



AOS & CIMES Newsletter

Program in Atmospheric and Oceanic Sciences (AOS) &
The Cooperative Institute for Modeling the Earth System (CIMES)



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Meet Our New Graduate Students

Winnie Chu



Winnie Chu

Winnie Chu earned her bachelor's degree from Harvey Mudd College where she majored in climate science. She is interested in the effects of climate change on ocean biogeochemistry and marine ecosystems, especially in the tropical Pacific region. During her time at Princeton, she hopes to tackle more aspects of climate change mitigation through physical oceanography and to integrate her research efforts with her interests in policy-making and visual arts for community outreach. Winnie's adviser is Curtis Deutsch.

Lynn Hirose



Lynn Hirose

Lynn Hirose completed her bachelor's degree in earth sciences at the University of Tokyo. While there, she jumped into climate modeling studies from the senior thesis project and studied paleoclimate using climate models. Her ultimate research interest and goal is to provide a unified explanation for past and modern climates to generate more accurate future predictions. Lynn has studied past warming periods because they provide critical constraints on the model performance of natural geologic processes, as well as insights into future climate change driven by anthropogenic forcing. At Princeton, she would like to develop a comprehensive and holistic understanding of climate science as well as a specialization under the advisement of V. Ramaswamy.

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Welcome!

With the fall term well underway, we hope many of you have had the opportunity to welcome our new students, who bring varied talents and interests to our Program.

In this issue, we introduce you to these five remarkable students. We highlight award winners Noemi Vergopolan and Maya Chung and a Prison Teaching Initiative Justice Studies course, developed by Marion Alberty. We call attention to the fall MOM6 Tutorial and some eye-catching work by Zack Labe. We share news of outreach events for educators, using rotating tanks and through QUEST, and for City University of New York (CUNY) students. We feature Maya Chung's ACDC Summer School experience and our annual AOS Program Retreat at Updike Farmstead. We welcome all of our AOS/CIMES newcomers and wish you and your families a happy and healthy holiday season!

Stephan Fueglistaler, Director AOS, CIMES
Gabe Vecchi, Deputy Director, CIMES

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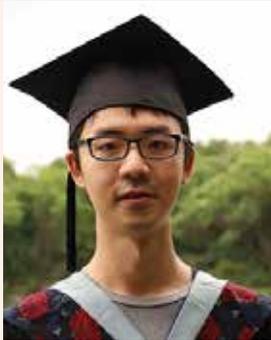
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Matt Lobo

Matt Lobo

Matt Lobo earned his bachelor's degree in mechanical engineering, with a minor in mathematics, from Portland State University in 2022. His research interests include better representing ocean mixing processes and air-sea interactions in ocean models, and furthering the development of theoretical geophysical fluid dynamics more generally. At Princeton, Matt hopes to contribute uniquely and meaningfully to the increasingly important fields of physical oceanography and climate science. In his free time, he hopes to hike with his dog, write a fiction novel, and construct many crosswords. Matt's adviser is Bob Hallberg.



Heng Quan

Heng Quan

Heng Quan earned his bachelor's degree from Peking University (Beijing, China) in 2022, majoring in physics and atmospheric science. He explored a wide range of topics during his undergraduate years: extreme events, midlatitude fronts, heatwaves and geoengineering. Heng enjoys finding the fundamental order hidden in the seemingly chaotic evolution of atmosphere and climate, with the help of modeling, statistics and machine learning techniques. He is excited to start his graduate career at Princeton under the advisement of Stephan Fueglistaler, and hopes to carry out pioneering works in climate science.



Gabriel Rios

Gabriel Rios

Gabriel Rios earned a bachelor's degree from Vanderbilt University and a master's degree from the City College of New York, both in mechanical engineering. He is interested in tropical meteorology (especially tropical cyclones, being from South Florida), boundary layer processes, and improving numerical modeling of high-impact events. On the technical aspect of his time here, he hopes to improve numerical modeling of subgrid-scale processes. On the societal side, he wants to learn how to translate his technical expertise into policy to expand the impact of the community's technical work. Gabriel's adviser is Gabe Vecchi.

Noemi Vergopolan Honored by AGU

AOS Postdoc Noemi Vergopolan was announced as the American Geophysical Union's (AGU) 2022 Science for Solutions Award recipient in recognition of significant contributions in the application and use of the Earth and space science to solve societal problems. She is one of 36 honorees who are receiving AGU's highest honors for their excellence in scientific research, education, communication, and outreach.

Vergopolan, a CIMES researcher working on solutions for water resources and climate, was nominated "for outstanding contributions to water and food security through advances in hyper-resolution land surface modeling and satellite remote sensing." Her research aims to aid actionable decision-making by improving hydrological information for monitoring and forecasting of hydrological extremes and their impacts. To this end, she develops scalable computational approaches for high-resolution hydrological prediction by leveraging satellite remote sensing, land surface modeling, machine learning, data fusion, and high-performance computing.



Noemi Vergopolan

"I'm honored and humbled to receive one of AGU's highest honors for excellence in scientific research – the Science for Solutions Award," Vergopolan said. "I'm incredibly grateful to all who supported me along the way and will continue to pay it forward to our scientific community."

Vergopolan joins other scientists, leaders, educators, journalists, and communicators from around the world who have made outstanding achievements and contributions by pushing forward the frontiers of science. Each recipient embodies the AGU's community's shared vision of a thriving, sustainable, and equitable future powered by discovery, innovation, and action, according to the announcement. Equally important, these recipients have worked with integrity, respect, and collaboration while creating deep engagement in education, diversity, and outreach.

