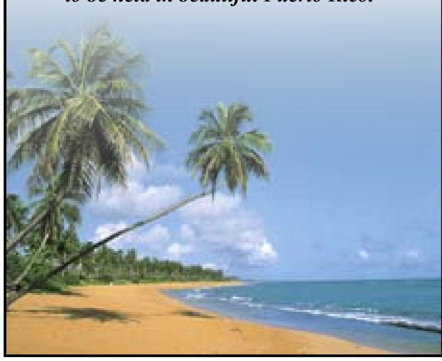
American Association for Wind Engineering

THE WIND ENGINEER

NEWSLETTER OF AMERICAN ASSOCIATION FOR WIND ENGINEERING

In This Issue

Americas Conference on Wind Engineering to be held in beautiful Puerto Rico.



Texas Tech's Hurricanes at Landfall Project 2008

Tanya Brown & Ian Giammanco

Texas Tech University
Wind Science & Engineering
Research Center

1. Introduction

The 2008 Atlantic Hurricane Season provided the first opportunity to deploy Texas Tech's newly developed surface observing system, dubbed "Stick-Net". The Stick-Net platforms, which were designed and built by Atmospheric Science and Wind Engineering students, became operational in 2006, when the two prototype instruments were tested in the severe local storm environment during spring field operations. Since that time, the fleet of instruments has expanded to 24 platforms. While the platforms had been used in the past three severe thunderstorm seasons, the 2008 Atlantic Hurricane Season marked the first time they have been deployed for land-falling tropical cyclones. So far they have been deployed for Hurricanes Dolly, Gustav, and Ike.

The Stick-Nets are designed to be small, versatile, and rapidly deployable. When deployed, the instruments collect high-resolution wind data at 2.25 m height, as well as the other standard meteorological variables. Figure 1 gives an example of a time series plot of wind speed and direction data obtained from Hurricane Ike, which was sampled at 5 Hz. The instrument consists of three main, independent parts: the tripod tower, the data acquisition (DAQ) enclosure, and an external battery enclosure (used primarily for hurricane applications to extend the run time of the system). The tripod tower is a modified engineering tripod, in which the wind sensor is mounted to the top of the tripod. The DAQ enclosure contains all of the electronics and storage medium for the data, and is attached to the tripod during deployment. During spring and summer operations, when data is collected for a short time period in the thunderstorm environment, these two parts are the only components used in the deployment. In the hurricane environment, when the instruments are required to operate for longer time periods, an external battery box is also added, allowing for 7-10 days of uninterrupted operation. The battery enclosure adds an additional 80 lbs. of weight to the platform, increasing probe stability. The completed tower is also staked to the ground at each of the three legs and is anchored by an earth screw to provide the best stability possible. Figure 2 depicts a fully deployed Stick-Net configured for the tropical cyclone environment.

2. Hurricane Dolly

Hurricane Dolly, which made landfall along South Padre Island, TX on July 23, 2008, marked the first deployment of the Stick-Net probes into the tropical cyclone environment. Twenty-two of the 24 platforms were deployed, all in Cameron County, TX, just north of the national border with Mexico. Figure 3 below shows the deployment locations for Hurricane Dolly. The majority of the probes were deployed in rural or farmland areas in Cameron County, while two were deployed on South Padre Island in an effort to show the versatility of the platforms and sample true marine exposure. The probe deployed on a dune near the northern end of the developed area on South Padre Island recorded the highest one-minute sustained wind speed of 78.3 mph, as well as the highest three-second gust wind speed of 93.7 mph.

The Stick-Nets were deployed in locations with a variety of soil and ground cover types, including two deployments on sand dunes, an airport deployment, rural farmland areas, and two near the Laguna Atascosa Wildlife Refuge. South Texas provided ideal deployment territory, as there was an abundance of open land relatively close to the coastline. All probes were deployed within about 25 miles of the coast, and a third of the fleet was located within 10 miles of the coast. Surge was not a primary threat with Hurricane Dolly, which allowed the team to be somewhat aggressive in selecting deployment sites in close proximity to the coast. Upon retrieval of the probes, substantial freshwater flooding was observed and a few of the probes were in standing water with no apparent affect on their stability.

3. Hurricane Gustav

Hurricane Gustav made landfall in Terrebonne Parish on September 1, 2008, and was the second deployment of the Stick-Nets into a land-falling hurricane. Twenty of the 24 probes were deployed in south-central Louisiana, in the parishes of Lafourche, Saint Mary, Iberia, Vermillion, Acadia, Lafayette, Iberville, Saint James, and Saint John the Baptist. Figure 4 depicts the deployment locations selected for Hurricane Gustav's landfall. The probe deployed northwest

