



# **Air Quality Support Operations in the Hydrometeorological Prediction Center *Air Quality Forecaster Focus Group Workshop***

*September 13-14, 2012*

*Silver Spring, Maryland*

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Andrew Orrison  
Air Quality Focal Point

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*“Where America’s Climate, Weather, Ocean, and Space Weather Services Begin”*



# Outline



- **FY12 - HPC Air Quality Support Role**
- **HPC Model Diagnostics Forecaster Approach (as relating to Air Quality - NAM based initialization errors)**
- **The Rise of the MetWatch Desk (what does this mean?) – Impact on the Model Diagnostics Desk?**
- **FY13 – What is the future of the HPC Air Quality Support Role to the NAQFC?**
- **Conclusions**
- **Questions and Feedback**



# FY12 HPC Air Quality Support

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- **Updated HPC AQ Web Drawer (based on FY2011 feedback):**
  - **Continue providing Simulated IR Satellite Imagery (NAM)**
  - **Continue providing Simulated Radar Reflectivity (NAM)**
  - **Snow and Ice Coverage Information provided**
  - **Gridded Data (including NAM boundary layer, 925mb, 850mb and 700mb temperature and wind fields (including advection)) provided down to 4km resolution where possible**
- **HPC Data Archiving (possible (but not server friendly!!))**
  - **Remains limited online to NAM Air Quality Diagnostic Discussion**
  - **Gridded archive data requests can be handled on a case by case basis (Mike Bodner – [mike.bodner@noaa.gov](mailto:mike.bodner@noaa.gov))**



# HPC Model Diagnostics Approach for Air Quality Support



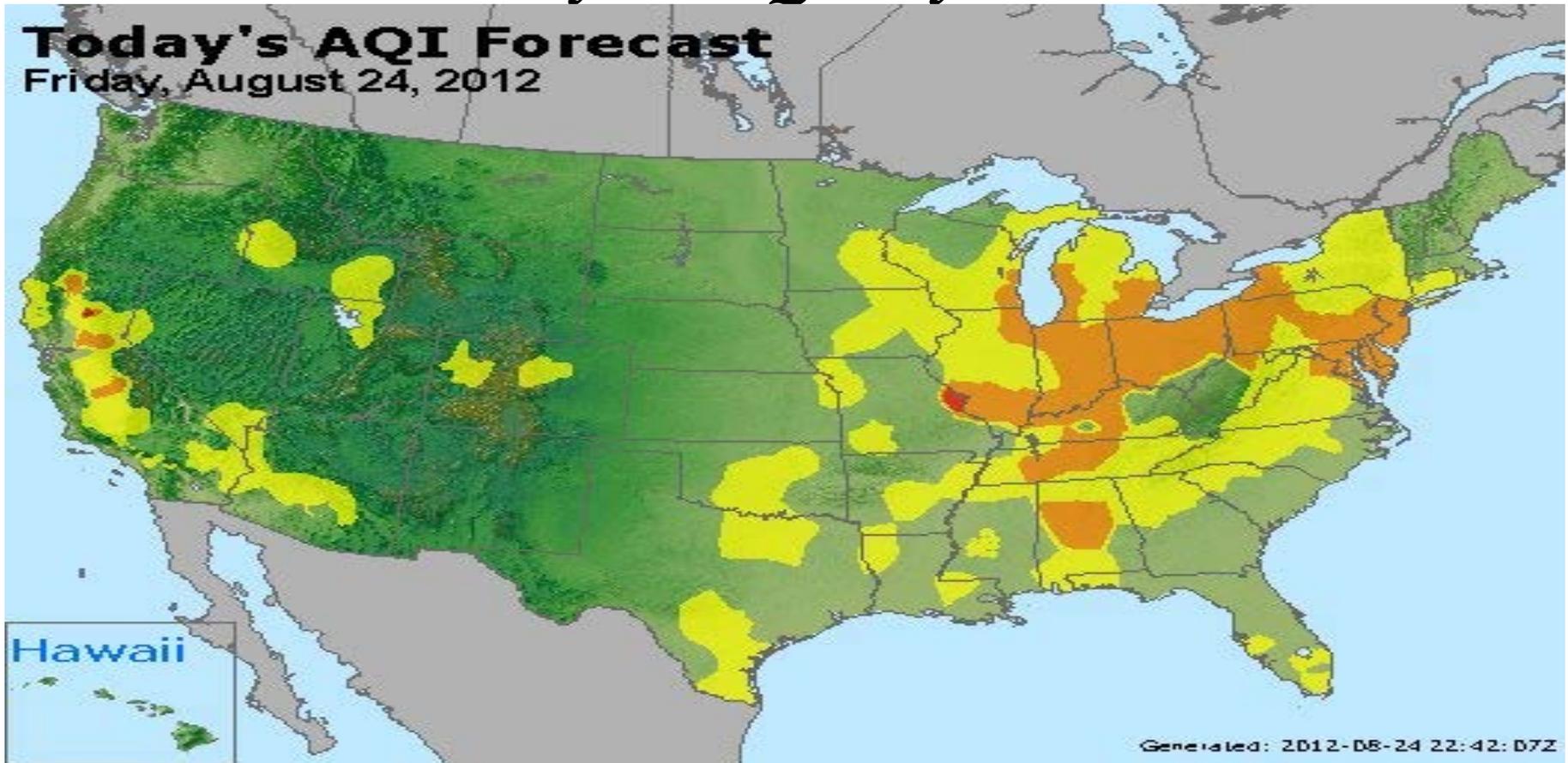
- **Understanding fields of relevance to the Air Quality Forecaster (based on your feedback):**
  - **Low Level Atmospheric Temperatures (surface, 850 mb, 700mb)**
  - **Low Level Wind Fields: Speed and Directional (surface, 850 mb, 700 mb)**
  - **Boundary Layer Mixing (as influenced by solar insolation, dynamic forcing, frontal zones)**
  - **Moisture, Cloud Cover and Precipitation (tends to be the most common initialization error on the NAM (also driving temperature/wind errors))**



