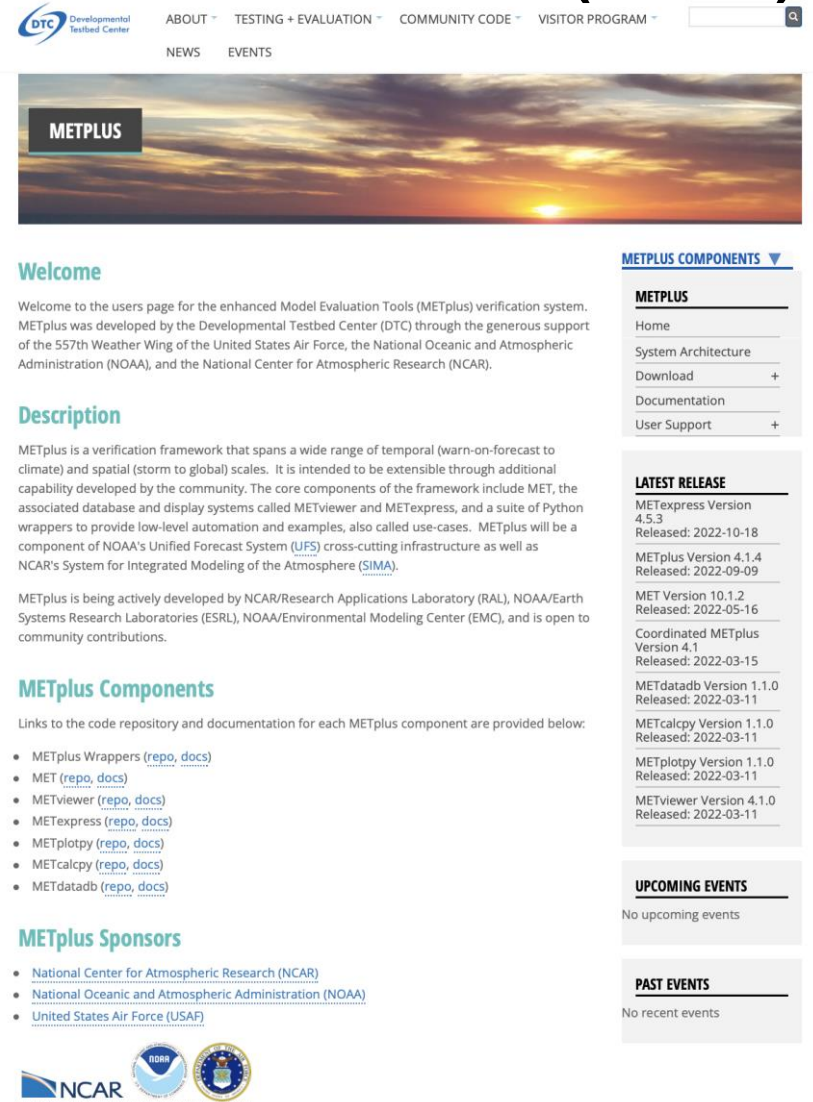


METplus : <https://dtcenter.org/community-code/metplus>

- 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)



Developmental Testbed Center ABOUT TESTING + EVALUATION COMMUNITY CODE VISITOR PROGRAM

NEWS EVENTS

Welcome

Welcome to the users page for the enhanced Model Evaluation Tools (METplus) verification system. METplus was developed by the Developmental Testbed Center (DTC) through the generous support of the 557th Weather Wing of the United States Air Force, the National Oceanic and Atmospheric Administration (NOAA), and the National Center for Atmospheric Research (NCAR).

Description

METplus is a verification framework that spans a wide range of temporal (warn-on-forecast to climate) and spatial (storm to global) scales. It is intended to be extensible through additional capability developed by the community. The core components of the framework include MET, the associated database and display systems called METviewer and METexpress, and a suite of Python wrappers to provide low-level automation and examples, also called use-cases. METplus will be a component of NOAA's Unified Forecast System (UFS) cross-cutting infrastructure as well as NCAR's System for Integrated Modeling of the Atmosphere (SIMA).

METplus is being actively developed by NCAR/Research Applications Laboratory (RAL), NOAA/Earth Systems Research Laboratories (ESRL), NOAA/Environmental Modeling Center (EMC), and is open to community contributions.

