

16th Weather Squadron

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Air Force Weather Ensembles

**Evan Kuchera
Fine Scale Models and Ensemble
16WS/WXN**



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Overview



- Air Force Weather Operational Ensembles
- Community development efforts
- Future plans



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AFW Operational Ensembles



■ **Goals for operational ensembles**

- Reliable, sharp prediction of mission-impact phenomena
- Tailored products: both quick-look AND detailed
- Timely!

■ **Global Ensemble Prediction Suite (GEPS)**

- 62 members from NCEP, CMC, FNMOC

■ **Mesoscale Ensemble Prediction Suite (MEPS)**

- 10 members of WRF-ARW with diverse initial conditions and physics
- 144 hour “global” at ~25 km, 60 hour regional at 4 km
 - 4 km or “storm scale” will be focus of this talk

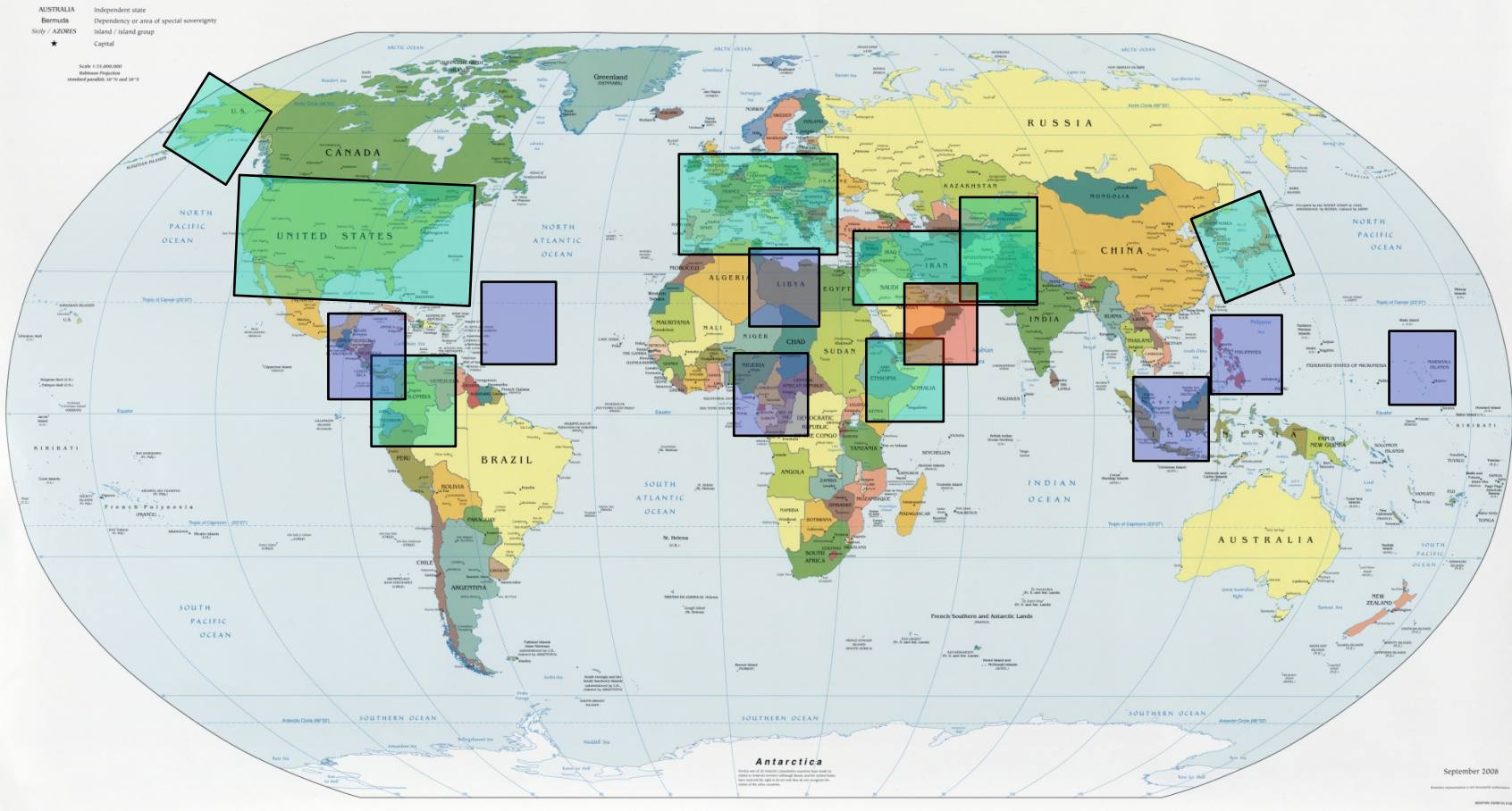


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4 km MEPS domains

Green—static running; Blue—relocatable with next upgrade
Red—relocatable running now

