Atmospheric and Oceanic Sciences

AOS
the science surrounding us all

2024 Newsletter

THE UNIVERSITY OF CALIFORNIA
LET THERE BE LIGHT
UCLA

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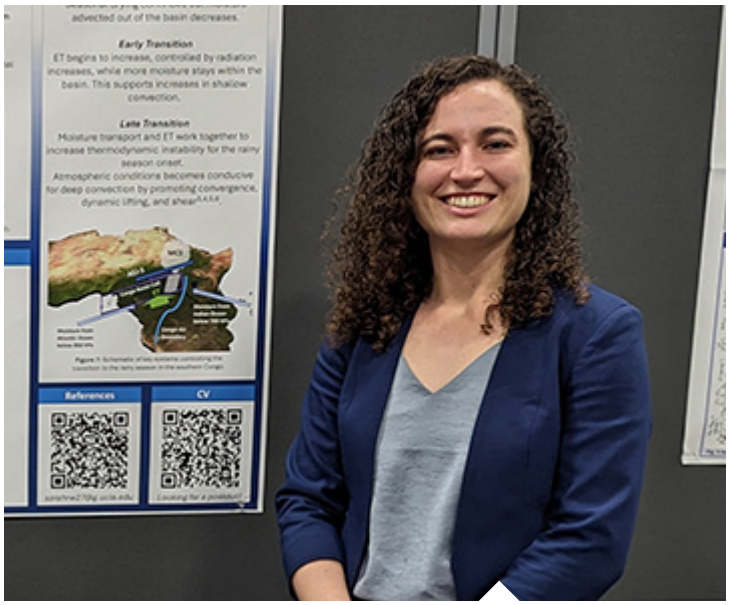


01 A MESSAGE FROM THE CHAIR

LETTER FROM THE CHAIR

WRITER: JACOB BORTNIK

It gives me great pleasure to present the second edition of the Atmospheric and Oceanic Sciences (AOS) department's newsletter! Much has happened in the three years since the publication of the first edition, and the following pages capture some of the happenings, the research accomplishments, the tremendous support we've received from our friends and alumni, and the inevitable turnover of our personnel.

The past three years have presented some formidable challenges, not unlike those reported in our inaugural newsletter. Though we've (thankfully) not had to deal with another global pandemic, we have nevertheless gone through a period of unprecedented strikes, political divisions, encampments, and a shocking outbreak of violence on campus that made international news. The rifts, the tensions, the feelings of fear, anger, and vulnerability run through our entire AOS community, and present a tragic example of when compassion and communication break down. We hope to be a healing community to those who have been impacted.

However, this period has also been marked by displays of generosity, excellence, creativity and initiative. In Winter 2023, our students created the Climate Justice Collective (Sec. 2) based on a series of feminist climate justice essays, which inspired art projects, a website, and a presentation at the Fall 2023 American Geophysical Union meeting. This initiative is now being transformed into a departmental class. Among our many supporters (Sec. 3) we've had generous donations from Hollis G. Lenderking '71, the Yanai family, and faculty emeritus Prof. Larry Lyons and his wife Susan Miller. The Hollis G. Lenderking '71 supports postdoctoral scholars affiliated with the Climate and Wildfire. The Yanai family created a historic endowed Chair to support the administrative leadership of the department, as well as supporting the Yanai lecture series (this year featuring famed aquanaut and explorer, Fabien Cousteau). A generous gift from quadruple bruin and faculty emeritus Prof. Larry Lyons and his wife Susan Miller, was used to create the fourth endowed chair in the AOS department, in support of a new faculty member in space physics.

Sections 4 – 9 provide brief highlights from the five main areas represented in the AOS department, those being: oceanography, space physics, biogeochemistry, atmospheric chemistry and physics, and applied dynamics and meteorology. The breadth of research is truly spectacular, ranging from the exploration of the depths of the ocean in the deep sea submersible Alvin, to studying the far reaches of the space environment, ionospheric motions using radars, space weather, and everything in between. The effects of turbulence have been shown to keep dust aloft for far longer than previously believed, aiding its transport from the Sahara Desert and over the Atlantic, and the subtle teleconnections between mountainous regions like the Rocky Mountains and Tibetan Plateau were revealed, aiding in the prediction of summer floods and droughts in downstream areas. A new area of research is described in Sec. 8, which was recently supported by a large award from the Simons foundation. Here, Prof. Kok outlines the importance of exploring potential techniques for temporarily mitigating the Earth's (rapidly) warming climate, for example by seeding shallow clouds

in the wintertime pole regions, which has several promising advantages over previous approaches.

The AOS department's faculty continue to be recognized at the highest levels Prof. Rong Fu was elected to the National Academy of Engineering, Prof. Pablo Saide was honored with the NSF CAREER, and Prof. Suzanne Paulson (former chair) received the Fulbright Specialist award. Closer to home, the AOS awards ceremony celebrated many outstanding achievements, as well as giving out a few hilarious and heartwarming awards, for example, XEP presented our Student Affairs Officer, Ms. Kathy Yi, the "Radiance Award" for "consistently brightening our days", and Prof. Jochen Stutz received the "Sunscreen Award" for his outstanding lectures on the dangers of solar radiation.

In continuing the tradition of excellence, we welcome two new faculty members to the department: adjunct professor and director of meteorology, Prof. Janine Baijnath-Rodino, and Assistant Prof. Yue Dong, who focuses on teleconnections and will be joining the department in Nov 2024.

The AOS department has been extremely busy with communication and outreach, for instance creating the Pathways to Inclusive research program, contributing to the 5th national climate assessment, starting the Atmospheric Forecasting society, and

Dr. Jacob Bortnik

even presenting to a local high school at a recent "NASA night". Next year, on April 27th, 2025, we plan an exciting and unprecedented collaboration with the Herb Alpert School of Music entitled "Climate Notes", with original works expressly written for this event by 4-5 UCLA composition majors ("Henry Weiss Fellows). We think this event will surely strike the right note!

To conclude, the end of the academic year always brings with it a share of "hellos" and "goodbyes". In addition to our two new faculty hires, we've welcomed four new staff members to our department who have been instrumental in our success. We've also celebrated the largest graduating class in recent memory (48 students), and are bidding farewell to our beloved department manager, who is retiring after 34 years of dedicated service to UCLA and to our department.

We hope you enjoy this newsletter, a beautiful product of the dedicated work of the communications and outreach committee. We hope you stay in touch, drop us a line, attend a departmental event, and if you're in the neighborhood, do drop by and visit your colleagues and friends at the AOS department!

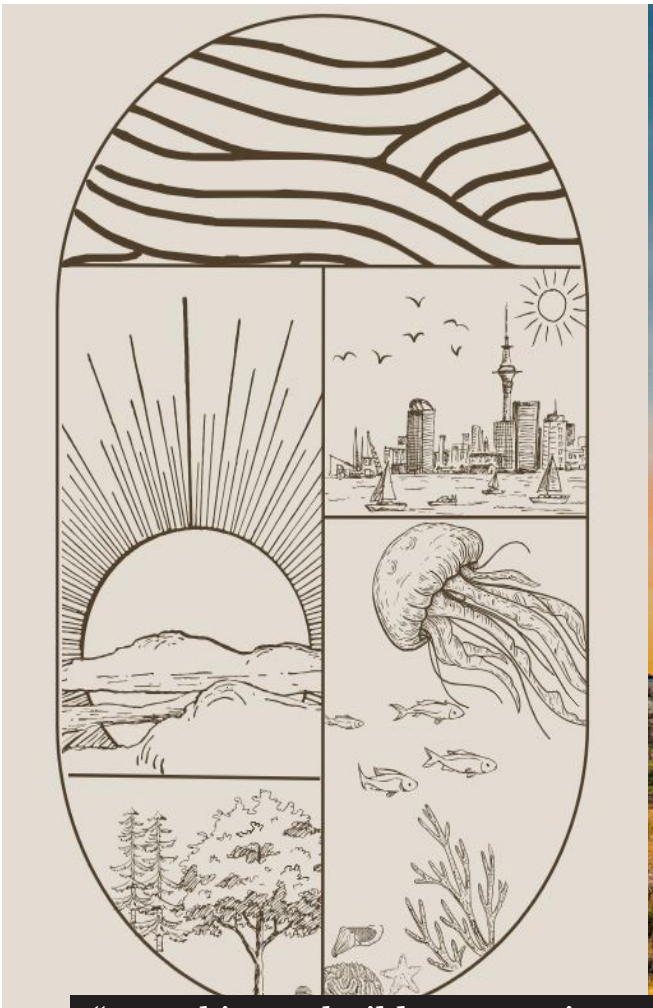
02

We would like to introduce the Climate Justice Collective!

STUDENT STORIES

EDITED BY: JEREMY MARTINEZ

In Winter 2023, a cohort of AOS students collaborated to organize a climate justice-focused reading and discussion group for the Spring Quarter. As atmospheric and oceanic scientists, our work is intricately tied to climate change and its global repercussions. We believe that nurturing values of community advocacy, restorative justice, and multicultural appreciation are essential for cultivating well-rounded scientists. This initiative arose as a platform for us to engage in meaningful discussions, expand our knowledge of climate and environmental justice, and explore our roles as advocates for change both within and beyond academic realms.



"...working to build community and raise awareness about our responsibility as scientists and researchers..."

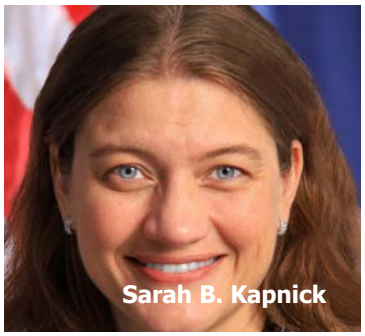
Please check out our website if you would like to learn more and stay tuned in to our future plans!
www.climatejusticecollective.co

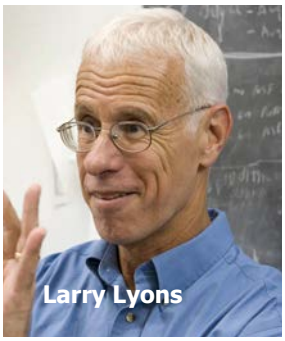
Our inaugural reading group centered on "All We Can Save," a collection of feminist climate justice essays by women encompassing various aspects of the climate movement. The response was overwhelmingly positive, with participants noting that it filled a crucial gap within the department, providing a space for discussing the societal motivations behind our research. Witnessing our community's dedication to integrating social justice into our scientific endeavors was truly inspiring.

Following the reading group, our community thrived. We embarked on art projects inspired by "All We Can Save," engaged in community social events, and delved into Ursula K. LeGuin's acclaimed work of speculative climate fiction, "The Dispossessed." Recognizing the value of our initiatives, we decided to share our resources with a wider audience, aiming to encourage the formation of similar climate justice communities among graduate students at other universities. This led to the creation of a website for sharing our reading group materials, culminating in a poster presentation at the American Geophysical Union (AGU) Fall Meeting in 2023.