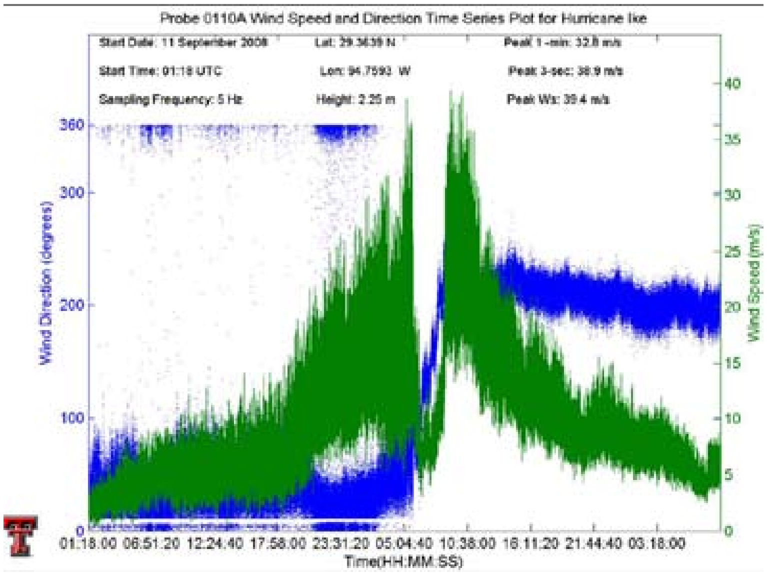


Figure 1: Sample wind time series plot from Hurricane Ike. Wind direction is blue, wind speed is green.

Figure 2: Stick-Net Probe deployed for Hurricane Dolly adjacent to Laguna Madre with the DAQ enclosure (white box) and the external battery enclosure (grey box) attached to the tripod.

Figure 3: Stick-Net deployment locations and track for Hurricane Dolly in Cameron County, TX.

of the city of Thibodaux in Lafourche Parish recorded the peak one-minute sustained wind speed of 61.9 mph, and the peak three-second gust wind speed of 79.6 mph.

As was the case in Hurricane Dolly, the Stick-Nets were deployed in a variety of locations, with deployments at three airports, several roadside deployments along US 90, numerous rural locations along parish roads, and two unique deployments at major name-brand company facilities—Weeks Island at the Morton Salt plant, and Avery Island at the Tabasco facility. Because of concerns for storm surge and inland flooding of bayous, canals and the Atchafalaya River, deployment locations were much further inland and at higher elevations than the deployment sites utilized for Hurricane Dolly, and covered a much broader area on either side of the river basin. The storm track nearly paralleled US 90, and even though probes were further inland, the majority of them were still located very near the center of the track.

Figure 4: Stick-Net deployment locations and track for Hurricane Gustav in south-central Louisiana.

4. Hurricane Ike

Hurricane Ike made landfall at Galveston, TX on September 13, 2008, and was the third deployment of the Stick-Nets during the 2008 Atlantic Hurricane Season, and the first time the entire fleet of 24 probes have been deployed. The majority of the platforms were deployed in rural farmland areas to the east of the Houston metropolitan area, in the vicinity of I-10 and US 90, although some were deployed closer to the coast and in more populated areas. This strategy was used in order to focus most of the assets in the area that seemed likely to be affected by the eastern eyewall. Probes were deployed in Liberty, Jefferson, Chambers, Harris, Galveston, and Brazoria Counties. Efforts were made to coordinate deployments with the University of Alabama-Huntsville mobile X-Band radar, the Florida Coastal Monitoring Program, Louisiana State University, and the Center for Severe Weather Research's Doppler on Wheels. Figure 5 shows the deployment locations for Hurricane Ike. The peak one-minute sustained wind speed observed in Hurricane Ike was 81.2 mph, and was measured a few miles north of Winnie, Texas. The peak three-second gust was 108.9 mph, measured along I-10 southeast of Hankamer. The wind speeds outside this small corridor dropped off considerably.

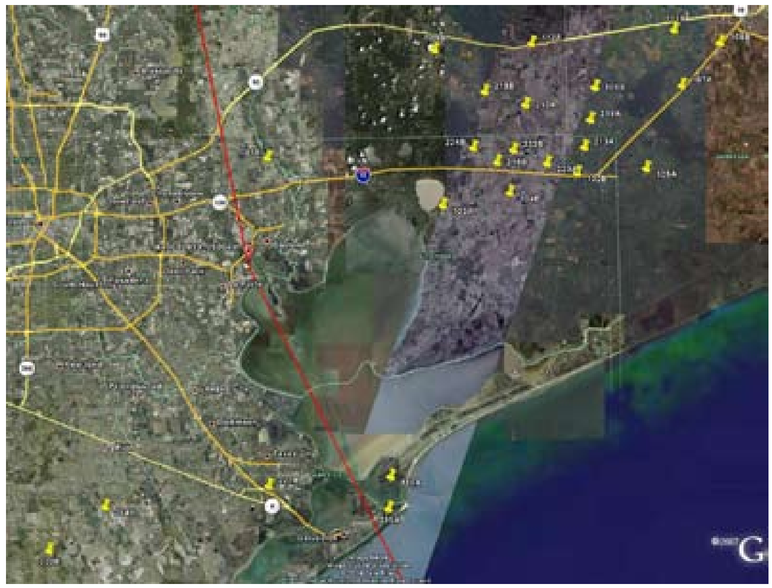


Figure 5: Stick-Net deployment locations for Hurricane Ike along the upper Texas coast.

