Louisiana Property and Casualty Insurance Commission
Full Commission Meeting

Thursday, April 14, 2011
Louisiana Department of Insurance
Plaza Hearing Room
10:00 a.m.

Minutes

Commission Members Present: Commissioner Donelon, Raymond Aleman, Lee Ann Alexander (via conference call), Paul Buffone, Michael Guy, Chris Haik, Ann Metrailer, Robert Moorman, and Rina Thomas

Commission Members Absent: Ted Haik, Jeff Albright, Senator Dan Morrish, Senator Eric LaFleur, Representative Chuck Kleckley, Representative Page Cortez, Sheriff Greg Champagne, Manuel DePascual, Nick Gautreaux, Lance "Wes" Hataway, LTC John A. LeBlanc, Stephen Schrempp, and Earl Taylor

Commission Staff Present: Terrell Moss, David Evans and Katie Walsh

DOI Staff Present: Trent Beach, Paul Boudreaux, Caroline Brock, Rachelle Carter, Denise Cassano, Wei Chuang, Lori Cherry, Kathy Drake, Sherice Forte, Linda Gonzales, Phaedra Grover, Charles Hansberry, Neysa Hurst, Madonna Jones, John Lamke, Ben Moss, Ron Musser, Candace Nalepa, Ed O'Brien, Rich Piazza, Tana Prejean, Cindy Riviere, Larry Steinert, Bill Werner, Kori White, Shantell Williams Taylor, and Judy Wright

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Mr. Chris Haik, acting as LPCIC Chairman for the meeting, called the meeting to order at 10:10 a.m. He acknowledged new member Rina Thomas (Governor's designee) and also welcomed the Commission members and all others in attendance.

Ms. Walsh called the roll.

Mr. Haik introduced representatives from Risk Management Solutions (RMS): Mr. Reid Edwards, Senior Director of Global Government Affairs, Ms. Kay Cleary, Director of Mitigation and Regulatory Affairs and Mr. Joel Taylor, Senior Analyst.

RMS – a leader in catastrophic risk modeling – released its most recent U. S. Hurricane Model, RiskLink 11, earlier this year. Mr. Taylor explained that insurers use hurricane models to help determine the amount of risk their policy portfolio represents and the amount of capital, reinsurance, and premium necessary to meet their hurricane exposure, as well as to develop their underwriting guidelines and rate individual risks. Mr. Taylor noted that it had been 8 years since the last major revision of RMS' hurricane model. Three drivers for updating the previous model include improvements in data, computing power and validation. Mr. Taylor explained how these three factors resulted in the model projecting a greater expectation of loss further inland because of a better understanding of how hurricanes deteriorate over different types of terrain. New loss expectations and potential rate impact on Louisiana were also covered in the presentation. RMS' new hurricane model has not yet been filed for use in Louisiana.

The RMS presentation is attached and thereby made a part of these minutes.

The RMS presentation generated extensive discussion between the members and RMS representatives with Commissioner Donelon and members of his actuarial staff, in particular, closely questioning the modelers. The topics of discussion were:

- » RMS explained that changes between its Version 10 and 11 hurricane models indicate a 50% increase in Average Annual Loss (AAL) for "wind only" in Louisiana for all lines of business combined (residential, commercial, and industrial). Thirty to thirty-five percent of this increase is in residential with the majority of the remainder in commercial.
  - **What changed so dramatically between the models to account for the increase?** RMS explained that this is the first time since 2003 that all four components of the model have been updated, including storm and claim data through 2008.
  - **Is it an increase in hazard (storm characteristics, such as wind) or vulnerability (the amount of damage to property inflicted by hazard) or both that is indicating the increase in AAL for Louisiana?** RMS replied that the main change impacting Louisiana is the use of a new methodology to calculate "inland filling" – what happens to the intensity of various types of storms as they move over land – that more accurately reflects what is observed in nature. So, the increase is primarily the calculation of hazard, but to a lesser extent vulnerability, too.
  - **What fraction of the change in AAL is due to vulnerability versus hazard?** RMS did not have a "breakout" available for Louisiana at the time, but stated that vulnerability was greater for commercial than residential.
  - **Why does the new model indicate greater vulnerability for commercial?** RMS pointed to detailed Hurricane Ike claims data that documented things like extensive roofing failure for commercial structures.
  - **Ike was not a major claims event in Louisiana like Katrina, Rita and Gustav. Would the model indicate the same changes without Ike data?** RMS stated that data from each storm was included in the model. Ike data helped validate the "inland filling" element of the model and Texas vulnerability. Without Ike data "inland filling" would still be the main driver of the changes in Louisiana.
  - **With regard to the 50% increase in AAL, do you have an actual breakdown comparing personal residential lines to commercial lines?** RMS did not have the information with it, but stated that the increase was generally higher for

commercial in all the states because of greater vulnerability due to the quality of commercial construction.

RMS agreed to provide additional detailed information at the parish level.

» RMS' former 6 U.S. hurricane vulnerability regions have been redefined as 14 regions. Previously the regions broadly reflected coastal, midland and inland damage exposure, but now reflect coastal and non-coastal, in part, because of stronger construction along the coastline. The new vulnerability regions place Alabama and Texas in a different region than Louisiana, Mississippi and Georgia.

- **Why is Alabama in a different and less vulnerable region than Mississippi and Louisiana?** RMS offered several possible reasons such as building codes (variations and enforcement) and climate (Gulf climate causes quicker deterioration of roofing.), but could not be specific.

RMS agreed to provide additional detailed information.

» RMS explained that its new model more accurately predicts storm surge, particularly when a hurricane like Katrina drops in intensity shortly before landfall. This storm surge feature can be used to predict the cost of "surge leakage" which occurs when the wind only insurer pays a portion of the water damage. The surge calculation is an option that can be selected by the user; the default is wind only.

- **How do you know whether an insurer's rates include "surge leakage?** RMS noted that the model outputs a report that clearly indicates whether the surge feature was used. In addition, the Louisiana Department of Insurance (LDI) actuarial staff routinely asks an insurer submitting a rate filing which switches were turned on and off when they ran the model.
- **Only a part of a parish would be affected by storm surge and unlike the tidal wave of a tsunami, the surge rises. How far inland are you factoring storm surge?** RMS stated that surge will occur farther inland at bays and estuaries, but had no specifics.

RMS agreed to provide additional information about the extent of storm surge.

» RMS displayed a graph (Slide 52) to show the possible impact that the new model could have on an individual insurer's portfolio as measured for all lines of business nationwide. The impact ranged from a near 350% increase to a 50% decrease measured at AAL and 100 and 250 years.

- **Was the underlying data dollar-weighted per book of business or was it treated as if each book had one exposure counted once and equally as if it had a million exposures?** RMS said that the graph represented the latter. It was agreed you could not determine "just what was going on in the marketplace" based on this graph; some of the books of business could have very small losses.

» RMS explained that it validated its new model through use of $7 trillion worth of test data, compared its modeled results with historical storm and claims data and submitted the new model to an external peer review.

- **How did you validate this new model? And how did it compare in that validation against Version 10?** RMS stated that the new Version 11 does compare better than Version 10. Comparisons are made with actual claims data on a client by client basis and on an industrywide basis. Inland filling and other portions of the model were validated as well.

  RMS agreed to provide a document that is coming out shortly that will cover the full validation that they have done.

- **Do you measure the error when you're validating as to how the model is off, either up or down, for each of those data sets? On average, what is the standard deviation of the modeled results against what actually occurs in an individual book of business? How close are they?**

  RMS agreed to provide this information in the validation document.

- **Is there reason to believe that there are going to be more increases in the future or was there any tempering of the results this time around with the new research from what your best estimate might have been, which would lead you to believe that maybe the result is going to go up again?** RMS said that there was no tempering, that this model is their best estimate of risk at the current time, and that they cannot project whether risk will go up or down in the future. RMS stated that they try to be scientifically and intellectually honest.

» RMS presented a generic example of a User Output report to demonstrate the many analysis settings in the model that can be selected by an insurer client when inputting its book of business. RMS explained that in reality the report could show how many insured locations "have storm shutters, how many have a gable roof."

- **How does a company know what kind of roof their insured property has?** RMS replied that it is the responsibility of each insurer to collect and store that information and that they encourage each company to store "as much information as they can accurately verify." Insurers may visually inspect each insured location or have the agent ask a series questions or have the applicant/insured fill out a form describing their home. It was suggested that roof type could be established by using satellite images. RMS stated that the quality of the data on each applicant/insured's residence is up to the insurer, agent and the applicant/homeowner. If the roof type is unknown then the model defaults to the predominant roof type in the parish ("pulls a specific curve that represents the distribution of what's in the county").

- **Is Louisiana factored in for what we have done in enacting and enforcing a statewide building code over the last 5 years?** RMS responded that building codes are reflected in the model as they change, but that enforcement is harder to reflect. If the user (insurer) knows that the structure is built to a specific building code, then that can be entered and reflected among the "hundreds of secondary characteristics" in the model. RMS stated that data relating to the quality of construction is not just the responsibility of the agent, but the homeowner as well.
- **Many consumers are unaware of the mandated premium discounts available for building or retrofitting to the building code. Why isn't anything built since the adoption of the statewide building code automatically recognized in the model as built to the building code?** RMS explained that its model does not automatically reflect building code compliance in Louisiana based on the year of construction (a "year band"), citing a lack of evidence regarding claims and enforcement data. In this regard Louisiana is treated differently than Florida. In Louisiana, only those applicants/insureds who "make the investment," bring building code compliance to the attention of the insurer/agent, and have their data inputted by the insurer get recognized for building code compliance. In RMS' model, building code is under the Vulnerability index and is on a parish by parish basis.

» Discussion shifted to the history, use, and reliability of catastrophe models, in general.

- **Did Karen Clark invent cat models?** RMS replied that she was one of the early pioneers along with RMS founder, Hemant Shah. RMS and AIR Worldwide Corp. (AIR) both started at about the same time around 1988. Prior to Hurricane Andrew neither RMS nor AIR were widely known. Andrew and to some extent Hugo helped accelerate development because models were not accurate enough based on prior historical record. RMS focused initially on earthquakes.
- **Do reinsurers and rating services use the same models?** RMS said that reinsurers use the same models, including those of RMS' competitors. Rating services use the same models but also look at how an insurer uses the models and the outputs of those models.
- **Who are your clients?** RMS believed every reinsurer in the world uses the RMS cat model or a competitor's or all 3 modelers' (RMS, AIR, and EQECAT). Of the major insurers in the U.S., most use RMS, and a lot of them will use more than one model. The major insurance and reinsurance brokers usually run all 3 models.
- **How can 3 models look at one insurance company and 2 of them produce identical results and the 3rd be way off?** RMS explained that cat modeling is a developing, evolving science. Each model has its strengths and weaknesses and assumptions that go into it. It is not unusual to have a variety of results. The models have a fair amount of uncertainty, which the modelers try to shrink over

time. RMS strongly encourages its clients not to use a point figure in the middle as the answer, because there is no one right answer. There is a range of possibilities between 1 and 100 or 1 and 250. Variations in models are based on the amount of research and development (R&D) and claims data. RMS stated that it has far more claims data than any competitor and invested more annually on R&D on updating and producing new models.

- **Even with all that you were off by 50% last year (the amount of total increase called for in LA this year). It seems that the best measure of risk is an insurer's and the insurance industry's profitability.** RMS said that it would not say that it was wrong before, just that now for the first time since 2003 it has more and new claims data and more and new science which has changed the view of risk. RMS agreed that rates are really important, but in the end solvency is even more important. Models are useful as part of a company's assessment of its overall risk and what its overall rate should be. Models are most valuable in understanding the nature of the risk overall and the need to be solvent.
- **The NAIC has spent a lot of time studying whether to set up its own cat model in order to compare and contrast with the insurance industry's modelers.** RMS expressed its hope for ongoing dialog with the states and is preparing a "best practices document" to aid regulators. RMS believes that a better educated regulating environment will do a better job of regulating its insurance clients, which is a positive for the companies, as well.

At 11:50, with no further business to discuss, Mr. Chris Haik made a motion to adjourn the meeting.

RMS

April 13, 2011

The RMS U.S. Hurricane Model Version 11

Joel Taylor

Senior Analyst - Mitigation and Regulatory Affairs

Kay Cleary

Director – Mitigation and Regulatory Affairs

Reid Edwards

Senior Director – Global Government Affairs

Louisiana DOI

Introduction to RMS

"At RMS, our goal is to help manage catastrophe risk through the practical application of the most advanced quantitative risk assessment techniques available."

- Hemant Shah, Co-founder & CEO

- Founded at Stanford University in 1988 (20+ years experience)
- >500 employees; 45% have advanced degrees and ~100 PhDs
- Over $150 million invested in research and development over the past 12 years
  - 40% of expenses committed to R&D
- Global presence in major insurance markets

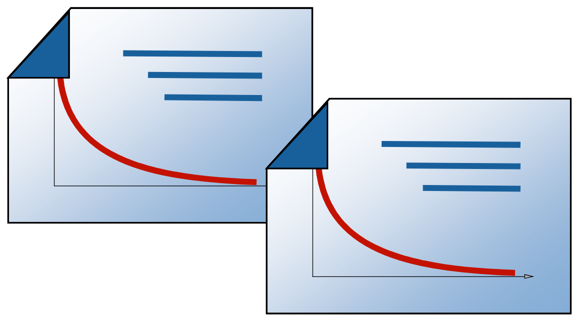
Agenda

- Catastrophe Models
  - How are they used
- RiskLink 11 Changes
  - Key model changes
- Loss Result Changes

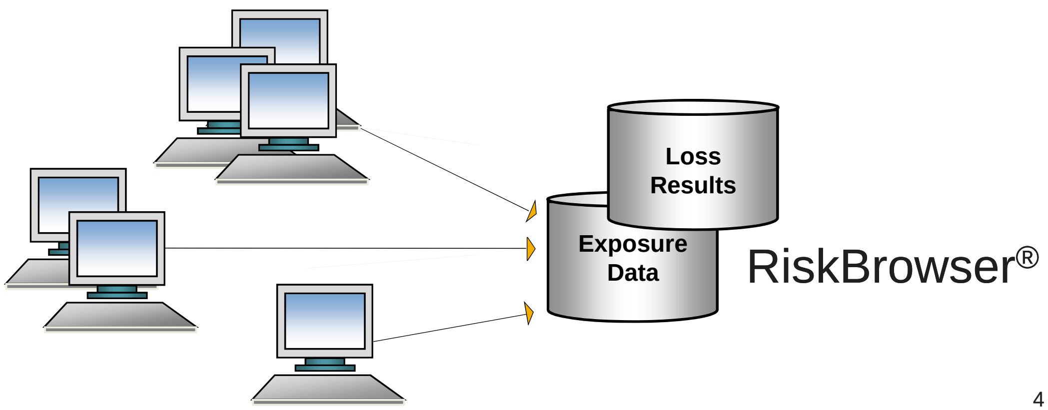
How are RMS Models used in the Market?

