Increasing the sample size for testing decadal forecasts

Authors: Greg Hakim, University of Washington

The remarkable success of operational Numerical Weather Prediction (NWP) derives from constantly testing improvements on out-of-sample events (forecasting an unknown future). Progress on NWP forecast skill derives from improving models, increasing observations, and novel data assimilation systems that are needed to produce accurate initial conditions. Although current Earth System models are capable of pursuing a similar evolutionary program for operational forecasting on inter-annual to decadal timescales, we lack the observations and data assimilation systems to initialize and verify forecasts over a large sample of independent states. Specifically, we must develop the ability to initialize and verify forecasts over centuries, if not millennia, using coupled Earth-system data assimilation systems in an ensemble framework. On these timescales, this necessarily also involves paleoclimate proxies and, for prototyping a wide range of algorithms, computationally efficient emulators of current Earth System models.

I will report on progress toward increasing the sample size for testing decadal forecasts using coupled atmosphere--ocean ensemble data assimilation for instrumental and paleoclimate proxy data using linear inverse models. In particular, I will review progress on climate reanalysis for the Common Era, extensions to the Last Glacial Maximum, and the skill of forecasts initialized from these states over the past 1000 years.