

PSD Review
Review Themes and Reviewer Biographies
Earth System Research Laboratory
Physical Sciences Division Review
May 12-14, 2015

Review Panel Chair



Anjali S. Bamzai, Ph.D.

Program Director
Climate and Large-Scale Dynamics Program
National Science Foundation

Dr. Anjali Bamzai is currently Program Director of the Climate and Large-Scale Dynamics program, Division of Atmospheric and Geospace Sciences, Geosciences Directorate at the National Science Foundation (NSF). The goals of the Program are to: (i) advance knowledge about the processes that force and regulate the atmosphere's synoptic and planetary circulation, weather and climate, and (ii) sustain the pool of human resources required for excellence in synoptic and global

atmospheric dynamics and climate research. At NSF, Bamzai has served on the management teams for the cross-cutting initiatives such as Earth System Modeling at Decadal and Regional Scales, Science Engineering and Education for Sustainability competitions. Bamzai has served as co-chair of the Interagency Working Groups at the US Global Change Research Program (USGCRP), such as the Climate Variability and Change Working Group, and Interagency Group for Integrative Modeling. Bamzai has completed stints as program manager of the climate modeling program at the U.S. Department of Energy, Office of Science, and the erstwhile Climate Modeling and Experimental Prediction (CDEP) program of the NOAA Climate Program Office at the NOAA Office of Oceanic and Atmospheric Research (OAR). In 2008, Bamzai received the Distinguished Alumna Award from George Mason University for "*Exemplary achievement, dedication, of service to the profession or the community*". She has published in *Mol. Phys*, *Reviews of Modern Physics*, *International J. Quantum Chemistry*, *J. Climate*, *Quart. J. Royal Meteor. Soc.*, and *Inter. J. Clim.*

Education:

- B.S., Fergusson College Pune, India, 1971
- M.S., Indian Institute of Technology Bombay, India 1973
- Ph.D., Theoretical Chemistry, Indian Institute of Technology Bombay, India 1979
- Ph.D., Earth Systems and Global Change, Institute of Computational Sciences and Informatics, George Mason University, 1997

Theme I: Observing the Physical System

Observations are critical for the monitoring, analyzing, interpreting and predicting of the atmosphere, ocean, cryosphere, and land surface. NOAA's Physical Sciences Division (PSD) experience and expertise in the design, test and development of *in situ* and remote sensing observing systems are applied to develop, deploy and maintain instrumentation that advance observation-based process understanding of the current environmental conditions as well as how these conditions may be changing and why. PSD sustains a long-term monitoring program of research-quality observations of key environmental data that provides critical information on boundary and surface layer fluxes between and among the atmosphere, ocean, sea ice and land. PSD makes strategic use of observations to advance scientific understanding of key physical processes controlling high-impact, extreme weather and climate events that include flux measurements in tropical cyclones and vertical profiles of atmospheric systems for nowcasting the intensity and duration of extreme precipitation. Advances in PSD's observation-based scientific understanding are used to guide development of physically based parameterizations of key physical processes that can improve the skill and reliability of global and regional forecast models.

Reviewers for Theme I



Chidong Zhang, Ph.D.

Professor
Rosenstiel School of Marine and Atmospheric Science
University of Miami

Dr. Chidong Zhang is a Professor at Rosenstiel School of Marine and Atmospheric Science, University of Miami. His research expertise lies in the areas of tropical meteorology and climate, and large-scale air-sea interaction. His primary research interest has recently been the Madden-Julian Oscillation, including its dynamics and global impact. He has also studied the ITCZ and its circulation, African dust, the West African monsoon, diabatic heating profiles, and equatorial Atlantic westerly wind biases in global climate models. He has participated in the TOGA COARE field campaign as a postdoctoral fellow, the EPIC field campaign as a PI, and the DYNAMO field campaign as the chief scientist. He has served in numerous national and international committees and panels, including International Science Working Group of North American Monsoon Experiment (NAME), International CLIVAR's Atlantic Implementation Panel (AIP), AMS Committee on Hurricanes and Tropical Meteorology, US CLIVAR MJO Working Group, WWRP/WCRP YOTC MJO Task Force, Council of the American Meteorological Society, among others. He is currently an Editor of Journal of Geophysical Research – Atmosphere. He has been awarded NOAA Global and Climate Change Postdoctoral Fellowship and was elected Fellow of the American Meteorological Society.

