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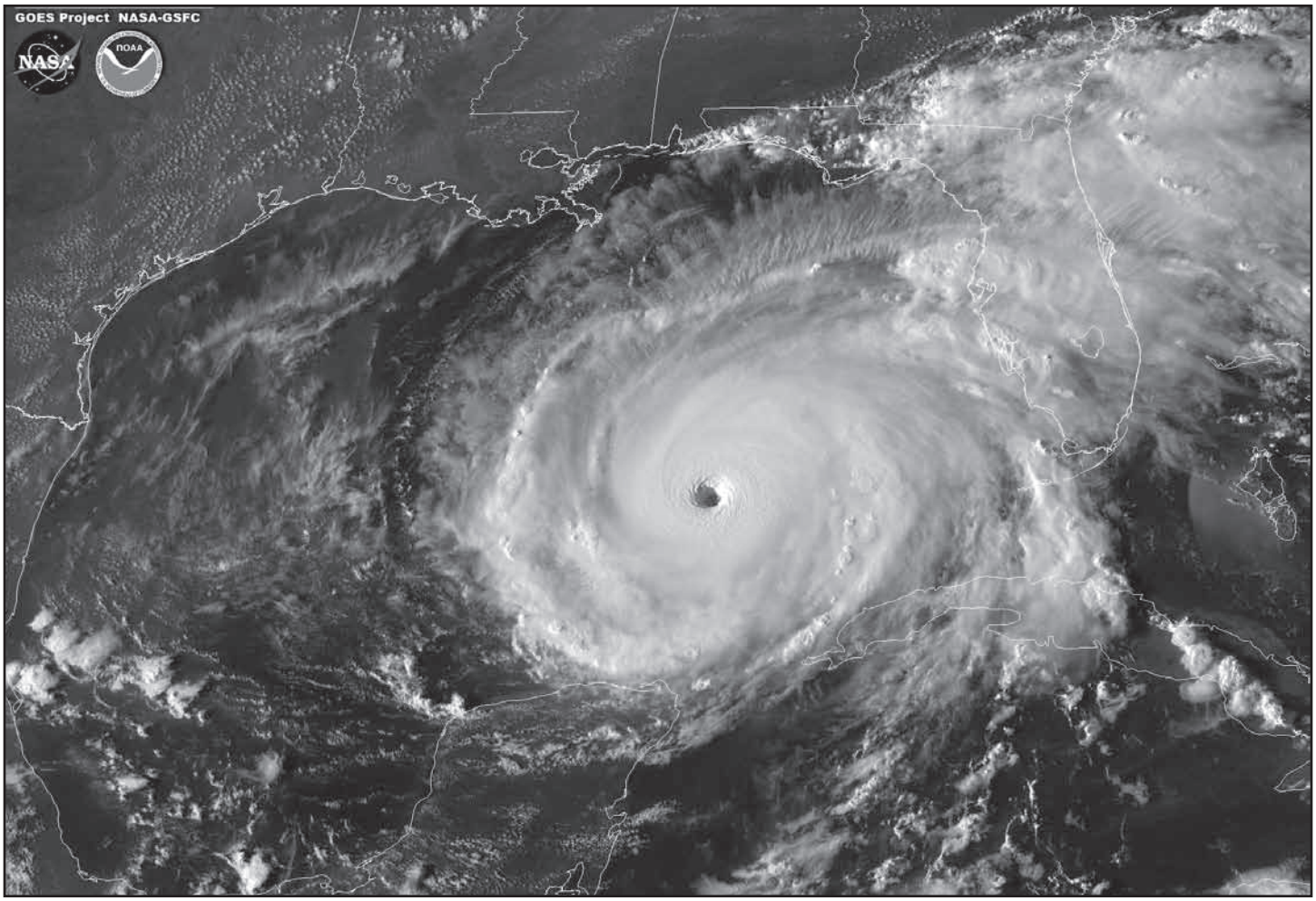

NASA/NOAA: Hurricane Rita GOES-12 21 September 2005 | http://goes.gsfc.nasa.gov/pub/goes/050921.rita.gif

HURRICANE CLIMATOLOGY OF THE CENTRAL-NORTHERN GULF OF MEXICO

FEATURE:

NEWS:

MAY 2012
VOLUME 20 • NO 3

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TABLE OF CONTENTS

MAY 2012 • Vol. 20 • No. 3

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President's Message

By Ronald L. Schumann, Jr., PE

Ronald L. Schumann, Jr., PE

The annual ASCE Louisiana Section Spring Conference was held on May 10-11, 2012 in Baton Rouge at the Crowne Plaza Executive Center. The conference was well attended, affording attendees the opportunity to earn up to 11 professional development hours. The conference was well organized and the credit goes to the efforts of Adam Smith with the assistance of Danielle Wellborn in putting together a well-run and successful annual conference. Thanks are also extended to the technical presenters who helped make the conference informative for all who attended. Also, thank you to all of our exhibitors and sponsors who helped underwrite a portion of the expenses to help keep the cost of the conference affordable for all attendees.

A major focus of the conference was the recently released ASCE 2012 Report Card for Louisiana's Infrastructure. The conference provided the opportunity for a more detailed presentation of the materials gathered on the condition of our State's infrastructure; the report card process; and, the methodology used in the evaluation and grading of the nine categories of infrastructure covered in the report card. Seven of the nine categories were presented at the conference covering the topics of Water, Levees, Ports, Dams, Roads, Wastewater, and Aviation. The Section was honored to have ASCE National President, Mr. Andrew Herrmann, attend the conference, and deliver the keynote address during the Thursday luncheon. The subject of Mr. Herrmann's presentation was the poor condition of America's infrastructure and the need for civil engineers to educate the public on the condition of our infrastructure. Infrastructure is one of the three strategic initiatives identified by ASCE nationally. The ASCE Report Card on America's Infrastructure has become a much referenced document on the condition of our national infrastructure. The responsibility and need for ASCE and civil engineers to become more engaged in educating politicians, legislators, and the public on the conditions of our infrastructure was emphasized. This cannot be accomplished by simply publishing report cards. ASCE is in the process of moving forward with this initiative on a national level by publishing a series of reports entitled "Failure to Act". This new series of reports show the economic benefits of improving our infrastructure and the economic impact and consequences if funding remains at its current levels. ASCE has completed reports on Transportation, Water and Wastewater and Electricity. These reports can be found on ASCE's national website. Reports addressing airports and marine ports are coming soon with the anticipation of completion scheduled by the end of July 2012. Mr. Herrmann also encouraged the membership to become more involved by becoming a Key Contact member. Information on the Key Contact Program and how you can contact your legislators is also available on the national ASCE website at www.asce.org. Just go to the tab at the top of the page marked Issues & Advocacy and click on Infrastructure.

As I said in my previous message to the membership, the release of the report card is not the end but just the beginning of the Louisiana Section's efforts to live up to its responsibility to educate and inform the public on the condition of Louisiana's infrastructure. We have established a Government Affairs Committee that will hopefully become a resource for our legislators and public officials on infrastructure issues in Louisiana. We will also be putting together a presentation on the Report Card on Louisiana's Infrastructure for presentation to other professional organizations, civic groups, and the general public.

Much of our infrastructure is approaching or surpassing its 50 year design life. While we have managed to live on the initial investments in our infrastructure we cannot afford to continue to defer maintenance if we expect the systems that we depend on to continue to serve us and bring us the quality of life that we have grown accustomed to receiving. Infrastructure conditions can make or break our economy and our quality of life. I encourage every civil engineer to get involved.

During the General Membership Meeting, held at the conclusion of the Spring Conference, the officers and board of directors were elected for the 2011-2012 administrative year. Congratulations are extended to next year's officers: President, Kurt Nixon; President Elect, Robert Jacobsen; Vice President, Pam Gonzales; and Secretary-Treasurer, Christopher Humphreys, along with all of the incoming board of directors.

Student awards were also presented to the Distinguished Civil Engineering Senior Student of the Year from each of our six student chapters throughout the state. This year's recipients were Jacob Benton, University of Louisiana at Lafayette; Kourtney Hoffpauir, McNeese State University; Christopher Rabalais, Louisiana Tech University; Jasmin Richardson, Southern University; Amy Robards, University of New Orleans; and Aleksandra Simicevic, Louisiana State University. They each received a plaque and a monetary award of $500 from the Section. A special thanks to Jerry Klier who year-after-year has volunteered his time and effort to make sure we recognized these worthy student members, the future leaders of our civil engineering profession and ASCE.

The Louisiana Section once again sent representatives to the annual ASCE Legislative Fly-In in Washington, D.C. Bob Jacobsen, Louisiana Section Vice President, attended on behalf of the Section. Nedra Davis and Kirk Lowery also participated at their own expense. This is a very important annual event. The Fly-In gives ASCE members the opportunity to educate and influence lawmakers at the national level on public policy issues affecting the profession of civil engineering. The Fly-In is an excellent opportunity for ASCE and Section leaders to develop relationships with our elected members of Congress and the Louisiana Section will continue to support this worthwhile program.

The Louisiana Section continues to be active in its endeavors to serve both its members and the public. The Louisiana Section is always striving to develop new ways to serve our members. If you have comments or suggestions on how the Section Board can better serve you, please feel free to contact any board member.

Hurricane Climatology of the Central-Northern Gulf of Mexico

By Bob Jacobsen, PE

Bob Jacobsen, PE

This article is a condensed version of a report on hurricane climatology funded by the Southeast Louisiana Flood Protection Authority—East, which is part of a larger study reviewing hurricane surge hazard analysis for southeast Louisiana. A complete version of the report on hurricane climatology, including color figures and complete references, can be obtained by sending a request to bobjacobsenpe@gmail.com.

Hurricane climatology is the science of tropical cyclone phenomena—with emphasis on examining quantifiable trends and variability in the regional recurrence of their characteristics and development. Louisiana engineers who engage in planning, design, operations, and maintenance for systems affected by hurricane induced wind and surge hazards need to be aware that the evaluation of such hazards is continually evolving with improved understanding of hurricane climatology. This is particularly applicable for systems intended to mitigate hurricane surge hazards—such as the New Orleans Area Hurricane and Storm Damage Risk Reduction System Design (HSDRRS), but also has implications for systems that must withstand the impact of hurricanes at some level, such as buildings; towers; roads; bridges; electric and gas utilities; drainage, water. and sewer conveyances and pump stations, and restored barrier islands.[1]

In 2006-07, in the wake of Hurricanes Katrina and Rita, the U.S. Army Corps of Engineers (USACE) spurred significant advances in the state-of-the-science in hurricane climatology for the Gulf of Mexico (GoM) as part of their efforts to remap surge flood hazards and redesign the HSDRRS. Over the past five years, science has continued to progress through the efforts of the National Oceanic and Atmospheric Administration (NOAA) and its many divisions, including the National Hurricane Center (NHC); the Hurricane Research Division (HRD); the National Climate Data Center (NCDC); the Climate Prediction Center (CPC); the Coastal Services Center (CSC); and the Geophysical Fluid Dynamics Laboratory (GFDL). Major contributions are also being made by academicians and privately employed scientists. In Louisiana, important research on hurricanes is conducted under the Office of the State Climatologist, Dr. Barry Keim.

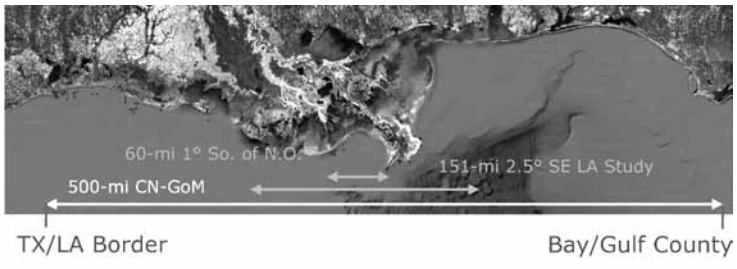

Figure 1. Central Northern Gulf of Mexico Region

This article summarizes the current science on four topics in the hurricane climatology of the Central-Northern GoM (CN-GoM, see Figure 1), including a recent analysis of hurricane statistics through the 2011 season. These topics are:

- GoM Hurricane Characteristics
- Influence of Seasonal and Climatic Trends
- CN-GoM Landfall Probabilities
- Joint Probability Analysis

Afterwards, some suggestions for continued research are provided.

1 See Sam Amorosa, PE, *Benefit Cost Analysis for Wind Hazard Mitigation*, Louisiana Civil Engineer, May 2009; and Robert Turner, PE, *Hurricane and Storm Damage Risk Reduction Design Concerns*, Louisiana Civil Engineer, February 2011.

