RamFest2025

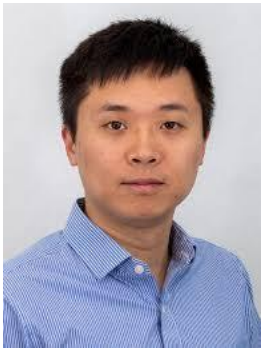
Program Book

Dr. Fonna Forman will moderate the panel of "Session 1: Surviving and Thriving Weather Extremes in California", in which high-level stakeholders will share their insights on climate resilience.

Fonna Forman is a Professor of Political Theory and Founding Director of the Center on Global Justice at the University of California, San Diego. The Center just completed construction of Santuario Frontera, the largest migrant shelter in the US-Mexico border region. Trained as a political theorist, Forman's research focuses on climate justice, borders, migration and informal urbanization. Forman is co-chair of the University of California President's Global Climate Leadership Council, and served as co-chair of the Climate Resilience California and Californians summit, a partnership between the California Governor's Office, The Vatican's Pontifical Academies of Sciences and Social Sciences, and the University of California Office of the President.

With UCSD climate scientist Ram Ramanathan, she also leads the University of California's climate education initiative, Bending the Curve: Climate Solutions, adopted by universities and agencies across California and the world. With long-time research partner Teddy Cruz she recently published Spatializing Justice: Building Blocks (MIT Press, 2022); and Socializing Architecture: Top-Down / Bottom-Up (MIT Press, 2023). A third, Unwalling Citizenship, is forthcoming with Verso.

Dr. Yangyang Xu will moderate the panel of "Session 2: Multidisciplinary approach to enhancing climate resilience", in which cross-disciplinary researchers and stakeholders will share their experiences on quantifying environmental changes, assessing the impact, and communicating with the public.



Dr. Yangyang Xu is an associate professor in the Department of Atmospheric Sciences at Texas A&M University. His research interests include climate modeling with applications to regional adaptations of heat stress and other hydroclimate extremes. He also works on climate mitigation, especially the role of short-lived climate forcers. He received his PhD from UC San Diego, working with Ram from 2008 to 2014, and has continued their collaboration. He is a recipient of the Global and Environmental Change Early Career Award from the American Geophysical Union.

Dr. Mark H Thiemens will give a presentation titled "Quantification of Himalayan Melting Rates Using Radiogenic ^{35}S."

The abstract of the presentation is as follows:

The Tibetan Himalayas, termed the Third Pole, provide drinking water for 40% of the world's population, providing water for India, China, Pakistan, and many Southeast Asia countries. Inspired by many early conversations with Ram regarding trans Himalayan atmospheric transport of pollutants and its importance, we subsequently employed a range of atmospheric, ice, and lake sediment sampling for numerous collections across the Tibetan plateau and Himalayas, including Mt Everest, to better understand ice stability. We have perfected a radio sulfur isotope clock (87-day half-life) to accompany other measures we make to better define melting rates and chemical sources to the plateau ice and their melting rates. This also included drilling of lake sediments to a depth corresponding to preindustrial times to define pollution compositions and sources.

Dr. Thiemens Received his PhD from Florida State University and was a Post Doc at the Enrico Fermi Institute for Nuclear Studies, University of Chicago. His career was spent at UCSD Department of Chemistry, hired as a replacement for Hans Suess and taking over the lab of Harold Urey as assistant Professor, promoted to Distinguished Professor and John Dove Isaacs Endowed Chair in Natural Philosophy (emeritus, recall). He was Chair of the Department and Founding Dean of Physical Sciences and of the Environmental Systems major.

His work involves isotopic studies of fundamental chemical physics and its applications. This includes the origin of the solar system, solar wind history from lunar studies, meteoritics, and atmospheric science. This includes time scales back to 3.8 billion years ago and defining the origin of life and oxygen, Snowball Earth, Holocene (ice core), Industrial Revolution to present times. His work involved rocket and balloon sampling, South Pole, Greenland, and Tibetan ice collections. His work in basic physics includes synchrotron studies and the development of nano scopes using quasi-particles as an imaging source for space return samples.

Dr. Jyoti Mishra will give a presentation titled "From climate trauma to collective resilience - inspired by the ever-optimist Dr. Ram".

The abstract of the presentation is as follows:

This talk will focus on a new emerging field at the intersection of climate change, accelerated disasters, and mental health impacts. It will showcase evidence from community-wide studies in California that disasters, particularly wildfires, can have long-lasting mental health impacts. These include clinical symptoms of post-traumatic stress disorder, anxiety, and depression, such that 30-40% of disaster-exposed community members can be impacted. Further studies of cognition and brain function reveal impacts on attention and decision-making capabilities, especially for individuals exposed to the wildfires, and a hyper-alert brain state that has come to be known as the 'fire brain'. Apart from understanding these serious impacts, we also need community-partnered solutions to build collective resilience. The talk will highlight how we are leveraging nature-based solutions both in UC education and in community partnerships to specifically build mental health resilience in the context of climate change.

Dr. Jyoti Mishra is an Associate Professor in the Department of Psychiatry at the University of California San Diego. She is the director of the NEATLabs and co-director of the UC-wide Climate Resilience Initiative (https://www.climateresilience.online/). She has led seminal community studies in California demonstrating the impacts of climate change on mental health that have been recognized by the National Climate Assessment and the IPCC.

Dr. Benjamin Z. Houlton will give a presentation titled "Ram: A visionary who rewrote the climate story".

The abstract of the presentation is as follows:

Ram Ramanathan is far more than a world-renowned climate scientist—he is a force of nature in his own right. His groundbreaking discoveries have shaped our understanding of climate change, but it is his rare ability to unite science with soul that truly sets him apart. Ram has been a master bridge-builder, weaving together the threads of religion, art, science, industry, and community into a powerful tapestry of climate action. Where others saw silos, Ram saw symphonies. He inspired collaborations that transcended disciplines and ideologies, forging unlikely alliances in pursuit of a shared future.

At the University of California, Ram helped pioneer a bold new model of academic engagement—one rooted in public-private partnerships and driven by real-world impact. His leadership of the Bending the Curve report was a clarion call to scholars: think beyond the ivory tower, and let your work ripple outward into society. This vision positioned UC as a global leader in climate solutions.

But Ram didn't stop there. In 2016, he launched the California Collaborative for Climate Change Solutions (C4S)—a sweeping initiative that united minds from UC, CSU, Stanford, Caltech, and USC. C4S became a launchpad for turning research into action, catalyzing major state investments in carbon removal, clean energy, and climate resilience. It was a cornerstone of Governor Jerry Brown's vision to make California a beacon of global climate leadership.

Ram's publication record is stellar, and his accolades are many. But his most enduring legacy lies in his ethos: one of radical collaboration, deep compassion, and unwavering hope. He has shown us that science can be a bridge—not just to knowledge, but to community, to justice, and to a better world. Ram Ramanathan doesn't just study the climate—he changes it, in every sense of the word.

Benjamin Z. Houlton is the Ronald P. Lynch Dean of the College of Agriculture and Life Sciences (CALS) at Cornell University and a professor in the Departments of Ecology and Evolutionary Biology and Global Development. Since beginning his deanship in 2020 and being reappointed in 2024, he has led CALS in advancing interdisciplinary research, education, and outreach, including co-chairing The 2030 Project: A Cornell Climate Initiative. Under his leadership, CALS launched the “Roadmap to 2050” strategic vision, which prioritizes moonshot thinking to support cutting-edge research, teaching, and extension across disciplines.

