NCAR | CLIMATE & GLOBAL DYNAMICS

CGD Seminar Series

Slow Modes of Global Temperature Variability in Regions of Weak Radiative Feedbacks

Robert Jnglin Wills

University of Washington

Date: Tuesday 27 October 2020

Time: 11am – 12pm

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

For live stream information, visit the CGD Seminar Webpage

ABSTRACT

Acting as both signal and noise, internal climate variability may confound estimates of the climate response to forcing but offers an opportunity to examine the dynamics controlling Earth's energy budget. We analyze the impact of low-frequency internal variability on global-mean surface temperature (GMST) and top-of-atmosphere (TOA) radiation in CMIP6 pre-industrial control simulations. Slow modes of variability are identified using low-frequency component analysis. The slow modes of variability with the largest impact on decadal GMST anomalies are focused in high-latitude ocean regions, where they have a minimal impact on global TOA radiation. When these regions warm, positive shortwave cloud and sea ice-albedo feedbacks largely cancel the negative feedback of outgoing longwave radiation, resulting in a weak net radiative feedback. The weak net radiative feedback means that less energy is required to sustain these long-lived temperature anomalies. These results suggest that on decadal and longer timescales, different processes control internal variability in GMST than control internal variability in global TOA radiation. We also discuss the contribution of low-frequency internal variability to uncertainty in estimates of climate sensitivity from decadal-mean anomalies in GMST and TOA radiative imbalance.