

USGS and AIR Worldwide: Leveraging Seismic Hazard as an Ingredient in Risk Modeling

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Who AIR is, What we do and How we interface with USGS

- Founded the catastrophe modeling industry in 1987
- Locations in U.S., London, Munich, Beijing, Tokyo, Singapore, and Hyderabad

AIR Worldwide

- Provide risk models for more than 400 clients for insurance, reinsurance, finance, corporate, and government
- Provide near real-time analysis of EQ Loss Results
- Provide calculation agent services to capital markets

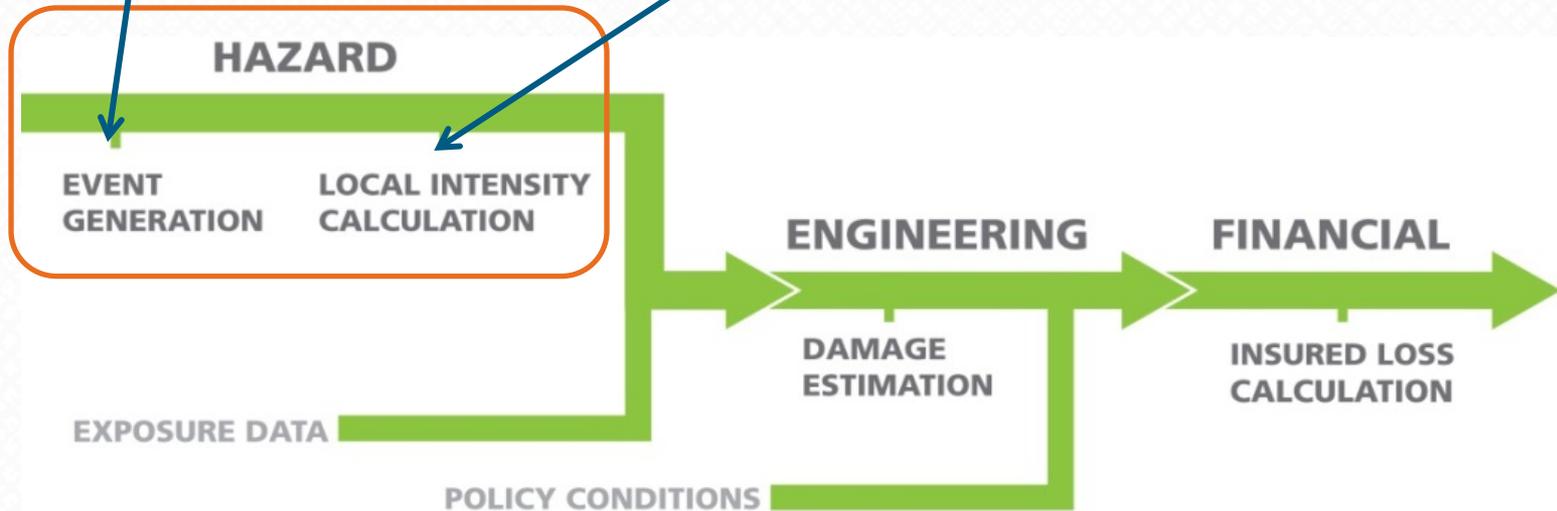
USGS

- Input Data & Final Products
- Final Products: Shake Maps
- Final Products: Event Parameters

