PL-4: State Specific Issues in Personal Lines Modeling Lessons Learned From the 2005 Hurricanes

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CAS Seminar on Ratemaking

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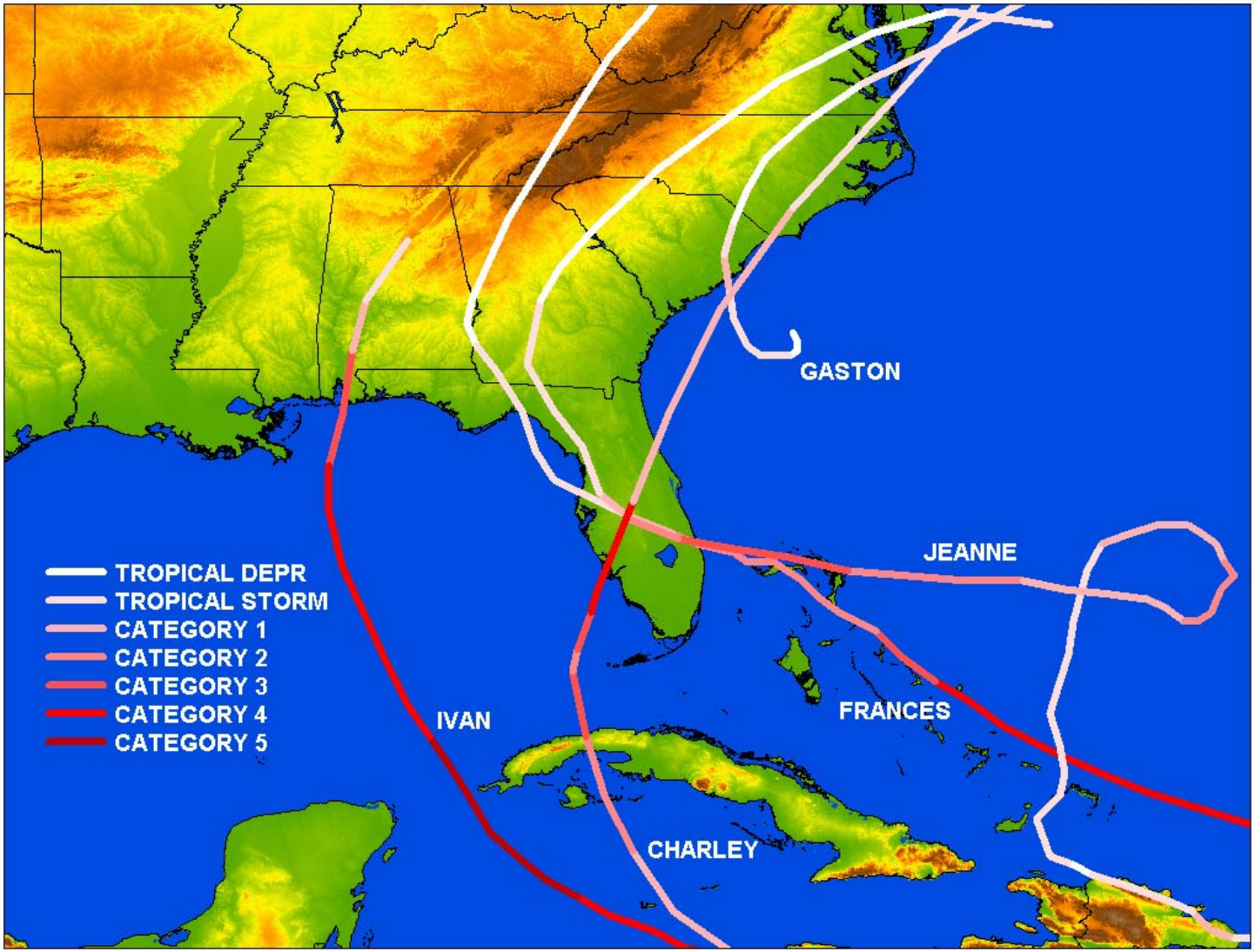
Salt Lake City, UT