We have since expanded our community beyond the AOS department, targeting other climate and earth scientists at UCLA. In Winter 2024, we hosted a discussion series focusing on topics such as indigenous knowledge, scientific ethics, land rights, and the economic dimensions of climate change. These sessions attracted participants from various disciplines, fostering enriching cross-disciplinary dialogues. Currently, we are working on establishing a recurring climate justice-focused reading and discussion group, planning to revisit "All We Can Save" with a new, interdisciplinary cohort in Spring 2024. Moving forward, we aim to have this reading group recognized as an official UCLA graduate seminar, offering course credit to participants and enhancing participation in vital climate justice initiatives within our professional and academic spheres.

Sincerely,
The Climate Justice Collective
Surabhi Biyani, Kira Fish, Sara Graves, Calvin Howes, Will Krantz, Olivia Salaben, and Ling Tsiang


Sarah B. Kapnick


Larry Lyons


Hollis Lenderking

Endowed Chairs

03

The Impact of Giving

We are incredibly thankful to all of our steadfast supporters and champions of our department. We would also like to give special thanks to alumnus **Hollis G. Lenderking, The Yanai Family (Satoshi, JoAn, Takashi and Patti), and The Lyons Family (Larry and Susan Miller)** who each made visionary investments in our AOS community that will have a profoundly positive impact for generations to come.

Investment in AOS Leadership in Space Physics:

We are elated to share plans for our latest endowed chair in the Department of Atmospheric and Oceanic Sciences. Larry Lyons, a quadruple Bruin and faculty emeritus, and his wife, Susan Miller, a retired speech therapist, pledged to establish an endowed chair in their name. This is the fourth endowed chair within AOS to date. The position will support a faculty member in the department with expertise in Space Physics, an area Larry continues to research today. Space physics is vital for safeguarding our Earth from space

Donors who generously gave $1,000+ gifts to the Department of Atmospheric & Oceanic Sciences between May 21, 2021 – June 30, 2023

Larry and Susan Lyons
Hollis G. Lenderking
The David and Lucile Packard Foundation
Satoshi Yanai and JoAn Cho
Takashi Yanai and Patti Rhee
Oceankind
Agnes Liou
Gordon and Betty Moore Foundation
University Corporation for Atmospheric Research
Albert and Elaine Borchard Foundation, Inc.
Chiyoko Furukawa
Yoko Yanai
David A. Randall
Lawrence W. Harding
Climate & Wildfire Institute
Chin-Hoh Moeng
Lance and Helen Bosart
Kuan-Man Xu
Stephen J. Lord
Roger and Jina Wakimoto
Sarah B. Kapnick
Douglas Kosty
Kwok W. Chow
J. David Neelin
Ioana V. Bazavan
Yunyan Zhang
Rong Fu
Donald J. Boucher
Frank M. Chang
Nirmal Keshava

hazards, advancing our understanding of the cosmos, enabling future space exploration, and fostering technological breakthroughs that improve our lives on Earth. The endowed chair ensures the continued leadership of our department in this critical field , and will help foster the next generation of Space Physicists at UCLA.

Visionary Investment in the future of Climate and Wildfire Research:

Postdoctoral researchers constitute a crucial component of any department, representing the next generation of faculty members, experts and change makers in industry. We are therefore thrilled and very grateful to Hollis G. Lenderking '71 for investing in this critical group of scholars both now and in the future through his gift to establish the Climate and Wildfire Postdoctoral Fund. The Climate and Wildfire Postdoctoral Fund will enable AOS to attract the best scholars working in climate and wildfire research for generations to come, empowering them to be able to fully immerse themselves in pioneering research that is critical to the world around us, make important contributions to the overall intellectual life of the department, and serve as essential mentors to graduate students.

Historic Investment in AOS Leadership:

We are honored and delighted to be the first department in the history of the Division of Physical Sciences (and only the second in the entire UCLA College of Letters and Science) to have an endowment dedicated to supporting the administrative leadership role of department chair. This historic Chair is the Michio and Yoko Yanai Endowed Chair in Atmospheric and Oceanic Sciences, named after Michio Yanai, a globally influential, collaborative and visionary member of the AOS faculty from the late 1960s, until his death in 2010, whose major contributions to

Michio and Yoko Yanai

UCLA and the meteorological community at-large are very much felt today, and his wife, Yoko Yanai, a certified public accountant who established the Century & Yanai accounting firm, where she served as president until 2021, remaining active as a consultant until her death in January 2022. We are deeply grateful that the couple's son's Satoshi and Takashi and their respective wives JoAn Cho and Patti Rhee chose our department to be the home of this incredible gift in loving memory of their parents.

Dean's Gift Matching Funds:

UCLA Physical Sciences Dean Miguel García-Garibay is dedicating resources from technological innovations developed by faculty to inspire others to give through the Physical Sciences Matching Gift Program, aimed at significantly transforming the future of UCLA Physical Sciences through endowed support. Endowed funds enable us to attract and support a broader pool of talent that fosters greater scientific accomplishments, promotes underrepresented communities that significantly benefit our society, and empowers our quest for excellence in education and research.

*Qualifying gifts to establish an endowed chair in the Physical Sciences Division will be matched at 50%. (For example, a 1.34M gift will receive a match of $670,000 for a $2M endowment.)

*Qualifying gifts of $5,000 - $100,000 towards a pooled endowment named "research excellence fund" to support Physical Sciences graduate students across the Division will be matched at 100%. (For example, a $100,000 pooled gift will become $200,000.)

*Qualifying estate gifts made through a testamentary pledge may be matched at 50% during the donor's lifetime. Estate gift matches are made on a case-by-case basis.

Dean's Gift Matching Program funds are limited and available on a first-come, first-served basis. To learn how you can establish your legacy through an endowment to support the Department of Atmospheric & Oceanic Sciences, please contact:
Madeleine Martin, mmartin@support.ucla.edu & (310) 882-3633.

A VISIT FROM FABIEN COUSTEAU

A Michio Yanai Distinguished Lecture

On Wednesday, May 22, 2024 AOS was lucky enough to host the famed aquanaut, Fabien Cousteau for a Yanai Lecture. Without the generosity of the Yanai family, and other incredible donors, events like these would not be possible.

Below is a summary of the talk:

Looking at the missing tool of ocean exploration. As growing concerns mount frenetically for our planet's health, the undercurrent of urgency is towing hope and enthusiasm out to sea. Third generation ocean explorer Fabien Cousteau will juxtapose the perceived catatonia of progress with a brief dive into what got us here and the development of a unique platform for ocean exploration that stands to change the course we have set for ourselves; a tool to help steer our future to one of realistic hope and engagement toward solution implementation.

“Being a recipient of the Turco fellowship not only alleviates the significant financial burden that I experience throughout my graduate education but also inspires me to continue striving for significant contributions and breakthroughs in my research. In a few years, I hope to be able to look back on receiving this fellowship as a key milestone in the successful completion of my PhD in AOS.”

Exploring AOS

EXPLORING AOS

WRITER: JASPER LACA

04

Nestled within the vibrant academic community of UCLA, the Atmospheric and Oceanic Sciences (AOS) Department stands as a beacon of excellence in the study of Earth's atmospheric and oceanic systems. With a mission to advance scientific knowledge and predict environmental changes, the department boasts a rich history of pioneering research and a strong commitment to education. Faculty and students alike are engaged in cutting-edge research projects that address some of the most pressing environmental challenges of our time, from climate change to natural disasters.

The AOS Department is renowned for its comprehensive approach, encompassing several specialized sub-departments: Space Physics, Oceanography, Biogeochemistry, Atmospheric Chemistry and Physics, and Applied Dynamics and Meteorology. Each of these areas contributes uniquely to our understanding of the planet's atmospheric and oceanic phenomena.

In Space Physics, researchers delve into the dynamics of the Earth's upper atmosphere and its interaction with solar wind and cosmic phenomena. This branch is crucial for advancing our understanding of how space con-

ditions affect Earth and technology, exploring the intricacies of geomagnetic storms and space weather.

The Oceanography sub-department is dedicated to studying the physical, chemical, and biological processes in the world's oceans. Their research spans from coastal ecosystems to deep-sea environments, providing vital insights into the movement of ocean currents, marine life habitats, and the impact of human activity on marine systems. Such work is essential for predicting climate change impacts and developing sustainable ocean management practices.

Biogeochemistry focuses on the chemical, physical, geological, and biological processes that govern the composition of the natural environment. At UCLA, this field examines the cycles of elements like carbon and nitrogen between the Earth's atmosphere, oceans, and land, addressing global challenges such as climate change and pollution.

In Atmospheric Chemistry and Physics, scientists investigate the composition and behavior of Earth's atmosphere. This includes studying pollutants, greenhouse gases, and aerosols, and their effects on climate and air quality. Researchers in this sub-department develop models to predict weather patterns and climate changes, providing critical data for environmental policy and public health.

The Applied Dynamics and Meteorology sub-department focuses on the dynamics of the atmosphere and its influence on weather systems. Utilizing advanced modeling and observational techniques, they study phenomena like hurricanes, tornadoes, and monsoons. The insights gained here are crucial for improving weather forecasting and mitigating the impacts of severe weather events.

The department fosters an inclusive and collaborative environment where students are encouraged to participate in groundbreaking research alongside esteemed faculty. Graduate and undergraduate students alike have the opportunity to engage in hands-on research, contribute to scholarly publications, and present their findings at international conferences. These experiences not only enhance their academic journey but also prepare them for influential careers in science, policy, and industry.

05

OCEANOGRAPHY

WRITER: TINA TREUDE

- EXPLORING -

Oceanography

End of June 2023, our group set 'sail' to participate in two back-to-back marine research expeditions onboard the research vessel Atlantis (AT50_11 and _12), which hosts the famous deep-sea submersible Alvin. The total length of the two expeditions, which were supported by the National Science Foundation and organized by the Woods Hole Oceanographic Institution, was over 5 weeks and took us to two different types of marine environments off the coast of southern California.

