CIMES RENEWED FOR FIVE MORE YEARS

The Cooperative Institute for Modeling the Earth System (CIMES) was successfully renewed for another five years under award NA23OAR4320198 from the National Oceanic and Atmospheric Administration (NOAA). CIMES is an outgrowth of a highly successful fifty-year collaboration between Princeton University’s Atmospheric and Oceanic Sciences (AOS) Program and the Geophysical Fluid Dynamics Laboratory (GFDL) and a successor to the Cooperative Institute for Climate Science (CICS).

The Princeton AOS/GFDL partnership has contributed to the development of oceanic and atmospheric models, produced research on climate and biogeochemical cycling and educated several generations of postdoctoral researchers and graduate students, in addition to other scientific efforts. CIMES was renewed for its highest dollar amount yet, totaling up to $85 million to support Earth system science research, education, and outreach.

CIMES will continue to be led by Director Stephan Fueglistaler and Deputy Director Gabe Vecchi. New staff additions include Tra Dinh who will support the Cooperative Institute as a Technical and Software Engineer, and Samantha Schuh who is overseeing CIMES-funded projects in the role of Project Manager. CIMES is expected to onboard its largest number of postdoctoral researchers to date in its first year of renewal.

"As the Cooperative Institute grows, I am continuously impressed by the high bar our researchers set for their work” says CIMES Director, Stephan Fueglistaler. "I look forward to another five years of collaborations and progress in earth system science with our colleagues at GFDL”.

More information on the Cooperative Institute can be found on the CIMES webpage.
Welcome to the New CIMES Postdoctoral Researchers!

Wengui Liang received his Ph.D. in Atmospheric Science from Stony Brook University in 2023. Prior to that, he earned his M.S. in Climatology and B.S. in Atmospheric Science from Peking University in 2017 and 2014, respectively. His research interests include hydroclimate changes, extreme precipitation, tropical/extratropical cyclones, and climate modeling, and he will be working with Ming Zhao at GFDL. Fun fact: He loves tennis! He started to learn tennis about ten years ago and can say he's pretty good (only at the recreational level). Feel free to reach out to him and have some fun on the tennis court!

Shipeng Zhang was lucky to read his Dphil at University of Oxford in the UK, where he could persue his passion for climate physics. His research interests are mostly focusing on understanding and estimating the impacts of human activities on the climate system using climate models, with a specific focus on greenhouse gases and anthropogenic aerosols' impact on surface temperature, clouds, and precipitation. He will be working with David Paynter and Vaishali Naik at GFDL. Fun fact: away from the world of research and data, he finds immense joy in embracing the wonders of nature. Whether you catch him hiking through breathtaking landscapes, or leisurely punting along serene rivers, Shipeng believe in finding the perfect balance between the pursuit of knowledge and the appreciation of life's simple pleasures!

Rui Wang comes from Civil and Environmental Engineering at Princeton to work with Elena Shevliakova. She is broadly interested in wildfire activities under the changing climate, utilizing high resolution satellite products to evaluate and improve model performance, and agriculture's contribution to climate change and air pollution. Fun fact: she started to learn figure skating last year and she wishes she could do the Axel jump one day!

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Andrew Williams recently started as a postdoc in the AOS program, working with Nadir Jeevanjee. Prior to this, he did his undergraduate and PhD studies at the University of Oxford in the UK. Research-wise, he is broadly interested in understanding the links between clouds, radiation and large-scale circulations in the tropics, with a particular focus on linking the results from full-complexity GCMs to simple theory. Fun fact: in his free time, he likes running, playing guitar and hanging out with his partner, Makayla, and their adorable feline, Cleo.

Xinru Li graduated in geography and the Institute for the Oceans and Fisheries at University of British Columbia in Vancouver, Canada, and she will be a postdoc working with John Krasting and Gustavo Marques. Her research largely focuses on understanding the evolution of Marine Heatwaves (MHWs) and their driving processes, as well as examining model ability to simulate MHW and future extreme thermal conditions under climate change. She hopes her work on understanding past and future MHWs will aid in mitigating and adapting to the adverse impacts of these ocean extreme temperature events on marine ecosystems and human communities relying on these ecosystems for services. In her spare time, Xinru enjoys music, cooking, painting and spending time outside (e.g., hiking, kayaking etc.).

