

66TH INTERDEPARTMENTAL HURRICANE CONFERENCE SUMMARY REPORT

This document provides a summary of the 66th Interdepartmental Hurricane Conference (IHC), sponsored and chaired by Mr. Samuel P. Williamson, Federal Coordinator for Meteorology, from March 5-8, 2012, in Charleston, South Carolina. The report includes the following sections:

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I. OVERVIEW

Purpose and Theme:

The Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) annually hosts the IHC to provide a forum for the responsible Federal agencies, together with representatives from the academic community, industry, and other user communities such as emergency management, to prepare for the upcoming hurricane season and to make improvements to the Nation's hurricane forecasting and warning program. In preparation for the upcoming 2012 hurricane season, the OFCM-sponsored Working Group for Hurricane and Winter Storms Operations and Research (WG/HWSOR) met to coordinate operational issues and update the *National Hurricane Operations Plan* (NHOP). This plan is published annually prior to the hurricane season and documents the interdepartmental effort to provide the United States and designated international recipients with forecasts, warnings, and assessments concerning tropical and subtropical weather systems. The 2012 NHOP will be electronically published by May 15th.

The theme of this year's conference was *Tropical Cyclone Operations and Research: Strength and Success through Partnerships and Alliances*. With strong partnerships built over many years, the conference was attended by 192 people, including representatives from academia, industry, and eight federal agencies: DHS (FEMA), DOC (NOAA, NIST), DOD (Navy, Air Force, and Army Corps of Engineers), DOI (USGS), DOT (FAA), NASA, NSF, and USDA.

Objectives:

The conference sessions were structured to address the following objectives:

- Recognize promising research and key partnerships that address near-term opportunities to improve tropical cyclone prediction and warning capabilities.
- Review Joint Hurricane Testbed results for transitioning research into operations.
- Explore other R&D opportunities that promote immediate improvements in the understanding and forecasting of tropical cyclones and their associated effects.
- Review the Nation's tropical cyclone forecast and warning program and update the National Hurricane Operations Plan to prepare for the 2012 hurricane season.
- Review hurricane response and strategies to improve stakeholder and user reactions.

Abstracts and Presentations: Abstracts for the presentations that were given at the 66th IHC can be found at http://www.ofcm.noaa.gov/homepage/text/spc_proj/ihc/booklet.html. Presentation slides may be viewed at <http://www.ofcm.noaa.gov/ihc12/66IHC-Linking-File.htm>.

Key Takeaways:

1. Significant progress has been made in the following areas:
 - Partnerships and alliances.
 - The importance of partnerships and the strong bonds that have been cultivated amongst the Federal agencies, industry, and academia cannot be over emphasized. The 66th IHC was a showcase for these partnerships, as the tropical cyclone community works together to solve the complex science issues, helping to provide an ever-increasing level of service to the people of our Nation as we seek to minimize the impact of future land-falling tropical cyclones. Ongoing collaborative efforts have proved to be absolutely vital as downward budget pressure hits agency core mission areas.
 - In 2007, through the work of the OFCM-sponsored Joint Action Group for Tropical Cyclone Research, the *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead* was published. The plan, for the first time, produced a common set of R&D priorities that were matched to operational requirements from the tropical cyclone forecast and warning centers. These R&D priorities served as the baseline document for NOAA's Hurricane Forecast Improvement Program (HFIP). In 2008 and 2010, the Working Group for Tropical Cyclone Research (WG/TCR) conducted a snapshot assessment to map ongoing agency research efforts with tropical cyclone research needs and operational priorities and highlighted the tropical cyclone research alliance between NOAA, NASA, Navy, NSF, USACE, and the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE). The WG/TCR's next assessment will be presented next year at the 67th IHC. Through these assessments, the WG/TCR has established a successful process to:
 - Keep the operational priorities updated.
 - Assess and evaluate how research is contributing to meeting those priorities.
 - Allow research managers to make informed decisions on future investments.
 - Facilitate interagency collaboration and coordination.
 - Partnership between the Air Force Reserve Command's 53rd Weather Reconnaissance Squadron (53 WRS) and the NOAA Aircraft Operations Center (AOC) is key to the provision of operational and research tropical cyclone reconnaissance data to the operational centers (principally NHC) and research agencies. Over the last 5 years, the 53 WRS has flown an

average of 866 hours per year in support of operational taskings; NOAA AOC has flown an average of 416 hours per year for both research and synoptic surveillance.

