
Exposure
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Exposure

- Estimating Exposure
  - Aggregates
  - PMLs
  - Market Share
  - Loss Models
- Deterministic Loss Modelling
  - Net Loss Model
  - RDSs
- Probabilistic Loss Modelling
  - Loss Models
  - EP Curves
- Exposure Management
  - Logistics
  - Pricing
  - Post-disaster management
  - Reporting


Extimating Exposure

Aims

- To introduce you to some of the methodologies currently in use to assess exposure
- To explain what we measure today and what we report to Lloyd's
- To emphasise these are estimates based on models - this is not a black and white science!

Estimating Exposure to Loss

Estimating Exposure

- Aggregate Exposure
- Probable Maximum Loss (PML)
- Market Share
- Scenario Loss Model
- Probabilistic Models

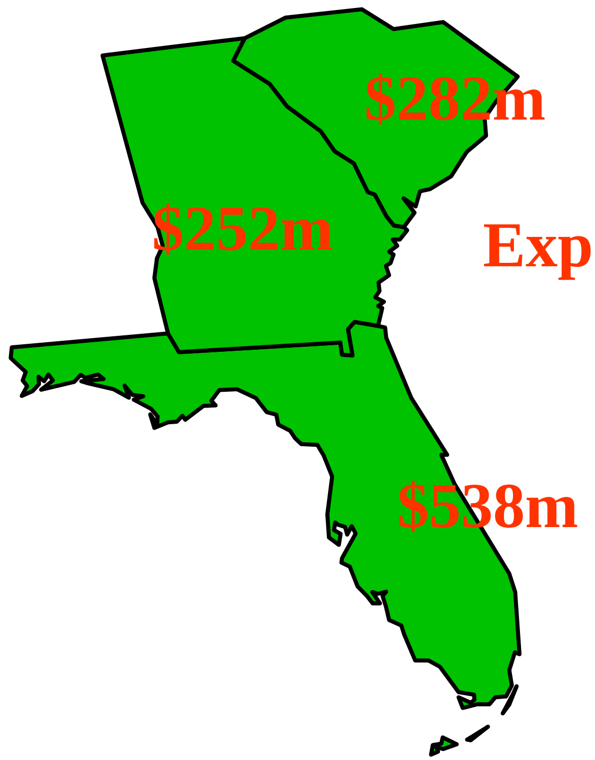
Aggregate Exposure

- Aggregate Exposure is the exposed value at risk in the event of total devastation
- Typically, this is determined from Original Sums Insured and limits/lines applied
- Typically, it is coded by geographical area then summed
- Typically, this is wrong!

“Arithmetic” of Aggregates

Aggregate Exposure in each State

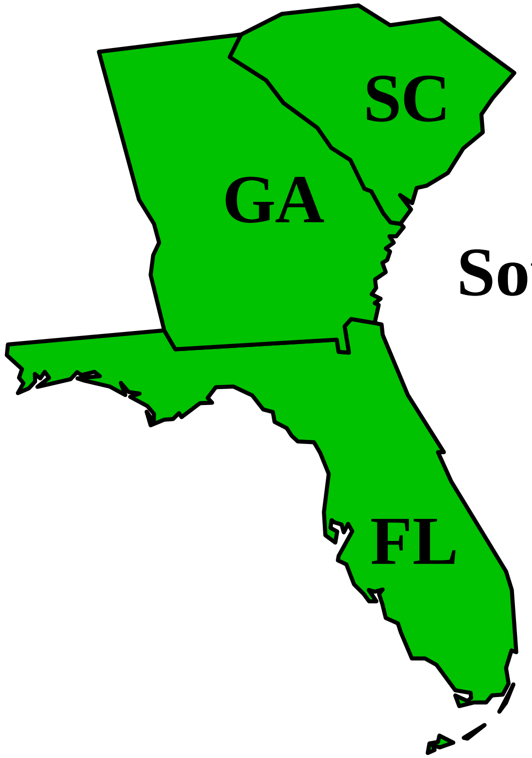
Windstorm Cat as-at 3rd July 2007



Exposure by adding each State $ 1,072m

“Arithmetic” of Aggregates

Aggregate Exposure across States
Windstorm Cat as-at 3rd July 2007



Correct
South East Zone Exposure
$ 746m

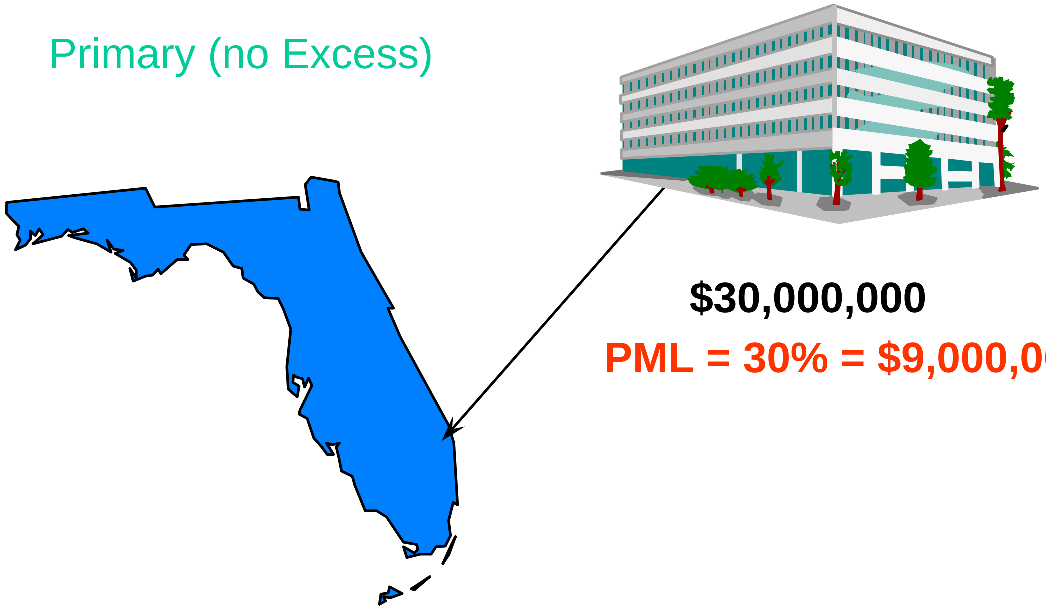
Probable Maximum Loss

- Probable Maximum Loss (PML) is the amount expected to result in loss
- This is meaningless without further clarification on type, location, and severity
- Typically, determined from Aggregate Exposure and a PML percentage, applied to each risk and area and then summed

“Arithmetic” of PMLs (1)

Single Risk

Primary (no Excess)



$30,000,000

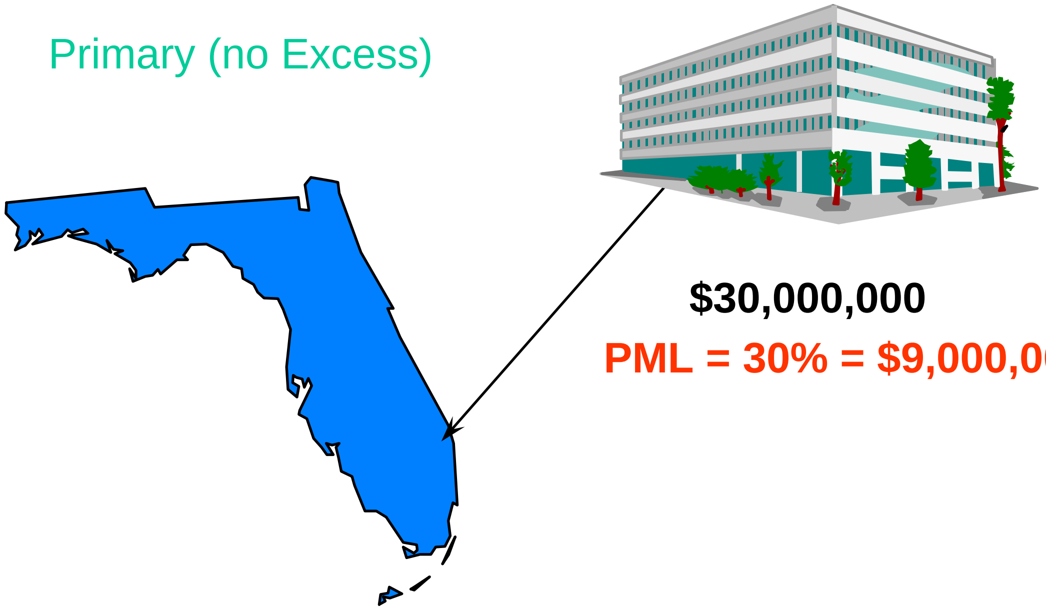
PML = 30% = $9,000,000

Risk PML = ?

“Arithmetic” of PMLs (1)

Single Risk

Primary (no Excess)



$30,000,000

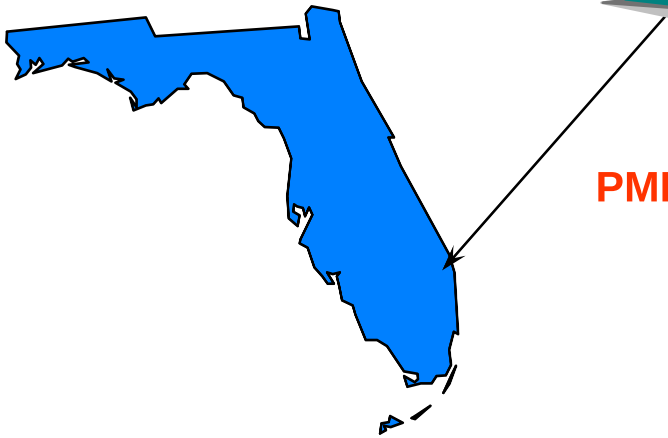
PML = 30% = $9,000,000

Risk loss = $9,000,000
Risk aggregate = $30,000,000
Risk PML = 30%

“Arithmetic” of PMLs (2)

Single Risk (2)

Deductible = $5,000,000
Limit = $5,000,000



$30,000,000

PML = 30% = $9,000,000

Risk PML = ?

“Arithmetic” of PMLs (2)

Single Risk (2)

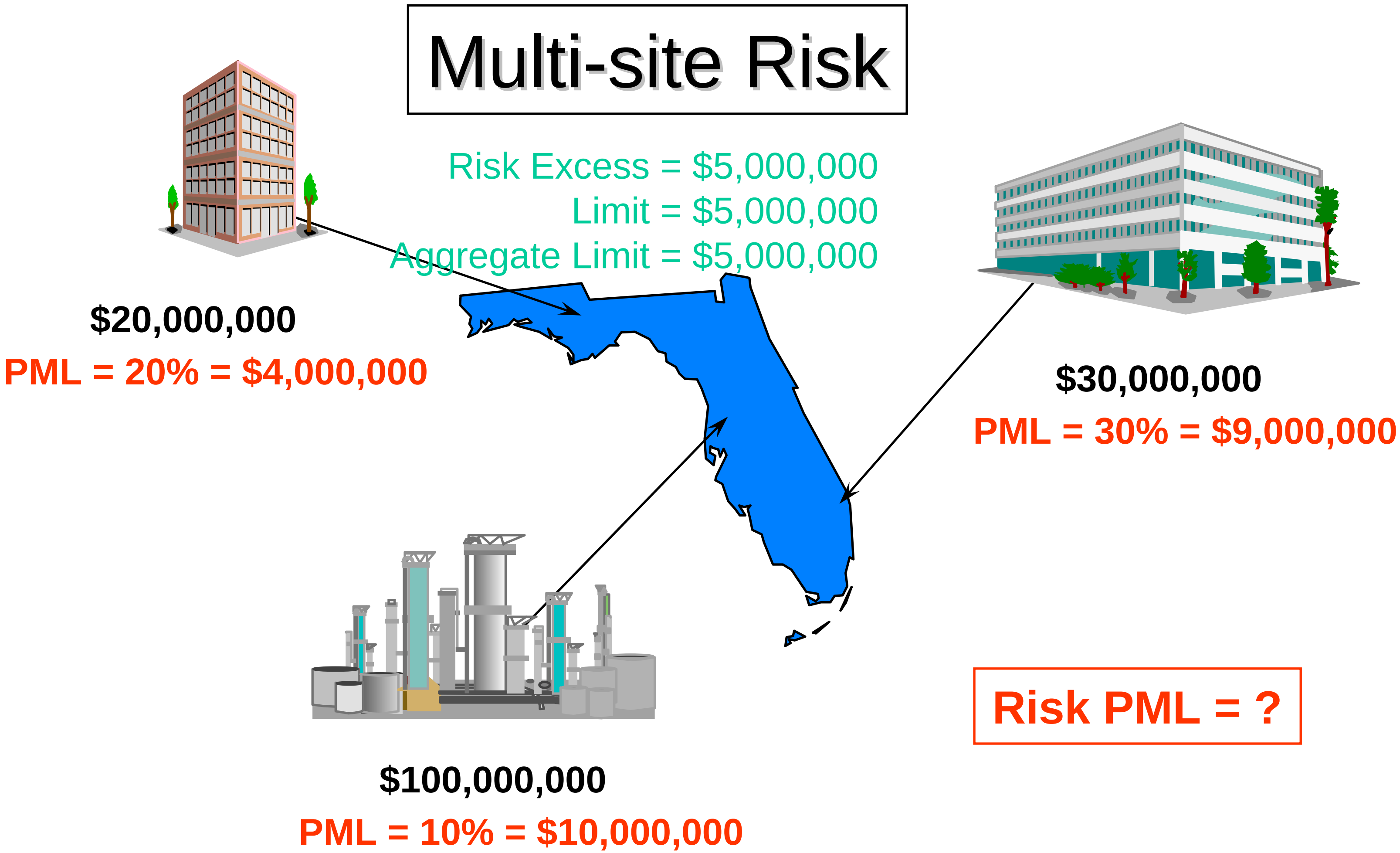
Deductible = $5,000,000
Limit = $5,000,000

$30,000,000

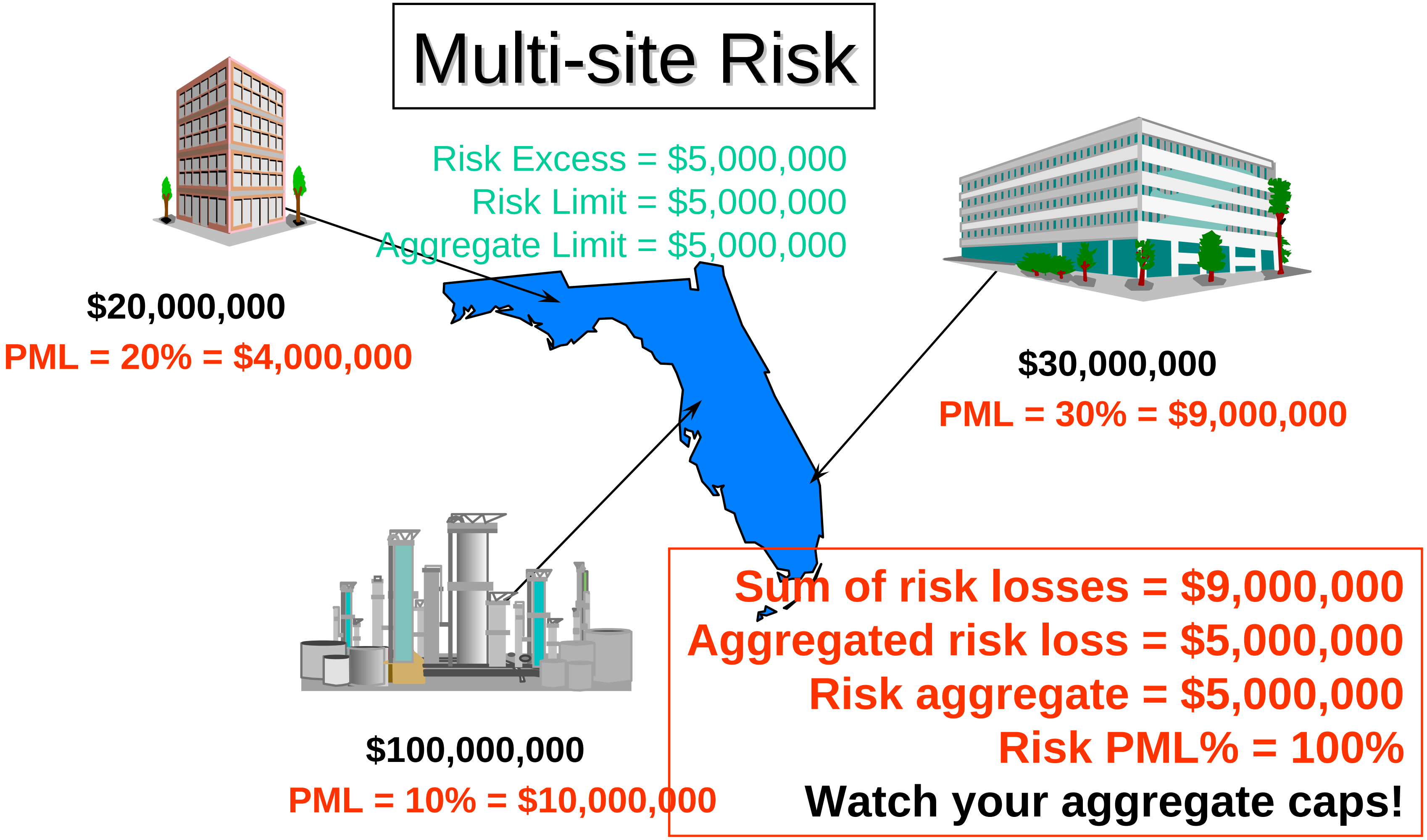
PML = 30% = $9,000,000

Risk loss = $4,000,000
Risk aggregate = $5,000,000
Risk PML% = 80%
So excess risks are a bit tricky …..

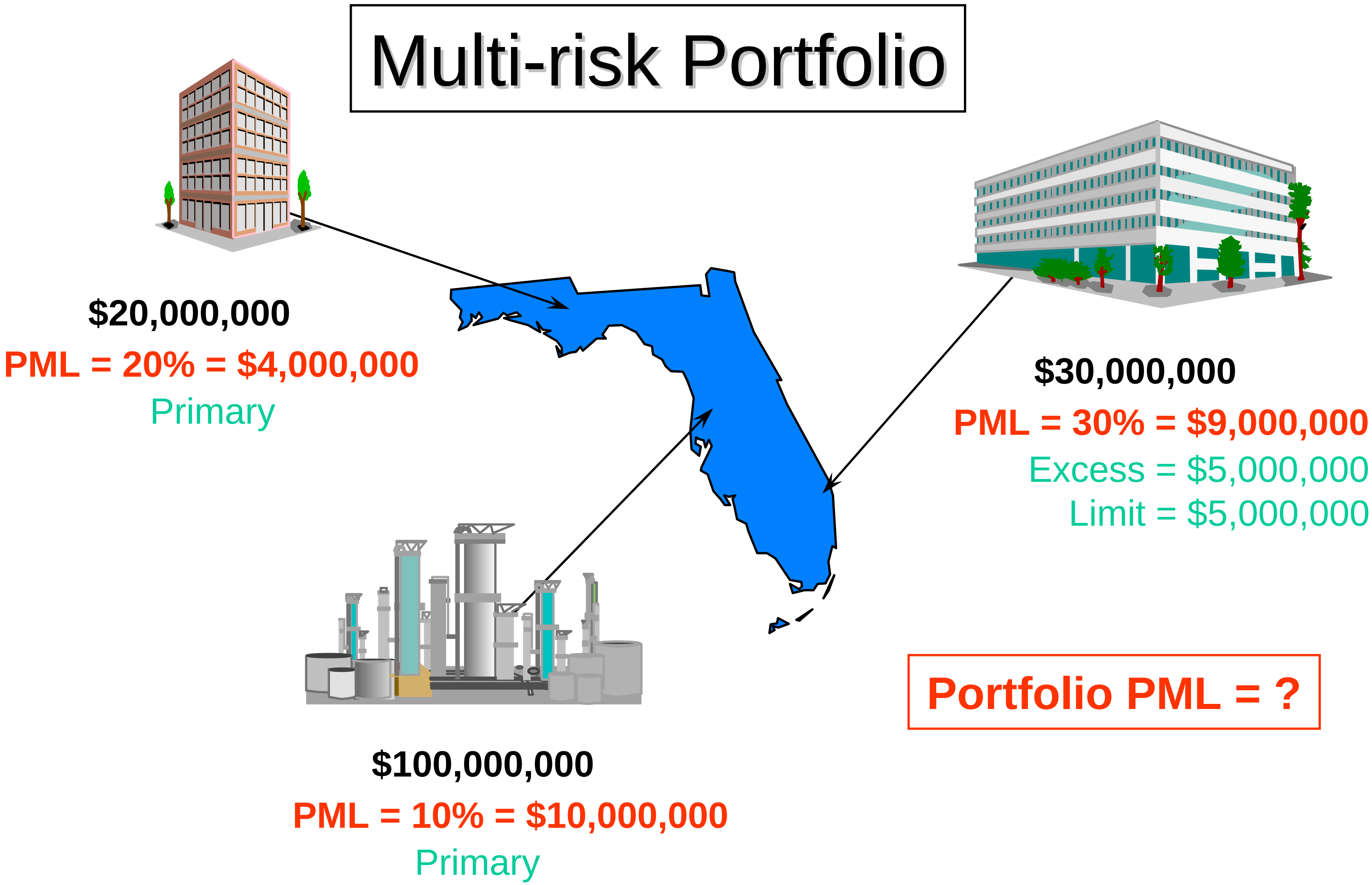
“Arithmetic” of PMLs (3)



“Arithmetic” of PMLs (3)



“Arithmetic” of PMLs (4)



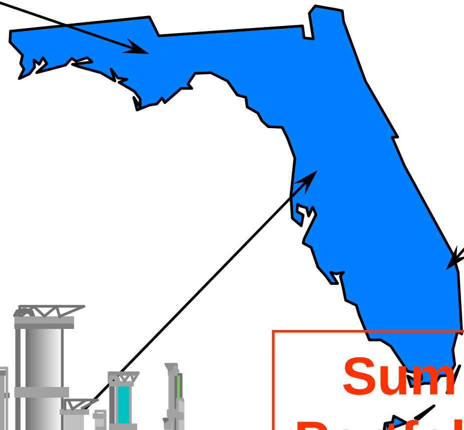
“Arithmetic” of PMLs (4)

Multi-risk Portfolio

$20,000,000

PML = 20% = $4,000,000

Primary

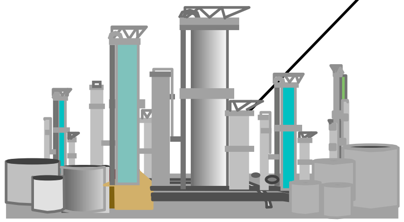


$30,000,000

PML = 30% = $9,000,000

Risk Excess = $5,000,000

Limit = $5,000,000



$100,000,000

PML = 10% = $10,000,000

Primary

Sum of risk losses = $18,000,000

Portfolio aggregate = $125,000,000

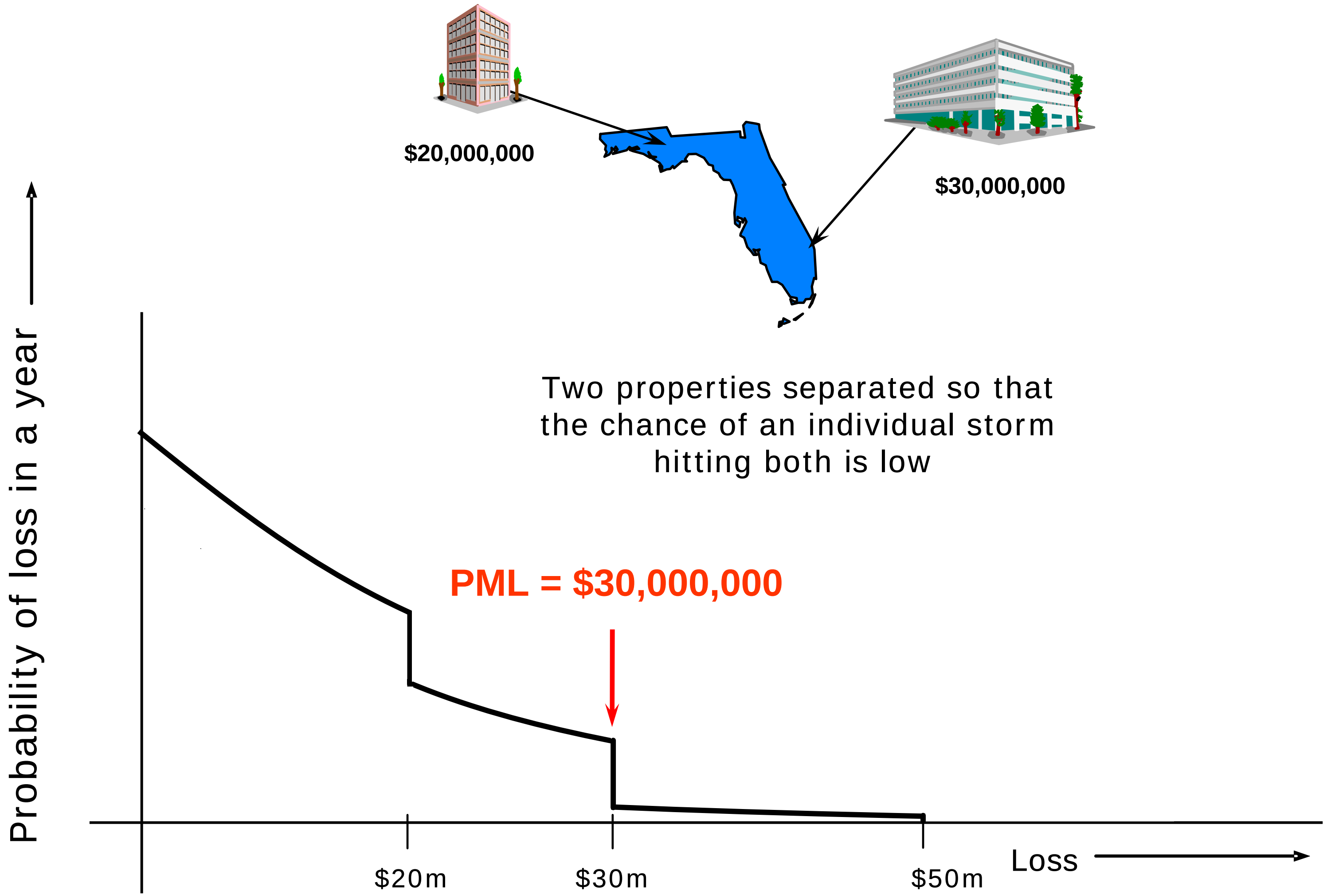
Portfolio PML% = 15%

But would one cat hit all these?

