

The BASC Newsletter, Volume 4, Number 1, 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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1. Message from the Director

Dear Colleagues:

Climate change has moved front and center in the public policy arena. This spring, the US Supreme Court ruled that EPA must consider greenhouse gases as pollutants. Speaker of the House Nancy Pelosi established a Select Committee on Energy Independence and Global Warming. Hearings on climate-related issues have been held by (at least): the House Science and Technology Committee; the House Committee on Oversight and Public Reform; the House Committee on Energy and Commerce; the Senate Committee on Environment and Public Works, and the Senate Committee on Commerce, Science, and Transportation (where BASC chair F. Sherwood Rowland was one of six witnesses at a hearing on "Climate Change Research and Scientific Integrity" on February 7, 2007). Various pieces of draft legislation are circulating.

Now that Congress is talking seriously about climate and there is virtually universal agreement that the Earth is warming, is the science finished? Of course not. It is as important as ever to contribute clear, objective scientific information to inform decision makers and the public. There are still many fundamental questions to be studied and uncertainties to be addressed. For instance, it is critical to understand and be able to model ice sheet dynamics and impacts on sea level, to improve projections of changes in precipitation and other variables in addition to temperature, especially at the regional level, and to achieve a better understanding of how the different components of the climate system interact. It is likewise critical that science move ahead into the realm of mitigation and adaptation.

The National Academies has built a considerable body of work related to understanding climate, climate dynamics, climate observations, and climate change and we hope that our work has influenced the discussions. (See our synthesis brochure, "Understanding and Responding to Climate Change," which describes the results of a dozen studies: <http://dels.nas.edu/basc/Climate-LOW.pdf>). Studies on climate change and transportation and

climate change and infectious diseases are underway, and major studies are being planned to assess different energy technologies and greenhouse gas emission reduction strategies.

But still, more information is needed, especially more sophisticated understanding of feedbacks and potential consequences, before we can set effective policy or spend huge sums on mitigation strategies. We need to be brutally frank about what we know and what we do not know, so science remains separate from politics. This is where the National Academies works best, and I encourage our whole community, and especially those of you who work for the federal government and states, to see us as a resource. Our consensus study process is the essence of why we exist – to bring diverse scientific perspectives together to provide advice to government. We can work to help prioritize research needs for a whole area of science or for a specific research program. We can bring together diverse perspectives to find common ground on controversial topics, pull together interdisciplinary teams to cross traditional boundaries, or look in detail at technologies and their capabilities.

BASC will hold its spring meeting May 17-18 in Washington and you are invited to attend. Our May 17 discussions, which will be held jointly with our Climate Research Committee, are of particular relevance, because we will be looking in depth at the IPCC working group reports, asking questions such as: what are the key outstanding questions and high priority research needs emerging from these reports? How can WGI research better inform WGII and III? What research might help improve the credibility of regional climate models? Please check our website, <http://dels.nas.edu/basc/boardmeetings.shtml>, for meeting details (an agenda will be posted by the end of April).

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2. Upcoming Meetings

- [April 23-24, 2007: Panel on "Ensuring the Climate Measurements from NPOESS and GOES-R"](#)
- [May 15-17, 2007: Scientific Accomplishments of Earth Observations from Space, Washington, D.C.](#)
- [May 16-17, 2007: Climate Research Committee, Washington, D.C.](#)
- [May 17-18, 2007: Board on Atmospheric Sciences and Climate, Washington, D.C.](#)

3. What's New

-- New Report: [Analysis of Global Change Assessments: Lessons Learned](#) informs decision makers about the scientific underpinnings of a range of environmental issues, such as climate change, stratospheric ozone depletion, and loss of biodiversity. Dozens of assessments have been conducted to date by various U.S. and international groups, many of them influencing public policies, technology development, and research directions. This report analyzes strengths and weakness of eight past assessments to inform future efforts. Common elements of effective assessments include strong leadership, extensive engagement with interested and affected parties, a transparent science-policy interface, and well defined communication strategies. The report identifies 11 essential elements of effective assessments and recommends that future assessments include decision support tools that make use of information at the regional and local level where decisions are made.