I. GoM Hurricane Characteristics

Today, the atmospheric physics of tropical cyclones are described in terms of six primary characteristics:

1. Core intensity
2. Core size
3. Wind field geometry
4. Dynamics
5. Forward speed
6. Track

All six characteristics are now understood to contribute to the potential wind and surge hazard of a landfalling hurricane.

Core Intensity

Core intensity—as indicated by the maximum sustained wind speed (Vmax) found in the eye wall—is the feature most traditionally associated with hurricane threats.[2] When atmospheric scientists began analyzing cyclone vortex development, the low central pressure within the eye, or the central pressure deficit (CPD) versus the ambient surrounding atmospheric pressure, also became a frequently adopted indicator. CPD is generally proportional to Vmax2. However, as shown in Figure 2, there is considerable scatter in the relationship.

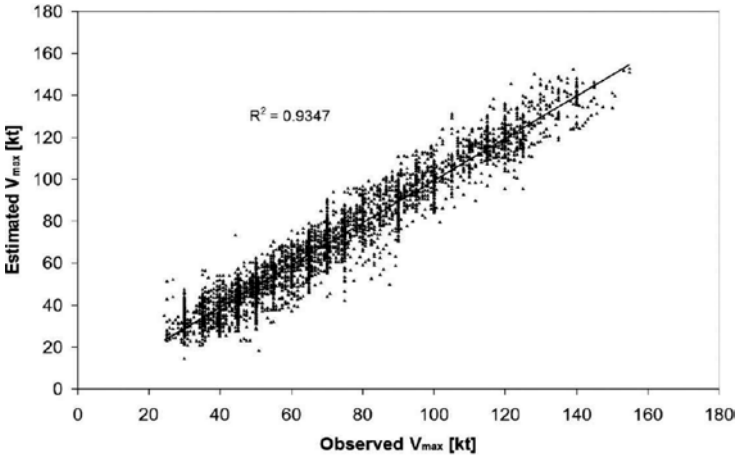

Figure 2. Observed V_{max} versus V_{max} Estimated as a Function of CPD
Knaff and Zehr, 2008

2 Maximum sustained surface winds are defined as the average wind speed over a 1 minute period at an elevation of 10 meters above the ground at an unobstructed location (e.g., over water). Wind speeds observed at flight level are reduced (using a factor of 65 to 90%) to estimate surface winds. Some atmospheric models that develop wind circulation patterns from regional atmospheric pressure conditions provide winds as 30-minute averages. For wind stress applied to water, hydrologists use a 10-minute average wind. Meteorologists and structural engineers often also refer to the 3-second gust. Generalized conversions include:

10-minute winds = 1.09 • 30-minute winds

1-minute winds = 1.24 • 30 minute winds, or 1-minute winds = 1.138 • 10-minute winds

3 second gust = 1.3 • 1-minute winds

All other storm characteristics and coastal landscape factors being equal (which they rarely are), a hurricane's wind damage has been correlated with landfalling Vmax2 to 3, and the rise in ocean still water level (SWL) due to wind-driven surge with landfalling Vmax2. Wind forcing accounts for at least 80% of the SWL rise. The CPD itself induces some SWL rise near the core—through a manometer effect—at about 4 inches of rise per 10 millibars (mb) of CPD. CPD and Vmax observations apply only within a very small area of a hurricane and, as discussed below, are highly transient.

The Saffir-Simpson Scale (SSS), developed in 1971, ranks hurricanes throughout their life cycle according to a 5-point core intensity scale (Table 1). As with the indicators, the SSS is effective in rating hazard potential **only if** other hurricane attributes and coastal landscape factors are equal. However, the other five characteristics and coastal features play critical roles in wind and surge hazards, and thus, the SSS should not be used alone to judge hazard potential. For example, Category 5 Hurricane Camille (1969) and Category 3 Hurricane Katrina (2005) both made landfall near Bay St. Louis, Mississippi but the surge of the latter exceeded the former by many feet.

Table 1. Saffir-Simpson Scale

Category	V_{max}			Central Pressure	
	mph	m/s	knots	mb	CPD mb (ambient at 1020 mb)
Tropical Depression	< 39				
Tropical Storm	39-73	17 - 33		< 1,000	> 20
1	74-95	33-42	64-82	< 980	> 41
2	96-110	43-49	83-95	979-965	41- 56
3	111-130	50-58	96-113	964-945	56 - 75
4	131-155	59-69	114-135	944-920	76 - 100
5	156+	70+	136+	< 920	>100

Table 2 presents a new compilation of hurricane numbers by SSS for NOAA recorded storms between 1851 and 2011. Eighty-eight (88) major Gulf hurricanes (GMHs) (Category 3 or higher) have occurred, nearly 29% of all recorded Atlantic Basin major hurricanes. Over the 161-yr record, this equates to a simple average of 55 GMHs per century. Table 2 also shows that of the 88 GMHs, 30 have struck the CN-GoM at major status, a simple average of 19 per century. These 30 hurricanes account for *over one-third of all GMHs and nearly 10% of all Atlantic major hurricanes.*

Table 2. Number of Hurricanes by Saffir-Simpson Scale (1851 to 2011)

Category	Atlantic Basin	GoM	At CN-GoM Landfall	GoM / Atlantic Basin	At CN-GoM Landfall / GoM
1	338	103	39	30.5%	37.9%
2	224	58	18	25.9%	31.0%
3	170	44	22	25.9%	50.0%
4	106	34	7	32.1%	20.6%
5	32	10	1	31.3%	10.0%
All	870	249	87	28.6%	34.9%
per century	540	155	54		
Major	308	88	30	28.6%	34.1%
per century	191	55	19		

Ten GMHs have reached Category 5, with half (noted in **bold**) making landfall in CN-GoM:

- *Rita* (2005), with GoM Vmax of 178 mph
- *Katrina* (2005), 172 mph
- *Ivan* (2004), 161 mph
- *Allen* (1980), 190 mph
- *Anita* (1977), 172. mph
- *Camille* (1969), 190 mph
- *Beulah* (1967), 161 mph
- *Carla* (1961), 172 mph
- *Ethel* (1960), 161 mph
- *Not Named* (1924), 167 mph

Only one, Camille actually made landfall at Category 5 strength, and that was in the CN-GoM.

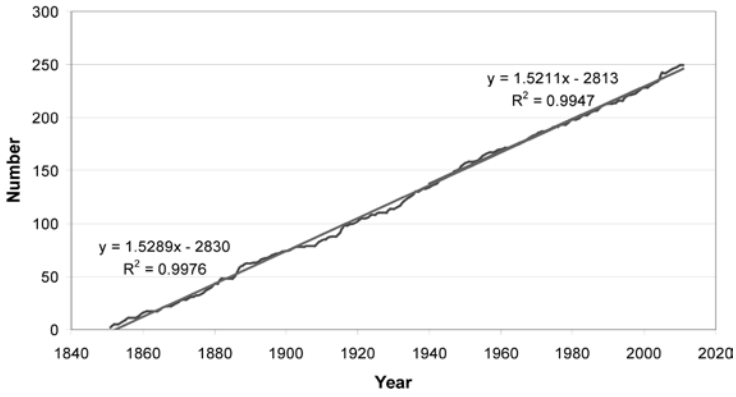

Figure 3a. Cumulative Number of GoM Hurricanes, 1851-2011

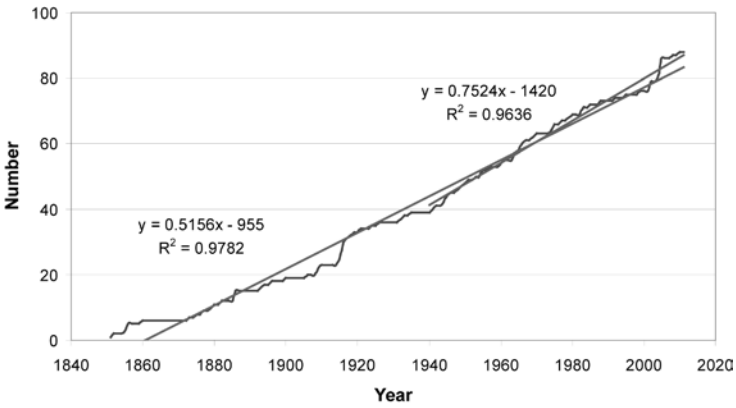

Figure 3b. Cumulative Number of GoM Major Hurricanes, 1851-2011

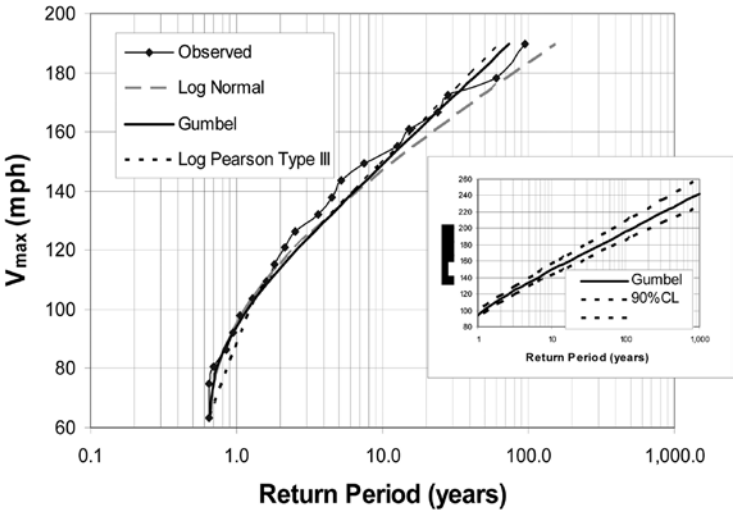

Figure 4. Return Period for GoM Hurricane V_{max}

Figures 3a and b illustrate that while the occurrence rate of GoM hurricanes of all categories has remained fairly stationary (the best fit overall linear rate is 152 per century, slightly less than the simple average), the post-1940 rate of GMHs is 50% higher than the 161-yr rate (75 versus 52 per century). The consensus among hurricane scientists attributes this increase to improved aircraft, satellite, and other observations following World War II. Figure 4 presents the observed return period for GoM Vmax and three common frequency distribution curves used to fit the observed data series—Log Normal, Gumbel, and Log-Pearson Type III. The inset in Figure 4 is an extrapolation of the Gumbel Curve with 90% confidence limits. The distorted spread of the confidence limits reflects the skewed nature of the distribution.

In addition to the reliability of observations, the use of return frequencies curves is subject to two noteworthy limitations:

1. Record length. It is worth noting that for any record length τ, there is only a 63% probability that a return period T = τ event is present. The probability does not reach 95% until $\tau \approx 3T$. The 161-yr record has a 96% probability of containing a hurricane with a 50-yr average return period, but an 80% probability of a 100-yr hurricane.

2. Extrapolation of physics to the more extreme event. Scientists are researching possible upper limits to hurricane intensity, based on various "braking" mechanisms, including sea temperature.

Core Size

Since 2005, scientists evaluating hurricane hazard potential have begun attributing more significance to the core size. Core size is indicated by the hurricane eye radius (Rmax), the distance from the storm center to the location of Vmax. At given Vmax a larger Rmax means a longer eye-wall wind path, and more wind damage and surge. Hurricane Katrina's size has been demonstrated to be the major reason why its surge height exceeded that of Hurricane Camille.

Scientists have long known that extreme hurricane intensification and eye contraction go hand-in-hand—much like a figure skater drawing in her arms and spinning faster. Consequently, they reasoned that intense cores would not usually be very large. However, the recent observation of large strong hurricanes (e.g., Katrina) and detailed investigations of ocean energy (heat) availability have stimulated suggestions that large strong storms are not that uncommon. Figure 5 presents a recent statistical analysis of the relationship of CPD and Rmax and indicates a modest inverse core intensity-size relationship, but with considerable scatter.

