

# Visualizing Long-Range Severe Thunderstorm Environment Guidance from the CFSv2

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# SPC Feedback (Mar. 10, 2015)

*A few hours ago there was no risk for storms in NC. Now, POOF! Here we are. You ignorant clowns pulled this number so many times last year that I lost count. If you had any expertise, or dignity, you would apologize for all of the meteorological stupidity.*

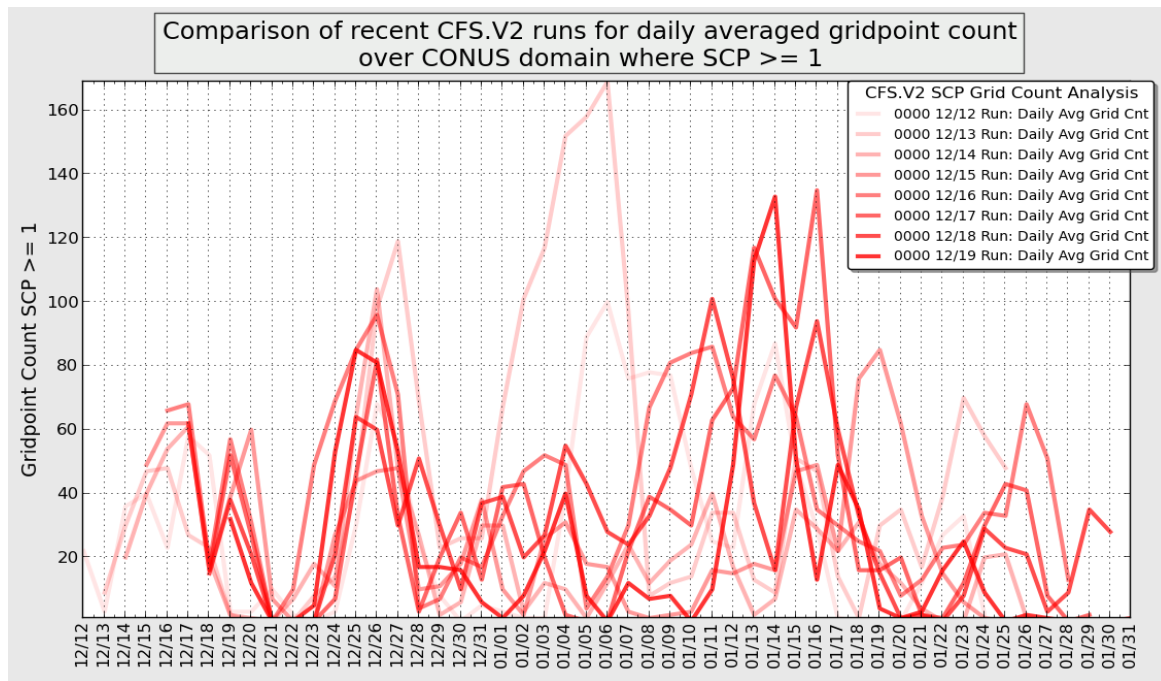
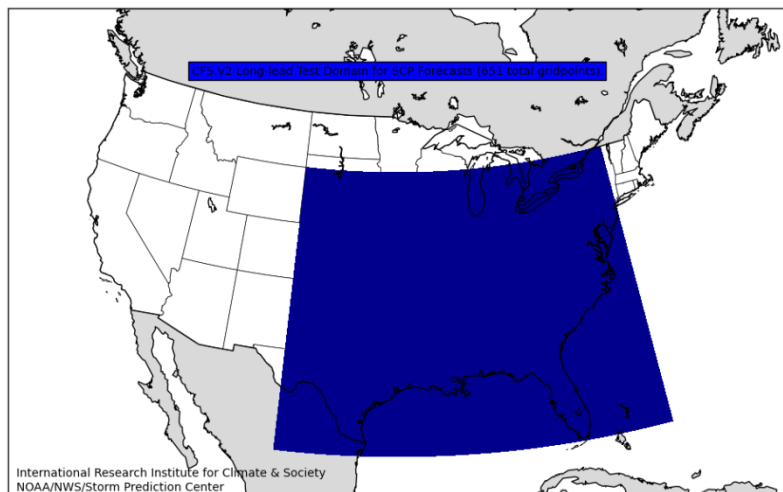
*pastrlogic@earthlink.net*

# Using CFS guidance for severe (SCP)

Utilizing IRI Data Library for access to CFSv2 data:

- 1) Download 00 UTC CFSv2 subset of grids over the CONUS for 1000&500mb u/v winds, 0-180mb MUCAPE, 0-3km SRH, & model convective precipitation\*
- 2) Compute a modified simple Supercell Composite Parameter (SCP) as follows:

$$\text{SCP} = \text{MUCAPE}/500 \times \text{0-3km SRH}/50 \times \text{EBWD-term}$$



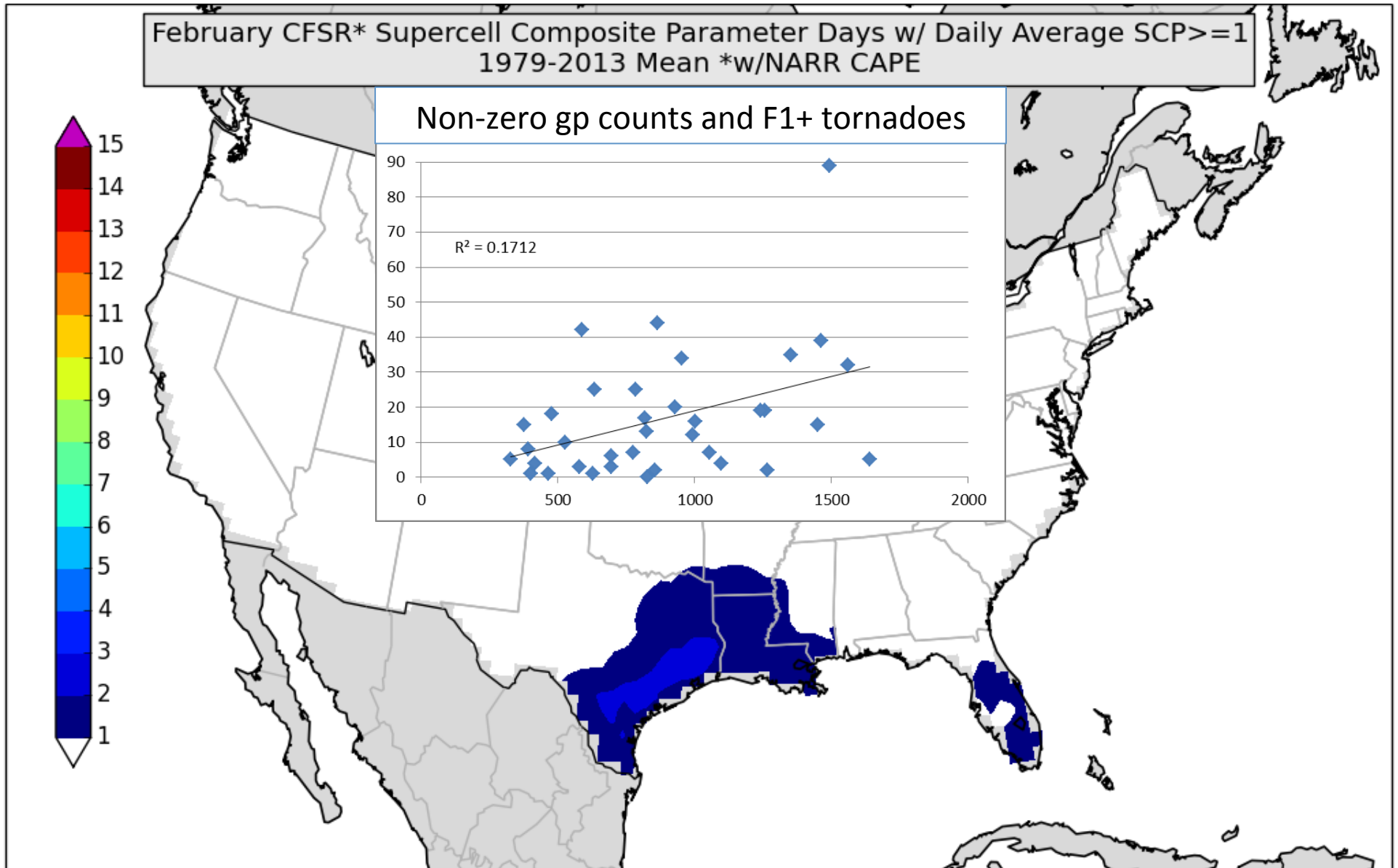
- 3) Count grid points in domain (out of 651) where 24-hour average (12z-12z):

$$\text{SCP} \geq 1$$

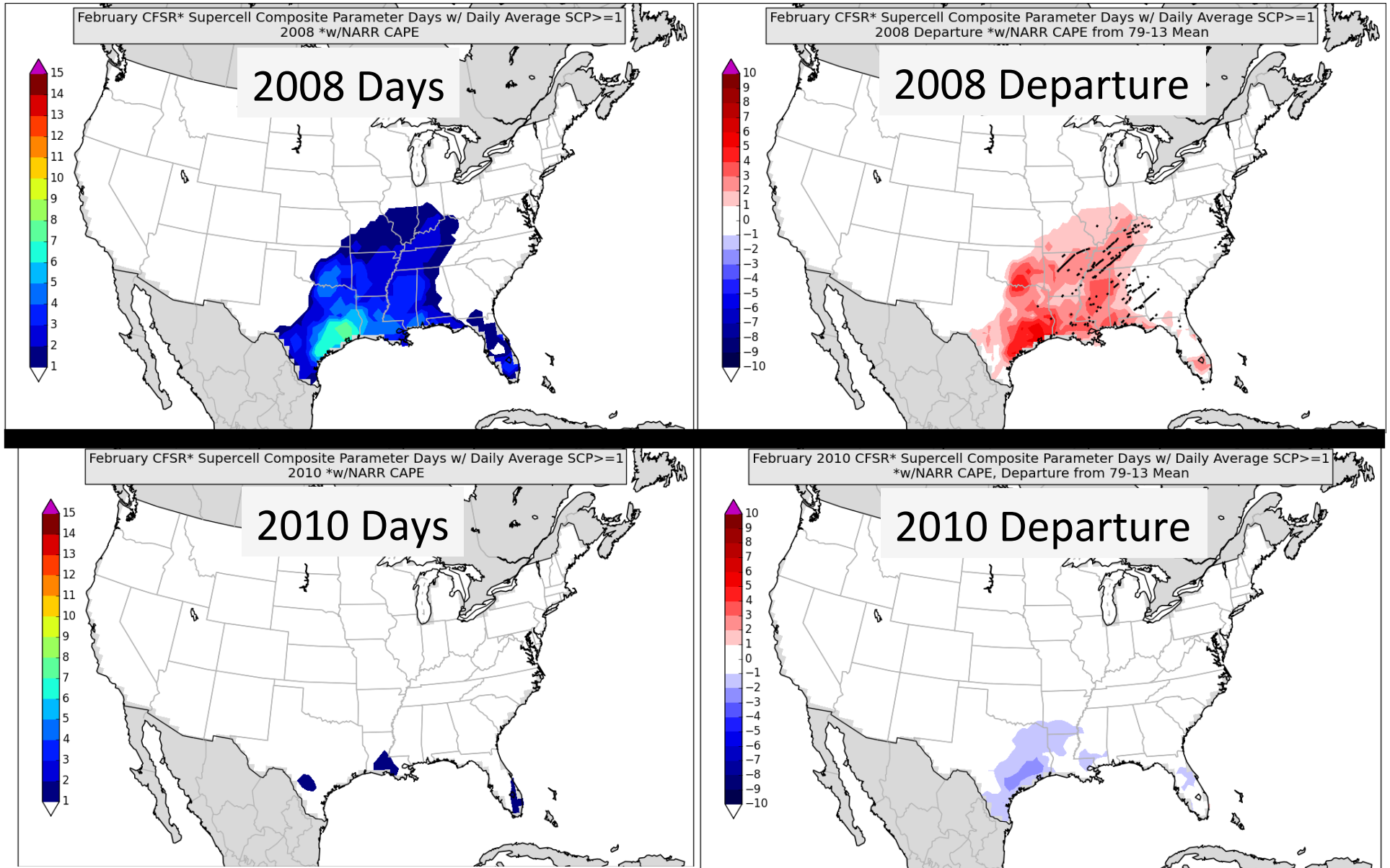
...for Day 1 through Day 45.

