

# Catastrophe Modeling Twenty Years After Northridge

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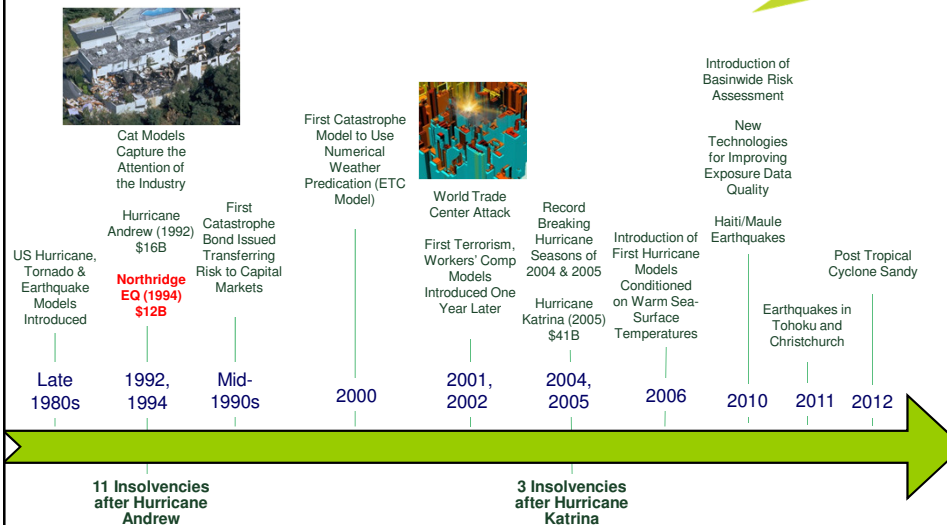


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## A Brief History of Catastrophe Modeling






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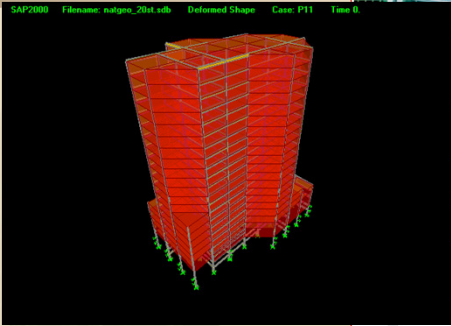
# Large Body of Research Since Northridge Has Improved Catastrophe Models



## 2008 United States National Seismic Hazard Maps

**T**he U.S. Geological Survey's National Seismic Hazard Maps are the basis for seismic design provisions of building codes, insurance rate structures, earthquake loss studies, retrofit priorities, and land-use planning. Incorporating these hazard maps into designs of buildings, bridges, highways, and critical infrastructure allows these structures to withstand earthquake shaking without collapse. Properly engineered designs not only save lives, but also reduce disruption to critical activities following a damaging event. By estimating the likely shaking for a given area, the maps also help engineers avoid costs from over-design for unlikely levels of ground motion.





SAP2000 File: natgeo\_2008.sdb Deformed Shape Case: P11 Time: 0


Colors on this map show the levels of horizontal shaking that have a 2-in-100 exceeded in a 50-year period. Shaking is expressed as a percentage of g (of a falling object due to gravity).

