

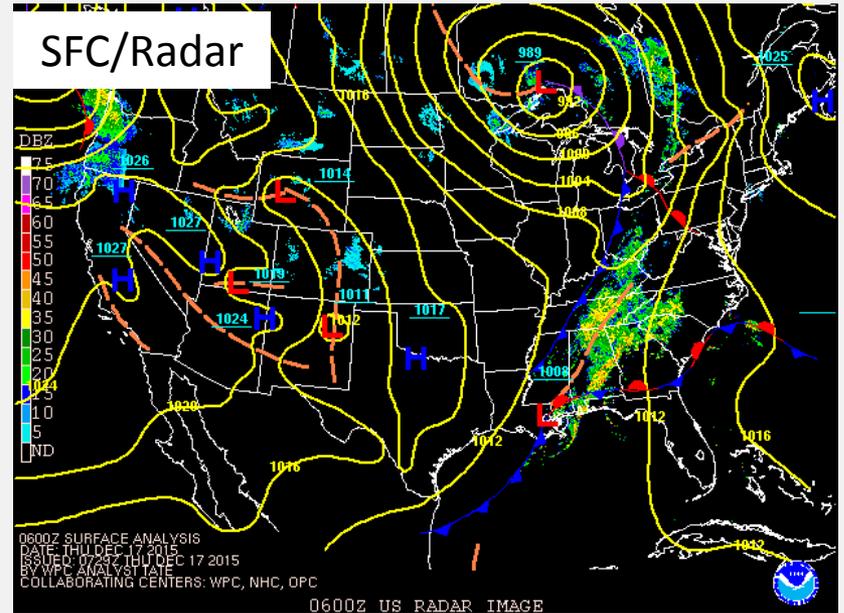
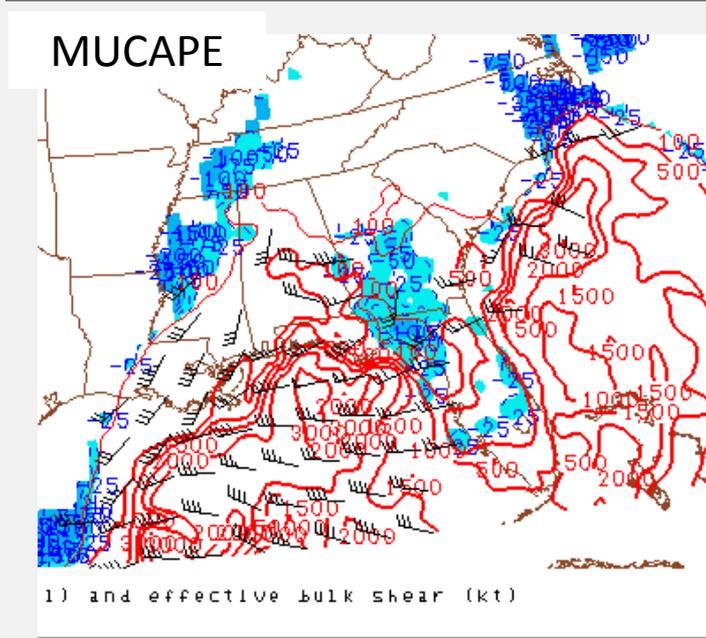
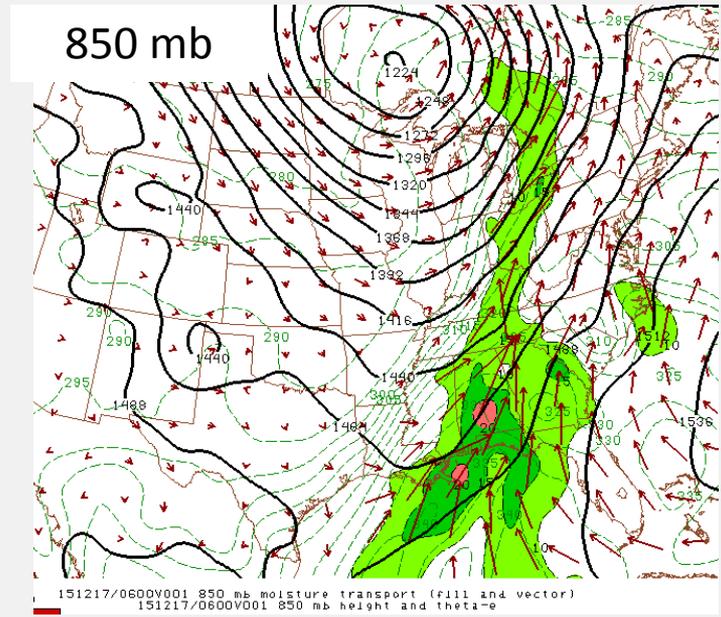
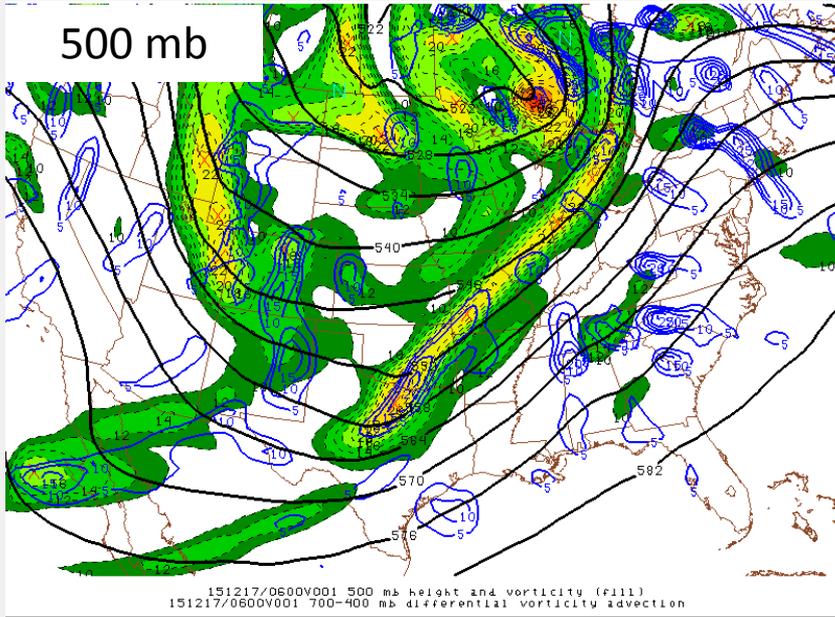
GFS Dry Bias across the Gulf Coast and Southeast

Marc Chenard
Weather Prediction Center

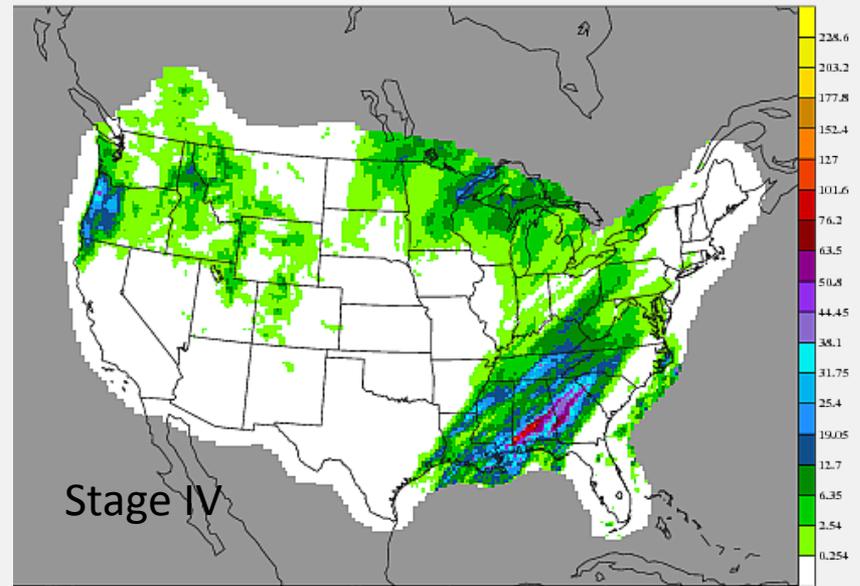
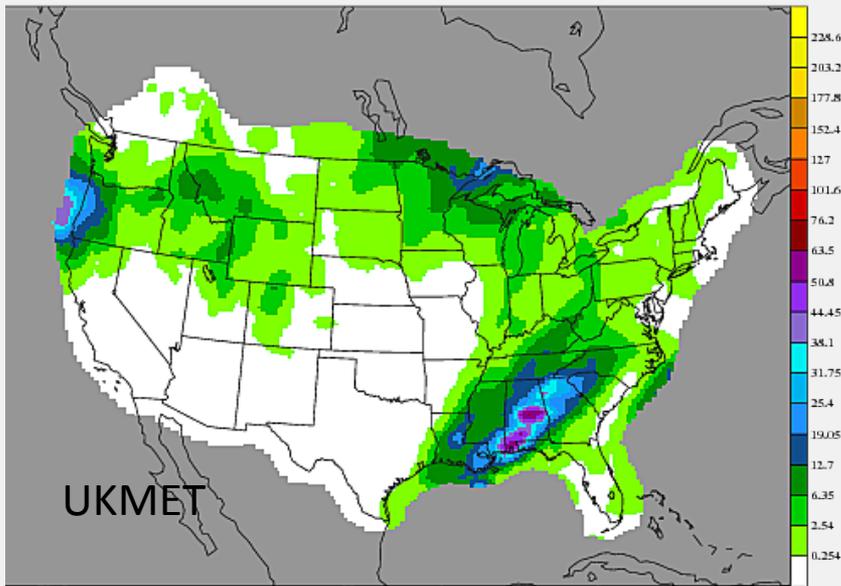
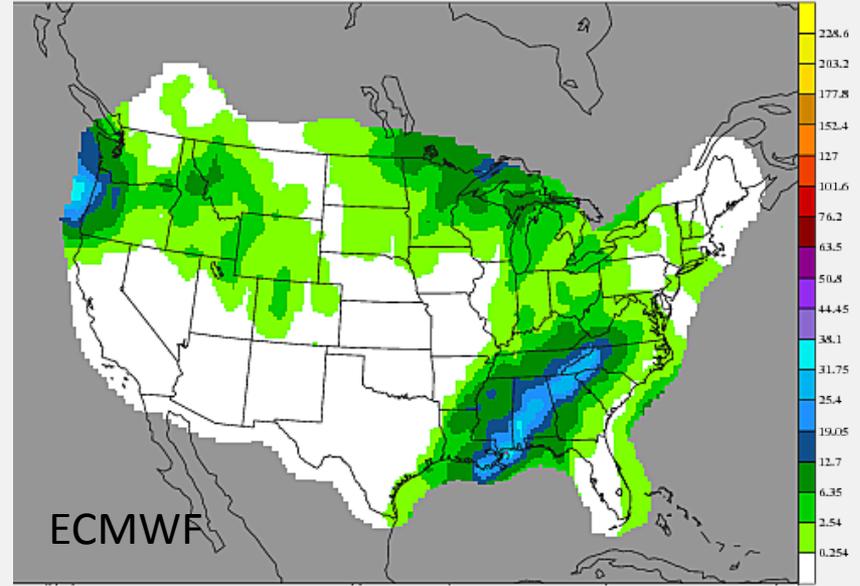
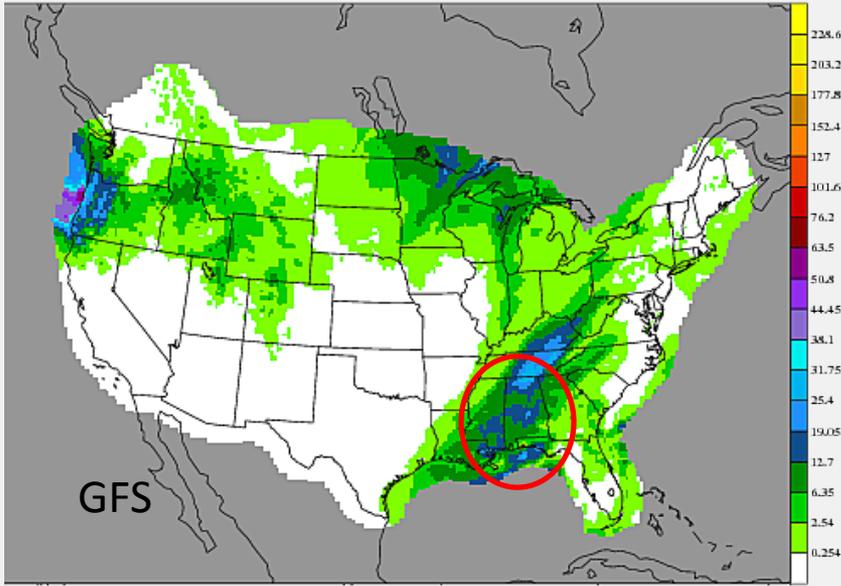
Overview

- Will be looking at 8 cases from Dec 2015 to Feb 2016 in which a significant dry bias can be seen in the GFS across portions of the Gulf Coast and/or the Southeast
 - Brief look at synoptic overview and then a QPF comparison from the GFS/ECMWF/UKMET
 - Generally focused on day 1 forecasts
 - Short term error more likely to be from a model systematic bias and not a mishandling of synoptic scale features
- Then will briefly compare the Operational GFS with the Parallel GFS for a few of these cases
- Will take a quick look at regional model QPF verification
 - Threat score and bias comparison

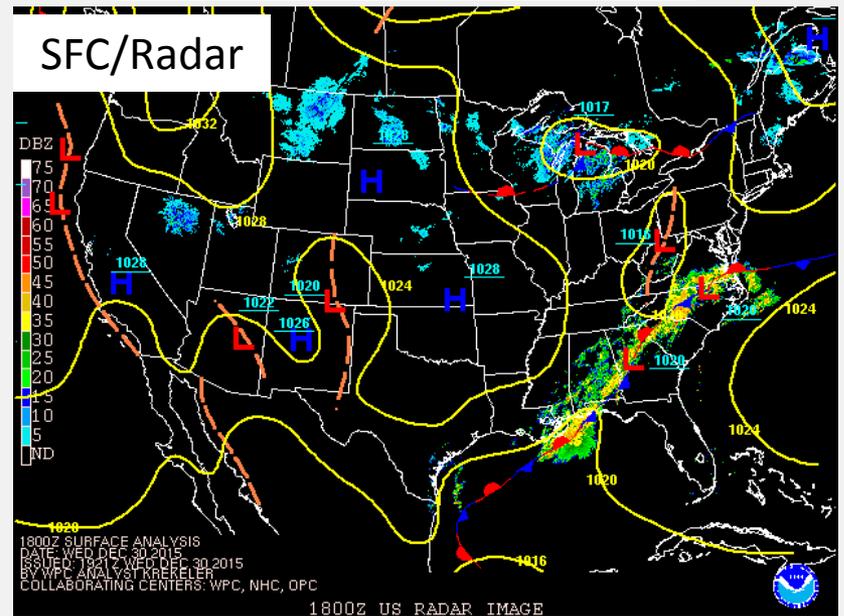
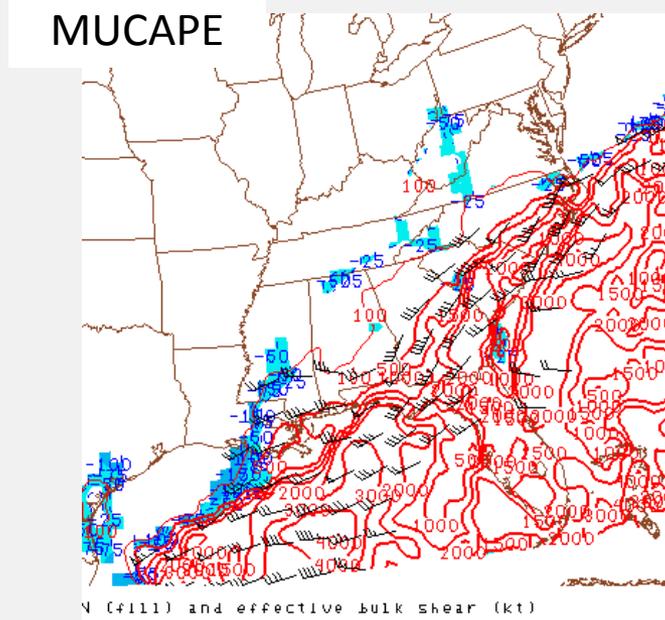
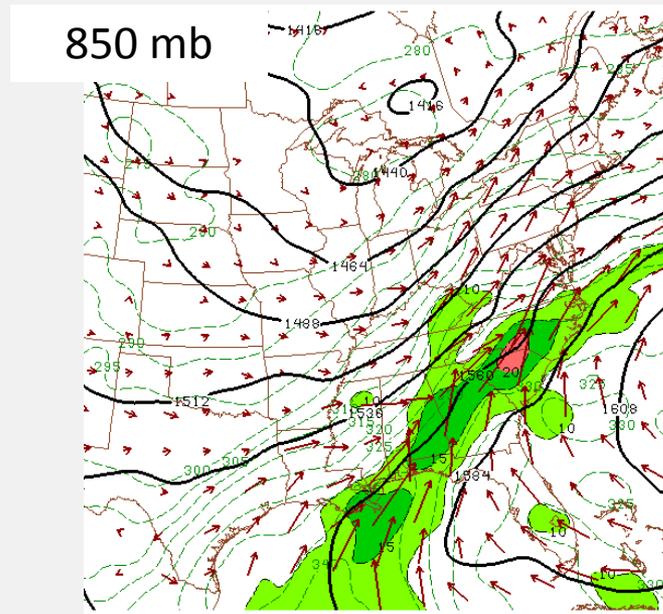
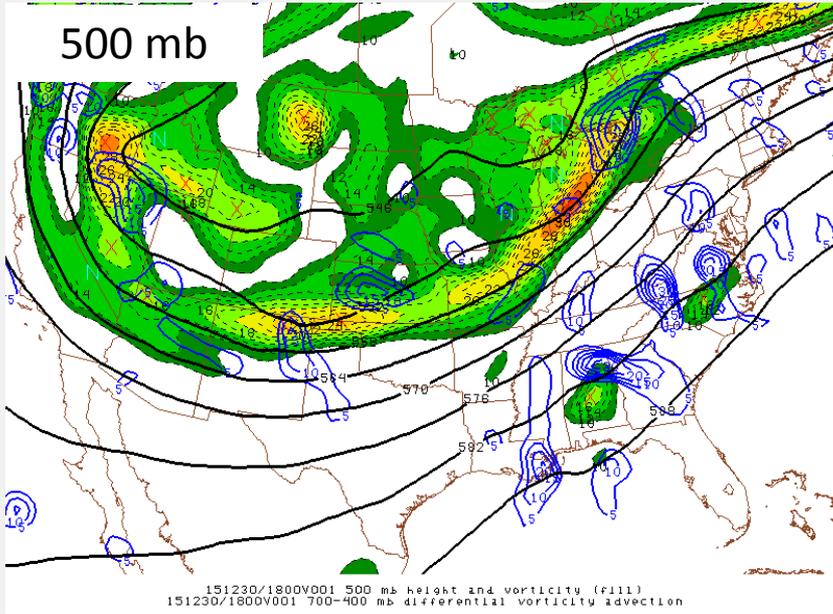
12/17/2015



