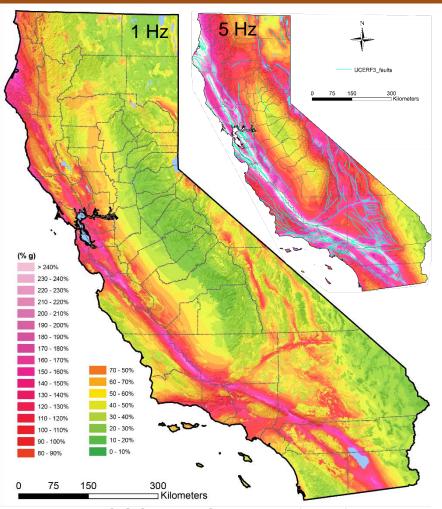# CGS Utilization of USGS Seismic Hazard Information

- Estimating statewide annualized losses

- Producing regulatory seismic hazard zone maps

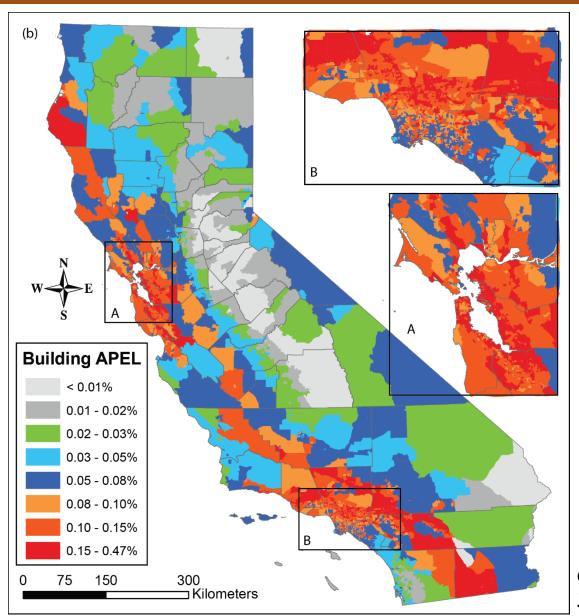- Developing earthquake scenarios and estimating scenario losses

1 Hz

5 Hz

UCERF3_faults

(% g)

> 240%	
230 - 240%	
220 - 230%	
210 - 220%	
200 - 210%	
190 - 200%	
180 - 190%	
170 - 180%	
160 - 170%	
150 - 160%	70 - 50%
140 - 150%	60 - 70%
130 - 140%	50 - 60%
120 - 130%	40 - 50%
110 - 120%	30 - 40%
100 - 110%	20 - 30%
90 - 100%	10 - 20%
80 - 90%	0 - 10%

Updated CGS Map Sheet 48 (draft):

NSHMs + V_{S30} Map by Wills et al. BSSA (in print) + Seyhan and Stewart EQS (2014) amplification model

CGS

CALIFORNIA GEOLOGICAL SURVEY

Statewide Annualized Loss Estimation

(b)

Building APEL

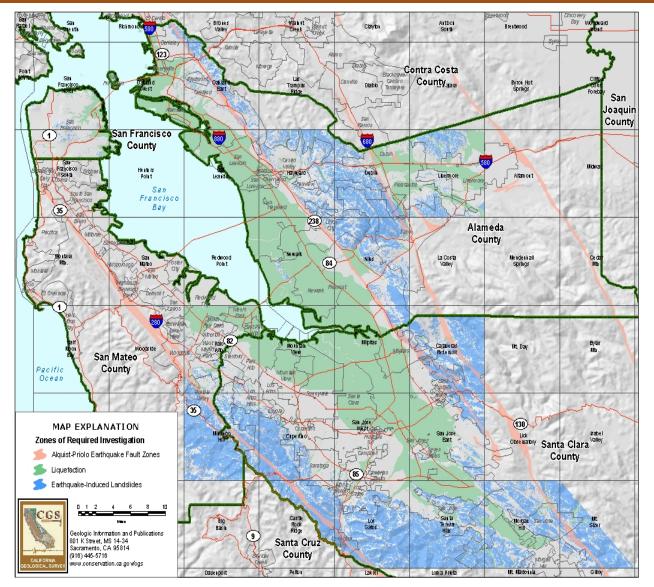|	
▨	< 0.01%
▨	0.01 - 0.02%
▨	0.02 - 0.03%
▨	0.03 - 0.05%
▨	0.05 - 0.08%
▨	0.08 - 0.10%
▨	0.10 - 0.15%
▨	0.15 - 0.47%

