— SUPERIOR HAZARD MODELING
— ADVANCED ENGINEERING
— UNPARALLELED INDUSTRY EXPOSURE DATABASE

The AIR Winter Storm Model for Canada

ADVANCED HAZARD MODELING	THE ISSUE.	THE SOLUTION.
Overcomes Lack of Historical Data to Provide a Robust View of Severe Thunderstorm Risk	Although Canada has the second highest number of tornado occurrences in the world and a "hail alley" that is one of North America's most volatile hail zones, detailed data on historical outbreaks in Canada are not consistently available.	To provide a comprehensive view of severe thunderstorm risk in Canada, AIR employs a "smart-smoothing" technique, which augments the limited observation data with information about atmospheric conditions such as moisture, instability, rotation, and lift—all key ingredients to a severe thunderstorm outbreak. This smartsmoothing allows for the simulation of plausible events where none appear in the historical record. The AIR model also leverages data from Environment Canada's public forecast regions, the U.S.'s Storm Prediction Center, and both radar and satellite data.
Realistically Represents an Entire Severe Thunderstorm Outbreak	Once a tornado, hailstorm, or straight-line windstorm is spawned in one location, more such events are likely to occur nearby. This propensity to cluster is a phenomenon often overlooked in severe thunderstorm models.	To produce a physically realistic spatial distribution of the various storm types that make up a severe thunderstorm outbreak, AIR uses "adaptive cluster sampling." The technique explicitly accounts for the increased probability that individual tornadoes, hailstorms, and straight-line winds are occurring within the vicinity of the initial location.
Daily Simulation Captures the Impact of Both Large and Small Loss-Causing Events	Although smaller outbreaks typically produce lower losses, the aggregation of those losses over the course of a year can add up.	The AIR model captures both the large outbreaks that produce insured losses in excess of CAD 25 million and smaller events that may last only one day. It does so by simulating daily severe thunderstorm activity based on realistic historical occurrence rates and weather patterns for a particular location and season. AIR's claims studies show that aggregate losses in Canada can be twice the occurrence loss—something that could not be captured without daily simulation.

AIR

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MODEL AT A GLANCE

MODELED SUB-PERILS Tornado, hail, straight-line wind

CATALOGS
In Touchstone®: 10,000-year, 50,000-year, and 100,000-year all-event catalogs, and 5 Extreme Disaster Scenarios. In CATRADER®: 10,000-year catevents catalog and 10 Extreme Disaster Scenarios

HAZARD MODULE
- Uses smart-smoothing to develop a robust catalog of simulated tornadoes, hailstorms, and straight-line windstorms
- Applies an adaptive clustering sampling technique to provide a realistic distribution of tornadoes, hailstorms, and straight-line winds in a given location
- Captures the impact of both large and small loss-causing events

MODEL VALIDATION
- Sub-Peril-specific damage functions for tornadoes, hail, and straight-line wind
- Damage functions vary by occupancy, construction, height, and year-built.
- Incorporates regional and temporal variation in vulnerability

MODEL VALIDATION
The hazard components of the AIR Severe Thunderstorm Model for Canada are validated against data from Environment Canada and other sources. The modeled losses are validated against multiple sources, such as IBC, Xactware®, PCS Canada, ICLR, and company losses from large Canadian insurers.

STATE-OF-THE-ART ENGINEERING

	THE ISSUE.	THE SOLUTION.
Sub-PerilSpecific Damage Functions Capture the Vulnerability of Canada's Residential, Commercial, Industrial, and Automobile Lines	The damage that tornadoes, hail, and straight-line winds cause varies widely	Separate damage functions for all three "sub-perils" capture the different types of damage that each inflicts. For example, hail damage is typically restricted to nonstructural elements, such as the roof covering, while tornadoes and the airborne debris they generate can penetrate the building envelope and cause significant structural damage.
Accounts for Regional and Temporal Variations in Building Codes and Practices	Because each region of Canada has its own building codes and construction practices that have evolved over time, building vulnerability varies across Canada.	The AIR model incorporates exhaustive research by AIR engineers into the regional and temporal variations in Canadian building codes, and supports 36 construction classes and 110 occupancy classes, 62 of which are for large industrial facilities.

LEVERAGES CUTTING-EDGE WIND ENGINEERING RESEARCH — NO ISSUE HERE.

The AIR Severe Thunderstorm Model for Canada incorporates numerical and experimental wind engineering research from such Canadian research institutions as: the Insurance Research Lab for Better Homes, which subjects full-scale homes and light-scale structures to simulated wind loads; Western University, whose Boundary Layer Wind Tunnel tests both buildings and bridges; and the Wind Engineering, Energy Research Institute (WindEEE RI), which tests synoptic winds such as those spawned by tornadoes on structures. For hail, AIR leveraged the study done by IBHS's full-scale hail testing facility.

UNPARALLELED INDUSTRY EXPOSURE DATABASE

AIR's industry exposure database (IED) is based on the latest available information on risk counts, building characteristics, and construction costs. The benefits and uses of the IED are many, from supporting industry loss warranties that pay out based on industry losses to providing the means by which companies can disaggregate their data for more accurate loss estimates.

ABOUT AIR WORLDWIDE

AIR Worldwide (AIR) provides risk modeling solutions that make individuals, businesses, and society more resilient to extreme events. In 1987, AIR Worldwide founded the catastrophe modeling industry and today models the risk from natural catastrophes, terrorism, pandemics, casualty catastrophes, and cyber incidents. Insurance, reinsurance, financial, corporate, and government clients rely on AIR's advanced science, software, and consulting services for catastrophe risk management, insurance-linked securities, site-specific engineering analyses, and agricultural risk management. AIR Worldwide, a Verisk (Nasdaq:VRSK) business, is headquartered in Boston, with additional offices in North America, Europe, and Asia. For more information, please visit www.air-worldwide.com.

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