

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
AND
SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION**

HEARING CHARTER

The State of Hurricane Research and H.R. 2407, The National Hurricane Research Initiative Act of 2007

**Thursday, June 26, 2008
10:00 a.m. - 12:00 p.m.
2318 Rayburn House Office Building**

I. Purpose

On Thursday, June 26, 2008 the Subcommittee on Energy and Environment and the Subcommittee on Research and Science Education of the Committee on Science and Technology will hold a joint hearing to examine the Nation's hurricane research and development priorities, and to receive testimony on H.R. 2407, the National Hurricane Research Initiative Act of 2007.

H.R. 2407, introduced by Representative Hastings (D-FL), establishes a National Hurricane Research Initiative to improve hurricane preparedness. The hearing will examine the proposed legislation that sets research objectives based on the National Science Board's 2007 Report, "Hurricane Warning: The Critical Need for a National Hurricane Research Initiative." The hearing will also examine the status of hurricane research, ways in which current research efforts could be improved, and how the proposed legislation would affect the overall state of our nation's hurricane preparedness, including our ability to save lives and mitigate property loss.

II. Witnesses

- **Dr. John L. "Jack" Hayes** is the Assistant Administrator for Weather Services and the Director of the National Weather Service, National Oceanic and Atmospheric Administration (NOAA). Dr. Hayes will discuss the current state of federally funded hurricane research at NOAA, NOAA's perceived role in a National Hurricane Initiative, and the agency's position on the proposed legislation.
- **Dr. Kelvin K. Droegemeier** is the former Co-Chair of the National Science Board's Task Force on Hurricane Science and Engineering. Dr. Droegemeier will discuss the findings and recommendations of the Board's report, "Hurricane Warning: The Critical Need for a National Hurricane Research Initiative".

- **Dr. Shuyi Chen** is an Associate Professor of Meteorology and Physical Oceanography at the University of Miami, Rosenstiel School of Marine & Atmospheric Sciences. Dr. Chen will provide her perspective, as a hurricane researcher, as to the current gaps in hurricane related research, and the role of a national research initiative.
- **Dr. David O. Prevatt** is an Assistant Professor at the Department of Civil and Coastal Engineering, University of Florida. As an expert in hurricane wind damage, Dr. Prevatt will provide input on the proposed legislation from the perspective of the wind engineering community.
- **Dr. Stephen P. Leatherman** is the Director of the International Hurricane Research Center at Florida International University. Dr. Leatherman will discuss the work being done at the Hurricane Research Center and comment on the proposed research initiative in the legislation.

III. Background

An increase in hurricane activity in recent years has brought to the Nation's attention our growing vulnerability to natural disasters. The devastation and far-reaching impact of recent hurricanes have demonstrated the urgent need for an improved understanding of hurricanes and the ways in which we can better prepare so as to minimize loss of life and destruction of property. The economic losses from hurricanes are staggering. It is estimated that hurricane-related losses averaged more than ten billion dollars annually from 1990 to 1995, and upwards of \$35 billion a year from 2000 to 2006¹. These numbers would most likely escalate in coming years as our economy grows and more investments are expected to be made in coastal infrastructure. While billions of tax dollars are spent on rescue and relief efforts after a hurricane strikes, the federal government invests relatively little in the science and engineering research that could prevent much of the destruction and greatly minimize losses. The National Science Board (NSB) estimates that federal fiscal year budget investments for science and engineering research related to hurricanes totaled around \$200 million dollars in fiscal year 2006.² When attempting to assess federal dollars going to hurricane research at the time, the NSB found the exact numbers difficult to pinpoint, indicating a potential lack of focus and coordination among agencies. Even so, the most optimistic of estimates suggest that our current funding levels are inadequate to address our increasing vulnerability to hurricanes.

In December of 2005, the National Science Board³ established the Task Force on Hurricane Science and Engineering in an effort to assess and improve our nation's ability

¹ <http://www.nsf.gov/nsb/committees/hurricane/financial.pdf>

² Hurricane Warning: The Critical Need for a National Hurricane Research Initiative, 2007. <http://www.nsf.gov/nsb/committees/hurricane/initiative.pdf>, appendix A.

