CoreLogic®

CATASTROPHE RISK MANAGEMENT

U.S. Severe Convective Storm Model

High resolution modeling with granular results to comprehensively manage risk

A Comprehensive Analytic View of Risk

Severe convective storms are among the most common and most damage-inducing natural catastrophes in the U.S. Population growth and economic development have contributed to increases in the losses from this peril. Unlike hurricanes, the localized nature of severe convective storms, the large yet sparse footprint of the event, the spatially variant footprints of the sub-perils (tornado, hail, and straight-line winds), and the incomplete historical data elevates the importance of having a high-resolution model. Insurers and other stakeholders want credible tools to make key decision about their business to efficiently manage their risks from severe convective storms in the U.S.

2011 was a record season with six EF-5 tornadoes hitting densely populated areas. That year the aggregated insured losses from tornadoes events were about $28B[1]. This underscores the need to have a comprehensive probabilistic model which quantifies risk potential from severe convective storms and enable insures and stakeholders to make strategic decisions including but not limited to risk transfer requirements, capital adequacy, and ascertaining premium rates for insurers. For mortgage lenders, it is important to know which properties could be impacted by tornadoes, hail, and straight-line winds.

The CoreLogic® U.S. Severe Convective Storm Model incorporates the latest science, research, post event data, and high-resolution modelling, capturing the extreme complexities of sub-perils like tornadoes, hail, and straight-line winds and their impact on properties and automobiles across the lower 48 states in the U.S.

Innovative Hazard Methodology

The U.S. Severe Convective Storm Model includes about 4 million probabilistic events to capture the full spectrum of risk and various potentials from the sub-perils. The high-resolution hazard modeling is based on proprietary radar-based weather forensic algorithms. The hazard model uses the historical data set from the National Oceanic and Atmospheric Administration's (NOAA) Storm Prediction Center (SPC) from 1950 to present day. It also utilizes the North American Regional Reanalysis (NARR) daily historical environmental data at a high resolution of 32 km from 1979 to present day. The data includes storm data on tornado path, hail reports, and wind reports gleaned from various sources. Furthermore, the model accounts for observational and climatological trends in the historical data.

Key Benefits:

- A high resolution, full simulation model and includes key scenario events
- Separate damage functions for each sub peril
- Supports a full range of structure types and accounts for roof types and RV and ACV for roofs
- Provide additional risk perspectives, considering the impact of ENSO cycles
- Real Time Event Management
- Enables confidence in risk management based decisions
- Validated with claims data from historical events

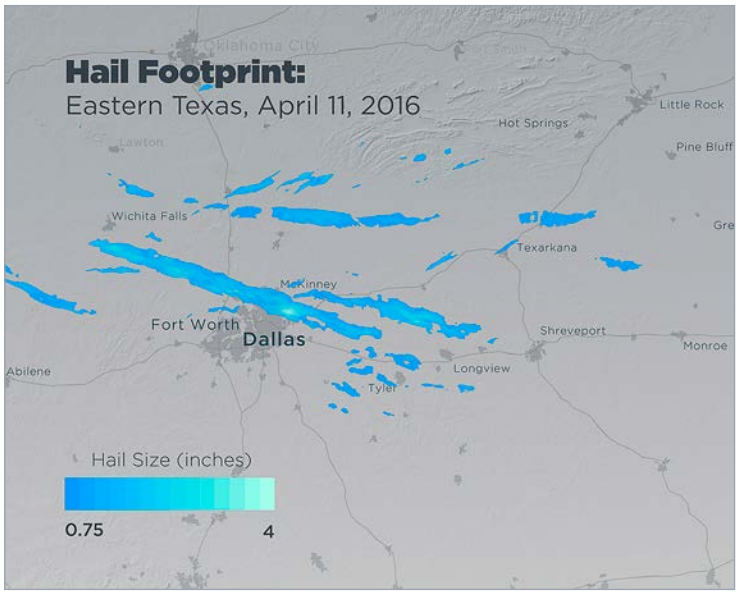
[1] https://www.ncdc.noaa.gov/sotc/tornadoes/201113

