

# SIAM MPE Community Meetings: Colloquium

**Dr. Chris Bretherton**

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## *AI-driven climate modeling: Present and future*

**Abstract:** AI-driven weather forecast models are now more accurate than the best physics-based models. Using similar technology, the open-source Ai2 Climate Emulator (ACE) has been trained to accurately emulate both the daily weather variability (including rainfall extremes) and climate of two leading global atmospheric models, at 100-1000x smaller computational cost. Unlike reanalysis-trained AI weather forecast models, ACE is designed to be trained and deployed across multiple climates; for this purpose, it can be coupled to a simple 'slab ocean' model. In the near future, ACE coupled to a companion emulator of a full-physics ocean will affordably emulate hyper-realistic but hyper-expensive 'digital twin' models of the atmosphere and ocean with km-scale grids. Digital twin models avoid key uncertainties in present-day coarser-grid climate models and may help us more reliably predict regional trends in precipitation and other climate extremes. The combination of ACE and digital twins promises to provide more reliable local information for climate-sensitive decision making without the complexity of dynamical downscaling.

**Biography:** Chris Bretherton directs a climate modeling group at the Allen Institute for AI (Ai2) in Seattle which uses machine learning trained on global storm-resolving model output and observational data to improve climate model simulations. He is an Emeritus Professor of the Atmospheric Science and Applied Mathematics Departments at the University of Washington, where for 35 years he studied cloud formation and turbulence and improved their simulation in atmospheric models. He is an American Meteorological Society Charney Award winner, IPCC author, AMS, and AGU Fellow, and a member of the National Academy of Sciences.

**Thursday, Nov. 21, 2024**

**11:00 AM EST**

Zoom link: [siam.zoom.us/j/85142274147](https://siam.zoom.us/j/85142274147)

Host:  
Pierre Lermusiaux  
<http://mseas.mit.edu>

Adapted Estimates