AGU supports members, from enthusiasts to experts, worldwide in Earth and space sciences, helping to advance discovery and solution-based science that is ethical, unbiased, and respectful of communities and their values. Their programs include serving as a scholarly publisher, convening virtual and in-person events, and providing career support.

AGU will formally recognize this year's recipients during the nonprofit's annual fall meeting, December 12-16, 2022, in Chicago and online.

Geosciences Service and Outreach Award for Graduate Students - Maya Chung



Maya Chung

AOS Graduate Student Maya Chung is the recipient of the Geosciences 2022 Service and Outreach Award for Graduate Students along with Elena Watts, a GEO graduate student.

The award, which consists of a monetary prize and an official notice in the Departmental records and publications, recognizes graduate students who have served the community through outreach and advocacy (including, but not limited to diversity) beyond the traditional definitions of "research" and "teaching."

Chung is advised by CIMES Deputy Director Gabe Vecchi, professor of geosciences and the High Meadows Environmental Institute (HMEI).

Marion Alberty Develops PTI Justice Studies Course

When the Prison Teaching Initiative (PTI) was looking for someone to adapt and develop a climate-focused course for the Justice Studies Program, they knew just where to turn.

AOS Postdoc Marion Alberty had been a PTI volunteer since 2019, teaching math courses at multiple facilities and taking on leadership roles within the organization. She had expressed a keen interest in teaching a climate course, if the opportunity ever presented itself.



Marion Alberty

That opportunity came in spring 2022 in a course titled, “Topics in Justice Studies: Climate, the Environment, and Justice.” The course would be one of the 15-20 accredited college courses PTI offers each semester to incarcerated students in New Jersey (in up to seven New Jersey Department of Corrections DOC institutions), and Alberty would be one of 150 active PTI volunteers, comprised of Princeton University graduate students, postdocs, faculty, and staff.

For Alberty, who not only wanted to find opportunities to gain experience teaching while at Princeton but also ones that align with her own personal values, this opportunity seemed like the perfect fit.

“I met with PTI leadership, came up with a plan for long-term course development, and started identifying potential collaborators and co-instructors,” Alberty said.

Spending a lot of time researching the course, looking into existing courses and syllabi, meeting with experts in moral philosophy, reading potential course material, and watching relevant lectures, Alberty developed a first draft of the course syllabus that would serve as the starting point for the course development.

“With the help of folks at PTI, we brought together a team of instructors with complementary expertise,” said Alberty, citing the expertise of Aiyu Zheng, a Ph.D. candidate in the Pacala Lab with expertise in plant ecology and ecosystems; Simona Capisani, a postdoc studying moral philosophy in the context of climate change and migration; and Chris Etienne, STEM program coordinator at PTI with a background in media and

communications.

The course begins by introducing the intersecting climate, food, water, and biodiversity crises, examining the ways in which these crises differentially impact populations on both the local and global levels, Alberty said, but also specifically investigates the role of environmental racism in shaping exiting policies, practices, and proposed solutions.

Alberty further describes the course as a multi-disciplinary course that asks students to engage with the science and philosophy of climate change from local to global perspectives. Students are asked to reflect on their own experiences with climate change and environmental issues, and engage with the question: “Where do I stand in the world of the climate crisis and environmental justice?”

“The course deals with emotionally challenging material for both the student and instructors,” said Alberty. “Helping students to navigate through this material was challenging in a way that doesn’t arise when teaching a typical science or math course.”

The COVID-19 pandemic also presented its own challenges, with instructors adapting to rapidly changing requirements and teaching modalities.

“Our course went from being an in-person course at one facility to a completely remote, paper-packet based course to a hybrid course taught across four different facilities,” Alberty said. “This changed the way we were able to both assess student progress and performance, and also how we would teach the course (discussion and activity based in-class teaching versus independently, paper-packet based learning).”

Despite these challenges, the course is a reading and discussion based course, Alberty said, where students are asked to engage both individually and collectively with a range of reading materials -- from journal articles to philosophical texts to news articles to literature and poetry. The students rely on teachers to provide secondary materials and field contextual questions as they come up in discussion.

“Our students are deeply concerned about the environment and climate change, but each person’s connection with the issues is different and very personal,” said Alberty. “Our course was most successful when we let that personal connection to climate change guide the students’ engagement with the course material and assessments.”

Developing an interdisciplinary course is incredibly rewarding, Alberty added, especially when working with a highly collaborative and dedicated group of scholars with a common goal.

“I learned a lot about social, moral, and philosophical issues surrounding climate change,” said Alberty.

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PTI Justice Studies Course continued from Page 4

Better still, the same can be said for the nineteen justice-impacted students who enrolled in the course at four facilities across the state, all of them pursuing a BA in Justice Studies with Rutgers University accrediting their degrees.

Founded in 2005, the Prison Teaching Initiative seeks to bridge Princeton University's academic and service-driven missions by providing the highest quality post-secondary education to incarcerated students in New Jersey; offering Princeton University graduate students, postdocs, faculty,

and staff innovative, evidence-based pedagogy training and the chance to diversify their teaching portfolios through intensive classroom experience; and fostering a robust campus dialogue on mass incarceration and its relationship to systemic inequalities in access to education. The Initiative reaches approximately 250 incarcerated students per year.

