

The BASC Newsletter, Volume 2, Number 3, is your update on the activities of the Board on Atmospheric Sciences and Climate of the National Academies. The Board seeks to advance understanding of the Earth's atmosphere and climate, to help apply this knowledge to benefit the public, and to advise the federal government on issues within the Board's areas of expertise. This newsletter can be viewed in its entirety at the [BASC website](#).

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Table of Contents

1. Message from the Chair
2. Upcoming Meetings
3. What's New:
 - *Understanding and Responding to Climate Change*
 - Town Halls on the Future of the Atmospheric Sciences at NSF
 - New Report: *Strategic Guidance for the National Science Foundation's Support of the Atmospheric Sciences: An Interim Report*
 - New Report: *Review of NOAA's Plan for the Scientific Stewardship Program*
4. Special Feature: Weather and Climate Spotlighted at the Marian Koshland Science Museum
5. Recent Reports
6. Studies in Progress
7. BASC in the Past: *Natural Climate Variability on Decade-to-Century Time Scales*

1. Message from the Chair

Dear Colleagues:

BASC's fall meeting, was held in Boulder, Colorado, in early November. This was the first time in many years that BASC has ventured outside of Washington, D.C., to hold a regular meeting. (Of course many of BASC's ad hoc study committee meetings are held outside of D.C. because of the relevance of the study topic to specific geographic areas and the scientific expertise resident there.) The purpose in taking BASC away from NRC headquarters was to further our outreach activities that are intended to improve interactions between BASC and the atmospheric sciences community and to create opportunities for broader participation and representation in BASC activities. Boulder was chosen because of the large contingent of atmospheric scientists located in universities, laboratories, and private sector companies along the front range of the Rocky Mountains. ([To view the meeting agenda, visit the Current Projects database.](#))

During the meeting we heard from Dan Albritton who described the reorganization of NOAA's six local labs into a new Earth System Research Laboratory with four divisions. Division Directors Sandy MacDonald (Global Systems Division) and Randy Dole (Physical Sciences Division) discussed their visions for the future. Dan described the process that led to the new organization and how it is designed to create greater synergy among intra- and inter-divisional activities, enhance interactions with universities and other labs, and promote activities that are in line with NOAA's principal goals.

BASC member Kerry Emanuel (MIT) organized a panel session on the timely topic of Hurricanes and Climate. Panelists Emanuel and Greg Holland (NCAR) presented their recent results on trends in hurricane intensity and how these trends might be related to climate variability and change. Roger Pielke, Jr. presented his thoughts on the societal impacts of hurricanes, how policy decisions can be subsequently influenced, and pitfalls to be avoided when making policy decisions. Rick Anthes (UCAR) provided a broad perspective on what is known and unknown about the relationships between climate and hurricanes and how future research can help to

answer critical questions. This session was standing room only and much lively discussion ensued.

A second panel was organized by NCAR. Chaired by Rit Carbone, panelists Bill Collins, Natalie Mahowald, Linda Mearns, and David Parsons from NCAR discussed different perspectives on the broader topic of weather and climate. The coupling of climate and weather models, relationships between climate and air pollution, predictability of precipitation and extreme events, and cloud aerosol interactions were all discussed. A major goal of these activities within TIMES (The Institute for Multidisciplinary Earth Studies at NCAR) is to model the variability of precipitation for Earth's current climate.

Steve Rutledge (Colorado State University), Paul Sperry (University of Colorado-Cooperative Institute for Research in Environmental Sciences), and Brian Toon (University of Colorado-Program in Atmospheric and Oceanic Sciences) joined us to describe the range of research and educational activities in their respective organizations.

In addition to these special agenda events, BASC conducted its normal business which included reviews of all recently completed, current, and planned projects. It is worthwhile mentioning that BASC and NRC studies usually have impacts on policy decisions. Just before this meeting we were notified that the TRMM satellite mission will be extended for at least the next five years. This decision follows BASC's recommendation of last December in the interim report, [Assessment of the Benefits of Extending the Tropical Rainfall Measuring Mission: A Perspective from the Research and Operations Communities](#). This decision will allow NOAA to prepare for effective operational use of the constellation of Global Precipitation Mission satellites scheduled to be launched in 2010. The second phase of the BASC study on TRMM will provide advice to NOAA on how to proceed in achieving this goal ([see the Current Project database for more information about this study](#)).

In another area we learned that the U.S. Congress is holding hearings on a new initiative in weather modification research that would emphasize fundamental research on the physics of advertent and inadvertent weather modification and set up mechanisms for national coordination of these efforts among agencies. This action is consistent with earlier BASC recommendations. Mike Garstang, chair of the 2003 BASC report [Critical Issues in Weather Modification Research](#), recently testified to the Congress on this topic.