AOS is excited to have so many new individuals joining the postdoc community. For any questions related to onboarding, work expectations, conference attendance, computing resources, office space, or anything else related to logistics or research, please see the administrative team in Sayre Hall. Be on the lookout for more postdocs arriving later this fall!
Welcome to the New AOS Graduate Students!

Five students will begin their doctoral studies in atmospheric and oceanic sciences at Princeton in 2023:

Qinlan Yang earned her joint bachelor's degree in atmospheric sciences from the University of Reading and Nanjing University of Information Science and Technology. She is highly interested in climate dynamics and has explored topics on cold air outbreaks, sudden stratospheric warming, large-scale circulation, and precipitation prediction during her undergraduate studies. During her time at Princeton, she hopes to delve into the causality and mechanism for climate challenges under global warming via statistical and modeling techniques. Qinlan expects to gain new perspectives in understanding global climate and translate her findings into long-term social and environmental benefits with the supervision of Stephan Fueglistaler.

Maxime Keutgen De Greef is from Belgium and completed his bachelor's degree in geology at UNamur. While working on his undergraduate thesis, he became aware of the research potential of novel statistical methods in the natural sciences. This motivated him to earn a master's degree in statistics at KU Leuven where he worked on the analysis of geochemical data. Maxime later followed classes in atmospheric sciences at Ghent University. At Princeton, Maxime would like to conduct research in oceanography. Maxime's advisor is Laure Resplandy.

Emma Levin earned her bachelor's degree from Yale University in May 2023, with a major in Applied Mathematics and a concentration in Earth and Planetary Sciences. After a high school research internship at GFDL from 2016-2018, Emma is thrilled to return to Princeton. At GFDL she studied the impacts of climate change on landfalling tropical cyclones. As an undergraduate, she continued her research on tropical cyclones and anthropogenic warming, particularly addressing the impacts of a weakening AMOC on storm genesis. As a graduate student, she hopes to leverage high resolution climate models, statistical tools, and interdisciplinary efforts to study how extreme events will change in a warming climate and how they will impact vulnerable communities. Emma's advisor is Gabe Vecchi.

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**New AOS Graduate Students Cont.**

**Mareya Saba** completed an integrated master’s degree from Imperial College London in Physics in 2022. For her master’s research project, she compared climate model simulations of the Earth’s outgoing longwave radiation with satellite data on diurnal timescales. She is especially interested in uncovering the relationship between climates on short and long timescales. Since graduating, Mareya has been conducting research at the National Physical Laboratory in London using atmospheric greenhouse gas measurements and atmospheric transport models. She is excited to begin her graduate career at Princeton under the advisement of V. Ramaswamy, and she hopes to contribute to the climate sciences so that we can better predict our future climate.

**Kiera Lowman** earned her bachelor’s degree in mechanical engineering from Queen’s University (Kingston, Canada) in 2023. Her research interests include improving the representation of ocean mixing and sea ice in ocean models to strengthen climate predictions. Having grown up and studied in towns on the shores of Lake Ontario, she is also interested in further incorporating the Great Lakes into climate models. At Princeton, she hopes to advance her understanding of computational fluid dynamics and contribute to estimates of ocean temperature change and forecasting severe weather events utilizing global models. Kiera’s advisor is Bob Hallberg.

We wish all the new graduate students a successful and enriching time during their years in Princeton AOS! More information about the holistic graduate school experience at Princeton can be found on the Princeton Graduate School webpage.
AOS Holds Workshop on Connecting Past and Present Climate

During the first week of August, AOS hosted a multi-day workshop entitled, “Paleo, present, and future: Leveraging the past to understand and predict our changing climate” which brought together members of the AOS community and three guest speakers. Drs. Kira Rehfeld from Tübingen University, Samantha Stevenson from UC Santa Barbara and Jessica Tierney from University of Arizona participated in panel discussions, plenary talks, post-plenary conversations, and blackboard talks to engage with AOS graduate students, postdocs, interns, and faculty. The workshop was organized by graduate students Maya Chung, Winnie Chu, and Matt Lobo, and was funded by Dr. Isaac Held’s BBVA Foundation Frontiers of Knowledge Award. Every year, the topic is voted on by graduate students, so start considering topics of interest for 2024!