MOM6 Demystified During Fall Tutorial

Members of the AOS/CIMES/GFDL community converged on Main Campus from October 17-18 for an immersive one-and-a-half-day tutorial on MOM6, the latest version of GFDL's Modular Ocean Model (MOM).

Approximately 45 people participated in the hybrid event, among them AOS students, postdocs, and faculty. The in-person component was held in Lewis Library.

The Modular Ocean Model (MOM) describes the numerical ocean models used to simulate ocean currents at both regional and global scales, enabling scientists to answer fundamental questions about the role of the ocean in the dynamics of the global climate. This latest version, a next-generation open-source ocean model combining the best of GFDL's MOM5 and Generalized Ocean Layer Dynamics (GOLD) ocean models, blends the techniques of traditional solvers with a dynamic vertical coordinate.

The tutorial provided a hands-on walk-through of MOM6, covering how to use MOM6 and how to contribute to the code, according to AOS Research Oceanographer Alistair Adcroft who organized the event.

"When we structured this event, we wanted to both help the AOS community use MOM6 and develop materials that we can post to the broader community for self-help," said Adcroft. "We also wanted to re-connect with the AOS postdocs and students, since we are still emerging from the pandemic-era and so many new arrivals don't know who's who, or who to reach out to for help."

Topics covered during the workshop included installing MOM6 on computers outside of GFDL, including on Stellar and laptops, how to debug the code, how to develop new experiments, and how to contribute code using GitHub.

"My cohort and I really enjoyed the MOM6 tutorial! said Winnie Chu, an AOS graduate student. "Not only was

it a great introduction to the technical aspects of model simulation, but also a great introduction to all of the amazing scientists who made it possible. I appreciate the effort that was put into organizing it, and the time spent helping us with all of our coding questions, no matter how basic they were!"

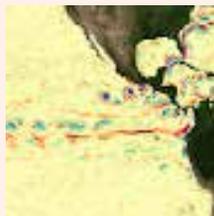
"Thank you to the MOM6 team for organizing this fruitful and enjoyable tutorial!" added Wenda Zhang, an AOS postdoc. "I learned a lot about the principles, structure, and algorithms of MOM6 from the lecture sessions and enjoyed the exercises of compiling and running the model and analyzing the outputs during the exercise sessions, where I could seek help anytime I had trouble. I also got a lot of helpful advice on coding and data management through interactions with the model developers and other users during the breaks."

"This was an intense exercise for both the attendees and the instructors, but based on the positive responses we've had, we all thought it was worthwhile," Adcroft said.

MOM6 is part of the long-standing MOM community of codes and has adopted the open-development paradigm, encouraging participation among government agencies and academic partners. Researchers at NOAA's GFDL lead the development, with critical contributions also provided by researchers worldwide.

Adcroft organized the fall workshop with members of GFDL's MOM6 Team, including Marshall Ward, Raphael Dussin, AOS Faculty Member Robert Hallberg and AOS Faculty Member Stephen Griffies, with support from the Cooperative Institute for Climate Science (CIMES).

MOM6 videos can be found on YouTube.



Zack Labe in Conversation

AOS Postdoc Zack Labe, a CIMES researcher, discusses his research and passion for communicating climate science through engaging data visualizations.

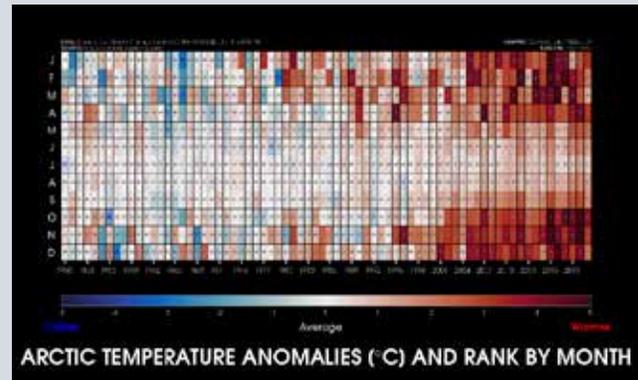
Can you tell us about your current research?

Broadly, my research is on disentangling the effects of climate change from natural variability. I am particularly interested in how we can improve our understanding of internal variability in the climate system to better quantify the range of uncertainty in future climate model projections. This involves combining data from historical observations, climate model large ensembles, and using statistical techniques like explainable neural networks. I also think a lot about climate change in the Arctic and how we can use these methods to better quantify the drivers of Arctic warming and sea ice variability.

During my first few months at AOS/CIMES and GFDL, I've been evaluating output from a wide range of simulations performed with GFDL's SPEAR to assess the timing of emergence of temperature signals in the contiguous United States and to understand the drivers of an unusual pattern of springtime cooling in northern North America. I am also participating on a larger NOAA team to develop a framework for near-real time climate attribution of extreme events in the United States, where this summer we focused on persistent heatwaves across the state of Texas.