# HPC Model Diagnostics Approach for Air Quality Support



- *Where are today's Air Quality concerns??*

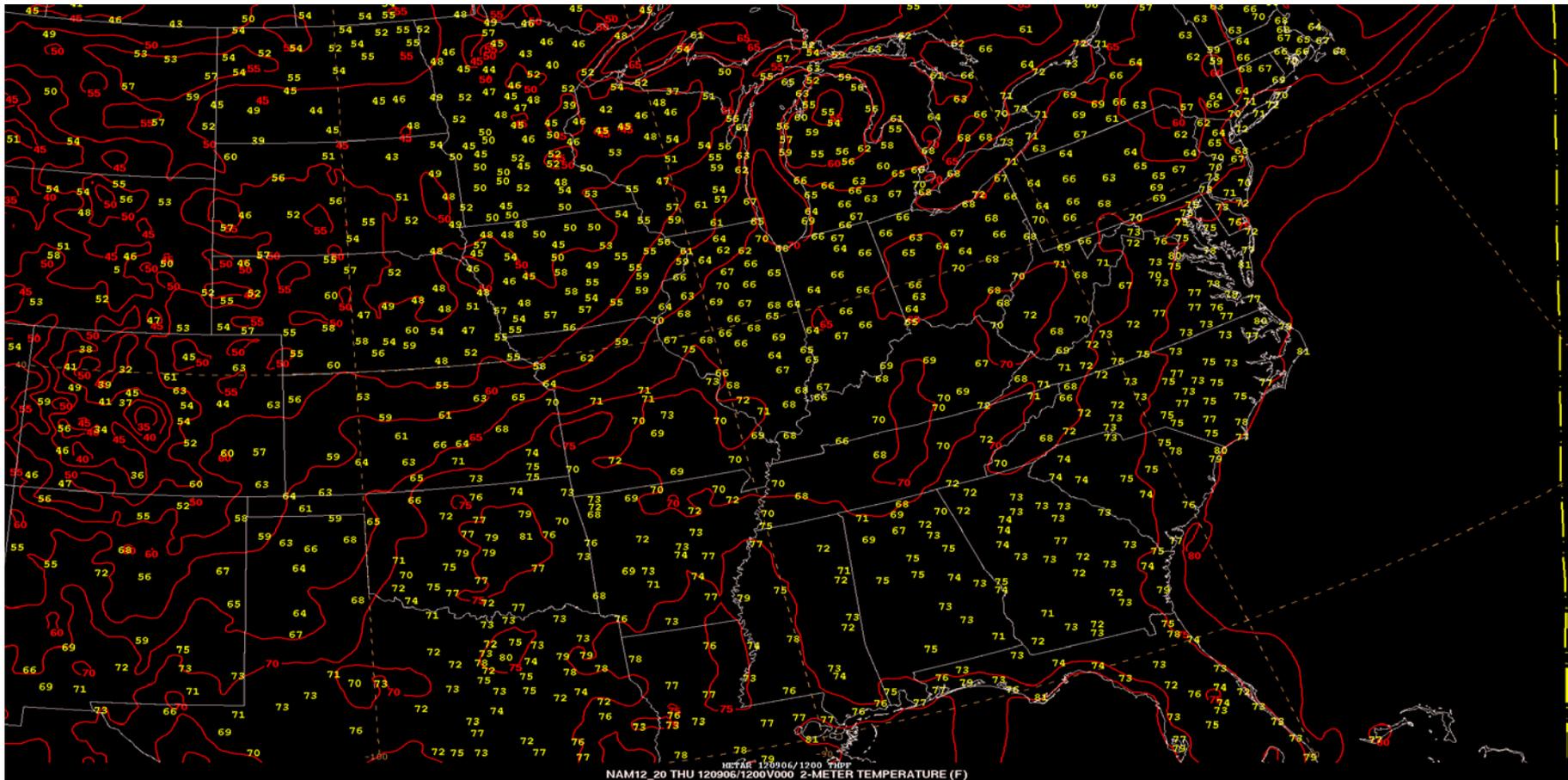




# HPC Model Diagnostics Approach for Air Quality Support



- \* *Compare 12Z Surface Observations to the 12Z NAM 2-meter Initialized Temperature Data – search for small scale errors*