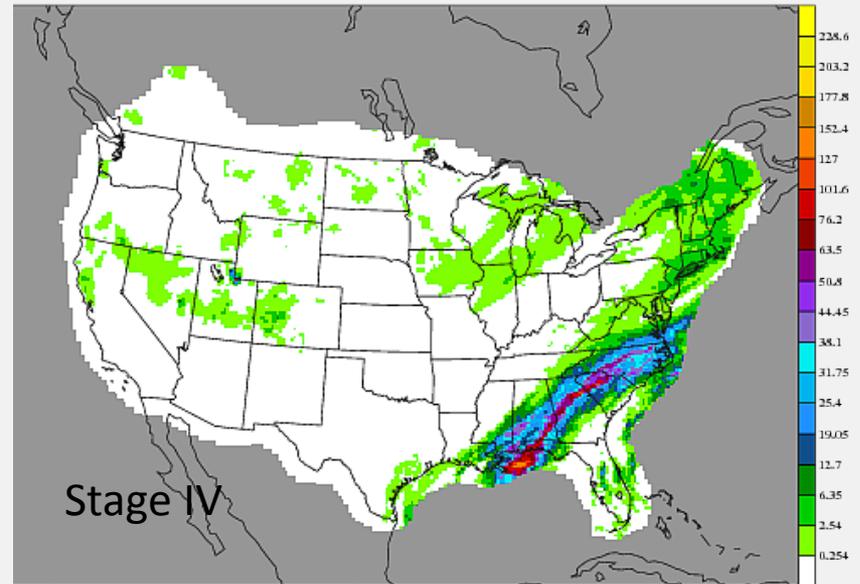
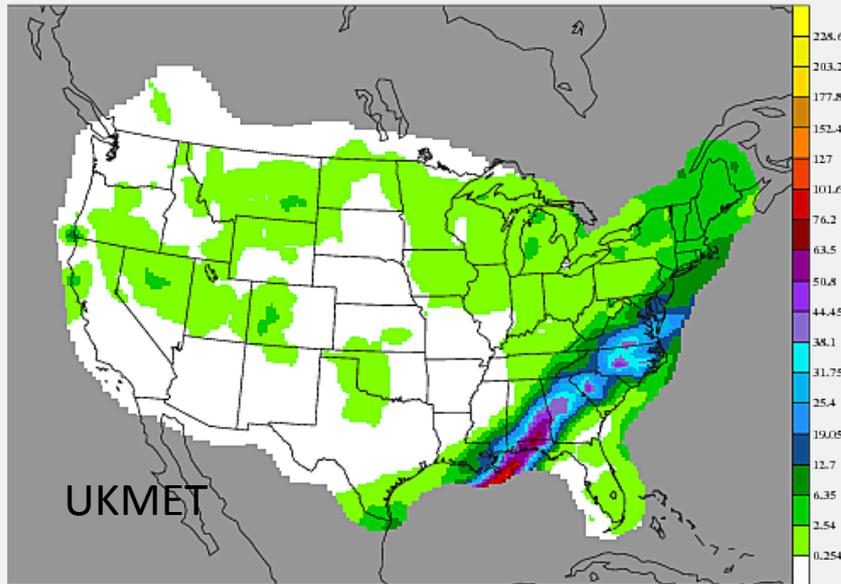
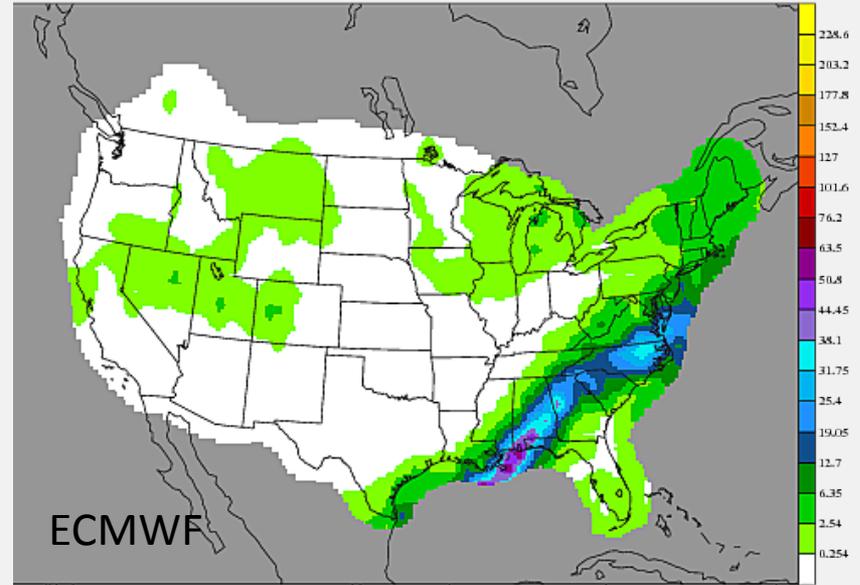
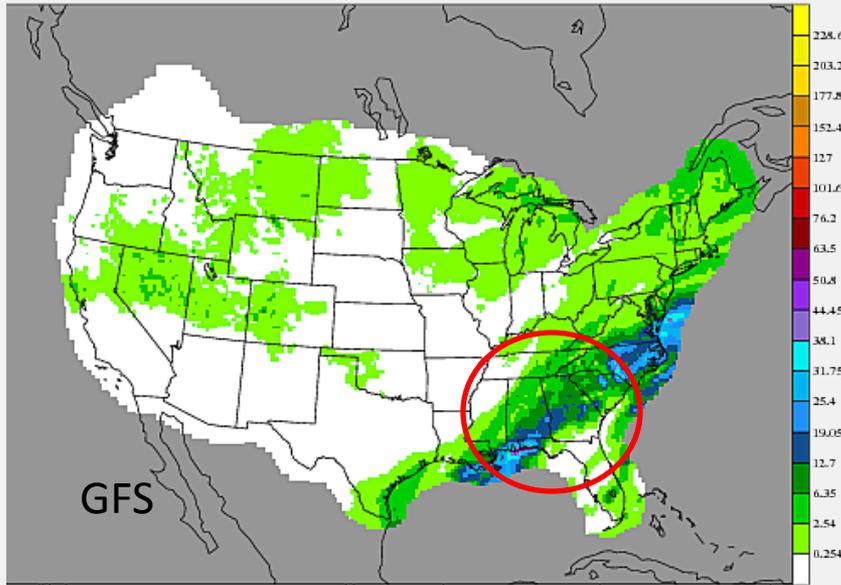
12/17/2015 Forecast Hour 36