- Track forecast error has improved in the areas of assimilation of aircraft radar and microwave satellite data, model improvements to include the use of ensemble output, and implementation of Joint Hurricane Testbed (JHT) results.
 - Continued Joint Hurricane Testbed project transitions from research to operations (R2O). From 2001-2011, there have been 74 total projects supported with 35.5 projects accepted for implementation. Of the remaining projects, 6 were completed but rejected, 9.5 projects were also completed but are pending further investigation, 11 projects are under evaluation for operational acceptance, and the last 12 projects are new initiatives.
 - Increased exploitation of research systems for operational use.
 - NASA research satellite data is available in near real time and is increasingly being used for operational applications.
 - Navy Research Lab's tropical cyclone satellite web page incorporates both operational and research data for operational use, a true R2O success story lauded by the interagency partners and international community.
 - Research results showing the way forward.
 - NOAA's Hurricane Forecast Improvement Program (HFIP) successfully providing framework to focus efforts and accelerate progress. Infrastructure allows for rapid test and evaluation of new discoveries and observations, enhancing R2O.
 - Intensity forecast improved by 10-20 percent at 2 to 5 days.
 - Rapid intensification forecasts improved by 10-20 percent with the increased use of ensemble and satellite microwave data.
 - Data assimilation and global and regional model development and improvement remain top research priorities, and work is ongoing. For example, the Navy's COAMPS-TC research model is showing great promise in forecasting TC intensity.
 - Technology innovation showing results; for example, the potential use of unmanned aerial systems (UAS) to provide operational dropsonde observations. NASA will use two Global Hawk UASs to achieve the mission objectives of its multi-year investigation of Atlantic hurricanes: *Hurricane and Severe Storm Sentinel (HS3)*. Deployments are scheduled to begin in September 2012.
 - Storm surge forecast improvements include better visual displays of products, integration of ensemble models and techniques, and increased coordination among agencies (including social scientists) with added focus on feedback from emergency managers and the public.
2. Significant challenge areas where gaps in capability remain include:
- Intensity, rapid intensification, and cyclogenesis forecasts.
 - Model initialization, data assimilation, ensemble research (including physics).
 - Moisture and wind integration into models (improved techniques and additional data sets; e.g., COSMIC and microwave data).
 - Uncertainty in the future of satellite microwave resources. Satellites (particularly, research satellites) are nearing their service life times with no planned replacement.
 - Weather warning messages to decision makers and the public still not sufficient for all desired actions (need more social science involvement).
 - Continued form and format issues (tailoring for the decision maker require more attention).
 - Better optimization of communication channels (use and impact of social media).
 - Improved infrastructure resiliency (building and planning codes, etc.).
3. Proposed follow-on actions (early actions for the WG/TCR) include the following:
- Explore options for satellite microwave sensing research scientists since systems are nearing their service life times with no planned replacements (next steps, temporary solutions, etc.)
 - Explore how to best leverage ongoing modeling and ensemble activities to improve tropical cyclone forecasts and warnings with respect to the:
 - National Unified Operational Processing Capability (NUOPC).
 - Earth System Prediction Capability (ESPC).

- NSF's proposed university-based ensemble program.
- Joint Center for Satellite Data Assimilation (JCSDA).
- Determine areas needing greater customer feedback to further focus tropical cyclone research on operational requirements.
- Investigate social science issues that prevent effective communication of forecast and warning messages to decision makers and the public, through the OFCM-sponsored Working Group for Social Science (includes content of message and how people react to them).