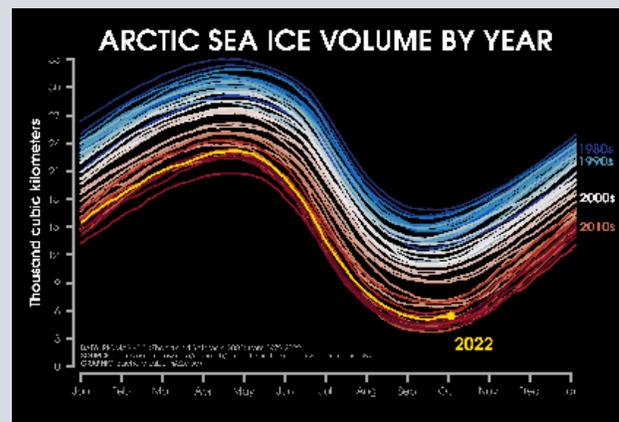
How did you come to work with data visualizations?

I think my interest in data visualization stemmed from some frustration... The beginning of grad school usually involves a lot of reading. This helps you become more familiar with the relevant literature on your thesis topic. My PhD research happened to study the connections between Arctic amplification and the large-scale mid-latitude circulation. This is a widely debated area of climate research, especially given that the Arctic is warming much faster than the globally averaged temperature trend. However, I started noticing that many of the graphics used to document the rapidly changing Arctic were using outdated datasets and figures that were difficult for even the experts to interpret and communicate. In other words, some of the changes in the Arctic are happening faster than scientific studies can document. For better or worse, this is mostly due to the long timeline of the scientific process. But I felt that we could potentially better track Arctic climate change data, with the hope of also communicating its impacts to a wider audience. I started by sharing just a few graphs of daily sea ice levels on my Twitter account, and I soon realized that there is a much greater desire for this type of communication approach than I ever could have imagined.



You refer to these visualizations as “data-driven stories.” Please explain.

I've only recently come to embrace the terminology “data-driven stories.” To be clear, I am not an expert on data visualization or science communication. By training, I am a climate scientist with a background in meteorology. To help improve my communication skills, I've tried attending presentations and workshops on the science communication of climate change. Most of these events offered advice to stick to human-driven impact stories, rather than using data and statistics. After reflecting on my initial graphs of Arctic sea ice levels on social media, I was very concerned that I was doing quite the opposite of these science communication strategies. However, I quickly realized that there is value and a growing need for using data visualization as a form of science communication and storytelling, which audience-wise can go far beyond the immediate science bubble.



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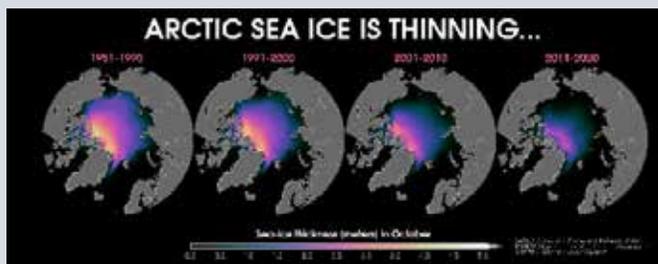
Zack Labe continued from Page 6

Do you view the visualizations you share on Twitter as an extension of your scientific research?

Absolutely. For one, creating visualizations of climate data helps me to track extreme weather and climate events in real-time. This is especially important for areas like the Arctic, where extremes such as rapid sea ice loss and wintertime heatwaves are becoming increasingly common. This has led to several successful collaborations that basically got their start by tracking these events on Twitter, such as the lack of sea ice in the Bering Sea in 2018 or the persistent Siberian heatwaves of 2020.

In addition to tracking these extremes, the data-related questions and conversations I have from this form of science communication have also inspired entire research avenues for me. For example, we recently published a paper on predicting temporary slowdowns in global mean surface temperature using machine learning. Along with all the research on the early 2000s 'hiatus' period, this paper was partly inspired by noticing another slowdown in the rate of warming in my visualizations over the last few years.

Lastly, I've had the opportunity to collaborate with scientists in cognitive psychology – specifically working with experts on perception of uncertainty in data visualization. This has led to several ongoing projects, including interpreting images of internal climate variability and designing an alternative form of the cone of uncertainty for assessing hurricane impacts and risk evaluation of evacuation decisions.



Why is communicating climate science data in this particular way so important to you? What are the biggest challenges you face when communicating this data?

I really see this form of science communication as a way to make science more accessible, transparent, and inclusive. For all my data visualizations, I share background information on the original data and methods to analyze it. While I think many might assume that no one is interested in these data details, I've been very encouraged by the number of questions and comments that I receive daily to learn more information about climate science methods. It's really all about thinking how to reframe and avoid jargon while also building trust in the data, messenger, and user.

Part of the challenge in using data visualization for communicating climate change is how to grapple with misinterpretation of nuisance and disinformation efforts. A simple example of this challenge is how to communicate that not every year will observe the lowest sea ice on record – i.e., climate change versus climate variability versus weather.

In your opinion, what is needed to push science communication and accessibility forward?

I really think we should encourage people to explore all mediums of science communication, whether that's through art, music, videos on TikTok, lists of facts and statistics, focusing on climate solutions, or again sharing those human-driven impact stories. I really don't think there is one correct way of communicating science. It's all about supporting others to explore their own interests and creative sides while sharing their science. I also believe that a combination of these forms of science communication will help to build trust in our work and break down the barriers for those interested in becoming part of the scientific process. Lastly, I'm hopeful that this will be more valued at the institutional level in the next generation of science.

Outside of your research and science communication efforts, what do you enjoy doing?