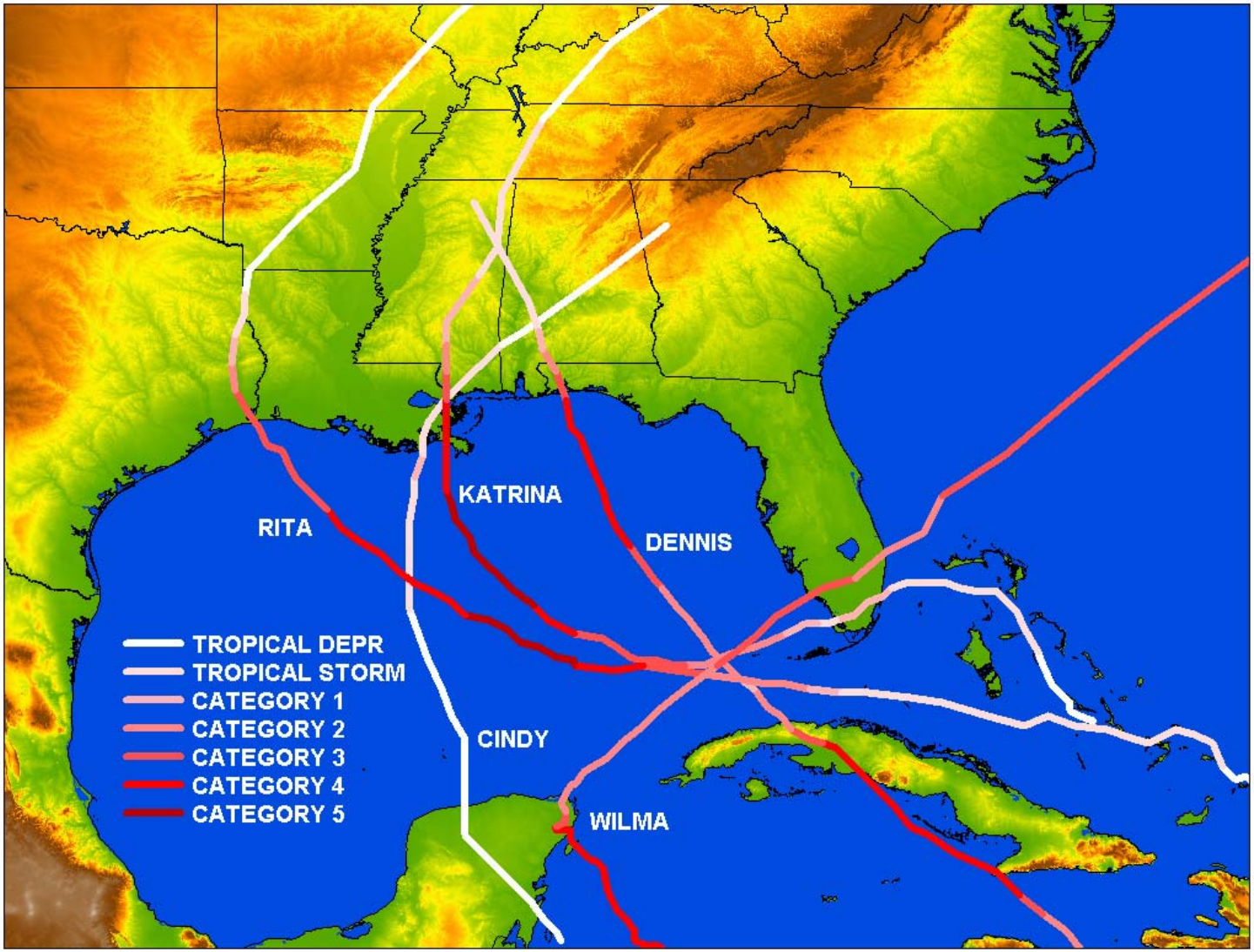
BETTER TECHNOLOGY
BETTER DATA
BETTER DECISIONS

AIR

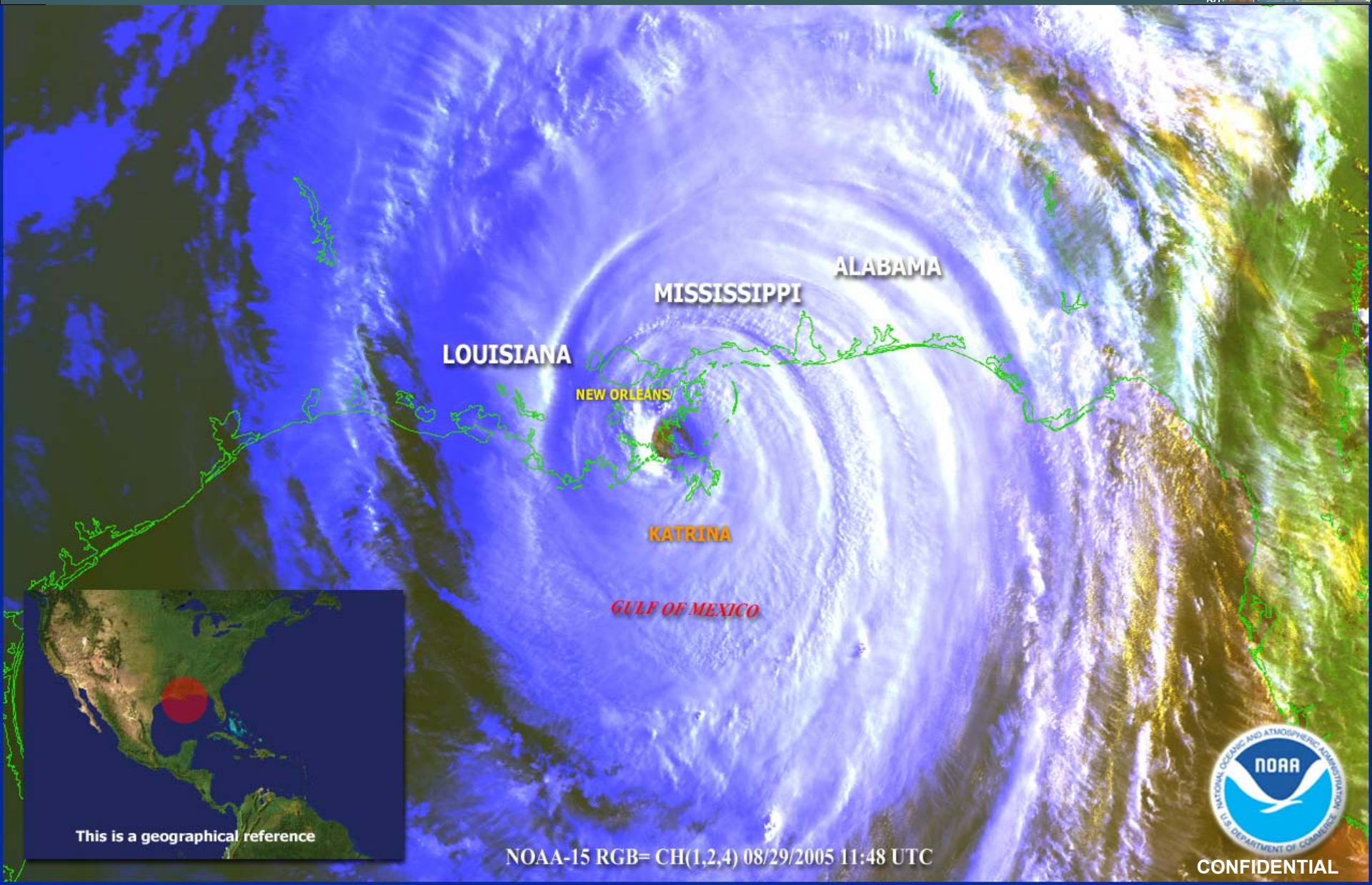
The 2004 Hurricane Season



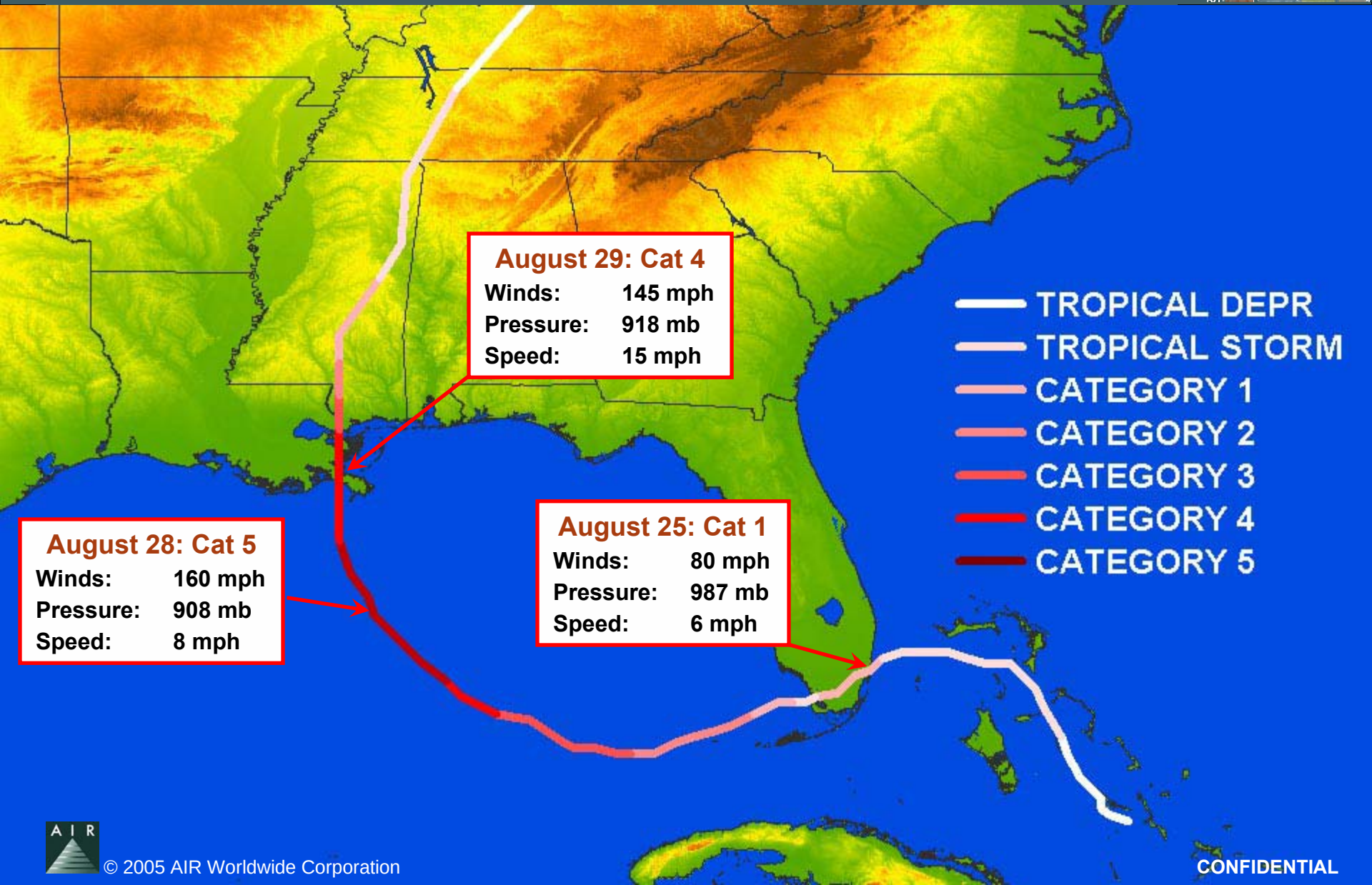
The 2005 Hurricane Season



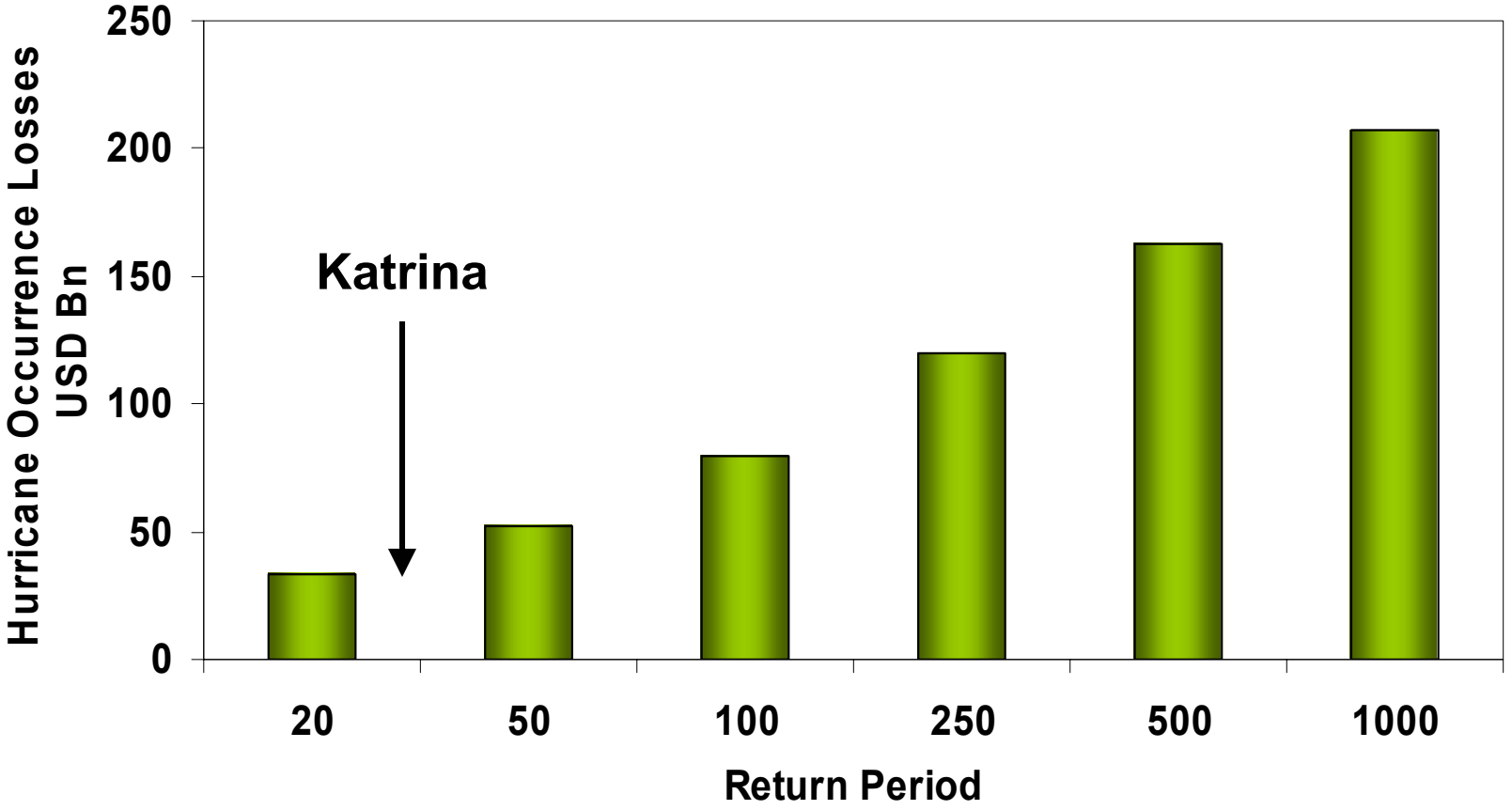
August 29: Katrina Makes Landfall Near Buras, Louisiana as a Category 4 Hurricane



Hurricane Katrina's Track and Meteorological Parameters



Even Before Katrina, AIR Hurricane Model Had Katrina-Size Losses and Greater

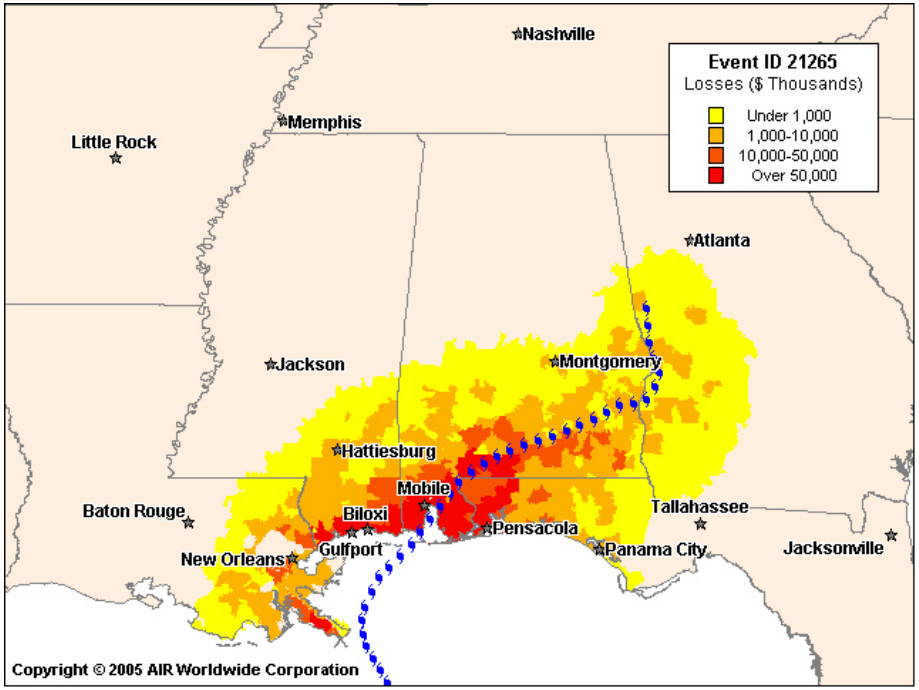


What Kinds of Storms Result in Higher Losses in the AIR Stochastic Catalog?

Event ID: 21265

Max. Winds: 155 mph

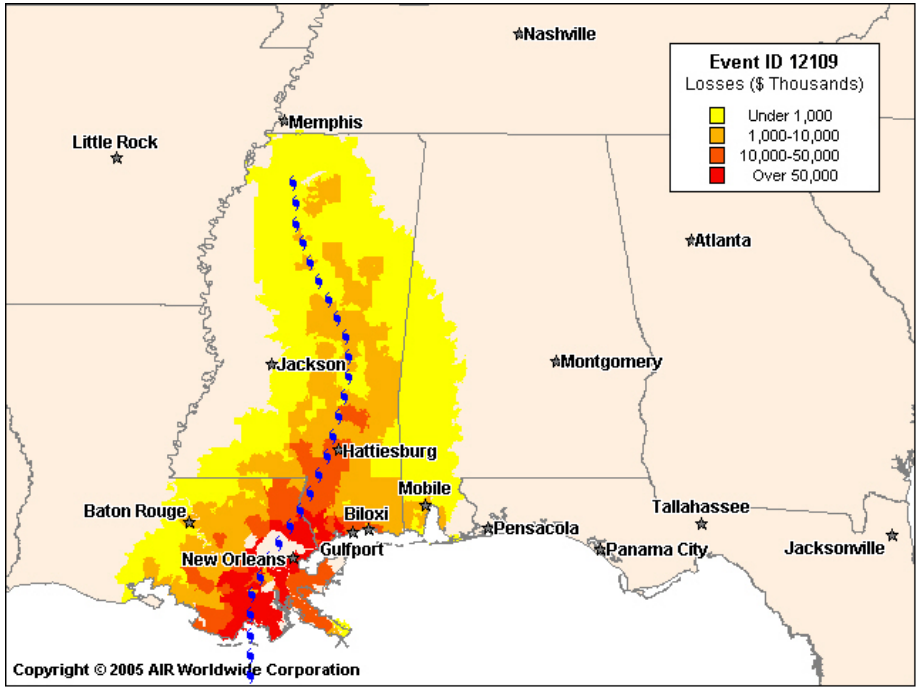
Insured Loss: $39B



Event ID: 12109

Max. Winds: 175 mph

Insured Loss: $51B



I've Run the Model, Have I Accounted for All the Risk

- AIR models losses to onshore property including:
  - Building
  - Appurtenant structures, outbuildings
  - Contents
  - Additional living expenses, direct business interruption
- If you've got your exposure right then this distribution provides a robust starting point for catastrophe risk management through understanding the relative risk; however additional analysis is necessary to obtain the best estimate of absolute risk
- AIR models provide additional loss estimates for:
  - Demand surge
  - Storm surge
  - Industry and residual market losses to be used as basis of assessment calculations

