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 Newly Admitted Graduate Students

Maya Chung

Maya Chung completed her bachelor's degree in Earth and Planetary Sciences at Harvard University in 2019, focusing on physical oceanography and applied mathematics. Since then, she has been teaching fifth graders in Boston Public Schools and at the Children's School of Science in Woods Hole. Her research interests include climate, extreme events, and ocean-atmosphere interactions. Maya also enjoys developing innovative mathematical approaches to climate science. At Princeton, she hopes to pursue research questions that are both scientifically intriguing and socially relevant, gain a deeper understanding of how climate research translates into policy, and continue teaching and mentoring students, under the advisement of Gabe Vecchi.

Kaylie Cohanim

Kaylie Cohanim received her bachelor's degree from UCLA, where she completed a joint major in mathematics and atmospheric and oceanic sciences. There, she was introduced to the study of oceanic geophysical flows and, using theory and high-resolution models, researched how cracks in ice-sheets affect the ocean profile and circulation of ice-covered regions. This experience inspired a particular interest in the high-latitudes, ice-ocean-atmosphere interactions, ocean mixing dynamics, and eddy mechanics. In the future, Kaylie hopes to combine theory, modeling, and observations to better understand the impacts of submesoscale processes on the larger-scale ocean circulation, as well as the role ice-covered regions play in our changing climate system. At Princeton, she intends to develop into a well-rounded scientist and acquire the skill-sets necessary to produce research that is beneficial to the general public, policy makers, and scientists from wide-ranging disciplines (and, as a warm-climate dweller, develop immunity to cold weather). Kaylie's adviser is Sonya Legg.

Welcome!

We hope this newsletter finds you and your families well during these extraordinary times. Despite the challenges presented by the ever-changing COVID-19 landscape, CIMES and AOS faculty, researchers, and students continue to navigate their daily research activities from their homes, accomplishing critical work. This would not be possible without the significant commitment, talent, and dedication of you all, and we thank you for rising to the challenge.

In this issue, we introduce you to our 2020 incoming graduate students. We highlight the work of Laure Resplandy, one of a number of projects recently awarded CIMES funding. We call attention to our summer internships that have gone virtual. We feature a recent paper, published in ***Science***, on the COVID-19 pandemic and climate. We welcome all those new to our AOS/CIMES community.

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

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Sam Ditkovsky

Sam Ditkovsky earned his bachelor's degree from Haverford College, with a major in astrophysics and a minor in philosophy. His undergraduate research involved climate modeling of Earth-like exoplanets. His current research interests are investigating the interface between physics, chemistry, and biology in the world's oceans. At Princeton, Sam hopes to apply his background in physics while expanding his scientific understanding to the biochemical realm. More specifically, he hopes to contribute to our understanding of ocean systems such that we as a global community are better equipped to address climate change. In the fall, Sam will be working with his adviser, Laure Resplandy, on modeling deoxygenation in the Indian Ocean.

Cameron MacDonald

Cameron MacDonald comes to Princeton from the University of Waterloo, Canada, where he obtained his bachelor's degree in mathematical physics. His research interests include atmospheric physics and fluid dynamics. Cameron hopes to make important contributions to climate science while at Princeton and have some fun along the way, supporting research that leads to a greater understanding of Earth's climate system and the implications of global climate change. He will be advised by Yi Ming.

Xinyue Wei

Xinyue Wei earned her bachelor's degree in marine science/physical oceanography from Ocean University of China. Broadly, she is interested in the ocean's role in climate, with a particular interest in the mechanisms and impacts of Atlantic meridional overturning circulation (AMOC). Under the advisement of Rong Zhang, Xinyue hopes to gain further expertise in physical oceanography and independence in conducting research at Princeton. She is excited about the possibilities for collaborative research and the extraordinary resources the University and GFDL provide students.