-- New Report: [Review of the U.S. Climate Science Program's Synthesis and Assessment Product 5.2, "Best Practice Approaches for Characterizing, Communicating, and Incorporating Scientific Uncertainty in Climate Decision Making"](#) reviews the U.S. Climate Change Science Program's new draft assessment product on characterizing and communicating uncertainty

information for climate change decision making, one of 21 climate change assessment products that the program is developing to meet the requirements of the 1990 Global Change Research Act. Although the draft assessment is effective in discussing methods of characterizing uncertainty, it falls short in several ways. It is written for researchers involved in assessment efforts and will likely be of use to them, but does not address other key audiences, particularly policymakers, decision-makers, and members of the media and general public. In addition, it does not assess the full range of "best practice approaches" for characterizing, incorporating, and communicating uncertainty. These weaknesses were due in part to a change in the prospectus after the process had begun to include new target audiences and a different scope of work. It will take a substantial revision of the current draft or production of a companion document, both requiring additional authors, to address these issues.

-- New Study: [Review of CCSP Draft Report 3.3: Weather and Climate Extremes in a Changing Climate](#) will review the U.S. CCSP's draft Synthesis and Assessment Product 3.3 entitled "Weather and Climate Extremes in a Changing Climate." The purpose of SAP 3.3 is to synthesize the current state of understanding about the characteristics and implications of uncertainty related to weather and climate extremes in a changing climate, and provide recommendations for best practices for characterizing, analyzing, and communicating that uncertainty. The NRC committee will provide a peer review of CCSP SAP 3.3.

-- BASC and CRC Joint Session: The Board on Atmospheric Sciences and Climate will meet jointly with the Climate Research Committee on Thursday, May 17, 2007 in Washington, DC, at the National Academy of Sciences Building. The morning session will focus on key outstanding questions and high-priority research needs emerging from the Intergovernmental Panel on Climate Change's Fourth Assessment Report. The afternoon session will feature a forum on seamless prediction and the "Year of Tropical Convection". Briefings are also scheduled on recently-released NRC reports: Analysis of Global Change Assessments: Lessons Learned and Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond and the new National Academies study on the National Polar-orbiting Operational Environmental Satellite System (NPOESS). For an updated agenda or more information, visit: <http://dels.nas.edu/basc/boardmeetings.shtml>.

4. Special Feature: [Analysis of Global Change Assessments: Lessons Learned](#)

Assessments synthesize and translate scientific information for decision makers. By engaging a range of stakeholders, evaluating the available scientific knowledge, and building consensus around pertinent issues, assessments can have a significant impact on public policies, technology development, and future research directions.

During the last four decades, many assessments have been conducted to address questions related to environmental issues such as stratospheric ozone depletion, climate change, and the loss of biodiversity. Global change assessments have been conducted at the international level, providing the scientific basis for the creation and elaboration of international agreements. Examples include The Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol on Substances That Deplete the Ozone Layer, and the United Nations Framework Convention on Climate Change and its Kyoto Protocol. In the United States, the first national assessment focused on climate change was conducted under the auspices of the U.S. Global Change Research Program and completed in the fall of 2000. The U.S. Climate Change Science Program (CCSP) initiated a second round of assessments in 2002 with 21 planned products; the first of these products was completed in May 2006 and the others are expected to be finished in 2007-2008.

A wealth of experience now exists on how to conduct effective global change assessments. Because of an increasing number of international and national mandates, it is likely that even more assessments will be initiated in the coming decades, placing further demands on the

resources devoted to these activities and the number of scientists involved. A new report from the National Academies, *Analysis of Global Change Assessments: Lessons Learned*, draws on the experiences of past global change assessments to provide guidance for the CCSP and other future assessment activities.

To read or order a copy of the pre-publication version of the report online, please visit http://books.nap.edu/catalog.php?record_id=11868.

5. Recently Released Reports

[*Analysis of Global Change Assessments: Lessons Learned*](#) informs decision makers about the scientific underpinnings of a range of environmental issues, such as climate change, stratospheric ozone depletion, and loss of biodiversity. Dozens of assessments have been conducted to date by various U.S. and international groups, many of them influencing public policies, technology development, and research directions. This report analyzes strengths and weakness of eight past assessments to inform future efforts. Common elements of effective assessments include strong leadership, extensive engagement with interested and affected parties, a transparent science-policy interface, and well defined communication strategies. The report identifies 11 essential elements of effective assessments and recommends that future assessments include decision support tools that make use of information at the regional and local level where decisions are made.

