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National Science Board
National Science Foundation
4201 Wilson Boulevard
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Submitted via email to NSBHSE@nsf.gov.

To Whom It May Concern:

On behalf of the Weather Coalition -- a diverse group of representatives from industry, academia, science and education consortia, and a national laboratory, committed to working together to improve the capabilities of the country's weather prediction and warning capabilities -- we congratulate you on the September 29th release of *Hurricane Warning* and strongly support the report's timely and comprehensive recommendation for a National Hurricane Research Initiative. As the report states, resources currently devoted to hurricane research and development do not reflect the impacts on the U.S. economy and coastal communities. A well coordinated and fully financed national R&D program will yield significant societal benefits. We trust the following comments will strengthen the report's recommendations and the case made for their rapid implementation:

Recognize more fully the current understanding of hurricanes. The executive summary states that "we know relatively little about the most important aspects of hurricanes..." This summary does not adequately recognize the significant strides made in hurricane research over the last decade, and does not accurately reflect the body of the report which better describes the specific gaps in current understanding, especially the factors influencing intensity.

Clarify the distinction between Investment Category #2 and #3. There appears to be some overlap and duplication between "Impacts and Interactions" and "Preparedness and Building Resiliency." The distinction between these two categories should be clarified, for example, by renaming the categories "Impacts" and "Preparedness and Response Measures," and briefly describing each category. Furthermore, the priority item "Interaction of Hurricanes with Engineered Structures" (in Category #2) seems very similar to "Resilience of the Built Environment" (in Category #3). The current Category #2 priority of "Technologies for Disaster Response and Recovery" would be better placed in Category #3.

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Identify cross-cutting issues. The last two priority items in Category #3, “Computational Capability” and “Training and Education Programs,” are cross-cutting and not just related to understanding and research, impacts, or preparedness and response measures. For example, computational resources are important for both research and operational forecasts. The incorporation of hurricane-related issues into engineering and other academic curricula also spans more than one of the existing categories. We therefore recommend creating a fourth category for cross-cutting issues.

Increase support for operational forecasts. Although the testbed facility is an important and proven element for infusing research to operations, additional resources will be needed to fully support the improvement of operational forecasts. Key areas include training for forecasters and improved computational resources at all levels. Even if this is deemed outside the scope of the NSB recommendations, the report should recognize and support this need.

Recognize the significance of land use decisions. Land use is a fundamental element of societal vulnerability to hurricane impacts, yet the report is circumspect on this issue. The physical and social sciences can greatly inform broader debates about land use decisions, and related issues such as private and federal insurance availability. Category #3 on Preparedness is incomplete without explicitly recognizing the significance of land use decisions and including it in the research portfolio.

Clarify the current and proposed research program budget. Appendix B cites existing total U.S. hurricane research funding of \$216 million (page 20). The report would be much stronger if it explained where this money is currently invested (versus the current breakout of only about 10 percent of the total), whether its allocation could be improved, and how the additional \$300 million annual investment recommended on page 2 relates to this existing \$216 million. As is, the report could be misconstrued to imply that the recommended \$300 million is addressing a blank slate. Specifically, the tables in Appendix C and D should attempt to show where the current \$216 million is spent, and, if appropriate, where it should be reallocated.

Reduce the priority of hurricane modification. The limited likelihood of achieving significant hurricane modification even with new knowledge gained through the proposed national research effort suggests that this area be given very low priority. Furthermore, modification raises daunting ethical, legal, and environmental issues.

Prioritize the maintenance and improvement of observing systems. While by no means solely related to hurricane research, maintaining and enhancing current observing capabilities is a very high priority for both research efforts and operational forecasting. Maintaining observing capabilities includes the ongoing replacement or upgrading of existing observing infrastructure in a timely fashion. High priority should also be given to more effective and efficient utilization of existing observations (such as ground-based and airborne radar), improving observing capabilities (such as improved dropsondes for atmospheric and ocean surface layer observations), and exploration of novel observing systems (remotely piloted vehicles and installation of radar on off-shore platforms).



Observing system simulation experiments (OSSE) should be recommended to help define the contribution and relative importance of current and proposed observing systems. Without this capacity, progress in hurricane research and forecasting would be crippled.

Prioritize satellite systems. Satellite systems are an especially important part of observing systems for hurricanes because of their large scale and genesis well offshore. The current U.S. satellite system, which has played a large part in the advances made in hurricane research and forecasts, is in the process of collapsing. While the initiative recommended by the NSB should not be expected to fund satellites, recognition of the importance of healthy polar orbiting and geostationary satellite programs, together with a strong recommendation to maintain and strengthen these programs would be helpful. An international cooperative approach to satellite infrastructure and data sharing would provide much needed protection against cost overruns, budget cuts, or launch failures.

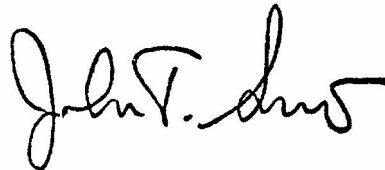
Set clear and realistic expectations. The report does not articulate expected outcomes from the overall research initiative, other than general improvements in the priority areas. Developing detailed expected outcomes may be beyond the scope of the current report, but should be recommended as a part of further work by NSF, NOAA, and other agencies. Additionally, the NSB report should place realistic expectations on hurricane forecasts and response measures. Hurricanes are complex and violent systems. Even the best research initiative will only improve forecasts, not perfect them. And even the best preparation and response measures cannot insulate society from hurricane impacts. The report should not raise unrealistic expectations on the part of decision makers and the public.

We hope these suggestions are helpful as you work to finalize this excellent report. Please do not hesitate to contact us to clarify any of these comments. We look forward to working with you in any way possible to support the National Hurricane Research Initiative.

Sincerely,



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