AOML/GFDL Science Connections Workshop

The AOML/GFDL Science Connections workshop, will be held virtually on Wednesday, August 12 and Thursday, August 13. The goal of this meeting is to strengthen collaboration between the two labs by exploring how scientists can combine observation and modeling work conducted at both labs to better understand Earth-system issues of mutual interest. Participants will have the opportunity to problem solve collaboratively to address these issues.

"Initially, we will focus on research over the Atlantic, Gulf of Mexico, and Caribbean region," said CIMES Associate Director Sonya Legg, a member of the workshop organizing committee.

The meeting will consist of two sessions - a morning session and afternoon session on each day. Workshop organizers are also planning to hold a GFDL model and AOML observational tutorial session on Wednesday August 19 (time TBA). Participants are welcome to join for individual sessions or participate in all sessions, according to Legg.

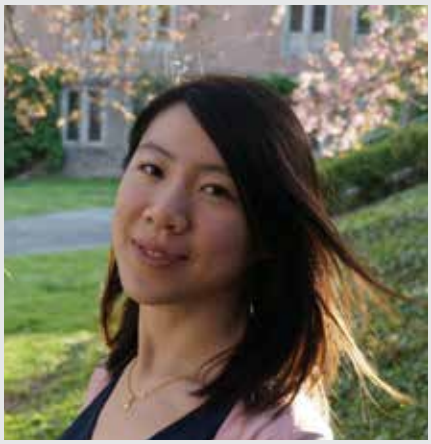
In preparation for the workshop, organizers sent a survey in late June to poll researchers at both labs to find out what cross-lab collaborations are already ongoing or in development.

"Ultimately, we hope the workshop will help us explore problems of mutual interest, and identify where our complementary expertise can be brought together to solve those problems," Legg said.

Submit your registration for the workshop via this link.

Ching-Yao Lai to Join AOS Faculty

The AOS Program will welcome new faculty member Ching-Yao Lai, assistant professor of geosciences, effective January 1, 2021.



Yao is a fluid dynamicist with a general interest in developing reduced-order models for nature's complexity. After a B.S. in Physics, Ph.D. in Engineering, and postdoctoral research in Earth Science, she is currently studying the physical processes that govern the vulnerability of ice shelves in a warming climate. Yao uses idealized mathematical models, laboratory experiments, and simulations to explore a range of problems involving the interplay between viscous flows, elastic structures, fractures, and multiphase interfacial flows, with applications in climate science and geophysics. Upon joining the AOS Program, Yao will explore fundamental questions centered around the future of ice sheets with both modeling and physics-informed deep learning.

CIMES Award Highlight

Ocean Eddies and Oxygen

The global ocean has lost dramatic amounts of oxygen (O2) over the past fifty years in response to warming, which makes O2 less soluble and limits the exchanges of O2 with the atmosphere. This ocean de-oxygenation is expected to continue during the 21st century unless greenhouse gas emissions are rapidly curtailed [IPCC, 2019].

A major concern is that tropical oxygen minimum zones (OMZs) - low oxygen layers between 200 m and 1000 m depth - will expand and threaten the survival of marine organisms that rely on O2 for respiration and affect the biogeochemical cycling of carbon and nitrogen, potentially amplifying global warming. Yet, Earth-system models (ESM) currently project dramatically different changes in OMZ volume (ranging from –2% to +16% by 2100), due to uncertainties in physical and biological processes controlling O2 in OMZs. A major limitation is to incorporate the influence of fine-scale heterogeneities induced by ocean eddies together with global circulation changes associated with warming.