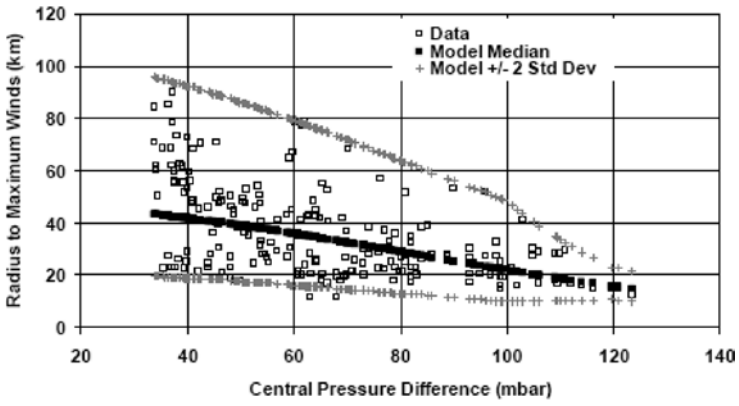

Figure 5. Rmax versus CPD
Resio et al 2007

One source of scatter in the CPD- Rmax relationship is the phenomenon of eye-wall replacement. Eye contraction in very intense storms reaches a limit, at which point favorable conditions for further intensification will cause the development of a new, outer eye wall. This secondary eye wall will begin to contract as the old, inner eye dissipates, leaving a much larger and stronger eye wall.

Wind Field Geometry

In addition to eye-wall replacement, the recent availability of detailed wind field data has led scientists to study characteristics such as wind field radial profile, spiral banding, asymmetry, and integrated kinetic energy (IKE). Figure 6 compares the generalized wind fields of Hurricanes Gustav and Ike (both from 2008) at the same Vmax and depicts significant differences in radial profile and symmetry. An exponential function developed by Holland is used to describe variations in the radial pressure deficit (PD) profile:

$$PD = CPD * \exp\left(R_{max}/r\right)^{B}$$

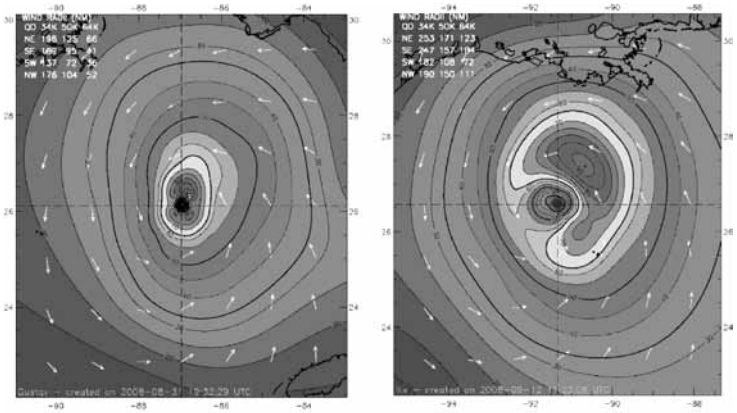

Figure 6. Comparison of Hurricane Gustav and Ike Wind Fields at Similar V_{max}

The parameter B varies between 0.9 and 1.6, with the higher B storms having a more gradual reduction in PD with increasing radial distance (versus a steeper profile for lower B values). A similar profile is applied to wind velocity. Hurricane wind field profiles are also commonly described in terms of the radial extent of hurricane force and tropical storm force winds. Holland B values for GMHs have not been found to correlate with other characteristics and have been proposed as a random attribute with a Normal Distribution.

Wind field profiles are rarely identical in all quadrants (see Dynamics, below), leading to notable asymmetries, as typified by Hurricane Ike in Figure 6. As hurricanes approach a CN-GoM landfall from the south, decay dynamics cause the highest winds to typically be found in the northeast quadrant.

To better index the total hazard potential of a tropical cyclone scientists have proposed considering the IKE. IKE has two advantages as a rating value: first, in calculating kinetic energy it employs a V2, which as noted above is more directly proportional to wind and

surge hazard than V alone. Second, it provides a value based on the nature of the overall wind field, not just a single point. The IKE is typically calculated for the portion of the wind field extending out to the limit of tropical storm force winds in each quadrant. Researchers have not yet developed information on the frequency or distribution of IKE values for GoM hurricanes.

A limitation of IKE in assessing surge hazard is that it does not account for variation in Vmax, which influences peak surge near the landfall location. Fitzpatrick has evaluated a modified index which uses IKE½ • Vmax , thus incorporating both IKE and Vmax and providing units of V2.

4. Dynamics

Hurricanes making a CN-GoM landfall generally traverse the GoM in less than four days, during which time their intensity, size, and wind field distribution can undergo major changes. Increasing availability of satellite and aircraft reconnaissance information has allowed scientists to evaluate the nature of hurricane genesis, development, intensification, and decay. Hurricane dynamics are critical to understanding the mechanisms, frequencies, and climatic trends of major hurricane occurrence. Hurricanes,that intensify and grow during a trek across the GoM are likely to become some of the most powerful hurricanes in the Atlantic Basin. Figure 7 illustrates the dynamics in CPD, Vmax , Rmax , and Holland B for Hurricane Katrina over the days leading up to landfall.

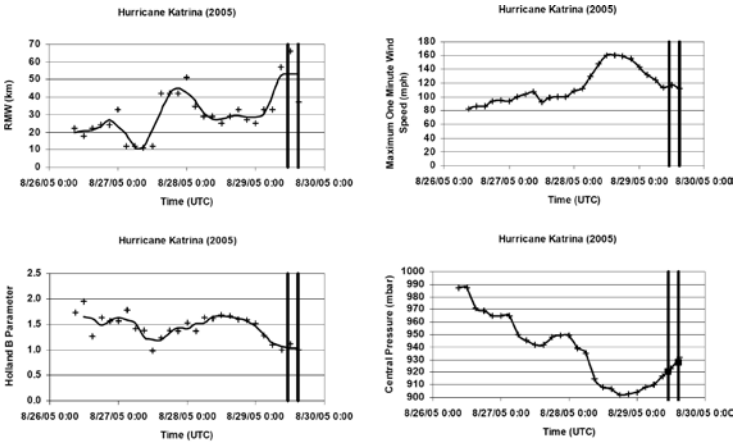

Figure 7. Dynamics of Hurricane Katrina
Resio et al 2007

Surge hazards cannot simply be considered a function of a landfall snapshot of hurricane conditions. Hurricane dynamics affect the cumulative energy directed at the coast during the days preceding landfall. A hurricane that develops into a large, strong storm well in advance of landfall can initiate an early coastal SWL rise, termed a forerunner, which can then be magnified during landfall.

Atmospheric scientists currently have less confidence in forecasting hurricane intensity than track. Intensity and geometric transformations are largely governed by three interactions:

1. Land masses. Hurricanes that avoid prolonged crossings of larger mountainous Caribbean islands (e.g., Hispaniola and Cuba) are more likely to emerge into the GoM with stronger circulation centers.

2. Sea surface temperature (SST). Hurricanes, which pass westward from the southern Florida Peninsula or Strait across the GoM can usually draw energy from the higher water temperatures of the Florida/Loop Current, illustrated in Figure 8. Hurricanes coming from the Yucatan Strait or western Cuba can pass over large warm eddies which periodically break off from the Loop Current. In general, a CPD above 80 mb requires a SST greater than 28.5° C. Importantly, warm surface waters can be replaced by colder deeper water if a hurricane stalls, reducing the source of energy to the hurricane and causing it to weaken. Recently, scientists have proposed that hurricane development and strengthening depends not just on SST, but also on local depth-averaged sea temperature. Studies are evaluating the relationship of intensification to the total available ocean energy—termed Tropical Cyclone Heat Potential (TCHP). The depth limit of warm ocean water is one important potential "braking" mechanism on the intensity and size of hurricanes.

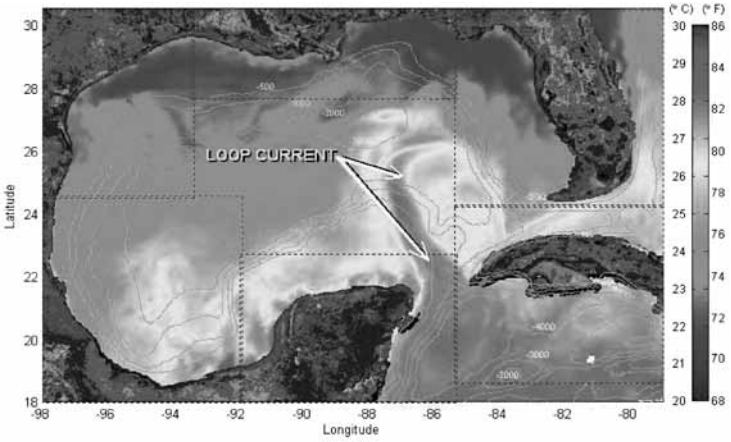

Figure 8. Example of the GoM Loop Current
WAVCIS Laboratory, Coastal Studies Institute, Louisiana State University

3. Atmospheric conditions. Hurricane stability and growth are significantly inhibited by encounters with: a) masses of cool dry air (which are readily sucked into the core and then interfere with convection and cyclonic circulation); b) regional environments with high wind shear (which disrupt the wind field); or c) interfering upper level pressure systems. To better understand regional atmospheric influences on hurricane genesis, intensification, and resiliency—and to improve intensity forecasts—meteorologists are employing higher resolution regional atmospheric models and studying detailed flight data to gain insights on hurricane wind field structures (e.g., spiral banding, eye-wall replacement, primary circulation broadness, vertical alignment/tilting, etc.) and internal mechanisms of intensification and resiliency.

Most hurricanes lose strength and symmetry as they approach landfall and move onshore. As the winds circulate counterclockwise into the forward right and then forward left quadrant (with respect to the track) they pass over land, encounter resistance, become disrupted, and decline in strength. The winds can rebuild again as they circle around the eye over water. The wind disruptions in the forward quadrants lead to intrusion of drier, higher pressure, overland air, which reduces the central pressure deficit and the engine for wind circulation—a process known as filling. Two storms that underwent rapid decay were Hurricanes Ethel (1960) and Lili (2002).

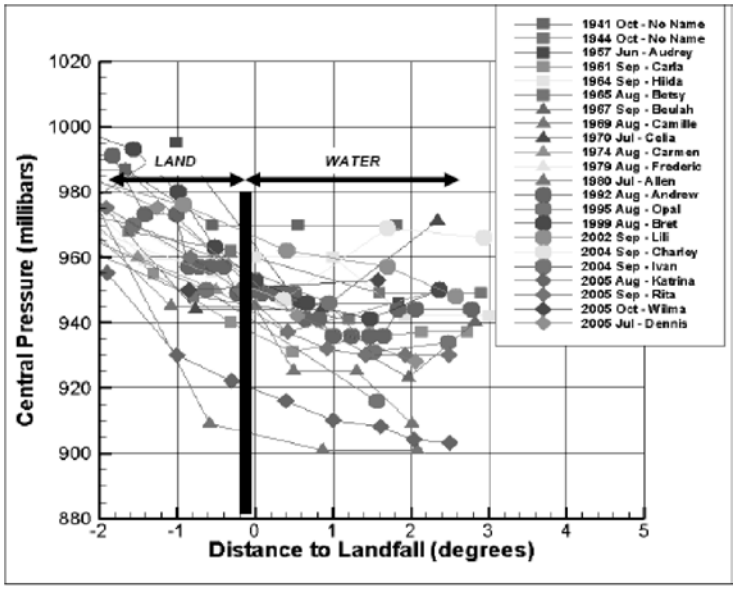

Figure 9. Rise in Hurricane Central Pressure Prior to Landfall
Resio et al 2007

Figure 9 summarizes the rise in central pressure for 22 post-1940 intense hurricanes (central pressure less than 955 mb) making landfall along the coast of the northern GoM. Weakening in the last 6 to 24 hours prior to landfall is typically also characterized by an increase in Rmax and a decrease in Holland B. Scientists have considered major hurricane decay sufficiently well established to incorporate decay rates in surge hazard analysis.

5. Forward Speed

Forward speed (Vf) also influences wind and surge hazard. Storms with higher Vf during landfall approach (the last 12 hours leading up to landfall) deliver a stronger wind punch—because forward speed is added to the radial wind speed east of the storm center. This higher landfall Vf leads to greater surge compression against the coast. However, prior to landfall approach, storms that have a slower Vf—especially those with higher IKE—may cause greater areal inundation from the build up of a forerunner. However, a storm with a very slow Vf can deplete the underlying ocean thermal energy and lose intensity.

6. Track

Over a hurricane's course, the NHC pinpoints the center of circulation and provides wind field descriptions at frequent (typically 3-hour) intervals. Five critical junctures along a GoM track are:

1. Entry into the GoM
2. Maximum intensity or IKE
3. Near coast prior to the onset of filling and decay
4. Landfall
5. Inland following reduction in coastal winds

The changing cyclonic characteristics between these five locations describe storm dynamics.