Best of luck to those departing AOS to begin new adventures!

Sonya Legg will take on the role of Director of the Center for Ocean Leadership at UCAR. Allison Hogikyan earned her PhD and will be joining University of Chicago as a postdoc. Khaled Ghannam will be joining Northeastern University as an Assistant Professor. Yanda Zhang is transitioning to his second postdoctoral position at Columbia University. Shuai Wang is joining the University of Delaware as an Assistant Professor. Spencer Hill is now an Assistant Professor at City College of New York. Hubert du Pontavice is now a Research Scientist at France Energies Marines. Yang Wang began a new postdoc position at Rutgers University. Maike Sonnewald started as an Assistant Professor at UC Davis. Zun Yin is working at Formation Environmental as a Senior Hydrometeorologist. Henri Drake is now an Assistant Professor at UC Irvine. Benjamin LeRoy began a new postdoc at The Climate Service Center Germany (GERICS).
Congratulations to the six CIMES interns who completed their summer research!

Haemah Akhtar (The College of New Jersey), hosted by Alex Huth and Olga Sergienko: Ice shelves, icebergs, and their impact on climate

Berenize Garcia-Nueva (Williams College), hosted by Veeshan Narinesingh and Joe Clark: Blocking and Heat Extremes in Current and Future Climates: Probabilities and Social Impact

Tasmeem Jahan Meem (Syracuse University), hosted by Zack Labe: Assessing the role of anthropogenic aerosols on regional patterns of climate change

Lily Johnston (Colorado College), hosted by Linjiong Zhou: Evaluation of Clouds and Precipitation Prediction in the Sub-10-km SHiELD Prediction System

Jonathan Lee (Cornell University), hosted by Liwei Jia: Predictability and projection of summertime hot and dry compound extreme in North America

Jennifer Melara-Valle (Framingham State University), hosted by Marco Corrales and Jessica Luo: Use of plankton imaging systems to validate satellite-based estimates of phytoplankton size structure

"I loved how the CIMES program is designed with a specific research focus but also gives you the flexibility to curate the research question according to your own interests"

- Tasmeem Jahan Meem

The program has made a significant impact on many of this year’s interns. Lily shared:

"My favorite part of CIMES has definitely been having the opportunity to get hands on experience in the field I am hoping to enter and to collaborate with researchers at GFDL. I have gotten to participate in meaningful research and find out more about what field I would like to pursue. I feel like this program has given me a lot of the tools and knowledge I will need in applying for graduate schools and in my career path. I have definitely developed my coding skills and am now confident using Python!"

Keep an eye out at upcoming conferences for posters from this year’s interns!
The GFDL FV3 team is playing a significant role in enhancing this year’s hurricane forecasting capabilities. Under the leadership of Lucas Harris from GFDL, the team includes researchers like Kun Gao, Linjiong Zhou, Joseph Mouallem, and Kai-Yuan Cheng from CIMES. Their collaborative efforts are focused on developing, maintaining, and continuously improving the GFDL Finite-Volume Cubed-Sphere Dynamical Core, known as FV3. This core serves as the engine of all current GFDL weather and climate models.

A dynamical core is the central component of a numerical model that simulates the physical processes governing the behavior of the atmosphere. It is essentially the engine that solves the fundamental equations of fluid dynamics to simulate the movement of air, temperature distribution, and other key atmospheric variables over time.

FV3 was selected as the dynamical core for the U.S. operational weather forecast model GFS primarily due to its excellent computation efficiency and accuracy. It is also integrated into the newly launched Hurricane Analysis and Forecast System (HAFS), a component of the Unified Forecast System (UFS) that commenced operations on June 28th. HAFS will be a key player in improving forecasts during this year’s hurricane season, and is the first operational hurricane model to use FV3.

