PL2 - Hurricane Modeling

Using Multiple Modeling Methodologies

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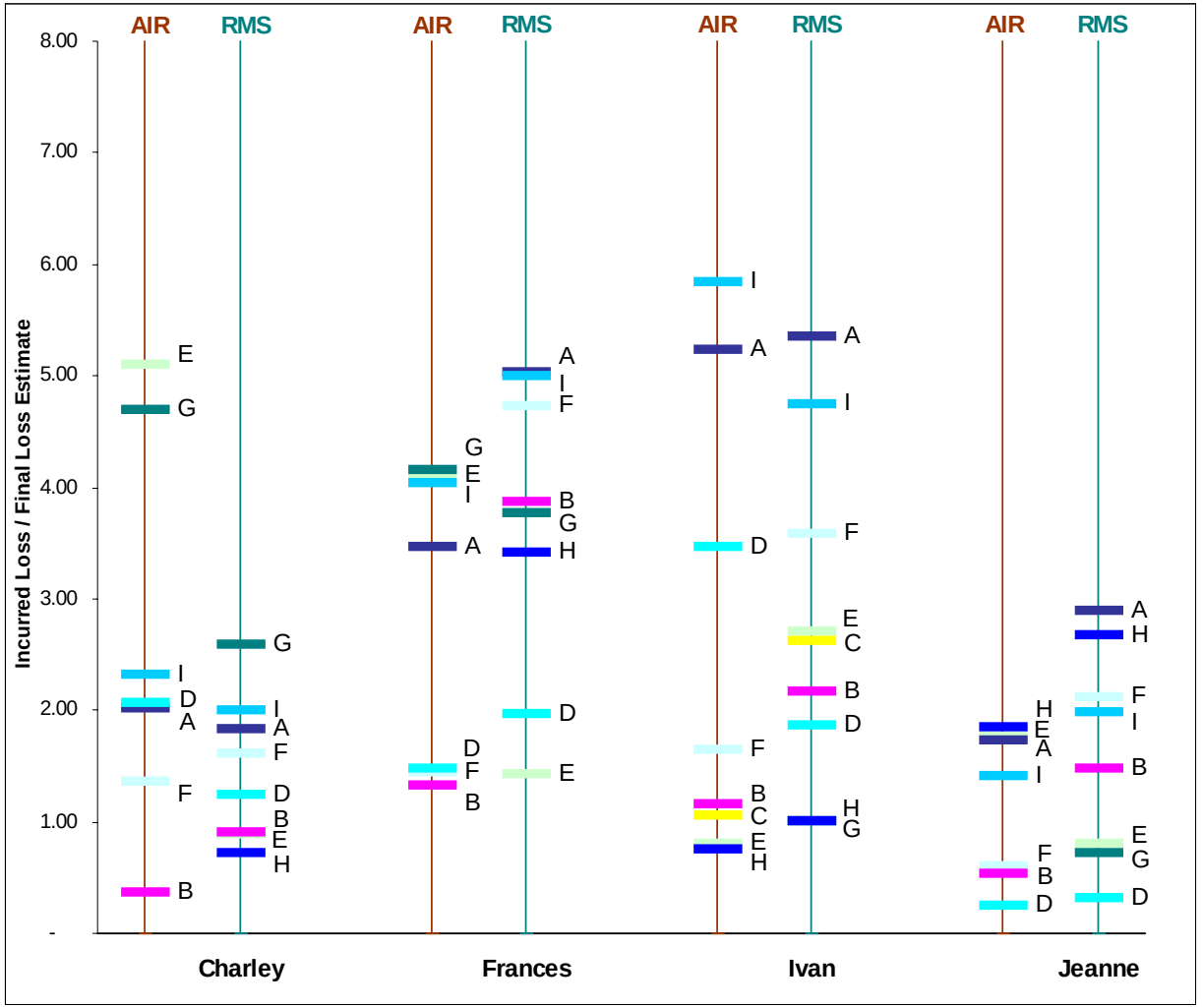
Agenda

- Background – recent modeling experience
- Considerations
- Types of Analysis – case study