In all, the experiment of holding our meeting in Boulder was quite successful, and it is likely that we will schedule another meeting away from D.C. next autumn.

Best wishes to you all for a wonderful holiday season.

Sincerely,
Bob Serafin
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2. Upcoming Meetings

- [Strategic Guidance for NSF's Support of the Atmospheric Sciences, Town Hall at the 2005 American Geophysical Union Fall Meeting, December 8, 2005, San Francisco, California](#)
- [Estimating and Communicating Uncertainty in Weather and Climate Forecasts, December 15-16, 2005, Washington, D.C.](#)
- [Strategic Guidance for NSF's Support of the Atmospheric Sciences, Town Hall at the American Meteorological Society's Annual Meeting, February 1, 2006, Atlanta, Georgia](#)
- [The Future of Rainfall Measuring Missions, February 27-March 1, 2006, Irvine, California](#)
- [Strategic Guidance for NSF's Support of the Atmospheric Sciences, April 5-7, 2006, Washington, D.C.](#)

- [Board on Atmospheric Sciences and Climate, April 5-6, 2006, Washington, D.C.](#)
- [Board on Atmospheric Sciences and Climate, August 8-9, 2006, Woods Hole, Massachusetts](#)

3. What's New

-- [Understanding and Responding to Climate Change](#) is a new booklet from the National Academies highlighting themes from its many reports that have served to advise agencies working on understanding changing climate, documenting its impacts, and developing effective response strategies. A PDF of the publication is available at <http://dels.nas.edu/basc/>. Or if you would like to receive a hard copy, contact BASC at the number below, or email us at basc@nas.edu.

-- The Committee on Strategic Guidance for NSF's Support of the Atmospheric Sciences will hold two Town Halls over the next few months. The first will be held on Thursday, December 8, at the 2005 American Geophysical Union Fall Meeting at the Moscone Center in San Francisco, California. The second will be held on Wednesday, February 1, 2006, at the American Meteorological Society's Annual Meeting at the Georgia World Congress Center in Atlanta, Georgia. The committee was established to provide guidance to NSF's Division of Atmospheric Sciences (ATM) on its strategy for supporting research to achieve the nation's scientific and education goals in the atmospheric sciences. The committee released its interim report in September and the town halls are an opportunity for the committee to solicit feedback on the report. If you are unable to attend, you can submit written comments to atminput@nas.edu. See <http://dels.nas.edu/basc/strat.shtml> for more information.

-- New Report: [Strategic Guidance for the National Science Foundation's Support of the Atmospheric Sciences: An Interim Report](#). The National Science Foundation's Division of Atmospheric Sciences (ATM) supports research to develop new understanding of Earth's atmosphere and how the Sun impacts it. *Strategic Guidance for the National Science Foundation's Support of the Atmospheric Sciences: An Interim Report* provides preliminary guidance to ATM on its strategy for achieving its goals in the atmospheric sciences, including cutting-edge research, education, and workforce development; service to society; computational and observational objectives; and data management. The report reviews how the atmospheric sciences have evolved over the past several decades and analyzes the strengths and limitations of the various modes of support employed by ATM, such as principal investigator grants, small and large centers, and cooperative agreements to support observing or computational facilities. A final report will be delivered in fall 2006.

-- New Report: [Review of NOAA's Plan for the Scientific Stewardship Program](#). To better understand our climate system, it is important that we have climate data records (CDRs)--time series of measurements of sufficient length, consistency, and continuity to determine climate variability and change--that possess the accuracy, longevity, and stability to facilitate credible climate monitoring. In 2004, the National Research Council (NRC) published [Climate Data Records from Environmental Satellites](#) to provide the National Oceanic and Atmospheric Administration (NOAA) with initial guidelines on how to develop and implement an effective CDR program. NOAA used this report to draft a plan for a new Scientific Data Stewardship (SDS) program, and then asked the NRC to review it. The new program will be responsible for processing, archiving, and distributing observations from satellite and supporting ground-based platforms for monitoring, diagnosing, understanding, predicting, modeling, and assessing climate variation and change. This report outlines ways to improve NOAA's draft plan.

4. Special Feature: Weather and Climate in the Spotlight at the Marian Koshland Science Museum of the National Academy of Sciences

The Marian Koshland Science Museum in Washington, D.C., recently hosted two public events on timely weather and climate issues: hurricanes and forecasting. Complimenting the educational outreach of the museum's global warming exhibit, these public events attract children and adults to the museum and explain the science behind headlines in the news.

