The BASC Newsletter, Volume 2, Number 2, 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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August 2005
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Table of Contents

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1. Message from the Director

Dear Colleagues:

BASC, together with all the units of the National Academies, has a base mission outlined in 1863 by President Abraham Lincoln at the height of the Civil War to "investigate, examine, experiment, and report upon any subject of science or art" whenever called upon to do so by any department of the government. We do this by bringing together *pro bono* committees of experts to address critical national issues and give advice to the federal government and the public.

One of the most frequently asked questions we get about BASC is "How are studies originated?" There are three general ways that study ideas emerge: congressional requests, agency requests (either state or federal), and proactive ideas that start with Board members or our community and then evolve to gain agency or other interest. The report *Flash Flood Forecasting Over Complex Terrain with an Assessment of Sulphur Mountain NEXRAD in Southern California* was requested by Congress; *Where the Weather Meets the Road: A Research Agenda for Improving Road Weather Services* was done in response to a request from the Federal Highway Administration. A lot of our work arises from collaborative discussions, when someone in an agency tells us of a concern and the Board works with agency staff and involved scientists to design an activity in response.

An example of a collaborative discussion that we hope will lead to an important study is our current effort on multipurpose mesoscale observation networks. Clearly, this is a much-discussed issue, and at the request of agency staff we organized a one-day brainstorming session on the topic in June. About 20 people (including some BASC members, other invited scientists, and staff from a half dozen agencies) talked in general about mesoscale observation needs, roles of the different sectors, users, and other issues, and helped outline a description of

the tasks that a committee on this topic might address. If all goes well and we've captured a sound idea, we hope to form a committee charged to identify ways to enhance meteorological observation systems so they effectively and jointly serve a broad range of national needs and provide opportunities to improve analysis and prediction capabilities while sharing resources and costs. If you're interested in seeing this draft study proposal, let us know. The broader lesson is that if you have an idea that you think might be served by the Academies' consensus study process, talk to a BASC member or staff. Any federal or state agency can request a study, and it is our job to work with you to see if we might serve your needs.

On a different issue, the National Academy of Sciences (NAS) is pleased to announce that Dr. Ralph Cicerone took over as president of the NAS and as chair of the National Research Council (our operating arm) on July 1, 2005. Dr. Cicerone is familiar to all our colleagues in the atmospheric sciences. An atmospheric chemist coming to us from the University of California at Irvine, Dr. Cicerone's work has helped shape policy on climate change and pollution. He has conducted research on the plasma physics of Earth's ionosphere, the chemistry of the ozone layer, and radiative forcing of climate change. He also helped identify the roles that nitrous oxide and methane play in climate change and global warming. He succeeds Dr. Bruce Alberts, who completed his second term as president, the maximum allowed by the Academy's bylaws. Dr. Alberts, a cell biologist on the faculty of University of California, San Francisco, and his wife, Betty, will return to California.

"The Academies will be in good hands for years to come," said Bruce Alberts. "Ralph Cicerone is an energetic, thoughtful, and respected leader. He will be a strong advocate for the advancement of science and for promoting the many applications of science for improving human welfare around the world." Here at BASC, we are looking forward to working closely with Dr. Cicerone.

Sincerely,
Chris Elfring
celfring@nas.edu

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2. Upcoming Meetings

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-- Estimating and Communicating Uncertainty in Weather and Climate Forecasts, September 22-23, 2005, Boulder, Colorado
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3. What's New

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The National Aeronautics and Space Administration (NASA), in cooperation with the Japan Aerospace Exploration Agency (JAXA), launched the Tropical Rainfall Measuring Mission (TRMM) in 1997. Designed as a minimum three-year mission with the goal of five years duration, TRMM has been collecting data for almost eight years, in large part due to the reliability of its sensors and the high quality of their measurements. Although initially intended as a purely

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In July 2004 NASA announced that it would terminate TRMM in August 2004. At the request of the National Oceanic and Atmospheric Administration (NOAA), and with additional urging from others in the scientific and operational user community, NASA agreed to continue TRMM operations through the end of the hurricane season and until the end of 2004. But many users hoped that the mission would be extended even longer, setting the stage for a difficult decision.

A further extension of TRMM into 2005 would pit financial constraints against the operational and scientific benefits of continuing; that is, are the benefits greater than the costs and can the necessary funds be secured? An even longer extension beyond late 2005 would add a third decision element relating to risk to life and property. The TRMM spacecraft is sufficiently large that it will not burn up completely on reentry into the Earth's atmosphere. By roughly September 2005 NASA would have to choose whether to (1) use TRMM's remaining fuel to conduct a controlled reentry into the atmosphere that directs the remains of the satellite into the ocean far from human settlements (in this scenario controlled reentry would be in 2008 after the satellite had drifted to a lower orbit for roughly two years) or (2) continue TRMM operation until the fuel runs out in 2010 or 2011 and accept the added risk of an uncontrolled reentry because of the operational and scientific benefits of doing so.

