

62nd Interdepartmental Hurricane Conference (IHC) Summary Report

I. OVERVIEW

Purpose:

The purpose of this document is to provide a summary of the 62nd IHC, a conference that was sponsored and chaired by Mr. Samuel P. Williamson, Federal Coordinator for Meteorology, from March 3-7, 2008, in Charleston, South Carolina. After providing an overview of the conference, this summary report will review the conference objectives, key events, conference results and conference action items.

Each year, the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) sponsors the IHC to provide a forum for the responsible Federal agencies, together with representatives of the user communities such as emergency management, to review the Nation's hurricane forecast and warning program and to make recommendations on how to improve the program. The theme of this year's conference was *Tropical Cyclone Operations and Research: Priorities for the Future*. With strong partnerships and alliances built over many years, the conference was attended by approximately 200 personnel for the ninth consecutive year, including representatives from nine federal agencies: DOC/NOAA, DOD (Navy, Air Force, and Army COE), NASA, NSF, DHS/FEMA, DOT/FHWA, DOI/USGS, USDA and DOE.

Sessions Conducted: In addition to the opening session on Monday afternoon and the poster session on Tuesday evening, there were 11 sessions conducted at the 62nd IHC:

Session #	Title
1	The 2007 Tropical Cyclone Season in Review
2	Workshop: Interagency Priorities for Tropical Cyclone Research
3	Observing the Tropical Cyclone and its Environment, Part 1
4	Observing the Tropical Cyclone and its Environment, Part 2
5	Observing the Tropical Cyclone and its Environment, Part 3
6	Tropical Cyclone Modeling and Prediction, Part 1
7	Tropical Cyclone Modeling and Prediction, Part 2
8	Field Experiments and Other Hurricane-related Research/Projects
9	Joint Hurricane Testbed: Project Updates and Plans for the Future
10	Products and Services
11	Workshop - Strong Local Partnerships: The Keys to Success

Media Coverage: Thanks to Mr. David Miller—NOAA Communications—and Ms. Barbara Vaughn—Director, Media Relations/Public Information for the City of Charleston—the 62nd IHC received outstanding media coverage. Coverage included the local affiliates of three of the local major television networks—Channels 2, 4, and 5—as well as Channel 7 from Spartanburg, SC. In addition, print media representatives from the Associated Press and *The Daniel Island News* also interviewed several IHC distinguished attendees. In all, 17 interviews were conducted throughout the week by the news media.

Location for 2009 IHC: The proposed location for next year's conference is Tampa Bay, Florida.

II. CONFERENCE SUMMARY

Objectives:

The agenda, to include the two workshops (sessions 2 and 11), was structured to address the conference objectives below:

- Review the Nation's tropical cyclone forecast and warning program from end-to-end.
 - Update the National Hurricane Operations Plan for 2008.
- Review the 2007 Joint Hurricane Testbed (JHT) projects, and identify candidates that may be successfully transitioned into operations.
- Examine how hazard risk reduction improvements can be made through stronger local partnerships and alliances.
- As recommended in the 2007 *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead*, begin developing an interagency implementation strategy for the tropical cyclone research priorities.

Key Events:

- Conference Opening Remarks: During the opening session, the Mayor of Charleston, The Honorable Joseph P. Riley, Jr. welcomed the attendees to Charleston and made opening remarks for the conference. Mr. Howard Chapman, Executive Director, Charleston Area Regional Transportation Authority introduced Mayor Riley. Mayor Riley noted the importance of hurricane forecasts and warnings to Charleston officials who help prepare their residents from the effects of dangerous hurricanes impacting the Charleston area. He made special reference to Hurricane Hugo, which impacted Charleston and surrounding communities in 1989. Mayor Riley indicated that experience gained by him and his staff was later shared with other cities facing hurricane hazards in subsequent years. The mayor stressed that the changes in population of the Charleston area, along with the growth of industry and other activities requires continued updates to hurricane preparedness.
- Keynote Address: Ms. Mary M. Glackin, Deputy Under Secretary for Oceans and Atmosphere, NOAA, provided the Keynote Address during the opening session. She emphasized the importance of collaborative partnership for the Nation's hurricane forecast and warning program, especially in the areas of data collection, modeling, research activities, and transition of research results to operations. She highlighted the ultimate purpose in the partnerships is to further improve capabilities in forecasting track and intensity, storm surge, rainfall/flooding, storm structure, and sea state (waves)—all supported by improved observations from new and traditional sensors and sensor systems. Her presentation covered other key activities that will help meet the challenges ahead, including outreach and education and positive interactions with the media. Success in all of these activities will depend on resources committed by the entire hurricane community and will pay off in improving hazard resiliency in coastal communities.