Hurricanes can make multiple landfalls in the Atlantic Basin. Hurricanes Betsy (1964), Andrew (1992), and Katrina (2005) all struck the east coast of Florida before crossing the GoM and making landfall in Louisiana. Hurricanes can even make multiple landfalls in the GoM, e.g., Hurricane Ivan (2004) shown in Figure 10.

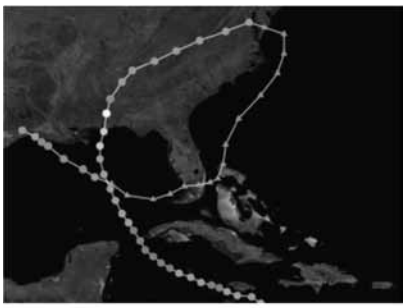

Figure 10. Track of Hurricane Ivan (2004)
http://en.wikipedia.org/wiki/Hurricane_Ivan

As noted above, GoM tracks over the Loop Current or associated eddies favor intensification. East to west tracks across the GoM allow for greater CN-GoM forerunner development (through combined westward long shore currents and a northward SWL setup induced by the Coriolis force).

Track locations in the 12 hours prior to and following landfall describe the heading angle (θ) at which the cyclone core makes landfall. Storms approaching an east-west shoreline from the southwest (easterly θ) tend to trap and amplify surge, compared to those approaching from the southeast (westerly θ). The actual influence of track θ greatly depends on the local variations in shoreline shape and bathymetry.

II. Influence of Seasonal and Climatic Trends

The frequency of tropical cyclones, major hurricanes, and particular genesis regions and tracks tends to correlate with the time of year and known inter-annual to multi-decadal climatic variations affecting ocean temperature and atmospheric conditions. Climatologists are examining these trends closely, as well as the potential influence of rising global temperature on hurricane frequency and characteristics.

1. Seasonal Trends

Atlantic Basin tropical cyclones develop primarily between May and December in association with the formation of low-pressure centers over warm ocean waters (generally above 26.5° C, 80° F) under modest shear and other conducive atmospheric conditions. Often these low pressure centers originate from waves of hot rising Sahara Desert air that propagate off the coast of West Africa in the inter-tropical convergence zone beginning in mid-to-late summer. The peak of hurricane season is from late September through early October. The NHC website on tropical cyclone climatology (http://www.nhc.noaa.gov/climo/) summarizes observations regarding seasonal hurricane trends, including:

- The observed tropical cyclone seasonal frequency (per 100 years) in the Atlantic Basin
- Typical points of origin by 10 day periods
- Typical tracks by month

2. Climate Cycles

Dating back to the mid-1980s climatologists have observed short- and long-term regional cycles that tend to influence SST/TCHP and atmospheric conditions—which in turn affect Atlantic Basin hurricane development and intensification. These cycles, the most well known of which is El Niño-La Niña, form the basis for seasonal hurricane activity forecasts issued by NOAA and others. Four important cycles, or oscillations, are:

- The Madden–Julian Oscillation (MJO), a 30-90 day intra-seasonal cycle in which large alternating regions of enhanced versus suppressed convection propagate eastward around the globe within the tropical zone. The former supports tropical cyclone development while the latter inhibits it. This pattern contributes to the inverse tropical cyclone activity level in the western-north Pacific versus the north Atlantic Basins.

- The inter-annual El Niño Southern Oscillation (ENSO), with warming (El Niño) versus cooling (La Niña) cycles in the equatorial eastern Pacific Ocean, which induce increased (decreased) wind shear in the western Atlantic Basin (e.g., GoM).

- The Atlantic Multi-decadal Oscillation (AMO), consisting of 50 to 90 year cycles of North Atlantic SSTs, with warmer phases increasing the potential for tropical cyclone development and intensifications. An AMO warm phase began in 1995 and is expected to last until 2015 to 2035, possibly peaking around 2020.

- The North Atlantic Oscillation (NAO), in which the centers of mid-Atlantic high and low atmospheric pressure—generally centered near the Azores and Iceland, respectively—shift and strengthen/weaken. The NAO influences tropical cyclone development off the west coast of Africa and the re-curving of Atlantic hurricanes versus tracking on toward the GoM. The NAO has significant seasonal and inter-annual variability.

In addition to frequency and intensity, scientists are evaluating if these cycles influence seasonal trends in hurricane size. Researchers are employing a wide range of techniques—from detailed, coupled ocean-atmospheric models to studies of prehistoric evidence on climate and hurricane frequency—to better understand hurricane climate cycles. They continue to investigate additional climate patterns for hurricane links, such as: solar activity, stratospheric and other zonal winds, Caribbean sea-level pressures, and African West Sahel rainfall activity.

Researchers have evaluated correlations of GoM hurricane activity to climate cycles and found both the MJO and ENSO to be important. Figure 11 presents rolling 5-year averages for annual GoM hurricanes and major hurricanes in the GoM, updated through 2011. While significant variations in activity are seen, Figure 11 does not indicate a consistent, repeatable long-term cycle. However, one group of scientists has proposed a 40-yr GoM cycle in total annual peak hurricane kinetic energy composed of 30-yr low and 10-yr high activity periods.

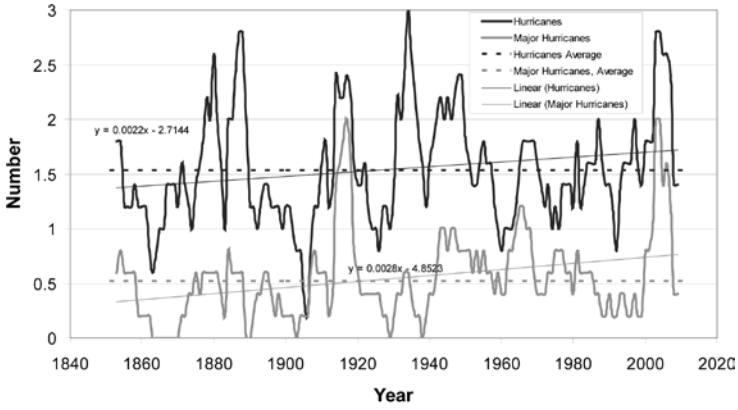

Figure 11. Running 5-yr Average for All Gulf Hurricanes and GMHs, 1851-2011

3. Climate Change

Climatologists are employing historic and prehistoric data, and high-resolution ocean-climate models, to look for potential correlations between long-term secular trends in global climate and tropical cyclone frequency and intensity. One current difficulty is distinguishing the influence of the current long-term AMO active phase from effects that might be attributable to global warming. A major challenge in studying the possible future impact of climate change is understanding conditions that might be unfavorable to hurricane development, such as increased atmospheric wind shear. Some researchers are indicating a modest potential for increases in hurricane activity and/or intensity. Done and Holland (2011 OTC Houston TX) estimated that tropical cyclone activity in the Atlantic Basin is likely to increase by up to 3 storms per season by 2100.

Figure 11 shows that there is no evidence yet for a secular trend in GoM hurricanes or major hurricanes—with long-term rate increases for both categories at less that 0.3 per century.

III. CN-GoM Landfall Probabilities

In addition to the general climatology of GoM hurricanes, wind and surge hazard analysis benefits from a more detailed analysis of landfalling intensity and other characteristics along the CN-GoM, as well as climate trends.

1. Landfall Intensity Return Frequency

The following notation is employed in discussing various sets of landfalling GMHs (see Figure 1):

L-500—landfalling, *but not necessarily at major status at landfall*, somewhere within the 500 mi CN-GoM segment as a whole.

LMH-500—*landfalling major hurricane* within the 500 mi CN-GoM segment.

L-151—landfalling within the 151 mi (2.5° longitude) segment centered below New Orleans.

LMH-151—landfalling major hurricane within the 151 mi (2.5° longitude) segment centered below New Orleans.

L-60—landfalling within the 60 mi (1° longitude) segment centered below New Orleans.

LMH-60—landfalling major hurricane within the 60 mi (1° longitude) segment centered below New Orleans.

The LMH-storms are included in the L-storms, and storms within the shorter segment are included in storms for a longer segment. Figure 12 depicts the tracks of, all 39 L-500 GMHs for the 161-yr period from 1851 to 2011. Of these 39, seven in **bold** were L-60 and

Figure 12. Tracks for 39 L-500 Hurricanes
http://www.csc.noaa.gov/hurricanes/#app=3d30&3e3d-selectedIndex=2

twelve were L-151, (the seven **bold** plus five in *italics*). Of these there were 30 LMH-500, 9 LMH-151, and 6 LMH-60. Figures 13a and b illustrate the cumulative number and linear rate for L-500 and LMH-500. Both figures depict a significant rate increase for the period since 1952, with escalations of 55 and 67%, respectively, to 31 and 27 CN-GoM landfalls per century. As noted earlier, this escalation appears to be attributable to better observations, including eye-wall aircraft reconnaissance at landfall.

Applying these escalations to overall rates for all three segments yields the following average return periods:

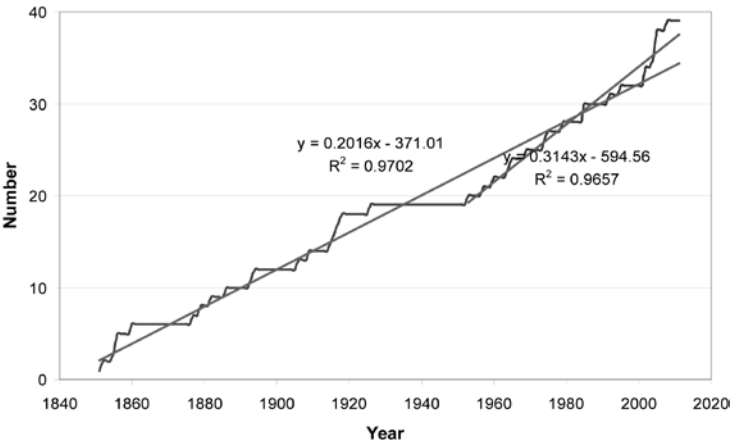

Figure 13a. Cumulative Number of L-500 Hurricanes, 1851-2011

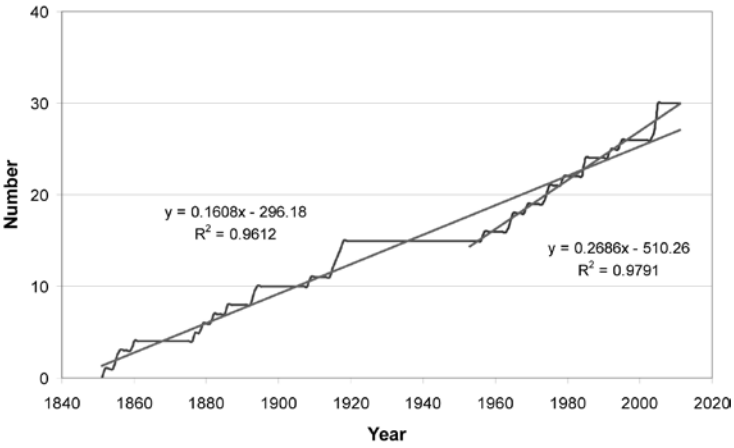

Figure 13b. Cumulative Number of LMH-500 Hurricanes, 1851-2011

L-500	2.7 yrs	**LMH-500**	3.2 yrs
L-151	8.5 yrs	**LMH-151**	10.7 yrs
L-60	14.9 yrs	**LMH-60**	16.1 yrs

Thus the 60-mi segment below New Orleans is estimated to experience landfall of a GMH at about once every 15 years, and a Category 3 or higher landfall every 16 years. The return period distribution for Vmax along L-60 (using a Gumbel Distribution), together with 90% confidence limits, are given in Figure 14.