Political Map of the World, September 2008



*(Still partly notional as of 1Jun12)

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■ Physics configurations

Member	Sea IC	Land IC	IC/LBC	LSM	Micro	PBL
1	Navy SST	LIS	UM	NOAH	WSM5	YSU
2	Navy SST	LIS	GFS	RUC	Goddard	MYJ
3	Navy SST	LIS	GEM	NOAH	Ferrier	QNSE
4	Navy SST	LIS	NOGAPS	NOAH	Thompson	MYJ
5	Navy SST	LIS	UM	RUC	Thompson	MYJ
6	Navy SST	LIS	GFS	NOAH	Thompson	QNSE
7	Navy SST	LIS	GEM	NOAH	Goddard	YSU
8	Navy SST	LIS	NOGAPS	NOAH	WSM5	QNSE
9	Navy SST	LIS	UM	RUC	Ferrier	QNSE
10	Navy SST	LIS	GFS	NOAH	WSM5	YSU

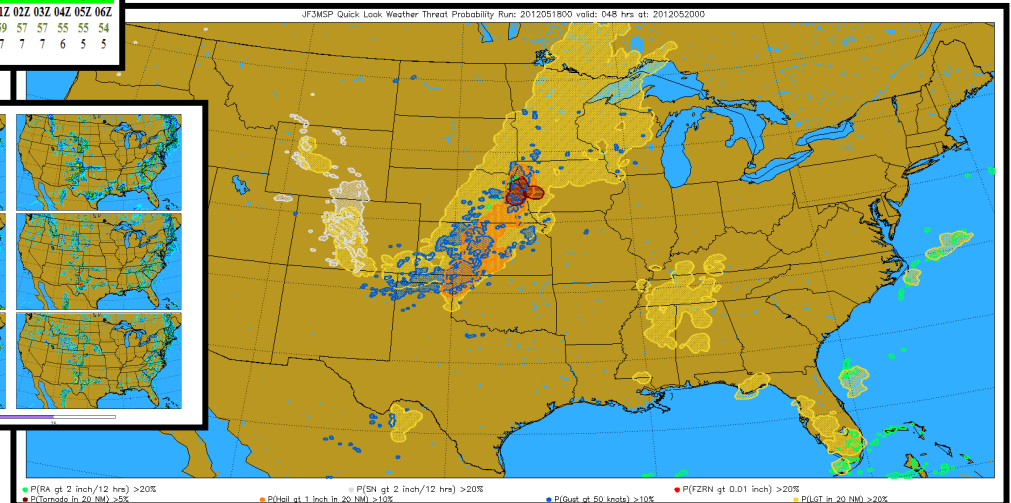
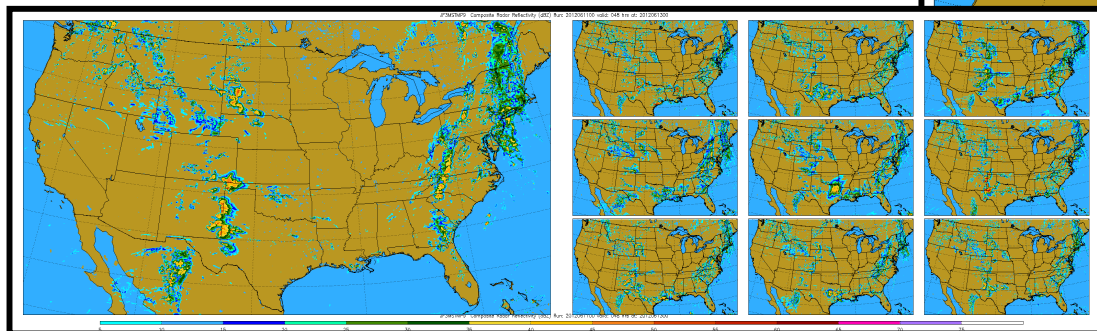
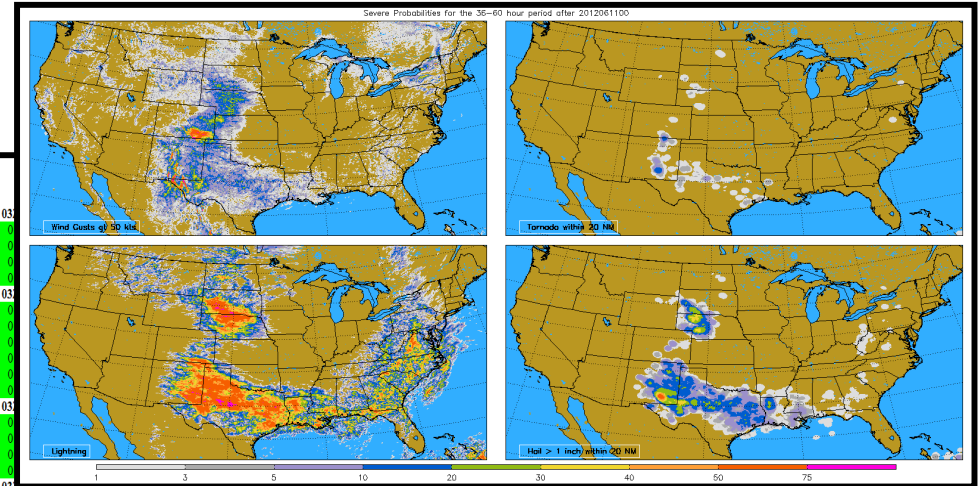
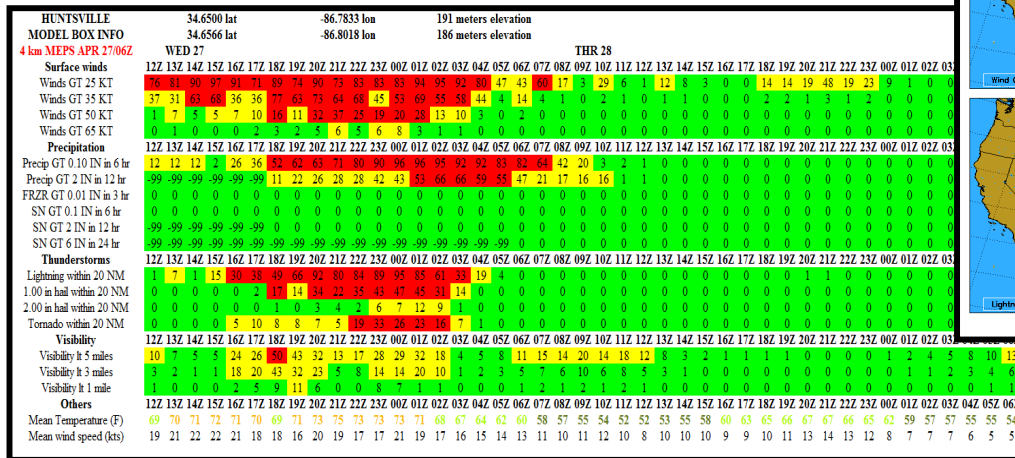
- No data assimilation, most recently available global model output is interpolated to the domain
- Only 26 vertical levels—does not seem to degrade quality (Aligo, et. al., 2008)



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AFW Operational Ensembles

Product Examples



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Community Efforts



- **Goals for working with the community**
 - Ensure AFWA-specific model diagnostics and post-processing routines become part of community code
 - Participate in mock operational testbeds (data and personnel) to ensure ideas and experiences are exchanged
 - Share data when possible
 - Place GEPS derived probabilities onto NOAA NOMADS as part of NUOPC commitment
 - Exploring potential to add operational CONUS 4 km data onto NOAA NOMADS as well
 - Also for development/research when feasible (dev ftp server)