The first event—"There's a Storm Brewing: Hurricane Forecasting"—was held on September 14, 2005. The featured speaker, Dr. Gerald Bell, a meteorologist from NOAA's Climate Prediction Center, explained how hurricanes form and explained NOAA's climate forecasts of Atlantic hurricanes for the 2005 season. Occurring just days after Hurricane Katrina hit the Gulf Coast, this event ended with the viewing of a documentary produced by NOVA Science Now about predicting hurricanes and the particular vulnerability of New Orleans to the impact of hurricanes. (The 12-minute documentary can be viewed online at <http://www.pbs.org/wgbh/nova/sciencenow/3204/02.html>.)

On November 18, the second event—"Is it Going to Snow? The Science of Predicting Washington's Weather and Global Climate"—focused on the various factors involved in developing weather and climate forecasts. The first speaker was Mr. Chuck Bell, a broadcast meteorologist for Washington's NBC4 station. Mr. Bell led the attendees in a demonstration on reading weather maps and forecasting for snowstorms. The second speaker was Dr. Antonio Busalacchi, a professor in the Department of Atmospheric and Oceanic Science at the University of Maryland and chair of the National Academies' Climate Research Committee. Dr. Busalacchi presented a comprehensive overview on climate variability phenomena, global warming, and future climate change projections.

Located at the Keck Center of the National Academies, the Koshland Science Museum opened in 2004 with an exhibit titled "Global Warming Facts & Our Future." This interactive exhibit will be on display for one more year before it begins traveling to other museums around the country. Other exhibits currently on display at the Koshland Science Museum include "The Wonders of Science" and "Putting DNA to Work." The museum's website provides visitor information and a list of future public events: <http://www.koshland-science-museum.org>. You can also sign up on the website to receive email notification from the museum on upcoming events, exhibits, and other news items.

5. Recently Released Reports

[*Strategic Guidance for the National Science Foundation's Support of the Atmospheric Sciences: An Interim Report*](#) provides preliminary guidance to the National Science Foundation's Division of Atmospheric Sciences (ATM) on its strategy for achieving its goals in the atmospheric sciences. The report reviews how the atmospheric sciences have evolved over the past several decades, analyzes the strengths and limitations of the various modes of support employed by ATM, and offers some preliminary recommendations regarding future directions for ATM.

[*Review of NOAA's Plan for the Scientific Stewardship Program*](#) provides input to NOAA on its draft "Scientific Data Stewardship (SDS) Implementation Plan." The SDS program will be responsible for processing, archiving, and distributing observations from satellite and supporting ground-based platforms for monitoring, diagnosing, understanding, predicting, modeling, and assessing climate variation and change. This report outlines ways to improve the draft plan.

[*Review of the GAPP Science and Implementation Plan*](#) provides a review of the GAPP Science and Implementation Plan, outlining suggestions to strengthen the plan and the GAPP program overall. The Global Energy and Water Cycle Experiment (GEWEX) Americas Prediction Project (GAPP) was established in 2001 to improve how changes in water resources are predicted on intraseasonal-to-interannual time scales for the continental United States.

[Review of the U.S. Climate Change Science Program's Synthesis and Assessment Product on Temperature Trends in the Lower Atmosphere](#) provides a review of the U.S. Climate Change Science Program (CCSP) synthesis and assessment report *Temperature Trends in the Lower Atmosphere: Understanding and Recognizing Differences*, which focuses on understanding reported differences between independently produced data sets of temperature trends for the surface through the lower stratosphere and comparing these data sets to model simulations.

[Thinking Strategically: The Appropriate Use of Metrics for the Climate Change Science Program](#) lays out a framework for creating and implementing metrics for the Climate Change Science Program (CCSP), which, along with its predecessor U.S. Global Change Research Program, has sponsored climate research and observations for nearly 15 years. However, the overall progress of the program has not been measured systematically. Metrics offer a tool for measuring such progress; improving program performance; and demonstrating program successes to Congress, the Office of Management and Budget, and the public. A general set of metrics provides a starting point for identifying the most important measures, and the principles provide guidance for refining the metrics and avoiding unintended consequences.

[Assessment of the Benefits of Extending the Tropical Rainfall Measuring Mission: A Perspective from the Research and Operations Communities](#) (interim report) provides advice on the benefits of keeping TRMM in operation beyond 2004. This report is the product of Phase I of a two-phase study on rainfall measuring missions. (See "Studies in Progress" below for information about Phase II, The Future of Rainfall Measuring Missions.)