- **Portfolio Management**
  - Determine risk drivers
  - Evaluate capital adequacy
  - Allocate capital
  - Estimate post-event losses
  - Accumulation management

- **Risk Transfer**
  - Determine reinsurance needs
  - Structure and price risk transfer
  - Communicate with counterparties
  - We are an independent party

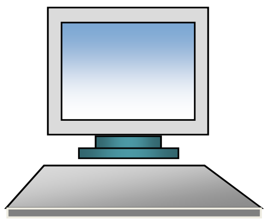


- **Underwriting**
  - Establish guidelines
  - Differentiate risks
  - Analyze policy structures
  - Develop pricing



How do Clients Use Our Models?

- Insurers have a limited amount of data to make projections
  - How well do they understand ‘tail risk?’
  - How well can they represent correlation of risk in their portfolios?
  - Will they be able to pay all of their losses if an event occurs?
- Clients pay to license our catastrophe model software
- Clients run the software locally
  - Clients must make decisions on user options
  - Clients are responsible for the quality of their exposure data
- Users input their book of business (referred to as exposure) and create a results database from our models

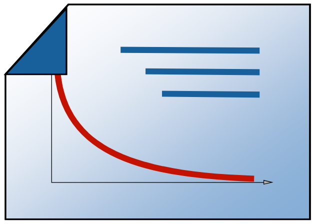


User Inputs

- Address
- Physical characteristics of insured buildings
  - Construction
  - Occupancy
  - Year Built
  - Number of Stories
  - Floor Area
  - Other characteristics…
- Coverages
  - Structures, Contents, Additional Living/Loss of Use
  - Limits, Values, Deductibles
  - Reinsurance

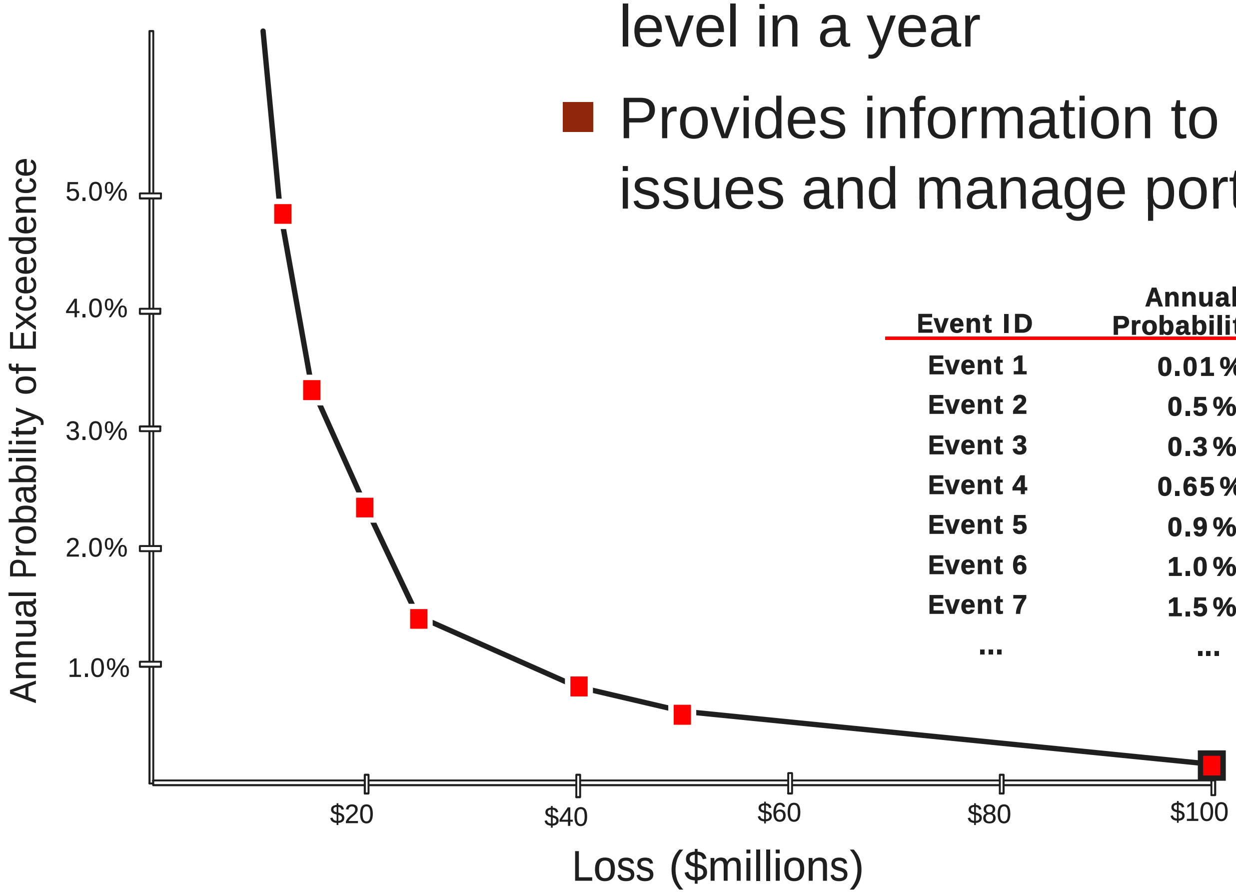
Loss Metrics

- Clients gather key metrics from our model to make their business decisions
  - EP curve: the probability of exceeding a loss level in a given year. Most often referred to as ‘return period’
    - Two types of EP curve: Occurence Exceedance Probability (OEP) and Aggregate Exceedance Probability (AEP)
      - OEP: Probability that the single largest event in a year will exceed a loss threshold
      - AEP: Probability that the aggregate event losses in a year will exceed a loss threshold (considers multiple events per year)
  - Average Annual Loss (AAL): the amount of modeled premium an insurer needs to collect in order to cover the average peril loss over time
    - Combination of event frequency and mean event loss



Exceeding Probability Analysis

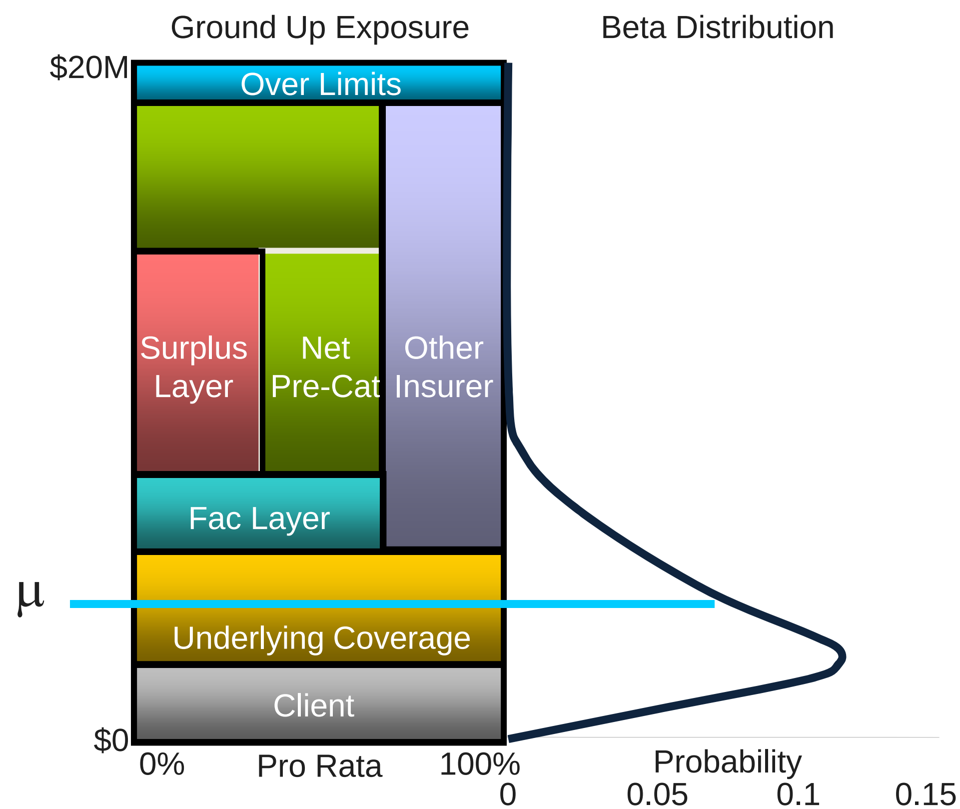
- The loss-exceedance curve plots the probability of exceeding a particular loss level in a year
- Provides information to assess solvency issues and manage portfolios



Event ID	Annual Probability	Loss	Cumulative Probability
Event 1	0.01%	$100	0.01%
Event 2	0.5%	$50	0.51%
Event 3	0.3%	$40	0.81%
Event 4	0.65%	$25	1.45%
Event 5	0.9%	$20	2.34%
Event 6	1.0%	$15	3.32%
Event 7	1.5%	$12	4.77%
...	...	...	...

Financial Modeling: Allocating Loss

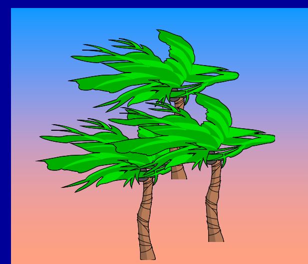
- Loss for a given event is borne by multiple participants
- Variability around mean drives potential loss to higher layers
- Exceedance probability curves can be generated for each participant



The U.S. Hurricane Model
Version 11

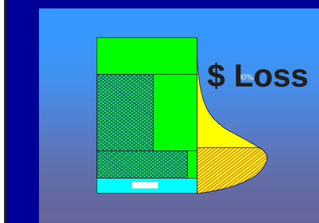
Framework for Modeling an Individual Event

Define Hurricane



Assess Wind Speed

Calculate Damage

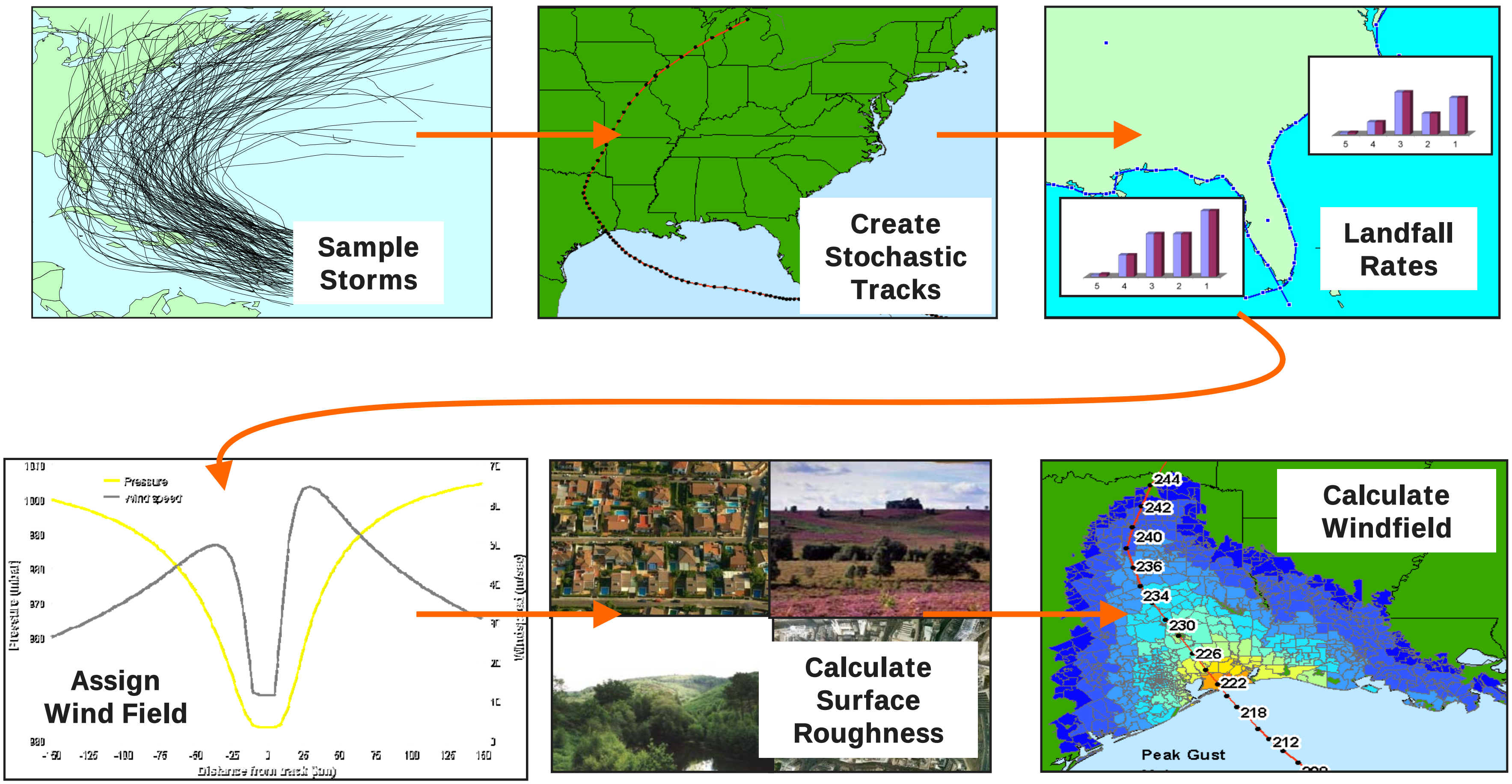


Quantify Financial Loss

Cat models are typically structured into various components that mimic the process of estimating hurricane risk to a portfolio.

- A **stochastic event component** which simulates physical parameters, location, and frequency for each storm in a set of stochastic storms covering the full range of potential hurricanes.
- A **hazard model** determines the relevant variables, for example the peak-gust wind speed for each stochastic storm and analyzed location.
- A **vulnerability module** that links hazard and damage.
- A **financial model** that estimates the loss given the damage.

From Historic Storms to Stochastic Windfields



Changes in Statewide AAL

- Based on 2011 RMS IED
- All Lines of Business

v10	v11	Absolute Difference	Percent Difference
710	1,066	356	50%

($millions)

Losses based on Gross average annual loss, historical event rates; include loss amplification

Absolute Loss Cost Changes vs. Percent Differences

- Percent change can demonstrate different message than absolute changes.
- Even after inland increases, risk is still far greater for coastal counties than inland counties.