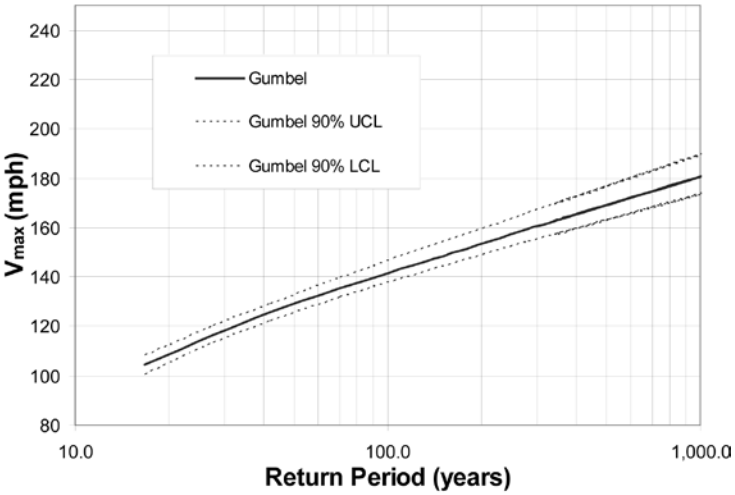

Figure 14. Return Period for L-60 Hurricane V_{max}

Converting the landfall return period to return frequency (1/T) and normalizing for segment length illustrates that the 60-mi reach actually has a much higher hurricane landfall hazard level:

L-500	0.075 per century-mile	**LMH-500**	0.062
L-151	0.077	**LMH-151**	0.062
L-60	0.11	**LMH-60**	0.103

The LMH-60 frequency is 66% higher than the LMH-151 or LMH-500. Furthermore, the LMH-60:L-60 ratio is 86% versus 75% for LMH-151:L-151 and 77% for LMH-500: L-500. These statistics show that not only do GMHs strike the 60-mi segment at a higher rate than elsewhere in the CN-GoM, they indicate that a GMH is more likely to remain a major storm when striking the 60-mi segment. Figures 8 and 12 illustrate that the Loop Current and associated eddies explain this higher frequency for the 60-mi segment. Hurricanes tracking over these warm waters are more likely to attain and keep major status, and if they are tracking over these waters, they are more likely to be heading toward this segment. *This aspect of regional hurricane climatology is crucial to understanding the special vulnerability of southeast Louisiana to wind and surge hazards.*

2. Other CN-GoM Landfall Characteristics

The relatively small number of regional landfalling GMHs limits findings with regard to other hurricane characteristics at landfall. Recent evaluations of these storms has indicated the following:

- CPD-Vmax2 landfall relationship also has considerable scatter

- Rmax , Holland B, and θ have random Normal Distributions
- Vf has a random Log Normal Distribution
- CPD, Holland B, and Rmax appear to follow a linear decay with landfall approach

To date there has been no research on landfall IKE or IKE½ • Vmax tendencies.

3. Landfall Climate Trends

Figure 15 presents rolling 2-year averages for annual L-500 and LMH-500 in the GoM, updated through 2011. As with GoM hurricanes generally, researchers have associated years of higher landfall activity with climate conditions, especially ENSO. However, as with GMHs the landfall records do not indicate a consistent, repeatable long-term pattern. Nor is there evidence yet for a secular trend—with long-term landfall rate increases for both categories at less that 0.1 per century.

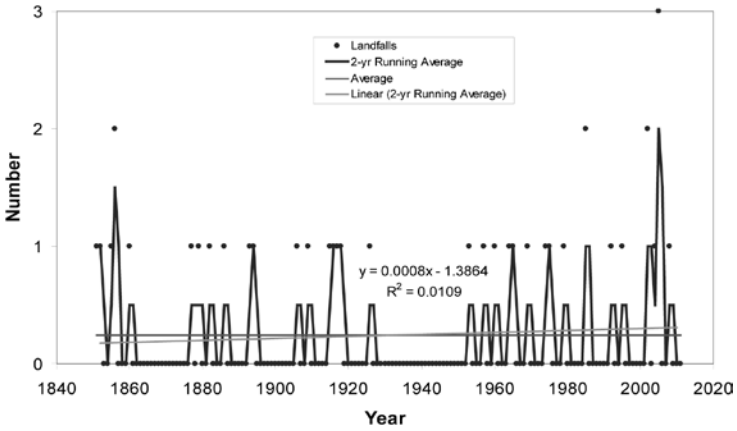

Figure 15. Running 2-yr Average for L-500

IV. Joint Probability Analysis

Given the various hurricane characteristics noted above and the importance of each to assessing wind and surge hazards—as well as the potential for storm conditions days before landfall to influence surge hazard—engineers must be concerned with the return frequency for *combinations* of storm characteristics. Statistical techniques for joint probability analysis (JPA) are not new—for example, hydrologists have employed them in estimating downstream Mississippi River flood hazards associated with flows contributed from multiple tributaries.

Hurricane JPA requires evaluating combinations of complex individual probabilities:

- CDP—with skewed distributions (e.g., Gumbel, Wiebull, etc.)
- Rmax, Holland B, θ—with Normal distributions
- Vf—with Log Normal distribution

The probability of various tracks is based on historical tracks with some variation. As noted above landfall decay/infilling (decrease in CPD and Holland B, increase in Rmax) are included as a linear trend. For some studies, the JPA can utilize a *full joint probability method (JPM)*—in which numerous incremental variations of each attribute are considered and the joint probability identified. With six attributes (CDP, Rmax, Holland B, θ, Vf, and track), and say five variations of each, a total of 15,625 separate combinations would be computed—*for each landfall location of interest*.

Hazard assessment typically requires coupling the JPA of regional hurricane climatology with a deterministic wind vortex model (in the case of wind hazard), or with a vortex plus surge/wave model (for surge hazard). With a full JPM, each storm must be input into the deterministic model to define the wind or surge associated with that particular joint probability hurricane. Once all the storms have been simulated, the cumulative probability distribution—i.e., wind or surge versus return periods—can be calculated.

In practice such *stochastic* analyses, require that the number of combinations be drastically reduced. Alternatives to the full JPM include:

a. The Monte Carlo technique, in which a sufficient number of combinations are selected at random to provide a suitably representative set. For example, analysis of a 500-year hurricane condition might require 2,500 years worth of storms. In the case of the L-500-, L-151- and L-60 this would equate to 926, 298, and 166 storms, a fraction of the full JPM.

b. An optimized set (OS) of storms, selected based on other comparisons to reasonably represent a particular range of conditions. For example, a Monte Carlo technique can be use to first assess regional wind hazards. Using this *wind hazard benchmark*, a smaller set of storms can be defined which effectively captures a range of probabilities within some error tolerance. This smaller set can then be simulated with the surge/wave model.

Figures 16 and 17 illustrate examples of particular wind and surge hazard levels for southeast Louisiana developed with hurricane JPA.

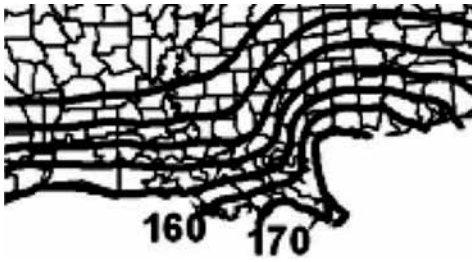

Figure 16. 1,000-Year Return Period Wind Gusts
Vickery et al 2009

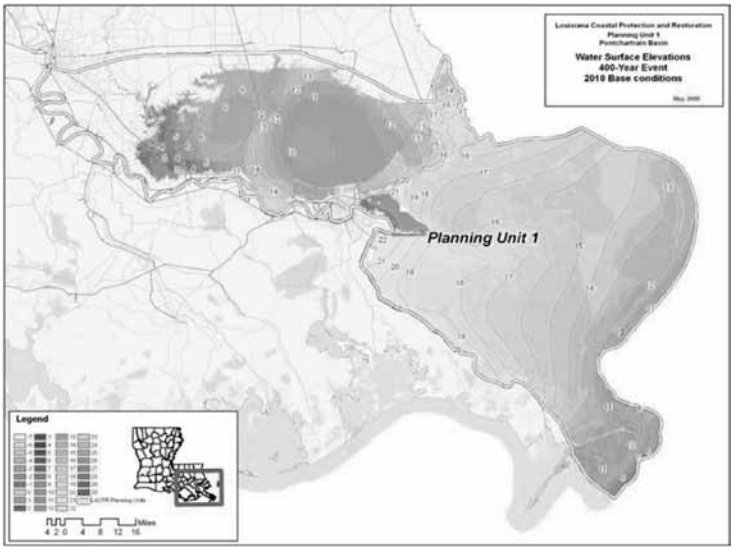

Figure 17. 400-Year Return Period Surge
USACE 2009

JPA for regional hurricane climatology has four important limitations:

1. The number of hurricane attributes included in the analysis—for example, whether to include: a) both intensity attributes CPD and Vmax; b) wind-field asymmetry and IKE; and, c) conditions at more critical points along the track.

2. The representativeness of the historical data for the attribute probability distributions (e.g. Gumbel distribution for CDP and Normal distributions for Rmax, Holland B, θ), functional relationships (e.g., linear decay), and estimation of proper confidence limits.

3. The degree to which known uncertainties in probability distributions and functional relationships are addressed in the JPA. For example, a Monte Carlo analysis can be expanded to select additional combinations in accordance with attribute confidence limits to yield estimates of associated uncertainty in the joint probability.

4. Set size limitations—i.e., additional error introduced by truncating a full, Monte Carlo, or OS to a particular number of combinations. These can be evaluated through sensitivity tests.

Limitations with a recent JPM-OS have caused difficulty in defining the return period for Hurricane Katrina, which had a borderline Category 4/5 CPD at landfall but strong Category 3 Vmax. Using the landfall CPD and an Rmax of over 35 mi, the USACE defined the return period as 398 years (or about 300 years if escalated based on the 1952-2011 analysis). However, using landfall Vmax with the Rmax would put the return period at less than 100 years.

A regional stochastic analysis of hurricane hazards is further limited by landfall point spacing, the accuracy and precision of deterministic modeling (e.g., surge model hindcasts), and integration and interpolation methods for developing return frequency curves.

Undertaking a hurricane JPA requires careful estimation of resource requirements (advanced computational systems, expert support, data, etc.), costs, and schedule. Ultimately, the quality of a JPA for regional hurricane climatology and associated hazards must be consistent with defined risk management objectives. Thus, a project to draw new flood maps in support of assessing flood insurance premiums might require one JPA approach, while a project to protect lives and enhance community economic vitality in a major metropolitan area might entail another.

Recommendations

To improve our understanding of hurricane climatology—particularly in support of coastal wind and surge hazard assessments—stakeholder agencies need to fund research to:

1. Update and improve GoM hurricane records on the full range of storm characteristics.

2. Refine the evaluation of intensity return frequency—carefully examining intensification and decay factors, especially Loop Current and filling trends.

3. Perform a more rigorous statistical analysis of hurricane characteristics and confidence limits; revisit the selection of a representative historical period—especially if GoM climate cycle analysis becomes definitive.

4. Incorporate any future findings on secular trends (climate change).

5. Expand JPA attributes (e.g., Vmax, wind-field asymmetry, IKE, IKE½ • Vmax , critical track junctures) and the JPA treatment of uncertainty in attribute statistics.

6. Better define the error and uncertainty associated with the JPA method under consideration in order to identify the most cost-effective approach for any given project.

Future wind and surge hazard engineering efforts will benefit greatly from these improvements.

Biography

Bob Jacobsen has been practicing in Louisiana in the fields of environmental and water resource engineering for over 30 years. Since 2004 he has specialized in high resolution 2D coastal hydrodynamic modeling in support of hurricane storm surge risk management and ecosystem restoration projects.

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ASCE National Legislative Fly-In

By Nedra Davis, MA and Bob Jacobsen, PE

At this year's Legislative Fly-In, ASCE members promoted several critical civil engineering messages on Capitol Hill. More than 160 national ASCE members visited more than 240 Congressional offices to take the case for infrastructure renewal to their elected representatives. Top priority for participants was asking lawmakers to pass a transportation bill so states can resume work fixing deteriorating roads, bridges and transit systems. Members also urged representatives to reauthorize natural hazards legislation that coordinates federal research efforts aimed at mitigating the effects of earthquakes and windstorms.

The Louisiana ASCE members attending this year's Fly-In were: Kam Movassaghi, PhD, PE and former Secretary of LA DOTD, who also was the Executive Director of the Louisiana Report Card; Bob Jacobsen, PE, Consultant and Vice President of the Louisiana Section; Kirk Lowery, PE, Consultant for HNTB and the Ports Topic Chair of the Louisiana Report Card; and, Nedra Davis, Communications Director of the Louisiana Report Card and Editor of the LA Section Journal.

The Legislative Fly-In began Tuesday, March 20, 2012. Dr. Movassaghi, Mr. Jacobsen, and Ms. Davis attended the Committee on America's Infrastructure (CAI), which was formed to assist the development of the upcoming *2013 ASCE National Report Card for America's Infrastructure*. An Advisory Council, made of CAI members and staff, provides guidance and feedback throughout the planning, development, and release of each national report card. Advisory Council members are often requested to assist with a state or local report card by offering recommendations; providing reviews and comments; and giving critical feedback on the content and grading. Dr. Movassaghi and Ms. Davis reported on the process of the Louisiana Report Card. Ms. Davis participated in the Digital Assets Development workgroup which is developing a mobile app, Facebook page, and other social media approaches to Report Card promotion.

