

STEPPING OUT OF THE MODEL: ESTIMATING TAIL RISK USING DETERMINISTIC SCENARIOS

eXTREME™ Tornado For Severe
Thunder Storm Tail Loss Estimates



Prasad Gunturi
Willis Re

- Probabilistic severe thunder storm models
- Deterministic methods for tail loss estimates
- Maximum Foreseeable Loss (MFL) model
- Case study

Deterministic scenarios to manage risk

- Deterministic event scenarios can be used
 - As a primary risk measure
 - Assessing account, territory risk
 - Measuring aggregate risk level
 - Setting risk tolerances, appetites, and limits
 - Evaluating benefit of reinsurance
 - To verify model calibration
 - Factor-based models
 - Stochastic models

Probabilistic severe thunder storm models

- Typically optimized for industry portfolios
 - Sample storm paths based on industry exposure
 - High probability of model failure for any given company
- Event set size and model resolution are critical for stable model
 - A very large number of events (e.g., 500,000)
 - An insufficient number of events can lead to over or under estimating the tail risk
 - High-resolution definition of tornado paths and other hazard footprints are important

Importance of event set size & resolution

- It is impractical to achieve loss convergence for all severe thunder storm business applications using a physical, event-based model in today's computing environment

Illustrative Calculations

Average size of a Path	0.5mi width and 5mi length
Average size of a county	50x50mi
<i>Min. Number of Paths Required to fully Cover a County</i>	<i>1,000</i>
Num. of tornado severity scenarios	5
Num. of possible orientations of the path to be modeled	18
Total Num. of Scenarios for a County	90,000
Number of counties in tornado alley	1,500
Total Number of Paths need to be Modeled	135,000,000
Avg. number of paths in a thunderstorm outbreak	20
Total Number of Thunderstorm Outbreaks to be Modeled	6,750,000

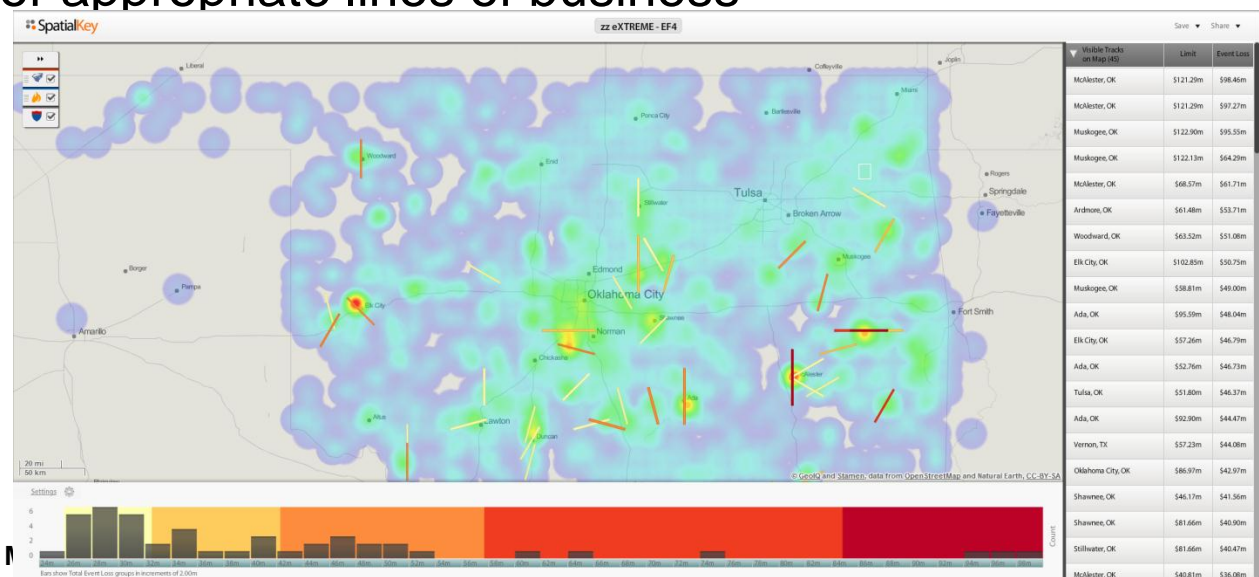
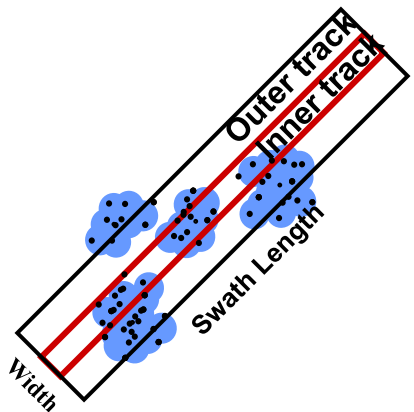
Deterministic methods for tail loss estimates