INTO THE DEEP: OUR TWO BACK-TO-BACK EXPEDITIONS WITH THE DEEP-SEA SUBMERSIBLE 'ALVIN' IN SUMMER 2023

The two swimmers on top of Alvin remove the deployment rope once the sub is in the water and are then picked up by the small, motorized boat, which is waiting in the back. Photo credit: Tina Treude

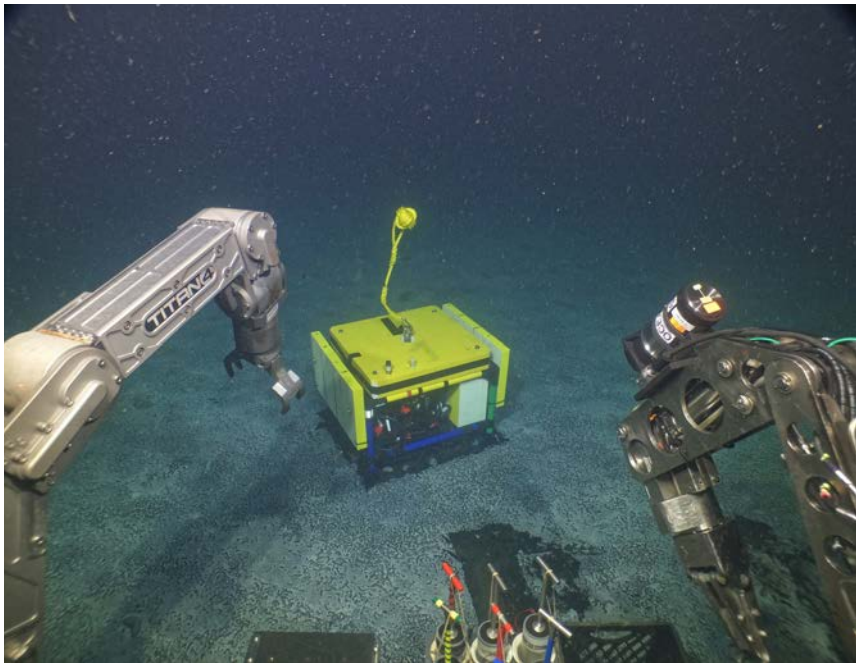
The first expedition (AT50_11) focused on microbial processes in the oxygen minimum zone of the Santa Barbara Basin. High productivity of plankton in the surface water and weak ventilation of the deep basin water triggers a strong decline of oxygen when bacteria feed on decaying planktonic biomass. The degradation of the organic material at the seafloor initiates a complex set of microbial and chemical processes, including the development of massive sulfur bacteria mats, which feed on hydrogen sulfide produced in the sediment. While most of these processes are natural, we are also interested to understand potential intensification and alteration of the processes related to human impacts such as climate change. For our research, we descended to the seafloor (maximum depth around 590 m) with the submersible Alvin for the deployment of chambers to measure fluxes of chemicals (such as oxygen, nitrate, sulfide) into and out of the sediment. Further analytical support was provided by the cute autonomous underwater vehicle (AUV) Sentry, which completed several pre-programmed dives through the Santa Barbara

The UCLA team and collaborator Felix Janssen (AWI) in front of the deep-sea submersible Alvin. Top row left to right: Jiarui Liu, DJ Yousavich, De'Marcus Robinson, George Vetushko, Zoë Collins, Felix Janssen; bottom row left to right: Tina Treude, Kira Homola, Emily Klonicki. Photo Credit: Tania Anders

Basin without a pilot to measure oxygen distribution and to monitor seafloor coverage of the sulfur bacteria mats. This NSF-funded expedition was a collaboration with the UC Santa Barbara (Dr. David Valentine), the Alfred Wegener Institute in Germany (Dr. Felix Janssen), and the Mt. San Antonio College (Dr. Tania Anders).

The second expedition (AT50_12) aimed at cold seeps that release fossil methane from the seafloor. Cold seeps are found at many locations off the coast of southern California (Malibu, Santa Monica, Redondo Beach, Palos Verdes, San Pedro, Del Mar) and seepage is often facilitated through migration of methane along tectonic fault systems. The methane serves as an energy and carbon source for many organisms and creates special cold seep communities. The seep ecosystem usually starts with microbes, who feed on the methane and provide biomass for other organisms higher up in the food chain. The overall aim of the project was to understand the connectivity between methane and organisms and the importance of cold seeps for the overall health of the deep-sea ecosystem. On our dives to the up to 1000 m deep methane seeps, we collected seep rocks (carbonates made from methane-derived carbon) and sediments to study methane-eating microbes and animals associated with this ecosystem. This NSF-funded expedition was a collaboration with the Scripps Institute of Oceanography (Dr. Lisa Levin), the Occidental College (Dr. Shana Goffredi) and Caltech (Dr. Victoria Orphan).

Diving with a deep-sea submersible such as Alvin is a dream come true for many marine scientists. It is not unlike boarding a spaceship – only few people in the world get a chance to experience it. Before boarding the submersible, scientists receive a safety training and must obey several safety rules, such as only wearing flame-resistant clothes and leaving any non-tested electronics such as cellphones behind.



A chamber is deployed by Alvin at the seafloor on top of a continuous white sulfur bacteria mat to study fluxes of chemicals into and out of the sediment. Alvin can use its two robotic arms to operate instruments. Photo Credit: Alvin/WHOI

All Alvin pilots are Navy-trained and the solid titan sphere that holds the humans is approved for dives up to 6,500 m (21,325 feet). Once on board (usually two scientists and one pilot), everyone gets busy quickly to make sure samples requested are taken and documented with video cameras. The usual 6-8 hours in the sub fly by quickly. For the hungry ones, lunch boxes with sandwiches and chocolate are provided – so is a 'toilet' in the form of a plastic bottle. If people get asked what their most memorable moment in the submersible was, many mention the bioluminescence (glow) of organisms in the darkness of the deep sea. Once returned to the surface, those who experienced their first Alvin dive are welcomed back by the science crew with a bucket of ice-cold water, a joyful ceremony known as the 'Alvin baptism'.

Next year, in late spring 2024, our group will get closer to Alvin's dive limit when we will explore methane seeps off Kodiak Island (Alaska) at depths up to 5,500 m. Data gained during this future expedition will be compared to data from the shallower southern Californian seeps to study shifts in the relevance of methane for the ecosystems relative to water depth.

"Diving with a deep-sea submersible such as Alvin is a dream come true for many marine scientists.."

SPACE PHYSICS

WRITERS: JACOB BORTNIK,
ROGER VARNEY, & LARRY LYONS

- EXPLORING -

Space Physics

We are excited to announce the new “Larry Lyons and Susan Miller Endowed Chair”, to support a faculty member in the Department of Atmospheric and Oceanic Sciences in the Division of Physical Sciences with an expertise in Space Physics, and a faculty search will be initiated in the Fall of 2025. For more information on this generous pledge, please refer to page 10.

06

The space physics group at the Department of Atmospheric and Oceanic Sciences continues to grow and thrive. We are excited to announce graduate student Donglai Ma successfully defending his PhD in Feb 2024, and accepted a postdoctoral appointment with Prof. Vassilis Angelopoulos at the Earth, Planetary and Space Sciences Department at UCLA.

We were fortunate to receive a number of awards this year, including a DOE award for studying plasma wave excitation in laboratory plasmas (performed at UCLA’s Large Plasma Device), a NASA/FINESST student fellowship to Ms. Dominique Stumbaugh, and an Office of Naval Research award for studying ionospheric structures. Prof. Roger Varney and Postdoctoral Researcher Dr. Robert Albarran continue their work with the Center for Geospace Storms, a NASA DRIVE Science Center focused on transforming the understanding and predictability of space weather. Professor Larry Lyons and Researcher Sneha Yadav are excited to have received an Air Force award in collaboration with Boston University and University of Texas Arlington to advance understanding of connections and impacts in the mid-high latitude ionosphere and thermosphere via strong, structured ionospheric flow and electron precipitation from the magnetosphere above

The UCLA SPACE Institute continues to grow, having hosted several popular workshops over the past year, and aiming to serve as the locus of all space-centered activity at UCLA. At the present time, the SPACE Institute is recruiting an Executive Director who will launch many of the programs that will take science and technology at UCLA to the next level.

We are excited to announce the new “Larry Lyons and Susan Miller Endowed Chair”, to support a faculty member in the Department of Atmospheric and Oceanic Sciences in the Division of Physical Sciences with an expertise in Space Physics, and a faculty search will be initiated in the Fall of 2025.

Best,

Prof. Jacob Bortnik
Prof. Roger Varney
Emeritus Prof. Larry Lyons

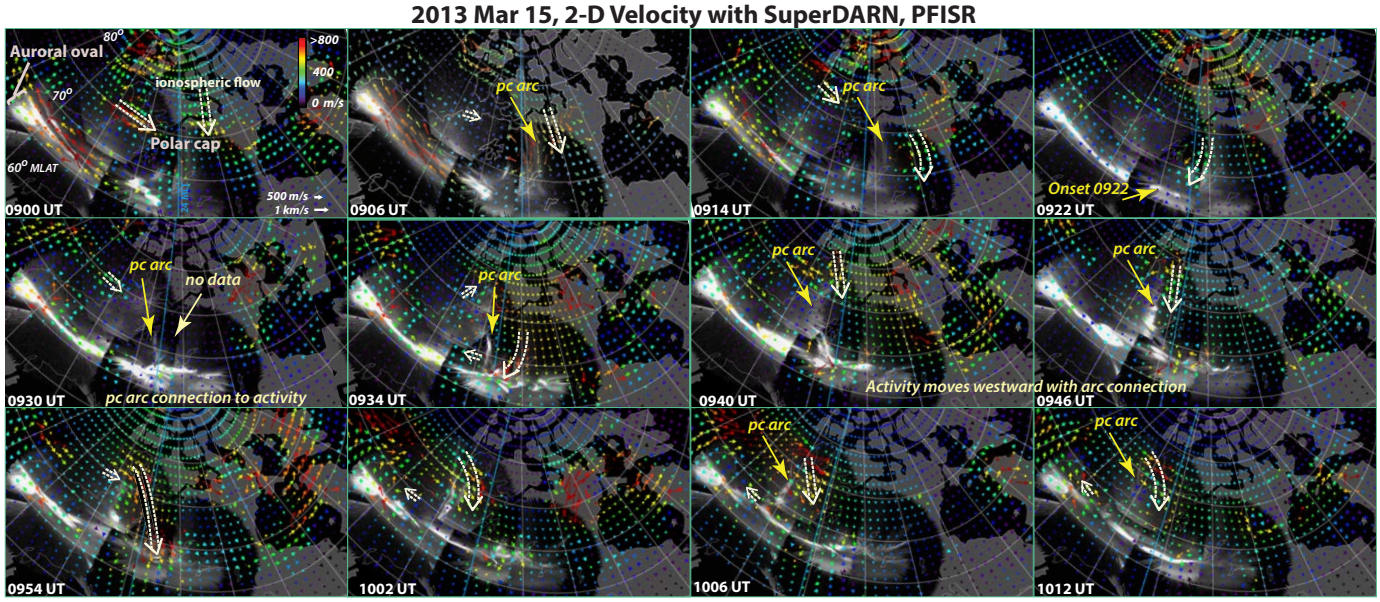
SPACE PHYSICS

Two-Dimensional Ionospheric Velocity from Radars

WRITER: LARRY LYONS
EDITED BY: JEREMY MARTINEZ

UCLA Atmospheric and Oceanic Scientists have, for the first time, used ionospheric radar data to demonstrate connections between the polar cap ionosphere and geomagnetic disturbances in the auroral oval, as revealed by the UCLA THEMIS array of all-sky auroral imagers that cover North America from Alaska to near Greenland. The above figure shows a time sequence of mosaics of auroral images over the nightside auroral oval and polar cap from ~20 to ~05 magnetic local time (MLT), with a light blue line marking 24 MLT. The auroral oval appears as light emissions from ~65° to 68° magnetic latitude (MLAT). A brightening of the aurora is identified in the 0922 UT panel at ~23 MLT and 66° MLAT, marking the start of a substorm, one of the most interesting disturbances of the magnetosphere and ionosphere, with clear signatures visible in the aurora. The array of small arrows in the figure illustrates ionospheric flows as seen by North American radars, with the two-dimensional aspect obtained using an innovative approach developed at Penn State and Boston Universities. An auroral arc oriented approximately perpendicular to the auroral oval can be seen extending poleward into the polar cap. Note the channels of enhanced flow seen by the radars lying adjacent to the polar cap auroral arc and directed towards the auroral oval. It can be observed that they are directed towards the location of the substorm onset, which lies within the auroral oval. Both the polar cap auroral arc and the adjacent flow can be seen moving westward after the substorm onset, remaining connected to enhanced auroral activity and appearing to drag the activity westward. The connection between the polar cap flow and auroral arc and the substorm activity within the auroral oval demonstrates a direct connection between the dynamical activity within the polar cap and the strong geomagnetic activity of a substorm.

