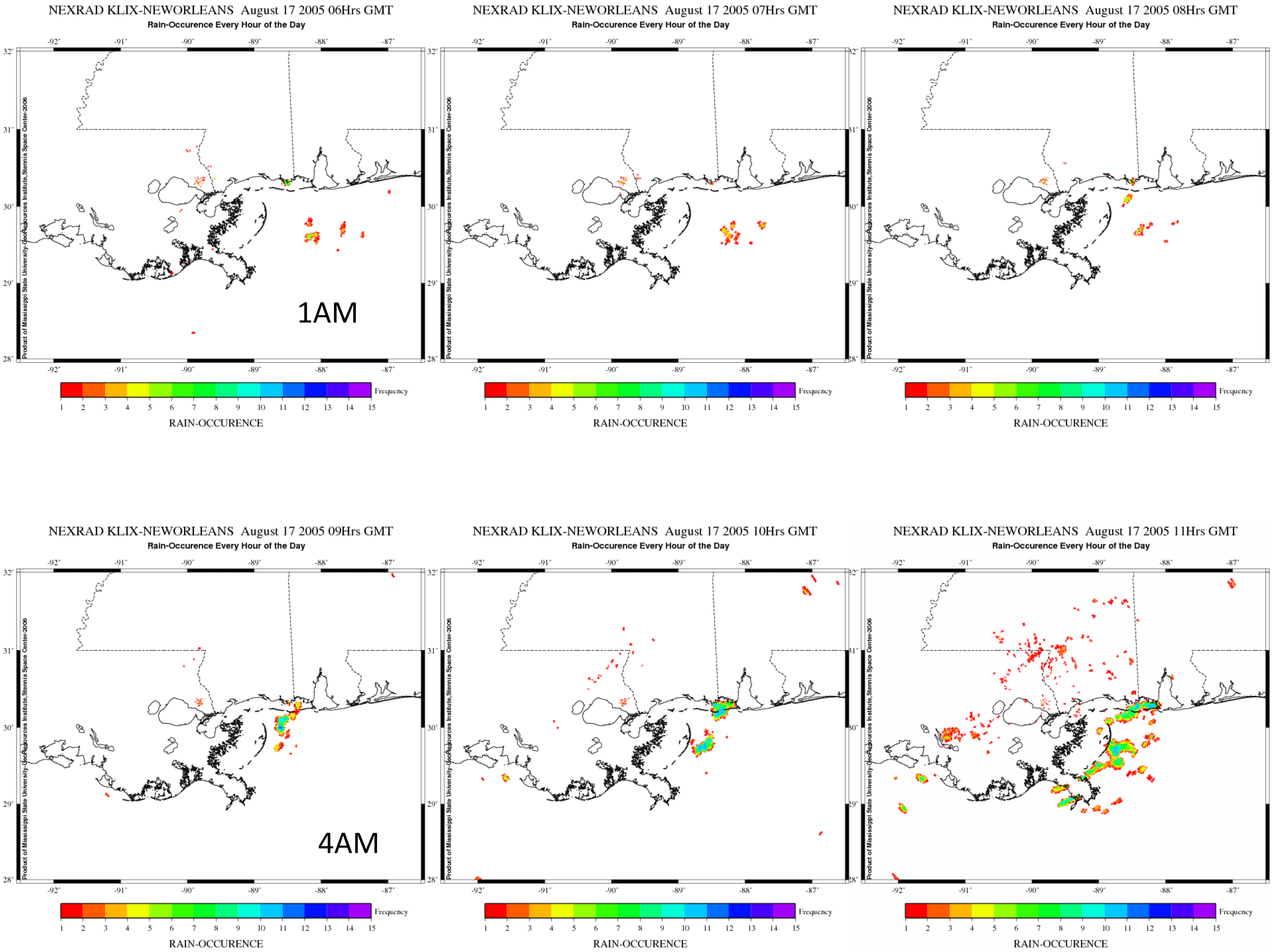
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Rain-Occurence Every Hour of the Day
1AM
NEXRAD KLIX-NEWORLEANS August 17 2005 07Hrs GMT
Rain-Occurence Every Hour of the Day
NEXRAD KLIX-NEWORLEANS August 17 2005 08Hrs GMT
Rain-Occurence Every Hour of the Day
NEXRAD KLIX-NEWORLEANS August 17 2005 09Hrs GMT
Rain-Occurence Every Hour of the Day
4AM
NEXRAD KLIX-NEWORLEANS August 17 2005 10Hrs GMT
Rain-Occurence Every Hour of the Day
NEXRAD KLIX-NEWORLEANS August 17 2005 11Hrs GMT
Rain-Occurence Every Hour of the Day
Product of Mississippi State University-GeoResources Institute,Stennis Space Center-2006
Frequency
RAIN-OCCURENCE

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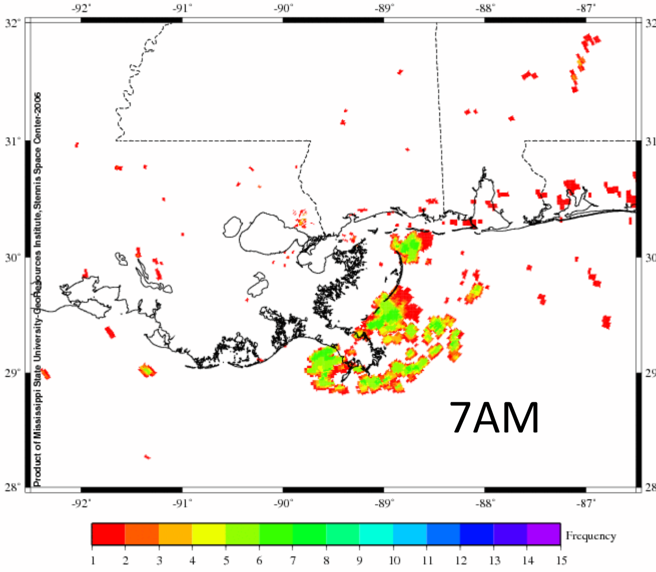
Rain-Occurence Every Hour of the Day



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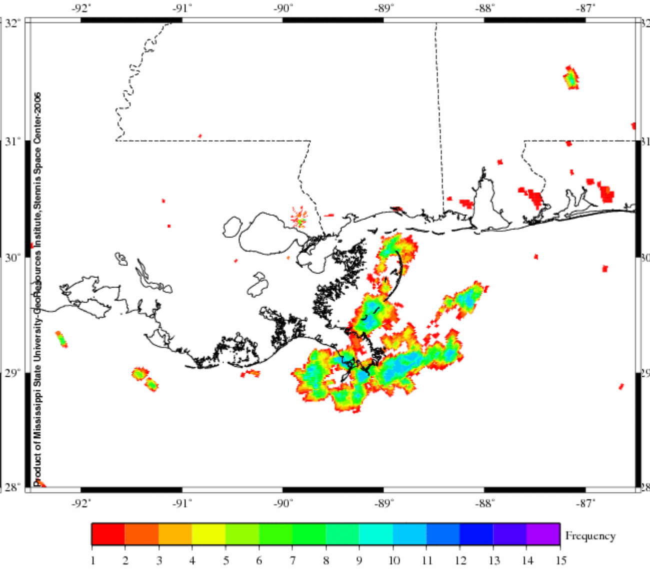