Where did PML come from?

- PMLs originate from fire risks where fire breaks produce discontinuities in the probabilility - hence "PML" is taken as the loss at this discontinuity
- This can also apply to catastrophe risks for separate locations
- But doesn't generally apply nor does it apply to portfolios which are continuous
- So PMLs are generally a delusion
  OR
  short-hand for damage at a "return period"

Loss Curve and PMLs



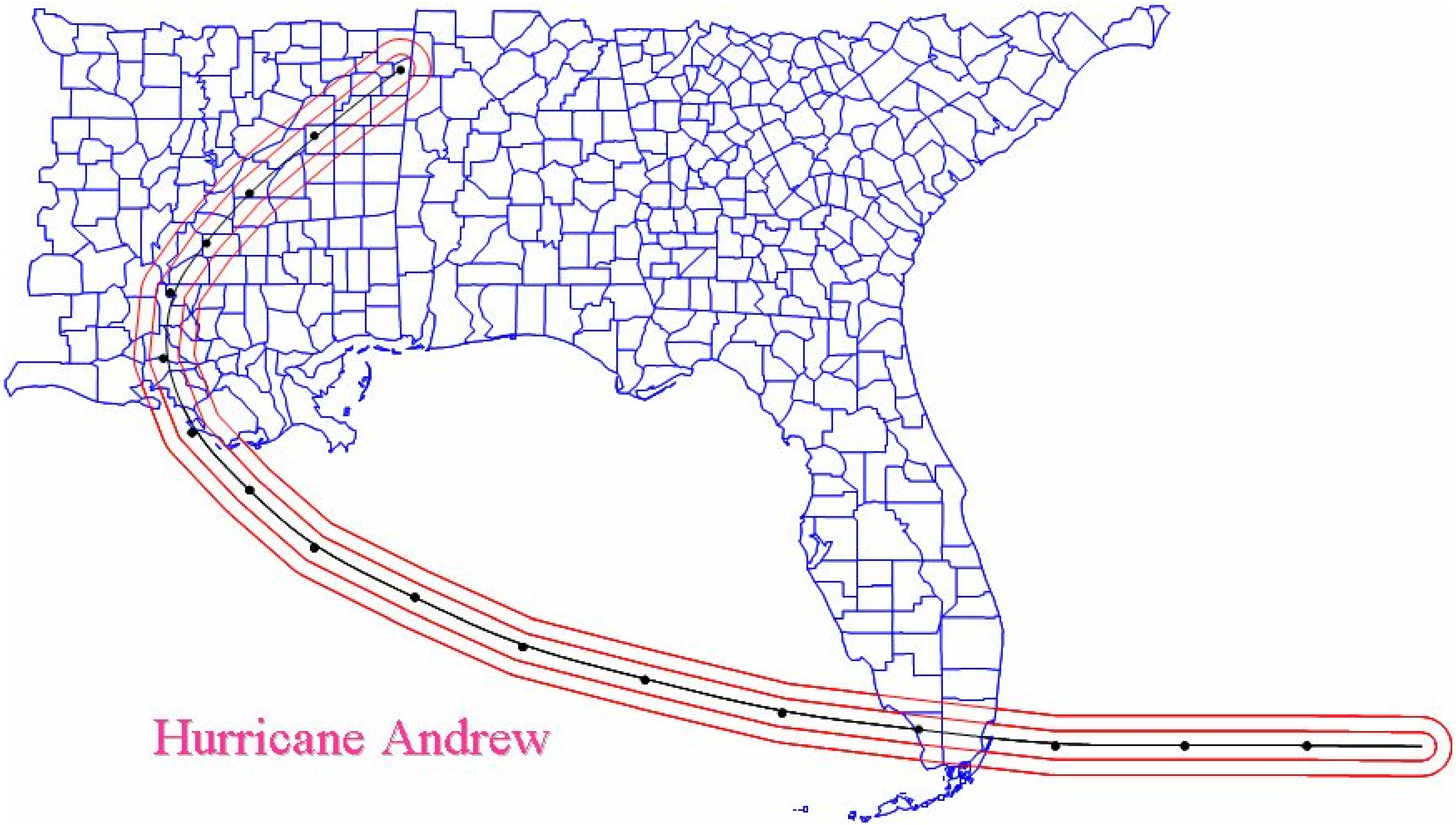
Market Share

- Takes a market share (usually premium) as a measure of the proportion of exposure assumed in an area by type of business
- The loss is then the market share % multiplied by an insured market loss
- Typically, this works for homogeneous primary business or reinsurances thereof
- Typically, it doesn't work otherwise

Scenario Loss Model

- A Scenario Loss (a.k.a. Deterministic) model applies an actual or possible catastrophic event to the insured interests
- Typically, this applies damage by location and type of interest and construction type (e.g. residential homes built after 1980 at a given Zip Code) using damage factors
- Typically, the model then aggregates losses and applies risk limits and lines

Scenario Loss Model



Probabilistic Loss Model

- Invoke scenario loss models with a model of the chance of many catastrophes yields a **Probabilistic Loss Model**
- These are the main offerings of the specialist catastrophe loss modelling companies such as AIR, EQE, and RMS
- Typically, “black boxes” needing very accurate data
- Results are in the form of a loss curve

Return Period

- Here's what it is not ...
  - The number of years which will elapse before Hurricane Andrew returns
  - The number of years before something like Andrew's cyclonic intensity hits Florida
- Here's what it is:
  - The average number of years that would elapse between losses greater than or equal to a specified insured loss level
  - Its reciprocal is the annual probability of a loss greater than or equal to the specified insured loss.

Conclusions

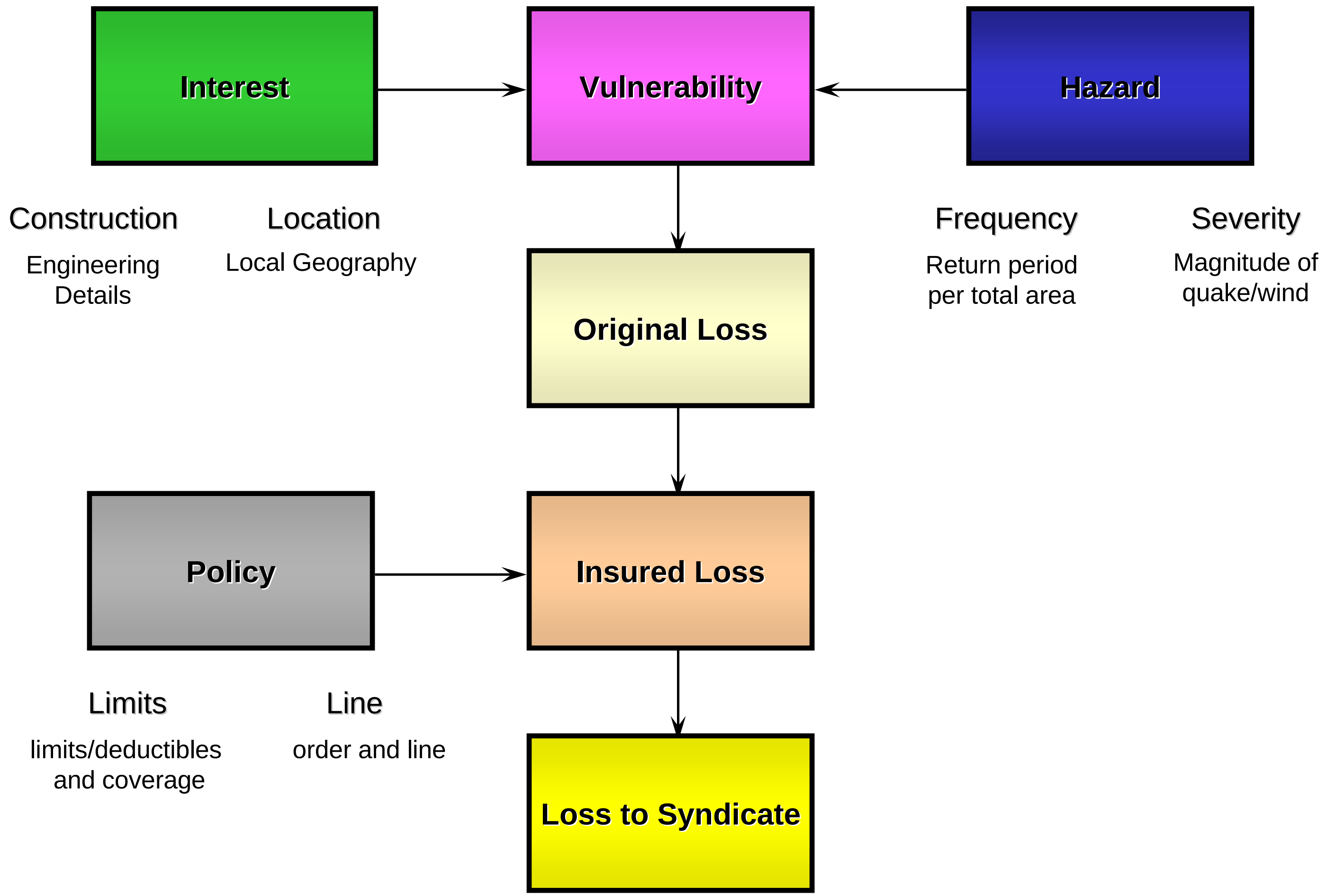
All Methods are flawed

Method	***Issues***
• Aggregate Exposure	*Unrealistic*
• PML methods	*Misleading*
• Scenario Loss Models	*Too selective*
• "Black Box" Models	*Too dependent on assumptions*
• Market Share	*Assumes homogeneity*

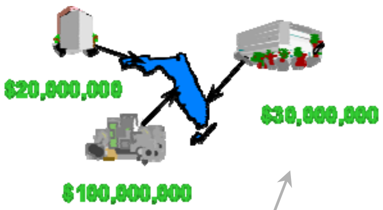
This is not an exact science!!

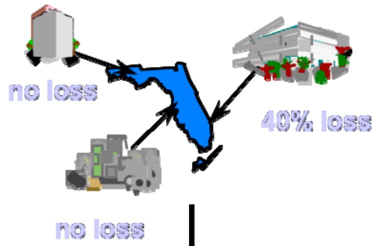

Deterministic
Loss Modelling

Principles of loss estimates



Actual Loss





Original Loss by Interest

$12,000,000

↓ Σ **by interest**

for this risk

Risk Excess = $5,000,000
limit = $10,000,000
Line = 20%

Loss by Risk

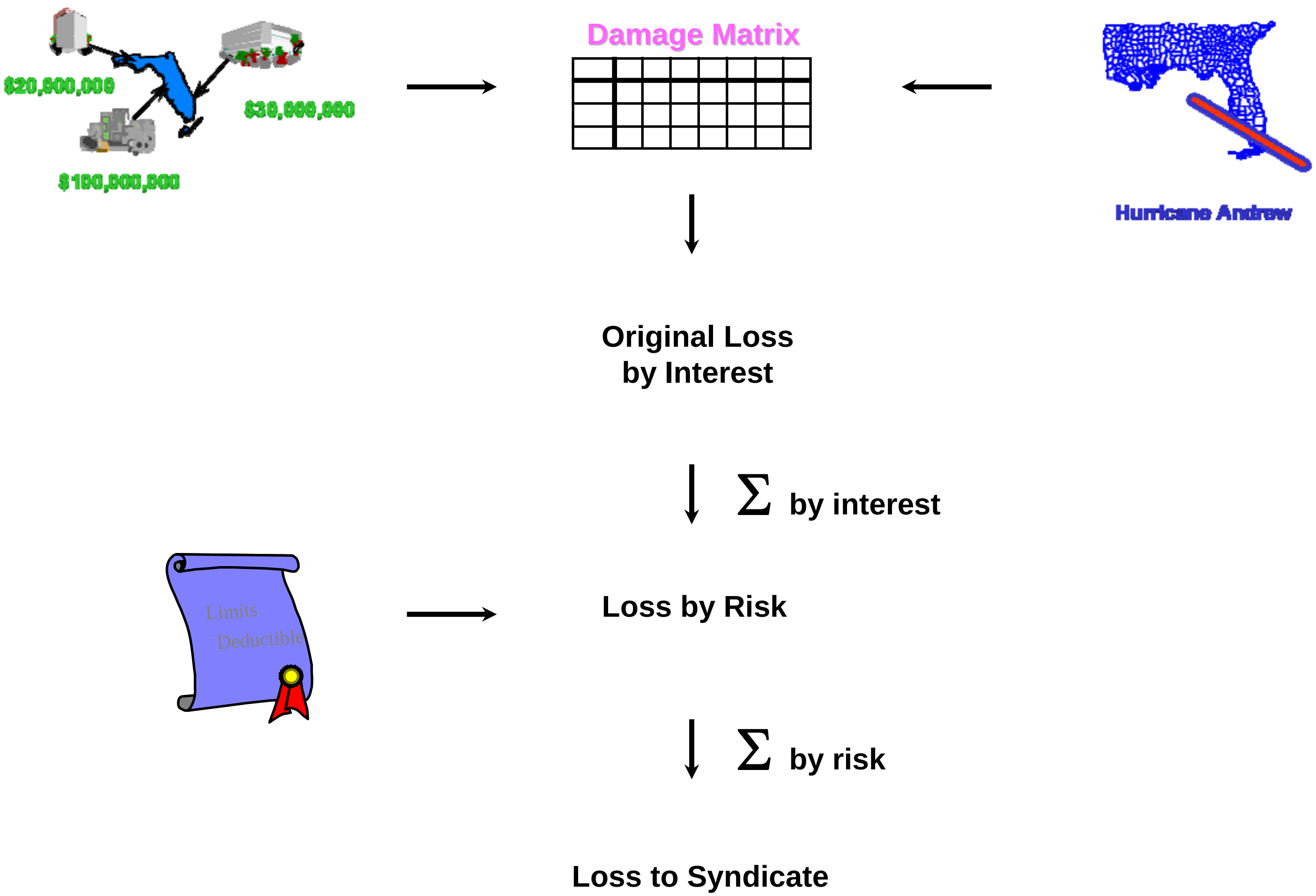
$7,000,000

↓ Σ **by risk**

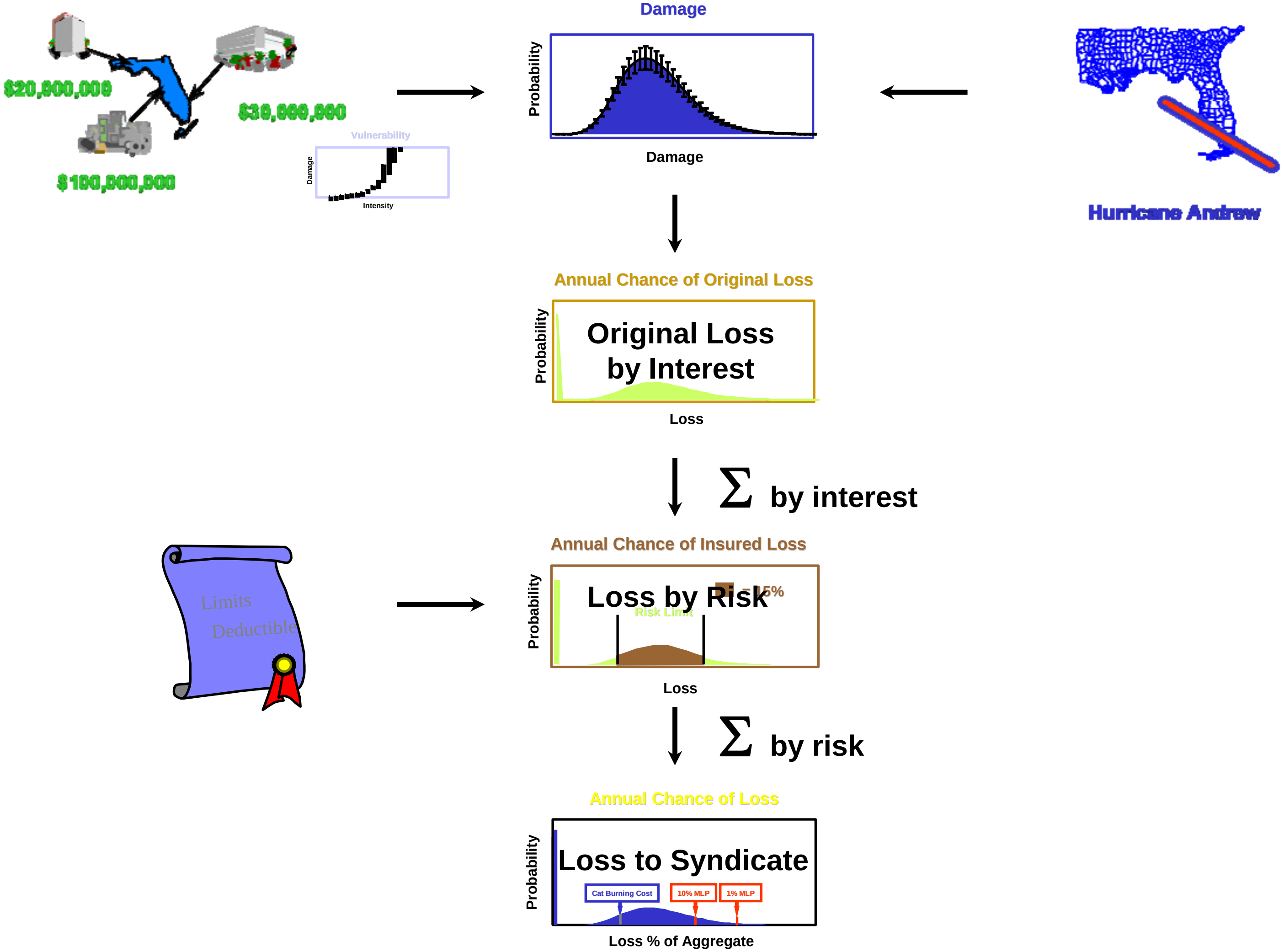
Loss to Syndicate

$1,400,000

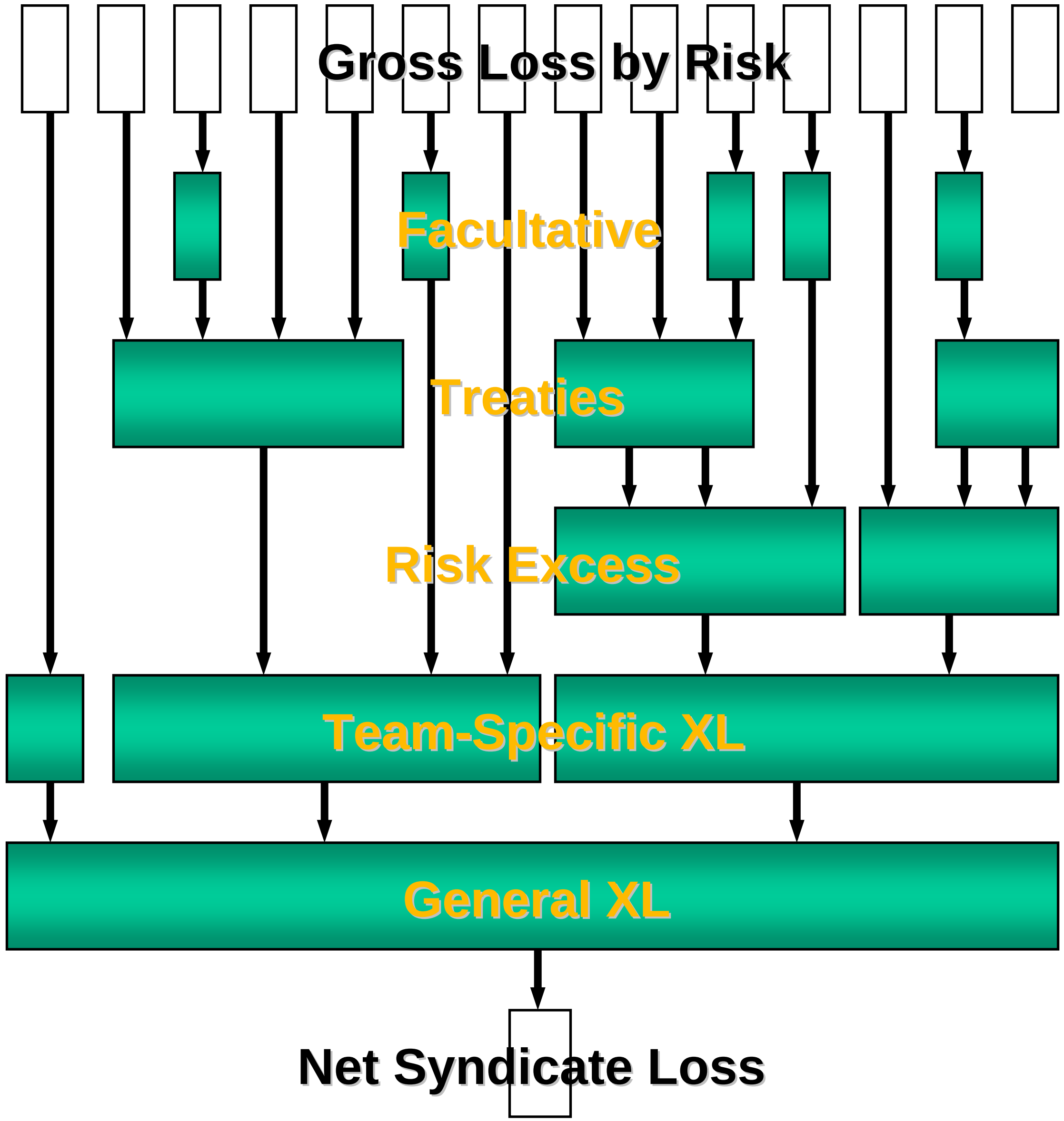
Simple Scenario Loss Model



Stochastic Scenario Loss Model



Net Loss Model


Gross Loss by Risk
Facultative
Treaties
Risk Excess
Team-Specific XL
General XL
Net Syndicate Loss

Realistic Disaster Scenarios

Lloyd’s Realistic Disaster Scenarios

- “Aggregate”
- Loss
- Inwards reinstatements
- Outwards RI Recoveries
- Outwards reinstatements
- Analysis by reinsurer
- Analysis by class of business