³ The National Science Board, comprised of twenty four members appointed by the President, is the governing body of the National Science Foundation, and serves as an independent body of advisors to the President and Congress on National science and engineering research and education policy issues.

to predict, mitigate, and better respond to hurricanes. The task force set out to evaluate and make recommendations for ways to improve the nation's hurricane-related research activities. In January, 2007, the Task Force released the results of its year long assessment, a report entitled, "Hurricane Warning: The Critical Need for a National Hurricane Research Initiative." The report concluded that "the U.S. must engage in a nationally coordinated, multi-agency and multi-disciplinary research initiative to greatly expand our understanding of hurricanes and identify more effective strategies for dealing with them."⁴ The report outlined the structure and budget necessary to implement such an initiative.

The report concluded that the United States is becoming increasingly vulnerable to hurricanes, while our coastal areas are becoming more and more heavily populated. A National Academies Study found that half of the U.S. populations live within 50 miles of coastline.⁵ Furthermore, taking into consideration the interconnectedness of our economy, hurricane devastation affects more than just the community hit. The effects are felt throughout the nation through increased fuel prices, displaced citizens, and much more.

National Hurricane Research Initiative, H.R. 2407

The National Hurricane Research Initiative (NHRI) takes the recommendations from the National Science Board report to create a multi-agency effort focused on improving our ability to predict hurricanes and their intensity, and on mitigating the devastating effects on coastal populations. This NHRI would engage all relevant federal agencies, industry, academia, and local government to strengthen hurricane research through an integrated and highly focused framework, promoting multi-disciplinary, multi-agency involvement. The National Oceanic and Atmospheric Administration (NOAA) and the National Science Foundation (NSF) are designated as the two leading agencies responsible for implementation and oversight of the Initiative.

The NSB report outlines four investment categories that are reflected in the bill language of H.R. 2407:

1. Understanding and Prediction: Research will be directed to more quickly and accurately predict hurricane intensification, size, and location of landfall. Also, research is needed to understand and model storm surge, rainfall and flooding from hurricanes. Research will be focused on improving hurricane storm observation technology through GPS technology, unmanned aerial vehicles, mobile radars, etc.
2. Impacts: Research will focus on the interaction of hurricanes with engineered structures, so coastal infrastructure can be better assessed for vulnerability to

⁴ Hurricane Warning: The Critical Need for a National Hurricane Research Initiative, 2007. <http://www.nsf.gov/nsb/committees/hurricane/initiative.pdf>

⁵ National Academy of Sciences, Meeting Research and Education Needs in Coastal Engineering, p. 11, National Academy Press (1999).

hurricanes. Research will be directed at better understanding the economic and social impacts of hurricanes, so we can identify impediments to implementing research outcomes. Also, fundamental research is needed to understand the relationship between hurricanes and climate and natural ecosystems.

3. Preparedness and response measures: Research will be directed towards implementing a national engineering assessment of coastal infrastructure to identify the levees, bridges, and other infrastructure that may be particularly vulnerable to hurricanes. Studies are needed to develop the most cost-effective improvements that can be made to already built infrastructure. Research will focus on improved technologies for disaster response and recovery as well as the complex challenge of evacuation and risk planning.
4. Crosscutting activities: Research is needed to learn how to better utilize the next generation of petascale computers in hurricane research and modeling. Research will also be directed towards incorporating hurricane impacts and related engineering principles in to training and education programs.

H.R 2407 also calls for the establishment of a National Infrastructure Data Base (NIDB) and The National Hurricane Research Test Bed (NHRTB). The NIDB will be a comprehensive database serving as a baseline to develop measurement standards that will aid the research community's ability to measure hurricane impacts and make effective recommendations for improved urban planning and building codes. In addition, the bill calls for the establishment of the NHRTB, which will be an interdisciplinary laboratory focused primarily on the transfer of research knowledge to operational applications. It will link models from a variety of related fields and conduct experimental integrative research. The NHRI is a model for a coordinated system to encourage interaction and collaboration for the purposes of a comprehensive hurricane research effort.

Current Federal Hurricane Research

While private companies are also making important advances in hurricane research, NOAA and NSF are the leaders in the federal hurricane research efforts.