Conference Action Items:

- OFCM will post conference presentations and this summary on the conference web page.
- OFCM will electronically publish the annual NHOP, to include accepted changes by the WG/HWSOR, no later than May 15, 2012.

II. CONFERENCE SYNOPSIS

Sessions Conducted:

In addition to the opening, poster, and plenary sessions, the 66th IHC agenda included the following:

Session #	Title
1a	2011 View of the Working Group for Tropical Cyclone Research (WG/TCR)
1b	The 2011 Tropical Cyclone Season in Review
2a	Joint Hurricane Testbed Project Updates, Part 1
2b	Joint Hurricane Testbed Project Updates, Part 2
3	Advances in Storm Surge Predictions
4a	Observations and Observing Strategies for Tropical Cyclones and their Environment, Part 1
4b	Observations and Observing Strategies for Tropical Cyclones and their Environment, Part 2
5a	Tropical Cyclone Model Development and Technology Transfer, Part 1
5b	Tropical Cyclone Model Development and Technology Transfer, Part 2
6	Other Research to Improve the Prediction of Tropical Cyclone Intensity and Structure, Track, Precipitation, and Coastal and Inland Inundation
7	Effective Communications: An Important Key to Saving Lives Panel 1: Effective Communications, Part 1: Are They Hearing What We're Saying?
8	Effective Communications: An Important Key to Saving Lives Panel 2: Effective Communications, Part 2: Will They Respond in the Intended Way?

Media Coverage:

The 66th IHC received extensive television, radio, and print media coverage, including interviews for Mr. Bill Read, Director of the National Hurricane Center; Rear Admiral David Titley, the Oceanographer and Navigator of the Navy and Director, Maritime Domain Awareness and Space; and Mr. Bryan Norcross, Hurricane Specialist from The Weather Channel. The information was centered on preparedness for the upcoming hurricane season, the purpose of the IHC, and relevant research. Local television coverage included the following stations, WCBD (News 2 - NBC), WCIV (News 4 - ABC), and WCSC (News 5 - CBS). On-line coverage included articles from The Charleston Post and Courier, the Associated Press, Reuters.COM, WirelessRERC.ORG, the above local TV stations, and WJBF (News 6 - ABC).

Key Events:

1. **Working Group for Hurricane and Winter Storms Operations and Research (WG/HWSOR) Meeting:** The working group met on March 5, 2012, and addressed 19 action items. Of those, 1 was deferred and 10 were either informational or closed through incorporating changes into the 2012 NHOP. The remaining 8 items will be worked through follow-on actions by the group.
2. **Working Group for Disaster Impact Assessments and Plans: Weather and Water Data (WG/DIAP) Meeting:** The working group met on March 5, 2012, and addressed 8 action items, of which all are still open and will be worked through follow-on actions by the group. The majority of the action items will be addressed through an update of the National Plan for Disaster Impact Assessments: Weather and Water Data (NPDIA).
3. **Conference Opening Remarks:**
 - **Conference Opening Remarks** - The Honorable Joseph P. Riley, Jr., Mayor, City of Charleston, South Carolina welcomed conference attendees and described Charleston's vulnerability to hurricanes. He cited the challenges of tropical cyclone hazards to local residents, adherence to building codes, and a growing population.
 - **Invited Speaker** - Dr. David Parsons, Director, School of Meteorology, University of Oklahoma, provided opening comments and insights on the role and importance of public-private partnerships in advancing the state of the science of tropical cyclone research and of atmospheric research, in general. ([presentation](#))
 - **Senior Leader Panel: Partnerships - The Key to Tackling Critical Challenges in Tropical Cyclone Operations and Research.** During the opening session, a panel of senior agency representatives provided their perspectives on the Nation's tropical cyclone forecasting and warning program as well as their insights into partnerships and alliances that strengthen the overall program. Senior leaders from NOAA, NASA, Navy, and Air Force reiterated the importance of partnerships to address the complex research challenges associated with further improving TC forecasting and warning capabilities, and emphasized their commitment to collaboration and interagency cooperation. Panel participants were:
 - Moderator: Mr. Bryan Norcross, The Weather Channel Hurricane Specialist ([presentation](#))
 - Panelists:
 - Rear Admiral David Titley, Oceanographer and Navigator of the Navy and Director, Maritime Domain Awareness and Space ([presentation](#))
 - Dr. Fred Lewis, Director, Air Force Weather ([presentation](#))
 - Dr. Jack Kaye, Associate Director and Research and Analysis Lead, Earth Science Division, National Aeronautics and Space Administration ([presentation](#))
 - Mr. David B. Caldwell, Director, Office of Climate, Water and Weather Services, National Weather Service ([presentation](#))
4. **Session 1a: 2011 View of Working Group for Tropical Cyclone Research (WG/TCR)**
 - The co-chairs of the WG/TCR provided an overview of the group's ongoing efforts and highlighted areas of promising research. ([presentation](#))
 - To accompany this presentation, an overview of the Hurricane Forecast Improvement Program (HFIP) Real-Time Experimental Forecast System for 2012 was presented. ([presentation](#))
5. **Invited Speaker** - Dr. Michael C. Morgan, Director, Division of Atmospheric and Geospace Sciences, National Science Foundation (NSF), highlighted the importance of partnerships in support of hurricane research from the NSF's perspective. His message on the role that NSF plays in the larger hurricane research community was particularly informative. NSF's ability to focus its resources on national priorities, like hurricane research, will be instrumental to future improvements in the tropical cyclone forecast and warning services provided to our Nation. ([presentation](#))

