

# CoreLogic U.S. Earthquake Model on Oasis

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## Modern challenges for modern times

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Modern insurance companies are under a number of pressures which are driving a change in the way they work, and this, in turn, is driving new demands of the modern model vendor.

In recent years, the low number of natural catastrophes combined with low returns from investment capital has created unprecedented pressures on insurers and reinsurers to do more with less. Even the catastrophes of 2017 and 2018 had little impact on the industry as a plentiful amount of alternative capital picked up the slack and downward pressure on rates was largely maintained. Hand in hand with this, there are pressures internally for cat modelling teams to add further value beyond 'running models.'

Taking advantage of an effective and flexible environment in which different vendor perspectives can be evaluated and consumed is a key part of this. In response, CoreLogic®, a global leader in property data, analytics and insights is rolling out its catastrophe models on the Oasis Loss Modelling Framework, commencing in the summer of 2019 with its U.S. Earthquake Model.

## Delivering leading science on your choice of platform

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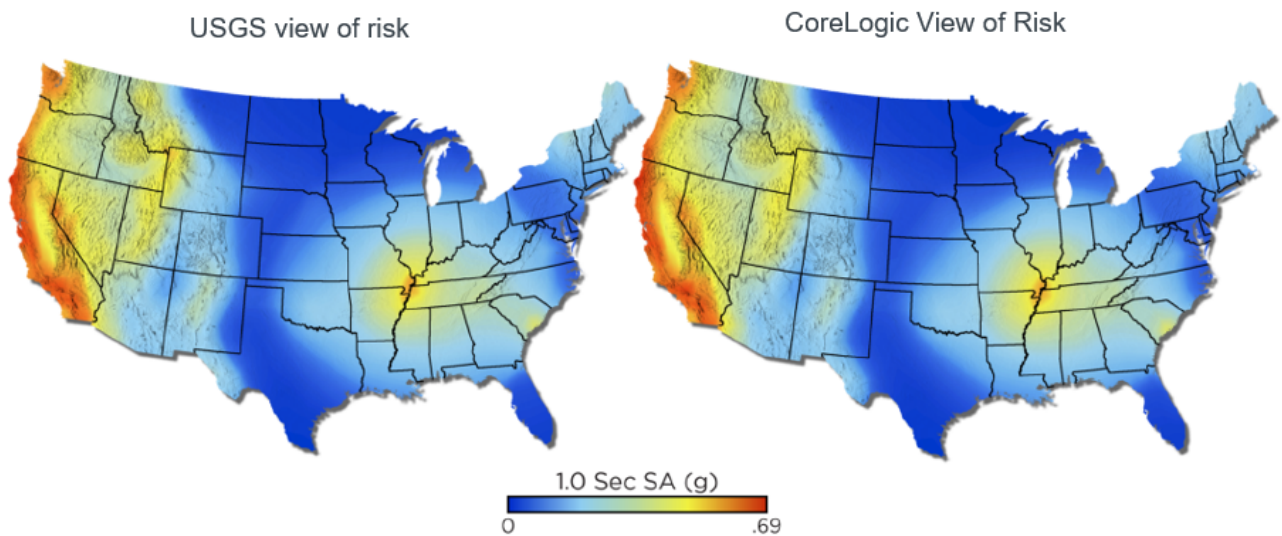
The modelling heritage of CoreLogic began in 1981 with EQE; it was this marriage of almost 40 years expertise in hazard science & engineering knowledge with the unrivalled breadth & depth of CoreLogic U.S. property data that drives our passion for delivering world class models.

The CoreLogic U.S. Earthquake Model incorporates a full implementation of the two initiatives that represent the best seismic science publicly available. Namely, the United States Geological Survey (USGS) 2014 National Seismic Hazard Mapping Project (NSHMP) hazard model and the Working Group on California Earthquake Probabilities (WGCEP) 2014 and 2015 Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) seismic source models.