*\*Initially tried constraining to areas where QPF>0 but resulting grid counts were too low.*

# CFSR\* SCP Days – February Mean



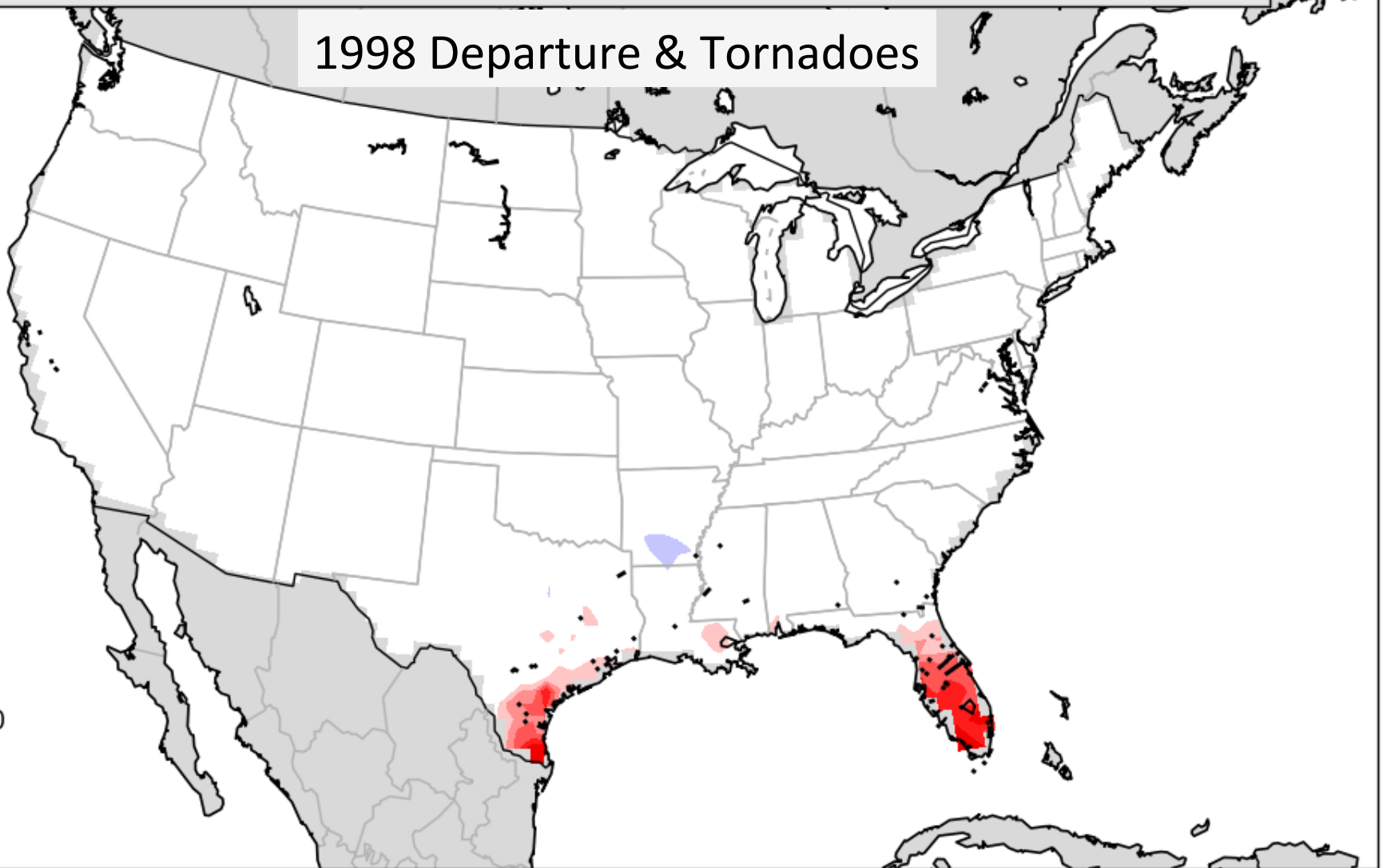
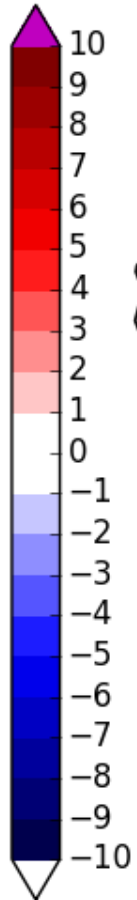
# CFSR\* SCP Days February 2008 vs. 2010



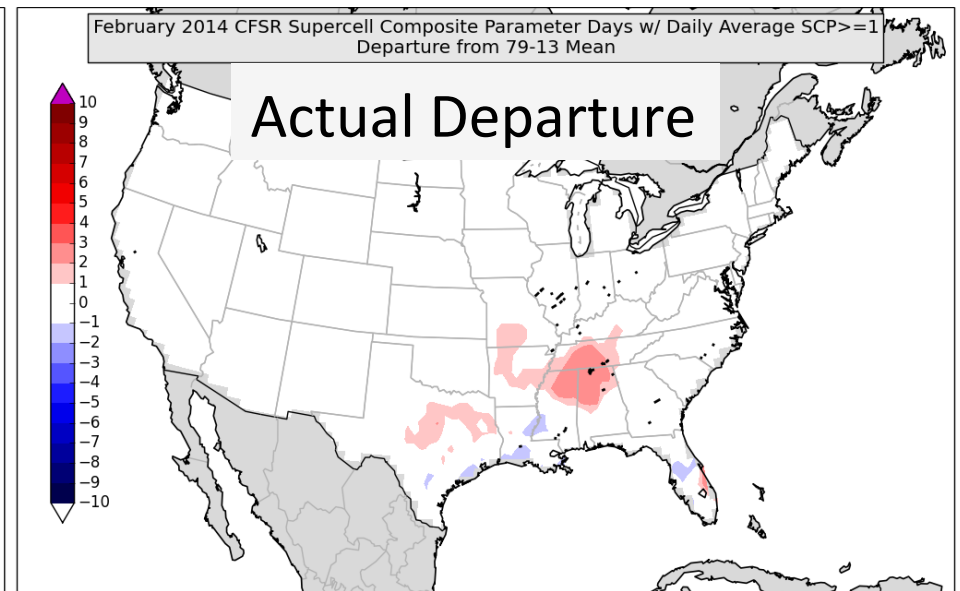
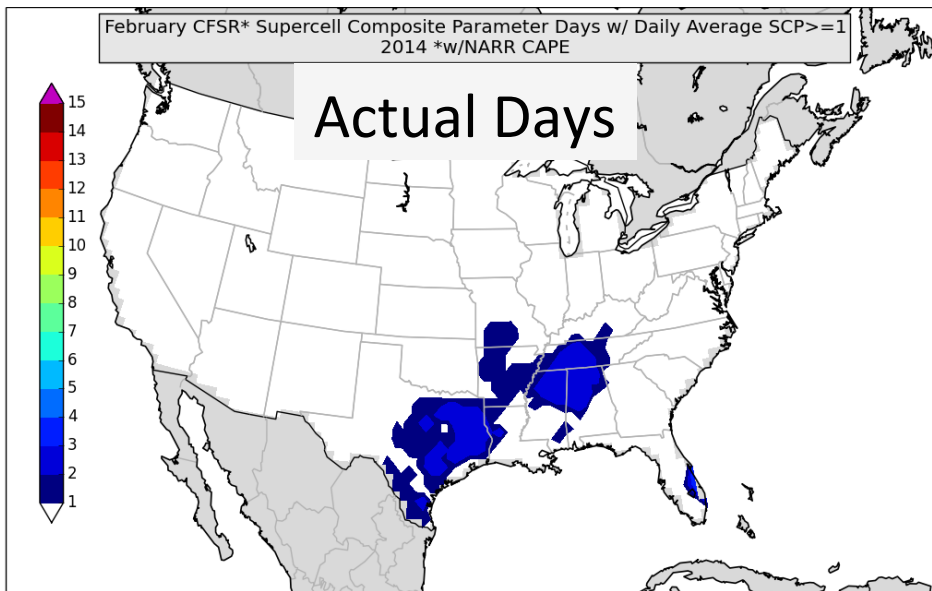
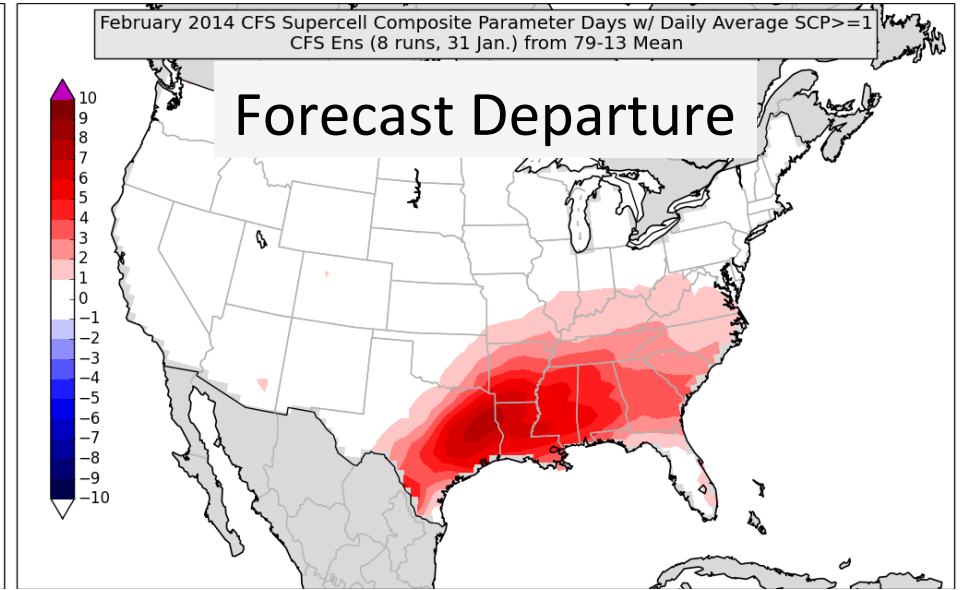
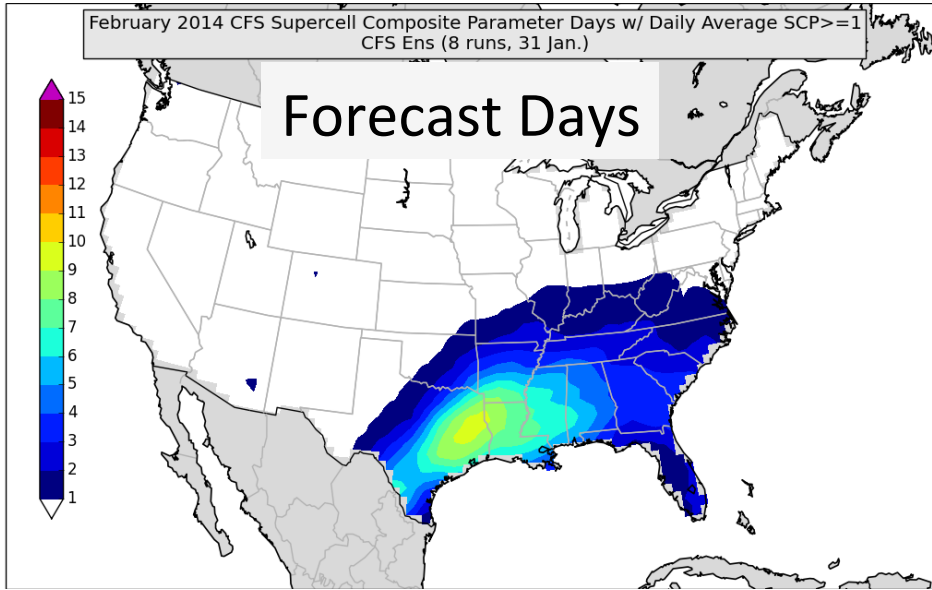
# CFSR\* SCP Days February 1998