While I am still trying to improve my own work-life balance, I really enjoy taking the time to visit roadside oddities. While some of the classics are of course along Route 66, like my favorite Blue Whale of Catoosa, you'd be surprised at how many hidden gems are all around. I recently stumbled across one by accident, where I discovered that the location of the 1938 'War of the Worlds' radio broadcast was featured in a town just down the road from here in Grovers Mill, New Jersey!

I also spend lots of time watching scary movies, especially by independent filmmakers. For whatever reason, it's the one way that I can totally disconnect from my work. As you can imagine, October is my favorite month of the year. In fact, I recently visited the first annual Lambertville Halloween Film Festival, which included a wide range of horror events and upcoming independent movies at their local screening room.

Zack's data visualizations can be found on Twitter @ZLabe, where he has over 50,000 followers, and throughout his [research website](#).

Spencer Hill Leads Earth Science Educators' Workshop Using Rotating Tanks

The dynamics of weather, oceanographic and climate processes are often difficult for teachers, let alone students, to conceptualize. With this in mind, AOS Associate Research Scholar Spencer Hill led a workshop focused on teaching key weather, ocean, and climate concepts using rotating tanks. The workshop was held this past summer at the eighth annual Earth Educators Rendezvous Conference in Twin Cities, Minnesota.



Spencer Hill



Earth Educators' Rendezvous Participants

Twenty-eight secondary school and university-level teachers participated in the two-day workshop, which featured rotating tank demonstrations – powerful investigative tools for teaching about weather, climate, oceanography, and planetary fluid motions. The workshop included a mixture of presentations, hands-on sessions, live demonstrations, and interactive discussions, while introducing the core underlying scientific and pedagogical concepts.

With each participant setting up the rotating tank platform and using it to practice a core set of demonstrations themselves – solid-body rotation, mechanical stirring, and a third chosen from an array of options – they were able to see firsthand how these demonstrations may be optimally incorporated into their teaching and individual classroom settings, according to Hill.

The workshop connected a diverse cohort of instructors, giving them an opportunity to brainstorm on how to integrate the demonstrations into their science curriculums. Hill and his co-organizers also taught participants about available resources to sustain teaching with rotating tanks well beyond the workshop.

“It was a real professional highlight for me to plan and execute this workshop, along with six DIYnamics co-organizers based at other institutions,” Hill said. In addition to Princeton, workshop conveners hailed from the University of California – Los Angeles, Yale University, and Iowa State University.

“The logistical challenges were immense ... among many other things, we shipped 30 full rotating tank kits to MN so that each participant could use one and then take it back (for free) to their home classrooms,” Hill added. “But it was absolutely worth it, especially the ‘demo carnival’ on day two where participant teams took turns teaching the rest of us a mini-lesson based around one of the demonstrations we trained them on. I’m extremely excited to hear how the participants go on to use the kits and the information from the workshop in their own teaching and outreach.”

If their post-workshop feedback is any indication, students can look forward to engaging in vivid rotating tank experiments in science classrooms and outreach events around the country.

In addition to generous funding from the Cooperative Institute for Climate Science (CIMES), the workshop was supported by the National Science Foundation (NSF) and NASA.

Summer 2022 Saw the Return of the In-Person QUEST Summer Institute

This summer, a group of New Jersey teachers gathered on Main Campus for the 2022 QUEST Summer Institute. The in-person, 5-day workshop was sponsored by the Cooperative Institute for Climate Science (CIMES), in partnership with Princeton University's Program in Teacher Preparation.

Designed to enhance teachers' knowledge of science and mathematics along with their enthusiasm and confidence in teaching science and math, the professional development program, held June 27-July 1, 2022, attracted educators from surrounding New Jersey school districts who instruct over 200 students in both urban and suburban school districts. The teachers participated in the Program under the guidance of content experts Steve Carson, a Princeton Township middle school teacher and former GFDL researcher, Danielle Schmitt, manager of the Geosciences undergraduate lab, and Jessica Monaghan, assistant director of STEM in Princeton's Program in Teacher Preparation.

"I had the privilege of acting as lead teacher during the Institute and throughout helped participants reflect on best practices around Next Generation Science Standards (NGSS), said Monaghan.

Throughout the week, educators deepened their understanding of weather, climate, and climate change, asking questions and clarifying misconceptions. The K-5 teachers worked in partnership with middle school teachers, affording them opportunities to extend their professional networks and create a sense of community while learning science through self-directed investigation and inquiry.

These discussions were followed by wider collegial conversations about pedagogy and instructing inquiry-based science, which adopts an investigative approach to teaching and learning.

CIMES support allowed materials used within the Institute to be sent home with participants so that they could bring many of the hands-on activities directly to their students. The support was not only limited to resources, the Institute also provided the content knowledge teachers need to generate well-designed, innovative standard-based science lessons that boost student engagement and learning. Students reap the benefits of enriched science instruction, led by teachers who bring a renewed enthusiasm to their teaching – a mutually beneficial outcome for both students and teachers.

In addition to teachers working with historically underserved student populations, there were educators who work in a dual language program that connected specific scientific modeling strategies as an interdisciplinary approach to their

literacy work, according to Monaghan. The participants came away from the Institute with a better understanding of the content in relation to their pedagogical practices and of their experience as learners.

"Overall, it was an awesome opportunity to have attended QUEST," said one of the participating teachers. "It was an engaging experience. This has motivated me to come up with more hands-on ideas to try when I go back to my classroom and teach science in fun and engaging ways."



QUEST 2022

"These labs made me see how science can come to life right in your classroom," commented another.

