

Independent Study on Potential Environmental Effects of Nuclear War

Committee

Antonio J. Busalacchi, Jr.

Co-Chair

Antonio J. Busalacchi Jr., has been president of the University Corporation for Atmospheric Research (UCAR) since August 2016. Prior to his appointment at UCAR, he served as director of the Earth System Science Interdisciplinary Center and professor in the Department of Atmospheric and Oceanic Science at the University of Maryland and was appointed chief of National Aeronautics and Space Administration Goddard's Laboratory for Hydrospheric Processes. Busalacchi studies tropical ocean circulation, its role in the coupled climate system, and phenomena such as El Niño. He has also been involved in the activities of the World Climate Research Programme (WCRP), and from 2008 to 2014 he chaired the Joint Scientific Committee that oversaw the WCRP. He is a Fellow of the American Meteorological Society (AMS), the American Geophysical Union, the American Association for the Advancement of Science, and Honorary Member and Fellow of the International Union of Geodesy and Geophysics and was the 2006 AMS Walter Orr Roberts Interdisciplinary Science Lecturer. In 2016, he was elected to the National Academy of Engineering. Busalacchi received a Ph.D. in oceanography from Florida State University. He has served on numerous committees of the National Academies of Sciences, Engineering, and Medicine, including as chair of the Board on Atmospheric Sciences and Climate, chair of the Climate Research Committee, and member of the Committee on Assessing the Impacts of Climate Change on Social and Political Stresses, Committee on Earth Science and Applications from Space, and the Committee on National Security Implications of Climate Change on U.S. Naval Forces.

Meng-Dawn Cheng

Co-Chair

Mengdawn Cheng is a Distinguished Research and Development Staff Scientist in the Environmental Sciences Division at the Department of Energy's Oak Ridge National Laboratory. Over the past two decades, he has supported the Department of Defense by leading inter-agency teams and universities in investigating the emissions of black carbon and the formations of soot particles from aircraft engines and air-breathing combustors. He has a diverse research portfolio and extensive experience in aerosol related areas. Cheng has achieved notable expertise in theory, sampling, instrumentation, and environmental effects related to aerosol particles over the past four decades. Currently, his research focuses on uranium aerosol science and technology, particle formation, and fate and transport in the environment for nuclear security applications. He also has studied airborne nanoparticles resulting from detonation applications of high energetics. In the early 2000s, he served on an expert panel for the Canadian Academy of Sciences on nanomaterials and has received several awards for his leadership and scientific and technical achievement from U.S. federal agencies. Cheng received his Ph.D. in atmospheric chemistry in environmental engineering from the University of Illinois Urbana-Champaign.

William D. Collins

Member

William D. Collins is the Associate Laboratory Director for the Earth and Environmental Sciences Area at Lawrence Berkeley National Laboratory (LBNL) and a Professor in Residence with the Department of Earth and Planetary Science at the University of California (UC), Berkeley. Before joining UC Berkeley and LBNL, he was a senior scientist at the National Center for Atmospheric Research and served as Chair of the Scientific Steering Committee for the Department of Energy (DOE)/National Science Foundation Community Climate System Model project. Collins is an internationally recognized expert in climate modeling and climate change science. His personal research concerns the interactions among greenhouse gases and aerosols, the coupled climate system, and global environmental change. He is a Fellow of the American Association for the Advancement of Science, the American Physical Society, and the American Geophysical Union (AGU). In 2019, He was awarded the AGU's Tyndall History of Global Environmental Change Lectureship. He served as Lead Author for the Fourth, Fifth, and Sixth Assessment reports published by the Intergovernmental Panel on Climate Change (IPCC); the IPCC was awarded the 2007 Nobel Peace Prize for its Fourth Assessment. His role as Chief Scientist in launching DOE's Accelerated Climate Model for Energy program was awarded the DOE Secretary's Achievement Award in 2015. Collins received his Ph.D. in astronomy and astrophysics from the University of Chicago.