February 1998 CFSR\* Supercell Composite Parameter Days w/ Daily Average SCP  $\geq 1$   
\*w/NARR CAPE, Departure from 79-13 Mean

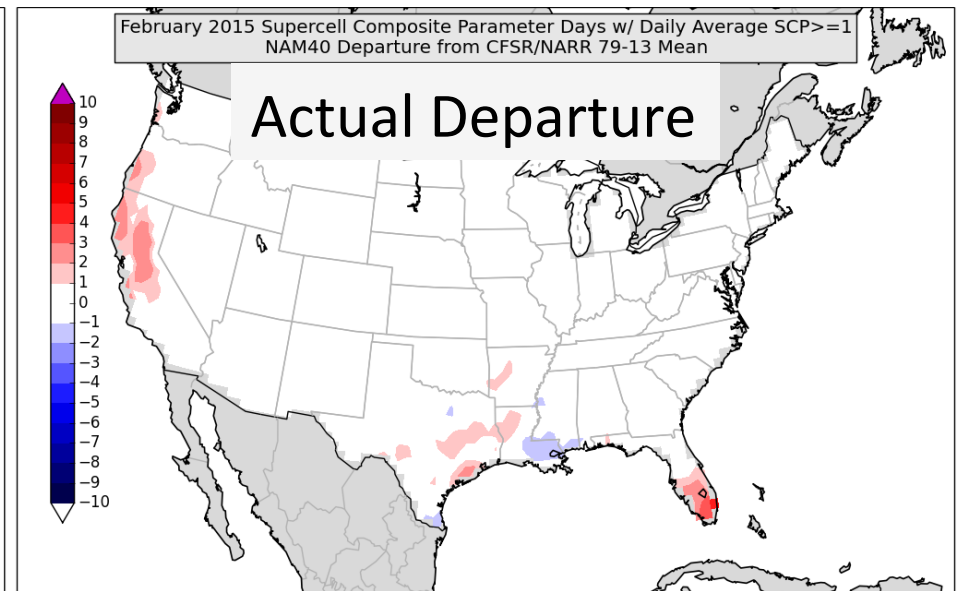
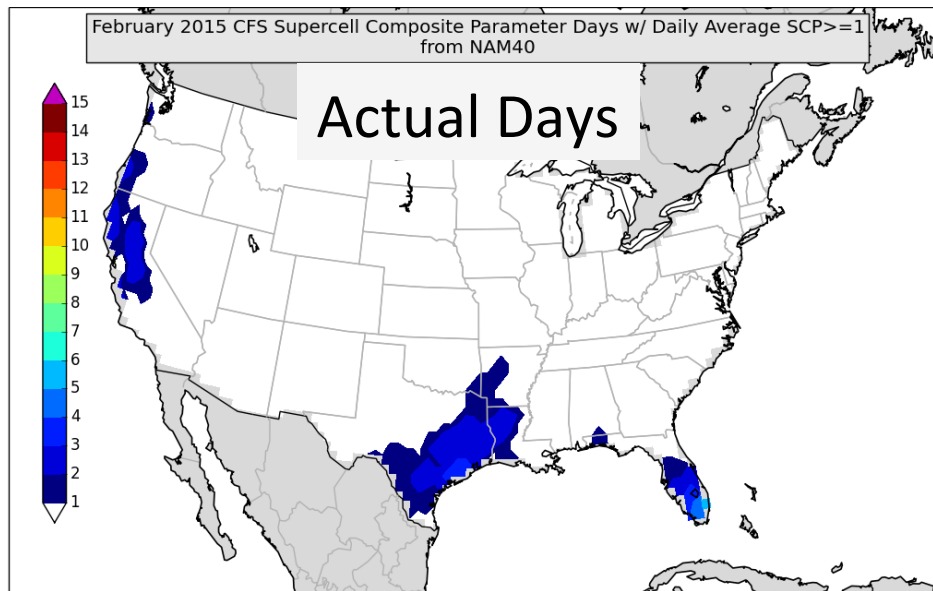
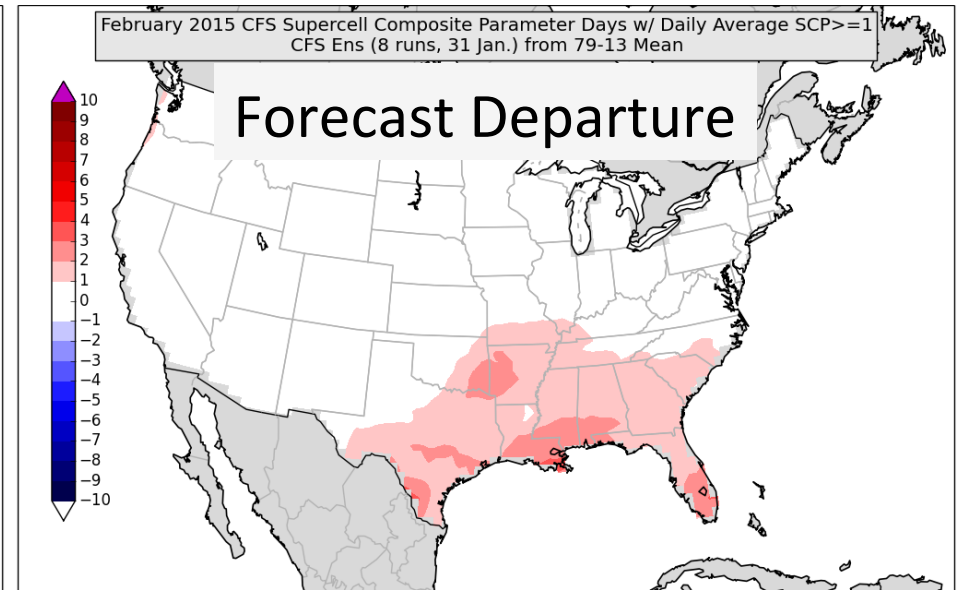
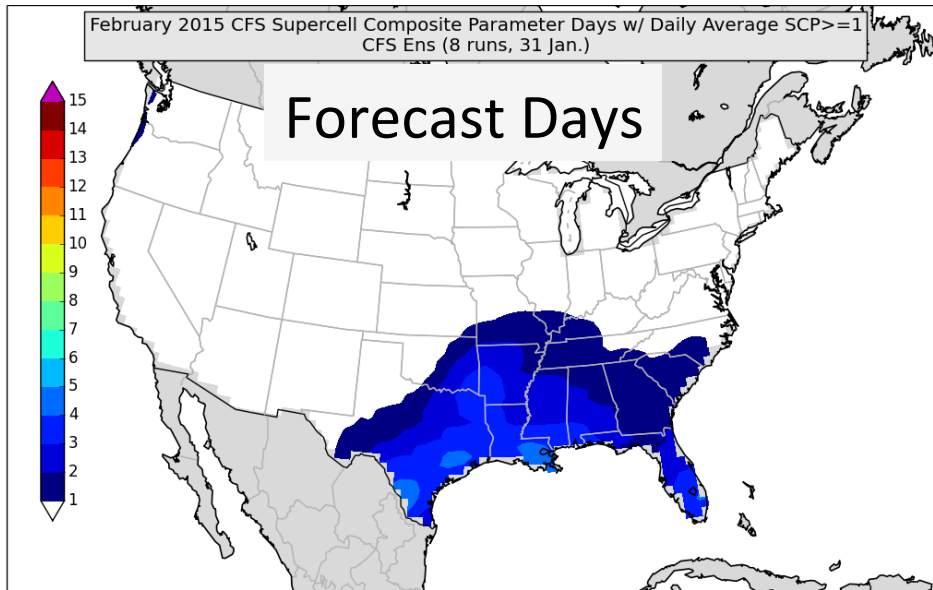
1998 Departure & Tornadoes