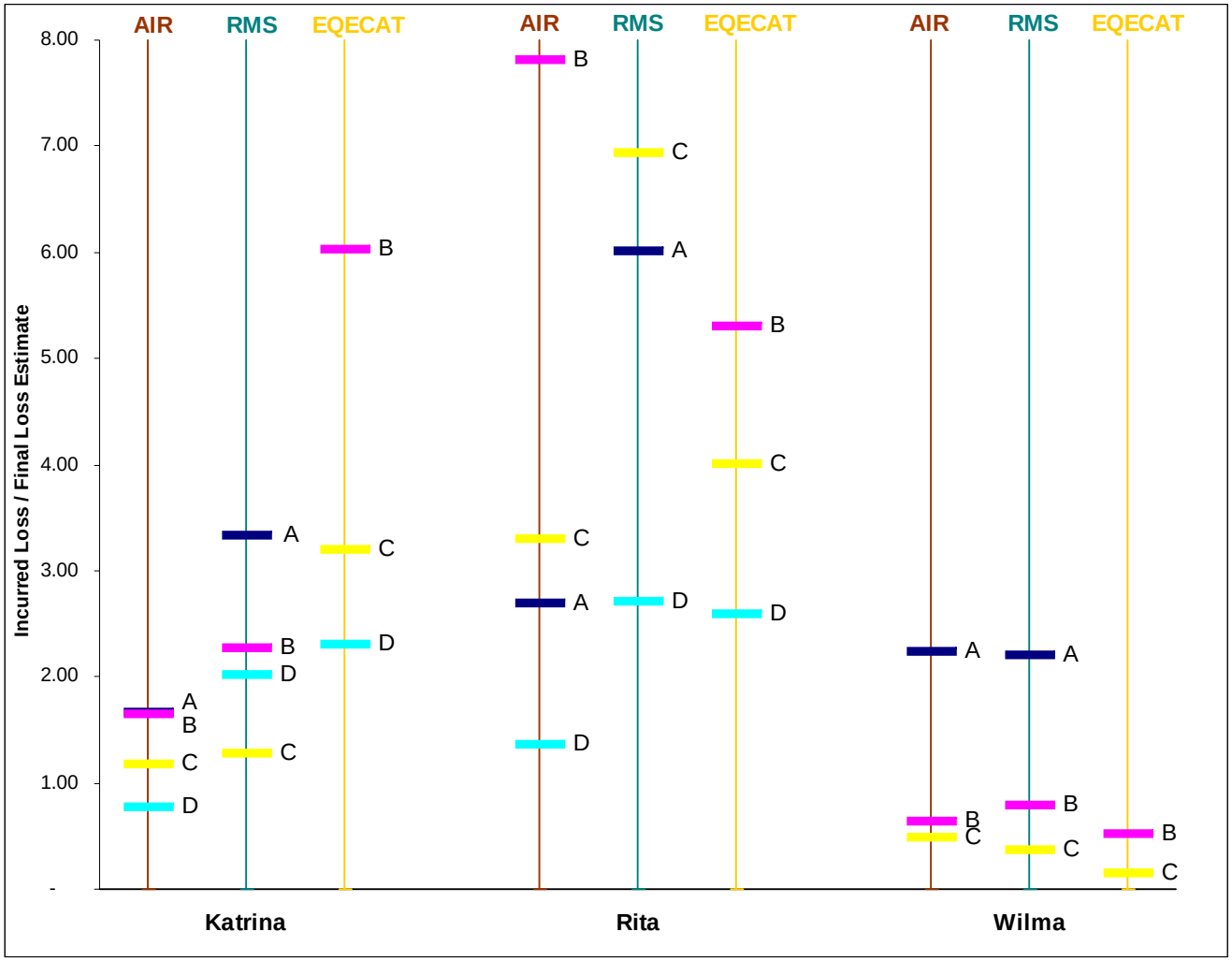
The Approach to Catastrophe Risk Has Evolved Over Time

- Historical losses - Prior to Hugo / Andrew
- Scenario - What if Hugo / Andrew hit here?
- Probabilistic - Focus on return times and AAL

