

## **A US National Multi-Model Ensemble ISI Prediction System**

The proposed research leverages an existing National Multi-Model Ensemble (NMME) team that has already formed and is already producing routine real-time intra-seasonal, seasonal and interannual (ISI) predictions and providing them to the NOAA Climate Prediction Center (CPC) on an experimental basis for evaluation and consolidation as a multi-model ensemble ISI prediction system. The experimental prediction system developed by this NMME team is as an “MME of opportunity” in that the ISI prediction systems are readily available and each team member has independently developed the prediction protocol.

The activity proposed here is to develop a more “purposeful MME” in which the requirements for operational ISI prediction are used to define the parameters of a rigorous reforecast experiment and evaluation regime. The NMME team will design and test an operational NMME protocol (i.e., a purposeful MME) that is to guide the future research, development and implementation of the NMME beyond what can be achieved based on an “MME of opportunity.”

The proposed activity will:

- i. Build on existing state-of-the-art US climate prediction models and data assimilation systems that are already in use in NMME-1 and ensure interoperability so as to easily incorporate future model developments.
- ii. Take into account operational forecast requirements (forecast frequency, lead time, duration, number of ensemble members, etc.) and regional/user specific needs. A focus of this aspect of the work will be the hydrology of various regions in the US and elsewhere in order to address drought and extreme event prediction.
- iii. Utilize the NMME system experimentally in a near-operational mode to demonstrate the feasibility and advantages of running such a system as part of NOAA’s operations.
- iv. Enable rapid sharing of quality-controlled reforecast data among the NMME team members, and develop procedures for timely and open access to the data, including documentation of models and forecast procedures, by the broader climate research and applications community.

The proposed activity will also include several NMME research themes:

- i. The evaluation and optimization of the NMME system in hindcast mode (e.g., assessing the optimal number of ensemble members from each model, how to best combine the multi-model forecasts, sources of complementary prediction skill, etc.),
- ii. Ocean and land initial condition sensitivity experiments.
- iii. The application of the NMME forecasts for regional downscaling and hydrological prediction.