Realistic Disaster Scenarios 2007

De Minimis Events

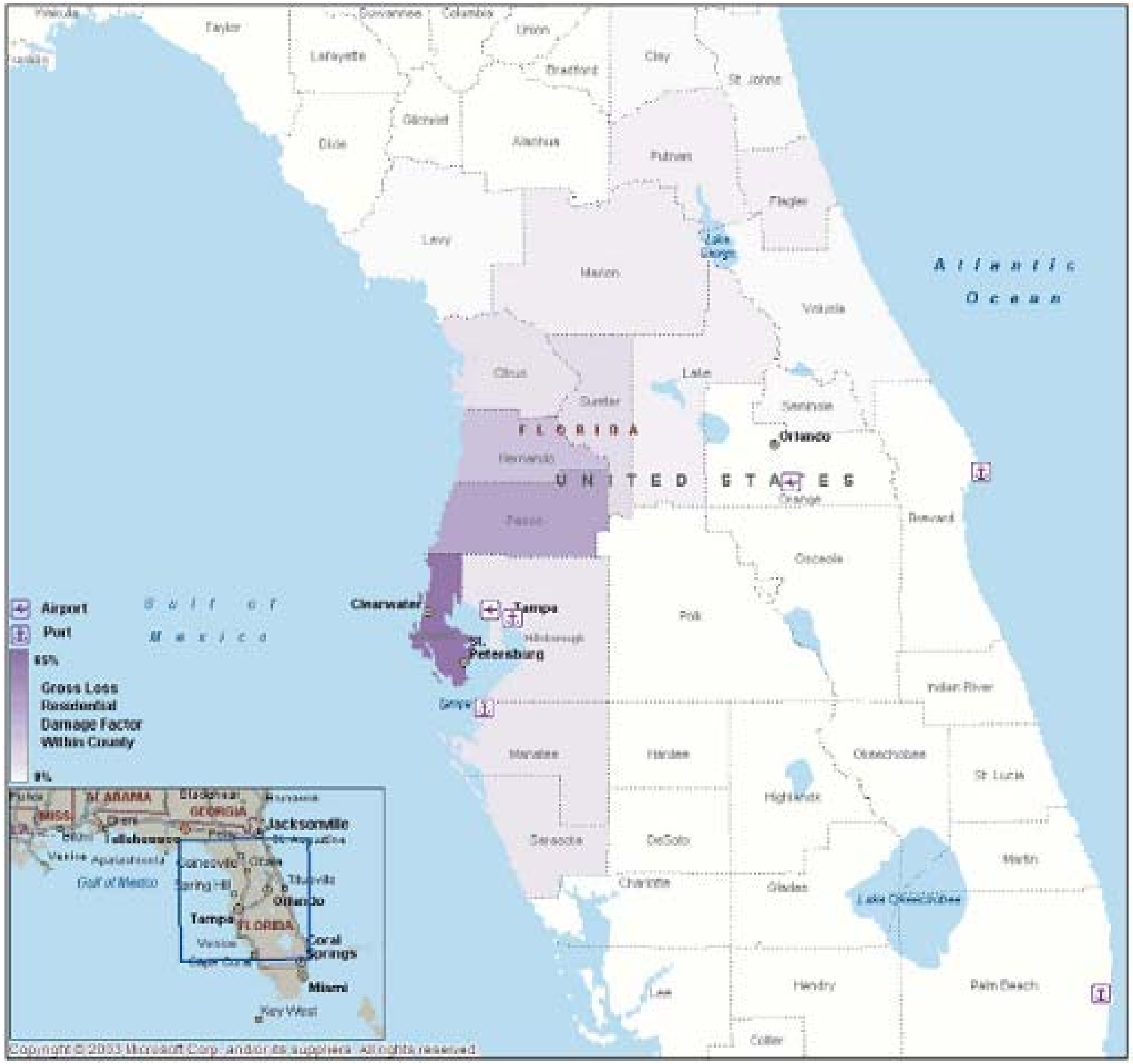
- Marine Event
- Loss of Major Complex
- Aviation Collision
- Major Risk Loss
- Satellite Risks
- Liability Risks
- Political Risks
- Alternative RDS: A
- Alternative RDS: B

Compulsory Events

- Two Events (NE+Carolina)
- Florida Wind (Two $108bn ea)
- Cal Quake (SF & LA $69bn ea)
- New Madrid ($42bn & $95bn)
- European Wind ($30bn)
- Japanese Quake ($50bn)
- Terrorism
- Gulf Wind ($11bn & $95bn)
- Japanese Typhoon ($14bn)

Florida Hurricane I

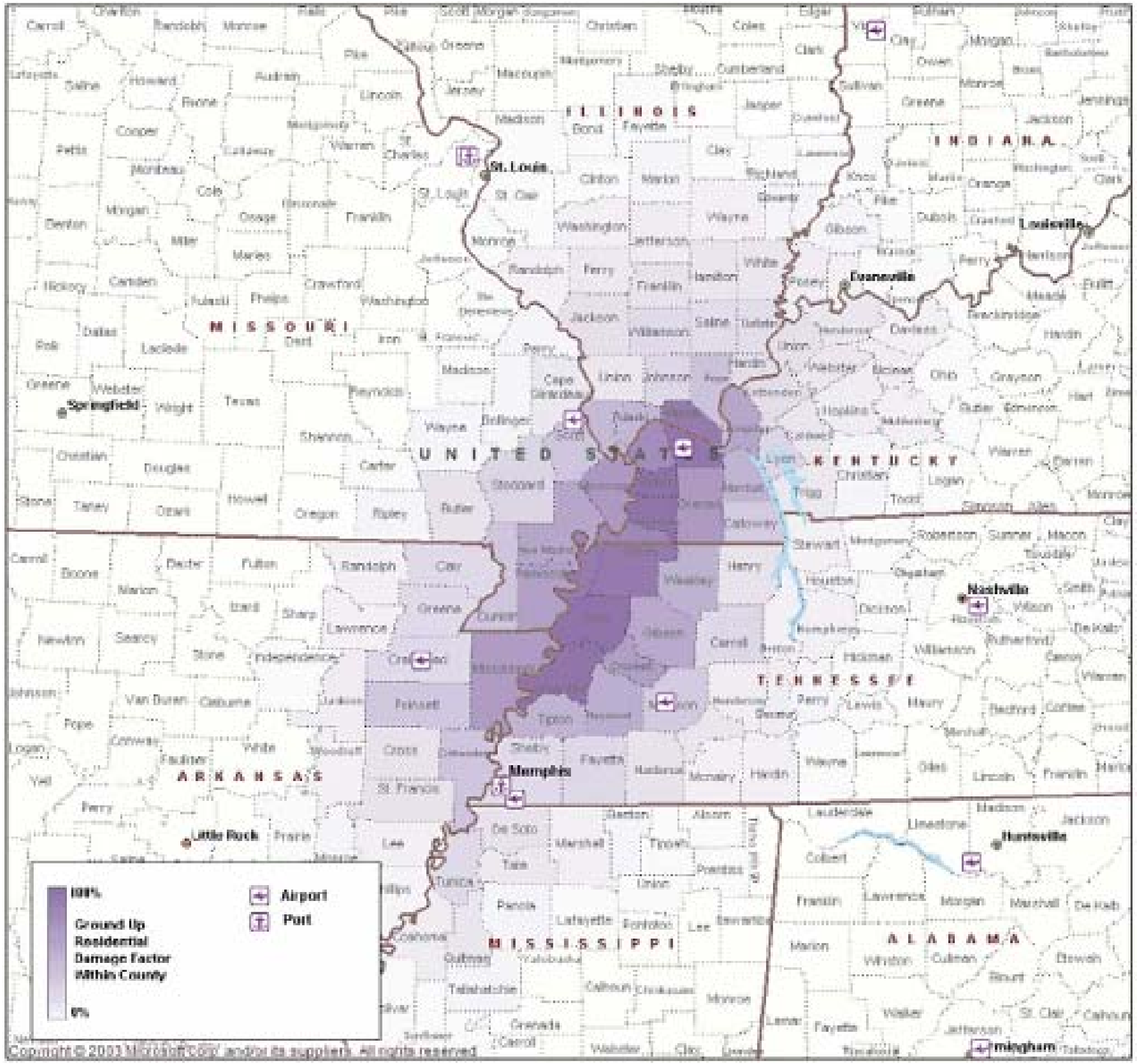
Florida Hurricane



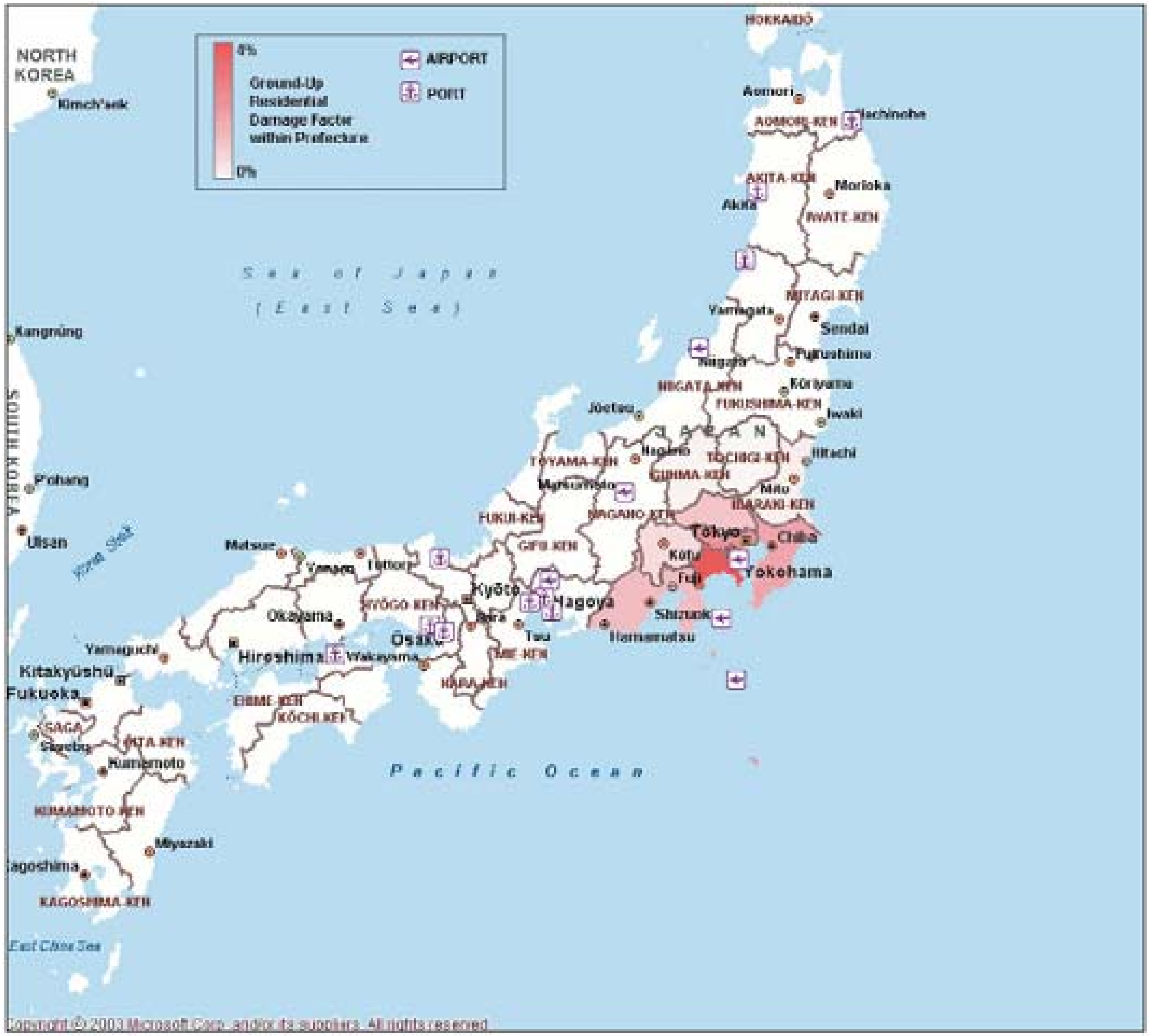
SF Quake

UNITED STATES
CALIFORNIA
NEVADA
Pacific Ocean
San Francisco
Oakland
Hayward
Fremont
Sunnyvale
San Jose
Santa Rosa
Vallejo
Concord
Stockton
Modesto
Sacramento
Citrus Heights
Salinas
Fresno
Airport
Port
Ground-Up Residential Damage Factor Within County

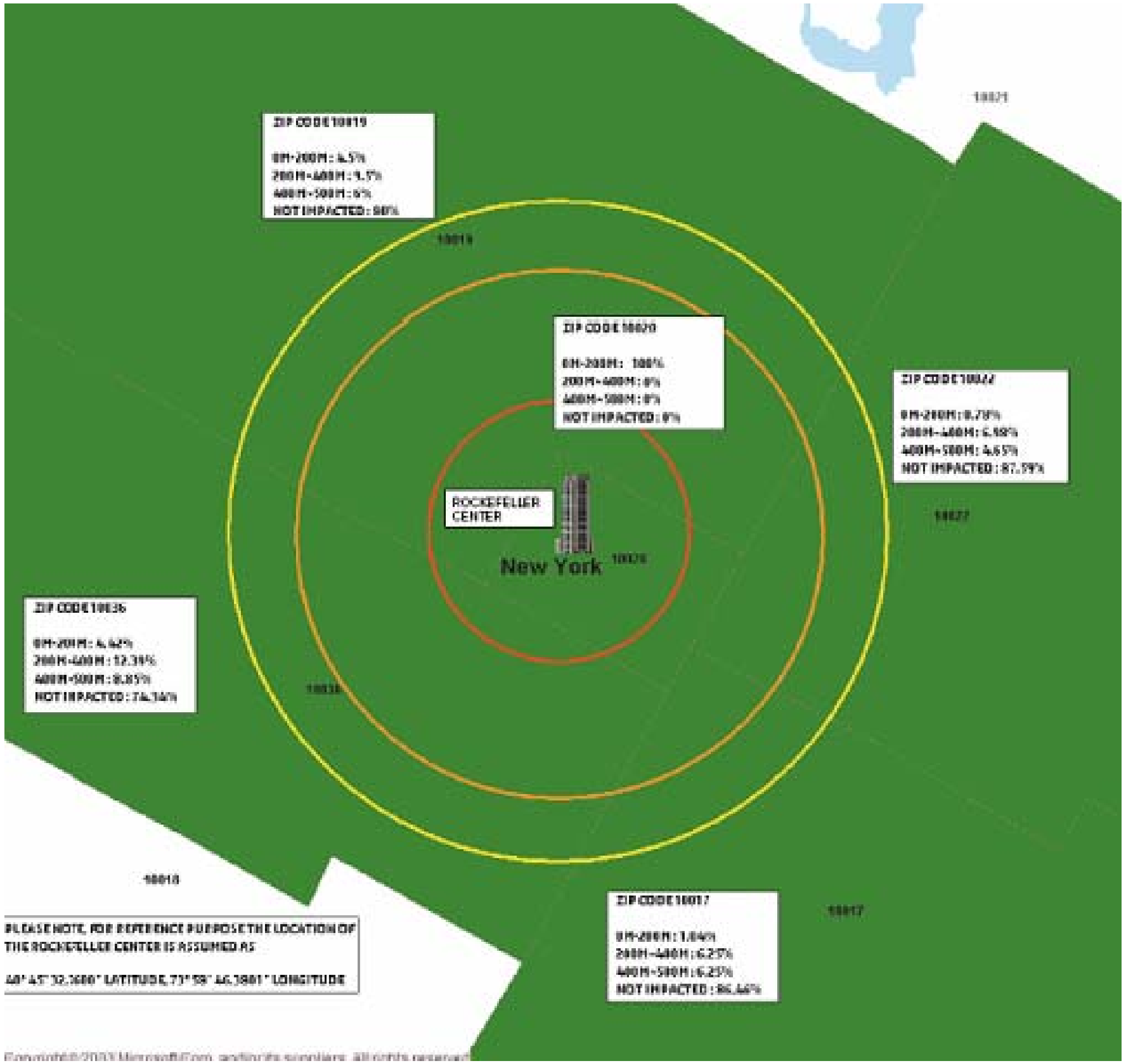
New Madrid Quake



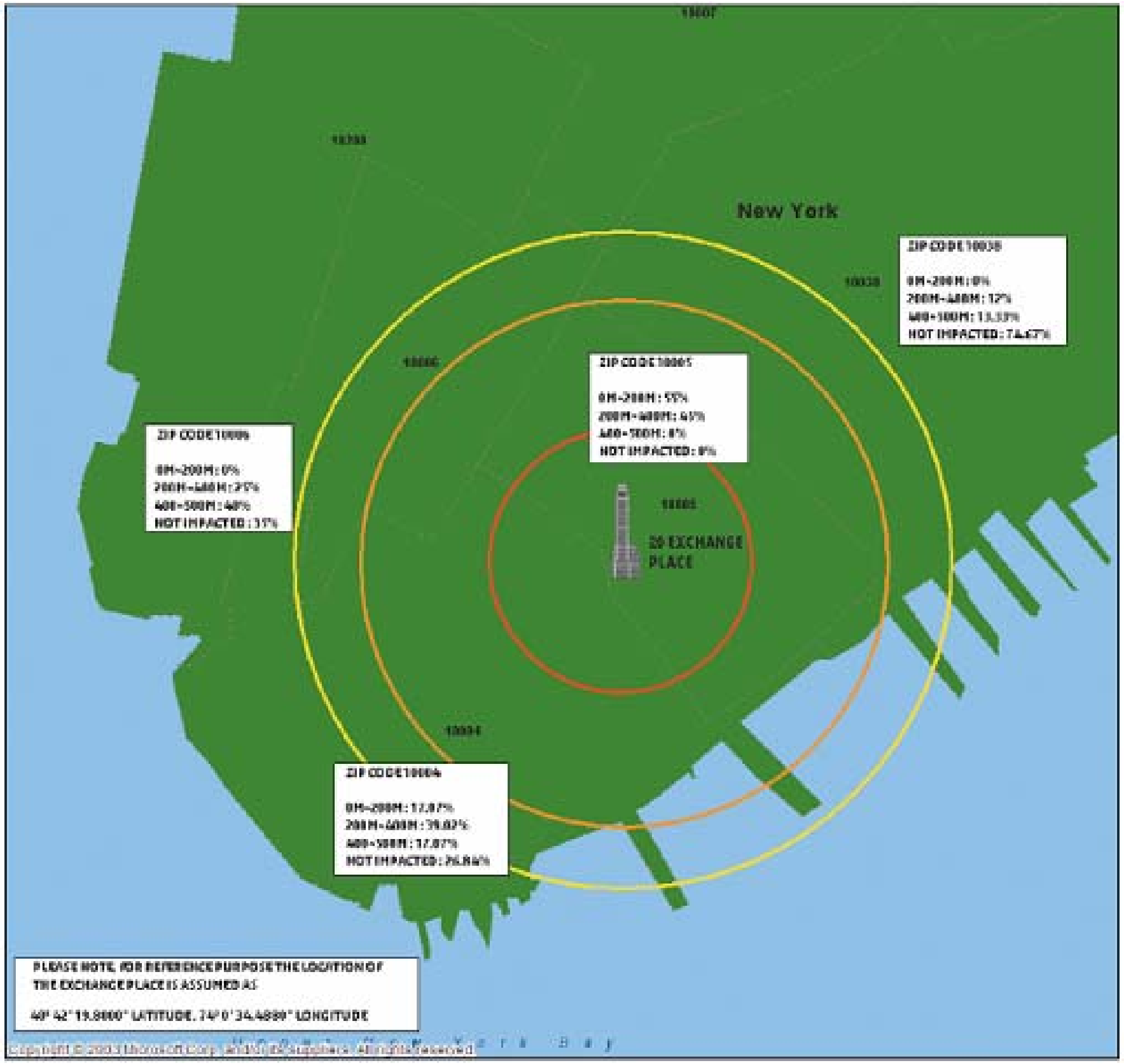
Japanese Quake



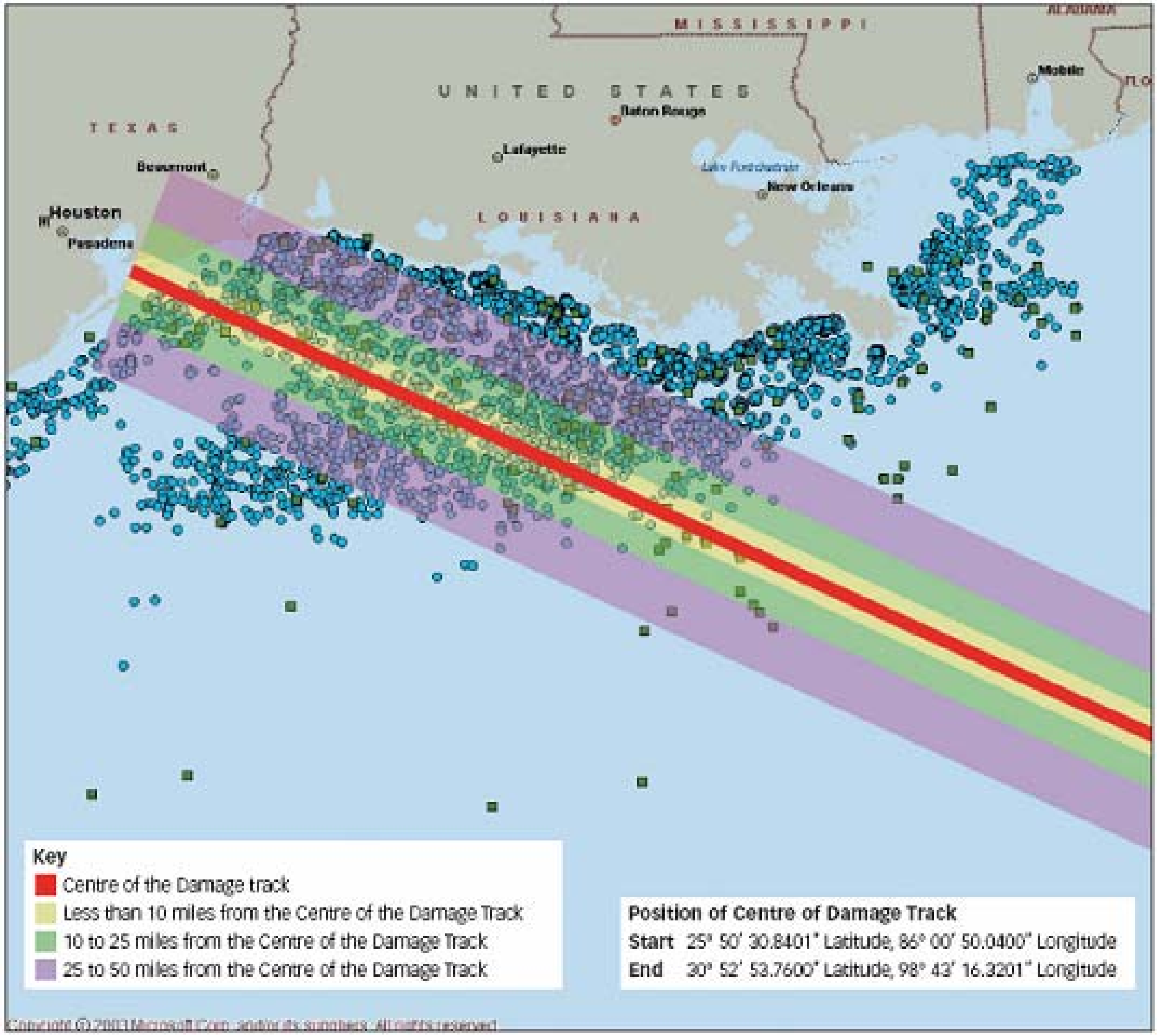
Terrorism - I


10021
ZIP CODE 10019
0M-200M : 6.5%
200M-400M : 9.5%
400M-500M : 6%
NOT IMPACTED : 80%
10019
ZIP CODE 10020
0M-200M : 100%
200M-400M : 0%
400M-500M : 0%
NOT IMPACTED : 0%
ZIP CODE 10022
0M-200M : 0.78%
200M-400M : 6.98%
400M-500M : 4.65%
NOT IMPACTED : 87.59%
10022
ROCKEFELLER CENTER
New York
10020
ZIP CODE 10036
0M-200M : 4.62%
200M-400M : 12.39%
400M-500M : 8.85%
NOT IMPACTED : 74.14%
10036
10018
ZIP CODE 10017
0M-200M : 1.04%
200M-400M : 6.25%
400M-500M : 6.25%
NOT IMPACTED : 86.46%
10017
PLEASE NOTE, FOR REFERENCE PURPOSE THE LOCATION OF THE ROCKEFELLER CENTER IS ASSUMED AS
40° 45' 32.3600" LATITUDE, 73° 58' 46.3801" LONGITUDE

