Simulations Working Group

Presenters

- Pacific Engineering (Silva)
- Regional Academy of Natural Science (Bykovstev)
- San Diego State/ETH (Olsen)
- UCSB (Archuleta)
- URS (Somerville)
- USGS (Zeng*)

Simulation Validation

Validation

There are seven earthquakes that will be used in the validation. Listed in order to perform the validation study:

2005 Riviere du Loup
1988 Saguenay
2000 Tottori
1994 Northridge
1989 Loma Prieta
1979 Imperial Valley
1999 Chi Chi

For each earthquake the fixed parameters and the station locations are given.

The validation has several elements. The first is to determine a faulting model that has minimum bias and standard deviation of the spectral acceleration response spectrum (5% damped) at periods of 10 s, 7.5 s, 5.0 s, 4.0 s, 3.0 s, 2.0 s, 1.5 s, 1.0 s, 0.5 s, 0.3 s, 0.2 s, 0.1 s and 0.05 s. The passband of the data may not allow comparisons at 10 s and 7.5 s.

Simulation Parameters

L: Rupture length.

W: Rupture width.

hTop: Vertical Depth to top of rupture plane.

hypoStrike: Horizontal distance along strike from top center of rupture plane to the hypocenter, in local rupture plane coordinates.

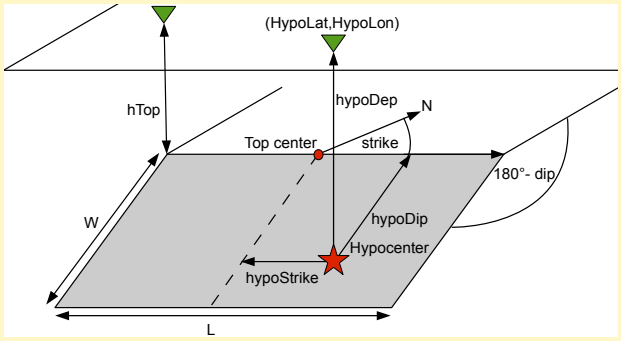
hypoDip: Vertical distance along dip from top center of rupture plane to the hypocenter, in local rupture plane coordinates.

hypoLat: Latitude coordinate of hypocenter.

hypoLon: Longitude coordinate of hypocenter.

hypoDep: Vertical depth of hypocenter.

M_0: Seismic moment.



Saguenay (Mw 5.8)

Parameter	Value
rupL [m]	10000
ddW [m]	9900
hTop [m]	22000
hypoStrike [m]	520
	4413.5116
hypoDip [m]	76
hypoLat [deg]	48.12
hypoLon [deg]	-71.18
hypo [m]	26000
M0 [N-m]	5.85E+17
strike [deg]	320
dip [deg]	65
rake [deg]	78

Thickness [km]	Vp [km/s]	Vs [km/s]	d[kg/dm^3]	Qp	Qs
1.44	4.5	2.6	2.3	500	250
6	5.5	3.4	2.5	1000	500
12	6.1	3.5	2.67	4000	2000
14	6.6	3.7	2.85	4000	2000
10	7	4	3.02	4000	2000
0	8.2	4.7	3.335	4000	2000

Stations	Longitude [deg]	Latitude [deg]	Vs30 (Wald & Allen, 2007) [m/s]
BSPQ	-70.5057	47.4418	566.365
CHIQ	-71.0123	48.4902	656.306
LMBQ	-70.1527	47.6553	760
LMQ	-70.3267	47.5483	467.178
QCQ	-71.2760	46.7791	749.979
ROUQ	-69.9966	47.4753	760
SANQ	-71.9917	48.3248	760
SFA	-70.8266	47.1244	500.744
SLBQ	-70.0160	46.7418	760
STPQ	-69.8045	47.4257	585.009
TADQ	-69.7189	48.1432	760

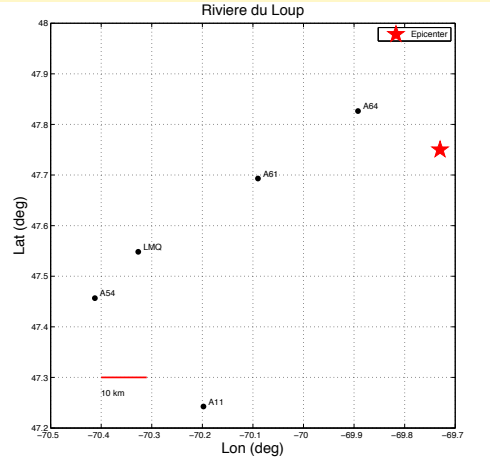
Tottori (Mw 6.7)

