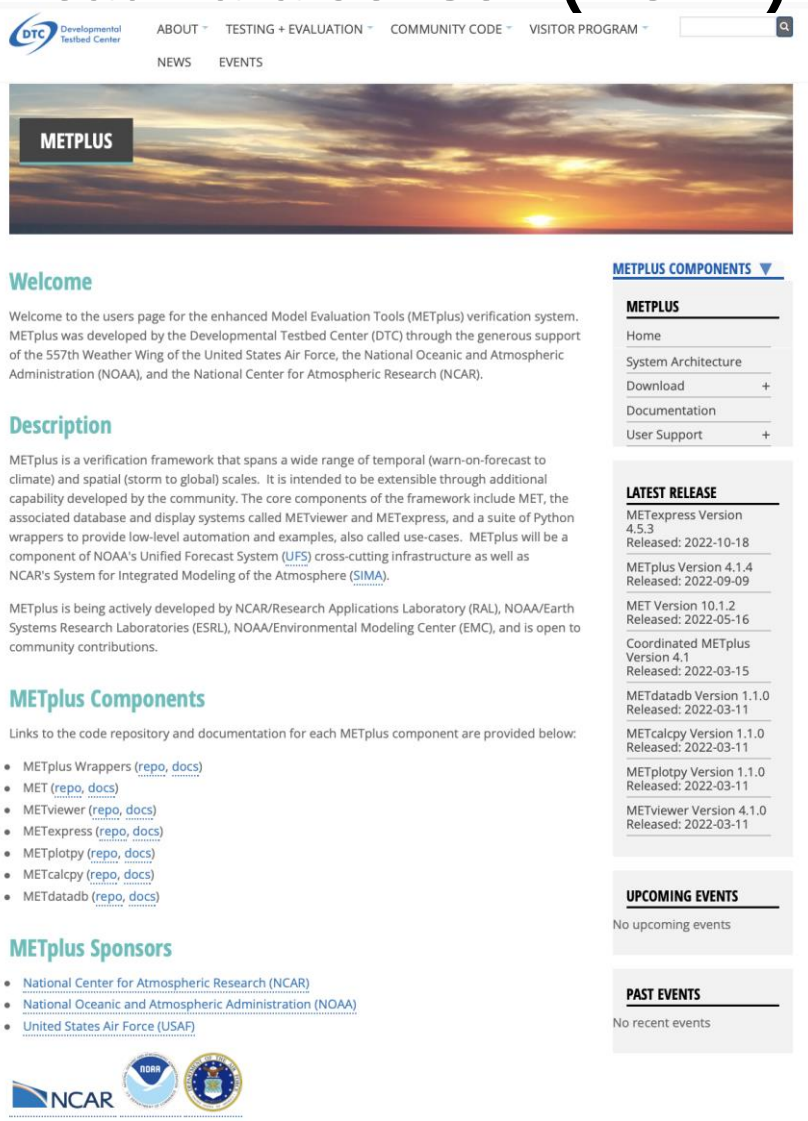
METplus : https://dtcenter.org/community-code/metplus

- Community based software, is a **tool for research-to-operation tech transfer.** Operational at UKmetO, BoM, NOAA
- Modular, python: Data Base, scoring, visualization.
- Includes verification tools for
  - Stations and gridded obs
  - Spatial verification
  - Inference (Confidence Intervals)
- Documentation, user support, online tutorials and workshops

Lead Tara Jensen (NCAR)



The Environmental Modeling Center Verification System (EVS): Real-time Verification of Unified Forecast System (UFS) Models

Presented at the 2024 European Geophysical Union General Assembly

Vienna, Austria

Jason Levit

Chief, Verification, Post-Processing, Product Generation Branch

NOAA/NWS Environmental Modeling Center

NOAA

National Weather Service

Acknowledgements

Project Manager: Jason Levit
Project Leads: Geoff Manikin and Alicia Bentley

Global Verification Project Lead: Alicia Bentley
Regional Verification Team Lead: Logan Dawson
Lynker Lead: Shelley Melchior