While a large portion of the Stick-Net fleet was deployed in rural areas near the interstate, several were deployed in other types of locations, including two deployments on levees, one of which was on Galveston Island, two airport deployment sites, and one probe deployed on the grounds of Fort Travis State Park on the Bolivar Peninsula. From west of Galveston Island, the probes were generally deployed closer to the coast, as this area was expected to experience offshore flow and storm surge flooding was of less concern. To the east of Galveston

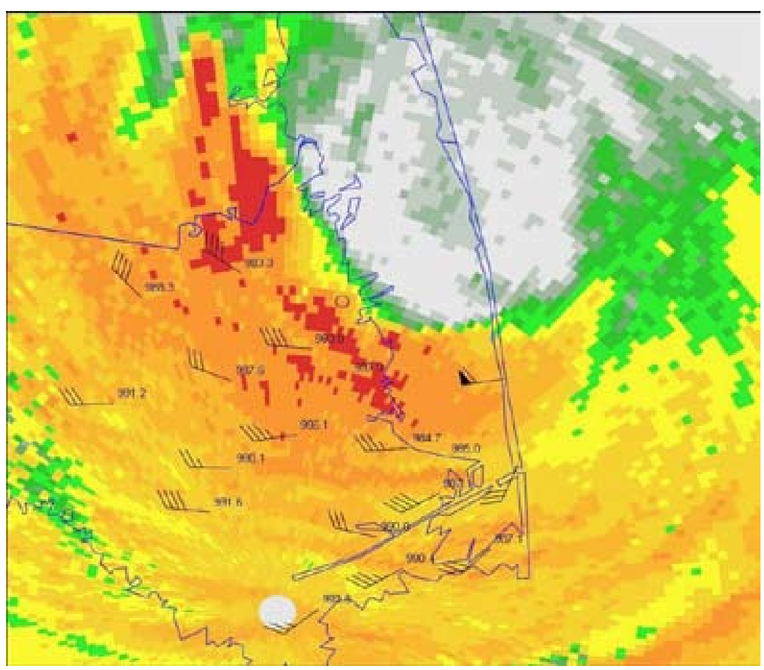


Figure 6: Station plots of Stick-Net deployments during Hurricane Dolly as the storm makes landfall in South Texas. Wind speeds given in knots.

Island, greater care was taken to avoid areas that could be affected by surge, so deployments were generally further inland. Upon retrieval, one of the probes, deployed east of Winnie along State Highway 73, was standing in surge water. It was estimated that the probe experienced approximately 3.5 feet of flooding; however the water did not affect the instrument, and it collected a full, clean record throughout the duration of the event. This location was more than 15 miles inland, and still received significant storm surge flooding. The only probe not deployed inland that was exposed to onshore flow was the probe at Fort Travis, but the fort grounds are quite elevated and surrounded by an 18 foot seawall. The probe was deployed well away from the edge of the seawall to mitigate any wave overwash effects.

5. Summary

Although Stick-Nets have been deployed for three seasons of severe thunderstorm studies, the lack of U.S. hurricane landfalls in 2006 and 2007 did not allow for a deployment until the 2008 Atlantic Hurricane Season. The instruments have performed quite admirably, and have been deployed in unique and variable conditions that until now, were not possible with the larger WEMITE towers used previously. The smaller size allows for more efficient transport and thus greater mobility for the deployment teams. The probes can be deployed in more remote, but ideal locations to sample all quadrants of a land-falling tropical cyclone. Unique deployment sites included dunes on South Padre Island, the Morton Salt plant, the Tabasco plant, Fort Travis, and levees in Galveston County. None of these sites would have been practical deployment locations without the Stick-Net platform. In addition, the instruments are rapidly deployable, with an average deployment time of 5 minutes or less, which allows the team to safely deploy closer to the time of landfall, thereby increasing the chances of sampling the desired portion or feature of the storm. A Stick-Net deployment greatly increases the total number of surface observations from the impacted region. Figure 6 shows an image of the Stick-Net deployments made for Hurricane Dolly in South Texas, along with the WSR-88D radar imagery at landfall. The spatial coverage of surface observations provided by Stick-Net is unprecedented and is unsurpassed by any current technology. As the program progresses, Texas Tech hopes to expand the fleet to 48 probes, doubling the number of probes currently available. The addition of real-time data observations is also a goal, as the high spatial and temporal resolution data would be of great value to operational forecasters, emergency management agencies, and first responders. The 2008 Atlantic Hurricane Season has provided a glimpse as to what continued coordinated Stick-Net deployments can offer both the operational and research communities during a hurricane landfall.

For more information regarding the Texas Tech University Hurricanes at Landfall project, please refer to our website at www.atmo.ttu.edu/TTUHRT. Summary statistics and data plots for the 2008 Atlantic Hurricane Season are all available on the website. ■

A Response to Article Entitled "Issues with Florida Shelter Design" by John Bakota

by: William L. Coulbourne, PE
Director, Wind and Flood Hazard Mitigation
Applied Technology Council

The author of the July 2008 article titled "Issues with Florida Shelter Design" seemed to be looking for more solid guidance from the State of Florida on the design parameters that should be used for shelters. He is definitely correct about the variation in guidance and design criteria that have existed in the past. There is change coming in design guidance for shelters that can be used nationally, even though it may not explicitly modify how Florida deals with shelter design standards.

