



UFS-R20 Progress & Year 3 Plan

Application Support Development Cross Cutting Team

6&7 December 2021

EMC, PSL,
GSL, CSL,
NSSL, ARL,
NESDIS





Application Support - Description and Goal



Description: Community outreach (user-facing) activities to promote engagement in and development of UFS Applications.

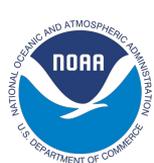
Scope: Contributing to App release preparations, providing user and developer support, establishing thorough documentation, offering training events, and governing procedures for code management

PoCs: DTC/GSL - Ligia Bernardet, Evan Kalina, Jeff Beck; DTC/NCAR - Mike Ek, Kathryn Newman, Jamie Wolff; EMC - Jun Wang (in kind)



Application Support - Progress and status update

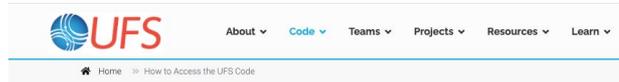
- Completed
 - Annual UFS Users' Training
 - [MRW Application Focus UFS Users' Training](#): 4-9 Nov 2020
 - [SRW Application Focus UFS Users' Training](#): 20-24 Sep 2021
 - Governance strategy for the HAFS code repository
- Ongoing
 - Provide UFS MRW App community support by answering questions on the forum
 - Support EMC and the larger community in preparing a UFS MRW App release
 - Provide Hurricane App community support by answering questions on the forum
 - Assist Hurricane App developers in creating and maintaining branches that contain their innovations in the HAFS code repository



Application Support - Major Accomplishments



MRW Releases:



HOW TO ACCESS THE UFS CODE

The [ufs-weather-model](#) repository contains the model code and external links needed to build the Unified Forecast System (UFS) model and associated components.

A [Getting Started](#) section leads you through a quick example. A [Graduate Student Test](#) is also available for students, postdocs and others to provide feedback on the usability of the UFS by running through a series of experiments and then filling out a questionnaire about the experience. [Participate now!](#)

UFS can be configured into multiple applications — to date, two have been formally released to the community: the Medium-Range Weather (MRW) Application and, more recently, the Short-Range Weather (SRW) Application. The table below provides links to App user guides, code repositories and wikis.

Release Name	Release Date	Release Description
UFS Medium-Range Weather Application 1.1.0	10/06/2020	Major release with upgrades and bug fixes. There is a full description of the v1.1.0 release here .
GitHub Wiki GitHub Repository Users Guide		
UFS Medium-Range Weather Application 1.0	3/11/2020	The UFS Medium-Range Weather Application targets predictions of global atmospheric behavior out to about two weeks. This application includes a user-friendly workflow, with pre-processing (preparation of inputs), a forecast model, and post-processing. There is a full description of this release here .
GitHub Wiki GitHub Repository Users Guide		

<https://ufscommunity.org/science/code/>

4-9 Nov 2020



NOV 4 - 9 2020

The Developmental Testbed Center (DTC), in cooperation with Subject Matter Experts (SMEs) from NOAA's Environmental Modeling Center (EMC) and Geophysical Fluid Dynamics Laboratory (GFDL), as well as NOAA's Climate and Global Dynamics (CGD) Laboratory, hosted a live, virtual training session for the Unified Forecast System (UFS) Medium-Range Weather (MRW) Application from November 4 and November 9, 2020. This training focused on teaching community users how to set up and run the latest officially released MRW Application version 1.1 for their own experiments, with some optional material on the last day of the training session for developers who wished to modify codes and contribute their changes back to the community code repository. The MRW Application targets predictions of global atmospheric behavior out to about two weeks; more details on the first MRW App release can be found [here](#).

Attendees were presented with live lectures from experts on the various UFS components, including the CME-based workflow, the atmospheric model PV dynamics core and physics suite options, and pre/post-processing. In addition to lectures, live virtual practice sessions were hosted to gain experience with building, running, and modifying the system to take full advantage of the supported capabilities for research and forecasting use. Participants were able to ask questions and interact with SMEs to gain a deeper understanding of the system and how to configure it for their purposes. The first day provided an optional "deeper dive" into the system for developers to cover advanced subjects, including code modification, domain configuration, and repository management protocols.

ABOUT

Agenda

- UFS Medium-Range Weather (MRW) Practical Session Guide
- MRW App v1.1 Practical Session Guide

MRW App Training:

<https://dtcenter.org/events/2020/unified-forecast-system-ufs-medium-range-weather-mrw-application-users-training>

SRW App Training:

<https://dtcenter.org/events/2021/unified-forecast-system-ufs-short-range-weather-srw-application-users-training>



SEP 20 - 24 2021

The Developmental Testbed Center (DTC), in cooperation with Subject Matter Experts (SMEs) from NOAA's Environmental Modeling Center (EMC), National Centers for Environmental Prediction (NCEP), and Geophysical Fluid Dynamics Laboratory (GFDL), hosted a live, virtual training session for the Unified Forecast System (UFS) Short-Range Weather (SRW) Application from September 20-24, 2021. This training focused on teaching community users how to set up and run the first officially released SRW Application for their own experiments. The SRW Application targets predictions of regional atmospheric behavior out to several days; more details on the first SRW App release can be found [here](#).