Michael S. Elliott

Member

Michael S. Elliott is a retired member of the Senior Executive Service. Before his 2015 retirement, he was Deputy Director for the Strategic Stability, Plans and Policy Directorate in the Joint Chiefs of Staff. In 1996, Elliott retired as a Lieutenant Colonel from the United States Air Force, following 25 years of service with a distinguished flying record as a Master Navigator/Weapons Systems Officer in the B-1B, FB-111, and B-52. He represented the Joint Chiefs during interagency policy debate on diverse topics such as nuclear weapons employment policy and implementation of the Intermediate-Range Nuclear Forces Treaty. He has extensive interagency experience in military operations, strategy and policy development, and strategic planning. He represented the military position of the Services and Combatant Commanders during the New Strategic Arms Control Treaty (New START) in Geneva, Switzerland; served as the Chairman of the Joint Chiefs of Staff representative to the New START negotiations with the Russian Federation; and was also a member of the United States Strategic Command. In 2015, he was conferred with the Presidential rank Award of Meritorious Executive in the Senior Executive Service. He currently serves as a member of the Sandia National Laboratories Nuclear Deterrence External Advisory Board. Elliott received an M.S. in human resources management from Gonzaga University.

Jason Knouft

Member

Jason Knouft is a Professor in the Biology Department at Saint Louis University and a Research Scientist at the National Great Rivers Research and Education Center. From 2021 to 2022 he served as a Climate and Water Security Analyst for the U.S. Department of State in the Bureau of Intelligence and Research (INR) through the Jefferson Science Fellows program. His research focuses on the investigation of freshwater system responses to environmental perturbations, with a particular interest in water security, climate change, contaminants, land use change, and adaptation strategies to address these issues. Recently, Knouft has served as an INR deputy representative to the Climate Security Advisory Council, an INR ex officio deputy representative to the National Academies of Sciences, Engineering, and Medicine's Climate Security Roundtable, a member of the National Advisory Council for Environmental Policy and Technology at the U.S. Environmental Protection Agency, and a Scientific Review Committee member at the National Socio-Environmental Synthesis Center. Knouft received a Ph.D. in biology from the University of Illinois Urbana-Champaign.

Maureen Lichtveld

Member

Maureen Lichtveld is the Dean of the School of Public Health, the Jonas Salk Chair in Population Health, and Professor of Environmental and Occupational Health at the University of Pittsburgh. With over 35 years of expertise in environmental health, her research focuses on environmentally-induced disease, health disparities, climate and health, environmental health policy, disaster preparedness, public health systems, and community resilience. Lichtveld is a member of the National Academy of Medicine (NAM). She is the Chair of the Consortium of Universities for Global Health and has co-authored the textbook on Environmental Policy and Public Health. Honors include Johns Hopkins University Society of Scholars and Woman of the Year for the City of New Orleans for her contributions to science. Lichtveld received an M.D. from the University of Suriname. She serves on the NAM Council as well as the advisory committees for the National Academies of Sciences, Engineering, and Medicine's Climate Communications Initiative and the Division on Earth and Life Studies.

Nicole S. Lovenduski

Member

Nicole Lovenduski is an Associate Professor of Atmospheric and Oceanic Sciences at the University of Colorado Boulder. She was a National Oceanic and Atmospheric Administration Climate and Global Change Postdoctoral Fellow at Colorado State University before beginning her faculty position. Her research investigates modern-day ocean biogeochemistry and its linkages with climate change, extremes, and variability, with a particular emphasis on the carbon cycle. Her research toolbox includes a variety of ocean and Earth system models, as well as satellite, ship-based, and autonomous observation systems. She is a recipient of the American Geophysical Union Ocean Sciences Early Career Award, she was selected for a National Science Foundation CAREER award, and she was a National Academy of Sciences Kavli Fellow. Lovenduski received a Ph.D. in atmospheric and oceanic sciences from the University of California, Los Angeles.

Lovenduski published the article "Rapidly expanding nuclear arsenals in Pakistan and India portend regional and global catastrophe" in Science Advances in 2019, related to the scale of climate and downstream socioeconomic impacts of a regional nuclear weapons exchange.

