

ATS/CIRA Colloquium

Mike Pritchard

Associate Professor at the University of California, Irvine

3 p.m. Thursday, Dec. 2

ATS 101

Hosted by Libby Barnes

Can we sneak sub-km resolution into global climate models ahead of schedule? Outlook from GPU-accelerated multi-scale modeling vs. machine learning process emulation

Finding ways to explicitly represent the fine-scale (sub-km) atmospheric eddies that mediate low cloud organization within global climate simulations remains an ongoing computational challenge. Enticingly, two emerging technologies -- GPU petascale supercomputing and machine learning parameterization — seem poised to help this decade. First, unusually high-resolution Multiscale Modeling Frameworks (MMFs) can now be run on large GPU clusters. This can allow unprecedented simulations of the planetary boundary layer's interaction with broader climate dynamics. I will show how even modestly refining interior MMF resolution already allows a missing regime-dependence of aerosol-cloud feedback to emerge in “ultraparameterized” pilot tests. I will then discuss the outlook for increasingly interesting hi-res MMF configurations linked to development by the DOE's Exascale Computing Project - from GPU porting, algorithmic enhancements, and load-balancing regionalized LES. The second front is machine learning parameterization, which is high risk but could have very high reward: As a snapshot of a subfield in rapid motion, I will discuss some personal “do's and don'ts” I am trying to collect from our and others' latest attempts to outsource actual calculations of explicit MMF turbulence to dumb sheets of digital neurons.

Colloquia page: atmos.colostate.edu/colloquia