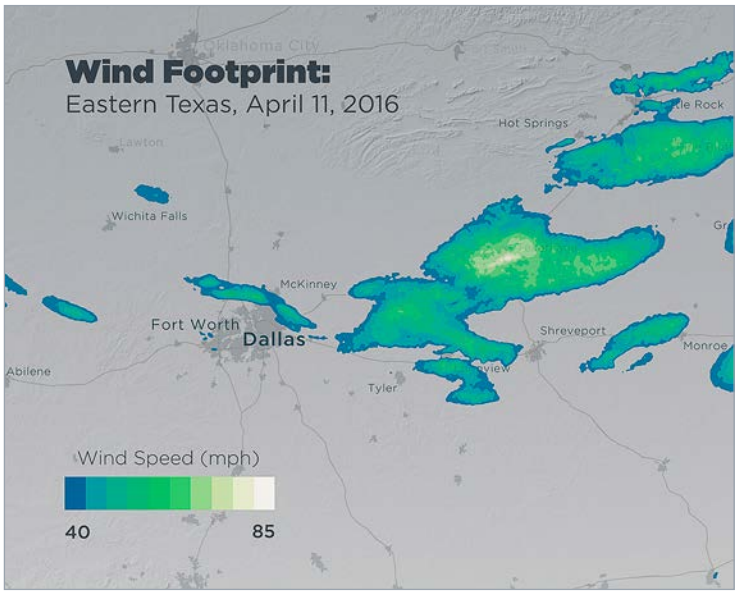
The historical data has inherent biases, particularly in hail and wind, due to evolving reporting quality and behavior. The CoreLogic model takes advantage of our proprietary forensic hail and wind algorithms to overcome these biases and has introduced a pioneering methodology called “Environment-Conforming Smoothing” which identifies regions with strong but physical gradients in storm behavior while also sufficiently smoothing in regions with naturally high variability. This methodology is bringing the model closer to reality and capturing the full potentials of damage impact from the events.

High Resolution Modelling

The model includes a complete and comprehensive stochastic event set for tornado, hail, and straight-line wind. All the sub-perils (tornado, hail, and straight-line wind) are modelled individually and as spatially coupled events as per climatology and insurers’ event definition practices.

The model includes high resolution tornado modelling and incorporates realistic, high-resolution hail and wind footprints, all of which is derived from proprietary radar-based weather forensic algorithms from CoreLogic. Additionally, radar data is incorporated to augment the historical, observed data for hail and wind. The model is based on 300,000-year simulation platform and provides spatially smooth and stable results.





Dr. Harold E Brooks, Senior Scientist of Forecast Research and in the Development Division from NOAA commented on the model, saying "The CoreLogic model is consistent with the scientific community's current understanding of the distribution of severe thunderstorm and tornado hazards. In addition, there are novel features to approaching uncertainties in our understanding that will help users make better decisions to address their needs."

Comprehensive Event Set

The model captures the full spectrum of risk which includes about 4 million probabilistic events across the 48 contiguous states in the U.S. The model also includes scenario events—about 50 hail events that have occurred since 2009 and a few major tornado events which have caused significant insured loss.

Additional Risk Perspectives

In addition to the standard risk view which considers the full spectrum of what has occurred in history, the model provides two additional risk perspectives, the La Niña phase and the El Niño phase, based on the ENSO cycle. CoreLogic has leveraged research and reports on the impact of ENSO on the U.S. Severe Convective Storm Model in terms of event frequency and geographical impact. Historically, major tornado outbreaks which occurred in the spring of 1974, 2008, and 2011 followed La Nina conditions that previous winter. Such information is insightful to understand the underlying risk exposure and the probable loss impact and consider alternate risk transfer options.

Damage Model by Sub-Perils

The model includes separate damage functions for each of the sub-perils to provide better risk differentiation. For tornado and straight-line wind, the 3-second peak gust windspeeds are used to calculate damage; storm intensity, hail density, and hail size is considered to calculate the damage for hail. The high-resolution hazard grids in the model provides enhanced risk differentiation and results that closely emulate reality.