12/31/2015

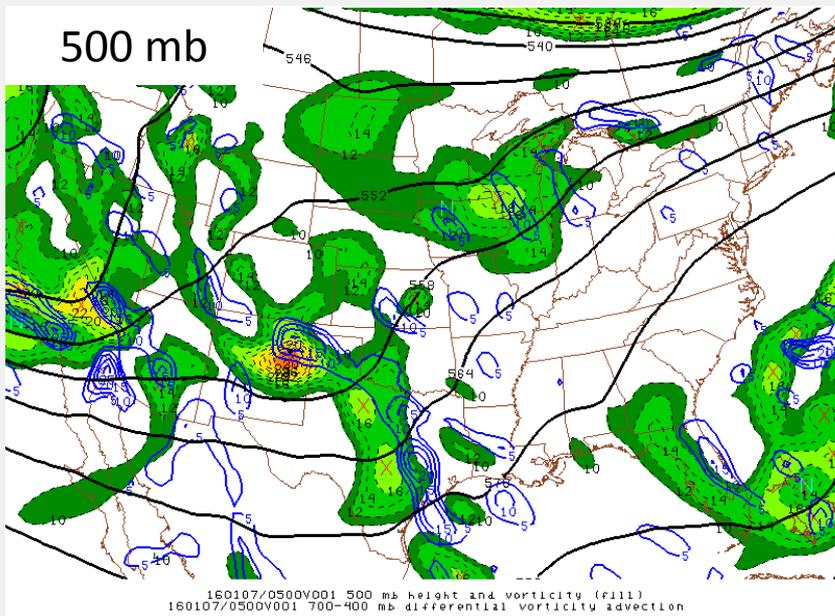


12/31/2015 Forecast Hour 36

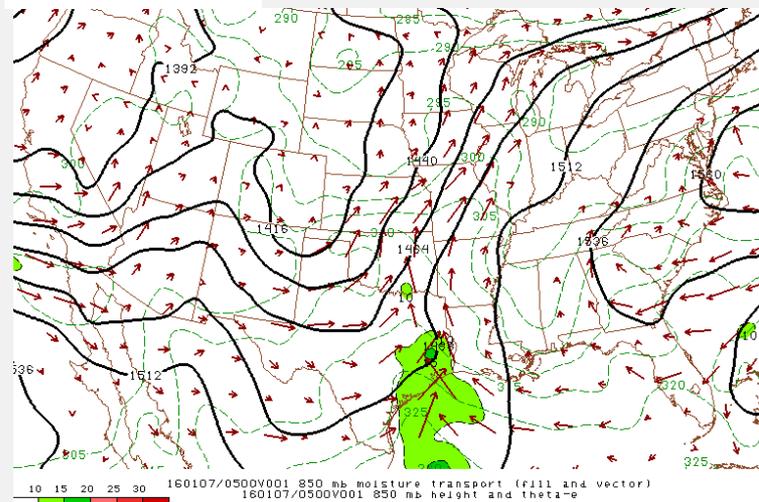


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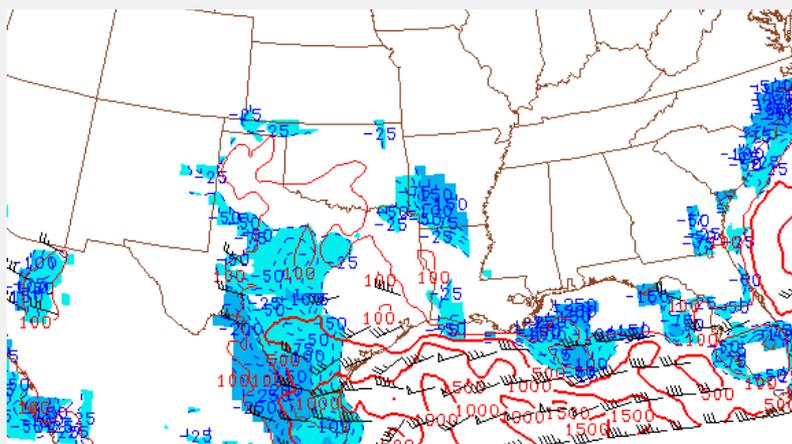
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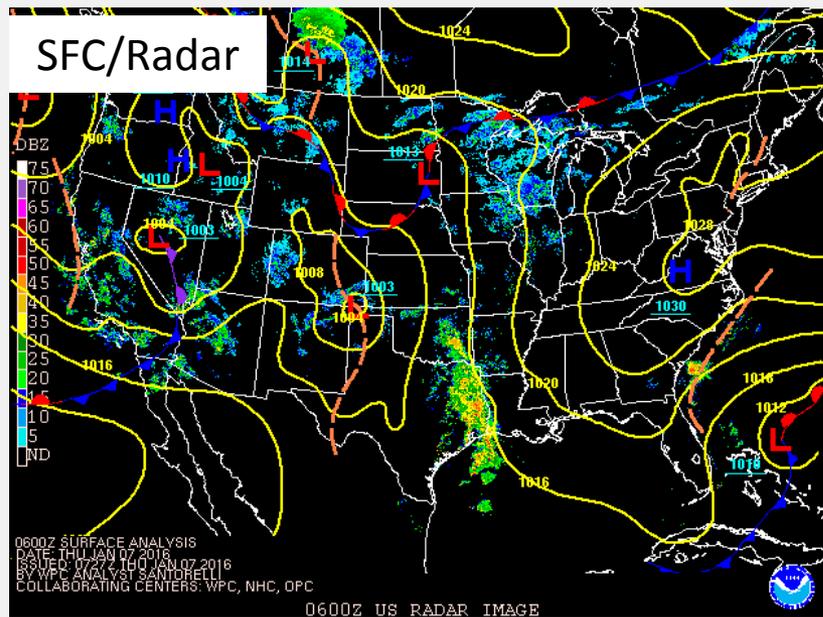
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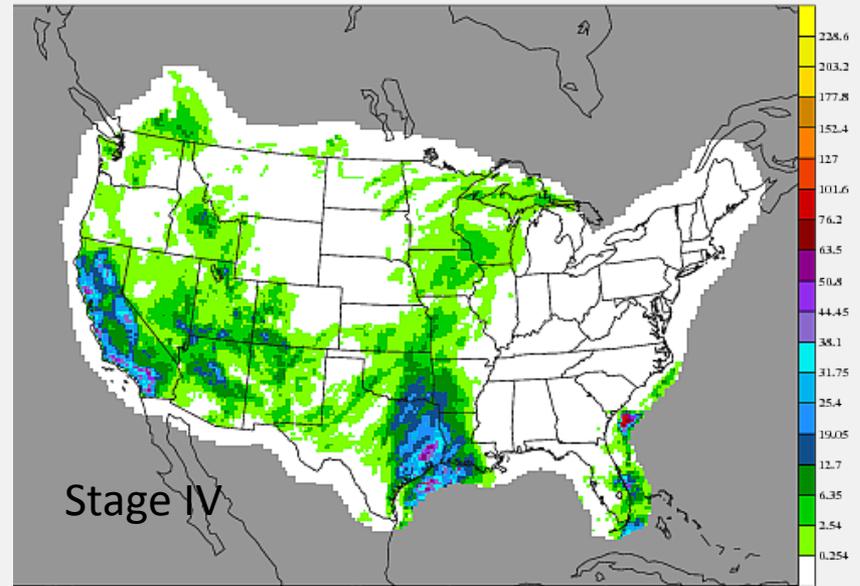
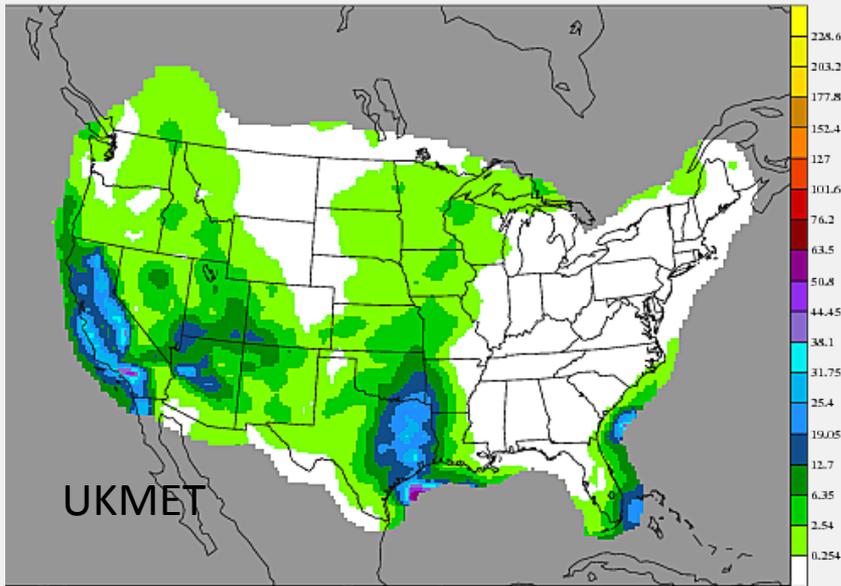
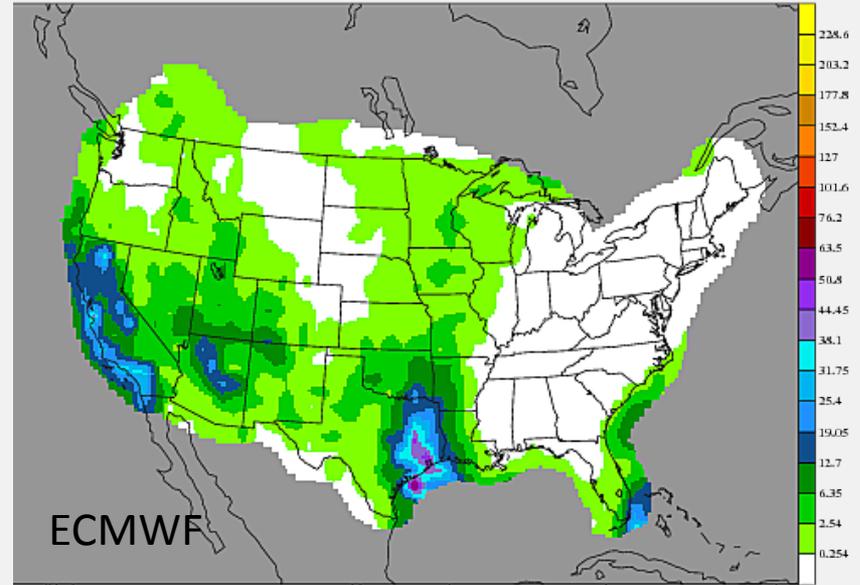
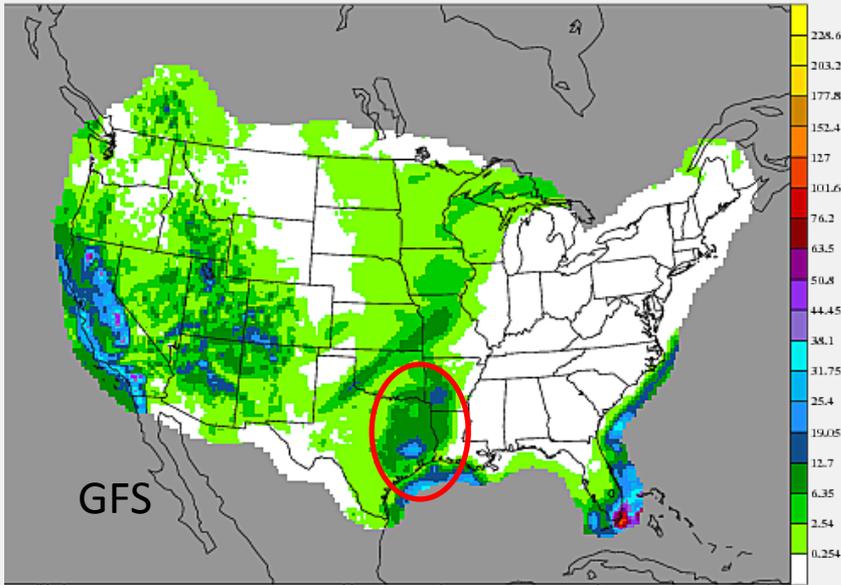
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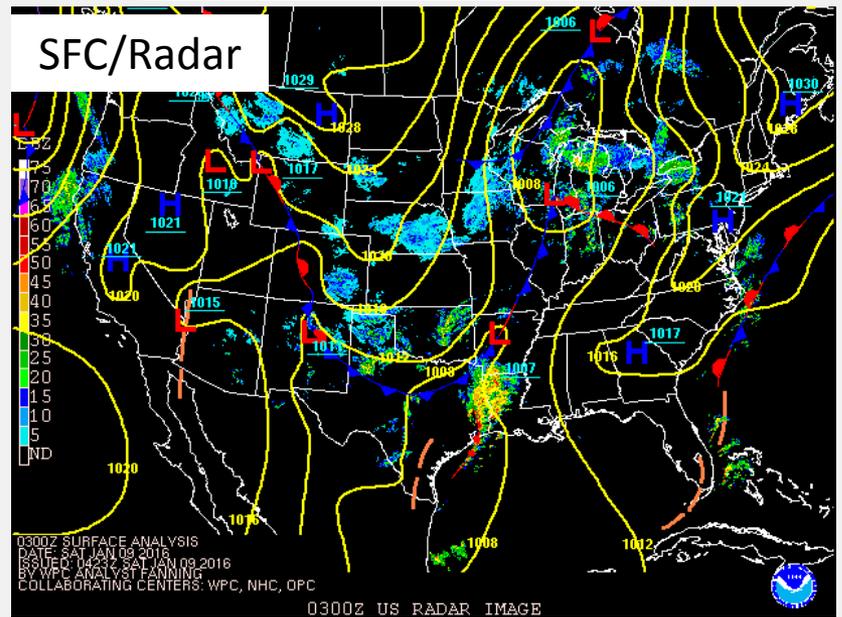
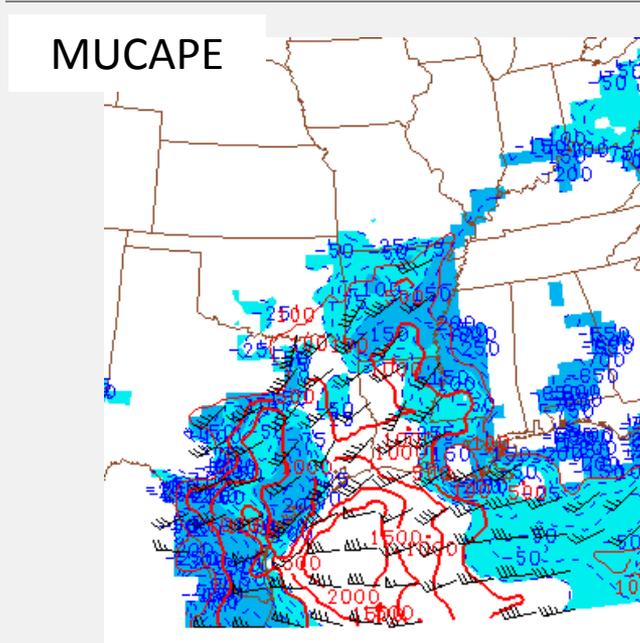
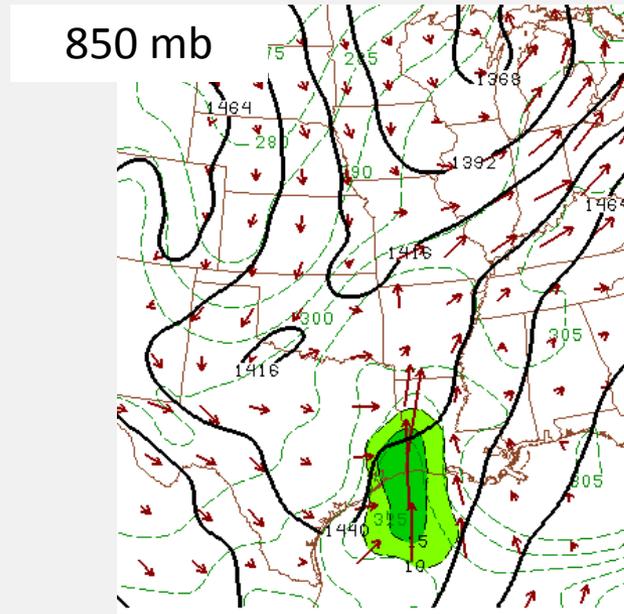
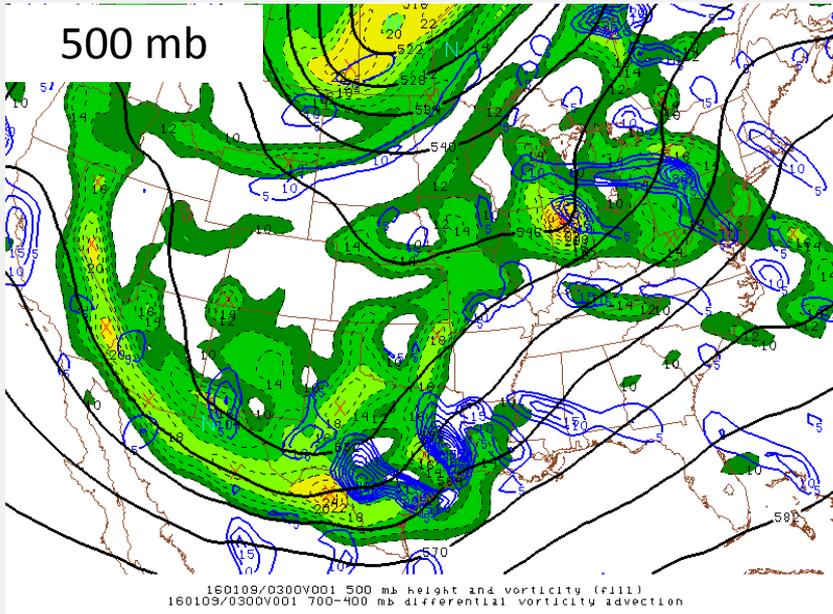
SFC/Radar



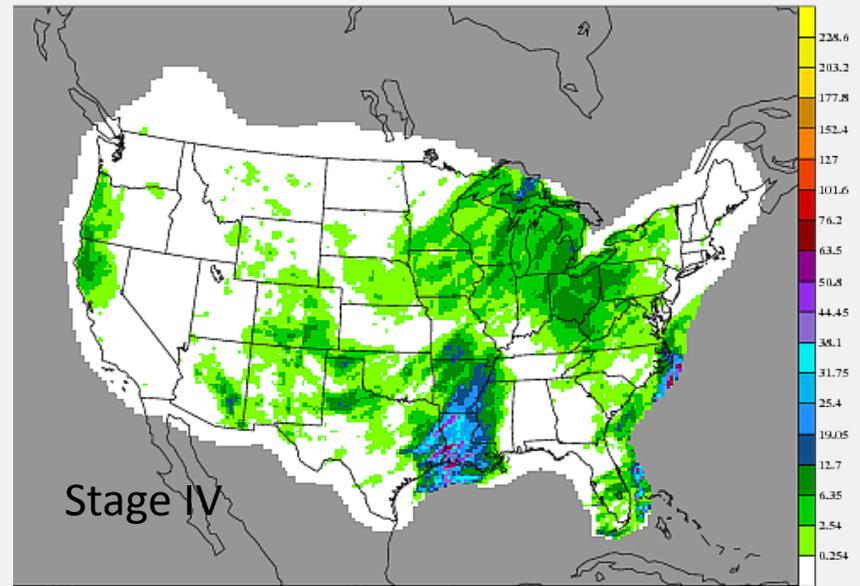
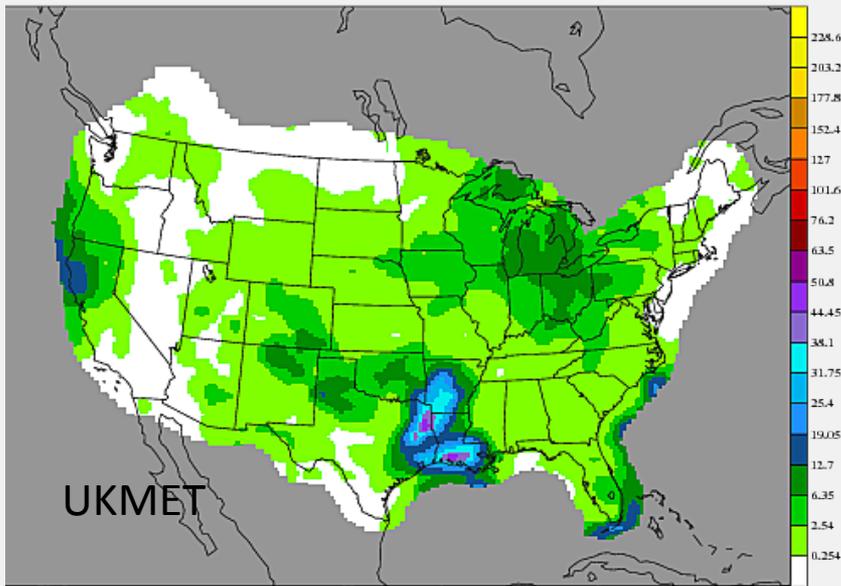
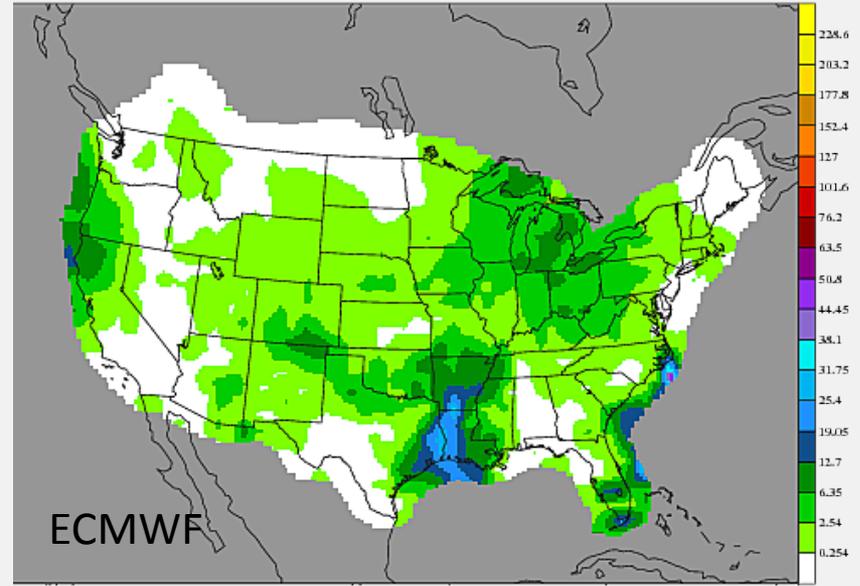
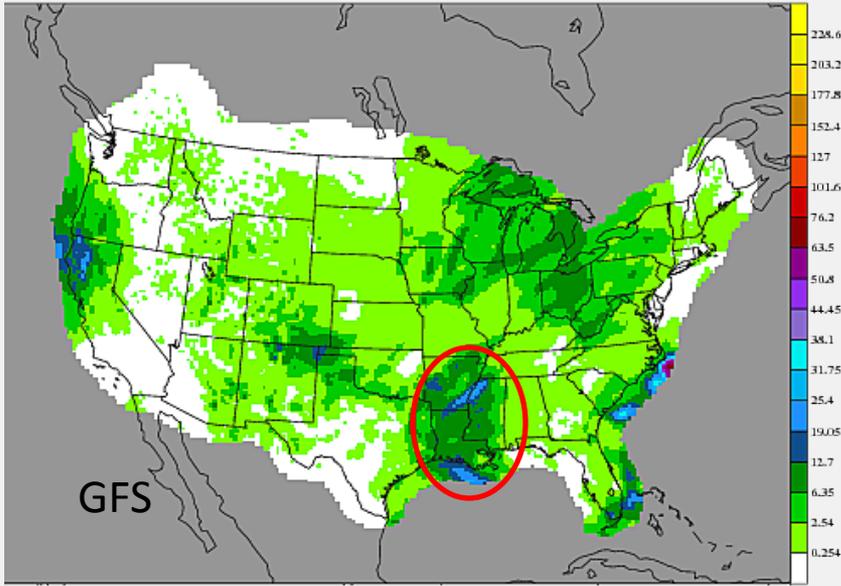
1/7/2016 Forecast Hour 36