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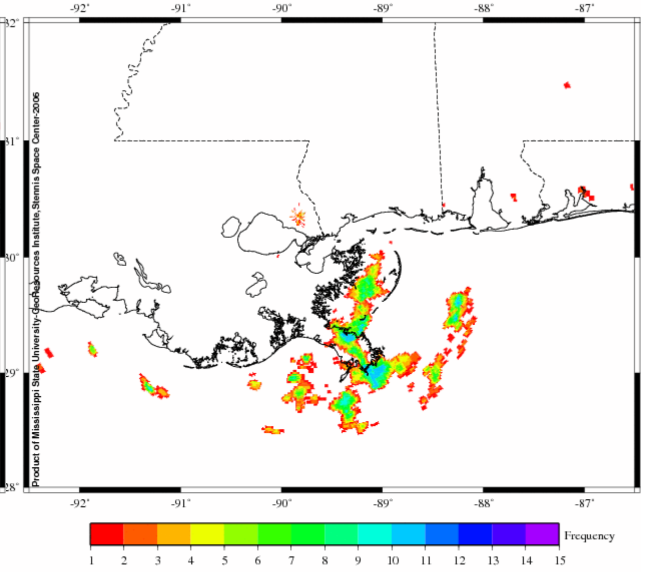

RAIN-OCCURENCE

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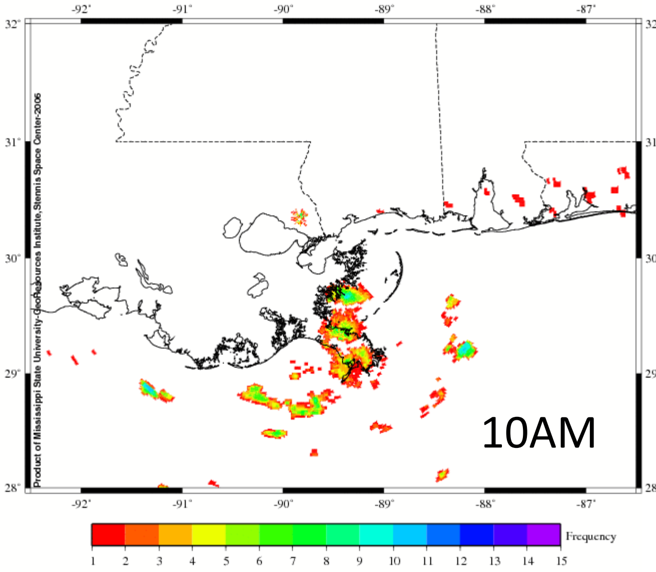

RAIN-OCCURENCE

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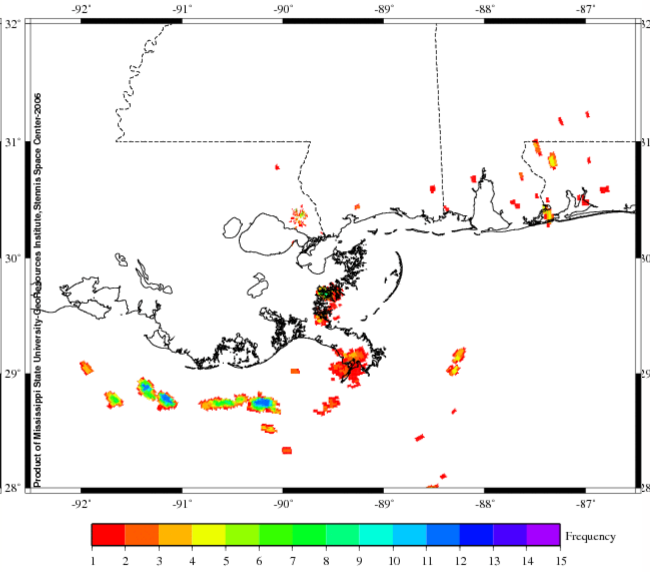

RAIN-OCCURENCE

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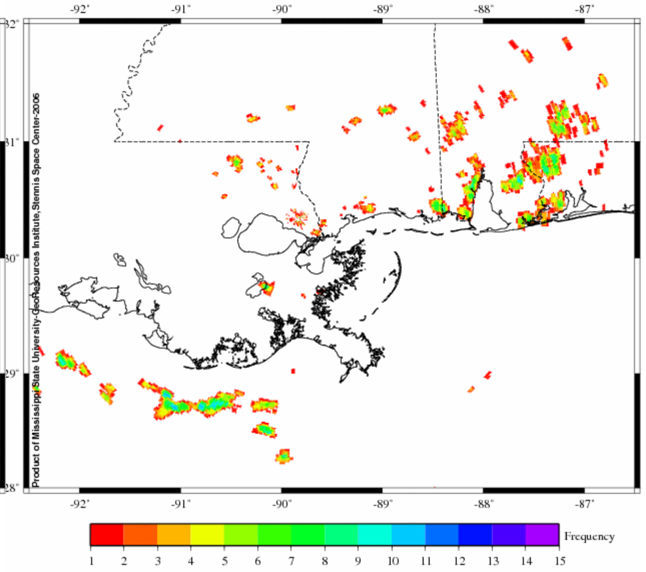
Rain-Occurence Every Hour of the Day



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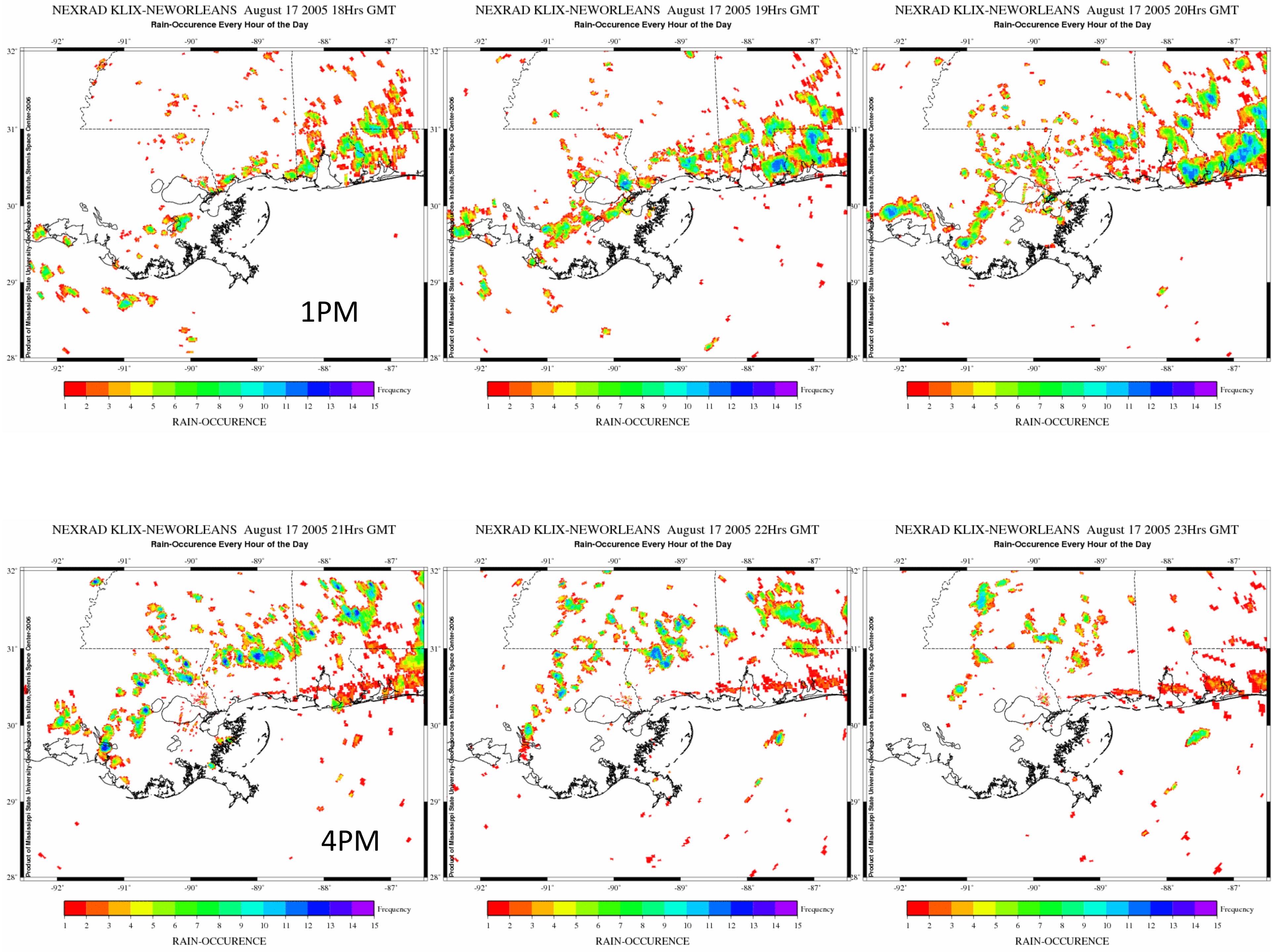
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Rain-Occurence Every Hour of the Day
NEXRAD KLIX-NEWORLEANS August 17 2005 21Hrs GMT
Rain-Occurence Every Hour of the Day
4PM
NEXRAD KLIX-NEWORLEANS August 17 2005 22Hrs GMT
Rain-Occurence Every Hour of the Day
NEXRAD KLIX-NEWORLEANS August 17 2005 23Hrs GMT
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-92° -91° -90° -89° -88° -87°
32° 31° 30° 29° 28°
Frequency
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
RAIN-OCCURENCE

