

# National ESPC



## EARTH SYSTEM PREDICTION CAPABILITY

The nation's security and economic well-being relies upon accurate global analysis and prediction of the physical environment over time scales of a few days to a few decades. The need for better-informed decisions is amplified by recent trends in the climate mean and variability, which reduce the reliability of predictions using average conditions and the recent extreme events affecting commerce, defense, infrastructure and water, energy and other resources.

***The National ESPC will improve environmental predictions and help decision makers address critical policy and planning issues by extending the national predictive capability from hours and days to seasonal, annual and decadal time periods through improved, coupled global environmental prediction.***

The National Earth System Prediction Capability (ESPC) is an ongoing collaboration between the National Oceanic and Atmospheric Administration (NOAA), U.S. Navy, U.S. Air Force, Dept. of Energy (DOE), National Aeronautics and Space Administration (NASA), and National Science Foundation (NSF).

### VISION

Develop and implement the next generation integrated physical earth system prediction capability at weather and longer time scales, to support hours-to-seasonal global prediction including the atmosphere, ocean, land, cryosphere and space.

- ◆ Extend predictive capability to decades using multi-model, multi-agency ensembles
- ◆ Use ensembles to identify and quantify uncertainty and risk
- ◆ Advance computational and environmental numerical prediction science and technology
- ◆ Enhance our understanding of complex interactions of the earth environment



### National ESPC

The National ESPC builds on progress made by the existing National Unified Operational Prediction Capability (NUOPC) partnership. NUOPC focused on implementing an operational, global, atmospheric ensemble system based on existing operational modeling technology at weather time scales. NUOPC developed an initial Tri-Agency collaboration and management including a common research agenda and common model architecture. The National ESPC engages multiple federal, private and academic organizations in a combined research, development and operational transition effort, to meet agency requirements for an earth system analysis and prediction framework at appropriate horizontal and vertical resolution.



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## What is the National ESPC?

- ◆ A collaboration between NOAA, Navy, Air Force, DOE, NASA and NSF to develop an improved coupled weather and ocean prediction capability and engage other federal agencies and academic partners involved in earth system modeling, research and development.
- ◆ A focus on extending prediction skill globally to address the nation's societal and security issues that are impacted by the environment.
- ◆ An effort to make integrated coupled ocean-ice-land-atmosphere and space predictions with a single system of systems.



## Why a National ESPC?

Emerging predictive capabilities internationally in a changing climate require a National initiative for the best information to stakeholders. Complex environmental models to deliver these forecasts require resource focus and:

- ◆ World-class expertise from multiple agencies: no one agency has expertise to do the whole problem
- ◆ Distributed computing: leverage separate agency resources
- ◆ Coordinated set of agency requirements
- ◆ A system approach to extreme weather prediction, climate change impact and future energy efficiencies



## Scientific Challenges

- ◆ Extending our predictive capability from minutes to decades through a better understanding of the earth system: Greatest prediction challenge is 10-100 day gap
- ◆ Improving the representation of physical processes in earth system models: the complex interaction between oceans/lakes, atmosphere, land, ice, ecosystems
- ◆ Identifying and quantifying uncertainty associated with multi-timescale environmental prediction: Assessing that uncertainty using model diversity of multi-model ensembles
- ◆ Using environmental observations to improve predictions
- ◆ Advancing our computational efficiencies and capability



## History

2005 Agreement by NOAA, Navy and Air Force Weather to explore a larger collaborative effort in prediction capability

2006-09 Exploratory NUOPC workshops, initial ESPC discussion

2010-11 Development Team formed, initial Science/Technology workshops held and Interim Science Steering Group (ISSG) established

2012 ESPC Project Office established

2013 ESPC Interagency Memorandum of Agreement established

2014 ESPC/NUOPC unification as National ESPC



## Recent Progress

- ◆ Incorporation of additional agencies to provide climate modeling and computational expertise/capacity
- ◆ Approval of ESPC and initial scientific challenges
- ◆ Plan established whereby accomplishments and advances realized by ESPC will transition to operations via NUOPC
- ◆ National Ocean Partnership Program effort for advancing coupled prediction on emerging computation architectures initiated; projects include the Earth System Prediction Suite: common interoperable codes for forecasts and projections from minutes to decades