[*Review of the U.S. Climate Science Program's Synthesis and Assessment Product 5.2, "Best Practice Approaches for Characterizing, Communicating, and Incorporating Scientific Uncertainty in Climate Decision Making"*](#) reviews the U.S. Climate Change Science Program's new draft assessment product on characterizing and communicating uncertainty information for climate change decision making, one of 21 climate change assessment products that the program is developing to meet the requirements of the 1990 Global Change Research Act. Although the draft assessment is effective in discussing methods of characterizing uncertainty, it falls short in several ways. It is written for researchers involved in assessment efforts and will likely be of use to them, but does not address other key audiences, particularly policymakers, decision-makers, and members of the media and general public. In addition, it does not assess the full range of "best practice approaches" for characterizing, incorporating, and communicating uncertainty. These weaknesses were due in part to a change in the prospectus after the process had begun to include new target audiences and a different scope of work. It will take a substantial revision of the current draft or production of a companion document, both requiring additional authors, to address these issues.

[*Strategic Guidance for the National Science Foundation's Support of the Atmospheric Sciences*](#) provides guidance to NSF's Division of Atmospheric Sciences (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.

[*Understanding and Responding to Multiple Environmental Stresses, Report of a Workshop*](#) explores current understanding of multiple environmental stresses in the earth-atmosphere system on natural, managed, and socio-economic systems, and discusses the types of research needed to improve integrated understanding of these kinds of complex, nonlinear problems.

[*NOAA's Role in Space-Based Global Precipitation Estimation and Application*](#) is the second in a 2-part series on the future of rainfall measuring missions. The report recommends that NOAA begin its Global Precipitation Measurement (GPM) mission preparations as soon as possible and develop a strategic plan for the mission using the Tropical Rainfall Measuring Mission (TRMM) experience as a guide. The first report in the series, [*Assessment of the Benefits of Extending the Tropical Rainfall Measuring Mission*](#) (December 2004), recommended that the TRMM mission be

extended as long as possible because of the quality, uniqueness, and many uses of its data. NASA has officially extended the TRMM mission until 2009.

[Surface Temperature Reconstructions for the Last 2,000 Years](#) describes and assesses the state of scientific efforts to reconstruct surface temperature records for the Earth over approximately the last 2,000 years using proxy data such as tree rings, ice cores, and historical documents. The report summarizes current scientific information on the temperature record for the last two millennia, describes the principal methodologies used to produce large-scale surface temperature reconstructions and the uncertainties associated with these approaches, and explains why the paleoclimate temperature record is not the primary evidence for the conclusion that climatic warming is occurring in response to human activities.

[Completing the Forecast: Characterizing and Communicating Uncertainty for Better Decisions Using Weather and Climate Forecasts](#) explores how to improve the generation, communication, and potential use of uncertainty information for hydrometeorological forecasts and makes recommendations for improvements. Uncertainty is a fundamental characteristic of weather, seasonal climate, and hydrological prediction and no forecast is complete without a description of its uncertainty. Effective communication of uncertainty helps people better understand the likelihood of a particular event and improves their ability to make decisions based on the forecast.

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

[Characterizing, Communicating, and Incorporating Scientific Uncertainty in Climate Decision Making](#) will review the U.S. CCSP's draft Synthesis and Assessment Product 5.2 entitled "Best-Practice Approaches for Characterizing, Communicating, and Incorporating Scientific Uncertainty in Climate Decision Making." The purpose of SAP 5.2 is to synthesize the current state of understanding about the characteristics and implications of uncertainty related to climate change and variability, and provide recommendations for best practices for characterizing, analyzing, and communicating that uncertainty. The NRC committee will provide a peer review of CCSP SAP 5.2.

[Developing Mesoscale Meteorological Observational Capabilities to Meet Multiple National Needs](#) will develop an overarching vision for an integrated, flexible, adaptive, and multi-purpose mesoscale meteorological observation network and seek to identify specific steps to help develop a network that meets multiple national needs in a cost-effective manner. The study will focus primarily on mesoscale observational requirements over the United States and adjacent coastal zones, with emphasis on characterizing the planetary boundary layer, forecasting on time scales up to 48 hours, and the needs of urban areas. It will provide a practical approach, stressing applications and how to design and implement a system that will significantly improve users' decision making. The study will also address the roles of federal, state, and local government and by commercial entities.

