

TESTIMONY BEFORE THE U.S. HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

H.R. 2407, NATIONAL HURRICANE RESEARCH INITIATIVE ACT

*A BILL TO ESTABLISH THE
NATIONAL HURRICANE RESEARCH INITIATIVE
TO IMPROVE HURRICANE PREPAREDNESS*

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**Testimony of
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before the
House Science Committee
June 26, 2008**

Florida International University (FIU) in Miami, Florida supports H.R. 2407, the National Hurricane Research Initiative Act, introduced by Rep. Alcee L. Hastings and co-sponsored by 18 other members of the Florida Delegation. Similar legislation, S. 931, introduced by Florida Senators Mel Martinez and Bill Nelson, is pending before the Senate Committee on Commerce, Science and Transportation.

FIU appreciates the recognition by our Florida leaders for the need for additional hurricane mitigation research and commends the Committee for holding this hearing. We strongly concur with the findings of the September 29, 2006, National Science Board Report (NSB) entitled "Hurricane Warning: The Critical Need for National Hurricane Initiative," which outlines the urgent national need for strategic action with respect to hurricanes. FIU applauds our Florida leaders for taking the lead on this national imperative and for introducing legislation which implements the recommendations of the National Science Board. We are pleased that 40 members of the House have co-sponsored H.R. 2407 and hope that FIU's statement will help convince the Committee and remaining members of Congress of the need to make passage of this legislation one of the chamber's highest priorities.

Florida International University -- Miami's public research university -- established in 1972, has more than 38,000 students, almost 1,100 full-time faculty and more than 124,000 graduates, making it the largest university in South Florida and placing it among the nation's 25 largest colleges and Universities. FIU offers more than 200 baccalaureate, masters and doctoral degree programs in 21 colleges and schools. Research is emphasized as a major component of its mission. The University is ranked as a Research University in the High Research Activity category of the Carnegie Foundation's prestigious classification system. FIU's College of Law received full accreditation in 2006, and it led all universities in the State with the highest pass rate of 94.4% on the 2007 stateside Florida Bar Examination. In the Fall of 2009 we will be welcoming our first medical school class.

FIU's International Hurricane Research Center is the state-wide center for hurricane mitigation research in Florida. We also lead the Florida System-wide Hurricane Mitigation Alliance, comprised of nine of the eleven Florida public universities.

Before commenting on the NSB report and H.R. 2407, I will briefly acquaint you with the work that we do at the International Hurricane Research Center and explain why we believe it is in the national interest, and the interest of the federal government, to support the development and

implementation of a rational research strategy focusing on the reduction of potential hurricane damage. I will conclude by providing FIU's thoughts as they pertain to the NSB report and then comment on the provisions of H.R. 2407.

International Hurricane Research Center

The International Hurricane Research Center (IHRC) at Florida International University (FIU) conducts basic and applied multidisciplinary scientific research to reduce the potential for damage from hurricane impacts to the human, natural and built environments in vulnerable communities throughout the United States and in other countries. It was established by the private sector in the aftermath of Hurricane Andrew.

As Florida's center for hurricane research, education and outreach, the IHRC offers a solid record of interdisciplinary and collaborative research, both basic and applied, focusing on the full spectra of hurricane impacts and the methods and techniques for hurricane loss reduction. The work of the IHRC has largely involved Florida and the larger Caribbean and Gulf basin, where most of the North Atlantic hurricanes make landfall.

The knowledge and findings resulting from the work of the IHRC, and the complementary education and outreach methodologies benefit not only Florida and specific countries in the Caribbean and Latin America, but every hurricane vulnerable community in the USA and abroad. These capabilities clearly allow the IHRC to support Federal strategic objectives and priorities, providing increased assistance to international partners while concentrating on the domestic front.

In fulfillment of its mission, the IHRC has engaged in a wide-ranging research agenda that includes the following areas:

- Research and development of effective and credible hurricane loss reduction methods and techniques for housing in Florida. This involves the testing of various building components and assemblies, development of improved building design criteria, and the analysis of various architectural and structural elements and their role in modifying the performance of buildings under hurricane conditions. IHRC researchers have developed an innovative full-scale structural testing facility – the Wall of Wind - to determine inherent weaknesses of structures when subjected to hurricane-force winds and rain. This research facility, the first-of-its-kind, will revolutionize our building construction and retrofitting practices. (Funded by Florida Department of Community Affairs, Florida Division of Emergency Management, National Science Foundation, Florida Sea Grant, Renaissance Reinsurance Holdings, Ltd, AIR Worldwide.)

