



Asia Typhoon Model

Region specific innovations in both hazard and vulnerability

Basin-wide Typhoon Model for Asia

The Asia Typhoon Model is a detailed, basin-wide model, with wide geographic coverage and provides results for wind only and combined wind, storm surge and rainfall-induced flooding, for all countries within the model.

Typhoon Risk in Asia

The Western Pacific basin is one of the most active basins in the world. It produces an average of about 28 tropical storms annually and is known for producing some of the world's most intense tropical cyclones. The combination of economic growth and underlying typhoon risk has elevated the risk profile for these nations on the global re/insurance industry. Recent notable events include Typhoons Morakot (2009), Hagupit (2008), Krosa (2007), and Saomai (2006), each of which resulted in more than \$1 billion USD in damage; and Super Typhoon Haiyan (2013), which caused over \$5 Billion USD in damage, making it the worst event in recent history to strike the Philippines.

Key Features

BROAD GEOGRAPHIC COVERAGE

Individual typhoon events have the potential to affect multiple countries. The Asia Typhoon Model provides consistent risk assessment throughout the region to appropriately capture the relevant spatial correlations. The wide geographic coverage of the Asia Typhoon Model includes: Japan, South Korea (ROK), China (PRC), including Hong Kong and Macau, Taiwan (ROC), the Philippines, Thailand, Vietnam and Malaysia.

The global property insurance market continues to evolve. CoreLogic will expand its geographic coverage to include additional countries.

ROBUST HAZARD DEFINITION

The historical best track database in the Asia Typhoon Model is from 1945 through 2015 and was compiled from three main data sources including the Joint Typhoon Warning Center (JTWC) in Hawaii, the Japan Meteorological Association (JMA) in Japan, and the Shanghai Typhoon Institute (STI) in China. Statistics for key storm parameters are developed directly from location-dependent distributions for wind speed and other parameters such as radius to maximum winds, translational velocity, and azimuth.

Tropical cyclone frequencies are based on the long-term storm climatology and take into account temporal and spatial clustering of events.

COMPREHENSIVE AGENTS OF DAMAGE

Primary agents of damage from tropical cyclones worldwide are the direct action of extreme winds upon structures, damage due to storm surge, and rainfall-induced flooding. The model allows analysis of wind only and combined wind, storm surge, and rainfall-induced flooding, providing clients with greater insight into the underlying model assumptions.

Storm characteristics, local geography, topography, and settlement patterns in Asia elevate the importance of storm surge and rainfall-induced flooding. The hazard model includes

The model is part of the Catastrophe Risk Management suite of products from CoreLogic® included in the catastrophe modeling platform, RQE® (Risk Quantification & Engineering)

typhoons, tropical storms, and tropical depressions to appropriately capture the full spectrum of damage impacts from wind, storm surge and rainfall induced flooding.

The Asia Typhoon Model has detailed hazard and vulnerability modeling for wind. The model is calibrated to the total losses from all three sub-perils via elevation and geographically-based algorithms to appropriately reflect the storm surge and rainfall-induced flood losses spatially.

LOCAL, REGION-SPECIFIC VULNERABILITY FUNCTIONS

Separate damage functions are created for three main types of coverages—structure, contents, and time element. In addition to considering the variation in local building practices, design, and building codes, the model considers the age and height of the building to properly model damages caused by wind, storm surge, and rainfall induced flooding. The model also includes separate damage functions for auto coverage.

CoreLogic leverages the expertise of structural engineers throughout the region to gain valuable insights on regional variations in construction practices and quality, historical evolution of building codes and their enforcement, and other regionally- dependent factors for damageability. A blended approach of claims data, engineering, and expert opinion is used to create vulnerability curves that relate wind speeds to damageability.

Model Specifications

LINES OF BUSINESS

Lines of business include residential, commercial, industrial, agricultural, and automobile for all the countries in the model, as well as Kyosai in Japan.

VARIABLE IMPORT RESOLUTION

The model accepts import data at various resolutions, from aggregate level data to location level risk; such as latitude/ longitude coordinate pairs, selected levels of postal codes and other commonly used geo-political entities, large city/ urban areas, and CRESTA zones. When exposure data is provided at aggregate levels, the model adds refinement to loss results by disaggregating data to finer resolution points based on weighted distribution of values for analysis and detailed risk differentiation.

COVERAGE TYPES

The model calculates damage to structures (building damage), contents, and time elements (business interruption and additional living expenses). Separate vulnerability functions are used for building and contents damage.

Time-element vulnerability is a function of both structural and contents damage.

DETAILED FINANCIAL MODELING

In the last decade, Asian countries have had significant development of infrastructure and commercial and industrial developments, with large investments in production plants and real estate. The Asia Typhoon Model supports facultative and high value re/insurance underwriting. The fit for purpose financial model aids in regulatory compliance and is consistent with the financial modeling in Asia to support a variety of insurance and reinsurance contracts, aligned with the local underwriting practices.

FLEXIBLE REPORTING HIERARCHY

The model is suitable for risk differentiation and pricing, risk aggregation as well as portfolio risk management, with suitable risk metrics and reports.

MODEL VALIDATION WITH EXPERT REVIEW AND HISTORICAL DATA

The Asia Typhoon Model is a comprehensive solution to managing risk from typhoon and leverages historical data to create a robust probabilistic event set providing uniform extreme risk metrics for all locations in the basin. The event set includes approximately 150,000 stochastic and over 2000 historical events. The model has been developed using detailed historical data, including storm footprint representations for each storm. The hazard and vulnerability models have been reviewed by the scientific community to ensure the model incorporates the best available science and provides plausible model outputs.

MODEL OUTPUT

Risk metrics include OEP and AEP loss exceedance curves, AAL, TVAR, and simulations of historical events. In addition, RQE's Year Loss Table (YLT) uniquely features three-dimensional output: simulation year, events, and sample outcomes. Instead of reporting mean losses with standard deviations, each loss in the YLT represents one possible outcome for the associated event. This allows users to retain the full distribution of uncertainty when using model output in dynamic financial analysis and other capital management tools. Conventional event loss results and other risk metrics can be derived from the YLT with arithmetic or simple database queries. YLT and event loss results are supported at the portfolio level. Other risk metrics are supported at multiple levels of refinement, from total aggregate portfolio results, to detailed output by policy and site. Hazard metrics are also available at site level.

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