The National Science Foundation invested an estimated \$13.5 million dollars in fiscal year 2006 in a variety of hurricane-related research.⁶ NSF awards research grants to carry out research in a variety of areas that seek to improve our fundamental understanding of hurricanes. NSF currently invests in research in each of the ten research areas designated in the bill language: Predicting hurricane intensity change; understanding ocean-atmosphere interactions; predicting storm surge, rainfall, inland flooding, and strong winds produced by hurricanes and tropical storms during and after landfall; improved observations of hurricanes and tropical storms; assessing vulnerable infrastructure; interaction of hurricanes with engineered structures; relationship between

⁶ Hurricane Warning: The Critical Need for a National Hurricane Research Initiative, 2007.
<http://www.nsf.gov/nsb/committees/hurricane/initiative.pdf>

hurricanes, climate, and natural ecosystems; technologies for disaster response and recovery; evacuation planning; and computational capability.

In response to the recommendations made by the NSB report as well as others, NOAA established the Hurricane Forecasting Improvement Project (HFIP) in order to accelerate improvements in forecasting the tracking of hurricanes, modeling capabilities, and intensity to increase confidence to enhance mitigation and preparedness decisions. Within the HFIP, NOAA seeks to embrace strong collaboration with non-NOAA partners with the objective to transition research into operations.

The April 2008 draft plan, *Proposed Framework for Addressing the National Hurricane Research and Forecast Improvement Initiatives: NOAA's Hurricane Forecast Improvement Project*⁷, provides the basis for NOAA and other agencies to work toward a national effort to coordinate national hurricane research and align not only other agencies, but the scientific communities' efforts in addressing the challenges posed to improve hurricane forecasts. The main goals of the HFIP are to:

- Improve the accuracy and reliability of hurricane forecasts;
- Extend lead time for hurricane forecasts with increased certainty; and
- Increase confidence in hurricane forecasts

These efforts will require major investments in enhanced observational strategies, improved data assimilation, numerical modeling systems, and expanded forecast applications based on the high resolution and ensemble based numerical prediction systems.

The plan mapped the needs into five research focus areas:

- Conduct basic research on the processes that contribute to rapid intensification and on the theoretical limits of predictability.
- Optimize exploitation of current and planned observing systems for both research and operations and identify observational gaps and develop initiatives to address those with significant potential.
- Improve data assimilation to fully exploit all in situ and remotely sensed data for both research and operational forecast.
- Improve numerical and other models for operational use to reduce error in track and intensity guidance, quantify uncertainty in these forecasts, and extend the timeframe for useful predictions related to hurricane development, evolution, and decay; build in the capacity to represent the physical processes responsible for rapid intensity change.
- Expand and enhance forecast tools and applications to add value to the model guidance and direct use of observations by the forecasters and diverse user community.

⁷ National Oceanic and Atmospheric Administration Hurricane Forecast Improvement Plan, 2008. http://www.nrc.noaa.gov/plans_docs/HFIP_Draft_Plan-1.pdf

H.R. 2407: *The National Hurricane Research Initiative Act of 2007*

Section-by-Section

Section 1. Short Title and Table of Contents

Provides the short title of the legislation: The National Hurricane Research Initiative Act of 2007.

Section 2. Definitions

Defines the terms Director as the National Science Foundation and Under Secretary for Oceans and Atmosphere of the Department of Commerce

Section 3. National Hurricane Research Initiative

Requires the Under Secretary and the Director to establish a National Hurricane Research Initiative and to cooperate with other specified federal agencies to focus on the improvement of hurricane research, forecasting capabilities, and mitigation impacts.

Also, requires such initiative to set ten research objectives (based on a National Science Board report) and make grants available for carrying out hurricane research in those ten specific areas.

Authorizes appropriations of \$285,000,000 for each fiscal year 2008 through 2018.

Section 4. National Infrastructure Database

Requires the establishment of a National Infrastructure Database as a virtual, cyber environment to catalogue traits necessary for providing a baseline; provides information to Federal, State, and local governments for use in policy-making; and provides data to researchers. Authorizes appropriations of \$20,000,000 for each fiscal year 2008 through 2018.

Section 5. National Hurricane Research Test Bed

Requires the development of a National Hurricane Research Test Bed to conduct integrative research and to facilitate the transfer of research knowledge to operational applications.

Authorizes appropriations of \$130,000,000 for each fiscal year 2008 through 2018.