The International Code Council (ICC) will be publishing a new ANSI-certified consensus standard titled ICC 500 – ICC/NSSA Standard for the Design and Construction of Storm Shelters. This standard will provide wind speed maps for the design of shelters. Maps are presented for two hazards - hurricane and tornado. The hurricane hazard map was developed to be used nationally much like the wind speed maps that exist in ASCE 7 for basic wind speeds and maps with fewer wind speed choices for the design of tornado shelters are also provided. The standard has sections that address missile speeds and missile criteria, such as missile size and weight, to be used for product testing. The standard will also deal with issues such as size of shelters, mechanical equipment placement in shelters, need for services such as air conditioning, plumbing, water, etc. The standard will call for peer review of drawings prepared for shelter construction and special inspections during construction to insure the important elements of the shelter design are not compromised. This ICC 500 standard is available as of August 2008 and was incorporated by reference into the 2009 versions of the IBC and IRC.

In addition both FEMA 361 (Design and Construction Guidance for Community Safe Rooms) and FEMA 320 (Taking Shelter From the Storm: Building a Safe Room in Your Home or Small Business) are being revised now and are now available on FEMA's web site and will be in print within a few months at the latest. The revisions to both of these documents are reflective of post storm studies and funded shelter projects since the FEMA guidance was first released in 2000. Also, the changes to the guidance are consistent with the research conducted during the development of the new ICC-500 standard. However, one thing that has not changed is that the guidance provided by FEMA is more restrictive than the ICC standard and that is primarily because if federal money is to be used to build safe places for people to stay during a storm, then FEMA wants that protection to be "near absolute". For example, the performance standard for wall sections is that the interior surface of the wall will not even 'dimple' when struck by a missile on the exterior of the wall.

One significant 'disconnect' in the shelter design process is that designing for extreme wind speeds requires both robust building elements well connected to resist extreme wind pressures and it requires opening protection and sturdy wall and roof systems to resist penetration by wind-borne debris. Designing elements and connections to resist the extreme pressures is attainable in most cases; installing sufficiently strong opening protection is not often attainable since there are not products available to resist these high speed missiles. There has been significant product testing for missiles generated by hurricanes. The current test protocols for the largest and fastest missiles use a 9 lb 2x4 traveling approximately 55 mph. This missile speed can be developed by wind speeds of approximately 138 mph (3-second peak gust) which is a Category 3 hurricane. Current test protocols do not include wind speeds that would represent more major hurricanes such as Category 4 or 5 storms. The current FEMA debris protection criteria for tornadoes is to protect people from being hurt or killed by wind-borne debris represented by a 15-lb 2x4 traveling as fast as 100 mph. This is a missile generated by an EF5 tornado. There are nearly no windows or doors with glazing that can meet this standard and certainly no readily available commercial products. For hurricanes, wind-borne debris protection is also specified in the criteria and is a function of the safe room wind speed selected from the hurricane hazard map.

Designs for shelters, no matter where they are located, are not yet activities regulated by building codes. The events and the building use are considered outside the bounds of normal construction and thus the design of these buildings is left to the practicing professional. The design basis must be worked out between building owner, architect, engineer and sometimes the community, since the community might be the most frequent user. Florida seems to have taken this same approach by recommending design wind speeds (40 mph + the building code speed) but left the decision to build to these standards to the local school boards and communities. Florida has such a deficit of qualified shelter space that anything the State can do to reduce that deficit is considered to be a positive step.

The requirements and recommendations in the Florida Building Code are helpful and should be considered applicable to buildings being constructed to provide improved performance and possibly life-safety protection. But the engineering community should now embrace the new ICC-500 Standard and the revised FEMA 361 and FEMA 320 guidance so they have the best available information with which to make decisions about how to conduct a design for such extreme winds. ■

TENURE TRACK POSITION IN WIND ENGINEERING

Department of Mechanical and Industrial Engineering
University of Toronto

The department of mechanical and industrial engineering at the University of Toronto invites applications for an academic tenure track position at the rank of Assistant Professor in the area of Wind Engineering. Candidates must have effective teaching ability and will be expected to make a major contribution to the Undergraduate and Graduate Programs. Candidates who have some experimental experience are especially encouraged to apply. Preferred applicants will be expected to develop a strong and independent research program to support the Department's strategic focus area of alternative energy systems. Applicants must have a doctoral degree, an outstanding academic record, and be prepared to obtain registration as a professional engineer. A minimum of 1-2 years of postdoctoral experience in a research setting would be a strong asset. Salary is commensurate with qualifications. Approximate start date is July 1, 2009.

Applicants should include in their responses: a detailed curriculum vitae, a clear statement of their specific teaching and research interests, and the names of three persons able to provide references in support of their application. Letters of application should be addressed to: Chair, Department of Mechanical and Industrial Engineering, University of Toronto, 5 King's College Road, Toronto, Ontario, M5S 3G8. The closing date for all applications is December 10, 2008

The University of Toronto is strongly committed to diversity within its community and especially welcomes applications from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to further diversification of ideas. All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.

CONSTRUCTING A DIGITAL HURRICANE:

FIELD RECONNAISSANCE AND RESEARCH AT LANDFALL

January 5-6, 2009 • Baton Rouge, LA

Since the late 1990s, university field research programs have deployed monitoring equipment to characterize and document hurricanes at landfall. With few exceptions, these programs have operated independently.

