

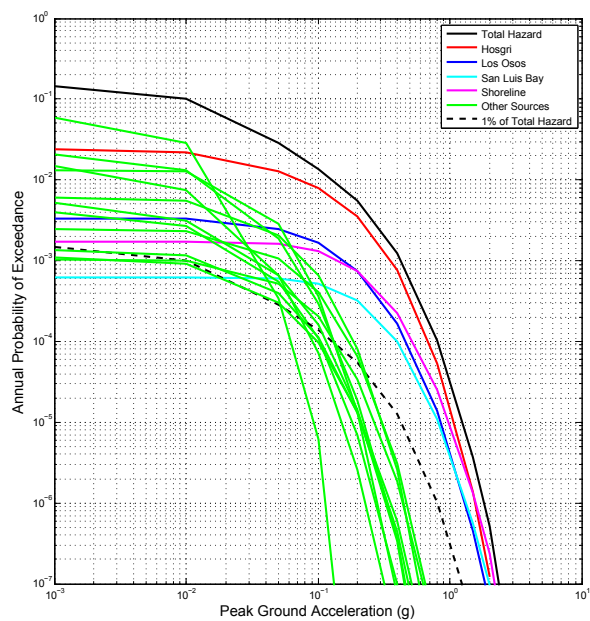
Sensitivity Studies

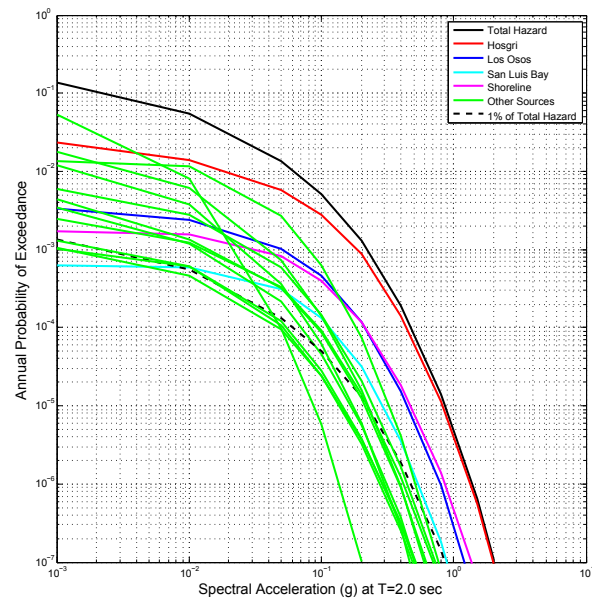
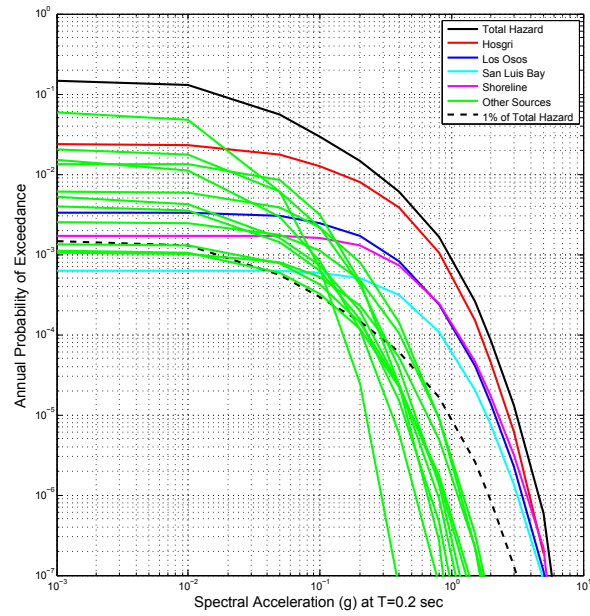
LTSP SSHAC Level 3 Update WS1
San Luis Obispo, CA

Kathryn Wooddell

Nick Gregor

11/29/2011





Seismic Source Characterization (SSC) Base Case

FAULT NAME	Percent Contribution to Total Hazard for PGA (10 ⁻⁴ Hazard Level)	Percent Contribution to Total Hazard for T=0.2sec (10 ⁻⁴ Hazard Level)	Percent Contribution to Total Hazard for T=2.0sec (10 ⁻⁴ Hazard Level)
Hosgri	51.24	54.92	75.21
Los Osos	13.47	16.36	8.06
San Luis Bay	10.73	8.70	1.82
Shoreline	24.49	19.84	9.73
Oceanic	0.00	0.00	0.19
West Huasna	0.01	0.04	0.85
Wilmar - Nipomo	0.00	0.01	0.16
Oceano - Pecho	0.02	0.05	0.16
Rinconada	0.00	0.00	0.45
Cambria	0.02	0.07	0.63
San Simeon	0.00	0.00	0.14
Casmalia	0.00	0.01	0.13
Santa Lucia Bank	0.00	0.00	0.47
SAF Southern	0.00	0.00	2.06
SAF Parkfield	0.00	0.00	0.00

Seismic Source Characterization (SSC)

Sensitivity to the following Seismic Source Characterization (SSC) Parameters was evaluated:

❑ Hosgri Fault

- Dip (degrees): (Base Case: 90 (0.1), 85 (0.4), 80 (0.5))
- Mean Characteristic Rupture Length (km): (Base Case: 20 (0.2), 45 (0.4), 70 (0.25), 110 (0.1))
- Slip Rate (mm/yr): (6 (0.1), 3 (0.4), 1 (0.4), 0.5 (0.1))
- Joint Ruptures (Hosgri)
- Location: (Hosgri Main Trace)

❑ Shoreline Fault

- Fault Length (km): (Base Case: 23 (0.2), 23 (0.4), 19 (0.3), 15 (0.1))
- Slip Rate (mm/yr): (Base Case: 1.0 (0.05), 0.6 (0.15), 0.3 (0.35), 0.1 (0.35), 0.05 (0.1))

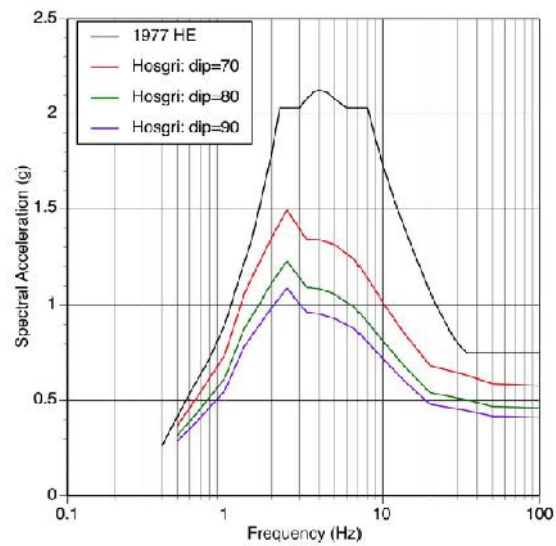
❑ Los Osos Fault

- Dip (degrees): (Base Case: 45 (0.3), 60 (0.6), 75 (0.2))
- Mean Characteristic Rupture Length (km): (19km (0.7), 36km (0.3))
- Crustal Thickness (km): (Base Case: 10 (0.2), 12 (0.6), 15 (0.2))
- Slip Rate (mm/yr): (Base Case: OBQ – 0.4v0.2h (0.6), 0.2v0.1h (0.4); REV – 0.4v (0.6), 0.2v (0.4))

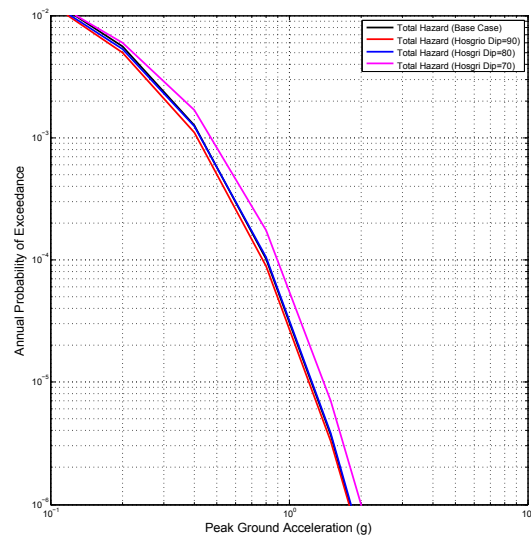
❑ San Luis Bay Fault

- Dip: (Base Case (degrees): 50 (0.2), 70 (0.4), 80 (0.4))
- Mean Characteristic Rupture Length (km): (8 (0.5), 16 (0.5))
- Crustal Thickness (km): (Base Case: 10 (0.2), 12 (0.6), 15 (0.2))
- Slip Rate: (Base Case: OBQ – 0.14v0.07h (0.8), 0.08v0.04h (0.2); REV – 0.14v (0.8), 0.08v (0.2))

Hosgri Fault: Sensitivity to Dip

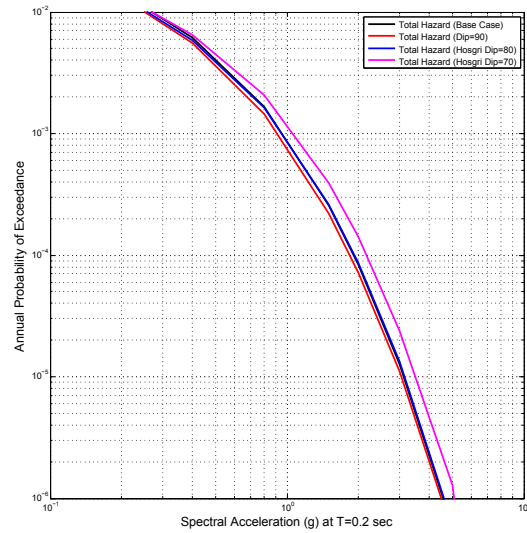


Hosgri Fault: Sensitivity to Dip



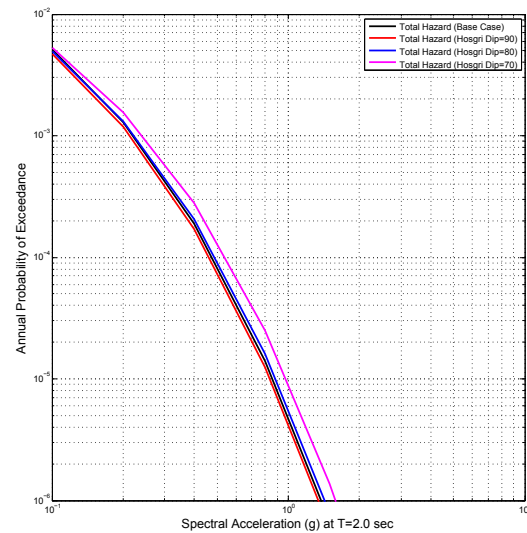
Dip (degrees): (Base Case: 90 (0.1), 85 (0.4), 80 (0.5))

