- ADVANCED HAZARD MODELING
- STATE-OF-THE-ART ENGINEERING
- SUPPORT FOR COMPLIANCE WITH CAPITAL REQUIREMENTS

The AIR Earthquake Model for Chile

ADVANCED HAZARD MODELING	THE ISSUE.	THE SOLUTION.
Comprehensive Data Set to Improve Assessment of Seismic Potential	While the region that is Chile today has experienced earthquakes for many millions of years, the *recorded* seismic history is relatively short. Therefore, additional information is needed to improve assessment of seismic hazard.	AIR compiled detailed active fault data, which was used in conjunction with local and regional GPS data, to determine the crustal deformation rate in all Chile's seismic source zones. This information was used to create a stochastic catalog reflecting the full range of future seismic activity.
Ground Motion Prediction Equations (GMPEs) Capture Unique Characteristics of Earthquakes in Chile	In Chile, deep subduction zone earthquakes have resulted in higher levels of observed ground motion than GMPEs might predict.	The AIR model appropriately accounts for the higher levels of ground motion associated with subduction zone events by incorporating GMPEs modified to accurately reflect ground motion in Chile.
High Resolution Geological Maps Capture Potential for Soil Amplification	Soil properties play a critical role in amplifying or de-amplifying seismic waves.	The AIR model features three sets of soil maps at varied resolution, including a map at 200-meter resolution covering the capital, Santiago, where more than 70% of Chile's exposure is located.
Time-Dependent and Time-Independent Earthquake Rupture Probabilities Provide Two Robust Views of Risk	According to time-dependent views of earthquake risk, the annual probability of an earthquake occurring on a given fault is dependent on when the last earthquake occurred on that fault.	The AIR model incorporates both time-dependent and time-independent earthquake rupture probabilities—the former for seismic source zones in Chile with well-known rupture histories, and the latter for source zones where rupture histories are not well known.
Appropriately Accounts for Loss Volatility	Infrequent, large loss-causing, or "tail" events, such as the M8.8 February 2010 Maule quake, drive earthquake risk in Chile. The 2010 Maule quake cost the insurance industry USD 8.5 billion. Information from historical earthquakes alone, however, is not sufficient to gauge future losses.	The AIR model appropriately captures the frequency and magnitude of "tail" events and outputs a reliable estimate of average annual loss—one that accounts for the volatility to be expected from periods of calm interrupted by the occurrence of extreme (tail) events.

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MODEL AT A GLANCE

YEAR RELEASED 2006

MODELED PERIL Ground shaking

CATALOG The model incorporates a 10,000-year catalog of 513,397 simulated earthquakes, 25,098 of which cause loss to industry exposure.

HAZARD MODULE Integrates all global, regional, and local catalogs, including:

- Pan American Institute of Geography and History (Instituto Panamericano de Geografía e Historia)
- United States Geological Survey (USGS)
- National Earthquake Information Center (NEIC)
- Preliminary Determinations of Epicenters (PDE)

VULNERABILITY MODULE Supports 42 occupancy classes and 22 construction classes; accounts for the impact of the evolution of Chile's building codes and other local factors affecting the seismic performance of buildings in Chile.

STATE-OF-THE-ART ENGINEERING	THE ISSUE.	THE SOLUTION.
Damage Estimation Based on Rigorous Engineering Analysis	How buildings respond to earthquakes depends on both the ground motion and the building type. Traditional approaches to damage estimation, which rely heavily on expert opinion, don't capture these complex interactions.	Complementing local expertise, damage estimation in the AIR model uses state-of-the-art engineering analysis, including results from detailed computer models of buildings subjected to actual ground motion records, and findings from post-disaster field surveys.
Comprehensive Set of Damage Functions	Chile's building stock is diverse, and vulnerability varies by construction and occupancy.	The AIR model offers a robust set of damage functions for 22 construction types and 42 occupancy classes. Supported lines of business include residential, commercial/industrial, and automobile.
Considers Impact of Regional Construction on Building Vulnerability	The seismic performance of buildings in Chile is greatly influenced by local construction practices, with damageability often affected by variations in workmanship, materials, and building code enforcement.	The AIR model takes into account these local factors and the evolution of Chile's building codes in assessing the vulnerability of various building types.

SUPPORT FOR COMPLIANCE WITH CAPITAL REQUIREMENTS — NO ISSUE HERE.

Chile's sophisticated insurance market is experiencing steady growth. As local regulators in Chile aim to revise the country's set of capital requirements to mirror Europe's Solvency II regime, Chile-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.

INPUT SCHEMA FOR DATA TRANSPARENT AND PUBLICLY AVAILABLE — NO ISSUE HERE.

AIR has long been a proponent of open exposure data standards, as reflected in the UNICEDE® standard, which AIR makes available to the industry via a public website, unicede.com. AIR was also the first catastrophe modeling firm to support ACORD's new building authority exposure data standard, and AIR's CATRADER® and Touchstone® platforms are the first to be ACORD-certified.

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

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Cover image: AIR Worldwide Damage Survey of the 2010 Maule Earthquake