Model Performance for 2004



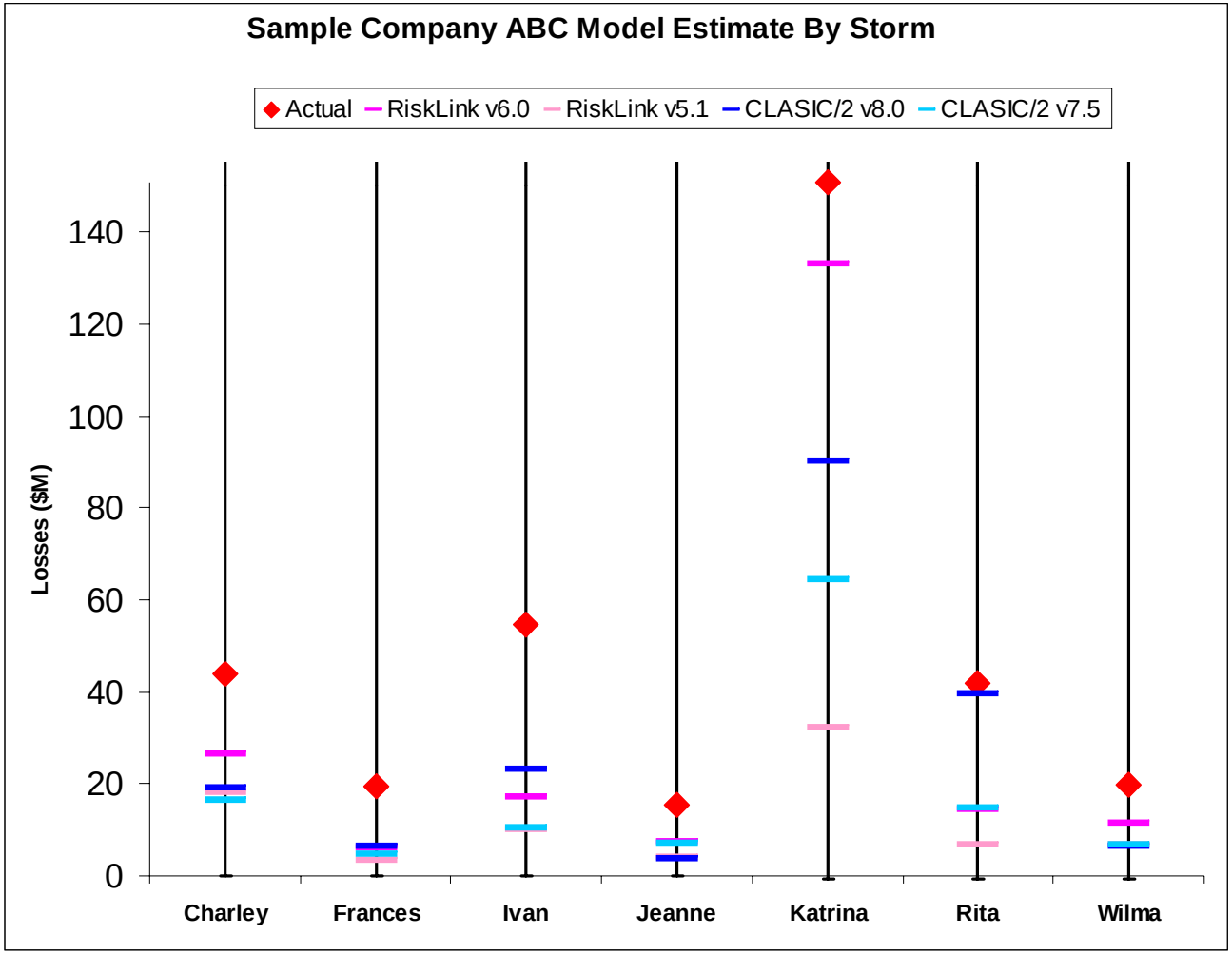
Model Performance for 2005



For Rita, the incurred for Company B was 130 times the RMS modeled loss

EQECAT Results were not available for Company A

Model Revisions – Good Enough?



Issues raised from recent history

- Impact from 4 mid-sized events on balance sheets
- Super cats
- Retentions and Reinstatements
- Primary vs. Reinsurance
- Model revisions based on review of claims data
- Introduction of short term libraries
- Rating agencies
- Market disruption in key areas
- FL legislation
- Katrina lawsuits

Ways to Expand Analysis

- Concentrations / mapping
- Multiple event seasons
- TVAR / TCE
- RDS

Concentrations / Mapping

Concentrations should be examined outside the models to allow for a broad consideration of risks