Hosgri Fault: Sensitivity to Dip



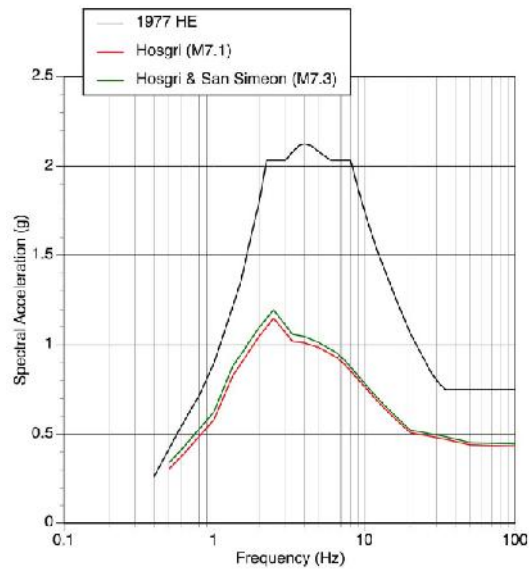
Dip (degrees): (Base Case: 90 (0.1), 85 (0.4), 80 (0.5))

Hosgri Fault: Sensitivity to Dip

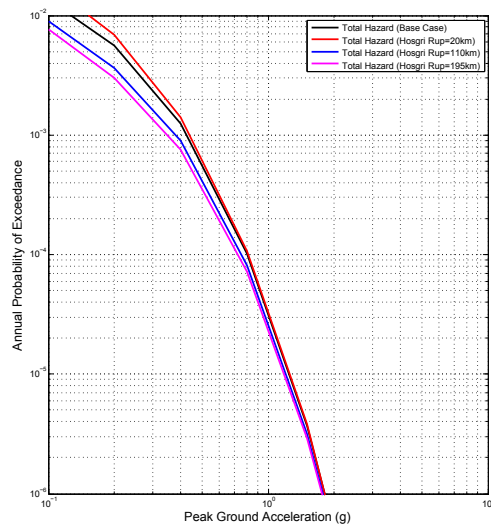


Dip (degrees): (Base Case: 90 (0.1), 85 (0.4), 80 (0.5))

Hosgri Fault: Sensitivity to Mean Char. Rupture Length

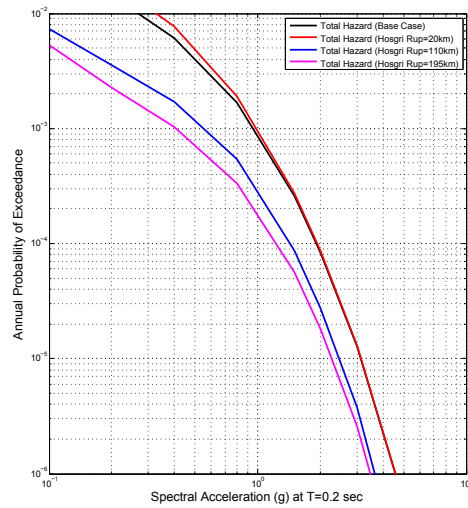


Hosgri Fault: Sensitivity to Mean Char. Rupture Length



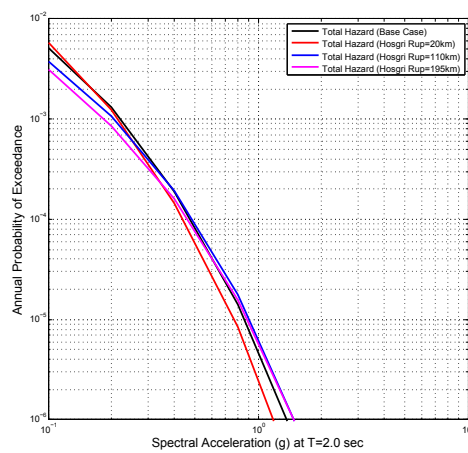
(Base Case: 20 (0.2), 45 (0.4), 70 (0.25), 110 (0.1))

Hosgri Fault: Sensitivity to Mean Char. Rupture Length



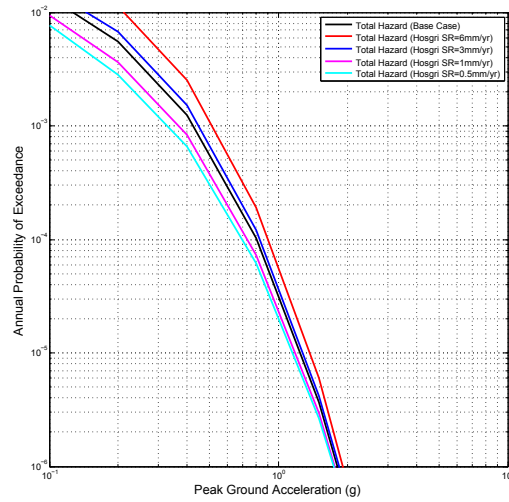
(Base Case: 20 (0.2), 45 (0.4), 70 (0.25), 110 (0.1))

Hosgri Fault: Sensitivity to Mean Char. Rupture Length



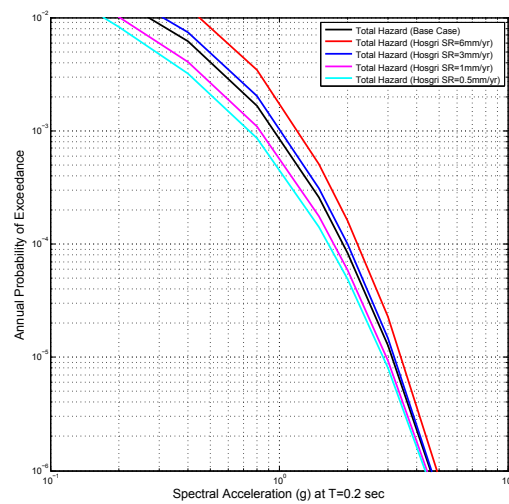
(Base Case: 20 (0.2), 45 (0.4), 70 (0.25), 110 (0.1))

Hosgri Fault: Sensitivity to Slip Rate



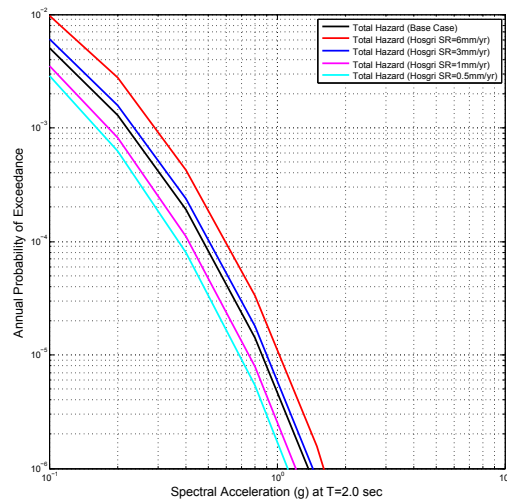
Slip Rate (mm/yr): 6 (0.1), 3 (0.4), 1 (0.4), 0.5 (0.1)

Hosgri Fault: Sensitivity to Slip Rate



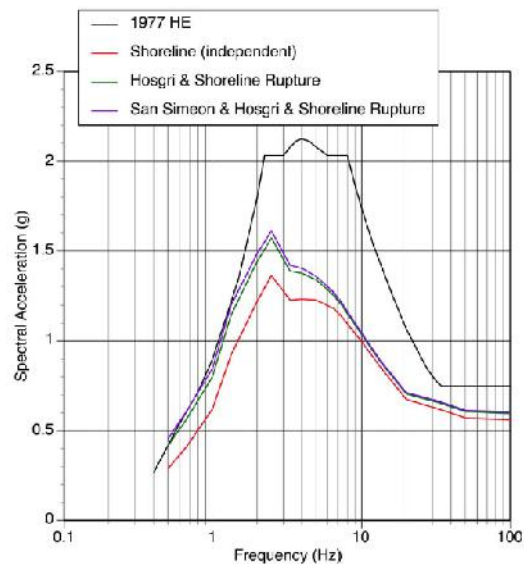
Slip Rate (mm/yr): 6 (0.1), 3 (0.4), 1 (0.4), 0.5 (0.1)

Hosgri Fault: Sensitivity to Slip Rate

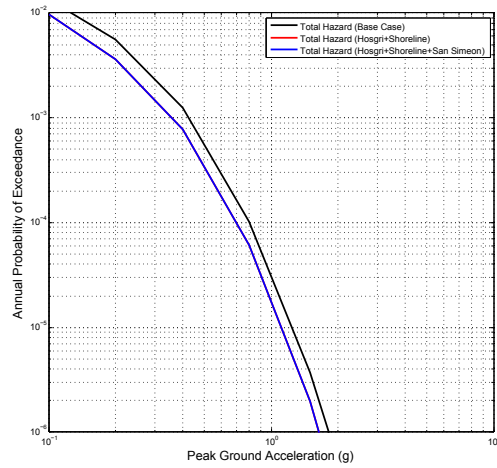


Slip Rate (mm/yr): (6 (0.1), 3 (0.4), 1 (0.4), 0.5 (0.1))