Additional Sources of Loss to Consider in Estimating the Absolute Level of Loss Potential

- Loss adjustment expenses
- Damage to offshore assets including oil rigs, yachts
- Damage to uninsured assets, including beaches, bridges, highways
- Demand surge to uninsured losses
- Indirect business interruption
- Looting, crime
- Inland flooding
- Hazardous waste cleanup
- Potential outbreak of disease
- Economic impacts
- …

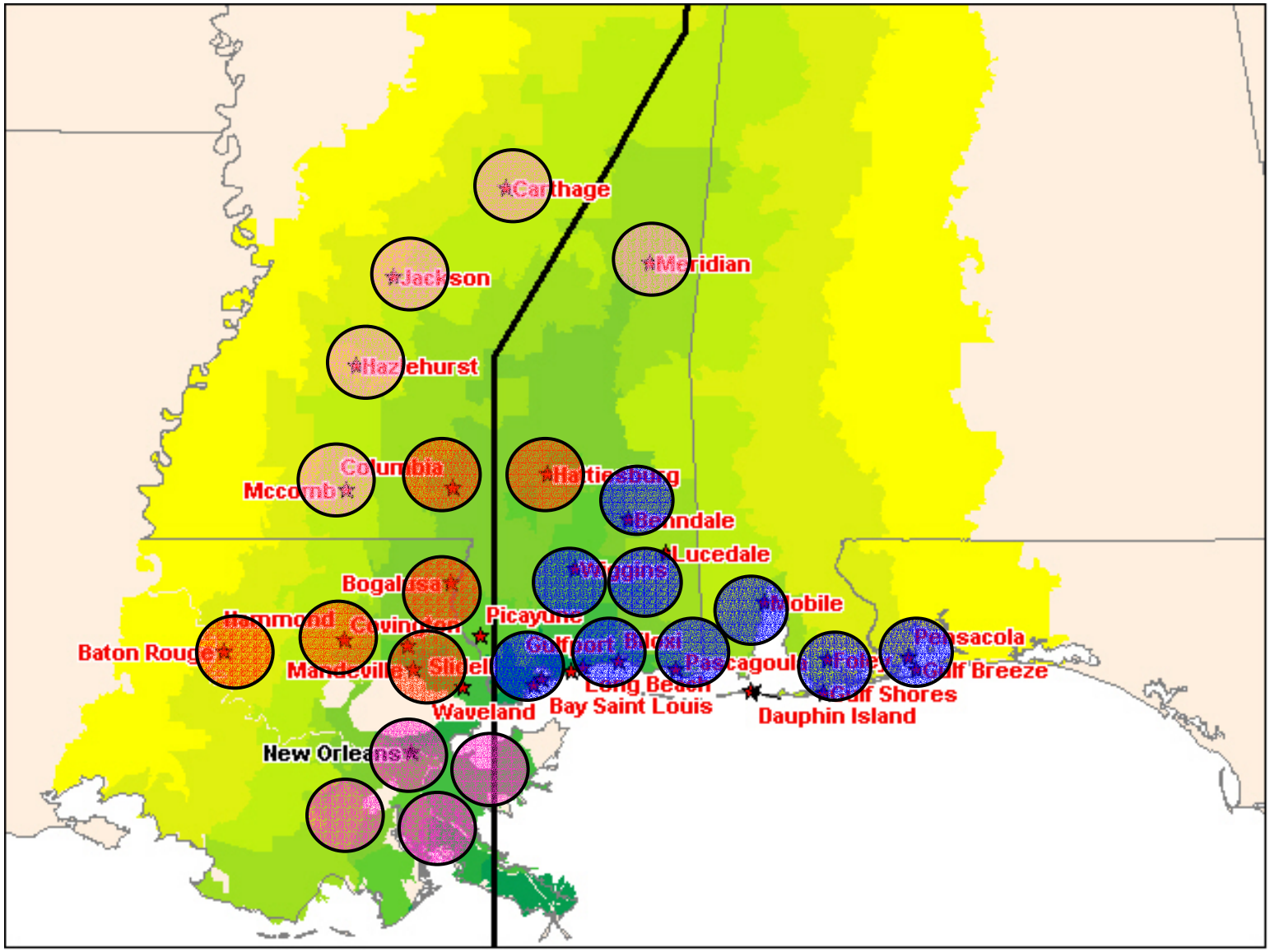
That's Implicitly Modeled!

- Damageability relationships begin from an engineering base and are subject to uncertainty.
- Claims data from clients which is used as part of the validation of these relationships does not always separate out details of loss; we must assume some ancillary losses are in the data.
- For example, since debris removal losses may be included in validation data we say that some debris removal loss is implicitly included in our loss estimates.
- It is, however, not unreasonable to include a separate explicit debris removal factor to loss estimates as the level of implicitly modeled loss is unknown and subject to uncertainty.

Goals of Post-disaster Damage Survey

- Obtain information on the overall extent and gradation of damage
  - Along the track up to a distance of (3 to 5)*Rmax inland
  - Across the track up to a distance of (2 to 3)*Rmax on either side of the track
  - Along the coast
- Use the information on the extent and gradation of damage to eliminate the uncertainties in the storm windfield
- Obtain detailed damage assessment using the individual property survey form
  - Damage relativities between various construction classes (wood frame vs. masonry)
  - Damage relativities between various occupancies (residential vs. commercial)
  - Specific building characteristic which drive the losses

Areas Surveyed by AIR Engineers



Areas Surveyed by AIR Engineers

Hurricane Katrina — Storm Surge and Flood

Long Beach, MS

Storm Surge versus Flood Inundation

Storm surge (the difference between storm tide and normal high tide) is the water driven onshore by high winds. The water subsequently recedes.

For purposes of this briefing, flood inundation is defined as the standing water in New Orleans caused by the breaking of the levees.