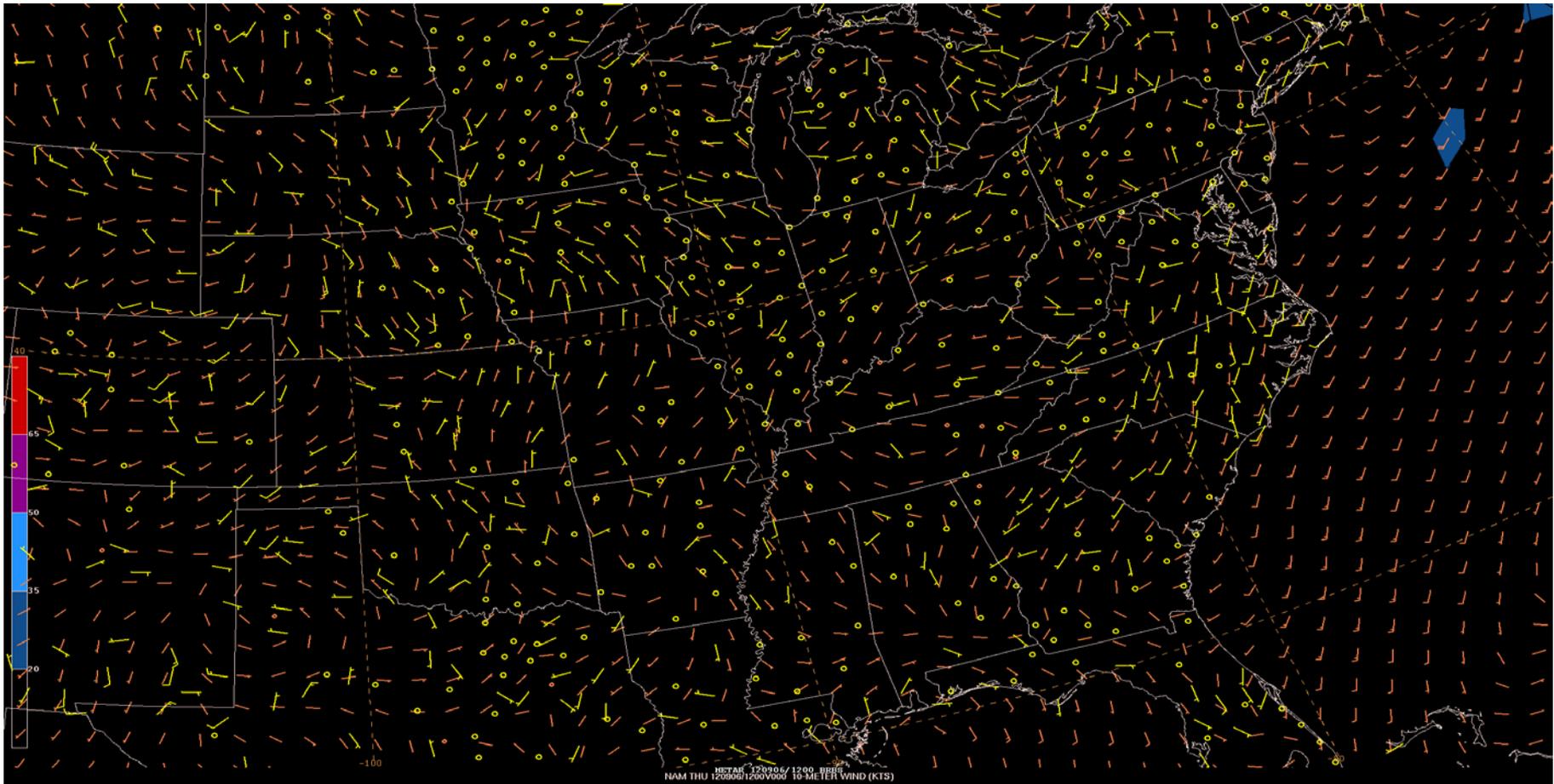




# HPC Model Diagnostics Approach for Air Quality Support



- \* *Compare 12Z Surface Observations to the 12Z NAM 10-meter Initialized Wind Data: Any wind field discrepancy (directional/speed)?*