Hosgri Fault: Sensitivity to Joint Ruptures

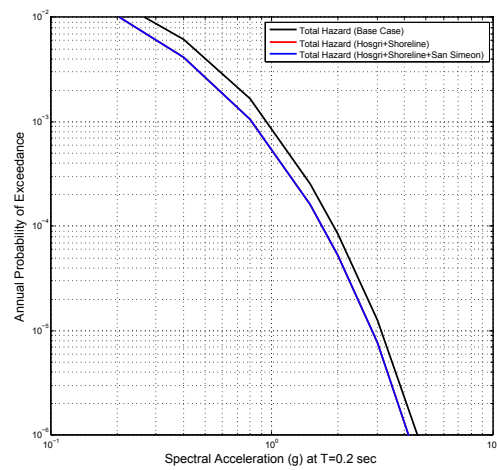


Hosgri Fault: Sensitivity to Joint Ruptures



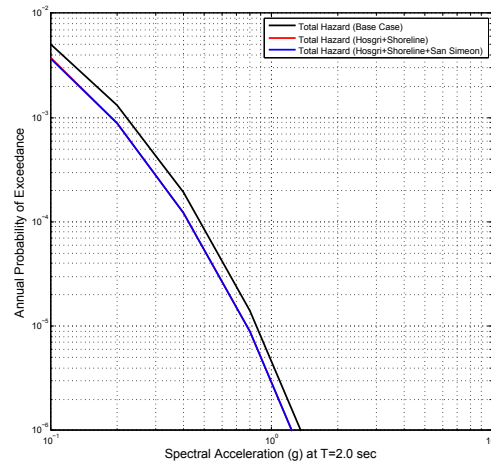
Base Case: Hosgri Alone

Hosgri Fault: Sensitivity to Joint Ruptures



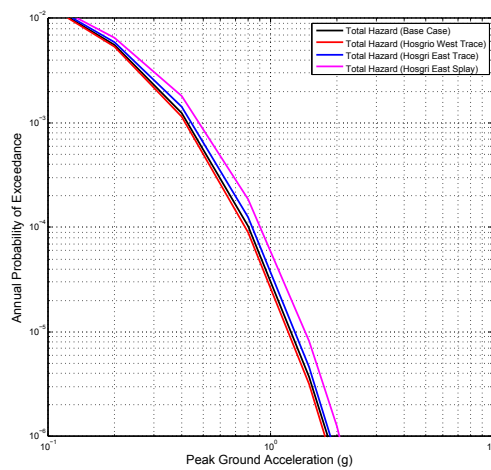
Base Case: Hosgri Alone

Hosgri Fault: Sensitivity to Joint Ruptures



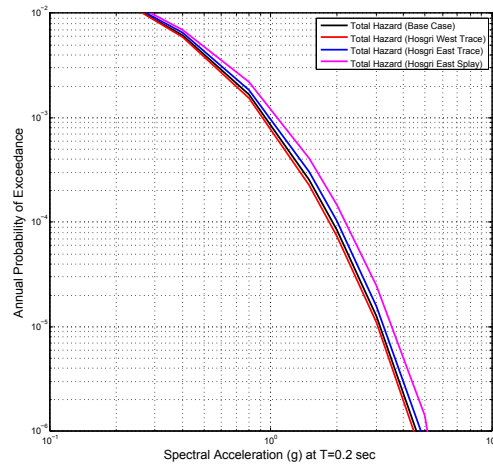
Base Case: Hosgri Alone

Hosgri Fault: Sensitivity to Location



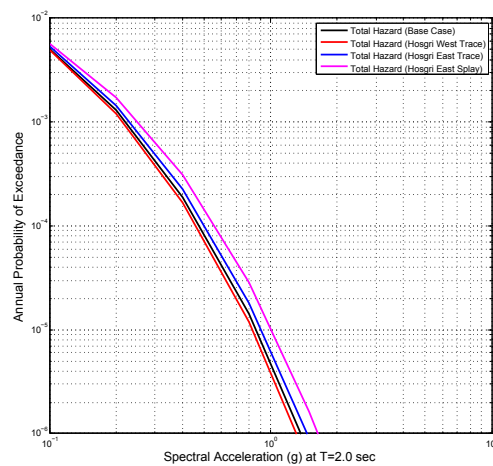
Base Case: Hosgri Main Trace

Hosgri Fault: Sensitivity to Location



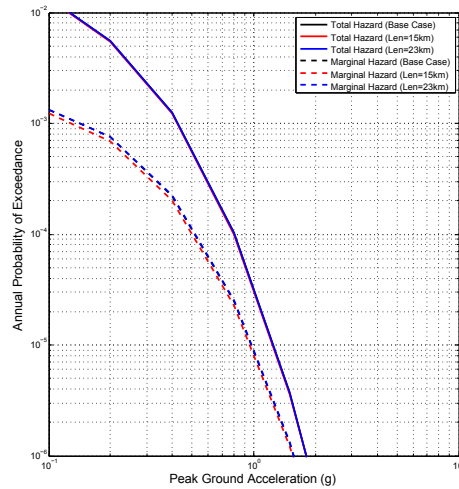
Base Case: Hosgri Main Trace

Hosgri Fault: Sensitivity to Location



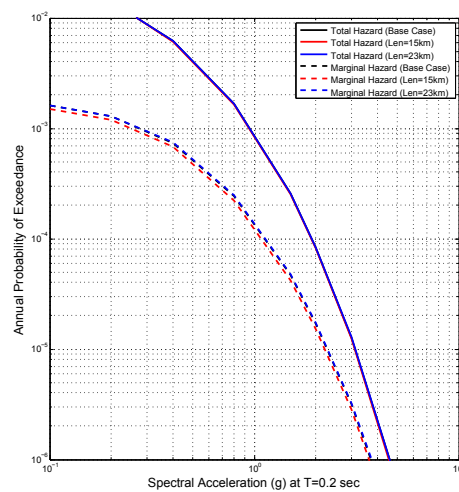
Base Case: Hosgri Main Trace

Shoreline Fault: Sensitivity to Fault Length



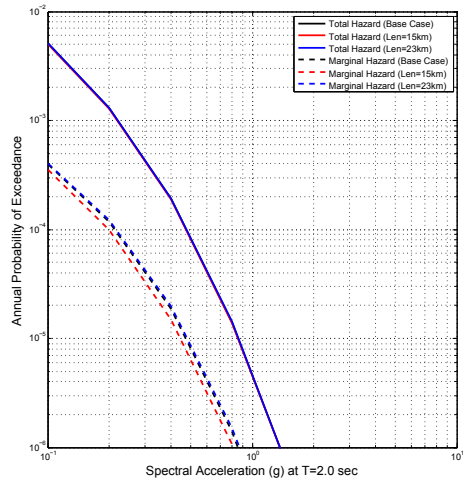
(Base Case: 23 (0.2), 23 (0.4), 19 (0.3), 15 (0.1))

Shoreline Fault: Sensitivity to Fault Length



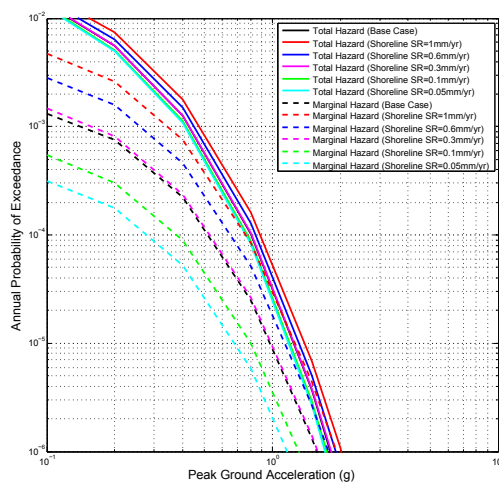
(Base Case: 23 (0.2), 23 (0.4), 19 (0.3), 15 (0.1))

Shoreline Fault: Sensitivity to Fault Length



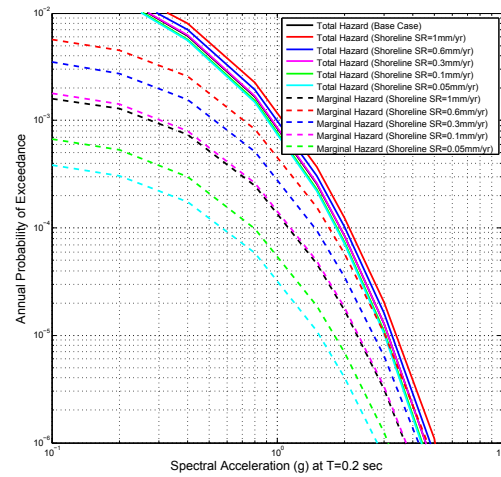
(Base Case: 23 (0.2), 23 (0.4), 19 (0.3), 15 (0.1))

Shoreline Fault: Sensitivity to Slip Rate



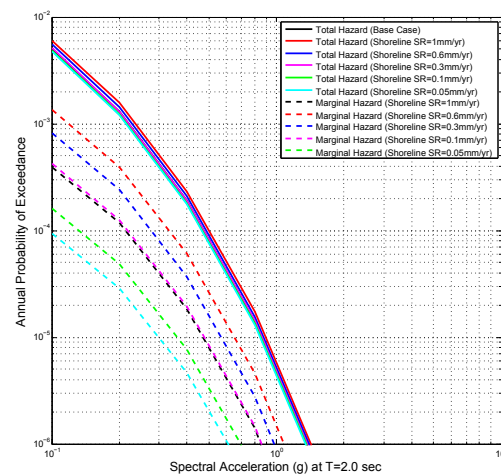
(Base Case: 1.0 (0.05), 0.6 (0.15), 0.3 (0.35), 0.1 (0.35), 0.05 (0.1))

Shoreline Fault: Sensitivity to Slip Rate



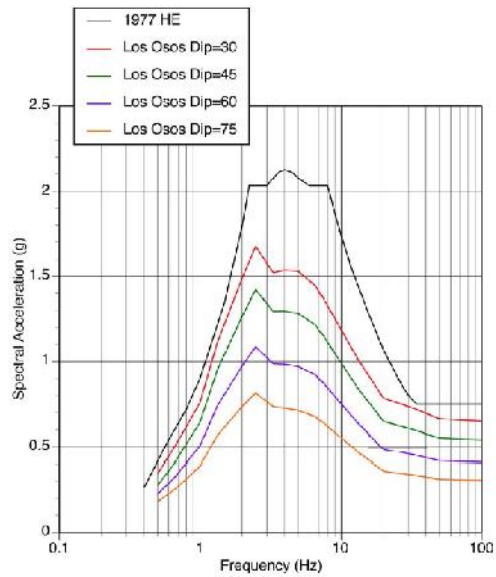
(Base Case: 1.0 (0.05), 0.6 (0.15), 0.3 (0.35), 0.1 (0.35), 0.05 (0.1))

Shoreline Fault: Sensitivity to Slip Rate

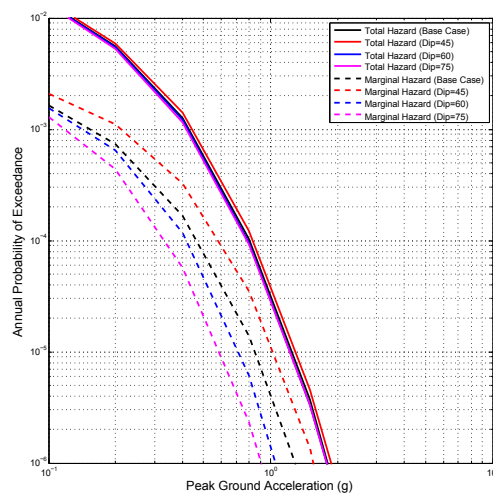


(Base Case: 1.0 (0.05), 0.6 (0.15), 0.3 (0.35), 0.1 (0.35), 0.05 (0.1))

Los Osos Fault: Sensitivity to Dip

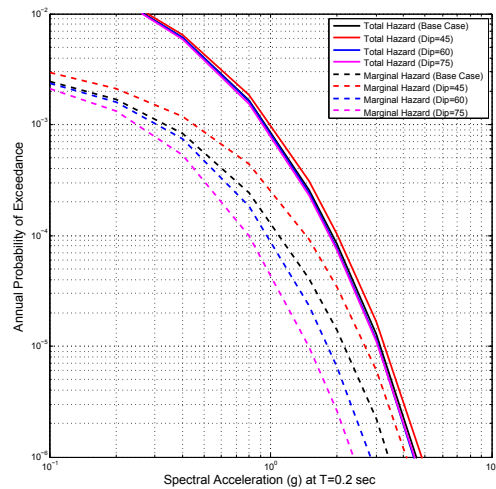


Los Osos Fault: Sensitivity to Dip



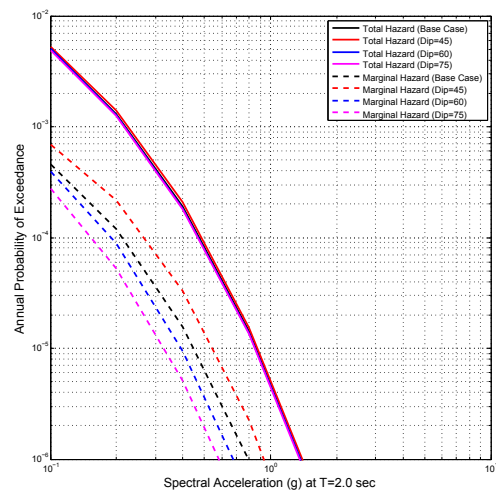
(Base Case: 45 (0.3), 60 (0.6), 75 (0.2))