Parish	v10	v11	Difference	% Change
Caddo	0.00	0.07	0.07	8402%
Cameron	4.28	3.88	-0.40	-9%
St. Bernard	1.36	1.84	0.48	35%

Losses based on Gross average annual loss, historical event rates; include loss amplification

Total Rate Impact

- Change in modeled hurricane loss does not directly relate to change in premium

Premium Component	v10	v11	Absolute Difference	Percent Difference
Caddo Parish				
Hurricane	0.00	0.07	0.07	8402%
Other Pricing	1.80	1.80	0.00	
Total	1.80	1.87	0.07	4%
Cameron Parish				
Hurricane	4.28	3.88	-0.40	-9%
Other Pricing	1.80	1.80	0.00	
Total	6.08	5.68	-0.40	-7%
St. Bernard Parish				
Hurricane	1.36	1.84	0.48	35%
Other Pricing	1.80	1.80	0.00	
Total	3.16	3.64	0.48	15%

Hypothetical rate example: Losses based on Gross average annual loss, historical event rates; include loss amplification

Three Key Drivers for the Upgrade

Data →

- $18 Billion high-resolution claims data
  - Refined vulnerability functions
- 10x more wind/surge data

Computing Power →

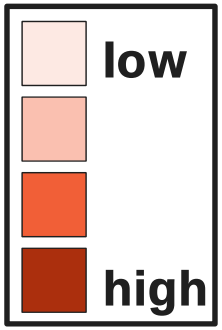
- Numerical wind modeling
  - Hurricane decay over land
  - Frictional effects of surface
- High-resolution storm surge model

Validation →

- $7 Trillion in test data
- Historical comparisons
- External peer review

What's New in Version 11 - Overview

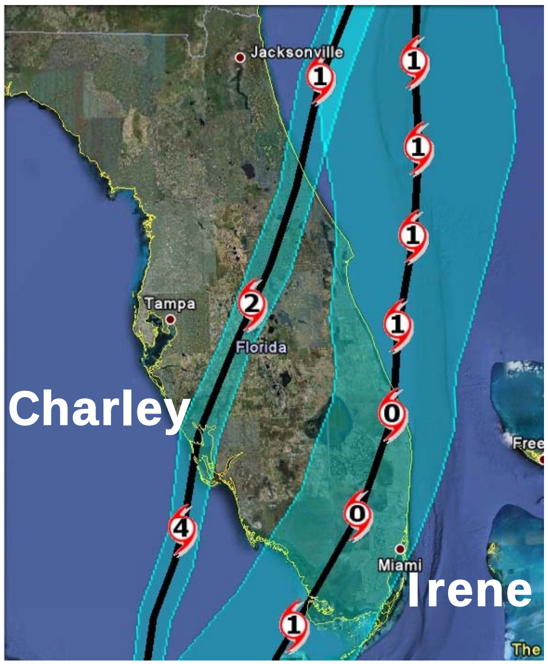
Model component	Main changes (methodology, input data)	Impact (scale)
Inland Filling Model	New model uses landfall predictors to determine more accurate decay rates	
Roughness Model	Incorporate results of new research on over water roughness reduces risk over land	
Vulnerability Model	New claims data from Ike indicated underestimate in old model	
Surge Modeling	New detailed methodology used to create realistic event sets.	
Post Event Loss Amplification	Reduction in Economic Demand Surge to reflect current state of economy	
Landfall Frequency	No change in landfall frequency	



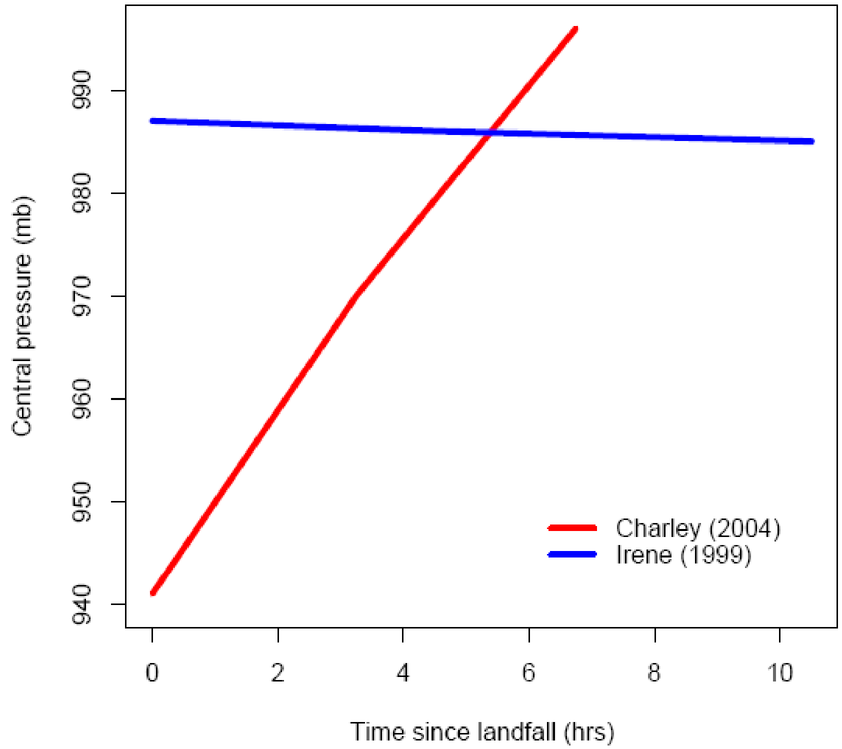
Inland Filling

Revised View of Inland Risk

- "Inland filling" characterizes how the eye of the storm "fills" after landfall and the pressure increases as hurricanes are removed from their primary energy source
- Not all storms fill in the same way - but detailed multi-parameter data limited to last 20 years
  - limited information to guide the simulations of a hurricane's decay after it makes landfall



Pressure time series from landfall



Addressing Inland Filling

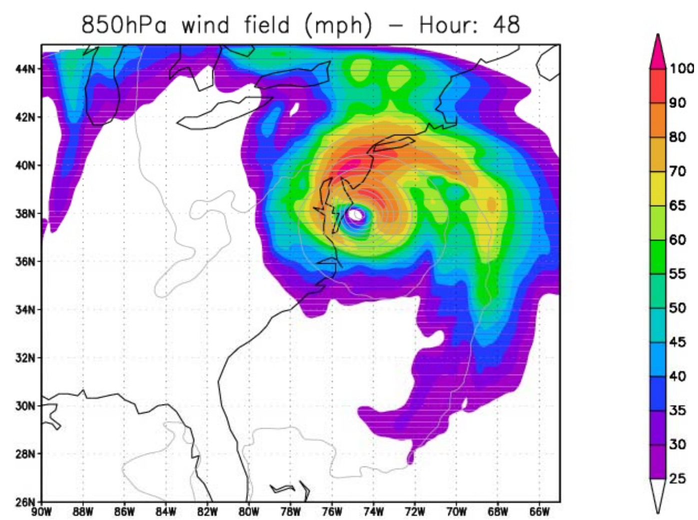
- Three year RMS R&D project involving a team of six PhDs
- RMS worked with leading experts in Hurricane modeling
  - <u>Dave Nolan - Associate Professor at University of Miami</u>
    - 10+ years experience in numerical simulations
    - Reviewer for the inland filling model

  - <u>Tim Hall - Senior Scientist at Goddard Institute for Space Studies</u>
    - 10 years experience in statistical modeling of tropical cyclones, and tropical cyclone landfall risk analysis
    - Assisted in track model development

Bringing New Modeling Methods to Fill the Gaps

- RMS conducted largest ever numerical modeling study (WRF) of hurricane behavior at and post landfall
  - Simulated over 1,000 years of hurricane landfalls in realistic mesoscale circulations
  - Increased the number of ‘storms’ by approximately 40 times compared to historical record
  - Used in combination with available historical data to produce a new model of inland filling
- Peer reviewed methodology

“Using Mesoscale Simulations to Train Statistical Models of Tropical Cyclone Intensity over Land” ,
Colette, A., Leith N., Daniel, V., Bellone, E, Nolan D.S.
Monthly Weather Review Vol. 138, No. 6. (June 2010)

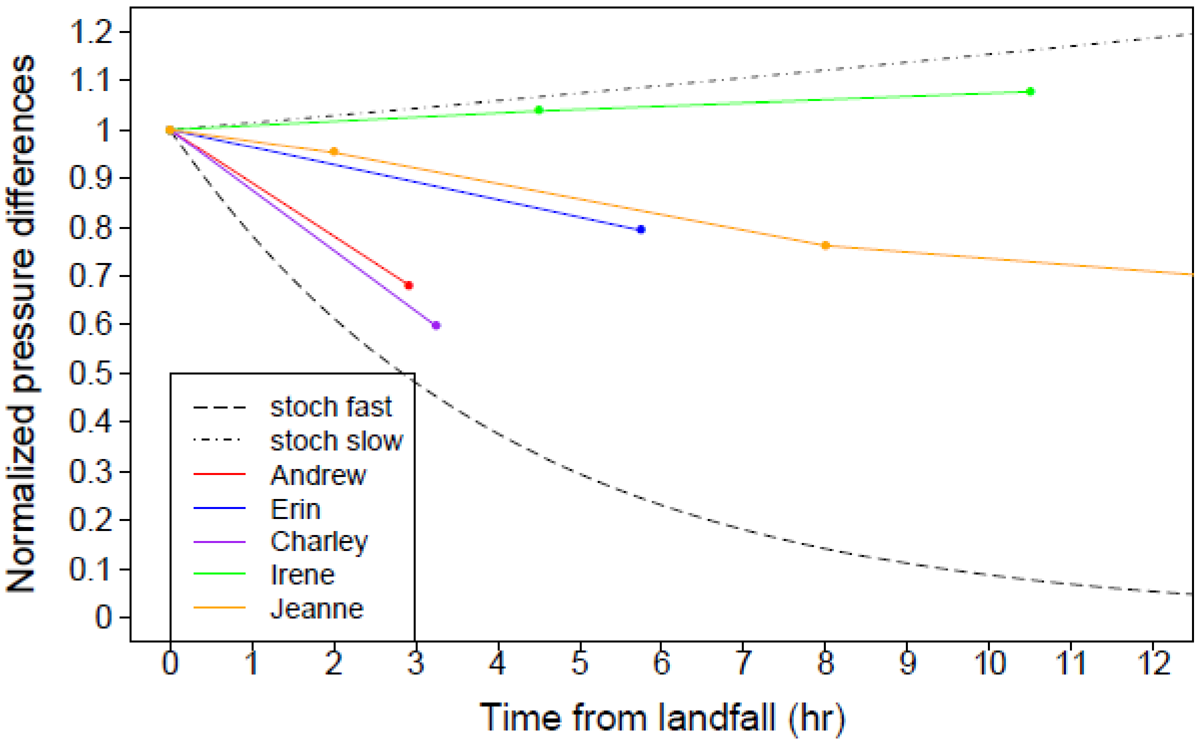


Key Features of New Statistical Filling Model

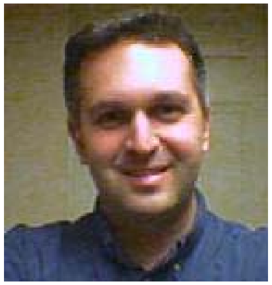
- Improved ability to produce full range of filling rates observed in nature.

1. Consideration of multiple storm-specific predictors
2. Regional models created for
   - Gulf Coast
   - Florida
   - Atlantic Seaboard
   - Caribbean

Comparison of bounds of RMS filling model with key historical storms.



Model Reviewed and Validated by Independent Expert



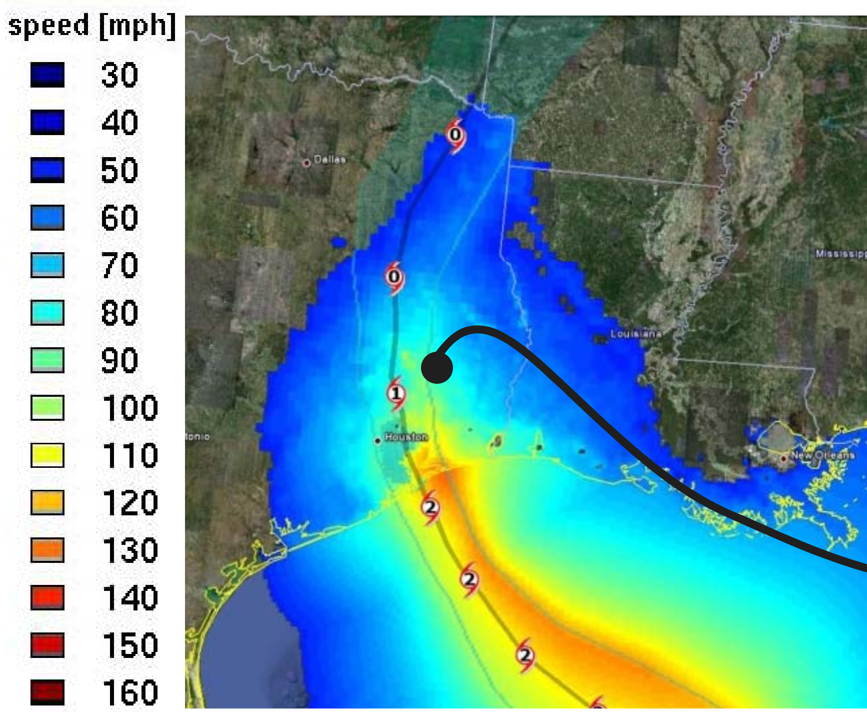
- RMS also engaged in other external reviews to validate that our methodology and models were sound and state-of-the-art.
  - Bob Hart (Associate Professor, Florida State University):
    - Reviewer for the inland filling model
    - 10 years of experience in hurricane simulations
- Quotes from Hart's review

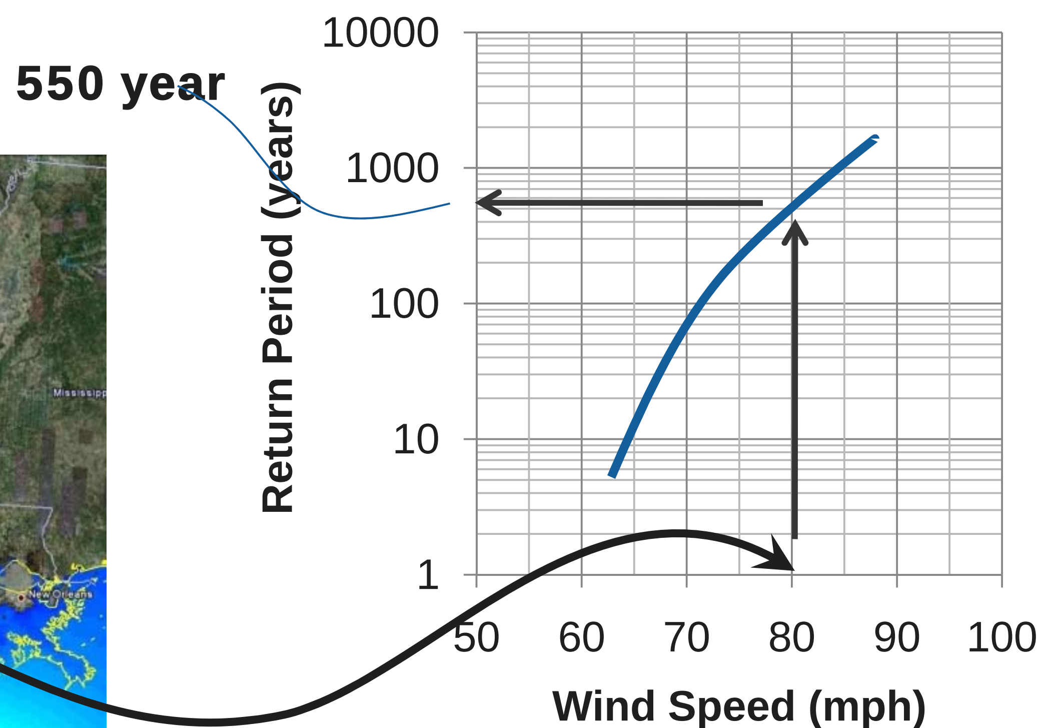
> **"These [RMS] models have more skill at predicting tropical cyclone intensity over land than similar models trained exclusively on historical data"**

Return Period of Hurricane Ike 2008 Wind Speeds

- RMS compared the observed wind speed footprint for Ike against the hazard return period from it's stochastic simulation.