Goal

Determine summertime precipitation and wind regimes in southern Mississippi and southeast Louisiana

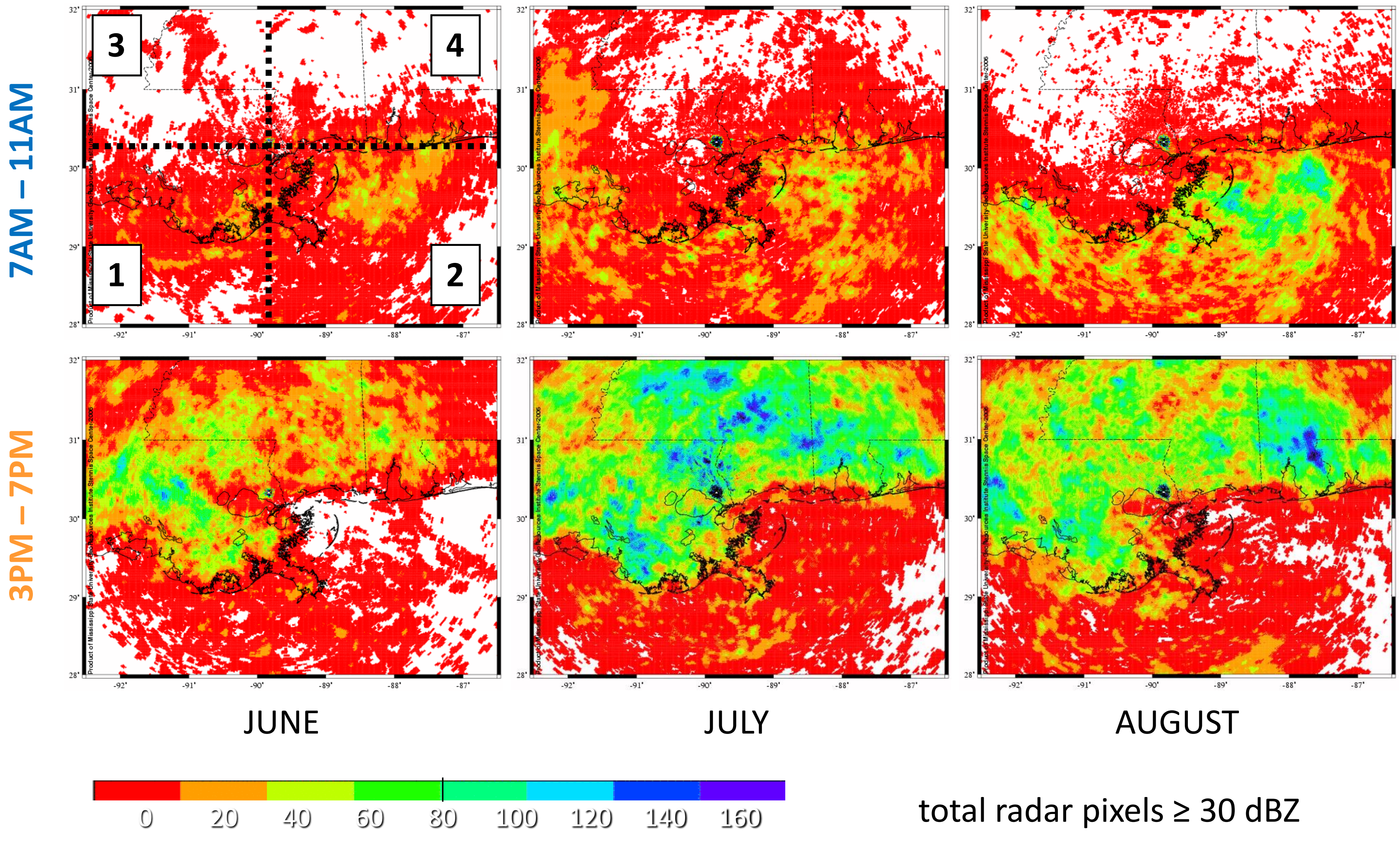
Procedure

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)



