



“The UFS-R2O Project”

Unified Forecast System Research to Operations Project

Accelerating a pathway for community innovations into operational weather and climate modeling systems

The Unified Forecast System Research to Operations (UFS-R2O) Project is a two-year (2020-2022) NOAA-supported UFS community (<https://UFSCommunity.org>) project to develop three major UFS forecast application systems targeted for operational implementation by 2024:



- Global: A coupled global ensemble system suitable for medium to extended range forecasts (days to weeks), the Global Forecast System (GFS) v17 merged with the Global Ensemble Forecast System (GEFS) v13;
- Regional: An ensemble regional forecast system suitable for short-range forecasts (hours to days), the Rapid Refresh Forecast System (RRFS) and the Hurricane Analysis and Forecast System (HAFS).

Project Deliverables

Prototypes of Ensemble Regional Forecast System:

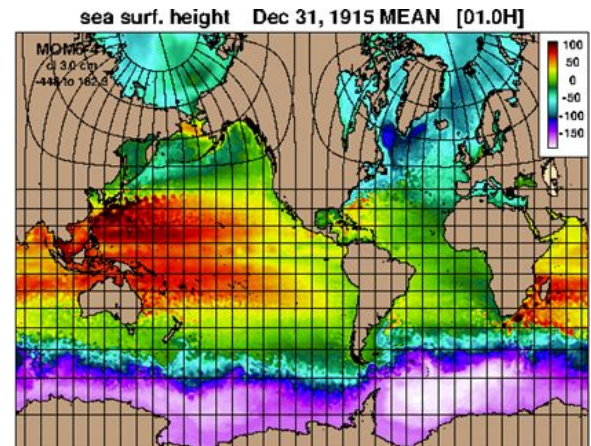
- Rapid Refresh Forecast System (RRFS);
- Three-Dimensional Real-Time Mesoscale Analysis (3DRTMA);
- Hurricane Analysis and Forecast System (HAFS) with moving nests following multiple storms;
- Physics: stochastic and based on the Common Community Physics Package (CCPP).



Prototype for GFSv17/GEFSv13:

Merging of the deterministic GFS for medium-range weather (0-16 days) with the ensemble GEFS for subseasonal forecast (17- 45 days):

- A 6-component coupled Earth system model that represents interactions among atmosphere, ocean, sea ice, waves, land and atmospheric composition (FV3ATM/MOM6/CICE6/WW3/Land/GOCART);
- Advanced physic suites, stochastic parameterizations, aerosol feedbacks;
- 30-year coupled reanalysis and reforecast for model calibration and post-processing of subseasonal forecast products;
- This system will be publicly released in 2022.





Technical Approach

The UFS-R2O Project entails coordinated development across the Weather Enterprise on shared modeling and data assimilation infrastructures and algorithms. Components targeted for coordinated development include:

- The JEDI data assimilation framework,
- Community model coupling infrastructure (ESMF, NUOPC, CMEPS),¹
- Interoperable atmospheric sub-grid physical parameterizations (CCPP),²
- Community data models (CDEPS),³
- Verification and validation frameworks (METPlus).⁴

Software development on all systems is aligned with the UFS community code management policies, which include the management of Git-based repositories with Gitflow (<https://github.com/ufs-community/ufs-weather-model>).

A public-version of the project proposal is available [here](#).



Project Organization

The UFS-R2O Project coordinates extensively between research and operations to streamline and accelerate the transition to operations. With over 200 participants from across the Weather Enterprise, including National Weather Service (NWS) National Centers for Environmental Prediction (NCEP), several Office of Atmospheric Research (OAR) Laboratories, University Corporation for Atmospheric Research (UCAR), and several Universities. Collaborators follow a single management framework with three co-equal Principal Investigators representing research, operations, and academia, respectively:

- **Dr. Jeff Whitaker**, NOAA Earth System Research Laboratory (ESRL) Physical Systems Laboratory (PSL) (Jeffrey.Whitaker@NOAA.gov);
- **Dr. Vijay Tallapragada**, NOAA National Centers for Environmental Prediction (NCEP) Environmental Modeling Center (EMC) (Vijay.Tallapragada@NOAA.gov); and
- **Dr. Jim Kinter**, Center for Ocean-Land-Atmosphere Studies, George Mason University (JKinter@GMU.edu).

More information is available at the project website: <https://UFSCommunity.org/ufsr2oproject>

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¹ ESMF: Earth System Modeling Framework; NUOPC: National Unified Operational Prediction Capability; CMEPS: Community Mediator for Earth Predictive Systems

² CCPP: Common Community Physics Package

³ CDEPS: Community Data Models for Earth Prediction Systems

⁴ METPlus: Model Evaluation Tools development package