

EQECAT Hurricane Loss Modeling

NAIC Fall National Meeting Sep 2007
Property and Casualty Insurance Committee
Catastrophe Insurance Working Group

EQECAT AND THE ABS TEAM

ABS

Federally chartered Marine and Offshore Classification and Certification business

ABS Consulting

Risk management Engineering Firm

- Process Risk (Manufacturing, Oil and Petroleum)
- Government
- Catastrophic Risk
- Global Consultancy

EQECAT, Inc.

Risk quantification for financial markets

- Software
- Consulting

EQECAT, Inc

Providing State-Of-The-Art Risk Management Technology

- Real-World Tested Solutions
 - risk model provider to the insurance, risk finance industry and major corporations
- Catastrophe Risk Quantification Software
 - 167 models - Earthquake, Hurricane, Flood, Snow/Ice, Tornado, Terrorism
 - 90 countries worldwide, 6 continents (covering 88%+ of global GDP)
- Supporting Global Risk-Transfer Market
 - leader in modeling of rated natural catastrophe bonds (CAT bonds)
 - international market support (World Bank projects)
 - private party risk swaps, exchanges, etc
- ABS Consulting Offices in 21 countries
 - EQECAT Offices in Japan (1), USA (5), UK (2), France (1), Germany (1)

Our Mission

EQECAT is dedicated to the quantification and mitigation of the operational and financial consequences of extreme events related to natural and manmade risks for the insurance industry and major corporations worldwide.

Goals of Catastrophe Modeling

■ Goal of Catastrophe Modeling

- Reduce the uncertainty in business operations due to potential losses from catastrophes (natural and man-made)

■ Do Catastrophe Models Help?

- Hurricane Andrew (1992) saw the insolvency of 11 insurance companies
- Hurricane sequence of 2004 (4 Cat events) triggered the insolvency of 4 insurance companies (2 groups)

CAT models promote business stability by reducing the uncertainty in prospective finance of natural catastrophe risk