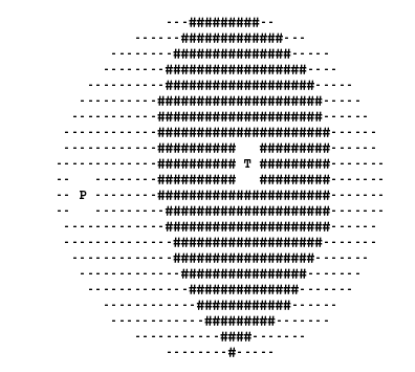
Parameter	Value
rupL [m]	40000
ddW [m]	20000
hTop [m]	500
hypoStrike [m]	0
hypoDip [m]	12000
hypoLat [deg]	133.35
hypoLon [deg]	35.275
hypo [m]	12500
M0 [N-m]	1.70E+19
strike [deg]	150
dip [deg]	90
rake [deg]	180

Thickness [km]	Vp [km/s]	Vs [km/s]	d[kg/dm^3]	Qp	Qs
2	5.5	3.179	2600	500	200
14	6.05	3.497	2700	500	200
12	6.6	3.815	2800	500	200
0	8.03	4.624	3100	500	200

Stations	Longitude [deg]	Latitude [deg]	Vs30 (PEER) [m/s]
OKY004	133.5018	34.9579	475.8
OKY005	133.7317	35.0098	293.4
OKY007	133.6121	34.7807	337.9
OKY008	133.9036	34.8701	450.6
OKY009	134.0923	34.9176	371.6
OKY014	133.7876	34.4462	362.2
OKY015	133.9256	35.2793	312.7
OKYH07	133.3169	35.0493	940.2
OKYH08	133.4055	34.9103	694.2
OKYH09	133.6765	35.1809	518.9
OKYH14	133.6205	34.9363	659.6
SMN002	133.0682	35.4714	138.8
SMN003	133.0929	35.1795	344
SMN004	132.9004	35.2881	281.4
SMN015	133.1704	35.3644	616.5
SMNH01	133.2604	35.2963	446.3
SMNH02	133.0856	35.2235	502.7
SMNH10	133.3031	35.5547	424.8
SMNH11	132.8033	35.4228	424.8
TTR005	133.8253	35.429	169.2
TTR006	133.6303	35.5106	352.7
TTR007	133.4902	35.2794	469.8
TTR008	133.3327	35.4227	139.2

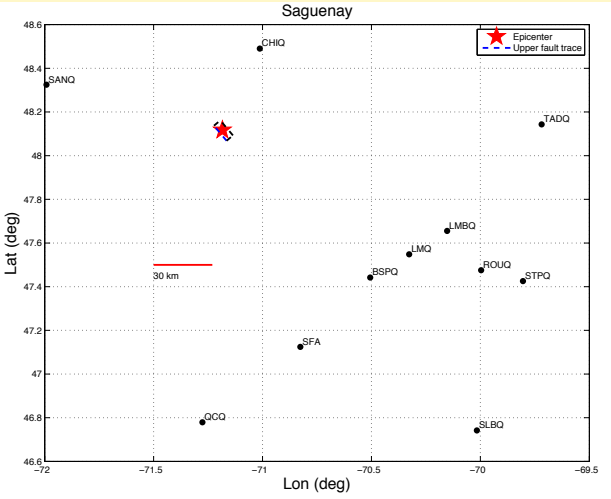
Rivière-du-Loup (Mw 4.6)