For QUEST, that's the whole point.

The QUEST program, initiated more than 30 years ago, hopes to continue next year with sponsorship from the Cooperative Institute for Modeling the Earth System (CIMES).



QUEST 2022

AOS/CIMES Cohorts Visit Bronx Community College & City College of New York

On October 27 and 28, two cohorts from AOS/CIMES had the opportunity to meet Bronx Community College (BCC) and City College of New York (CCNY) students to discuss climate science and their personal, academic, and professional journeys into the field. Both schools are part of the City University of New York (CUNY), a network of public institutions in New York City renowned for its facilitation of upward mobility.

AOS/CIMES Postdocs Veeshan (Vee) Narinesingh, Akshaya Nikumbh, Mingyu Park, and Bor-Ting Jong, visited BCC on October 27. Latoyia Kirton, a NOAA/GFDL administrative support specialist, joined them, discussing pathways in climate science as federal employees, contractors, and grantees.



L to R: V. Narinesingh, L. Kirton, A. Nikumbh, B-T Jong, & M. Park Visiting BCC

On October 28, Narinesingh and AOS Students Cindy Wang and Gabriel Rios visited the CCNY campus at the invitation of the City College Physics Club. For these scientists, all three CCNY alum, it wasn't the first time on campus. A key reason for participating in this outreach event is that they launched their academic journeys at CCNY and have seen first-hand the possibilities and futures it can foster.

Sharing their passion for science and promoting a spirit of community engagement, the scientists discussed their ongoing research, covering topics from Rossby waves, to Arctic warming, to weather extremes and climate, to climate modeling and aerosol-cloud interactions. They held Q&A sessions with large groups of attentive BCC and CCNY students, sharing their academic backgrounds and individual career pathways – including the factors that challenged them or inspired them along the way. They also fielded general questions about climate science and earth system modeling.

The visit had many reciprocal benefits for the researchers seeking professional growth and for the community college students who welcomed the opportunity to connect with

Princeton scientists. Students were introduced to early career scientists with similar interests but different career trajectories, clarifying misconceptions of what scientists look like and breaking down barriers for students to follow scientific career paths. For the scientists, both days were opportunities to communicate their science to a lay audience and to hone-in on why climate science and the work of climate scientists matters.

The endeavor not only exposed BCC and CCNY students to the field and the varied pathways to enter it, but also provided a unique opportunity for the AOS/CIMES scientists to gain new perspectives and see beyond their Princeton experience.

"It was an honor to go back home to CUNY and now experience things from in front of the lecture hall," Narinesingh said. "You could feel the energy and curiosity in the room from these brilliant students. From our conversations, you could tell the students were not only genuinely interested in the science itself, but also how to apply it to help their communities. It was a beautiful experience; I can't wait until the next one!"

"Sharing our research and personal journey with the students at BCC was a great learning and rewarding experience," Nikumbh said. "I was glad to see an active participation during the Q & A session! I was particularly amazed to hear genuine questions about ways to reduce our climate footprint, possible technological-social solutions, and studying climate science."

"We all want to learn about climate change and how to tackle it, but where do we start?" said Charanjot Singh, a CUNY undergraduate who organized the CCNY event. "This event showed the clear path you need to bring the changes."



L to R: C. Wang, G. Rios, & V. Narinesingh Visiting CCNY

"It was especially poignant for Veeshan, Gabe, and I to return to our alma mater and reflect on our journey since then," said Wang. "Beyond their academic classes, it was vital that we reinforce that CUNY is well-equipped with the tools and opportunities for these students to succeed. Our discussions navigated tough topics, like imposter syndrome and having an unconventional background in academics, and I sensed a genuine comradery amongst those in attendance over our shared experiences at CUNY."

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BCC & CCNY Visits continued from Page 10

"I felt that it allowed us to engage with them more personally instead of just formally as visitors," Wang added. "It was particularly touching for me to have my undergraduate thesis adviser present at the talk and see burgeoning interest in our field from these young scientists and engineers. This experience has reinforced my interest in maintaining my connections with CUNY professionally and personally, and I can't wait for other opportunities to give back!"

"It was great to see three of our former students, who are all studying and working at Princeton now, to come back to their alma mater and share their experiences in pursuing a career in climate science," said Johnny Luo, professor and chair of the Department of Earth and Atmospheric Sciences, CUNY. "Their visit and presentations bring tremendous encouragement to CCNY students, many of whom come from underprivileged backgrounds and are always looking for role models and guidance in their pursuit of passion and career. To me, as their former mentor/instructor, I was very delighted to witness their growth in both character and knowledge."

This recent outreach effort echoes a wider movement within AOS/CIMES to ramp up efforts to broaden participation in STEM disciplines for those from all backgrounds and identities, as well as to ultimately help diversify the talent pool and frames of reference in the climate science community. The hope is to continue working with institutions serving large underrepresented populations to help these students get a better understanding of what climate science is, and the different pathways one can take to get into it.

The effort not only exposed the students to the work being conducted in AOS/CIMES and GFDL in the field of climate and earth system science, but also ensured the students that there is support from scientists, at institutions like Princeton, to navigate their way forward in the academic world and in the entire spectrum of career possibilities.

AOS/CIMES researchers interested in outreach and engagement beyond Princeton should contact Sonya Legg to be added to the AOS outreach listserv.