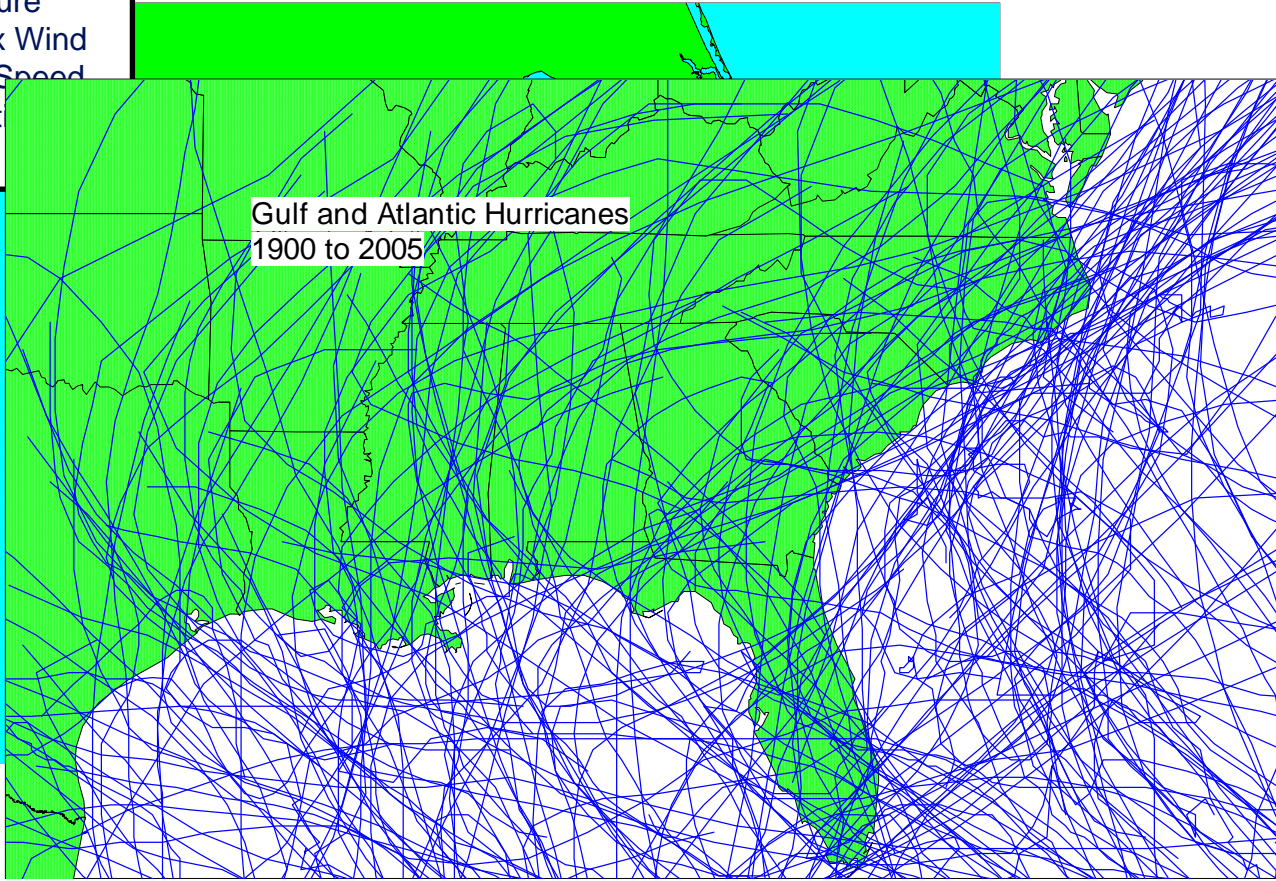
What are CAT Models: Methodology

Step One: Define the Hazard

HURRICANE

Central Pressure
Radius to Max Wind
Translational Speed
Wind Attenuat
Terrain

Gulf and Atlantic Hurricanes
1900 to 2005

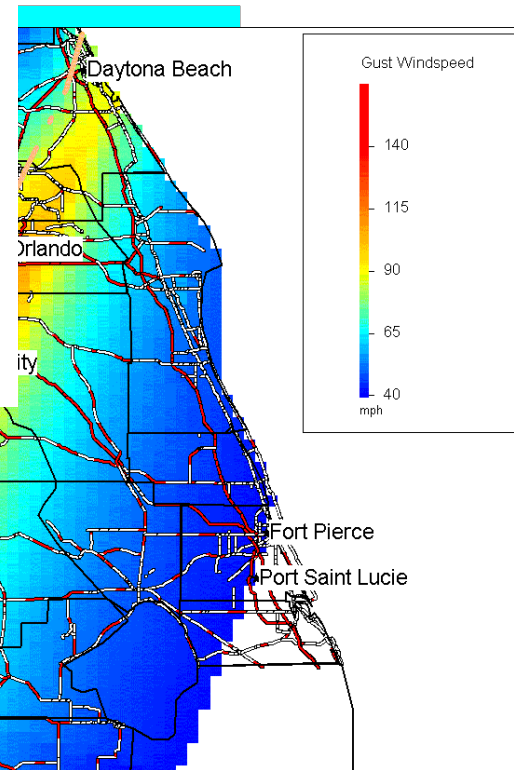
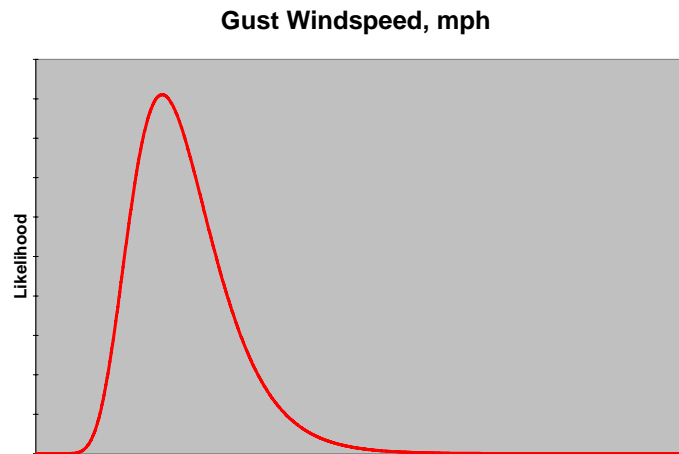
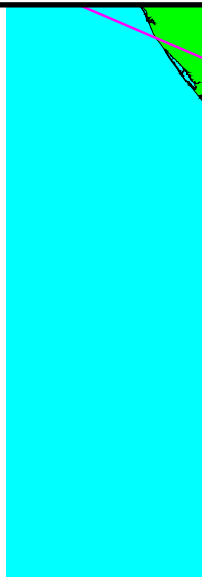