Education:

- B.S., Meteorology, Peking University, Beijing, 1982
- M.S., Meteorology, University of Utah, 1985
- Ph.D., Meteorology, The Pennsylvania State University, 1989



Susan K. Avery, PhD

President

Woods Hole Oceanographic Institution

Dr. Susan Avery took office as president and director of WHOI on February 4, 2008. Avery is the ninth director in the institution's 78-year history, and the first woman to hold the position.

As an oceanographic leader with a background in atmospheric research, Avery has used her unique position to underscore the importance of ocean-atmosphere interactions in understanding whole Earth systems. Since taking the helm at WHOI, Avery has delivered Congressional testimony and presentations at scientific conferences such as the

American Meteorological Society, the IEEE International Geoscience & Remote Sensing Symposium, the American Geological Union, and the Partnership for Observation of the Global Ocean (POGO), often directing her comments at the intersection of atmospheric, earth, and ocean science.

Avery has extensive experience as a leader within scientific institutions. She came to WHOI from the University of Colorado at Boulder (UCB), where she was a member of the faculty since 1982, and where she served in interim positions as vice chancellor for research and dean of the graduate school, as well as provost and executive vice chancellor for academic affairs. From 1994-2004, she served as director of the Cooperative Institute for Research in Environmental Sciences (CIRES), the first woman and first engineer to hold that position. There, she facilitated new interdisciplinary research efforts spanning the geosciences while bringing them together with social and biological sciences and helped establish a thriving K-12 outreach program and a Center for Science and Technology Policy Research.

Avery's research includes studies of atmospheric circulation and precipitation, climate variability and water resources, and the development of new radar techniques and instruments for remote sensing. The author or co-author of more than 80 peer-reviewed articles, Avery helped form an integrated science and assessment program that examines the impacts of climate variability on water in the American West. She also worked with the National Oceanic and Atmospheric Administration and the Climate Change Science Program to help formulate a national strategic science plan for climate research.

Avery is a fellow of both the Institute of Electrical and Electronics Engineers and of the American Meteorological Society, for which she also served as president. She is a member of the advisory board for the Jet Propulsion Laboratory and a past chair of the board of trustees of the University Corporation for Atmospheric Research. She has also served on numerous advisory panels, committees, and councils for the National Science Foundation, the National Research Council, the National Oceanic and Atmospheric Administration, and the National Center for Atmospheric Research.

Education:

- B.S., Physics, Michigan State University, 1972
- M.S. Physics, University of Illinois, 1974
- Ph.D., Atmospheric Science, University of Illinois, 1978

Theme II: Understanding the Physical System

An integrated understanding of Earth system processes spanning weather and climate timescales is essential to improve the quality of environmental intelligence NOAA delivers to the nation. PSD research describes, interprets, and assesses the predictability of weather and climate variations and trends on time scales ranging from hours to a century. PSD innovates in applying weather and climate diagnostic methods advance capabilities to detection, understand, explain, and predict weather and climate extreme events, and of trends in these extremes. Understanding how weather and climate conditions are currently being impacted, and may be affected in a changing climate not only provides early warning and informs preparedness, but also identifies prospects for improved future forecasts and predictions. PSD's efforts to improve current knowledge of the complete water cycle advancing our ability to fully understand the linkages between weather, climate and water. The collective understanding from PSD research provides the foundation to create effective and credible scientific knowledge that is needed to inform policy, planning, and decision making in the management of current and future risks.

Reviewers for Theme II



Peter Stott, Ph.D.

Head

Climate Monitoring and Attribution

Met Office Hadley Centre

Dr. Peter Stott is the Scientific Strategic Head for the Climate Monitoring and Attribution area of the Met Office Hadley Centre. He leads a team of thirty scientists involved in the development of the observational evidence base for responding to climate variability and change and for improving our understanding of the causes of observed changes. The group is responsible for developing observational data sets for monitoring, including the HadCRUT global surface temperature series, and for enabling the better use of

observations to improve the skill of climate forecasts through better model initialization, and through better understanding of current model deficiencies to improve the representation of processes in models. His personal research interests focus on detection and attribution of climate change. He is leading the development of operational systems for attributing the causes of extreme weather events in near-real time by calculating the odds of such events and how they have changed as a result of different factors.

He is a co-editor of the annual report in the Bulletin of the American Meteorological Society, which explains previous extreme weather and climate events of the previous year from a climate perspective. He was a Lead Author in the Fourth Assessment report of the IPCC for both the Working Group 1 report on the Physical Science Basis and the Synthesis Report and was Coordinating Lead Author for Chapter 10 (Detection and attribution of climate change: from global to regional) of the Working Group 1 of IPCC AR5. He has a strong involvement in public outreach including appearances in TV documentary programmes on extreme weather and climate change and writing articles for New Scientist and the Guardian, amongst others.