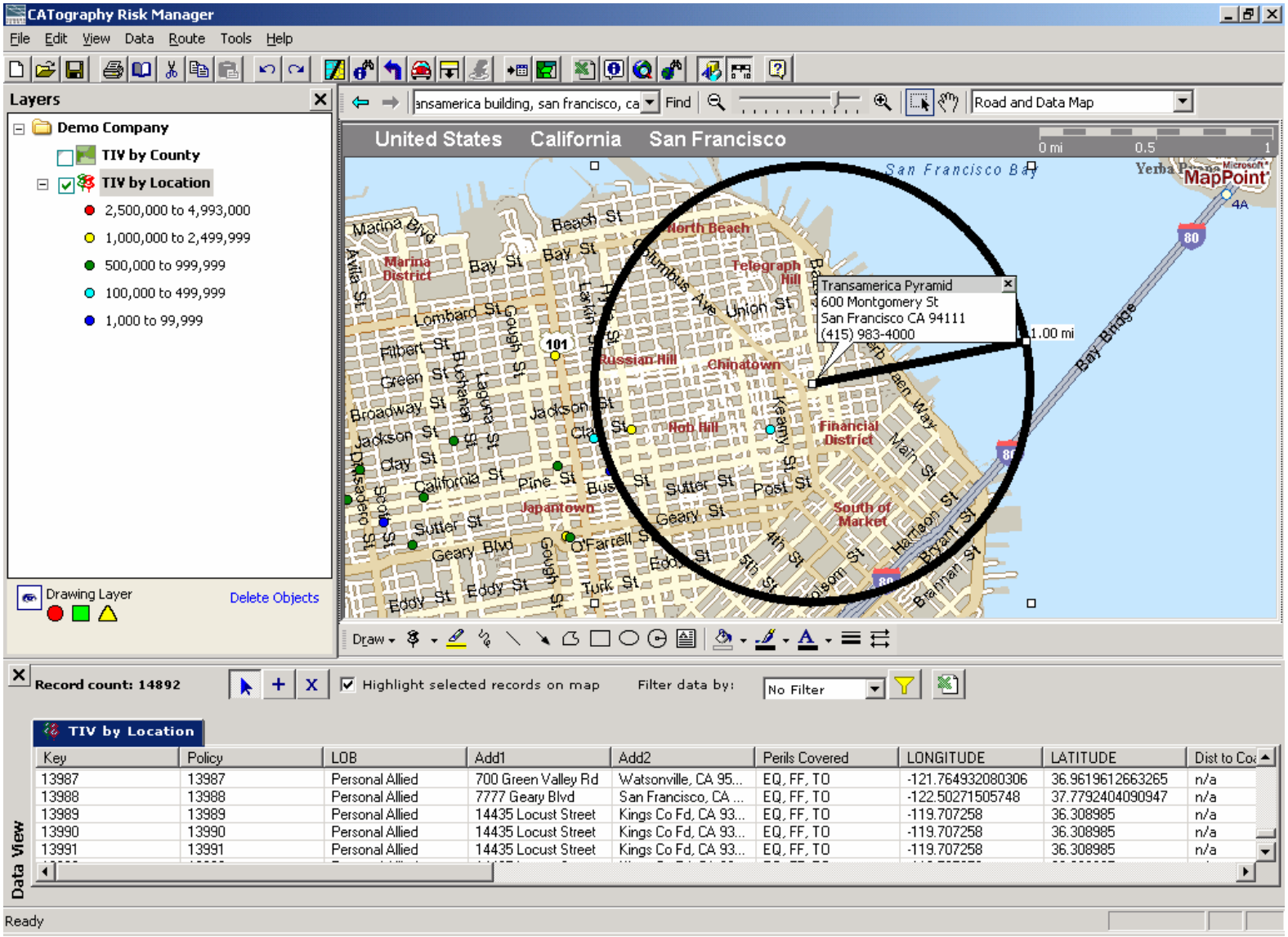
- Industrial accidents
- Dam / Levee failure
- Wildfire / Conflagration