Hazard is One Ingredient in AIR's Risk Modeling Methodology

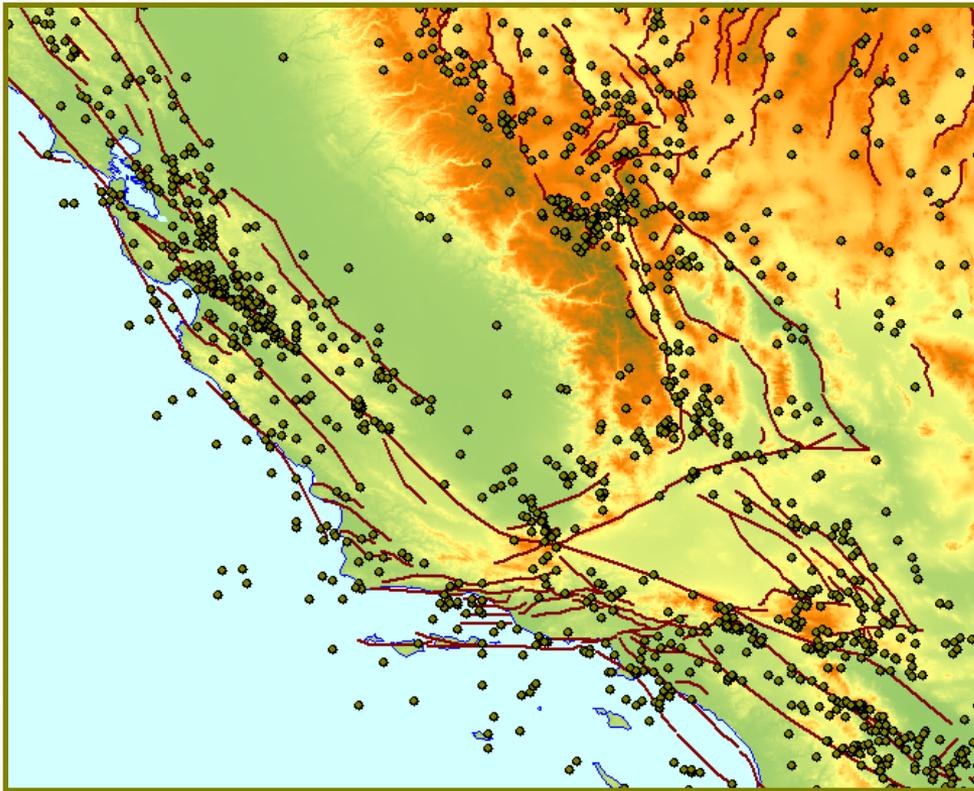
Where does the event occur?
How often do events occur?
**USGS Hazard Input Data,
UCERF, etc.**

How strong is the event at
my location?
**Ground Motion Prediction
Models (GMPEs)**

