

CGD SEMINAR



DATE: Tuesday, 10 October 2017

TIME: 11 a.m.

LOCATION: NCAR, 1850 Table Mesa Drive
Mesa Lab, Main Seminar Room

TITLE: Do Southern Ocean radiation biases
and cloud feedbacks matter for 21st
century warming?

SPEAKER: Bill Frey, University of Colorado

ABSTRACT:

Many climate models, including CESM, have large shortwave radiation biases over the Southern Ocean which have been linked to observational constraints on cloud phase. In this talk, I explore both equilibrium and transient climate change impacts of “fixing” these biases through observationally motivated modification to mixed-phase clouds. The equilibrium climate response has historically been quantified by equilibrium climate sensitivity (ECS), the warming in response to instantaneously doubled atmospheric CO₂. In the improved model, ECS increases by 1.5 K as a result of more positive extratropical shortwave cloud feedbacks. ECS has been historically correlated with warming in more realistic transient forcing experiments. Yet, when this same “fix” is implemented in a plausible transient 21st century climate simulation, the warming in the improved model remains similar to the control. Why? In transient simulations, extratropical ocean heat uptake delays surface warming and sea surface temperature-driven cloud feedbacks over the Southern Ocean responsible for increasing ECS. Persistent extratropical ocean heat uptake implies that extratropical cloud biases may not be as important to 21st century warming as biases in other regions. Observational constraints on cloud phase and shortwave radiation produce a large ECS increase but do not imply large changes in 21st century warming.

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