[Radiative Forcing of Climate Change: Expanding the Concept and Addressing Uncertainties](#) examines the human and natural causes of climate change, including greenhouse gases, aerosols, land-use change, and solar variability. Whereas emphasis to date has been on how these climate forcings affect global mean temperature, the report finds that regional variation and climate impacts besides temperature deserve increased attention. The report also identifies research that should be pursued to improve understanding of climate forcings.

6. Studies in Progress: For more information about a specific project, click on the link provided.

Analysis of Global Change Assessments is a new study that will identify lessons learned from past assessments to guide future global change assessment activities of the U.S. Climate Change Science Program (CCSP). To do so, the committee will conduct a comparative analysis of past assessments that have stated objectives similar to those of the CCSP and identify approaches and products that are most effective for meeting the CCSP's stated objectives for assessments. [Check the Academies' Current Projects System for more information.](#)

[Earth-Atmosphere Interactions: A Workshop on Understanding and Responding to Multiple Environmental Stresses](#) will explore current understanding of multiple environmental stresses in the earth-atmosphere system on natural, managed, and socio-economic systems, and discuss the types of research needed to improve integrated understanding of these kinds of complex, nonlinear problems.

[Estimating and Communicating Uncertainty in Weather and Climate Forecasts](#) will provide findings and recommendations to guide NOAA/NWS as it improves methods used to estimate uncertainty in its weather, hydrometeorological, and short-term regional climate forecasts, with emphasis on the means used to communicate forecast uncertainty.

[The Future of Rainfall Measuring Missions](#) will provide advice on potential follow-on research and operational missions. In Phase I, the committee addressed how best to use the remaining TRMM spacecraft life (see [Assessment of the Benefits of Extending the Tropical Rainfall Measuring](#)

[Mission: A Perspective from the Research and Operations Communities](#)). Phase II will focus on needs for satellite-based measurements of rainfall in 2006 and beyond.

[Strategic Guidance for the National Science Foundation's \(NSF\) Support of the Atmospheric Sciences](#) will provide guidance to NSF's Division of Atmospheric Sciences (ATM) on its strategy for supporting research to achieve the nation's scientific and education goals in the atmospheric sciences. In essence, the committee will consider how ATM can best accomplish its mission of stewardship of the atmospheric sciences into the future. (See the committee's interim report [Strategic Guidance for the National Science Foundation's Support of the Atmospheric Sciences: An Interim Report](#).)

7. BASC in the Past: Natural Climate Variability on Decade-to Century Time Scales

In 1990, the Intergovernmental Panel on Climate Change (IPCC) released its first scientific assessment on climate change. This document presented, for the first time, a comprehensive international scientific perspective on the status of our understanding of global climate change. One gap it identified involved our understanding of natural variability in the Earth's climate system, a context necessary to understand the significance of human-induced changes. To help close this gap, in the window 1992-1998, the National Academies (through the Board on Atmospheric Sciences and Climate and its Climate Research Committee (CRC)) produced two documents exploring decade-to-century scale climate variability and change.

The first report, [Natural Climate Variability on Decade-to Century Time Scales](#) (1995), has the dubious honor of being the largest BASC report ever published (630 pages). But more importantly, this report provides an extremely detailed record of a workshop held to assess the state of understanding of natural climate variability on the time scale of a few human generations. The report contains 42 authored papers and associated discussions. Each chapter includes an essay that charts progress in the field, from atmospheric observations and atmospheric modeling to ocean observations and climate proxy data. Together the materials show that significant progress had been made toward describing, understanding, and modeling the spatial and temporal structure, magnitude, and patterns of natural variability.

In this same period, a World Climate Research Programme report proposed creating a new internationally-coordinated, interdisciplinary research program on climate variability and predictability. As the science plan for this program, ultimately known as the CLIVAR, was developed, the U.S. Global Change Research Program began planning for a U.S. national science plan to address climate variability and change on decade-to-century scales. To assist, a BASC-CRC committee was tasked to provide guidance for a national research strategy, and it produced [Decade-to-Century Scale Climate Variability and Change: A Science Strategy](#) (1998). This report was based on an aggressive outreach program to ensure that the opinions of the U.S. climate community were accurately represented. The science strategy focused on six attributes considered to be most directly relevant to society (i.e., precipitation and water availability, temperature, solar radiation, storms, sea level, and ecosystems) and on six components of the climate system that control these attributes (i.e., atmospheric composition and radiative forcing, atmospheric circulation, hydrologic cycle, ocean circulation, land and vegetation, and cryosphere). The report concludes with recommendations to guide a national research strategy to improve our understanding of decade to century scale variability, including a strategy for monitoring, modeling, and assessing the forcing state of the climatic systems on decade to century time scales.

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