Preliminary NGA-West2 Idriss Ground Motion Equations for the Horizontal Component of 5% Damped Pseudo-Acceleration Response Spectra (0.01 to 10 sec)

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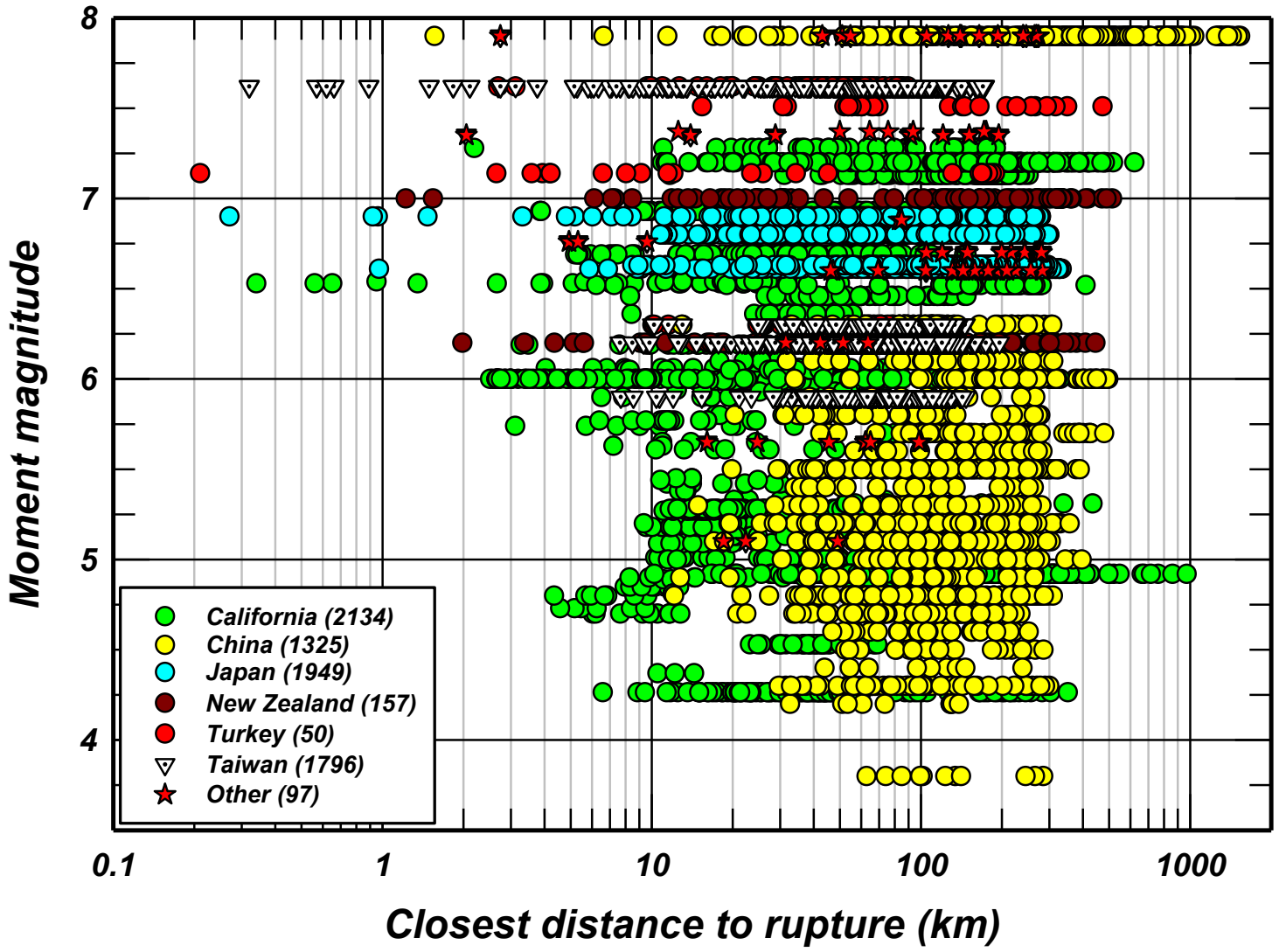
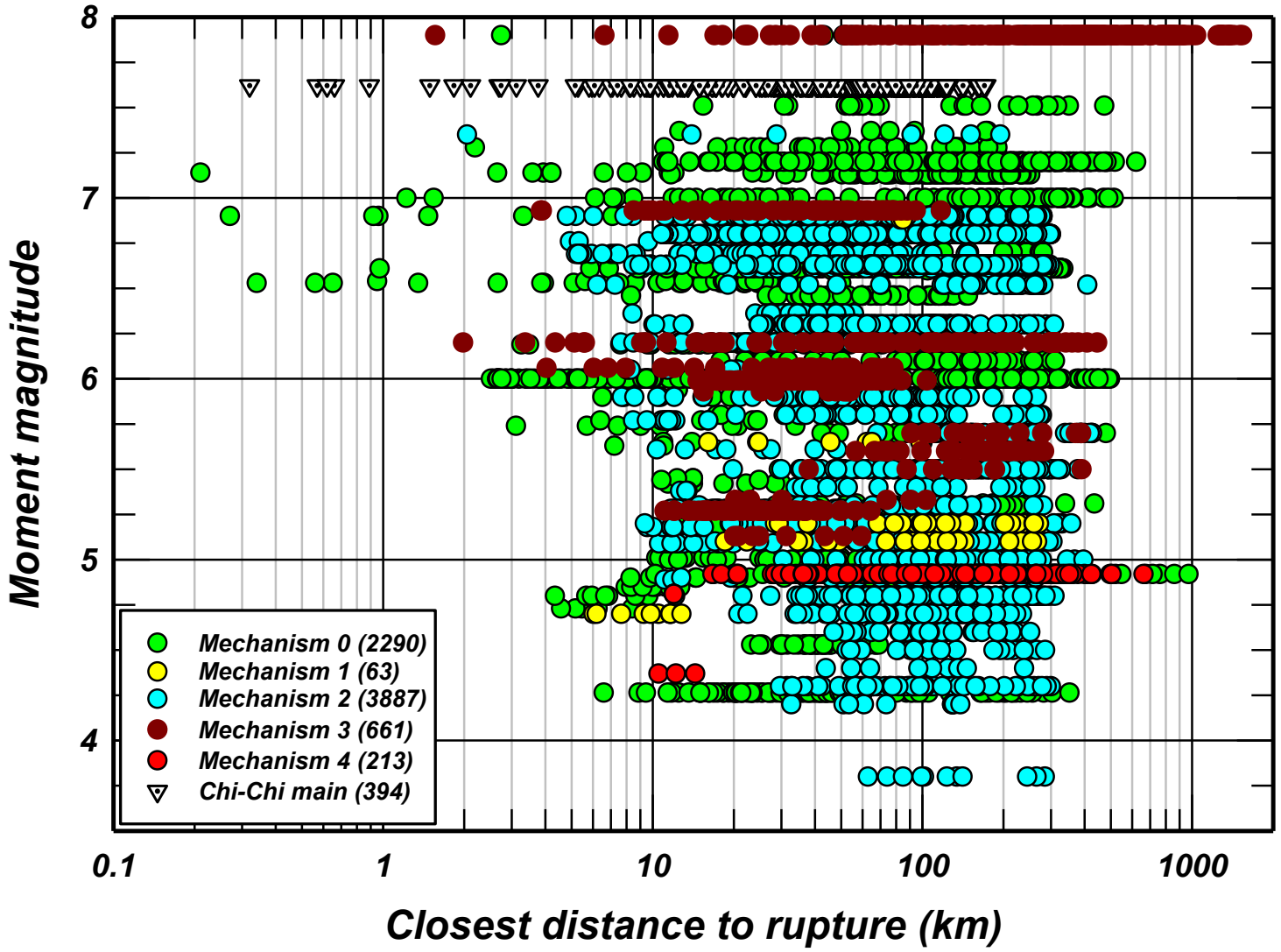
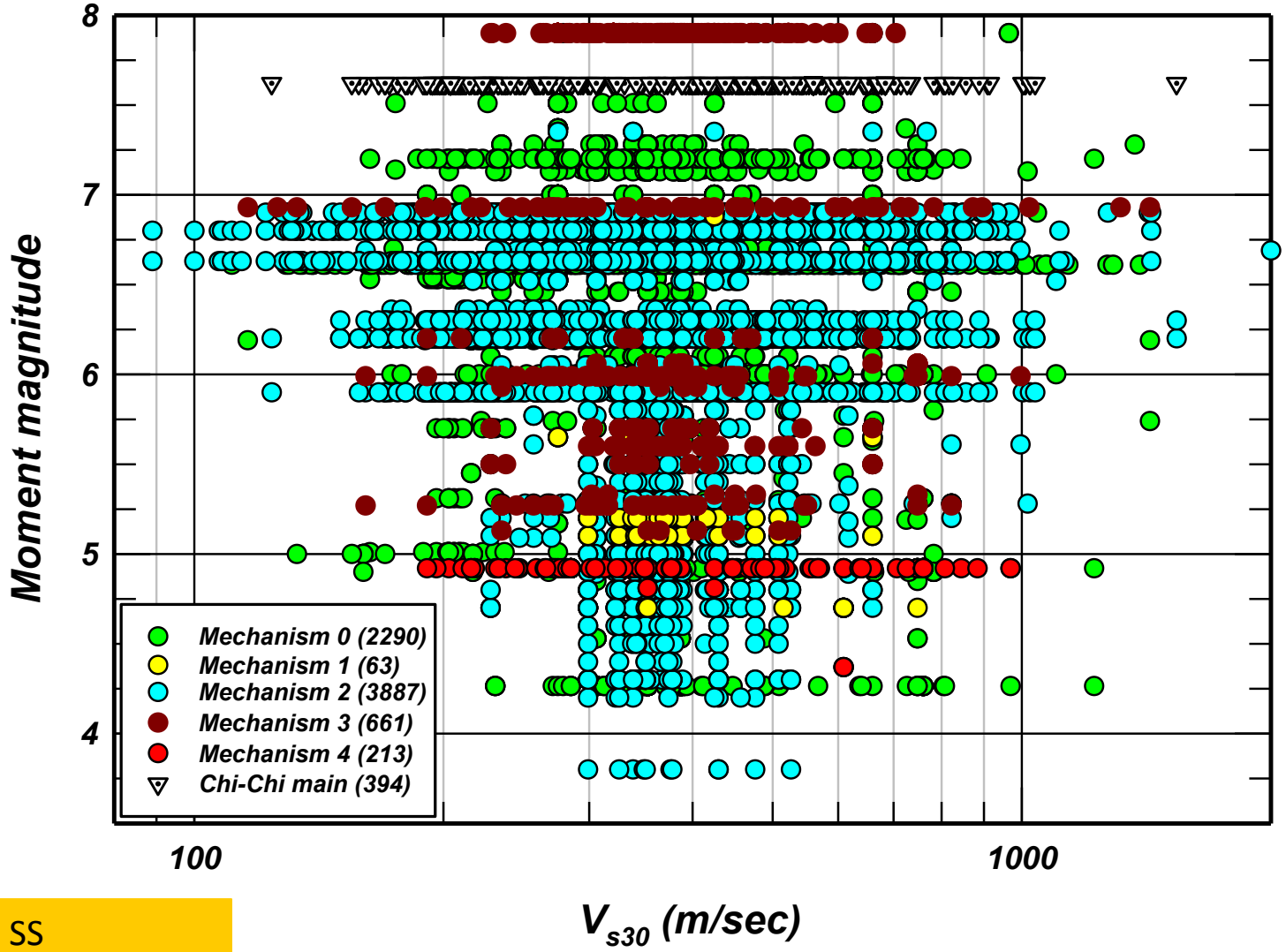