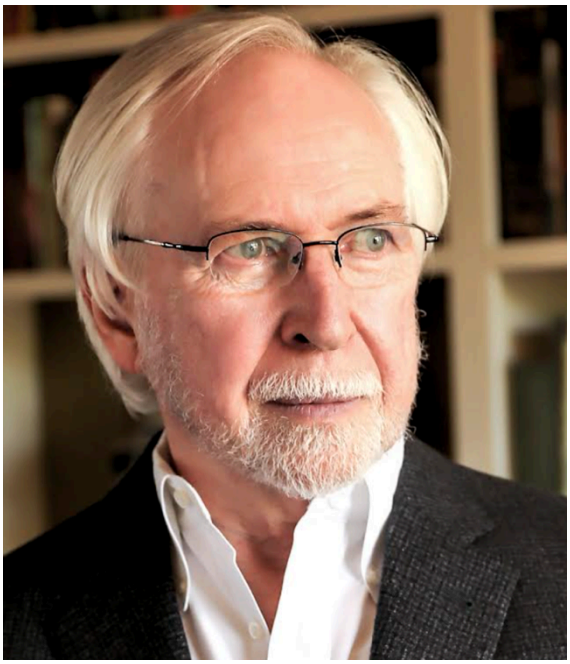
An internationally recognized scientist, Houlton’s research focuses on global ecosystem processes, climate solutions, and agricultural sustainability, with over 150 publications. He is co-founder of The N3gative (pronounced Negative) Company and founding PI of the Working Lands Innovation Center, and he serves on numerous advisory boards and scientific organizations. Houlton actively works with diverse farmers, agri-business, NGOs, and the mining sector to innovate carbon removal solutions for agriculture. Houlton holds degrees from the University of Wisconsin–Stevens Point, Syracuse University, and Princeton University, and previously led the John Muir Institute of the Environment at UC Davis.

Dr. Jack Miles will give a presentation titled "Science, Religion, and the Climate Crisis".

The abstract of the presentation is as follows:

Ram Ramanathan, a son of the global South and a cultural Hindu, has long maintained that only the West presumes that science and religion must be mutually incompatible. If with him we assume for the sake of argument that they are compatible, then the question becomes: compatible in what regard or in what way? What classic religious traits might characterize a scientifically guided, religiously shaped movement to save the world by stabilizing its climate?

I propose three: conversion, asceticism, and transcendence. Conversion: sudden, radical change governing every aspect of life. Asceticism: the renunciation of certain pleasures in service to a postulated higher good. Transcendence: the enlargement of the moral world beyond the material to the spiritual and beyond the present to the future.



Dr. Jack Miles is Distinguished Professor Emeritus of English & Religious Studies at the University of California, Irvine. He is the author of a trilogy of works on God in three classic scriptures, of which the first, God: A Biography, on God in the Jewish Bible won a Pulitzer Prize in 1996. Miles was a MacArthur Fellow during the years 2003-2007, partly on the strength of a seminal essay, "Global Requiem: The Apocalyptic Moment in Science, Religion, and Art." During his year as Mellon Scholar at Caltech (1996-1997), Miles won the teaching award given by the student body. His doctorate is from Harvard University. He is an alumnus as well of the Hebrew University, Jerusalem, and the Pontifical Gregorian University, Rome.

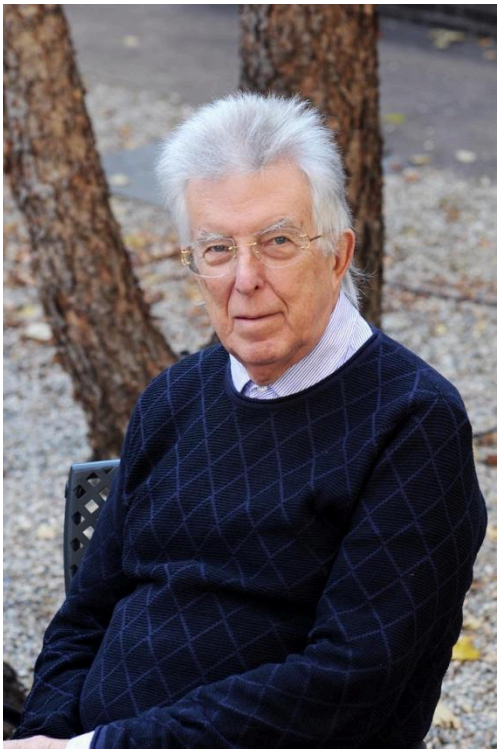
Roger Reynolds will give a presentation titled "Considering one's 'audience': shaping the message to what it can hear".

The abstract for this presentation is as follows:

As a composer, in times lacking a widely shared "common practice" such as Mozart had in
his, one is faced with the task of fashioning one's own consistency: a coherent practice that might allow an uninitiated listener to orient themselves to musical experiences they are unprepared for.

The scientific community that comprehends the gravity of our current climate crisis has a similar dilemma: the science underlying their concerns rests on probabilities and nuanced predictions based on trends. Most of us do not think in that way. How can scientists shape not only the content they wish their uninformed audiences to receive, but also to devise a communicative mode that can successfully carry their urgent message? This is not a "one size fits all" circumstance.

To elicit reception, grasp, and potentially action on the part of one's listeners, one has to fashion varied packages, provide metaphoric handles that allow dissemination on at least three distinct levels: the novice, the dimly aware, and the well-informed. The last is the least important.



Roger Reynolds is a Pulitzer Prize-winning composer based at UC San Diego where he has professed for more than six decades. He is a University Professor Emeritus in the system, and a Member of the American Academy of Arts and Letters. The Library of Congress has a Special Collection devoted to his materials. His creative work is informed by interactions with scientists and their insights. His compositions explore novel dimensions: notational practice, simulation of auditory spaces, algorithmic modification of recorded sound, and cross-modal exploration. Roger and Ram befriended one another in 2016 when they were recipients of UCSD's Revelle Medal. They lunch as schedules allow.

Dr. Kimberly A. Prather will give a presentation titled “Community Voices Validated: Tijuana River Pollution Drives Regional Air Quality.”

The abstract for this presentation is as follows:

The Tijuana River has long carried untreated sewage and industrial waste into South San Diego County, creating a public health crisis that extends beyond the water’s edge. Our measurements show that polluted river flows release hydrogen sulfide and other toxic gases into surrounding neighborhoods, degrading regional air quality. These findings confirm what residents have been reporting for years—their voices served as the first air quality sensors, and science has now validated their lived experience. By demonstrating the direct connection between poor water quality and poor air quality, this work highlights an overlooked exposure pathway and underscores the need for urgent action to protect vulnerable communities.

Dr. Kimberly A. Prather is Distinguished Professor and Distinguished Chair in Atmospheric Chemistry at the Scripps Institution of Oceanography and in the Department of Chemistry and Biochemistry at the University of California San Diego. She is internationally recognized for developing advanced tools to measure aerosols and gases, including single-particle mass spectrometry, which has advanced our understanding of the sources, composition, and transformations of airborne particles. As the founding Director of the NSF Center for Aerosol Impacts on Chemistry of the Environment (CAICE), she led a pioneering effort to bring the entire ocean–atmosphere system into the laboratory—allowing, for the first time, direct study of how pollutants and microbes are transferred from the ocean surface into the air, and how these emissions impact atmospheric chemistry, climate, and health. She also co-founded the Meta-Institute for Airborne Disease in a Changing Climate, which focuses on airborne exposures to pollutants and pathogens from contaminated waters and their impacts on human and ecosystem health. Her leadership and scientific achievements have been recognized with numerous honors, including election to the National Academy of Sciences, the National Academy of Engineering, Association for the Advancement of Science, the American Academy of Arts and Sciences, and the American Philosophical Society.

Dr. Jennifer Burney will moderate the fourth annual Ramanathan Climate Conversation.

Recognizing that climate change is a global challenge that requires global solutions, Climate Conversations: Pathways to Action webinars on Climate Sustainability in South and East Asia in honor of V. Ramanathan focus on Asia while aiming to identify pathways to action relevant to viewers and policymakers around the world. The panel conversation will explore the drivers and impacts of air pollution in India, with a special focus on agricultural practices, and actions that are being taken to address public health concerns.

Dr. Burney is a Professor in Global Environmental Policy and Earth System Science in the Doerr School of Sustainability at Stanford University. Her research focuses on the coupled relationships between climate and food security – measuring air pollutant emissions and concentrations, quantifying the effects of climate and air pollution on land use and food systems, understanding how food production and consumption contribute to climate change, and designing and evaluating technologies and strategies for adaptation and mitigation among the world's farmers. She has a PhD in Physics from Stanford University and was named a National Geographic Emerging Explorer in 2011. Prior to joining the Doerr School, she served on the faculty at UC San Diego's School of Global Policy and Strategy and Scripps Institution of Oceanography.