Maya Chung Examines Dynamics of the Global Water Cycle at ACDC Summer School

AOS Graduate Student Maya Chung attended the Advanced Climate Dynamics Course (ACDC) from September 4-16, 2022 in Rondvassbu, Rondane National Park, Norway. Coordinated by the University of Bergen since 2009, the summer school brings Ph.D. students, postdocs, and faculty from around the world together in a remote locale to study climate science.



Maya Chung

This year's focus was "Dynamics of the Global Water Cycle," covering topics related to the atmosphere, ocean, land, and cryosphere, modern and paleoclimate, and empirical and dynamical approaches to understanding the global water cycle. Students at the summer school attended lectures, went on field excursions, and worked in small groups to lead discussions and conduct research projects.

A priority of the summer school is to identify a set of tractable research questions around the theme of the global water cycle – potentially spanning traditional disciplinary boundaries – and to make substantial group-level progress in researching answers to these questions. The course was designed to be highly interactive, and students were encouraged to inquire, question, and get involved in the conversation during and outside lectures.

"It was an incredible privilege to attend ACDC and interact

with climate scientists from all over the world, especially after two years of limited networking," Chung said. "Each student brought different expertise to the table, so the professors treated us like peers."

Held in the heart of the Norwegian mountains, the summer school made the most of its natural setting and surrounding landscape, with breaks from lectures for exploration and casual interaction and connection. Adding to this year's experience, the lecturers and students went on a weekend hike and camping trip.

"It was also nice to be able to disconnect for two weeks (there was no wifi or phone service), and this helped us connect with each other and fostered deeper discussions," said Chung. "I walked away inspired and excited to explore new research questions."

By combining fieldwork with interdisciplinary lectures, ACDC students gain integrated perspectives on global warming cycling from empirical observations, fundamental dynamics, and numerical modeling, with the ultimate goal of catalyzing work across the world in different disciplines.

Chung's research interests are in climate change, extreme events, ocean-atmosphere interactions, and interactions between climate and infectious diseases. Her primary Ph.D. thesis research focuses on the El Niño—Southern Oscillation (ENSO) and its interactions with ocean salinity and climate change. AOS Faculty Member Gabe Vecchi is Chung's thesis adviser.

AOS Program 2022 Retreat

The AOS Program Annual Retreat, a semester highlight for members of the AOS community, was held on August 30, 2022. Approximately 40 members of the AOS community, including graduate students, postdocs, and faculty, gathered at the historic Updike Farmstead in Princeton for a day of social interaction and community building.



Members of the AOS community at Updike Farmstead

The new locale was the idea of AOS Graduate Student Ben Johnson whose great grandfather was raised on the farm. The Farmstead, now owned and operated by the Princeton Historical Society, was the ideal location for newcomers to get their first glimpse of the community as a whole as well as an unparalleled opportunity to for everyone else to reacquaint themselves with one another. While the retreat did not feel “fall-like” with a daytime high in the nineties, it did not disappoint.

The day began with introductions, especially notable for meeting and welcoming the AOS Program’s newest graduate students Winnie Chu, Lynn Hirose, Matt Lobo, Heng Quan, and Gabriel Rios and introducing them to the research community within the Program.

“We did the activities/lunch in a restored barn, which was quite cool (though it was a bit hot!), said Johnson, a retreat organizer.

The retreat offered some surprises. Following introductions, participants were broken into four groups and were handed a copy of the abstract from 2021 Nobel Laureate Suki Manabe’s 1975 paper “The Effects of Doubling the CO₂ Concentration on the Climate of a General Circulation Model.” The task was a bit unusual, according to Johnson. One group member read the abstract aloud, and then the rest of the group performed an “interpretative dance” to give the audience a visualization of the abstract.

“Honestly, I was quite impressed with how creative people were,” Johnson said. “My group got a little wet when AOS Faculty Member Bob Hallberg used a water bottle to demonstrate that the “doubling of carbon dioxide significantly increases the intensity of the hydrologic cycle.”

For the next activity, the organizers had the four groups compete to build the tallest structure out of dry spaghetti and marshmallows – no small feat! Each group took a slightly different approach, with Johnson’s group trying to build the bottom, middle, and top separately, but ultimately finding that their base was not strong enough to hold the top. The group who built a hexagon shape were ultimately triumphant, having built the tallest structure. Within all of the groups, it is fair to say that both fun and *frustration* abounded.

Having worked up their appetites, the groups broke for sandwiches and salads from Lucy’s, a welcomed break and a perfect opportunity for casual interaction and exploration of the grounds and Farmhouse. One of the highlights of the property is the Einstein Collection, one of the larger 3D collections of Einstein materials in the United States.

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Energized from lunch and perhaps even a bit inspired by Einstein, a renowned creative thinker, four new groups unleashed their creative juices in the day's culminating activity. Retreat organizers gave each group a silly research project to explore, including "Modeling the earth system at the atomic scale," "Rebuilding the Greenland ice sheet with snowmakers," "Perturbing the climate to better understand the climate system," and "Enhancing ocean mixing with whale breeding." The group tasked with "Modeling the earth system at the atomic scale" concluded that we would need many universes of energy to run the simulation. A second group, tasked with "Rebuilding the Greenland ice sheet," suggested that we use the snowmakers over the North Pacific to warm the atmosphere and create a Rossby wave train that increases snowfall over Greenland. The other two groups rounded out the exercise with similarly creative and entertaining solutions.

