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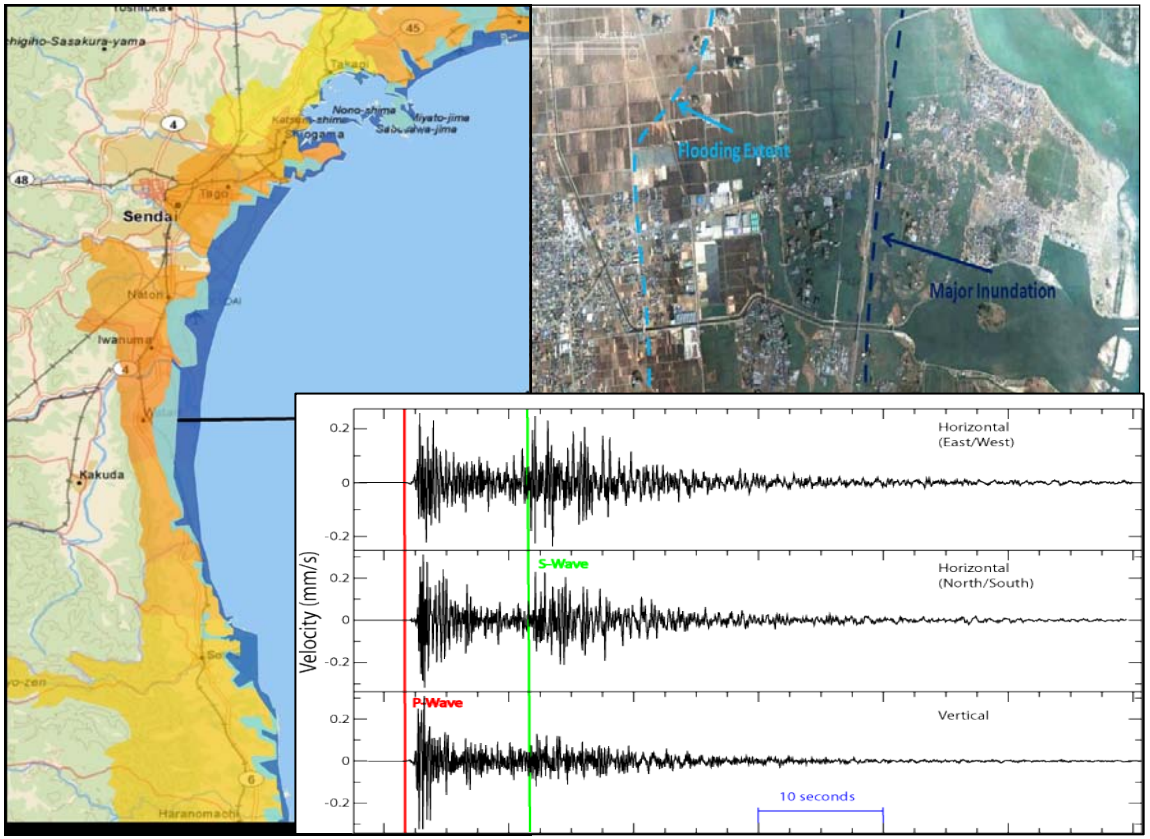
An Insurance Perspective on Recent Earthquakes

September 30, 2011
PEER Annual Meeting, Berkeley, California



Craig Tillman
President
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Framework for Today's Talk

- Overview of recent events, from an insurance perspective
- Observations about how the insurance industry manages catastrophic risks
- What the future holds...