Concentration – Man-Made Disaster Scenarios

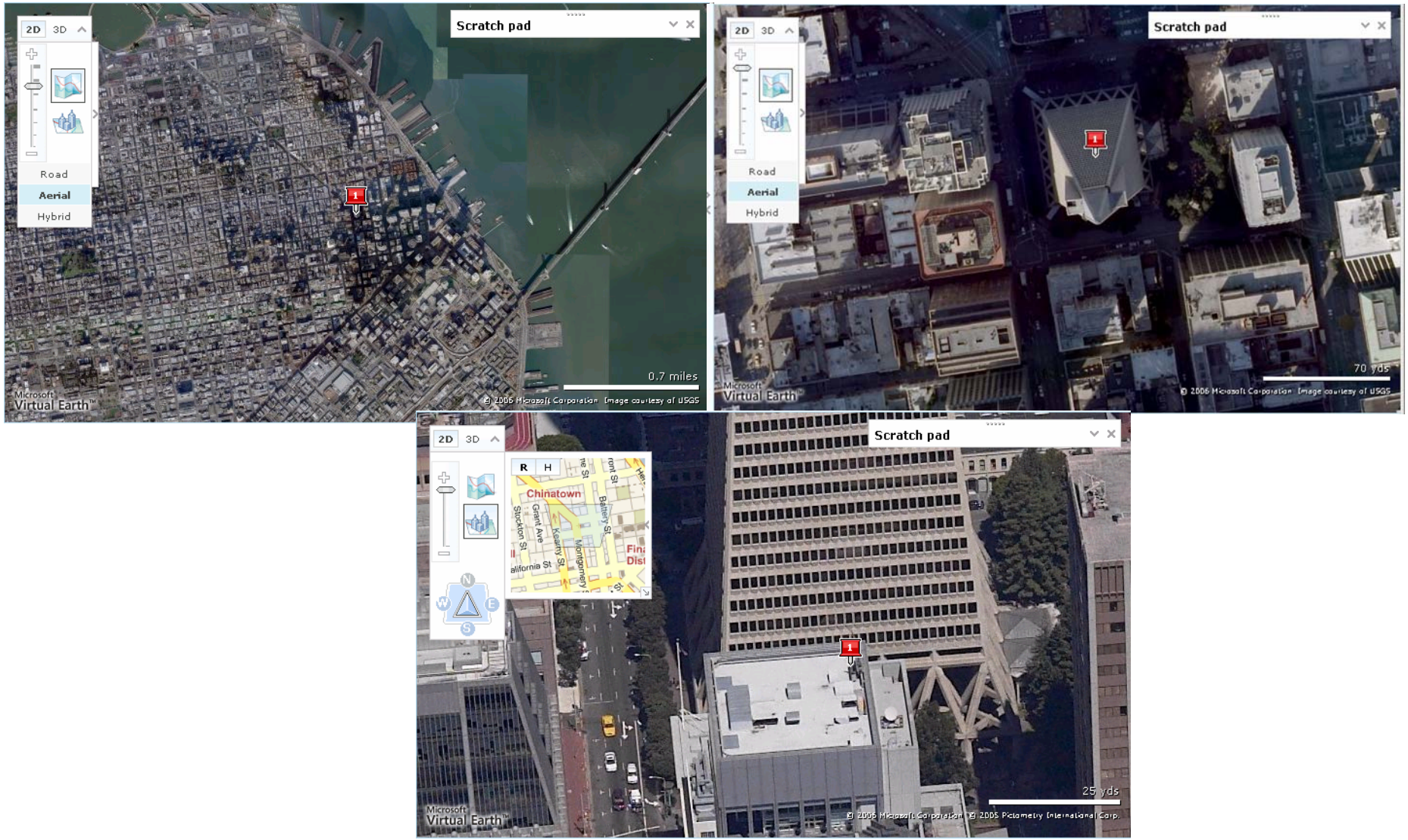
Top 10 Concentrations (Best Terrorism SRQ) - Multiple Buildings in 500' Radius

Center	Longitude	Latitude	TIV	Risk Count
ROCKWALL, TX 75087	-96.4600	32.9000	$ 61,708,900	2
AMARILLO, TX 79101	-101.8400	35.2000	48,488,000	3
WEST MONROE, LA 71291	-92.1300	32.5000	44,021,900	5
LUBBOCK, TX 79401	-101.8600	33.5800	39,397,100	9
BATON ROUGE, LA 70816	-91.0500	30.4000	34,247,050	3
DENTON, TX 76201	-97.1500	33.2200	32,167,500	5
LONGVIEW, TX 75601	-94.7400	32.4900	31,501,000	6
AUSTIN, TX 78759	-97.7500	30.4000	30,928,700	1
LAFAYETTE, LA 70501	-92.0200	30.2200	28,800,650	12
SAN ANTONIO, TX 78212	-98.4900	29.4600	27,465,850	3

Review Concentrations Around Potential Targets



Microsoft Aerial Imagery



Note: Microsoft currently provides “Bird’s Eye” aerial views only for major metropolitan areas

Illustrative Example

- Property insurer focused largely on commercial business
- Writes in most of the hurricane exposed states
- 30% of their exposures are in Gulf region and Florida
- About $50 billion in hurricane exposed value

Gross Loss ($Millions)

PML

	Hurricane Near Term View		Hurricane Historical View		Earthquake		Tornado/Hail	
Return Period	RiskLink v6.0	CLASIC/2 v8.0	RiskLink v6.0	CLASIC/2 v8.0	RiskLink v6.0	CLASIC/2 v8.0	RiskLink v6.0	CLASIC/2 v8.0
20	81.4	75.3	68.2	61.1	3.6	10.0	30.2	16.9
50	130.1	113.9	112.2	103.9	12.5	28.5	41.6	24.2
100	173.9	150.1	153.6	129.4	28.5	56.9	51.5	29.6
250	240.3	198.2	216.3	174.6	70.6	99.7	66.4	41.1
500	299.0	236.5	271.5	201.2	211.3	545.3	79.1	48.0
1000	364.3	288.4	333.7	248.2	495.9	899.1	93.1	55.7