For the first time, the research programs responsible for collecting wind, storm surge and wave damage data will convene to discuss in-field coordination and the production of real-time data streams. The goal of this symposium is to mesh these independent deployment activities to form organized campaigns that produce integrated datasets in real-time.

Data producers and users, both in the public and private sector, have been invited to the symposium to share information about their research and operational means and requirements.

SYMPOSIUM INFORMATION

Date & Time 8:00 AM – 5:30 PM Monday, Jan 5, 2008
8:00 AM – 12:00 PM Tuesday, Jan 6, 2009

Location: Louisiana State University, Baton Rouge, LA

Meeting Venue: Germano Center, Room 2412, Patrick F. Taylor Hall, Baton Rouge, LA 70803, which may be found on the campus map: http://www.lsu.edu/campus/maps/CEBA02.html

Organizers: Forrest Masters, Assistant Professor, University of Florida, masters@ce.ufl.edu, (352) 392-9537 and Marc Levitan, Director, LSU Hurricane Center, levitan@hurricane.lsu.edu, (225) 578-4445

Hotels:
A block of rooms has been reserved for Symposium participants at two nearby hotels for two nights at discount rates, for Sunday night, 01/04/2009 and Monday night, 01/05/2009. Symposium participants are responsible to make their own reservations

The Cook Alumni Hotel is located on the LSU campus. The Symposium group rate is $125/night + tax for single or double occupancy, with full breakfast buffet included. Call 225/383-2665 for reservations and ask for the Digital Hurricane Symposium rate. Cutoff date for the discounted group rate is Thursday December 11, 2008. The Cook Hotel, 3838 W. Lakeshore Dr., Baton Rouge, LA, 225/383-2665, www.thecookhotel.com

The Marriott Courtyard is about 2 miles from the LSU campus, right off Interstate 10 at Acadian Thruway. The Symposium group rate is $99/night + tax for single or double occupancy. No breakfast included but they have restaurant on site. Call (225) 924-6400 for reservations and ask for the Digital Hurricane Symposium rate. Cutoff date for the discounted group rate is Monday December 15. Marriott Courtyard Baton Rouge Acadian Center, 2421 South Acadian Thruway, Baton Rouge, LA, 70808, (225) 924-6400, www.marriott.com/hotels/fact-sheet/travel/BTRCH

Airports: Louis Armstrong New Orleans International Airport (MSY) and Baton Rouge Metropolitan Airport (BTR)

REGISTRATION
Attendees must contact Forrest Masters (masters@ce.ufl.edu) via email to register for the event by no later than December 12, 2008. A limited amount of seats are available. At this time, a registration fee is not being assessed. An email went out to all AAWE members about this symposium in early December. It included a full schedule of speakers.

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RMS

Wind Effects of Hurricane Ike on Chase Tower in Downtown Houston

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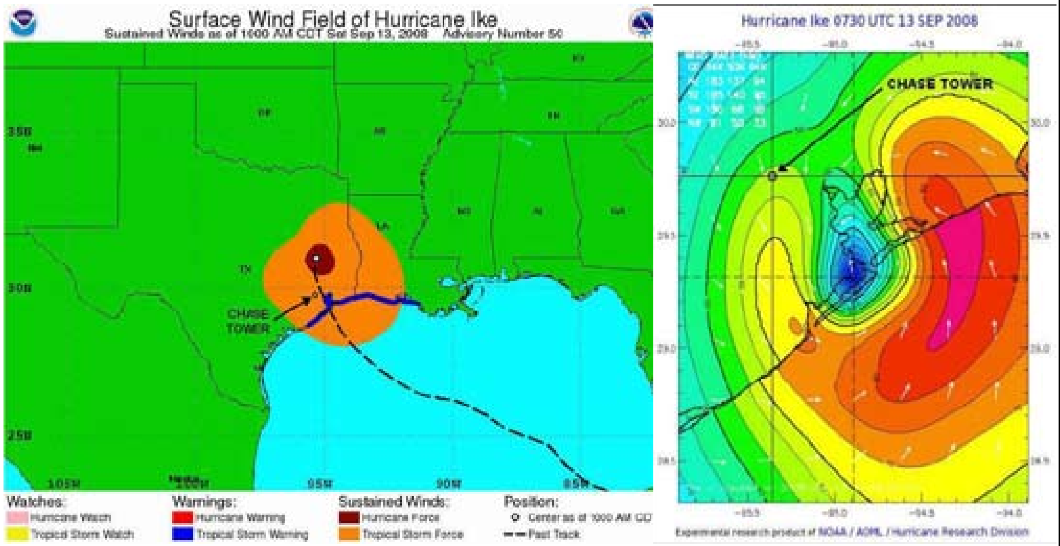

Figure 1: Hurricane Ike Track and Wind Swath Relative to Chase Tower. (Image Courtesy of NOAA)

On September 13, 2008, Hurricane Ike made landfall at Galveston, Texas about 2:10 a.m. as a Category 2 storm (Figure 1). As Ike moved inland, passing slightly east of downtown Houston, the 75-story J.P.Morgan Chase Tower and an adjacent parking garage experienced extensive glazing damage.

Eyewitnesses report that the windows began breaking shortly after 3:00 a.m. with local news video capturing "vortices" propelling wind-borne debris (glass fragments) between the Chase Tower and the adjacent parking garage resulting in progressive window damage to both buildings. The extent of damage can be seen from photos in Figure 2.