July

11PM-3AM

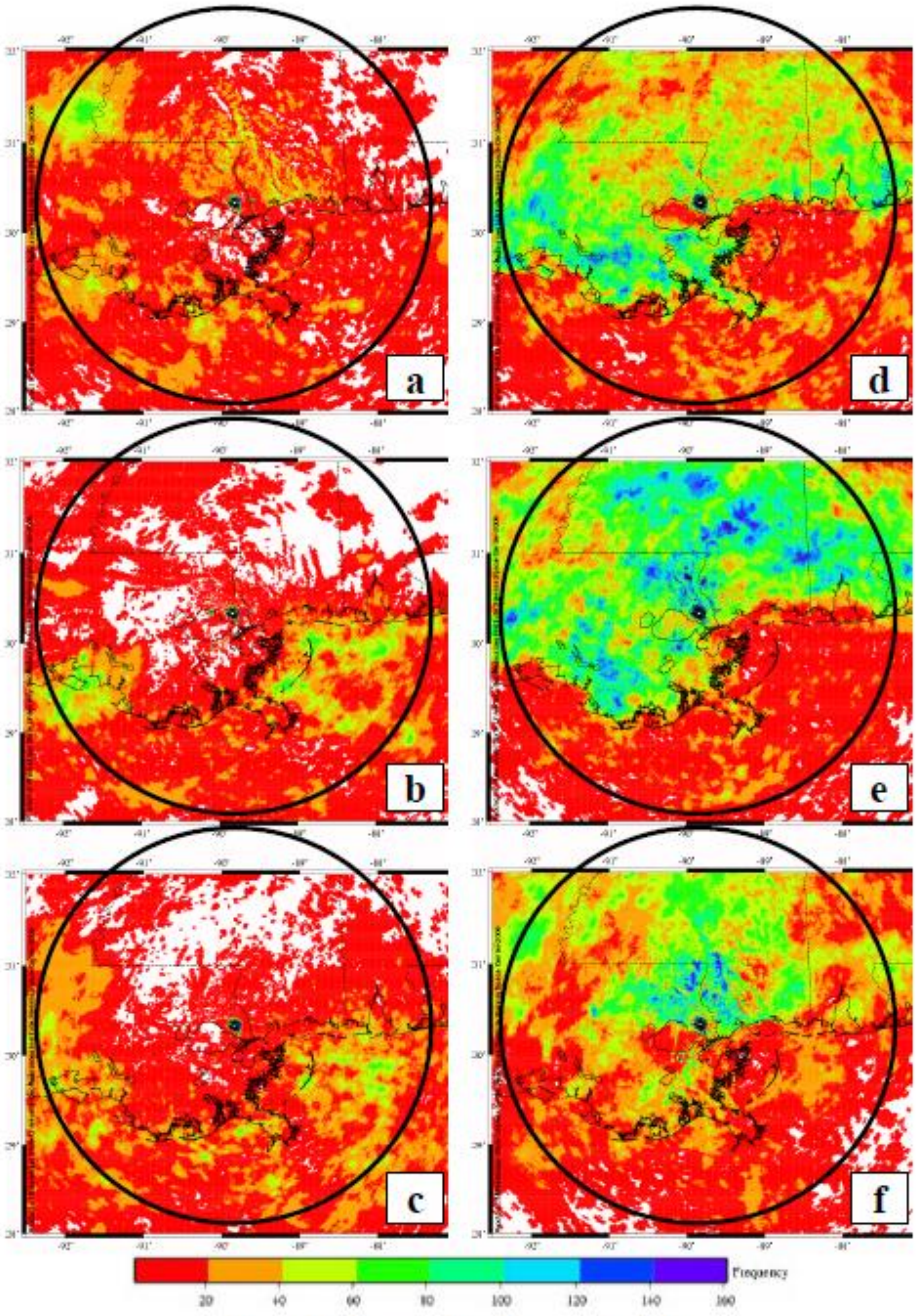
11AM-3PM

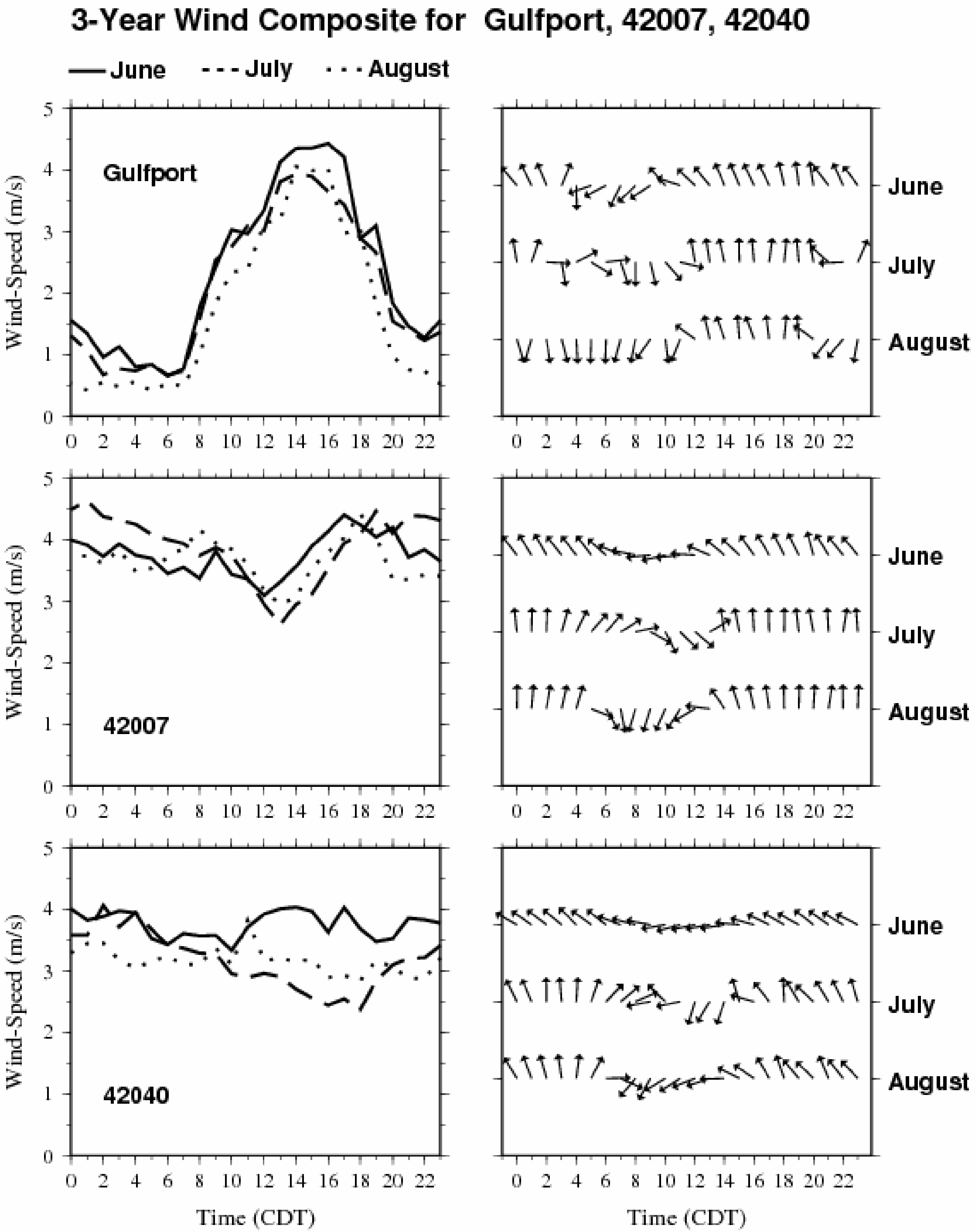
3AM-7AM

3PM-7PM

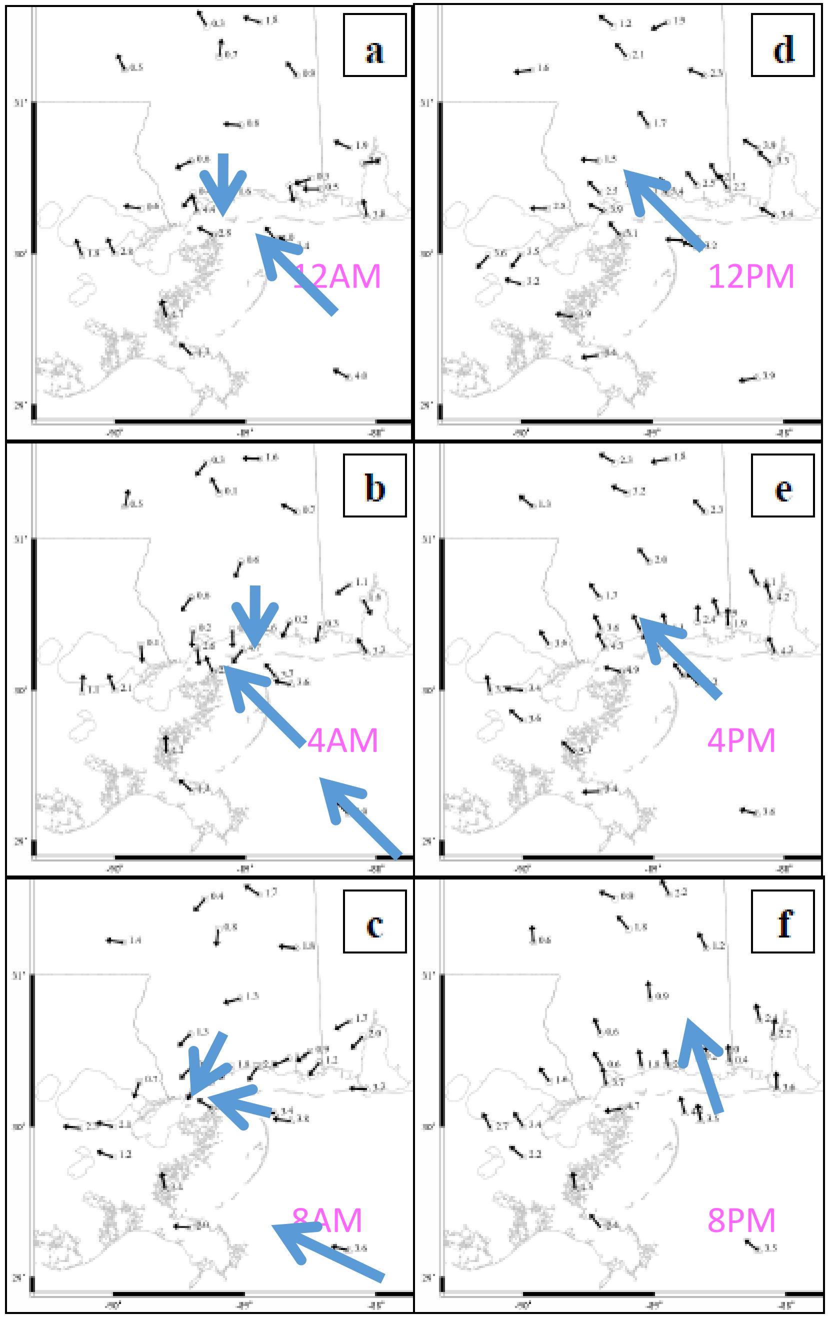
7AM-11AM

7PM-11PM




3-Year Wind Composite for Gulfport, 42007, 42040
June
July
August
Gulfport
