iPAM institute for pure & applied mathematics

Mathematics and Machine Learning for Earth System Simulation

February 2 - 6, 2026

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Column CO Burden (10¹⁸ molec cm⁻²)
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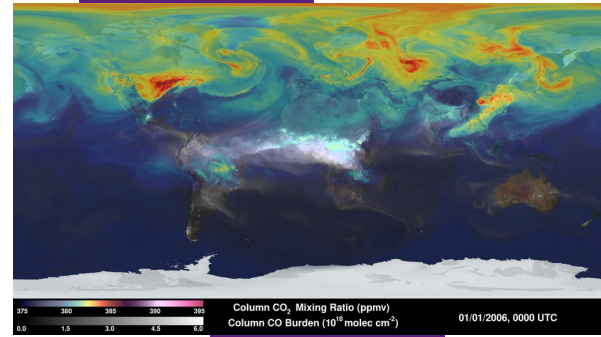
Scientific Overview

Modern scientific progress is often driven by numerical computations and simulations to represent large numbers of complex and interrelated physical processes. In recent years, machine learning (ML) applications in earth system simulation and prediction have promised to accelerate the accuracy and computational processing power of Earth system models including physics-constrained approaches, super ultra-high resolution, large language models for earth systems, and uncertainty quantification.

In this workshop we aim to bring together experts from diverse fields related to earth system simulation (e.g. computer science, mathematics, atmospheric science, earth system science, etc.) to explore the intersection of mathematics, traditional numerical methods, data assimilation, and cutting-edge machine learning techniques.

Topics that will be discussed include

- Integration of Numerical and Data-Driven Algorithms
- Mathematical Operators and Inference
- Scale Agnostic Forecasting
- Foundation Models for Downstream Task

Participation

Additional information about this workshop including links to register and to apply for funding, can be found on the webpage listed below. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission, and we welcome their applications.

Organizers

Katherine Breen, **Chair** (NASA)
Donifan Barahona (NASA)
Nico Caltabiano (University of Southampton)
Milan Curcic (University of Miami)
Adam Rupe (Pacific Northwest National Laboratory)
Marcus van Lier-Walqui (Columbia University)

Speakers

Donifan Barahona (NASA)
Tom Beucler (University of Lausanne)
Katherine Breen (NASA)
Noah Brenowitz (NVIDIA)
Milan Curcic (University of Miami)
Michael Fischer (University of Miami)
Gary Froyland (University of New South Wales)
David John Gagne (National Center for Atmospheric Research (NCAR))
Michael Ghil (UCLA)
Dimitris Giannakis (Dartmouth College)
Pedram Hassanzadeh (University of Chicago)
Franca Hoffmann (California Institute of Technology)
Mohamed Iskandarani (University of Miami)
Po-Lun Ma (Pacific Northwest National Laboratory)
Johan Mathé (Atmo Inc.)
Romit Maulik (Pennsylvania State University)
Maria Molina (University of Maryland)
Damian Rouson (Lawrence Berkeley Laboratory)
Adam Rupe (Pacific Northwest National Laboratory)
Tapio Schneider (California Institute of Technology)
Eduardo Siman (New Institution)
Andrew Stuart (California Institute of Technology)
Marcus van Lier-Walqui (Columbia University)

For more information, visit the program webpage:
www.ipam.ucla.edu/wcs2026