Education:

- B.S., Mathematics, University of Durham, 1983
- Certificate of Advanced Study in Mathematics, University of Cambridge, 1984
- Ph.D., Imperial College, University of London, 1988
- Master of Advanced Studies, University of Cambridge, 2011 (following decision by University of Cambridge to award retrospectively Masters degrees to successful candidates of Part III Mathematics Tripos)



David H. Bromwich, Ph.D.

Professor, Atmospheric Sciences Program, Dept. of Geography
Director, Polar Meteorology Group, Byrd Polar Research Center
The Ohio State University

Dr. David Bromwich is a Professor with the Atmospheric Sciences Program of the Department of Geography and heads the Polar Meteorology Group at the Byrd Polar and Climate Research Center of The Ohio State University. His research interests focus on the weather and climate of the northern and southern polar regions and the interactions with the global climate system. He leads the development and global distribution of the polar version of the Weather Research and Forecasting (Polar WRF) model. He has published more than 150

peer-reviewed papers in the leading atmospheric science journals.

Education:

- B.Sc. Honors, Physics, University of Sydney, Australia, 1969
- Diploma of Meteorology, Bureau of Meteorology, Australia, 1971
- M.Sc. Meteorology, University of Melbourne, Australia, 1976
- Ph.D. Meteorology, University of Wisconsin, Madison, 1979

Theme III: Modeling the Physical System

Observations and physical process understanding are transformed into predictive capabilities through numerical modeling. NOAA's Physical Sciences Division (PSD) develops and applies data assimilation systems coupling atmospheric, oceanic, and land data in global and regional earth system modeling to advance analysis, forecast and prediction capabilities. PSD develops new parameterizations and forecasting approaches that are applied in global and regional forecast and prediction modeling systems to advance forecast and prediction capabilities. PSD applies global and regional forecast and prediction modeling systems to develop and to advance the scientific basis to provide early warning and inform preparedness across weather and climate time scales. Collectively PSD's assimilation, development, analysis, and modeling research are critical to meet NOAA's mission responsibilities to understand and predict changes in climate, weather, oceans, and coasts, and to share that knowledge and information with others.

Reviewers for Theme III



Lisa Goddard, Ph.D.

Director

International Research Institute for Climate and Society

Earth Institute

Columbia University

Dr. Lisa Goddard is the Director of the International Research Institute for Climate and Society (IRI), a senior research scientist at the IRI and an adjunct associate professor within the Department of Earth and Environmental Sciences of Columbia University. Dr. Goddard's research is aimed at improving the quality and content of climate predictions. She has extensive experience in forecasting methodology and has published papers on El Niño, seasonal climate forecasting and verification, and probabilistic climate change projections. Much of Dr. Goddard's research focuses on diagnosing and extracting meaningful information from climate models and available observations. She has developed and oversees a national post-doctoral program, the Post-docs Applying Climate Expertise Program (PACE), which explicitly links recent climate PhDs with decision-making institutions. In addition, Dr. Goddard also sits on several national and international science advisory panels, and is the co-chair of International CLIVAR under the World Climate Research Programme.

Education:

B.A., Physics, University of California at Berkeley, 1988

M.A., Atmospheric and Oceanic Sciences, Princeton University, 1992

Ph. D., Atmospheric and Oceanic Sciences, Princeton University, 1995

Theme IV: Research to Applications, Operations and Services

The transition of research findings, products and methods into applications, operations and services is fundamental to ensure the best available science is being applied to support NOAA mission responsibilities. To address growing service demands and needs for increased accuracy of weather and climate information, PSD works closely with the NOAA service line offices and external partners to accelerate the timely transfer of research advances into operational settings and the delivery of information for use in policy, planning, and decision making. For example, PSD works closely with the NOAA National Weather Service (NWS) to incorporate weather and climate research to operations, including: implementation of testbeds, data assimilation techniques, regional prediction capabilities, air-sea heat flux parameterizations, post-processing forecast tools and techniques, seasonal and subseasonal climate, drought, and hazard outlooks, monitoring analyses, and El Nino Southern Oscillation (ENSO) diagnostic discussion. PSD partners with the NOAA National Marine Fisheries Service (NMFS) to develop actionable information in the form of science-based climate and weather knowledge that has been transformed to be readily understandable and immediately available to support decision making. PSD also collaborates with groups such as: the US Bureau of Reclamation (USBR), the US Agency for International Development (USAID), the US Army Corps of Engineers (USACE), the US Department of Defense (DOD), the US Department of Energy (DOE), the State of California Department of Water Resources (CA-DWR), SCWA and the National Integrated Drought Information Service (NIDIS) to provide the best available weather and climate science to inform policy and management decisions. In addition, PSD conducts research on how stakeholders use weather and climate information to assess what is needed for the information to be useable and actionable, thus linking management planning processes and operational issues with potential uses of weather and climate forecasts and information.