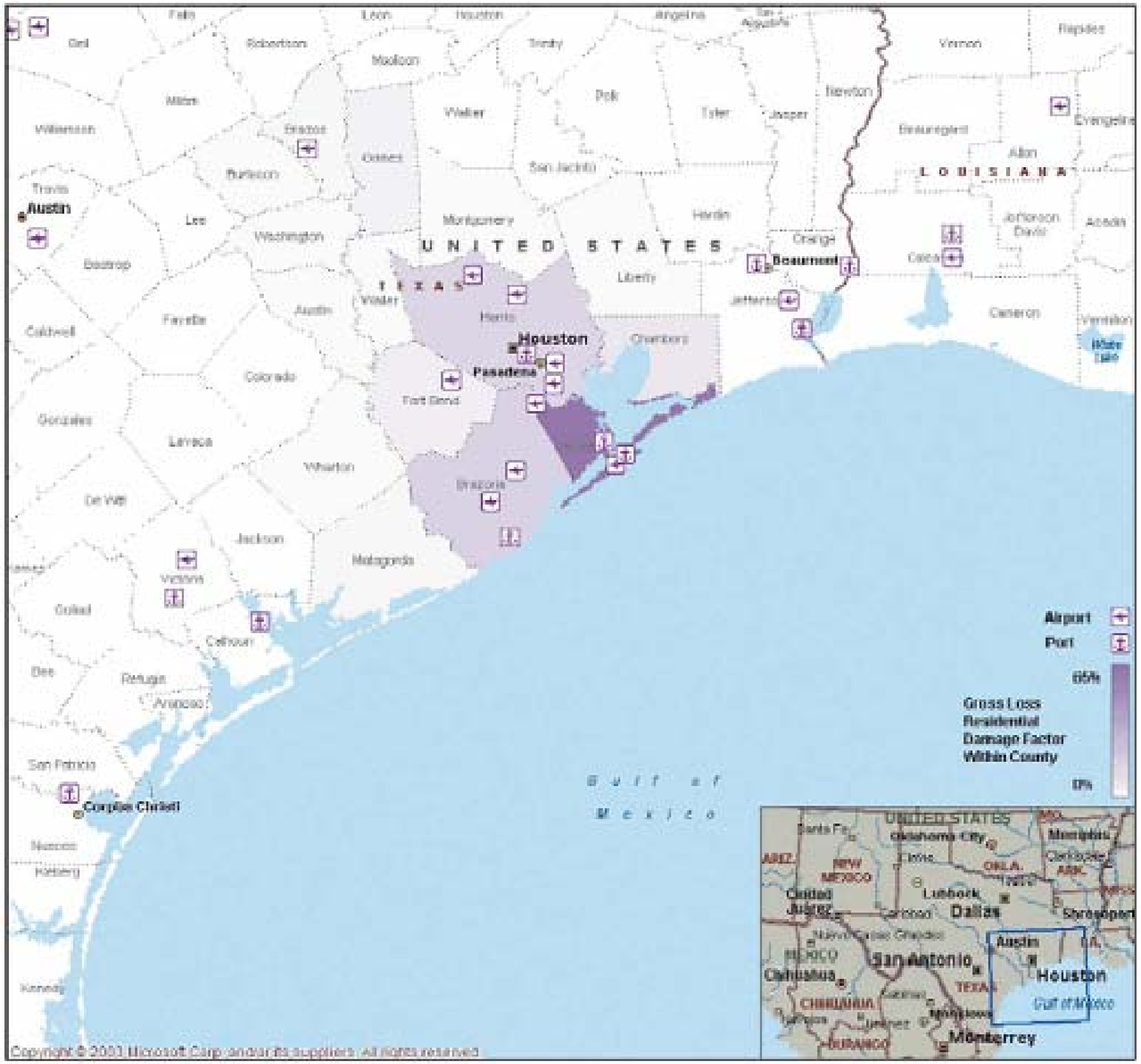
Terrorism - II



Gulf - Offshore



Gulf - Onshore



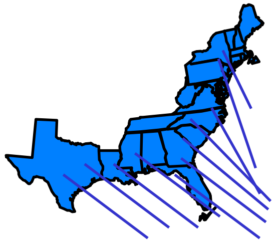
Japanese Wind


Probabilistic
Loss Modelling

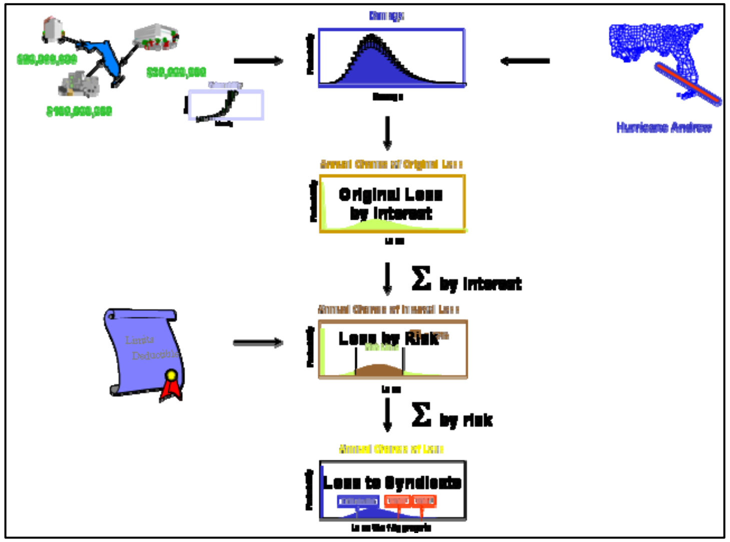
Probabilistic Loss Modelling

Probabilistic Loss Model

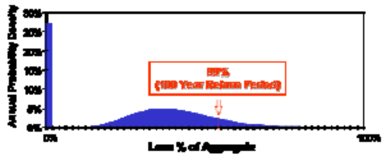
Catalogue of Events



Run Stochastic Loss Model for each event

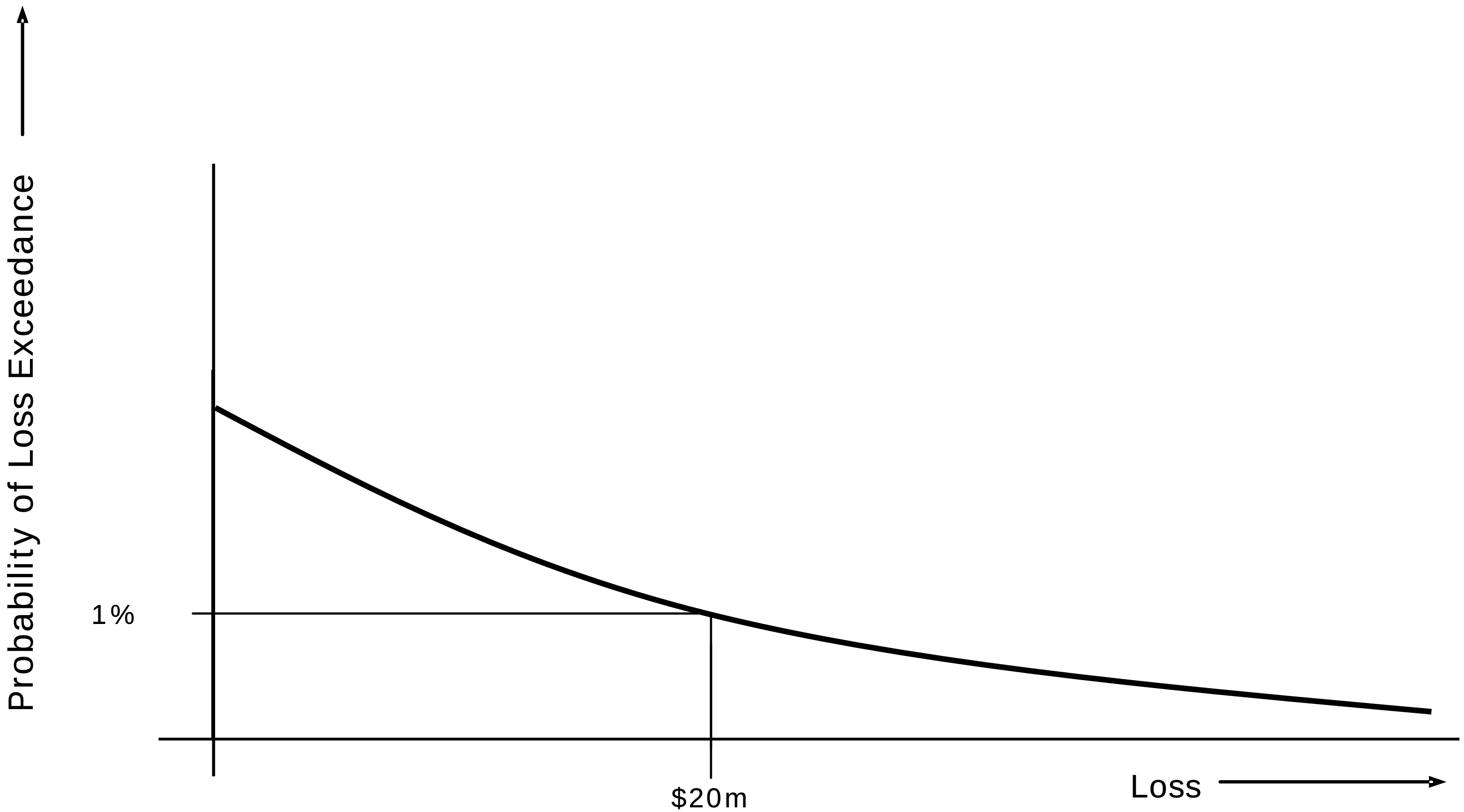


Construct Loss Curve

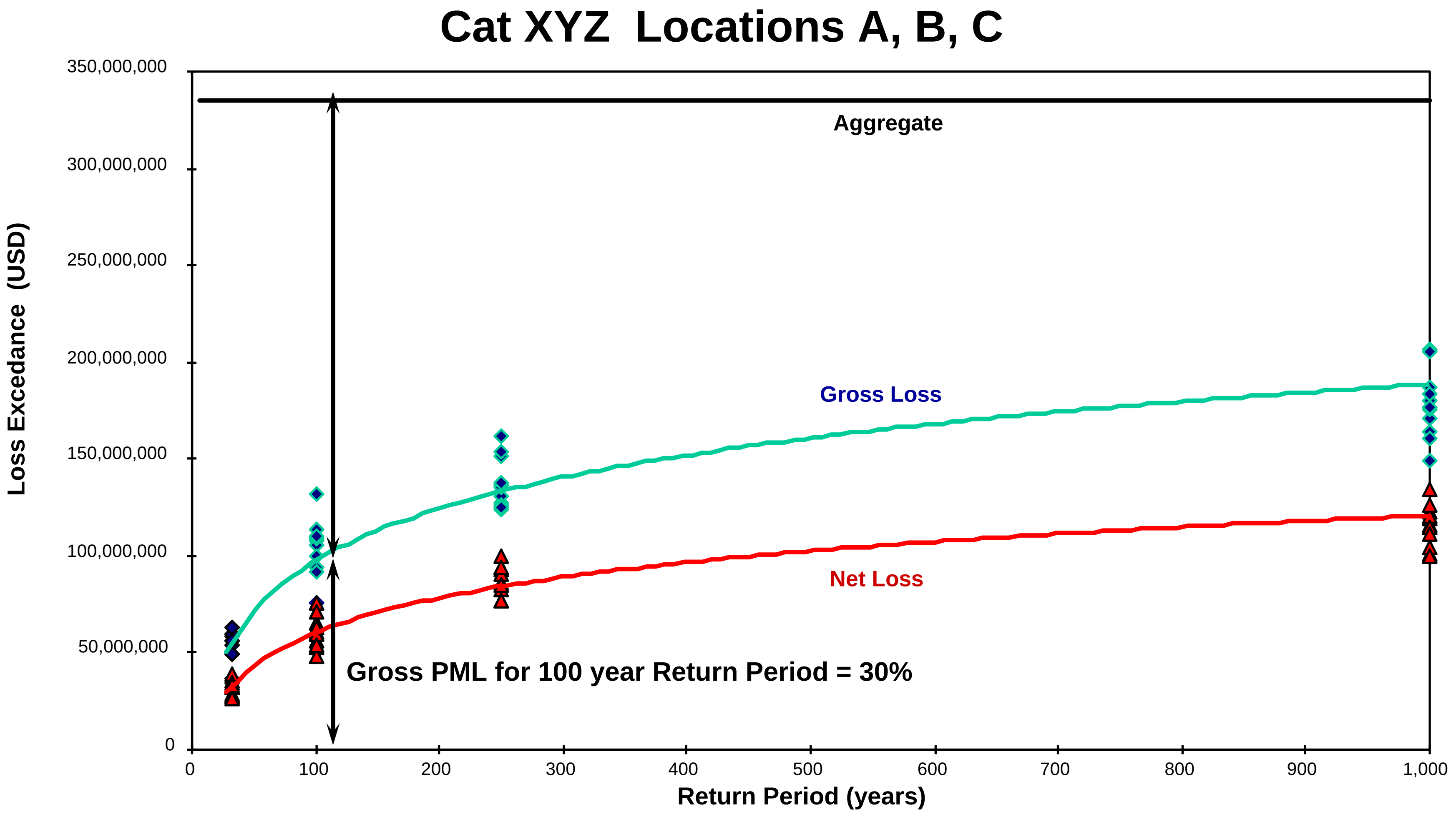


The EP Curve

Exceedance Probability (EP) Curve



EP Curve (Version 2)



Constructing the EP Curve

- RMS Method
  - Event catalogue
  - Each event has
  - Use (reciprocal … this to construct frequency
  - This give Occurrence E…
  - Use an algorithm to co… …gregate EP curve
- AIR (and EQECAT) Method
  - Simulate 10,000 years
  - Sample events to apply in each year
  - Rank order from largest to get frequency
  - Choose Sum for AEP and Max for OEP

Easier to use (for OEP), BUT

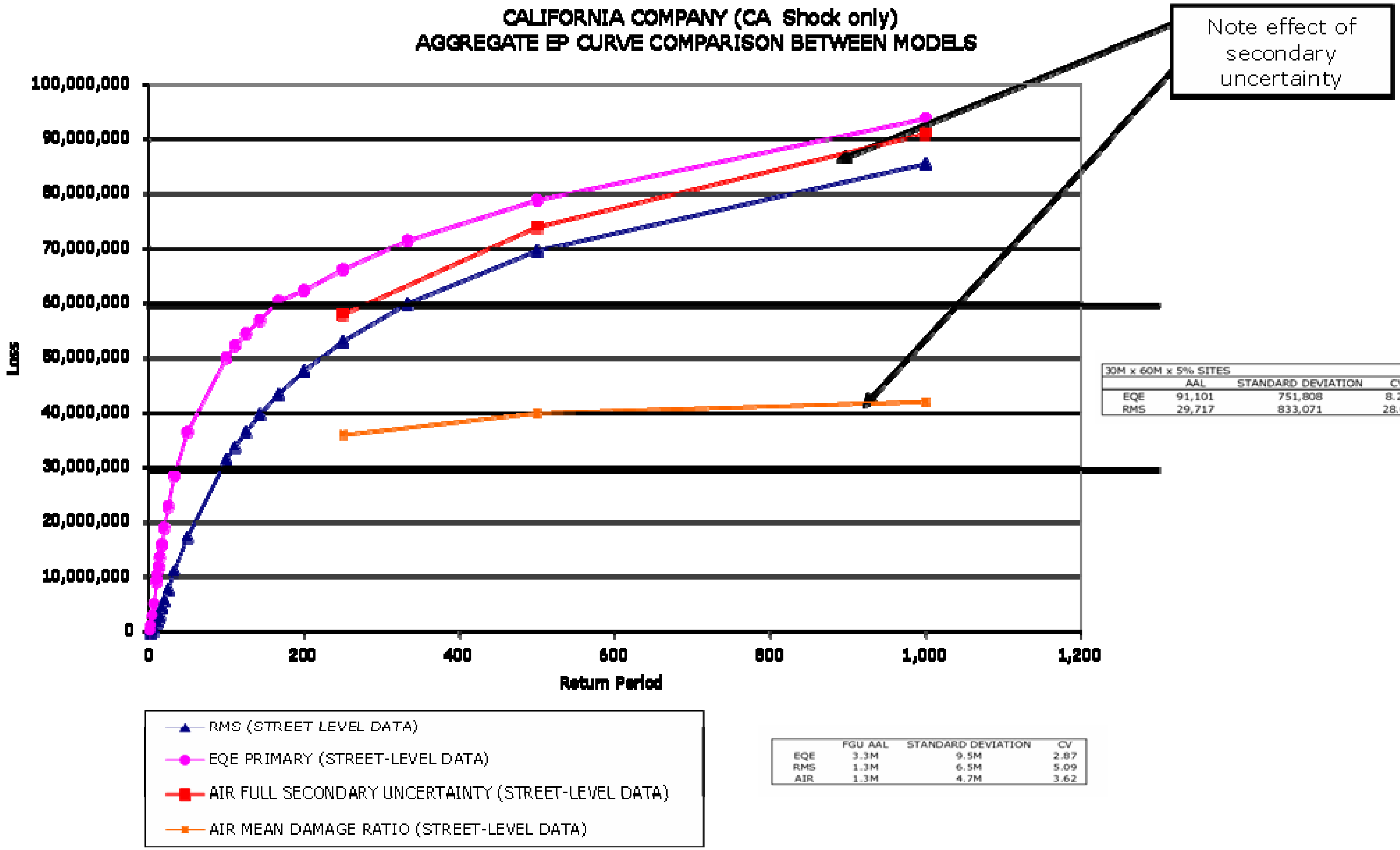
Can't handle clustering

Credibility of Models

Credibility of Models

- Comparison of Models
  - Sometimes similar sometimes not
  - Secondary uncertainty
  - Granularity of data
  - Models of hazards can be very different
- Understated losses – eg. Isabel
- Incorrect assumptions – eg. Katrina
  - Event Inadequacy
  - Storm Surge damage
  - New Orleans flood
  - Demand Surge impact
  - Understated values

Model Comparison - similar



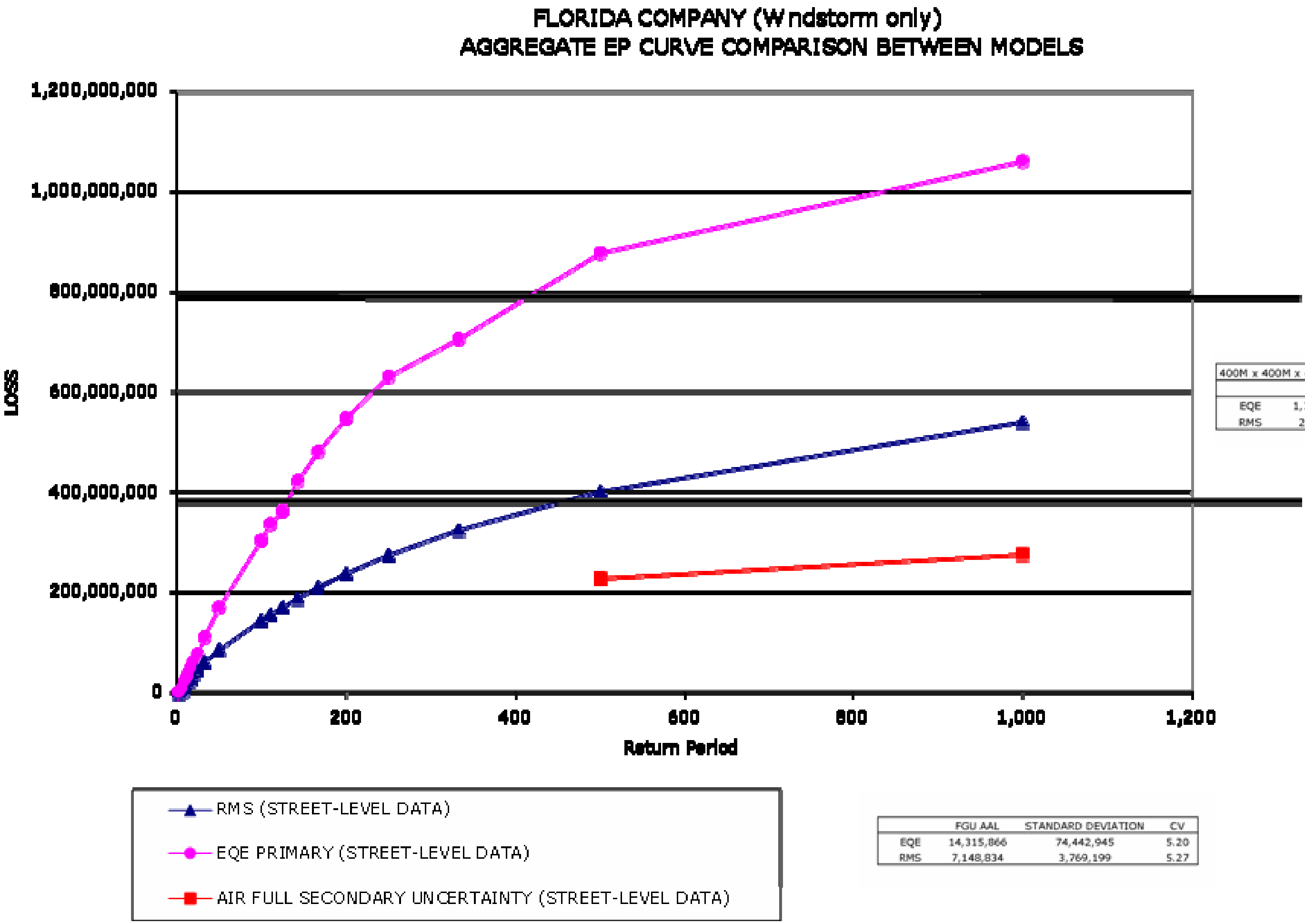
30M x 60M x 5% SITES			
	AAL	STANDARD DEVIATION	CV
EQE	91,101	751,808	8.25
RMS	29,717	833,071	28.03

	FGU AAL	STANDARD DEVIATION	CV
EQE	3.3M	9.5M	2.87
RMS	1.3M	6.5M	5.09
AIR	1.3M	4.7M	3.62

Credibility Factors

- Data
  - TSI accuracy
  - Granularity
  - Coding
- Model
  - Adequacy
  - Parameters
  - Risk data (e.g. underlying protections, site-specific deductibles)

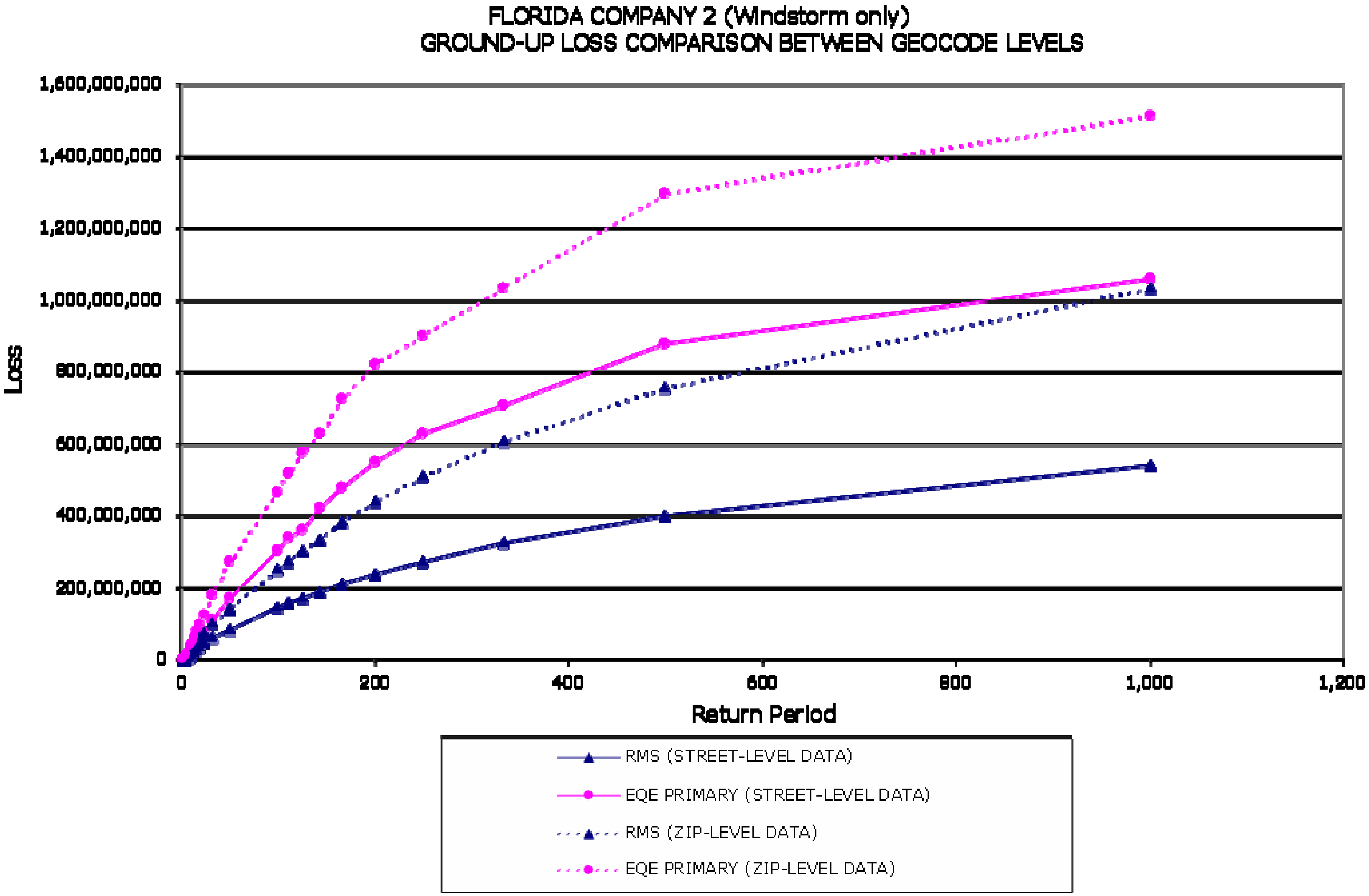
Model Comparison – differing!