6. Session 2a-b: Joint Hurricane Testbed (JHT) Project Updates

- The JHT facilitates the transfer of promising research into tropical cyclone forecast operations within a period of about 2 years. As has been the custom for the last 10 years, the IHC provides a forum to update IHC participants on the progress of JHT projects.
- From 2001-2011, there have been 74 total projects supported with 35.5 projects accepted for implementation. Of the remaining projects, 6 were completed but rejected, 9.5 projects were also completed but are pending further investigation, 11 projects are under evaluation for operational acceptance, and the last 12 projects are new initiatives.
- The 12 projects that have just begun the JHT process are from the 6th round (FY10-12), and were tested and evaluated during the 2011 hurricane season. Principle investigators for these 12 projects plus other JHT projects provided updates during Sessions 2a-b. The table below provides a breakout of the primary focus areas.
- With 35.5 projects successfully transitioned to operations since 2001, the JHT and its associated partners are helping to pave the way for improved tropical cyclone services.

Primary Area of Focus	# of Projects
Improvements to dynamical models (for track, intensity, and precipitation)	3
Statistical intensity forecast guidance	4
Enhancements to observed data assimilation	4
Tropical cyclone structure/wind/wave distribution	1
TOTAL	12

7. Session 3: Advances in Storm Surge Predictions – Session three highlighted the new emphasis on storm surge hazards and efforts to improve the Nation’s storm surge forecasting, evacuation, and coastal zone management and planning capabilities. Presenters discussed efforts underway to meet the rapidly expanding needs for accurate and timely storm surge products and services. ([session presentations](#))

8. Invited Speaker - Mr. Brad Rippey, Meteorologist, US Department of Agriculture, Office of the Chief Economist provided comments on how the 2004-2005 hurricane season impacted Florida’s citrus belt and how seven years later, Florida’s citrus production still continues to languish. ([presentation](#))