- Panel - *Priorities for Tropical Cyclone Research: A Senior Leader Perspective.* During the opening session on Monday afternoon, Dr. Elbert W. (Joe) Friday, Professor Emeritus, University of Oklahoma, moderated a panel of senior agency representatives that provided agency perspectives on priorities for tropical cyclone research and improvements in operations and services. The participants included: Dr. Alexander “Sandy” MacDonald, Deputy Assistant Administrator for NOAA Research Laboratories and Cooperative Institutes; Mr. Robert Winokur, Technical Director, Office of the Oceanographer and Navigator of the Navy; Dr. Jack Kaye, Associate Director for Research, Earth Science Division, NASA; Dr. John “Jack” Hayes, Assistant Administrator for Weather Services, NOAA; Colonel Ralph Stoffler, Air Force Deputy Director of Weather; and RDML David Titley, Commander, Naval Meteorology and Oceanography Command.
 - Dr. MacDonald described the potential role for Unmanned Aircraft Systems (UAS) in hurricane research and prediction. He reviewed five types of UASs—Altair Predator B, Global Hawk, Global Observer, Aerosonde, and Zephyr—and described their capabilities and limitations. The UASs can collect data that may assist in forecasting hurricane intensity and they may also enhance the ability to continually and quantitatively monitor the storm intensity. Missions of the UASs could vary from loitering above a hurricane for days at a time to shorter, low-level missions.
 - Mr. Winokur summarized U.S. Navy priorities and initiatives for tropical cyclone research. He emphasized the Navy’s commitment as evidenced by their new maritime strategy which supports activities such as partnership building, joint programs, transition of research to operations, preparations for NPOESS, and reduction of uncertainty in forecasts. The Navy must also be prepared to support humanitarian assistance and disaster response. Additionally, the Navy also emphasizes rapid transition to operations for their mission applications. Priority is needed to exploit sensors to determine tropical cyclone structure. Joint agency activities will help address common global NWP needs consistent with the National Unified Operational Prediction Capability (NUOPC) Partnership “VISION (2015).” Another goal is to reduce the uncertainty in forecasts.
 - Dr. Kaye summarized NASA’s involvement with tropical cyclone research. He indicated the involvement covered four broad areas: satellite remote sensing, sensor development, NASA-sponsored field campaigns and numerical modeling. Six NASA satellites provide a variety of data for research and in some cases also have operational applications. Recent field programs have gathered data from storms off Western Africa. Collaboration includes UAS demonstrations, airborne simulator, and the GEOSTAR development. Their programs are supporting current science and advancing capabilities for the future. Another benefit is communicating research results and technology capabilities to partners and to the public.
 - Dr. Hayes restated the NWS commitment to hurricane research and forecast improvement. He presented a report card that reviewed NWS and NHC performance during the past hurricane season. Planned improvements for 2008 include observations, data assimilation, numerical modeling, and product suites. Each of