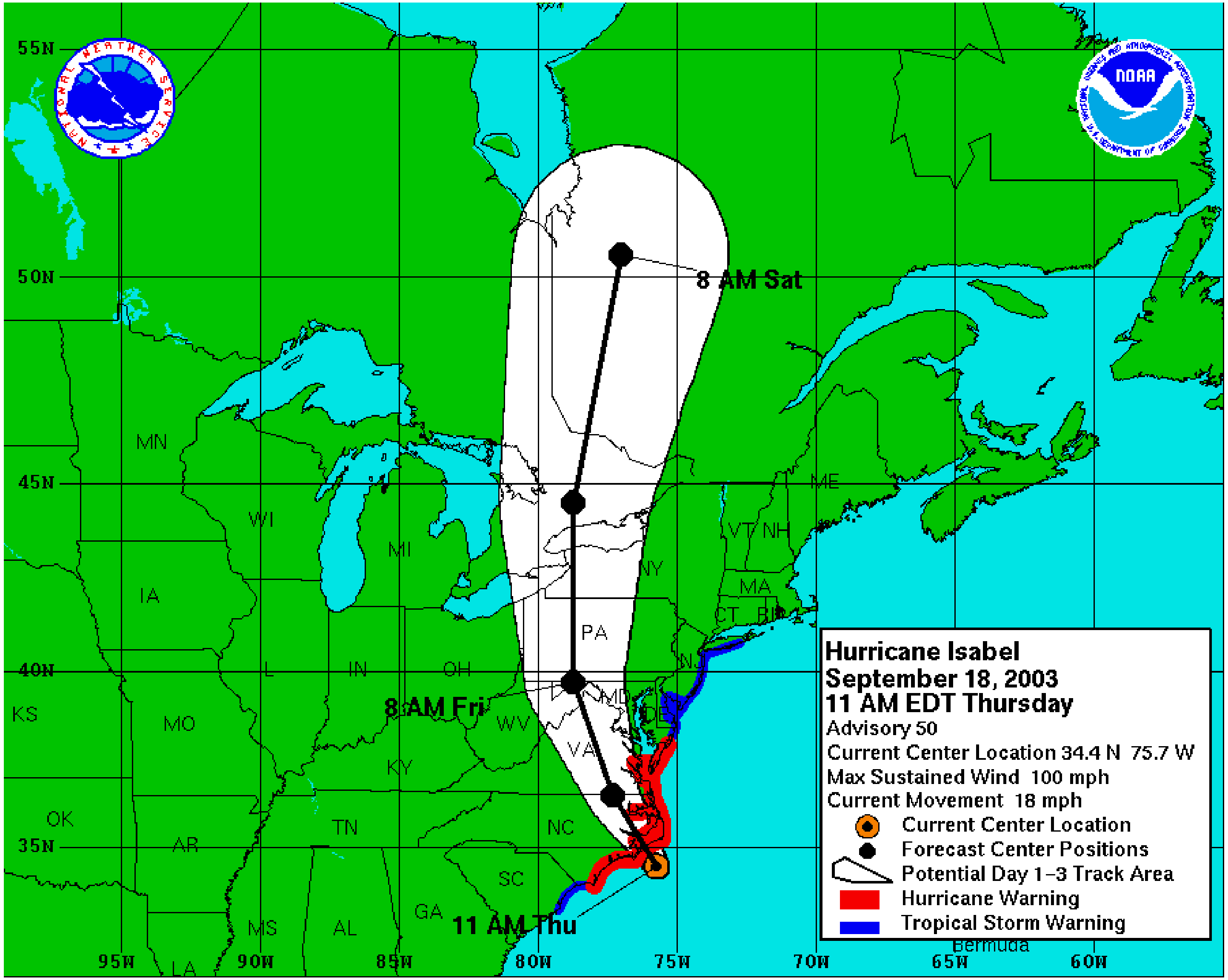
400M x 400M x 4% SITES			
	AAL	STANDARD DEVIATION	CV
EQE	1,315,561	15,926,066	12.11
RMS	207,716	7,436,673	35.80

	FGU AAL	STANDARD DEVIATION	CV
EQE	14,315,866	74,442,945	5.20
RMS	7,148,834	3,769,199	5.27

Model Comparison – data sensitivity



Hurricane Isabel 18th Sept 2003 Cat 3



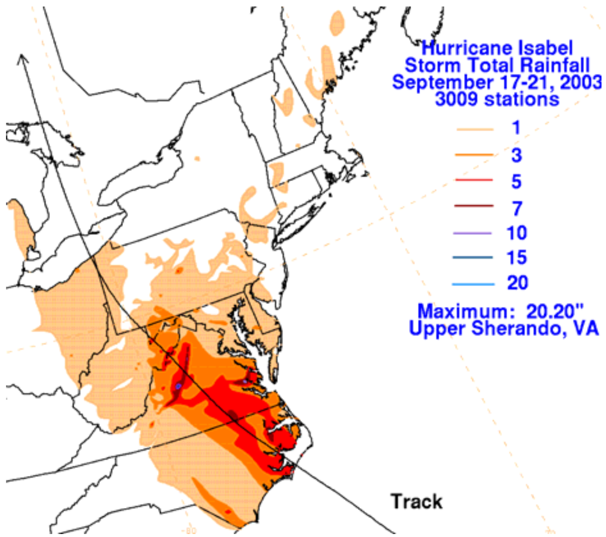
Hurricane Isabel

American Association of Wind Engineers:

"... the damage that resulted was not of a type that might have been expected for the average winds ..."

"... there was very little damage directly attributed to high wind velocities... The greatest sources of damage were from storm surge, wave action, flooding and tree failures ..."

"... The types of failures and damage that occurred in Isabel indicate that there is a whole new area of research that should be pursued by wind engineers."

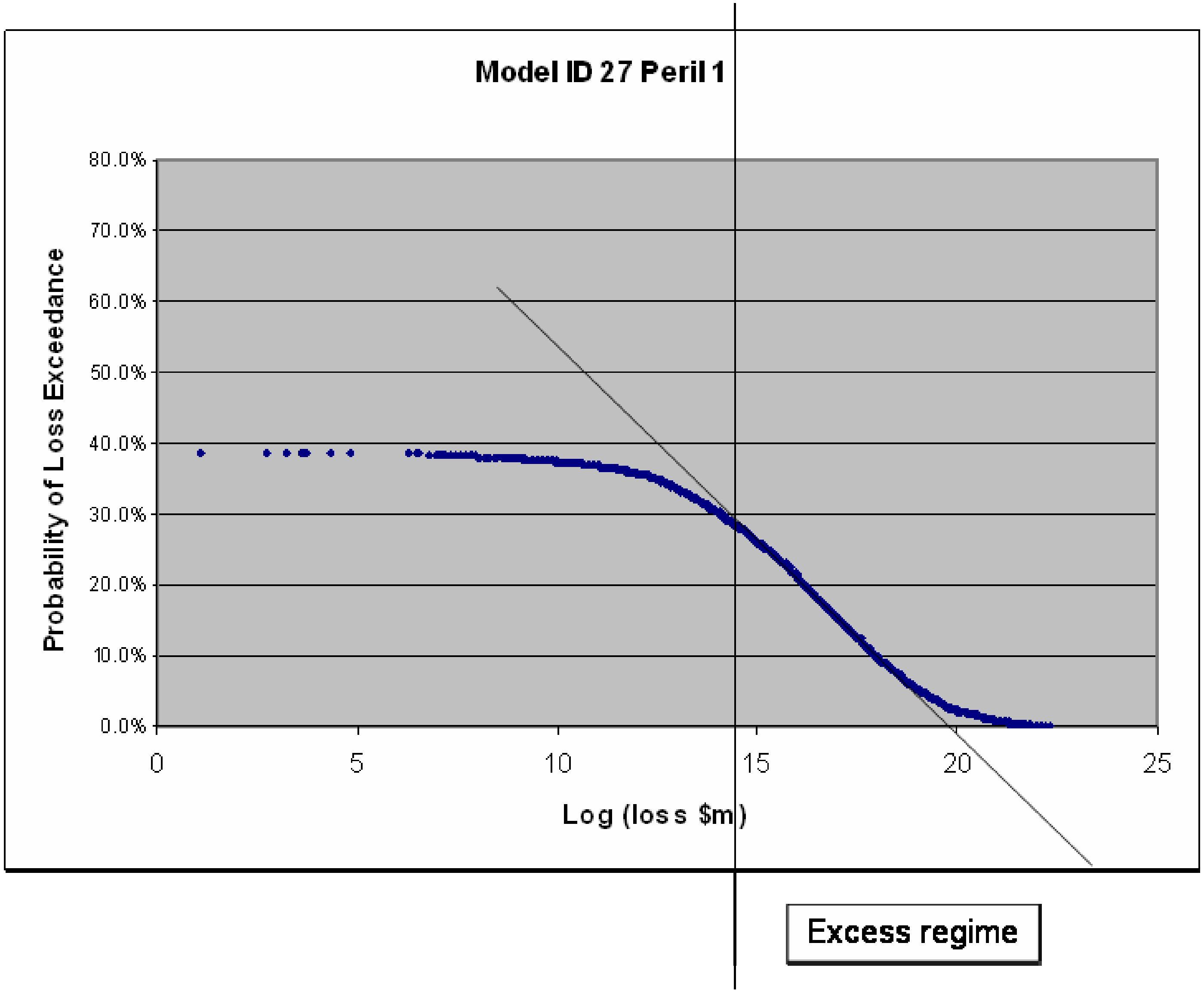


Sources of non-modelled loss (wind)

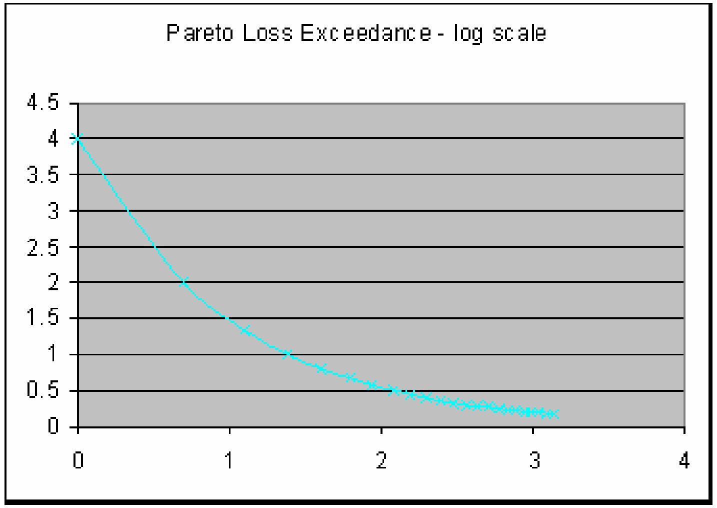
- Loss Adjustment Expense
- Tree damage and removal
- Debris removal
- Demand Surge
- Satellite dishes
- Power outage
- Food spoilage
- Flooding