Los Osos Fault: Sensitivity to Dip



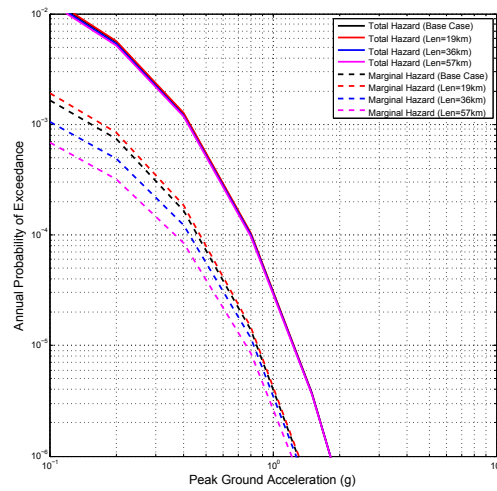
(Base Case: 45 (0.3), 60 (0.6), 75 (0.2))

Los Osos Fault: Sensitivity to Dip



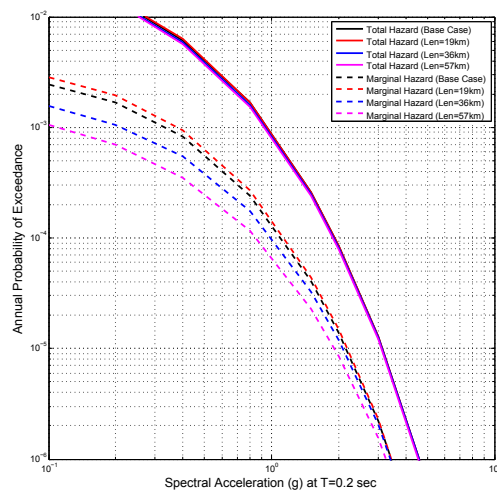
(Base Case: 45 (0.3), 60 (0.6), 75 (0.2))

Los Osos Fault: Sensitivity to Rupture Length



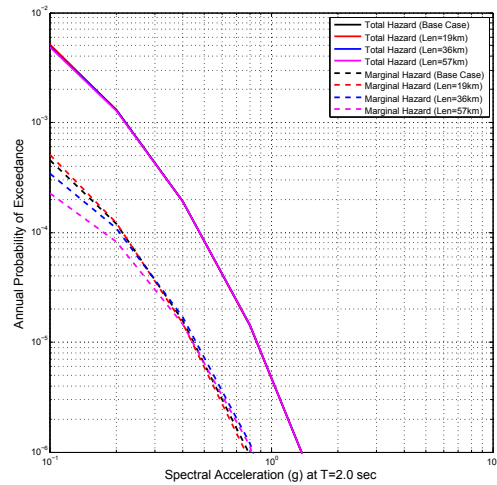
Base Case: (19km (0.7), 36km (0.3))

Los Osos Fault: Sensitivity to Rupture Length



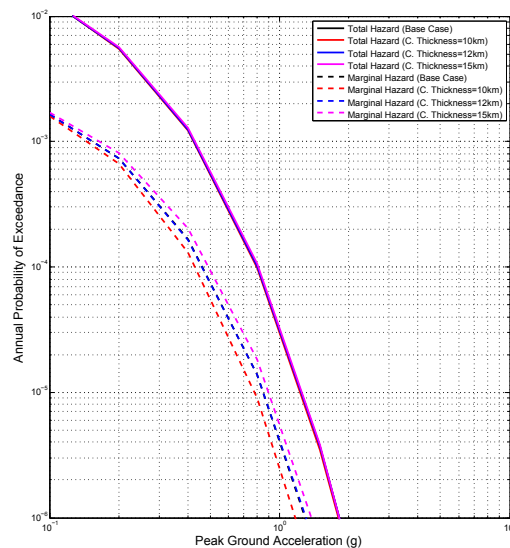
Base Case: (19km (0.7), 36km (0.3))

Los Osos Fault: Sensitivity to Rupture Length



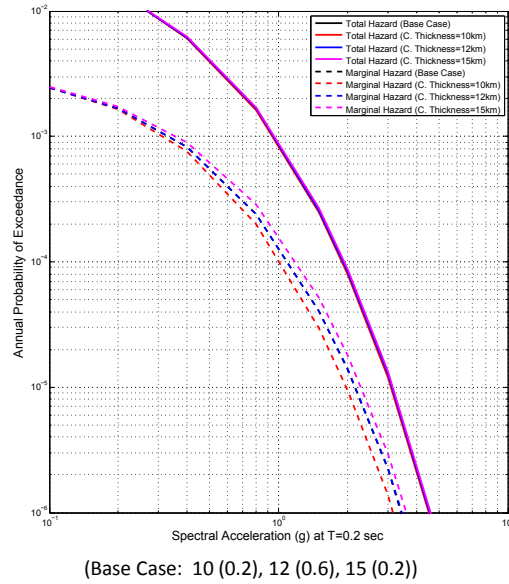
Base Case: (19km (0.7), 36km (0.3))

Los Osos Fault: Sensitivity to Crustal Thickness

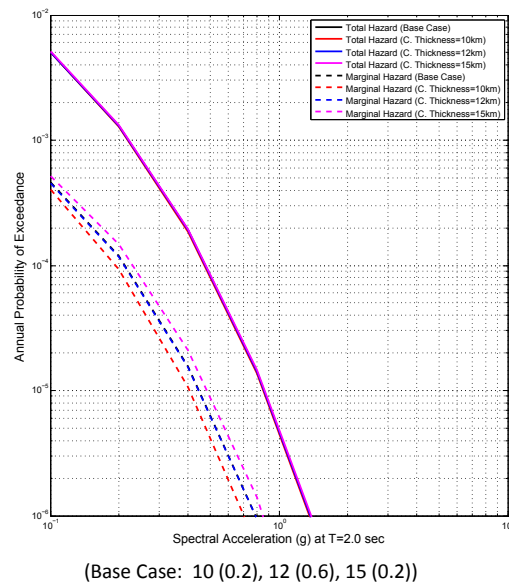


(Base Case: 10 (0.2), 12 (0.6), 15 (0.2))

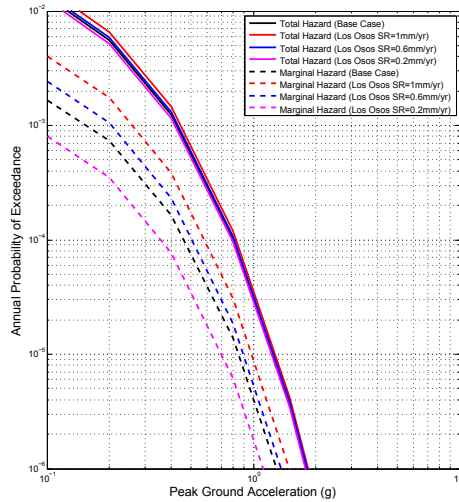
Los Osos Fault: Sensitivity to Crustal Thickness



Los Osos Fault: Sensitivity to Crustal Thickness

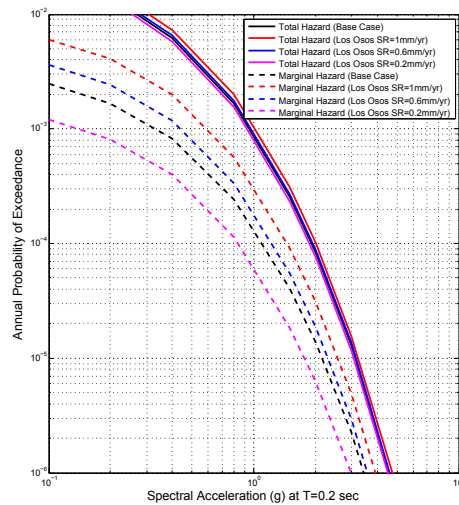


Los Osos Fault: Sensitivity to Slip Rate



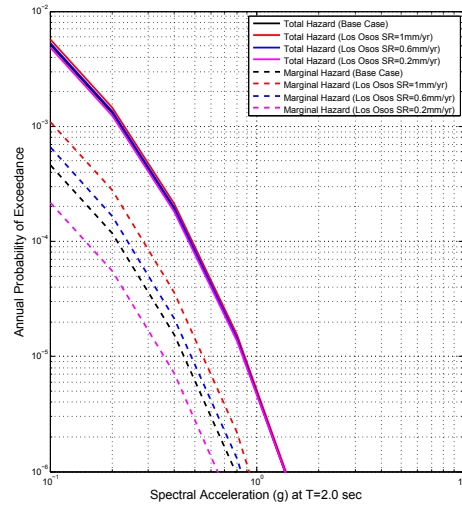
(Base Case: OBQ – 0.4v0.2h (0.6), 0.2v0.1h (0.4); REV – 0.4v (0.6), 0.2v (0.4))

Los Osos Fault: Sensitivity to Slip Rate



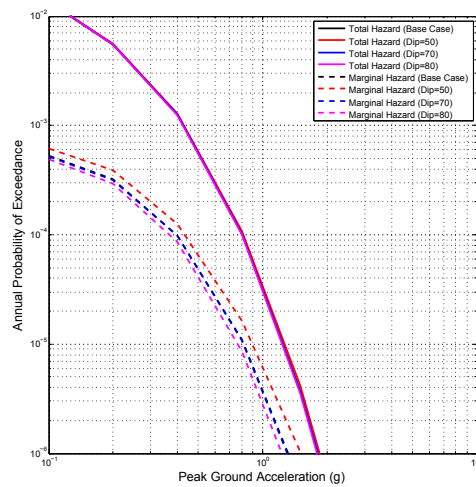
(Base Case: OBQ – 0.4v0.2h (0.6), 0.2v0.1h (0.4); REV – 0.4v (0.6), 0.2v (0.4))