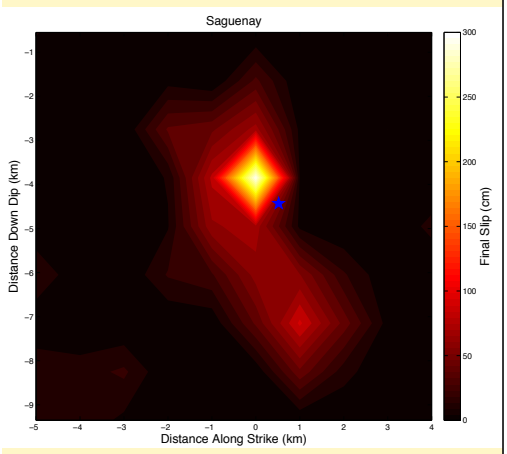




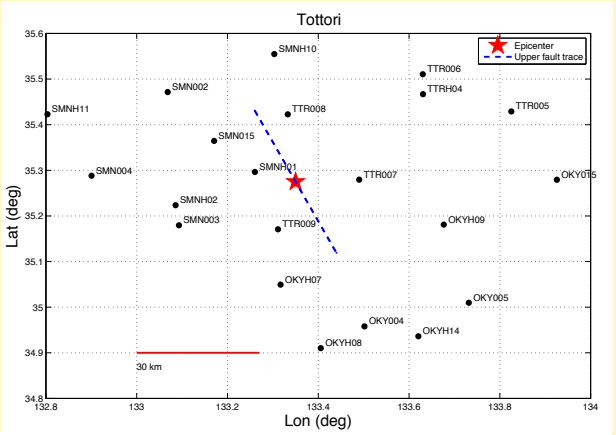
Parameter	Value
hypoLat [deg]	47.75
hypoLon [deg]	-69.73
hypo [m]	13000
M0 [N-m]	9.02E+15
strike [deg]	170
dip [deg]	60
rake [deg]	80

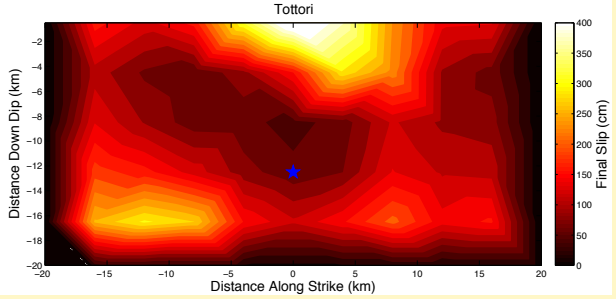
Saguenay (Mw 5.8)



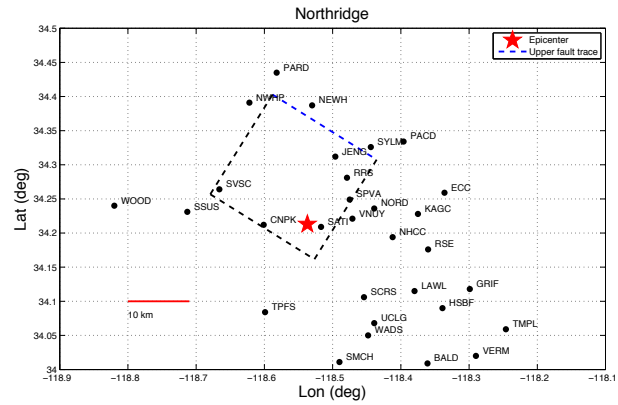


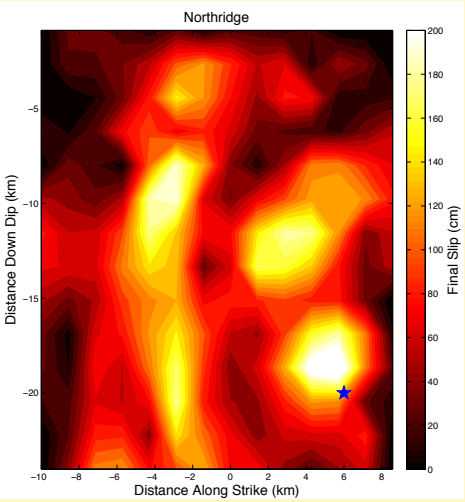
Tottori (Mw 6.7)



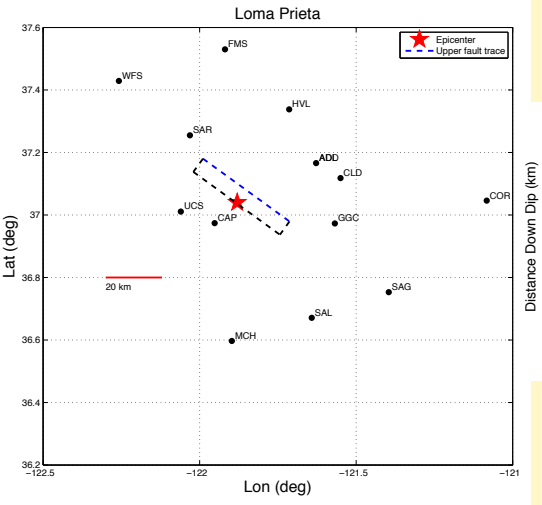


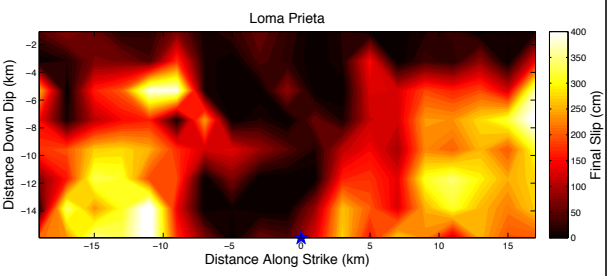
Northridge (Mw 6.7)