- these improvements requires a joint effort among members of the research and operational communities in order to become successful. Beyond this season, NWS will continue to seek ways to improve hurricane forecasting capabilities. Increasing partnerships will be critical to this improvement. One of the biggest challenges in tropical cyclone operations will be in forecasting rapid intensity changes and pinpointing landfalling hurricanes.
- Colonel Stoffler reported on the impact of current tropical cyclone forecast accuracy and highlighted improvements that are needed for Air Force operations. He reviewed USAF tropical cyclone support in THORPEX, The Observing System Research and Prediction Experiment and in hurricane reconnaissance by the AF Reserve. He challenged the research community to improve intensity accuracy over the next 10-years by a factor of two, and stated the Air Force’s top priority is improved tropical cyclone intensity and structure forecasts. The Air Force is also concerned about the influence of climate change on tropical cyclone frequency, movement and intensity trends.
 - RDML Titley’s emphasis in tropical cyclone research and operations was on cooperation and communications. He stressed that the Navy has a warfighting focus and is knowledge centric. He highlighted the fact that Navy meteorology has six primary activities including JTWC and numerical weather prediction. Communications activities should help delineate hazardous vice destructive storms. RDML Titley also noted the importance of tropical cyclone products in safety operations and partnerships. Future emphasis includes changes in NOGAPS, exploiting ensemble techniques, and hiring and educating people in work centers. The Navy remains committed to excellence in meteorology.
 - Workshop - Interagency Priorities for Tropical Cyclone Research: This workshop was moderated by Dr. Alexander “Sandy” MacDonald (NOAA). The participants reviewed current and planned hurricane research compared to the research priorities outlined in the *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead (February 2007)*. Focused efforts toward the research priorities will aid in enhancing operational hurricane forecasts in the categories of track, intensity, structure, sea state (waves), storm surge, and rainfall—all of which are supported by improved observations. The participants included: Dr. Frank Marks, NOAA AOML/HRD; Dr. Scott Braun, NASA/GSFC; Dr. Simon Chang, NRL; and Ms. Pamela Stephens, NSF.
 - Dr. Marks discussed hurricane research in NOAA, including NOAA’s vision to “significantly improve forecast guidance with modeling systems capturing range of natural variability in tropical cyclone track, intensity and structure with sufficient fidelity to predict rapid intensity changes with minimal uncertainty.” He reviewed the overarching research, characterizing the research in three areas with the questions posed below:
 - What physical processes limit predictability of track, intensity and structure?
 - What is best way to represent natural variability of processes in the model system?
 - What is the best mix of data for model initialization?

He then described NOAA's Hurricane Forecast Improvement Project (HFIP) and emphasized the project's overlap with Table 5.1 (Research Priorities in Atmospheric and Ocean Science) of the *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead (February 2007)*.

- Dr. Braun presented NASA's contribution to research activities including satellite remote sensing, field campaigns, numerical modeling, and new sensor development. He highlighted NASA's Modeling, Analysis, and Prediction program (MAP), with a focus on global modeling to study climate change impacts and high-resolution mesoscale modeling. After briefly discussing hurricane research in the four areas identified above, he discussed NASA's research contributions to the research priorities in Table 5.1 of the tropical cyclone research plan, particularly with regard to eye wall evolution, satellite-based research of the Saharan Air Layer, TRMM multi-satellite precipitation analysis measures, Cloudsat and instrument development such as LIDAR wind technologies.
- Dr. Chang discussed the U.S. Navy's on-going basic and applied research activities related to tropical cyclones including tropical wave dynamics, predictability, prediction systems, data assimilation, and observations. The Navy's major research priorities are cyclogenesis and formation, intensification processes, structure and intensity changes, extratropical transition, air-sea interactions and associated oceanographic research. Dr. Chang highlighted the Tropical Cyclone Structure 2008 (TCS08) experiment, which has an emphasis to improve the capability to predict the evolution of disturbances in the monsoon trough over the western North Pacific (e.g., genesis, structure and intensity changes, outer winds). He also discussed research activities in ocean mixed layer evolution in hurricanes, high resolution NWP for intensity forecasts, new spray parameterization techniques and ocean response in the Navy's high-resolution, coupled, regional NWP model (i.e., COAMPS). He also discussed research efforts to understand the impact of observations on forecast error. Navy basic and applied research programs contribute to all three groups of research priorities from the interagency tropical cyclone research plan and are being executed in collaboration with others.
- Ms. Stephens described NSF involvement in many of the basic research initiatives identified in the interagency tropical cyclone research plan. Primary research areas include: seasonal prediction, relation to climate change, cyclogenesis, intensity changes, sediment transport and air-sea fluxes. NSF sponsored the RAINEX field campaign in 2005 and NCAR hurricane modeling priorities are funded by the NSF. Also funded by NSF is new observation development, such as Balloon-Based Driftsondes—now in prototype—and the use of COSMIC atmospheric profiles. Early results of using occultation measurements from COSMIC satellites show that increasing thermodynamic data in data-sparse regions may have an effect on model performance in relation to forecasting tropical cyclogenesis and storm tracks. The THORPEX Pacific Asian Regional Campaign (T-PARC) and TCS08 are scheduled to take place in August-September 2008 and will involve targeted observations in an effort to improve track forecasts and forecasts of downstream impacts. NSF has also sponsored research regarding hurricane intensity in a warming climate. NSF engineering, social, behavioral, and economic studies have focused on disaster