Figure 2: Next-Morning Damage Photos

On September 18, 2008, ABS Consulting field engineers, performing aerial and ground reconnaissance of damage from Hurricane Ike, surveyed the downtown Houston area including the vicinity of Chase Tower (Figures 3 to 5).

Figure 3: Downwind View of Chase Tower (Southeast Face) with Parking Garage in Foreground. (Photo by EQECAT/ABS Consulting)

Figure 4: Upwind View of Chase Tower with Parking Garage Behind. (Photo by EQECAT/ABS Consulting)

Figure 5: Uprooted Trees between Buildings (left), Glass Fragment from Chase Tower (top right), and Window Damage to Parking Garage (bottom right). (Photos by ABS Consulting)

Based on the team's observations, several components appear to have contributed to the formation of the observed vortices:

- The tall, flat northeast wall surface of the Chase Tower may have produced a strong vertical downward component of wind flow.
- The 90-degree "bluff-type" east corner (opposite the chamfered west corner) of the Chase Tower is favorable for a strong wake formation to the southeast.
- A redirecting flat wall surface of the mid-rise (smaller) parking garage may enhance formation of local vortices.
- The north-northwest angle of attack of extreme winds around 3:00 a.m. combined with the shape and orientation of Chase Tower and the upwind Calpine Center is favorable for strong downwind vortices. This appears to be the predominant cause of this damage.

The above observations, illustrated in Figures 6 – 8, should not be considered as conclusive or even as a detailed investigation, but rather a plausible explanation of the phenomena observed at Chase Tower during Hurricane Ike. Figure 8 shows a reasonably good correlation of window damage in Chase Tower and the height of the Calpine Center, suggesting the possibility of some marked vortices formed by the silhouette of the upwind building. The design of windows for a net wind force produced at the leeward side of the Chase Tower (a negative external pressure plus (minus) a positive internal pressure) in an undisturbed flow may have been acceptable. However, these possible "organized" vortices produced by the upwind building could be thought of as translating low pressure zones that may have aggravated the suction forces between the Chase Tower and the parking garage.

The upwind Calpine Center was built in 2003 and thus newer than the Chase Tower which was built in 1978-82. As a result, the Calpine Center likely was not included in a wind tunnel study for the Chase tower. New policies or requirements may be needed to investigate the effects of new construction to its surrounding urban environment or neighbor buildings. It is also possible that curved surfaces such as those of the Calpine Center, capable of producing downwind vortices, may have been sensitive to the Reynolds number and perhaps, even in a wind tunnel study, may not be fully represented.

As Isyumov[1] states, "Strict scaling of the mean wind and the turbulent Reynolds number for the approach flow is generally not possible for wind-tunnel model studies of buildings and structures. The consequences of insufficiently high values of Re [Reynolds number] on model pressures and other wind effects can be evaluated through comparisons with full-scale data, selected tests using a larger scale model, or tests conducted over a range of wind speeds".

This short-article perhaps raises more questions than answers, but so is the nature of learning, therefore we encourage discussion on the subject.

[1]N. Isyumov, Wind Tunnel Studies of Buildings and Structures, ASCE Manuals and Reports on Engineering Practice No. 67. 1999.

