CGD Seminar Series

The pattern effect and its implications for climate sensitivity

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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
Equilibrium climate sensitivity (ECS), the long-term global surface warming in response to a doubling of CO₂, is primarily governed by radiative feedbacks. While radiative feedbacks have long been assumed to be constant over time, both models and observations have recently demonstrated that radiative feedbacks depend on the spatial pattern of sea-surface temperatures (SSTs) and thus can change over time as SST patterns evolve – the so-called “pattern effect”.

In this talk, I will focus on two questions: what causes the pattern effect and what causes the observed SST pattern? In the first part, I will present a mechanism of the pattern effect obtained from a Green’s function analysis within one atmosphere model (CAM4), highlighting the tropical western Pacific as the dominant control on changes in radiative feedbacks. Then I will show a multi-model study accessing the ECS values derived from historical energy budget constraints, indicating that discrepancies between modeled and observed historical warming patterns (particularly in the tropical Pacific) can bias model ECS values. In the second part, I will focus on the potential impacts on the tropical Pacific warming pattern from the Southern Ocean. I will show a two-way teleconnection between the Southern Ocean and the tropical Pacific associated with regional circulation change. Overall, the results suggest that understanding how the observed SST pattern has developed and how it will evolve in the future is crucial for ECS constraints.