Magnitude versus Distance

Free-field recordings obtained in various regions of the world



Magnitude versus Distance
Mechanism -- Free-field recordings



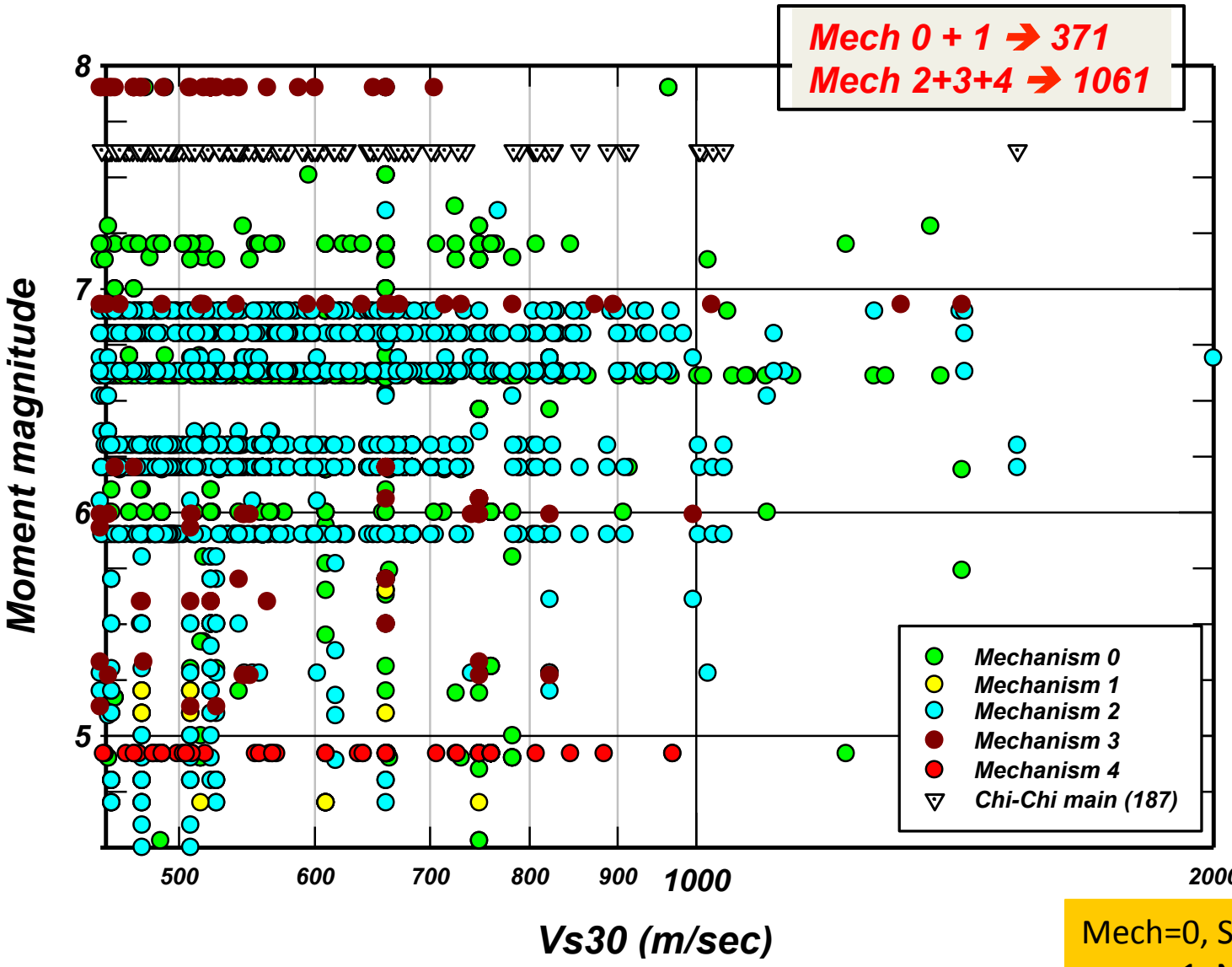
Mech=0, SS
=1, Normal
=2, Reverse
=3, Rev. Oblique
=4, Nm, Oblique

Magnitude versus V_{s30}
Mechanism -- Free-field recordings

$$Ln(y) = a_1 + a_2 M + a_3 (8.5 - M)^2 - (b_1 + b_2 M) \lozenge Ln(R + 10) + x Ln(V_{s30}) + gR + j F$$

The Flatfile data used to derive the parameters a_1, a_2, a_3, b_1 and b_2 and the factors [illegible], [illegible], and φ are:

1. Free field stations [Geomatrix first letter A, B, I, K, L and M in addition to those stations for which no first letter had been assigned (-999)].
2. The recordings from the Chi-Chi main shock were not included, but recordings from the aftershocks were included.
3. Recordings at distances less than 175 km.
4. Magnitude range: 4.5 to 7.9.
5. $V_{s30} \geq 450$ m/sec.