Dr. Meha Jain will participate in the panel discussion of “Session 3: Air Pollution in India: Ramanathan Climate Conversation 2025”, which is presented by the National Academies with a live audience online.

Dr. Jain is an Associate Professor in the School for Environment and Sustainability and is also part of the Sustainable Food Systems Initiative at the University of Michigan. Jain's research examines the impacts of environmental change on agricultural production, and strategies that farmers may adopt to reduce negative impacts. To date, her work has focused on the impacts of weather variability and groundwater depletion on agricultural production in smallholder systems, and whether farmers are able to adapt their cropping practices to mitigate these impacts. She has a B.A. in Ecology and Evolutionary Biology from Princeton University, a Ph.D. in Ecology, Evolution, and Environmental Biology from Columbia University, and postdoctoral experience in the Department of Earth System Science at Stanford University.

Dr. Pallavi Pant will participate in the panel discussion of "Session 3: Air Pollution in India: Ramanathan Climate Conversation 2025", which is presented by the National Academies with a live audience online.

Dr. Pant is an environmental health scientist whose work focuses on the health impacts of air pollution, especially in low- and middle-income countries. As Head of Global Initiatives at the Health Effects Institute (HEI), she leads efforts to strengthen local evidence, strengthen capacity, and raise public awareness around air quality and health. She has published widely on exposure assessment, and the intersection of air quality and health.

Beyond her research, she has worked on various science communication and public engagement initiatives, helping make data and evidence accessible to policymakers, journalists, and communities. Her work often bridges academia, policy, and civil society, helping connect rigorous science with practical solutions for cleaner air. She also serves on the editorial boards of Air Quality, Atmosphere & Health and PLOS Global Public Health, chairs the Governing Board of OpenAQ, and advises international initiatives through the World Health Organization and the Climate and Clean Air Coalition. Dr. Pant has a Ph.D. in Environmental Health from the University of Birmingham, UK, and a Master's in Environmental Sciences from the TERI School of Advanced Studies, India.

Dr.Meera Mahadevan will participate in the panel discussion of “Session 3: Air Pollution in India: Ramanathan Climate Conversation 2025”, which is presented by the National Academies with a live audience online.

Dr. Meera Mahadevan is an Assistant Professor at the School of Global Policy and Strategy at UC San Diego. Her research lies at the intersection of development, energy, and environmental economics, focusing on public service delivery, infrastructure, and political economy in low- and middle-income countries. She currently works on projects on electricity transitions, water markets, and governance in South Asia. Mahadevan holds a Ph.D. in economics from the University of Michigan, an M.Sc. in economics for development from the University of Oxford, and a B.A. (Hon..) in economics from Delhi University.

Dr. David Victor will moderate the panel of "Session 4: All-hands on deck approach to Climate Science and Climate mitigation:", in which researchers and stakeholders will share their insights on how atmospheric composition has shaped recent climate changes and how targeted mitigation may slow down its future pace.

Dr. Victor is a distinguished professor of innovation and public policy at the School of Global Policy and Strategy at UC San Diego. He also co-directs the campus-wide Deep Decarbonization Initiative, which focuses on the engineering, economic, and political challenges associated with bringing the world to nearly zero emissions of warming gases. He has been heavily involved in many different climate- and energy-policy initiatives, including as convening lead author for the Intergovernmental Panel on Climate Change (IPCC).

He is also an adjunct professor in Climate, Atmospheric Science & Physical Oceanography at the Scripps Institution of Oceanography and a professor (by courtesy) in Mechanical and Aerospace Engineering. Prior to joining the faculty at UC San Diego, Victor was a professor at Stanford Law School, where he taught energy and environmental law. His Ph.D. is from the Massachusetts Institute of Technology and A.B. from Harvard University.

Dr. Venkatachalam Ramaswamy will give a presentation titled "Earth's Energy Imbalance and hydrological Extremes" and participate in the panel discussion of “Session 4: All-hands on deck approach to Climate Science and Climate mitigation”.

The abstract of the presentation is as follows:

Satellite observations over the past two decades indicate an increasing imbalance in the Earth's radiative energy, with a distinct temporal evolution in the solar and longwave components, from the low to the high latitudes. Spectral top-of-the-atmosphere measurements combined with model simulations demonstrate that the observed signatures of the imbalance are explainable in terms of the forcings, feedbacks, and natural variability in the Earth System, including the effects of greenhouse gases, aerosols, land-surface changes, and clouds.

This line of investigation is a direct legacy of the pioneering research of Professor Ramanathan, who pointed out how satellite radiation measurements combined with fundamental theory yield impacts of changes in atmospheric composition on the Earth’s energy imbalance and climate. Climate model integrations accounting for variability and forcings illustrate the capability of predicting the frequency of extreme weather occurrences concomitant with the increasing energy imbalance, e.g., extreme precipitation, and heat and humidity extremes.

Dr. Ramaswamy is Director of NOAA's Geophysical Fluid Dynamics Laboratory (GFDL) and Professor in the Atmospheric and Oceanic Sciences Program at Princeton University. Ramaswamy received his PhD in Atmospheric Sciences from the State University of New York at Albany. He was a Fellow in the Advanced Study Program at the National Center for Atmospheric Research, Boulder, where he did his postdoctoral research working with Professor Ramanathan on climate interactions involving aerosols and clouds.

At NOAA/GFDL, his research interests include mathematical modeling and the understanding of the Earth System, leading to predictions and projections with applications to a wide range of extremes on weather-to-climate timescales. He is a member of the National Academy of Sciences, Fellow of the American Geophysical Union and American Physical Society, and Fellow and recipient of the Carl Gustaf Rossby Medal of the American Meteorological Society.

Dr. Ralph Keeling will give a presentation titled "Perspectives on modern climate change from 67 years of direct atmospheric measurements" and participate in the panel discussion of “Session 4: All-hands on deck approach to Climate Science and Climate mitigation”.

The abstract of the presentation is as follows:

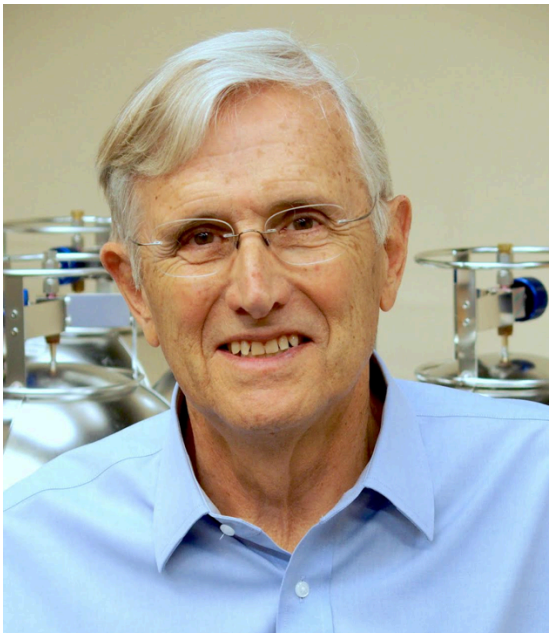
At the forefront of modern climate change research are time-series observations of atmospheric CO_2 and related species, such as atmospheric O_2. These records now span many decades, providing unequivocal evidence of the profound influence of humans on the planet—particularly through the burning of fossil fuels. This talk will briefly chart the history of this field, from the early measurements and scientific puzzles to today’s continuing challenges.

Dr. Keeling’s work centers on long-term measurements of the major constituents in the air. He has been on the faculty at the Scripps Institution of Oceanography, UC San Diego, since 1993. He was the first to demonstrate that the O2 content of air is decreasing due to the burning of fossil fuels and has directed a program to track this decrease since 1989. Since 2005, he has also directed the Scripps CO2 program, which sustains the iconic record of carbon dioxide at Mauna Loa and other sites, begun by his father, Charles D. Keeling. Keeling has received the Rosenstiel Award in marine and atmospheric chemistry, the Humboldt Research Award, and is a Fellow of the American Geophysical Union.