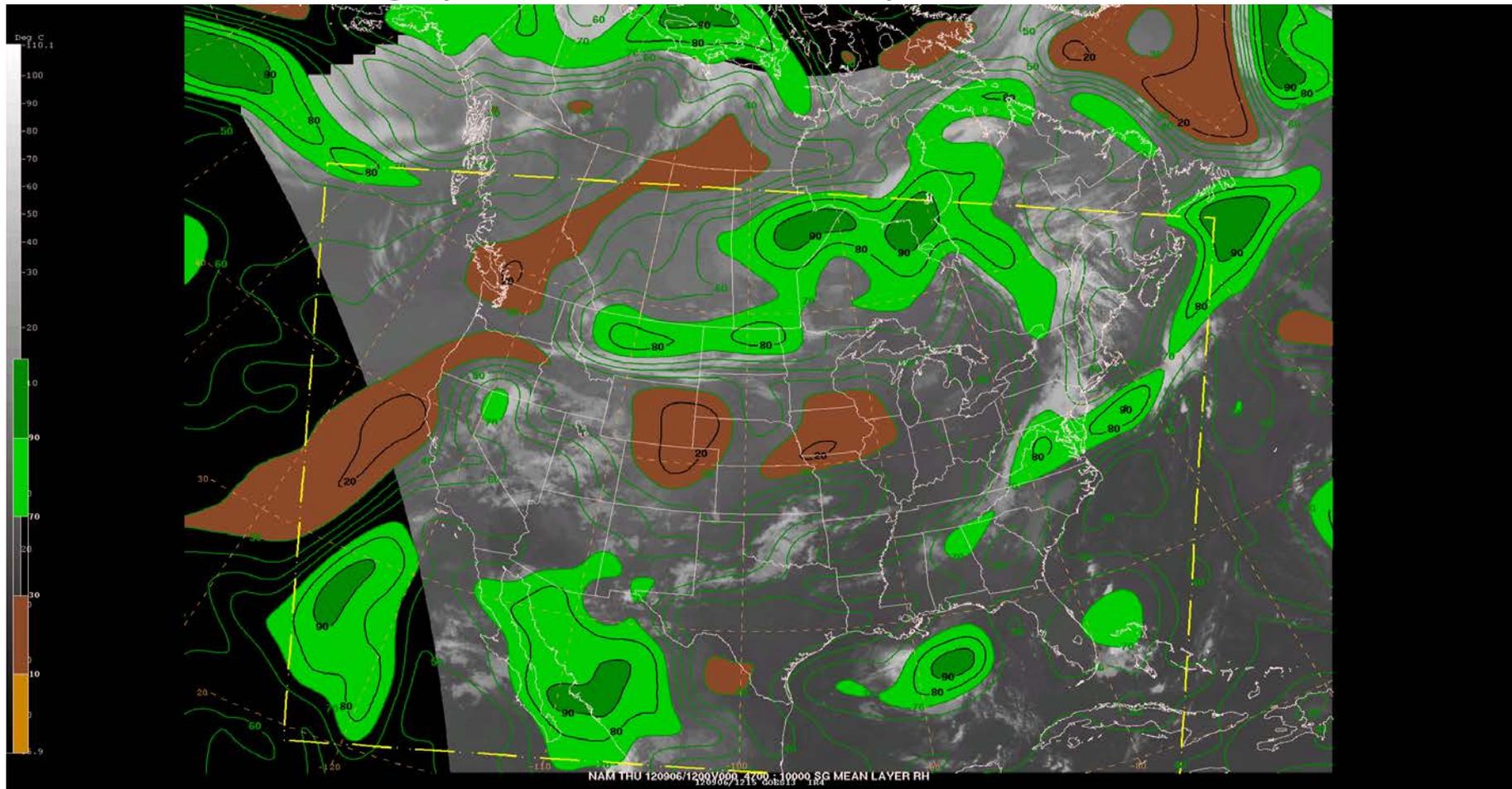




# HPC Model Diagnostics Approach for Air Quality Support



- *Compare GOES IR Satellite Imagery to 12Z NAM Simulated Satellite Imagery or 12Z NAM Mean Layer RH (1000mb-470mb)*