# CFS SCP Days & Verification February 2014



# CFS SCP Days & Verification February 2015

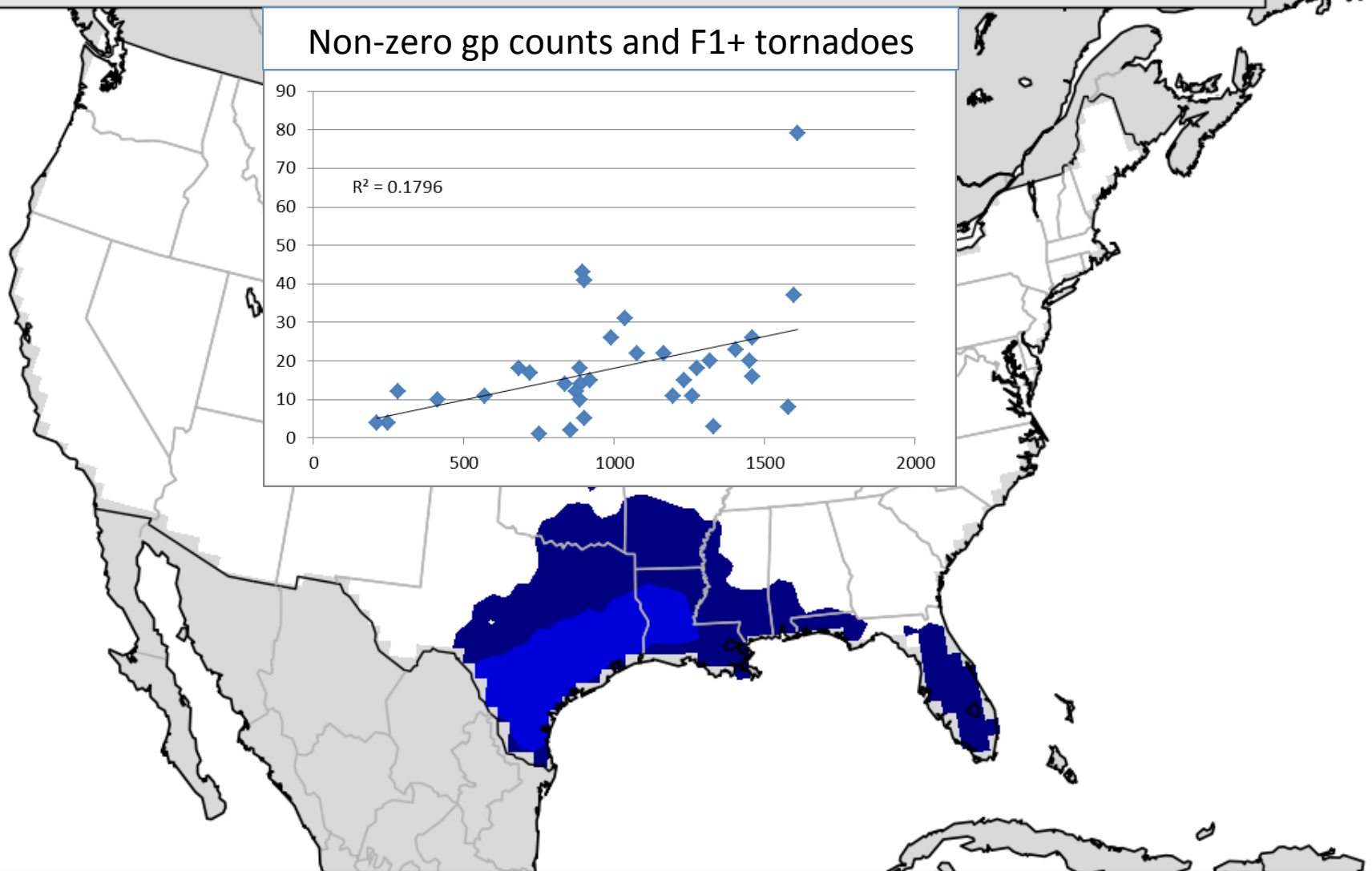
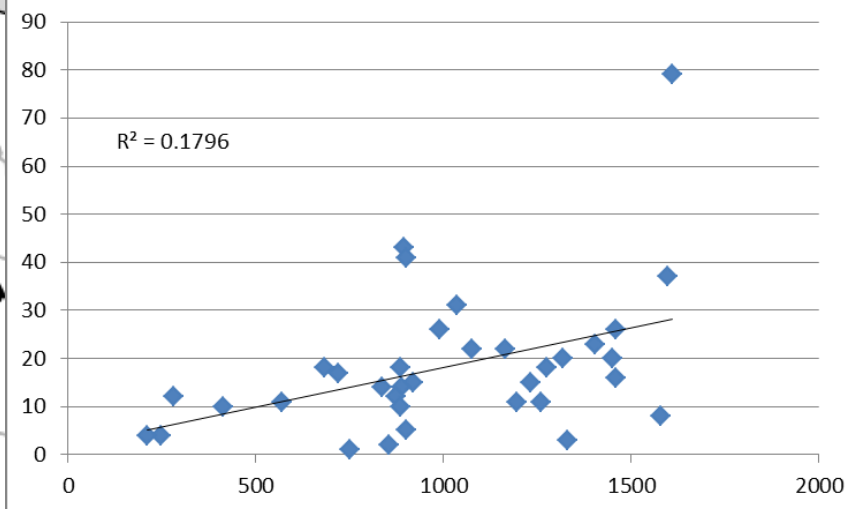
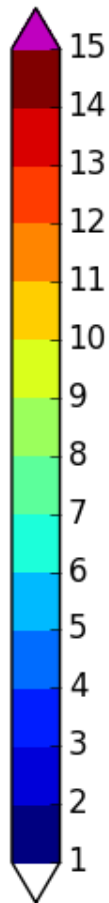




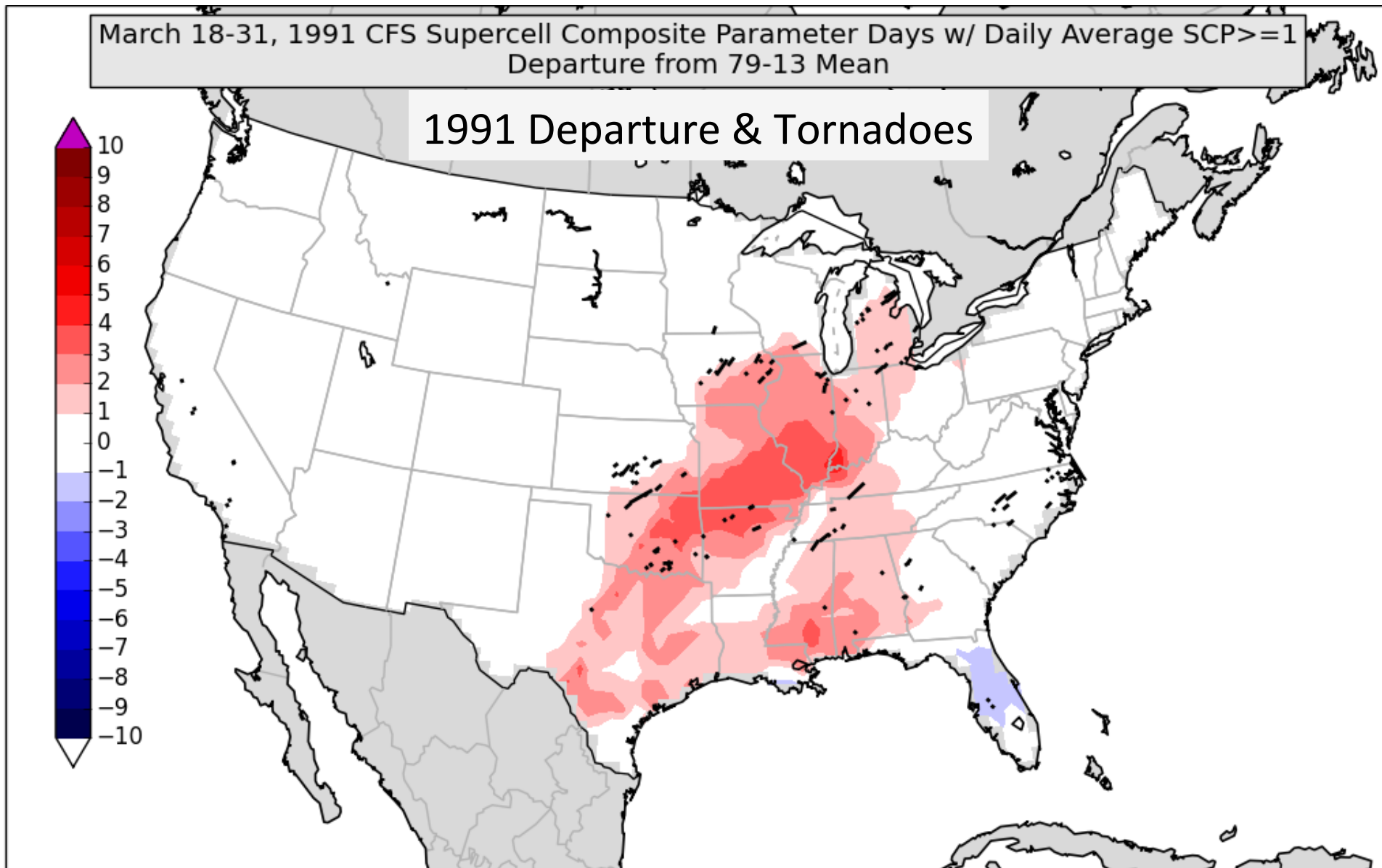
# CFSR\* SCP Days March 18-31, 79-13

March 18-31, CFSR\* Supercell Composite Parameter Days w/ Daily Average SCP  $\geq 1$   
\*w/NARR CAPE 79-13