42007
42040
Wind-Speed (m/s)
Time (CDT)
June
July
August

Wind composite
for sea breeze days,
June.



Wind composite
for sea breeze days,
July.

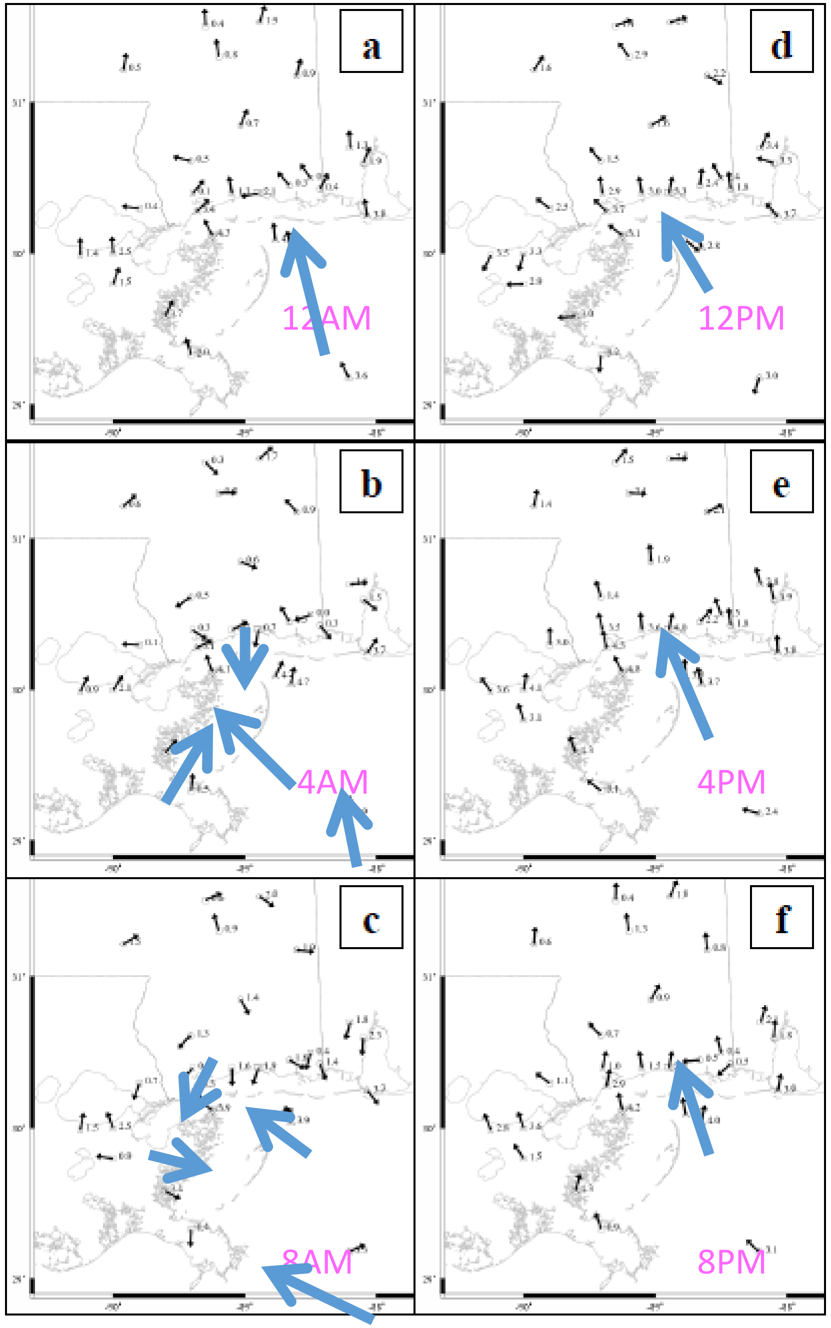
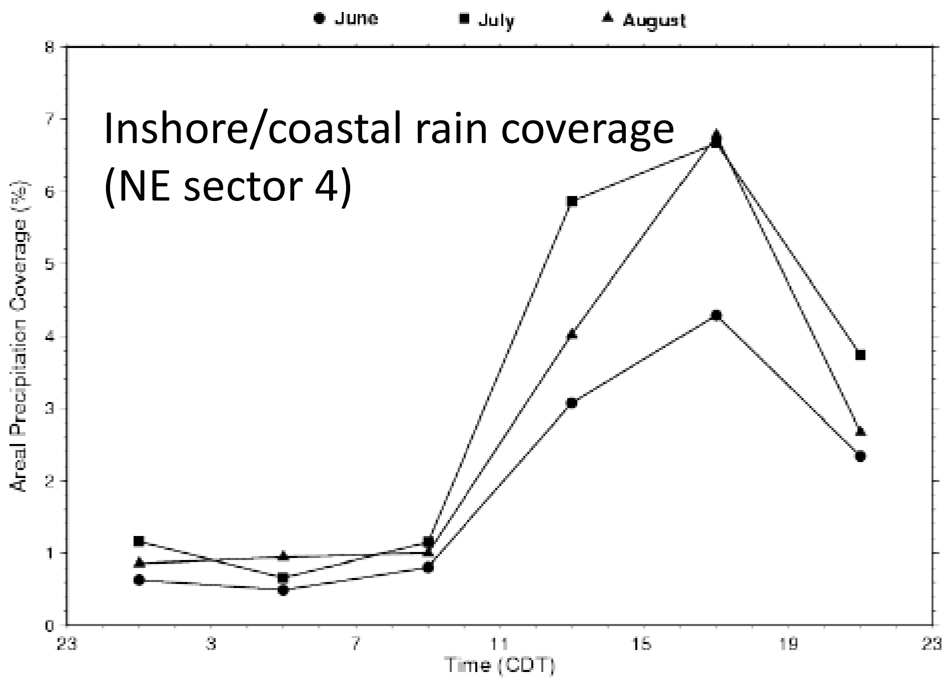
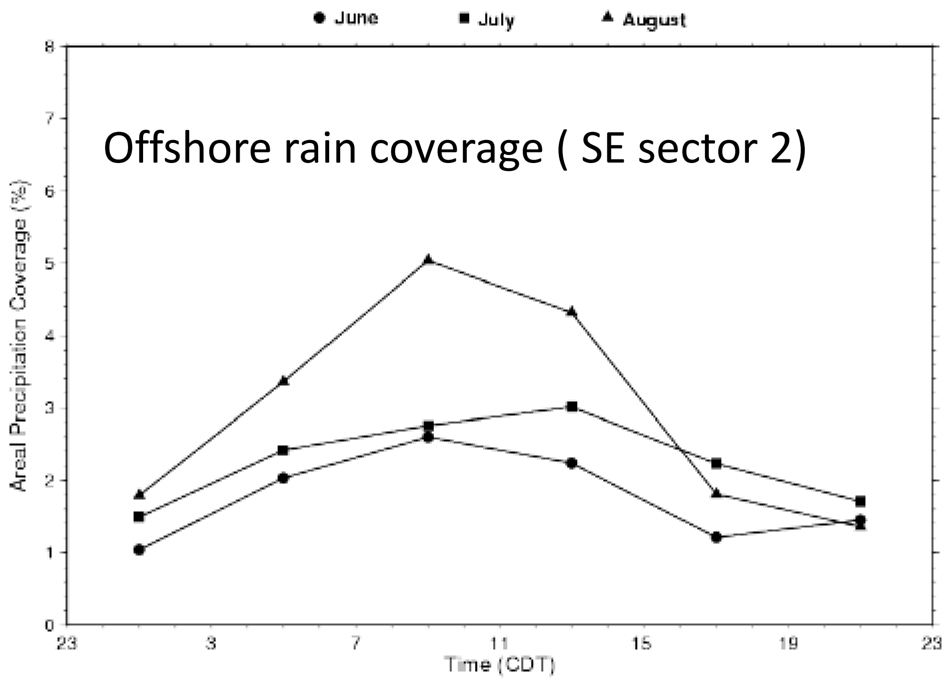