Attendees were presented with live lectures from experts on the various UFS components, including the regional workflow, NCEP datasets, the PV dynamics core and limited area model (LAM) configurations, physics suite options, pre/post-processing, and Python plotting scripts to visualize output. Additional factors on current and future development of the SRW App were also presented. Live virtual hands-on practice sessions were hosted to gain experience with building, running, and modifying the system to take full advantage of the supported capabilities for research and forecasting use. Participants were able to ask questions and interact with SMEs to gain a deeper understanding of the system and how to configure it for their purposes. In addition, a "deeper dive" into the system to cover advanced subjects, such as GitHub overview, domain configuration, code modifications, and repository management protocols were provided.

ABOUT

Agenda

- UFS Short-Range Weather (SRW) Practical Session Guide

20-24 Sep 2021

<https://vlab.noaa.gov/web/ufs-r20/>



Application Support - Major Challenges



- MRW releases are having limited use
 - Propose to drop MRW support in Dec 2021
- MRW workflows have diverged: release uses CIME and developers use *global_workflow* for uncoupled runs and *CROW* workflow for coupled runs
- Workflow unification/consolidation is needed to engage the community
- The UFS does not have a path/plan for upcoming releases
- Roles/responsibilities for release are unclear
 - UFS (SC and groups), UFS-R20 Application Teams, EPIC, EMC, DTC,...
- Roles/responsibilities for supporting components vs. Apps are unclear



Application Support - Vision for Transition of DTC work to EPIC

- The Earth Prediction Innovation Center (EPIC) project is part of the broad R2O2R effort to help accelerate getting research innovations into operational systems. EPIC cannot encompass the entire R2O2R domain, rather, it supports the R2O2R process.
- EPIC will provide basic software infrastructure for the continuous development, testing, and integration of innovations for the UFS Weather Model (WM) and UFS applications.
- DTC will continue to be a clearing house to support the research community in conducting scientific testing and evaluation of UFS innovations.
- The support of UFS WM and UFS applications, such as the MRW and SRW Apps, currently in DTC, will gradually move to EPIC. DTC will still play a role as Subject-Matter Experts.
- DTC has been and will remain the primary developer CCPP (including CCPP SCM) and METplus (for verification), which includes continuing to provide community support. These are key tools for the Hierarchical System Development and Testing.
- Given CCPP (including CCPP SCM) and METplus (for verification) are important components of the UFS models/applications and corresponding workflows, it will be important for EPIC to gain a basic understanding of these packages.



Application Support - Work Plan for Year 3



Overview: Engage in a limited capacity in release preparation and support as this role transitions to EPIC. Overall goal is to continue to provide and sustain engagement of the broad community with the UFS.

Task
Contribute to answering MRW/SRW/Hurricane questions on the UFS Forum as a SME
Support EPIC and the larger community in preparing a UFS MRW/SRW App release
Contribute to Annual UFS Users' Training
Contribute to UFS Users' Workshop
Assist HAFS developers in creating and maintaining branches that contain their innovations in the HAFS code repository
Update/expanded documentation on using the HAFS workflow available to developers



Application Support - Deliverables



- Contribution to UFS Users' Training(s)
 - Lectures and hands-on exercises
- Contribution UFS User's Workshop
 - Member of organizing committee
- Contribution to MRW and SRW releases
 - Planning and documentation
- Contribution to MRW, SRW, and Hurricane App support
 - Answering questions on forum
- Contribution to Hurricane App code management
 - Feature branches creation and maintenance



Application Support - Assumptions/Constraints/Risks



- Assumptions
 - UFS community will adopt App releases, contribute to code development, and participate in support of components and Apps
- Constraints:
 - Unknown amount of subject-matter expertise and engagement from EPIC
 - Lack of a portable/documented workflow for MRW
 - Lack of a UFS-wide body for release planning
- Risks:
 - Release does not meet the goals or needs of developers
 - Community makes limited use of release



Application Support - Compute Requirements



Small amount of HPC resources are needed in a large variety of platforms to prepare the release, provide support, and do (NOAA RDHPCS, NCAR Cheyenne, cloud, etc.)



Application Support - Anticipated in kind effort



- UFS support and releases requires collaborative effort involve community subject-matter experts from many institutions (EMC, GFDL, GSL, NSSL, AOML, NCAR, DTC, etc.)
 - Integrated application teams
 - Main developers of (sub-) components (preprocessor, ESMF, FV3, CCPP, stochastic physics, workflow, METplus etc.)
- EPIC is expected to play a big role in release and support but the timeline for ramp-up is yet-to-be-determined
- DTC is currently supported via NOAA base funds for SRW App code management and user support. Continuation of this funding is TBD and relates to timeline of transition to EPIC and on support received from UFS-R20 project.



Application Support - Summary & Closing Remarks



- Community engagement is key for the success of the UFS
- Historically, the UFS-R20 project coordinated releases and support and this role will gradually transition to EPIC on Year 3
- Releases and support require involvement of the entire UFS community (e.g., App teams need to set goals and help prepare code, subject-matter experts need to answer questions)
- For EPIC to meet its goal to release MRW and SRW by June 2022, the scope of the release must be defined soon
- The new initiative for development of a modular/unified workflow is critical for the success of community engagement; Subject-Matter Experts should be consulted as this is developed