Hurricane Ike footprint

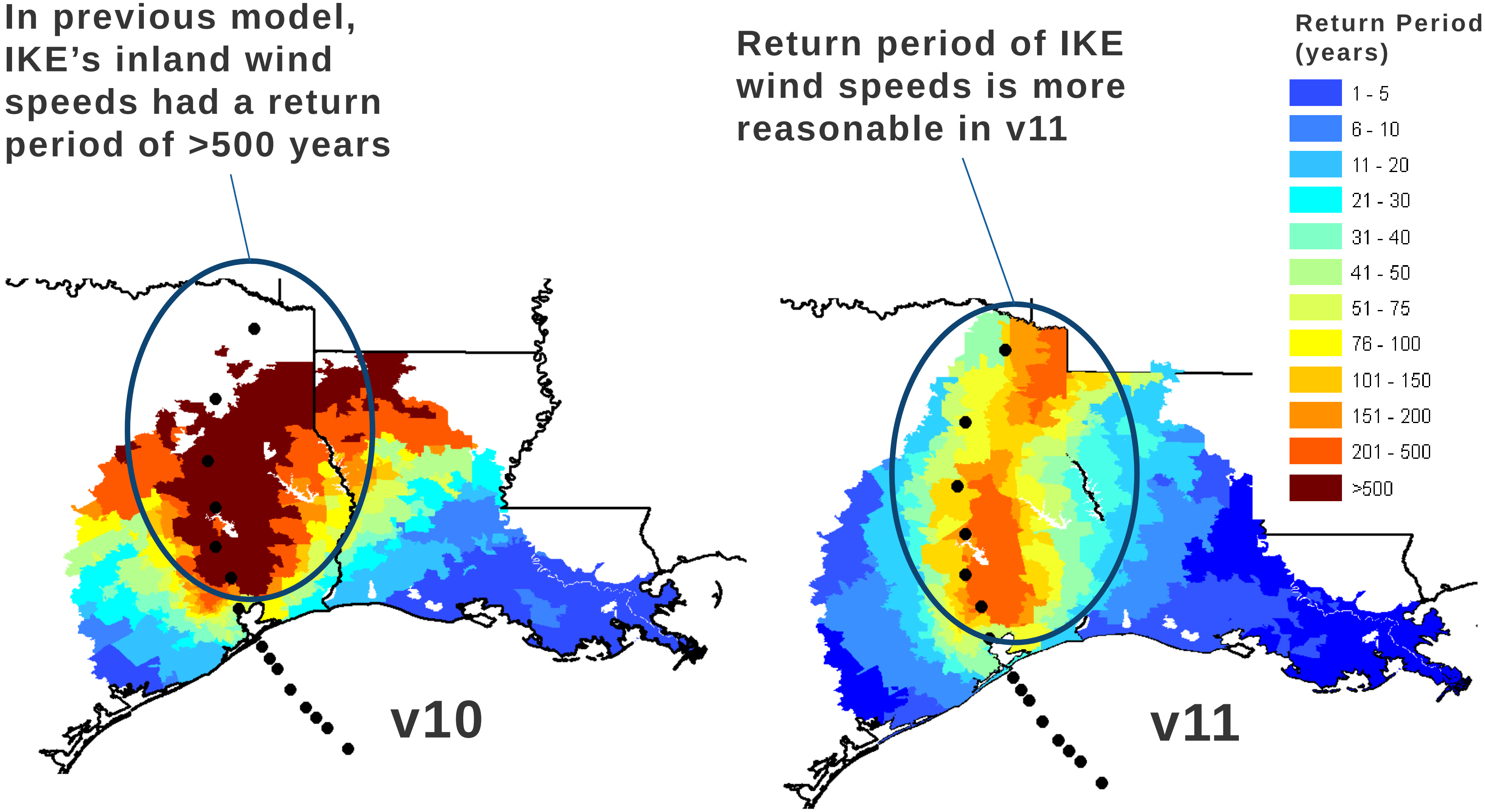




Location specific hazard return period from previous model

Return Period of Ike Wind Speeds

- Validation of inland filling model in stochastic set against historical event

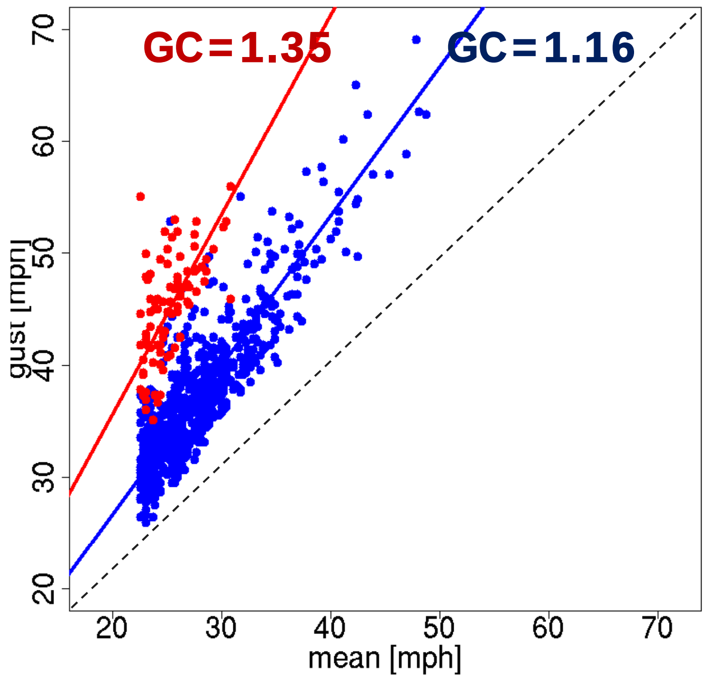


Roughness Model

Roughness and Gust Coefficients

- Roughness factor relate eq over water mean winds to local mean winds – Function of upstream roughness changes
- Gust factors relate local mean winds to local peak gusts
- Site coefficient = Roughness factor * Gust factor
- Directional coefficients

Gust versus mean for 2 wind directions



Decrease in Over Water Roughness Length

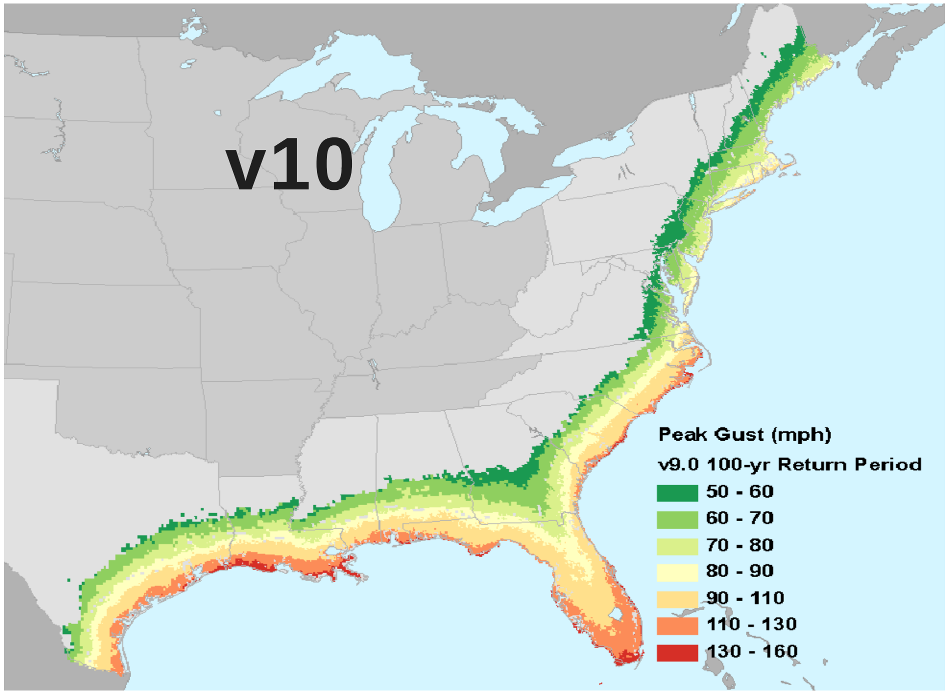
- Model relies on a similar but advanced formulation

- Decrease in "over water" roughness length
  - Based on research by Powell et al (Nature 2003)
  - Over water roughness length levels off or decreases with increasing wind speeds

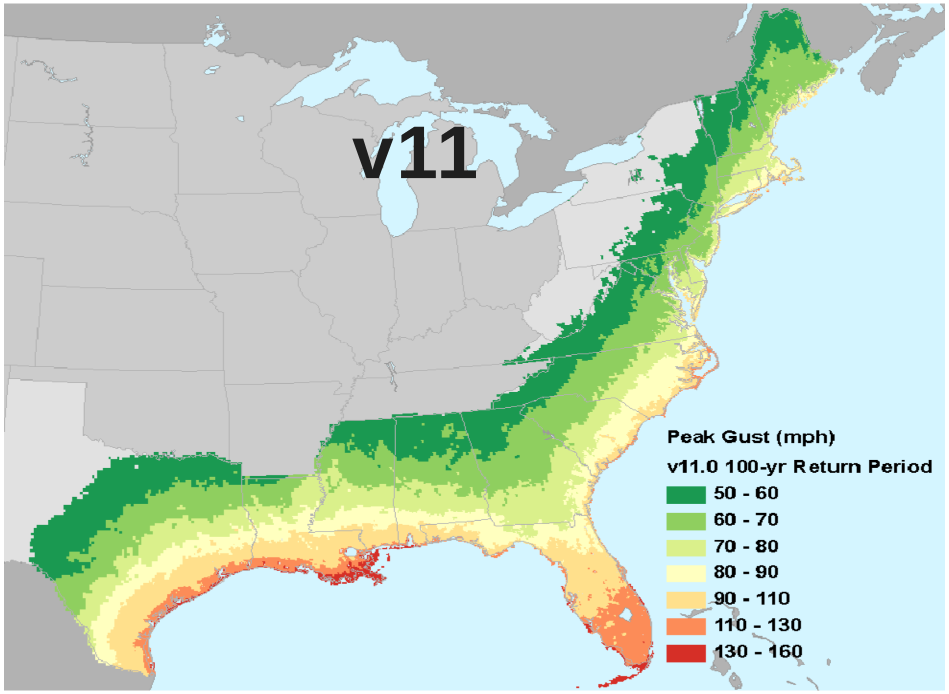
- Impact on wind hazard:
  - Decreases modeled wind speeds over land.