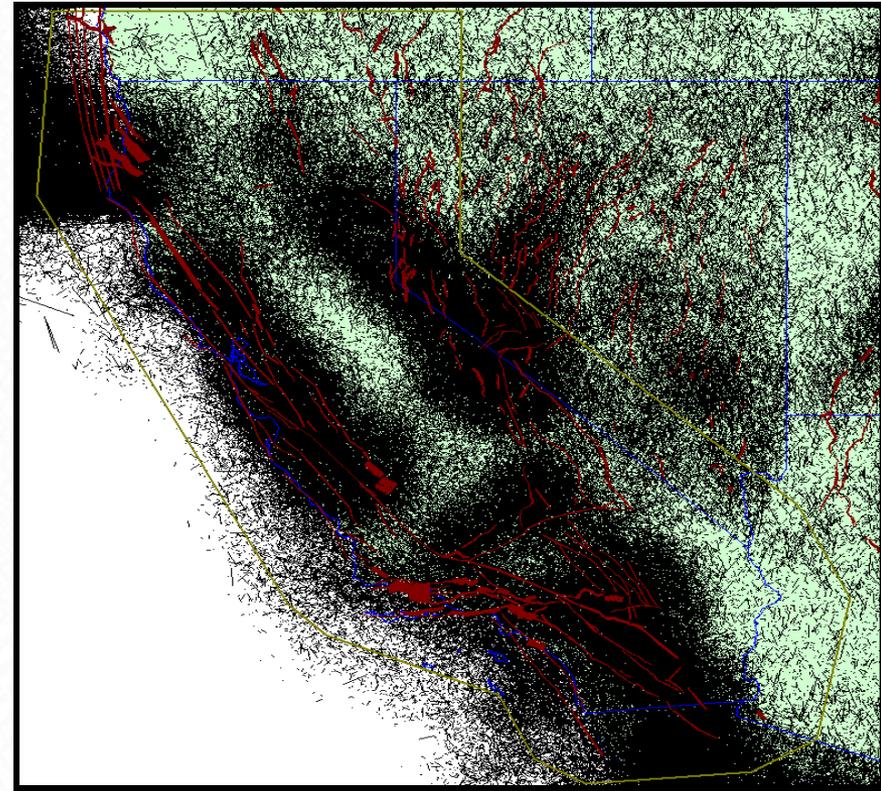


AIR uses USGS Hazard Data and Models to Develop our Stochastic Catalog

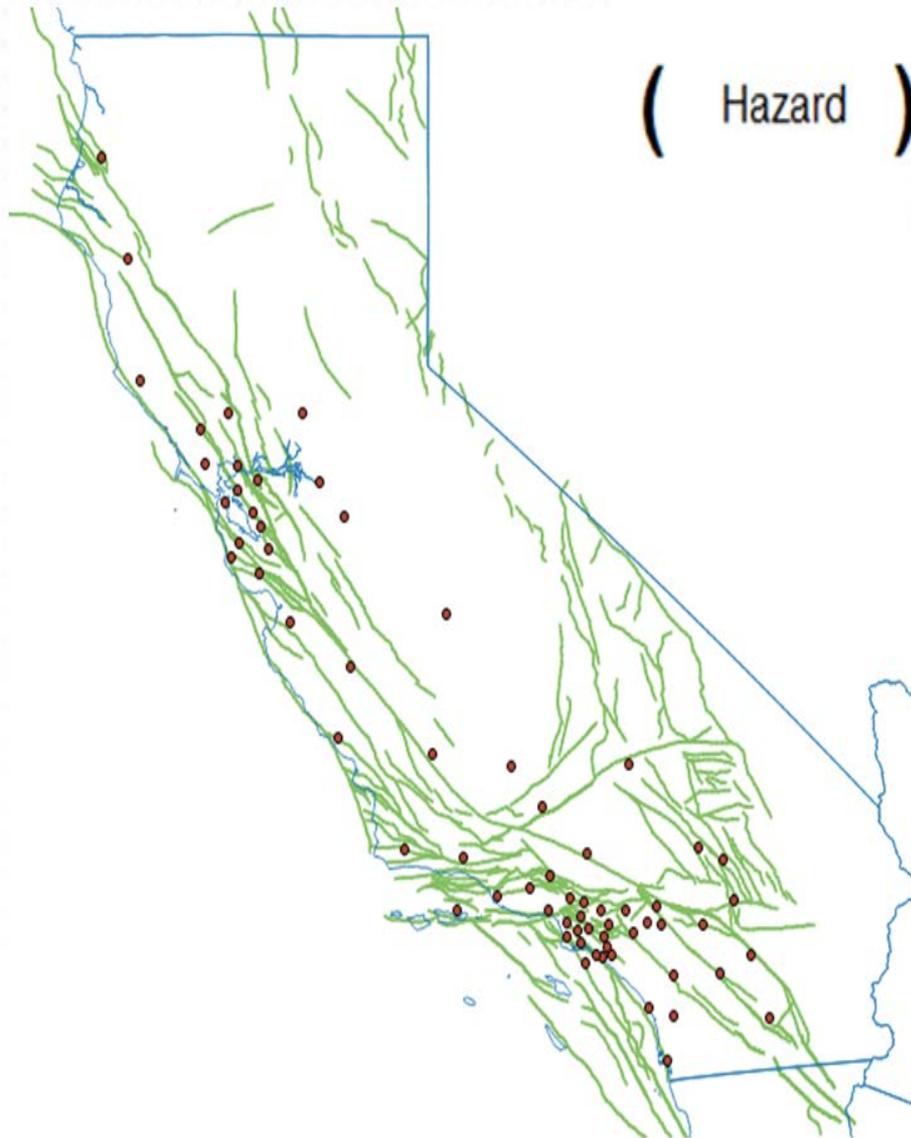
USGS Input Data & Modeling



AIR Stochastic Catalog



AIR's Approach to Constructing a 100k Catalog Compatible with the UCERF3 1.6 Million Scenarios



(Hazard)