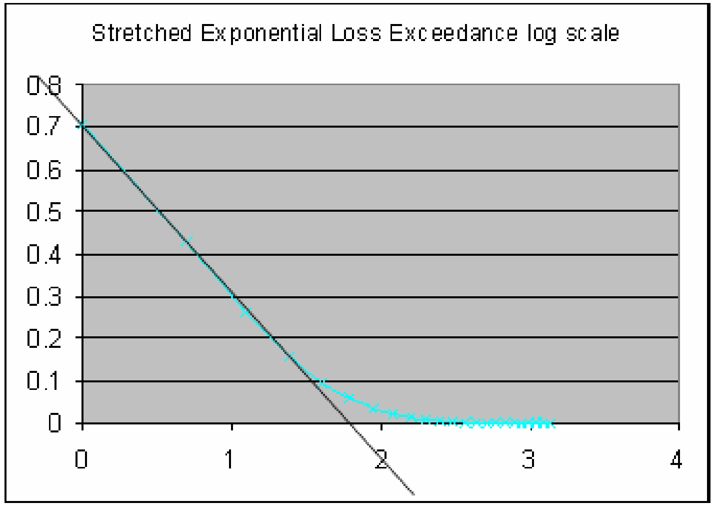
Analysing EP Curves

EP Curves on a Log Loss Scale

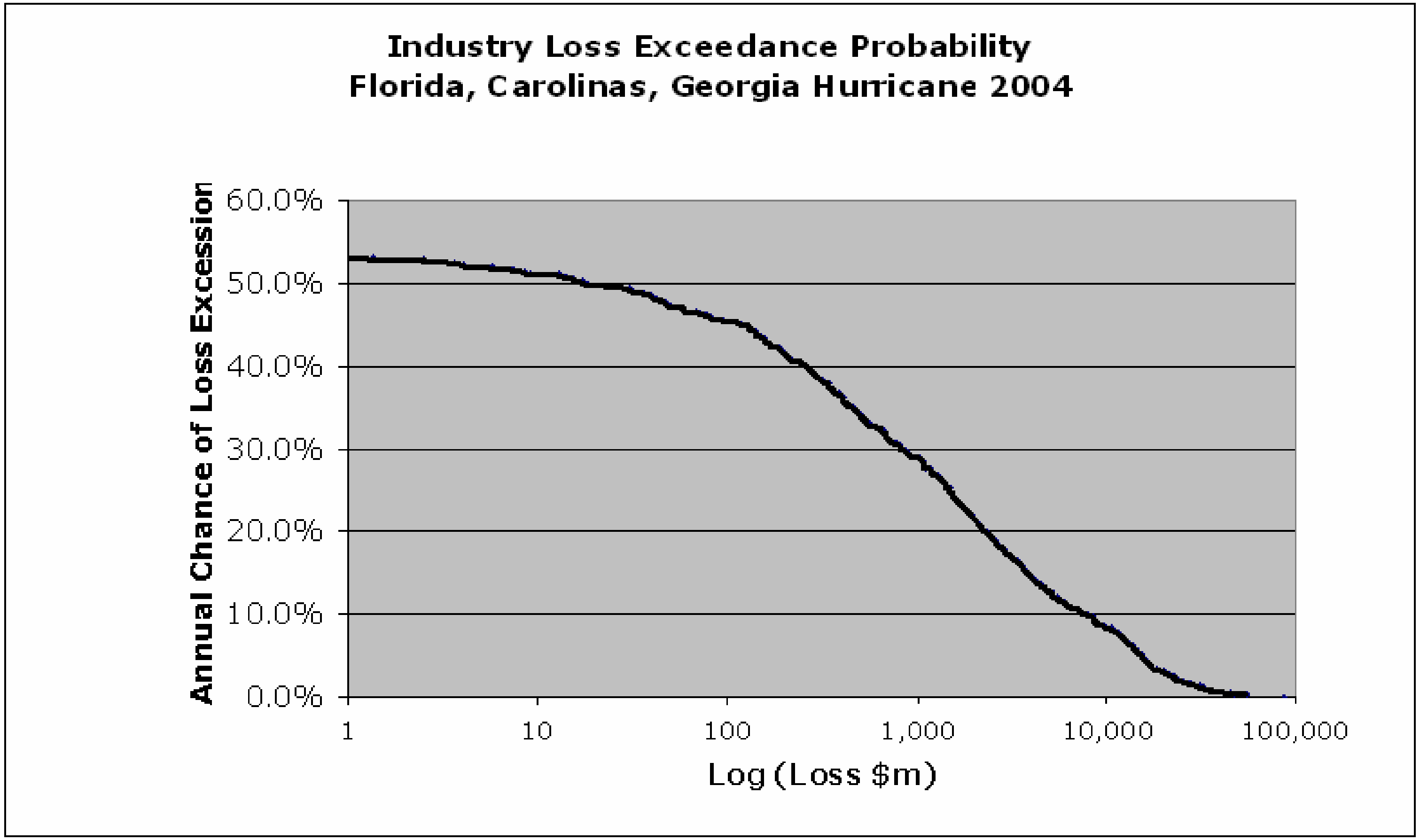


Stretched Exponential EP Curves

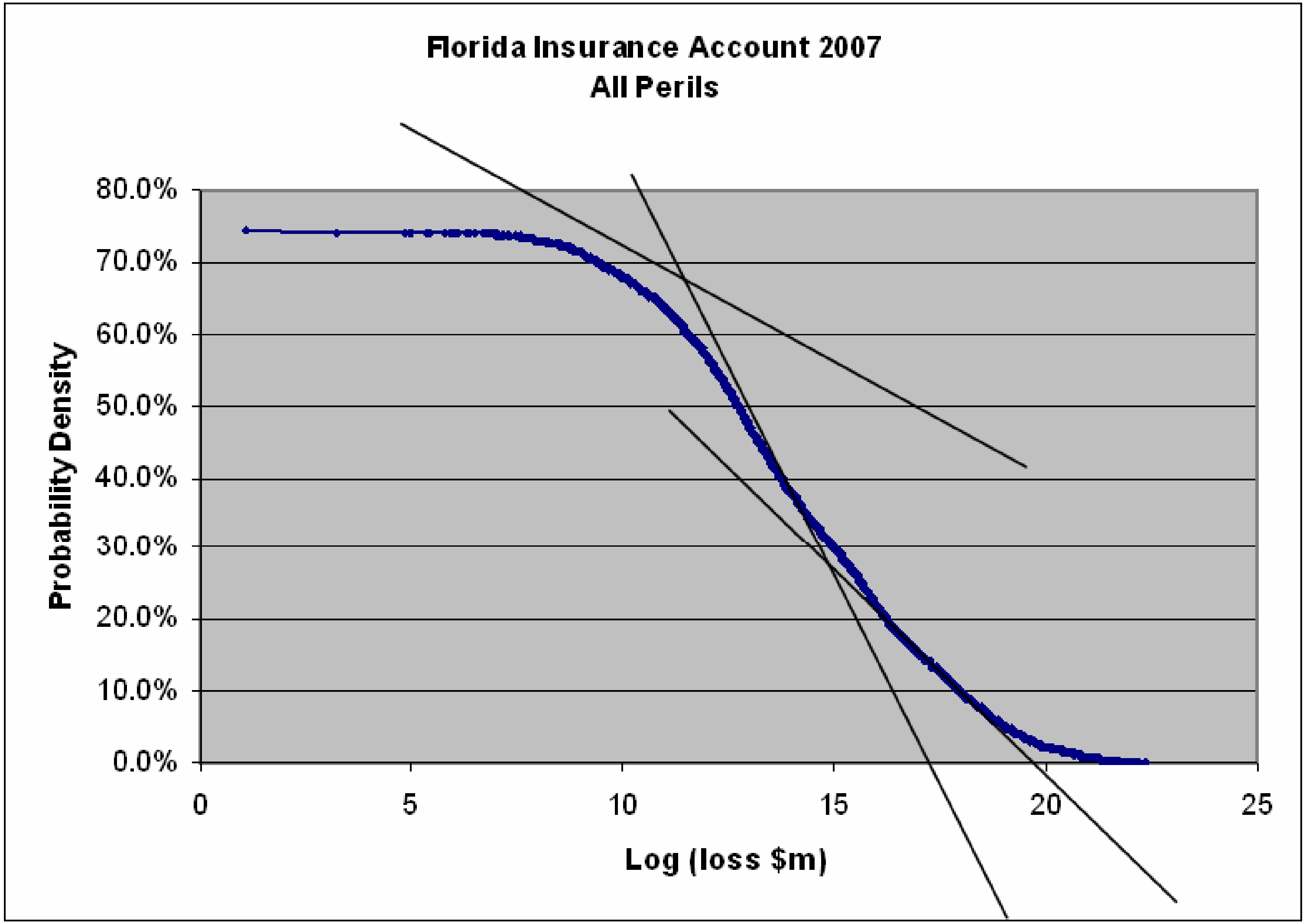




Example EP Curves - RMS



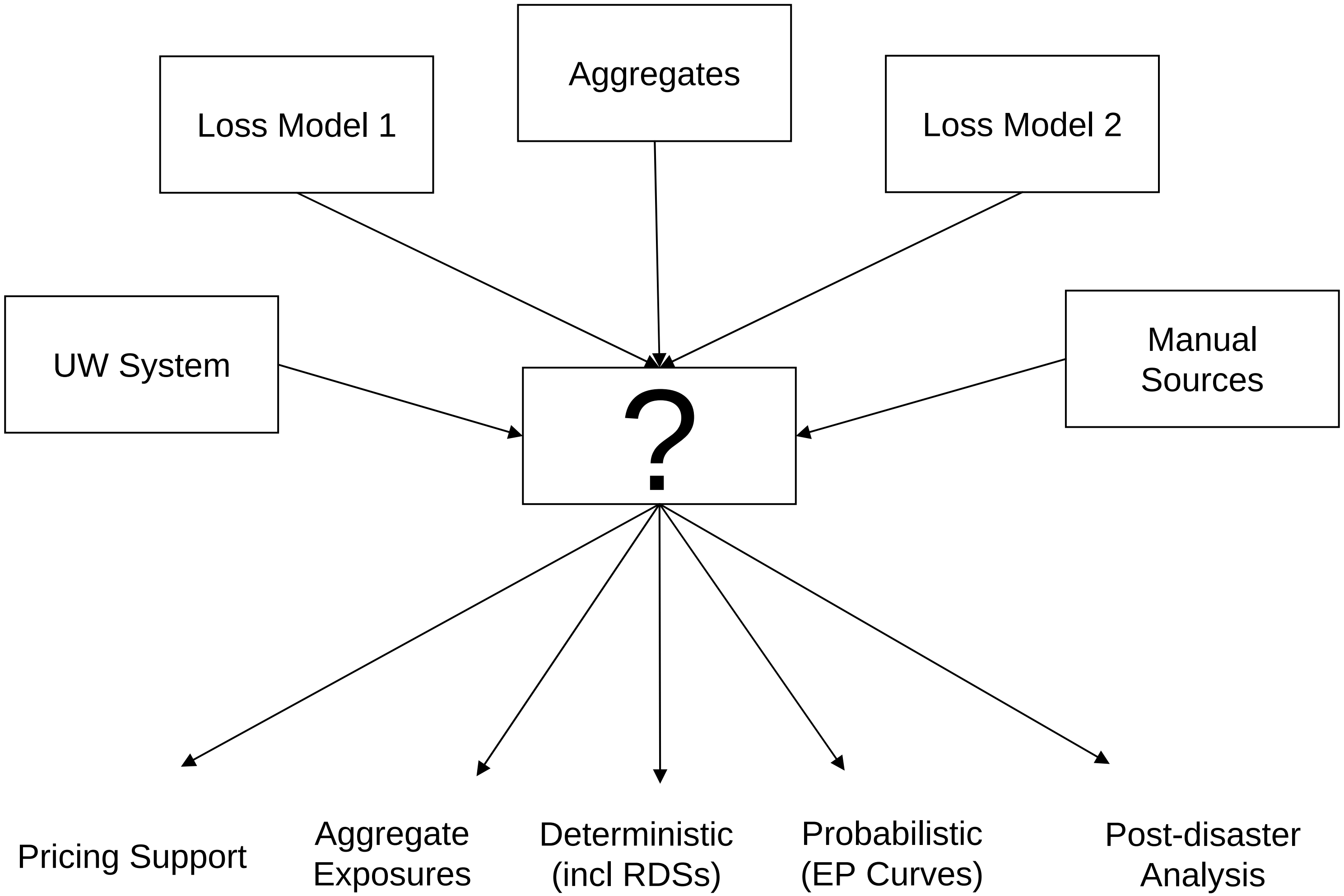
Example EP Curves - AIR



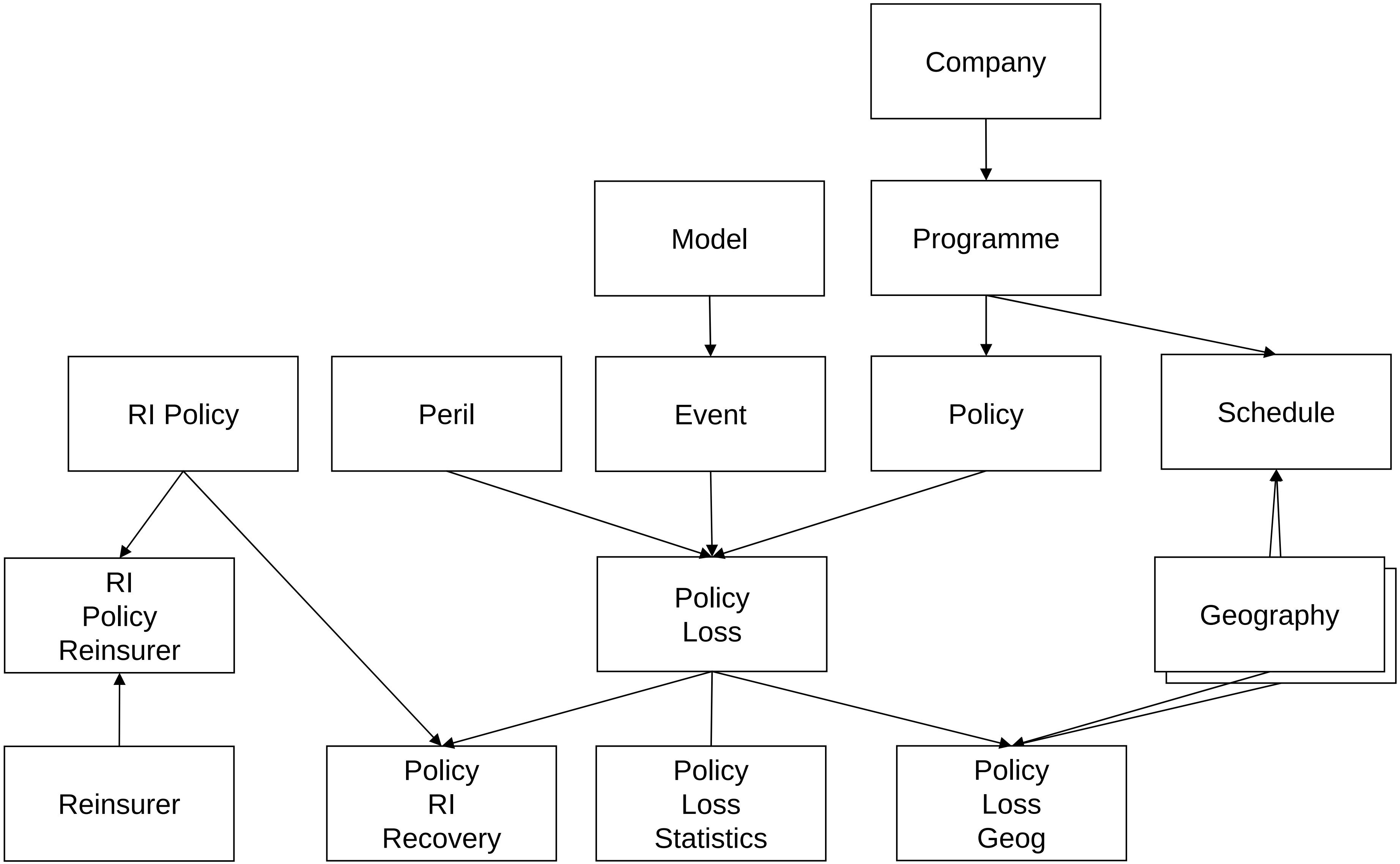
Exposure Management

Logistics

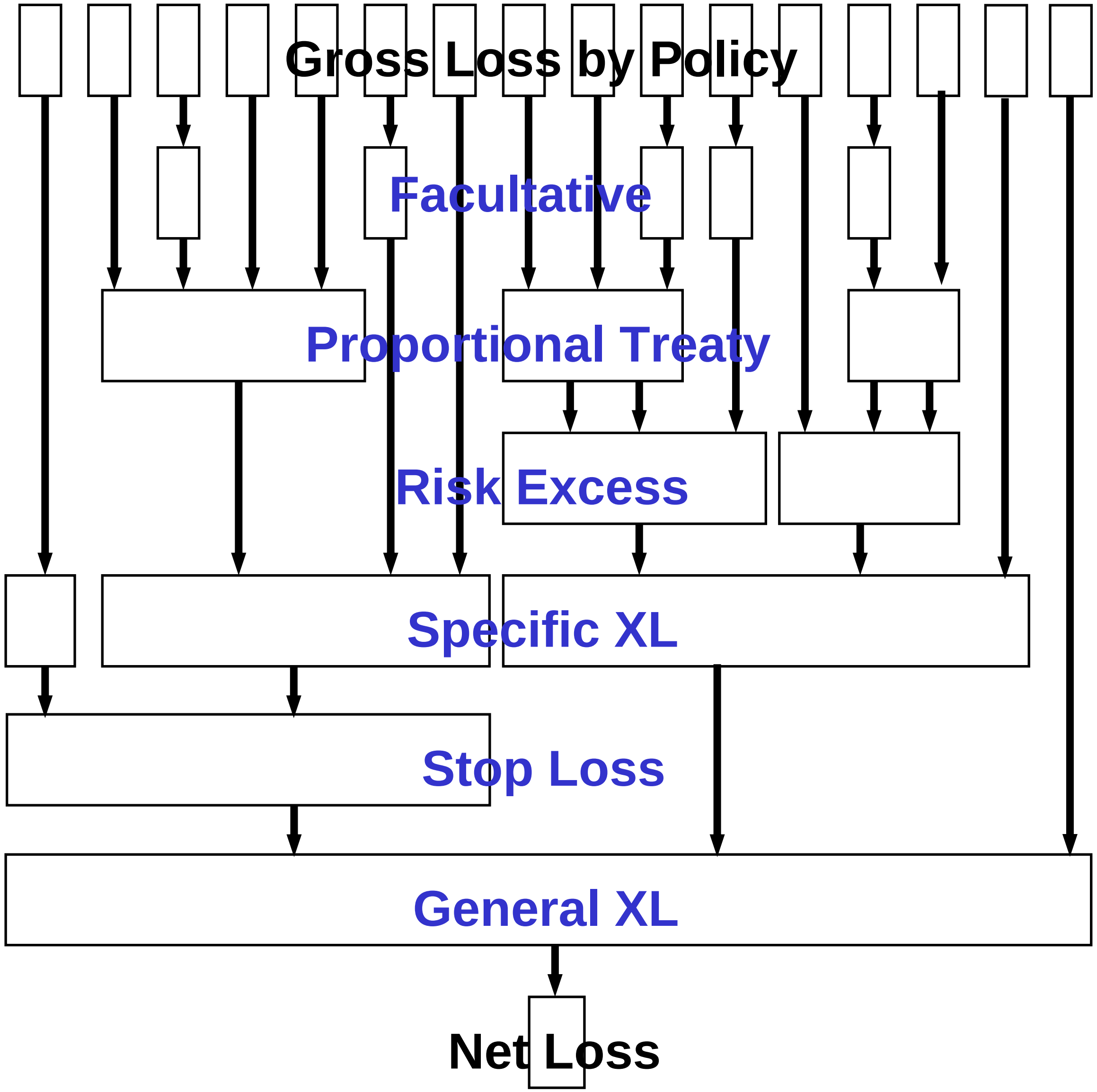
Exposure Management



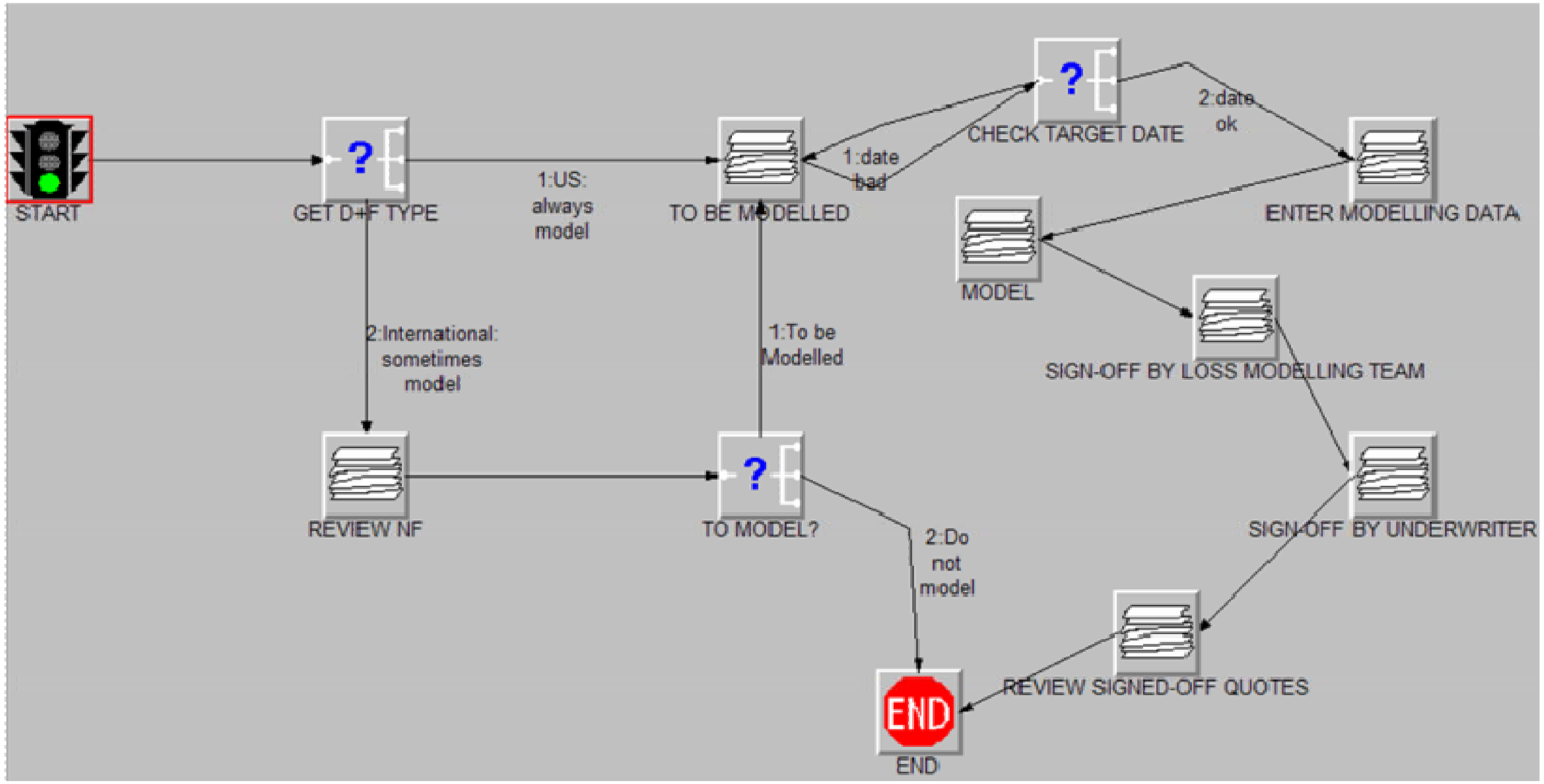
Conceptual Data Model



RI Calculation



Workflow



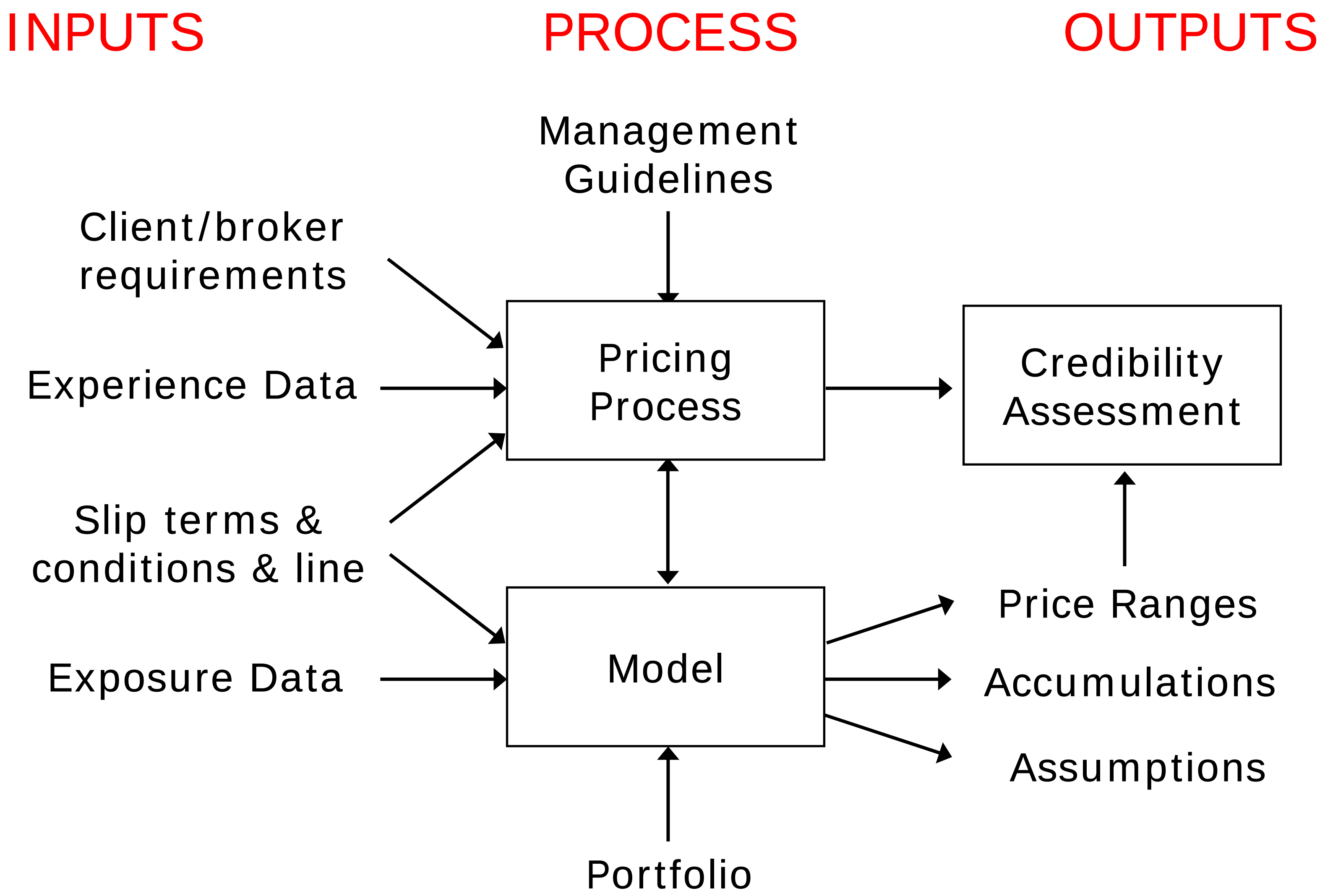
START
GET D+F TYPE
1:US: always model
TO BE MODELLED
1:date bad
CHECK TARGET DATE
2:date ok
ENTER MODELLING DATA
MODEL
SIGN-OFF BY LOSS MODELLING TEAM
SIGN-OFF BY UNDERWRITER
REVIEW SIGNED-OFF QUOTES
2:International: sometimes model
1:To be Modelled
REVIEW NF
TO MODEL?
2:Do not model
END

Checklist

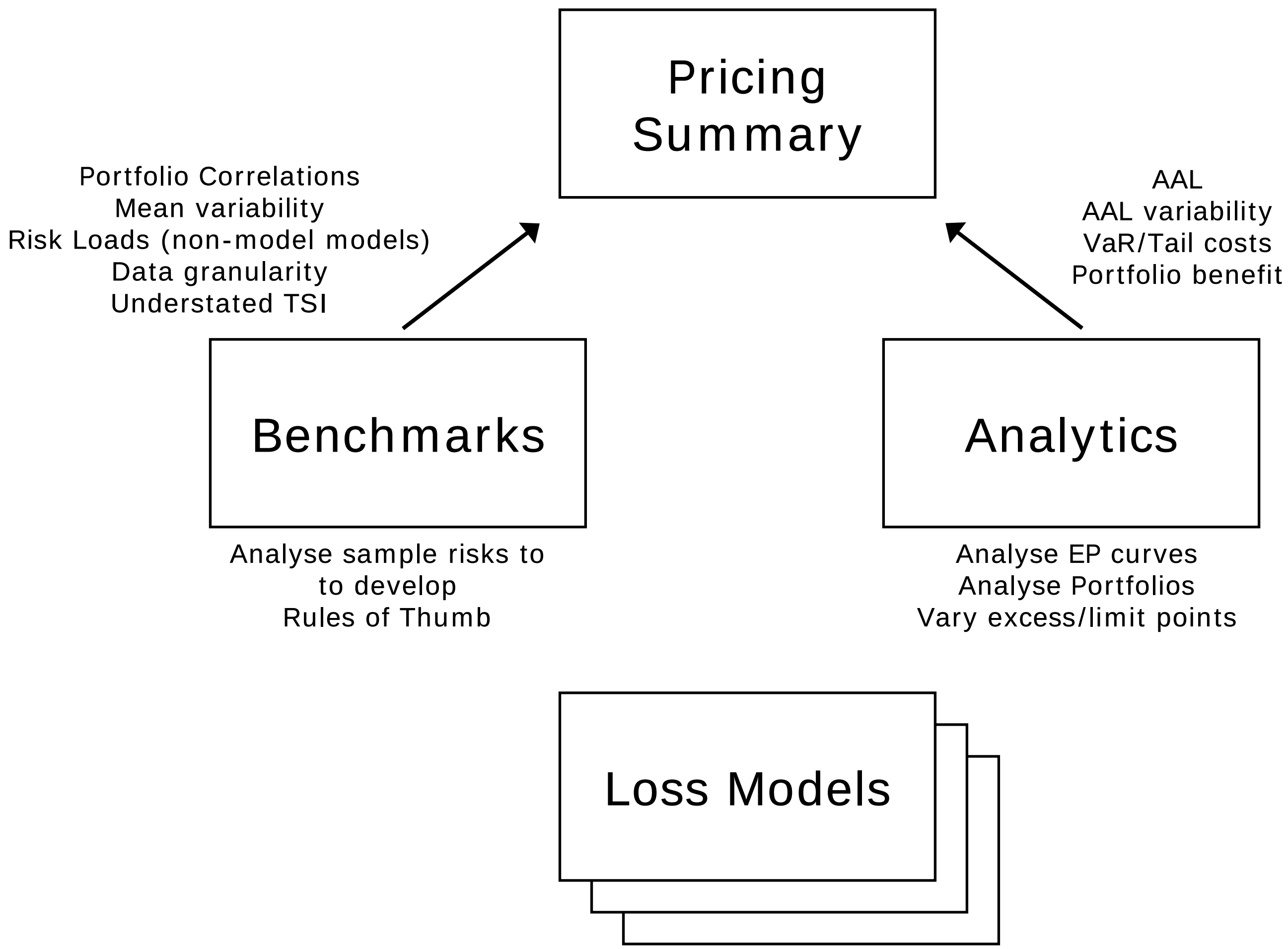
Area	Function	Typical System Used Today	Issues
Loading	Schedule Recording	Loss Model or Aggregate system	Need automated links to save re-keying
	Workflow Management	None	
Underwriting	Pricing Tools	Spreadsheet	Uses Loss model stats …
	Modelling	Loss Model	
	Market Share	Spreadsheet	Hmmm
	Model Comparison (EP Curves)	Manual	No comparison system available
	Reviewing Exposures and Aggregates, incl GIS relative to Portfolio	Aggregate System	Should be provided by Loss Model system so aggregates can be compared to modelled losses
	RDS probes (incl GIS)	Manual or Aggregate System	Should be provided by Loss Model system
Reporting	Aggregates and Hotspots	Aggregate System	Why not Loss Model system?
	RI Calculation / Net Loss Model	Custom System	Critical for many companies. Need reinstatements calculated as well
	Deterministic (RDS)	Manual	Use Loss Model or Aggregates System for source gross losses
	Probabilistic EP Curves	Loss Model	Portfolio solutions have to created manually
	Urban Concentration	Loss Model or Aggregates System	
	Reinsurer Exposure	Manual	
Post-disaster Management	Real-time Loss Assessment	Manual	
	Estimate Development	Manual	

UW Pricing

Pricing


INPUTS
PROCESS
OUTPUTS
Management Guidelines
Client/broker requirements
Experience Data
Slip terms & conditions & line
Exposure Data
Pricing Process
Model
Portfolio
Credibility Assessment
Price Ranges
Accumulations
Assumptions

Pricing – Components



Factors governing price

- How much we know about the risk and similar
- Attachment point and limit
- Risk conditions (e.g. exclusions, reinstatements)
- Loss experience
- Can the risk be modelled?
- What data do we have on exposures?

and

- Commissions and expenses
- Average annual loss (pure technical price)
- Cost of capital
- Profit margin

and

- Risk loadings for uncertainties ...