METplus Components

Links to the code repository and documentation for each METplus component are provided below:

- METplus Wrappers ([repo](#), [docs](#))
- MET ([repo](#), [docs](#))
- METviewer ([repo](#), [docs](#))
- METexpress ([repo](#), [docs](#))
- METplotpy ([repo](#), [docs](#))
- METcalcpy ([repo](#), [docs](#))
- METdatadb ([repo](#), [docs](#))

METplus Sponsors

- [National Center for Atmospheric Research \(NCAR\)](#)
- [National Oceanic and Atmospheric Administration \(NOAA\)](#)
- [United States Air Force \(USAF\)](#)

METPLUS COMPONENTS

METPLUS

- Home
- System Architecture
- Download +
- Documentation
- User Support +

LATEST RELEASE


- METexpress Version 4.5.3 Released: 2022-10-18
- METplus Version 4.1.4 Released: 2022-09-09
- MET Version 10.1.2 Released: 2022-05-16
- Coordinated METplus Version 4.1 Released: 2022-03-15
- METdatadb Version 1.1.0 Released: 2022-03-11
- METcalcpy Version 1.1.0 Released: 2022-03-11
- METplotpy Version 1.1.0 Released: 2022-03-11
- METviewer Version 4.1.0 Released: 2022-03-11

UPCOMING EVENTS

No upcoming events

PAST EVENTS

No recent events





NOAA

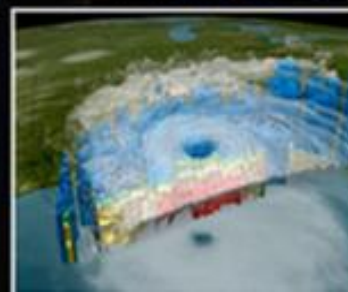
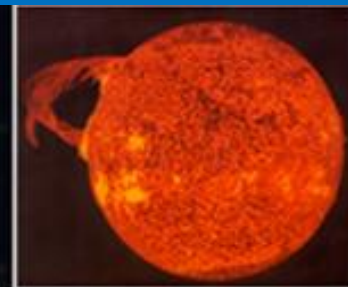
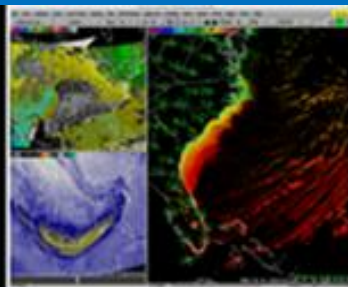
National Weather Service

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



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

DTC: Tara Jensen, John Halley Gotway, Julie Prestopnik, and the rest of the METplus development team