Dr. Ray Weiss will give a presentation titled "Potent GHGs: Rams' pioneering influences on the roles of minor atmospheric trace gases on climate and climate policy" and participate in the panel discussion of "Session 4: All-hands on deck approach to Climate Science and Climate mitigation".

The abstract of the presentation is as follows:

In 1975, just one year after Molina and Rowland's landmark paper showing that chlorofluorocarbons (CFCs) catalytically destroy stratospheric ozone, Ram raised further concern over these emissions by showing that, despite their parts-per-trillion atmospheric abundances, anthropogenic CFCs are also exceptionally potent greenhouse gases (GHGs). This marked the beginning of Ram's research on the effects of a broad range of trace gases on climate. This included a major emphasis on controlling methane as a way of "bending the curve" due to its shorter atmospheric lifetime. Ram's pioneering work has played a significant role in the evolution of climate policy over the intervening decades.



Dr. Weiss is a Distinguished Professor Emeritus at the Scripps Institution of Oceanography, University of California, San Diego. His career has been devoted to the use of chemical tracers to study global and regional processes in the oceans and the atmosphere. His current research focuses on the global atmospheric distributions, trends, and emissions of more than 50 industrial and biogenic greenhouse gases and of substances that deplete the stratospheric ozone layer. He leads the central experimental laboratory of the Advanced Global Atmospheric Gases Experiment (AGAGE), a 13-nation research collaboration that measures and models the global and regional distributions and emissions of these gases. He has published more than 265 research papers and is a Fellow of the American Geophysical Union and of the American Association for the Advancement of Science.

Dr. Jessica Seddon will give a presentation titled "Peculiar particles: reflections on black carbon, aerosols, and the intersection of science, policy, and public awareness" and participate in the panel discussion of "Session 4: All-hands on deck approach to Climate Science and Climate Mitigation".

The abstract of the presentation is as follows:

The science of aerosols is clear: they are small particles with significant impacts – on climate, health, ecosystems, and more. And in some sense, the policy response should also be clear: limit the emissions of both particles and their precursors, especially when they are where people can breathe them in. The thread, however, often gets lost somewhere in the middle. This talk will reflect on the ways that particles, including black carbon, have been represented – and all too often overlooked - as objects of environmental governance over the past couple of decades. It will discuss some of the emerging possibilities for improving their visibility and, ideally, accelerating efforts to reduce their impacts.

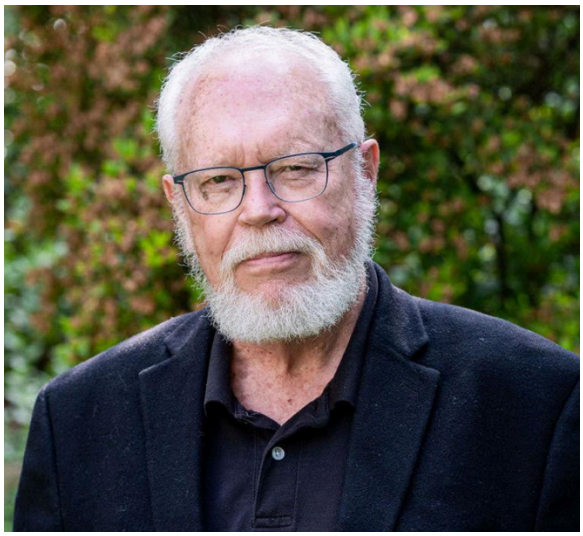
Dr. Seddon is Senior Lecturer and Director of the Deitz Family Initiative on Environment & Global Affairs at the Yale Jackson School of Global Affairs. She is also a co-founder of The Institutional Architecture Lab. Her work on environmental governance focuses on how new sources of data can be leveraged to enable new (and more sustainable) ways of interacting with the environment around us. Her career in India and the U.S. spans academic, program leadership, and strategic advisory roles focused on institutional design for integrating science into policy and social initiatives.

She was an Assistant Professor at UCSD's policy school, then called International Relations and Pacific Studies (IR/PS) in the mid-2000s, where she collaborated with Ram and others on several science-policy papers on short-lived climate pollutants. They later worked together on projects to address black carbon and other pollution from transport and household energy in India.

Mr. Durwood Zaelke will give a presentation titled "Super climate pollutants: Ram's influence and advocacy on non-CO2 super pollutants, UNEP/CCAC and Montreal Protocol" and participate in the panel discussion of "Session 4: All-hands on deck approach to Climate Science and Climate mitigation"

The abstract of the presentation is as follows:

Ram introduced the world to what was until then the forgotten half of warming – the non-CO2 climate pollutants. He did pioneering research on the science, while also helping build key institutions to mitigate these pollutants. He became and remains a leading advocate for stronger policy, especially to protect the most vulnerable 3 billion, working in sophisticated partnerships, including California Governor Jerry Brown and other governors, Pope Francis and the Vatican Pontifical Academies, and the Dalai Lama.



Durwood Zaelke is the founder and President of the Institute for Governance & Sustainable Development in Washington, DC, and Paris, focusing on fast mitigation strategies that avoid the maximum amount of warming over the next decade to slow climate feedbacks and avoid tipping points. Prior to IGSD, Zaelke co-founded and served as President of the Center for International Environmental Law in Washington, DC, and Geneva, and co-founded the Program on Governance for Sustainable Development at the Bren School of Environmental Science & Management, UC Santa Barbara, where he is an adjunct professor teaching climate courses. Zaelke is the author of International Environmental Law & Policy (with Hunter & Salzman) (6th ed. 2022).

Dr. Marcelo Suárez-Orozco will give a presentation titled "Vatican-sponsored global movement for climate resilience".

The abstract of the presentation is as follows:

This paper offers five reflections on Pope Francis' 2024 call for integral climate resilience, emphasizing the unity of ecological and social justice. Building on his writings and the Planetary Protocol, co-authored by Ram Ramanathan and me and signed by Pope Francis, the Pontifical Academies are convening ten global summits uniting civic, scientific, faith, Indigenous, and youth leaders.

The reflections highlight:
(1) the indivisibility of the cry of the Earth and the cry of the poor;
(2) solidarity as a global mandate;
(3) the MAST framework (Mitigation, Adaptation, Societal Transformation);
(4) proactive resilience planning; and
(5) ecological conversion.

Region-specific blueprints from every hemisphere on Earth are emerging, offering actionable, science-based, and interdisciplinary pathways toward a just and sustainable future.

Marcelo Suárez-Orozco is Chancellor of the University of Massachusetts Boston. Previously, he served as the inaugural UCLA Wasserman Dean, leading UCLA's oldest and highest-ranked School. He served as the Thomas Professor of Human Development at Harvard and the Ross University Professor at NYU. His research spans cultural psychology, anthropology, education, migration, globalization, and climate resilience. A prolific scholar, his award-winning books have been published by Harvard, Stanford, Cambridge, NYU, Columbia, UC Press, and others. He is co-editor with Ram Ramanathan of From Climate Crisis to Climate Resilience, published by the Vatican Press.

He regularly contributes to major media outlets worldwide. Elected to the American Academy of Arts and Sciences and the National Academy of Education, Pope Francis appointed him to the Executive Council of the Pontifical Academy of Social Sciences, where he currently co-leads the 10-nation Global Summits for Building Climate Resilience. He serves on multiple boards and has received the Mexican Order of the Aztec Eagle for his global contributions to the study of human migration. His first tenure appointment was in Anthropology at UCSD.

Dr. Jos Lelieveld will give a presentation titled “The Center for Clouds, Chemistry and Climate (C4) pioneered links between air quality and climate”.

The abstract of the presentation is as follows:

Ram’s pioneering science on climate pollutants inspired an international team to address one of the planet’s greatest challenges: massive air pollution hazes and their far-reaching effects on air quality and climate. To lead this effort, Ram founded the Centre for Clouds, Chemistry and Climate (C4) 35 years ago. C4 undertook major field experiments, combining satellite data, in situ measurements, and modeling. These studies uncovered the central role of atmospheric brown clouds in climate change and planetary health. It motivates generations of researchers to work towards “bending the curve”.