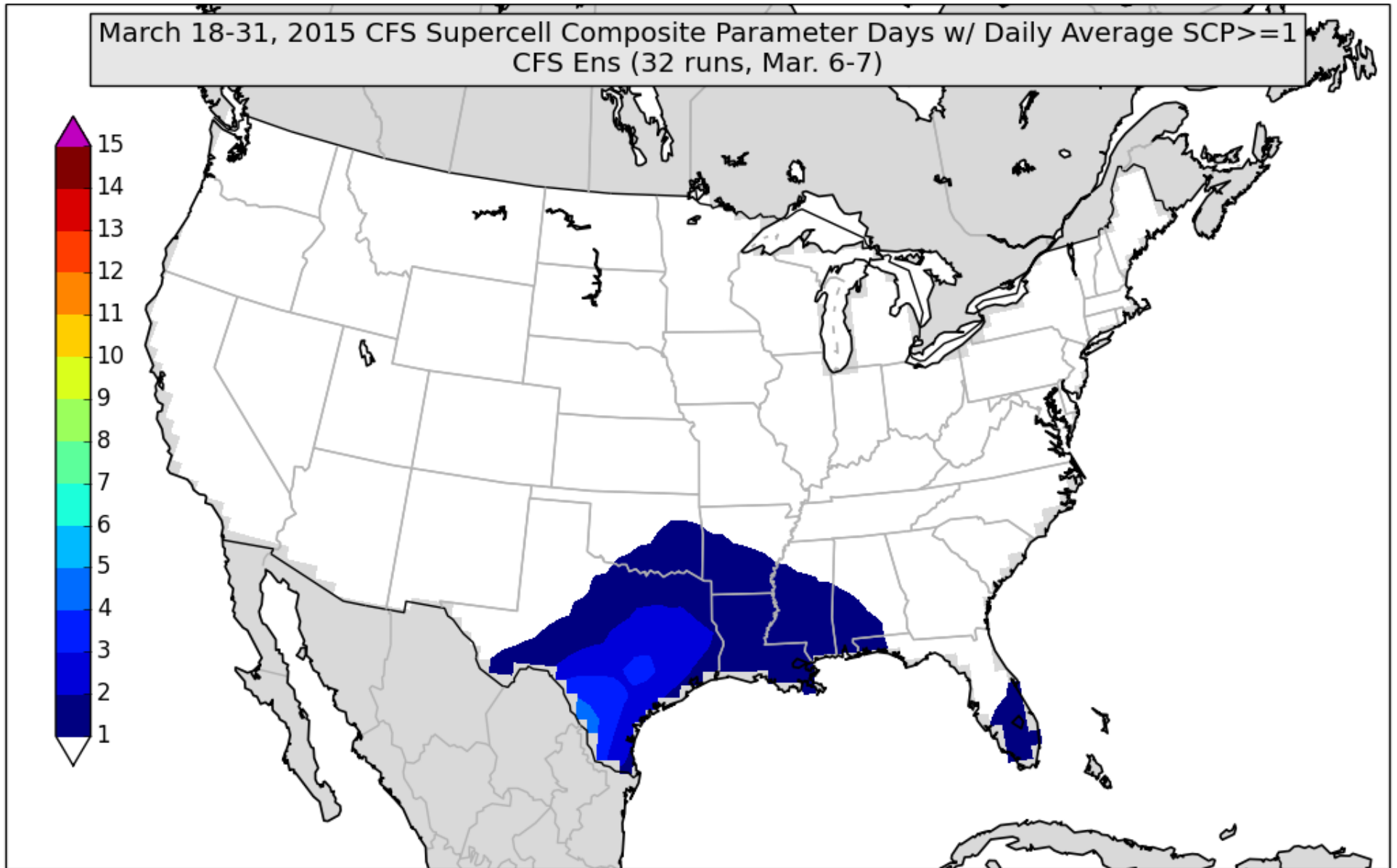
Non-zero gp counts and F1+ tornadoes



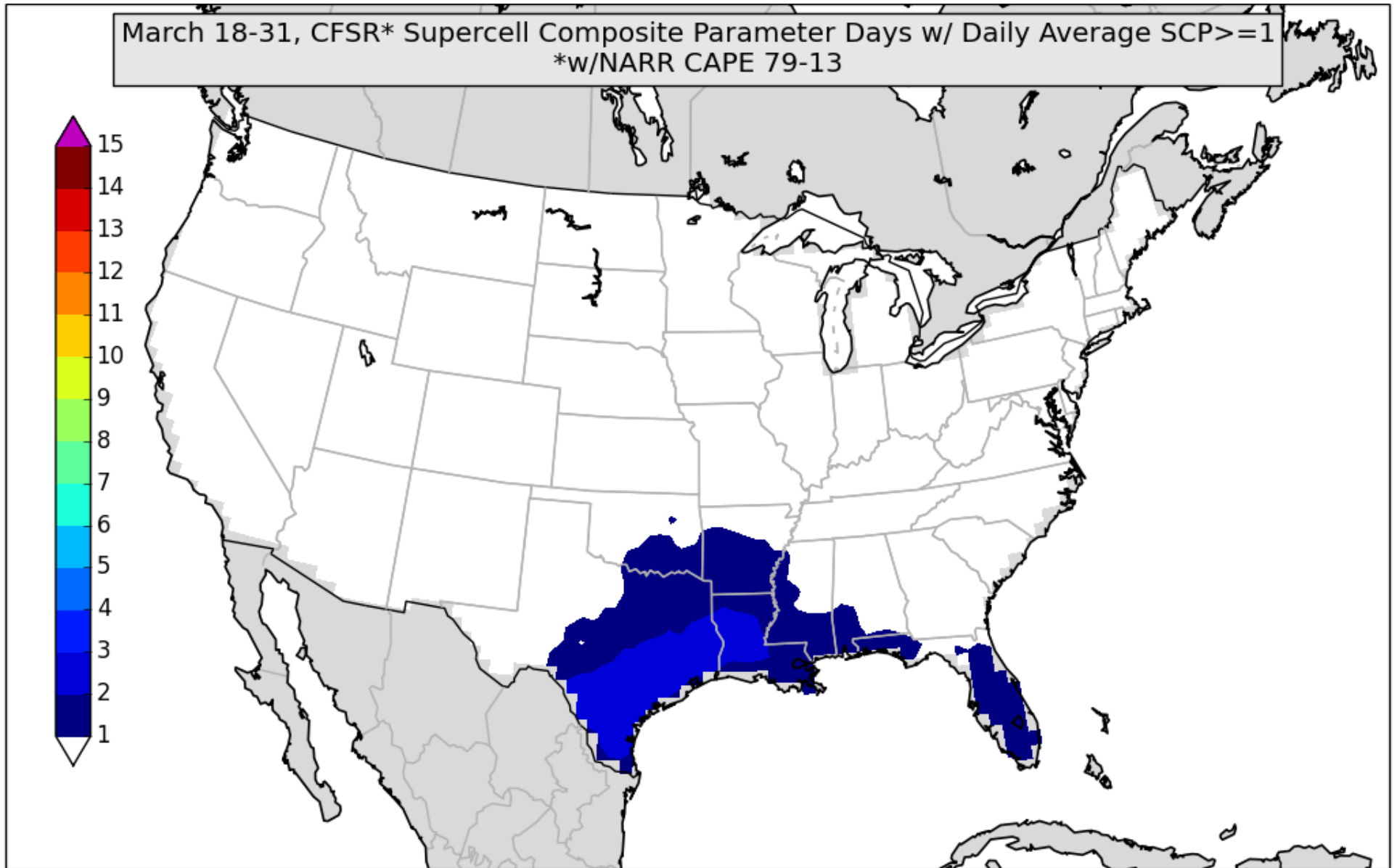
# CFSR\* SCP Days March 18-31, 1991



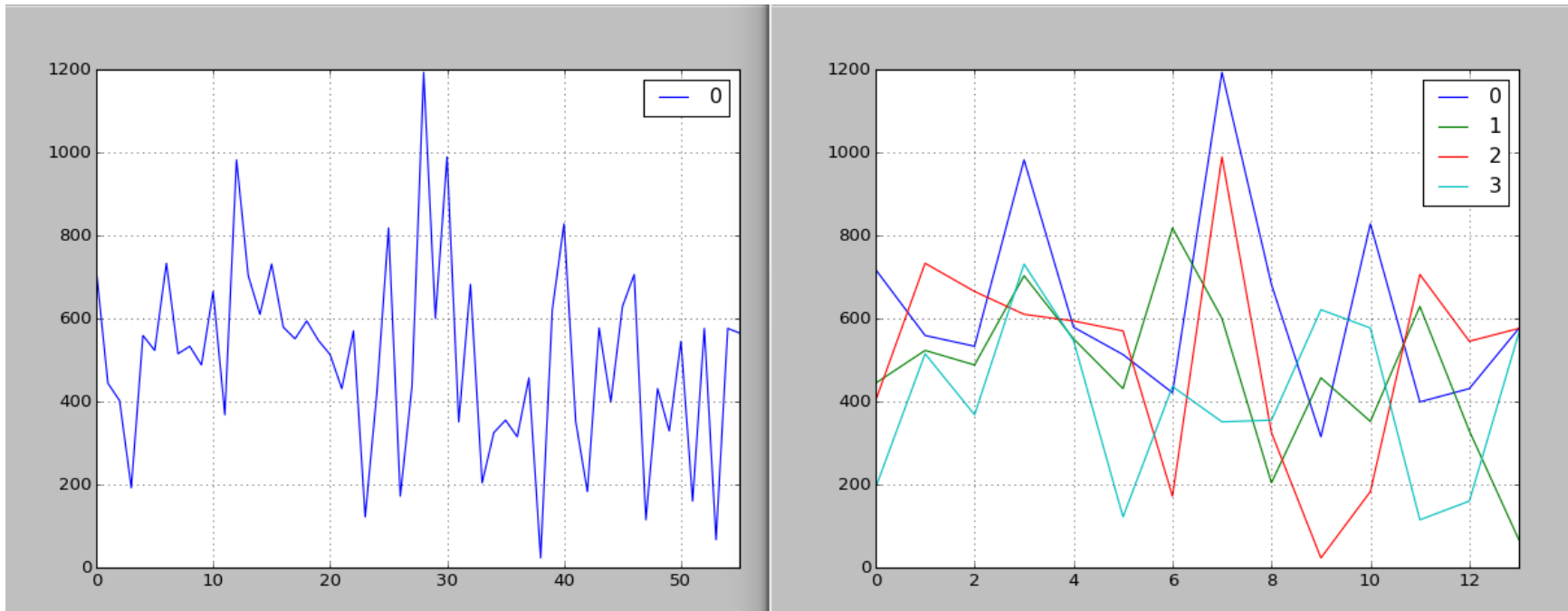
# CFS SCP Days March 18-31, 2015



# CFSR\* SCP Days March 18-31, 79-13



# CFSv2 SCP days>5 gp counts March 2015

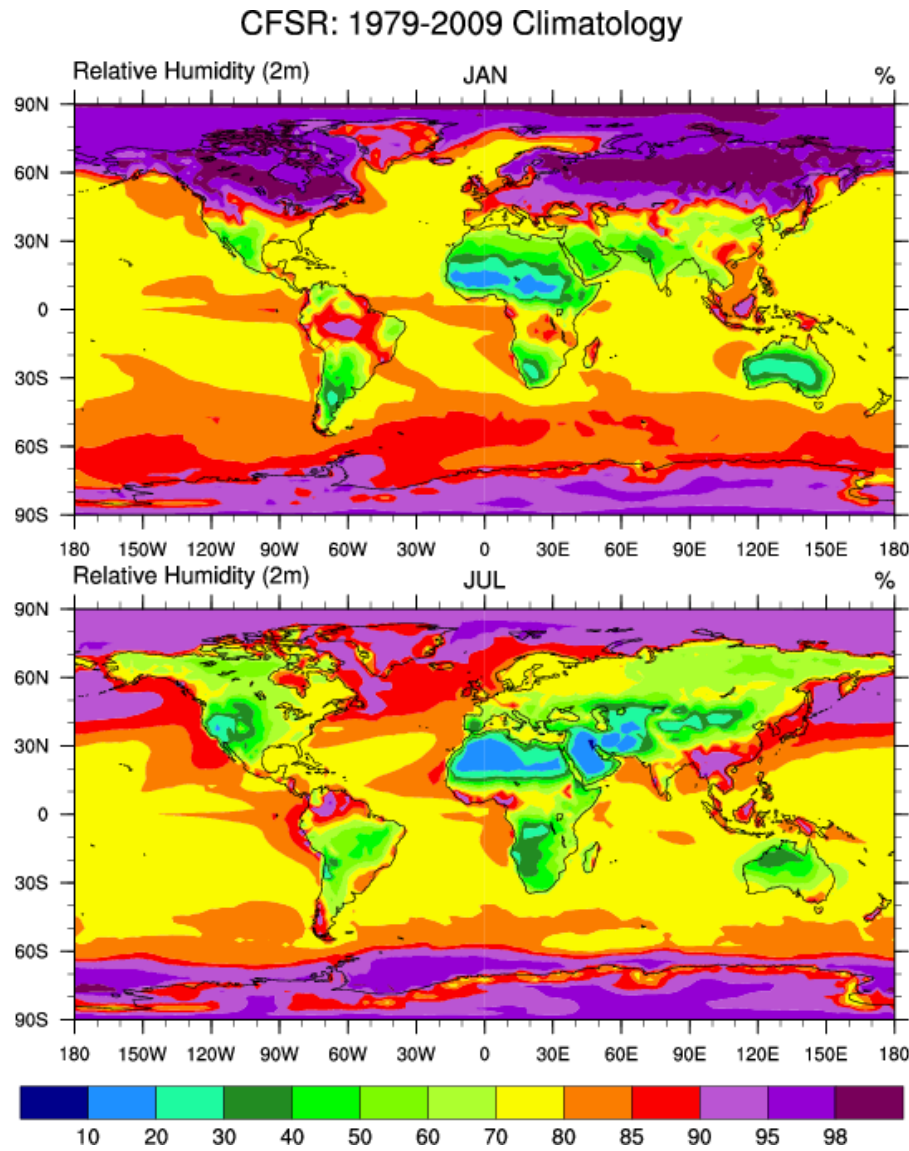


56 forecasts from 2/25-2/28

# Very Preliminary Observations

- “SCP days” weakly correlated with tornadoes
- Simple large ens mean possible from CFS
- Past two Februarys verify as CFS over-forecasts
- Latest two-week “SCP days” forecast ~ climo!