Katherine A. Lundquist

Member

Katherine Lundquist is a research staff member for the National Atmospheric Release Advisory Center (NARAC) at Lawrence Livermore National Laboratory (LLNL). She leads the development of the NARAC models that are used to predict the consequences of hazardous atmospheric releases, particularly those for nuclear detonations or other radiological releases. Her expertise is in multiscale atmospheric modeling, atmospheric transport and dispersion, and nuclear effects. Lundquist also has researched atmospheric boundary layer flows over urban and complex terrain. She received the Lawrence Scholars Program Fellowship while at University of California, Berkeley and studied jointly as a graduate fellow at LLNL. She continued her post-doctoral studies at LLNL before taking her current position as a research staff member, where she recently received the LLNL Early Career Recognition award. Lundquist received a Ph.D. in mechanical engineering from the University of California, Berkeley.

Lundquist published the article “Examining the climate effects of a regional nuclear weapons exchange using a multiscale atmospheric modeling approach” in *Journal of Geophysical Research: Atmospheres* in 2020, related to the scale of climate forcing resulting from a regional nuclear weapons exchange.

James T. Randerson

Member

James Randerson is the Ralph J. and Carol M. Cicerone Professor of Earth System Science at the University of California (UC), Irvine. Prior to joining the faculty at UC Irvine, he worked as an assistant professor at Caltech from 2000 to 2003 and as a postdoctoral scholar at UC Berkeley and the University of Alaska Fairbanks from 1998 to 2000. Randerson researches the terrestrial biosphere and the role of fire in the Earth System. He uses high-resolution satellite imagery to identify how fires are changing in response to climate warming and land use intensification. He has conducted field measurements in boreal forests of Siberia and Alaska and temperate forests in California to quantify fire impacts on surface fluxes and atmospheric composition. He uses atmospheric models to understand how fires influence atmospheric chemistry, downwind ecosystems, and human health. Randerson is the recipient of the James B. Macelwane Medal and Global Piers J. Sellers Mid-Career Award from the American Geophysical Union (AGU). He is a Fellow of the AGU and a member of the U.S. National Academy of Sciences. Randerson received a Ph.D. in biological sciences from Stanford University.

Osvaldo E. Sala

Member

Osvaldo Sala is the Julie A. Wrigley Chair, and Regents' and Foundation Professor, at Arizona State University (ASU) in the School of Life Sciences and School of Sustainability; he is also the Founding Director of the Global Drylands Center. Before joining ASU in 2010, he was the founding Director of the Environmental Change Initiative and the Sloan Lindemann Professor of Biology at Brown University. Sala is a trained ecologist, and his research focuses on large-scale field manipulative experiments that simulate climate change globally. His work has been interdisciplinary, collaborating with geologists, social scientists, mathematicians, and humanists. At the global scale, he has developed highly-cited scenarios of biodiversity change for the year 2100. He has contributed to numerous international efforts, including the Millennium Ecosystem Assessment, the Global Biodiversity Assessment and IPCC (Intergovernmental Panel on Climate Change) assessments. He is a past President of the Ecological Society of America. He is an elected member of the American Academy of Arts and Sciences, the Academy of Sciences of Argentina, and Fellow of the American Geophysical Union, the American Association for the Advancement of Science, and the Ecological Society of America. Sala received a Ph.D. in ecology from Colorado State University.

Susan Solomon

Member

Susan Solomon is the Martin Professor of Environmental Studies at the Massachusetts Institute of Technology. Solomon has recent work in effects of wildfire smoke in the stratosphere and the influence of volcanoes on the chemistry, climate, and radiative properties of the Earth's atmosphere. She has pioneered notable research on the Antarctic ozone hole and the irreversibility of climate change and has a glacier in the Antarctic named after her. Solomon received the 1999 U.S. National Medal of Science, the Grande Medaille of the French Academy of Sciences, the Crafoord Prize of the Swedish Academy of Sciences, the Blue Planet Prize, and the Volvo prize. She is a member of the National Academy of Sciences, the French Academy of Sciences, the Pontifical Academy of Sciences, and the Royal Society in the United Kingdom. Solomon received a Ph.D. in chemistry from the University of California, Berkeley. Solomon currently serves as a member of the Science and Security Board of the Bulletin of the Atomic Scientists.

