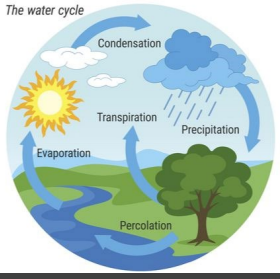
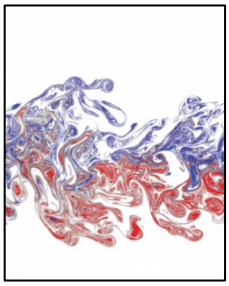
Boase Seminar Series in Hydrology and Water Resources Engineering

Department of Civil, Environmental and Architectural Engineering





Hybrid data-driven Tools to Support short- and long-term Water Resources Planning and Management: a California case study

Prof. Scott Steinschneider

Department of Biological and Environmental Engineering

Cornell University, Itacha, NY

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Zoom: https://cuboulder.zoom.us/j/93058839188

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Abstract:

Process modeling is ubiquitous in forecasting and projections of future hydrology and climate. Yet ensemble simulations for risk-based analysis with state-of-the-art process models are often limited based on data requirements and computational cost. In addition, process models can exhibit substantial biases in key characteristics of hydroclimate variability and extremes that dominate water system performance, thus reducing their value for decision-making. However, purely data-driven approaches to water resources risk analysis struggle to extrapolate beyond the historical record, and so are not well suited to quantify risk in a nonstationary or under-observed environment. This presentation focuses on hybrid strategies that combine data-driven and process modeling to leverage the strengths of both, and applies these strategies two challenges in water resources planning and management. First, we explore the use of synthetic forecast generation to extend datasets available for the formulation and testing of forecast-informed reservoir operations. Second, we assess the utility of physics-informed machine learning for long-term hydrologic projections under climate change. These advances are discussed in the context of two case studies in the California water system.

Speaker Bio: Scott Steinschneider is an Assistant Professor in the Department of Biological and Environmental Engineering. His research program enhances the sustainability of water systems through innovations in climate risk management that enable adaptation decision-making under deep uncertainty in future climate and hydrologic conditions. He advances this program through three inter-related themes, including: 1) assessing the variability, predictability, and change of hydroclimate processes that impact the performance of water infrastructure; 2) developing stochastic methods to quantify the risk these hydroclimate processes pose to water services; and 3) identifying robust adaptation strategies that can mitigate this risk. Dr. Steinschneider pursues this agenda across scales, with primary focal points on hydroclimate forecasts for short-term management and long-term planning under climate change. His work has focused on water systems across the United States and globally and has been sponsored by the U.S. Army Corps of Engineers, National Atmospheric and Oceanic Administration, New York Sea Grant, National Science Foundation, and US Department of Agriculture. Dr. Steinschneider earned his B.A. in Mathematics from Tufts University and his M.S. and Ph.D. in Civil and Environmental Engineering from the University of Massachusetts, Amherst. Prior to arriving at Cornell, he was a postdoctoral research fellow at Columbia University.