Specific contributions from the CIMES researchers to HAFS include its multiple grid nesting capabilities developed by Joseph Mouallem. "Storm-following nests", or high-resolution nested grids over individual moving storms, was an idea originally developed by GFDL back in the early 1990s and later implemented into the Hurricane Weather Research and Forecasting Model (HWRF). Joseph shared, “The telescopic nesting technology bears a resemblance to the James Webb Space Telescope, affording us the opportunity to observe hurricanes from a novel perspective. I am eagerly looking forward to the exciting new scientific insights that this will bring”. A multiple moving nests capability is now being developed by AOML in close collaboration with GFDL.

Other significant contributions from the CIMES researchers to HAFS include Linjiong Zhou's cloud microphysics parameterization package, which describes the processes of cloud and precipitation formation and evolution. Furthermore, Kun Gao, a hurricane specialist from CIMES, actively participates in scientific discussions with the HAFS team. This collaborative exchange serves as a platform for generating innovative ideas, addressing challenges, and fostering productive cooperation.

According to NOAA, “running the experimental version of HAFS from 2019 to 2022 showed a 10-15% improvement in track predictions compared to NOAA’s existing hurricane models. HAFS is expected to continue increasing forecast accuracy, therefore reducing storm impacts to lives and property”.

The FV3 team is proud of the strides being made to improve hurricane forecasting. CIMES Associate Researcher Scholar Kun Gao said, “HAFS is built upon cutting-edge modeling technology and legendary ideas for hurricane forecasting, and it is a successful demonstration of the community-based UFS. The utilization of the faster and more accurate FV3 dynamical core in HAFS opens up numerous possibilities for future advancements in hurricane forecasting”.

The most recent updates can be found here. Special thanks to all members of the FV3 team for their contributions to the HAFS.
CIMES Postdocs to Convene Sessions at AGU Fall Meeting

The American Geophysical Union (AGU) Fall Meeting will be held from December 11-15 in San Francisco, CA and online. At this year’s meeting, three CIMES postdoctoral researchers will serve as session conveners. Session details are described below:

**Bridging the Gap from Climate to Extreme Weather: Observations, Theory and Modeling convened by Veeshan Narinesingh**

There is a growing need to understand how extreme weather phenomena will change in the future under climate change. Such a goal requires insight into how such phenomena, including but not limited to severe thunderstorms, tornadoes, hurricanes, extreme precipitation, and heat waves, emerge within the climate system in general. This session seeks novel research bridging the gap between climate and extreme weather with an emphasis on understanding both the underlying climate physics that generate such events and the mechanisms by which their statistics vary across climate states, including global warming. Analyses employing a wide range of methodologies are welcome, including idealized and high-resolution climate modeling, observational and historical data analysis, and theory.

**Jetstream Dynamics, Atmospheric Rossby Waves, and Associated Extreme Weather and Climate Events convened by Akshaya Nikumbh and Mingyu Park**

Recent extreme weather and climate episodes, including the 2022 heatwaves across Europe, Asia and the US cold-air outbreak in February 2021, highlight the need to advance understanding of planetary and synoptic-scale atmospheric jetstream and Rossby wave dynamics, in particular their impacts on extreme weather and climate events, including the predictability of such events. Abstracts are solicited that are dedicated to:

- linear and non-linear dynamics of Rossby wave propagation or quasi-stationarity, wave-breaking, atmospheric blocking, recurrent regimes, atmospheric jet waveguides, with implications for extreme events.
- different diagnostics of Rossby waves, blocking, wave-breaking and waveguides, their connections to extreme events, and assessment of their representation in numerical weather/climate models; analyzing their projected future changes
- the role of Rossby wave dynamics on S2S predictability (2 weeks-to-several-months) and implications for extreme events
- advanced statistical methods including AI/ML techniques for analyzing extreme events driven by atmosphere dynamical mechanisms and improving their representation in models.
What is your background and area of expertise? What excites you about being at Princeton and working with people at GFDL?

I completed my undergrad in Mechanical Engineering, specializing in Fluid Mechanics with a keen interest in Computational Fluid Dynamics, and pursued a PhD in Atmospheric Science, focusing on physics and chemistry of pollutants during long-range transport, particularly wildfire-emitted trace gases and aerosols. At Princeton/GFDL, I’m thrilled to collaborate with leading experts in climate modeling. Their insights continuously spark new ideas, and the supportive environment helps my independent research.