9. Session on Effective Communications

- **Invited Speaker** – Mr. Dave Jones, Founder, President & CEO, StormCenter Communications, Inc, provided comments on the need for collaboration within and across emergency operations centers and similar partners for real-time decision making as well as how critical effective communications is to delivering any message that requires action. Accurate, geo-located visualizations enable rapid situational awareness and enhanced decision making. Information reaching the public continues to be insufficient, particularly for those who are not familiar with the geographic area or the languages in which information is presented (e.g., tourists, travelers, and newcomers).
- **Panel Discussions** - Two social science sessions addressed the question of whether or not people are hearing warning messages and if they are responding as intended - Part 1: Are They Hearing What We’re Saying? and Part 2: Will They Respond in the Intended Way? Dr. Brenda D. Phillips, Professor of Political Science, Fire and Emergency Management Program, Oklahoma State University captured the following key takeaways:
 - Social scientist panelists confirmed that partnerships are the key to delivering warning message content. Simply relying on crafting a warning message and disseminating the content through traditional means does not insure that people will receive the warning, which must be written in an understandable fashion designed to motivate the desired response.
 - Meteorologists, emergency managers, media, the military, weather-related services, and others involved in disseminating messages must coordinate with each other and with community-based organizations, faith-based organizations, disability experts, and others to reach people. An effective effort takes all of these partners going the last mile to complete the forecast and warning dissemination and alerting process.

- Ms. DeeDee Bennett from Oklahoma State University's Fire and Emergency Management program discussed social media's increasing awareness across a broader group of demographics (elderly, people with disabilities, emergency managers); however, few studies exist on its effectiveness. In the case of the 2011 Alabama tornadoes, the Alabama Emergency Management Agency launched multiple social media platforms to disseminate messages. As a result, information-seeking spikes occurred with weather events, volunteer management, and added Spanish-language texts. Recommendations for social media include early adoption, educating emergency managers on usage, and facilitating partnerships (usually through linkages). Social media has enormous potential, especially in rapidly reaching a broad public and also by allowing for immediate corrections and updates. ([presentation](#))
- Ms. Brenda Philips from the University of Massachusetts' Center for Adaptive Sensing of the Atmosphere (CASA) discussed the integration and connection of meteorologists and emergency managers from nearly a decade of research. Emergency managers were found to use a variety of devices, with their most significant challenge stemming from slow data flow due to bandwidth issues. Comments and discussion from the audience revealed that the public continues to seek multiple, diverse, and redundant weather warning delivery mechanisms. ([presentation](#))
- Mr. Frank Lucia, who has worked with the Georgia Institute of Technology's Wireless Engineering Research Center, focused on why people were not "hearing" the message. His research on disabilities demonstrated the need to deliver messages through multiple means and to conduct research into the meaning of the wording. To illustrate, the terms "low lying" area and "take cover" may convey different behavioral intentions to people who are deaf or hard of hearing. An assessment of the 2011 National Emergency Alert System test revealed that 45.6 percent of people with disabilities did not get the test warning. Active discussion from the audience ensued, leading to concurrence with FEMA Director Fugate who wrote "we must adapt to the ways people communicate" rather than to expect people to adapt to the ways we deliver information. ([presentation](#))
- Dr. B. Lee Linder from the College of Charleston, Department of Physics and Astronomy, spoke on local storm surge understanding. His research uncovered a lack of understanding on the implications of storm surge, particularly in areas with less frequent, high-consequence events. He presented visual images showing surge depth over familiar landmarks such as schools. Comments and discussion from the audience confirmed that linking the visual reality of storm surge to the context of daily life provides a powerful means to capture the public's attention. ([presentation](#))

10. 66th IHC Banquet and Richard Hagemeyer Award:

- The banquet address was given by Mr. Bill Walsh, Lead Meteorologist, WCSC-TV Charleston (News 5 - CBS). His light-hearted stories on the important partnerships between the media and the tropical cyclone operations and research community provided meaningful insights and were a perfect transition to the next day's effective communications sessions. ([presentation](#))
- In-person presentation of the 2011 Richard Hagemeyer Award, which is presented annually in honor of the longtime Director of the NWS Pacific Region and supporter of the IHC, was awarded to Dr. Peter Black, Marine Meteorology Division, Naval Research Laboratory and SAIC, Inc. Dr. Black was not present at last year's conference.
- This year the 2012 Richard Hagemeyer Award was awarded to Mr. Jeffrey Hawkins, Marine Meteorology Division, Naval Research Laboratory.

III. Tentative Location for Next Year: The location for the 67th IHC (2013) is TBD.