Dr. Lelieveld holds a PhD in atmospheric physics from the University of Utrecht in the Netherlands (1990). Since 2000, he has been a director at the Max Planck Institute for Chemistry in Mainz, Germany. He has contributed fundamental knowledge about the chemistry of atmospheric change and its role in air quality and climate. He has been a highly cited researcher for nearly two decades and has received many international distinctions. His studies focus on the self-cleaning (oxidizing) capacity and atmospheric composition. He develops methods to attribute air pollution and its climate and health impacts to the sources, which time and again implicates the use of fossil fuels and advocates for clean, renewable energy sources.

Dr. S. K. Satheesh will give a presentation titled "Insights from INDOEX and Kashidoo Climate Observatory".

The abstract of the presentation is as follows:

Satheesh was the resident scientist in Kaashidhoo Climate Observatory (KCO) in the Republic of Maldives from 1998 to 2000. He was an active participant in INDOEX prior to and during his postdoctoral research at the Centre for Clouds, Chemistry and Climate. As part of INDOEX, Satheesh participated in several shipborne experiments onboard ORV Sagar Kanya. Satheesh will share insights from KCO and INDOEX briefly.

Dr. Satheesh is Professor and Chair of the Divecha Centre for Climate Change and Dean (Planning and Infrastructure) of the Indian Institute of Science, Bangalore. He is the Director of the Future Earth South Asia Global Secretariat Hub. Prof. Satheesh published more than 200 scientific articles. He published around 200 scientific articles. He is the recipient of numerous national and international awards. Some of these include The World Academy of Sciences (TWAS) Prize, American Geophysical Union Medal, and the Infosys Prize.

Dr. Örjan Gustafsson will give a presentation titled "Hanimaadhoo Observatory, Pontifical Academy and beyond: examples of Ram's living legacies".

The abstract of the presentation is as follows:

It is heartening that the many massive legacies of Ram are joyfully celebrated! Will here share on two Ram-stamped legacies:

- The Maldives Climate Observatory – the heart and soul of South-Asia based SLCF research
- The Vatican's Science Academy – how Ram joined forces with Pope Francis to leverage attention to how we can bend the curves of the climate crisis to a climate-resilient world, for all.

Dr. **Gustafsson** (PhD MIT'97) is Professor at Stockholm University, elected academician to the Royal Swedish Academies of Science and the Pontifical Academy of Sciences (PAS, the Vatican). He has contributed over 250 research articles, spanning from methane releases of thawing subsea permafrost and collapsing hydrates in the Russian Arctic Ocean (6 months at sea in the Arctic) to running climate observatories downwind of India and China that help pinpoint sources and effects of climate-perturbing aerosols, CO, and methane. He also seeks to contribute towards climate resilience through consultations with governments and multi-sectoral stakeholders from across the world, contributions to media/communications and teaching the UC/Ram--initiated course on climate change solutions - bending the curve.

Dr. Yan Feng will moderate "Session 5: Energy Balance and Aerosol-Cloud-Circulation Interactions", in which researchers will share their insights on Perspectives on Atmospheric Composition and Radiative Forcing as well as Advances in Interactions of Aerosols, Clouds, Water Vapor, and Circulation.

Dr. Yan Feng is a Principal Atmospheric Scientist and Department Head of Earth and Atmospheric Sciences at Argonne National Laboratory of the U.S. Department of Energy. She is also a senior scientist at large with the University of Chicago. Her research focuses on aerosol modeling and its interactions with radiation, chemistry, clouds, and biogeochemical cycles. More recently, she has worked on machine-learning enhanced Earth system modeling and developing predictive models for wildfire and dust storms. Yan did her postdoctoral research with Ram from 2005 to 2010, after receiving her PhD from the University of Michigan.

She currently serves as an Associate Editor (2021-) for the Journal of Advances in Modeling Earth Systems (JAMES), and committee member for the AGU James R. Holton Award (2021-2024) and Science For Solutions Award (2024-). Following RamFest2025, she will lead a special issue on "Advances in Earth's Energy Balance, Aerosols, Cloud Processes & Climate" hosted by the
AGU's JGR-Atmos and Perspectives of the Earth and Space Scientists, which will feature the submitted presentations along with additional community contributions.

Dr. Jeffrey Kiehl will give a presentation titled "Radiative Reflections: The Early Years".

The abstract of the presentation is as follows:

I first met Ram in the summer of 1978 at NCAR, while I was a graduate student. This initial meeting turned into a collaborative friendship spanning nearly fifty years. In this presentation, I review our early work together on radiative transfer, climate modeling, and the use of ERBE satellite data. I also consider our collaboration in the founding of the Center for Clouds, Chemistry, and Climate (C4).

I reflect on the influence Ram has had on my scientific research over these many years. I conclude my presentation by considering Ram's long-term commitment to climate science communication and how this interest has overlapped with my work in this area. These reflections will be sprinkled throughout with numerous personal anecdotes about Ram.

Dr. Kiehl was a scientist at the National Center for Atmospheric Research from 1982 to 2020 and an adjunct faculty member at the University of California Santa Cruz from 2015 to 2023. He carried out research in atmospheric radiation, stratospheric ozone depletion, cloud climate interactions, aerosol effects, and paleoclimate.

He received his PhD from SUNY Albany in 1981. He began his collaborations with Ram in 1979. He is a fellow of both the American Geophysical Union and the American Meteorological Society and was awarded the AGU Climate Communication Prize in 2012. He also holds two advanced degrees in psychology and was an adjunct faculty member of Pacific Graduate Institute.

Dr. Qiang Fu will give a presentation titled "Global Stratospheric Methane Loss from Observations".

The abstract of the presentation is as follows:

Stratospheric CH4 oxidation is an important sink in the global CH4 budget and a major source of stratospheric water vapor and hydrogen radicals, influencing climate and ozone chemistry. However, its magnitude remains uncertain, with past estimates mainly from chemical-climate models (CCMs).

Using satellite data (2007–2010), we present the first observationally based estimate of stratospheric CH4 loss (LSTR), derived from CH4 diabatic flux across the isentropic surface fitted to tropical tropopause. We find LSTR = 52.3 ± 8.2 Tg/yr, compared with 38.1 Tg/yr from reanalysis and 25.7 Tg/yr (19.6–35.9 Tg/yr) from CCMs.

Applying our observational estimate in the bottom-up CH4 budget analysis for 2000s reduces the imbalance from 23 Tg/yr to ~0, bringing it into agreement with top-down estimates (–4 to 13 Tg/yr). These results underscore the importance of observational constraints on LSTR for resolving the global CH4 budget and understanding stratospheric H2O and O3.

Dr. Fu is the Calvin Professor of Atmospheric Sciences at the University of Washington (UW) in Seattle. He received his bachelor's and master's degrees from Peking University and earned his Ph.D. from the University of Utah. He was on the faculty at Canada's Dalhousie University before joining the UW in 2000, where he has been a full professor since 2006. His main research interests include atmospheric radiation and cloud, atmospheric remote sensing, stratospheric circulation and stratosphere–troposphere exchanges, and climate change. He is a member of the U.S. National Academy of Sciences and the Washington State Academy of Sciences and a Fellow of the American Meteorological Society (AMS), the American Geophysical Union, and the American Association for the Advancement of Science. His many honors include the Alexander von Humboldt Research Award and the AMS Jule G. Charney Medal.

Dr. Eric Wilcox will give a presentation titled "Regional circulation responses to radiative forcing of black carbon aerosols – a legacy of the Indian Ocean Experiment".

The abstract of the presentation is as follows:

The Indian Ocean Experiment (INDOEX) showed for the first time that light absorbing aerosols, through their strong radiative forcing in the atmosphere and at the surface, can have major impacts on low cloud layers, surface temperature gradients, and regional circulation patterns, such as the Indian Monsoon. Here we review the legacy of INDOEX and regional climate responses to aerosol forcing, including those mediated by changes in the turbulent mixing of the lower troposphere and boundary layer in response to radiative forcing by light-absorbing aerosols.