- Probability and possibility
- Large event set with no gaps in coverage
- High-severity events
- “What if” scenarios
- Top loss scenarios can be 1:500 to 1:10,000 events

eXTREME™ Tornado - A Maximum Foreseeable Loss model

- Exhaustive set of high-severity events, centered specifically on a portfolio
 - ~1 million events can be built specifically for a company's portfolio (no coverage gaps)
 - Street-level property address information is critical
 - Tornado, hail, or wind swaths independently or together
 - Damage curves for appropriate lines of business

MFL Swath scenario



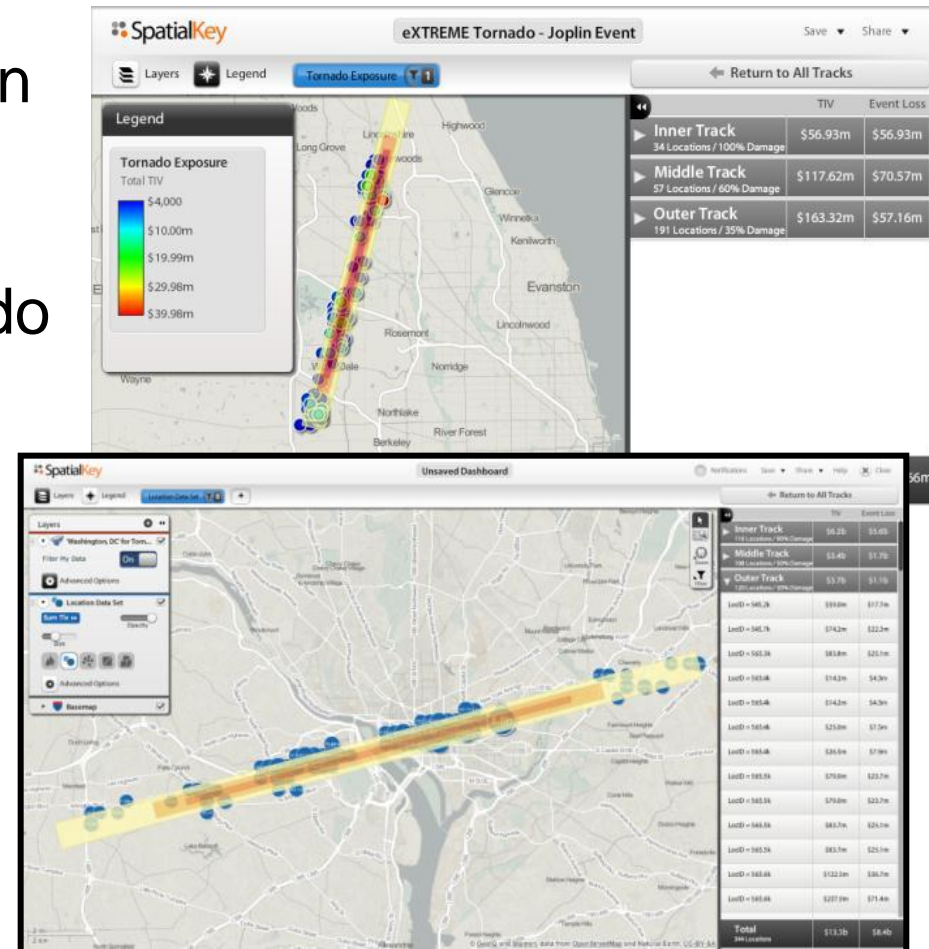
Case study- F4 tornado scenario

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MANAGING EXTREMES

- A storm producing a single F4 tornado with path size of Joplin tornado
- Winds and damage within the track based on detailed tornado research
- Top loss scenarios are similar to 1:500 to 1:10,000 events
- Customized to fit company's portfolio
- Supplemented vendor output
- Independently assessed loss severity potential

Examples of deterministic MFL tracks



Case study results

- F4 storm scenario loss estimates are 15% to 35% higher than probabilistic model estimated 1:10,000 year loss

Probabilistic model results for study region/exposure

Study region loss results		
Return Period	Loss in million USD	
	AEP	OEP
10,000	\$ 122	\$ 111
1,000	\$ 87	\$ 78
250	\$ 53	\$ 45
100	\$ 36	\$ 31

F4 Scenario Summary Statistics

- 34% scenarios >\$55m
- 12% scenarios >\$85m
- 4% scenarios > \$120m

Closing thoughts on deterministic scenarios

- Intuitive nature of deterministic scenarios can help communicating with senior managers, BOD and other stakeholders
- Deterministic methods can be used for stress testing and developing risk management solutions
- Deterministic scenarios can be paired with stochastic models
- Useful in developing alternative views of risk by considering different sizes of events and “what if” analyses

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