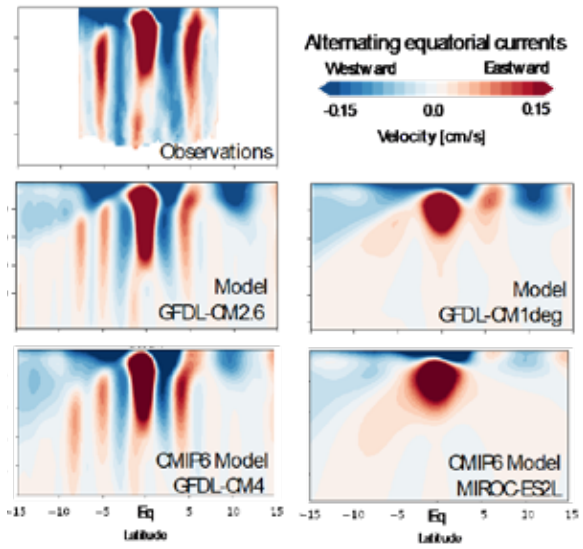


Figure credit: Julius Busecke and Laure Resplandy. East-west alternating Equatorial currents in the Pacific Ocean in observations (Johnson et al., 2002) and four ESMs.

With funding from CIMES, Laure Resplandy, assistant professor of Geosciences and Princeton Environmental Institute, and Julius Busecke, postdoctoral researcher at Princeton University, used the high-resolution ocean (10 km) ESM developed at NOAA-GFDL (named CM2.6) and coarser ESMs including the Climate Model Intercomparison Projects CMIP5 and CMIP6 to investigate the role of eddy-scale ocean circulation features on the distribution and future evolution of the largest OMZ in the tropical Pacific Ocean. They showed that eddy-scale east-west alternating currents associated with the Equatorial Undercurrent (EUC) system are key to represent the OMZ structure and temporal variability (Figure). Coarser ESMs commonly misrepresent these currents, which leads to an unrealistic shallowing of the OMZ in the eastern Pacific Ocean and an OMZ that becomes too sensitive to global ocean circulation changes. This shortcoming compromises the ability to reproduce the OMZ temporal variability.

The latest CMIP exercise – CMIP6 – is the first CMIP exercise to include a few models, such as the GFDL-CM4 model, that resolve eddy-scale structures of the Equatorial Undercurrent system (Figure). Ongoing work by the researchers show that the presence of these alternating currents influences future projections of the OMZ. Models that do not include these jets systematically project a strong expansion of the Pacific OMZ, while models including these jets show very weak changes by 2100. This suggests that the ocean circulation at the eddy scale stabilizes the OMZ and limits its expansion under global warming. Shortcomings in the representation of this eddy scale dynamics contribute to the disparate trends in next century ESMs projections. This work is done in close collaboration with John Dunne from GFDL.

Recent publications supported by CIMES:

Busecke, J.J.M., Resplandy, L., Dunne, J.P., 2019. The Equatorial Undercurrent and the Oxygen Minimum Zone in the Pacific. Geophysical Research Letters 46, 6716–6725.

Resplandy, L., 2018. Will ocean zones with low oxygen levels expand or shrink? Nature 557, 314–315.

Warmer Climates Unlikely to Slow the Spread of Novel Coronavirus

With the summer months upon us, many had hoped that the spread of SARS-CoV-2, the novel coronavirus that causes COVID-19, would follow other coronaviruses that spread more slowly in the warmer months. A recent study, published May 18 in the journal Science, however, cast some doubts.

The researchers, led by PEI Postdoctoral Research Associate Rachel Baker, found that humans' current lack of immunity to SARS-CoV-2 and the speed at which the pathogen spreads – not local variations in climate – will likely be a primary factor behind the spread of the novel coronavirus this summer and into the fall.

The rapid spread of the virus in Brazil, Ecuador, Australia and other nations in the tropics and the Southern Hemisphere — where the virus began during the summer season — provides some indication that warmer conditions will indeed do little to halt the pandemic, Baker said.

"It doesn't seem that climate is regulating spread right now," Baker said. "Of course, we do not yet directly know how temperature and humidity influence the virus' transmission, but we think it is unlikely that these factors could completely halt transmission based on what we see among other viruses."

For the study, the research team ran simulations on how the pandemic would respond to various climates across the globe based on what is known about the role of climate in the spread of similar viruses. The first scenario assumed that the novel coronavirus has the same climate sensitivity as influenza, based on a prior model from laboratory studies that highlighted the importance of low humidity to promote spread. In the second and third scenarios, the virus was given the same climate dependence and length of immunity as human coronaviruses OC43 and HKU1, which are two causes of the common cold.