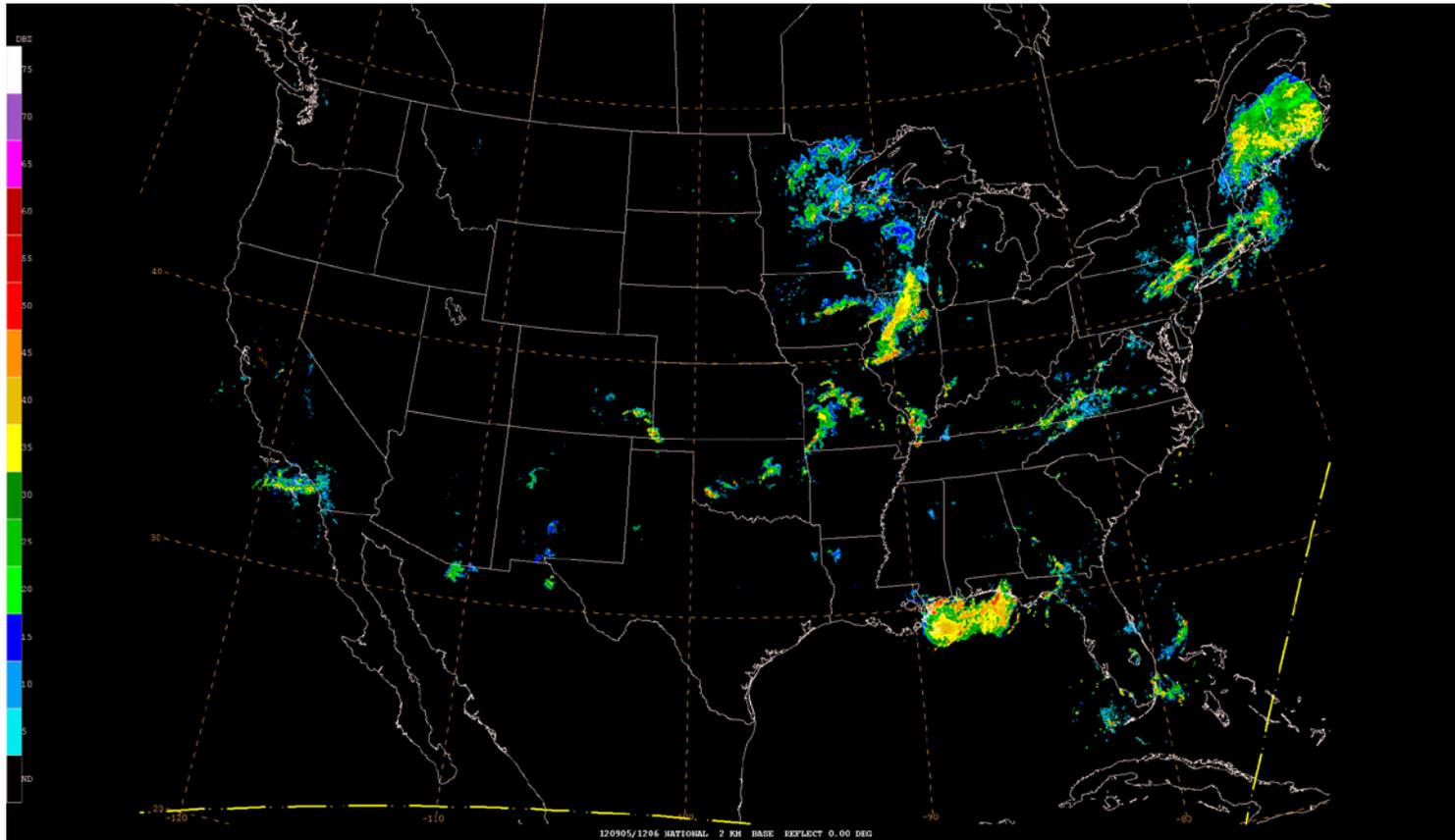




# HPC Model Diagnostics Approach for Air Quality Support



\* *Compare 12Z Radar Imagery to 12Z NAM 3-hour QPF Output*

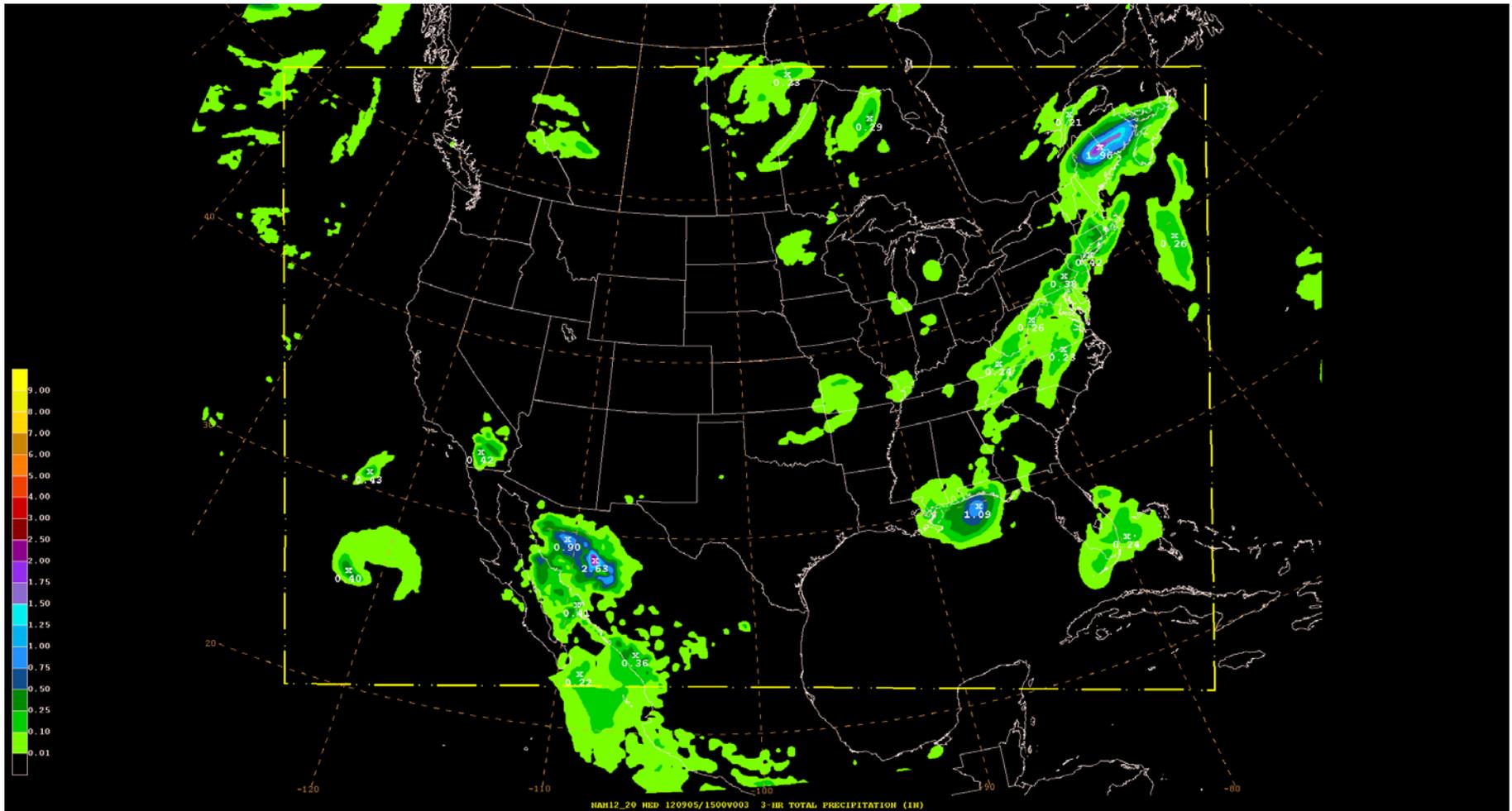




# HPC Model Diagnostics Approach for Air Quality Support



\* *Compare 12Z Radar Imagery to 12Z NAM 3-hour QPF Output*





# HPC Model Diagnostics Approach for Air Quality Support

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- **When Evaluating NAM Initialization Errors:**
  - **HPC Model Diagnostics Forecasters apply a general 10% Error Threshold as a ‘Rule of Thumb’ for determining “Significant” Errors**
  - **These “Significant Errors” are then detailed in the NAM Air Quality Diagnostic Discussion**
  - **Confined to the AIRNOW Threat Areas (CODE: YELLOW through MAROON)**



# HPC Model Diagnostics Approach for Air Quality Support



- **NAM Air Quality Diagnostic Discussion:**
    - typed and sent typically by 1430Z (12Z NAM)
  - **Model Diagnostic Forecasters Issue the PMDHMD 4 times per cycle (12Z/00Z)**
    1. NAM
    2. GFS
    3. CMC/UKMET
    4. ECMWF
- >> Includes all relevant mass field initialization errors, model trends, comparisons, and final model preferences (along with confidence)**



# HPC Air Quality Support to the NAQFC – Are changes coming?

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- **What is this rumor I hear about HPC starting a MetWatch desk?**
- **I am hearing something about a Mesoscale Precipitation Discussion (MPD). What is that?**