Code Managers: Perry Shafran and Shelley Melchior

EVS Developers: Samira Ardani, Partha Bhattacharjee, Marcel Caron, Gwen Chen, Logan Dawson, Lin Gan, Ho-Chun Huang, Yali Mao, Olivia Ostwald, Jiayi Peng, Mallory Row, Perry Shafran, Roshan Shrestha, Shannon Shields, Steven Simon, Deanna Spindler, Binbin Zhou

Coordination: Rahul Mahajan, Raffaele Montuoro

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NCO: Steven Earle, Justin Cooke, Anne Myckow, Margaret Curtis, Jesse Marks, Carissa Klemmer, Dataflow team

What is EVS?

The EMC Verification System

Real-time verification of operational models and product systems

Quality control

A tool for curiosity and discovery

The EVS Story

VPPPGB Established

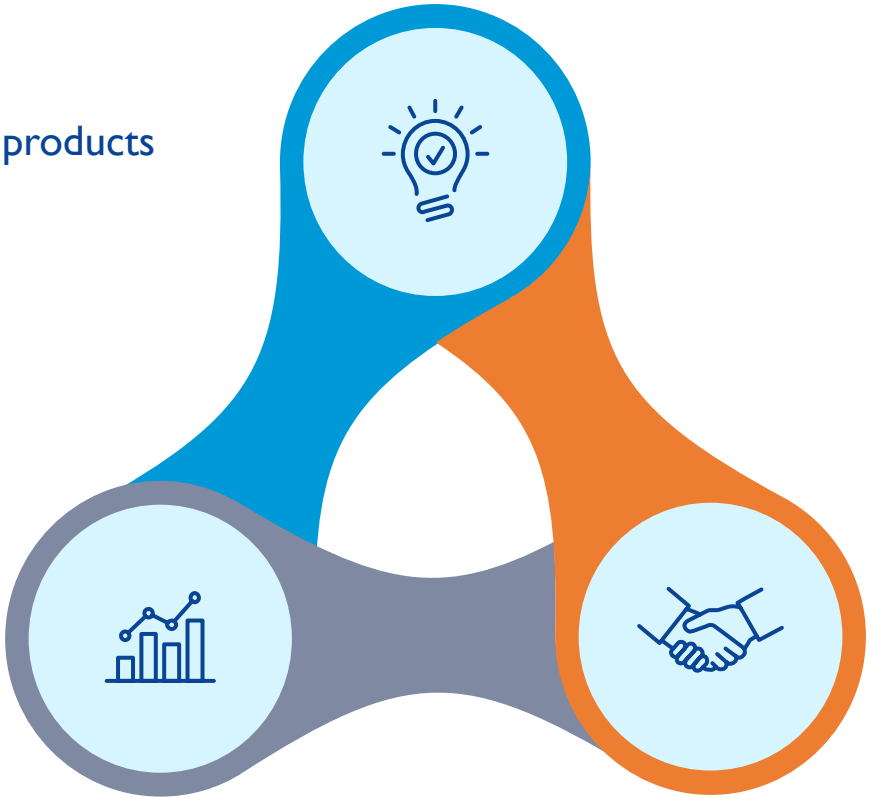
- Branch established in May 2017
- Mission: create and quality control model products
- Verification software challenges

Metrics Workshop

- 2021 DTC UFS Metrics Workshop
- Established UFS standards for verification metrics
- Dozens of follow-on meetings to solidify intent

Software Solution

- Create a single verification package for EMC
- Verify all model products
- Real-time system for transparency



EVS Benefits

Cost Savings

- Single software system
- Reduces O&M cost
- Improves spin-up time for new hires

Real-time data

- Operational models verified
- Can use for briefings as soon as available

IDSS Support

- Communicate model performance to partners
- Event reviews and assessments
- Establish systematic errors and biases

Public Service

- Expands list of metrics for reporting to Congress
- Could assist with establishing an ROI baseline

EVS Outline

EVS Baseline

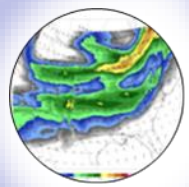
- **METplus** core
- Python libraries
- Internal standards