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



METplus

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

446,000

893,000
images per day
generated

893,000

325 variables
measured
across the
production
suite

325

409 Github pull
requests

409

EVS

EVS Webpage

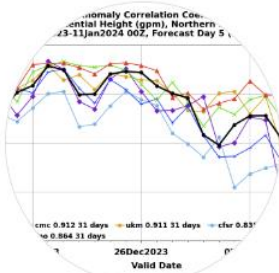


EMC VERIFICATION

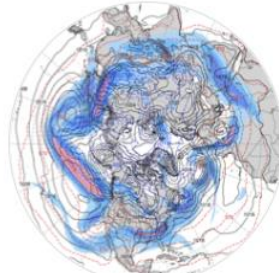
ABOUT US

MODEL EVALUATION GROUP

EMC Home / EMC Verification



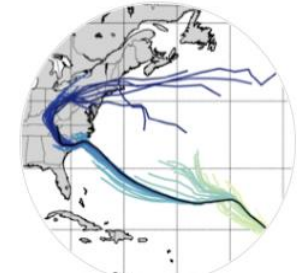
Headline Scores



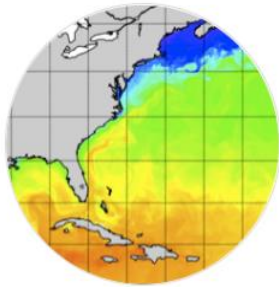
Global Models



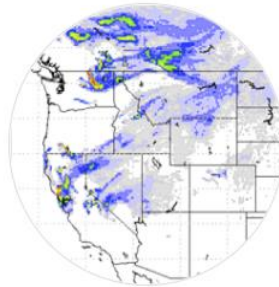
Regional/Hi-Res Models



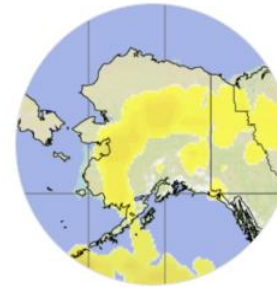
Hurricane Models



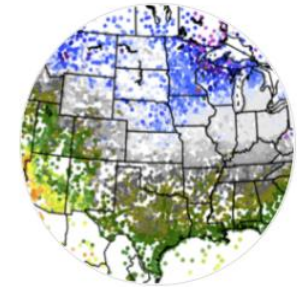
Ocean/Lake Models



Air Quality Models



Aviation Products



Real-time Analyses

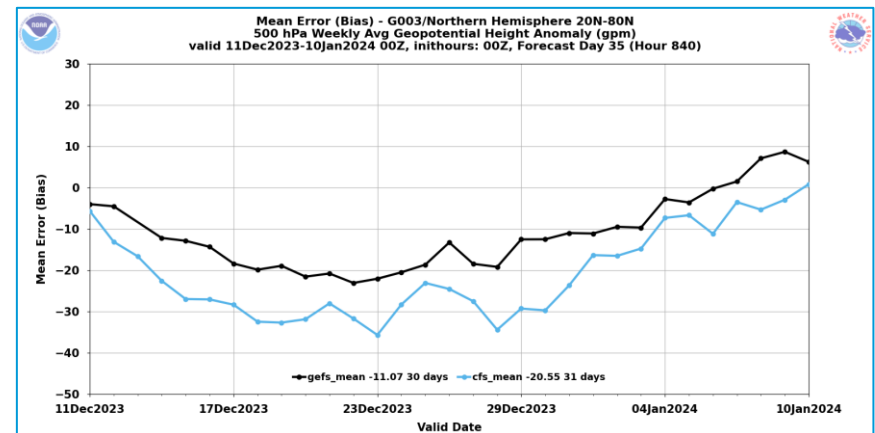
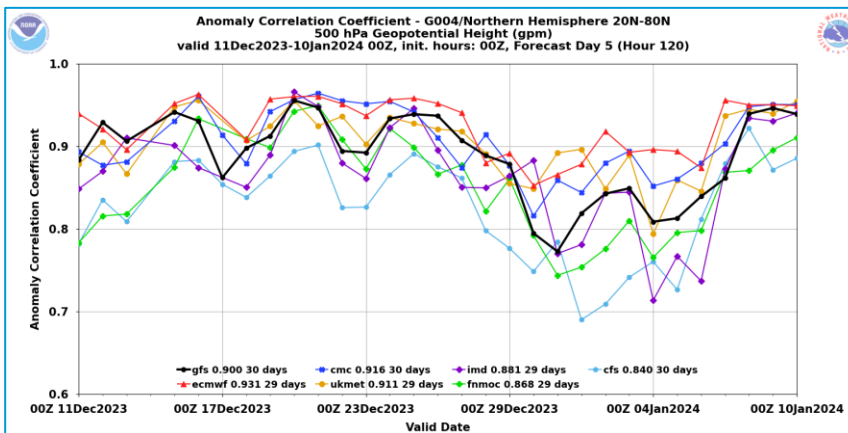
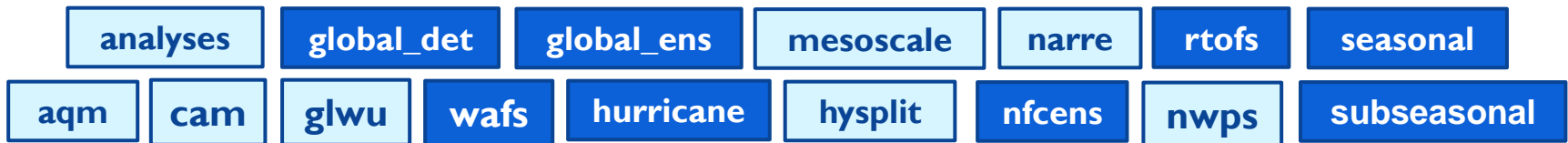
- Colors representing each application are consistent across all plots
- NOAA/NWS logo on each plot
- 893,000 images per day (and growing)!