In August 2004 NASA Administrator Sean O'Keefe requested that the National Academies provide advice on the anticipated scientific and operational contributions from extending TRMM beyond 2004. The charge to the Committee on the Future of the Tropical Rainfall Measuring Mission was to determine how best to use the remaining TRMM spacecraft life. The Academies, led by BASC, began the study process in October 2004, assembling a committee, chaired by Gene Rasmusson, and hosting an information-gathering workshop. The committee and workshop participants were asked to consider

- scientific and research contributions of TRMM to date and those expected if TRMM is continued;
- operational contributions of TRMM to date and those expected if TRMM is continued;
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The committee delivered its report in December 2004. It contained one recommendation: "The committee strongly recommends continued operation of TRMM, at least until such time as a decision on controlled reentry becomes unavoidable. The additional year can be used to more fully weigh the benefits, costs, and risks." The immediate result was a press announcement from NASA stating that it would extend the mission into spring 2005. This new deadline coincided with the completion of a NASA senior review that examined all of its missions that are currently extended. TRMM mission staff cited the NRC report heavily in their senior review documents.

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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 the "Special Feature" section of this newsletter for more details.

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.

Review of the U.S. CLIVAR Project Office evaluates the performance of the U.S. CLIVAR Project Office in fulfilling its charge from supporting agencies. The Climate Variability and Predictability (CLIVAR) program, established internationally in 1995 and expanded to include a U.S. component in 1998, focuses on improving understanding and skill in predicting climate variability on seasonal to centennial time scales. The report concludes that the project office is vital for coordinating U.S. CLIVAR activities and is effective despite limited resources. It also provides suggestions for enhancing the communications from and visibility of U.S. CLIVAR activities and for developing strategic directions for the future.

Flash Flood Forecasting Over Complex Terrain: With an Assessment of the Sulphur Mountain NEXRAD in Southern California assesses the performance of the Sulphur Mountain NEXRAD in

Southern California, which has been scrutinized for its ability to detect precipitation in the atmosphere below 6000 feet. The report finds that the Sulphur Mountain NEXRAD provides crucial coverage of the lower atmosphere and is appropriately situated to assist the Los Angeles-Oxnard National Weather Service Forecast Office in successfully forecasting and warning of flash floods. The report concludes that, in general, NEXRAD technology is effective in mountainous terrain but can be improved.

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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.

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. Phase II will focus on needs for satellite-based measurements of rainfall in 2006 and beyond. (See the “Special Feature” section of this newsletter, as well as the “Recently Released Reports” section.)

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.

Climate Data Records from Operational Satellites is assisting the National Oceanic and Atmospheric Administration-National Environmental Satellite, Data, and Information Service (NOAA-NESDIS) as it designs a plan to guide satellite data utilization from existing and new instruments aboard NOAA satellites, including National Polar-orbiting Operational Environmental Satellite System (NPOESS) instruments, for understanding, monitoring, and predicting climate variations and changes. The first report was released and NOAA prepared a draft science implementation plan in response. The Committee is currently reviewing that plan.

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7. BASC in the Past: *The Meteorological Buoy and Coastal Marine Automated Network for the United States*

In April 1997, the National Oceanic and Atmospheric Administration (NOAA) called upon the National Research Council (NRC) to examine the Coastal Marine Automated Network (C-MAN) and the national meteorological data buoy program. As of early 1997, 33 of the 118 buoys or C-

MAN stations managed by NOAA could no longer operate due to insufficient funds. NOAA asked the NRC to recommend a distribution of observing platforms that would maintain National Weather Service (NWS) observing and forecast capabilities. Dr. Lance Bosart, Department of Earth and Atmospheric Sciences, State University of New York at Albany and former member of BASC was the principal investigator for this 1998 study that resulted in a report called *The Meteorological Buoy and Coastal Marine Automated Network for the United States*. The priority recommendation that emerged from this report is that a single sponsoring agency, NOAA, should be placed in charge of installation, operation, and maintenance of the core moored buoys and C-MAN stations. Bosart also suggested expanding the scope of this report into one that reviews all complementary observing systems that are essential for providing crucial global weather and climate data for operational and research purposes. Currently, there are approximately 60 stations that make up C-MAN. These stations are of great importance especially given the recent strong hurricane season(s). After all, when the National Weather Service issues a hazardous weather warning, forecasters primarily gather data from observations made from the buoy/C-MAN.