What are the goals of your postdoc project? What questions are you trying to answer?

I will be developing and implementing a mechanistic parametrization for injection of emitted carbonaceous aerosols and other chemical tracers from wildfires into the troposphere based on fire radiative power. I am working with AM4/LM4, the state-of-the-art global atmosphere and land model for this purpose. This project is led by Paul Ginoux, GFDL’s senior scientist at b-division. The project also involves collaborations with Elena Shevliakova on implementing the wildfire plume injection and emissions into the land model. The ultimate goal is to have a fully coupled Earth system model to examine historical and future relationships between climate and wildfires.

What is the significance and importance of modeling wildfires?

Modeling wildfires helps us fight fires better, keep people safe, and lessen its damage. It protects our environment and air quality, and shows how climate change affects fires and the other way around. By studying past fires with computer models (such as GFDL’s coupled earth system models), we can predict how future fires will act, helping us get ready for more fires in a hotter world.

How has climate change affected the frequency and intensity of wildfires?

Wildfires are a natural part of forests; excessive wildfires, however, can burn homes and kill people. Climate change increases wildfires by intensifying heat and aridity. When the vegetation is dry it accelerates burning.
IPCC AR6 has several reports on this topic. Satellite observations show that human-caused climate change has increased area burned by wildfires. There are studies showing that climate change has increased drought between 2000 to 2020, increasing the aridity of vegetation, and increasing intensity and frequency of wildfires.

**What impacts do wildfires have on human health, air quality, the carbon cycle, and overall climate change?**

In terms of human health, smoke from wildfires can cause respiratory disease and heart problems.

Wildfires emit aerosols and trace gases into the atmosphere affecting climate in several ways including, but not limited to:

- changing atmospheric chemistry (emitting carbon monoxide, carbon dioxide, black carbon, volatile organic carbons, and other trace gases and aerosols into atmosphere)
- affecting radiation budget (emitted aerosols can absorb radiation), and
- affecting cloud microphysics (aerosols can become cloud condensation nuclei and form clouds).

Many of these climate effects can result in positive feedbacks, exacerbating the dangers more and more over time. In other words, climate change can cause wildfires, and the effects of wildfires can lead to further warming and climate change.

**How does your research connect to the wildfires in Maui? Do you think these wildfires are linked to climate change? How can modeling efforts help with wildfire prediction, prevention, and mitigation?**

In my opinion, climate change is one of the many factors causing the devastating wildfires in Maui. The spread of non-native vegetation, population growth, an increase in the number of tourists, and, above all, the heat and aridity resulting from climate change are drivers of this wildfire. Thus, several factors, ranging from land to atmosphere, are involved.

In my research, we are trying to connect the dynamic change in vegetation on land, its impact on wildfire intensity/spread, and its emissions to the atmospheric model. We are working towards a fully coupled land-atmosphere model that can predict future climate projections while considering all aspects of wildfires. We hope to better understand the interaction between climate and wildfires and identify high-risk regions around the globe, paving the way for improved prevention and mitigation in the future.

Maui wildfires. Photo from *The Maui News*.
Princeton’s environmental newsletter, The Charge, provides cutting-edge research and critical insights about energy, climate and the environment from the labs, classrooms and campus of Princeton. CIMES associate research scholar Kun Gao was recently introduced by The Charge as an expert on hurricane prediction. Check out his feature here and subscribe to the monthly newsletter.

CIMES postdoctoral researcher Jing Feng gave a virtual seminar at NASA Goddard Institute for Space Studies entitled, “The Importance of Atmosphere on Outgoing Longwave Radiation and Longwave Feedback”. A recording of Jing’s talk can be found here.

Earlier in the summer, CIMES postdoctoral researcher Caio Mattos was featured as an expert on hydrology in a documentary about drought and wildfires in his native country, Brazil. The documentary navigates the effects of drought and wildfires on different communities and explores the future of ecosystems in the Pantanal as climate change progresses. The documentary, “Seca no Pantanal: 2019 a 2022" can be viewed here.