In all three scenarios, climate only became a mitigating factor when large portions of the human population were immune or resistant to the virus.

On the upside, a simulation of the average impact of control measures such as social distancing suggested that the longer these measures are in place, the more sensitive the virus becomes to warmer weather.

Baker conducted the study with co-author Bryan Grenfell, the Kathryn Briger and Sarah Fenton Professor of Ecology and Evolutionary Biology and Public Affairs and associated faculty in PEI; second author Wenchang Yang, an associate research scholar in geosciences; CIMES Director Gabriel Vecchi, professor of geosciences and the Princeton Environmental Institute; and C. Jessica Metcalf, assistant professor of ecology and evolutionary biology and public affairs.

As a next step, the researchers plan to test their model by comparing future changes in the pandemic curve with detailed measurements of local climate, controls measures and other local variables in different climate regions, according to Metcalf. They also aim to extend their initial model – which provided detailed results for nine cities – to more rural areas.

The study, Vecchi noted, also has far-reaching implications for refining the integration of meteorological information into understanding disease outbreaks.

"We are currently exploring the extent to which weather and climate predictions can help provide improved information about the likely course of this disease," Vecchi said. "Weather is only one of many factors. A deeper, interdisciplinary understanding of the interplay of multiple factors that impact disease evolution –disease dynamics, weather and socioeconomic drivers, including mitigation measures undertaken by society – is needed."

The publication stems from PEI's Climate Change and Infectious Disease Initiative, which brings together climate scientists and epidemiologists to better understand the direct and indirect impacts of climate on human health.

The paper, "Susceptible supply limits the role of climate in the early SARS-CoV-2 pandemic," was supported by the Cooperative Institute for Modeling the Earth System (CIMES), the Princeton Environmental Institute (PEI), and the Princeton Institute for International and Regional Studies (PIIRS). DOI: 10.1126/science.abc2535

Summer Internships Go Virtual

Summer internships may look different this summer due the COVID-19 pandemic, but AOS and GFDL hosts and mentors are committed to creating a meaningful virtual internship experience for interns who are working remotely this summer under the sponsorship of the Cooperative Institute for Modeling the Earth System (CIMES) and the Princeton Environmental Institute (PEI).

For the mentors and their interns, transitioning to a remote experience means flexibility and ingenuity to ensure similar learning opportunities as on-location internships. This is particularly important for CIMES interns who may not have these opportunities at their home institution or elsewhere. The CIMES Research Internship Program, initiated in 2016 under the Program's predecessor CICS, is designed to broaden participation of historically underrepresented groups in Earth system sciences, bridging the gap between NOAA-GFDL, the University, and the wider academic community.

The interns and their hosts have created an online community through a slack channel, virtual climate science tutorials from different GFDL and AOS scientists, and informal lunchtime video-conference discussions. These activities are important to ensure that the students expand their network and develop professional skills, as well as focus on their individual research projects under the guidance of their hosts. The internships are oftentimes a transformative experience for the students, who hail from universities from around the country, representing varied academic interests and experiences. "The students are actively participating in our discussions, most recently on tackling racism in academia, shaping our virtual experience and making a positive impact on the quality and diversity of the climate sciences workforce," said CIMES Associate Director Sonya Legg,

Spanning a range of research conducted at GFDL, the remote CIMES summer projects include modeling mechanisms of coral thermal refugia, conducted by Quiana Berry (Bronx Community College) under the mentorship of Jessica Luo and Liz Drenkard; validating tropical Pacific circulation in the GFDL ocean models conducted by Akira di Sandro (Oberlin College) under the mentorship of Marion Alberty and Sonya Legg; and ocean surface waves under landfalling hurricanes, conducted by Avery Barnett (Grinnell College) under the mentorship of Brandon Reichl.