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Community Efforts



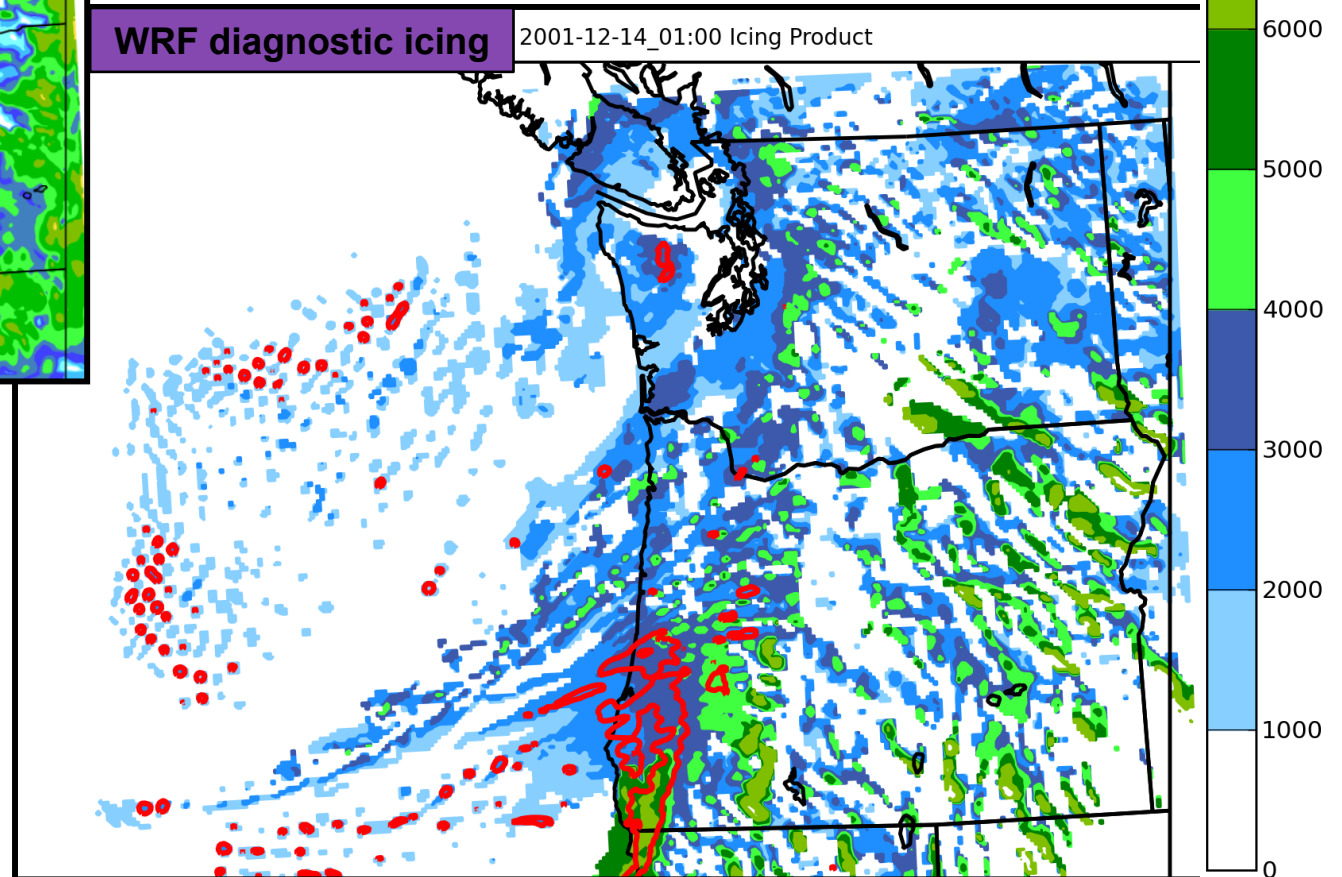
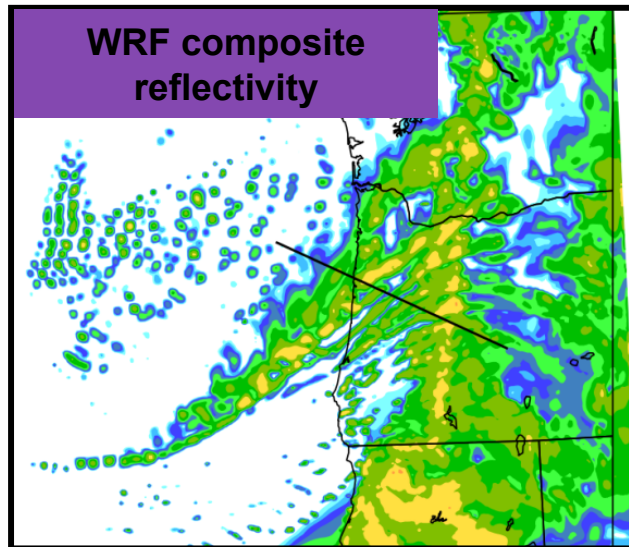
- **Purpose of diagnostics: Access data from the model for “post-processing” while it is available in memory (P99; Creighton)**
 - **Reduces I/O load**
 - **Enables tracking of maxima and minima**
 - **Given WRF parallelization, is generally cheap**
- **Targeted variables**
 - **Simulated clouds/satellite and radar**
 - **Clear and rime aircraft icing**
 - **Precipitation Type/snowfall**
 - **Surface visibility (fog/precip/dust)**
 - **Severe weather (lightning/hail/tornado/winds)**