Net Change in Hazard

Updated View of Wind Risk in v11

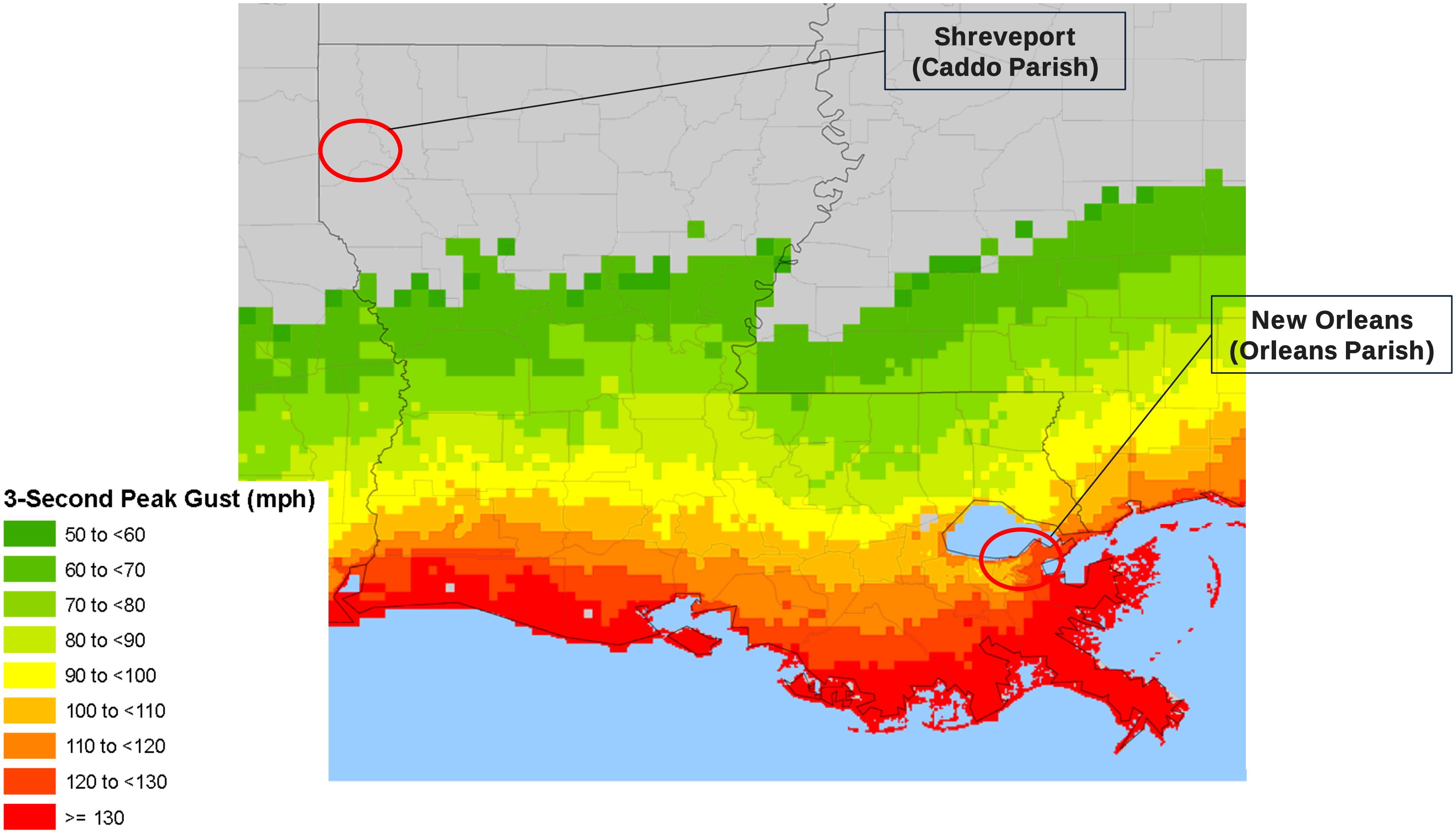


Peak Gust 100 Year Return Period Maps

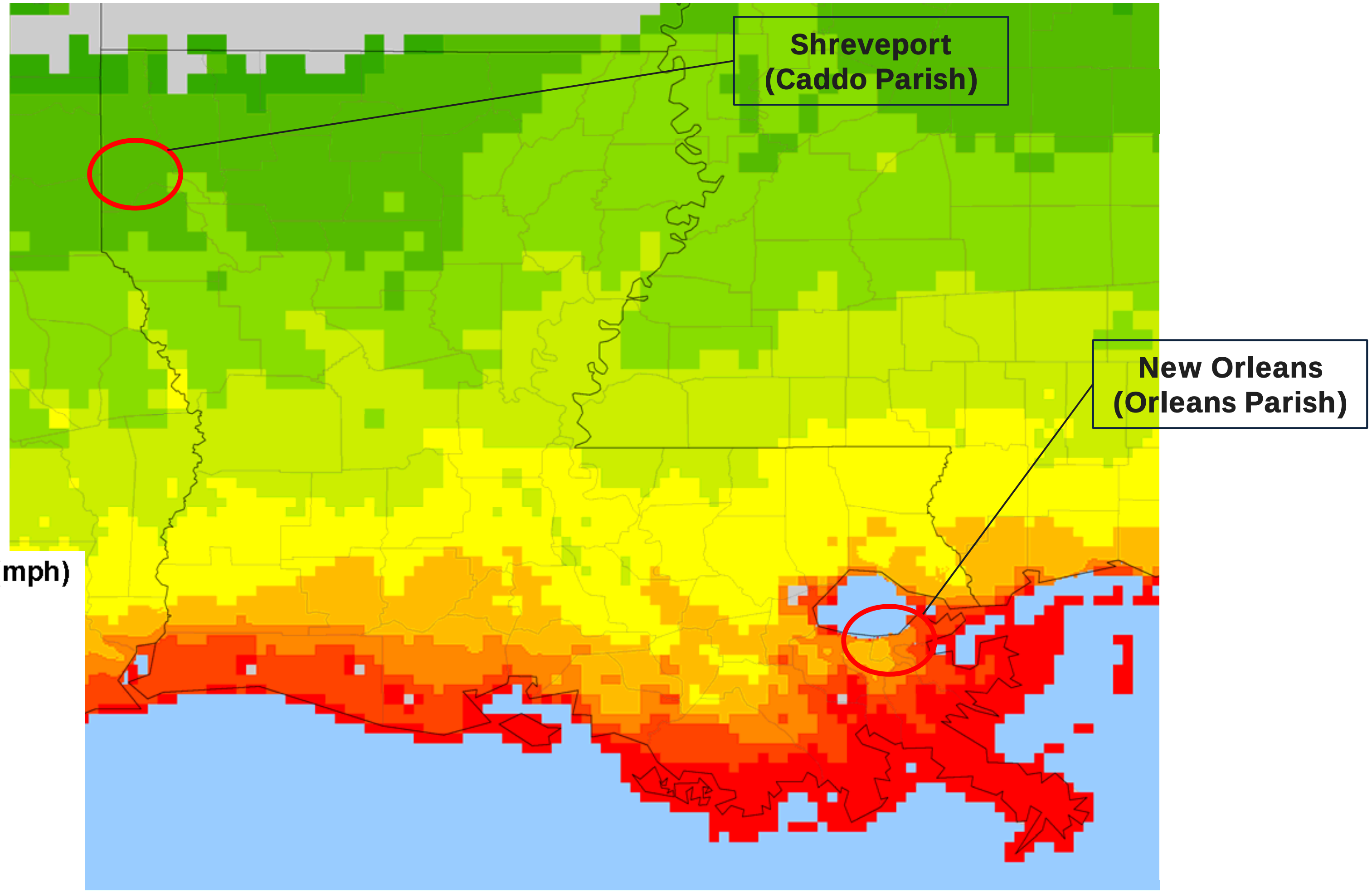


- **Inland hazard increasing**
- **Coastal hazard decreasing in some places: but not all**
- **Increased Hazard -> Interaction with vulnerability curves**

Version 10 – Louisiana Hazard Map



Version 11 – Louisiana Hazard Map



3-Second Peak Gust (mph)

- 50 to <60
- 60 to <70
- 70 to <80
- 80 to <90
- 90 to <100
- 100 to <110
- 110 to <120
- 120 to <130
- >= 130

Comparison of 100 Year Wind Hazard with Published Building Codes

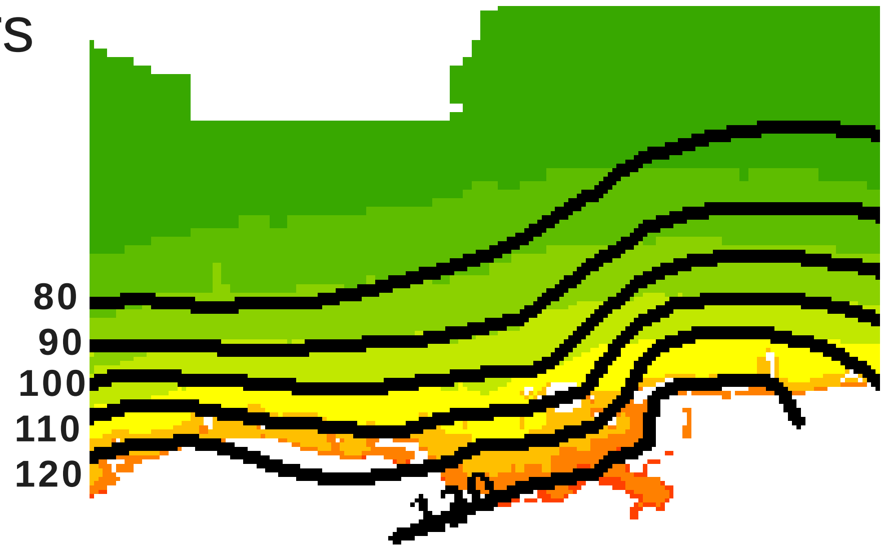
- New hazard map compares favorably with 100 year return period map used by design community, released May 2010.

- Compare contours with colors

Wind Speed, mph

— ASCE 7-10

RiskLink 11 Modeled wind speed
- 50 - 80
- 81 - 90
- 91 - 100
- 101 - 110
- 111 - 120
- 121 - 130
- 131 - 140
- 141 - 155



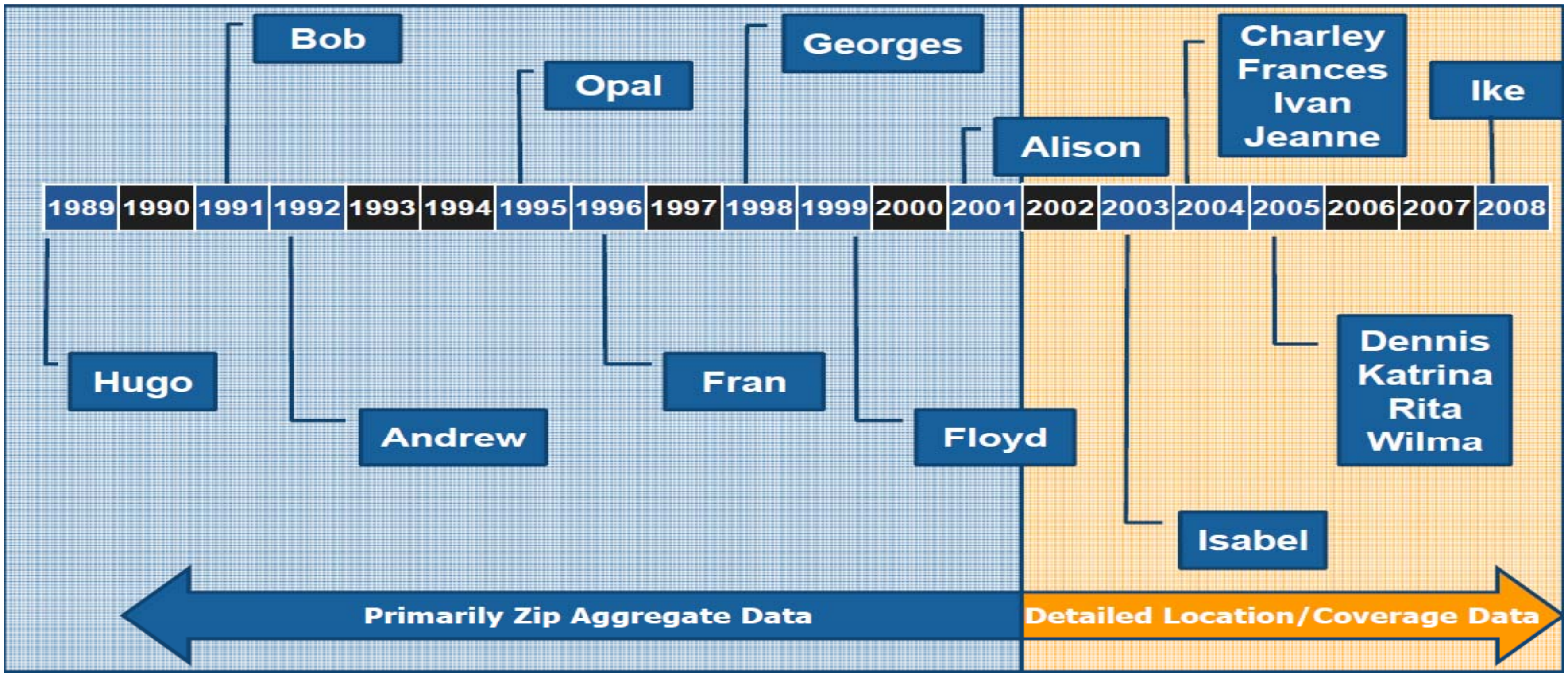
Contour values are 100 year 3-sec gust wind speeds from ASCE 7-10

Vulnerabilty Changes

Twenty Years of Loss Data

- Engineering driven development
- Each region uses data and information specific to that region
- Calibrated with $18 billion claims data – increasing detail

20 years of claims data – total $18 billion in-house



Residential Claims Data

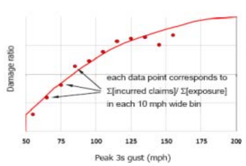
Season	Storm	Claims Data ($m)	Affected Region
2004	Charley	877	FL
2004	Frances	1,110	FL
2004	Ivan	534	FL, AL
2004	Jeanne	542	FL
2005	Katrina	291	LA, MS
2005	Rita	246	TX, LA
2005	Wilma	1,459	FL
2008	Ike	1,237	TX, LA

- Majority of data is from Florida, until Hurricane Ike
  - More than $1.2 billion in location-level Hurricane Ike claims for TX and LA:
  - 20%+ of total effort spent on-site looking at claims notes, talking with loss adjustors, claims handlers
- RMS has made concerted effort to gather significant portions of the total event loss

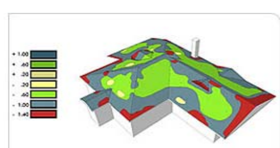
Engineering Driven Vulnerability Development

- Vulnerability curves where we don't have claims data are based on:
  - Industry loss reconstructions
  - Post-event engineering surveys
  - Information related to building codes and practices
  - Consultant data on regional construction quality
  - Engineering simulations using analytical simulation models

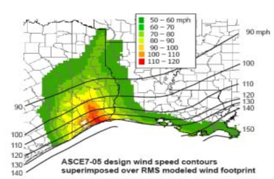
Detailed Claims Data



Bldg Element Simulations



Building Codes

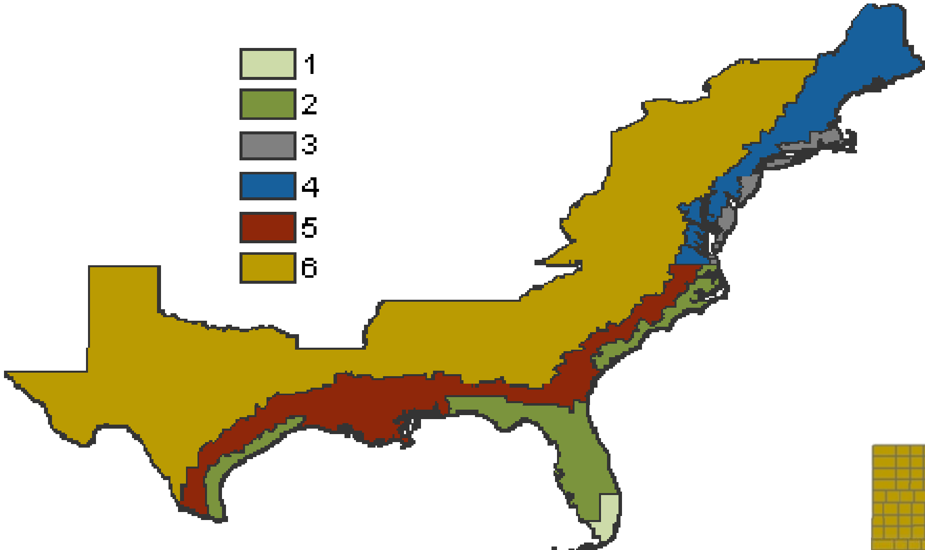


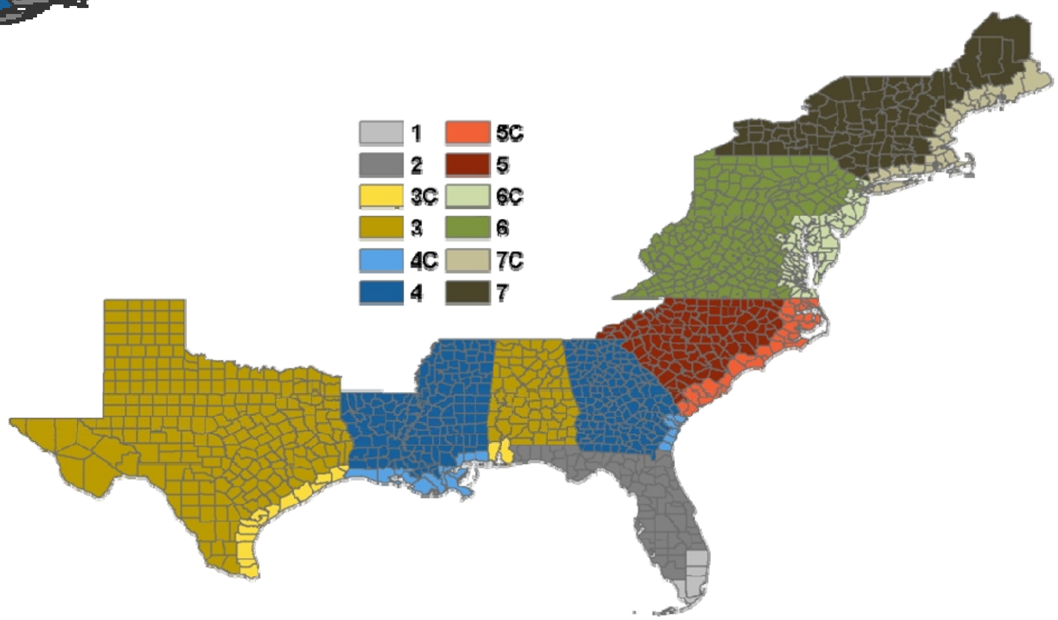
Construction Quality

Historical PCS/Claims

Vulnerability Regions in v10 and v11

- 6 regions were introduced in 2006
- 3 zones from the coast in many regions: coastal, mid- and inland





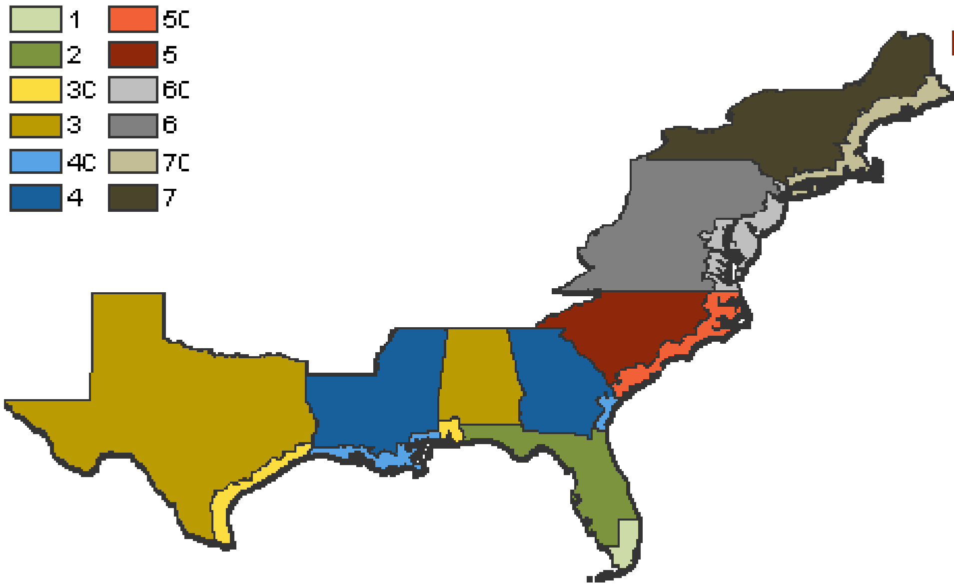
- 14 regions in place for v11
  - All regions have a coastal region included

RMS Roof Construction Quality Experts

To develop regional relativities RMS engaged a panel of roofing consultants.