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2010 – 2011: A Time of Learning

Chronology of Earthquake Events:

- 1/12/2010 – M7.0 Haiti
- 2/27/2010 – M8.8 Offshore Bio-Bio, Chile
- 4/04/2010 – M7.2 Baja California, Mexico
- 9/03/2010 – M7.0 New Zealand
- 2/21/2011 – M6.1 New Zealand
- 3/11/2011 – M9.0 East Coast of Honshu, Japan
- 6/13/2011 – M6.0 New Zealand
- 8/23/2011 – M5.8 Virginia

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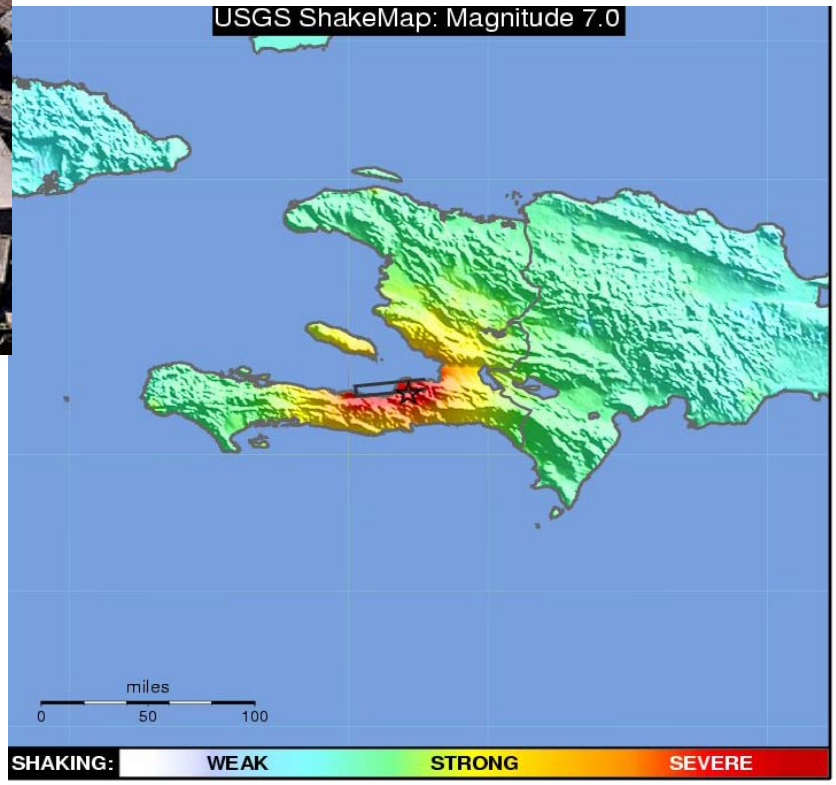
M7.0 Haiti Earthquake

(U.S. Navy photo/Kristopher Wilson)

- Approx. **220k killed**
- > **300k injured** (+70k hospitalized for cholera)
- 1.5M displaced (>1M still in camps after 10 mos.)



- Economic loss estimates (Feb 2010) range from $8 – 14B
- **Insured loss ~$0.1B**
- 280,000 buildings destroyed