Los Osos Fault: Sensitivity to Slip Rate



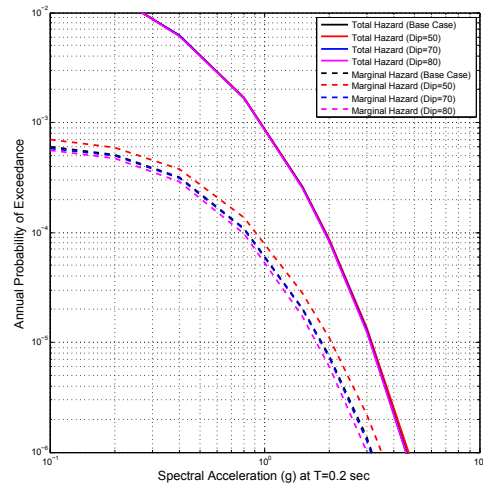
(Base Case: OBQ – 0.4v0.2h (0.6), 0.2v0.1h (0.4); REV – 0.4v (0.6), 0.2v (0.4))

San Luis Bay Fault: Sensitivity to Dip



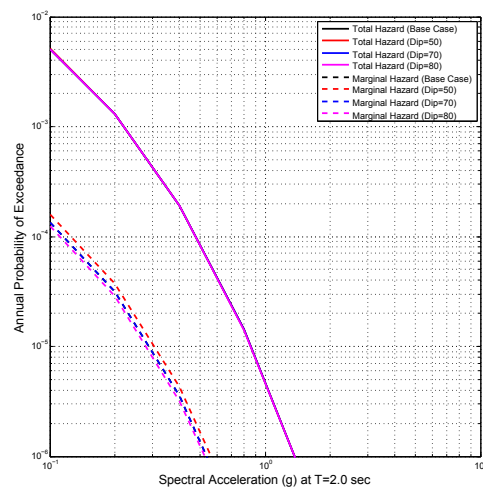
(Base Case (degrees): 50 (0.2), 70 (0.4), 80 (0.4))

San Luis Bay Fault: Sensitivity to Dip



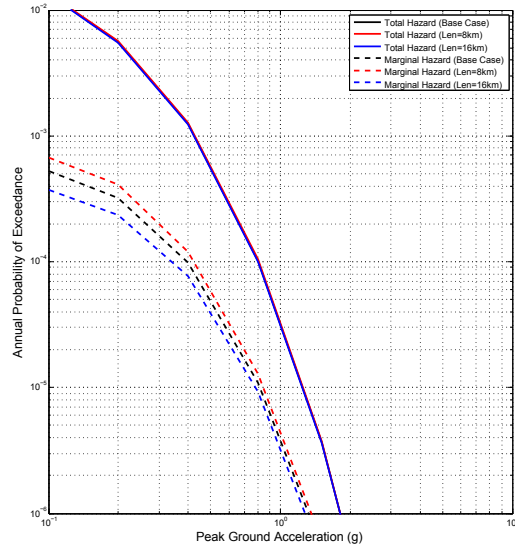
(Base Case (degrees): 50 (0.2), 70 (0.4), 80 (0.4))

San Luis Bay Fault: Sensitivity to Dip



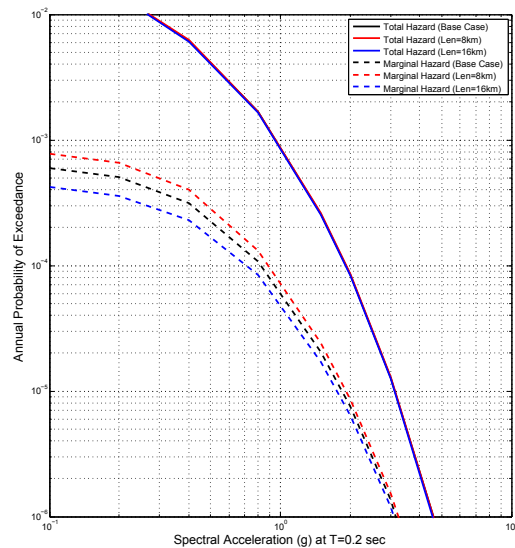
(Base Case (degrees): 50 (0.2), 70 (0.4), 80 (0.4))

San Luis Bay Fault: Sensitivity to Rupture Length



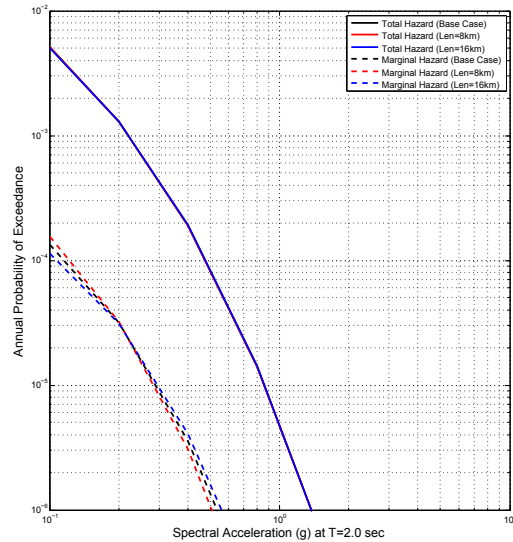
Base Case: (8 (0.5), 16 (0.5))

San Luis Bay Fault: Sensitivity to Rupture Length



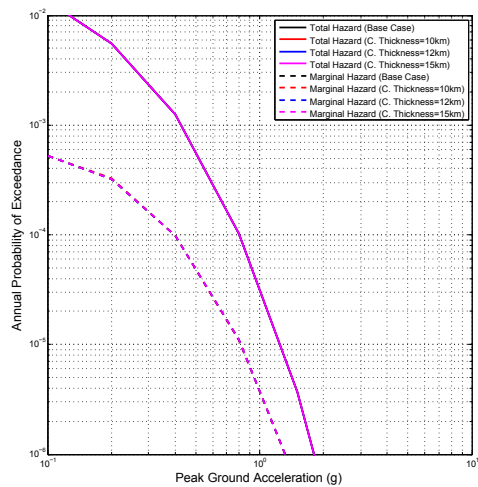
Base Case: (8 (0.5), 16 (0.5))

San Luis Bay Fault: Sensitivity to Rupture Length



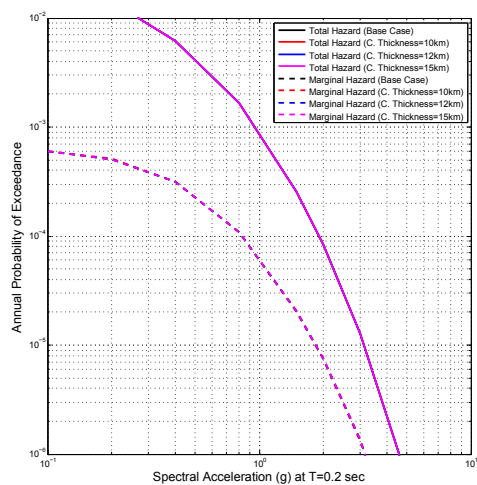
Base Case: (8 (0.5), 16 (0.5))

San Luis Bay Fault: Sensitivity to Crustal Thickness



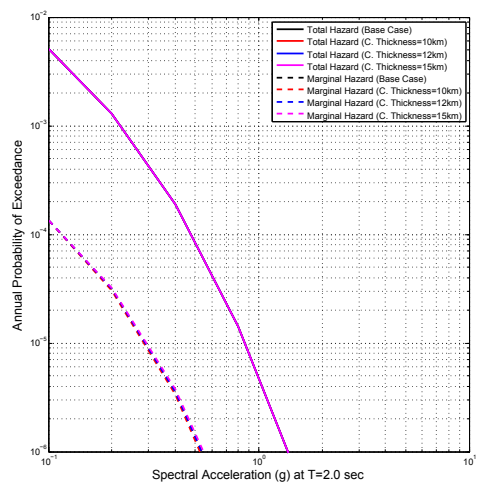
(Base Case: 10 (0.2), 12 (0.6), 15 (0.2))

San Luis Bay Fault: Sensitivity to Crustal Thickness



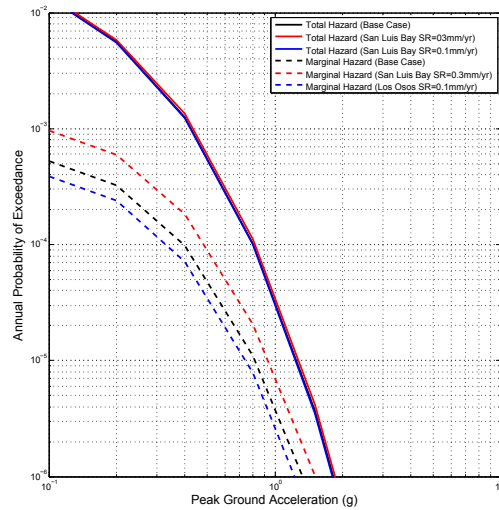
(Base Case: 10 (0.2), 12 (0.6), 15 (0.2))

San Luis Bay Fault: Sensitivity to Crustal Thickness



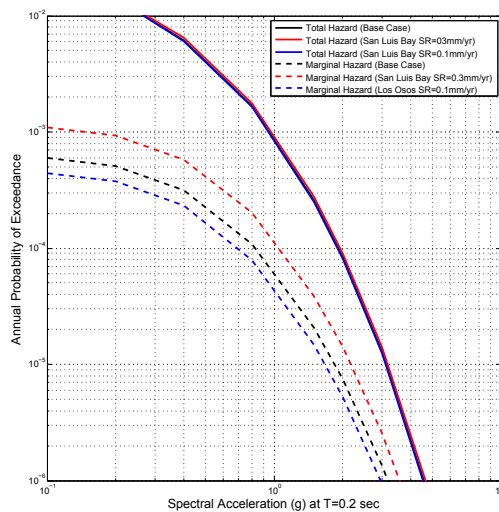
(Base Case: 10 (0.2), 12 (0.6), 15 (0.2))

San Luis Bay Fault: Sensitivity to Slip Rate



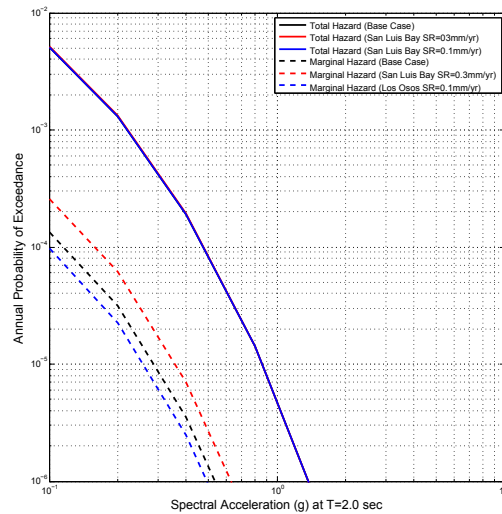
(Base Case: OBQ—0.14v0.07h (0.8), 0.08v0.04h (0.2); REV — 0.14v (0.8), 0.08v (0.2))