- Development of a public domain hurricane loss model to assess risk and estimate potential losses. This integrated model is particularly useful to insurers, re-insurers, regulators as well as the financial and housing industries. The model includes newly-

developed knowledge databases and an updated wind field model. (Funded by Florida Office of Insurance Regulation.)

- Implementation of a windstorm simulation and modeling. This project focuses on the use of high-resolution data acquisition with airborne LIDAR technology and IHRC-developed algorithms, enhanced storm surge modeling, computer simulation and visualization complemented by public education and outreach programs. (Funded by the Federal Emergency Management Agency, National Oceanic and Atmospheric Administration.)

- Assessment of beach erosion, sea level rise impacts and coastal vulnerability. Quantification and assessment of erosion resulting from hurricanes and long-term sea level rise through the use of airborne LIDAR technology. This project uses high-resolution elevation data and local geomorphology features to assess coastal vulnerability at specific locations. (Funded by National Oceanic and Atmospheric Administration, The Andrew W. Mellon Foundation.)

- Assessment of social consequences and the human impact of hurricanes. Evaluation of how various social factors such as demographics, socio-economic strata or education may affect perceptions and attitudes influencing critical issues such as hurricane evacuation and the use of mitigation measures. (Funded by the National Science Foundation, National Oceanic and Atmospheric Administration, Florida Division of Emergency Management.)

To complement its research program, the IHRC also engages in efforts of education and outreach to transfer critical knowledge and findings to potential users and policy-makers in various fields. This includes the *Developing a Culture of Mitigation through Education* project focusing on K-12 students, their parents and teachers, and the community at large.

The Need for a National Hurricane Research Agenda

Hurricanes have shredded every ounce of public belief and trust in the safety and resiliency of community life by not only destroying people's homes, but everything else they need in their daily lives -- businesses, schools, hospitals, gas stations, and places of worship.

It is hard to identify any other societal need or engineering problem as challenging, recurring, and multi-disciplinary as hurricanes. Among weather hazards, hurricanes account for over half of the total damage inflicted.

The National Oceanic and Atmospheric Administration's National Hurricane Center, located on FIU's campus, predicts the six-month 2008 hurricane season which began June 1st has a 65

percent probability of being above normal, with 12 to 16 named storms, including 6 to 9 hurricanes and 2 to 5 major hurricanes with winds in excess of 111 mph. William M. Gray, a noted hurricane expert from Colorado State University, in April predicted a “well above-normal” season with 15 named storms, eight of them becoming hurricanes when they grow to 74 mph or more, and four developing into major-hurricane intensity.

FIU believes the following provide compelling evidence of the critical need for prompt congressional enactment of a national hurricane research initiative:

- Hurricanes represent 65% of insured losses by natural hazards in the U.S., with the potential to affect every state from Maine to Texas.
- In 2004 the value of insured coastal properties in the 18 East Coast and Gulf states exposed to hurricanes totaled \$6.9 trillion, or 16 percent of insurers’ total exposure to loss in the U.S.
- In 2005 alone, hurricane losses surpassed \$80 billion and caused more than 1,800 fatalities.
- Analyses of the top 40 most costly insurance losses worldwide for 1970 - 2005 indicate that \$147 billion in worldwide insured losses were associated with hurricanes compared to \$25 billion for earthquakes. Over the last 5 years, actual economic losses from U.S. hurricanes alone are estimated to be \$179 billion (in constant 2006 dollars).
- If a hurricane of the same category as Hurricane Andrew which hit South Florida in 1992 would hit Miami directly, it could be a \$100+ billion disaster, comparable to the physical damage New York suffered as a result of 9/11.
- Fifty percent of the U.S. population lives within 50 miles of the coastline, where the physical infrastructure in the late 1990s was valued at about \$3 trillion in the Gulf and Atlantic regions alone.
- If a hurricane caused permanent closure of only one percent of businesses in South Florida, 13,500 jobs would be lost in addition to \$1.8 billion in sales and \$414 million in lost payroll. By comparison, Hurricane Andrew permanently closed 10 percent of the businesses in the area. We believe similar losses would occur in other densely populated areas along the Gulf Coast and Atlantic Ocean.
- In Florida, estimates show that only 35 percent of small and mid-sized businesses have a disaster recovery plan in place, and less than 10 percent have contingency, business recovery and resumption plans, despite studies that show that 40 percent of companies that were shut by a disaster for three days failed within 36 month.
- FIU has a Wall of Wind test facility that enables development of innovative, high performance building systems and structures capable of withstanding hurricanes as intense as Category 5 and performance-based evaluation of two-story buildings, including residences, low-rise commercial buildings, schools, power lines, traffic signals, gas stations, commodity stores, focusing on issues of sustainable community and business continuity.
- In advance of Hurricane Katrina’s landfall a 29 foot storm surge in Mississippi was predicted by FIU researchers. The CEST storm surge model, currently under development, proved highly accurate and will continue to be a major asset to vulnerable regions as emergency managers will have additional tools to predict flooding potential.