management: mitigation, preparedness, response, and recovery. New solicitations for research have requested studies on the communication of hurricane information.

- Workshop - *Strong Local Partnerships: The Keys to Success*: The second workshop was moderated by Dr. Denise Stephenson Hawk, NCAR Associate Director and Director of the Societal-Environmental Research and Education (SERE) Laboratory. Accurate hurricane forecasts are effective only if they result in appropriate actions at every level of response. Understanding how different stakeholder groups utilize forecast and warning messages to make decisions is a social science challenge. This workshop focused on the social science aspect of hurricane events, emphasizing the importance of strong local partnerships for tropical cyclone preparation, recovery and resilience. The workshop relates to Section 5.3, Research Needs in the Social Sciences, in the *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead (February 2007)*. The participants included: Ms. Cathy Haynes, Director, Charleston County Emergency Preparedness Division; Mr. Walt Dickerson, Director, Mobile County Emergency Management Agency; Mr. Michael Emlaw, Meteorologist-in-Charge, NWS Weather Forecast Office, Charleston, SC; Dr. Betty Hearn Morrow, Professor Emeritus Florida International University, Consulting Sociologist; Ms. Naomi Moye, Hazards Communications Consultant; and Mr. Ronald Glaser, Sandia National Laboratories, Program Manager, Integrated Public Alert and Warning System (IPAWS).
 - Ms. Haynes framed her discussion into two main topics: (1) how her team monitors the threatening situation and (2) how they get the word out. For the first area, she indicated they monitor the status of the storm using a weather satellite feed. Also, NOAA weather radios were placed in ~ 100 schools, dispatch centers, and federal offices. Her staff coordinates with the NWS by dialing into the NWS-led weather conference calls leading up to an event and they also monitor local media broadcasts. For the second area, Ms. Haynes described her methods to get the word out to the citizens of Charleston County included pre-hurricane community talks and a year-round “road show.” State and county-produced hurricane guides, along with web sites are very important tools to disseminate important information. Charleston County also builds Community Emergency Response Teams (CERTS) to train their citizens on methods for getting the hurricane information prior to, during, and after the storm.
 - Mr. Dickerson began by emphasizing that building strong local partnerships is the key to success! He stressed that all emergencies are local. He indicated there is a need for the emergency manager to sequester the local elected officials and ensure they have a true understanding of the emergency plan. There is a need to build the local partnerships early on with elected officials, first responders, volunteers and the private sector. You must partner strategically, think regionally, act locally, work with NGOs, instill a culture of preparedness and leverage MOUs. The IPAWS and Connect-CTY (i.e., mass notification systems via phone) work to help get important information to the citizens of Mobile County. Also of great importance is the need to identify vulnerable populations and to develop mechanisms (e.g., a registry for citizens with special needs) to ensure the entire population gets the message and has the means to take appropriate actions.
 - Mr. Emlaw outlined his discussion into four parts: outreach, data collection,