San Luis Bay Fault: Sensitivity to Slip Rate



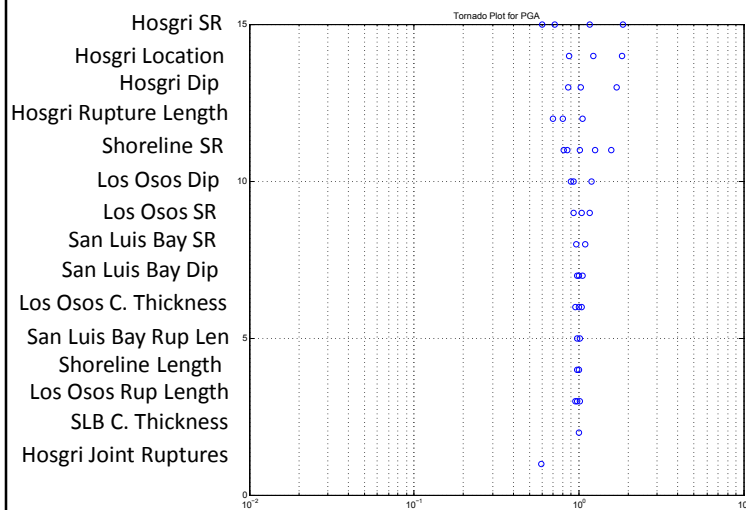
(Base Case: OBQ—0.14v0.07h (0.8), 0.08v0.04h (0.2); REV — 0.14v (0.8), 0.08v (0.2))

San Luis Bay Fault: Sensitivity to Slip Rate

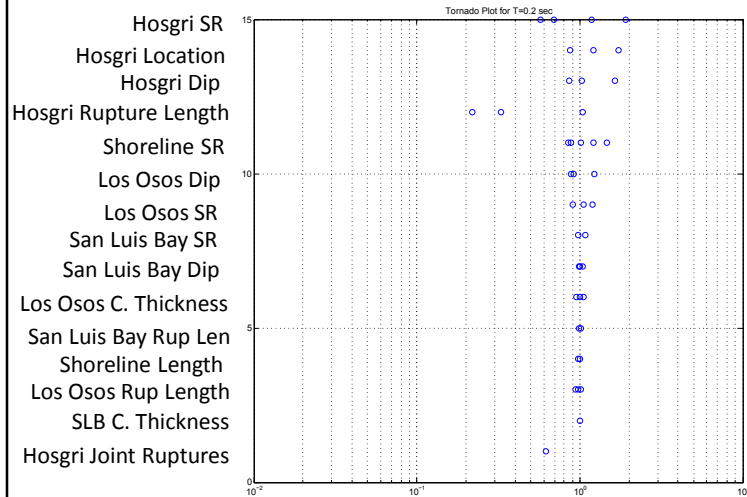


(Base Case: OBQ—0.14v0.07h (0.8), 0.08v0.04h (0.2); REV — 0.14v (0.8), 0.08v (0.2))

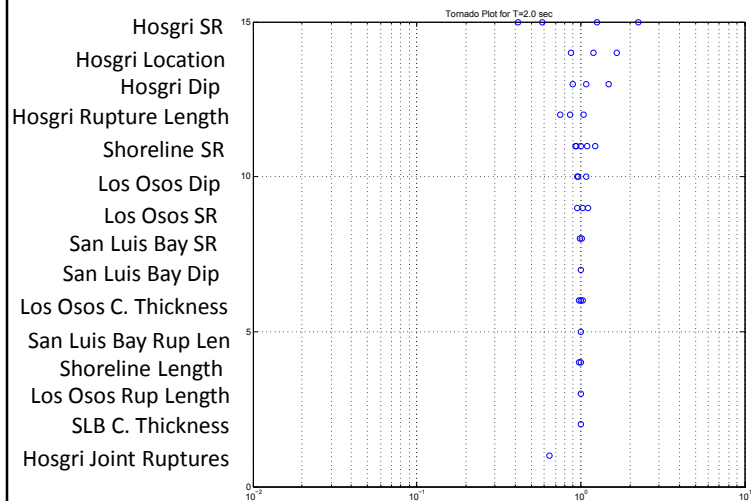
Summary of SSC Sensitivity: PGA



Summary of SSC Sensitivity: T=0.2 sec



Summary of SSC Sensitivity: T=2.0 sec

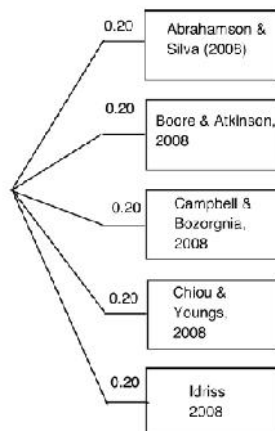


Ground Motion Characterization (GMC)

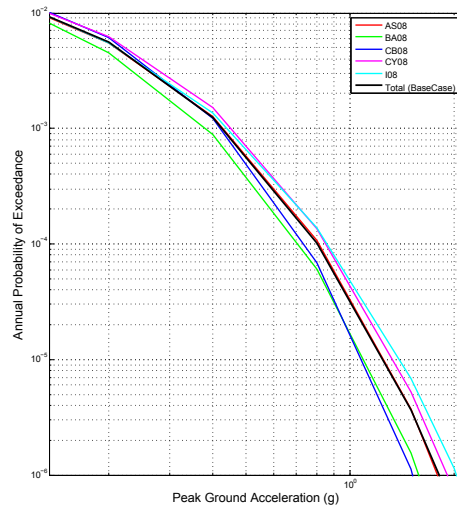
Sensitivity to the following Ground Motion Characterization (GMC) Parameters was evaluated:

- ☐ Ground Motion Prediction Equations (GMPEs)
 - Next Generation Attenuation (NGA) Models
 - Additional Epistemic Uncertainty Model
- ☐ Ergodic Assumption
 - Site-Specific Single-Station Sigma Approach vs. Ergodic Approach
- ☐ Hanging Wall Factor
 - HW factor in the AS08 model
 - HW factor in the CY08 model
- ☐ Sigma Model
 - 3 Constant ϕ iSS models
 - Magnitude Dependent ϕ iSS
 - Magnitude & Distance Dependent ϕ iSS
- ☐ Sigma Truncation for Ground Motion Model
- ☐ Directivity
 - Average Horizontal
 - Fault Normal
 - Fault Parallel
 - Spudich & Chiou
- ☐ Fling