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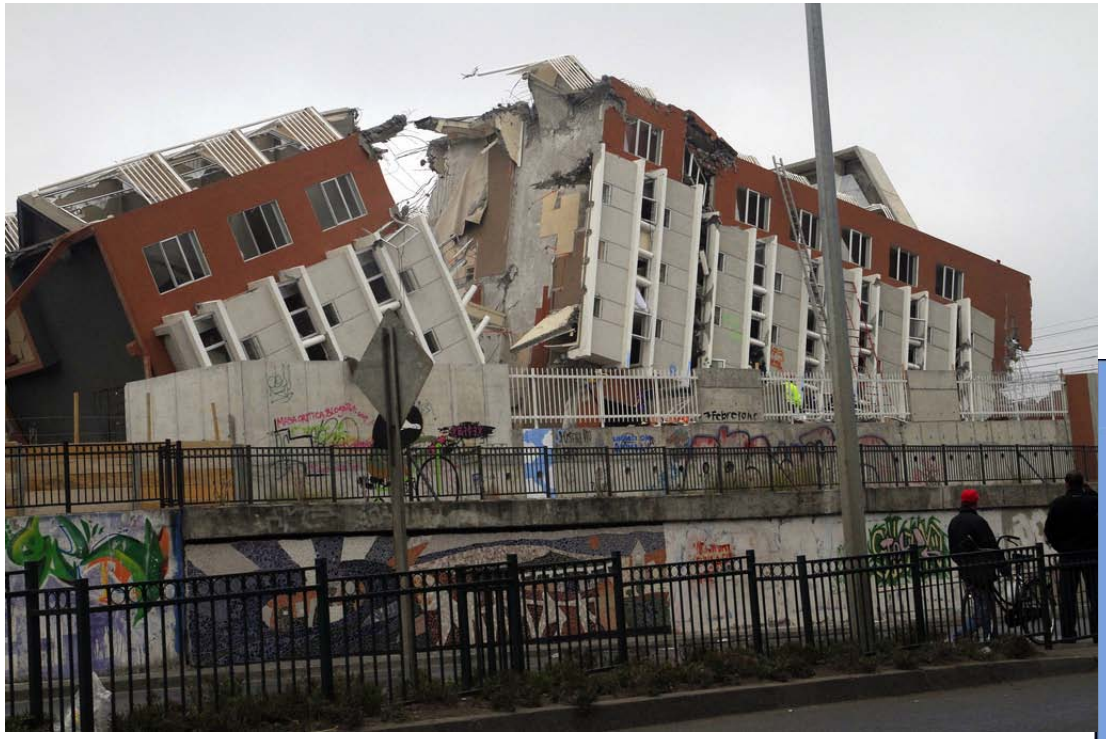
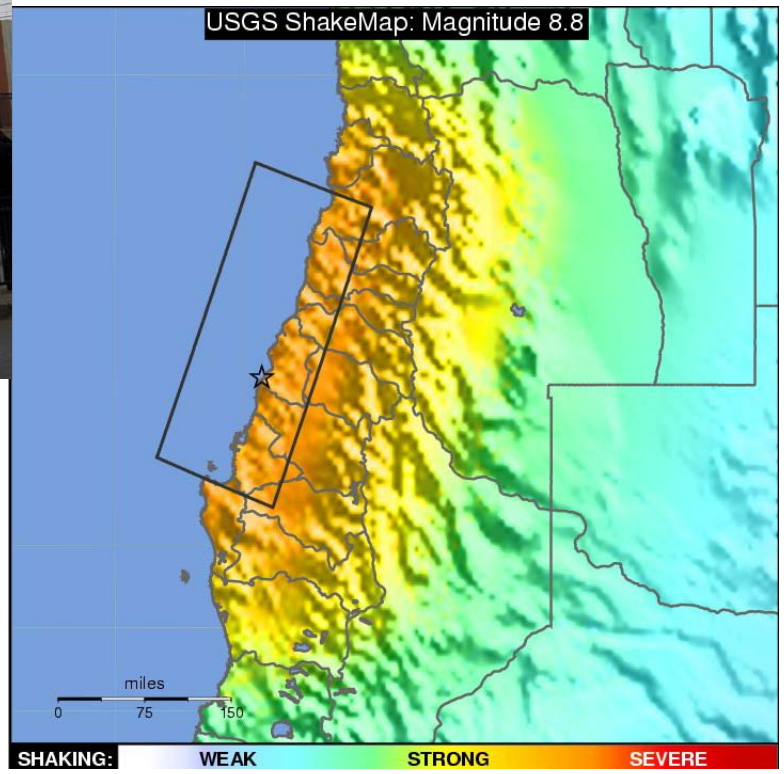
M8.8 Chile Earthquake



(Photo: Claudio Nunez)

- **< 1,000 killed**
- ~ 500 injured
- 44,000 displaced



- Economic losses range from $15 – 30B
- **Insured losses ~ $8B**
- 500,000 buildings destroyed
- Seismic codes implemented after 1960 EQ, revised 1993.