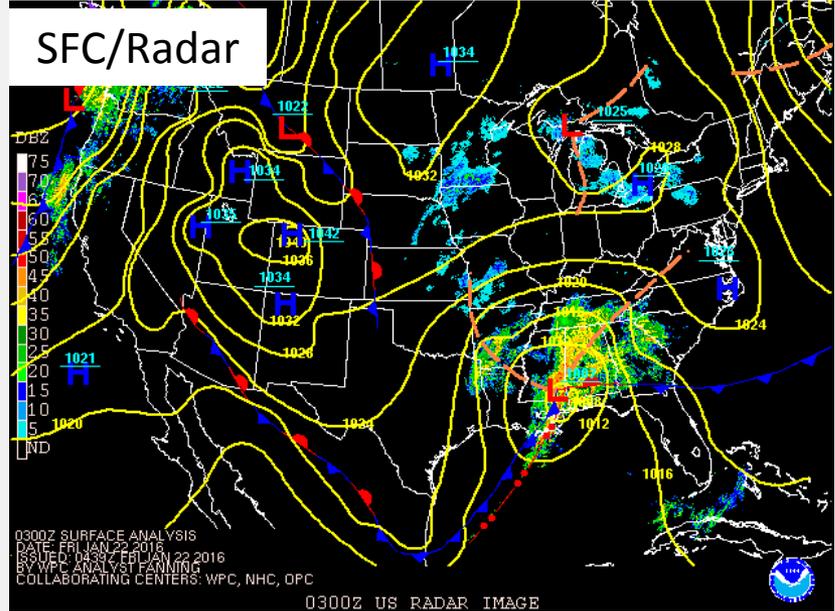
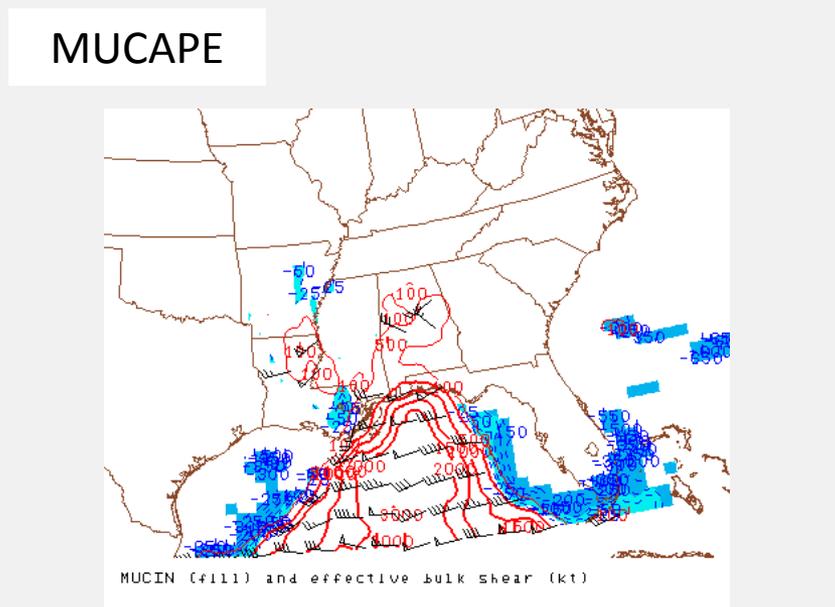
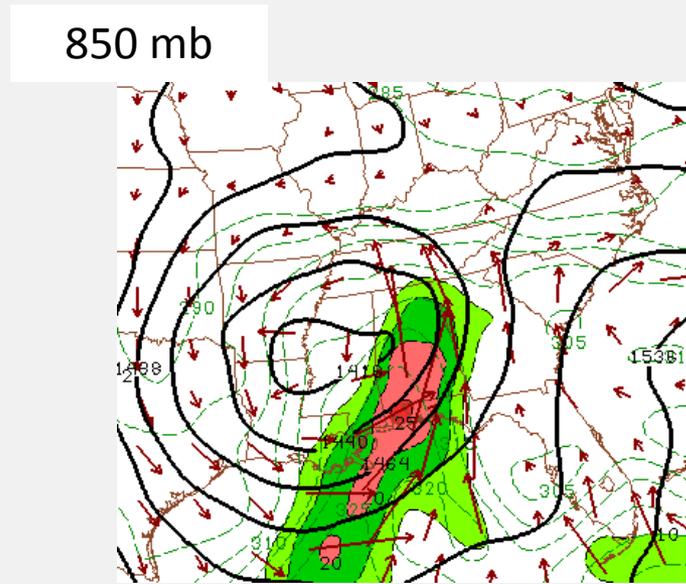
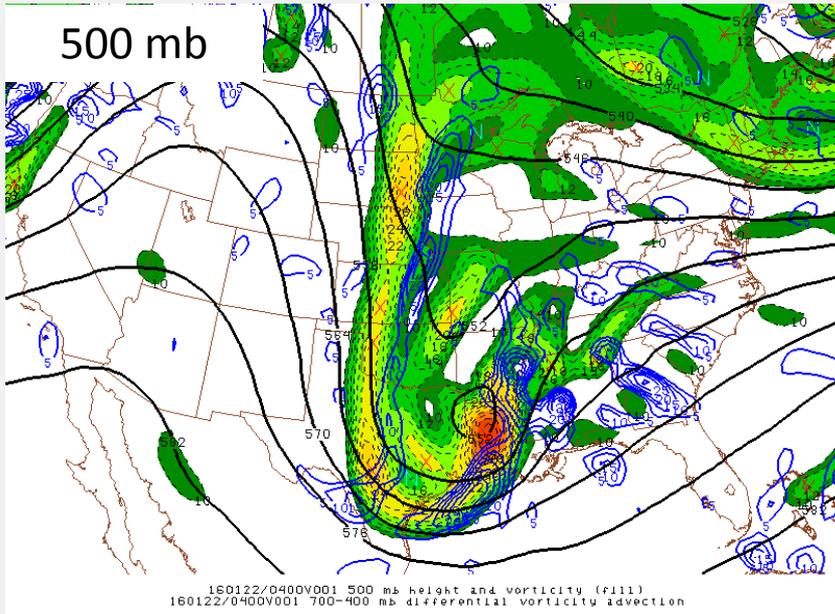
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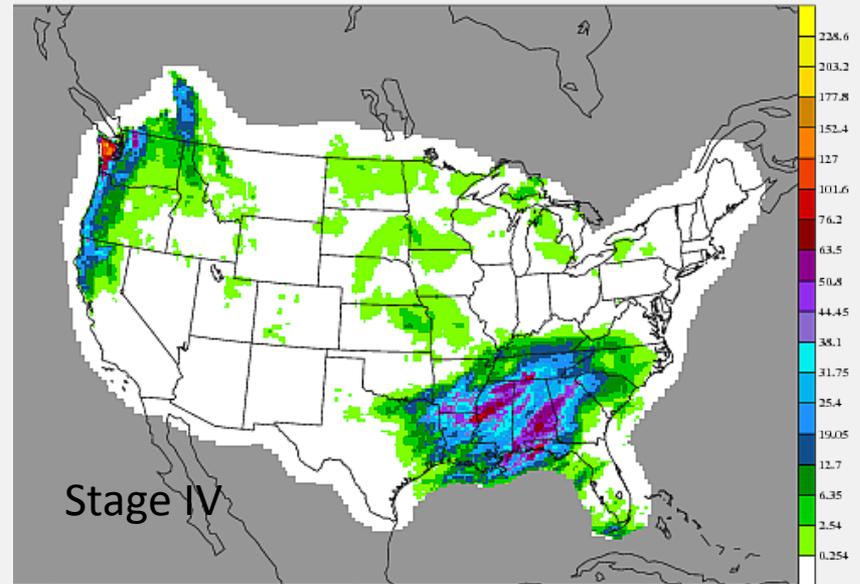
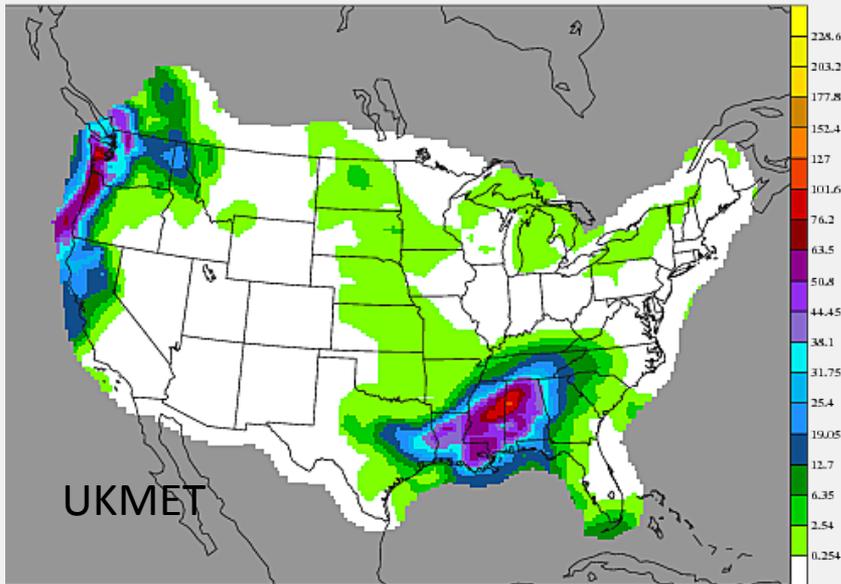
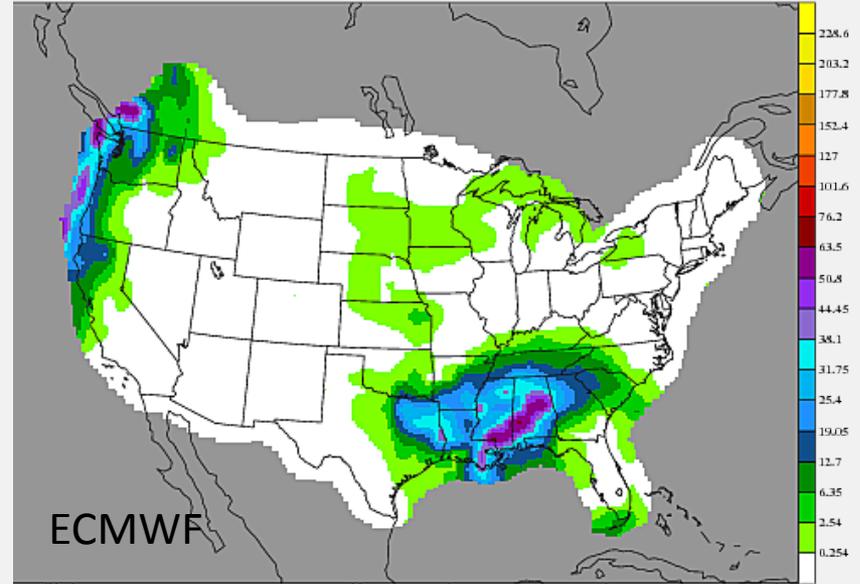
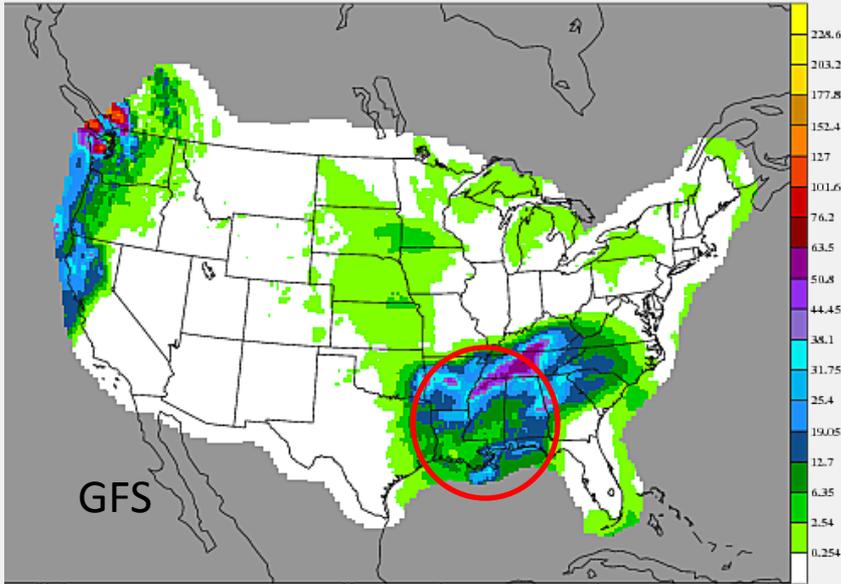
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01/22/2016

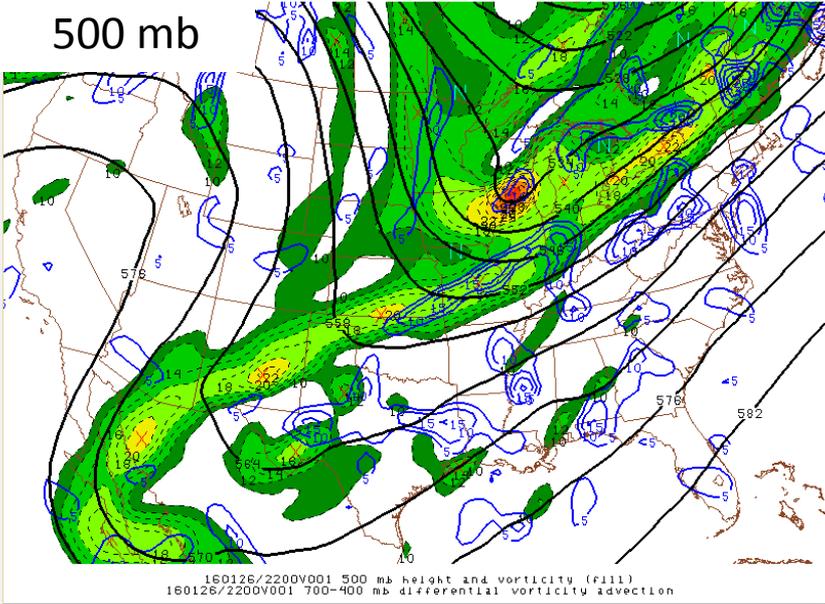


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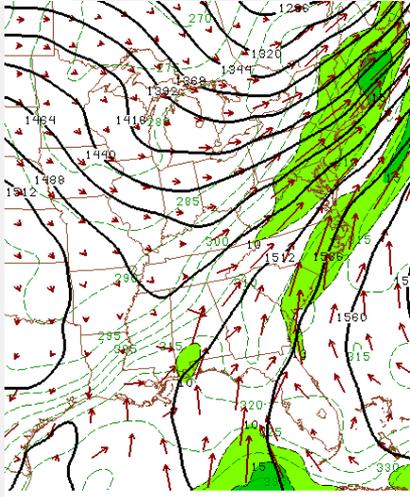


