NCAR | CLIMATE & GLOBAL DYNAMICS

CGD Seminar Series

Using large ensembles to investigate ENSO teleconnections and future projections

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Time: 11am – 12pm

For Zoom information, please contact Tracy Baker tbaker@ucar.edu

For live stream information, visit the CGD Seminar Webpage

ABSTRACT

We first investigate whether ENSO teleconnections are modulated by Pacific Decadal Variability over North America using five large ensembles. The use of large ensembles means that we can composite many events from different combinations of PDV and ENSO phases, allowing a statistically robust comparison of ENSO events that occur during different phases of the PDV. We find that a positive PDV enhances El Niño temperature and precipitation teleconnections and diminishes La Niña teleconnections. A negative PDV has the opposite effect. The modulation of ENSO by the PDV occurs due to differences in the location and strength of the Aleutian low and the Pacific Jet Stream. Additionally, this modulation is a linear combination of the effects of the PDV and ENSO on North America in the absence of the other. Finally, we show that ENSO and the PDV can be used to evaluate the likelihood of temperature and precipitation anomalies occurring, which has implications for understanding extremes, but cannot be used to directly predict these anomalies due to the high variability between individual events.

Second, we investigate ENSO projections in 14 large ensembles. Future projections of ENSO variability are found to be non-linear with time. Additionally, the pattern of sea surface temperatures associated with ENSO in the tropical Pacific changes under a strong warming scenario, but these pattern changes are not consistent across models. Finally we investigate the relationship between ENSO variability and mean-state projections in each large ensemble. In many models ENSO variability increases along with a weak El Niño-like mean-state warming pattern. This is followed by a plateau in ENSO variability concurrent with strong El Niño-like warming. Last, in some models ENSO amplitude begins to decrease again. These results highlight the advantages of large ensembles, particularly in isolating the forced response from internal variability, and investigating the time evolution of highly variable quantities such as ENSO.