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Department of Civil and Environmental Engineering

Experimental Seasonal Water Supply Forecast in the California-Nevada Region

by

Dr. Ming Pan

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Host: Dr. Xiaogang He
Department of Civil and Environmental Engineering

Date: 04 April 2023, Tuesday
Time: 10:00 am – 12:00 am
Venue: E1A-06-21/22
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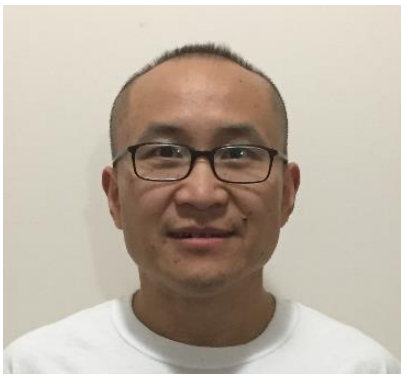
Abstract

Water supply in the densely populated southwestern United States (especially California) have been under increasing stress in recent years. The water resources community has recognized the challenges as well as the urgent need to enable smarter and better-informed water resources management practices in the region. An important first step toward such goals is to better capture the ongoing hydroclimatic signals and to generate more skillful seasonal streamflow forecasts. For example, the current California Bulletin 120 water supply forecast service relies on relatively limited information and simple methodology to predict inflows into reservoirs in the state. At the same time, the research community has developed much more sophisticated models, data and tools for streamflow forecast purposes. We are therefore motivated to develop an experimental water supply forecast system for the region based on the state-of-the-art tools and technology from the research community.

The CW3E experimental forecast system currently uses the process-based WRF-Hydro model as the core component to simulate the land surface hydrologic dynamics at 1-km and 1-hourly scale. The meteorological forcing engine ingests data from multiple sources (PRISM, NLDAS-2, HRRR, Stage IV, West-WRF, etc.) and generate multiple evolving streams of forcing data, including (1) a retrospective data stream (1979 to 6 months behind real time) for reanalysis & reforecast purposes; (2) a near real time (NRT) data stream for every day monitoring; and (3) a forecast data stream in ensemble form that extends to 6 months into the future. For the forecast operation, the system currently utilizes the West-WRF weather forecasts in the first 7 days and then switched to statistical approaches (Ensemble Streamflow Prediction and Canonical Correlation Analysis). The streamflow forecast is post-processed for bias correction and skill enhancement. A data-driven machine learning (ML) based runoff modeling option is also being developed as an alternative to WRF-Hydro.

Speaker's Biography



Ming Pan is currently a senior hydrologist and hydrology program lead at the Center for Western Weather and Water Extremes (CW3E), Scripps Institution of Oceanography (SIO), University of California San Diego (UCSD). He received his Ph.D. degree in Hydrology and Water Resources from Princeton University in 2006. He conducted postdoctoral research at Massachusetts Institute of Technology in 2006-2007 and served as a research scholar at Princeton University until 2021 before joining UCSD. He specializes in physically based hydrologic modeling (e.g. land surface models, river hydrodynamic models, human water use/water management), remote sensing of hydrologic parameters, hydrologic reanalysis/monitoring/forecast/projection, and related applications.

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