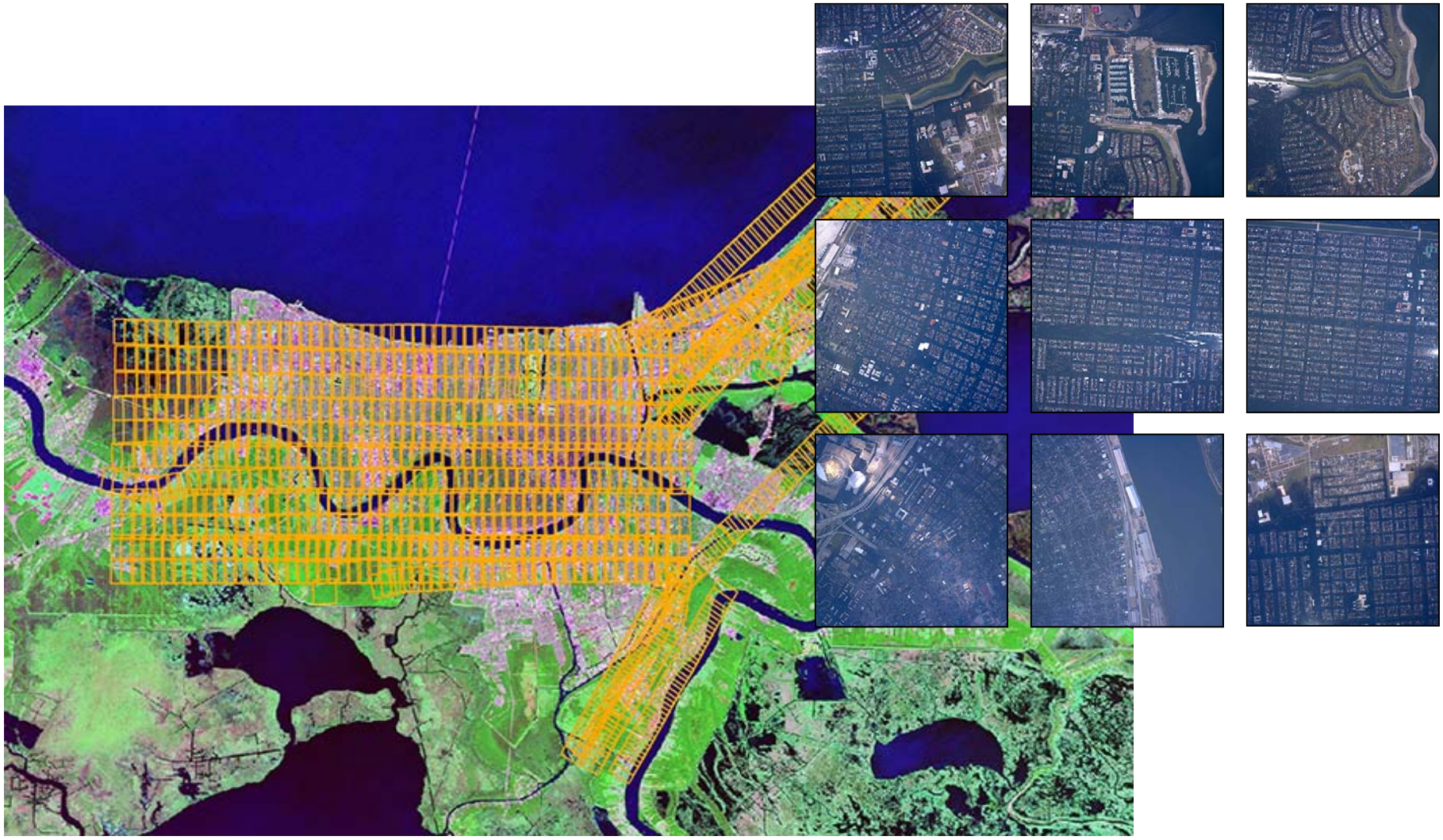
Measuring Surge Levels

Flood: New Orleans Under Water

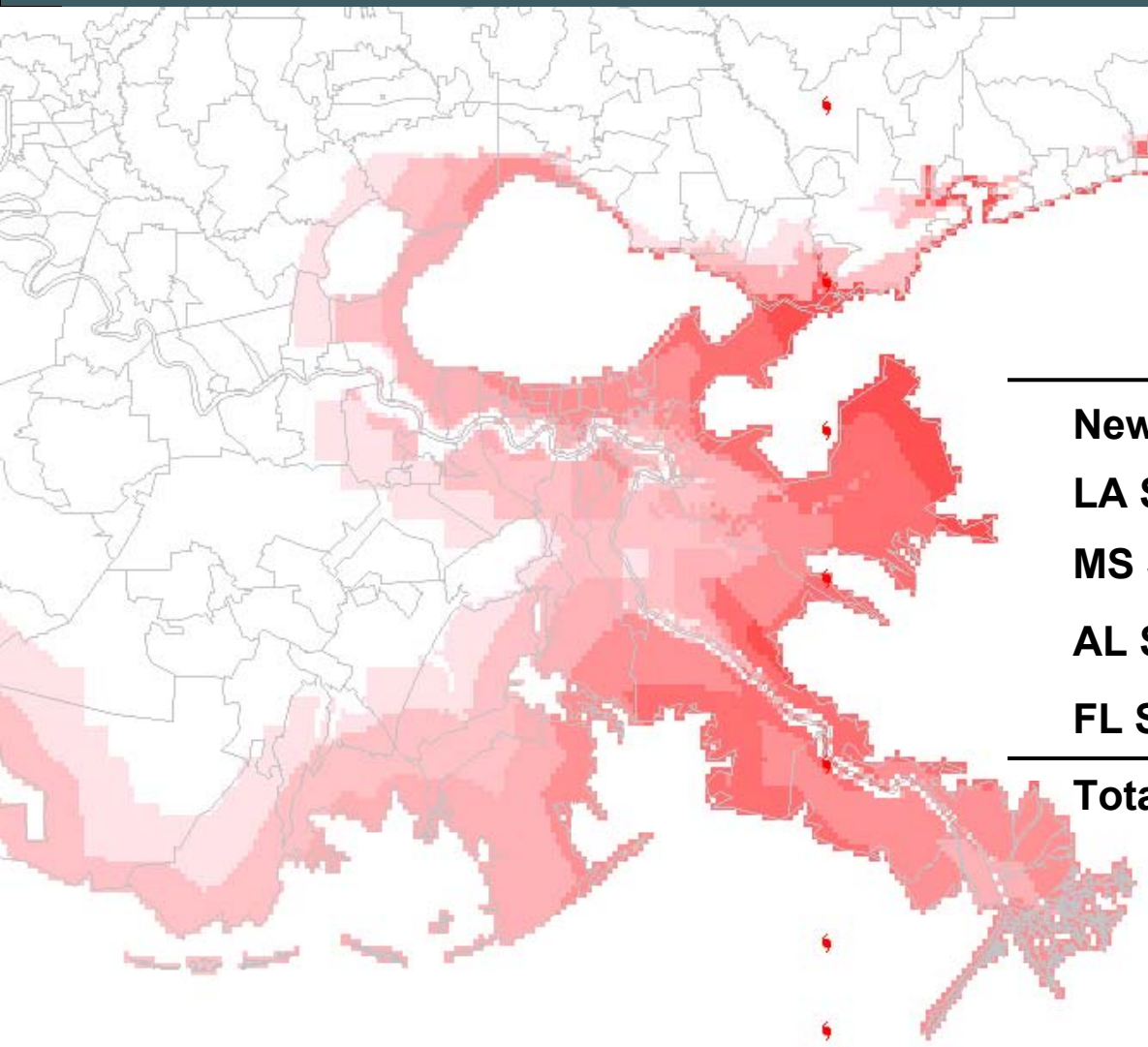
Methodology for Estimating Flood Depths in New Orleans

- Aerial images from NOAA are geo-referenced and analyzed to define flood boundaries
- Flood boundary landmarks are overlaid on high resolution digital elevation models (DEM) to determine the flood elevation at each location
- A flood elevation surface is created from the landmark points and the flood elevations assigned to them
- Subtracting the DEM from the flood elevation surface and taking the positive values provides the flood depth

Sample of the Hundreds of Aerial Images of New Orleans



Total Modeled (Insured and Uninsured) Damage from Hurricane Katrina's Surge and Flood



	Total Damage (USD Millions)
New Orleans Flood	22,571
LA Surge	16,156
MS Surge	4,389
AL Surge	793
FL Surge	32
Total	43,941

Additional Items Leading to Increased Losses

- Delay in repairs due to
  - Infrastructure damage
  - Delay in building permit process
  - Shortage of building inspectors
- Extended exposure to elements
- Temporary fixes made to mitigate future loss while waiting for repair
- Compliance with building code upgrades
- Per diem rates paid to workers brought in from other areas
- Increase in loss payments to avoid bad press
- Claims overpayments due to workload pressures on claims adjusters

- **ITV issues should not be confused with demand surge**

Demand Surge Lessons Learned

- The demand surge experienced for a particular hurricane is impacted by losses from other hurricanes with proximity in time and geographical region affected.
- Building material and labour prices in different regions respond differently to same amount of industry loss
- Demand surge is different for different coverages.
- Large events delay the start time of repair and reconstruction, increasing losses from business interruption and additional living expenses
- A lot of losses attributed to demand surge may have resulted from under valuation
- Demand surge related to Katrina impacted by wind and flood losses
- Cleanup costs contribute significant expense
- Industry preparedness has increased
- Barrier's to increase in prices like price gauging laws and strict government control have been introduced.