2013 Mar 15, 2-D Velocity with SuperDARN, PFISR



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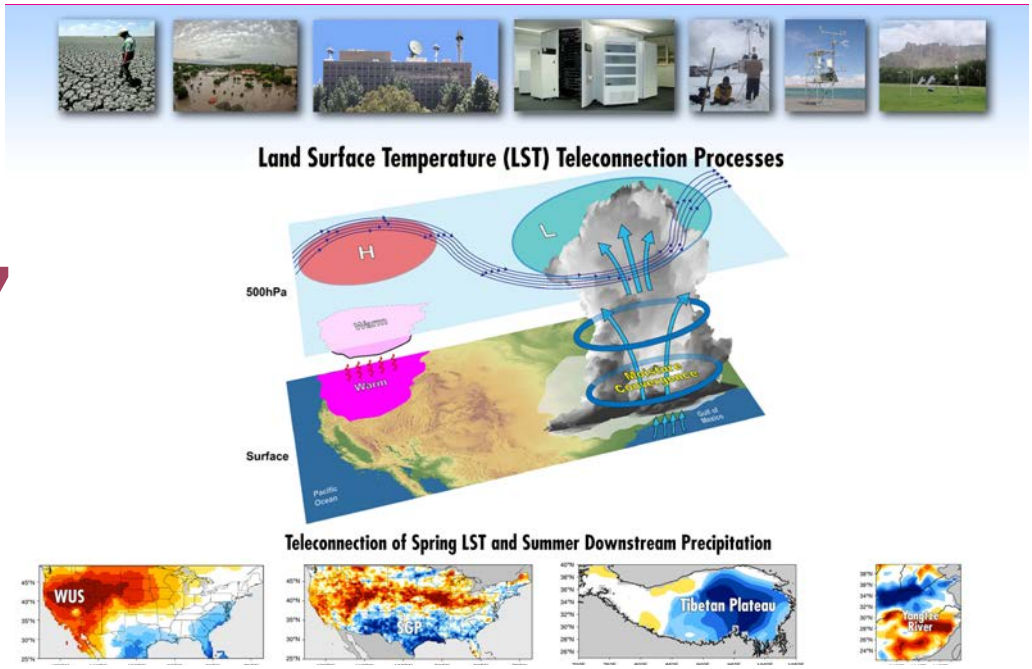


BIOGEOCHEMISTRY

WRITER: YONGKANG XUE
EDITED BY: JEREMY MARTINEZ

- Exploring -

Biogeochemistry

The primary cause of severe hydroclimate events in a changing climate is fluctuating precipitation on subseasonal-to-seasonal (S2S) time scales. However, predicting S2S precipitation over land has been consistently challenging. While sea surface temperature (SST) has historically been seen as a key factor in S2S predictability, it only partially explains the phenomena.
Our research began in the early 2000s, focusing on the remote impact of land surface temperature/ subsurface temperature (LST/SUBT) in high mountain regions like the Rocky Mountains (RM).

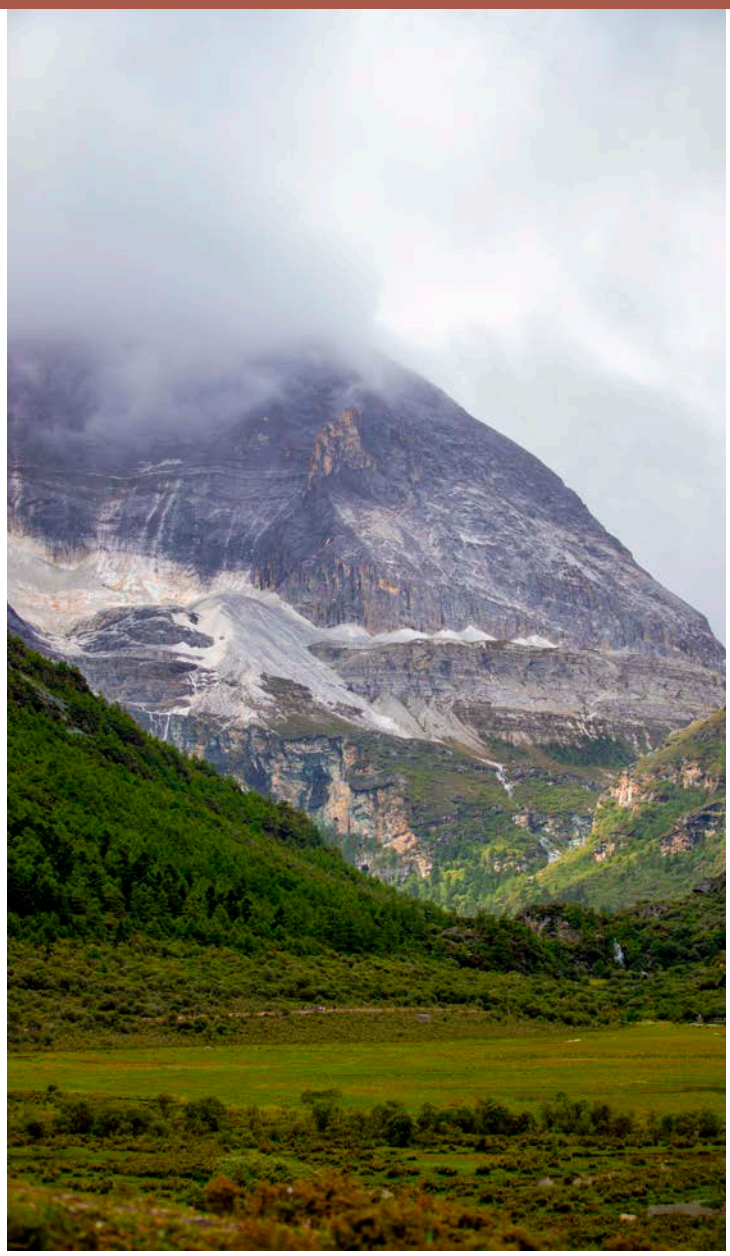
Spring Tibetan Plateau soil temperatures are found to affect boreal summer climate regionally, globally through Tibetan Plateau-Rocky Mountain Circumglobal Wave Train (TRC)

We aimed to uncover the mechanisms driving these remote effects. This approach became particularly useful as extreme hydroclimate events like the 2011 Texas drought and the 2015 Texas flood increased. We found that understanding the effects of RM and Tibetan Plateau (TP) spring LST/SUBT on summer floods and droughts in downstream areas like the Southern Great Plains and Yangtze River Basin helped predict droughts and floods at S2S scales.

Our findings inspired the GEWEX program to launch the LS4P initiative in 2018, focusing on the impact of initialized land temperature and snowpack on sub-seasonal to seasonal prediction. In Phase I, we conducted Earth System Model (ESM) experiments to test the remote effect of TP LST/SUBT. The 2003 case study, marked by an extreme summer drought/flood after a cold spring in TP, was chosen for analysis.

Improvements were made in simulating TP spring near-surface temperature and summer dry/wet conditions, leading to the identification of 8 hotspot regions globally where June precipitation correlates significantly with May TP LST/SUBT anomalies. Notably, the southern Yangtze River basin and Southern Great Plains showed strong agreement in LS4P-I ESMs.

Observations revealed an out-of-phase oscillation between TP and RM surface temperatures in May, along with a TP-RM Circumglobal wave train (TRC) influencing weather patterns across continents. Comparing the TP LST/SUBT effect with global SST effects, TP LST/SUBT and SST together explained around 25-50% of precipitation anomalies in hotspot regions. This underscores the importance of TP LST/SUBT as a primary driver of S2S precipitation predictability, comparable to SST effects.



Xue Y., I. Diallo, A. A. Boone, T. Yao, Y. Zhang, X. Zeng, J. D. Neelin, W. K.M. Lau , et al., , 2022: Spring Land Temperature in Tibetan Plateau and Global-Scale Summer Precipitation – Initialization and Improved Prediction. Bulletin of American Meteorological Society. 103, 12, DOI: https://doi.org/10.1175/BAMS-D-21-0270.1, E2756-E2767

Xue Y., I. Diallo, A. A. Boone, Y. Zhang, X. Zeng, W. K.M. Lau, J. D. Neelin, T. Yao , et al.,, 2023: Remote effects of Tibetan Plateau spring land temperature on global subseasonal to seasonal precipitation prediction and comparison with effects of sea surface temperature: The GEWEX/LS4P Phase I experiment. Climate Dynamics. https://doi.org /10.1007/s00382-023-06905-5

