ATS/CIRA Colloquium

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Visiting ATS from the University of Washington

The relative roles of radiative feedbacks and poleward heat transport in the spatial pattern of climate change

Hosted by Elizabeth Barnes

Friday, Dec. 1, 2017

ATS room 101
Discussion will begin at 11:15 a.m.
Refreshments will be served at 10:45 a.m. in the weather lab

The pattern of greenhouse-gas induced climate change is not spatially uniform. For example, we have observed amplified warming in the Arctic, slow warming in the Southern Ocean and Antarctica, and an enhanced hydrologic that has increased precipitation gradients – all features that are robustly simulated by global climate models. What sets these patterns?

I show that zonal-mean climate change can be largely understood in terms of a moist energy balance model (MEBM) that, given radiative feedbacks and forcing, predicts the patterns of surface warming, poleward heat transport, and hydrologic cycle changes seen in CMIP5 models. The MEBM represents atmospheric heat transport as a simple diffusion of latent and sensible heat – as a down-gradient transport of moist static energy with constant diffusivity, as supported by comprehensive climate models and atmospheric reanalyses. Using the MEBM, I consider the relative roles of feedbacks and poleward heat transport in setting the robust patterns of climate change. Moreover, I consider sources of uncertainty in large-scale climate prediction; while uncertainty in tropical feedbacks induce a global temperature response, the impact of uncertainty in polar feedbacks is predominantly confined to the poles.

Link to colloquia page: https://www.atmos.colostate.edu/colloquia/