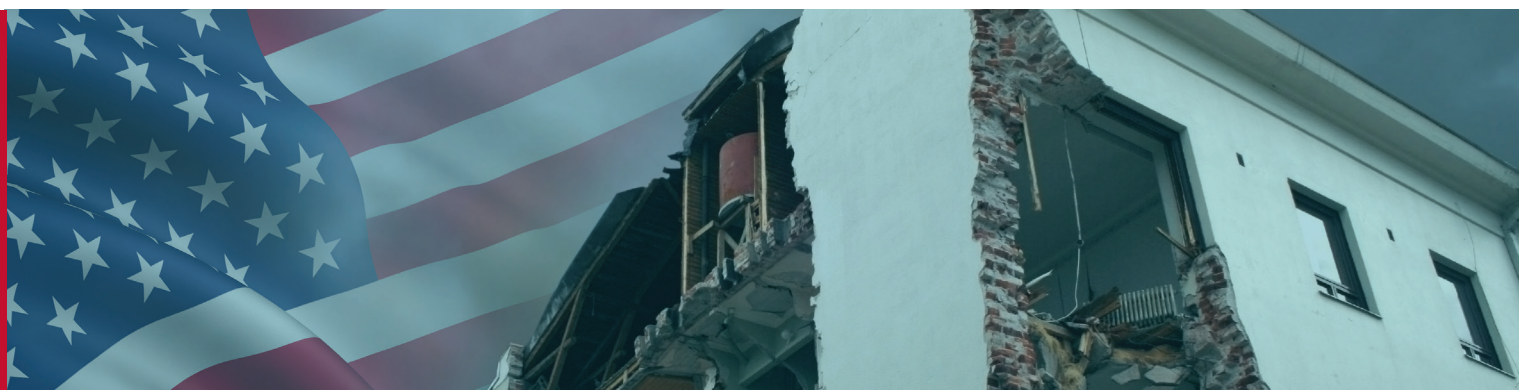




# RMS® United States Earthquake Model

Comprehensive, high-resolution earthquake modeling, incorporating the latest science



## KEY BENEFITS

- Latest scientific understanding of seismic sources and incorporating data from the third Uniform California Earthquake Rupture Forecast (UCERF3)
- Seamless model provides consistent framework to model loss from location, portfolio, or cross-border level
- Advanced ground motion models that leverage thousands of historical earthquake recordings to predict the attenuation of shaking from source to site
- Soil amplification model includes largest available mapping of Vs30 data
- New, probabilistic liquefaction model leverages research and claims data from the 2010-11 Canterbury Earthquake Sequence in New Zealand
- More than 3,800 unique vulnerability functions for U.S. building shake coverage
- Inclusion of latest research into the seismic performance of very tall buildings
- New model for tsunami and updated models for fire following earthquake and earthquake sprinkler leakage
- Updated industry exposure and loss curves

## The Latest Scientific View of Seismic Hazard for the United States

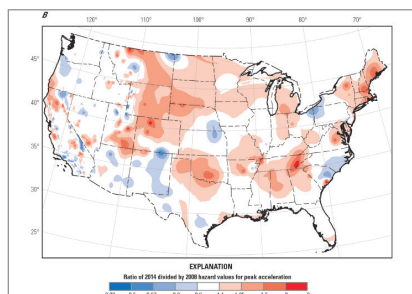
The RMS United States Earthquake Model incorporates the latest scientific understanding of seismic hazard in the contiguous U.S., Alaska and Hawaii. The model incorporates seismic source data from the U.S. Geological Survey (USGS) 2014 National Seismic Hazard Mapping Project, including data from the third Uniform California Earthquake Rupture Forecast (UCERF3). The model also incorporates the latest seismic source data for Alaska and Hawaii, which were not covered in the 2014 USGS mapping project.

RMS earthquake models use a consistent framework across the U.S., Canada and Mexico. Each model is seamless across borders, enabling efficient rollup of multi-national portfolios. At the same time, analysis of portfolios with exposures in only one country include seismic sources across borders that have the potential to cause loss.

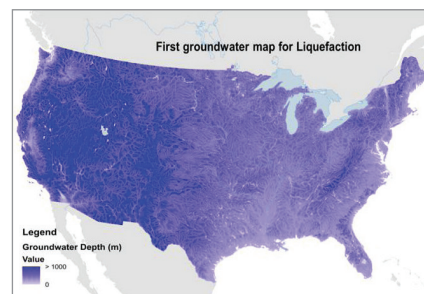
## Accurately Predict Ground Motion Attenuation from Source to Site

Pricing risk at the right premium to cover claims from seismic events is challenging without an accurate view of how earthquake shaking decays from source to insured location. The U.S. Earthquake Model incorporates the latest ground motion prediction equations from the Pacific Earthquake Engineering Research Center's (PEER) Next Generation Attenuation Relationships for Shallow-Crustal Earthquakes in the Western U.S. (NGA-West 2) project, together with other recently released global and local ground motion models for both active and stable continental tectonic regions.

