INFORMATION SHEET FOR THE FY2024 NOAA/OAR/WPO FIRE WEATHER COMPETITION

The Organic Act of 1890 provides NOAA broad authority to provide weather and climate information for the nation. Other Federal actions, such as the 1988 Stafford Disaster Relief and Emergency Assistance Act and the 2017 Weather act, directs NOAA to work to support state and local emergency assistance efforts through improved observations, forecasts, and impact-based decision support services (IDSS), including those associated with wildland fires. These activities span a range of timescales in the fire lifecycle, from subseasonal-to-seasonal (S2S) prediction of conditions that are correlated with a high likelihood of dangerous wildfire (e.g., drought conditions), to early ignition detection, short-term and medium-term forecasting associated with the near-fire environment and the downstream air quality and post-fire hazards.

The increase in the frequency of drought and hot-dry-windy conditions over the last several decades, combined with the continued expansion of the wildfire-urban interface region, has led to a marked increase in the number of acres burned by hazardous wildfire. The number of wildfires and the acres burned are projected to further increase as the climate warms, with profound changes to certain ecosystems. Wildfires threaten forest and grasslands, housing and communities, aquatic and soil ecosystems, and air quality both near to and far from the fires, ultimately costing the Nation billions of dollars a year when accounting for the local costs of damage to buildings and communities and the downstream impacts on human health associated with smoke and the resulting poor air quality.

There are a large number of gaps that need to be addressed to provide better predictions and tools to help forest and emergency managers, operational forecasters, and local, state, and national agencies better prepare and address hazardous wildfires. Some of the gaps are due to the current inability to utilize observations effectively in high resolution modeling systems. Acquiring and maturing the use of technologies to incorporate profiles of temperature, humidity, wind, and fire emissions into NOAA modeling systems will provide new insights into interactions among fire, weather, chemistry, and air quality.

Other gaps are associated with uncertainties or lack of capability of **predictive modeling systems**. A UFS-based **coupled fire-atmosphere high resolution modeling system** is needed to predict how a currently burning fire might spread in the hours-to-days ahead. **Ensemble prediction systems** are needed to provide probabilistic guidance for various stakeholders on how fires might spread and impact downstream air quality.

NOAA is developing a unified modeling approach to support prediction of extreme weather and its associated drivers at extended time ranges. Fire weather development projects must focus on

developing the UFS and are encouraged to coordinate with new fire weather modeling activities funded by recent Supplementals as coordinated by the Global Systems Laboratory (GSL) (https://gsl.noaa.gov/impacts/fire-weather) and with the NWS Storm Prediction Center (SPC). Applicants with a focus on UFS developments are furthermore encouraged to articulate how they would collaborate with the Earth Prediction Innovation Center (EPIC), leveraging and incorporating scientific advances to adopt EPIC's continuous improvement continuous deployment framework, providing code documentation, incorporating code testing, or utilizing cloud computing. See the Earth Prediction Innovation Center (EPIC) Program section for details on EPIC capabilities.

Fire weather projects that are most appropriate for this competition may span the development range of readiness levels (RL 2–6).

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Earth Prediction Innovation Center (EPIC) Program

The Weather Research and Forecasting Innovation Act of 2017 (WRFIA; Public Law 115-25) instructs NOAA to prioritize improving weather data, modeling, computing, forecasting, and warnings for the protection of life and property and for the enhancement of the national economy. The National Integrated Drought Information System Reauthorization Act of 2018 (NIDISRA; Public Law 115-423) instructs NOAA to establish the Earth Prediction Innovation Center (EPIC) to accelerate community-developed scientific and technological improvements into the operational applications for Numerical Weather Prediction (NWP).

EPIC is a virtual center that leverages resources to better coordinate the weather research and modeling community in an effort to continually inform and accelerate advances in our nation's operational weather forecast model systems. EPIC will advance weather modeling skill, reclaiming and maintaining international leadership in the area of Numerical Weather Prediction, and improving Research to Operations (R2O) by:

- Leveraging the weather enterprise to remove barriers to improving NWP;
- Enabling scientists and engineers to effectively collaborate in areas important for improving operational global NWP skills;
- Strengthening NOAA's ability to undertake research projects in pursuit of substantial advancements in weather forecast skill;
- Utilizing and leveraging existing resources across NOAA's enterprise; and
- Creating a community global weather research modeling system that is accessible by the public, meets end-user requirements, and utilizes innovative strategies and methods, including cloud-based computing, when appropriate and cost-effective.

EPIC supports the software infrastructure of the UFS, as well as community engagement, user support and scientific innovation. EPIC will establish and provide access to Continuous Integration/Continuous Delivery (CI/CD) pipelines that enable and accelerate the infusion and testing of innovations in the UFS and its applications. The EPIC team is in the process of making the UFS weather model cloud-ready, including providing necessary high-performance computing (HPC) configurations and relevant data needed for model execution, evaluation, and validation in cloud platforms. An EPIC service desk will be established to provide user support and ensure access and usability by all community members, regardless of the level of expertise in forms of training, tutorials, hackathons, code sprints, and workshops.

Proposals in this competition relevant to the development of the UFS are strongly encouraged to collaborate with EPIC and consider the following capabilities:

- Training, tutorials, and user support of the UFS Weather Model (https://github.com/ufs-community/ufs-weather-model) and UFS Short Range Weather Application (https://github.com/ufs-community/ufs-srweather-app);
- Software support to integrate open-source codes and scripts with the UFS Weather Model and UFS Short Range Weather Application;
- Coordination of releases of the open-source codes and scripts with the UFS Weather Model and UFS Short Range Weather Application;
- Provision of dependent data in open platforms to support research and development of the UFS;
- Design and development of workflow for UFS applications that are portable across cloud and on-premise platforms;
- Containerized versions of the UFS with support to improve developer productivity, performance, efficiency, and application portability; and
- Integration of the UFS to cloud services for the purpose of continuous integration, data services, model integration, reforecasts/reanalysis, and portability.

What can be included in my Letter of Intent (LOI) and proposal?
In the LOIs, indicate the intent to collaborate with EPIC and list areas of potential collaboration or services needed. In the full proposal, a separate paragraph can be included to list proposed tasks, timeline, and proposed support from EPIC software engineers that if the proposed tasks can benefit from EPIC collaboration.

Further information about the EPIC Program may be found through the following links,

- EPIC Community Portal: https://epic.noaa.gov/
- EPIC Program page: https://wpo.noaa.gov/Programs/EPIC
- EPIC Tutorials: https://epic.noaa.gov/tutorials
- EPIC Training and Community Engagement Events: https://epic.noaa.gov/event
- EPIC-supported user forums:
  https://github.com/orgs/ufs-community/discussions
  https://github.com/ufs-community/ufs-weather-model/discussions
  https://github.com/ufs-community/ufs-srweather-app/discussions
- Technical FAQs: https://epic.noaa.gov/technical-faqs
- General program FAQs: https://wpo.noaa.gov/Programs/EPIC/FAQs

For further information about the EPIC Program, contact Dr. Maoyi Huang, Program Manager, using the email Maoyi.Huang@NOAA.gov.