What are CAT Models: Methodology

Step Two: Determine Site Hazard Severity

WIND SPEED

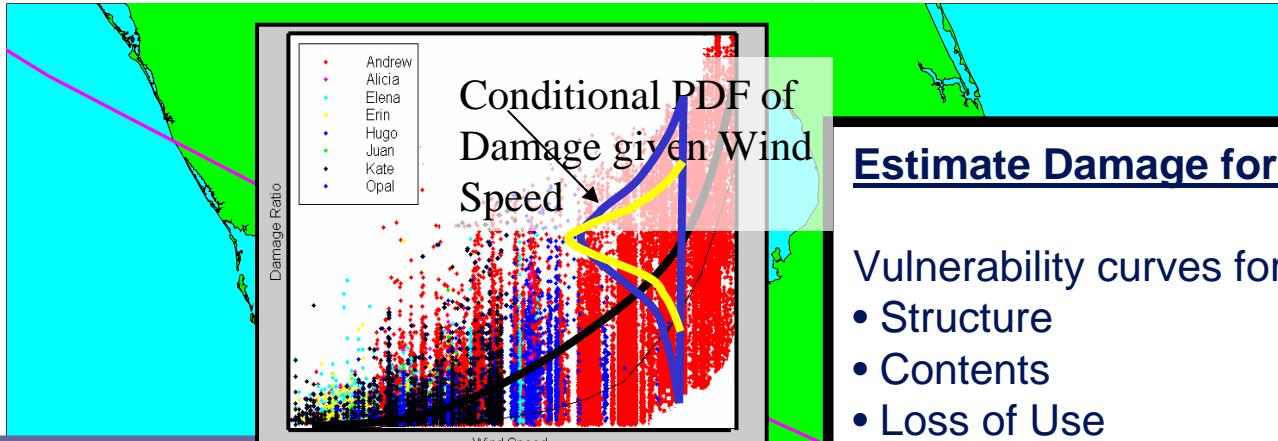
Calculated for each site
 $V_w = f(P_c, d, \text{region})$



Hurricane Charley
13 August, 2004
Estimated Maximum Gust Winds
source: EQECAT

What are CAT Models: Methodology

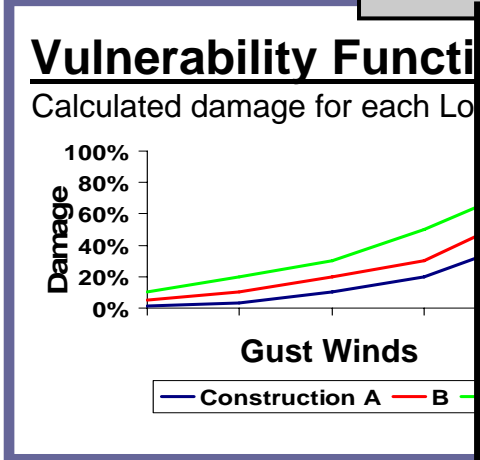
Step Three: Estimate Ground up Damage



Estimate Damage for each Site:

Vulnerability curves for:

- Structure
- Contents
- Loss of Use



3 approaches for Vulnerability Function Development:

- Empirical Approach
 - Historical Wind Fields and Claims Data
- Engineering Approach
 - Define failure modes & estimate capacity
 - Combine failure modes for overall capacity
- Expert opinion

Building Vulnerability to Damage

- Building vulnerability is a function of
 - Primary Structure Description (Masonry, Frame, Other)
 - Design Code (function of year and region)
 - Mitigation measures present
 - Gable Bracing
 - Hip roof
 - Shingle type
 - Roof Nailing
 - Clips / Straps
 - Roof Anchors
 - Shutters (wood, steel, engr'd)
 - Window Glazing

What are CAT Models: Methodology

Step Four: Compute Insured Loss

- For any given property, the insurer loss is the greater of two quantities: (1) zero, and (2) the damage minus the deductible, but not greater than the policy limit. Because the damage is a random variable, i.e., it is associated with a probability distribution, so too is the insurer loss. However, we can calculate the average insurer loss (mathematical expectation) by the following expression:

$$TIV \cdot \left[\int_D^{D+L} (x - D) \cdot f(x) dx + \int_{D+L}^{\infty} L \cdot f(x) dx \right]$$