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Community Efforts

Becky Adams Selin, AER



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Community Efforts



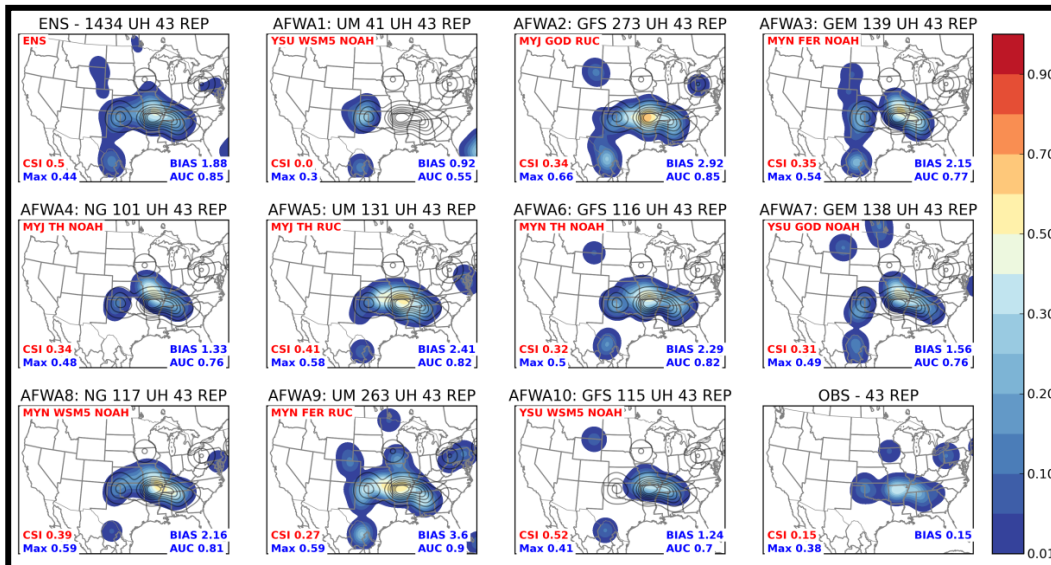
- **Testbed participation in the last year:**
 - **Hydrometeorological Prediction Center: focus on winter hazards during Jan/Feb 2012**
 - **Hydrometeorology Testbed (NOAA/ESRL and NCAR/DTC): focus on clouds and precipitation in western CONUS from Dec 2011 to Apr 2012 (P55; Jensen et al)**
 - **NSSL/Storm Prediction Center: focus on severe convective weather during May/June 2012**
 - **Aviation Weather Center: focus on convective impacts to aviation during June 2012**