Figure 5. Same as Figure 4, except for July.

My P-value interpretation

P value range	Evidence that two datasets are different	Tabular symbol used
> 0.15	No difference	
0.05 to 0.15	Suggestive, but inconclusive	^
0.01 to 0.05	Moderately convincing	*
0.001-0.01	Convincing	**
< 0.001	Very convincing	***





Hour (CDT)	June vs July Sector 2	 Sector 4
23-03	^	*
03-07	^	^
07-11		^
11-15	*	**
15-19	**	*
19-23	^	^

Much more daytime inshore rain coverage in July versus June

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

Hour (CDT)	July vs August Sector 2	 Sector 4
23-03		
03-07	*	^
07-11	*	
11-15		^
15-19		
19-23		

Hour (CDT)	June vs August Sector 2	 Sector 4
23-03	*	**
03-07	**	**
07-11	**	^
11-15	**	
15-19	**	^
19-23		

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

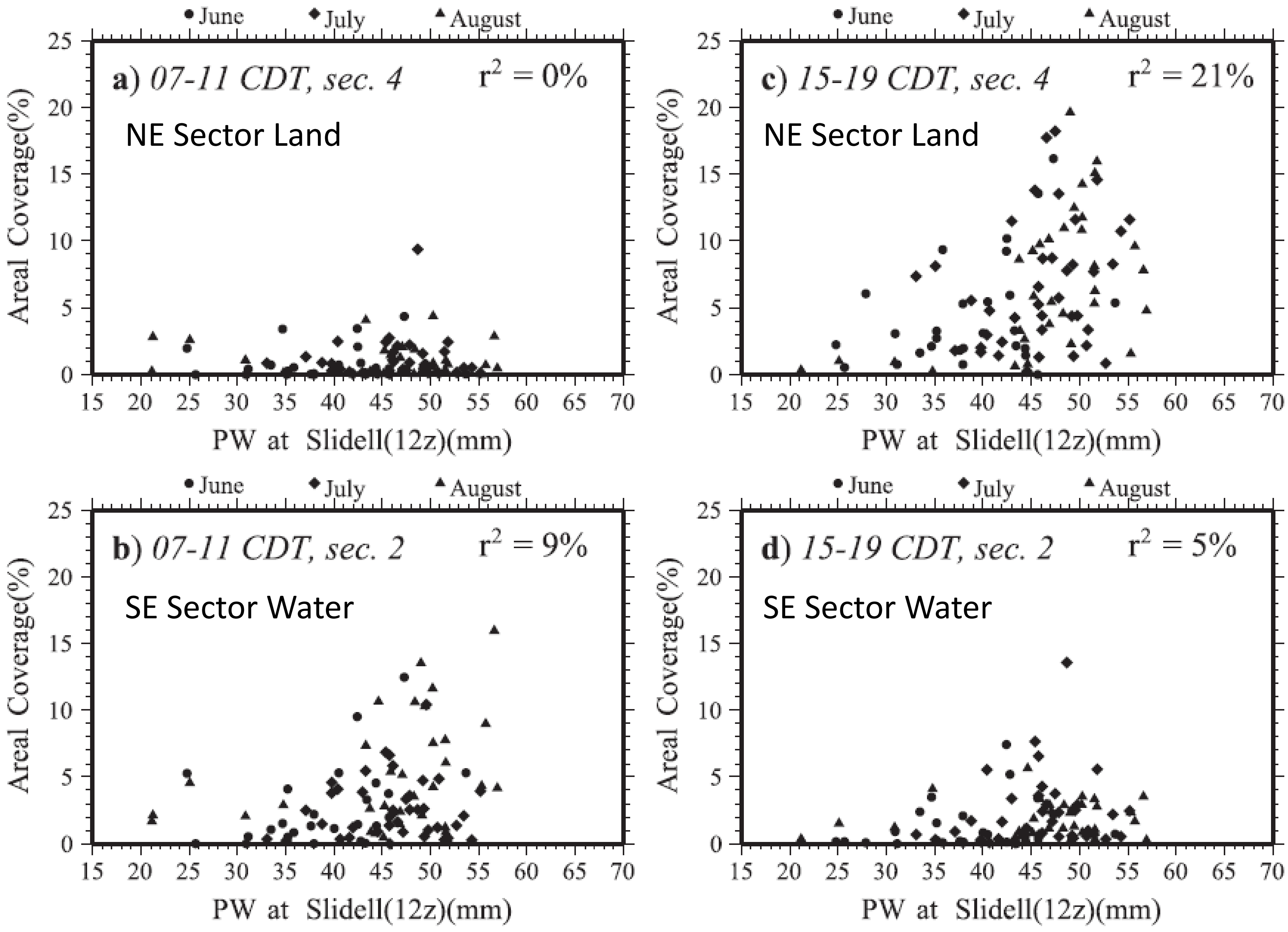
(yellow > 99% significant level)

		7 - 11 AM (land breeze convection)	3 - 7 PM (sea breeze convection)
NE sector (4)	Land	R^2=4% 850-mb Wind direction=0.19	R^2=29% PW=0.48 CAPE=0.26 Td850=-0.18
SE sector (2)	Water	R^2=19% PW=0.37 CAPE=0.29 T850-T500=-0.21 Td850=-0.16	R^2=6% PW=0.23 850-mb Wind direction=0.11