EVS Products

- **Statistics** files generated from METplus
- **Graphics** generated via **Python - *several hundred thousand per day***

EVS Web Interface

- **Verification graphics** will display on the **EMC website**
- Real-time updates
- Drop-down **menu** lists for **navigation**



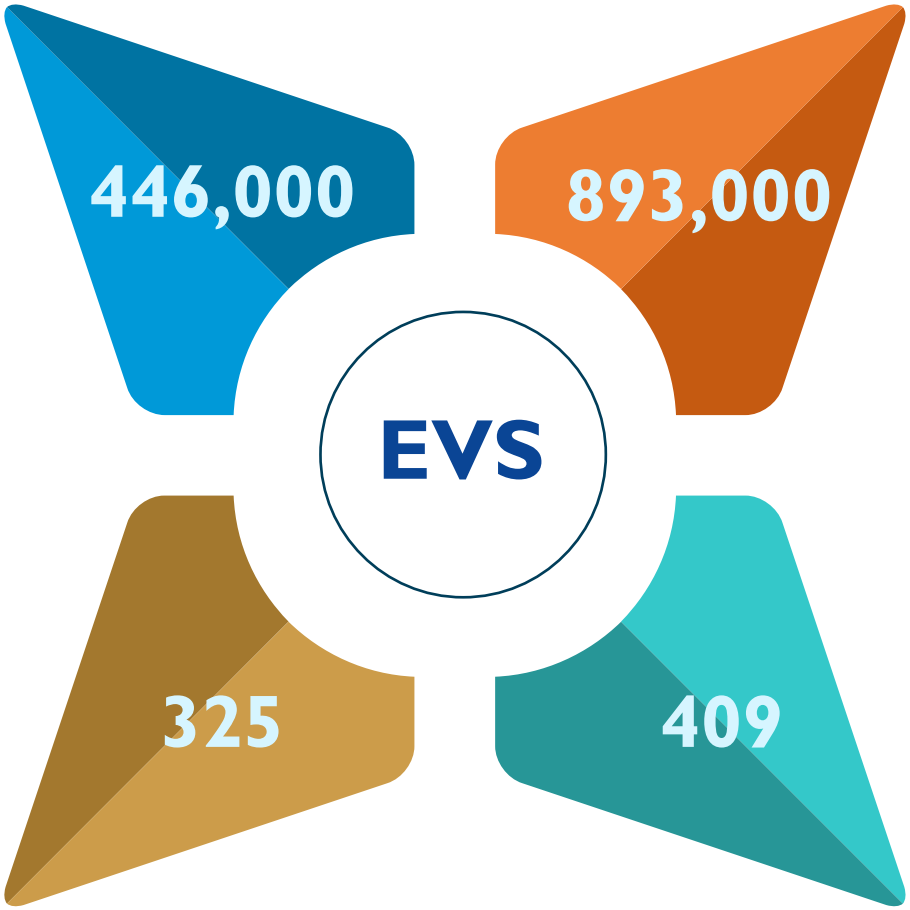
EVS Uses

- **Evaluation** of new Earth System Models
- Model Evaluation Group (**MEG**) webinars