### Next-Generation Performance-Based Seismic Design Guidelines

for New and Existing Buildings

August 2006

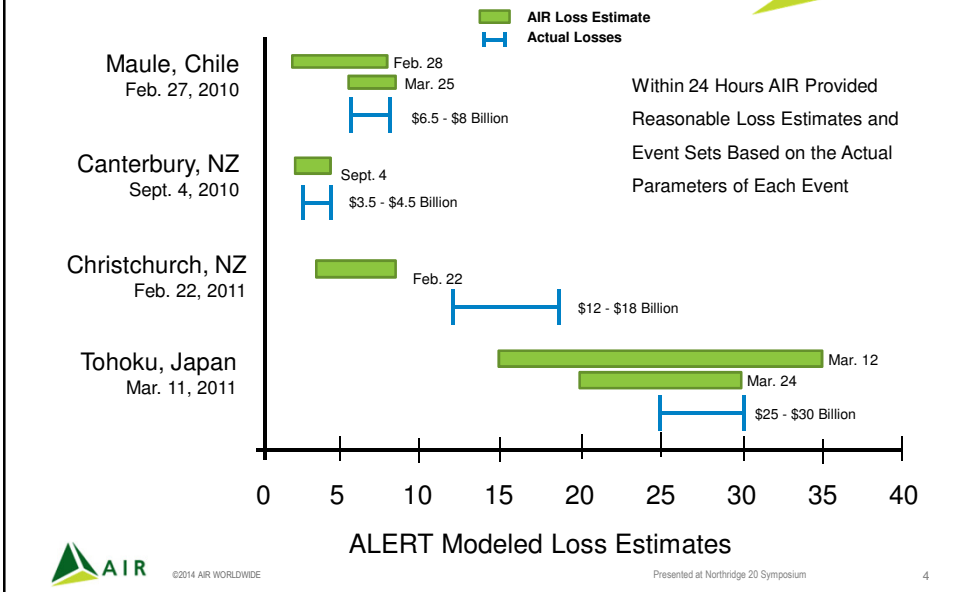


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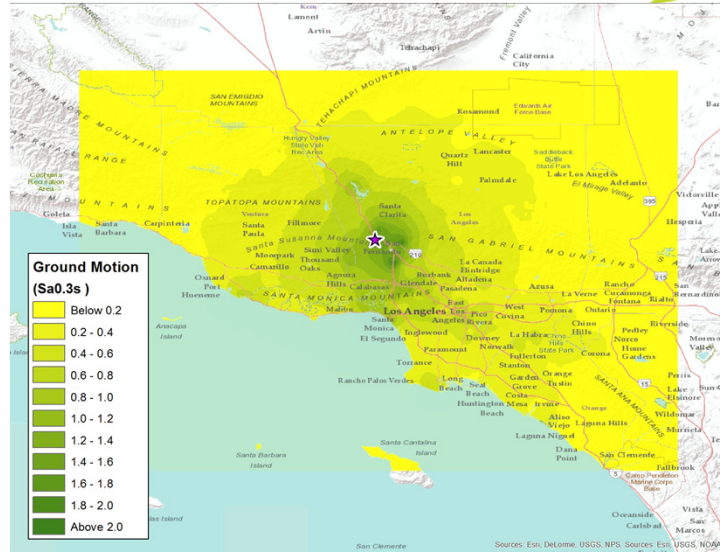
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# Current Generation of Catastrophe Models Have Skill in Estimating Losses



## Observed Ground Motion from Northridge Shows Pockets of High Shaking

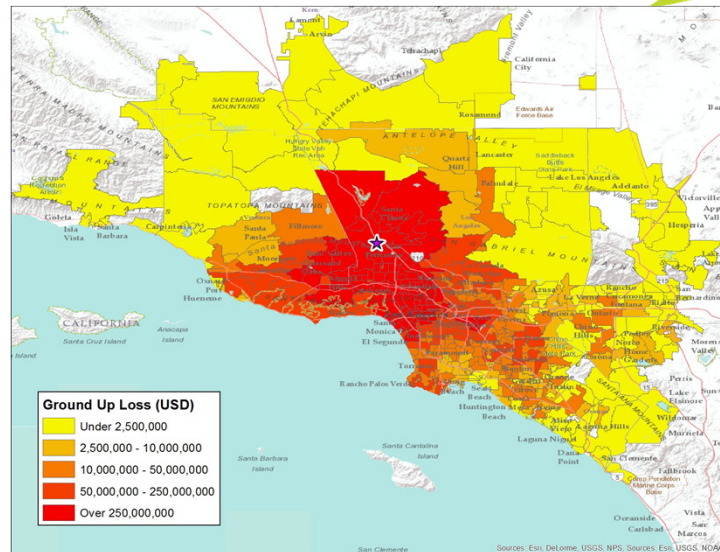


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## Modeled Loss Footprint for Repeat of Northridge (2012 Property Exposures)