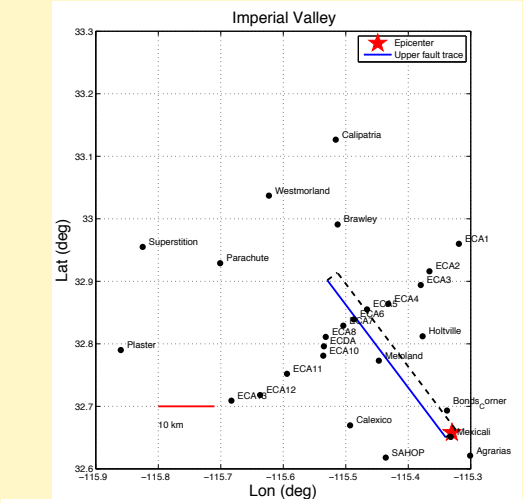


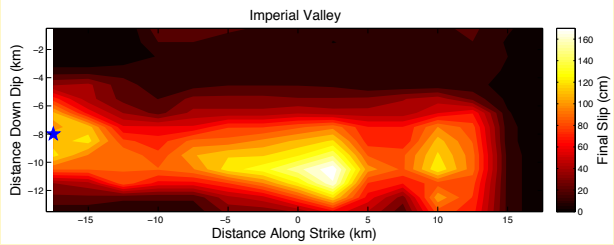
Loma Prieta (Mw 7.0)



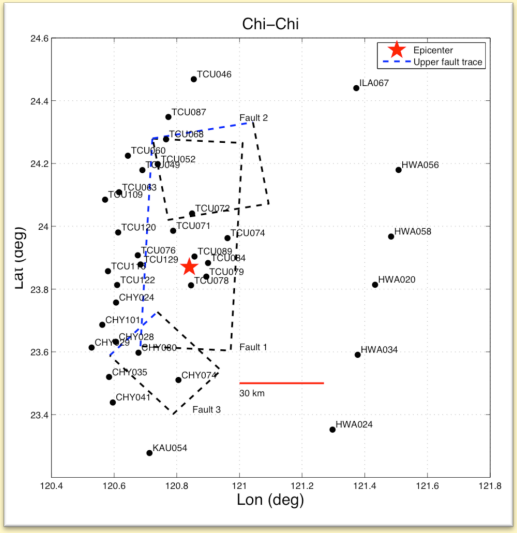


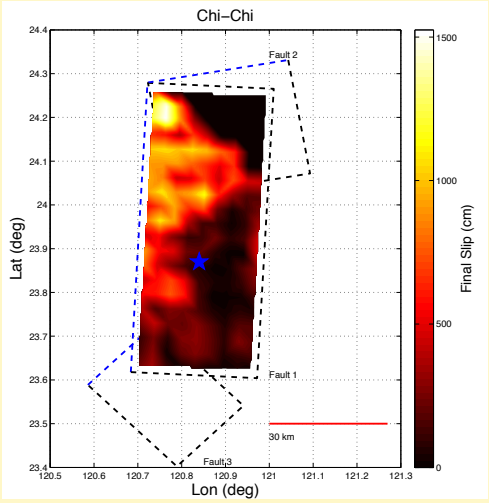
Imperial Valley (Mw 6.6)