- pre/during/post event actions and possible future partnerships. To facilitate outreach, some of the partners include: (1) emergency management hurricane task force efforts to organize the community; (2) media outlets to get the word out; (3) Sea Grants to capture rip current awareness; and (4) the College of Charleston regarding the storm surge visualization project. The WFO is leveraging a vast array of public and private sources for unique and valuable data sets. They capture and use pilot boat data, emergency manager information, state park observations, Navy lake observations, DOT bridge wind information, web cams, port authority observations, ferry boat information, university data, and USDA data. Prior to, during and post event, the NWS leads a conference call that includes first responders, businesses, media, and local government officials.
- Dr. Morrow framed her discussion around four examples of local partnerships that lead to better decisions and improved “buy-in” from all involved parties. The first example is the work that the city of Charleston is doing, including the StormReady program, the 211 information hotline, the Voluntary Organizations Active in Disaster (VOAD), and the neighborhood association program. Mayor Riley hired a staff member to focus on building neighborhood associations to help the rapid and effective communication with people using various communication methods (e.g., e-mail, phones, door-to-door). Each association must organize officially, become chartered, and elect officials. To date they have chartered their 100th community. Miami boasts a partnership between FIU and Exxon in developing a hurricane brochure for its inhabitants. Pensacola Naval Air Station sends their recruits to shelters during some emergencies. The recruits help manage the shelter and being there also gives the recruiter a chance to continue the recruiting duties. Tampa Bay has developed a special needs registry for their citizens, with the uniqueness being that local municipal fire stations help manage and keep the registry current. In the event of an evacuation, the fire department can also provide special needs information to the county for bus pick up and other planning needs.
 - Ms. Moyer began her discussion by highlighting the extensive partnerships in the Mobile County communities. She noted that the Governor of Alabama partnered with Google to compile and make available special geospatial information for first responders. She also indicated that Mobile County teamed up with the Independent Living Center of Mobile to mitigate the loss of life and loss of economic assets. Ms. Moyer outlined the information flow using a proprietary communications model. She especially highlighted the recently developed special needs registry in Mobile County. She noted that the county also printed a hurricane FAQ brochure in five languages. Finally, she recognized the utility of technology like Connect-CTY among others, but noted that determined, compassionate and non-technological solutions remain vital to ensuring all citizens within a community receive important information and have the ability to take appropriate actions.
 - Mr. Glaser began by providing an overview of IPAWS. He indicated that the IPAWS, a DHS program started in 2004, is a public alert “system of systems” that will become the nation’s next-generation emergency warning system. IPAWS will work with public and private sectors to integrate warning systems to effectively communicate alerts via television, radio, telephone, internet/computer, cell phone,

and other personal communications devices. It will allow first responders as well as government officials to communicate with each other as well as rapidly get messages to citizens within communities by multiple means—with the same message. The end vision of IPAWS is to deliver coordinated messages over more channels to more people, anywhere, anytime. IPAWS will be developed in a series of spirals, with Spiral 0 (August 2007) covering areas in Louisiana, Mississippi and Alabama. By Spiral 3, with a target date of December 2010, the system is planned to be nationwide.

- 62nd IHC Banquet and Richard H. Hagemeyer Award:
 - The significant events that occurred during the banquet are described below:
 - Mr. David Maurstad, Assistant Administrator for Mitigation (FEMA), provided welcoming remarks to the banquet attendees. He emphasized the importance of the IHC and the work done throughout the year to help protect the growing populations—both coastal and inland—that are vulnerable to loss of life, property damage, and socioeconomic hardships caused by hurricanes.
 - Dr. Steve Lyons, Tropical Weather Expert, The Weather Channel was an outstanding banquet speaker. The title of his presentation was, “Communicating Your Message through a Diverse Media.” One of the “take-home” points was to remember that, in most cases, the weather organization (e.g., NWS/NHC, NWS WFOs) that disseminates hurricane information is not the presenter. Therefore, to remove ambiguities, help prevent confusion and limit speculation the disseminated hurricane information must be accurate, timely and as specific as possible. Put another way, as Dr. Lyons stated, “To say nothing is to allow the media to race out of control feeding upon itself in the process!” Dr. Lyons outlined three steps to success: (1) keep it simple and relevant; (2) tailor your message for the media; and (3) if you don’t say it, the media will infer it.
 - For 2007, the Richard H. 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 Mr. Robert Dumont, retired military officer and federal employee who had a passion to plan, organize and execute past IHCs and help improve the Nation’s hurricane forecast and warning program. As Assistant Federal Coordinator for Meteorological Supporting Research at the OFCM, he was integral to bringing the Stepped Frequency Microwave Radiometer (SFMR) from research into operations. Additionally, he transformed the IHC to its current format, increasing attendance by all the responsible agencies. Finally, he was a strong proponent of the National Hurricane Operations Plan (NHOP) as the authoritative document governing interagency hurricane operations, and ensured inputs and actions regarding the NHOP and other areas were considered and worked through the Working Group for Hurricane and Winter Storms Operations and Research.