Reviewers for Theme IV



Jonathan Overpeck, Ph.D.

Co-Director and Professor, Institute of the Environment
Geosciences Regents Professor, Atmospheric Sciences
University of Arizona

Dr. Jonathan Overpeck, or "Peck" as he prefers to be called, is a founding co-director of the Institute of the Environment, as well the Thomas R. Brown Distinguished Professor of Science and a Regents Professor of Geosciences and Atmospheric Sciences at the University of Arizona

Peck has published more than 170 papers in climate and the environmental sciences and served as a coordinating lead author for the Nobel Prize-winning UN Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment (2007). He also has been awarded the US Department of Commerce Bronze and Gold Medals, as well as the Walter Orr Roberts award of the American Meteorological Society, for his interdisciplinary research. In addition, Peck was a Guggenheim Fellow and the 2005 American Geophysical Union Bjerknes Lecturer, and won, with co-authors, the 2008 NOAA Oceanic and Atmospheric Research Outstanding Scientific Paper Award. He recently received the Quivira Coalition's Radical Center Award for his work with rural ranchers and land managers, and was also a recent Fellow of the Victorian Centre for Climate Change Adaptation Research at the University of Melbourne, Australia, where he maintains a visiting professorship. Peck is a fellow of the American Association for the Advancement of Sciences. Peck commits significant time at the interface between science and society, both to help promote understanding of science and help scientists understand broader views, particularly those of decision makers in society who must deal with real-world climate variability and change.

Before coming to the University of Arizona, Peck was the founding director of the NOAA Paleoclimatology Program and the World Data Center for Paleoclimatology, both in Boulder, Colorado. While in Boulder, he was also a fellow at the Institute of Arctic and Alpine Research at the University of Colorado. He has worked at Columbia University and NASA.

Education:

B.A., Geology, Hamilton College, 1979

M.S., Geological Sciences, Brown University, 1981

Ph.D., Geological Sciences, Brown University, 1985



Andrew Wood, Ph.D.

Research Applications Laboratory
National Center for Atmospheric Research

Dr. Andy Wood is currently a research scientist with the National Center for Atmospheric Research (NCAR) Research Applications Laboratory, in Boulder, Colorado. His masters and dissertation research focused on water resources, systems engineering, hydrologic monitoring and prediction, and the assessment of climatic change impacts, and he has over 15 years of experience in these areas in academic, private, and public settings. His major accomplishments include the development of the widely-used BCSD technique for statistical downscaling of climate projections, and the creation of drought monitoring and forecasting systems such as the UW Surface Water Monitor. For two years, Andy was a senior and then lead scientist of the Seattle firm 3TIER, Inc., focusing on forecasting and assessment of hydropower, solar and wind energy for US-based and international clients. Since then, he spent three years as a development and operations hydrologist with the US National Weather Service River Forecast Centers in Salt Lake City, Utah and Portland, Oregon. He was the chair of the Hydrology Committee of the American Meteorological Society (AMS) from 2010-2013, and is currently an associate editor with the AMS Journal of Hydrometeorology. He recently served as a co-leader of the NOAA MAPP Drought Task force (from 2011-2014). Since 2011, Andy has been a co-leader of the international Hydrologic Ensemble Prediction Experiment (<http://www.hepex.org>), which focuses on advancing the application of ensemble forecasting for water management, and has organized a number of national and international conferences on hydrology, forecasting and water resources. His current work centers on practical applications of scientific advances in hydrologic, weather and climate modeling, prediction and projection to improve our understanding and management of water, energy and terrestrial ecosystems.

Education:

- B.A., English, Amherst College, 1988
- M.S.E., Civil and Env. Engineering, Water Resources & Systems, University of Washington, 1995
- Ph.D., Civil and Env. Engineering, Hydrology, University of Washington, 2003