# Climate Forecast System (CFS) Guidance



2<sup>nd</sup> version of NCEP Climate Forecast System

V2 Became operational in March 2011

Global model: coupled ocean-sea ice-land-atmosphere

1979-2011 CFS-reanalysis was used to calibrate and initialize the CFSv2 but CDASv2 is used to init operational CFSv2 runs

T126 horizontal resolution (~100km) & 64 vertical sigma-pressure hybrid layers

16 CFSv2 operational runs per day:

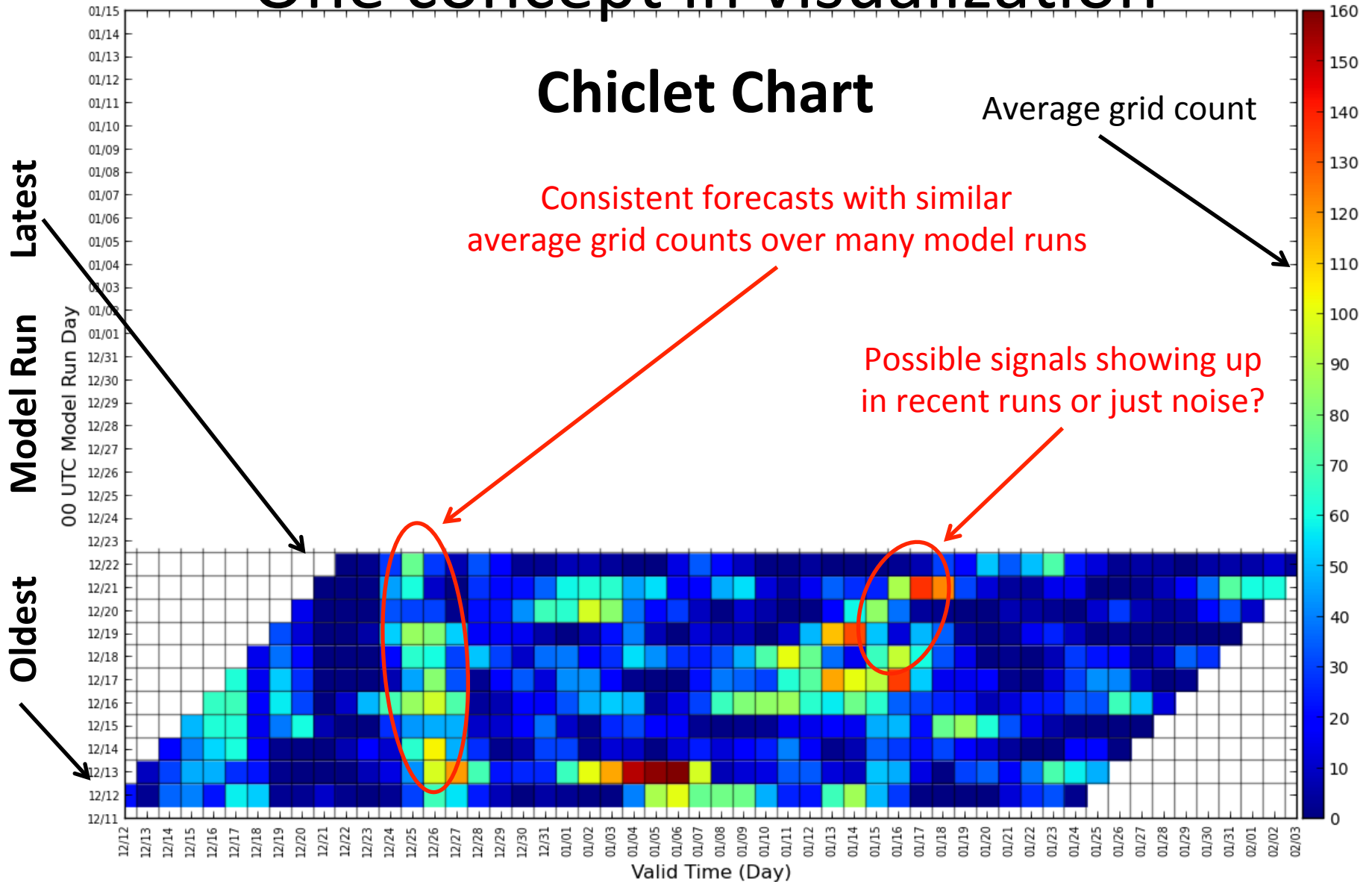
4 out to 9 months

3 out to 1 season

9 out to 45 days

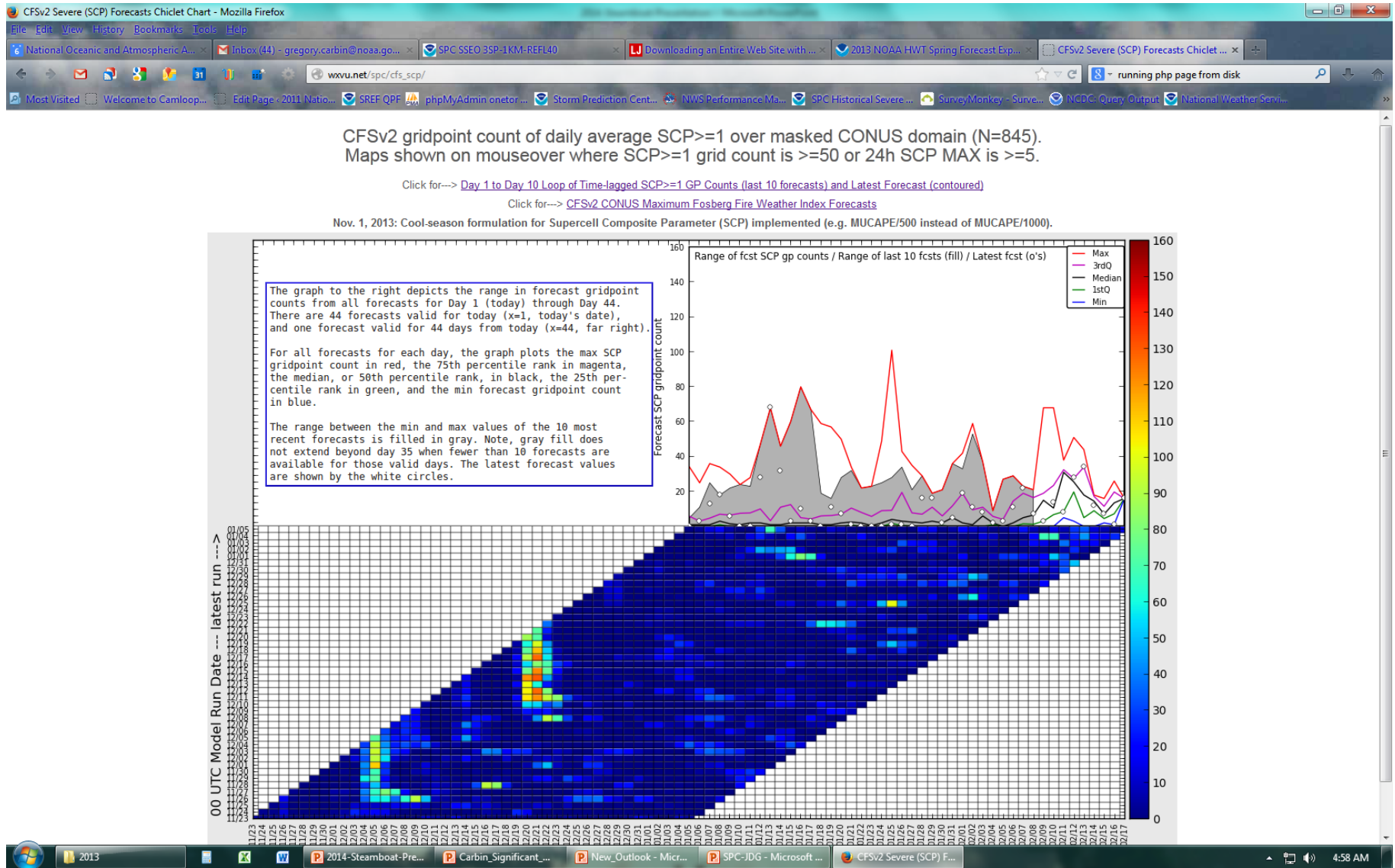
# One concept in visualization

## Chiclet Chart

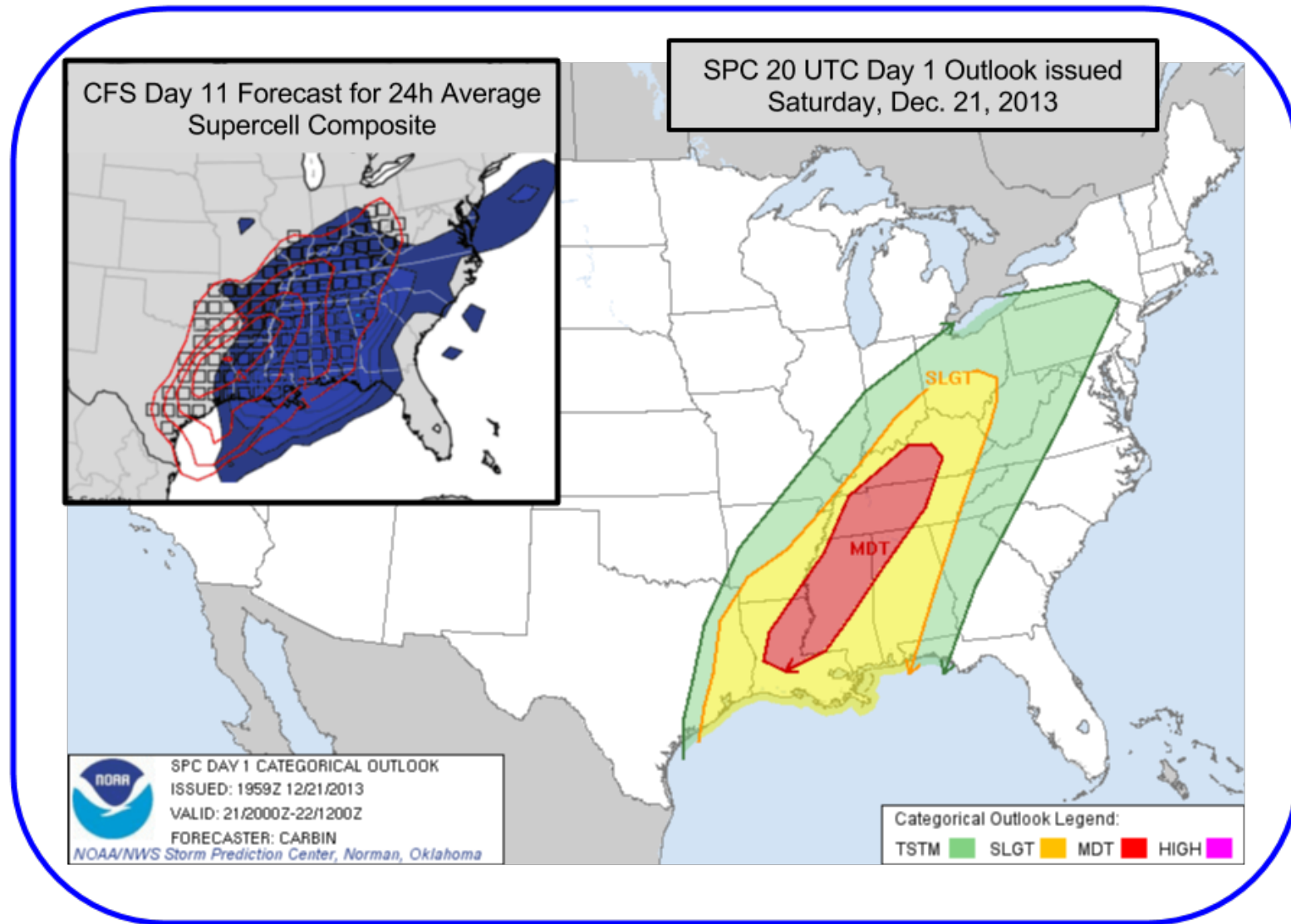




# CFSv2 chiclet chart and Nov. 17, 2013



# CFS Day 11 & SPC Day 1 on Nov. 17, 2013



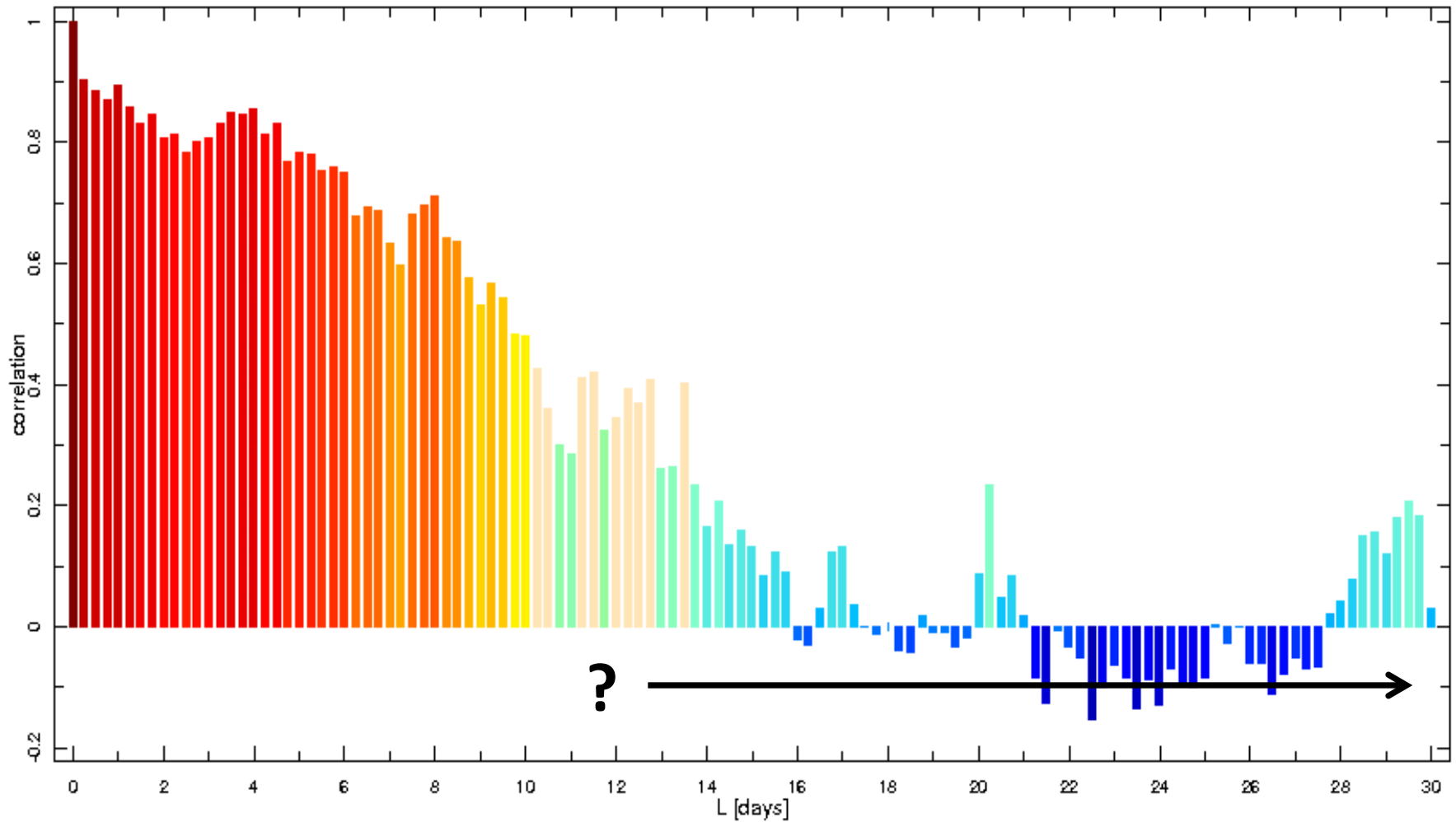