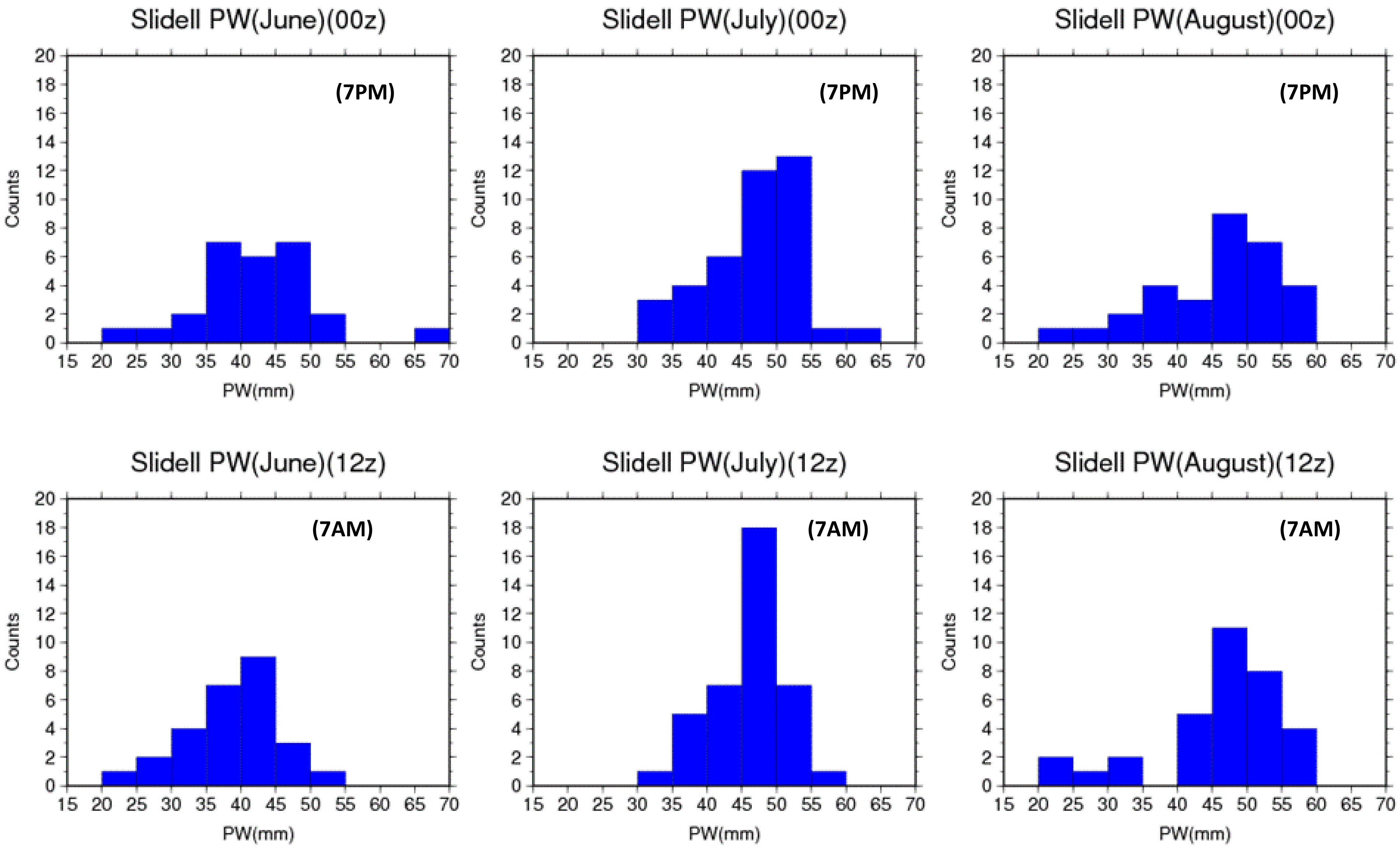
For all 24 cases (Sectors 1-4, 6 four-h periods), at 90-100% significance level, PW occurs 17 times, CAPE 11 times, wind direction 3 times, Td850 5 times, and lapse rate 4 times.

KI and 700-DD were only occasionally selected in stepwise routine, and rarely >90% significant

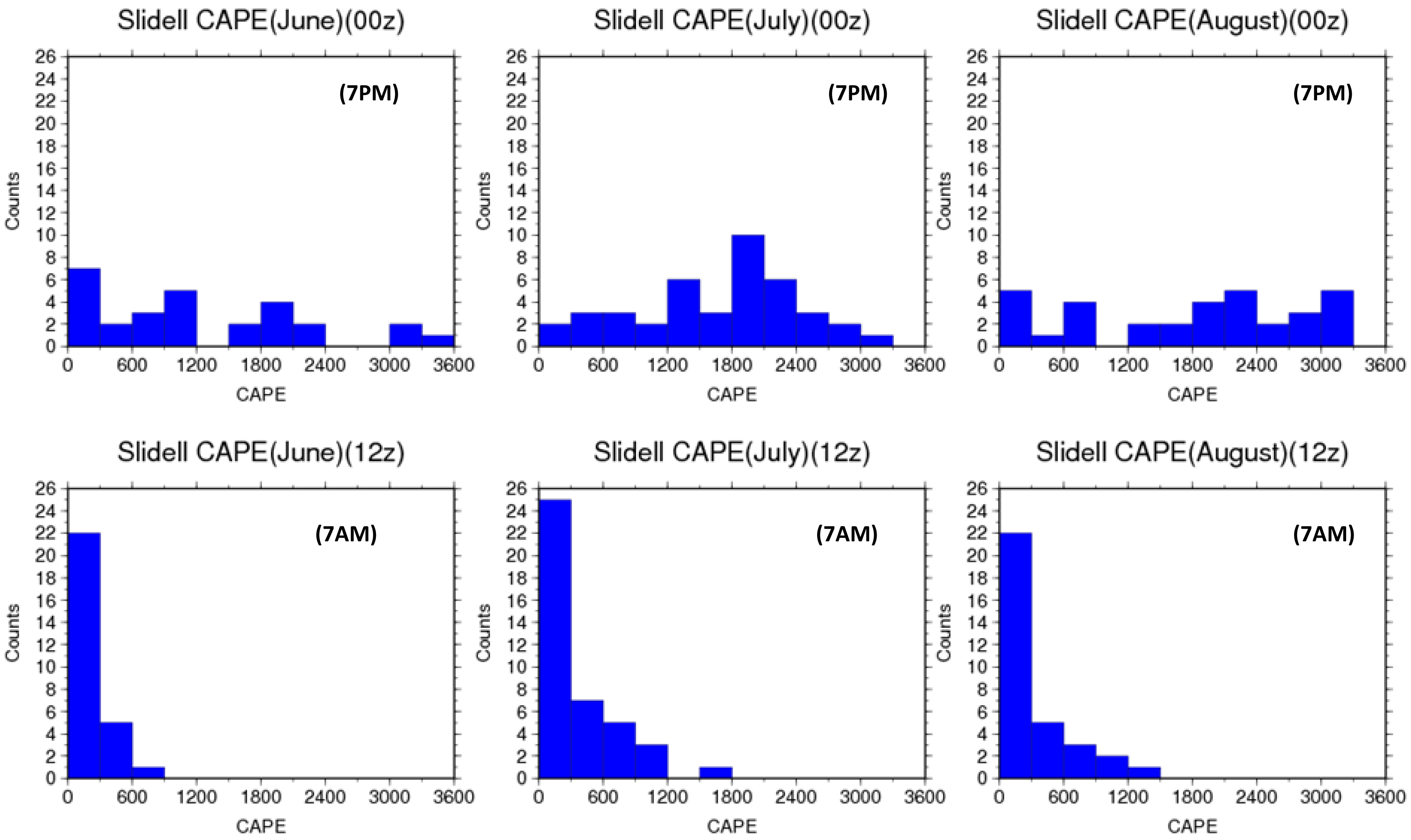
mm	inches
30	1.2
35	1.4
40	1.6
45	1.8
50	2.0
55	2.2