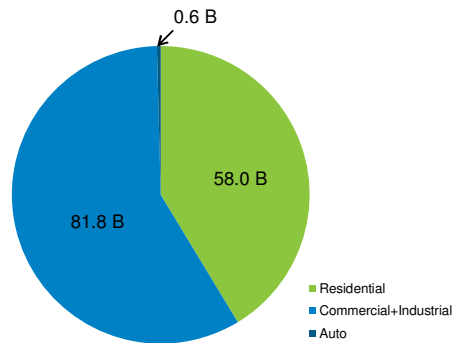
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## Direct Impacts of Northridge

- Predominant impact is due to shaking and damage to buildings and contents
- Secondary perils, like fire following, liquefaction make minor contributions
- Significant contribution of losses due to business interruption

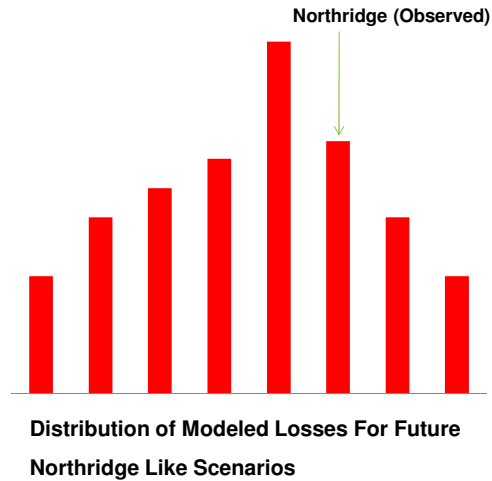
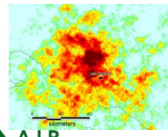
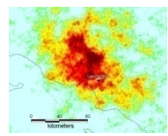
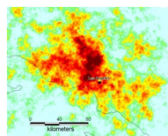
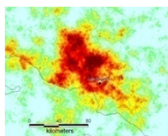


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## The Next Northridge Will Result in a Different Loss Outcome

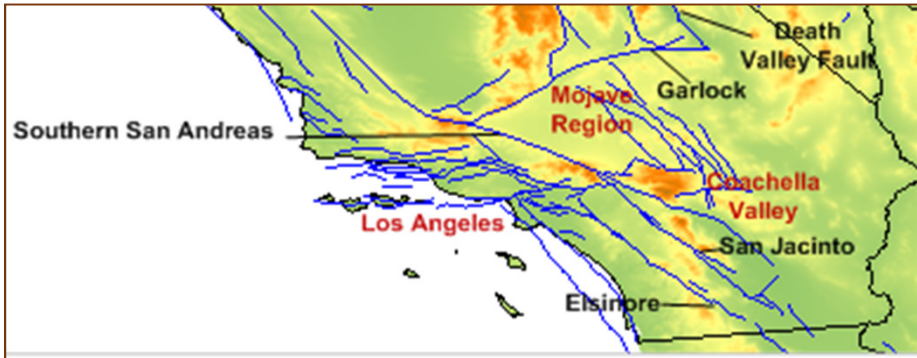


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## Many Faults Contribute to Risk in Southern California

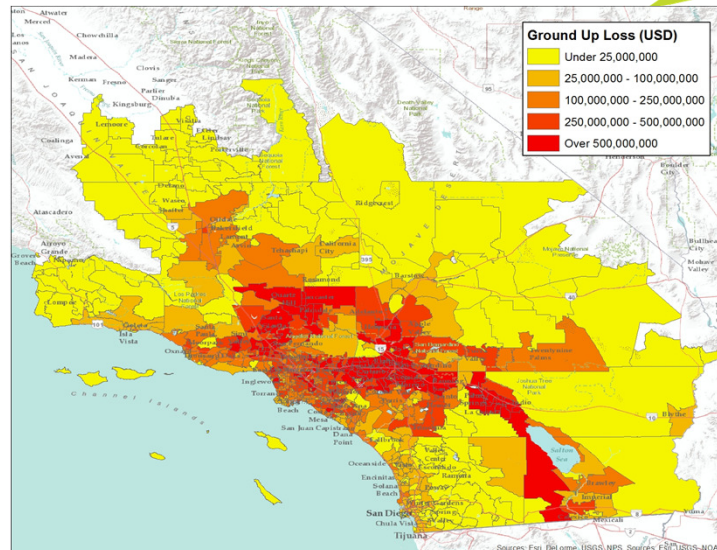


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## Modeled Loss Footprint for Analog of Shakeout Scenario on San Andreas (2012 Property Exposures)