Dr. Eric Wilcox is Research Professor in the Division of Atmospheric Sciences at the Desert Research Institute in Nevada and a member of the graduate faculty at the University of Nevada, Reno. His research addresses interactions among aerosols, clouds, and convection. Dr. Wilcox is also the statewide director of the Nevada NASA Space Grant and NASA EPSCoR programs supporting STEM workforce development and advancing research infrastructure in Nevada. He received a BS in physics from UC San Diego in 1995 and a Ph.D. from SIO/UCSD in 2002, working in Ram's lab from 1996 to 2003.

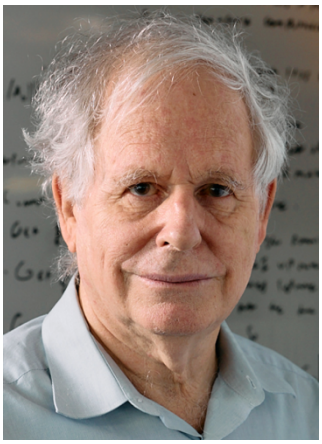
Dr. Daniel Rosenfeld will give a presentation titled "Overlooked and Underrated: How Ultrafine and Coarse Aerosols Change Climate Forcing ”.

The abstract of the presentation is as follows:

Anthropogenic air pollution aerosols offset nearly one-third of the warming due to anthropogenic greenhouse gas (GHG) emissions. Present quantification is primarily based on the effects of fine aerosols, which can serve as cloud condensation nuclei (CCN). However, ultrafine and coarse aerosols have comparably significant effects.

Ultrafine aerosols can significantly enhance deep tropical convective clouds (DCC), leading to larger, longer-lived, and more electrified clouds that precipitate more frequently and have more extensive and colder anvils, with a possible warming effect.

On the other hand, coarse sea salt aerosols have the opposite impacts on DCC. The coarse sea spray aerosols also counteract the cooling effects of fine aerosols on marine boundary layer clouds. Including these processes in GCMs is necessary for a proper calculation of the Earth’s thermodynamic and radiative energy budgets.



Dr. Daniel Rosenfeld is a Professor Emeritus at the Hebrew University of Jerusalem, Israel, from where he graduated in 1986. He pioneered aerosol cloud interactions impacts on precipitation and radiative forcing, for both stratocumulus and deep convective clouds, mostly by means of satellite and aircraft observations. He served as a Lead Author in the latest IPCC report in the chapter on Water Cycle Changes. He co-authored with Ramanathan their most cited paper, "Aerosols, climate, and the hydrological cycle” (Science, 2001). He is a Fellow of the AMS and AGU and has received numerous international awards.

Dr. Zhanqing Li will give a presentation titled "A new look at aerosol-cloud-interaction (ACI) by accounting for cloud-PBL coupling: A key to help unlock ACI deadlocks".

The abstract of the presentation is as follows:

Aerosol-cloud-interaction (ACI) remains the largest source of uncertainties in climate forcing, with many outstanding problems, including (1) systematic differences between observation and model-based estimates, (2) large discrepancies among observation-based estimates, and (3) controversies concerning the aerosol invigoration effect. A fundamental cause of the problems is found to be rooted in the cloud-PBL-coupling (CPC), which plays a key role in affecting the vertical distributions of aerosol and CCN, atmospheric thermodynamics, surface forcing, and thus cloud development.

Using comprehensive field observation data together with modeling, we have accounted for the coupling effect to gain new insights into the responses of both warm and cold clouds to aerosol. Through modulations of CCN, CAPE, entrainment rate, and sensible heat flux, the state of cloud-PBL-coupling can significantly affect cloud development from warm boundary-layer clouds and deep convective clouds. Accounting for such effects, all three major problems may be alleviated considerably, if not resolved.

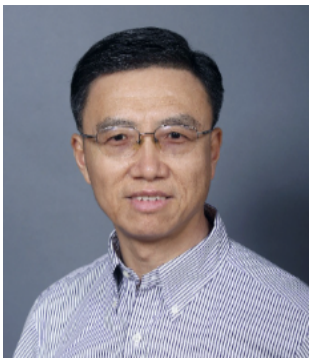
Dr. Li is a Distinguished University Professor at the University of Maryland. He has broad research interests concerning remote sensing technology, atmospheric physics and chemistry, climate, environment and public health, land and boundary meteorology, focused on aerosol, CCN, cloud, radiation budget, precipitation, wildfires, air pollution, PBL, and land-atmosphere interactions, documented in ~430 papers cited over 38000 times. Dr. Li is a fellow of AMS, AGU, and AAAS. He has received awards bestowed by organizations in US: AGU's Kaufman Outstanding Research Award and Tyndall Global Environment Lectureship, AMS's Suomi Tech. Medal, Fulbright Specialist; Canada: Head of Public Service Award, Aloutee Award, Bystrom Information Award, Tech. in Government Medal; Germany: Humboldt Research Award. He collaborated with Ram on aerosols and impact on monsoon climate in Asia (Li et al. 2016, Rev. Geophy.)

Dr. Guang J. Zhang will give a presentation titled "Convection, clouds, and atmospheric circulation interaction in climate".

The abstract of the presentation is as follows:

Convection and clouds interact strongly with atmospheric circulation to affect the Earth's climate. Convection is forced by the atmospheric thermodynamic instability and circulation. The condensational heating from convection, in turn, is a major energy source driving the circulation. The tropical circulation change due to convection further affects air-sea interaction.

This talk will first summarize my work on tropical air-sea interaction during CEPEX and then on how the simulation of tropical climate systems, such as ITCZ and MJO, is linked to convection in global climate models. My recent work on machine learning for atmospheric convection and clouds will also be briefly presented.



Dr. Zhang is a Distinguished Researcher at Scripps Institution of Oceanography. He joined Scripps in 1992 after being recruited by Professor Ramanathan to the Center for Clouds, Chemistry and Climate (C4) to work on the interaction of convection, clouds, and climate, partly motivated by Ram's "thermostat hypothesis". Over the years, his research interest has expanded to areas of tropical air-sea interaction, convection and cloud parameterization in global climate models, simulation of tropical climate systems such as ITCZ and MJO, weather extremes, and, more recently, machine learning. His work on convection parameterization, known as the Zhang-McFarlane scheme or simply as ZM, has been widely used by major climate modeling centers in the world in the past 30 years.

Dr. Meng Gao will give a presentation titled "Brown carbon in Asia and associated impacts on regional climate and air quality".

The abstract of the presentation is as follows:

Brown carbon (BrC) has been recognized as an important light-absorbing carbonaceous aerosol, yet understanding of its influence on regional climate and air quality has been lacking, mainly due to the ignorance of regional coupled meteorology-chemistry models. Besides, assumptions about its emissions in previous explorations might cause large uncertainties in estimates.

Here, we implemented a BrC module into the WRF-Chem model that considers source-dependent absorption and avoids uncertainties caused by assumptions about emission intensities. We then applied the developed model to explore the impacts of BrC absorption on radiative forcing, regional climate, and air quality in Asia.

Dr. Meng Gao is a professor at Hong Kong Baptist University. His research focuses on atmospheric chemistry and climate modeling, chemistry-climate interactions, and climate change mitigation. He received his Ph.D. degree in Chemical Engineering from the University of Iowa in 2015, and was a Postdoctoral Fellow at Harvard University from 2016 to 2019. He is a recipient of the European Geoscience Union Atmospheric Science Division Outstanding Young Scientist Award, and he is also a member of the World Meteorological Organization Global Air Quality Forecasting and Information System (GAFIS) Steering Committee.

Dr. Steven Sherwood will give a presentation titled " Atmospheric humidity and its role in heat stress".

The abstract of the presentation is as follows:

In recent years, heat stress has emerged as possibly the most severe direct impact on humans from climate change. Moreover, the important role of humidity is becoming recognised but is still sometimes overlooked. I will discuss the role of humidity in heat stress and some recent work explaining how very high values of wet-bulb temperature can eventuate in rare circumstances and what this might mean for future heat stress.

Dr. Sherwood is a Professor at the Climate Change Research Centre of UNSW Sydney, having received a Ph.D. in 1995 with Ram at Scripps in Physical Oceanography.