- Facultative
Treaties

LOSS COSTS PER \$1,000
PERSONAL RESIDENTIAL -Owners -- MASONRY

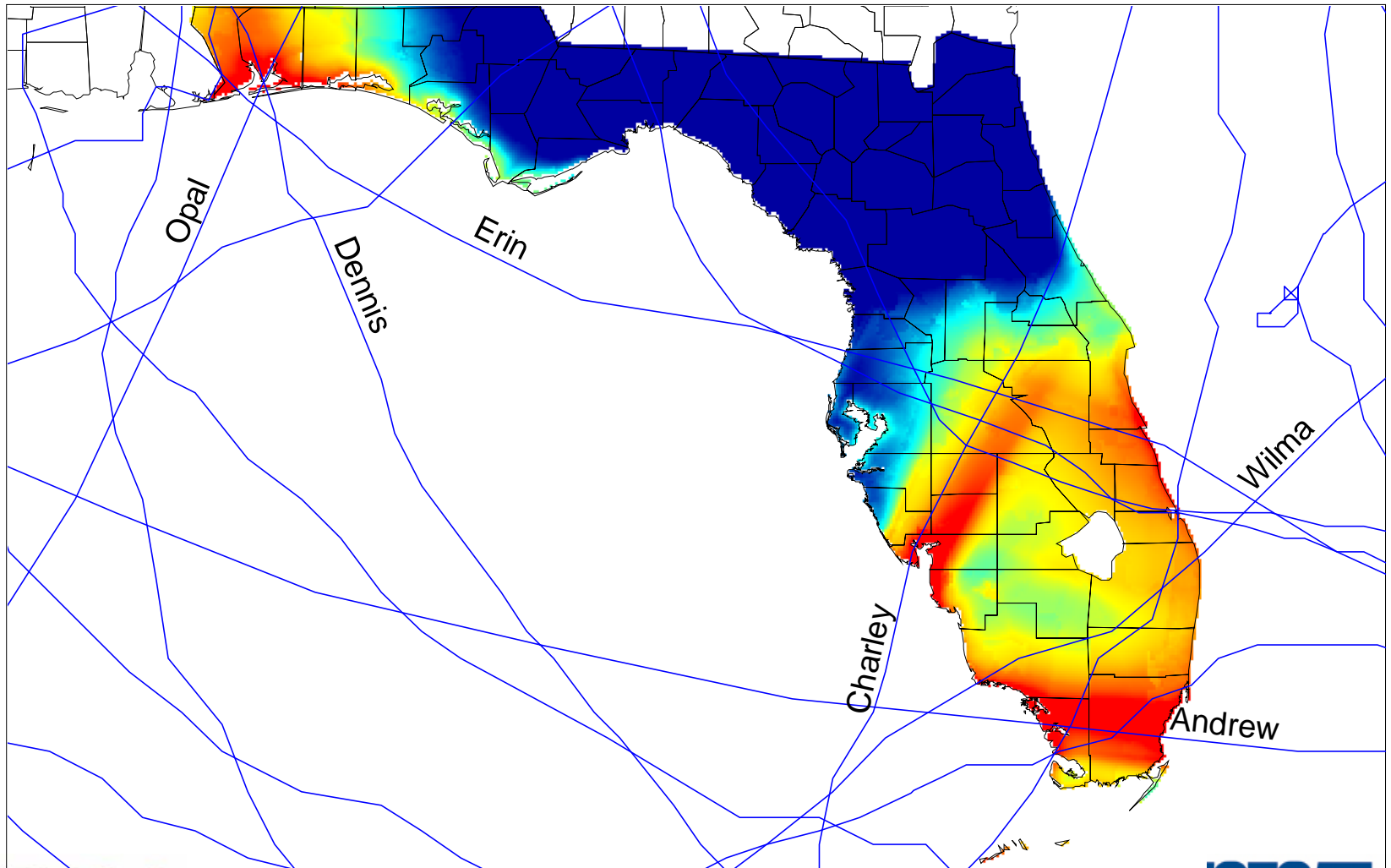
LOSS COSTS	\$500 DEDUCTIBLE TOTAL*	\$1,000 DEDUCTIBLE TOTAL*	\$2,500 DEDUCTIBLE TOTAL*	1% DEDUCTIBLE TOTAL*	2% DEDUCTIBLE TOTAL*	5% DEDUCTIBLE TOTAL*
LOW	0.298	0.229	0.126	0.229	0.151	0.055
HIGH	0.428	0.341	0.202	0.341	0.236	0.104
WGHTD AVE	0.349	0.272	0.154	0.272	0.173	0.074