No matter the outcome, collaboration, connection, and an abundance of fun was at the heart of planned activities, making the retreat a win-win for the entire AOS community.

Following the day's activities, the first-year students met with AOS Director Stephan Fueglistaler for an introduction to the Ph.D. Program.

"The retreat is always a great way to welcome new students to the Program, and for everyone to connect with each other," Johnson said. "I may be biased, but I think people really enjoyed it. I think the clear favorite activity of the crowd was building structures out of marshmallows and spaghetti!"



A hexagon base -- genius!



Ta-da!

"As an incoming first-year, the retreat was a great chance to meet everyone in the department, from students and postdocs to faculty and administrative staff, in a laid-back setting," said AOS Graduate Student Gabriel Rios. "The 'submit a fictional proposal' activity was a highlight -- it was fun watching professors and students amicably bicker over specific details on hypothetical situations, such as 'how many AC units would it take to melt Greenland?' Big thanks to Ben Johnson and Josh Rines for organizing!"

The credit for the success of the 2022 retreat goes to an organizational committee comprised of graduate students and staff who oversaw the planning and implementation of the retreat, including science and social activities. In addition to Johnson, committee members included AOS Graduate Student Josh Rines and AOS Graduate Administrator Anna Valerio, who lent administrative support to the committee members during the planning process.

Alumni News

AOS Graduate Alum **Sarah Kang** (Ulsan National Institute of Science and Technology) was awarded the [Atmospheric Sciences Ascent Award](#) by AGU.

Former AOS Postdoc **Corinne Le Quééré** (University of East Anglia) was selected to deliver AGU's [Rachel Carson Lecture](#).

Former AOS Postdoc **Dan Li** (Boston University) received the [Timothy Oke Award](#) in the Field of Urban Climatology from the International Association of Urban Climate. Dan was also recently tenured and promoted to associate professor at Boston University.

AOS Graduate Alum **Anna Trugman** (University of California, Santa Barbara) was awarded the [AGU Global Environmental Change Early Career Award](#).

AOS & CIMES News

Congratulations to **Houssam Yassin** who successfully defended his Ph.D. Thesis, "The Geostrophic Turbulence of Boundary Buoyancy," on August 11. He accepted a postdoctoral position at the University of Maryland.

Congratulations to **Juho Iipponen** who successfully defended his Ph.D. Thesis, "Role of Clouds in Tropical Climate and its Variability," on August 26. Juho accepted a computational fluid dynamics developer position at WindSim A/S in Tønsberg, Norway.

Suki Manabe's Nobel Prize in Physics was awarded largely for his early work on one-dimensional models of "radiative-convective equilibrium" (RCE), which produced the first credible estimates of Earth's climate sensitivity. A new article reviews that work and tries to identify those aspects that make it so distinctive. The [retrospective](#), led by **Nadir Jeevanjee** (GFDL) with AOS Senior Meteorologist **Isaac Held** and AOS Faculty Member **V. Ramaswamy**, was recently published in BAMS.

AOS Postdoc **Zack Labe** received an Early Career Scientist Best Poster Award at the [CLIVAR CDP 2022 Workshop](#).

Arrivals

Yi-Hung Kuo joined the Program in early August to work with Ming Zhao as a postdoc. He comes to Princeton from the University of California, Los Angeles.

Wenda Zhang arrived in late August, from Stony Brook University, to work with Steve Griffies as a postdoc.

Minki Hong joined the Program in late August to work with Elena Shevliakova as a professional specialist. He comes to Princeton from Texas A&M.

Tsung-Lin Hsieh arrived in early September, from HMEI (Princeton) where he worked with Gabe Vecchi, to work as a postdoc with Lucas Harris.

Theresa Morrison joined the Program in mid-September to work with Bob Hallberg as a postdoc. She comes to Princeton from the University of California, San Diego.

Qianqian Song arrived in late September, from the University of Maryland, to work with Paul Ginoux and David Paynter as a postdoc.

Nora Loose joined the Program in early October to work with Alistair Adcroft as a postdoc. She comes to Princeton from the University of Colorado, Boulder.

Ilai Guendelman arrived in mid-October to work with Tim Merlis and Stephan Fueglistaler as a postdoc. He comes to Princeton from the Weizmann Institute of Science.

Xia Li joined the Program in late October to work with Mitch Bushuk and Zhihong Tan as a postdoc. She comes to Princeton from the University of Utah.

Emanuele Gentile arrived in early November, from the University of Reading, to work with Ming Zhao and Leo Donner as a postdoc.

Departures

Yujin Zeng left the Program in late August to work as an assistant research scientist at GESTAR II.

Wei Zhang left the Program in late August. He accepted a research scientist position at the University of Miami. He also serves as a visiting scientist at NOAA Global Systems Laboratory.

Alex Huth accepted a physical scientist position at GFDL in mid-October.

Chloe Gao is leaving Princeton in late November, but will continue to collaborate remotely through mid-January. She accepted a tenure-track position at Fudan University, Shanghai.

Alex Haumann is leaving the Program at the end of December. He accepted a tenure-track group leader position that is shared between the Alfred-Wegener-Institute and Ludwig-Maximilians-University in Munich.

Naser Mahfouz is leaving the Program at the end of December. He accepted a position at PNNL.

Christina Schultz is leaving the Program at the end of December. She accepted a position as an assistant professor at Northwestern University.