Multiple Events Analysis

# Events per Year	All Events			Years where at least 1 event is greater than retention		
	# Years	Probability	Average Annual Gross Loss	# Years	Probability	Average Annual Gross Loss
0	1513	15.1%	-	8961	89.6%	6,847,723
1	2782	27.8%	7,182,846	989	9.9%	66,559,073
2	2580	25.8%	13,600,583	47	0.5%	135,187,418
3	1627	16.3%	20,463,083	3	0.0%	142,180,127
4	838	8.4%	24,276,165	0	0.0%	-
5	400	4.0%	34,259,470	0	0.0%	-
6	176	1.8%	42,539,930	0	0.0%	-
7	54	0.5%	45,579,737	0	0.0%	-
8	20	0.2%	59,730,413	0	0.0%	-
9	5	0.1%	40,899,445	0	0.0%	-
10	5	0.1%	41,889,974	0	0.0%	-
11	0	0.0%	-	0	0.0%	-

- Based on simulation of 10,000 years
- Hurricane Gross loss, without adjustment for non-modeled loss

Risk of Financial Impairment

- Tail Value at Risk (TVAR) is defined as the average loss from events in excess of a particular threshold
- Larger TVAR indicates more area in the tail of the distribution and thus higher potential of loss that will have an adverse impact on surplus
- A. M. Best is requiring TVAR / TCE calculations at different return times, but it is not clear what guidelines they will produce for these metrics

Gross Loss ($Millions)

PML

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TVAR

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20	141.2	168.2	126.0	146.7	40.2	69.7	43.9	25.4
50	201.3	207.0	182.8	179.6	90.5	150.0	57.5	33.7
100	253.6	265.1	232.7	226.9	162.3	260.9	69.2	41.1
250	332.1	320.5	307.7	272.0	342.0	543.7	86.5	52.1
500	398.6	357.9	371.8	305.9	569.3	906.5	101.0	60.5
1000	469.5	385.7	441.2	330.3	793.8	1,122.0	116.8	68.5

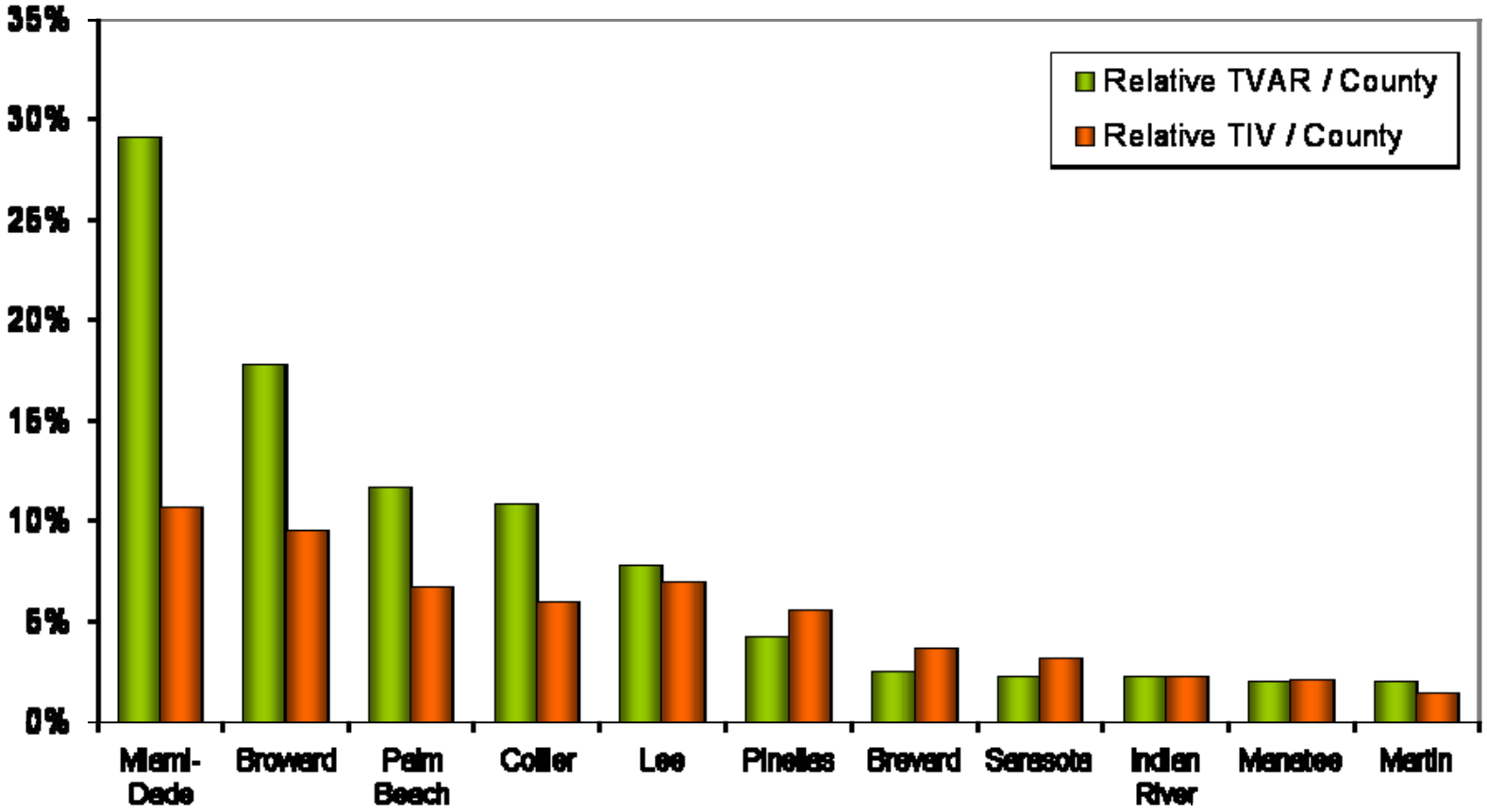
Tail Value at Risk (TVAR)