Sample

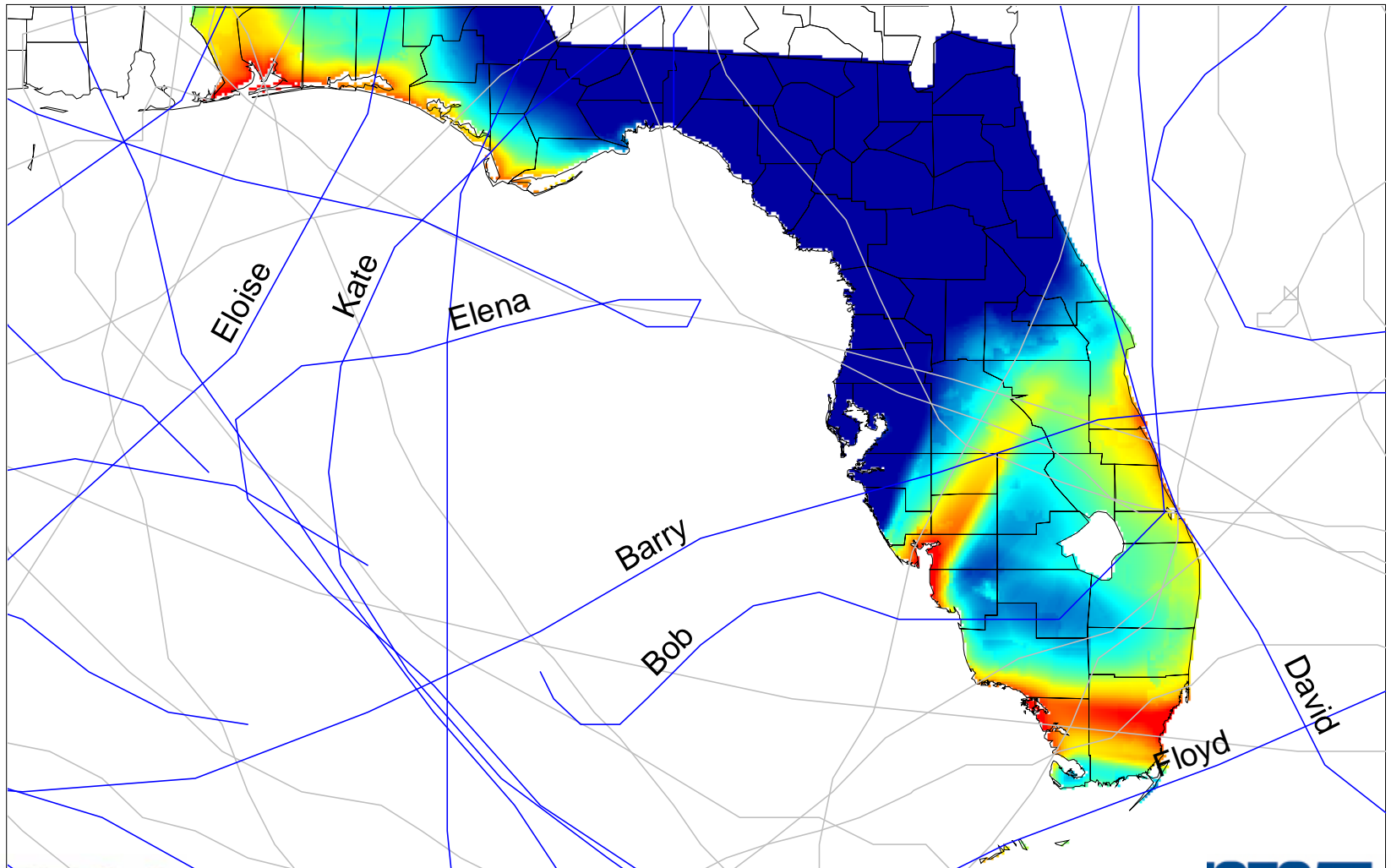
Outputs provided to FCHLPM

- Core output used by insurers is the “Loss Cost”
- Loss cost varies
 - Geographically
 - By structure type, mitigation credits
 - By deductible level

