

2022 Model Hierarchies Workshop



Stanford University
California, USA
Aug 29th - Sep 1st, 2022

PROGRAM AND LIST OF POSTERS

DAY 1 - Monday 29 August

09:00-09:05: **Welcome**

09:05-10:30: **Panel - The future of climate model hierarchies**

Chairs: Aditi Sheshadri/Allison Wing

- Ramalingam Saravanan
- Tapio Schneider
- Pier Luigi Vidale
- Kelly Hereid

10:30-11:00: *Coffee break*

11:00-12:30: *Session 1 - Climate variability and change*

Chairs: Wenwen Kong/Laura Mansfield

- (S1-01) Ivan Mitevski - Non-monotonic and Asymmetric Response of the Climate System to idealized CO₂ forcings
- (S1-02) Wenwen Kong - The basic ingredients of summertime continental near-surface air temperature distribution
- (S1-03) Po-Chun Chung - The role of water vapor in polar amplification
- (S1-04) Elisa Ziegler - How warming changes the distributions of temperature and precipitation: insights from a hierarchy of climate models

12:30-14:00: *Lunch*

14:00-15:30: *Session 2 - Modeling the general circulation*

Chairs: Zhaoyi Shen/Aman Gupta

- (S2-01) Isla Simpson - An update on idealized modeling capabilities within the Community Earth System Model framework
- (S2-02) Gavin Schmidt - Coherent model hierarchies using the NASA GISS Earth System Model and ROCKE-3D
- (S2-03) Pier Luigi Vidale - Hierarchy of simulation designs for high-resolution climate modelling
- (S2-04) Michela Biasutti - Ventilation revisited: how dry continental air splits the ITCZ and stops the monsoon

15:30-17:00: **Posters** (see the list of posters below)
(including drinks and snacks)

DAY 2 - Tuesday 30 August

09:00-10:30: Session 3 - Tropical circulation

Chairs: Adam Burnett/Ofer Shamir

- (S3-01) Allison Wing - Convective aggregation, tropical clouds, and climate in RCEMIP
- (S3-02) Nadir Jeevanjee - How faithful are cloud-resolving simulations at the kilometer scale?
- (S3-03) Ashwin Seshadri - Investigating the role of simpler models in a hierarchy through examples
- (S3-04) Shaocheng Xie - A hierarchy of modeling testbeds used in understanding the diurnal cycle of precipitation in weather and climate models

10:30-11:00: Coffee break

11:00-12:30: Session 4 -Tropical convection and clouds

Chairs: Yi Zhang/Brian Green

- (S4-01) Zhaoyi Shen - A library of large-eddy simulations for training physics-based machine-learning parameterizations
- (S4-02) Joao Teixeira - Stratocumulus to cumulus cloud transition: from turbulence to climate
- (S4-03) Timothy Merlis - Climate change in a global-storm resolving model
- (S4-04) Brian Medeiros - Using a hierarchy of global atmosphere models to probe the links between extreme precipitation, organized convection, and moist physics

12:30-14:00: Lunch

14:00- 15:30: Session 5 -Data-driven approaches to modeling the atmosphere

Chairs: Mariana Clare/Aman Gupta

- (S5-01) Duncan Watson-Parris - ClimateBench: A benchmark for data-driven climate projections
- (S5-02) Ashesh Chattopadhyay - Long-time instability of deep learning-based Earth digital twins: Causes and solutions
- (S5-03) Laura Mansfield - Using gravity wave resolving simulations to inform sub-grid scale parameterizations
- (S5-04) Eviatar Bach - Towards the combination of physical and data-driven forecasts for Earth system prediction

15:30-17:00: Posters (see the list of posters below)
(including drinks and snacks)

DAY 3 - Wednesday 31 August

09:00-10:30: Session 6 - Midlatitude and stratospheric dynamics

Chairs: Chris Kruse/Catherine Wilka

- (S6-01) Lei Wang - Atmospheric blocking as an evolution of Rossby Wave Packets in a hierarchy of climate models
- (S6-02) Pedram Hassanzadeh - Hierarchical modeling to understand the future changes of blocking events
- (S6-03) Yi Zhang - Validating model simulated heat extremes with observations and theory
- (S6-04) Gang Chen - Disentangling the causality between stratospheric planetary wave activity and North American cold events with model hierarchies

10:30-11:00: Coffee break

11:00-12:30: Session 7 - Model hierarchies for the ocean 1

Chairs: Mark England/Wenwen Kong

- (S7-01) Tien-Yiao Hsu - A Hierarchy of Global Ocean Models Coupled to CESM1
- (S7-02) Mariana Clare - Assessing risk from coastal flooding hazards in a changing climate using multilevel multifidelity Monte Carlo methods
- (S7-03) Oliver Mehling - Bridging the gap in modeling multicentennial AMOC variability with a GCM of intermediate complexity
- (S7-04) Gianluca Meneghello - Learning from analytical models and observations: The case of the Beaufort Gyre