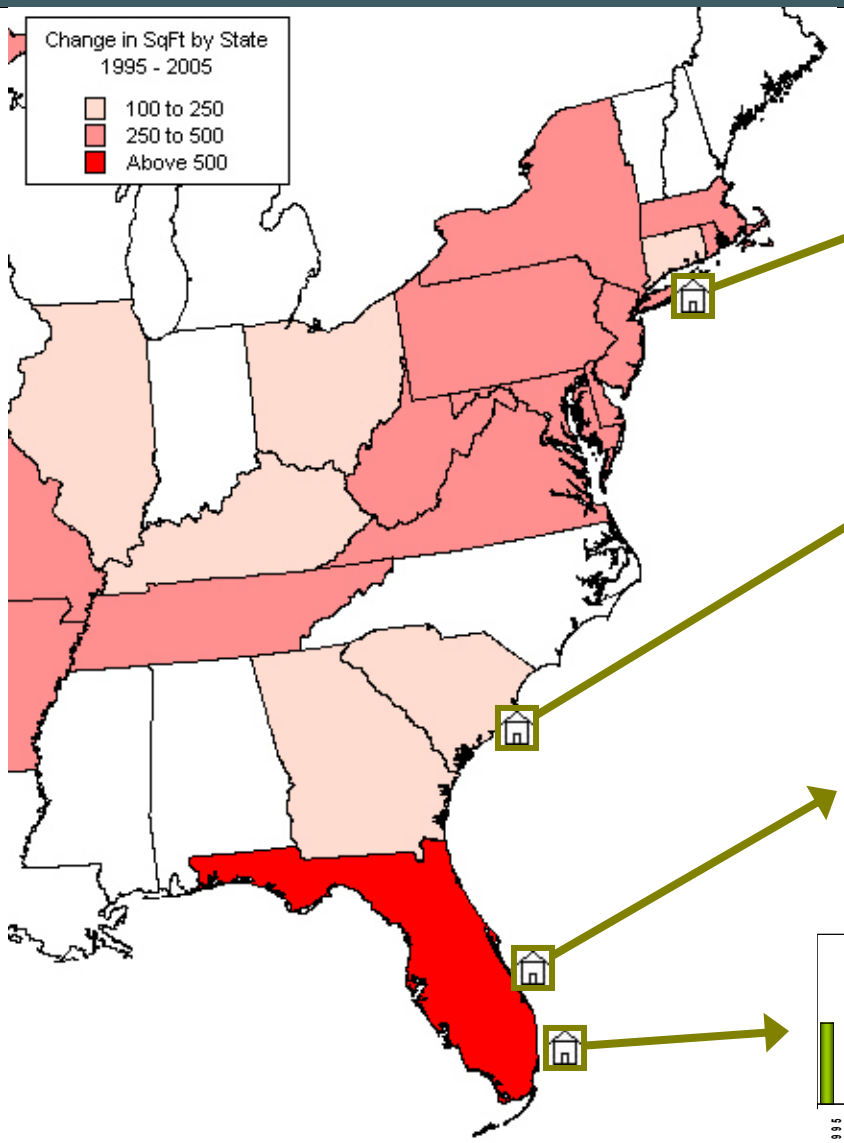
Highlights of AIR Exposure Data Quality Analysis

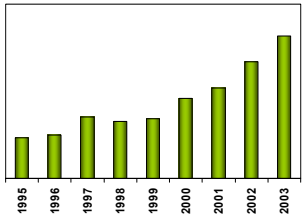
- Nine out of ten commercial properties analyzed had replacement values less than the amount estimated using a standard engineering-based cost estimation process.
- To obtain accurate catastrophe loss estimates, the coverage limit should not be used as a proxy for the replacement value, particularly for polices covering only a share of the property.
- Over 50 percent of companies analyzed lacked construction and/or occupancy information for more than a third of their policies.
- Accurate analysis of multiple-location policies requires an address for each location.

Growth in the Number of Housing Units, 1995-2005

California	35%
Florida	24%
Georgia	44%
N. Carolina	41%
S. Carolina	37%
Texas	37%
U.S.	31%

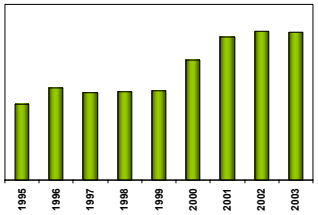
New Homes Are Getting Larger





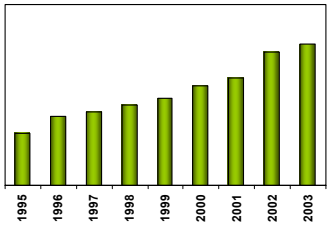
Sag Harbor/Long Island

1995 ~ 2,100 sq. ft.
2003 ~ 3,550 sq ft
Growth ≈ 70%



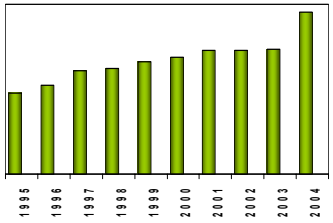
Charleston Area

1995 ~ 2,200 sq. ft.
2003 ~ 2,850 sq ft
Growth ≈ 30%



Palm City Area

1995 ~ 2,080 sq. ft.
2003 ~ 3,060 sq ft
Growth ≈ 47%



Fort Lauderdale Area

1995 ~ 2,900 sq. ft.
2004 ~ 4,400 sq ft
Growth ≈ 52%

New Homes Are Also More Architecturally Complex

Yesterday…

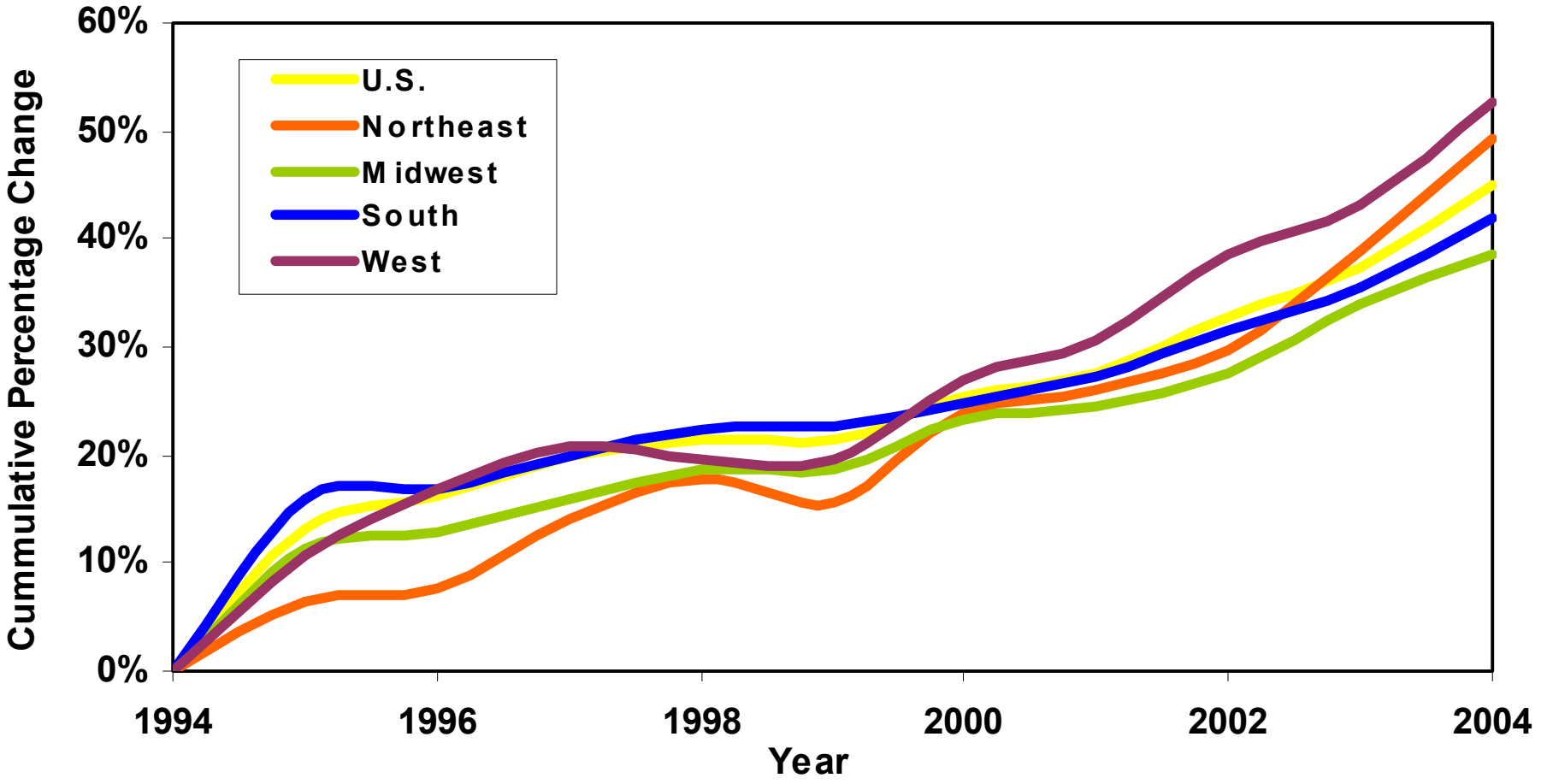
and today.