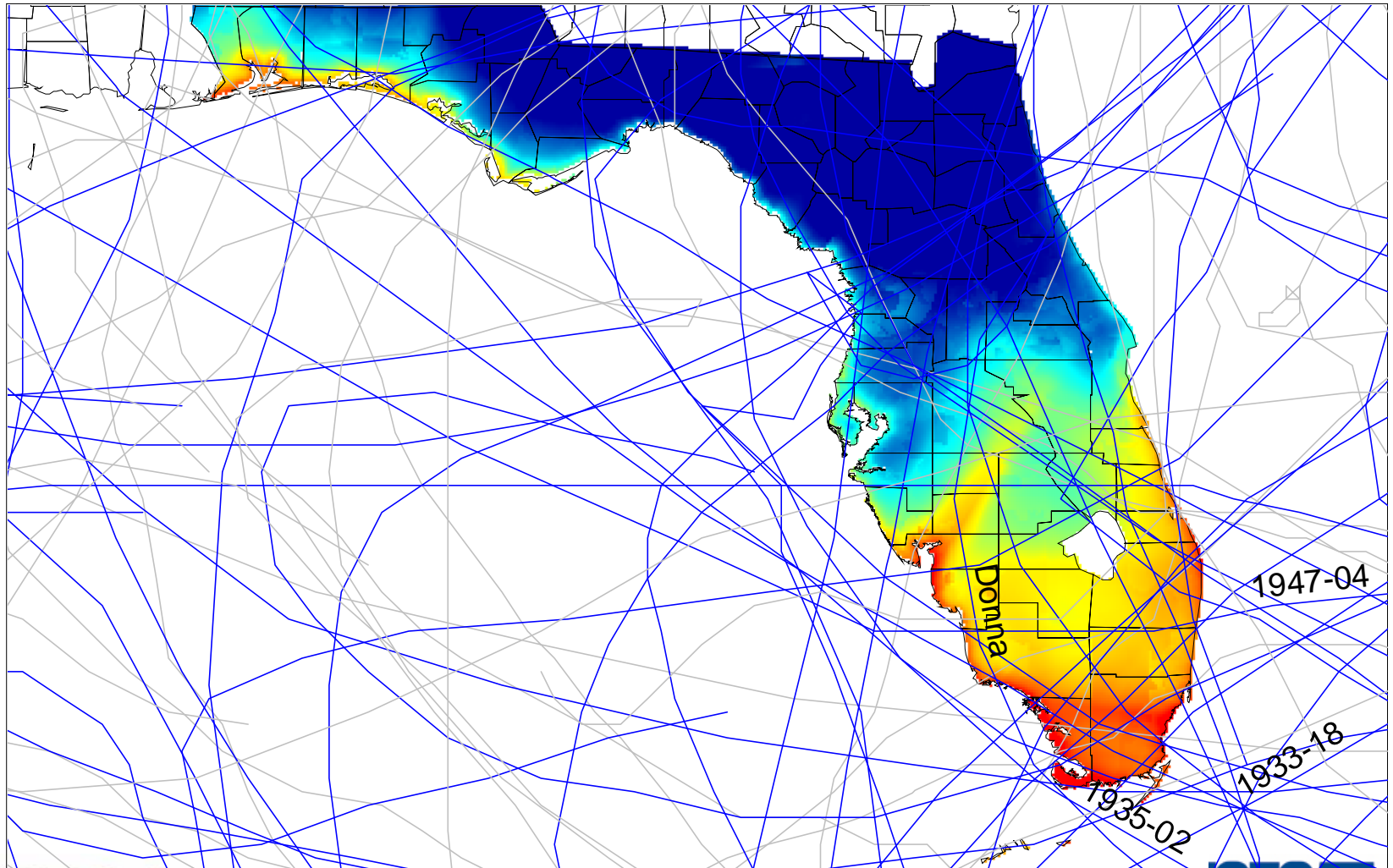
Loss Cost, 1990 to 2005 Storms



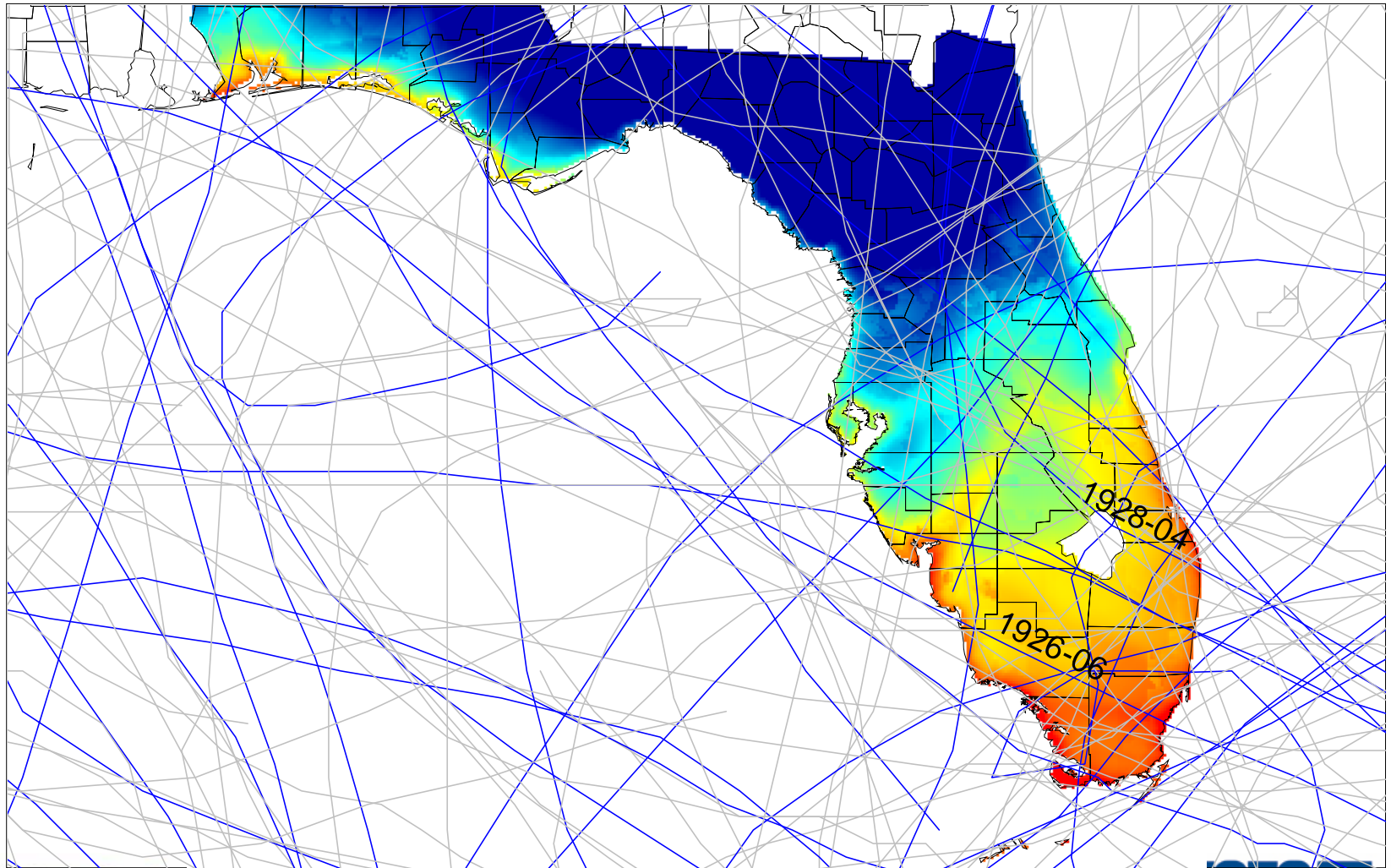
Loss Cost, 1970 to 2005 Storms



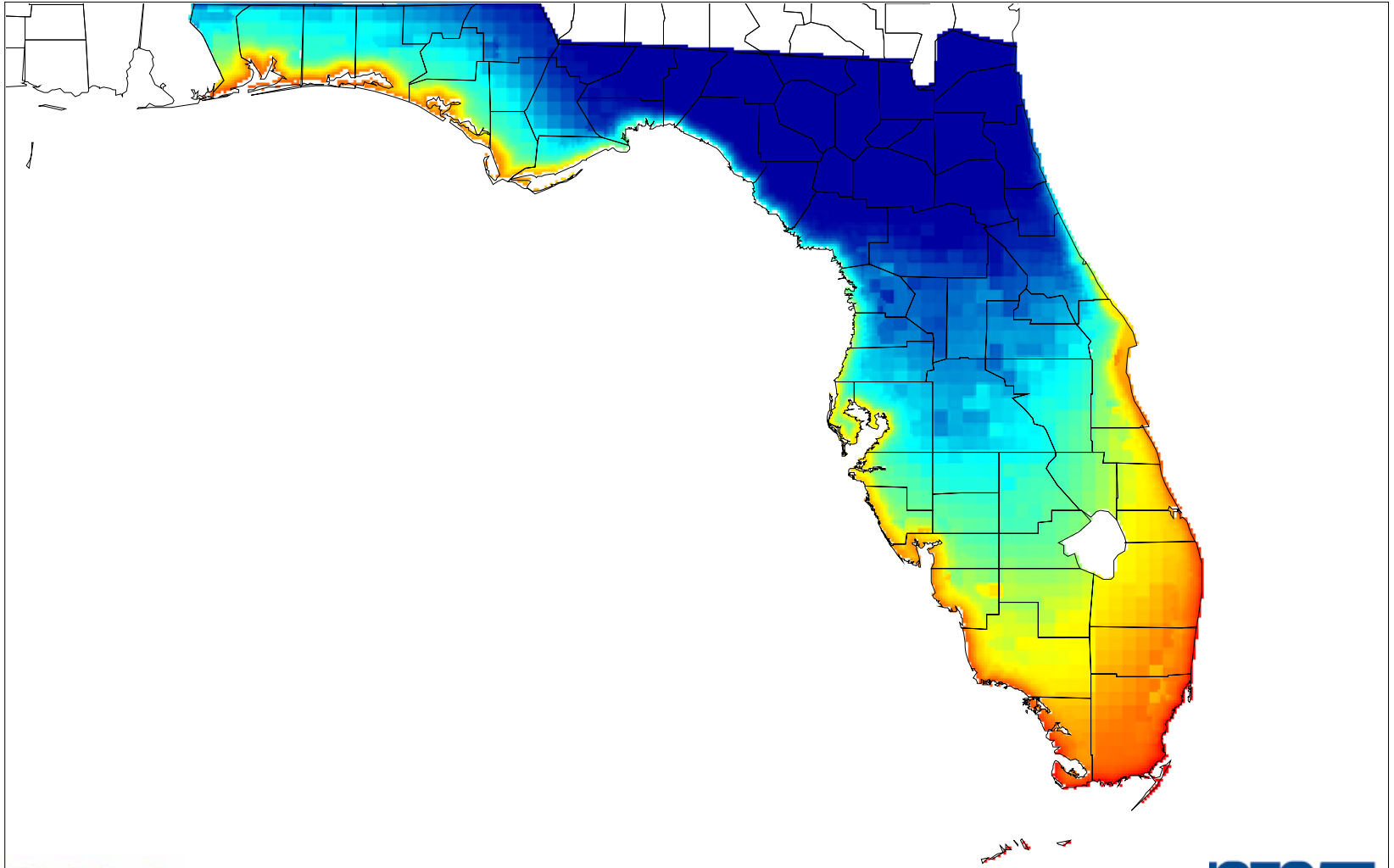
Loss Cost, 1930 to 2005 Storms



Loss Cost, 1900 to 2005 Storms



Probabilistic Loss Cost



Oversight of CAT model usage

■ Hurricane

- Florida
 - Legislative Branch – FCHLPM
 - Office of Insurance Regulation
- South Carolina Department of Insurance
- Louisiana Department of Insurance
- Texas Department of Insurance
- Hawaii Dept of Commerce & Consumer Affairs – Insurance

■ Earthquake

- California Department of Insurance
- Alaska Division of Insurance
- Washington State Office of the Insurance Commissioner
 - And More!

Hurricane Risk Modeling & Climate Change

Climate Change, Weather Cycles & CAT Modeling

- There is a general consensus that we are in an era of increased land-falling hurricane activity
 - Some attribute this to long-term Atlantic Multi-decadal Oscillation (US NHC position)
 - Some attribute this to global climate change
- The business and regulatory community are demanding companies quantify their risks to climate change
 - Global reinsurance community is already acting
 - US SEC is signaling that it will be setting higher standards of analysis and disclosure

EQECAT Catastrophe Modeling

- The basis of the EQECAT CAT models is empirical data from
 - Physics – Meteorology, Geology, Geophysics
 - Engineering
 - Insurance and actuarial science
- It has been tested and compared to actual event outcomes to produce a reliable measure of risk