**Prospectus**
**NOAA-DOE Precipitation Processes and Predictability Workshop**
November 30 - December 2, 2020

**Background**: Many extreme events and the impacts they cause (e.g., billion-dollar disasters) are associated with precipitation amounts (either too much or too little). A key to reducing these impacts is to be able to anticipate when, where and how much precipitation will fall. Although models have a good track record of simulating global and regional temperature, precipitation related fields are not captured as well. The challenges in forecasting precipitation and the ongoing user needs have been acknowledged by the U.S. Congress and the Executive Office of the President with several established mandates, including the 2017 Weather Act, and the administration's 2021 Earth System Predictability priority led by Office of Science and Technology Policy (OSTP).

NOAA has recently launched the Precipitation Prediction Grand Challenge (PPGC) Initiative to help further align NOAA's research efforts in the coming years. DOE's Earth and Environmental Systems Sciences Division (EESD) has both a broad interest in water cycle predictability—the 2018 EESD strategic plan identifies Integrated Water Cycle as one of its 5 grand challenges— as well a focused interest in precipitation, reflected also by workshops conducted and portfolio of funded research.

To accelerate progress in addressing precipitation biases and improving precipitation simulations and predictions across a broader set of phenomena and timescales, it is important to know practicable predictability limits and opportunities therein. Many model biases are due to inadequate representations of key physical processes (such as convection, aerosol-cloud interactions, coupling of atmosphere, ocean, sea ice and land, boundary layer) in models.

**Objective**: The workshop will focus on advancing understanding of precipitation predictability and physical processes key to precipitation biases. The workshop will bring together the observational, modeling, and research communities to address the following questions:

- What are the sources of predictability that have the biggest influences on precipitation at weather, subseasonal-to-seasonal to multi-decadal timescales, including extremes?
- What are the key physical processes that have the strongest imprint on the model biases and precipitation predictions and projections?
- How can we most effectively take advantage of existing observations and data (satellite and in-situ) to advance process-level understanding of the key processes and predictability?
- What are the gaps and needs for targeted observations and process studies to improve understanding and model representations of those key processes?
- How do we benefit from national and international collaboration to make significant progress?

**Expected Outcome**: A workshop report will be developed to summarize discussions, key findings, and research recommendations. The report will inform the scientific communities and modeling centers about research gaps and opportunities for collaboration to improve understanding of precipitation processes and predictability.

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