

- ADVANCED HAZARD MODELING
- STATE-OF-THE-ART ENGINEERING
- INDUSTRY EXPOSURE DATABASE

# The AIR Tropical Cyclone Model for Mexico

## ADVANCED HAZARD MODELING

## THE ISSUE.

## THE SOLUTION.

Explicitly Captures Wind and Precipitation-Induced Flood Losses from Bypassing Storms

Mexico faces risk not only from landfalling storms, but also from bypassing storms in both the Atlantic and Pacific basins. These storms can track parallel to long stretches of the coastline, bringing damaging winds to coastal exposures and flooding well inland.

The AIR Tropical Cyclone Model for Mexico includes both landfalling and bypassing tropical cyclones originating in the Atlantic and Pacific basins; the model captures the effects of wind and rain-induced flooding on insured properties, accounting for a wide variety of coverages, construction types, and occupancies.

Basinwide Approach Allows Assessment of Risk to Portfolios Spanning Multiple Countries

A significant percentage of storms in the North Atlantic impact multiple countries and model domains.

To more accurately estimate losses to policies and portfolios spanning multiple countries, the model's catalog contains the same storms found in the tropical cyclone models for the U.S., the Caribbean, Central America, and U.S. offshore assets.

Accounts for Precipitation-Enhancing Effects of Mexico's Mountainous Topography

Mexico's coastal mountains force tropical cyclone winds upward, which can increase rainfall. Thus, even storms with relatively low wind speeds can be accompanied by significant flooding.

The AIR Tropical Cyclone Model for Mexico incorporates a high-resolution precipitation-induced flood module that estimates accumulated runoff, which is based on total precipitation produced by a simulated storm, topography, elevation, and the ability of local soils to absorb water.

Explicitly Accounts for the Negative Correlation of Storm Activity in the North Atlantic and East Pacific Basins During El Niño and La Niña Cycles

During El Niño conditions, tropical storm activity in the Atlantic is typically depressed, while activity in the Eastern Pacific is elevated. During La Niña conditions, the situation is reversed.

The AIR model explicitly accounts for the relationship between tropical cyclone activity in the North Atlantic and Eastern Pacific basins during the cyclic warming (El Niño) or cooling (La Niña) of ocean waters in the eastern equatorial Pacific.

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## MODEL AT A GLANCE

**MODELED PERILS** Tropical cyclone winds and precipitation-induced flood

**CATALOG** 10,000-year standard catalog with more than 43,000 events, 21,641 of which make landfall from the Pacific and 10,731 from the Atlantic

### HAZARD MODULE

- Explicit modeling of precipitation-induced flood
- Basinwide catalog allows companies to capture losses that span the U.S., Caribbean, Mexico, Central America, and U.S. offshore assets in the Gulf of Mexico

**VULNERABILITY MODULE** Separate damage functions for wind and flood perils are based on engineering principles and reflect the vulnerability of Mexican building stock. Damage functions are also available for contents and time element losses.

**MODEL VALIDATION** Extensively validated against loss estimates issued by industry sources, claims data when available, and results from detailed damage surveys around the world

### STATE-OF-THE-ART ENGINEERING

#### Accounts for Mexico's Heterogeneous Construction

While Mexico's insured residential building stock is dominated by masonry and concrete construction—both relatively wind resistant—insured commercial construction varies from poorly constructed low-rise masonry to well-maintained steel and concrete structures.

### THE ISSUE.

### THE SOLUTION.

To reflect the true vulnerability of Mexico's building stock, AIR engineers have developed more than 60 separate damage functions for wind and flood for a wide range of occupancies and construction types. Damage functions are also available for contents and time element losses. The model also accounts for local construction practices, and labor and materials costs.

#### Reflects the Effects of Storm Duration

Most models use only peak wind speeds to estimate tropical cyclone damage; however, the amount of damage a storm causes also depends on how long a storm batters a structure. For example, Hurricane Wilma pounded the Yucatán coast for a long time at a high intensity, which caused damage to be exacerbated.

Using the storm's forward speed and direction, the AIR model develops a complete time profile of wind speeds and is thus able to capture the cumulative effects of winds on structures—an important driver of loss.

### SUPPORT FOR COMPLIANCE WITH CAPITAL REQUIREMENTS

### NO ISSUE HERE.

Mexico's insurance market is experiencing strong growth. Mexico-based insurers can use AIR models to manage their risk and make the case to regulators for a more tailored capital reserve that better reflects their unique portfolio's risk.

### INDUSTRY EXPOSURE DATABASE

AIR's industry exposure databases provide a high-resolution view of properties and their respective replacement values—an invaluable tool in calculating industry loss estimates for all event types, whether simulated events from a stochastic catalog, or for actual events unfolding in real time.

### EXTENSIVE MODEL VALIDATION

To ensure the most robust and reliable model output possible, each component of the AIR Tropical Cyclone Model for Mexico was independently validated against multiple sources. To validate modeled loss estimates, AIR analyzed claims data for recent storms from some of Mexico's largest insurance companies, representing nearly 30% of industry premium. The model was also validated using data representing more than 50% of total claims from 2005's Hurricane Wilma, which caused the largest insured hurricane loss in Mexico's history.

## About AIR Worldwide

AIR Worldwide (AIR) is the scientific leader and most respected provider of risk modeling software and consulting services. AIR founded the catastrophe modeling industry in 1987 and today models the risk from natural catastrophes and terrorism in more than 90 countries. More than 400 insurance, reinsurance, financial, corporate, and government clients rely on AIR software and services for catastrophe risk management, insurance-linked securities, detailed site-specific wind and seismic engineering analyses, and agricultural risk management. AIR is a member of the Verisk Insurance Solutions group at Verisk Analytics (Nasdaq:VRSK) and is headquartered in Boston with additional offices in North America, Europe, and Asia. For more information, please visit [www.air-worldwide.com](http://www.air-worldwide.com).