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Haiti vs. Chile – Mitigation Pays

- Implementation and enforcement of building codes reduces building damage and saves lives.
- The insurance industry wants the public to know how well mitigation pays off…

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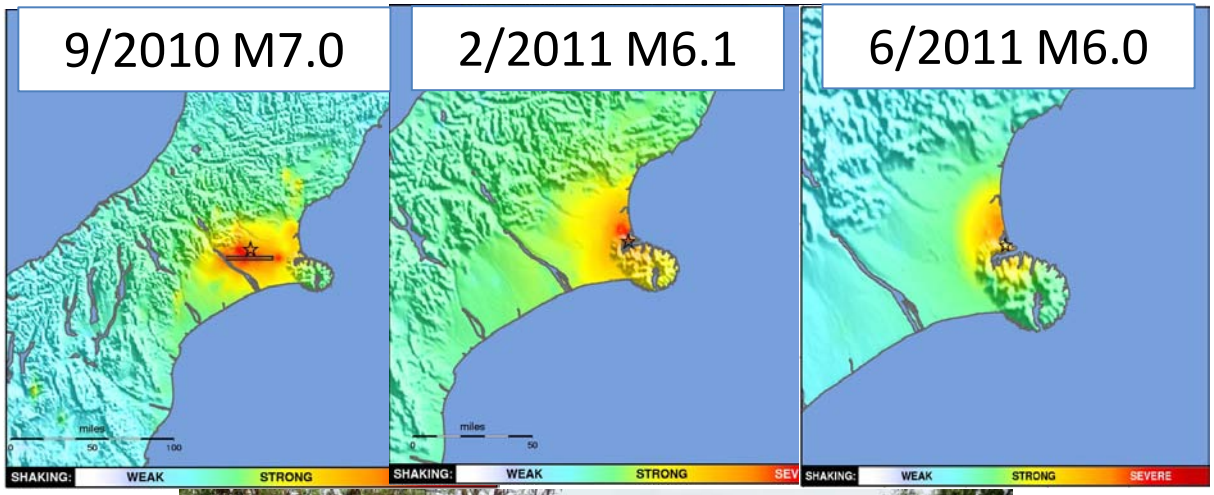
New Zealand I vs. II – The Aftershock Dominates



(Photo: Martin Luff)

- 2011 events shallower, much closer to urban center
- Insured Loss: $4.5B (9/2011) vs. $6 - $12B (2/2011)
- Deaths: 0 (9/2011) vs. 172 (2/2011)
- Extensive liquefaction damage in all 3 events. Very shallow groundwater.

NZ EQs - Surprises

- Extensive liquefaction of native soils in each event.
- While the possibility of faults in this area was recognized, the events occurred on unmapped faults (areas previously modeled as background seismicity)
- Deep sedimentary basin effects not well understood?
- Demand surge?

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M9.0 Japan Earthquake & Tsunami

- Subduction event
- ~16,000 fatalities (~5,000 missing), ~5,300 injuries
- More than 130,000 displaced
- Economic Loss > $300B, Insured Loss $25-$35B
- Ground motion of 2.93g recorded
- Secondary effects dominated
  - Tsunami
  - Nuclear Power Plant Explosions & Radiation Release
  - Dam Failure

(Photos: US Navy/Matthew M. Brady, Dylan McCord)

Japan EQ – Surprises

- Despite being in an area with a significant EQ history (400 yrs, 18 M7-8 events), the Magnitude was larger than expected – multiple segments ruptured together that had previously been modeled as rupturing individually.
- Tsunami larger than expected – sea walls were typically 10 m high.
- Large short period spike in ground motion; longer period ground motion content lower than other significant events (e.g., Kobe)