12:30-14:00: Lunch

14:00-15:30: Session 7 - Model hierarchies for the ocean 2

Chairs: Eviatar Bach/Ofer Shamir

- (S7-05) Chengfei He - The role of the atmosphere in the North Atlantic warming hole
- (S7-06) Glenn Liu - Understanding the drivers of Atlantic multidecadal variability using a stochastic model hierarchy
- (S7-07) Andrew Stewart - Saturation of the Antarctic Circumpolar Current transport by mesoscale eddies vs. standing waves
- (S7-08) Andre Nogueira Souza - Statistical Emulator for Oceanic Simulations

15:30-17:00: Posters (see the list of posters below)

17:00-18:00: Reception

18:00-21:00: Dinner

(both reception and dinner will be hosted outside at Huang Amphitheatre)

DAY 4 - Thursday 1 September

09:00-10:30: Session 8 - Modeling land, ice, and the biosphere

Chairs: Catherine Wilka/Brian Green

- (S8-01) Emily Zakem - How do we best represent microbial communities in Earth system models?
- (S8-02) Yujie Wang - Modeling global canopy fluxes and hyperspectral canopy radiative transfer simultaneously using CLIMA Land
- (S8-03) Tiffany Shaw - Simulating and understanding the midlatitude responses to polar sea ice loss using the climate model hierarchy
- (S8-04) Lettie Roach - Exploring sea ice seasonality in a hierarchy of models

10:30-11:00: Coffee break

11:00-12:30: Session 9 - Model hierarchies for impacts

Chairs: Zhaoyi Shen/Laura Mansfield

- (S9-01) Ramalingam Saravanan - Are there limits to useful climate prediction?
- (S9-02) David Stainforth - Hierarchies of models to design hierarchies of ensembles to support hierarchies of decisions
- (S9-03) Adam Sobel (*remotely*) - Hierarchies of physical climate risk models
- (S9-04) Richard Rood - Overcoming use of ad hoc simulations to support climate adaptation

End of workshop

LIST OF POSTERS

Name	Poster Title	Poster N°
Ankur Mahesh	Validating Neural Networks' Atmospheric River Detections using Idealized Climate Simulations	D1-02
Bernardet Ligia	Hierarchical capabilities offered by the Common Community Physics Package and its Single-Column Model	D1-03
Biasutti Michela	Ventilation revisited: how dry continental air splits the ITCZ and stops the monsoon	D2-02
Clement Amy	The Big Breakup: A mid-20th century transition in the behavior of modes of climate variability	D3-02
Duan Suqin	Consistent Patterns of Hydroclimate Change over Tropical Land in GCMs through the Lens of Soil Moisture	D1-01
England Mark	Correcting the outsized climate impacts of conventional sea ice loss perturbations	D3-01
Fei Cuiyi	Understanding the mechanism of recurrent Rossby waves by stationary wave model and GCMs	D1-06

Fu Hao	Spontaneous tropical cyclogenesis in a quasi-stochastic barotropic model	D2-04
Ge Bowen	Understanding temperature extremes under global warming in a stochastic moist energy balance model (EBM)	D1-07
Hsieh Tsung-Lin	A downscaling formula for tropical cyclone frequency developed using a hierarchy of models	D2-05
Kruse Christopher	Using a neural network + Idealized weather model to reproduce observed convective gravity waves	D3-03
Langeland Ervik Haakon Ludvig	Learning stochastic closures for a turbulence and convection model from indirect data using Kalman methods	D2-03
Lee Donggeon	Impact of Kuroshio intrusion on YECS phytoplankton future change under global warming	D3-04
Lemaitre Tom	Towards a model for tropical downdrafts: results from RCE simulations	D2-06
Lessig Christian	Hybrid global circulation models using observation-based representation learning	D2-07
Macdonald Cameron	Modeling tropical intraseasonal oscillations in a moist general circulation model with a simple convection scheme	D2-08
Noh Kyung Min	Emergent Constraint for Future changes in Arctic Phytoplankton	D3-06
Oh Ji-Hoon	Centennial memory of the Arctic Ocean for future Arctic climate recovery in response to a carbon dioxide removal	D3-07
Reed Kevin	Building understanding of convection, circulation, and climate using the CAM hierarchy	D2-09
Seidel Seth	A negative climate feedback due to the lightness of water vapor	D1-09
Shamir Ofer	A model hierarchy for data-driven gravity wave parameterization	D2-11
Smyth Jane	Leveraging high-resolution modeling and dynamical theory to elucidate changes in extreme precipitation in a monsoonal regime	D2-12
Sun Wu	From realism to robustness - Atmospheric CO2 observations as a top-down constraint on terrestrial biosphere model complexity	D3-08
Szapiro Nicholas	Decomposing Arctic errors through single column to fully coupled models	D3-09
Tarshish Nathaniel	Would the temperature stop rising if emissions cease?	D1-08
Wilka Catherine	The impact of single wavenumber interactions on sudden stratospheric warmings in an idealized model	D3-10
Yanase Tomoro	Low-level circulation and its coupling with free-tropospheric variability as a mechanism of spontaneous aggregation of moist convection	D2-13