For the interns who opted for a traditional on-site internship experience, CIMES permitted students to postpone their internships to fall 2020 onwards.

Four PEI interns are also working remotely this summer with AOS hosts under the auspices of PEI's Environmental Internship Program, which offers Princeton undergraduate students the opportunity to complement their academic course of study with hands-on research and project experiences during the summer months.

Viki Mancoridis '23 is working with Fernando González Taboada exploring novel approaches to integrate environmental information into the assessment and prediction of fish stocks dynamics to assess the importance of different drivers on the variability of fish catches. Chaz Bethel-Brescia '22, Yael Stochel '22, and Karena Yan '23 are working with Graeme MacGilchrist and Sarah Schlunegger analyzing changes in marine ecosystem processes and environmental stressors in GFDL's ESM2M under three emission scenarios – aggressive mitigation (RCP2.6), standard mitigation (RCP4.5), and business-as-usual (RCP8.5). Differences between marine health between the low, medium, and high emissions scenarios will provide important considerations for governance, policy, and allowable emissions, according to MacGilchirst and Schlunegger.

In addition to the CIMES and PEI interns, Celeste Tong, an undergraduate from the University of Virginia, is working remotely with the Fueglistaler Group over the summer, focusing on the cloud radiative effect as reported by NASA's CERES/EBAF mission. Natalie O'Leary, a Princeton undergraduate, is researching robust techniques to deploy the Earth System Grid Federation software stack in cloud platforms (e.g. Google Cloud Platform and Amazon Web Services) to expand access to exascale scientific data, under the ASDI and AWS Educate initiatives, with Aparna Radhakrishnan.

Despite the challenges, all of these virtual internships present an opportunity to take remote learning to a new level, with mentorship and collaboration still at their core. The students are engaging frequently with their hosts and participating in remote seminars and events. CIMES Associate Director Sonya Legg acknowledges the effort made by the volunteer mentors and hosts who are navigating this new normal to increase participation in the climate-related sciences. "When they learned of their intern's interest to participate remotely this summer, they worked hard to redesign projects to fit remote work and find ways to maintain communication with the interns."

While this is not the experience any of them would have imagined before the onset of the pandemic, the students and their hosts are not only meeting the challenge, but rising above it – inspiring future research and possible career pathways.

Virtual AOS Program Workshop Planned for August

Due to related COVID-19 concerns, the annual AOS Program summer workshop is moving forward as a virtual event. "Cloud Feedbacks and Climate Sensitivity" will be held virtually during the week of August 17-21, with the generous support of a share of AOS Senior Meteorologist Isaac Held's BBVA Foundation Frontiers of Knowledge Award.

The student-sponsored workshop promises to be an impactful and informative workshop experience, despite the physical distancing, with productive, in-depth scientific discussion at its core. The workshop will build on the success of the Program's previous seven workshops in providing a friendly, informal environment where students and early-career researchers can interact with the invited speakers on a research topic that sits at the heart of climate science.

The invited plenary speakers include: Tim Cronin, Massachusetts Institute of Technology; Dennis Hartmann, University of Washington; Ivy Tan, McGill University; and Mark Zelinka, Lawrence Livermore National Laboratory.

An assistant professor of atmospheric science, Tim Cronin's research interests lie at the intersection of the role of regional-scale atmospheric dynamics, radiative transfer, and coupled surface-atmosphere interactions in the climate system. He combines pencil-and-paper theory and simplified numerical models of the atmosphere to test hypotheses about climate sensitivity, climates of the distant past, and interactions between weather and climate.

A professor in the Department of Atmospheric Sciences and an AOS alum (1975), Dennis Hartmann's research interests include dynamics of the atmosphere, atmosphere-ocean interaction, and climate change. His primary areas of expertise are atmospheric dynamics, radiation and remote sensing, and mathematical and statistical techniques for data analysis. Current research includes the study of climate feedback processes involving clouds and water vapor, which is approached using remote sensing data, in situ data and models, and attempts to take into account radiative, dynamical, and cloud-physical processes.