CIMES postdoctoral researcher Zack Labe has been interviewed for several recent articles as a climate change expert. Check out his features:
- CBC: July on track to be hottest month ever recorded, analysis shows
- USA Today: The oceans are unusually hot and on track to get hotter. That's not good
- CNET: As a 'Sea Ice Free' Arctic Looms, the Climate Consequences Are Mounting
- Bulletin of the Atomic Scientists: ‘Uncharted territory’: Warming oceans and disappearing sea ice alarm scientists
Join the AOS Outreach Team!

The AOS/CIMES Outreach and Engagement group was formed in August 2022, to encourage participation in outreach and engagement activities by facilitating communication about opportunities and experiences, particularly in the wake of the pandemic when most activities had been canceled or curtailed.

Over the past year the group has participated in a large number of different events, with audiences ranging from elementary school children to college students, aiming to bring climate, atmospheric, and oceanic science to a wider audience, and broaden participation in climate and earth system science. Events for school children have largely focused on table-top hands-on experiments, while events for undergraduate students have discussed climate research and career paths. Shared presentations and materials (e.g. for table-top demonstrations), as well as debriefing sessions, have helped the group to build the experience together. In total, since September 2022, the team has participated in 6 events for school children and 5 different college visits, involving a total of 24 different members of the AOS/CIMES community, usually as a small group of about 3-6 at each event.

Activities over the 2022-2023 academic year included:

- College visits at Bronx Community College, City College of New York, and Mercer County Community College, for presentations on climate science, career paths, and opportunities, followed by Q&A with the students.
- Workshop at the Boys and Girls Clubs of Mercer County on climate science, including a rotating tank demonstration, visit to the high school afterschool program to discuss climate science and educational opportunities, and participation at the Youth STEM Conference and BGC Mercer Women & Girls Conference.
- Hands-on demonstrations at PPPL’s Young Women’s Conference for grades 7-10 girls.
- Participation in Spring into Science, organized on Princeton main campus by Princeton Science Outreach for 4th-10th grade school children with demonstrations of table top experiments.
- Table at NJ Ocean Fun Days at the Jersey Shore, organized by NJ Seagrant.

How can you get involved?

- Send an email to sammi.schuh@princeton.edu to be added to the listserv: aosoutreach@princeton.edu.
- Volunteer for events when they are publicized to the group via the listserv.
- Share new outreach opportunities with the group.
- Develop new ideas for outreach and engagement and involve the group.
New Publications and key findings

Scientific publications are a key output of CIMES-funded research and showcase the work coming out of Princeton AOS in collaboration with GFDL. CIMES authors noted with * are funded under award NA18OAR4320123 from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration, or the U.S. Department of Commerce.

A New Framework for Evaluating Model Simulated Inland Tropical Cyclone Wind Fields  
by Jie Chen*, Kun Gao*, Lucas Harris, Timothy Marchok, Linjiong Zhou*, and Matthew Morin, published in Geophysical Research Letters (August 2023)

- This study introduces a new framework for evaluating modeled inland tropical cyclone (TC) wind fields with observation-based, theory-predicted wind profiles
- The theory-predicted wind profile well represents the observed radial distribution of inland TC wind speeds
- The authors propose simple indicators to summarize the model performance on inland wind field predictions

The Influence of Large-Scale Radiation Anomalies on Tropical Cyclone Frequency  

- Tropical cyclone frequency is strongly influenced by the global pattern of heating and cooling due to radiation, a process that has been neglected in existing theories.
- This theory improves understanding of how tropical cyclones respond to climate change, explaining why one model may predict a frequency increase while a different but equally realistic model may predict a frequency decrease.
- One reason for the difficulty in predicting tropical cyclone frequency is found to be the difficulty in predicting how global cloud distribution will change in the future.

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Better regulation of explicit convection reduces North Atlantic hurricane track errors in a high-resolution model by 10% at days 4 and 5.

Improved track forecasts are related to a more realistic representation of the North Atlantic subtropical ridge.

Explicit convection is modulated by implicit diffusivity in the model's advection scheme.