EVS Statistics

446,000 lines of code developed

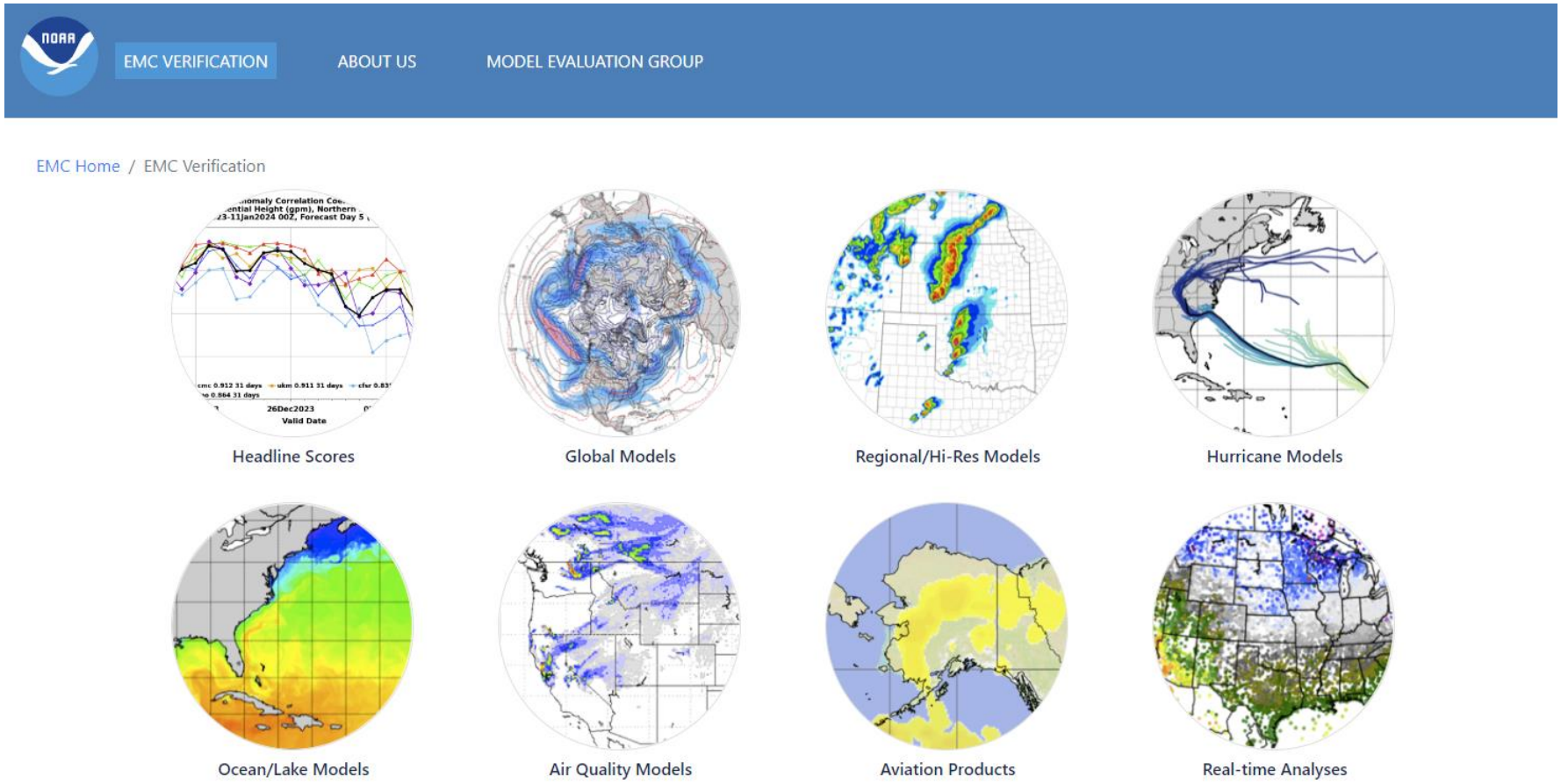
325 variables measured across the production suite