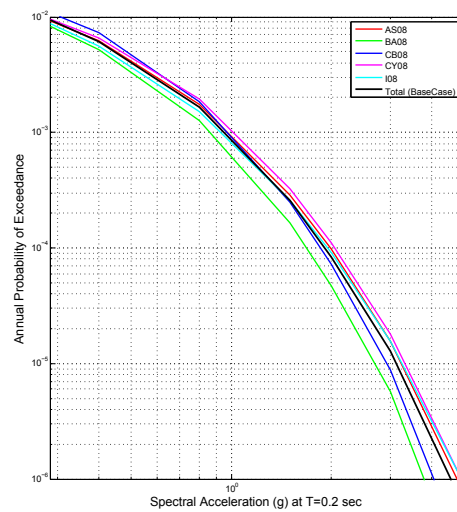
Ground Motion Model Logic tree



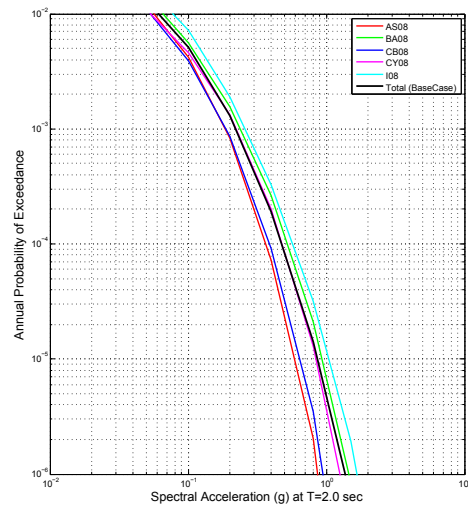
Sensitivity to GMPE



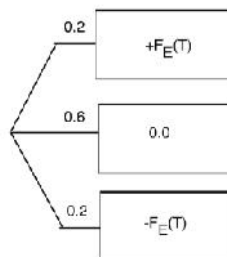
Sensitivity to GMPE



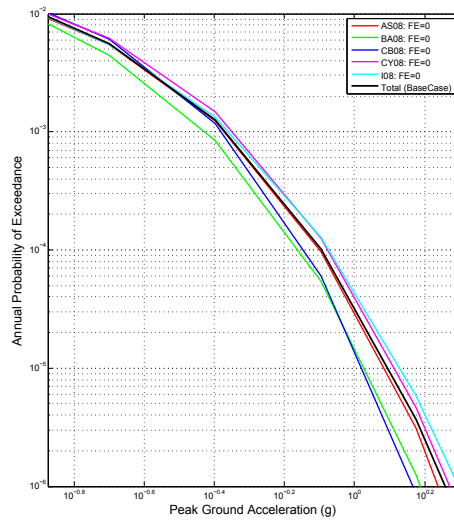
Sensitivity to GMPE



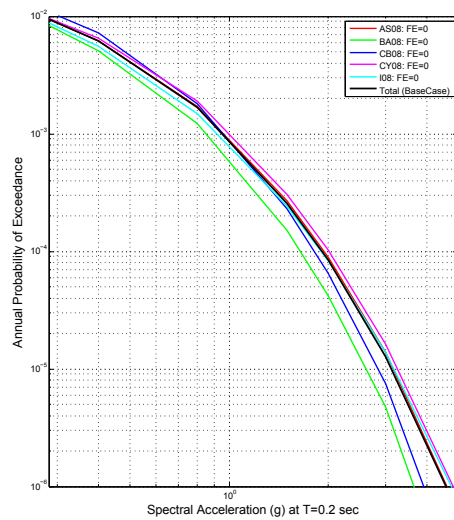
Epistemic Uncertainty Logic tree



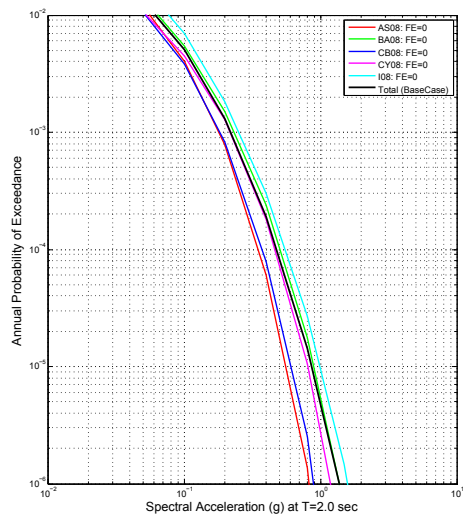
GMPEs: $FE(T)=0.0$



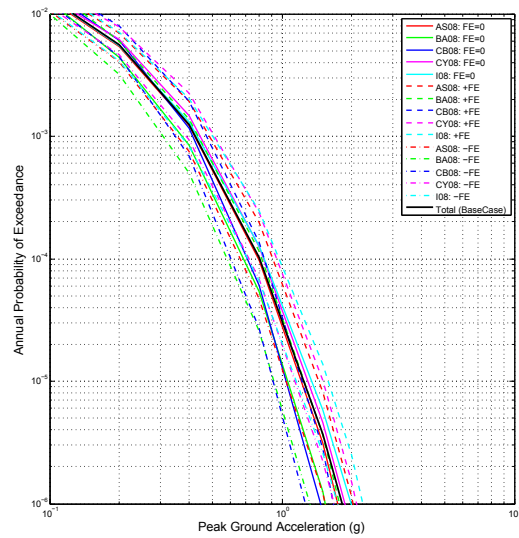
GMPEs: $FE(T)=0.0$



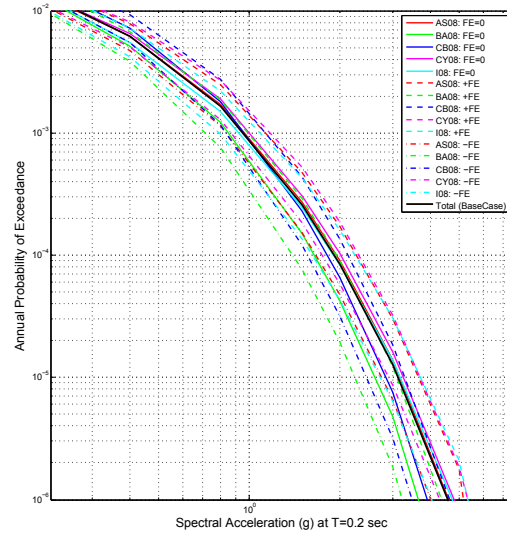
GMPEs: $FE(T)=0.0$



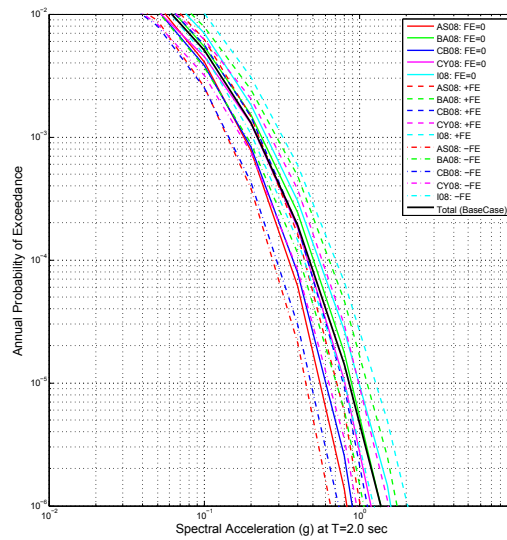
GMPEs $\pm FE(T)$



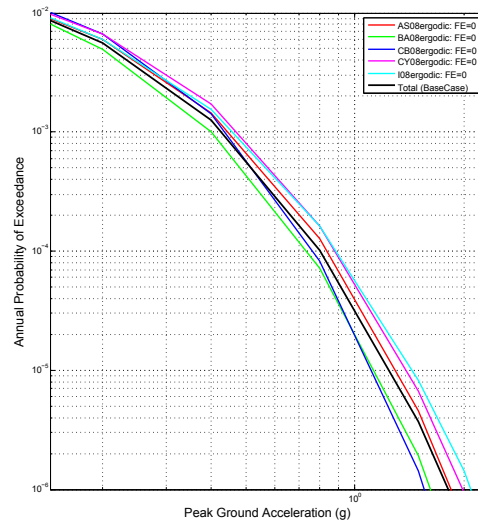
GMPEs $\pm$ FE(T)



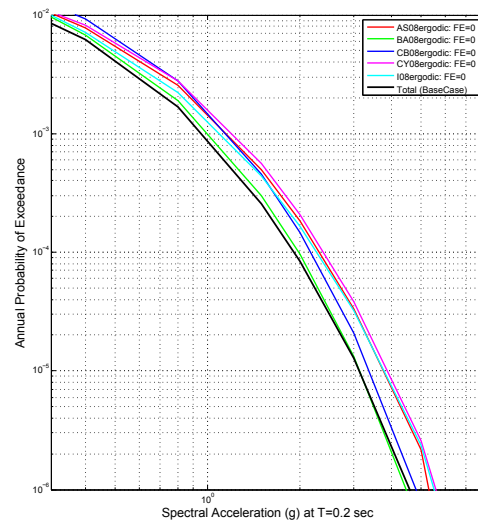
GMPEs $\pm$ FE(T)



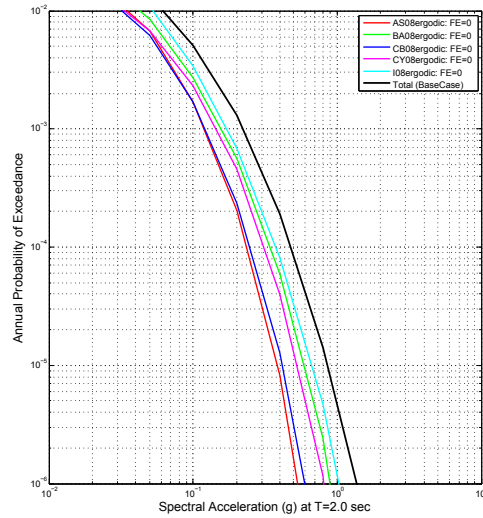
Sensitivity to Ergodic Assumption: $FE(T)=0.0$



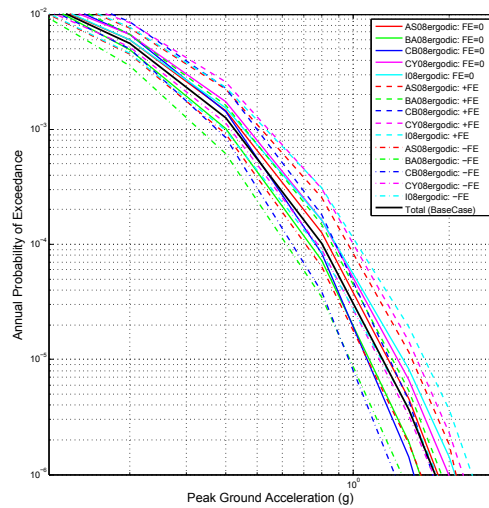
Sensitivity to Ergodic Assumption: $FE(T)=0.0$



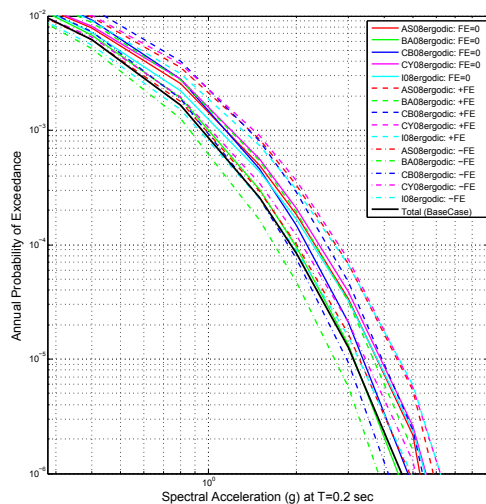
Sensitivity to Ergodic Assumption: $FE(T)=0.0$



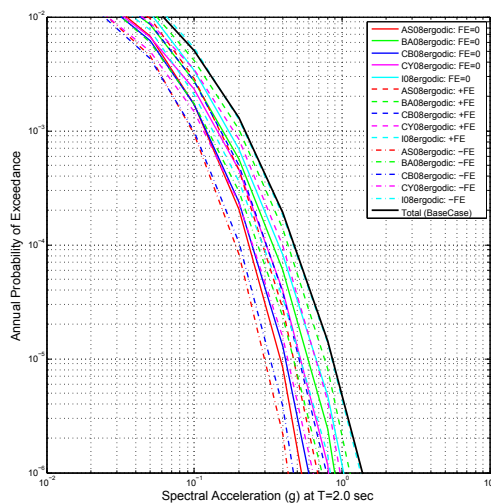
Sensitivity to Ergodic Assumption $\pm FE(T)$



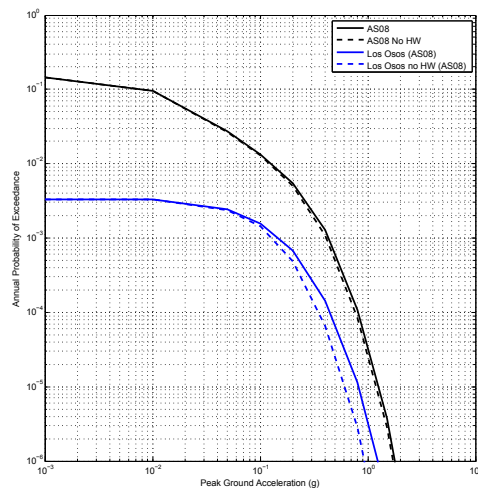
Sensitivity to Ergodic Assumption $\pm$ FE(T)



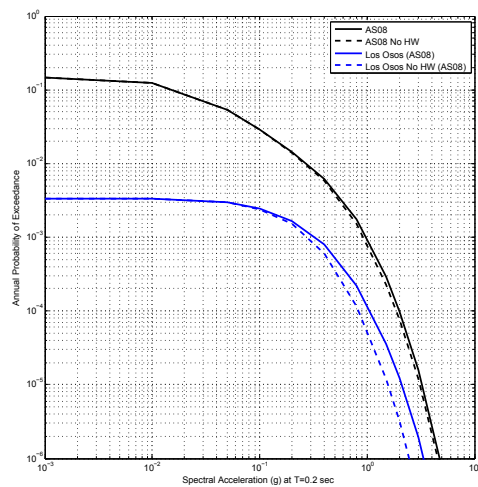
Sensitivity to Ergodic Assumption $\pm$ FE(T)