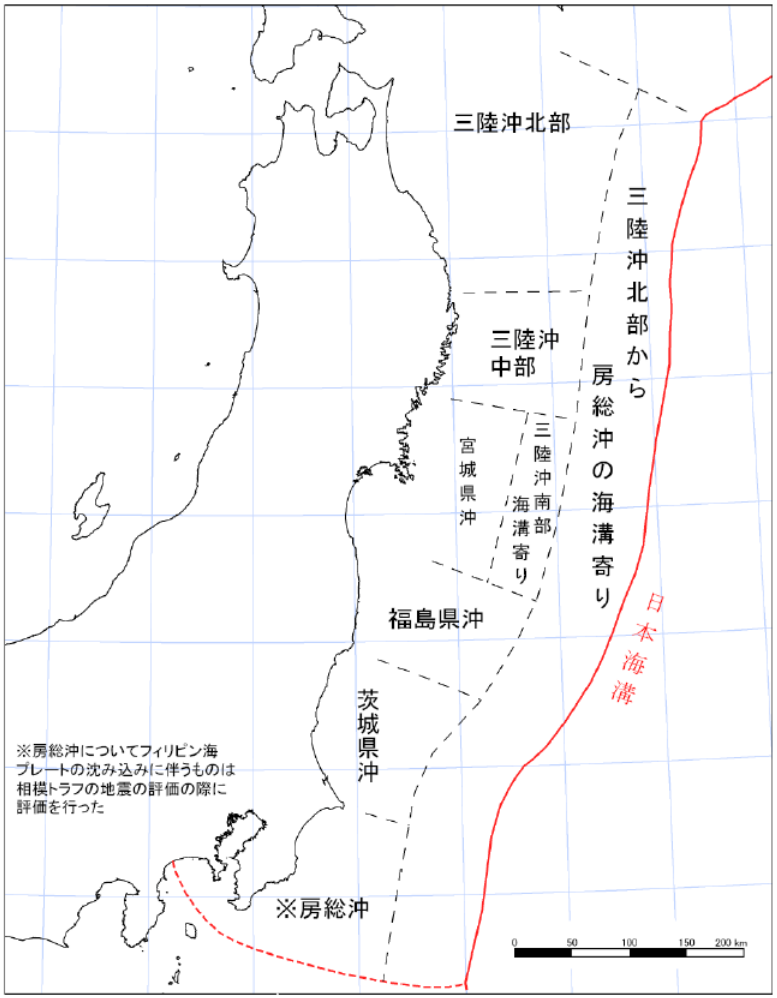

図1　三陸沖北部から房総沖の評価対象領域

地震調査委員会(2009)：三陸沖から房総沖にかけての地震活動の長期評価（一部改訂）（平成21年3月9日公表）

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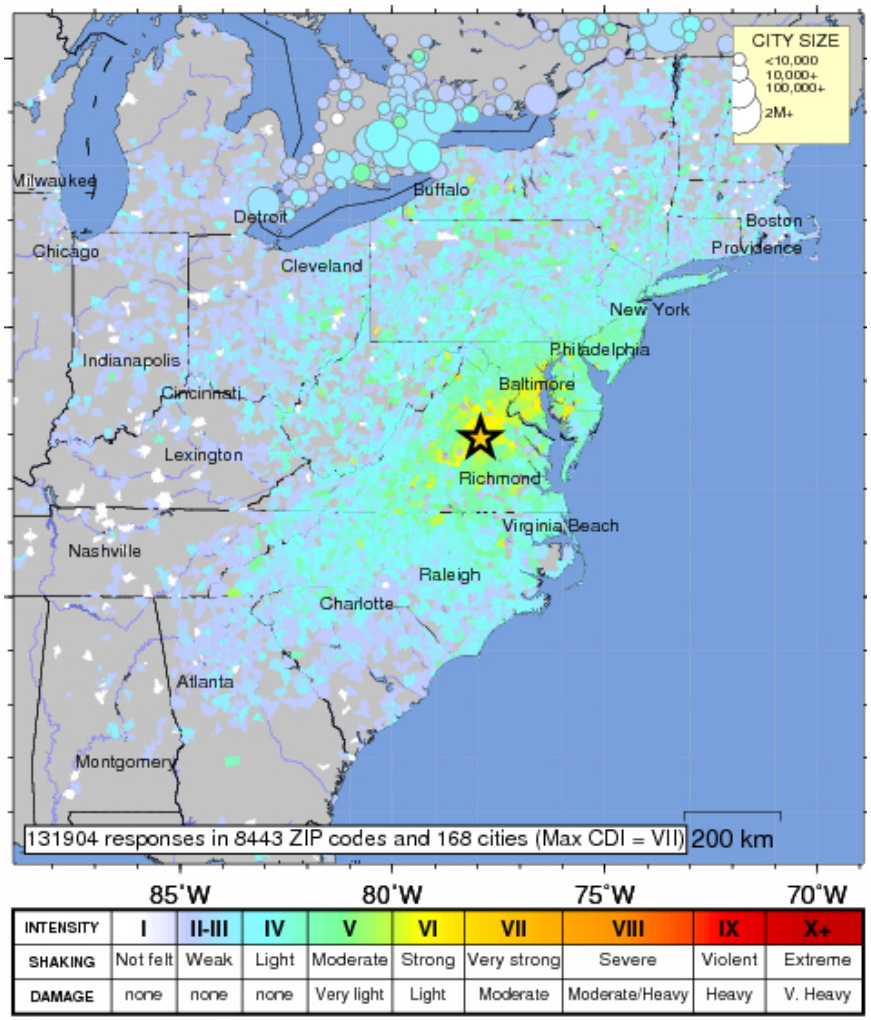
M5.8 Virginia

- Epicenter 84 miles SW of DC
- No Deaths, few injuries
- Business interruption from NYC to Richmond, VA
- Damage included URM & gable walls, and chimney collapse
- Ground stops at JFK, EWR and DCA
- Nearly coincident with Hurricane Irene
- Scenario estimates for Charleston and New Madrid



INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+
SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy

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Issues Raised by Recent Events

- NZ –