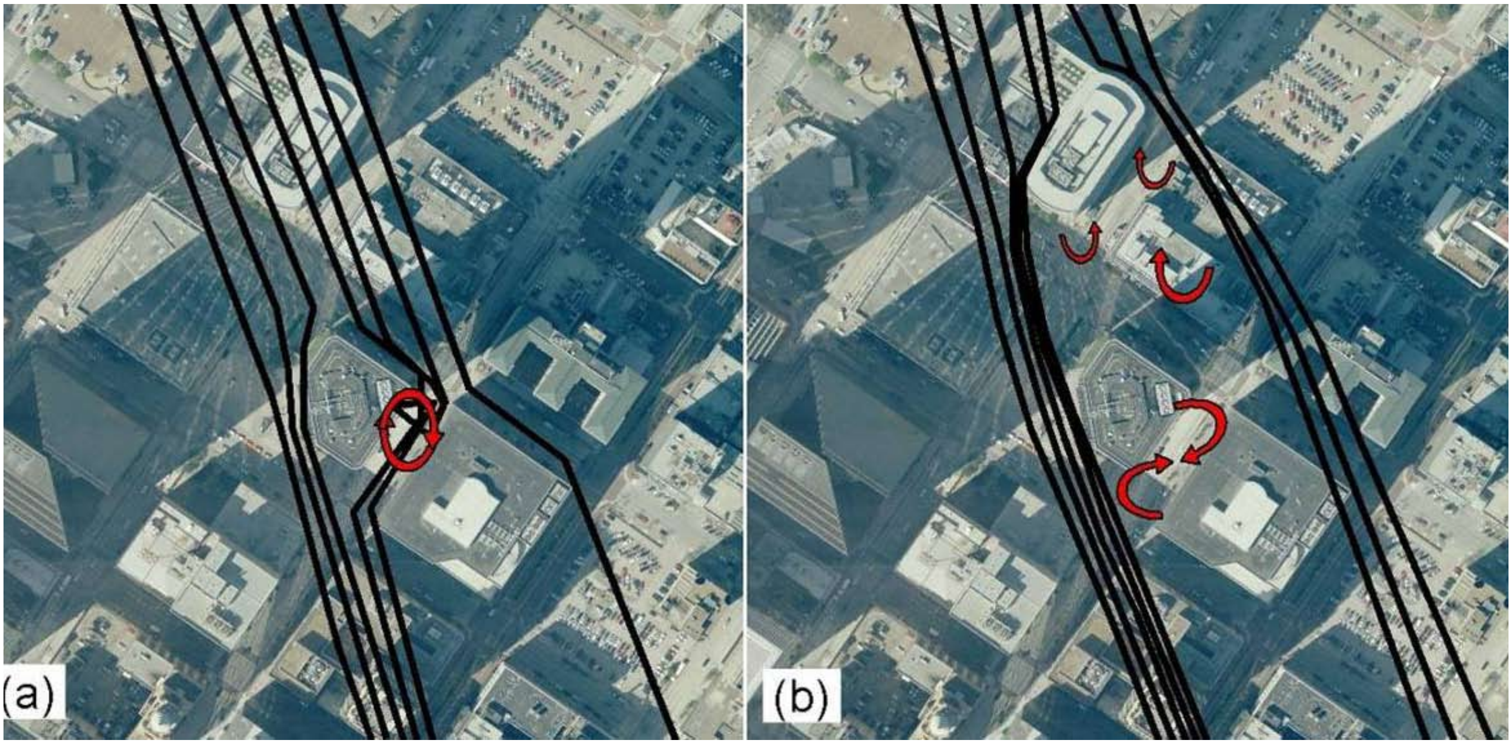

Figure 6: Wind Flow Approaching Chase Tower from North-northwest direction, (a) local vortices and (b) "organized" vortices produced by upwind building.

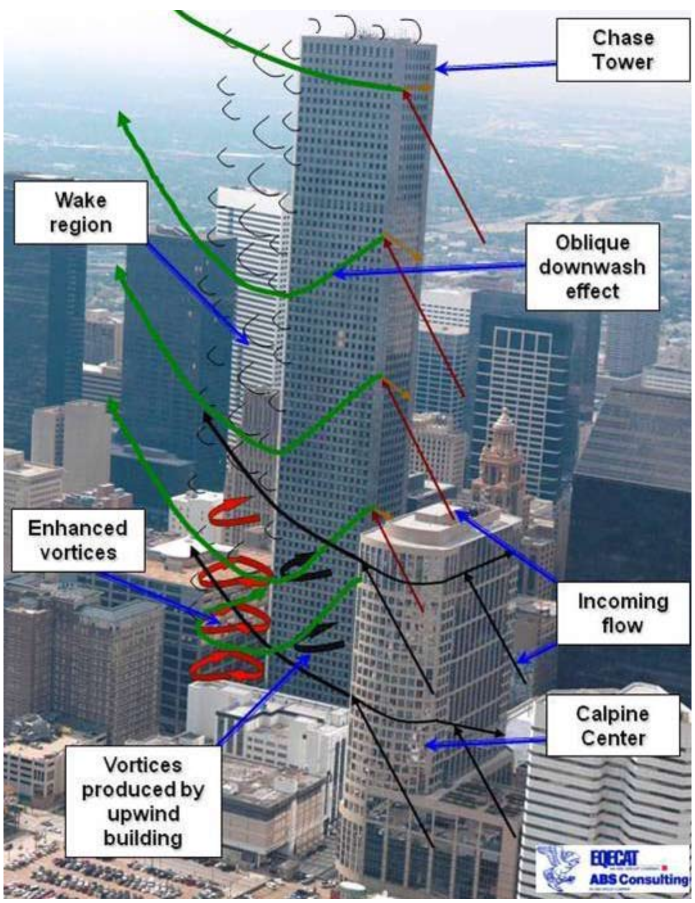

Figure 7: Possible wind environment producing window damage in Chase Tower (Photo by EQECAT/ABS Consulting)