08

AC & P

WRITER: JASPER KOK
EDITED BY: JEREMY MARTINEZ

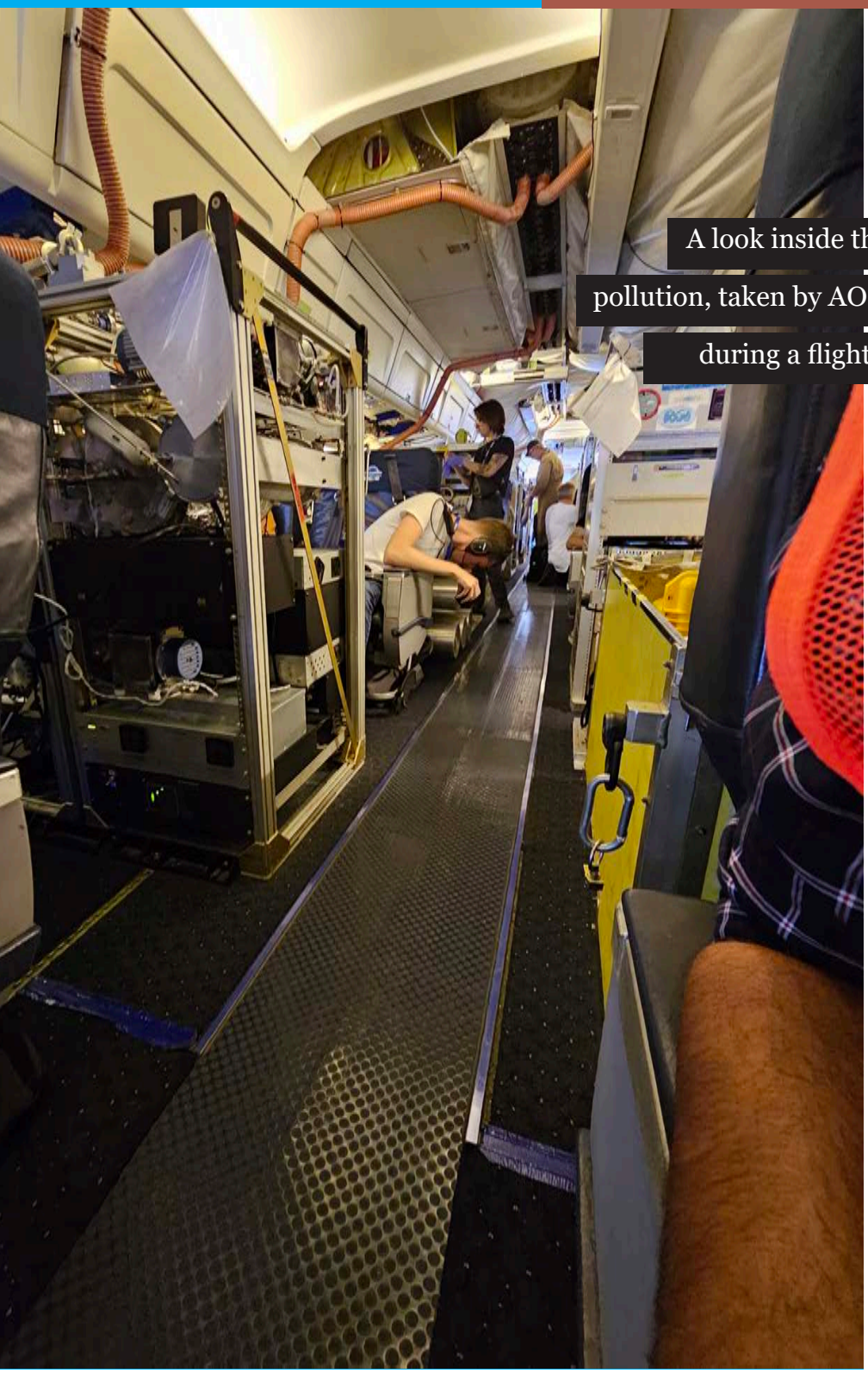
- Exploring -

Atmospheric Chemistry & Physics

With global temperatures already 1.2°C above pre-industrial levels and carbon emissions continuing to rise, meeting the 1.5°C goal set by the 2015 Paris Agreement seems increasingly unlikely. This has prompted a growing recognition of the need to explore potential techniques for temporarily mitigating the planet's warming. These methods could offer a buffer while the world aggressively cuts greenhouse gas emissions. However, prominent climate intervention techniques like injecting reflective aerosols into the stratosphere and brightening low-level marine stratocumulus clouds have significant negative side effects, such as altering the hydrological cycle and delaying ozone hole recovery, with potential winners and losers globally, complicating governance and potentially fostering geopolitical instability. In response to these challenges, Professor Jasper Kok initiated a new project investigating an alternative climate intervention technique: seeding shallow clouds in wintertime poles. Known as mixed-phase cloud thinning (MCT), this method could cool the Earth by enhancing ice formation in these clouds, leading to rainfall. Since these clouds warm during the polar night (with no sunlight), MCT might achieve an annual mean cooling of around 1°C at the poles, where global warming is most pronounced. This technique offers advantages such as potentially less interference with the hydrological cycle and localized cooling, easing global governance challenges compared to other methods. The project, funded by the Simons Foundation, will utilize satellite observations to estimate MCT's cooling potential. Modeling will assess the climate system's response to this cooling, evaluating both positive and negative impacts, including effects on Arctic communities. The project will involve Arctic communities in incorporating local concerns into research design and engaging LAUSD high school students in Next Generation Science Standards-aligned lessons exploring the use of climate intervention to mitigate climate change impacts.

Shallow mixed-phase clouds over the Arctic in the Fall, photographed by Jasper Kok from a transcontinental airliner.

Science team picture during NASA ASIA-AQ field campaign in between the G-3 (left) and DC-8 (right) aircrafts used for studying air quality in multiple locations in Asia.

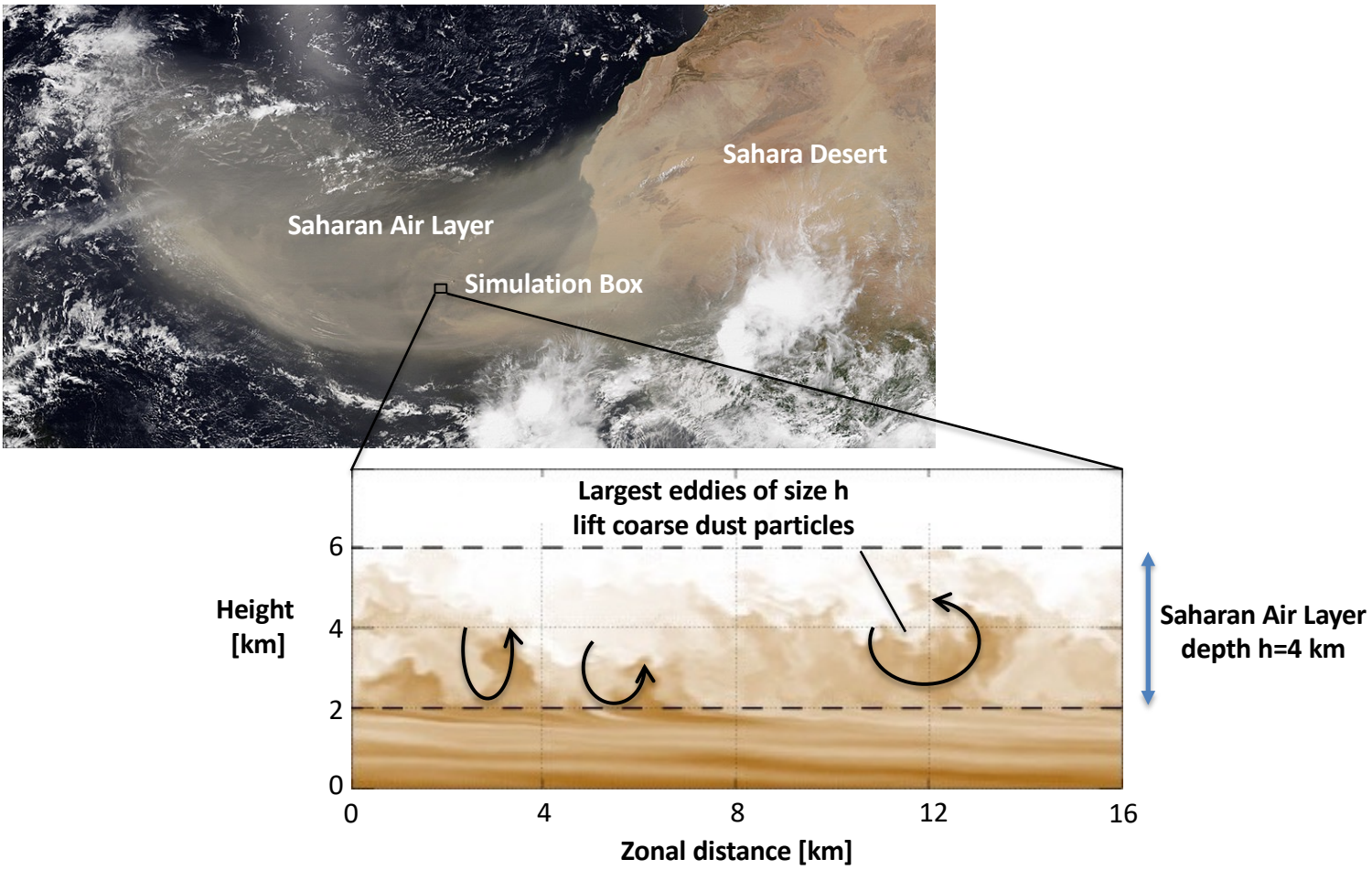


A look inside the DC-8, a flying laboratory to study air pollution, taken by AOS postdoctoral scholar Manas Mohanty during a flight in the Philippines in the context of the NASA ASIA-AQ field experiment

WRITER: MARCELO CHAMECKI
EDITED BY: JEREMY MARTINEZ

- EXPLORING - Applied Dynamics and Meteorology 09

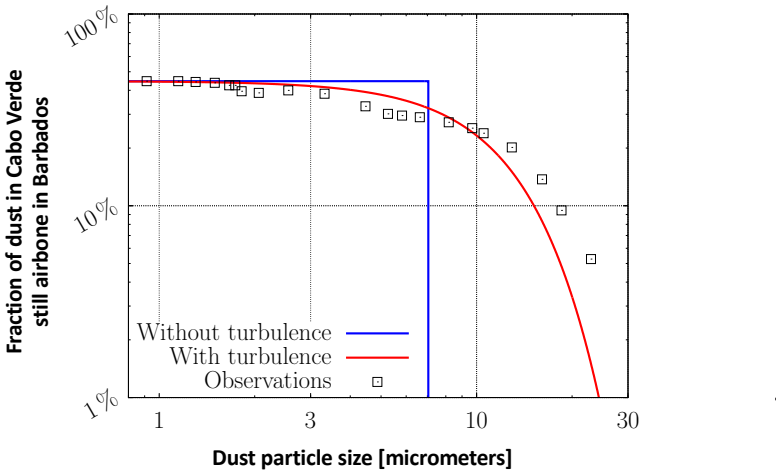
Numerical Simulations of Turbulence in the SAL