Summary of Results:

- It was clear from the first workshop, *Interagency Priorities for Tropical Cyclone Research*, that all agencies are doing important, relevant research against the research priorities outlined in Chapter 5 of the *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead (February 2007)*. The partnerships required to tackle all the priorities are well accepted, with normal agency concerns/reservations remaining as far as control/funding. Some potential gaps/deficiencies were highlighted during the workshop:
 - U. S. is not producing enough new personnel with the education and training required for improving tropical cyclone forecasts via advanced data assimilation and numerical modeling systems
 - There is slow progress on wind lidar (global 3D wind solution)
 - Need increased emphasis in the area of operationalizing data
 - Calibration, validation and quality control
 - OSSEs for impact definition
 - Civil agencies lack targeted funding for transition of research to operations (e.g., DoD 6.4 funding)

The workshop, in conjunction with all of the other sessions conducted at the 62nd IHC, provided a baseline of research activities to track against the research priorities outlined in Table 5.1 of the *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead (February 2007)*.

- The workshop, *Strong Local Partnerships: The Keys to Success*, which related to Section 5.3 (Research Needs in the Social Sciences) in the *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead (February 2007)*, provided some key take away points. All emergencies are local, with local emergency managers (EMs) charged to lead hazard preparation, response and recovery. In this regard, it's important that EMs: (1) convene pre-hurricane public talks designed to define actions; (2) prepare citizens to act in advance of hazards (e.g., develop Community Emergency Response Teams); and (3) sequester local elected leaders and ensure that they understand the plan of action. To be successfully prepared, local partnerships are vital (e.g., with local NWS WFO; local, state, regional and federal officials; neighborhood associations; media [should be an ally—build cooperative relationships early]). Additionally, the workshop highlighted that current decision support systems (e.g., television overrides, Connect-CTY, WebEOC) and those in development—like the Integrated Public Alert and Warning System (IPAWS)—have the potential to further improve hazard preparation, response and recovery by enabling the dissemination of critical information to all citizens of communities, including citizens with language barriers, disabilities, economic constraints, and those with literacy challenges.
- Working Group for Hurricane and Winter Storms Operations and Research.
 - There were 18 actions items stemming from the meeting of the Working Group for Hurricane and Winter Storms Operations and Research. Of those, seven will be

closed by updating portions of the 2007 *National Hurricane Operations Plan* (NHOP), four items were informational in nature and six (plus three open actions from the 61st IHC) will be worked through follow-on actions by the group.

Conference Action Items:

- Update and execute the National Hurricane Operations Plan for the 2008 hurricane season.
- As mentioned above, the first workshop (*Interagency Priorities for Tropical Cyclone Research*), in conjunction with all of the other sessions conducted at the 62nd IHC, provided a baseline of research activities to track against the research priorities outlined in Chapter 5 of the *Interagency Strategic Research Plan for Tropical Cyclones: The Way Ahead* (February 2007). An analysis of the research activities will begin the process of developing an interagency implementation strategy for the tropical cyclone research priorities.
 - Actions:
 - Analyze tropical cyclone research activities presented at the 62nd IHC and other subsequent forums with respect to the priorities established in Table 5.1 of the interagency strategic research plan.
 - Identify overlaps, gaps, areas for collaboration and leveraging opportunities.
 - Establish the next steps needed to fill the gaps.

III. CONCLUSION

The IHC was extremely successful in bringing the operational and research communities together to further improve the tropical cyclone forecast and warning program. It was also successful in addressing the needs of the federal agencies and user communities that have a stake in the Nation's tropical cyclone program. Finally, the conference provided a baseline of research activities that will enable the development of an interagency implementation strategy for the tropical cyclone research priorities, which can be reviewed at subsequent IHCs.

Samuel P. Williamson/OFCM/March 26, 2008/301-427-2002/Samuel.Williamson@noaa.gov