Ivy Tan recently joined the Department of Atmospheric & Oceanic Sciences at McGill University as an assistant professor. Her interest lies in understanding mixed-phase cloud microphysical processes in extratropical cloud feedbacks. She uses a combination of satellite observations and climate models to research how clouds influence climate change. Some of her recent work includes analyzing the thermodynamic phase shifts of cloud optical depth with temperature, with the hope of better understanding their potential responses to climate change.

An atmospheric scientist who researches climate change, Mark Zelinka is interested in how much global warming we should expect from increasing greenhouse gases. This inevitably leads to the study of clouds, which cool the planet by reflecting sunlight back to space and warm the planet by reducing the infrared radiation emitted to space. How the balance of these competing effects changes as the planet warms (known collectively as the 'cloud feedback') largely determines how much warming accompanies increasing greenhouse gases. He uses theory, observations, and global climate models to investigate these challenging questions.

The structure of the 2020 workshop is similar to past workshops only virtually, featuring a combination of lectures, tutorials, and opportunities for interaction between the speakers and the AOS/GFDL community. Each day will involve four hours of planned activities. In addition to the four plenary lectures, open to the entire AOS/GFDL community, the interactive workshop will include blackboard-style lectures and tutorials for AOS students and postdocs. Group discussions between students and invited speakers who may have overlapping interests are planned, as is a panel discussion between the speakers and the wider AOS community. The discussion will be moderated by the workshop committee, composed of AOS Graduate Students Glen Chua, Lingwei (Liv) Meng, Cindy Wang, and Elizabeth Yankovsky, with both invited speakers and AOS/GFDL scientists serving as panelists.

Despite the virtual format, the committee is hoping that there will still be opportunities for casual and spontaneous interaction between AOS students, postdocs, and faculty, reinforcing pre-COVID social and scientific interactions between the various communities.

Committee members reiterated that they are "planning for an experience that is interactive and engaging for our remote participants, with many stimulating scientific exchanges."

Questions related to the upcoming workshop may be directed to members of the workshop planning committee.

Alumni News

AOS Alum Jane Baldwin (Lamont-Doherty Earth Observatory) accepted an assistant professorship position at UC Irvine's Department of Earth System Science, effective July 2021. As an AOS graduate student, she was advised by CIMES Director Gabe Vecchi.

In related news, Jane was awarded the 2020 Carbon Mitigation Initiative Best Paper Award for Postdoctoral Fellows for her paper "Temporally Compound Heat Wave Events and Global Warming: An Emerging Hazard" published in Earth's Future last spring. She also recently presented in a National Academy of Science panel/Webinar on "Environmental Extreme Events and COVID-19 in 2020: A Discussion of Challenges, Needs and Priorities." This interactive webinar explored implications of compound environmental events for disaster preparedness and response with attention to decision making and equity dimensions as communities also grapple with COVID-19. Jane focused her discussion on compound extreme events, and projected changes with warming, Over 1300 people registered for the event.

AOS Alum Geeta Persad accepted an assistant professor position in the Jackson School of Geosciences a the University of Texas - Austin, effective fall 2020. She was co-advised by V. Ramaswamy and Yi Ming.

2020 SOCCOM Annual Meeting Held Virtually

The annual meeting of the Southern Ocean Carbon Climate Observations and Modeling (SOCCOM) program was held virtually from Wednesday, June 17 through Friday, June 19, 2020 due to the COVID-19 pandemic. Originally planned as an in-person meeting, the event still attracted over 70 cross-disciplinary experts from institutions across the United States to hear about the initiative's progress over the past six years and plans for the future.

SOCCOM has just completed its sixth year and is embarking on renewal funding for the next four years, The program has 156 deep-diving biogeochemical floats currently operating in the Southern Ocean, including 31 floats deployed this spring through heroic efforts by US and international research partners to overcome challenges due to shortened cruises and travel restrictions in the midst of the pandemic. The floats are autonomous and transmit measurements of ocean oxygen, nitrate, and pH, as well as bio-optical measurements, from the remote Southern Ocean, and all data are publicly available in real-time.

