University of California, Irvine
Statistics Seminar

The "Certain Uncertainty" of Internal Variability, with Implications for Western US Water resources

Karen McKinnon
Asst. Professor of Statistics
UCLA

4 p.m., Thursday, Dec. 2, 2021
Join via Zoom: https://tinyurl.com/4azdp5zh

The presence of random, internally generated variability in the climate system can confound interpretation of the observational record, which -- due to its relatively short duration -- provides an incomplete sampling of this variability. To address this challenge, the past several years have seen an explosion of initial-condition large ensembles that are designed to provide additional simulated versions of the climate system that differ only in their sampling of the phase space of internal variability. Proper characterization of internal variability is key for effective and robust decision making in the face of climate change, and large ensembles provide a helpful intellectual framework for distinguishing between the uncertainty related to internal variability ("certain uncertainty") versus other, potentially reducible, types of uncertainty. However, climate models commonly have substantial biases in their simulation of the regional climate variability that is itself key for decision making. Here, we present a statistical framework for generating an observationally-based large ensemble that can be interpreted in a manner analogous to a climate model-based large ensemble. We both validate our approach and demonstrate its inherent limitations using the CESM1 large ensemble. We then apply the methodology to precipitation observations, with a focus on western US water resources. The observationally-based large ensemble, by effectively providing new samples of the observational record, provides a more complete picture of the probability of extreme events and the distribution of important water resource metrics such as repeated low precipitation years and 'whiplash' years between high and low precipitation.