Current Techniques

- Experience Stats   Requires data, no volatility
- Rate on Line / Return Period   Risky guess
- First Loss Curve / ILF   Needs curves
- Combined ratio target   No volatility
- “Mean plus third Standard Deviation”   Guess
- Correlation Kreps   Guess
- Value at Risk (VaR)   No account of excess VaR

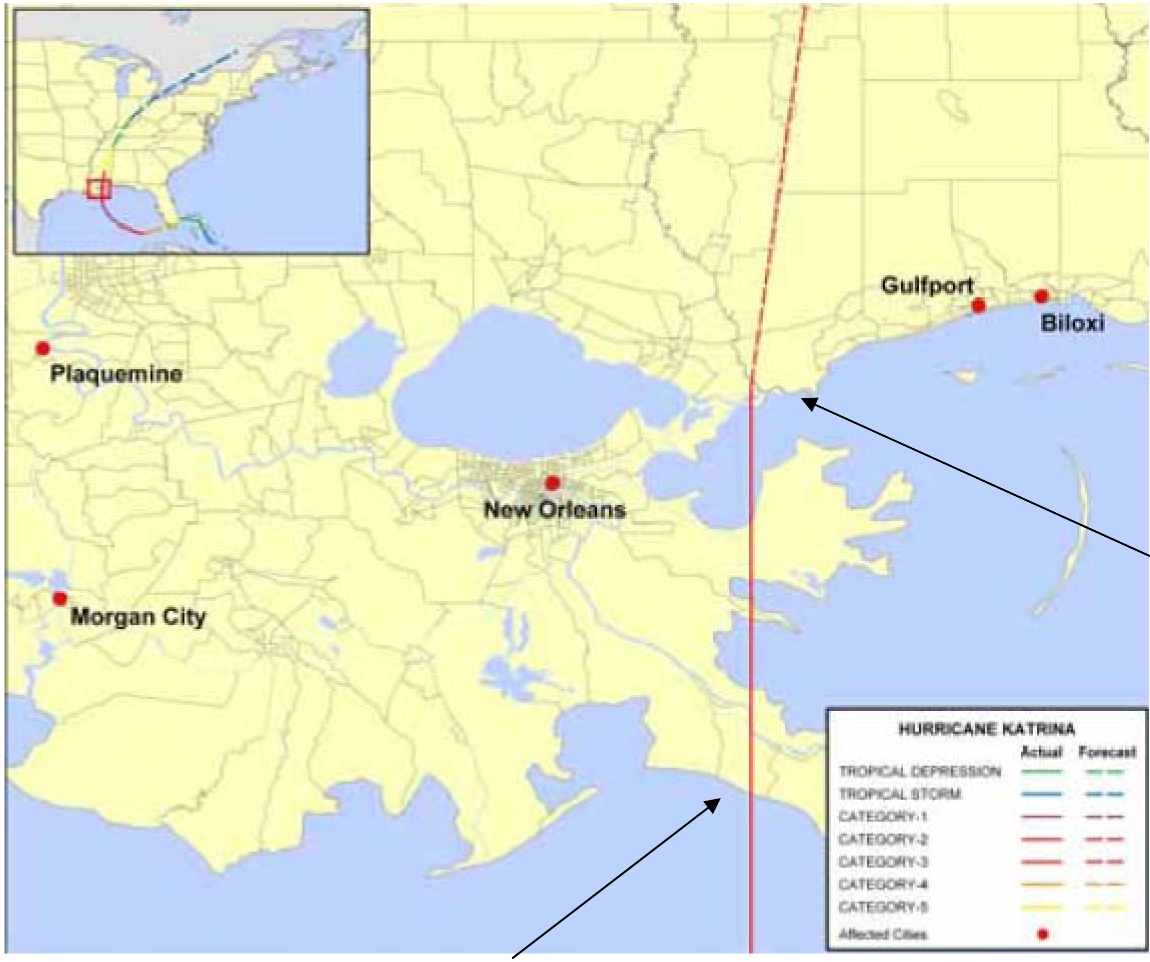
Post-disaster Loss Assessment

Hurricane Katrina

Katrina formed over the Bahamas on 24th August

1st landfall, 25th August, South

Florida Category 1



It regained strength in the Gulf of Mexico, made its 2nd landfall on 29th August in Louisiana as a Category 4 hurricane with winds of 140 mph. It's final landfall was made at the Louisiana/Mississippi border later that day as a Category 3 hurricane with winds of 125 mph. A 15 to 30 ft storm surge came ashore on virtually the entire coastline from Louisiana, Mississippi and Alabama to Florida. The 30 ft storm surge recorded at Biloxi, Mississippi is the highest ever observed in America.

Gulfport
Biloxi
Plaquemine
New Orleans
Morgan City
HURRICANE KATRINA
Actual
Forecast
TROPICAL DEPRESSION
TROPICAL STORM
CATEGORY-1
CATEGORY-2
CATEGORY-3
CATEGORY-4
CATEGORY-5
Affected Cities

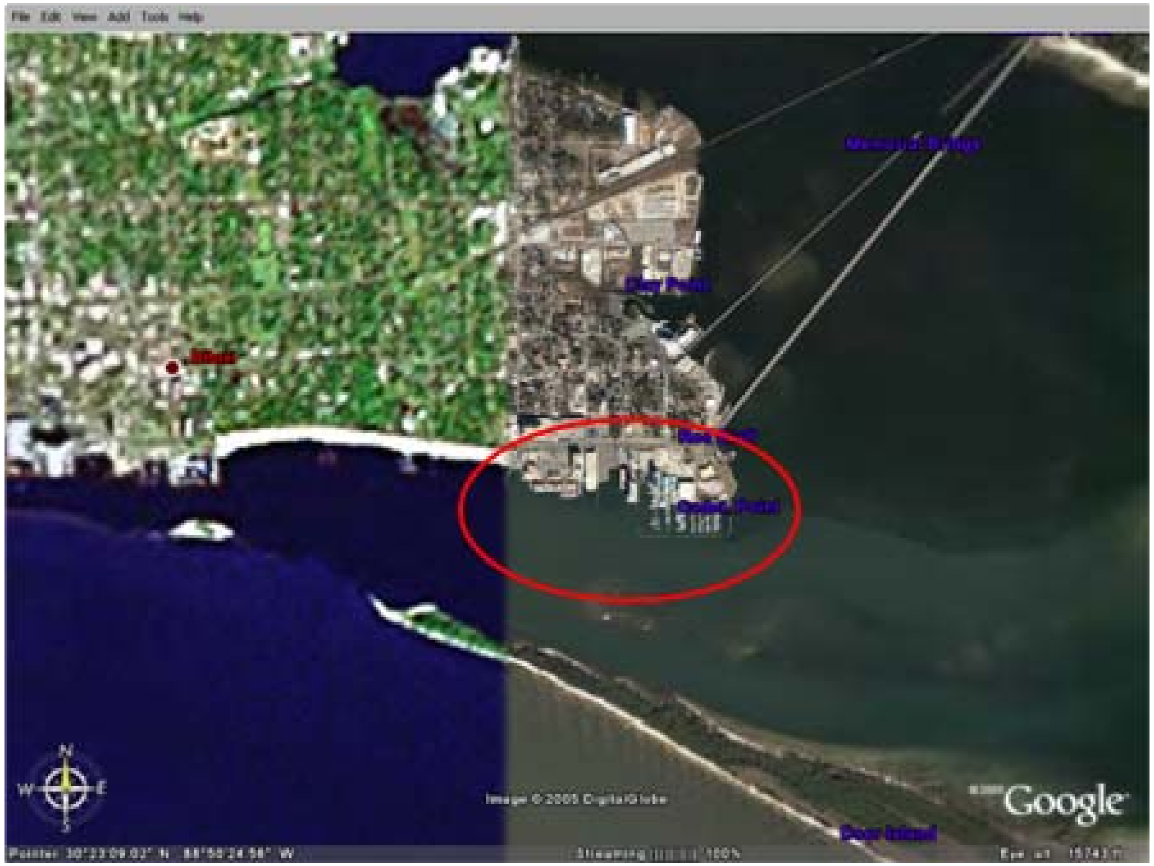

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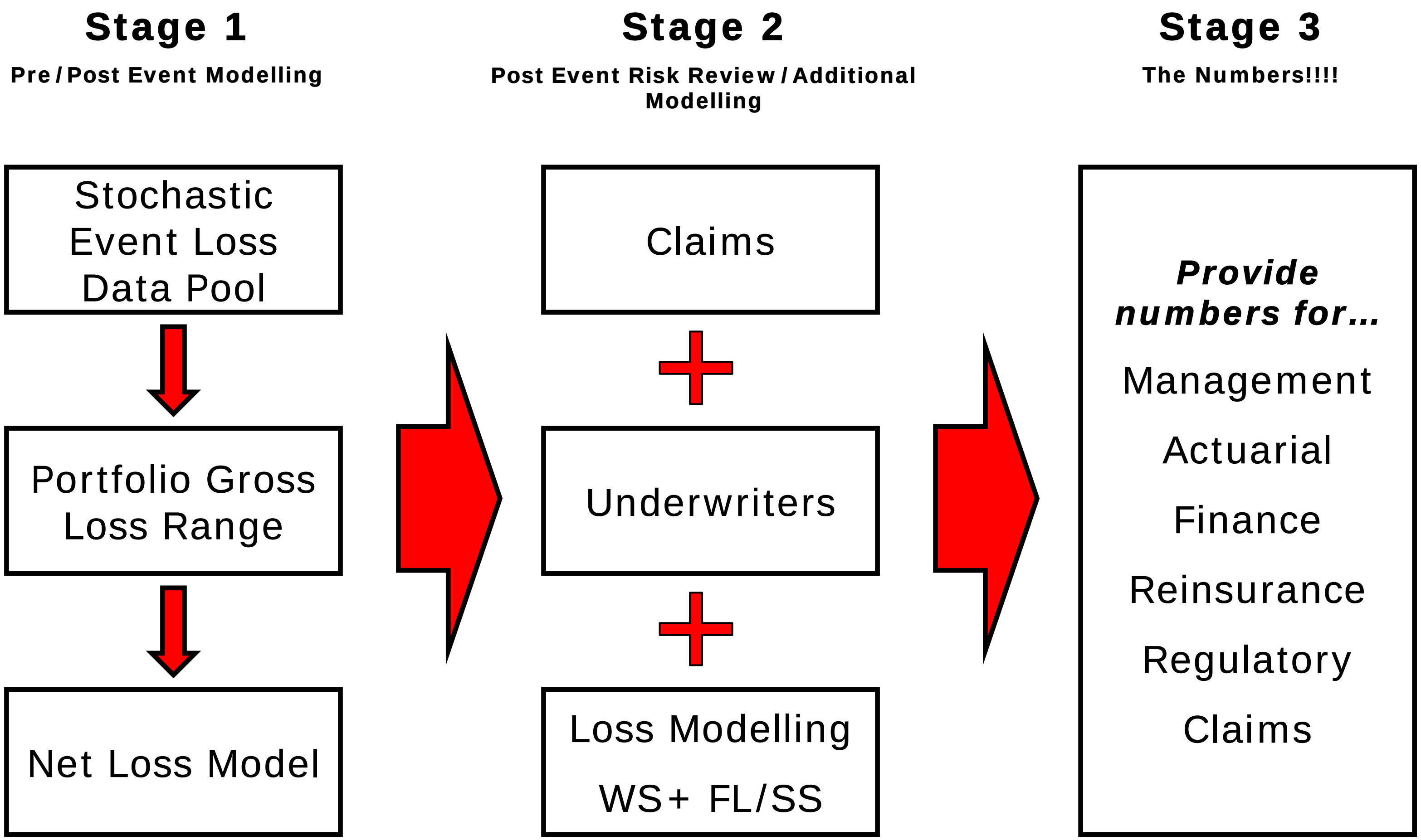
Image © 2005 DigitalGlobe
Google

Hard Rock Casino, Biloxi

Hard Rock Casino, Biloxi

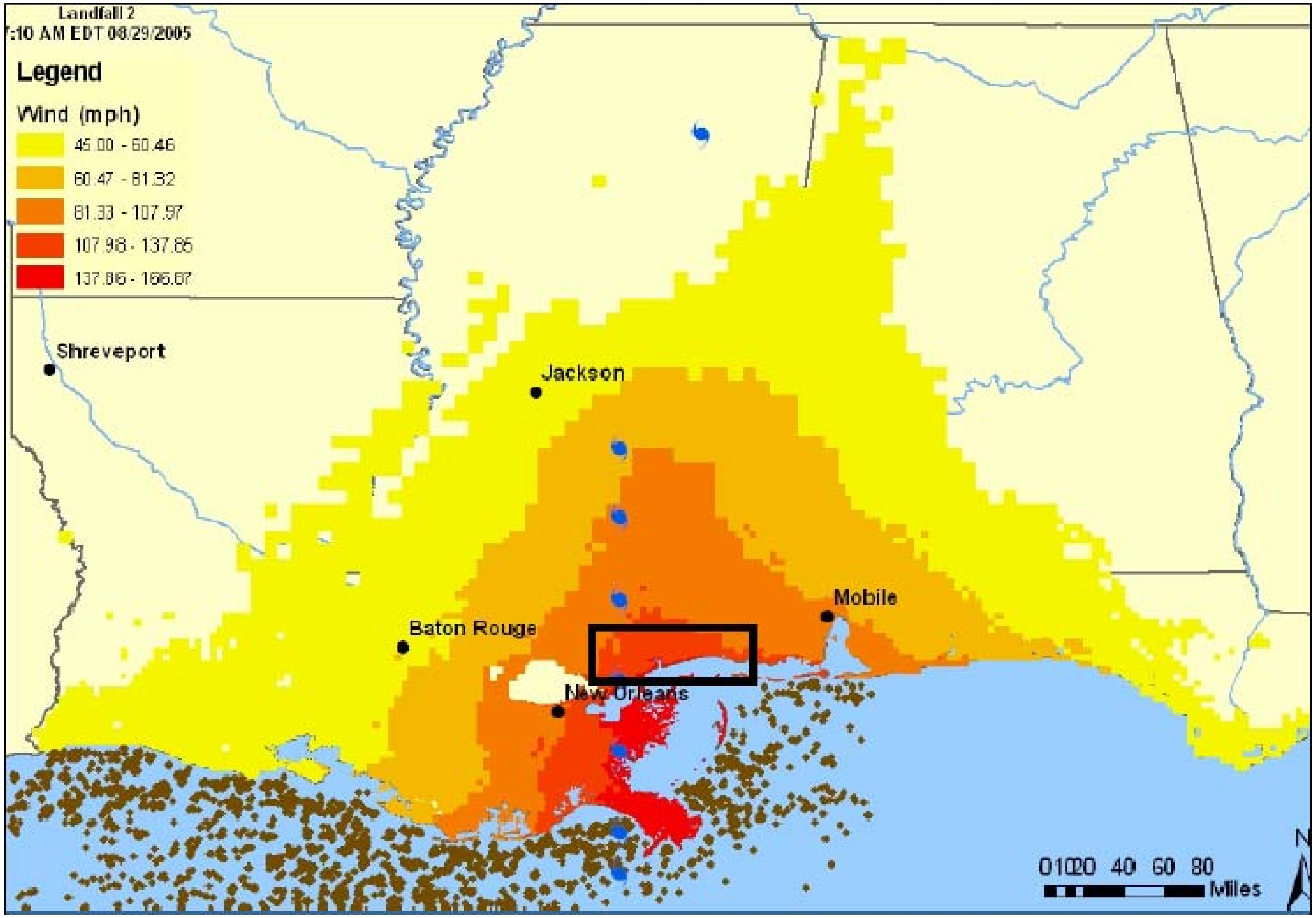
Loss Assessment System



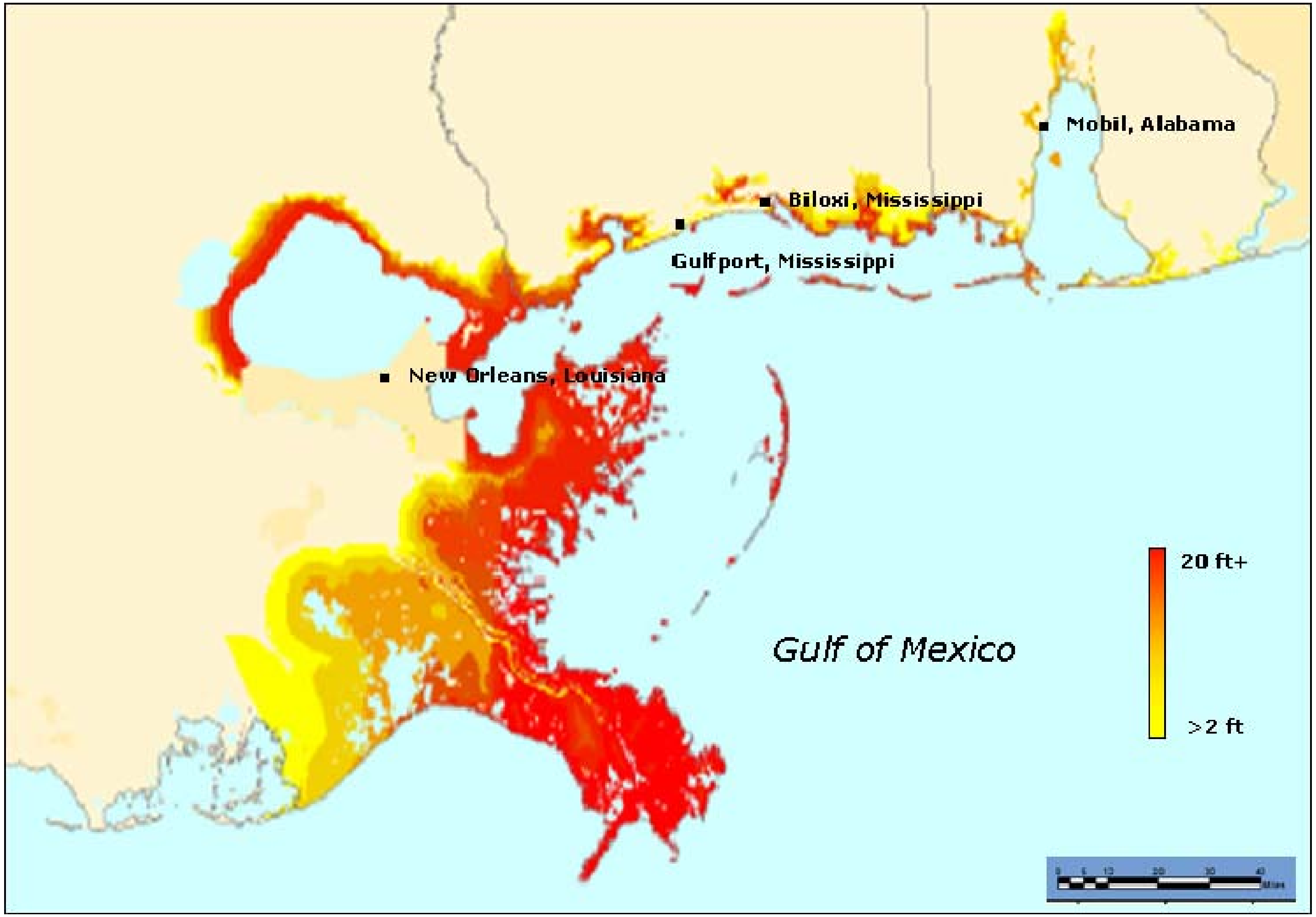
Risk List

- Didn't rely solely on RMS model
- Took RMS model wind footprint
- Took the RMS recon storm surge footprint
- Took an RMS flood footprint for New Orleans
- Looked at each affected risk by underlying building location and potential cause of loss
- Met with claims and UWs to agree Optimistic, Pessimistic, Pick for reporting to Lloyd's

Katrina Wind Footprint (RMS model)



Katrina Storm Surge Footprint (RMS recon)



Katrina New Orleans Flooding (RMS study)

Katrina Loss Estimate Development

	RMS Industry	AIR Industry
Pre-Event Est (no flood)	$10-25bn (30/08)	$12-26bn (29/08)
August Close (no flood)	$20-35bn (09/09)	$18-25bn (30/08)
Lloyd's Pick (inc flood)	$40-60bn (13/09)	$42-61bn (27/09)
Sept Close	$40-60bn (27/09)	$42-61bn (27/09)
Oct 9th	$40-60bn (27/09)	$42-61bn (27/09)

Actual insurance industry loss (Swiss Re figure) $66bn

RMS Event Estimates

Katrina was 24th August

RMS Initial Event Postings (Posted on 31/08/05) for Second Landfall

Track 1	$ 5.7bn (5bn LA, 0.6bn MS, 20m AL)
Track 2	$ 8.5bn (5.6bn LA, 2.7bn MS, 150m AL)
Track 3	$ 7.7bn (3bn LA, 4.4bn MS, 340m AL)

RMS Current Event Postings (Posted on 27/09/05) for Second Landfall

Track 1	$10.2bn (9.2bn LA, 1bn MS)
Track 2	$ 9.2bn (8.5bn LA, 0.8bn MS)

Modelling Conclusions

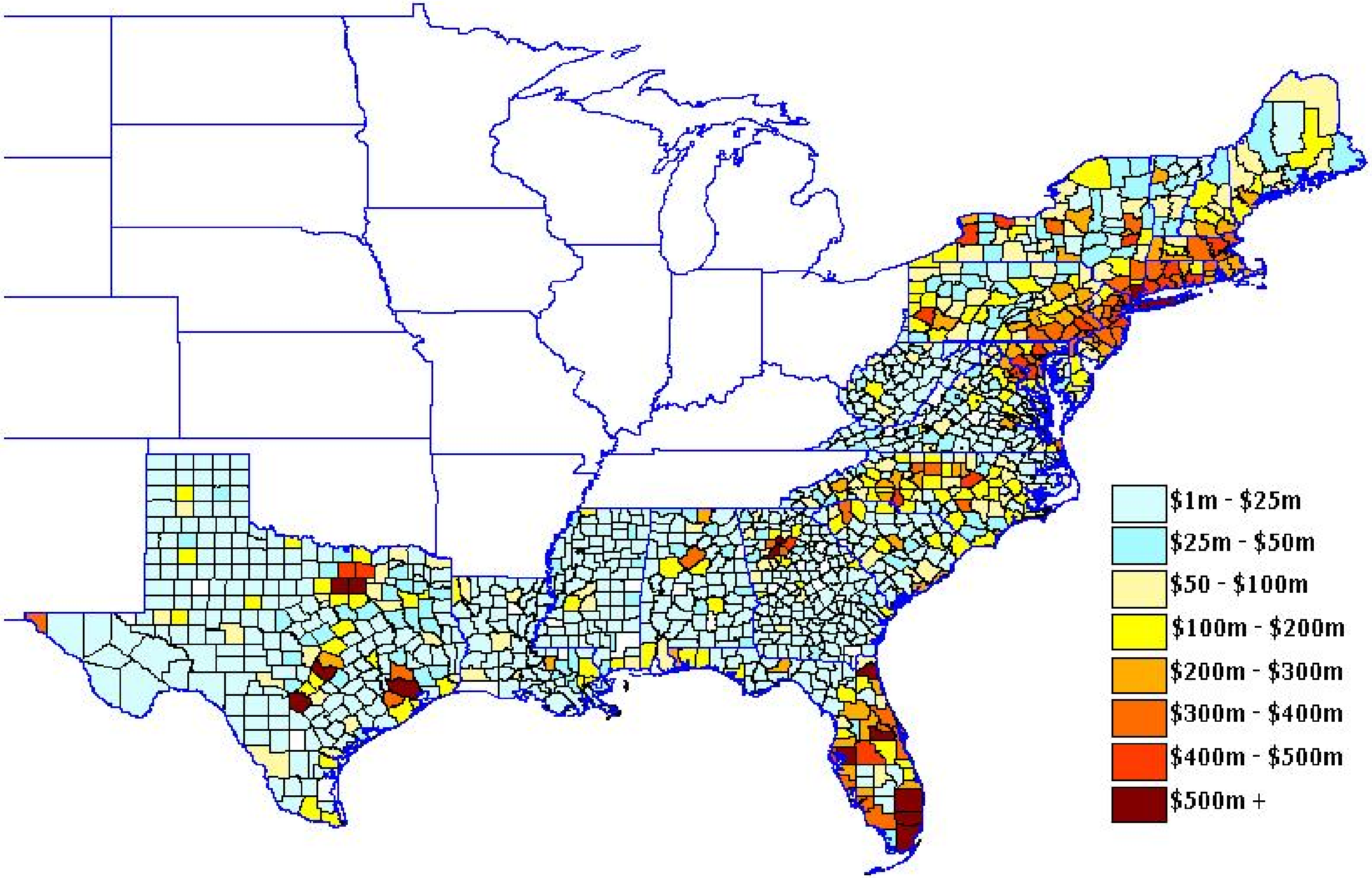
- Pre-event estimates too low and RMS representative events are still too low
- Models excluded inland flood including that due to hurricanes (specifically breaches)
- Storm surge loss modelling too conservative and particular risks not coded or modelled
- Lack of diagnostic tools to spot aggregations
- Values understated on certain accounts
- Demand surge and related “loss amplification” effects greater than modelled