The new ground motion models were developed based on thousands of historical earthquake recordings and have less uncertainty than older vintages.



Ratio of peak ground acceleration (475 year return period) for the 2014 and 2008 versions of the national seismic hazard maps



First groundwater depth map for Liquefaction

## REGIONS COVERED IN THE RMS U.S. EARTHQUAKE MODEL:

- Shake, Fire Following Earthquake, and Earthquake Sprinkler Leakage
- Contiguous U.S., Hawaii, and Alaska
- Tsunami
- Cascadia Subduction Zone – U.S. west coast
- Liquefaction and Landslide
- Contiguous U.S., Hawaii and Alaska

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RMS is the world's leading catastrophe risk modeling company. From earthquakes, hurricanes, and flood to terrorism and infectious diseases, RMS helps financial institutions and public agencies understand, quantify, and manage risk.

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## High-Resolution Amplification Models Enable Next-Generation Hazard Modeling

The U.S. Earthquake Model includes an upgraded soil amplification methodology that empowers (re)insurers to enter a new era of high-resolution geotechnical hazard modeling. The new soil amplification model reflects the latest science and explicitly uses Vs30 (average shear wave velocity in the top 30 meters at a site). To enable the new methodology, RMS developed a high-resolution Vs30 data layer covering all the U.S., derived from direct Vs30 measurements and surficial geology.

The U.S. Earthquake Model also includes updated basin amplification models for Los Angeles, Seattle and the Mississippi Embayment. The basin models were custom built by RMS using empirical and numerical simulation approaches.

## Analysis of Liquefaction Risk: Lessons from New Zealand

RMS invested significant resources to understand the effects of liquefaction from the 2010-11 Canterbury Earthquake Sequence in New Zealand. Leveraging billions of dollars of claims data, RMS developed a new probabilistic liquefaction model that covers all the U.S. (including Alaska and Hawaii) and uses a series of RMS-developed data layers, including ground water depth. The new model can predict the location and severity of liquefaction at high resolution and allows (re)insurers to price differentially and select risk more effectively.

## Advanced Vulnerability Modeling

The U.S. model includes more than 3,800 unique vulnerability functions for building shake coverage, with the ability to differentiate risk based on four primary and 21 secondary building characteristics. The inclusion of the latest engineering research also delivers the latest modeling for very tall buildings (> 40 stories), enabling more accurate underwriting of these high-value assets. The vulnerability module includes damage curves specifically developed to predict losses to contents coverage. Business interruption is calculated as a function of both direct facility damage and disruption to lifelines necessary for continued facility operations, such as water or electricity.

## Evaluate Secondary Perils: Tsunami, Fire Following Earthquake, and Earthquake Sprinkler Leakage

Getting the full picture of earthquake risk for the U.S. requires analysis of tsunami. The RMS U.S. Earthquake Model includes a suite of earthquake-induced tsunami accumulation footprints generated by Cascadia Subduction Zone events. Each tsunami event is also included in the stochastic event set, enabling comparison of tsunami and shake losses.

The fire following earthquake model incorporates region-specific, high-resolution data for calculating fire loss across all the U.S. The fire model is based on precompiled results derived from Monte Carlo simulations that modeled the full life cycle of conflagrations, from fire ignition, to fire spread to fire suppression. The U.S. Earthquake Model also includes earthquake sprinkler leakage across the entire country.

## Market Insight Provides More Accurate Estimates of Industry Loss

RMS has also developed U.S. earthquake and fire following earthquake Industry Exposure Databases (IEDs) and Industry Loss Curves (ILCs). The IEDs were built using high-resolution building stock, building size and replacement cost data from a variety of sources. Within major metro areas, building level data was also incorporated. RMS surveyed public and private sources to determine coverage relativities, limits, deductibles and take-up/penetration rates by peril, line of business and region to provide the best estimate of insured exposure in the U.S. The ILCs present industry loss by peril, line of business and region and are derived from the IEDs in combination with the RMS U.S. Earthquake Model.

## Find out more

Ask your RMS sales or customer services representative for more information about the RMS United States Earthquake Model, or email [sales@rms.com](mailto:sales@rms.com).