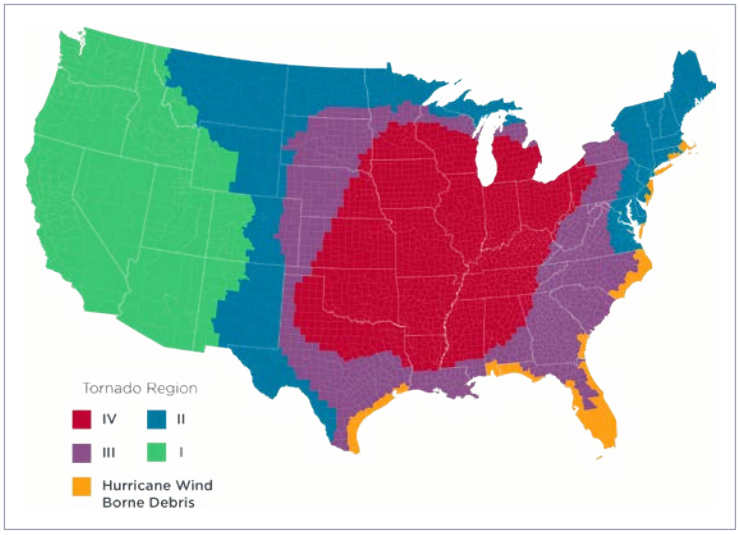
Vulnerability Model

CoreLogic uses an engineering approach, claims data, and expert opinion to develop the vulnerability functions within the model. The model incorporates vulnerability curves that are prepared from the claims data and historical database of events.

The model incorporates and reflects the evolution of building codes in the U.S., regional nuances in building code, and local building practices, enforcement of building codes, and the year of construction to enable better risk differentiation of structure vulnerability across the U.S., over time.

The component-based vulnerability incorporates the CoreLogic property characteristic data and reconstruction cost algorithms. The model contains a comprehensive set of secondary structural characteristics including but not limited to roof profile and roof age with smart defaults based on year of construction, locality, construction practices, building codes, and enforcement of those codes.

FIGURE 1: REGIONAL VULNERABILITY MAP FOR US SEVERE CONVECTIVE STORMS



Source: CoreLogic

The model supports about 340 options under 56 features for individual building characteristics. About 98 Construction classes and 80 Occupancies are available in the model. The Insurance Institute for Business and Home Safety (IBHS) Scientists reviewed the vulnerability component of CoreLogic's US Severe Convective Storm Model, and CoreLogic incorporated the recommendations from the review into the model.

Real Time Event Management

Having the access to loss and damage data quickly after an event is essential in the claims management process to deploy resources and quantify and communicate the impact of an event in a reasonable amount of time. The CoreLogic model offers the ability to import the actual event footprint data into the scenario storm set to access the loss impacts for actual events.

Financial Modeling

Insurance conditions at structure, site, and policy levels are fully supported along with sub-limits based on almost any user specified criteria. Sub-perils can have their own limits and deductibles. The full range of reinsurance contracts including facultative, per risk, proportional, and non-proportional excess of loss treaties is supported. All results are fully correlated with our unique copula based correlation methodology using several parameters. A date-stamped Year Loss Table is created that can be used to generate loss metrics including the clustering of events occurring in the same area at the same time.

The model supports insurance contracts which are based on replacement cash values as well as actual cash values for roof. It allows for the calculation of damage based on the insurance contract. The loss results could vary significantly based on the actual or replacement cash value of roof for hail events. The actual cash value of the roof considers the depreciation of the roof over time.

Attritional loss and non-attritional loss is available via SQL query using the Year Loss Table (YLT). Users can define the threshold for attritional loss, and the reports will be generated to reflect that based on Industry Loss or Portfolio Loss.

Global Catastrophe Modeling Platform

Available through a suite of catastrophic risk management products from CoreLogic, the U.S. Severe Convective Storm Model is included in the global multi-peril catastrophe modeling platform, Risk Quantification & Engineering RQE®. RQE is a statistically robust simulation platform delivering high confidence outputs. As one of the most comprehensive full simulation Catastrophe Modeling solutions in the market, CoreLogic offers a wide range of analytics outputs allowing for the accurate assessment of catastrophe exposure, both gross and net of reinsurance contracts that can used to inform underwriting decisions, pricing, diversification, portfolio accumulations and capital requirements.

Why Consider CoreLogic?

Increasing catastrophic events are challenging the P&C insurance industry to revisit existing catastrophic risk management and loss adjustment strategies by improving the overall understanding of all-natural hazards. CoreLogic is dedicated to the science of understanding natural hazard risk and focused on delivering decision support data and products to the insurance industry. With a staff of Ph.D.-level scientists and engineers, we have taken risk assessment a step further by developing a proprietary methodology that enables a more granular level of risk management control and reporting. Catastrophe risk management from CoreLogic offers a comprehensive look at risk by evaluating probable events, and verifying current and post event impacts.

For more information, please call 866.774.3282
or email us at hazardrisk@corelogic.com.

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