

- SUPERIOR HAZARD MODELING
- ADVANCED ENGINEERING
- SUPPORTS JAPAN-SPECIFIC POLICY CONDITIONS

The AIR Typhoon Model for Japan

SUPERIOR HAZARD MODELING

Wind Field Modeling Captures Unique Characteristics of Northwest Pacific Typhoons

Given the same central pressure, typhoons in the Northwest Pacific tend to have lower wind speeds than hurricanes in the North Atlantic.

To ensure realism in wind speeds at the location level, which is critical to reliable loss estimation, AIR used region-specific data to formulate a central pressure–wind speed relationship unique to the Northwest Pacific.

Precipitation-Induced Flood and Storm Surge Losses Are Accounted for Separately

Little correlation exists between typhoon wind speed and precipitation intensity, while storm surge is strongly correlated with wind speed. Furthermore, policy conditions in Japan differ significantly for the flood and storm surge perils, as compared to the wind peril.

AIR's flood module explicitly captures precipitation-induced flooding, distributing total accumulated precipitation based on high-resolution topography and soil absorbency. The model also accounts for extratropical transitioning, which typically leads to an increase in the size and asymmetry of a storm's precipitation shield. Through the use of high-resolution bathymetry and terrain elevation data, the model simulates a storm surge event from its inception to its furthest extent inland.

Basinwide Approach Provides More Accurate Loss View

More than half of landfalling typhoons in the Northwest Pacific basin impact more than one country. Models that do not take a basinwide approach fail to account for the dependence in losses between countries.

The AIR model's basinwide catalog—which features a unified catalog of 293,000 simulated events—accounts for the dependence in losses between countries, allowing users to accurately model losses to portfolios that cross borders.

ADVANCED ENGINEERING

Comprehensive Understanding of How Buildings in Japan Respond to Wind, Flood, and Storm Surge

There are regional differences in construction practices, and building age has a significant impact on vulnerability. In addition, damage patterns from typhoon winds are dramatically different compared to those from precipitation-induced flooding or storm surge.

Incorporating findings from a comprehensive study of local construction practices and building codes, the AIR model appropriately captures the variation in damage from wind, precipitation-induced flood, and storm surge. Explicitly modeling the damage by peril returns more accurate loss estimates.

Component-Based Approach to Modeling Industrial Facilities Is Incorporated

Traditional approaches to estimating the vulnerability of industrial facilities treat them as a single entity. Yet they typically comprise hundreds of distinct structural components—each of which responds differently when subjected to typhoon winds, precipitation-induced flood, and storm surge.

The AIR model uses a rigorous engineering approach to estimate losses to a wide range of commercial and industrial facilities at the component level and also to account for complex business interruption and supply chain risks.

continued

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MODEL AT A GLANCE

MODELED PERILS Tropical cyclone winds, precipitation-induced flood, and storm surge.

EVENT CATALOG 10,000-year standard includes 293,235 simulated events ranging from tropical storm to super typhoon.

HAZARD MODULE

- Explicit modeling of precipitation-induced flood and storm surge
- High-resolution 1-km land use/land cover data incorporated to capture surface winds at any location
- Basinwide catalog allows companies to model losses to portfolios that span Japan, mainland China, Hong Kong, Taiwan, South Korea, and the Philippines

VULNERABILITY MODULE Damage functions are based on objective engineering principles and feature an in-depth understanding of the variations in vulnerability across the region—variations that reflect historical storm experience. The model has separate wind, flood, and storm surge damage functions for buildings, contents, and time element coverages for 62 construction types, including specialized risks like railway, marine cargo, and marine hull.

MODEL VALIDATION Each component of the AIR Typhoon Model for Japan is independently validated against multiple sources. Model wind speeds, precipitation totals, and storm surge heights for the historical events in the catalog are validated using AMeDAS and buoy data from the Japan Meteorological Agency. Modeled losses have been validated against actual loss and claims data from major typhoons since 1991, from companies representing roughly 30% of market share in Japan.

ADVANCED ENGINEERING (contd.)

Accounts for Japan's Engineered Flood Defenses

Japan continues to invest heavily in flood mitigation measures by increasing the number of national flood defenses, including levees, dams, and cisterns.

THE ISSUE.

THE SOLUTION.

AIR's model accounts for these systems—including their current state of repair, which can differ significantly from design conditions.

INDUSTRY EXPOSURE DATABASE CAPTURES EXCEPTIONAL LEVEL OF DETAIL **NO ISSUE HERE.**

AIR's high-resolution 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.

SUPPORTS JAPAN-SPECIFIC POLICY CONDITIONS

The model supports a wide array of location, policy, and reinsurance conditions, as well as Extra Expenses and Debris Removal. The complex policies that are commonly used, such as endowment and step policy functions, are also supported.

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, a Verisk Analytics (Nasdaq:VRSK) business, is headquartered in Boston with additional offices in North America, Europe, and Asia.



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