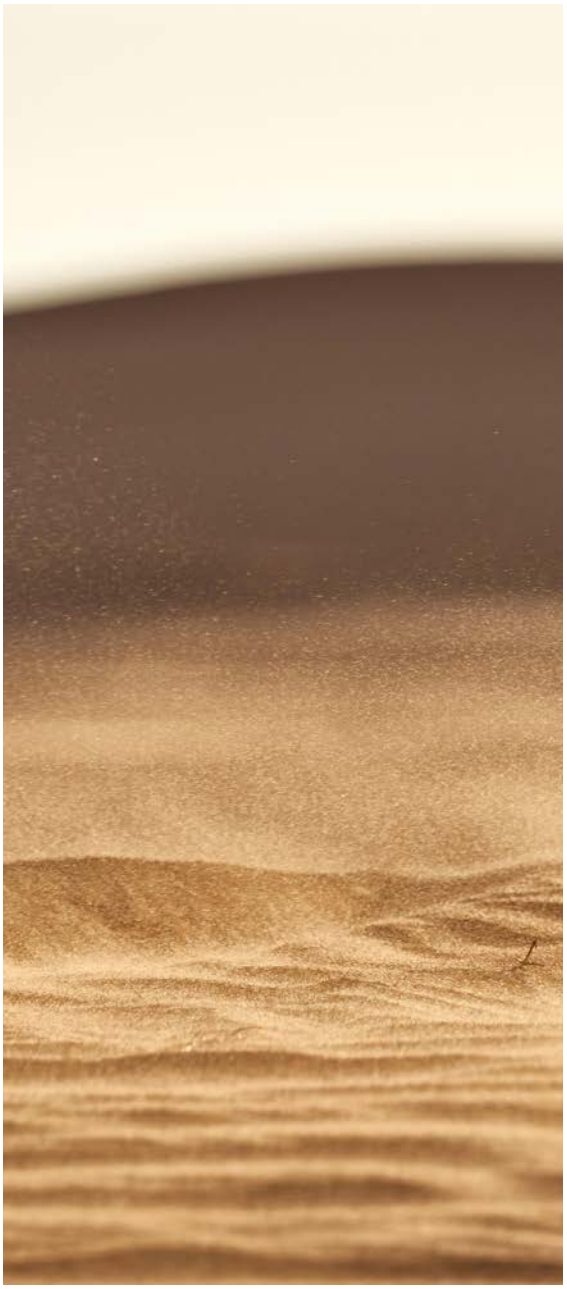


The numerical domain (LES box) is a very small region

within a huge dust plume that departs from the Sahara

Comparison between model predictions and observations

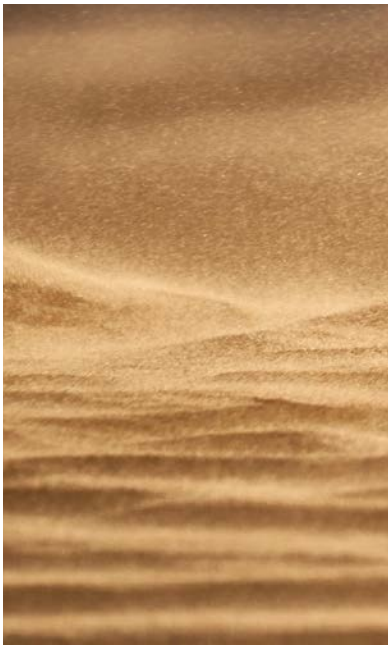




Dust from desert surfaces significantly impacts climate, weather, and ecosystems by affecting cloud formation, interacting with radiation, and carrying vital nutrients. Accurately predicting how long these particles remain airborne is essential, yet current models underestimate this duration and the resulting horizontal transport. For instance, the transatlantic movement of coarse dust particles from the Sahara to the Americas remains poorly understood despite their faster deposition rates than smaller particles.
The Sahara emits 200-3000 Tg of dust annually, comprising 70% of Earth's total dust emissions. Our focus was on the Saharan Air Layer (SAL), a dust-laden air mass that originates over the Sahara, traverses the Atlantic Ocean within the upper atmosphere, and reaches the Americas around 5 days later. We explored the hypothesis that turbulence within the SAL contributes significantly to the transatlantic transport of coarse dust particles. During summer, the African Easterly Jet generates substantial wind shear at higher altitudes, potentially inducing turbulence if buoyancy stratification is insufficient to suppress it.

Through dust mass balance models and large-eddy simulations, we discovered that turbulence can double the time dust remains suspended compared to non-turbulent conditions. This increase can be estimated based on the mixing-to-settling timescale ratio. Accounting for irregular dust particle shapes, which slow deposition, our theory aligned with observations of super coarse Saharan particles in the Caribbean. This underscores turbulence as a key mechanism facilitating long-distance dust transport.

Rodakoviski, Rodrigo, Jasper Kok, and Marcelo Chamecki. "Dust settling from turbulent layers in the free troposphere: Implications for the Saharan Air Layer." Journal of Geophysical Research: Atmospheres 128, no. 6 (2023): e2022JD037724.



A D & M

WRITER: JASPER LACA

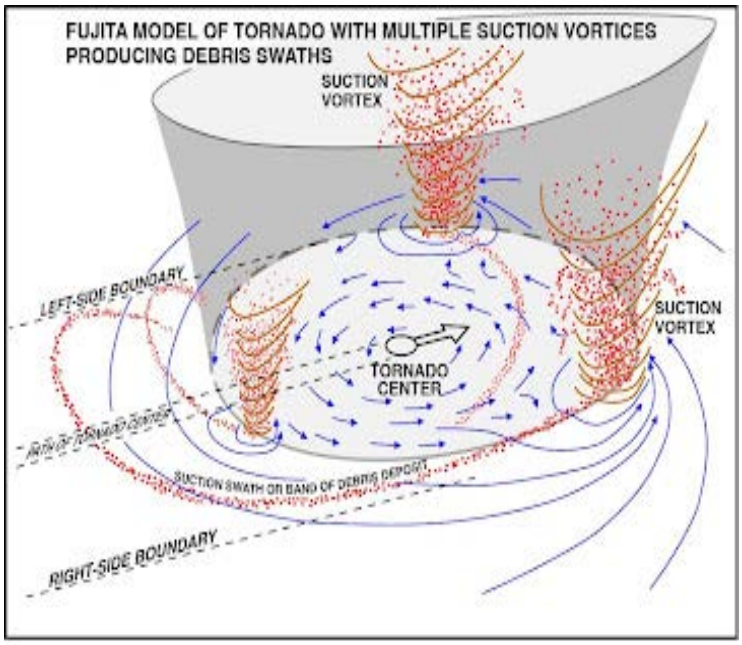
Unraveling Tornado Mysteries: New Insights into Debris Swath Formation

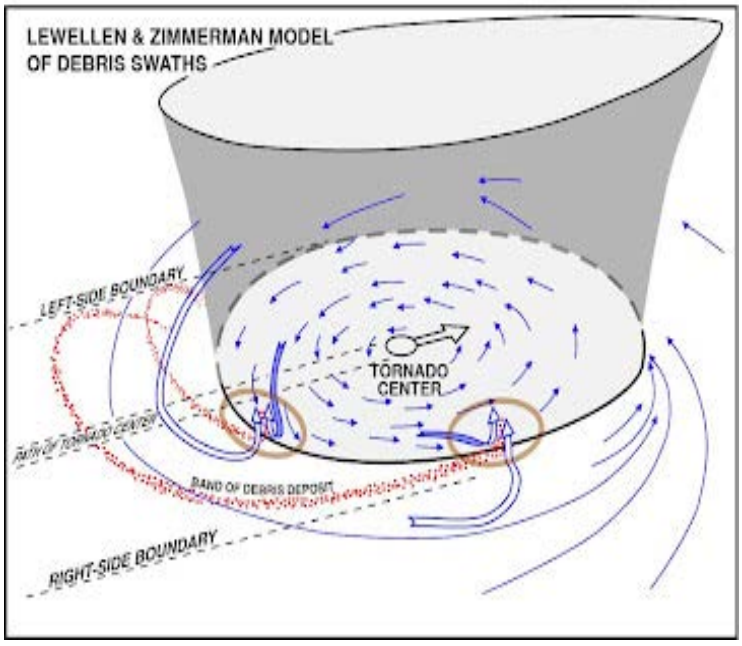
A recent study delves into the intriguing phenomenon of cycloidal damage swaths left by tornadoes, shedding light on contrasting theories about their formation. Traditional understanding, dating back to Fujita et al. in the 1970s and 1980s, proposed the role of suction vortices within tornado cores in creating these distinct debris patterns. However, newer research, spearheaded by Lewellen and Zimmerman, challenges this notion, suggesting that the marks result from specific dynamics within the tornado's updraft annulus.

In a groundbreaking analysis, researchers conducted an aerial damage survey of a tornado near Dodge City, Kansas, in 2016. Their observations revealed well-defined cycloidal marks, providing a unique opportunity to investigate the mechanisms behind their formation. By combining data from polarimetric radar scans with high-resolution photographs of the tornado, the study offers unprecedented insights into the tornado's structure and the characteristics of its lofted debris cloud.

Surprisingly, the analysis suggests that the cycloidal marks align more closely with the updraft annulus hypothesis rather than the traditional suction vortex theory. This challenges decades of conventional wisdom in tornado research and calls for a reevaluation of terminology regarding tornado structures and debris patterns.

The study underscores the importance of continued research in this field, emphasizing the need for further investigations that combine radar data with on-the-ground surveys to validate these findings. By unraveling the mysteries of tornado dynamics, researchers aim to enhance our understanding of severe weather phenomena and improve forecasting and mitigation efforts in tornado-prone regions.





MEET OUR NEW FACULTY

Dr. Janine Ann Baijnath-Rodino

Professor Janine Baijnath-Rodino recently joined UCLA as Director of Meteorology and adjunct assistant professor of atmospheric and oceanic sciences (AOS). A passionate scientist with a global perspective on climate change, Janine works with other scientists and engineers in academia and at NASA JPL to better understand extreme weather events and natural disasters.

Her current research focuses on identifying surface-atmospheric hydrometeorological processes that drive wildland fire behaviour across multiple spatial and temporal scales. Dr. Baijnath-Rodino obtained her Ph.D. in 2018 from the University of Waterloo, in Ontario, Canada. Her research focused on conducting historical spatiotemporal trends in extreme lake-effect snowfall events. During this time, she was also a research associate at NASA Ames in California, conducting in-laboratory simulations for testing and developing early warning signals for predicting major earthquakes. In 2018 she became a Postdoctoral Researcher at McGill University in Montreal, Canada, in the Departments of Civil Engineering and Applied Mechanics. Her research focused on assessing both the biophysical and socio-economic impacts of climate change on subarctic communities using state-of-the-art high-resolution models. She was also a Lecturer in the Atmospheric and Oceanic Sciences Department, teaching a course titled "Natural Disasters" to a class of 600 + students. In 2020 she became a Postdoctoral Researcher in the Department of Civil and Environmental Engineering at the University of California, Irvine. Apart from her research experience, Dr. Baijnath-Rodino worked for seven years as a Television Meteorologist for the Canadian Broadcasting Corporation (CBC) News. She produced newsworthy weather and climate stories that were captivatingly broadcasted to local and national audiences. She is a big advocate for science communication and has interviewed the famed "Bill Nye the Science Guy" to 2000+ audience members. She is actively involved in mentoring undergraduate and graduate students on successful research.