- Tom Smith, TLSmith Consulting, Inc.
- Tim Marshall, Haag Engineering
- Phil Dregger, Pacific Building Consultants, Inc.
- Dick Canon, Canon Consulting & Engineering Co., Inc.
- Scott Sundberg, Category X Coastal Consulting

New Vulnerability Zones



- Coastal vs. Inland vulnerability zones
  - Coastal locations less vulnerable
  - Greater public awareness – "generational memory" of hurricane landfalls

- Regional vulnerability relativities driven by (Gulf to Northeast):
  - Climatic variation: Gulf coast harsher climate results in more rapid deterioration
  - Building code variation and history
  - Building code enforcement

S. Florida	Least Vulnerable
Northeast	↓
Mid-Atlantic	
Texas	
Gulf	Most Vulnerable

Floor Area Band

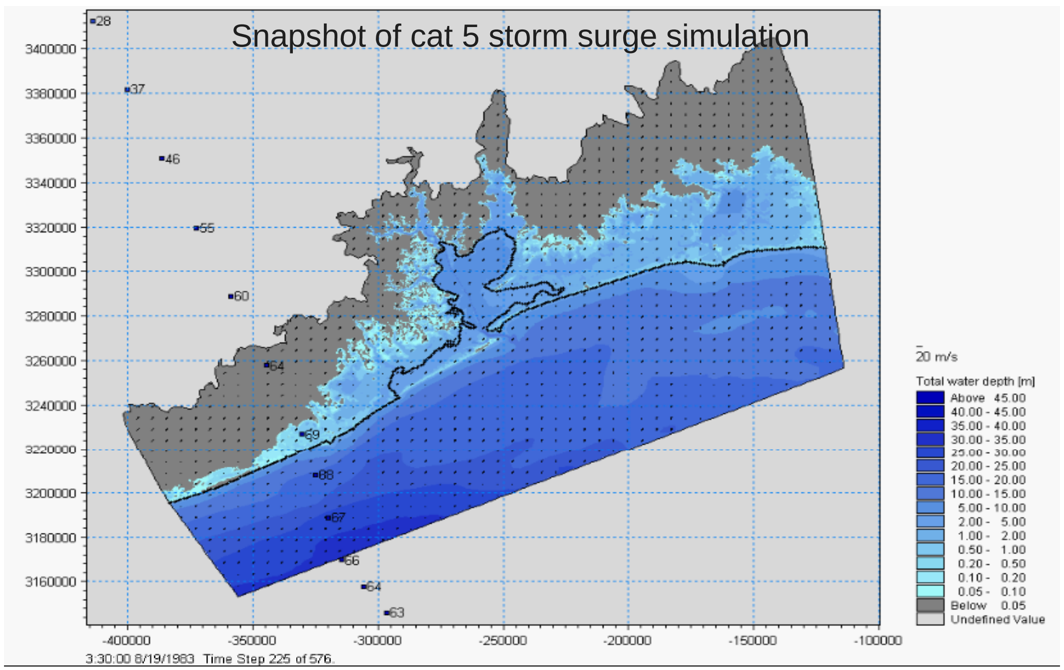
- Larger floor areas have lower loss ratios than smaller homes
- Single-family dwelling floor area bands redefined based on new claims data received
- Introduced a 5th large floor-area band which is less vulnerable.

v10	v11
< 1,500 ft^2	< 1,500 ft^2
1,500 – 2,000 ft^2	1,500 – 2,500 ft^2 (default when floor area not specified)
2,000 – 4,500 ft^2	2,500 – 5,000 ft^2
> 4,500 ft^2	5,000 – 10,000 ft^2
	> 10,000 ft^2

Storm Surge

Breakthrough in Storm Surge Modeling

- Storm surge models have traditionally been ‘parametric’
  - A model takes the attributes of a storm at landfall (e.g., Category, size, forward speed) and creates a surge footprint
  - This misses storms that experience changes in intensity before landfall
    - Katrina was a Category 3 at landfall, but had a Category 5 storm surge



“MIKE 21 system has been used worldwide over the last 20 years for over 400 studies, including those in the United States”

- New solution is a numerical storm surge model dynamically linked with the windstorm model throughout entire lifecycle
  - Better captures the surge build up at sea e.g., Ike and Katrina and penetrates further inland than current model
  - The high resolution of numerical modeling allows for detailed representations of water flow over terrain and topography

Storm Surge Modeling Options

- Accurate loss modeling is more than an accurate hazard model
  1. Storm surge losses paid out by wind policies
     - RMS model default of "surge leakage" varies by LOB and damage severity
     - Enhanced NFIP take-up rates now at VRG level
     - In v11 can explore customizable options
  2. Location specific base-flood elevations
     - Model defaults – enhanced in v11, now at VRG level
     - User-defined – in EDM
  3. Flood defenses
     - Model incorporates New Orleans, Galveston, Port Arthur defenses
     - Users can input local flood walls into EDM

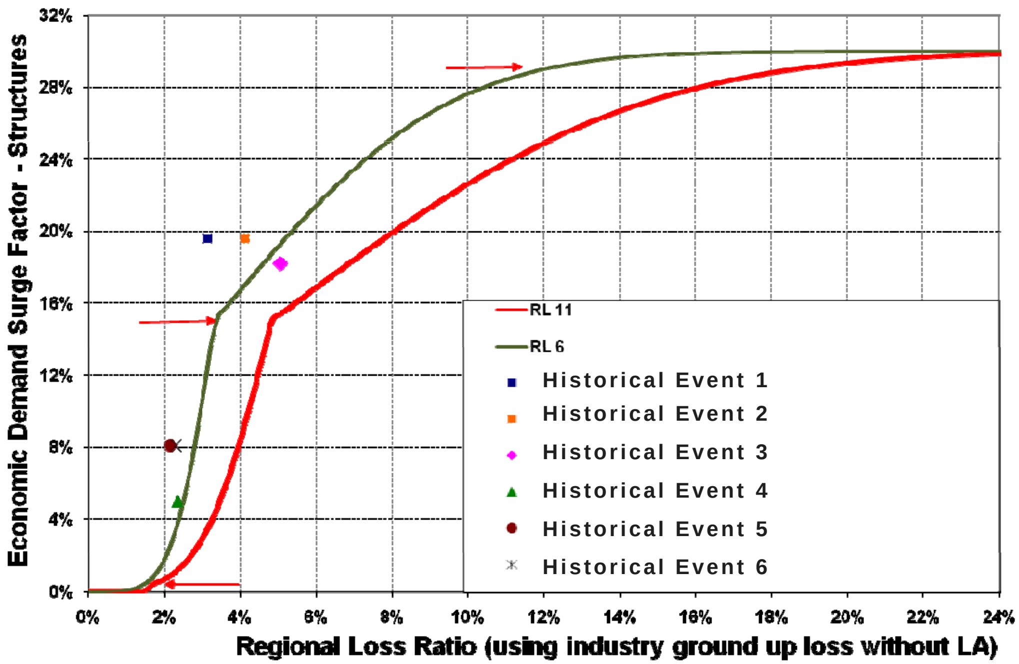
Elevated Properties Post Ivan - Dauphin Island

Post-Katrina wind and wave damage in Waveland

Other Model Changes

Financial Model

- Post Event Loss Amplification model (Demand Surge)
  - Economic Demand Surge (EDS) portion of methodology been updated with new economic data that accounts for changes in Gross Domestic Product, our current state of the regional economy and influence of out of state workforce for significant events.
  - **Reduction** in EDS for equivalent loss levels



Changes in Losses

Changes in Results – Wind Only

- Change is result of combination of vulnerability and hazard updates

v10	v11	Absolute Difference	Percent Difference
710	1,066	356	50%

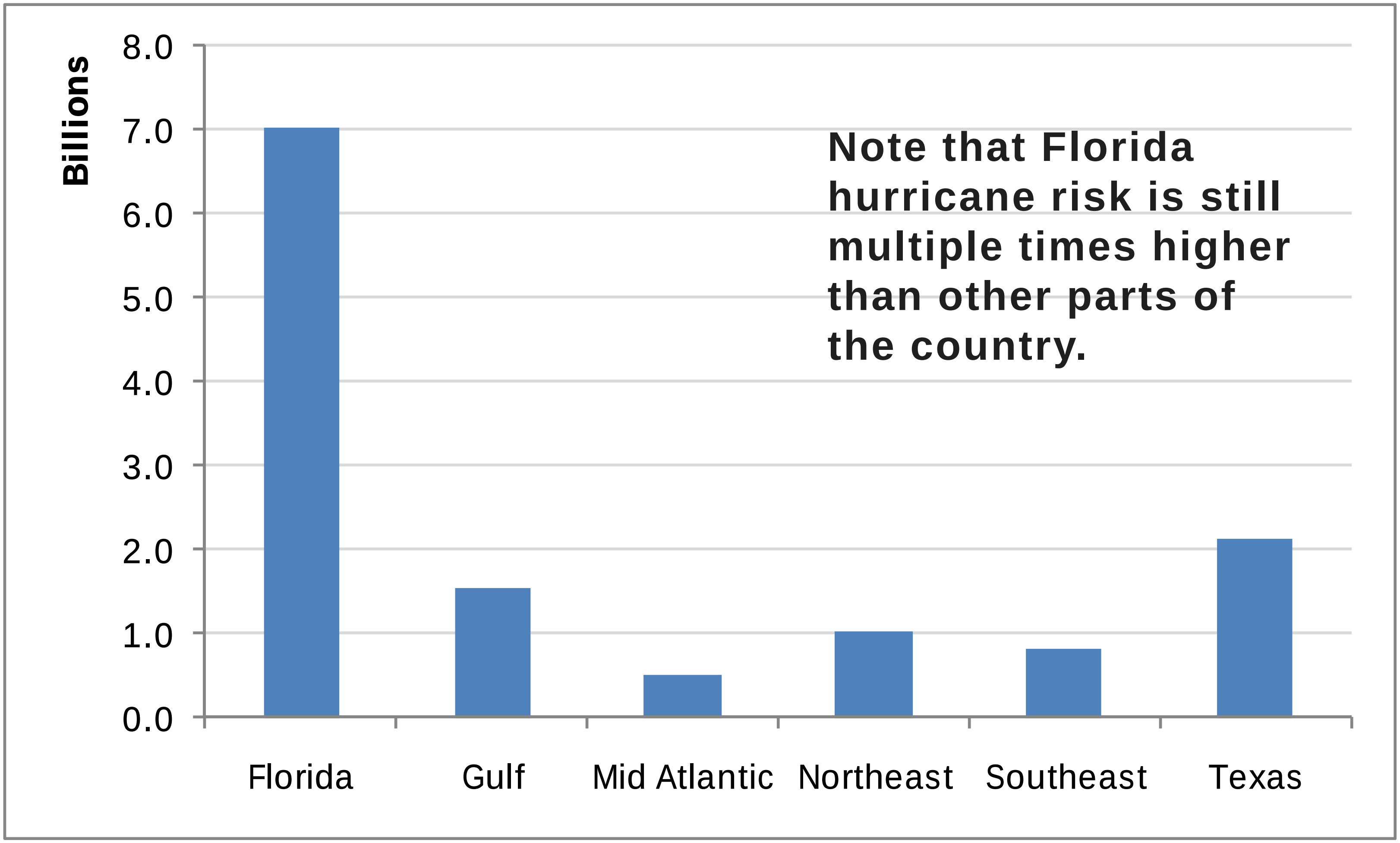
($millions)

All Lines – Based on 2011 IED

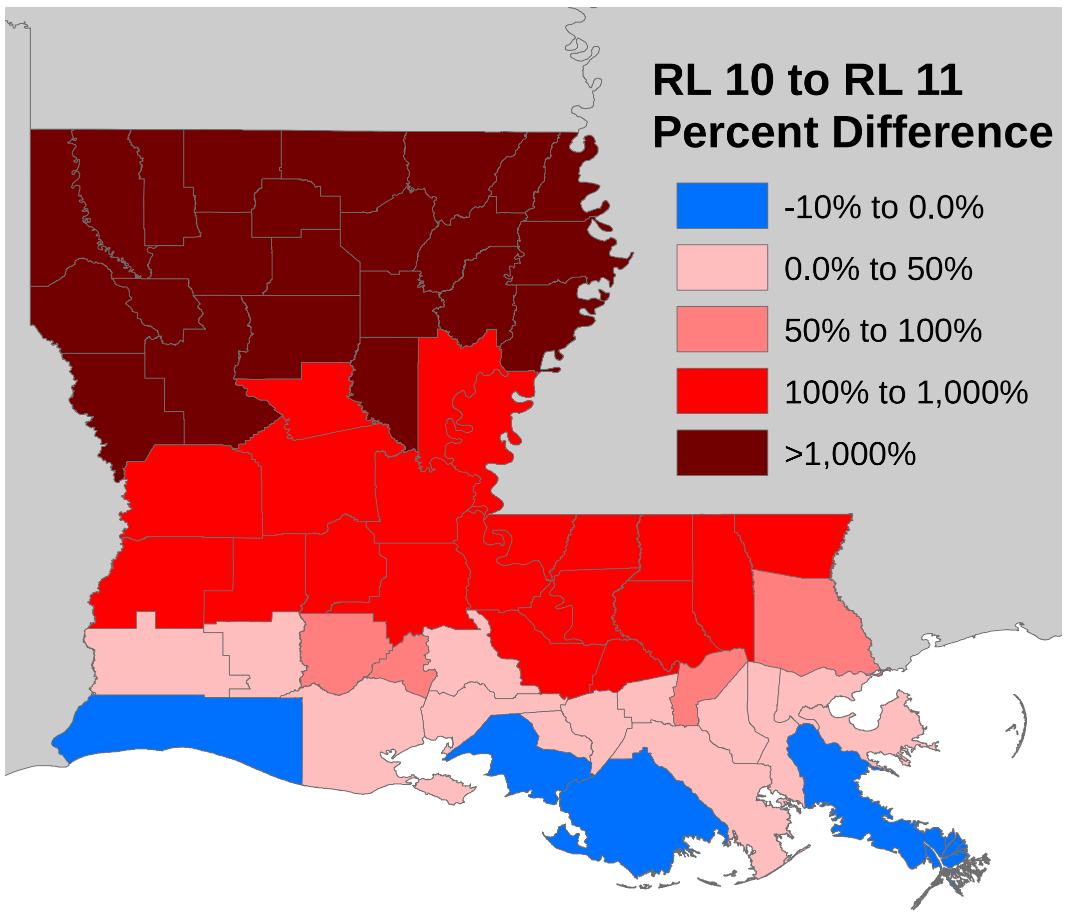
Losses based on Gross average annual loss, historical event rates; include loss amplification