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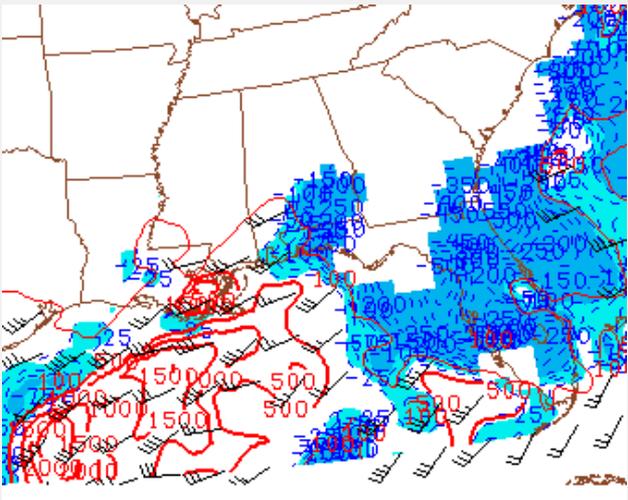
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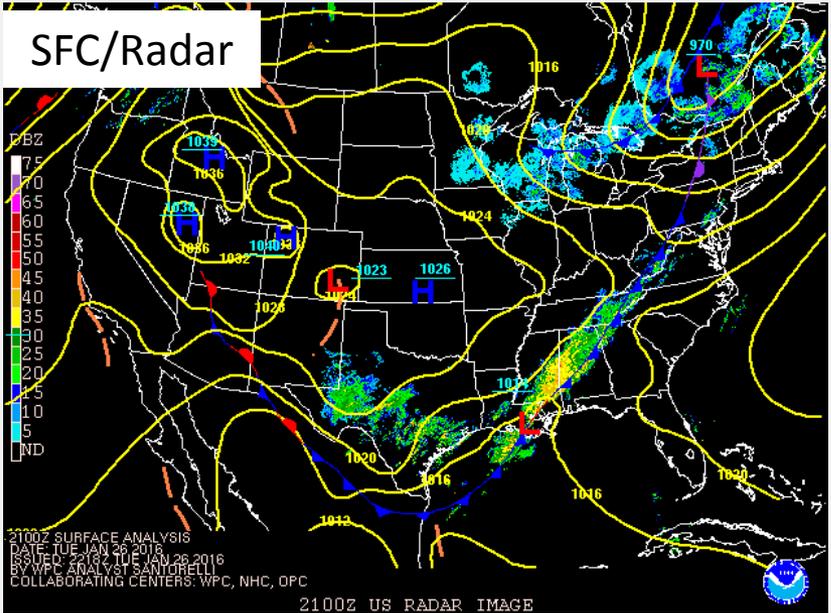
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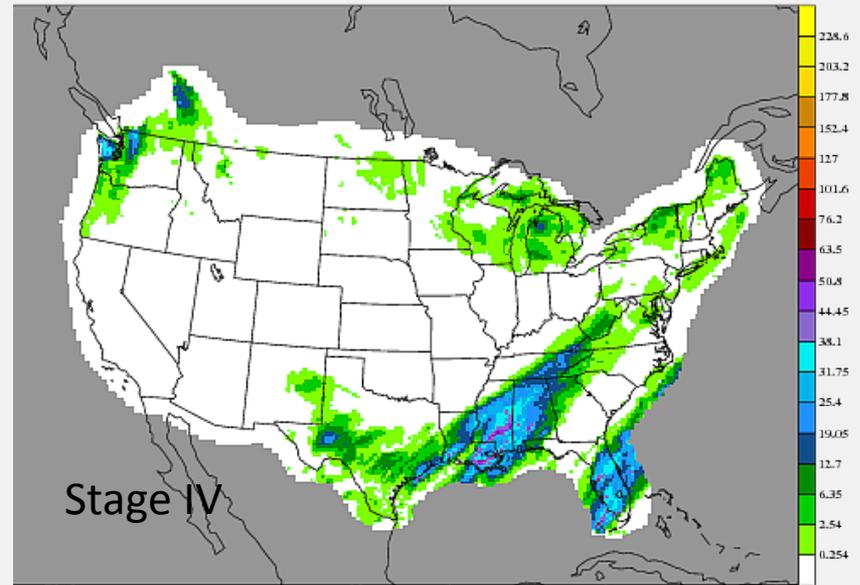
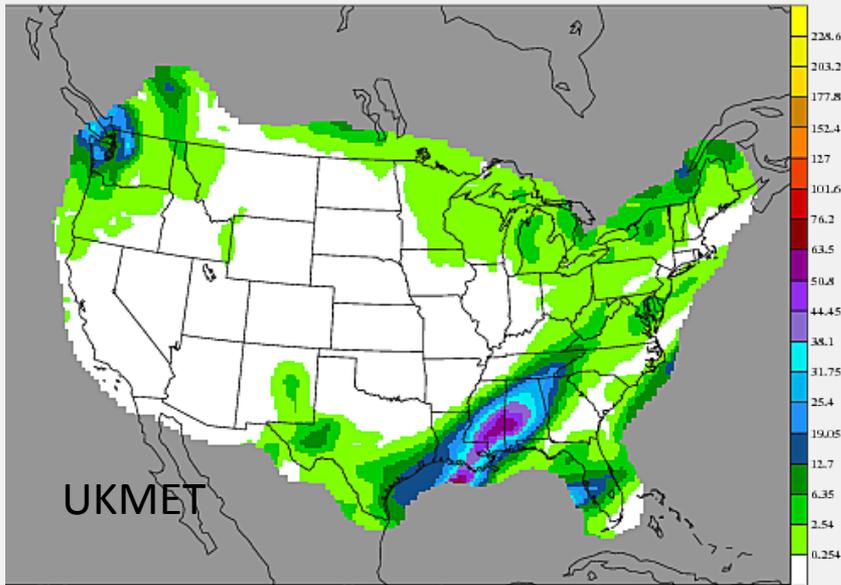
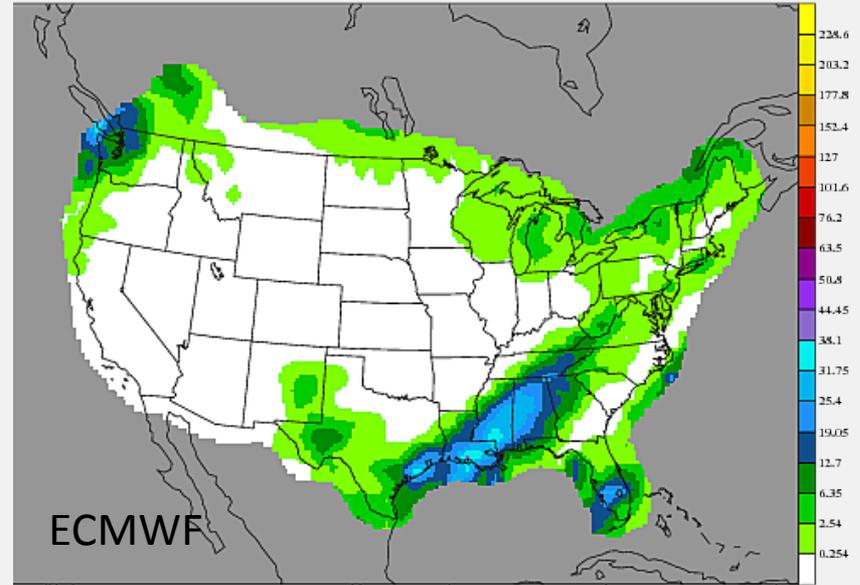
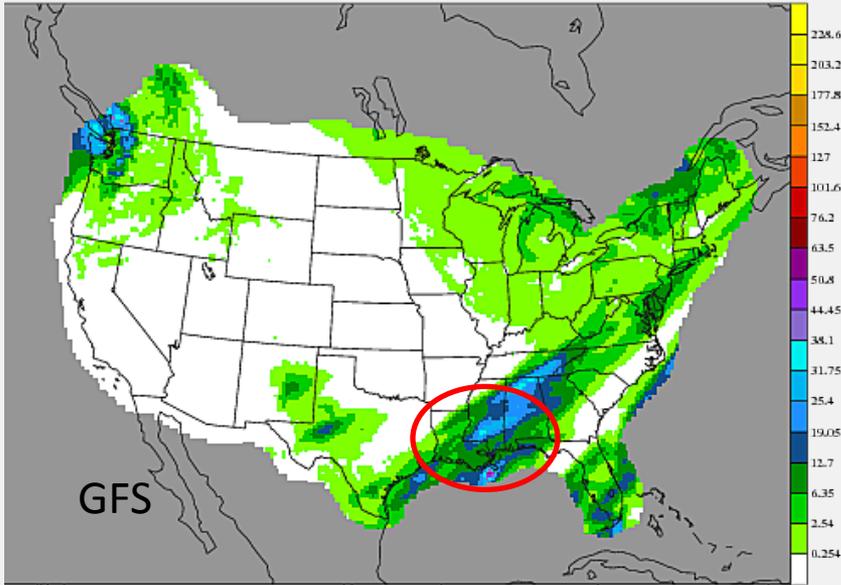
MUCAPE



SFC/Radar

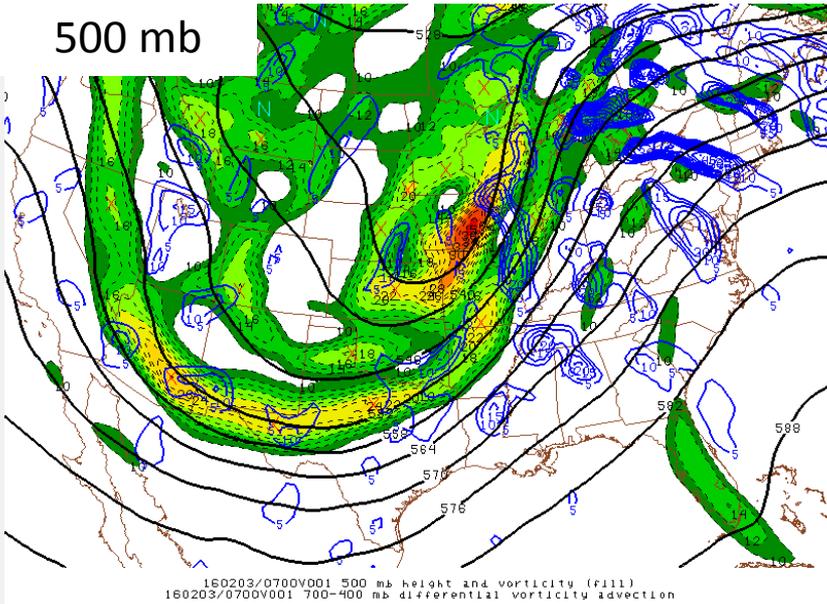


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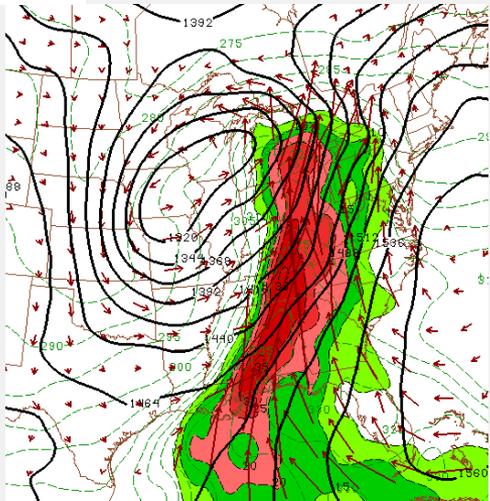


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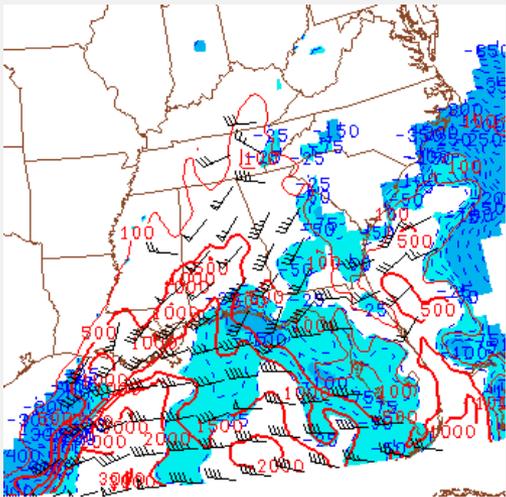
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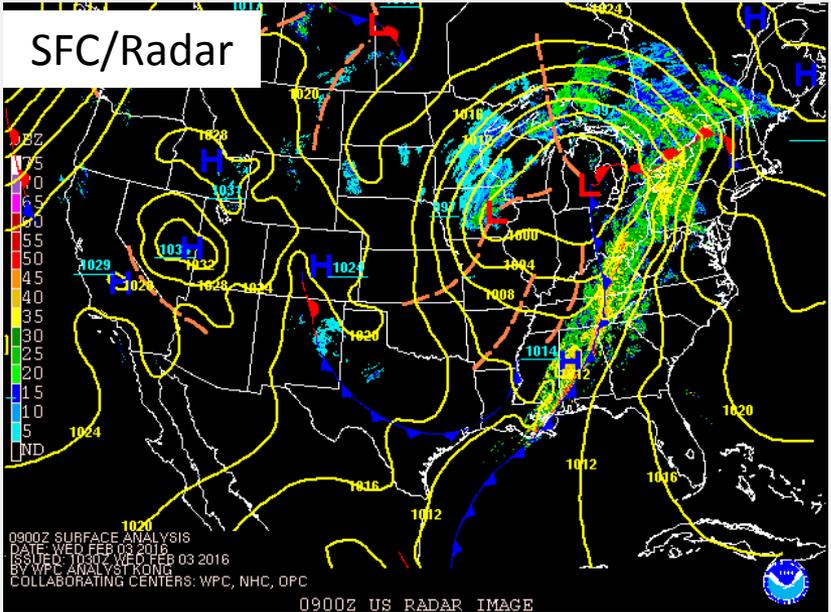
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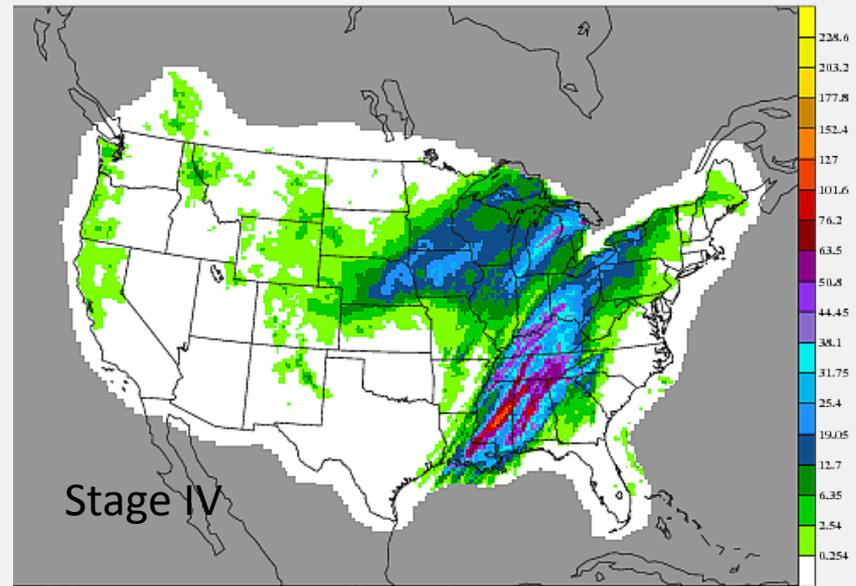
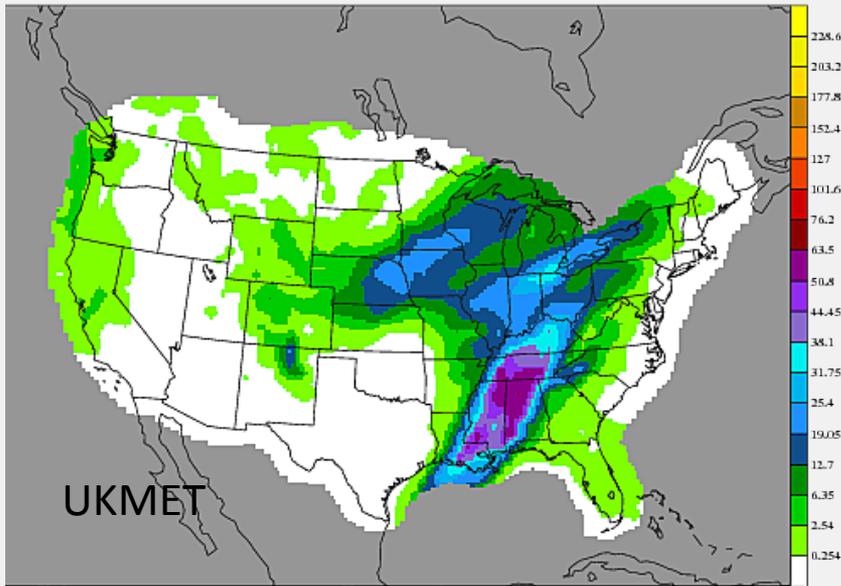
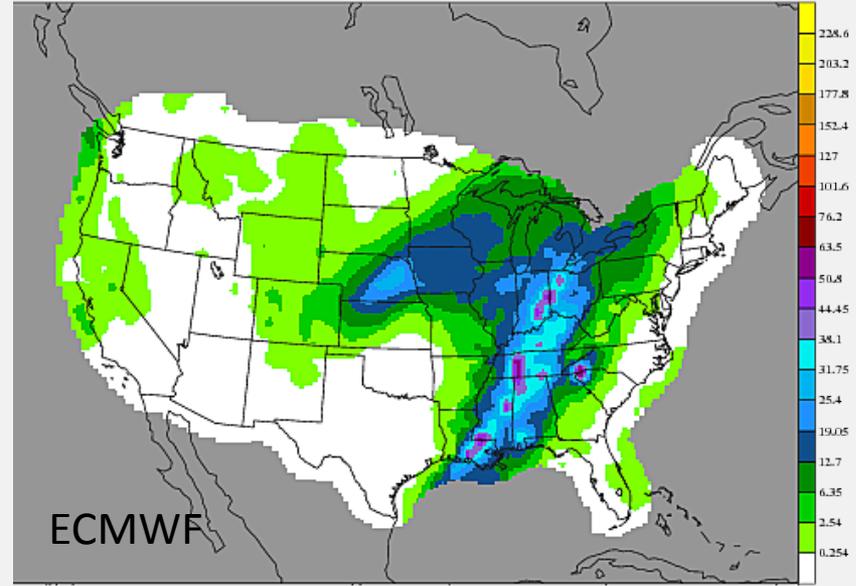
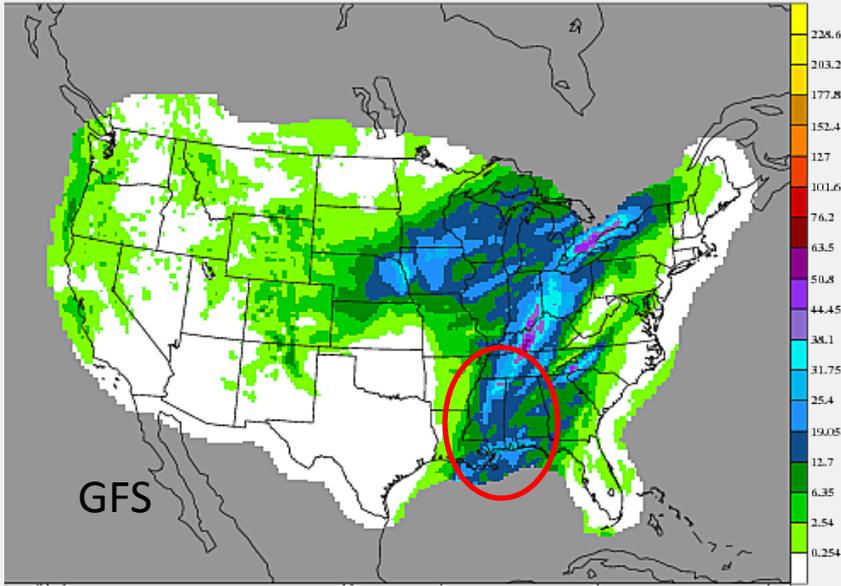
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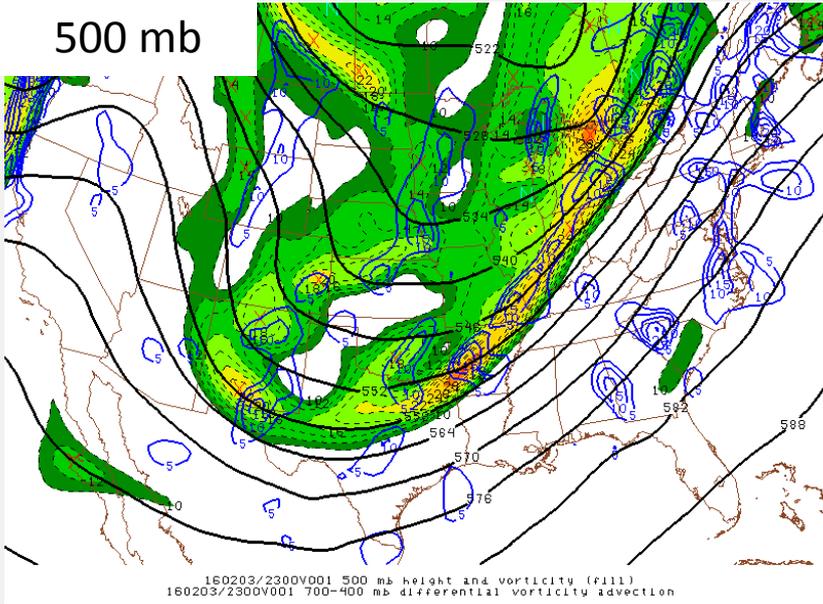