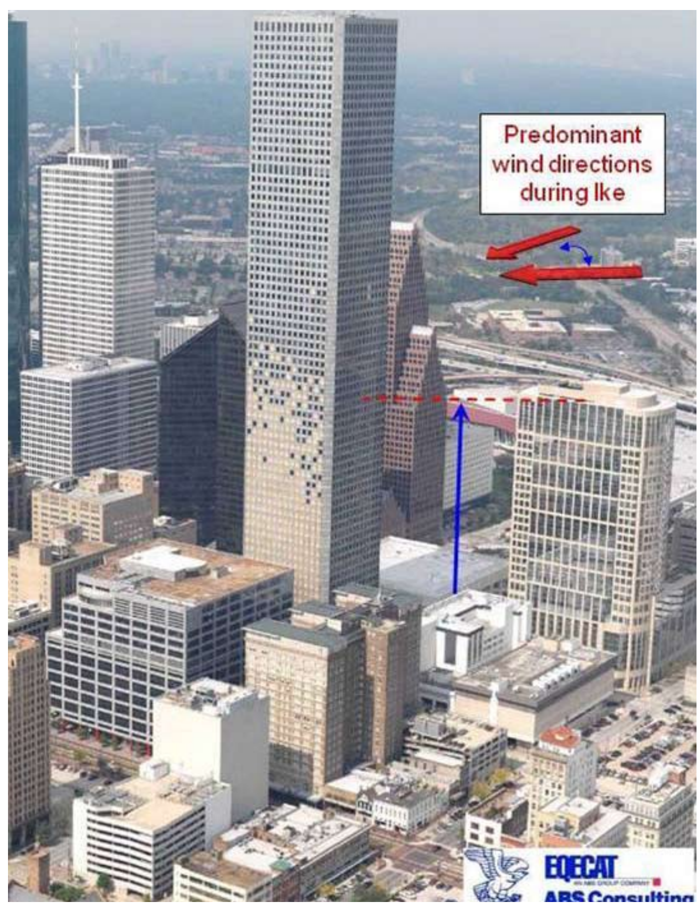

Figure 8: Comparison of heights between window damage of Chase Tower and upwind building. (Photo by EQECAT/ABS Consulting)

President's Corner

It has been a busy two years working to enhance AAWE for its future growth, but on New Year's Eve it comes to an end and I would like to welcome Nick Jones, of Johns Hopkins University, into the AAWE presidency for 2009-2010. Before I took office I had a list of things I wanted to achieve – some small and some large. Not all of the ideas came to fruition, but many did. One major task was getting a new webpage designed and installed at a new host server with many new features: the ability to handle financial transactions for membership and conferences, include a members' area with a collection of conference/workshop proceedings, a video and photographic library, as well as a background membership database. Thanks to Mike Gaus and MediaTech Productions in pushing this effort through. It is interesting to note that the ability to join AAWE via the webpage has had the effect of diversifying our membership. We now have many more members from private engineering or consulting practices and an increase in those from overseas too. Our corporate membership has also grown from six to ten.

Another event that I hope continues, at about eighteen month intervals, is the informal AAWE Workshop which started off in Vail this year. I believe that is a useful gathering for the local AAWE community. Thanks must go to the major sponsors who helped make this event a success and the personnel at CPP Inc. who put it all together. Many small financial and governmental interactions occurred over the last two years to keep AAWE in compliance and good financial health. However, one important government interaction was the effort by many AAWE members (in association with ASCE personnel) to get Federal Government funding for the NWHRP bill. This effort is still ongoing.

Not all the projects I planned have been completed. For example I had hoped to add a members-only, web-based discussion page on our website that might help with individual queries and general member-to-member communications. Hopefully this will be a future addition to our web presence. Also, the AAWE Bylaws need to be updated for electronic communications and voting procedures (to mention just two issues) and a volunteer committee is still working on the task.

I would like to thank the AAWE Board and Past Presidents for their timely and helpful advice. In particular my routine communications with Steve Cai and Michael Gaus on financial, web and membership issues were really appreciated. I hope everyone has a great 2009, and that you all give your full support to Nick Jones during his tenure. I see a very bright future for AAWE as it proceeds through its fifth decade.

Lastly, I would like to ask the members to encourage others interested in wind engineering to join AAWE, either as individuals or as a corporation. Please pass this newsletter on to them so they can see what we do and encourage them to visit the website to become a member (note that the membership calendar year of 2009 now applies).

Leighton Cochran
[970] 498 2334
lcochran@cppwind.com

11th Americas Conference on Wind Engineering (11ACWE)

San Juan, Puerto Rico
June 22-26, 2009

Convened by the American Association for Wind Engineering
Hosted by Polytechnic University of Puerto Rico

SECOND ANNOUNCEMENT AND CALL FOR PAPERS

The conference is accepting abstract submission in all topics related to Wind Engineering, such as (but not limited to):

- Wind climate
- Extreme value analysis and design wind prediction
- Wind measurement and monitoring
- Hurricanes, tornadoes and downburst characteristics
- Wind-related hazards
- Wind-borne debris - trajectories and impacts
- Structural aerodynamics
- Wind loading and response of offshore platforms
- Dynamic response and control
- Wind-induced vibrations
- Computational wind engineering
- Wind tunnel testing
- Full scale and field studies
- Wind damage
- Loss estimation and insurance
- Wind and emergency management
- Wind energy
- Wind erosion
- Dispersion of pollutants
- Urban wind issues
- Vehicle aerodynamics
- Wind engineering applications
- Wind codes and standards
- Wind engineering education

KEYNOTE SPEAKERS:
DR. PETER IRWIN
DR. MARK POWELL
DR. EMIL SIMIU

CONFERENCE VENUE:

THE CONDADO PLAZA HOTEL & CASINO

December 10, 2008

KEY DATES:

~~November 24, 2008~~	Last date for abstract submission
February 28, 2009	Notification of acceptance
April 30, 2009	Submission of full length paper

For more information and details, please visit:

www.pupr.edu/11acwe

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American Association for Wind Engineering

Objectives:

- The advancement of science and practice of wind engineering.
- The solution of national wind engineering problems through transfer of new knowledge into practice.

Established in 1966

Corporate Members of AAWE

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Boundary Layer Wind Tunnel Laboratory, University of Western Ontario
www.blwtl.uwo.ca

Cermak Peterka Petersen, Inc.
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www.windlab.colostate.edu

Wind Science and Engineering Research Center, Texas Tech University
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THE WIND ENGINEER

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