Dr. Yue Dong

Prof. Yue Dong is a dedicated climate scientist specializing in large-scale climate dynamics and climate change. She will join the department as an assistant professor in November 2024. Her research focuses on on large-scale interactions within the coupled climate system, including critical processes such as atmosphere-ocean interactions and tropics-extratropics teleconnections. She investigates how these dynamic processes influence the Earth's radiative responses and climate sensitivity to both anthropogenic and natural forcings.

Prof. Dong obtained her PhD in Atmospheric Sciences from the University of Washington in 2021, where she studied how global surface warming patterns modulate climate sensitivity and climate feedbacks. She was awarded the NOAA Climate & Global Change postdoc fellowship and worked at Columbia University during 2022-2023, focusing on large-scale interactions between the tropical Pacific and the Southern Ocean. Before joining UCLA, Dr. Dong was a research scientist at the University of Colorado Boulder, researching global surface ocean changes under historical forcings.

Utilizing a combination of complex global climate models, idealized conceptual models, and observational data, Dr. Dong aims to unravel the fundamental physics underlying the coupled climate system. This approach allows for a comprehensive understanding of the intricate interactions between various components of the climate system.Key areas of investigation within Prof. Dong's group include:

- Earth's energy budget, climate sensitivity and hydrological sensitivity
- Formation of global surface warming patterns
- Interactions between tropical and polar climates
- Coupled dynamics between the atmosphere (clouds, precipitation, circulation) and oceans (temperature, salinity, heat uptake)

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AWARDS

The annual AOS award dinner ceremony was held in the UCLA Meyer and Renee Luskin Conference Center on January 25, 2024, to celebrate the accomplishments of the graduate students in our department. These awards include the Neiburger, Bjerknes, Turco and Bosart award for outstanding teaching, research, publications and student fellowships.

Graduate Awardees

Surabhi Biyani - Bosart Award

Dominique Stumbaugh - Bosart Award

Danny Leung - Bjerknes Award

Jiaqi Shen - Bjerknes Award

Yidongfang Si - Bjerknes Award

Surabhi Biyani - Neiburger Award

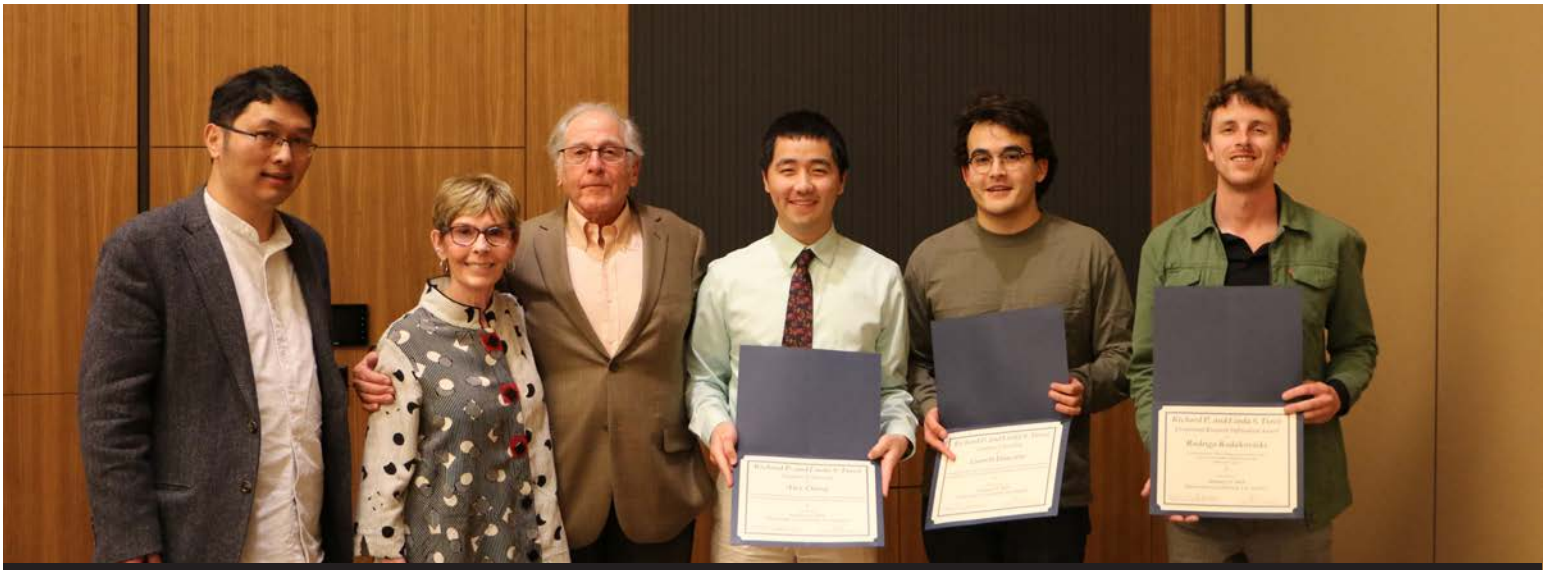
Marco Sandoval Belmar - Neiburger Award

Dominique Stumbaugh - Neiburger Award

Rodrigo Rodakoviski - Turco Paper Award

Alex Chang - Turco Fellowship

Garrett Finucane- Turco Fellowship



From left to right, Professor Gang Chen, Linda Turco, Distinguished Professor Emeritus Richard Turco, Alex Chang, Garret Finucane, and Rodrigo Rodakoviski

From left to right, Surabhi Biyani, Cat Banach, Sara Graves, and Dominique Stumbaugh

From left to right, Surabhi Biyani, Dominique Stumbaugh, Prof. Jochen Stutz, Marco Sandoval Belmar, Rodrigo Rodakoviski, Alex Chang, Garret Finucane, and Kathy Yi

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Every year, XEP gives a fun award to a faculty member that stood out to the first-year students. This year, we're calling it the Sunscreen Award because although this professor teaches students about the harsh impacts of solar radiation, they also shield students from deriving complicated equations by hand by teaching us how to solve them numerically. Awarded to Professor Jochen Stutz!

The Radiance Award is given out to a staff member who is consistently brightening our days. We cannot thank you enough for putting up with the endless emails, repetitive questions, and department logistics! Awarded to Student Affairs Officer, Kathy Yi!

From left to right Vice Chancellor Roger Wakimoto, Dominique Stumbaugh, Surabhi Biyani, Mrs. Wakimoto.

Prof. Jacob Bortnik

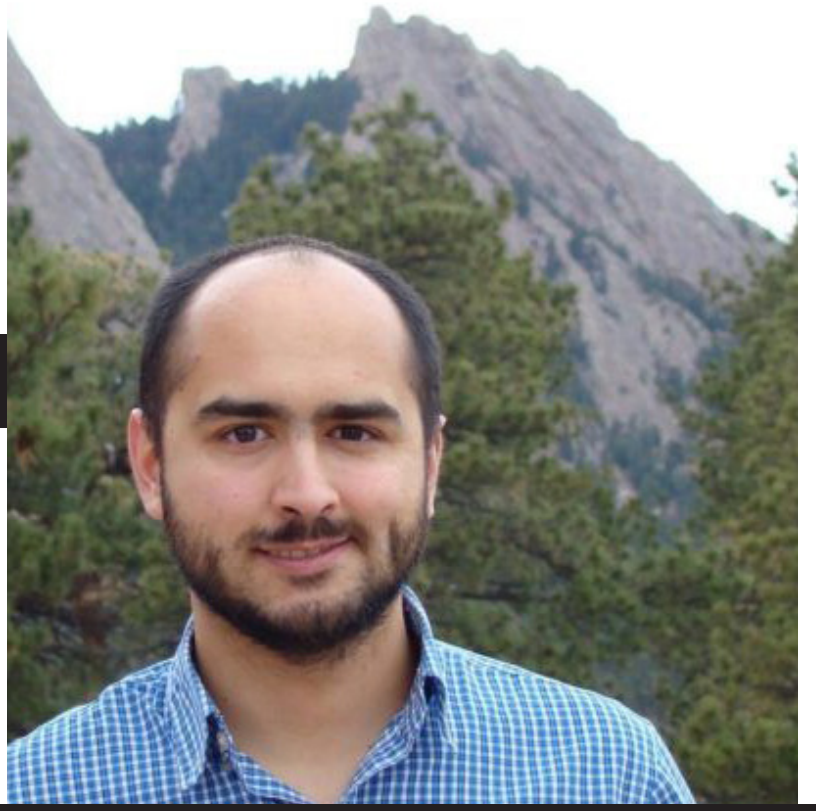
Jason Pang and Katy Yi

From left to right, Prof. Marcelo Chamecki, Prof. Jacob Bortnik, Prof. Danieli Bianchi

Prof. Suzanne Paulson (left), Prof. Janine Baijnath-Rodino (right

Faculty Awardees

Prof. Rong Fu elected to National Academy of Engineering



Prof. Pablo Saide Receives the NSF Career award

Prof. Suzanne Paulson Receives Fulbright Specialist Award

- AOS -

OUTREACH & EVENTS

CDLS Oceans

AOS Faculty Professor Robert Eagle and Professor Aradhna Tripati have established the Center for Diverse Leadership in Science's Ocean Science Learning Ecosystem (CDLS) at UCLA in 2016 focussed on recruitment and retention in the environmental sciences, as well as creating scientific communities for developing belonging, reducing isolation and provide mentorship and training opportunities. More recently Professor Eagle has with support in the form of a $1.8 million investment from the David and Lucile Packard Foundation, as well as Oceankind, Dalio Philanthropies, and the National Science Foundation, established CDLS Oceans with a focus on supporting students in their studies at UCLA in Oceanography. A particular emphasis of CDLS Oceans is to help students develop partnerships with outside groups such as the Cal State Universities, East LA College, Tribal organizations such as the Amah Mutsun Tribal Band and Northern Chumash Tribal Council, and LA-based community groups such as Heal the Bay and the Bay Foundation. CDLS Oceans is currently supporting 10 graduate student fellows and 2 postdoctoral scientists across the AOS Department, the Institute of the Environment and the Earth, Planetary, and Space Sciences Department.