2/3/2016 Forecast Hour 36

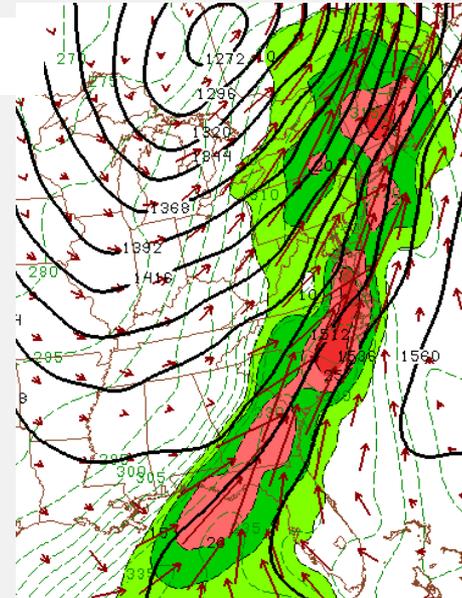


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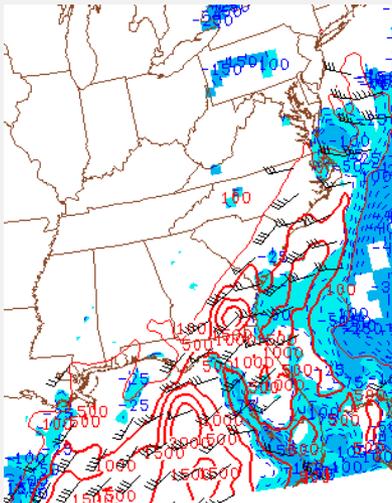
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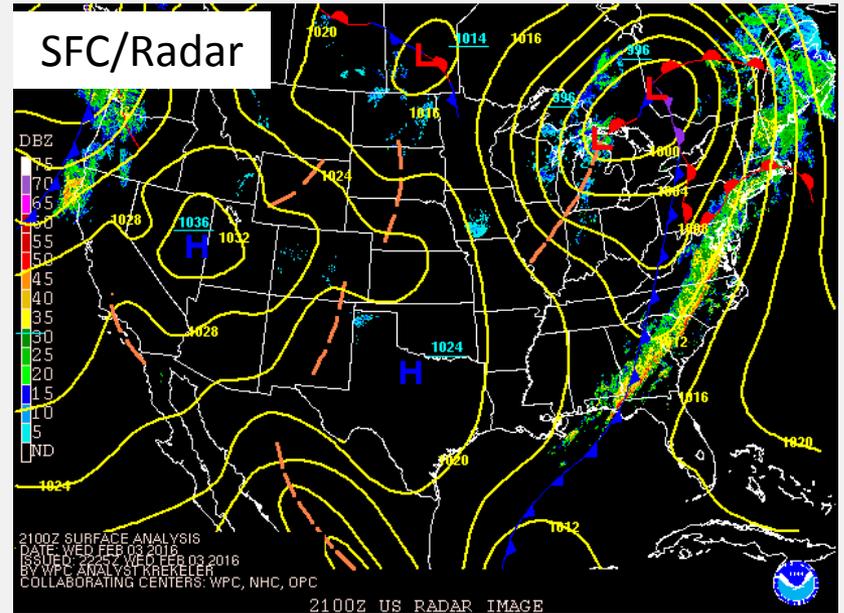
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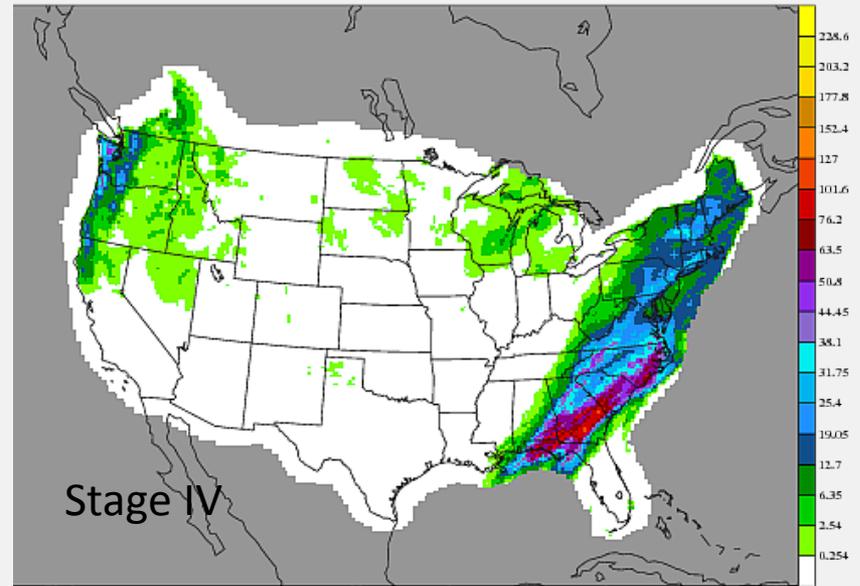
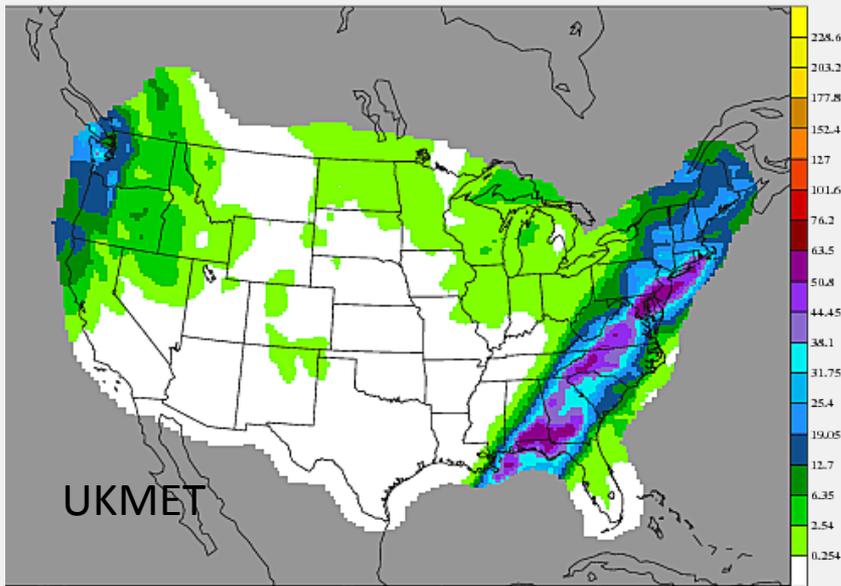
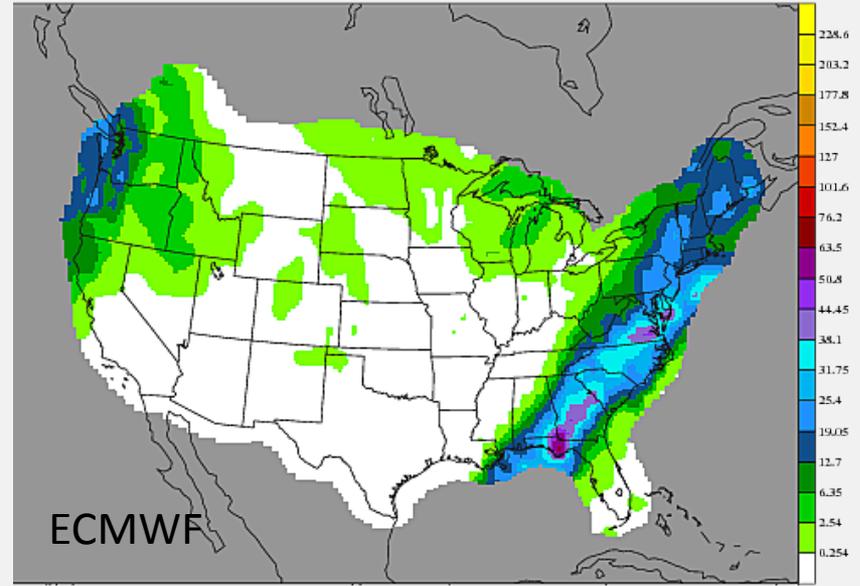
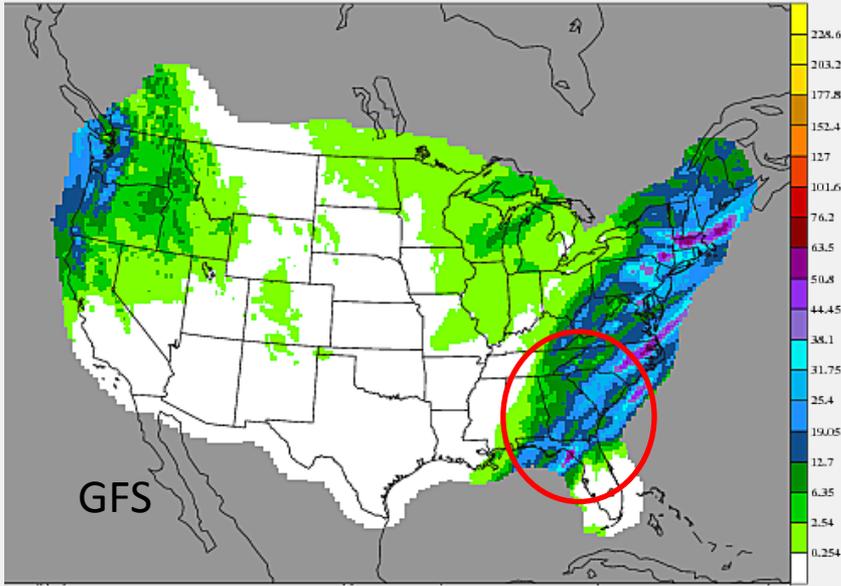
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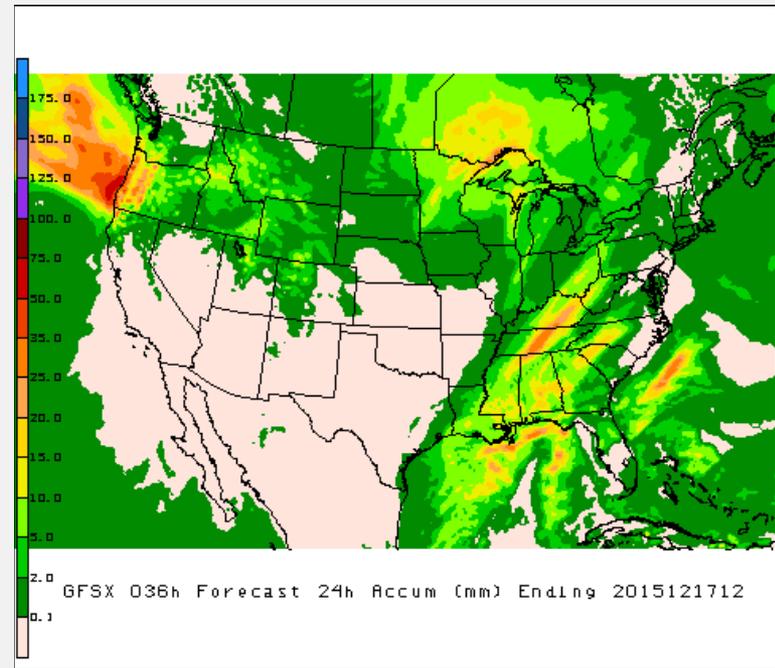
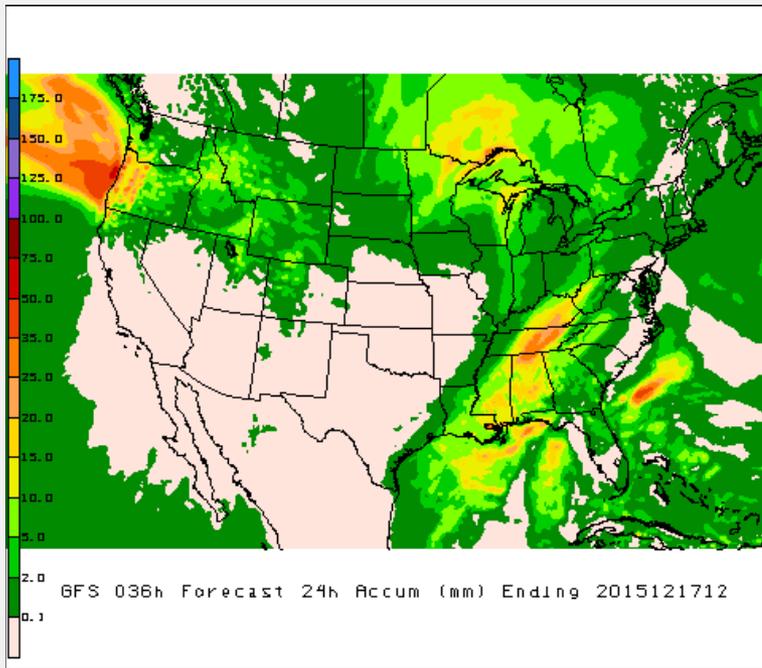


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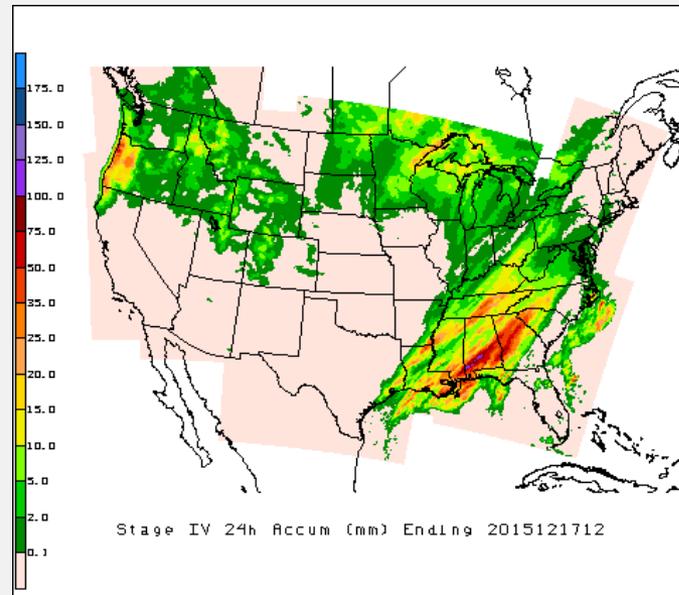


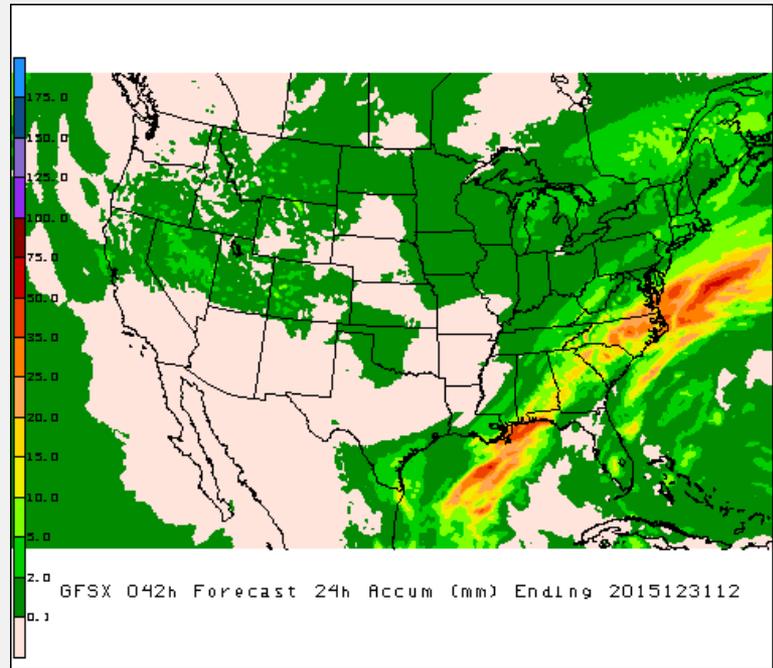
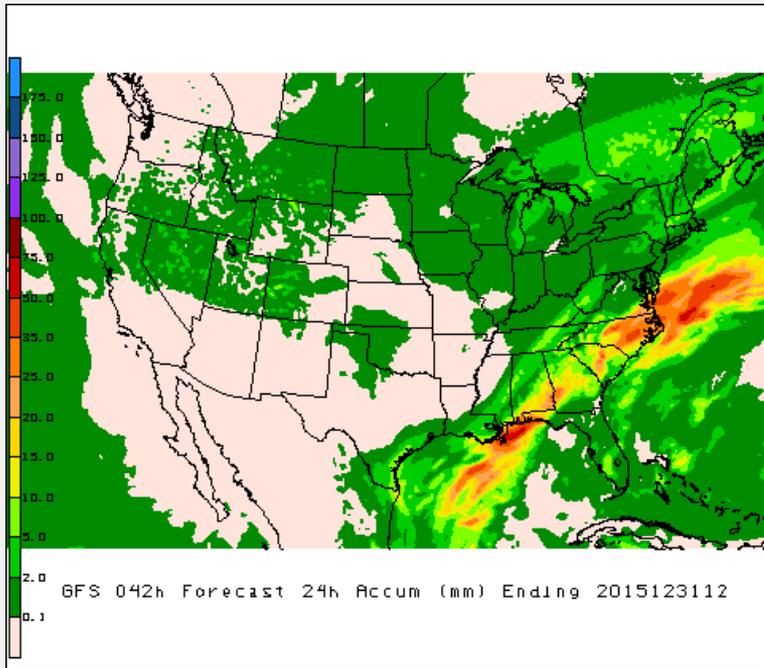
2/4/2016 Forecast Hour 36