He studies atmospheric processes, particularly storm-related processes, how they interact with water vapour and clouds, and how these relate to global warming. He has been an IPCC lead author, ARC Laureate Fellow, AGU Fellow, and is currently co-lead of the World Climate Research Programme Safe Landing Climates Lighthouse, which seeks to identify pathways to a safe future climate.

Dr. Kristina Pistone will moderate the panel of “Session 6: Synthesis of Earth observations and climate modeling”. This session will focus on examples of field work and satellites and how Ram's legacy in this area of research translates to modeling results.

Dr. Pistone finished her PhD in 2014 with Ram as her advisor. Her research then and since has largely focused on observation-based studies of radiative effects of anthropogenic factors, specifically focused on the impacts of biomass burning aerosols. She is currently a research scientist at the Bay Area Environmental Research Institute based at NASA Ames Research Center. She also has experience and interest in science policy, communication, and education, both at NASA and elsewhere, including with AGU programs, local government, and community groups.

Dr. Manvendra Dubey will give a presentation titled "Black Carbon Mixing in Wildfire Plumes: Tropospheric Forcing & Stratospheric Lofting".

The abstract of the presentation is as follows:

Black carbon (BC) mixing state (internal, coated (core-shell or extruded), or external) determines the optical and hygroscopic properties of smoke emitted by wildfires. Organic carbon (OC) and water coated BC can enhance light absorption. While fresh BC is hydrophobic, mixing with hydrophilic inorganics can reduce its burden.

Field observations of BC coatings in shallow smoke plumes reveal growth in the near field by condensation and coagulation followed by a decline by evaporation. Observations of aged wildfire smoke plumes transported over long range show coating effects that depend on environmental conditions. Recent observations of thickly coated BC particles injected into stratosphere by Pyro-cumulous are a new regime that is not well understood.

We develop a reduced order modeling and analysis framework to understand evolution of BC mixing. The impacts of proper treatment of BC radiative forcing in Earth system models used to assess fossil energy and nuclear winter will be highlighted.

Dr. Manvendra Dubey is a Senior Scientist and Fellow at Los Alamos National Laboratory's (LANL) in Earth and Environmental Sciences. Dubey's research has integrated laboratory and field measurements to refine Earth system models for three decades. He has performed targeted greenhouse gas and aerosol observations to verify emission inventories and validate model parameterizations. He demonstrated that smoke from fires plays a key role in nuclear winter and radiative forcing. Dubey discovered the methane hot spot at Four Corners. He is building bridges between the public and private sectors at the nexus of environment and national security. Dubey is an AAAS and a Fulbright Fellow. He gave the 2023 Keeling lecture and is a member of the 2025 UN panel to assess the effects of nuclear war.

Dr. Amato Evan will give a presentation titled "Using in-situ measurements and satellite data to constrain the magnitude of the dust direct radiative effect".

The abstract of the presentation is as follows:

Mineral dust alters climate by absorbing and scattering radiation, yet its net radiative effect remains poorly constrained. Here we use three years of measurements of aerosols and radiation in southeastern California, combined with a novel soil mineralogy retrieved from aircraft measurements, to estimate the dust direct radiative effect (DRE). Our results show that at the surface and top of the atmosphere, the dust DRE is constrained to be negative. Our results underscore the importance of quantifying the iron oxide content of soil within dust sources.

Dr. Evan is a Professor in the Climate, Atmospheric Science and Physical Oceanography Division at the Scripps Institution of Oceanography, University of California, San Diego. His research focuses on understanding the physical processes that drive dust storms through a combination of observations and modeling, and on informing efforts to mitigate the adverse effects of wind-blown dust in California.

Dr. Dan Lubin will give a presentation titled "ALCINA: An Antarctic Field Program Led by Ram's Disciples".

The abstract of the presentation is as follows:

Among Ram's contributions to climate science are major field programs including the Central Equatorial Pacific Experiment (CEPEX), Indian Ocean Experiment (INDOEX) and Maldives Aerosol Campaign (MAC). With these campaigns Ram demonstrated how complex atmospheric variability can sometimes provide a natural laboratory for climate study.

One current issue involves mixed-phase clouds at high southern latitudes. Our lack of understanding of how they evolve in response to varying sources of cloud condensation nuclei and ice nucleating particles leads to an inability of Earth system models to accurately simulate circulation, oceanic energy input, and surface energy balance over Antarctic ice shelves.

Two SIO veterans of Ram's field programs, Dan Lubin (CEPEX & INDOEX) and Greg Roberts (MAC), along with Lynn Russell (SIO) and Jessie Creamean (Colorado State), will soon begin an 18-month campaign called Antarctic Low Cloud Interaction with Natural Aerosol (ALCINA), which will use Palmer Station as a natural cloud physics laboratory.

Dr. Dan Lubin is a Distinguished Research Physicist at the Scripps Institution of Oceanography. His interests include atmospheric science in polar regions, and stellar astrophysics related to terrestrial climate change. He has also served as an engineering duty officer in the US Navy Reserve (recently retired), where he acquired skills in technical project management and systems engineering.

He received his PhD from the University of Chicago in 1989, where Ram was a member of his thesis committee. As a postdoc and assistant researcher at Scripps, he worked with Ram on field programs in the Indian and Pacific Oceans. In recent years, he has organized and led two Antarctic field programs,

including a DOE ARM Mobile Facility campaign on Ross Island and the West Antarctic Ice Sheet.

Dr. Greg McFarquhar will give a presentation titled "From INDOEX to ESCAPE: Observational Constraints on how Aerosols Impact Cumulus Cloud Microphysics and Applications to Models".

The abstract of the presentation is as follows:

It has long been known that anthropogenic aerosol particles have large impacts on Earth's radiative forcing indirectly through modification of cloud properties. Although earlier studies on indirect effects concentrated only on the first and second indirect effects of cloud brightening and precipitation suppression, it is now recognized that aerosol impacts on cloud properties are more complex and can include semi-direct effects as well as feedbacks that must be considered.

Further, it is difficult to disentangle variations in clouds caused by meteorological influences versus those changes induced by aerosols themselves. Although only cloud properties can be measured and not cloud processes, direct measurements of cloud and aerosol properties can be made in simple meteorological settings in order to more easily hypothesize the role of different processes.

This presentation will examine data from 2 field campaigns conducted in such a setting, namely the 1999 Indian Ocean Experiment (INDOEX) where in-situ measurements of clouds and aerosols were made south of the Maldives during the winter monsoon and the 2022 Experiment of Sea Breeze Convection, Aerosols, Precipitation and Environment (ESCAPE) where isolated convective cells under sea breeze flow in the vicinity of Houston, Texas were sampled in order to see aerosol impacts in simple meteorological scenarios.

In-situ and remote sensing data from INDOEX were instrumental in establishing that increases in aerosols decrease cloud droplet size, cloud coverage and cloud height while increasing cloud droplet concentration in trade cumulus clouds. Complementary modeling studies established that not only the amount of aerosols, but also their vertical profile impacted the relative importance of the semi-direct effect as opposed to indirect effects. But insufficient data were available to determine how updraft strength in cloud varied with the degree of pollution.

The INDOEX results provided a foundation for ESCAPE that took place more than 20 years later. In-situ observations from ESCAPE provide similar findings in that droplet concentrations were enhanced and droplet sizes reduced in more polluted air masses east of Houston compared to cleaner continental conditions west of Houston and more

pristine oceanic conditions over the Gulf. A random forest algorithm applied to all updraft cores sampled during ESCAPE shows that vertical velocity, temperature and aerosol optical depth are the most important environmental conditions affecting cloud properties. In addition, the ESCAPE data allow characterization of how updraft core properties vary with altitude and investigation of whether in-cloud supersaturations in intense updraft cores are supportive of the warm-phase cloud invigoration hypothesis. Results show that vertical velocities and mass fluxes increased with height above cloud base, consistent with the nucleation of ultrafine aerosols releasing more latent heat in updraft cores. Although direct measurements of supersaturation are not available from ESCAPE, calculations of supersaturation using a quasi steady-state supersaturation show evidence of enhanced values in intense updrafts in pristine clouds that are consistent with condensational invigoration.