EVS – Global Models

EVSvI 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

EVSvI

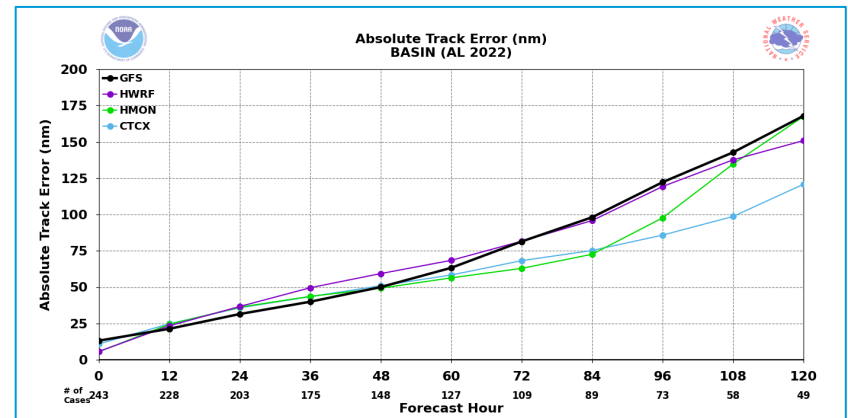
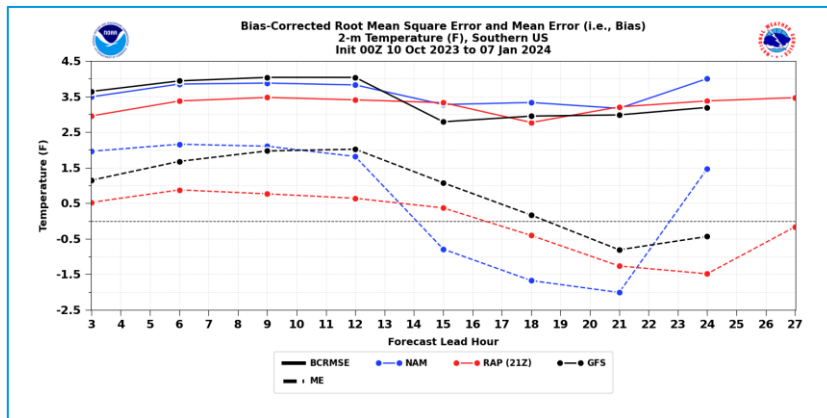
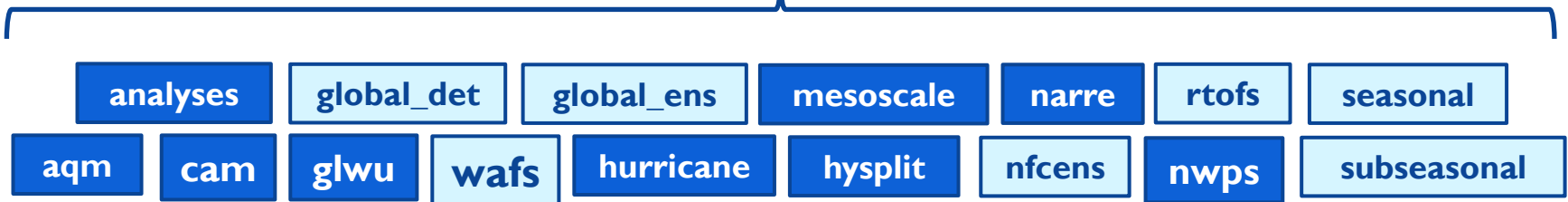


EVS Regional and Hurricane Models

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

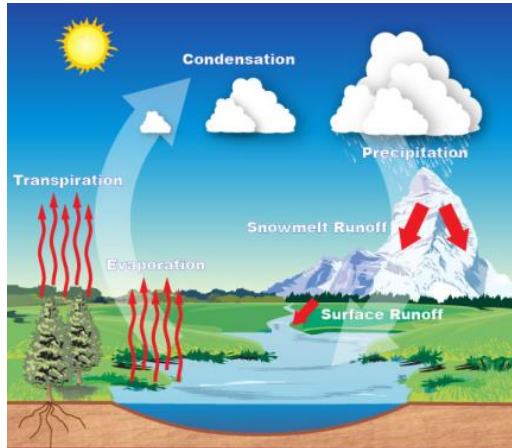


EVS - What's Next



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!