# Utility in forecasting

- Vertical stripes of similar color indicate run-to-run consistency in SCP $\geq$ 1 grid counts.
  - Similar areal extents of environments conducive to severe weather.
- On the website, moving the mouse vertically upward on a highlighted stripe reveals consistency / trends in SCP-environment placement.
- Above the chiclet chart, a graph of quartile ranges of the SCP grid point count keeps track of the last several forecast runs, in the sense of ensemble statistics.
- Where there are more horizontal stripes indicates more inconsistency between runs.

# Current Links...

- [http://wxvu.net/spc/cfs\\_scp/](http://wxvu.net/spc/cfs_scp/)
- <http://wxvu.net/spc/exper/sref/cfsplumes/>

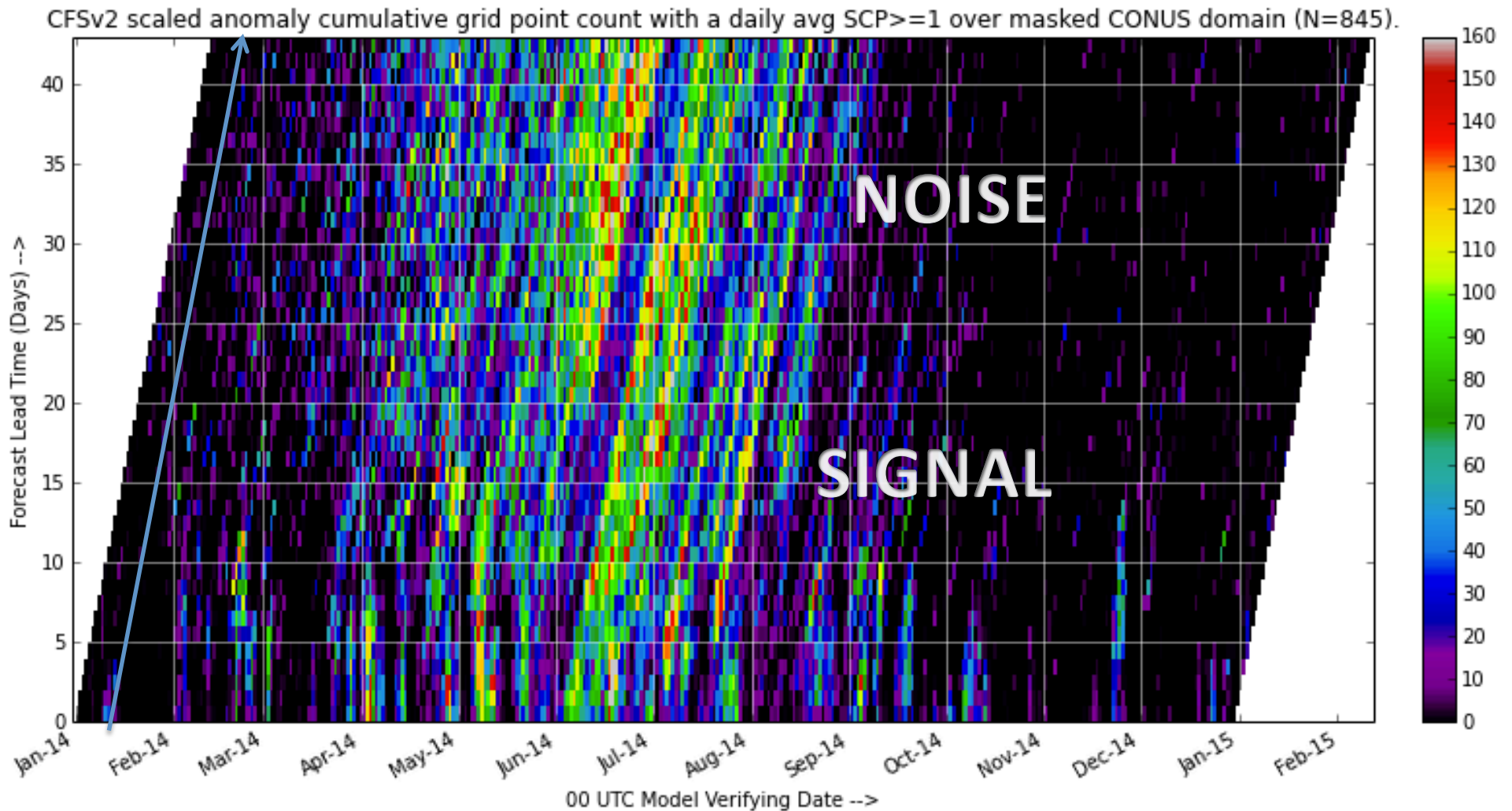
# CFS trends to climatology (or worse!)