- **How will that impact operational workflow at HPC?**
- **Will the NAM Air Quality Diagnostic Discussion and the PMDHMD be affected???**

# Hydrometeorological Prediction Center Proposed Product Suite Realignment



- Establishment of a new desk: *MetWatch*  
**>> A new product:**  
*Mesoscale Precipitation Discussion (MPD)*
- Initiation of Nighttime Medium Range Package

***NOAA Center for Weather and Climate Prediction***

June, 2012



# Proposed Changes

- **Addition of Medium Range (Day 4-7) suite of products at night (CONUS only)**
  - Elimination of second daytime Medium Range grids package
- **Establish 24/7 desk (MetWatch) to monitor precipitation and issue Mesoscale Precipitation Discussions (MPDs) as needed**
  - Product will be similar to the SPC Mesoscale Convective Discussion in format
  - Model Diagnostics Discussion (PMDHMD) will be modified to free up resources (4 issuances down to 2 issuances)
  - Seasonal NAM Air Quality Diagnostic Discussion (likely to be maintained) – but is contingent on future of the NAM/CMAQ
- **Resource neutral within NCEP**
  - No additional FTEs



# Why Start a MetWatch Desk?

- **NCEP has been asked to provide a product similar to SPC Mesoscale Convective Discussions (MCD) focusing on heavy rainfall**
  - Central Region requested NCEP provide this product
  - HERO project submitted to OSIP
- **Support for product emerged during HPC's strategic planning process**
  - » Positions HPC to better support NWS's Weather-Ready Nation initiative