Nedra Davis, Representative Boustany, and Dr. Kam Movassaghi

Kirk Lowery, Representative Cassidy, and Bob Jacobsen

Louisiana Section members attended the ASCE State Government Relations (SGR) Committee. The SGR Committee works with many National groups such as Council of State Governments, National Conference of State Legislatures, and Republican Governors Association and Democratic Governors Association. Key items discussed were:

- State infrastructure funding—widely cited as on of the top issues facing state lawmakers in their 2012 session;
- SGR efforts at tracking key state bills of interest to members (370 currently pending), as well as regulatory proposals (12);
- The SGR website, which has been revised to include links to issue information, alerts, and legislative tracking; and
- The SGR staff hosted webinar on April 18, 2012 that is available to Sections and Branches.

Adam Gangon, Manager of State Government Relations Program, commended the Louisiana Report Card. Ms. Davis was asked to serve on the SGR Committee for ASCE Region 5. The regional committee facilitates information exchange between the Regions and Sections on SGR policy and program implementation; assists the Key Contact committee; liaises with Raise the Bar and Sustainability Committees; and works with Section/Branch lobbyists where applicable.

Following a "Fly-In 101" overview, everyone enjoyed dinner, which featured remarks from U.S. Transportation Secretary Ray LaHood. Secretary LaHood described America as "one giant pothole" and urged attendees to ask their elected leaders to "put partisan politics aside for one day and pass the transportation bill."

Wednesday's activities started with ASCE staff briefs on relevant "inside the beltway" issues. Following lunch, ASCE members departed for Congressional visits on Capitol Hill arranged by ASCE staff. The Louisiana members made plans to:

A) Hand deliver copies of the *Report Card for Louisiana's Infrastructure* (tri-fold and detailed booklet) to each Louisiana House and Senate office; and

B) Urge them to continue supporting the transportation bill, which enjoyed the unanimous approval of our delegation due to the attached Restore Act (dedicating BP oil spill revenues to Gulf Coast restoration).

At Senator David Vitter's office the members visited with Mr. Charles Brittingham, II, Projects Director, who has worked diligently on the bi-partisan transportation bill and continues to work with LADOTD and the Louisiana Governor's Office to better Louisiana infrastructure. Mr. Brittingham had read the *Report Card for Louisiana's Infrastructure* and was current on the issues. It was an informative visit and according to Mr. Brittingham Sen. Vitter was fully briefed and in support of the engineering community.

At Senator Mary Landrieu's office the members met with Ms. Natalie Angelo, Projects Director. The staff were very knowledgeable about Louisiana and national infrastructure issues and had already used *Report Card for Louisiana's Infrastructure* to help prepare the Senate transportation bill.

On the House side our members visited with Reps. Fleming, Cassidy, and Boustany, and the staff of Reps. Scalise, Richmond, Landry, and Alexander, who also were all well informed on the infrastructure issues. Afterwards, members attended a reception on Capitol Hill.

On Thursday several ASCE committee meetings were held, which were open to member attendance. The week's activities wrapped up that evening with the ASCE Outstanding Projects and Leaders (OPAL) Gala. The event was a great opportunity to network with fellow ASCE members from across the nation.

Section members can still take part in the "Fly-In @ Home"– ASCE's Click & Connect with Congress website makes it easy to send messages to elected officials on the same issues pressed by Fly-In participants in person. Please sending a message to your congressman and share with them the importance of continued infrastructure funding to our state. At a time of continuing economic stagnation, a multi-year highway and transit reauthorization is critical for boosting productivity, economic competitiveness, and job creation.

In Memoriam: Emery Domingue, PE

Emery Domingue, PE

Emery Domingue was born January 9, 1926 and died February 26, 2012 in Lafayette. Mr. Domingue began studies at Southwestern Louisiana Institute (SLI, now ULL) but interrupted his studies to serve in multiple European campaigns with the U.S. Army's 20th Armored Division during World War II. Being fluent in French, he was pressed into service as an unofficial translator for his unit. Upon returning from the service, Mr. Domingue completed his B.S. degree in Civil Engineering at SLI.

Upon graduation from college, he was first employed with the right-of-way section with the Louisiana Department of Highways from 1949 to 1950, then by the East Texas Construction Company from 1950 to 1951. Having served during his senior year as a student instructor, he joined the Civil Engineering faculty at SLI where he was employed from 1951 to 1961. During this time, Mr. Domingue completed his M.S. degree in Civil Engineering from the University of Illinois at Urbana-Champaign and taught many students who would go on to successful engineering careers in public service and private practice. With two other faculty members, he co-founded Lafayette's first consulting firm (now known as Domingue, Szabo, & Associates, Inc.), where he served as President until his semi-retirement from the firm in 1991. He was a member of Chi Epsilon and was registered to practice Civil Engineering in Louisiana and Texas.

Engineering was one of Mr. Domingue's lifelong passions, and he was active in numerous professional organizations and received several awards during his career. He was a past president of the Lafayette Chapter of the Consulting Engineering Council of Louisiana (CEC) and received the A.E. Wilder Award for outstanding service. He was named a Fellow (1980) and a Life Fellow (1996) in the American Consulting Engineers Council (ACEC). He was a past president of the Lafayette Chapter of the Louisiana Engineering Society. In ASCE, he was a Life Member and a past president of the Baton Rouge branch. In 2011, Mr. Domingue was honored with the Wall of Fame Award by the Acadiana Branch and the Louisiana Section. The Wall of Fame Award is the highest honor bestowed upon a Louisiana civil engineer by the Louisiana Section.

Mr. Domingue helped play a significant role in the development of the city of Lafayette's infrastructure. He and his firm helped design many of the roads, bridges, drainage, water and sewer systems in the Acadiana area. In addition to his association with professional organizations, he was also involved with the Lafayette Parish Planning Commission, the Greater Lafayette Chamber of Commerce, the Kiwanis Club of Lafayette and the Krewe of Gabriel Mardi Gras Association.

He is survived by his wife of 61 years, Bea, three sons, a sister and several nieces and nephews.

SPRING CONFERENCE PHOTOS

Kam Movassaghi, Ph.D, PE opens the general session

Ronald Schumann, Jr, PE, President of the LA Section opens up session for the spring conference

Joey Coco, PE opens general session with the report card

Christopher Knotts, PE and Kurt Nixon, PE

Danielle Wellborn, PE organizes the Spring Conference

Session attendees

Annual Membership Meeting attendees

Charlie Eustis and Ron Rodi

Ronald Schumann, Jr., PE and Andrew Herrmann, PE, President ASCE National

Kurt Nixon, PE; Ali Mustapha, PE; and, Patrick Furlong, PE - the Shreveport crew

SPRING CONFERENCE AWARDS

Jerry Klier, Student Awards Committee Chair

Amy Robards, UNO

Aleksandra Simicevic, LSU

Christopher Rabalais, LA Tech

Jacob Benton, ULL

Kourtney Hoffpauir, McNeese

Distinguished Civil Engineer Seniors, Left to right: Jacob Benton, Amy Robards, Kourtney Hoffpauir, Alexandra Simicevic, and Christopher Rabalais

SPRING CONFERENCE PHOTOS: CRAWFISH BOIL








ASCE-T&DI Louisiana Chapter News

By Dan Aucutt, PE

Your T&DI Newsletter Editor recently vacationed in the Philippines for about a month. One immediate observation was the critical need for efficient transportation. In the States we can identify many areas that could stand improvement. We have infrastructure report cards that provide a means to direct limited funding to the most critical areas. Manila has a transportation system that has been superimposed over a 15th century city that Wikipedia claims is the most densely populated city in the world. The Sucat interchange south of Manila (see inset) has three north and south toll way lanes, four toll booths, two frontage roads (each with individual north bound and south bound lanes), all leading to a 4-lane overpass (which morphs into 6 or 8 lanes, if the vehicles are small). There are no traffic control devices at this intersection. No traffic lights, no yield signs, no pedestrian "Walk" signs. Total anarchy! This was my 4th trip to the area, and I have never seen an accident at this intersection. In fact, very few vehicles even have dents. The saving grace is the fact that the average speed through this constricted area is likely measured in meters per hour, rather than kilometers per hour. The system works. It may be inconvenient and it probably would rate below any reasonable report card grading system, but it works.

In March, ASCE-T&DI sponsored our first seminar in Lafayette at the request of Acadiana Branch President Luke Hebert, PE. Luke was aware of the varied seminars that the T&DI LA Chapter had presented. He requested a repeat of the *I-10 Twin Span Elevation Determination* seminar, which was originally held in Baton Rouge in February, 2011. Luckily, we were able to secure the original speaker, Mr. Jeffrey Shelden, PE, Senior Coastal Engineer from the Raleigh, NC office of Moffatt & Nichol. Jeff explained that the Hurricane Katrina damage to the twin span focused attention on improving methods to predict wave forces experienced by such bridge structures. Wave compression of the air space between the girders caused massive uplift forces that overwhelmed the girder to foundation gravity connections. The discussion continued with a review of the Guide Specifications for Bridges Vulnerable to Coastal Storms published by the American Association of State Highway and Transportation Officials (AASHTO) in 2008. Luke's choice was validated by the record-breaking attendance of 48 professionals and students. Your T&DI Chapter is planning a repeat of the Infrastructure Program Management seminar for the Shreveport branch later this Spring.

In continuation of our efforts to promote interest in transportation engineering, the T&DI LA Chapter attended the 2012 Louisiana Science and Engineering Fair held on March 25-27 at the Royal Cotillion Ballroom at the LSU Student Union. The State is divided into 12 Regions. Each region holds a Science Fair early in the year. The top winners from each region can participate at the State level. The Judges for the transportation-related exhibits consisted of LSU's Dr. Minkyum Kim, and T&DI Executive Committee Members Robert Dugas, Jr., PE, and Michael Paul, PE.

Mike Paul wrote, "Although the number of projects that were specific to the field of transportation and development were limited, it was still difficult to select winners as there were many worthy projects. I believe we were all impressed with the students' knowledge, professionalism and amount of time and effort that was spent developing the projects."

The special awards winners are listed below:

Junior Division
1st Place – Michael Strickler, "Lowering Drag in 18 Wheelers"
2nd Place – Riley Devall, "Will a Paper Bridge Hold Me"

Senior Division
1st Place – Wilson Brown, "Examining the Strength of Various Ratios of Aggregates in Concrete"
2nd Place – Amira Muhsen, "Concrete: The Perfect Mix"

LSU has posted a list of the various winners for 2012, along with a YouTube video that captures the essence and excitement of the Science Fair contest: Please go to http://www.outreach.lsu.edu/Sciencefari/default.asp?Home=1.

In April, your T&DI Chapter turned its attention to aviation. In fact, the seminar was held in the Parabola Boardroom at Louis Armstrong New Orleans International Airport (MSY). Our thanks to Committee Member Dennis Lambert, PE for managing all the details to bring this seminar to New Orleans. Mr. Andrew Lamb, Computer Specialist from the Federal Aviation Administration's Capacity Analysis Group in Atlantic City, New Jersey provided an interesting discussion of Capacity Design of Airfield Operations. Mr. Lamb described the immense quantity of data required to construct a working model of a major hub airport, such as MSY. The effort required formation of design teams at each major airport across the country. The individual teams evaluate current and future runway configurations, as well as the layout of taxiways and exits. The challenge for the air transportation industry in general, and MSY in particular, is to enhance existing airport and airspace capacity, and to develop new facilities to handle future demand. Mr. Lamb pointed out that environmental, financial, and other constraints will restrict the development of new airport facilities, with increased emphasis placed on the redevelopment and expansion of existing airport facilities.

In keeping with the intent of the Institute to provide training and networking opportunities for all professionals involved in transportation projects, the Chapter is planning the following future seminars:

- Hurricane Evacuation
- Toll Road Feasibility for the LA1/I-10 Connector in West Baton Rouge Parish
- NOLA Streetcar System – Past and Present
- Environmental-Impact of New Air and Noise Regulations on Transportation Permitting.

If you would like a seminar on any special topic, please contact Karen Holden at karenholden@providenceeng.com or Dan Aucutt at djaucutt@gmail.com.