These hazard models include updates and lessons learnt from recent earthquakes around the world. Studies from the 2011 magnitude (M) 9.0 Tohoku earthquake in Japan and the 2010 M7.1 Darfield earthquake in New Zealand have proven that earthquakes are more connected at depth. This means that larger earthquakes can occur in the California model than previously thought. To capture this, the new model 'relaxes' fault segmentation, allowing ruptures to 'jump' to connected neighbouring faults.

In June 2016, CoreLogic was the first major model vendor to release the U.S. Earthquake Model based on this most recent science. Kenneth W. Campbell, Ph.D., director of model

development for CoreLogic, is among the world's leading earthquake hazard scientists. He is a member of the USGS National Seismic Hazard Mapping Project (NSHMP) Steering Committee and a lead researcher with the Next Generation Attenuation (NGA) project. His deep expertise in ground motion and site response modelling allowed CoreLogic to create good agreement with the base models. When comparing the USGS/UCERF models to the CoreLogic U.S. Earthquake Model, the return period hazard curves are consistent. For any location in California, the curves are within 2%, and for any location in the rest of the U.S. they are within 5%, up to the 1 in 1,000-year return period.



The damage potential from liquefaction was keenly felt in the 2011 M6.9 Christchurch earthquake in New Zealand. Liquefaction and earthquake-induced landslide are included as components in the model.

The CoreLogic model includes a Time Dependent view of risk for California and the Cascadia subduction zone mega-thrust earthquake events.

The model uses high resolution soil maps to account for soil amplification and local site conditions. Research has been performed on deep sedimentary basins and their effect on ground motion waves, amplifying longer ground motion periods in particular. The model includes sedimentary deep basin modelling in Northern and Southern California and the Puget Sound region of Washington that includes Seattle.

The California Earthquake Authority (CEA) has used the CoreLogic U.S. Earthquake Model since its inception in 1996. The CEA operates under a law that mandates strict standards for rate-setting science:

*"Rates shall be established based on the best available scientific information for assessing the risk of earthquake loss."* CALIFORNIA INSURANCE CODE § 10089.40

The earthquake model from CoreLogic has met that standard for the CEA for each U.S. Earthquake Model update. To date, the CoreLogic Earthquake Model is the only one used by the CEA to establish rates.

For the New Madrid Seismic Zone (NMSZ), the USGS model does not assume that earthquakes are independent (poissonian) and implements a 95% weight that earthquakes will occur in a sequence (multiple events) as was witnessed in the 1811 – 1812 New Madrid sequence, that occurred over a period of 3 months, within a one-year period. CoreLogic includes this temporal clustering to the rupture of fault segments as per the USGS, the impact of which can be seen in the OEP vs AEP financial losses in the CoreLogic model.

## Vulnerability model

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CoreLogic uses an engineering approach, claims data, and historical earthquakes experience data for buildings and equipment to develop the vulnerability functions within the model based on observed loss data, experimental research, and structural calculations performed by CoreLogic engineers.

The model incorporates vulnerability curves that are well-honed from thousands of seismic studies conducted by CoreLogic and its affiliated engineers over the past 40 years and are additionally founded on first-hand observations from more than 90 earthquakes worldwide. Vulnerability is calibrated to tens of thousands of claims and exposure data points from the Northridge (1994), Loma Prieta (1989) and other events in California.

CoreLogic is proud of its data property characteristics set and combines the access to this data set with claims data, and the engineering capabilities gained from the last 40 years, to inform vulnerability curves, and unknown defaults where building characteristics are unknown.

The modelling criteria describe above has been captured and maintained in the CoreLogic implementation of the U.S. Earthquake Model in the Oasis LMF, allowing, for the first time, access to CoreLogic leading science and a best-in-class U.S. Earthquake Model, outside of the CoreLogic proprietary platform, RQE®.

For further information on our Earthquake model or to hear more about our plans for deploying other models on the Oasis Loss Modelling Framework, please contact:

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