  - Are there other areas currently treated as background seismicity that could pose a significant risk?
  - How well do current models capture the effects of significant aftershocks and near-field ground motions? What does this mean for CA?
  - Extensive liquefaction highlights one of the challenges in modeling the overall risk, but also presents an opportunity for quantifying better how liquefaction influences losses.
- Japan –
  - What other fault systems (worldwide) have segments that could rupture simultaneously?
  - Many sea walls were overtopped. Where else have we engineered into a false sense of security? What does this mean for the PacNW?

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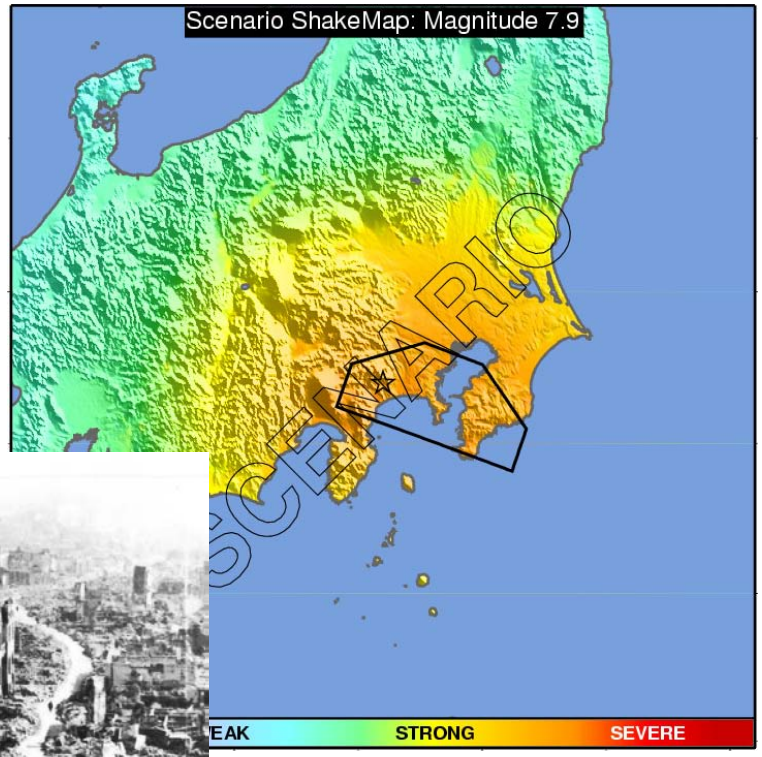
What if… 1923 Kanto Earthquake