893,000 images per day generated

409 Github pull requests

EVS Webpage

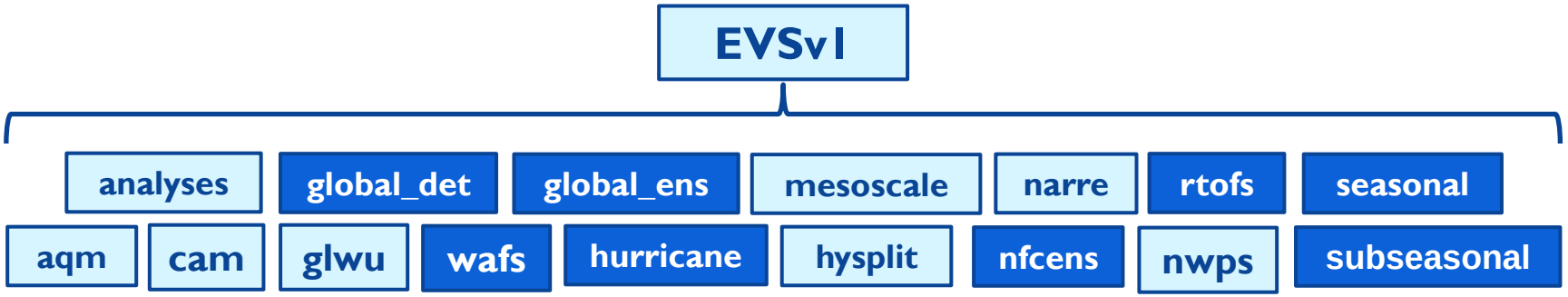


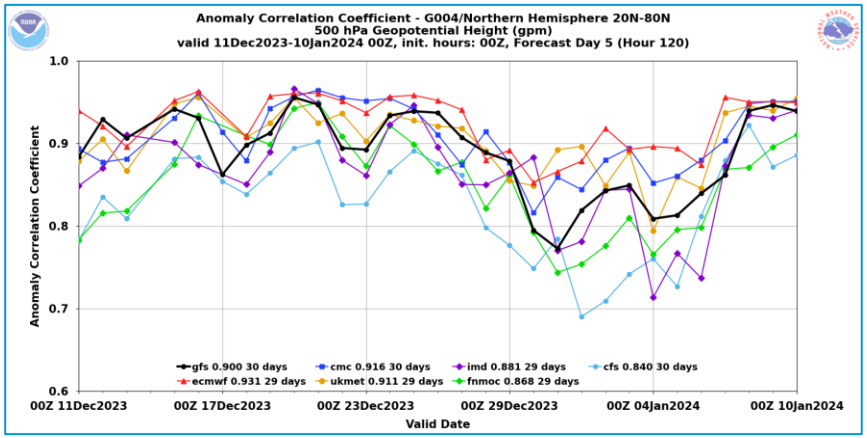
- Colors representing each application are consistent across all plots
- NOAA/NWS logo on each plot
- 893,000 images per day (and growing)!

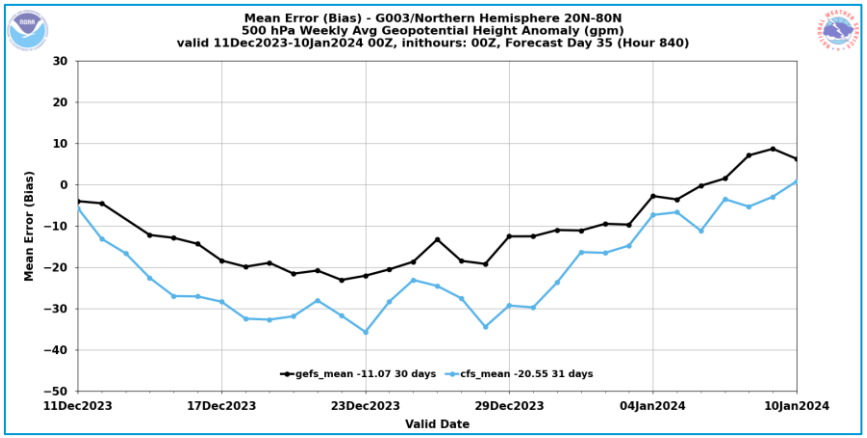
EVS – Global Models

EVSv1 includes a combination of global and regional components

- Global: 1) global_det (e.g., GFS), 2) global_ens (e.g., GEFS, NAEFS), 3) subseasonal (e.g., GEFS/CFS), 4) rtofs, 5) nfcens, 6) wafs, 7) hurricane
- Seasonal verification will be added in a future version of EVS