Data issue example – A floating casino

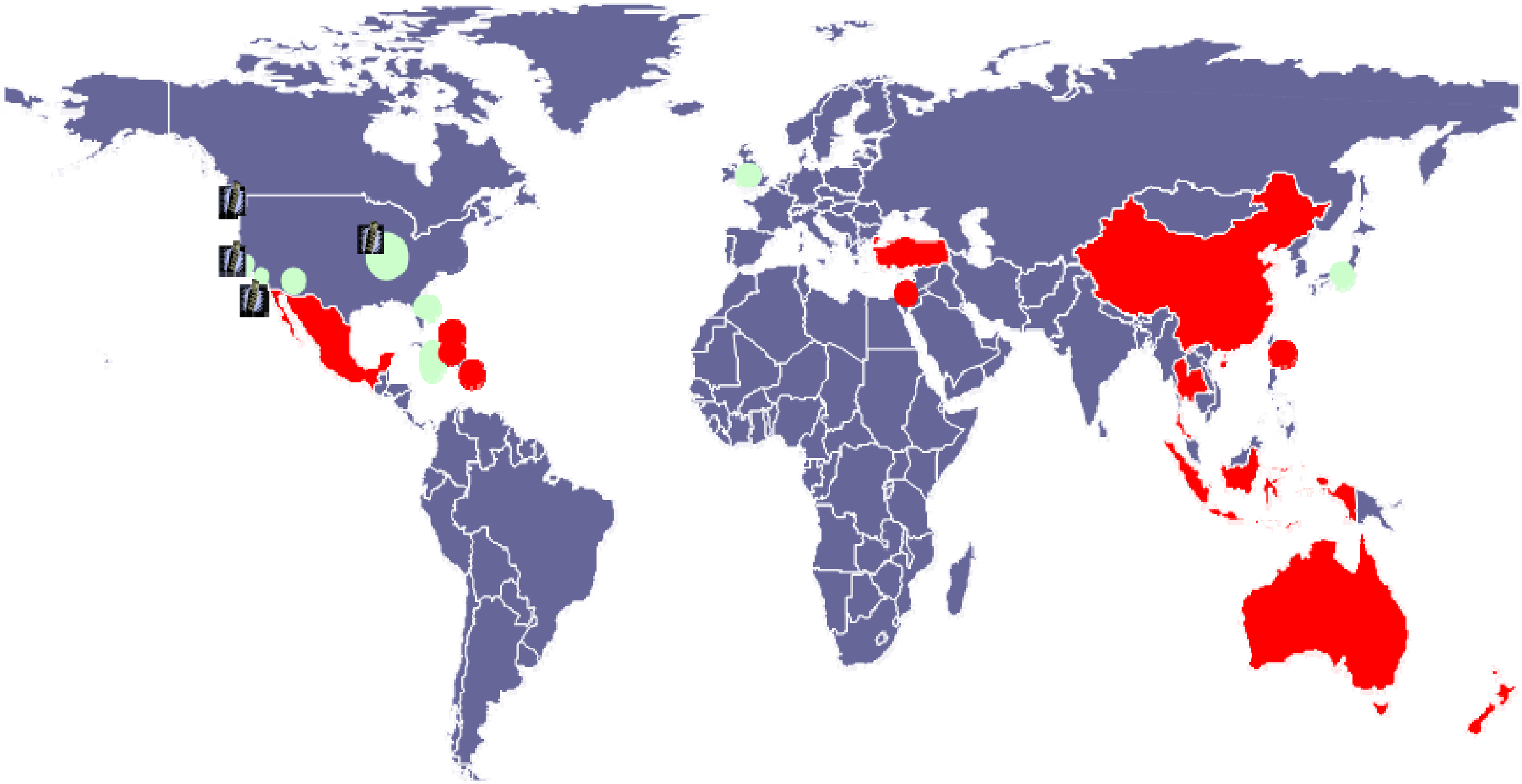
- RMS model wind reasonable
- Storm surge understated
- Location originally ignored surge

Ground-up loss estimates for Biloxi only unless otherwise stated	Schedule Values	RMS event 442255 10,000 yr EP **original location**		RMS event 442255 10,000 yr EP **actual location**	
		Wind	Surge	Wind	Surge
Buildings	$141m	$52m	$0	$ 58m	$ 2m
Content	$26m	$12m	$0	$ 13 m	$ 1 m
BI	$62m	$ 31m	$0	$ 34m	$ 4m

Aggregates Revisited



UW Exposure Reporting



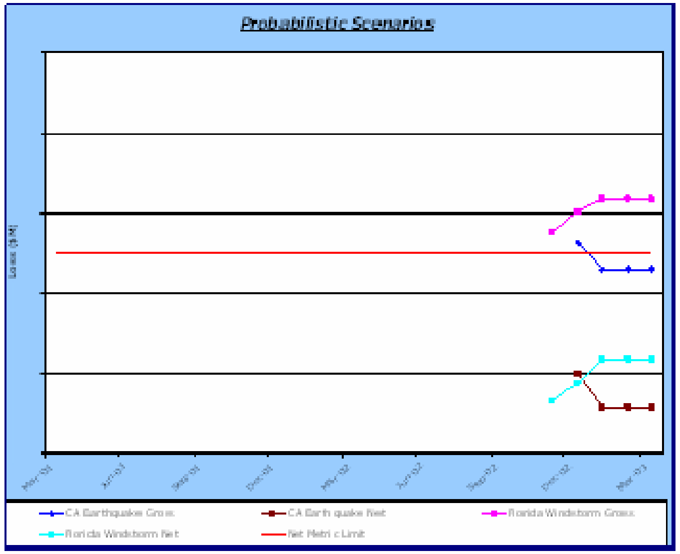
A) Probabilistic Modelling

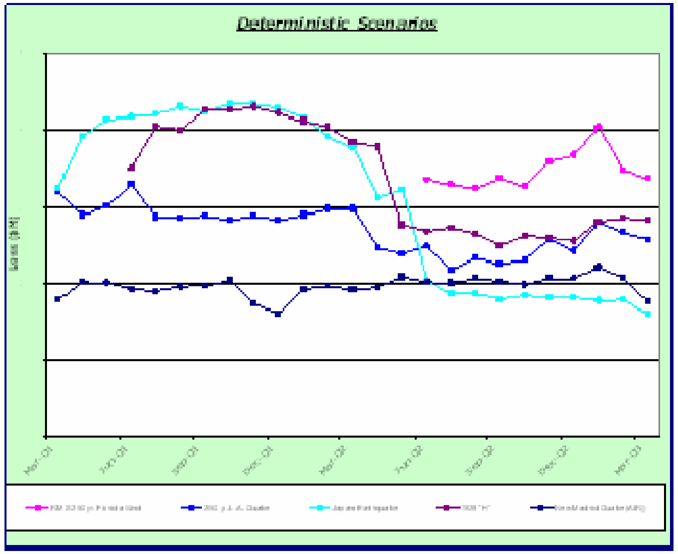
B) Deterministic Modelling

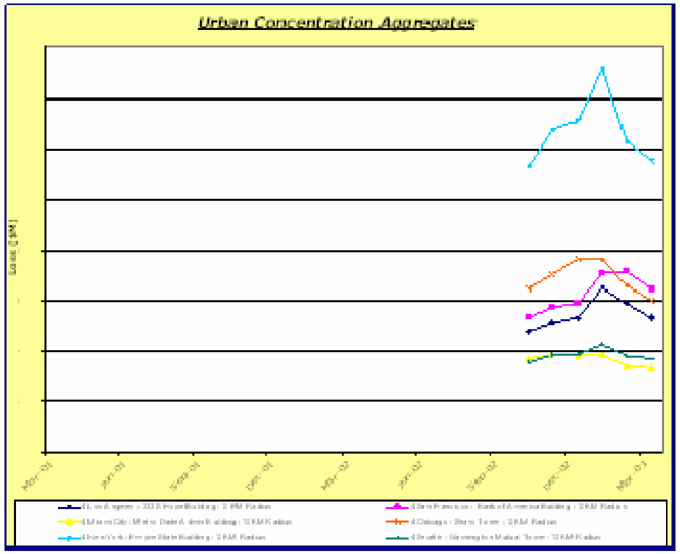
C)Urban Concentration Aggregates

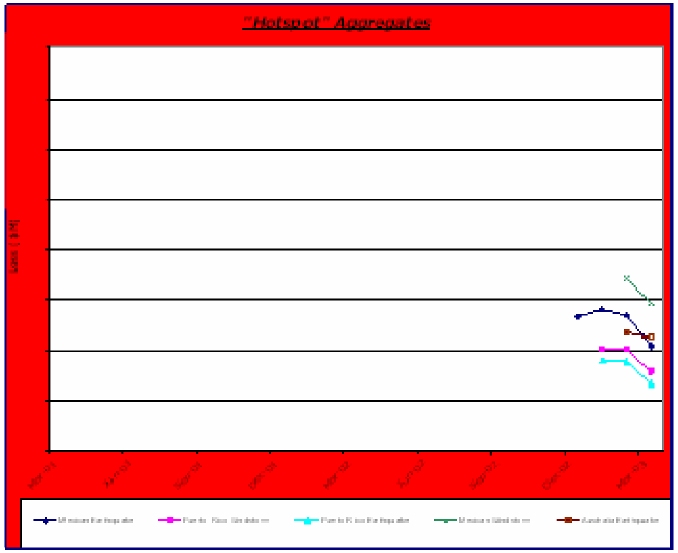
D)"Hotspot" Aggregates

Progressions

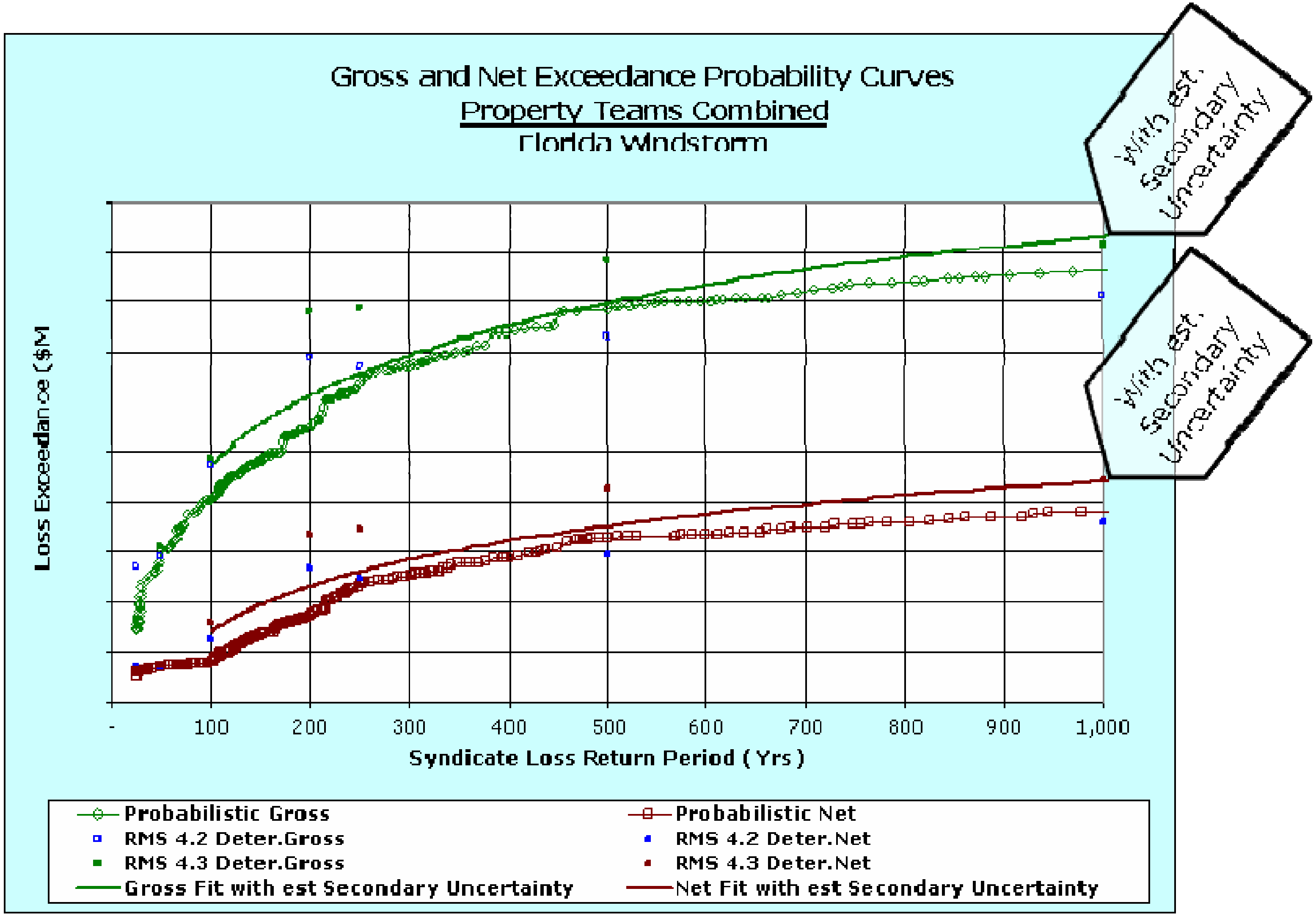








Probabilistic



Deterministic Scenarios

Florida

1 Hurricane Andrew: A scenario based on an AIR Simulation of the 1992 storm, which hit Southern Florida.

2 100 yr. Florida Wind: AIR's tenth worst market loss in Florida in 1,000 years

3 250 yr. Florida Wind: AIR's fourth worst market loss in Florida in 1,000 years.

4 333 yr. Florida Wind: AIR's 333 yr. Florida Windstorm, market loss $50bn.

5 25 yr. Florida Wind : Based on RMS's 25 year market loss for Florida.

6 50 yr. Florida Wind : Based on RMS's 50 year market loss for Florida

7 100 yr. Florida Wind : Based on RMS's 100 year market loss for Florida.

8 100 yr. Florida Wind : Based on RMS's RiskLink 4.3 100 year Faraday loss for Florida.

9 200 yr. Florida Wind : Based on RMS's 200 year market loss for Florida.

10 250 yr. Florida Wind : Based on RMS's 250 year market loss for Florida.

11 250 yr. Florida Wind : Based on RMS's RiskLink 4.3 250 year Faraday loss for Florida.

12 500 yr. Florida Wind : Based on RMS's 500 year market loss for Florida.

13 1000 yr. Florida Wind : Based on RMS's 1000 year market loss for Florida.

California

14 Northridge: A scenario based on an AIR simulation of the 1994 L.A. earthquake.

15 100 yr. L.A. 'Quake: AIR's tenth worst market loss in Southern California in 1,000 years.

16 250 yr. L.A. 'Quake: AIR's fourth worst market loss in Southern California in 1,000 years.

17 1,000 yr. L.A. 'Quake: M7.1 on Newport Inglewood fault, based on AIR 1,000 year L.A. earthquake, market loss $68bn.

18 250 yr. San Francisco 'Quake: AIR's 250 yr. SF 'Quake, market loss $32.1Bn.

19 500 yr. San Francisco 'Quake: AIR's 500 yr. SF 'Quake, market loss $39.7Bn.

20 Richter scale 8.0 San Francisco 'Quake: AIR's largest loss in 1,000 years in Northern California.

21 250 yr. California Quake : Based on RMS's RiskLink 4.3 250 year Faraday loss for California.

22 500 yr. California Quake : Based on RMS's RiskLink 4.3 500 year Faraday loss for California.

USA Miscellaneous

23 N.E. Windstorm: Based on AIR's worst simulated market loss to a NorthEast Windstorm in a 1,000 year period, affecting 11 states in the region.

24 Richter scale 7.0 New Madrid 'Quake: Largest loss in a 1,000 year period according to AIR, affecting 8 states

25 1928 "H": Hypothetical hurricane event modelled by AIR, impacting both the Caribbean and Florida, considered a 1 in 200 year event for this region, with an estimated market loss of $27b

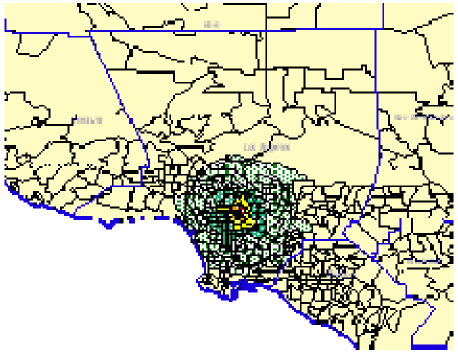
Miscellaneous

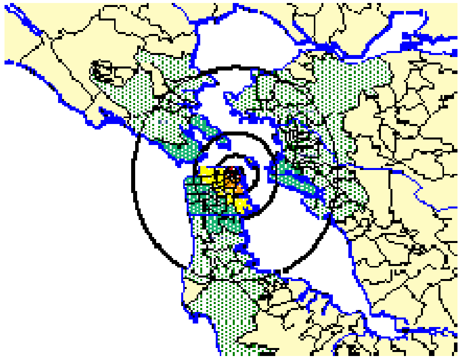
26 U.K. Flood: Based upon the U.K. Flood of 1953.

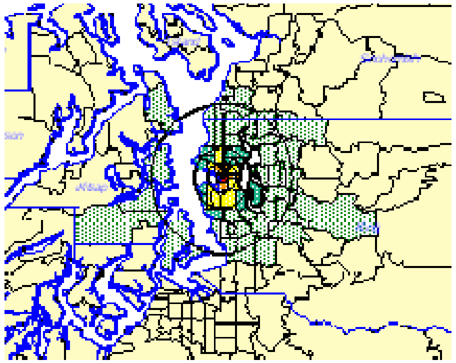
27 Japan Quake: Originally based on RMS Report, M7.5 Great Kanto Earthquake of 1923 but revised based on Underwriter's judgement.

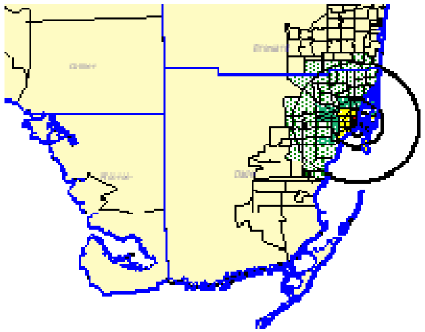
Deterministic Reinsurer Analysis

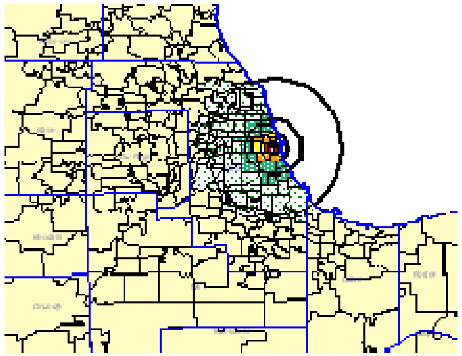
Urban Concentrations

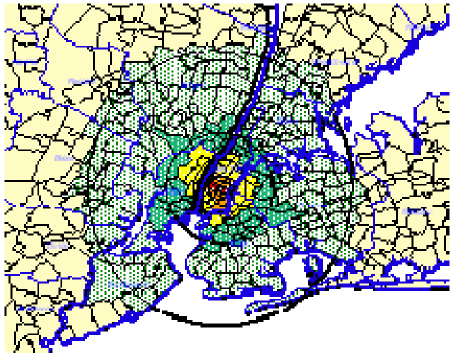












Hotspot Aggregates

Aggregates For Quake/Wind At Country Level
All Figures in US$ M

Continent	Country	Peril	Binder & Lineslip	Primary	Low Excess - xs $5m	Mid Excess - xs $25m	High Excess - xs $100m	Treaty	Total
Asia	China	Quake Wind							
	Indonesia	Quake Wind							
	Israel	Quake Wind							
	Singapore	Quake Wind							
	Taiwan	Quake Wind							
	Thailand	Quake Wind							
	Turkey	Quake Wind							
North Americ	Jamaica	Quake Wind							
	Mexico	Quake Wind							
	Puerto Rico	Quake Wind							
	U.S. Virgin Islands	Quake Wind							
Oceania	Australia	Quake Wind							
	New Zealand	Quake Wind							

Blocked Out

Aggregate by country max of all perils > $50m

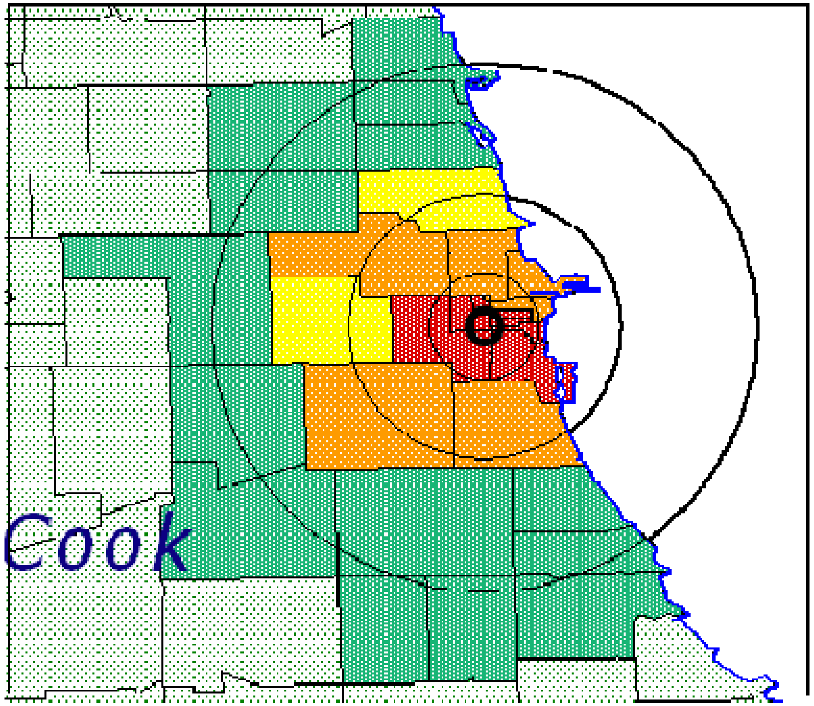
Aggregate by country max of all perils > $100m

Aggregate by country max of all perils > $300m

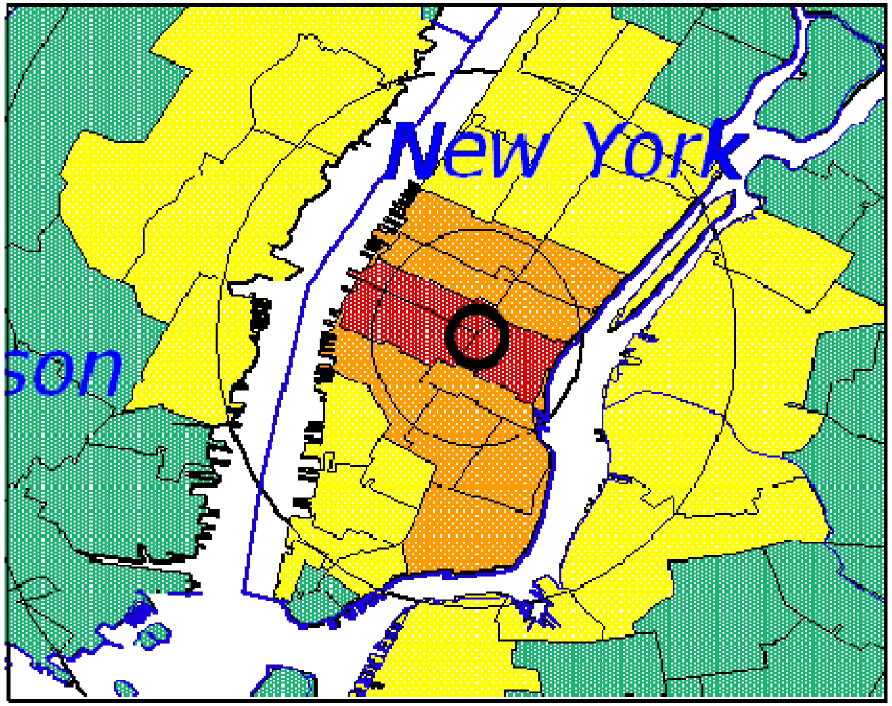
Aggregate by country max of all perils > $500m

Lloyd's Terrorism RDS

Chicago – Sears Tower
Radius – 0.5km, 2km, 5km, 10km



New York – Empire State Building
Radius – 0.5km, 2km, 5km



250 passengers + 12 crew per aicraft
1,000 fatalities at target building
Total loss of target building
25% damage within 250m
10% damage beween 250m and 500m

Conclusions

What’s the Question? - I

- What-if?
  - What would we lose in the event of a catastrophe of a given insured market loss (e.g. Florida hurricane of insured loss of $16 bn)?

    Market Share or Scenario Loss Model
  - What would we lose in the event of a particular catastrophe (e.g. an earthquake of Richter magnitude 7.1 in the Los Angeles area)?

    Scenario Loss Model

What's the Question? - II

- Are we a sound market?
  - What information would satisfy rating companies such as Best's?

Scenario Loss Models for various cats and return periods?

  - What information would satisfy the regulators of the market?

Scenario Loss Models for various cats and return periods?

AND NOW

EP Curves for Individual Capital Assessment (1 in 200 years)

What's the Question? - III

- What level of **risk** do we wish to bear?
  - What's the chance of us losing a certain amount of money (e.g. $250 m) or more on catastrophic risk in any one year?

    Probabilistic (AEP)

  - What amount of money could we expect to lose more than once in a certain number of years (e.g. 200)?

    Probabilistic (EP)