[Scientific Accomplishments of Earth Observations from Space](#) will document major scientific accomplishments resulting from the unique vantage point provided by satellite observations of the Earth system. The study's main objective will be to document, using examples and explanation, how satellite observations uniquely contributed to scientific understanding of the atmosphere, ocean, land, biosphere, and cryosphere. The study will also address how satellite observations have contributed to the ability to predict variations in the Earth system (e.g., weather, climate variability, water availability, earthquakes, volcanoes, and tsunamis) and comment on opportunities to improve future Earth science research enabled by the vantage point of space. See the AGU town hall announcement under "Upcoming Meetings" for instructions on how to submit suggestions of major accomplishments for the committee to consider.

[Analysis of Global Change Assessments](#) 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.

[Archiving and Accessing Environmental and Geospatial Data at NOAA](#) will assist NOAA as it develops plans to meet its data archiving and data access requirements. A preliminary set of principles and guidelines for data archiving developed in the Committee's interim report, [Preliminary Principles and Guidelines for Archiving Environmental and Geospatial Data at NOAA: Interim Report](#), will be refined and expanded using community input in a final report that also addresses the extent to which a wide variety of data sets should be made available. The committee's final report will also include specific examples of how these principles and guidelines could be applied to existing and planned data streams across NOAA.

7. BASC in the Past: Abrupt Climate Change: Inevitable Surprises

Abrupt Climate Change Inevitable Surprises: Abrupt change is a common feature of the global climate system and available evidence suggests that abrupt climate changes are not only possible but likely in the future, potentially with large impacts on ecosystems and societies. Currently it is difficult to predict these changes but climate history shows that they were particularly common when the climate system was undergoing a strong forcing, e.g., when changing from ice age to interglacial. The period between 15,000 and 10,000 years before present shows a quick warming followed by a relapse into cold condition (the 'Younger Dryas' event) that was reversed abruptly. In historical times, abrupt changes also occurred; a general drying in Africa and the Middle East occurred around 3000 BC and multi-decadal droughts led to the collapse of early Mesopotamian and Egyptian cultures around 2200 BC and of the Maya cultures after 750 AD. A similar event contributed to the collapse of Mexican population in the late 16th century. Between 1920 and 1930 a strong warming in northern latitudes of up to 4 °C in Greenland was recorded and led to strong changes in fisheries. On geological timescales, there is evidence of global climates without any polar ice on earth ('hothouse') and 'icehouse' climates like today's or even a fully frozen Earth ('snowball-earth'). Current climate models do not accurately simulate warm climates of the past and can only partially simulate the speed of the paleoclimatic shifts. As we are currently forcing Earth by anthropogenic greenhouse gas emissions, the probability of abrupt changes on different spatial scales increases.

Despite the evidence in the historical and paleoclimate records, in 2002, there was no comprehensive review of the science and potential impacts of abrupt climate change and no overall plan for improving the understanding of abrupt climate change. The U.S. Global Change Research Program requested that this topic be investigated and the National Research Council formed the Committee on Abrupt Climate Change. The committee, which was guided by staff from BASC, Polar Research Board and Ocean Studies Board, was charged to: describe the state of knowledge about abrupt climate change; identify critical knowledge gaps concerning the potential for future abrupt climate changes; and outline a research strategy to fill these gaps. The committee was chaired by Richard Alley of Pennsylvania State University and included Jochem Marotze, William Nordhaus, Johnathan Overpeck, Dorothy Peteet, Roger Pielke, Jr., Raymond Pierrehumbert, Peter Rhines, Thomas Stocker, Lynne Talley and J. Michael Wallace.

The committee recommended a coordinated research program that focused on understanding thresholds and nonlinearities in geophysical, ecological and economic systems. Key research areas of the climate system are oceanic circulation, sea- and land-ice transport processes, the hydrological cycle and atmospheric behavior. The committee recommended that integrated modeling efforts to simulate abrupt climate change be developed and that more and better data on past abrupt climate changes needed to be collected. Development of 'no-regrets' adaptation strategies, especially for developing countries and focusing on institution building were also recommended. To this day, this report serves as a critical document in understanding global climate change.

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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, 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: F. Sherwood Rowland (chair), University of California, Irvine; M. Joan Alexander, NorthWest Research Associates; Michael L. Bender, Princeton University; Rosina M. Bierbaum, 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.; Vernon R. Morris, Howard University; Thomas H. Vonder Haar, Colorado State University; 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.