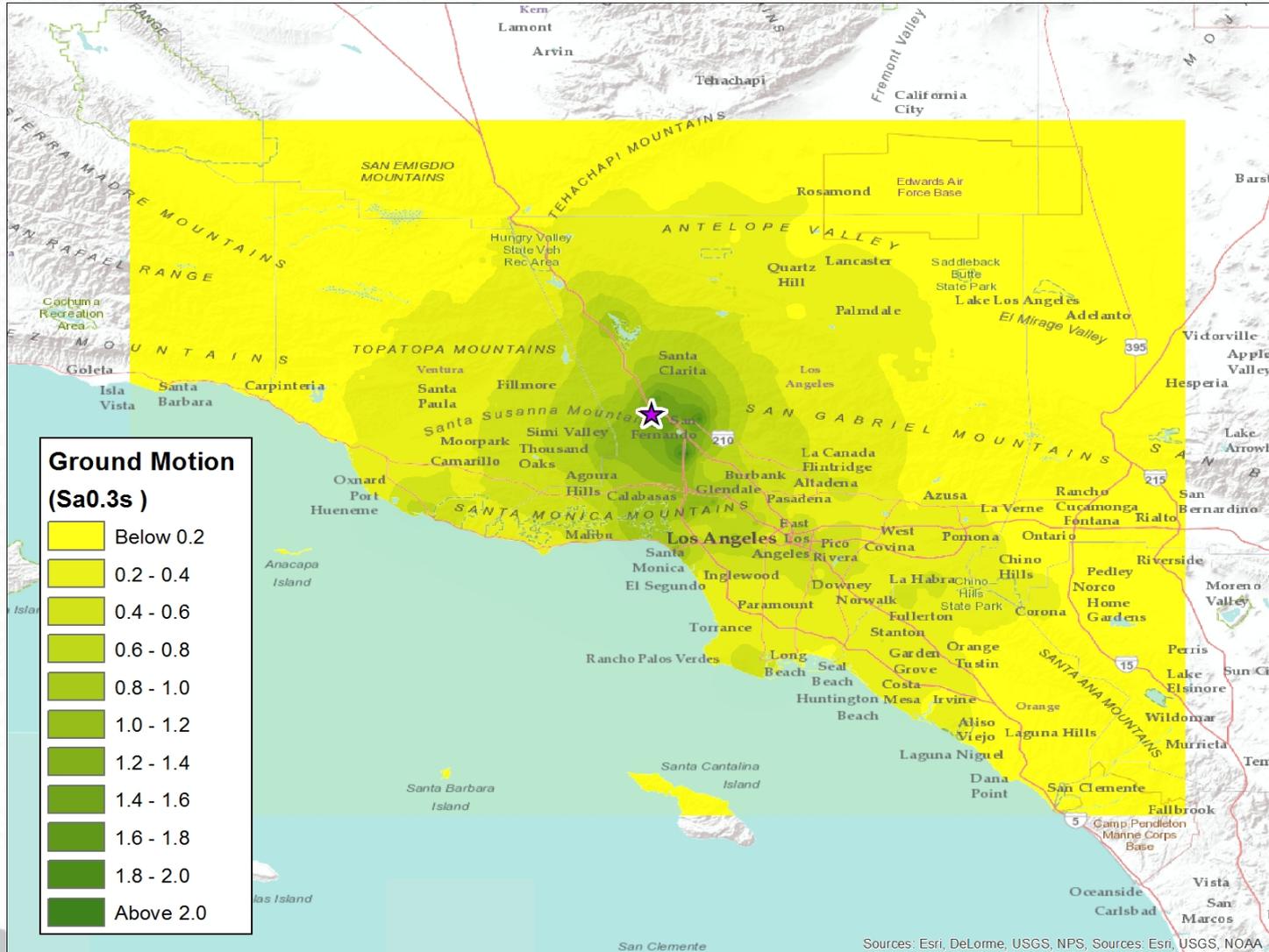
From 1.6 Million
Earthquake Scenarios

= (Hazard)

From 100k
Stochastic Catalog

- ✓ Create a database of hazard contribution values for each UCERF3 scenario at all sites
- ✓ Develop a genetic optimization algorithm to extract an optimum 100k catalog in such a way that the total hazard values at all sites are preserved

Rely on USGS as input for “real-time” analysis: AIR’s ALERT and CEA’s EARLE Programs



USGS is Used as a Reporting Agency to Establish Event Parameters for ILS Transactions

M8.3 - 46km W of Illapel, Chile

IX OVER, VIII ShakeMap, ORANGE PAGER

Location
Data Source US⁴

31.570°S 71.654°W depth=25.0 km (15.5 mi)
[View Interactive map](#)

M8.3 - 46km W of Illapel, Chile

IX OVER, VIII ShakeMap, ORANGE PAGER

Scientific - Origin
Data Source US⁴

Origin Detail	Phases	Magnitudes
Magnitude	8.3 mww	
Location uncertainty	31.570°S 71.654°W ± 5.3 km	
Depth uncertainty	25.0 km ± 1.7	
Origin Time	2015-09-16 22:54:33.220 UTC	
Number of Stations	-	
Number of Phases	285	
Minimum Distance	74.25 km (0.67°)	
Travel Time Residual	1.11 sec	
Azimuthal Gap	19°	
FE Region	Offshore Coquimbo, Chile (135)	
Review Status	MANUAL	

Catalog ALERT™ :: Event Summary - Google Chrome

User Feedback Summary

- AIR is a great beneficiary
 - User of detailed USGS data
- USGS provides good transparency
 - More transparency!
 - More intermediate results for understanding and validation
 - e.g. detailed magnitude-rate distribution for background seismicity of different regions.(magnitude frequency data plotter?)
- Are we interested in uncertainty?
 - YES!!!
 - Risk specific issues for uncertainty quantification
- Alternative ground motion intensity parameters for damage estimation
- Updating existing products to reflect current model
 - Historical shake maps

Thank You