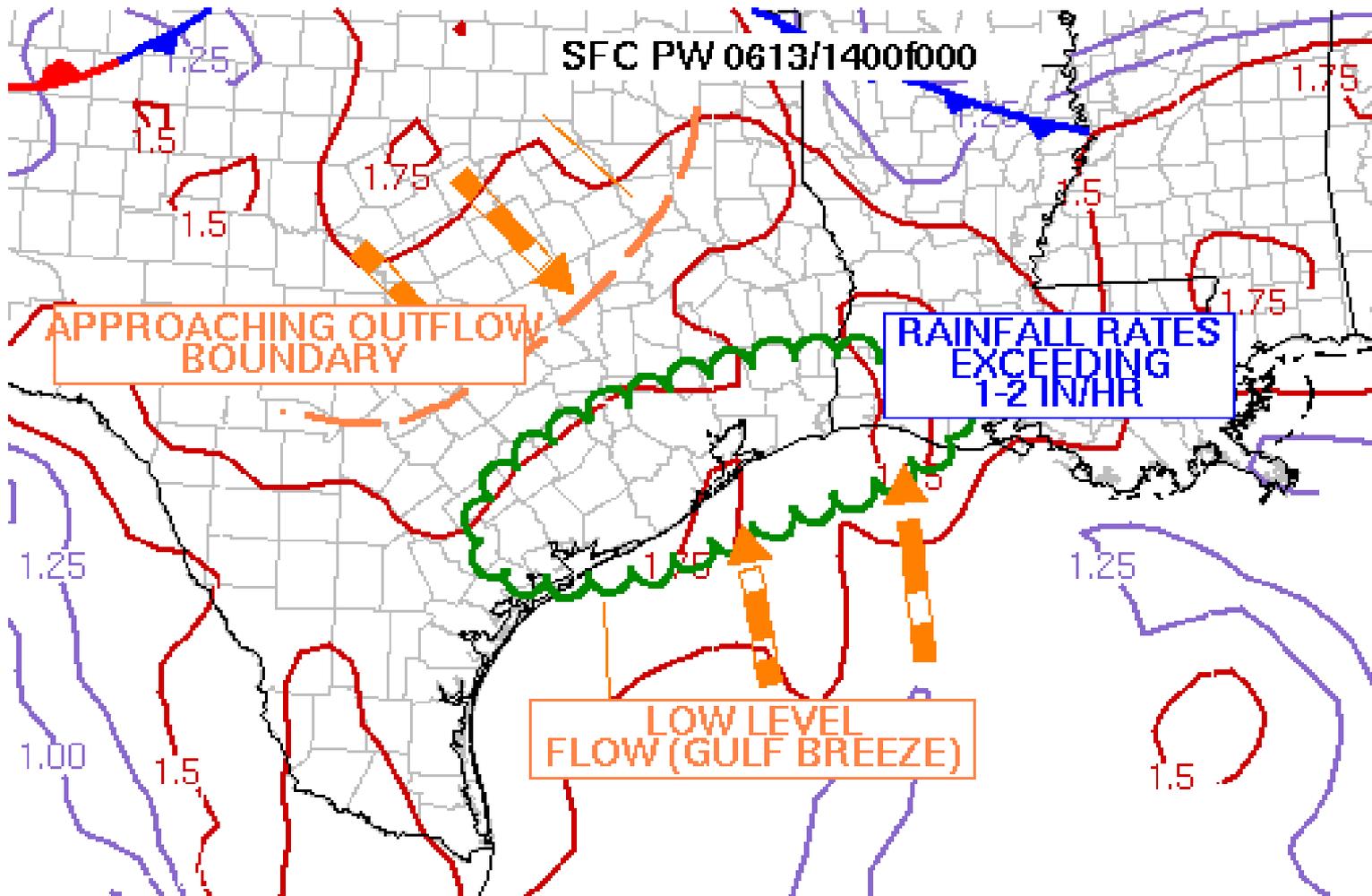
***The goal of HPC's Mesoscale Precipitation Discussion is to enhance NWS flash flood warning services by providing enhanced situational awareness of potential flash flood events.***



# Mesoscale Precipitation Discussions

- **Mesoscale discussions will:**
  - » Be issued at the forecaster's discretion
  - » Cover events in the 1-6 hour time period (NOWCAST)
  - » Focus on events impacting an area approximately the size of 2 CWAs
  - » Focus strictly on evolving flash flood potential with the goal of providing anticipatory support (giving WFOs lead time)
- **Mesoscale discussions will NOT:**
  - » State whether flash flood watches/warnings are needed
  - » Be issued for individual convective cells
  - » Focus on river flooding
  - » Discuss other convective trends such as severe weather

# Example Graphic



HPC MPD #0032



# Example Discussion



MESOSCALE PRECIPITATION DISCUSSION 0032

NWS HYDROMETEOROLOGICAL PREDICTION CENTER CAMP SPRINGS MD

1216 PM EDT WED JUN 13 2012

AREAS AFFECTED...SOUTHEAST TEXAS...SOUTHWEST LOUISIANA

CONCERNING...HEAVY RAINFALL...FLASH FLOODING POSSIBLE

VALID 131600Z - 132000Z

...SLOW MOVING CONVECTION WITH POTENTIALLY EXCESSIVE RAINFALL AMOUNTS ACROSS COASTAL AREAS IN SOUTHEAST TEXAS AND WESTERN LOUISIANA...