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We encourage your comments on this newsletter as well as on the reports and activities of BASC. To provide input, contact basc@nas.edu.

To unsubscribe to this newsletter, contact basc@nas.edu.

BASC is a unit of the National Academies. The nation turns to the National Academies -- National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council -- for independent, objective advice on issues that affect people's lives worldwide. BASC members include: Robert J. Serafin (chair), National Center for Atmospheric Research; M. Joan Alexander, Colorado Research Associates; Frederick R. Anderson, McKenna Long & Aldridge LLP; Michael L. Bender, Princeton University; Rosina M. Bierbaum, University of Michigan; Mary Anne Carroll, University of Michigan; Carol Anne Clayson, Florida State University; Walter Dabberdt, Vaisala Inc.; Kerry A. Emanuel, Massachusetts Institute of Technology; Dennis L. Hartmann, University of Washington; Peter R. Leavitt, Weather Information Inc.; Jennifer A. Logan, Harvard University; Vernon R. Morris, Howard University; Thomas H. Vonder Haar, Colorado State University; Roger M. Wakimoto, National Center for Atmospheric Research; Chris Elfring (director, BASC).

We encourage you to share this newsletter with colleagues. If they would like to be added to the email list a simple request to basc@nas.edu is all that is needed.

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5. Recently Released Reports

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 the "Special Feature" section of this newsletter for more details.

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.

Review of the U.S. CLIVAR Project Office evaluates the performance of the U.S. CLIVAR Project Office in fulfilling its charge from supporting agencies. The Climate Variability and Predictability (CLIVAR) program, established internationally in 1995 and expanded to include a U.S. component in 1998, focuses on improving understanding and skill in predicting climate variability on seasonal to centennial time scales. The report concludes that the project office is vital for coordinating U.S. CLIVAR activities and is effective despite limited resources. It also provides suggestions for enhancing the communications from and visibility of U.S. CLIVAR activities and for developing strategic directions for the future.

Flash Flood Forecasting Over Complex Terrain: With an Assessment of the Sulphur Mountain NEXRAD in Southern California assesses the performance of the Sulphur Mountain NEXRAD in

Southern California, which has been scrutinized for its ability to detect precipitation in the atmosphere below 6000 feet. The report finds that the Sulphur Mountain NEXRAD provides crucial coverage of the lower atmosphere and is appropriately situated to assist the Los Angeles-Oxnard National Weather Service Forecast Office in successfully forecasting and warning of flash floods. The report concludes that, in general, NEXRAD technology is effective in mountainous terrain but can be improved.

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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.

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. Phase II will focus on needs for satellite-based measurements of rainfall in 2006 and beyond. (See the “Special Feature” section of this newsletter, as well as the “Recently Released Reports” section.)

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.

Climate Data Records from Operational Satellites is assisting the National Oceanic and Atmospheric Administration-National Environmental Satellite, Data, and Information Service (NOAA-NESDIS) as it designs a plan to guide satellite data utilization from existing and new instruments aboard NOAA satellites, including National Polar-orbiting Operational Environmental Satellite System (NPOESS) instruments, for understanding, monitoring, and predicting climate variations and changes. The first report was released and NOAA prepared a draft science implementation plan in response. The Committee is currently reviewing that plan.

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7. BASC in the Past: *The Meteorological Buoy and Coastal Marine Automated Network for the United States*

In April 1997, the National Oceanic and Atmospheric Administration (NOAA) called upon the National Research Council (NRC) to examine the Coastal Marine Automated Network (C-MAN) and the national meteorological data buoy program. As of early 1997, 33 of the 118 buoys or C-

MAN stations managed by NOAA could no longer operate due to insufficient funds. NOAA asked the NRC to recommend a distribution of observing platforms that would maintain National Weather Service (NWS) observing and forecast capabilities. Dr. Lance Bosart, Department of Earth and Atmospheric Sciences, State University of New York at Albany and former member of BASC was the principal investigator for this 1998 study that resulted in a report called *The Meteorological Buoy and Coastal Marine Automated Network for the United States*. The priority recommendation that emerged from this report is that a single sponsoring agency, NOAA, should be placed in charge of installation, operation, and maintenance of the core moored buoys and C-MAN stations. Bosart also suggested expanding the scope of this report into one that reviews all complementary observing systems that are essential for providing crucial global weather and climate data for operational and research purposes. Currently, there are approximately 60 stations that make up C-MAN. These stations are of great importance especially given the recent strong hurricane season(s). After all, when the National Weather Service issues a hazardous weather warning, forecasters primarily gather data from observations made from the buoy/C-MAN.

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We encourage your comments on this newsletter as well as on the reports and activities of BASC. To provide input, contact basc@nas.edu.

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