Interiors Feature More Opulent Finishes

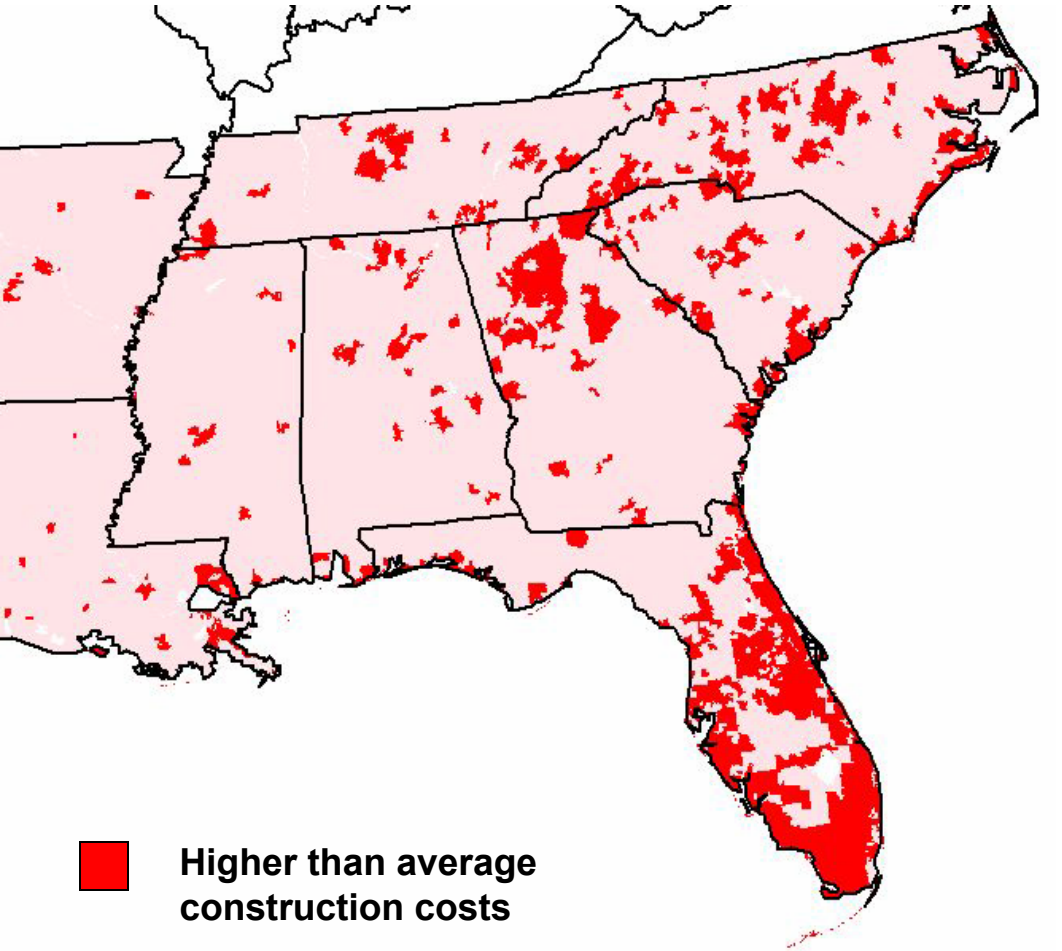
Yesterday…

and today.

Change in Residential Costs Per Square Foot – U.S. Regional Average Costs



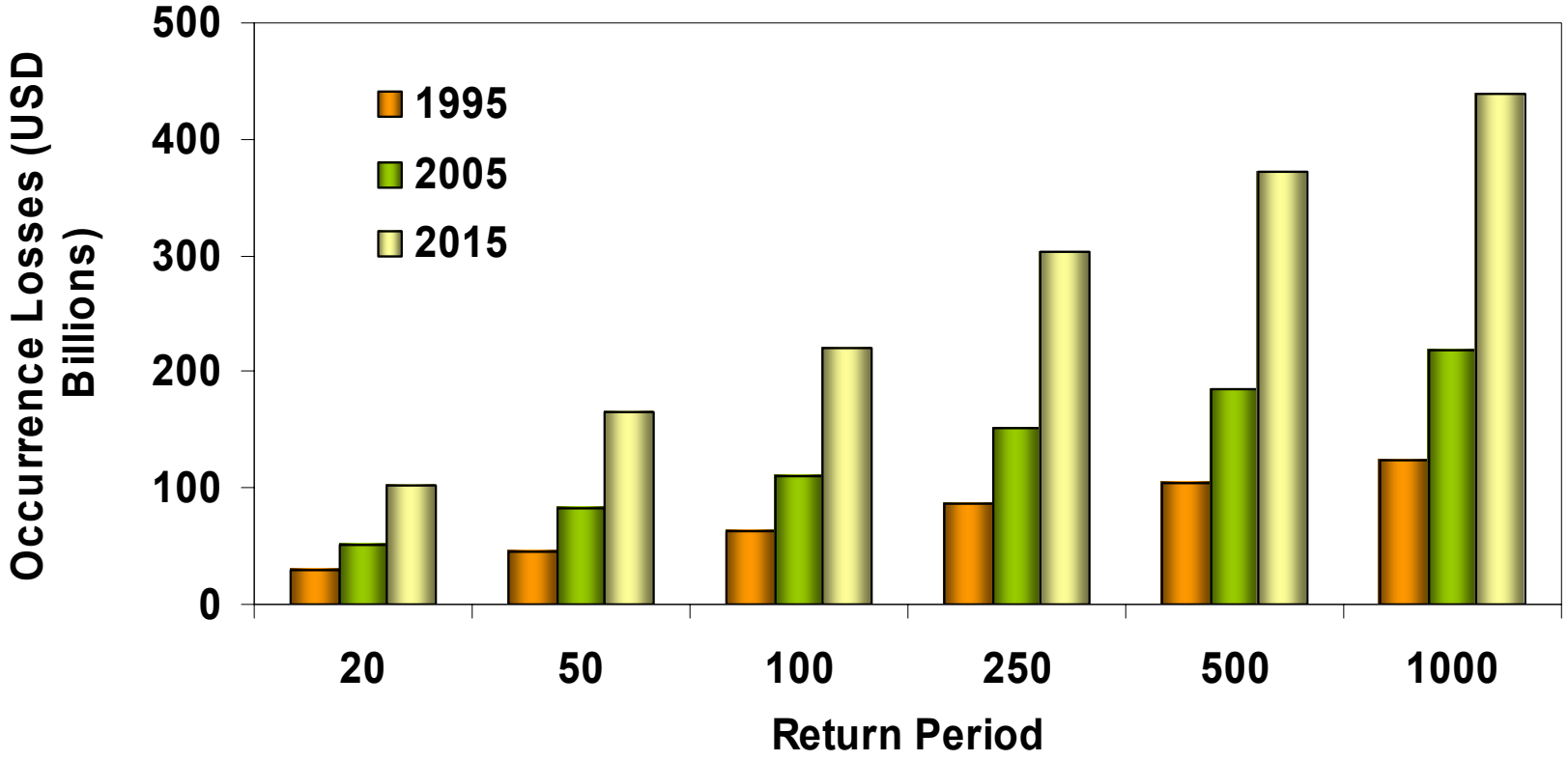
Construction Costs Vary by Location



Local and Site-Specific Factors Affecting Construction Costs

- **Demographics**
  - Wealthier neighborhoods are typically charged higher labor rates
- **Accessibility**
  - More costly - narrow roads, steep terrain, remote area, congested urban area, heavy traffic, elevator required to transport labor and materials, etc.
  - Less costly - flat terrain, suburban area, nearby access to major routes, light to normal traffic, etc.
- **Local Ordinances**