EVS Regional and Hurricane Models

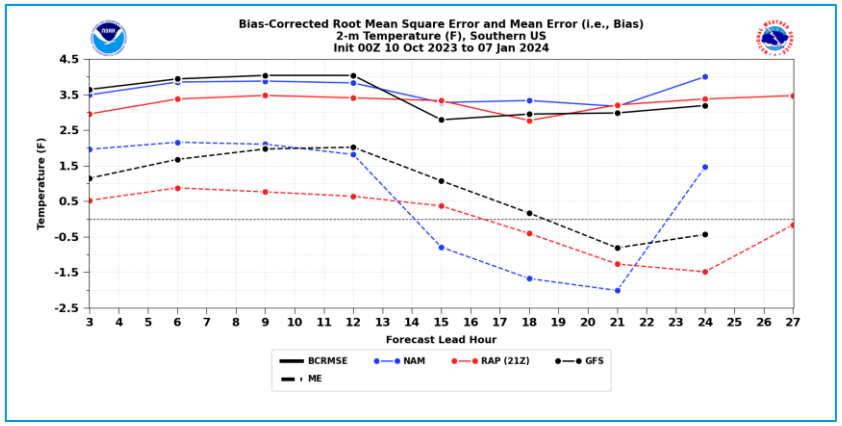
EVSv1 includes a combination of global and regional components

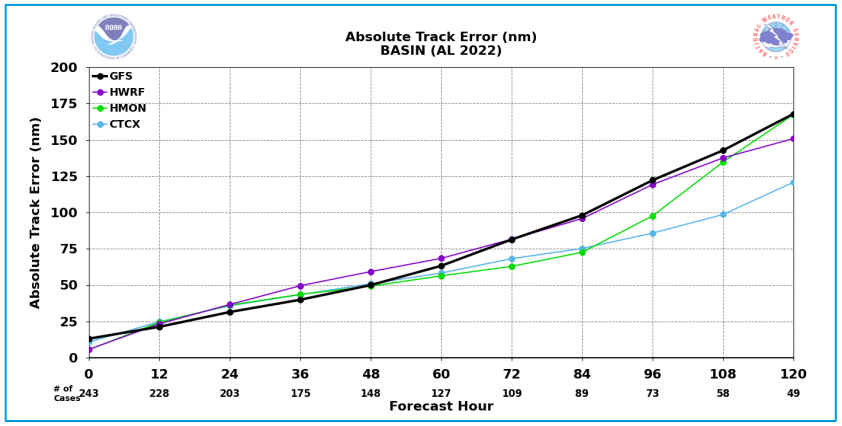
- Regional: 1) mesoscale (e.g., NAM, RAP, SREF), 2) cam (e.g., HRRR, NAM Nest, HiResWs, HREF), 3) analyses (e.g. RTMA/URMA), 4) NARRE, 5) AQM, and 6) hurricane (e.g., HAFS)
- GLWU and NWPS verification will be added in a future version of EVS

EVSv1

analyses | global_det | global_ens | mesoscale | narre | rtofs | seasonal

aqm | cam | glwu | wafs | hurricane | hysplit | nfcens | nwps | subseasonal

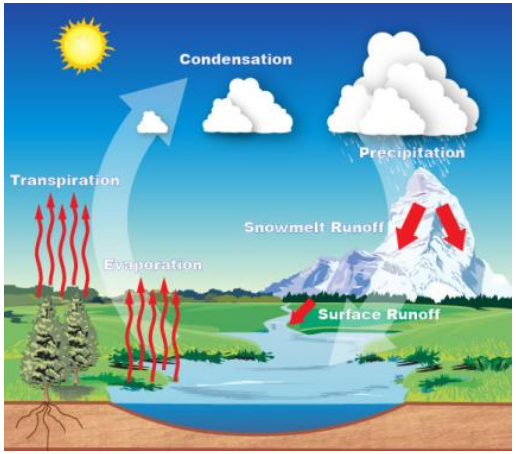




EVS - What's Next

Technology Upgrades

- Improved web page?
- Faster execution
- Software additions not in EVS v1



Science Upgrades

- Process oriented metrics
- Object oriented metrics
- AI/ML uses?
- Additional metrics
- Monitoring dashboard?
- Consolidated metrics?

Thank you!

EVS on Github:
https://github.com/NOAA-EMC/EVS

EVS Real-Time Graphics:
https://emc.ncep.noaa.gov/users/verification/

SCAN ME!