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## **NOAA's Unified Forecast System Research to Operations (UFS-R2O) Project for accelerated transition of UFS based forecast applications into operations**

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Funded jointly by NOAA's National Weather Service (NWS) Office of Science and Technology Integration (OSTI) and the Oceanic and Atmospheric Research (OAR) Weather Program Office (WPO), the UFS-R2O Project has made significant progress coordinating a large community of researchers, both inside and outside NOAA for integrating new research into the operational UFS applications. The project began in July 2020 as a collaboration between the National Centers for Environmental Prediction (NCEP) Environmental Modelling Center, 8 NOAA research labs, the National Center for Atmospheric Research (NCAR), the Naval Research Lab (NRL) and 6 universities and cooperative institutes.

The project was conceived with a focus on leveraging the nascent UFS community to build new UFS applications that will replace several existing operational modeling systems and simplify the NCEP Production Suite (NPS). The project consists of three integrated teams covering the global Medium Range Weather/Subseasonal to Seasonal (MRW/S2S); the regional Short Range Weather/Convection Allowing Modeling (SRW/CAM); and the Hurricane applications, and are supported by seven cross-cutting development teams shown in Figure 1. The MRW/S2S team is leading the development of a six-component global coupled (atmosphere/ocean/land/sea-ice/wave/aerosol) ensemble system targeted for combining the Global Forecast System (GFS) and the Global Ensemble Forecast system (GEFS) as a single application, the SRW/CAM team is leading the development of a regional hourly-updating high-resolution and convection-allowing Rapid Refresh Forecast System (RRFS) for prediction of severe weather, and the Hurricane team developing the Hurricane Analysis and Forecast System (HAFS) for high resolution global tropical cyclone predictions.

Some of the highlights of the progress accomplished thus far include: (1) testing and evaluation of various prototype versions of the global coupled prediction system with incremental improvements to the component models and the coupling infrastructure; (2) development of a prototype coupled data assimilation system that can update the ocean, sea-ice, atmospheric and land states; (3) development of a limited-area convective-scale short-range ensemble prediction

system that formed the basis for the RRFs; and (4) development of moving nest capability within the global or regional domains for the HAFS.

This presentation highlights the outcomes of the UFS R2O Project thus far, with emphasis on results from the UFS based coupled model deterministic and ensemble prototypes targeted for medium range and sub-seasonal weather forecasts. We will also discuss on the reanalysis and reforecast strategies for sub-seasonal to seasonal prediction capabilities, and eventual development of the Seasonal Forecast System (SFS) that will replace the existing Climate Forecast System (CFSv2) in operations.

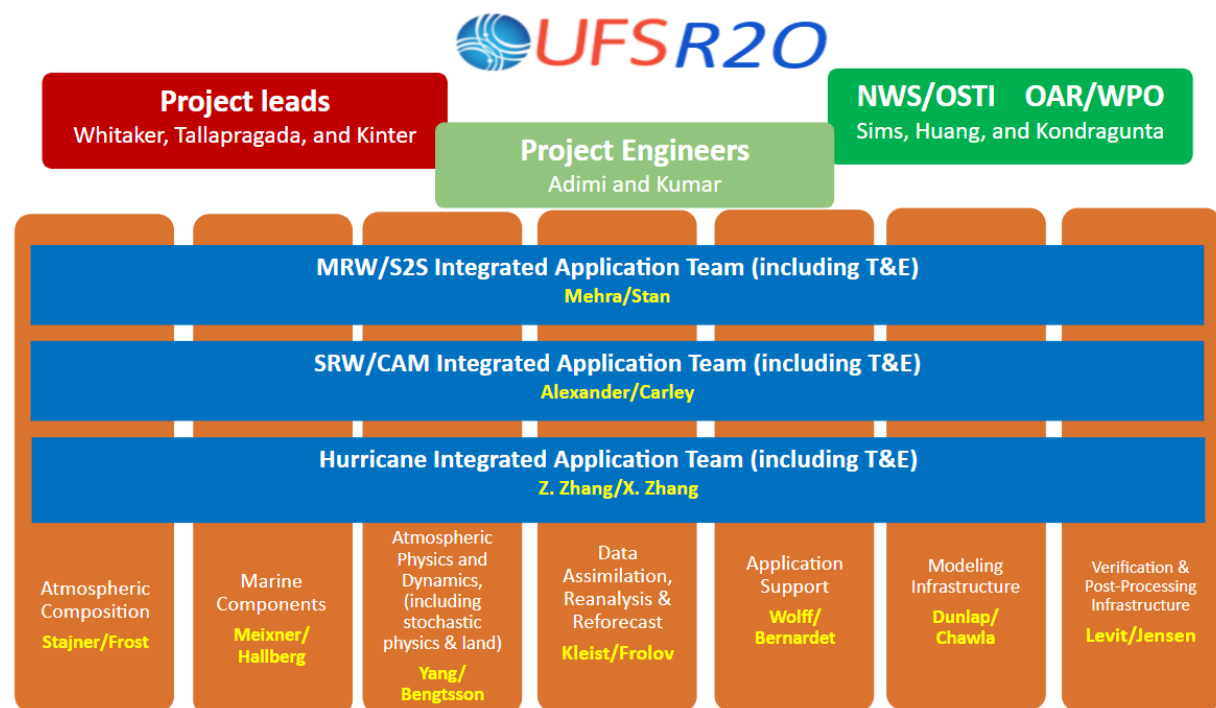


Figure 1: Structure and composition of the UFS-R2O Project