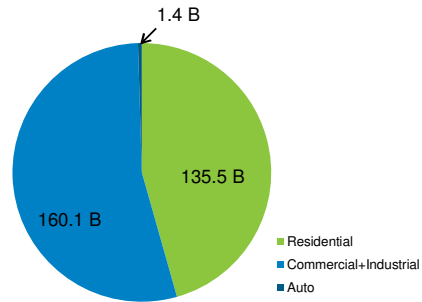
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## Direct Impacts of Scenario on San Andreas

- Predominant impact is due to shaking and damage to buildings and contents
- Fire following makes a significant contribution
- Significant contribution of losses from business interruption
- Economic impact to be felt in many sectors for a long time

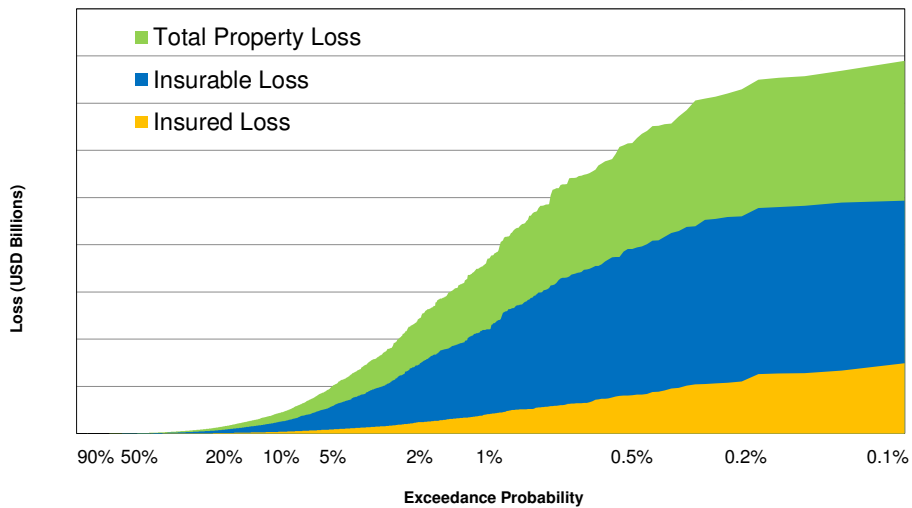


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## Under Today's Market Conditions, Only a Small Fraction of the Total Residential Losses Is Insured



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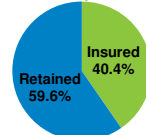
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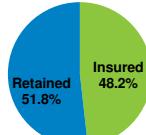
## Models Can Be Used to Estimate Share of Retained and Insured Losses Under Alternative Schemes (Simulation of Northridge)

### Single Family Homes

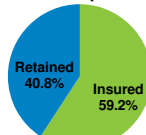
% Share of Loss (15% deductible)



% Share of Loss (10% deductible)



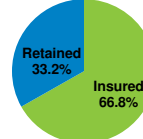
% Share of Loss (5% deductible)



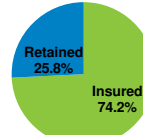
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### Commercial

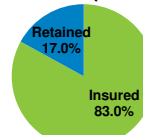
% Share of Loss (15% deductible)



% Share of Loss (10% deductible)



% Share of Loss (5% deductible)



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## Summary

- Catastrophe modeling has improved over the last two decades and provides a credible view of risk
- Earthquake risk in California has been quantified, however, there are gaps in dealing with the economic consequences
- Models can be used to design various insurance products and develop strategies for risk mitigation and risk management
- Today a large part of the risk in California remains uninsured and models can be leveraged to evaluate alternative scenarios to create a viable but stable outlook



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