# An Alternative Display

- Lead-time is on the y-axis
- Forecast valid time is on the x-axis
- This puts the model runs on parallel diagonals
- Great for verification as the x-axis can be expanded easily

# All 00Z CFS runs initialized in 2014



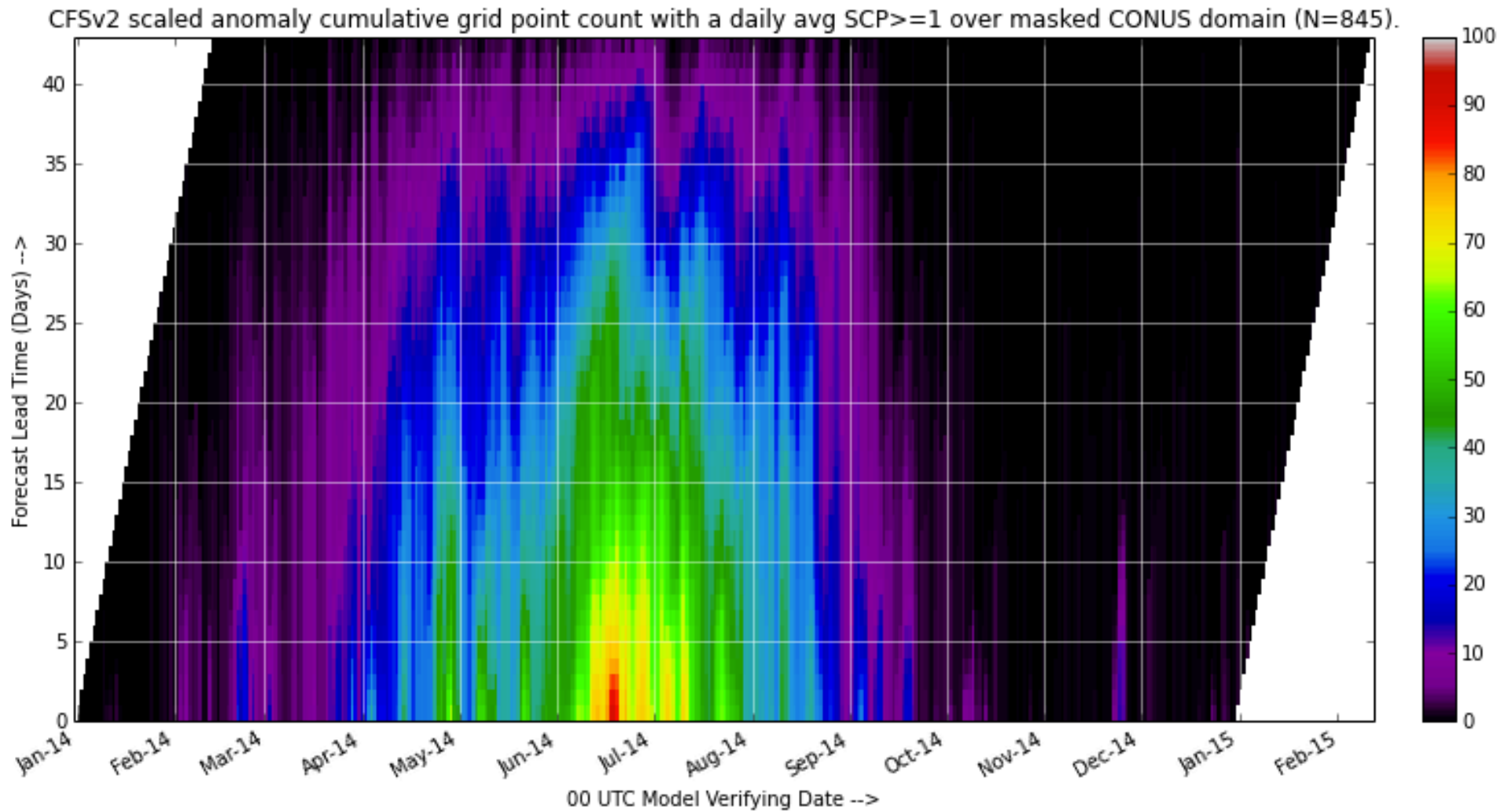
**Forecast  
Run**

# Accumulate data from past runs

- Generally beyond a lead time of 10 days, there is larger run-to-run variability, and less signals for events.
- Another method: By accumulating run-to-run grid point count clearer signals emerge for events up to 3 to 4 weeks in advance.



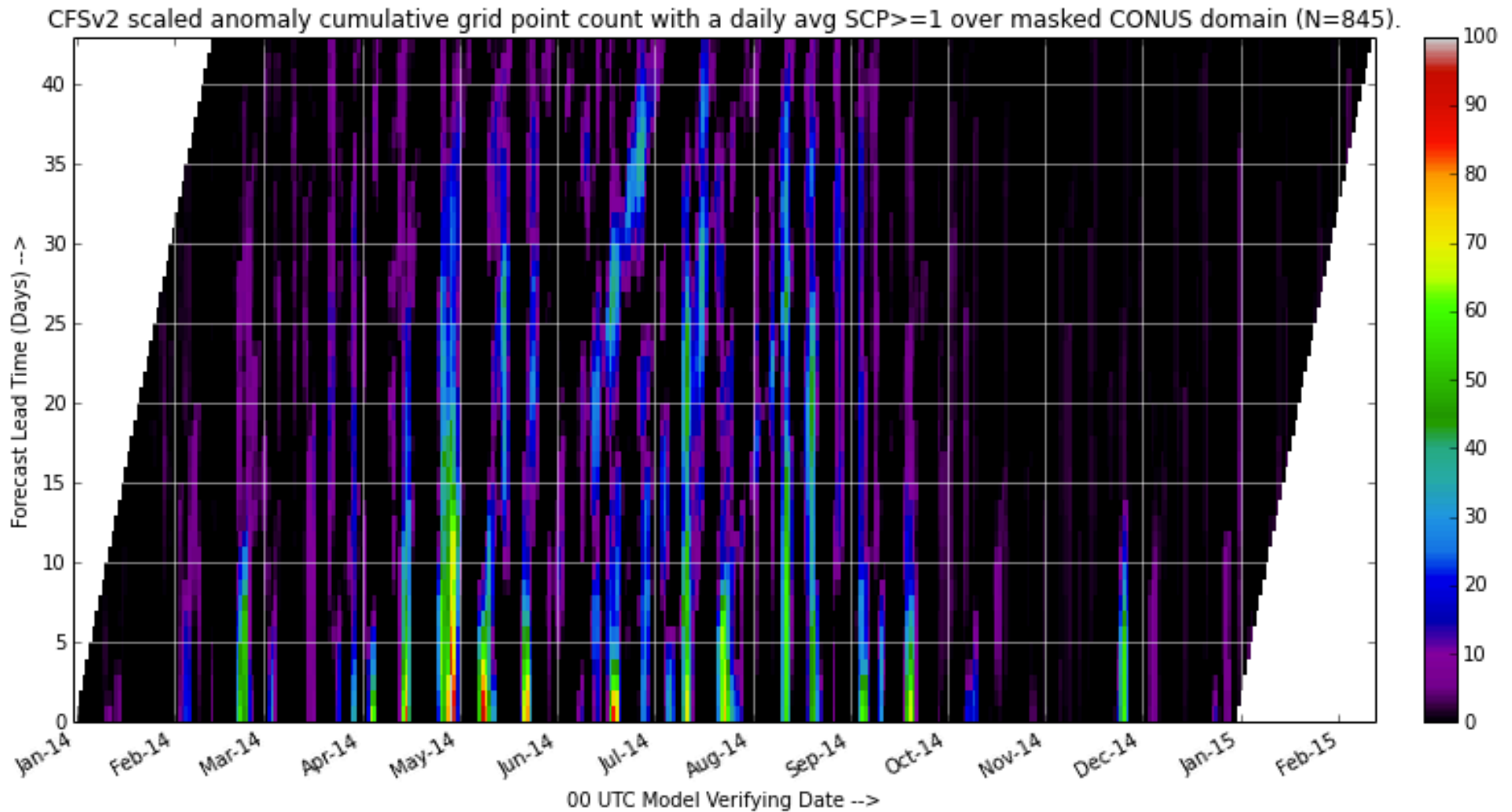
# All 00Z CFS runs initialized in 2014



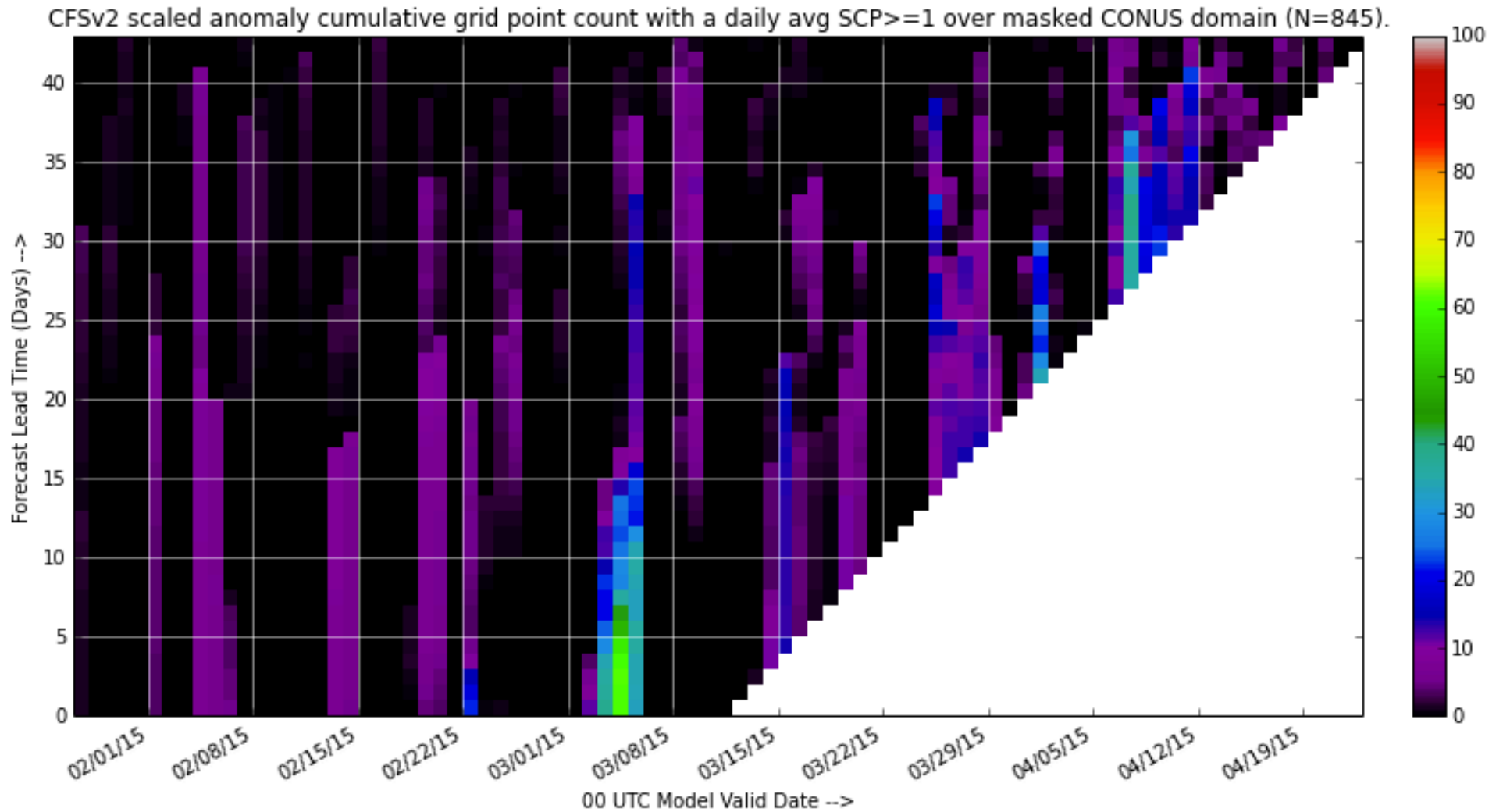
# Accumulate data from past runs

- Taking a running sum of all SCP grid point counts verifying on the same day produces a climatological curve of CONUS-wide SCP.
- Embedded in the curve are spikes where forecast runs have exhibited particularly favorable conditions for severe weather, above climatology.
- After removing the climatological curve, long vertical stripes remain, where SCP has “accumulated” over many forecast runs.

# All 00Z CFS runs initialized in 2014



# Latest Forecast



# Next steps...

- Currently transitioning this to an operational product for SPC forecasters.
- Continue to expand utilization of CFSv2 data, including ensemble uncertainty analysis, and other time-lag ensemble analysis techniques.
- Apply same visualization methodology to GFS ensemble.
- Acknowledgements: NOAA-OAR-CPO-2014 #2003692