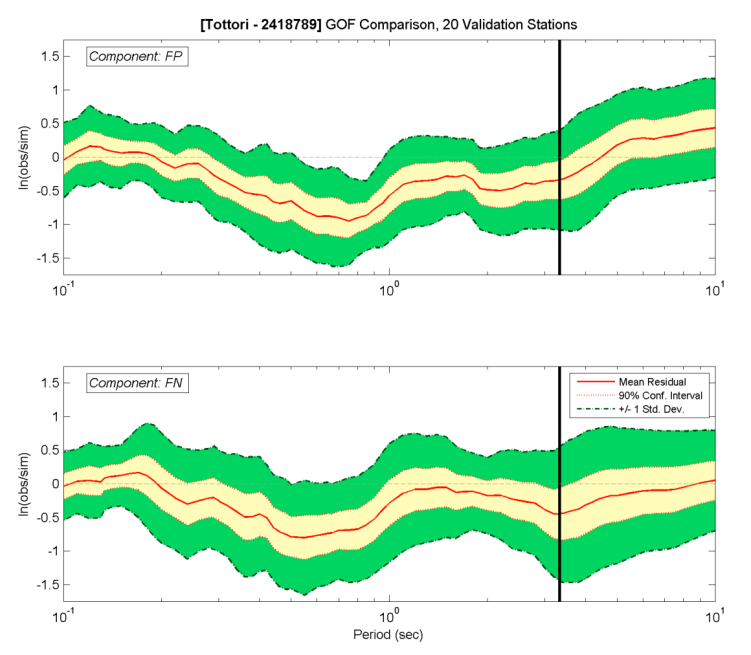


Chi Chi (Mw 7.6)



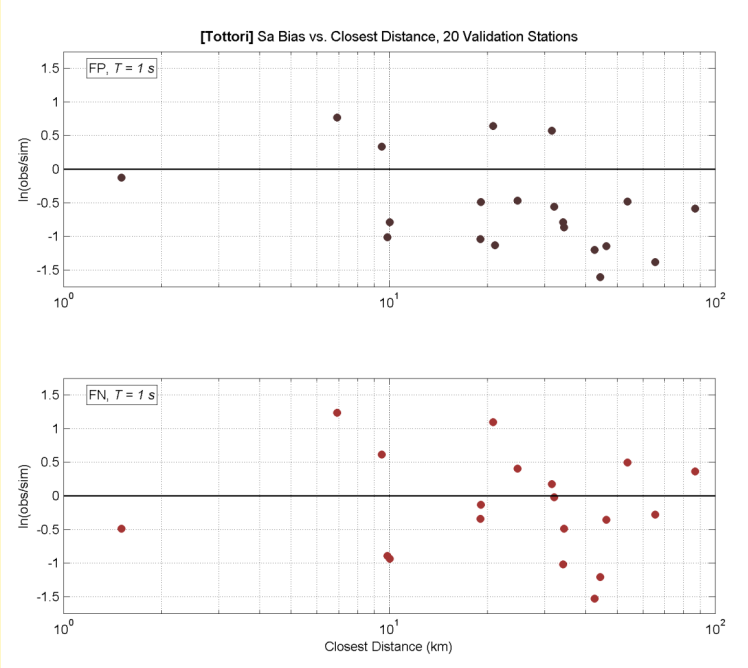


Bias, Confidence, Stdev



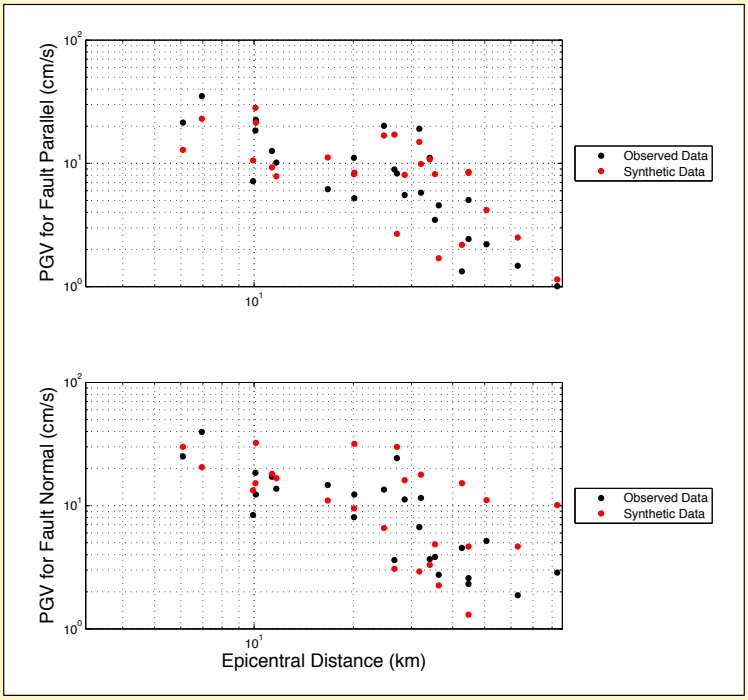
URS Simulation, Tottori

Bias as a Function of Distance, T=1.0 s



URS Simulation, Tottori

PGV as a Function of Distance



UCSB Simulation, Tottori

Data and Synthetics