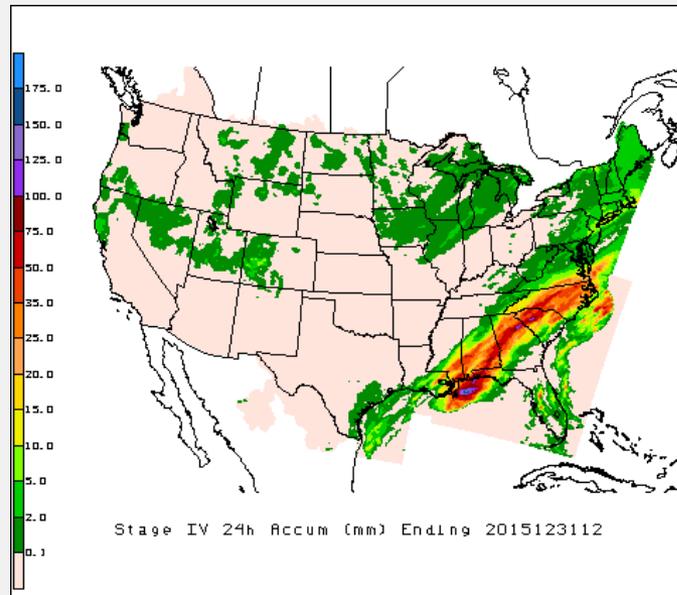


GFS vs GFS Parallel Comparison

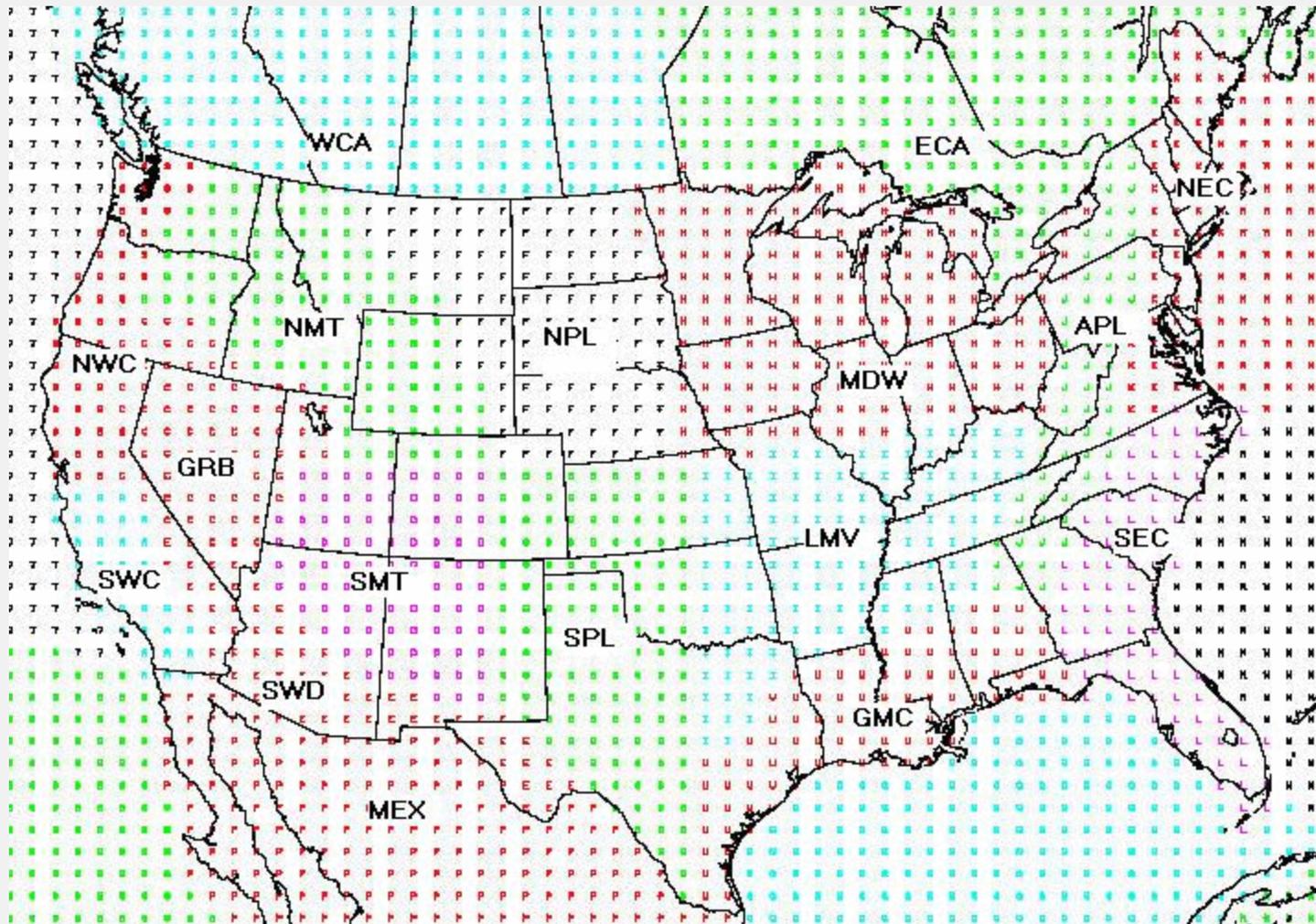




GFS vs GFS Parallel Comparison



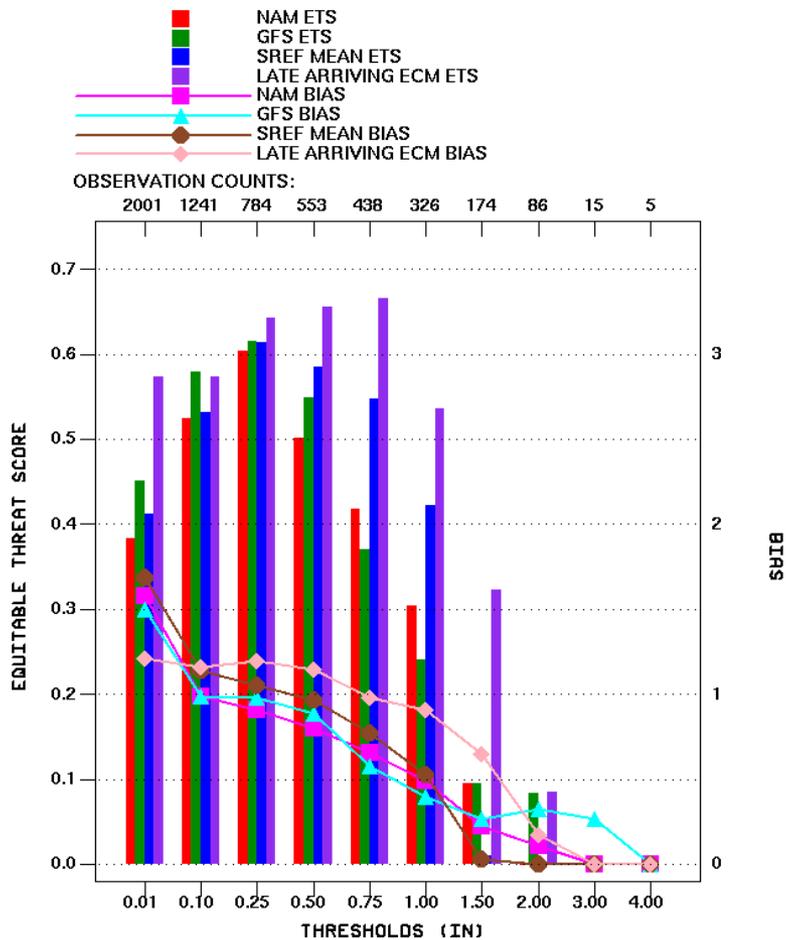
Verification Regions



Bias Statistics

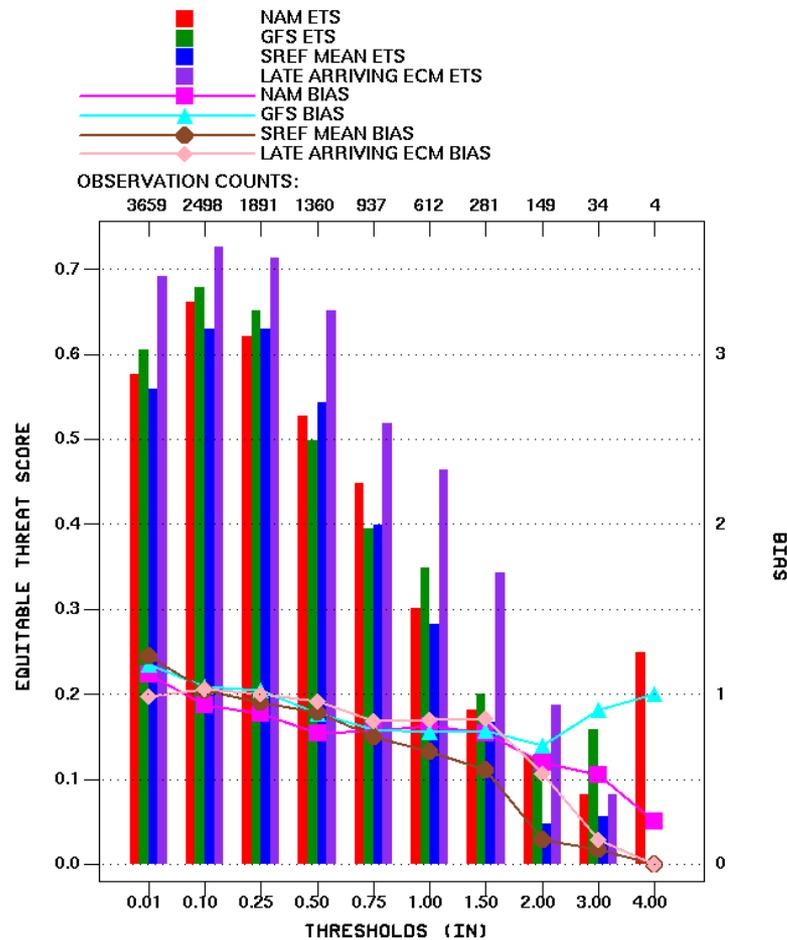
1/11/2016 - 2/11/2016

PERFORMANCE FOR 24-H FORECAST OF 24-H PRECIP ACCUM DURING PAST 1 MONTH FROM 20160111 TO 20160211 OVER GULF COAST REGION



Gulf Coast

PERFORMANCE FOR 24-H FORECAST OF 24-H PRECIP ACCUM DURING PAST 1 MONTH FROM 20160111 TO 20160211 OVER SOUTHEAST REGION

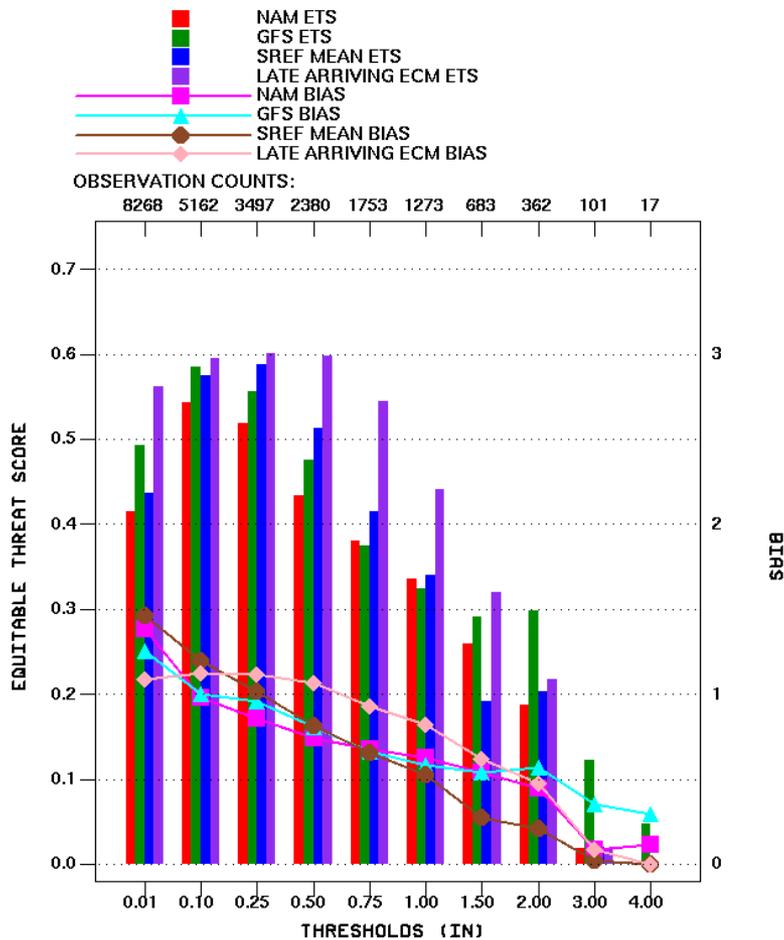


Southeast

Bias Statistics

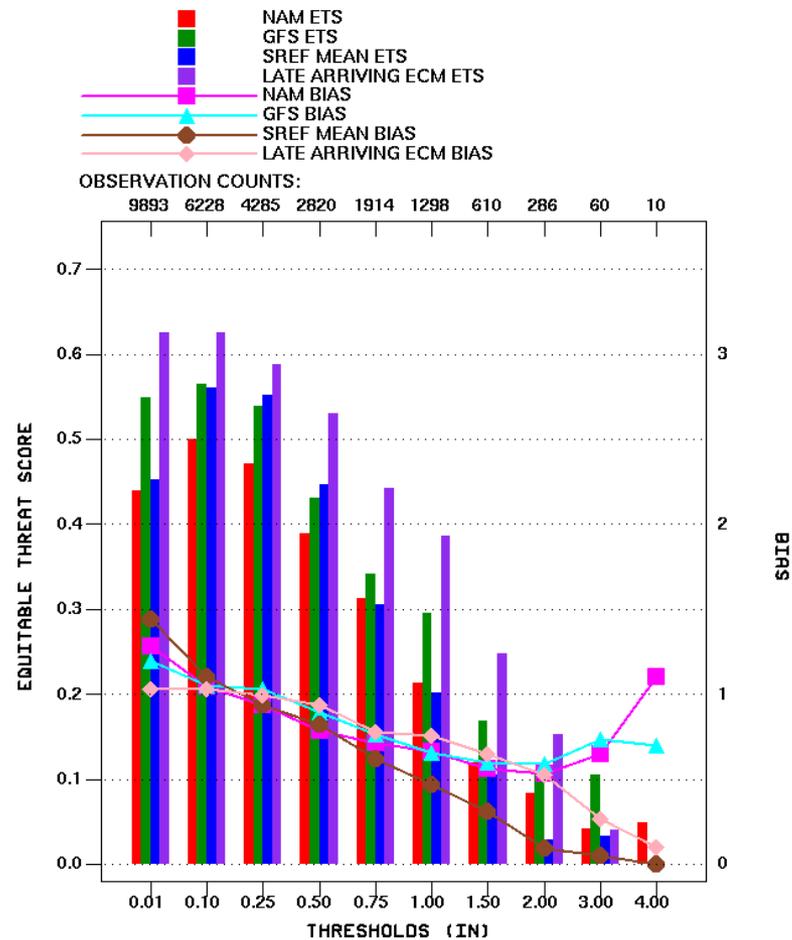
11/12/2015 - 2/11/2016

PERFORMANCE FOR 24-H FORECAST OF 24-H PRECIP ACCUM DURING PAST 3 MONTHS
FROM 20151112 TO 20160211 OVER GULF COAST REGION



Gulf Coast

PERFORMANCE FOR 24-H FORECAST OF 24-H PRECIP ACCUM DURING PAST 3 MONTHS
FROM 20151112 TO 20160211 OVER SOUTHEAST REGION

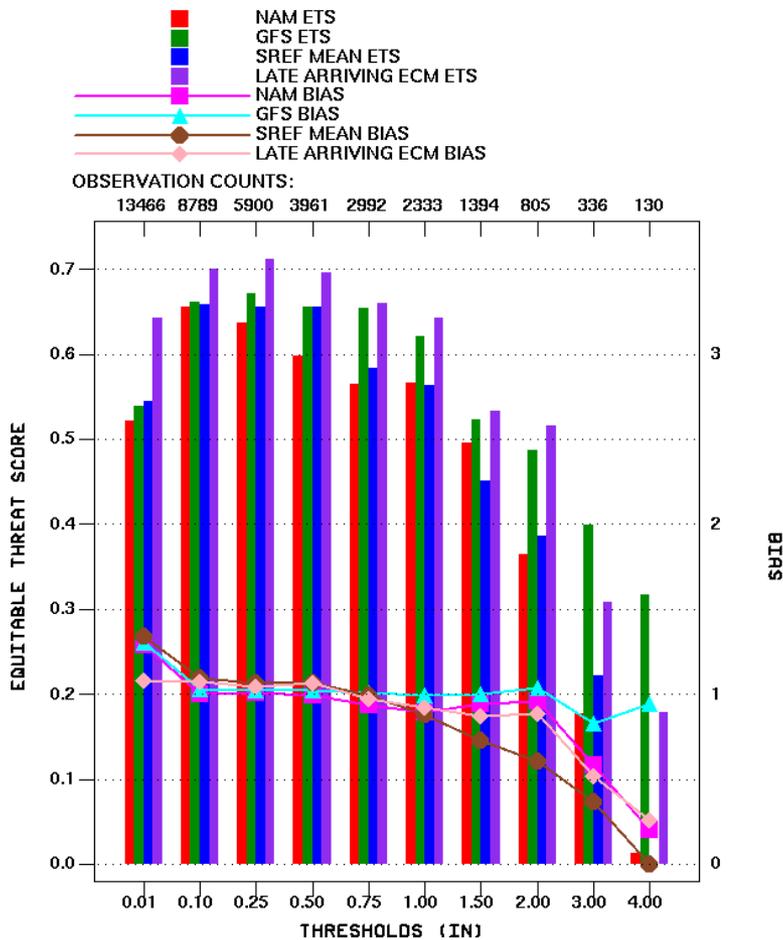


Southeast

Bias Statistics

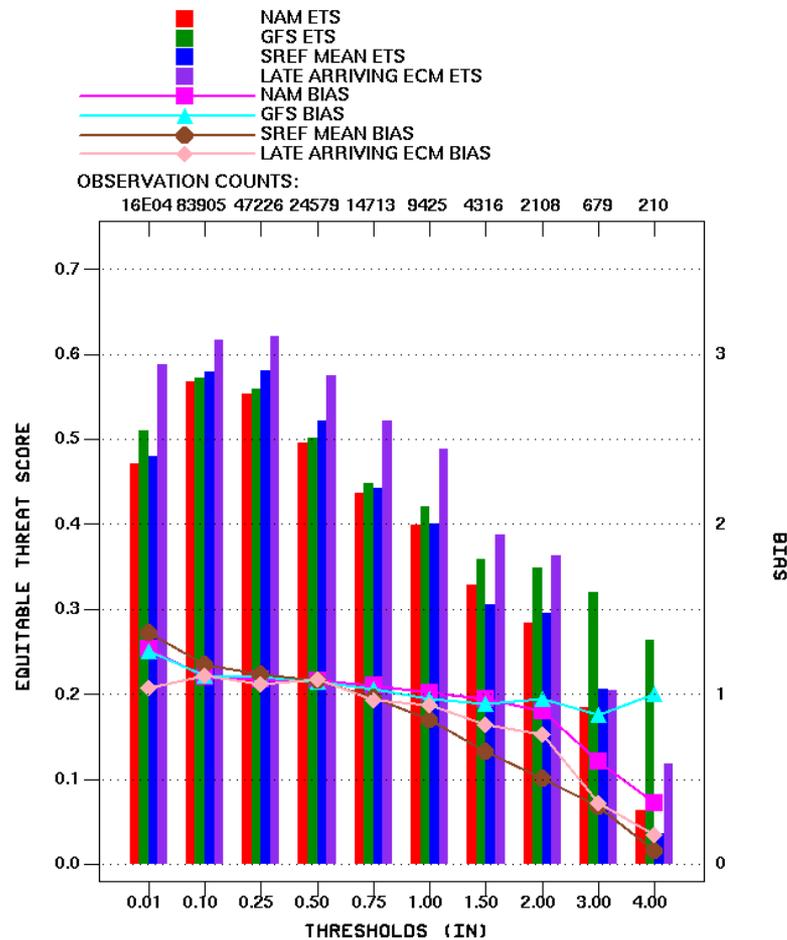
11/12/2015 - 2/11/2016

PERFORMANCE FOR 24-H FORECAST OF 24-H PRECIP ACCUM DURING PAST 3 MONTHS FROM 20151112 TO 20160211 OVER LOWER MI VALLEY REGION



Lower MS Valley

PERFORMANCE FOR 24-H FORECAST OF 24-H PRECIP ACCUM DURING PAST 3 MONTHS FROM 20151112 TO 20160211 OVER CONUS REGION



CONUS

Summary

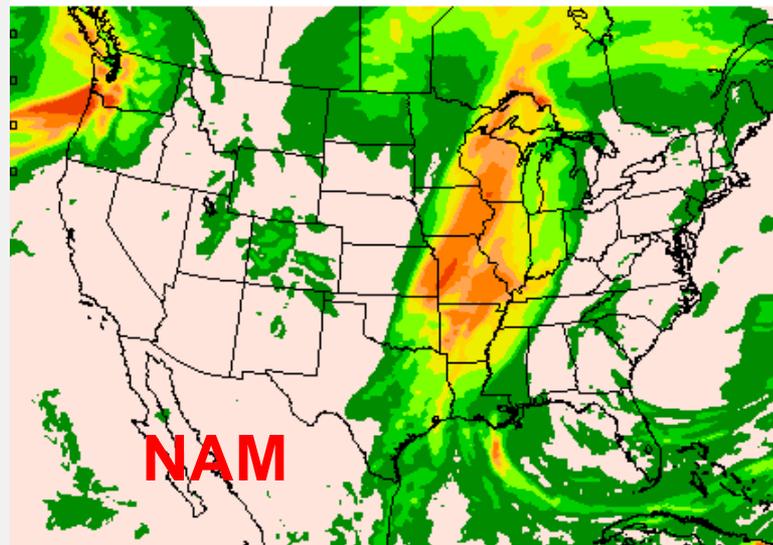
- Differing amounts of Synoptic Forcing seen in cases
- Most had strong low level moisture flux and convergence along/ahead of a frontal boundary
- Instability was present but generally below a 1000 J/kg in most of the cases
- Seems to be an issue of underdoing QPF in the less dynamic yet more unstable portion of the system
- Bias near 1 seen in the Lower MS Valley Region
 - Likely a region of more strongly forced stable warm sector precipitation the last 3 months