0   75   150   300
Kilometers

Required Hazard Information:

- PGA, PGV, and PSAs at 0.3 s and 1.0 s

- On a coordinate grid covering California

- For 8 or more hazard levels

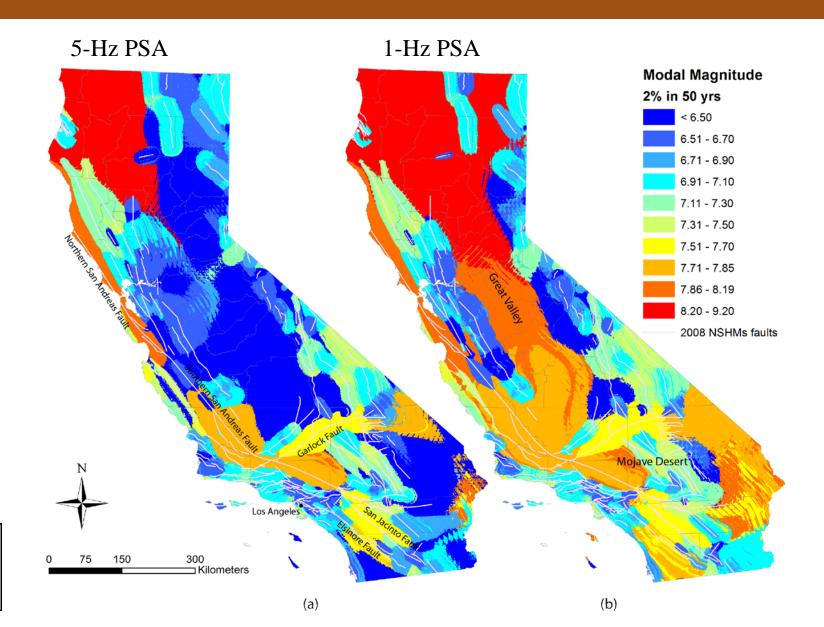- Incorporate site conditions (V_{S30})

Chen et al. 2013 *Earthquake Spectra*, 29(4)
Jaiswal et al. 2015 *Earthquake Spectra*, posted

Regulatory Liquefaction and Earthquake Induced Landslide Zone Maps

- Empowered by *Seismic Hazard Mapping Act*
- Need modal M on a grid via grid-based deaggregation
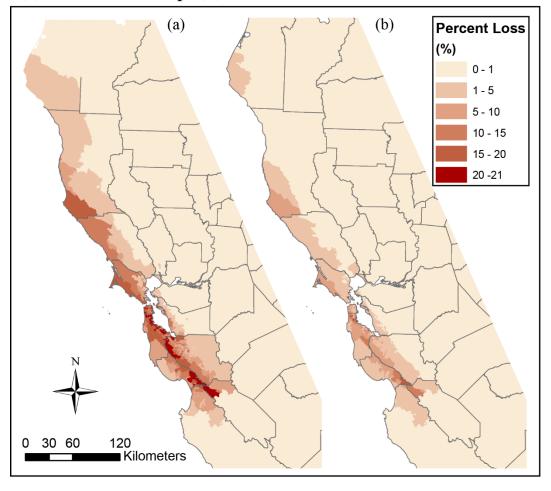- Need to scale PGA by M to account for duration effects

Examples of Modal Magnitude Maps

5-Hz PSA   1-Hz PSA

Modal Magnitude
2% in 50 yrs

- < 6.50
- 6.51 - 6.70
- 6.71 - 6.90
- 6.91 - 7.10
- 7.11 - 7.30
- 7.31 - 7.50
- 7.51 - 7.70
- 7.71 - 7.85
- 7.86 - 8.19
- 8.20 - 9.20
- 2008 NSHMs faults

(a)   (b)

Earthquake Planning Scenarios and Scenario Loss Estimation

A repeat of M7.9 1906 San Francisco earthquake,

(a) 2003 ShakeMap, (b) Frankel code with 2008 NGAs

Percent Loss (%)
- 0 - 1
- 1 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 21

For a particular earthquake we can project:

- **Ground shaking**
- Surface fault displacement
- Maps of potential liquefaction and landslide areas
- Damage to different types of structures
- Damage to infrastructure
- Economic losses

Chen et al. 2013 *Earthquake Spectra*, 29(4)