The meeting focused on newly observed zonal asymmetries in heat, carbon, and freshwater fluxes as well as modeling studies of climate modes and climate prediction in the Southern Ocean. Moderators and presenters included SOCCOM Director Jorge Sarmiento and current and former AOS researchers Joellen Russell (University of Arizona), Brendan Carter (University of Washington), Seth Bushinsky (University of Hawaii), John Dunne (GFDL), Benjamin Taylor (AOS), Ruth Moorman (AOS), Elizabeth Yankovsky (AOS), Alex Haumann (AOS), Lionel Arteaga (AOS), and Haidi Chen (AOS), who reported on the science and recent research initiatives and BGC float technology advances. Bob Key (AOS) reported on the program's adopt-a-float initiative, which has also gone virtual and has been lauded by teachers for providing much-needed opportunities for interaction during distance learning. The meeting was also preceded by an online workshop on the project's Southern Ocean biogeochemical state estimate, B-SOSE, organized by AOS researchers Sarah Schlunegger and Graeme MacGilchrist, which attracted 68 participants from over 50 institutions around the world.

SOCCOM floats have collected over 16,000 profiles containing over 5 million biogeochemical measurements, according to SOCCOM director Jorge Sarmiento, Princeton's George J. Magee Professor of Geoscience and Geological Engineering, Emeritus. The initiative has made the Southern Ocean the best-observed region of the ocean in terms of biogeochemistry and resulted in over 100 publications. SOCCOM will continue to deploy BGC-Argo floats over the next 4-5 years and Sarmiento is also a co-PI on an NSF proposal to extend the project to the global ocean.

SOCCOM is supported by the National Science Foundation (NSF).

AOS & CIMES News

Arrivals

Joseph Mouallem joined the Program as a research software engineer in mid-April. He is working with Lucas Harris and Tim Marchok. He came to Princeton from the University of Waterloo in Ontario, Canada.

Celeste Tong, an undergraduate from the University of Virginia, is working with the Fueglistaler Group over the summer months as an intern.

PEI Interns **Chaz Bethel-Brescia**, Viki Mancoridis, Yael Stochel, and Karena Yan began their remote internships in early June. Viki is working with Fernando Gonzalez Taboada and Chaz, Yael, and Karena are working with Graeme MacGilchrist and Sarah Schlunegger.

Natalie O'Leary, a Princeton undergraduate, began a remote internship in late June with support from CIMES. She will be working with Aparna Radhakrishnan.

Maya Chung, one of our new graduate students, began working remotely in early July under the advisement of Gabe Vecchi.

Neeraja Bhamidipati joined the Program in early July, from the University of Cambridge, to work with Alistair Adcroft, Steve Griffies, and Bob Hallberg as a postdoc.

We welcome back **Pablo Zurita-Gotor**, a returning faculty member from the Universidad Complutense de Madrid, who began working remotely in early July.

Yuchao (Chloe) Gao joined us in mid-July, from MIT, to work with Vashali Naik as a postdoc.

Wei Zhang will join us in early August, from RSMAS, University of Miami, to work with Tom Knutson and Lucas Harris as a postdoc.

Zun Yin will join us this summer, from the Laboratoire de Météorologie Dynamique (LMD), to work as a postdoc with Kirsten Findell and Elena Shevliakova. (His start date is not yet finalized.)

Departures

Effective in mid-April, **Nadir Jeevanjee** moved from AOS to GFDL where he holds a physical scientist position.

AOS Postdoc **Jian He** left the Program at the end of June. She accepted a research scientist position at CIRES, University of Colorado Boulder.

COVID-19: Coronavirus Update!

AOS faculty, staff, and students should continue to check the University's COVID-19 website for updates on the continuing effort to ensure the health and well-being of the community.