- Hurricane
  - Probability of exceeding reinsurance limit = 0.227%
  - TVAR = $277 million
  - Net 33% hit to surplus
- Earthquake
  - Probability of exceeding reinsurance limit = 0.186%
  - TVAR = $526 million
  - Net 107% hit to surplus

Although hurricane loss potential drives reinsurance pricing and structure, earthquake loss potential presents a greater threat to solvency when the big event occurs

Analyzing Contributions to TVAR

- Next phase of analysis is to evaluate factors that are contributing disproportionately to TVAR
  - Data mining model output at the location level can be used to identify geography, occupancy, etc that contribute more to TVAR than to TIV



RDS / Scenario Analysis

- A focus on return times limits our understanding of risk
- Lloyds RDS events are useful for reviewing the markets' view, but may not fit the exposure distribution of an individual client
- A. M. Best requires an analysis of 5 events at the 1 in 100 and 1 in 250 year loss levels
- Historical events and other deterministic events that impact concentrations should be reviewed

Lloyd's Realistic Disaster Scenarios (Lloyd's RDS)

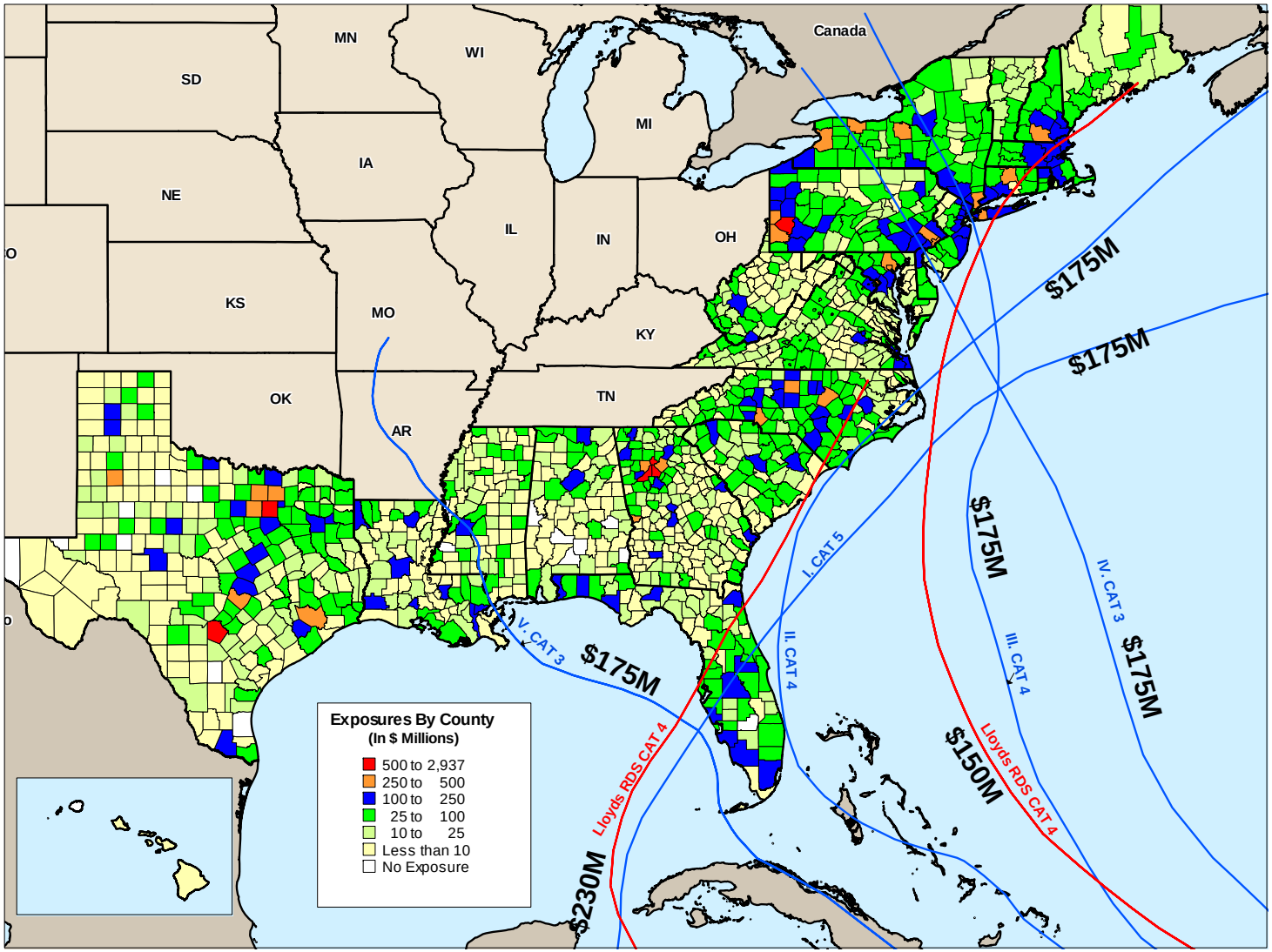
Lloyd's RDS	Company Loss	Company Return Period	Industry Return Period
Northeast Windstorm: A $69 billion event including demand and storm surge making landfall in New York.	$150 million	70 Years	46 Years.
Florida Windstorm: A $108 billion industry event including demand and storm surge making landfall at Pinellas County, FL.	$230 million	222 Years	109 Years.
New Madrid Earthquake: A $42 billion industry event including shake and fire following and demand surge.	$200 Million	485 Years	107 Years.

Company's Five Events for 1-in-100 and 1-in-250 Return Period