Community Efforts

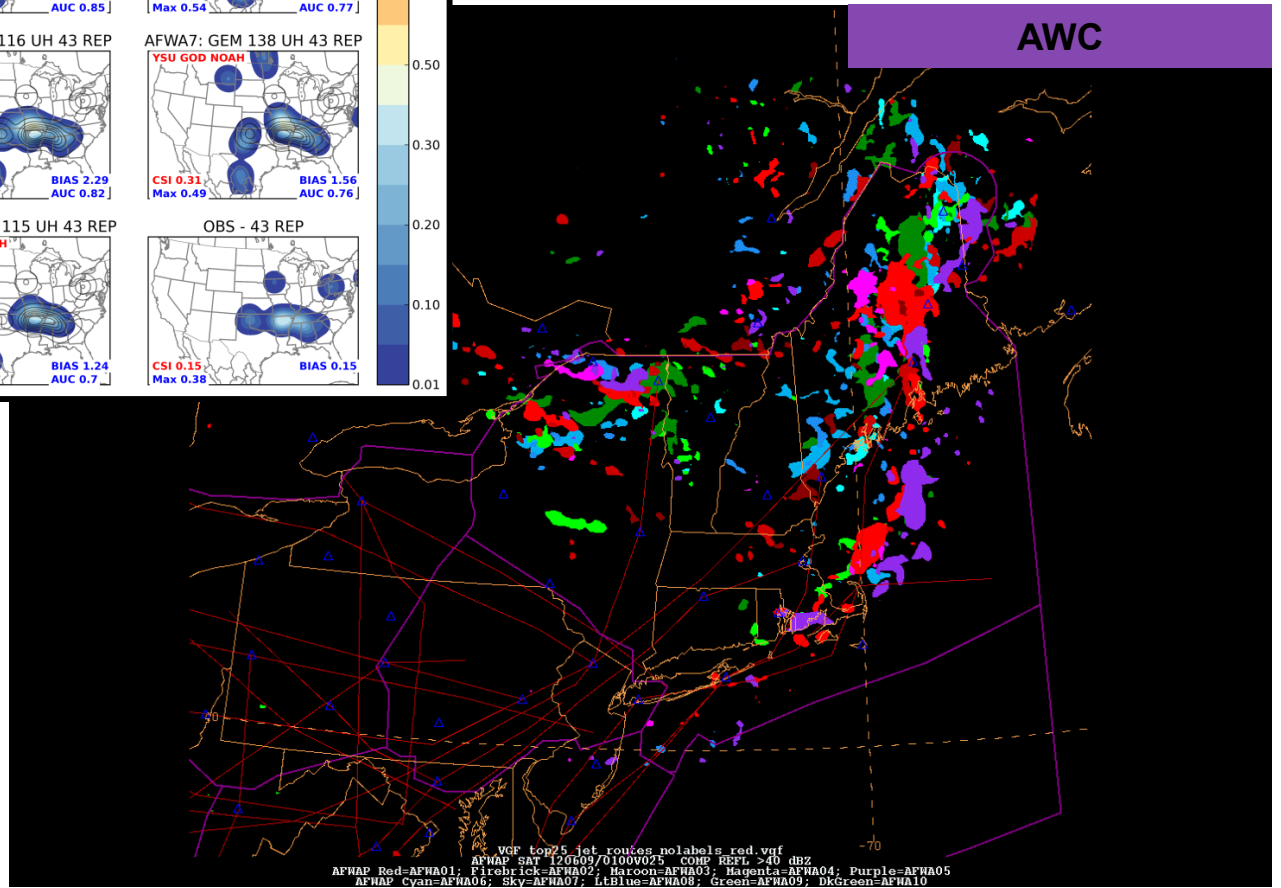


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NSSL/SPC

AWC



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Future



- **Goals for future development**
- **Ensemble member/system upgrades**
 - Increase physics package sophistication, add members, utilize SKEB
 - Diversify SST and land surface ICs, explore EnKF
- **Ensemble post-processing upgrades**
 - Diagnostics
 - Create query-able database of all ensemble members
 - Users can request joint probabilities, any time period of choice, etc
 - Ex→ probability of heavy snow AND strong winds concurrently
- **Merging with climatology (P30; Hamilton)**
 - Ensemble of modeled climatology to reduce biases
 - Apples to apples comparisons between forecast and climo



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Summary



- **Air Force Weather is executing operational ensemble prediction systems**
 - **Timely, storm-scale products tailored to mission needs**
- **Partnering with larger WRF community**
 - **Diagnostics contributed back to community code**
 - **Participating in numerous testbeds**
 - **Provide data when possible**
- **Future**
 - **Interactive database**
 - **Migrate to more advanced physics and initial conditions**
 - **Merge products with climatology**