- ~25,000 deaths (17,000 from shaking, 8,000 from fire)
- ~170,000 injuries
- Insured losses expected to exceed $100B



(Photo: USGS/ George A. Lang Collection)

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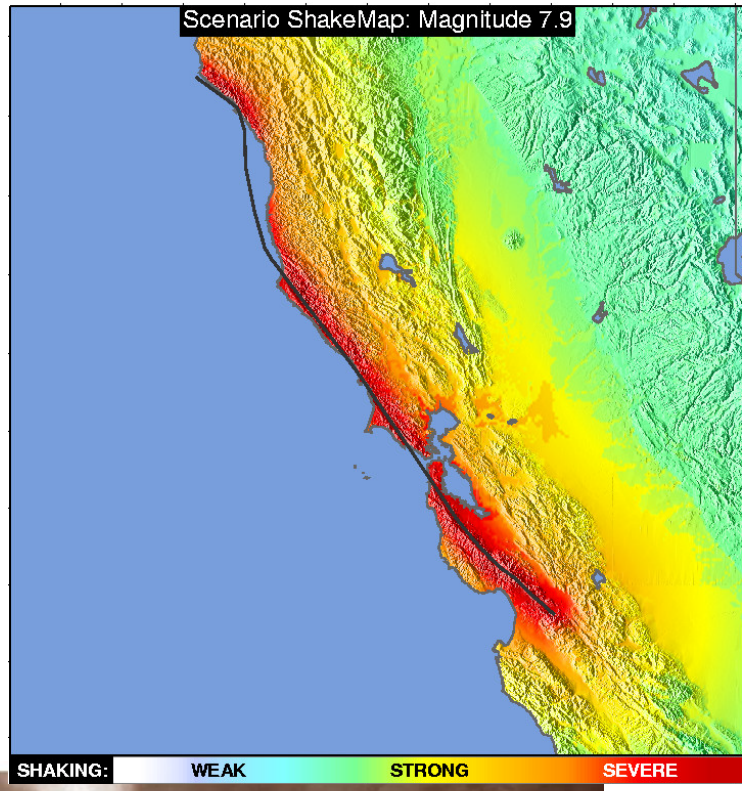
What If… 1906 San Francisco EQ

- 23,000 – 63,000 injuries, 800 - 3,400 deaths
- 160,000 – 250,000 displaced households
- 7,000 – 10,000 commercial buildings closed
- $90 – $100B in building damage & related losses; not incl. fire following
- Insured losses > $50B



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Take-Away 1

- With mitigation, catastrophe risk (even in peak exposure regions), is a manageable risk, from the perspective of the financial industry.

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Take Away 2

- The events of the last two years have reminded the insurance industry of the inherent uncertainty in managing CAT risk.
- Communities did not anticipate the size of recent events well.
- More emphasis needs to be placed on assumptions in the existing models.

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Take Away 3

- The insurance industry understands that the business of earthquake engineering is about saving lives (Haiti vs. Chile).
- The insurance industry encourages the engineering and science communities to move forward on the implementation of performance based design.

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Questions?

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