DESCRIPTION (MAGNITUDE/INTENSITY AND LOCATION/PATH) OF 5 EVENTS GENERATING LOSSES SIMILAR TO THE GROSS PML FOR EACH OF THE FOLLOWING RETURN PERIODS	
(01) 100 Years	(02) 250 Years
1 CAT 5 landfalls at southwest of FL	1 CAT 4 landfalls in NY
2 CAT 4 landfalls in NC	2 CAT 4 landfalls in NC, and VA also as a CAT 4
3 CAT 4 landfalls in NY	3 CAT 5 landfalls in NC, and NY, also as a CAT 5
4 CAT 3 landfalls in DE	4 CAT 5 landfalls at southwest of FL
5 CAT 3 landfalls in FL Keys, and LA as a CAT 4	5 CAT 5 landfalls at AL

Concentration - Natural Disaster Scenarios

Lloyd's RDS and Best SRQ 100 Year Return Period Events



Final Thoughts

The company used in this example is wrestling with:

- A 15% difference between RMS and AIR in their 100-year hurricane estimates (near term) and 19% (historical catalog)
- A 29% difference between RMS and AIR in their 250-year earthquake estimates
- RDS for Hurricane of $150 million for the Northeast scenario and $230 million for the Pinellas scenario
- RDS for Earthquake of $200 million, 100% higher than their AIR 250-year estimate
  - Should they use the RDS instead of the EP for Earthquake?
- 250-year TVAR estimates that would significantly erode surplus
- Scenario analyses reveal a range of areas where the 100-year loss level could be reached including landfalls in Florida (both coasts), North Carolina, New York and Delaware

Final Thoughts

In deciding which methodologies to use, the company also needs to consider:

- The quality of their exposure data
- Model accuracy
- Non-modeled exposures
- Secondary perils (severe storms, winter storms)
- Fair plan participation
- The regulatory and judicial guidelines of the states they operate in
- Ultimately, the examination of catastrophe exposures should facilitate ERM analyses