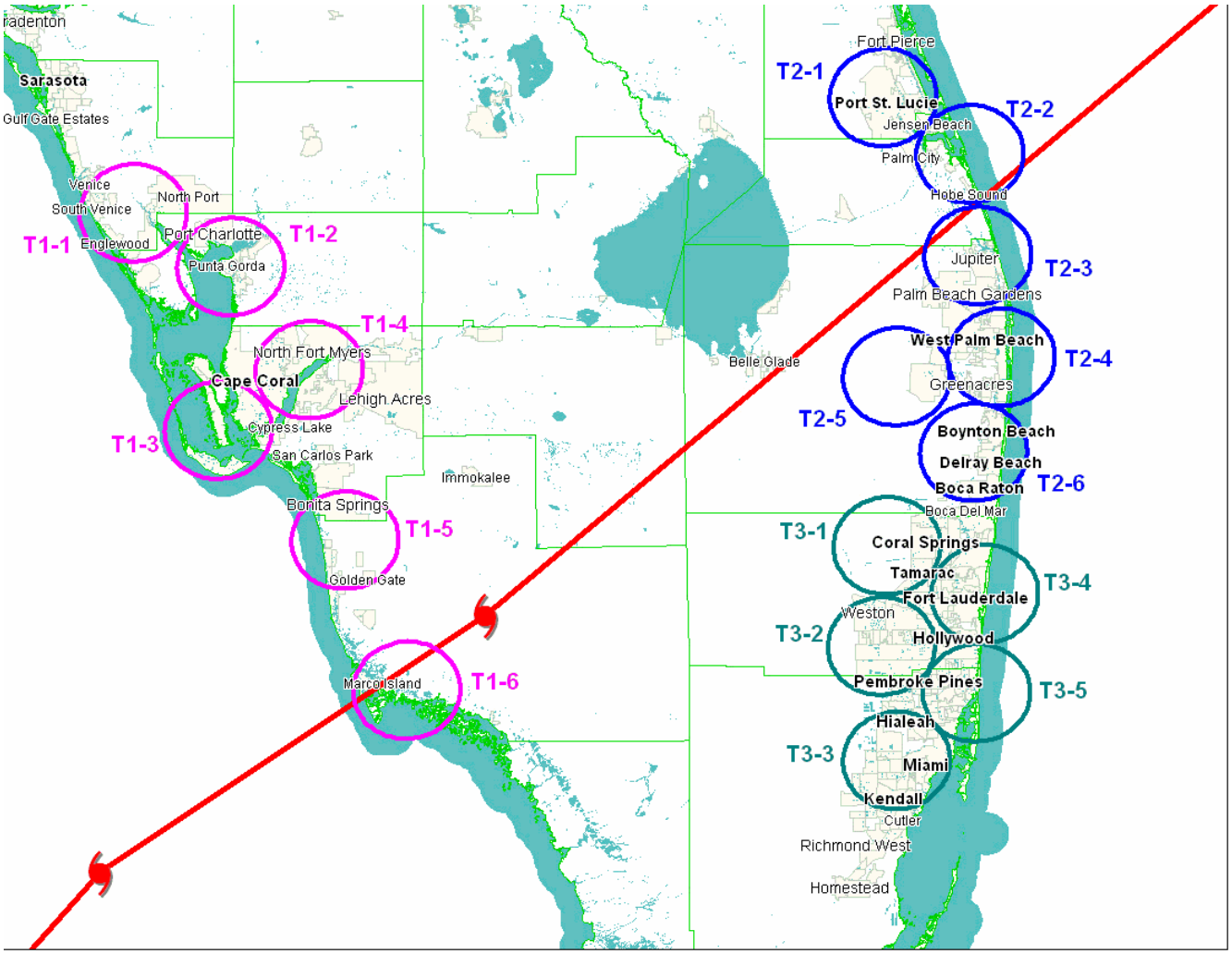
Exposure Growth Alone Results in a Doubling of AIR Industry Losses Over Past Decade



Losses include hurricane, earthquake, fire following, winterstorm, severe thunderstorm

Losses include aggregate demand surge

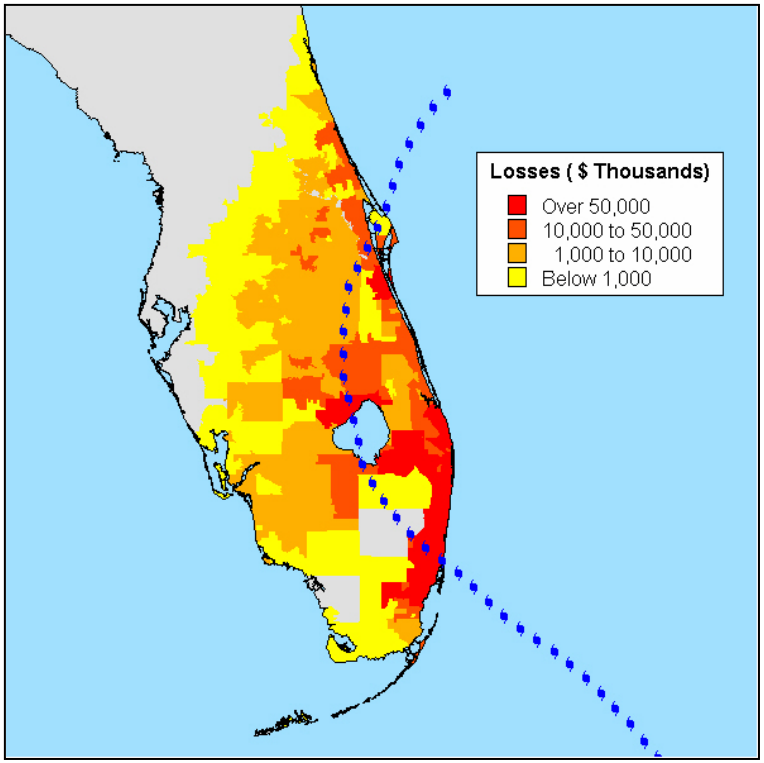
Let's Not Forget Wilma



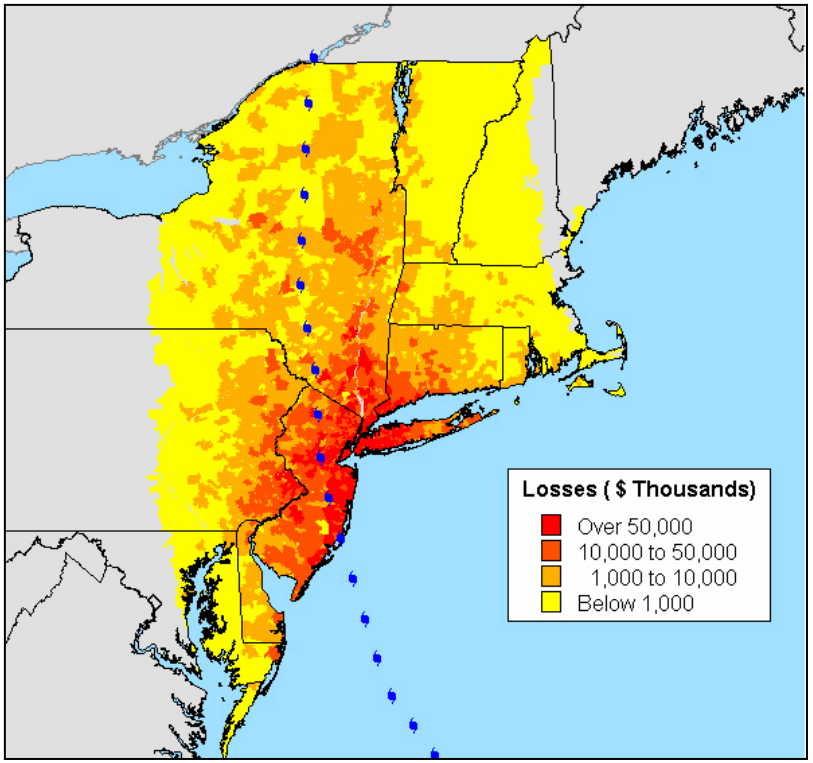
Pool Enclosures

Where Can the Industry Experience Insured Losses Greater Than $100 Billion?

Event ID: 20877
Category 5
Insured Loss: $137B



Event ID: 6845
Category 4
Insured Loss: $109B



Summary

- Catastrophe models are robust tools for estimating relative risk; users of models need to understand what models do and don't include and make appropriate adjustments to estimate absolute levels of loss
- Growth in property exposures is a primary driver of increasing catastrophe losses