- ADVANCED HAZARD MODELING
- STATE-OF-THE-ART ENGINEERING
- LEVERAGES CUTTING-EDGE WIND ENGINEERING RESEARCH
- UNPARALLELED INDUSTRY EXPOSURE DATABASE

The AIR Winter Storm Model for Canada

ADVANCED HAZARD MODELING	THE ISSUE.	THE SOLUTION.
Numerical Weather Prediction Technology Yields Highly Realistic View of Potential Storms	An essential part of managing winter storm risk is understanding the complex meteorological conditions that can give rise to a damaging event	Only a physical approach to modeling can capture all the complexities of extratropical cyclones, or winter storms. The AIR model is based on Numerical Weather Prediction (NWP) technology, today's leading scientific technique for simulating complex storm systems. Using mathematical equations that govern fluid flow and thermodynamics, NWP realistically captures how the atmosphere behaves in three dimensions and over time.
Captures Regional Differences in Storm Characteristics	Winter storms affect nearly all areas of Canada, but they manifest themselves differently depending on regional climate conditions and topography.	The AIR model captures regional manifestations of all the natural winter storm sub-peril combinations, ranging from high winds and heavy snowfalls in the west, to strong winds over the Prairies, to ice storms in the Great Lakes and St. Lawrence Lowlands, to nor'easters along the east coast.
Captures Ice Accumulation—A Major Driver of Damage and Loss	As exemplified by the Great North American Ice Storm of 1998, thick, heavy accumulations of ice from freezing rain can cause downed trees and power line failures—but often the difference between light snow or heavy ice accumulations depends on only a few degrees of temperature.	The AIR model simulates winter precipitation (snow, ice pellets, and freezing rain), accounting for the vertical distribution of temperature in the atmosphere. By allowing simulated events to "experience" warmer air in the upper atmosphere, but below-freezing temperatures at Earth's surface, the AIR approach explicitly captures occurrences of freezing rain.
Sub-Peril-Specific Damage Functions Capture the Vulnerability of Canada's Diverse Building Stock	Wind, winter precipitation (snow, ice pellets, and freezing rain), and freezing temperatures cause loss through different damage mechanisms.	Separate damage functions for all three sub-perils capture the different types of damage that winter storms can inflict.

AIR

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MODEL AT A GLANCE

MODELED SUB-PERILS

- The AIR Winter Storm Model for Canada considers insured losses associated with three sub-perils: wind, winter precipitation (snow, ice pellets, and freezing rain), and freezing temperatures.
- Within the winter precipitation subperil, freezing rain events are given special damage considerations to account for their increased damage potential.

CATALOGS

A 10,000-year all-events catalog of over 68,000 simulated winter storms (over 62,000 of which are losscausing events), a set of 5 major historical events, and a set of 5 Extreme Disaster Scenario (EDS) events are included in the model.

HAZARD MODULE

- Employs NWP technology to develop a realistic catalog of tens of thousands of potential storms.
- Simulates meteorological characteristics of winter storms to explicitly model wind, winter precipitation (snow, ice pellets, and freezing rain), and freezing temperatures.
- Captures the impact of both large and small loss-causing events.

MODEL VALIDATION

- Hazard components are validated against data from NOAA—including data from the National Hurricane Center and National Climatic Data Center—Environment Canada, and other sources
- Modeled losses are validated against data from the

STATE-OF-THE-ART ENGINEERING	THE ISSUE.	THE SOLUTION.
Explicitly Captures the Damage Associated with Freezing Rain (in the Form of Ice Accumulation)	Heavy accumulations of ice from freezing rain can result in downed trees that cause building and auto damage, as well as power outages that can lead to time element losses and increased building vulnerability.	The AIR model captures the additional damage mechanisms of freezing rain events, such as enhanced building and automobile vulnerability due to downed trees; enhanced building vulnerability from burst pipes and increased freezer/content, business interruption, and additional living expenses due to power outages.
Explicitly Accounts for Regional and Temporal Variations in Building Vulnerability	Design wind and snow loads have changed over time across Canada. In addition, there are generally continual changes in building construction materials and practices, code enforcement, engineering attention regarding the design of a structure, structural aging, and building maintenance.	The AIR model incorporates exhaustive research by AIR engineers into the regional and temporal variations in Canadian building codes and construction practices.

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

The AIR Winter Storm Model for Canada incorporates 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 Laboratory simulates atmospheric boundary layer winds; and the Wind Engineering, Energy and Environment (WindEEE) Research Institute, which simulates boundary layers, parts of hurricanes, tornadoes, downbursts, low-level currents, and gust fronts.

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 estimations.

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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Cover image: Hurricane Juan South of Nova Scotia, courtesy of NASA