- Could be an issue with the Convective Parametrization and/or how this parameterization interacts with the model
- Is model underdoing convective precipitation or non convective precipitation?
 - In the future would like to look at model convective and stable precipitation output
- Is model handling the low level moisture flux correctly?
- Parallel GFS very similar to Operational GFS. Not any worse with this bias but not any better either
- The Overall CONUS Bias is near 1 for the GFS/NAM to around the 2” mark

Previous NAM Dry Bias

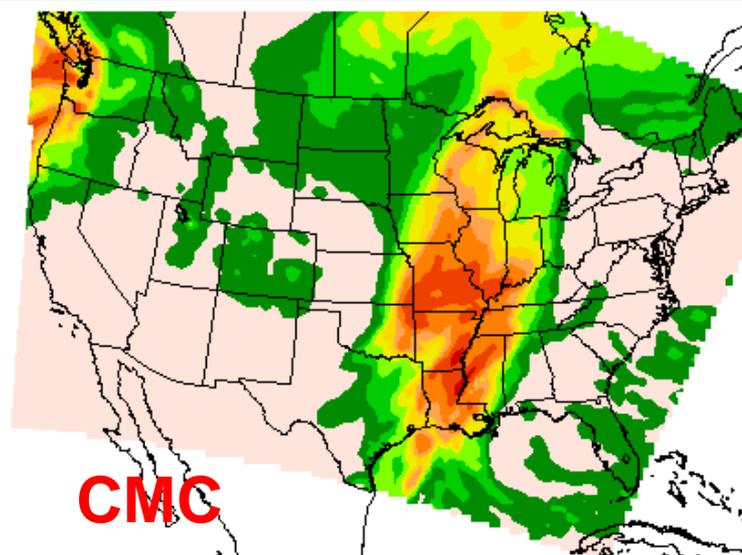
- A similar problem had been noted in the NAM over the past 3-4 years
- Was generally too dry on southern end of cold fronts in area of strong low level convergence and moderate instability
- Best synoptic forcing in most of the NAM cases was lifting into Great Lakes
- In Most of these cases GFS was significantly better

EXAMINATION OF NAM WARM SECTOR LOW PRECIP BIAS

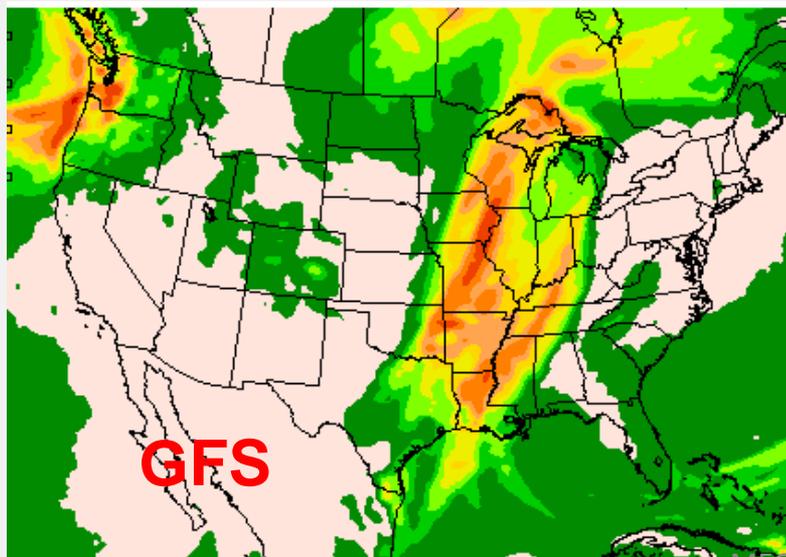
12-36 hr precip for Nov 10 12 UTC-Nov 11 12 UTC



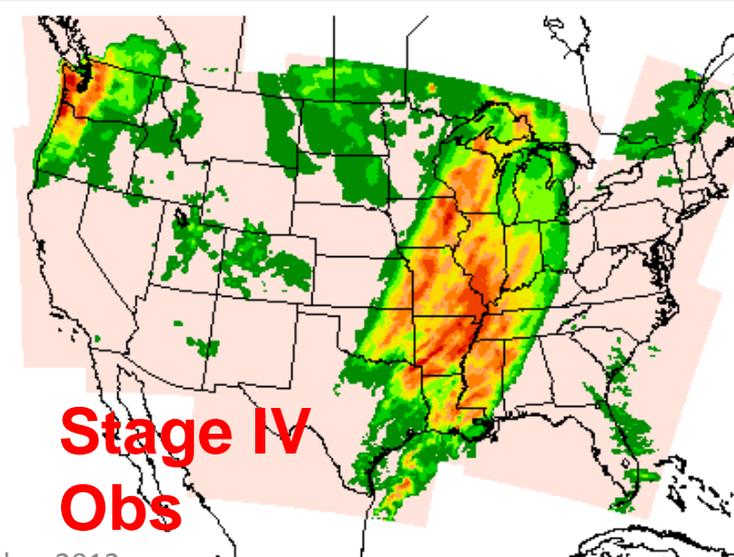
NAM 036h Forecast 24h Accum (mm) Ending 2012111212



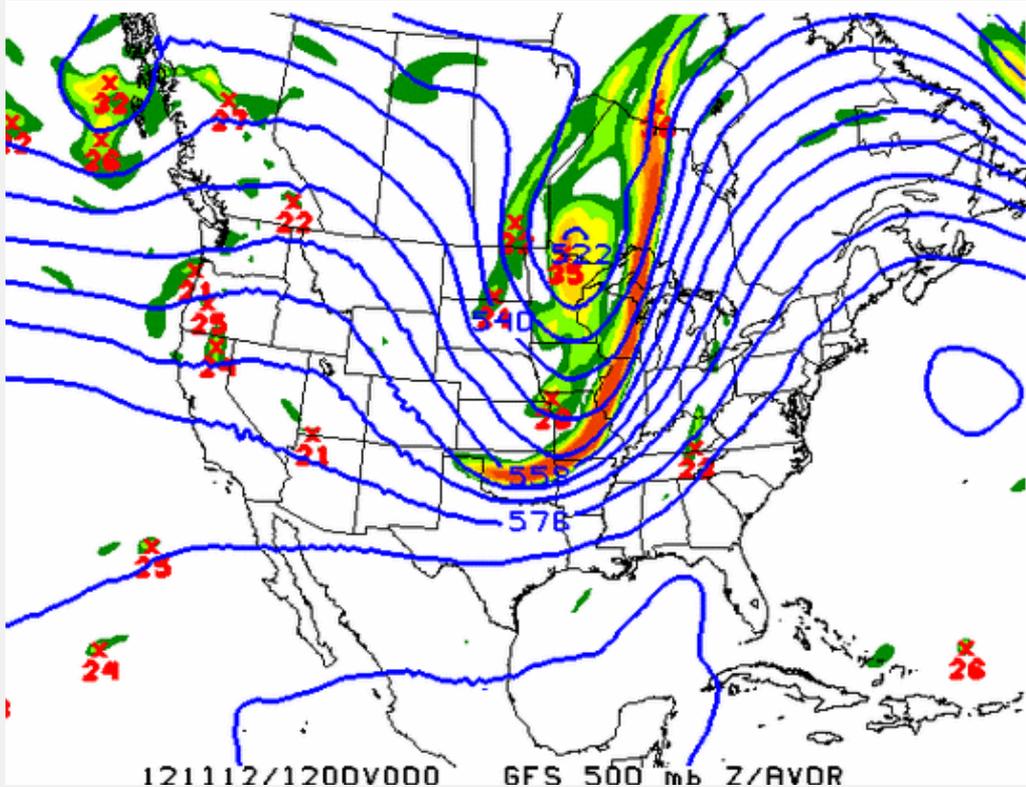
CMC 036h Forecast 24h Accum (mm) Ending 2012111212



GFS 036h Forecast 24h Accum (mm) Ending 2012111212



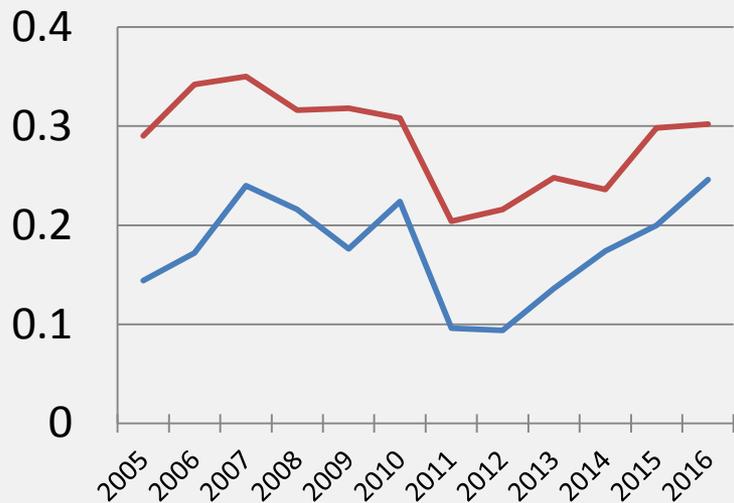
Stage IV (3 mos) 24h Accum (mm) Ending 2012111212



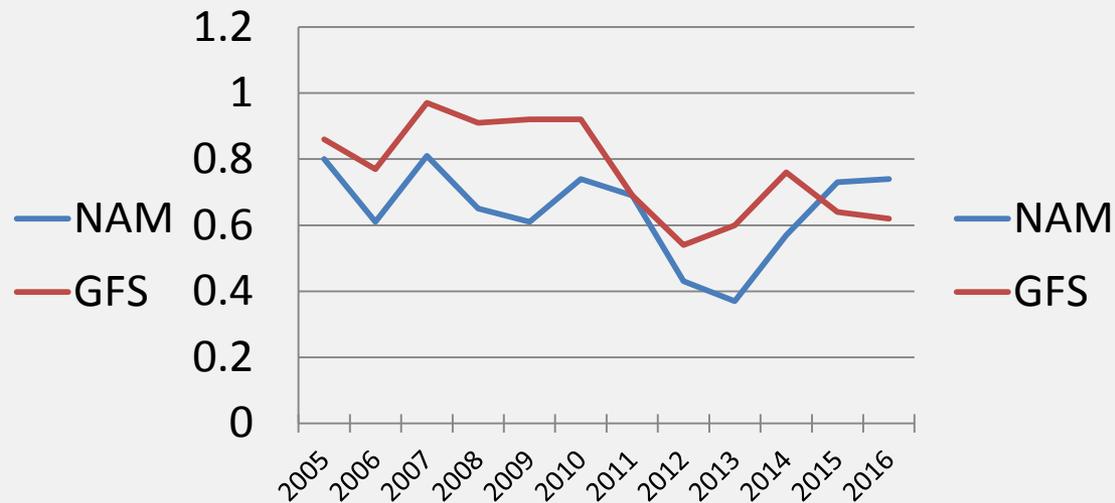
In this example, trough is lifting, and best dynamics are shifting northeast, away from Gulf Coast. But good convergence, instability, and moisture in place near Gulf Coast.

1" Average Sep-Jan Threat Score Gulf Coast

Threat Score



Bias



- Trends show a dip in bias and threat scores across this region around 2010 in both NAM/GFS
- Both GFS/NAM have since showed a trend upward in 1" threat scores through Jan 2016
- Since 2013 NAM has continued to improve its dry bias...but the GFS bias has been pretty steady since 2010