University of South Florida and University of West Florida have recently joined the Hurricane Mitigation Alliance and aid in this research effort.

- IHRC researchers developed the first dynamic model of hurricane evacuation behavior. This multi-period model can address questions such as how levels of evacuation might be affected by an improved 3-day vs. 2-day forecast, extended hurricane warning, reduced costs of evacuation, and reduced benefits of evacuation.
- Real-time hurricane track forecasts were made available through the FIU-led Hurricane Mitigation Alliance to the National Hurricane Center by Florida State University using their superensemble model.
- The University of Florida and FIU team of wind engineers used meteorological towers to intercept landfalling hurricanes during the 2004 and 2005 hurricane seasons. This real-time, surface data characterizes the winds that actually cause damage. A highlight of the 2004 season was first-ever recording of surface wind during passage of the hurricane eye wall, and forecasters at the National Hurricane Center based advisories upon these data.
- FIU scientists, working with colleagues at NOAA's Hurricane Research Division, formulated a new analytical model of hurricanes' horizontal structure based upon aircraft observations. This research will lead to more realistic assessment of windstorm underwriting risk and more accurate storm-surge forecasts.
- University of Central Florida has built building virtual models of the effects of hurricane wind forces on residential houses as funded through FIU-led Hurricane Mitigation Alliance. The models include visualization of different types of damage to different types of structures (for example concrete block vs. wood frame structures), which will be used in educational programs.

Adoption and adequate funding of the NSB plan can result in as much as a 50% reduction in costs of hurricanes.

FIU's Comments on the NSB Report, "Hurricane Warning: the Critical Need for National Hurricane Initiative"

FIU and its Alliance colleagues have been vocal critics of the woefully inadequate attention that hurricane science, research and education have received at the federal level. The university wholeheartedly agrees with the NSB that "The present Federal investment in hurricane science and engineering research relative to the tremendous damage and suffering caused by hurricanes is insufficient, and time is not on our side." We concur with the NSB that hurricane-related research has been conducted, for the most part, as a relatively modest, loosely coordinated enterprise, but we leave to others to determine the amount of annual funding necessary to implement a meaningful, successful program to reduce the enormous public outlays, loss of life, and the associated societal disruption caused by hurricanes.

FIU also agrees with the NSB that any legislative National Hurricane Research Initiative be a "focused activity, with well defined metrics for success, effective assessment mechanisms and a clearly articulated pathway from research to operations." Finally, we share the NSB's conclusion that time is not on our side with respect to the federal investment in hurricane science

and engineering, as hurricanes are an inevitable part of our future. Our nation simply cannot afford the status quo. Added to the huge financial cost is the intolerable and unnecessary loss of life associated with hurricanes.

FIU has carefully reviewed the “Research Imperatives” identified as priorities in the NSB report and have the following comments noted in black type with respect to level of urgency given by the NSB. Also provided are areas not addressed in the NSB report that we believe are essential and should be included in H.R. 2407, the National Hurricane Research Initiative.

Investment Category #1: Understanding and Prediction

- *High priority. Predicting hurricane intensification and size, and reducing the uncertainty associated with where and when hurricanes will make landfall. **FIU’s recommended level of priority: Highest***
- *High Priority. Understanding air-sea interactions. **FIU’s recommended level of priority: Medium***
- *High Priority. Predicting storm surge, rainfall and inland flooding from hurricane and tropical storms. **FIU’s recommended level of priority: Highest***
- *Medium Priority: Understanding the relationship between hurricanes and climate: **FIU’s recommended level of priority: Medium***
- *Medium Priority. Improved observations. **FIU’s recommended level of priority: Highest***
- *Medium Priority. fundamental hurricane predictability. **FIU’s recommended level of priority: Medium***
- *Medium Priority. Hurricane modification. **FIU’s recommended level of priority: Low***