Editorial: Engineering Create Destruction

By Deborah Ducote Keller, PE

Deborah Ducote Keller, PE

Last year I wrote an editorial on "sustainability" to create an awareness of ASCE's worldwide effort to foster, ***"A set of environmental, economic, and social conditions in which all of society has the capacity and opportunity to maintain and improve its quality of life indefinitely, without degrading the quantity, quality or the availability of natural resources and ecosystems."***

As I stated then, my personal experience in public works infrastructure hasn't shown me a benevolent public willing to make sacrifices so that everybody wins, nor such abundant financial resources that initial project costs can fund the best practices environmentally, socially, and economically for all stakeholders. Therefore, we have inherited an aging infrastructure that we can't afford to maintain, while we build new infrastructure that, we can't afford to make sustainable.

A book worth reading is "Too Big to Fall: America's Failing Infrastructure and the Way Forward" by Barry B. LePatner, whom I had the pleasure to give a private tour of post-Katrina New Orleans in 2006. The book chronicles the failure to maintain America's critical infrastructure. You'll be intrigued with his comments regarding the National Transportation Safety Board's report on the I-35 W bridge collapse in Minneapolis in 2007.

The author laments, "America is always about the next new thing. We build beautifully. But, building brings with it responsibility that extends long past the date when a project is completed and put into use. Our record of maintaining what we build is less than beautiful…"

The Honorable James L. Oberstar, former chair of the U.S. House Committee on Transportation and Infrastructure commented, "Unfortunately, infrastructure is not like fine wine. It does not improve with age. We do not save money by deferring maintenance. LePatner's book should sound the alarm for anyone-in and out of government-who uses and values our national transportation assets." Now, here is another concept that we engineers are accustomed to calling "functional obsolescence". Although this concept has its origins in Marxism, today "creative destruction" has a different connotation.

"Creative destruction" refers to innovation that is of such genius that it destroys the status quo and revolutionizes that which came before it. Think of the Gutenberg printing press, the Internet, digital technology, smart phones, and the I-pad as prime examples.

What does creative destruction (out with the old and in with the new) have to do with sustainability (make it once and forever)? I suggest that perhaps creative destruction is the solution to both aging infrastructure, which we cannot afford to maintain, and sustainable construction, which we cannot afford to build.

With our social and physical environment continually progressing with each new innovation that transforms civilization, do we want all infrastructures to last forever? I can't imagine wanting to trade any innovative consumer products I own today for its predecessors.

Perhaps our profession is not being creative and ambitious enough in our approach to infrastructure. Rather than thinking statically, we need to be more dynamic. We need to seek out that which will creatively destroy and revolutionize our infrastructure, rather than limiting ourselves only on maintaining old designs and making the current designs last longer.

Branch News

ACADIANA BRANCH

By Luke Hebert, PE, Branch President

The ASCE Acadiana Branch started the 2012-year with our first luncheon on February 29, 2012 at Abacus in Lafayette, Louisiana in which Dr. Kam Movassaghi, PhD, PE, F.ASCE from Fenstermaker presented on the recently completed "Report Card for Louisiana's Infrastructure."

Left is Mr. Jeffrey G. Shelden, PE from Moffatt & Nichols and on the right is Branch President, Luke Hebert, PE

The March seminar hosted by ASCE T&DI Louisiana Chapter, ASCE Acadiana Branch, and Co-Sponsored by ULL Department of Civil Engineering was held on March 20, 2012; attendees received 2 PDH. The seminar was presented by Mr. Jeffrey G. Shelden, PE from Moffatt & Nichols on the "I-10 Span Elevation Determination Case Study & the AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms." The seminar was well received with 48 attendees and over half of the attendees were ULL students.

The Branch took part in Engineering and Technology Expo Day on March 28, 2012 at the University of Louisiana at Lafayette where we set up an exhibit and spoke to approximately 500 high school students from the surrounding areas about Civil Engineering and ASCE.

We are currently working on setting up our yearly crawfish boil between ASCE, LES and IEEE which will be held sometime at the end of May.

If you should have any questions please call or email me at 337-237-2200/ luke@fenstermaker or any board member through our website at www.asceacadiana.net.

BATON ROUGE BRANCH

By Clinton Willson, PhD, PE, Branch President

Major thanks goes to Adam Smith, the Baton Rouge Branch Past-President, for chairing our Louisiana Section spring conference. We had a number of excellent technical sessions and were delighted to have the ASCE National President, Andy Herrmann, as one of our luncheon speakers and an active attendee at several of the sessions. I would also like to thank the sponsors and exhibitors for their support of ASCE.

There are some exciting things going on with our student chapters. In April, we co-sponsored an LSU/Southern University Career Fair and Networking Event. Thanks to Jennifer Richmond, our Younger Member Chair, and the following sponsors for helping us raise over $1600 for the student chapters: ABMB; CSRS; Engensus; Fenstermaker; Ford, Bacon and Davis; Fugro; GSA; and HNTB. During the first week of final exams, our LSU Practioner Adviser, Sarah Laakso, provided lunch one day for the LSU students – this event was a tremendous success and one that we will continue in future semesters. If you haven't heard the news, the Southern University student chapter will be hosting the Deep South Region Conference next spring. Please contact Kahli Cohren, our Southern University Practioner Adviser, for more information or if you would like to get involved. Finally, we would like to wish the LSU Steel Bridge team good luck at Nationals, being held at Clemson University. Geaux Tigers!

SHREVEPORT BRANCH

By Patrick Furlong, PE, Branch President

This year is flying by. We have had many great experiences and many more to come. This past March, Dr. Nazimuddin M. "Wasi" Wasiuddin was our featured speaker. Dr. Wasi is an Assistant Professor at LA Tech and he gave a very informative presentation, "*Performance-Based Test Methods for Asphaltic Surface Treatment*." Thanks again Dr. Wasi.

On April 20, 2012, the Branch hosted its annual Spring Classic Golf Tournament at Olde Oaks Golf Club. It was a great time to cut loose, relax and play a little golf. Special thanks go to David Smith for planning and organizing a successful tournament. On behalf of the Branch, I would like to thank all those who sponsored and participated in this year's tournament. Thanks to this support, the Branch will be able to continue awarding annual scholarships to Louisiana Tech students. Thank you for your continued support in our endeavors.

Spring Classic Golf Tournament at Olde Oaks Golf Club

Before our summer break, we will meet later this May. We are looking forward to hearing Paul B. Fossier, Jr., PE, give a presentation about the John J. Audubon Bridge.

NEW ORLEANS BRANCH

By Malay Ghose Hajra, PhD, PE, Branch President

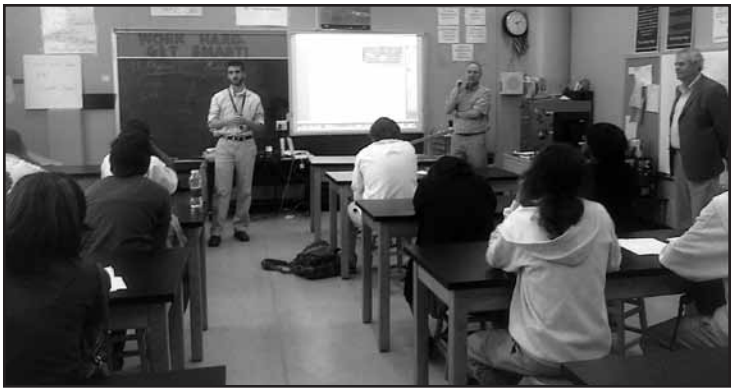
The New Orleans branch coordinated several events in the first quarter of 2012. The branch celebrated Engineers Week on February 25, 2012. Ms. Meg Adams, PE organized volunteer work at New Orleans City Park in the morning followed by a field trip to the Huey P Long bridge widening site. Enthusiastic participation by fifty (50) professional and student members of ASCE made this event a big success.

Dr. Denise Reed with the University of New Orleans (UNO) gave an informative and lively presentation

On March 21, 2012, Dr. Denise Reed with the University of New Orleans (UNO) gave an informative and lively presentation on the "*2012 Master Plan for Louisiana Coastal Protection and Restoration*." This membership event was held at Heritage Grill and drew a large crowd of 64 participants. On April 18, Mr. Rudolph McLellan, PE, senior technical advisor (structures) with G.E.C., Inc. gave a presentation on "*Structural Design overview of Bascule Span Bridge"* at our monthly luncheon membership meeting held at Five Happiness restaurant. In addition to getting a 1 Professional Development Hour (PDH) certificate, the attendees learned about the different types and components of Bascule Span bridge as well as their unique structural design challenges.

Several active members of the branch, spearheaded by Ms. Meg Adams, PE, participated in a new outreach activity to educate and encourage New Orleans High School students about Civil Engineering. On March 19, several practicing civil engineers and engineering students from UNO met with freshman and senior level students at a local charter school in their classrooms to explain the important role civil engineers play in the society and to encourage them in considering civil engineering as a profession. An educational tour to the college of Engineering at UNO was arranged on April

New Orleans High School students learn about Civil Engineering



Engineering students from UNO met with freshman and senior level students at a local charter school

12, where the fifty (50) high school students interacted with faculty members and current students to gain first-hand knowledge about the profession. The following day, the high school students were taken on a field trip to the Huey P Long bridge site in Jefferson parish, where they witnessed a historic civil engineering structure designed and constructed by practicing civil engineers. This outreach event was supported by ASCE State Public Affairs Grant (SPAG) and received positive feedback from the high school students and their teachers.

Many of our members have been busy with several other outreach programs in the city as well. Ben Cody, PE of Eustis Engineering participated in the Mathcounts competition by monitoring and coaching during the event. The New Orleans branch also donated money in support of the Mathcounts event. Ben and Nathan Junius, PE of Linfield Hunter and Junius also were judges at the Greater New Orleans Science and Engineering Fair (GNOSEF). The New Orleans branch also awarded cash prizes to the top three civil engineering projects at GNOSEF in both middle and upper school levels, as well as to the teachers of the winning students. The New Orleans branch also provided funds to the University of New Orleans (UNO) Concrete Canoe and Steel Bridge competition teams to participate in the Deep South competition.

The Engineers without Borders (EWB) – New Orleans professional chapter recently completed a reconnaissance trip to Caserio Toreras, a small rural community in the northeastern corner of El Salvador. The long term goal of this new project is to provide potable water to the community of about 250 people and as well as build a water distribution system to deliver water from natural springs in the area to all households, the local school, and the community fishery. A second assessment trip to the community is being planned for October or November of 2012. While the first assessment trip focused on collecting data from all sources within the community, the second trip will collect more detailed information on site

Engineers without Borders (EWB) trip to Caserio Toreras, El Salvador

EWB-NOLA - 4 member team who recently completed the reconnaissance tour to El Salvador; Harley Winer pictured far right.

conditions around those springs with the most potential for future development. The second trip will also provide an opportunity to talk more with the community about the potential alternatives and any constraints or specific objectives to be included for design. To get more information about the mission, you can visit http://ewbnola.wordpress.com.

Looking ahead in our calendar of events, the annual Louisiana Civil Engineering Conference and Show will be held on September 19 and 20 (Wednesday and Thursday), 2012 at Pontchartrain Center in Kenner, Louisiana. I encourage everyone to participate in the conference as well as nominate great speakers for the different sessions. More information about the conference and speaker nomination form can be found at http://www.louisianacivilengineeringconference.org.

As many of you already know, the Huey P. Long Bridge in Jefferson Parish was recently named a National Historic Civil Engineering landmark by ASCE National. The New Orleans branch will host the dedication ceremony on September 28, 2012 in the presence of President of ASCE National and other dignitaries. As plans are finalized, more information on the dedication ceremony will be communicated to the membership.

2012 also marks the 50th anniversary of the New Orleans Branch. The year- long celebration for our golden jubilee is underway to review past achievements and recognize individuals responsible for them. We have set up a special email address, asceno50@gmail.com, to collect input from all ASCE members. Please send us your civil engineering memories of the past 50 years. Pictures and videos are welcome and encouraged. As we finalize our plans to celebrate this achievement, more information will be posted on our website (www.asceneworleans.org) and communicated to the membership by email.

The ASCE New Orleans branch is looking forward to an eventful and busy 2012. Please visit our website www.asceneworleans.org for upcoming events and news and do not hesitate to contact me at mghoseha@uno.edu if you have any questions or need additional information.

