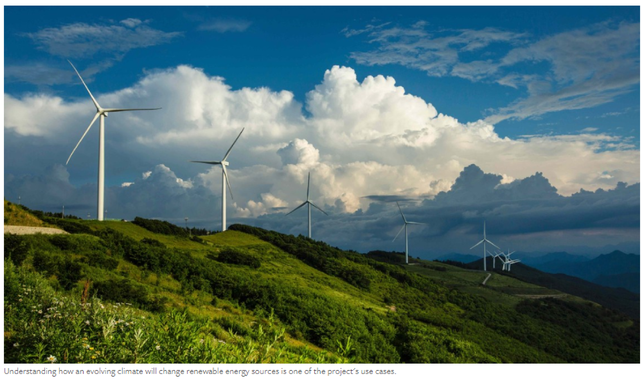

Understanding how an evolving climate will change renewable energy sources is one of the project's use cases.

AROUND CORNELL

News directly from Cornell's colleges and centers

An integrated framework for atmospheric and climate modeling

By Paul Redfern

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Cornell will lead a four-year, $2 million project sponsored by the National Science Foundation to implement a multi-container software framework for the Weather Research and Forecasting (WRF) Model.

The project, known as I-WRF, will combine the skills of the Cornell Center for Advanced Computing (CAC) with others at the National Center for Atmospheric Research (NCAR). CAC director Rich Knepper will lead the project with colleagues Sara C. Pryor, professor of Earth and atmospheric sciences at Cornell, and Melissa Bukovsky and Jared Lee, project scientists at NCAR.

Software containers are packages of software that contain all the necessary elements to run in any environment. The name "I-WRF" was chosen to emphasize the "integration" of multiple software containers in a framework that enables multi-node simulations complete with verification and visualization capabilities.

"The goal of I-WRF is to lower the bar for multidisciplinary researchers who wish to use WRF in parallel on multiple platforms, ranging from desktops to cloud and supercomputers," Knepper said. "By enabling easier and more effective use of this set of applications, I-WRF makes atmospheric modeling accessible to a broader range of researchers, such as agricultural scientists and civil engineers, who no longer must set up and maintain a complex suite of software applications."

The portability, traceability and ease of deploying the multi-node containerized framework will support the urgent need for more and better simulations of possible future climate states signaled by the UN Climate Change Conference and the establishment of the NSF Engineering Research Visioning Alliance on the Role of Engineering in Addressing Climate Change.

I-WRF application containers will incorporate software tools developed mainly at NCAR. These include the WRF model and Model Evaluation Tools (METplus), as well as visualization and analysis tools that are enhanced for interactive investigations.

Optimized to enable parallel analysis of large domains with a high level of spatial discretization, I-WRF containers will be freely available at a container repository. Adopters will use the I-WRF container components to build and modify their own containers, thus saving time and increasing overall container availability and sharing within and between scientific communities.

To prove container validity, scaling studies will be performed on a range of use cases. Pryor and NCAR scientists Sue Ellen Haupt and Jared Lee will examine the intermittency of renewable energy supplied to the grid across a range of scales and the degree to which these "weather dependent" renewable energy sources will themselves be changed by an evolving climate. Other use cases led by Bukovsky and Lee will examine the effect of land use and climate change on severe weather events, and the relation between air quality in US cities and human morbidity and mortality.

The ability to run I-WRF multi-node simulations on desktops will also overcome current obstacles in training students who use WRF at NCAR and in university curricula.

Three postdoctoral fellows will be supported by the project and based at Cornell with research stays at NCAR.

The framework implementation project was awarded under the Cyberinfrastructure for Sustained Scientific Innovation (CSSI) umbrella program. It is supported by the NSF Office of Advanced Cyberinfrastructure (OAC) in the Directorate for Computer and Information Science and Engineering and the Directorate for Geosciences.

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