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Workshop on Earth System Predictability R&D Agenda
June 4-5, 2020

Opportunity for additional input and discussion BEFORE and AFTER the meeting

In the days leading up to workshop, please join our Earth System Predictability R&D Slack Workspace! Within the workspace, we have created a channel for each of the 6 workshop sessions. Please use this space to share information on the topic (including slides, papers, or other resources), and to post questions or comments before or after the workshop. We will use this information to spark discussion during the workshop and allow for conversation after the workshop. Questions regarding the Slack channel? Please email Rob Greenway, rgreenway@nas.edu

To join the Virtual Workshop:
Please use the link embedded in the project website here. All questions and comments will be submitted to the panel using a chat tool, called Pubble, which will be integrated with the webcast in real-time. If you experience difficultly joining, please email: support@sparkstreetdigital.com

Summary:

Understanding to what degree different features of the Earth system are predictable across its physical and biogeochemical components – from individual thunderstorms, to regional or continental-scale droughts and floods, to fishery and crop yields – has great practical value to society. Past research into Earth system predictability has led to profound insights into the Earth system and has facilitated improved predictions. However, to accelerate progress in providing practicable predictions across a broader set of phenomena, it is important to know predictability limits and opportunities that are crucial for optimizing federal investments. In the Memorandum, "Fiscal Year 2021 Administration Research and Development Budget Priorities", Departments and Agencies are directed to prioritize R&D in the area of Earth system predictability, with an

awareness of its importance to society. This workshop is designed to promote a discussion of relevant issues and solicit feedback on the direction that the Federal government should take in this area. While the prediction problem itself is seamless, discussions will emphasize Earth system predictability from intraseasonal through interannual timescales.

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June 4, 2020

***All time is Eastern Daylight Time (EDT)**

11:00 AM **Welcome and Purpose of the Workshop**
Jim Hurrell, Chair of ESP R&D Workshop Organizing Committee (5 min)
Kelvin Droegemeier, Office of Science and Technology Policy (10 min)

11:15 AM **Purpose-driven Practicable Predictability**

Addressing "practicable predictability" requires understanding the information needs of decision makers and incorporating that understanding into Earth system predictability research. This session will focus on the demand for predictions, explore the barriers to expanding their utility, and emphasize the importance of understanding predictability for the development of co-designed prediction systems.

Chair:	Brad Colman, The Climate Corporation
Plenary Speaker:	Sarah Jones, Deutscher Wetterdienst
Panelists:	Nathan Mantua, NOAA
	Olga Wilhelmi, NCAR
	Roger Pulwarty, NOAA
	Andrew Robertson, IRI, Columbia University

12:45 PM Break

1:15 PM **Theoretical Limits on Earth System Predictability**

This session will focus on the theoretical foundations of Earth system predictability. Our current understanding of predictability limits is based on imperfect models and incomplete understanding and representation of critical processes, such as those linking the atmosphere to more slowly-evolving components of the Earth system. How can targeted research improve our understanding of Earth system predictability limits?

Chair:	Jim Hurrell, Colorado State University
Plenary Speaker:	Prashant Sardeshmukh, NOAA/CIRES, U. of Colorado at Boulder
Panelists:	Dale Durran, The University of Washington
	Nicole Lovenduski, The University of Colorado at Boulder
	Emanuele Di Lorenzo, The Georgia Institute of Technology
	Marika Holland, NCAR

2:45 PM Break

3:15 **Exploring Predictability through New Methodologies and Technologies**

This session will focus on technological advances and other new methodologies and approaches – from machine learning to coupled data assimilation – that can help advance theoretical understanding of predictability and inform the development of models that more accurately represent the coupled Earth system and its predictability.

Chair:	Jeanine Jones, California Department of Water Resources
Plenary Speaker:	Elizabeth (Libby) Barnes, Colorado State University
Panelists:	Jeff Anderson, NCAR
	Michael Dietze, Boston University
	Gudrun Magnusdottir, The University of California, Irvine
	Tapio Schneider, The California Institute of Technology

4:45 PM **Synthesis/report out**
Amanda Staudt, NASEM

5:00 PM **Adjourn**

June 5, 2020

***All time is Eastern Daylight Time (EDT)**

11:00 AM **Welcome back**
Jim Hurrell, Chair of the ESP R&D Organizing Committee

11:05 AM **Optimizing Observations to Explore Predictability**

The observation and study of key processes is crucial to advance theoretical understanding of predictability and also to improve the modeling of those processes. This session will identify opportunities to take a much more deliberate approach to observations in the context of Earth system predictability research and development.

Chair:	Gabriele Pfister, NCAR
Plenary Speaker:	Sarah Gille, The University of California, San Diego
Panelists:	Klaus Keller, The Pennsylvania State University
	Joellen Russell, The University of Arizona
	Jim Randerson, The University of California, Irvine
	Peter Neilley, IBM/The Weather Company

12:35 PM Break

1:00 PM **A Holistic Earth System Modeling Framework**

Our current understanding of predictability limits is based on imperfect models and incomplete understanding and representation of critical processes that are key to making skillful predictions. As such, the upper bounds of Earth system predictability are difficult to quantify. This session will focus on the necessity to better integrate predictability research with Earth system model development and application.

Chair:	Scott Doney, The University of Virginia
Plenary Speaker:	Jean-Francois Lamarque, NCAR
Panelists:	Ruby Leung, DOE-PNNL
	Natalie Mahowald, Cornell University
	Charles Stock, NOAA/GFDL
	Cecilia Bitz, University of Washington

2:30 PM Break

3:00 PM **A New Research Framework for Practicable Earth System Predictability**

Development of a national approach and strategy to better connect predictability-focused theoretical work with observational, modeling and technology research is an imperative for advancing practicable prediction. How can we avoid the compartmentalization of communities to make convergent research the new normal, and how do we develop and sustain a creative workforce focused on the science and applications of Earth system predictability research?

Chair:	Jenni Evans, The Pennsylvania State University
Plenary Speaker:	Duane Waliser, NASA
Panelists:	Paula Bontempi, NASA/The University of Rhode Island
	Waleed Abdalati, NOAA/CIRES, U. of Colorado at Boulder
	Chris Bretherton, The University of Washington

4:30 PM **Synthesis/report out**
Amanda Staudt, NASEM

4:45 PM **Next Steps**
Kelly Oskvig, NASEM
Kelvin Droegemeier, Office of Science and Technology Policy

5:00 PM **Adjourn**