COMPOSITE RADAR LOOPS SHOW REGENERATING CONVECTIVE CLUSTERS ALONG THE GULF BREEZE BOUNDARY ACROSS COASTAL PORTIONS OF SOUTHEAST TEXAS...EAST OF VICTORIA...AND SOUTHWEST LOUISIANA. THESE CELLS ARE AIDED BY THE STRENGTHENING DIURNAL DESTABILIZATION...WITH THE LATEST SPC MESOANALYSIS INDICATING SURFACE-BASED CAPES BETWEEN 3,000-4,000 J/KG...COINCIDENT WITH THE RICH...DEEP MOIST ENVIRONMENT WITH SURFACE DEWPOINTS IN THE MID 70S...K INDICES IN THE MID TO UPPER 30S...AND PWATS BETWEEN 1.75 AND 2.00 PER THE LATEST GPS AND 12Z UPPER AIR ANALYSIS.

AS THE OUTFLOW BOUNDARY FROM PREVIOUS NOCTURNAL MCS APPROACHES THE GULF COAST...EXPECT ENHANCED LOW LEVEL MOISTURE CONVERGENCE AND MORE NUMEROUS CONVECTIVE CLUSTERS. THE 850-300 MB OR APPROXIMATE STEERING FLOW IS EXPECTED TO PICK UP A BIT DURING THE AFTERNOON...W TO NW AROUND 15-20 KTS...THOUGH AGAIN LIKELY SUFFICIENT TO ALLOW FOR A BIT MORE ORGANIZED CLUSTERED CONVECTION AND FEWER PULSE CELLS...WHILE THE ENHANCED SOUTHERLY LOW LEVEL COMPONENT VIA THE GULF BREEZE AND SHORTENING MBE VECTORS WILL LIKELY KEEP THE AVERAGE CELL MOTION LESS THAN 10 KNOTS. SLOW MOVING AND/OR REGENERATION OF NEW CELLS WILL BE CAPABLE OF PRODUCING RAINFALL RATES BETWEEN 1.5 AND 2 INCHES PER HOUR...WHERE THE POTENTIAL WILL EXIST FOR ADDITIONAL RAINFALL AMOUNTS BETWEEN 4 AND 6 INCHES THROUGH 20Z.

...HURLEY.. 06/13/2012

ATTN...WFO...LCH...HGX...CRP...EWX... LAT...LON 28399668 28419704 28719735 29229718 29779637 30179525  
30429385 30219268 29789250 29519279 29159377 28839481 28499573 28399668

# Model Diagnostic Discussion

- **No longer have a forecaster dedicated to preparation of Model Diagnostic Discussion**
  - Discussions will be shorter
  - Only two will be issued
    - » After NCEP (NAM/GFS) models become available
    - » After non-NCEP (UKMET/CMC/ECMWF) global models become available
  - May occasionally be delayed due to preparation of Mesoscale Precipitation Discussions (MPDs)
- **Priority placed on systems based on:**
  - » Sensible weather impact (particularly precipitation)
  - » Coverage of system impacts
  - » Guidance spread



# Timeline

- **Prototype Phase - Through Aug 15**
  - Feedback solicited from field
  - Daytime only due to limited staff
  - May not be staffed everyday
  - Coordinate with field, NESDIS SAB, and SPC
- **HPC moves to new building weekend of August 17-20**
  - Dual staffing at two locations precludes staffing for MPDs
- **Simulation Phase - Aug 22 Through Sep 15**
  - Planned 24 hour coverage
- **Evaluation and Development Phase – Sep 15 – Dec 3**
  - HPC support staff will develop tools identified as required during prototype phase
- **Experimental MPD implemented 24/7 – Dec 4**
- **Nighttime Day 4-7 implemented – Dec 4**



# FY13 HPC Air Quality Support



- **Event-driven and seasonal NAM Air Quality Diagnostic Discussion product generation MAY continue JUNE 1<sup>st</sup> to AUGUST 31<sup>st</sup> (depends on CMAQ status for FY13)**
- **Still will push for an expansion of the seasonal timeframe assuming NAQFC program acceptance**
- **Continue full-time HPC AQ Web Drawer Support with continuation of the HI-RES 4 km NAM/CMAQ:**
  - **Simulated IR Satellite Imagery (4 km NAM)**
  - **Simulated Radar Reflectivity (4 km NAM)**
  - **Any new gridded data needed? Air Quality Forecaster needs?**
- **HPC Data Archiving possible (server issues likely to remain).**
- **HPC MetWatch Desk enters experimental phase (handles PMDHMDs and possibly NAM Air Quality Diagnostic Discussion)**



# Conclusions

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- **HPC remains committed to supporting the National Air Quality Forecast Capability (NAQFC)**
- **Continue AQ Web Drawer Support Year Round**
- **HPC MetWatch Desk enters experimental phase**
- **Air Quality support will continue through the PMDHMD and the NAM Air Quality Diagnostic Discussion (modified workflow due to MetWatch operations)**
- **Air Quality Forecaster feedback is requested to help give HPC more direction on improved product support**



**Thank You!**  
**Comments or Questions?**

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