Dr. McFarquhar is the George Lynn Cross Research Professor in the School of Meteorology and Director of the Cooperative Institute for Severe and High Impact Weather Research and Operations (CIWRO) at the University of Oklahoma (OU). His research concentrates on obtaining knowledge of cloud properties from aircraft in-situ and remote sensing observations and on better understanding processes occurring in clouds through associated modeling studies. He has led or participated in 36 airborne field campaigns.

He received his Ph.D. from the University of Toronto and worked at Scripps, the National Center for Atmospheric Research, and the University of Illinois before joining OU. He is a fellow of the American Meteorological Society and the American Geophysical Union and President of the International Commission on Clouds and Precipitation.

Dr. William D. Collins will give a presentation titled "What's Past is Prologue: Studies of Fast Cloud Feedbacks using Machine Learning and Climate Emulators".

The abstract of the presentation is as follows:

The response of the climate system to increased greenhouse gases and other radiative perturbations is governed by a combination of fast and slow feedbacks. Slow feedbacks are typically activated in response to changes in ocean temperatures on decadal timescales and often manifest as changes in climatic state with no recent historical analog. On the other hand, fast feedbacks can be activated in response to rapid atmospheric physical processes on timescales of weeks and are already operative in the present-day climate.

This distinction implies that the physics of fast radiative feedbacks is present in the historical reanalyses that have served as the training data for many of the most successful recent machine-learning-based emulators of weather and climate. In addition, these feedbacks are functional under the historical boundary conditions pertaining to the top-of-atmosphere radiative balance and sea-surface temperatures. We discuss our work using historically trained weather emulators to characterize and quantify fast radiative feedbacks without the need to retrain for conditions pertinent to a future warmer climate.

Dr. William Collins is an associate laboratory director of Earth and Environmental Science at Berkeley Lab and a professor in residence in the Department of Earth and Planetary Science at UC Berkeley. His research interests center on the interactions among greenhouse gases and aerosols, the coupled climate system, and global environmental change with a focus on extremes. He is now actively exploring the potential of machine learning to advance the scientific foundation and practical application of climate science.

He received his PhD from the University of Chicago, where he joined Ram's group as a postdoctoral researcher. They continued their active collaboration at Scripps and worked together on several field campaigns, including CEPEX, ARESE, and INDOEX. He was awarded the AGU's Tyndall History of Global Environmental Change Lectureship in 2019 and their Jule Charney Lectureship in 2024. Dr. Collins is a Fellow of the American Association for the Advancement of Science (AAAS), the American Physical Society (APS), the American Geophysical Union (AGU), and the American Meteorological Society (AMS).

Dr. Gerald Meehl will give a presentation titled " The pattern effect, tropical cloud feedbacks, and CEPEX".

The abstract of the presentation is as follows:

The pattern effect debate, regarding whether the tropical Pacific SST response to increasing GHGs should be El Niño-like or La Niña-like, is relevant to a 1991 paper by Ram and Bill Collins postulating that cirrus anvils from deep convection over the Western Pacific Warm Pool could regulate how warm the underlying SSTs can become. The Central Equatorial Pacific Experiment (CEPEX) addressed this problem in 1993. Ram led this observational field project based in Fiji in collaboration with Joachim Kuettner, Bill Collins, and others.

Results from CEPEX showed cloud feedbacks indeed play a key role in Warm Pool SSTs along with contributions from surface evaporation. Subsequent papers in the 1990s invoked various processes, including cloud feedbacks over the Warm Pool explored in CEPEX, to postulate either an El Niño-like or La Niña-like , tropical Pacific SST response. This debate continues today and resonates with that early work by Ram and Bill.

Dr. Meehl is a Senior Scientist at the National Center for Atmospheric Research (NCAR). He leads the Earth System Predictability Section and is Chief Scientist of CATALYST, a collaborative research project involving NCAR and the U.S. Department of Energy to study Earth system predictability of modes of variability such as MJO and ENSO on subseasonal to decadal timescales.

Following Ram's example of combining field work with research, he has participated in several tropical field experiments, including TWERLE in American Samoa, MONEX in Borneo and Nepal, TOGA COARE in Townsville, Kapingamarangi and Nauru, and he was a scientific visitor to the CEPEX project that Ram led in Fiji.

He collaborated with Warren Washington and Ram in the 1980s in formulating the first global coupled climate model at NCAR, and he continues to study the mechanisms of Earth system variability and change relevant to the resilience of human societies.

Dr. Shang-Ping Xie will give a presentation titled "Climate response to anthropogenic aerosols: Robust spatial pattern of uncertain magnitude".

The abstract of the presentation is as follows:

Much attention has been given to radiative and cloud interactions with aerosols, but climate response to anthropogenic aerosols remains poorly constrained, as reflected in large uncertainties in global radiative forcing estimates in IPCC reports.

On the other hand, robust large-scale structures have emerged in global climate model response to Northern Hemisphere-wide aerosol increase over much of the 20th century, including a southward displacement of the ITCZ. Recent work shows that ocean meridional overturning circulation, both the deep and shallow types, damps the cross-equatorial Hadley / ITCZ response in the atmosphere, to a degree that zonal variations in SST and precipitation changes are prominent.

Over the past four decades, aerosol emissions have evolved in geographic distribution, resulting in climate response distinct from the pre-1980 epoch. This presentation highlights recent progress in understanding large-scale structures of aerosol-induced climate change.

Dr. Xie is the Roger Revelle Professor of climate science at Scripps Institution of Oceanography, UC San Diego. He was a lead author of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report. Dr. Xie received the Sverdrup Gold Medal from the American Meteorological Society for "fundamental contributions to understanding the coupled ocean-atmosphere feedback processes involved in climate variability and climate change."

Dr. Leo Donner will give a presentation titled "Basic Science and Actionable Science in Earth System Models: Ram's C4 Challenge in 2025".

The abstract of the presentation is as follows:

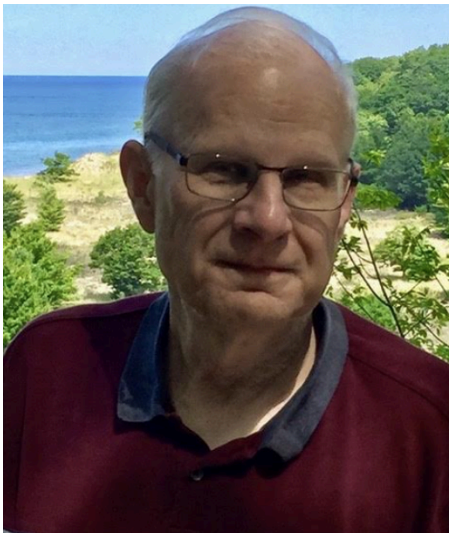
Within the past few years, multiple major challenges have emerged in Earth system modeling:

(1) As Earth has warmed in recent decades, model trends in sea surface temperature patterns have differed from observations;

(2) Conventionally constructed Earth system models are exhibiting out-of-sample behavior when applied to climate regimes outside of the historical record for which they were structured and tuned; and

(3) A major international assessment of the bounds on climate sensitivity found key cloud processes lack the representational adequacy in Earth system models to strongly constrain sensitivity.

These challenges require advances in basic understanding to empower actionable science to its fullest extent. Foundational to this understanding are many problems identified and explored at the Center for Clouds, Chemistry, and Climate (C4), a Science and Technology Center Ram led in the 1990s. Many of the approaches C4 pioneered are keys to addressing these major challenges.



Dr. Leo Donner is a physical scientist at the National Oceanic and Atmospheric Administration Geophysical Fluid Dynamics Laboratory (GFDL) and a lecturer at Princeton University. His research focuses on clouds and convection in the climate system and the development of global atmospheric models.

He worked with Ram on a 1980 study of the climate effects of methane and nitrous oxide. He served as science chair for the GFDL Atmospheric Model-3, which was awarded a 2012 Group Gold Medal by the United States Department of Commerce, and is a fellow of the American Meteorological Society and the American Association for the Advancement of Science.