William J. Tedeschi

Member

William Tedeschi is a Technical Fellow at MITRE Corporation. Previously, he was at the Department of Energy (DOE) as a senior scientist in the Office of Intelligence and Counterintelligence and he has more than 30 years in technical and management roles in the various nuclear weapons programs at Sandia National Laboratories. He is recognized as one of the nation's foremost experts in nuclear weapon systems, weaponization, high-altitude electromagnetic pulse, and risk assessments. While at DOE, Tedeschi served on a Joint Duty Assignment at the Office of the Director of National Intelligence. He has served on the Air Force Scientific Advisory Board and has received multiple honors and awards, including a Secretary of Energy Achievement Award, a Secretary of Defense Award for Excellence, a letter of Commendation from President Bill Clinton, and a Meritorious Public Service medal from the Director of the Defense Nuclear Agency. Tedeschi received a Ph.D. in mechanical engineering from the University of Texas at Austin.

Roberto O. Valdivia

Member

Roberto O. Valdivia is an Assistant Professor and Senior Researcher in the department of Applied Economics at Oregon State University. He is the co-leader of the regional economics team of the Agricultural Model Intercomparison and Improvement Project (AgMIP) and co-developer of the Tradeoff Analysis Model for Multi-Dimensional Impact Assessment (TOA-MD). His agricultural economics work started with projects funded by the International Development Research Centre-Canada in Peru and Bolivia. He worked for the International Potato Center and later, for the Tradeoffs in Sustainable Agriculture Project funded by the U.S. Agency for International Development. Valdivia's main international research focuses on Africa, Asia, and Latin America, as well as the United States, and he has been a consultant to several agricultural research and development institutions such as the Food and Agriculture Organization, the Bill and Melinda Gates Foundation, the International Fund for Agricultural Development and several CGIAR centers. He has extensive experience on analysis of agricultural production systems and impact assessment: tradeoff analysis, foresight, assessing economic, environmental, and social impacts of policy and technologies, climate change impacts, adaptation, and mitigation, including analysis of economics of terrestrial and geological carbon sequestration. Valdivia received a Ph.D. in development economics and environmental economics from Wageningen University in Netherlands.

Christine Wiedinmyer

Member

Christine Wiedinmyer is the Associate Director for Science at the University of Colorado (CU) Boulder's Cooperative Institute for Research in Environmental Sciences and a research professor in the Department of Mechanical Engineering. Prior to CU Boulder, she was a Scientist at the National Center for Atmospheric Research (NCAR). Wiedinmyer's research focuses on the prediction of pollutant emissions and modeling the transport and fate of emitted pollutants in the atmosphere. She is the creator of the Fire INventory from NCAR (FINN) model that estimates emissions of pollutants from open burning globally; FINN emissions estimates have been applied in numerous air quality and climate studies to evaluate their impacts. She is the recipient of the Walter Orr Roberts Lecturer for Interdisciplinary Sciences from the American Meteorological Society (2014) and the 2022 Colorado Governor's Award for High-Impact Research. She is founding member and a current Board member of the Earth Science Women's Network. Wiedinmyer received a Ph.D. in chemical engineering from the University of Texas at Austin. She was a member of the National Academies of Sciences, Engineering, and Medicine's Committee on the Future of Atmospheric Chemistry Research and the planning committee for Wildland Fires: Towards Improved Understanding and Forecasting of Air Quality Impacts Workshop.

Aixi Zhou

Member

Aixi Zhou serves as the Vice Provost for Research and Innovation at Norfolk State University. Prior to that appointment, he was the department chairperson in the Department of Applied Engineering Technology at North Carolina A&T State University from 2018 to 2024, and a professor in fire protection at the University of North Carolina at Charlotte from 2007 to 2018. His primary expertise areas are fire protection engineering and the response of materials and structures under elevated and high temperatures. His recent research projects include ignition mechanisms, spread mechanisms, firebrand phenomenon, and mitigation and protection strategies in wildfires and wildland-urban interface fires. He also conducts research in advanced manufacturing and engineering materials. Zhou is a licensed Professional Engineer with a specialization in Fire Protection. He was elected a Fellow of the Society of Fire Protection Engineers (SFPE) in 2020, is a lifetime member of the International Association for Fire Safety Science, a member on the American Society of Civil Engineers (ASCE) Structural Engineering Institute Fire Protection Committee (since 2011), the ASCE Structural Design for Fire Conditions Committee (since 2008), and the SFPE Standing Committee on Research, Tools, and Methods (since 2016). Zhou received a Ph.D. degree in engineering mechanics from Virginia Tech.