Investment Category #2: Impacts and Interactions

- *High Priority. Interaction of hurricanes with engineered structures. **FIU’s recommended level of priority: Highest***
- *High Priority. Economic and social impact of hurricanes and mitigation measures. **FIU’s recommended level of priority: Highest***
- *High Priority. Technologies for disaster response and recovery. **FIU’s recommended level of priority: Highest***
- *Medium Priority. Interaction of hurricanes with natural ecosystems. **FIU’s recommended level of priority: Medium***

Investment category #3: Preparedness and Building Resiliency

- *High Priority. Assessing and improving the resilience of the built environment. **FIU’s recommended level of priority: Highest***
- *High Priority. Human behavior and risk planning. **FIU’s recommended level of priority: High***
- *High Priority. Evacuation planning. **FIU’s recommended level of priority: High***
- *Medium Priority. Computational capability. **FIU’s recommended level of priority: Medium***
- *Medium Priority. Training and educational programs related to hurricane impact. **FIU’s recommended level of priority: Medium***

FIU's Specific Comments on H.R. 2407

FIU applauds this bill, which is comprehensive and addresses key research priorities. In addition, this legislation should include socioeconomic research and implementation, such as public and governmental adoption of mitigation measures and linking disaster recovery to mitigation. Our specific comments are as follows wherein we give the highest priority ratings to those areas which have the greatest potential for breakthrough science and return on investment in terms of mitigating losses:

- Predicting hurricane intensity change—**Highest** priority
- Understanding ocean-atmosphere interactions—**Medium** priority
- Predicting storm surges and inland flooding—**Highest** priority
- Improved hurricane observations—**High** priority
- Assessing vulnerable infrastructure—**Medium** priority
- Understanding hurricane and structural interaction—**Highest** priority
- Assessing hurricanes and climate change—**Medium** priority
- Improving response and recovery technologies—**Medium** priority
- Evacuation planning—**Medium** priority
- Computation capability—**Low** priority

Conclusions

FIU strongly believes in the need for coordinated programs at the federal level to reduce the impacts of hurricanes and other windstorms. As such, FIU has been a lead advocate of the 2004 National Windstorm Impact Reduction Act and strongly urges Congress to reauthorize the Act this year, before its 2008 authorization expiration. We are heartened, thanks to the efforts of Reps. Debbie Wasserman Schulz (FL) and Dennis Moore (KS) that the FY '08 Commerce, Justice Science appropriation Conference Report includes \$11.3 million to implement the bill. We are disappointed that neither the National Oceanic and Atmospheric Administration, the National Institute of Standards and Technology, and the National Science Foundation has chosen to fund the Act, presumably due to budget shortfalls and different priorities. FIU strongly urges the Committee to advise these agencies of the importance of the National Windstorm Impact Reduction Act and to make implement of the 2004 Act a high agency priority.

If a hurricane of the same category as Hurricane Andrew (which hit South Florida in 1992) would hit Miami directly, it would be a \$100+ billion disaster, comparable to the physical damage New York suffered as a result of 9/11. While the size of the national hurricane mitigation research program that the National Science Board outlined is significant, it only represents 1% of the present value of the damage caused by Hurricane Andrew. Our research shows that funding for a strong, coherent and united research agenda, such as that embodied in

H.R. 2047, could lead to significant loss reductions -- in lives saved and structural damage incurred.

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Education

Ph.D., Environmental (Coastal) Sciences, University of Virginia, 1976
B.S., Geosciences, North Carolina State University, 1970

Publications

16 books and National Academy reports, including *Hurricanes*, *Sea Level Rise: History and Consequences*, and *Barrier Island Handbook*.

Over 200 journal articles and technical reports authored, including articles in both Science and Nature

Expert testimony for the U.S. Senate and U.S. House of Representatives ten times.

On-screen host and co-producer, "Vanishing Lands" film, 1992, winner of 3 international film awards, including the Golden Eagle.

Professional Presentations

Over 200 speeches at national and international scientific conferences including Antigua, Argentina, Bahamas, Brazil, Canada, China, Denmark, Egypt, England, France, Hong Kong, Iceland, Ireland, Italy, Japan, Mexico, Micronesia, Netherlands, Norway, Puerto Rico, Thailand, Venezuela and Wales.