Florida Continues to Drive Wind Risk

Average Annual Loss ($billion) in v11 , Historical Frequency
All Lines Combined: based on v11 IED

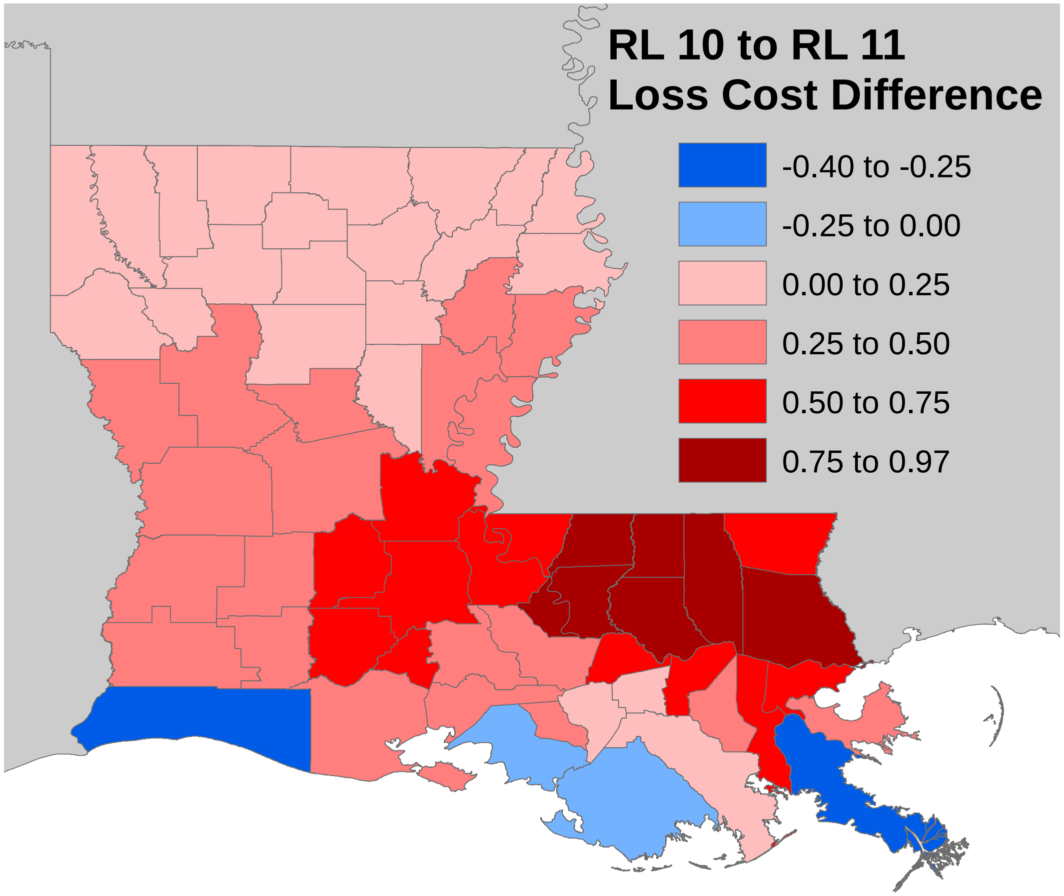


RL 10 to RL 11 – Percent Difference by County



Losses based on Gross average annual loss, historical event rates; include loss amplification

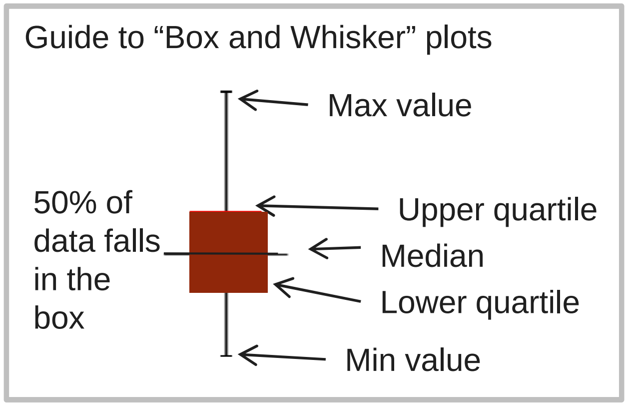
RL 10 to RL 11 – Absolute Difference by County

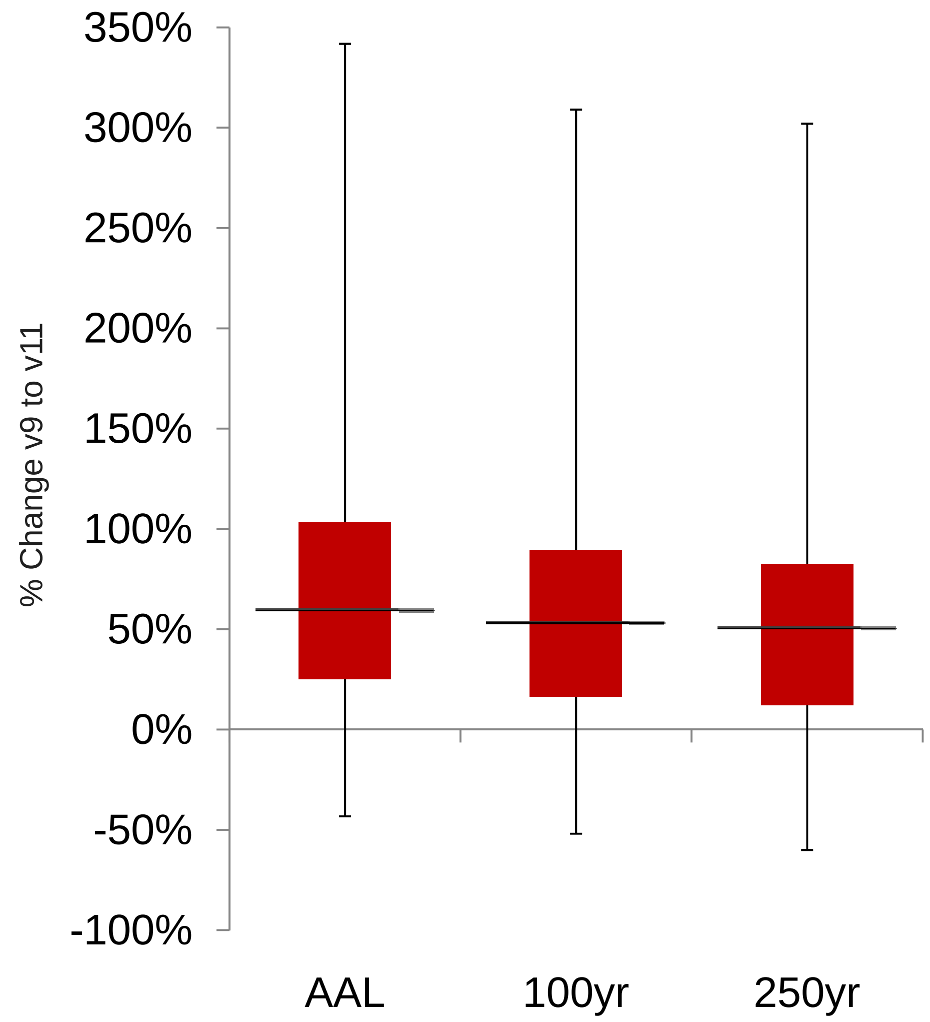


Losses based on Gross average annual loss, historical event rates; include loss amplification

Large Range Will Be Seen in Individual Portfolios

- Largest increases are concentrated small sample portfolios - coastal vs inland, and specific regions
- Variability is very high – focusing on understanding why
- Median is by count, not weighted by value
- Portfolios are mixtures of U.S. wide portfolios





Regulator Support

Documentation

- RMS creates documents in the public realm to support the regulatory and third party users
  - ASOP 38
  - State specific interrogatories
  - Florida Commission on Hurricane Loss Projection Methodology Submission (www.sbafla.com/methodology)
- Plans to create a best practices document
  - Planned for release in Summer 2011

Sample Output Report

Analysis Summary Report for FCHLPM

RMS RISKLINK®

Monday, March 28, 2011

Version 11.0.SP1 (Build 1411)

Analysis Settings:

Analysis Name (ID) :	OF $0 Deductible(17)		
RDM Database :	RMS_RDM		
DLM Profile Name :	FCHLPM Certified Hurricane Lo	**Loss Amplification :**	Bldg+Cont+BI
Analysis Date :	03/23/2011	**Residual Demand Surge :**	Excluded
Perils :	Wind Only	**Currency :**	US Dollar
Region :	North Atlantic (including Hawaii)	**EDM Database :**	FormA6_EDM_OF
Analysis Mode :	Distributed	**Exposure Type :**	Portfolio
Analysis Type :	Exceedance Probability	**EDM Portfolio :**	00
Vulnerability Curves :	Vulnerability - Default		
Event Rate Set :	2011 Historical Event Rates		

Storm Surge assumptions : None

- **SFD :** 0.00
- **Low-Rise MFD and COM :** 0.00
- **Other :** 0.00

Primary modifiers assumed 'Unknown' : None

All secondary modifiers assumed 'Unknown' : No

Scale Factors

- **Building :** 1.00
- **Contents :** 1.00
- **BI Values :** 1.00

'Unknown' deductibles assumed 2% : Yes

Local defenses ignored : No

All user entered Base Flood Elevation values reset to RMS Default : No

Regulator Training Course - Potential Agenda

- Overview of Cat Models
  - History
  - Perils & Lines of Business
  - Main Components: Event Set Generation, Hazard, Vulnerability, Financial Model
  - Modeled vs. Non-modeled Loss
- Key Metrics & Applications
  - Exceedance Probability Curves
  - Average Annual Loss (Pure Premium)
  - Excess AAL
  - Tail Conditional Expectation
- Data Quality Implications
  - Aggregate vs. Detailed Data Analyses
  - Data Quality
- Case Studies
  - Rate Relativities
  - Risk Selection (portfolio or individual risk)
  - Reinsurance purchasing

Proposed Training Course aimed at Regulator Audience

	RMS Recommendation	Other Possibilities
Course Length	6-8 hrs	1-3 days?
Delivery/Location	Combine with insurance industry event (e.g., NAIC or CAS meeting)	•Stand-alone? •Webinar?
Frequency	One-time	Annual/Bi-annual?
Assessment/ Certification	Continuing educ. Credit	•Confirmation of attendance? •Exam to pass?

Additional Information Requested and Received from RMS after 4/14/11 Meeting

Attachment 1

Attachment 2

Date: May 22, 2011

To: Terrell Moss, Director, Louisiana Property and Casualty Insurance Commission

CC: Kay Cleary (RMS), Reid Edwards (RMS), Rich Piazza (LA DOI), Larry Steiner (LA DOI)

From: Joel Taylor (RMS)

RMS HURRICANE MODEL VERSION 11

During our visit with the Louisiana Property and Casualty Insurance Commission on April 14, 2011, we were requested to provide additional information showing the change in losses for Louisiana and surrounding states for v11 of our North Atlantic Hurricane model compared to our previous model version. This document contains several tables and maps with the requested information.

The expected losses were calculated using our 2011 Industry Exposure Database (IED) as well as a notional exposure set with one single-family, masonry structure in each postal code. The IED represents our estimate of the replacement cost values of all properties insured for hurricanes for both Commercial and Residential lines. Because the IED represents the actual insured buildings, it provides an overview of how the risk of monetary loss has changed for the entire industry. However, the notional exposure set (an identical building in each postal code) is a better measure of model change since the building characteristics and insured values do not change from postal code to postal code. This notional set is able to quantify changes when all else is held equal and the only change is the model software used to calculate expected loss. We have provided statewide results by line of business using the IED to see how the overall risk has changed and maps showing loss costs from a notional exposure set.

Tables 1 and 2 below show the changes in gross Average Annual Loss (AAL) and gross loss cost (AAL/$1,000s of exposure) in Louisiana and several surrounding states between RiskLink's version 10 and version 11 North Atlantic Hurricane models, broken out by commercial and residential lines of business. The expected losses were calculated using the 2011 IED. Slide #13 from the presentation we gave (provided at the end of this memo) show that the change for Louisiana for all lines combined is 50%.

Figures 1 through 4, based on the notional exposure set described above, show postal code level loss costs and their changes from v10 and v11.

The results in Tables 1 and 2 show that the overall risk is higher in Louisiana than in the surrounding states of Texas, Mississippi, and Alabama. This is because Louisiana's most highly populated areas (New Orleans and Metairie) are in a higher hazard area than are high exposure areas in surrounding states, where major cities are more inland. This can be seen in Figures 1 and 2.

Please do not hesitate to contact any of us if you'd like to discuss these comparisons in more detail, or if there is additional information we can provide.