On April 13, 2012, about 50 High School students from New Orleans Charter Science and Math High School were taken to the Huey P Long bridge widening site in school buses. A powerpoint presentation gave the students information about the history of the bridge, construction methods and current construction activities. The high school students were then taken to the bridge site on the levee to show them how the actual construction of the bridge is done. According to Mr. Timur Akman-Duffy, Physics I and Math Essentials: Geometry Instructor, New Orleans Charter Science and Math High School, "It was a great experience and we hope to make it an annual tradition! The students really enjoyed seeing the different aspects of engineering, and I think you even hooked a couple of them!"

Spearheaded by Dr.Norma Jean Mattei, ASCE- New Orleans branch organized a fun outreach activity for kids who came with their parents to enjoy Jazz Fest in New Orleans. The kids made different shapes with Legos. Additionally, kids had fun participating in a Geodesic Dome activity using tubes made of rolled up newspaper and masking tape. These future engieers had a lot of fun constructing pyramids, bridges, houses and other structures using the rolled up newspaper tubes.

ASCE 50th Anniversary Celebration of New Orleans Branch

American Society of Civil Engineers New Orleans Branch — PO Box 8281, Metairie, LA 70011-8281

2012 marks the 50th anniversary of the New Orleans Branch. Planning for the year- long celebration is underway. We will review past achievements and recognize individuals responsible for them. Our celebration will build throughout the year and culminate with a banquet in late summer. As we finalize our plans to celebrate this achievement, more information will be posted on our website (www.asceneworleans.org) and communicated to the membership by email.

We have set up a special email address, asceno50@gmail.com , to collect input from all ASCE members. Please send us your civil engineering memories of the past 50 years. Pictures and videos are welcome and encouraged. These memories will be used in various ways throughout the celebration.

Congratulations and sincere appreciation to all ASCE members for your continued support and participation as we celebrate our Golden jubilee.

ASCE-SEI New Orleans Chapter News

By Om Dixit, PE, FASCE, Newsletter Editor

STRUCTURAL ENGINEERING INSTITUTE
New Orleans Chapter

On Thursday, March 29 at the 2012 Structures Congress in Chicago SEI New Orleans Chapter was given the award of 2012 SEI Chapter of the Year at the Opening Plenary Awards Luncheon. The award was accepted by our founding member Om Dixit, PE on behalf of the Chapter. The SEI New Orleans Chapter has been selected to receive the Award in recognition of our exemplary activities and efforts to advance the structural engineering profession.

Since our report in February 2012 issue of this magazine, ASCE SEI New Orleans Chapter was busy hosting 2 seminars and has planned the following future seminars in New Orleans.

First seminar was held on January 26, 2012. SEI New Orleans Chapter invited Anthony J. Lamanna, PhD, PE of Anthony J. Lamanna Consulting Engineers, Inc., New Orleans to present a "CONCRETE ANCHOR DESIGN IN ACCORDANCE WITH ACI 318 APPENDIX D". Dr. Lamanna stated the history, scope, and organization of ACI 318 Appendix D Design of Mechanical Anchors with some basic anchorage definitions. Then he walked through a few provisions of the appendix, explaining the procedures and provisions in simple terms. The seminar was attended by about 65 members.

Another seminar was held on March 29, 2012. SEI New Orleans Chapter invited David Mandina of Mandina's Inspection Services, Inc. New Orleans to present seminar "APPLICATION AND ADVANCES IN NON DESTRUCTIVE WELD TESTING". David Mandina provided guidance on the requirements for welding inspectors, and NDT technicians and appropriate testing methods. The probability of detection (POD) of the latest NDT methods, the appropriate application and limitations of VT, MT, UT and PT were addressed and a few lessons learned and project experiences were also presented. The seminar was attended by about 45 members.

SEI New Orleans Chapter also cospons ored with ACI Louisiana Chapter the *ACI/PCA 318-11 Building Code Seminar on April 12, 2012. This seminar covered all the major changes in this new edition of the code.*

On May 9 SEI New Orleans Chapter has invited Dr. Joseph Yura, (University of Austin, Austin, Texas) to present the 2012 David Hunter Lecture "Connection Eccentricities and Restraints: Common Misconceptions". Dr. Yura addressed the confusion among the structural engineers about the moments and forces caused by eccentricities and undesired restraints in steel structures design.

ASCE SEI New Orleans Chapter sponsored Coaches Lounge at the Regional Mathcounts competition held at University of New Orleans and provided a few volunteers for managing the competition.

The ASCE SEI New Orleans Chapter sponsored awards at Greater New Orleans Regional Science Fair held in February 2012. The award winners were:

Junior Division
The First Place ($150) award was given to **Kevin Le** for his project "Addesive Strength". The Second Place ($100) award went to **Grace Borcherdin** of John Curtis Christian School for her project "Would You Like a Hammer or Nail Gun".

Senior Division
The First Place ($150) award was given to **Blake Theriot** of John Curtis Christian for his project "Good Vibrations". The Second Place ($100) award was given to **Amira Mottsen** of for his project "Concrete, the Perfect Mix".

This year the awards of $50 were also given to the Teachers of the first place project's school for encouraging their students to do a Structural Engineering project. These teachers were ***Julie Abreo*** and ***Cathy Boucvalt*** of John Curtis Christian.

The committee is looking for good topics and speakers for future presentations. Members with expertise in the field of structural engineering would be welcome to join the Executive Committee. For any suggestion and information on joining the Executive Committee, contact Chairman Zolan Prucz, PhD, PE, at zprucz@modjeski.com.

All seminars are held at the University of New Orleans. Seminar dates, pertinent information, and registration can be found on the New Orleans Branch website at www.asceneworleans.org. To add your name to our mailing list, e-mail Om P. Dixit at om@fenstermaker.com.

At the Structural Congress in Chicago on March 29 Om Dixit, PE (center) accepting the "SEI Chapter of 2012" award on behalf of the SEI New Orleans Chapter. Others in photo are Sam Rihani, PE, President SEI (left) and Charles Roeder, PhD, SEI Awards Committee Chair (right)

UNIVERSITY OF LOUISIANA AT LAFAYETTE

By Jacob Benton, Student Chapter President

The student chapter has continued to excel through this semester. Numerous students have attended conferences so far this spring semester and have represented the university well. The student chapter has sent students to the national leadership conference, the spring ACI conference, as well as the ASCE regional Deep South Conference.

At the end of January six students ventured to Nashville, TN to attend the ASCE National Leadership Conference. In an effort to continue to improve the status of our student chapter a decision was made to send sophomores and juniors to the conference. While at the conference the students gained knowledge on what tactics and methods would be successful in running a student chapter. They also had an excellent opportunity to network with both students and professionals. All students returned saying that the conference was a success and would be extremely beneficial to our chapter.

To continue a presence in the ACI community a group of six students traveled to Dallas, TX in early March. The purpose of this trip was to participate in the concrete bowling ball competition. Two teams of three students each entered the competition. Both teams put forth a valiant effort however neither team placed in the prize categories. While attending the conference the students attended committee meetings and presentations to further their knowledge of concrete. The students thoroughly enjoyed the conference and felt their attendance was a valuable learning experience.

The ASCE Deep South Regional Conference took place March 30-31 at the University of Tennessee-Martin. The student chapter is very proud to say that they had the largest number of students at the conference with 24 in attendance. The students also entered every competition which is a great feat for our chapter. The chapter would also like to recognize those students who competed and did an excellent job. The asphalt pigeon team placed third while the surveying team and mystery design team both put tremendous efforts into their respective competitions. The concrete canoe team achieved a major goal for our chapter by building a canoe for the first time in nearly ten years. The canoe team also performed well by placing in two of the races held at the conference. The steel bridge team was nothing short of spectacular at the conference. Not only did the team place second overall and qualify for nationals but they also placed in every prize category. The bridge team has garnered much support as they plan to compete at the national competition at the end of May.

The student chapter wrapped up a successful year with a banquet on April 27. The chapter would also like to congratulate the eleven seniors that are graduating this May and wish the steel bridge team best of luck as they embark on the national competition.

If you wish to contact the UL Lafayette Student Chapter they can be reached at ullafayetteasce@gmail.com.

ASCE students at the spring ACI Conference in Dallas, TX

ASCE students at the Deep South Regional Conference

UNIVERSITY OF NEW ORLEANS

By Amy Robards, Student Chapter President

The University of New Orleans' ASCE Chapter has been working very hard since the beginning of the 2012. UNO ASCE has participated in service hour events, socials events, a field trip to the Huey P Long Bridge, and an Engineers-Week (E-Week) presentation that took place at Sci High, a New Orleans Charter Science and Mathematics School.

Located on Loyola Avenue, Sci High is one of the top six public schools in New Orleans. They stress an importance on critical thinking, leadership and community, and hard work. Teachers and students, from UNO and ASCE New Orleans, visited the freshman and senior level physics classes and explained the different types of engineering and described the typical work they do on a daily basis. Sci High will also be participating in a tour of the UNO campus during mid April. The engineering societies plan to show the students around the engineering building and explaining the specific projects they work on each semester, such as the concrete canoe and the steel bridge.

UNO ASCE also proudly participated in a tour of the new segments of the Huey P. Long (HPL) Bridge. Workers from LTM, a government company who is working on the bridge, allowed professionals and students to tour the work being done from underneath and on top of this monumental structure, which is being recognized as a National Engineering Landmark later this year. The tour was in conjunction with a service project called Super Saturday. Engineers spent the first half of the day laying new trails in the depths of City Park, and then the group bussed to the HPL to tour the bridge. The event was a great success, with over thirty professionals and students in attendance.

UNO ASCE also helped organize a couple of social events throughout the year including the UNO Bowling Event at Rock n' Bowl, where engineering students enjoyed a night of bowling and networking, and the most recent event, the ASCE BBQ and Canoe day at Bayou St. John. At this event, which is held the first weekend in April, members of the organization met at the bayou to race canoe and kayaks, play kickball, and enjoy some good barbecue.

ASCE UNO plans on inducting the new officers by mid April and since the school year is coming to a close, our final event will be participating in Senior Cap Day and wishing the seniors good-luck as they graduate from UNO and enter the workforce. Overall, it has been a great year and we look forward to making it an even better time next year.

Service project called Super Saturday

UNO ASCE tour the new segments of the Huey P. Long (HPL) Bridge

— CALENDAR OF EVENTS —

JUNE 2012	
June 21, 2012	**Past Presidents and Awards Luncheon** *Time and Location: 11:30, Drusilla Catering $* *25 Members, $30 Non-Members, $10 Students* *RSVP: secretary.ascebr@gmail.com*
June 25-27	**CRCL/CPRA State of the Coast - New Orleans**
JULY 2012	
July 18-20, 2012	**Structural Design of Buildings and Industrial Facilities for Bomb Blasts and Accidental Chemical Explosions** *Region 5 - New Orleans*
MORE INFO	
October 24-26, 2012	**ATC-SEI Advances in Hurricane Engineering - Miami, FL**
November 4 -8, 2012	**Electrical Transmission and Substation Structures Congress - Columbus, OH**
May 2-4, 2013	**Structures 2013 Congress - Pittsburgh, PA**

Please check for latest updates online: **http://www.lasce.org/calendar.aspx**

REGION 5 – ASCE SUMMER 2012 CONTINUING EDUCATION SEMINARS AND WORKSHOPS

Geographic Services is proud to announce the Continuing Education Schedule of seminars and workshops for Spring 2012 and Summer 2012 scheduled in your geographic area. These seminars/workshops have been produced by ASCE's Continuing Education Department with your members in mind. This new schedule has been placed under the ***Links*** *tab* on each Region website.

July 18-20, 2012 - New Orleans, LA
Structural Design of Buildings and Industrial Facilities for Bomb Blasts and Accidental Chemical Explosions

September 13-14, 2012 - New Orleans, LA
Structural Design of Industrial Facilities ~ *Newly Updated*

September 27-28, 2012 - Atlanta, GA
Pumping Systems Design for Civil Engineers

If you have any questions, please contact me, Jackie Simon at 703-295-6143 or jsimon@asce.org

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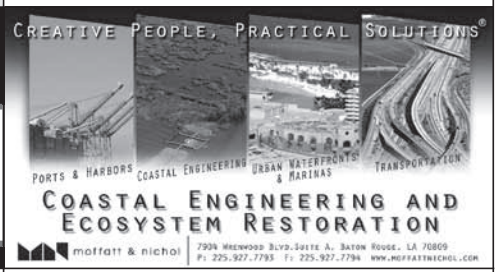

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