Understanding future change in subseasonal temperature variability and heat waves with the large ensemble approach

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In the first part of the talk, I'll show based on the CESM1 large ensemble experiment that in addition to a shift in the seasonal mean temperature, the summertime subseasonal temperature variability in the U.S. Great Plains is enhanced by approximately 20% in 2070–2100 relative to 1980–2010. In particular, daily temperature departures from the new climatologies during future heat waves are on average 0.6°C warmer than are the corresponding departures under present-day conditions. Although in both periods heat waves in the Great Plains tend to be associated with planetary wave events, the amplification of future heat waves does not appear to be induced by changes in planetary wave variability in the midlatitudes. Instead, in this experiment the strengthening appears to be primarily caused by enhanced local land-atmosphere feedbacks resulting from a warmer/drier future climate. In the 2nd part, I will present a series of idealized prescribed soil moisture experiments to demonstrate how these process-oriented large ensemble experiments can shed new lights on the formation and maintenance of summertime quasi-stationary planetary wave events as a result of soil moisture forcing.