Table 1 - Change in Statewide AAL ($millions)

State	LOB	v10	v11	Percent Difference	Absolute Difference
TX	Com	475	896	89%	421
	Res	691	1,213	76%	522
LA	Com	250	415	66%	165
	Res	453	643	42%	189
MS	Com	115	99	-14%	-17
	Res	155	150	-3%	-5
AL	Com	91	66	-27%	-25
	Res	244	162	-34%	-82
FL	Com	2,877	2,935	2%	58
	Res	4,528	4,034	-11%	-494
GA	Com	27	50	85%	23
	Res	70	118	67%	47

Table 2 - Change in Statewide Loss Cost

State	LOB	v10	v11	Percent Difference	Absolute Difference
TX	Com	0.26	0.48	89%	0.23
	Res	0.29	0.51	76%	0.22
LA	Com	0.66	1.09	66%	0.43
	Res	1.10	1.55	42%	0.46
MS	Com	0.66	0.56	-14%	-0.10
	Res	0.59	0.57	-3%	-0.02
AL	Com	0.28	0.20	-27%	-0.08
	Res	0.51	0.34	-34%	-0.17
FL	Com	1.89	1.93	2%	0.04
	Res	1.93	1.72	-11%	-0.21
GA	Com	0.04	0.07	85%	0.03
	Res	0.07	0.11	67%	0.04

Figure 1 – v10 Loss Costs – 1985 Year Built

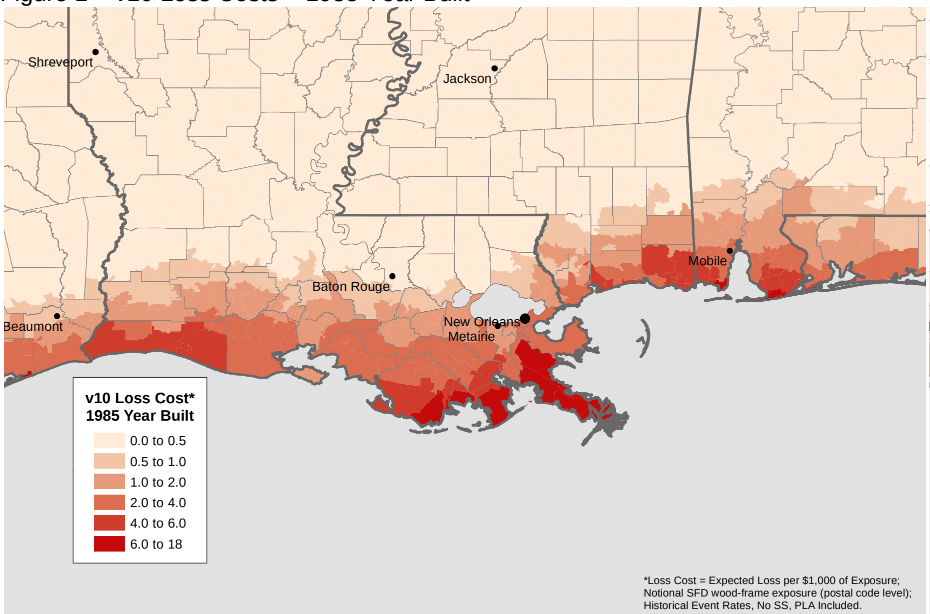


Figure 2 – v11 Loss Costs – 1985 Year Built

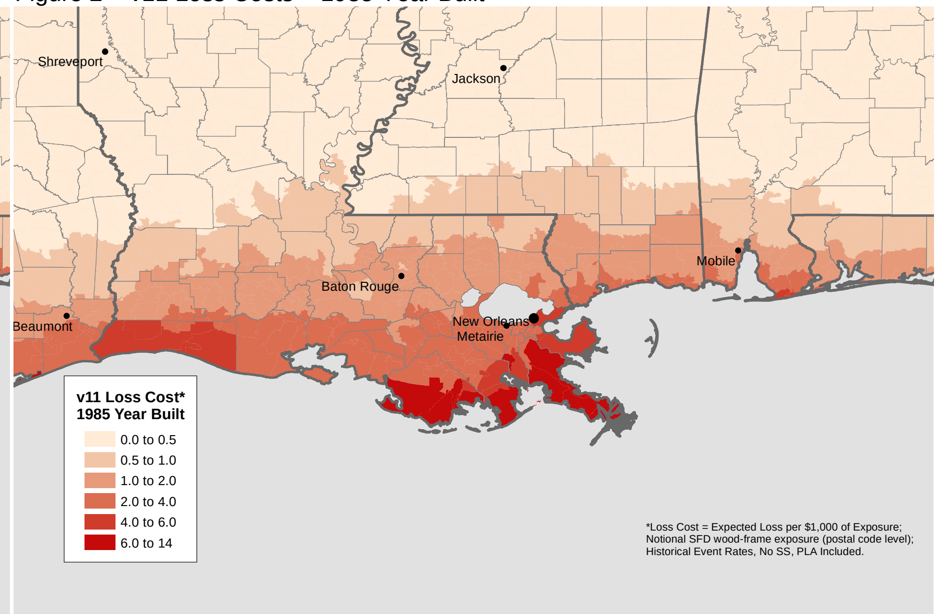


Figure 3 – Difference in v10 and v11 Loss Costs – 1985 Year Built

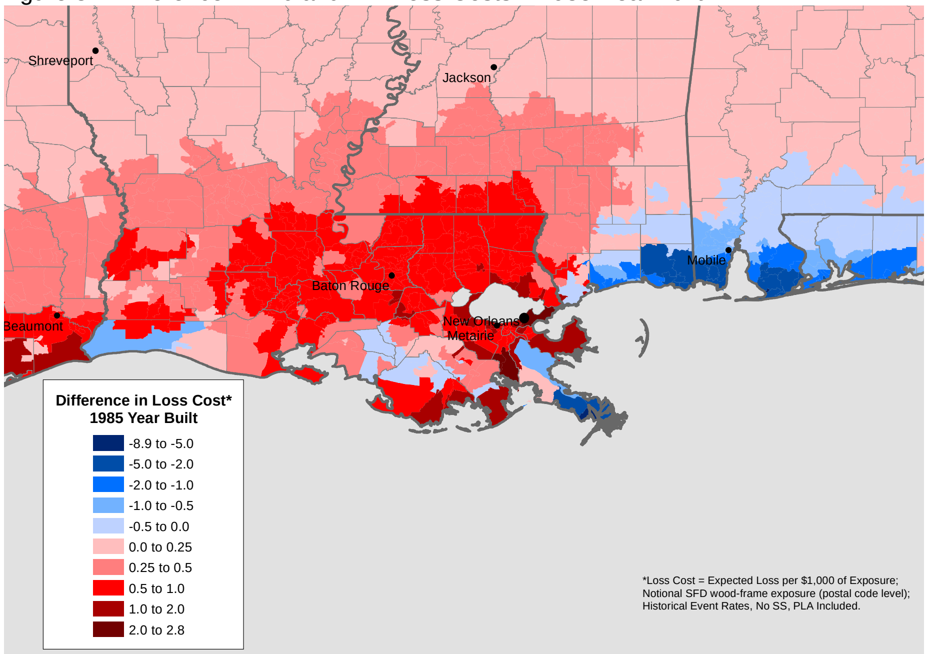
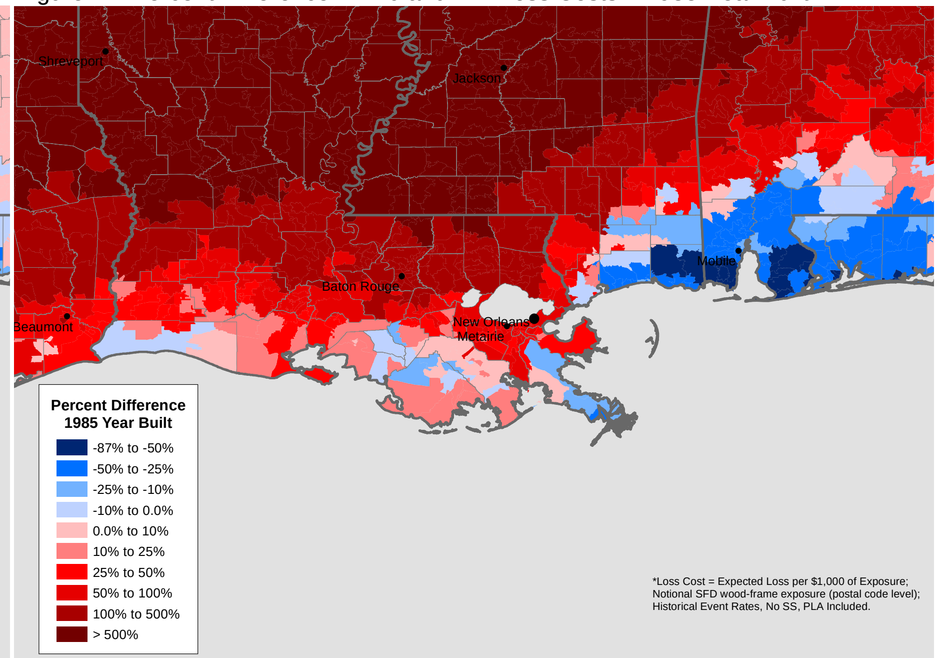


Figure 4 – Percent Difference in v10 and v11 Loss Costs – 1985 Year Built



RMS

Changes in Statewide AAL

- Based on 2011 RMS IED
- All Lines of Business

v10	v11	Absolute Difference	Percent Difference
710	1,066	356	50%

($millions)

Losses based on Gross average annual loss, historical event rates; include loss amplification

RMS

Date: June 14, 2011

To: Terrell Moss, Director, Louisiana Property and Casualty Insurance Commission

CC: Joel Taylor (RMS), Reid Edwards (RMS), Rich Piazza (LA DOI), Larry Steiner (LA DOI)

From: Kay Cleary (RMS)

RMS HURRICANE MODEL VERSION 11

During our visit with the Louisiana Property and Casualty Insurance Commission on April 14, 2011, we were requested to provide information showing the areas in Louisiana that could be impacted by storm surge.

The Figure 1 map below shows both where surge could occur and the severity of the surge. The highest potential water depth for each area, considering all events, is shown in feet. The most exposed areas could see maximum depths of approximately 25-30 feet (dark orange), while isolated areas (red) could be even higher. As expected, inland areas would not see more than a minimum amount of surge (< 1 foot, blue).

In addition, while reviewing our information, we discovered that the information we provided in April contains an incorrect map on slide #34. Layers defined for the mapping software did not include the lowest wind speeds (50-60 mph) but should have. These areas are not expected to experience much damage due to the relatively low wind speed. This occurred only in the map creation and is not a problem in the model software. The corrected map, as well as that originally provided, is shown below in Figures 2 and 3.

Please do not hesitate to contact us if you have further questions.

Figure 1- Maximum Potential Surge Depth

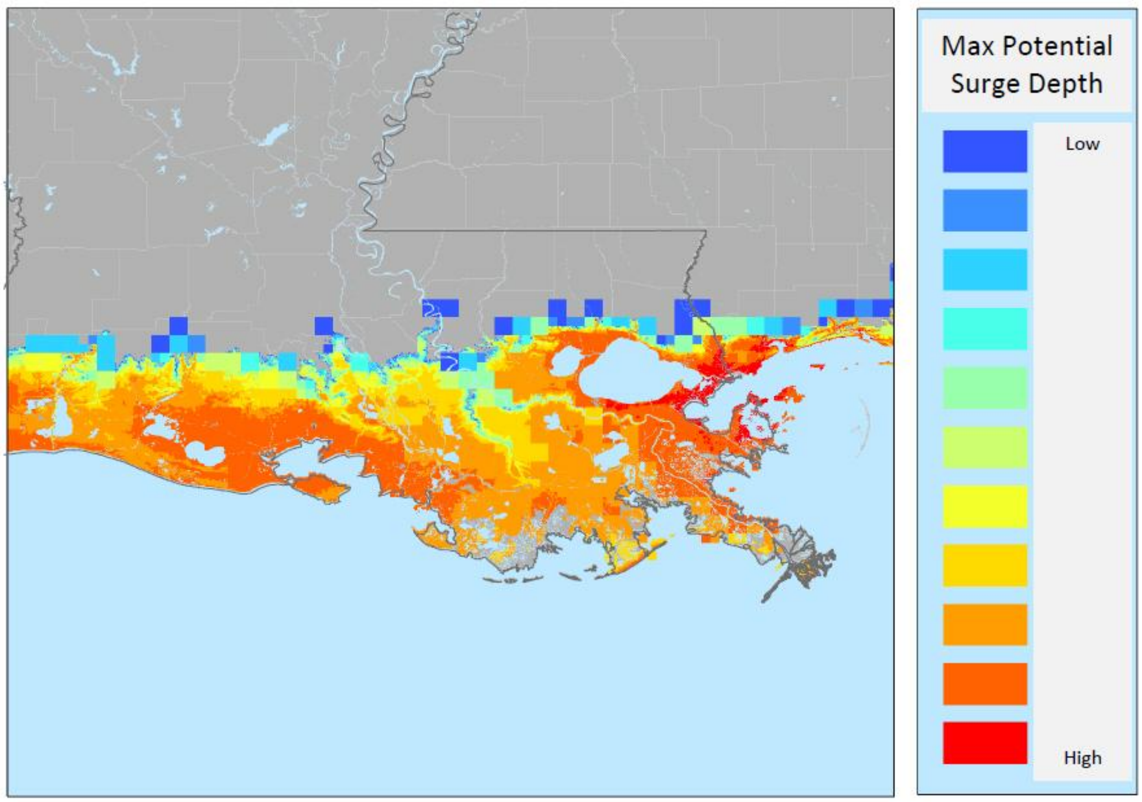


Figure 2 – Original v11 100 Year Peak Gust Wind Speed Map

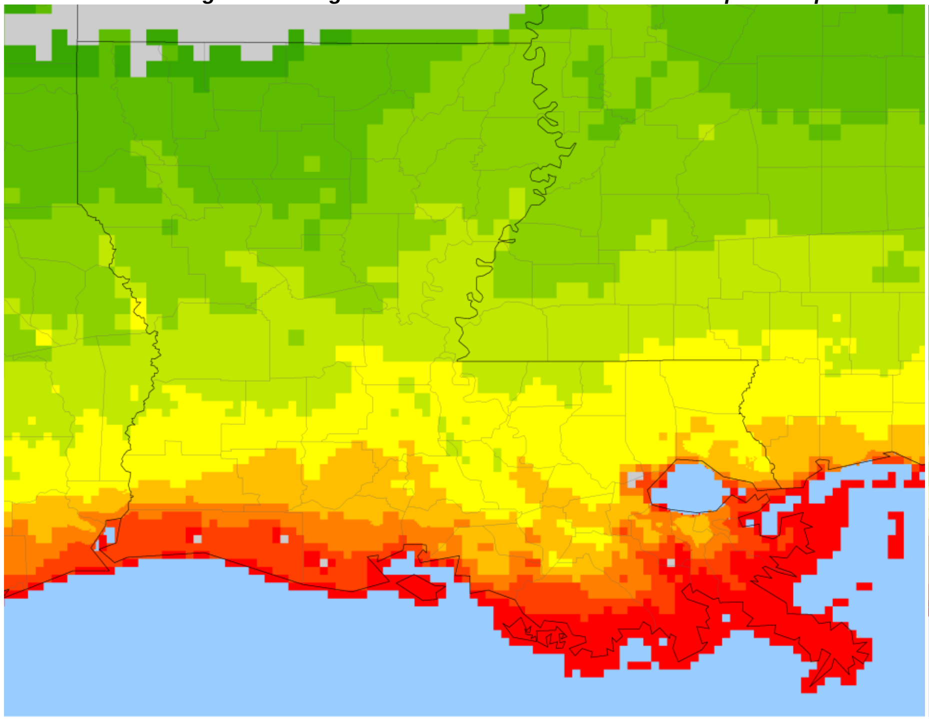


Figure 3 – Updated v11 100 Year Peak Gust Wind Speed Map