This work examines how extratropical waves can come over the monsoon region during the boreal summer and investigates the role of extratropical forcing on monsoon trough during large-scale heavy rainfall events (LEREs).

Stationary Rossby wave rays originating over the north Atlantic ocean can come over India at midlevels, following approximately the great circle route.

LEREs are preceded by Atlantic blocking high and central Asian high about a week and 3 to 5 days before the events, respectively. The Atlantic blocking high strengthens the downstream central Asian high by generating a stationary Rossby wave response. The central Asian high comes in phase with the equatorial monsoon trough at mid and low levels.

The central Asian high supplies eddy momentum, dynamic forcing and static instability, which strengthens the equatorial monsoon trough, thereby create an environment conducive for heavy rainfall events.

An atmospheric feedback process maintained by greenhouse gases crucially stabilizes Earth’s climate under global warming.

Earth’s clear-sky thermal energy budget is unlikely to runaway due to its stable atmospheric composition and thermodynamic structure.

A simple, analytical model can accurately predict the state-dependent clear-sky longwave feedback spectrum.
Upcoming Campus Events

GEO Department Seminar
Pierre Regnier, Université libre de Bruxelles
Tuesday, September 19, 12:30-1:30pm
10 Guyot Hall

GEO Department Seminar
Laure Resplandy, Princeton University
Tuesday, September 26, 12:30-1:30pm
10 Guyot Hall

“Powering possibilities for a clean energy future”
celebration of sustainability, renewable energy,
and environmental stewardship
Saturday, September 23, 10:00am-2:00pm
Princeton Plasma Physics Laboratory

Bradford Seminar: “Partnering with Nature and
Technology to Address Climate Challenges”
David Hayes, Lecturer in Law at Stanford Law
School and a Senior Fellow at the Natural
Resources Defense Council
Monday, September 11, 12:15-1:15pm
300 Wallace Hall; Online via Media Central Live

“Global Geographies of Weather Modification in
an Era of Climate Change”
Emily Yeh, Professor of Geography at the
University of Colorado, Boulder
Thursday, September 14, 12:00-1:30pm
Louis A. Simpson Building, Room 144

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“Ecological States”: A Book Talk with Jesse Rodenbiker, Mi Shih, Emily Yeh, and Jerry Zee
- Author, Jesse Rodenbiker, Associate Research Scholar with the Center on Contemporary China at Princeton University, Assistant Teaching Professor of Geography at Rutgers University.
- Mi Shih, Associate Professor of Planning and Public Policy at Rutgers University
- Emily Yeh, Professor of Geography at the University of Colorado, Boulder
- Jerry Zee, Assistant Professor of Anthropology and the High Meadows Environmental Institute at Princeton University
Thursday, September 14, 4:30-6:00pm
Louis A. Simpson Building, Room A71

Bradford Seminar: “Cooperating for the Climate: Learning from International Partnerships in China’s Clean Energy Sector”
Joanna Lewis, Provost, Distinguished Associate Professor and Director, Science, Technology and International Affairs (STIA) at Georgetown University
Monday, October 2, 12:15-1:15pm
300 Wallace Hall; Online via Media Central Live

“An Immense World”: with Pulitzer Prize winning science writer, Ed Yong
Ed Yong, Science Journalist
Wednesday, October 4, 4:30-6:00pm
Aaron Burr Hall, Room 219

Bradford Seminar: “Wielding the Tools of Environmental Policy: How Regulatory Rulemaking Serves the Climate, Clean Air, and Environmental Justice Agenda”
Joseph Goffman, Principal Deputy Assistant Administrator, Office of Air and Radiation, at US Environmental Protection Agency (EPA)
Monday, October 30, 12:15-1:15pm
300 Wallace Hall; Online via Media Central Live

Bradford Seminar: “Planning the Mid-Transition for Just and Sustainable Decarbonization”
Emily Grubert, associate professor of sustainable energy policy, University of Notre Dame
Monday, November 13, 12:15-1:15pm
300 Wallace Hall; Online via Media Central Live

Kathleen Segerson, Board of Trustees Distinguished Professor of Economics at the University of Connecticut
Monday, November 27, 12:15-1:15pm
300 Wallace Hall; Online via Media Central Live