2003 – 2005 Slidell Precipitable Water, Sea Breeze Days Only

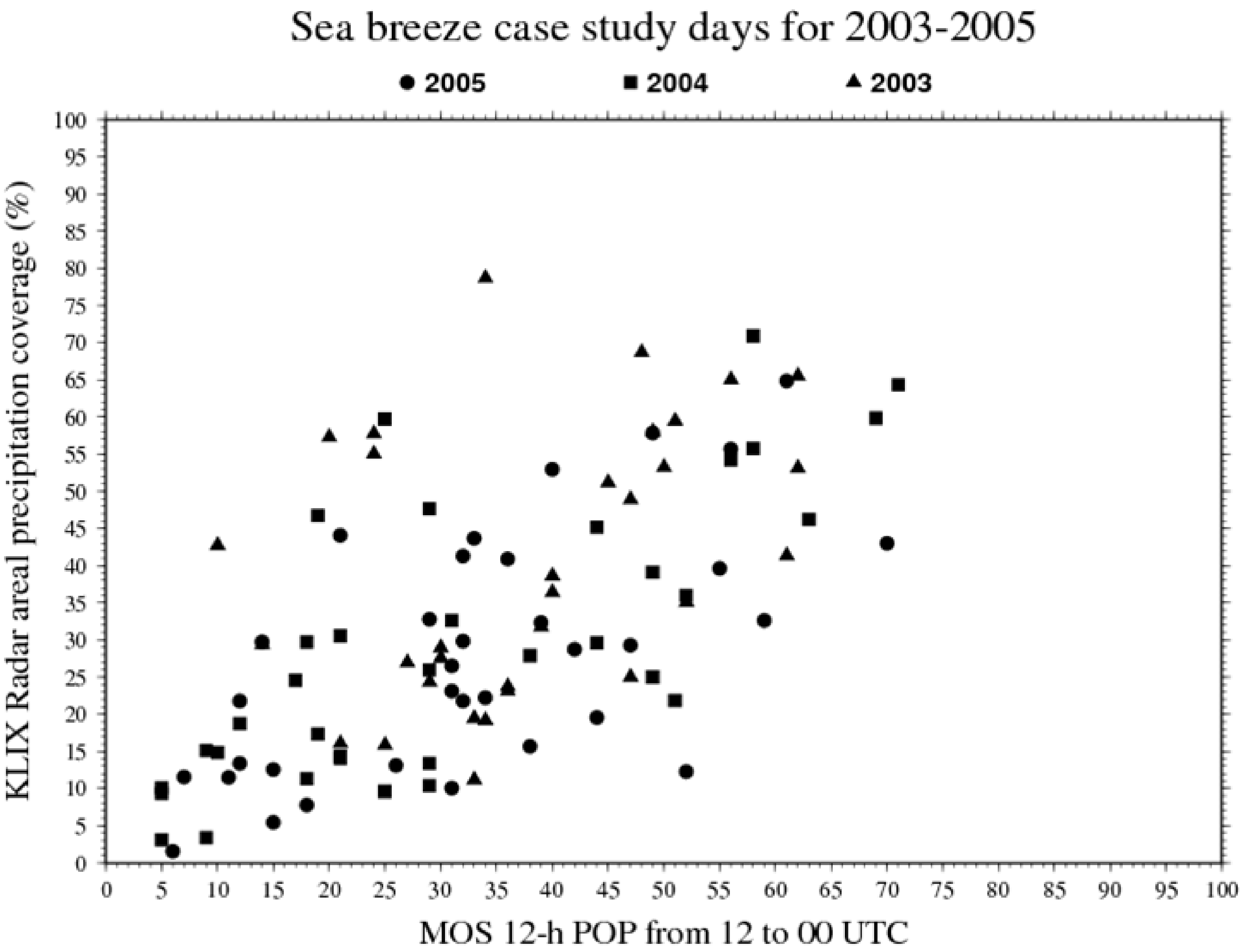


2003 – 2005 Slidell CAPE, Sea Breeze Days Only



Does POP correlate to areal coverage?

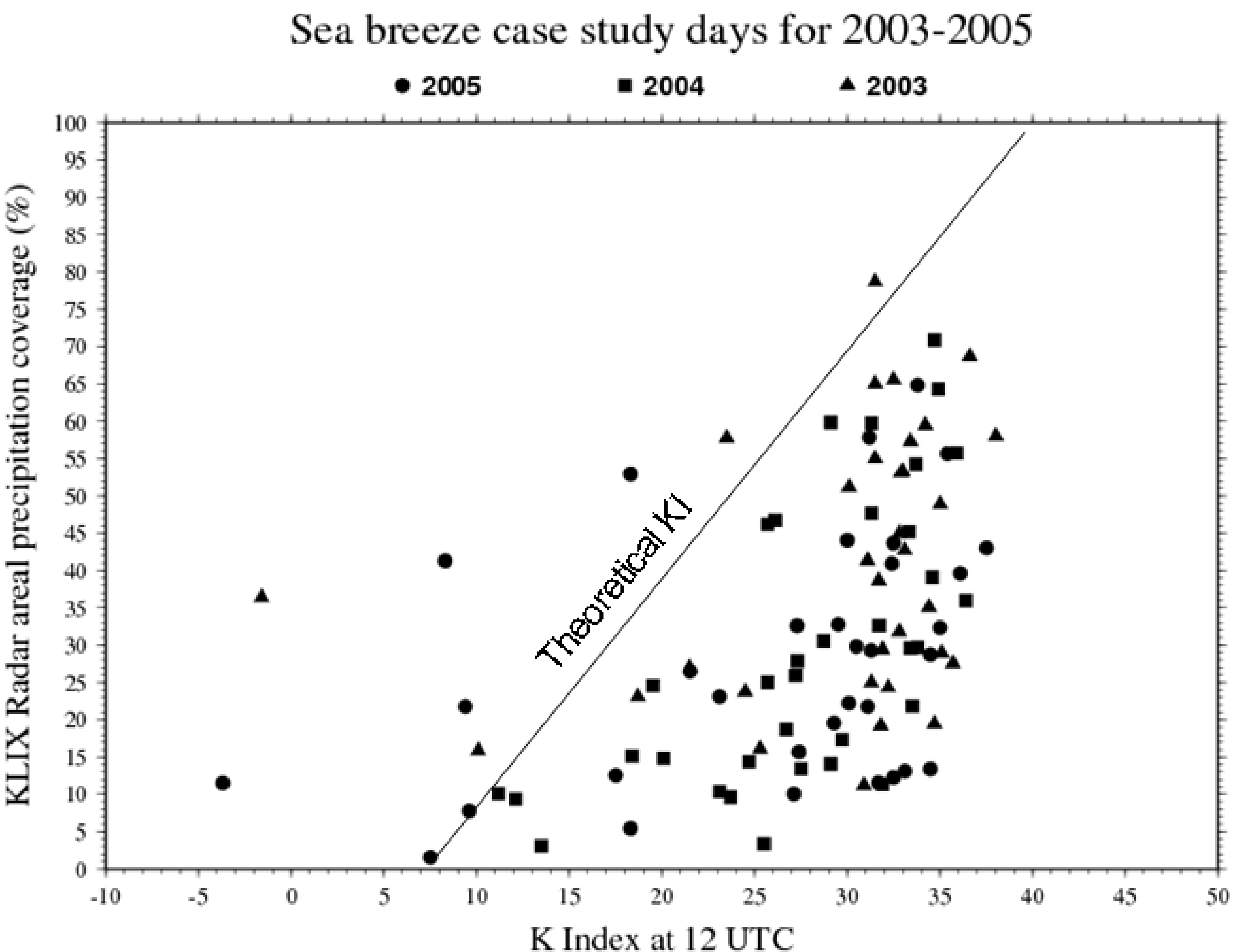
Generally, yes. But error margin is still apparent.



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