Piloted from an award from THE 2023 California Sea Grant PATHWAYS TO INCLUSIVE RESEARCH TRAINING PROGRAM and matched with funds from the David and Lucile Packard Foundation, CDLS Oceans and East LA College (ELAC) created the Pathways INTO ENVIRONMENTAL Research MENTORING (PIER MENTORING; https://piermentoring.wixsite.com/elac-ucla-pier) program, a program LED on the UCLA AOS side by Dr Jeana Drake, graduate student Carolina Fulginiti, and Professors Robert Eagle and Aradhna Tripati. ELAC student participants/mentees engaged in basic science lectures, skills-based workshops, field trips - including on the AOS Zodiac and virtual and hands-on research experiences with UCLA graduate student mentors. These meaningful, hands-on learning experiences for the ELAC mentees, representing open engagement, and further selected engagement with specified UCLA graduate student mentors, provided new experiences for all levels of students across both institutions. Feedback from the first two cohorts, conducted in summer and fall 2023, indicated

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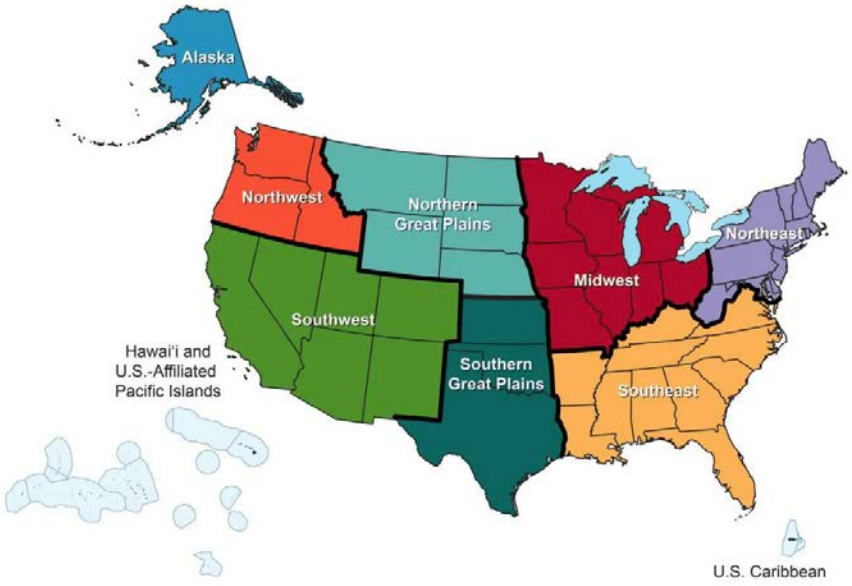
mentees also gained a competitive edge when applying to other research programs through training in and awareness of other environmental resource training programs for undergraduate students. With this positive feedback, ELAC faculty and staff have fully taken over administering the program since spring 2024 and plan to continue in the 2024-2025 academic year. Mentees from all three cohorts to date have presented their research at symposia at ELAC (Summer and Fall 2023) and UCLA (Spring 2024).

The PIER Mentoring program serves a diverse student group, from both a community college and a PhD granting institution, which included students from both STEM and non-STEM majors, non-traditional, first generation, and Black, Indigenous Persons of Color (BIPOC) students. Students engaged with local community organizations such as Heal the Bay, Surfrider, Cabrillo Marine Aquarium, and participated in California's Coastal Cleanup Day. During the Sea Grant funding period, 166 ELAC students were trained in program lectures, workshops, and field trips; 33 ELAC students were mentored in hands-on science projects by CDLS Fellows and PIER Mentoring program administrators; and seven CDLS Fellows served as mentors.

Professor Tripati & Professor Hall Contributes to the 5th Nation Climate Assessment



AOS launches the Atmospheric Forecasting Society of Los Angeles" Est. 2023, with the purpose of providing curious students with a space to discuss recent weather events affecting the LA region and other parts of the country and world.

PhD Student, Dominique Stumbaugh keynote presenter at the 'NASA Night' at Vintage Math Science Technology Magnet School in North Hills

Undergraduate research night, introducing students to exciting research opportunities in the AOS department

- AOS -

OUR HISTORY

2000s

The Department was selected as the top Atmospheric Sciences Department in the United States by the NRC.

A new climate change major was developed and is now offered by the department.

As of today, the AOS Department focuses on different areas of Climate Science such as Atmospheric Dynamics & Meteorology, Biogeochemistry, Atmospheric Chemistry and Physics, Upper Atmosphere, Space Physics & Planetary Atmospheres and Oceanography.

The Department is now composed of 35 faculty members, 47 researchers, 110 students and 11 staff members.

1990s

The department focus expanded into Oceanography and Biogeochemistry.

1980s

UCLA's weather station managed by Meteorologist James Murakami.

The UCLA weather station is part of a national network of cooperative weather observers (volunteers) and used by the National Weather Service. Limited data also gets archived at NOAA's National Centers for Environmental Information (climate records).

1970s

The department moved to the Math Sciences Building and reached 13 faculty members for 40 undergraduate and 40 graduate students in 1960.

1960s

The first global circulation model was developed by Yale Mintz and Akio Arakawa.

The Meteorology department became a founding member of National Center of Atmospheric Research (NCAR).

1950s

The department moved to the Math Sciences Building and reached 13 faculty members for 40 undergraduate and 40 graduate students in 1960.

1940s

The UCLA Department of Meteorology was founded by J. Bjerknes, J. Holmboe, and J. Kaplan. Faculty conducted research in weather and atmospheric dynamics. During WWII, the department trained 1200 meteorologists.

The first Bachelor Degrees were awarded in 1941 and the first Doctoral Degrees were awarded in 1946 to Jules G. Charney and Yale Mintz.

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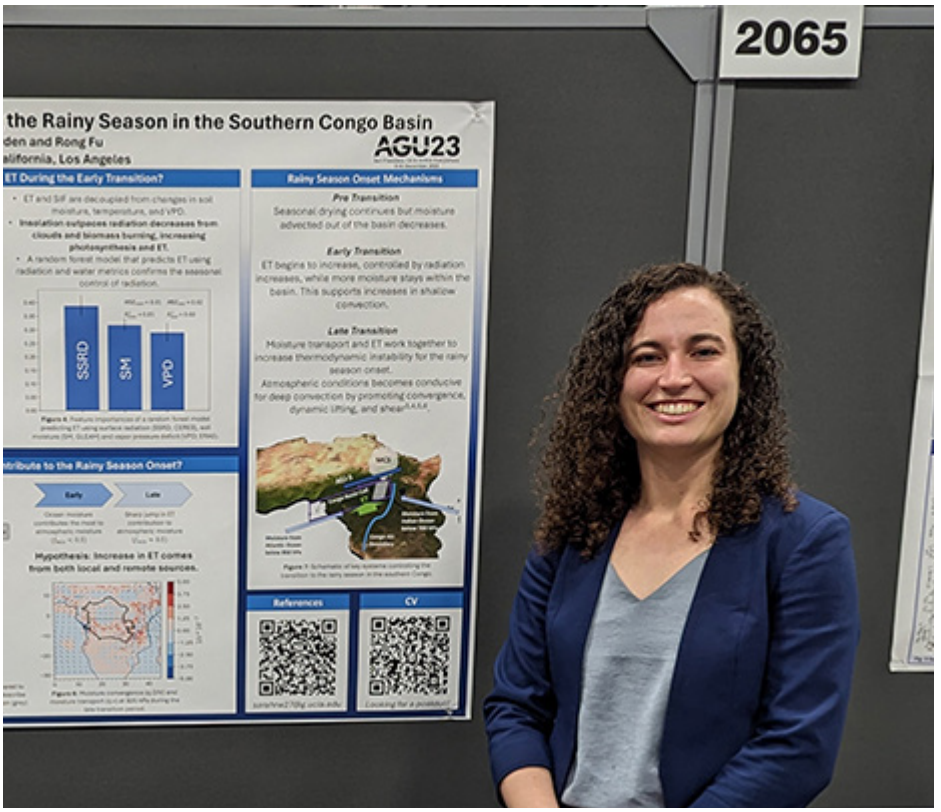
WRITER: ALISON HEWITT

- AOS -

STUDENT SPOTLIGHT

Uniting art and science, from concert hall to carbon cycle

Violinist Sarah Worden will earn her doctorate in atmospheric and oceanic sciences this month



Growing up with a dad who studied earth sciences, Sarah Worden notes with amusement how her childhood bedroom had unusual décor, such as posters about the differences between good and bad ozone.

Though her path to a science career wasn't a straight line, perhaps it's no surprise this early immersion led her to become an earth scientist: Worden will earn her Ph.D. in atmospheric and oceanic sciences from UCLA this month. Next, she will study the carbon and water cycles of tropical rainforests at NASA's Jet Propulsion Laboratory to help answer questions about climate change.

Between learning about ozone as a kid and studying water cycles in the Congo rainforest for her doctorate, however, the Southern California native spent years as a concert violinist. She took violin lessons over Skype with a teacher in Moscow before coming to UCLA, where she double-majored in music and physics as an undergraduate.

Art and science may seem like polar opposites on the academic spectrum — literally so on a map of UCLA (North Campus versus South Campus). But coincidentally, the university's music building and physics building are right next to each other. It was the perfect fit, allowing Worden to practice violin until just minutes before her next physics lecture and reflecting the similarities she sees in both disciplines.

"Whether you're learning physics or musical compositions, you break it down into basics," Worden said. "You master the technical skills and then build up the layers to make it more complicated."

Years of performing in concert halls also helped her overcome her public speaking jitters, she said, making it easier to present her scientific research to an audience.

"The UCLA school of music is good at developing a performance presence that carried over into my presentations," Worden said. "Both are also about developing a story for your audience. With music, you build up the emotional layers. With science, it's the story of why the findings are important, why it matters, why I'm excited about it and you should be too."

read the full story at:

https://newsroom.ucla.edu/stories/sarah-worden-art-science-carbon-cycle-commencement-2024

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GRADUATION 15

AOS faculty and staff at the 2024 departmental graduation ceremony

2024 commencement speaker lunch, from left to right, Madeleine Martin, Hedi Knight, Prof. Jacob Bortnik, Geoff Knight, Prof. Jochen Stutz, Prof. Janine Baijnath-Rodino

Invited commencement speaker, Geoff Knight, with AOS faculty

HELLOS & GOODBYES 16

From left to right, Jason Pang, Ronald Chiang,Dao Khuong, Grace Leon, Prof. Jacob Bortnik, Eileen Sir, Janet Villanueva, and Kathy Yi

THIS YEAR WE WELCOME:

Brandon L. Curtis - Information System Analyst 2

Dao Khuong - Administrative Coordinator

Jason Pang - Information Technology Manager

Kathy Yi - Student Services Manager

WE SAY GOODBYE TO: Eileen Sir - CAO

Eileen has been at UCLA for over 34 years, moving through positions of increasing responsibility which included leading IoES, then Chemistry and Biochemistry, and now AOS. She is highly organized, meticulous, dedicated, and careful. She cares deeply about her departments and about UCLA. Eileen has a remarkable ability to remember a vast number of issues and to follow up accordingl, always with good humor.
- From Department Chair - Prof. Jacob Bortnik

Eileen, we wish you a wonderful retirement. Thank you for your impeccable service to the department and to UCLA!

Brought to you by the AOS Communications and Outreach Committee