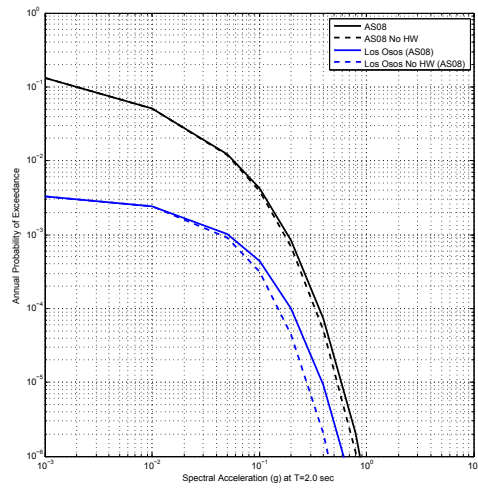
Sensitivity to HW: AS08



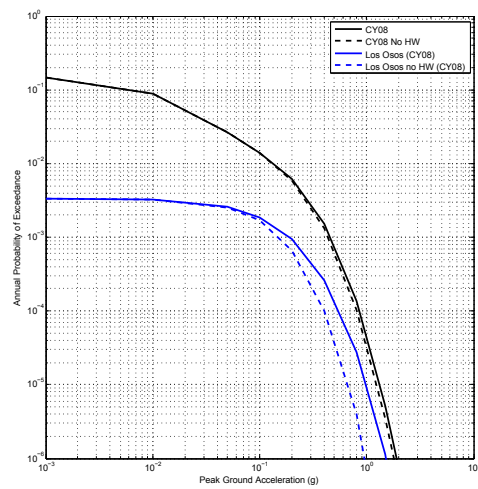
Sensitivity to HW: AS08



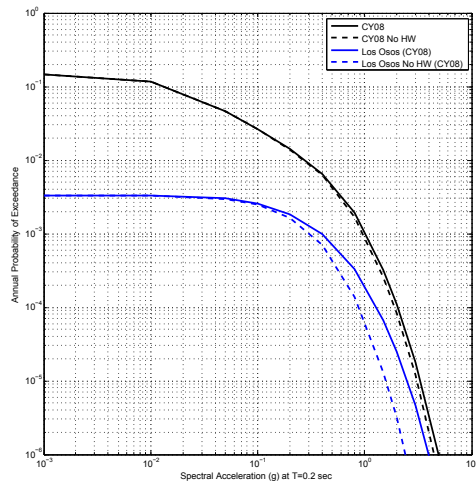
Sensitivity to HW: AS08



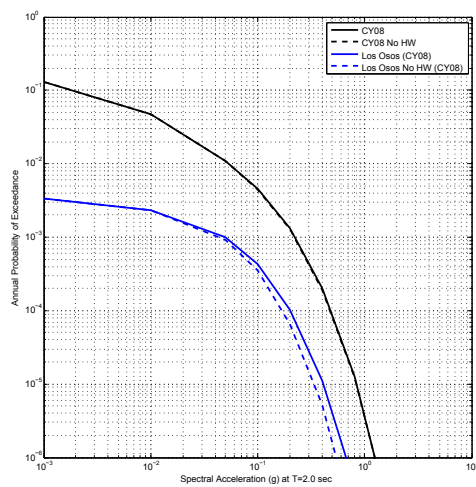
Sensitivity to HW: CY08



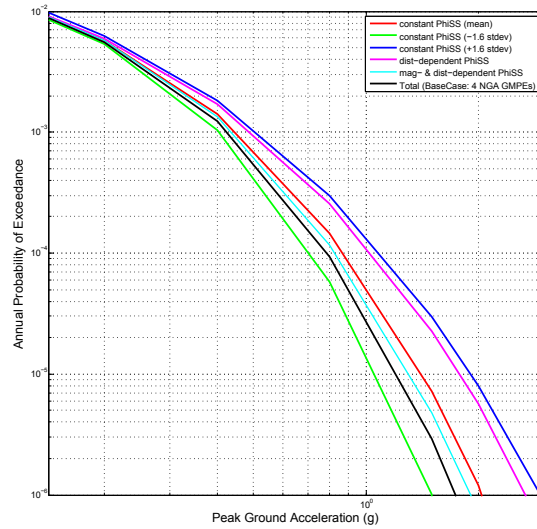
Sensitivity to HW: CY08



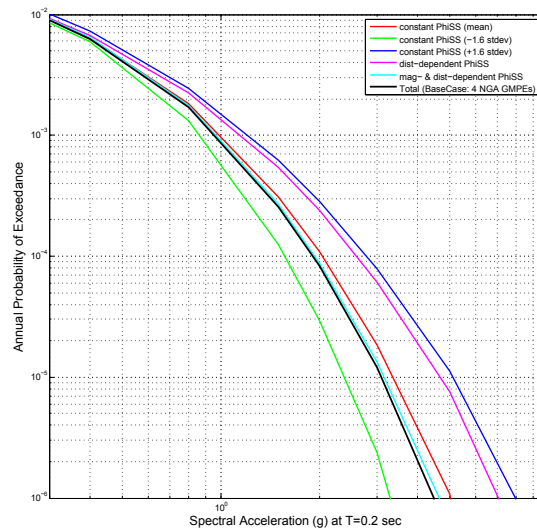
Sensitivity to HW: CY08



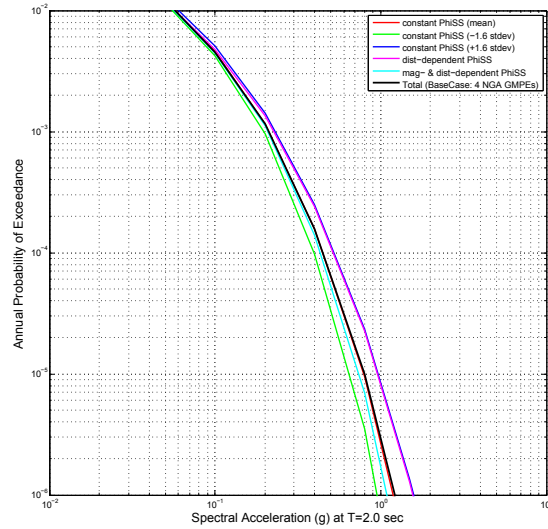
Sensitivity to Sigma Model



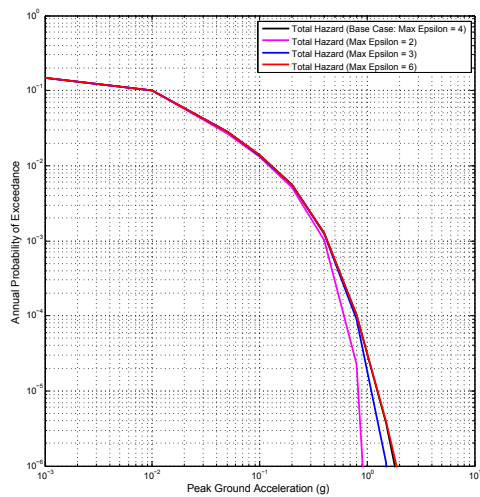
Sensitivity to Sigma Model



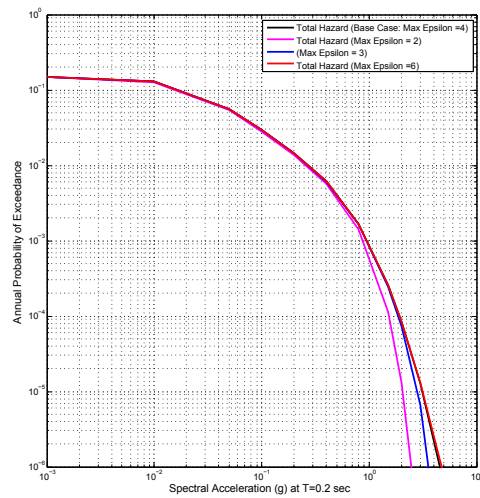
Sensitivity to Sigma Model



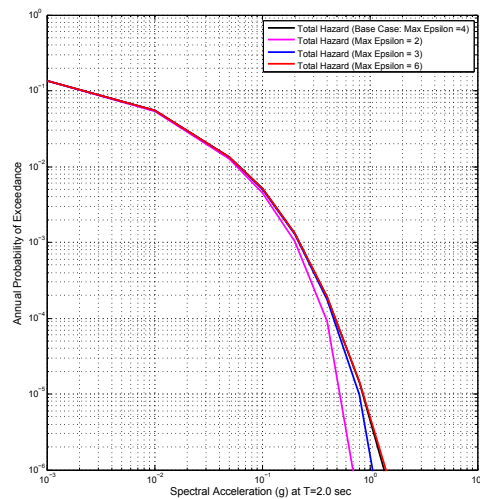
Sensitivity to Sigma Truncation



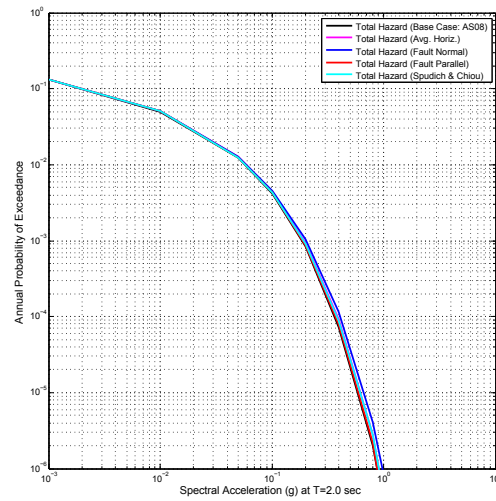
Sensitivity to Sigma Truncation



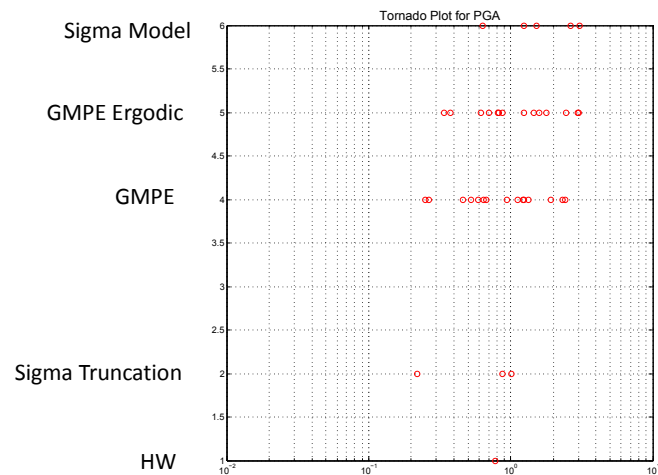
Sensitivity to Sigma Truncation



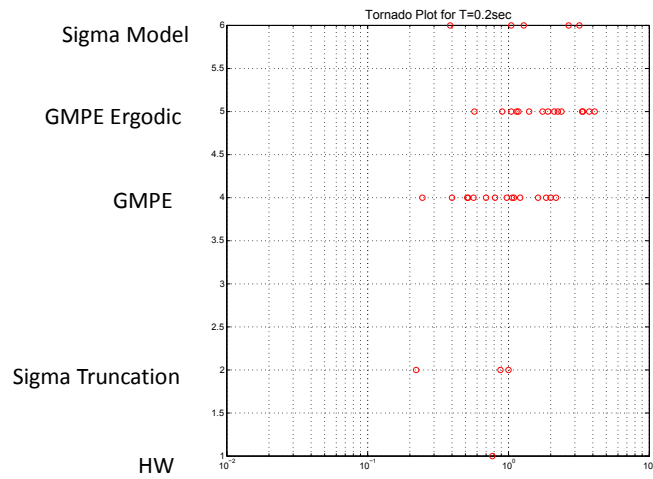
Sensitivity to Directivity



Summary of GMC Sensitivity: PGA



Summary of GMC Sensitivity: T=0.2 sec



Summary of GMC Sensitivity: T=2.0 sec