Magnitude versus V_{s30} -- Recordings used

Mech=0, SS
=1, Normal
=2, Reverse
=3, Rev. Oblique
=4, Nm, Oblique

$$Ln(y) = a_1 + a_2 M + a_3 (8.5 - M)^2 - (b_1 + b_2 M) \lozenge Ln(R + 10) + x Ln(V_{s30}) + gR + j F$$

Data used

M = 4.5 to 7.9; Dist < 175 km; V_{s30} = 450 – 1200 m/sec

[recordings from Chi-Chi main shock not included]

M > 6.75

Period (sec)	α_1	α_2	α_3	β_1	β_2	ξ	γ	φ
0.01	5.9497	-0.0794	0.0589	2.9827	-0.2287	-0.36	-0.0025	0.08
0.02	5.9747	-0.0794	0.0589	2.9827	-0.2287	-0.36	-0.0025	0.08
0.03	6.0497	-0.0794	0.0589	2.9827	-0.2287	-0.36	-0.0025	0.08
0.04	6.3233	-0.2965	0.0265	2.9239	-0.2390	-0.20	-0.0040	0.08
0.05	5.3208	-0.1923	0.0417	2.8960	-0.2319	-0.15	-0.0038	0.08
0.06	4.5492	-0.1279	0.0573	2.8960	-0.2355	-0.11	-0.0040	0.08
0.075	4.7279	-0.1614	0.0527	2.9223	-0.2326	-0.06	-0.0030	0.08
0.1	6.3190	-0.1887	0.0442	2.8840	-0.2211	-0.23	-0.0026	0.08
0.15	6.7018	-0.0665	0.0329	2.4516	-0.1676	-0.42	-0.0038	0.08
0.2	8.4558	-0.1698	0.0188	2.5119	-0.1685	-0.55	-0.0027	0.08
0.25	9.0253	-0.1766	0.0095	2.3873	-0.1531	-0.65	-0.0027	0.08
0.3	9.8038	-0.2798	-0.0039	2.3727	-0.1595	-0.70	-0.0029	0.08
0.4	9.7171	-0.3048	-0.0133	2.3304	-0.1594	-0.70	-0.0032	0.08
0.5	9.9095	-0.2911	-0.0224	2.3113	-0.1584	-0.77	-0.0032	0.08
0.6	9.9447	-0.2973	-0.0253	2.2829	-0.1574	-0.81	-0.0028	0.08
0.75	9.9059	-0.3097	-0.0267	2.2300	-0.1577	-0.86	-0.0025	0.08
1	9.0339	-0.2565	-0.0198	2.1861	-0.1532	-0.83	-0.0026	0.06
1.5	7.3956	-0.2320	-0.0367	2.0996	-0.1470	-0.69	-0.0022	0.04
2	6.6264	-0.1226	-0.0291	2.0519	-0.1439	-0.76	-0.0021	0.02
3	4.1307	0.1724	-0.0214	1.9840	-0.1278	-0.73	-0.0020	0.02
4	1.9629	0.3001	-0.0240	1.8429	-0.1326	-0.68	-0.0033	0
5	0.0772	0.4609	-0.0202	1.7770	-0.1291	-0.62	-0.0037	0
7.5	-2.6210	0.6948	-0.0219	1.6383	-0.1220	-0.60	-0.0023	0
10	-3.9783	0.8393	-0.0035	1.5727	-0.1145	-0.65	-0.0020	0

$$Ln(y) = a_1 + a_2 M + a_3 (8.5 - M)^2 - (b_1 + b_2 M) \lozenge Ln(R + 10) + x Ln(V_{s30}) + g R + j F$$

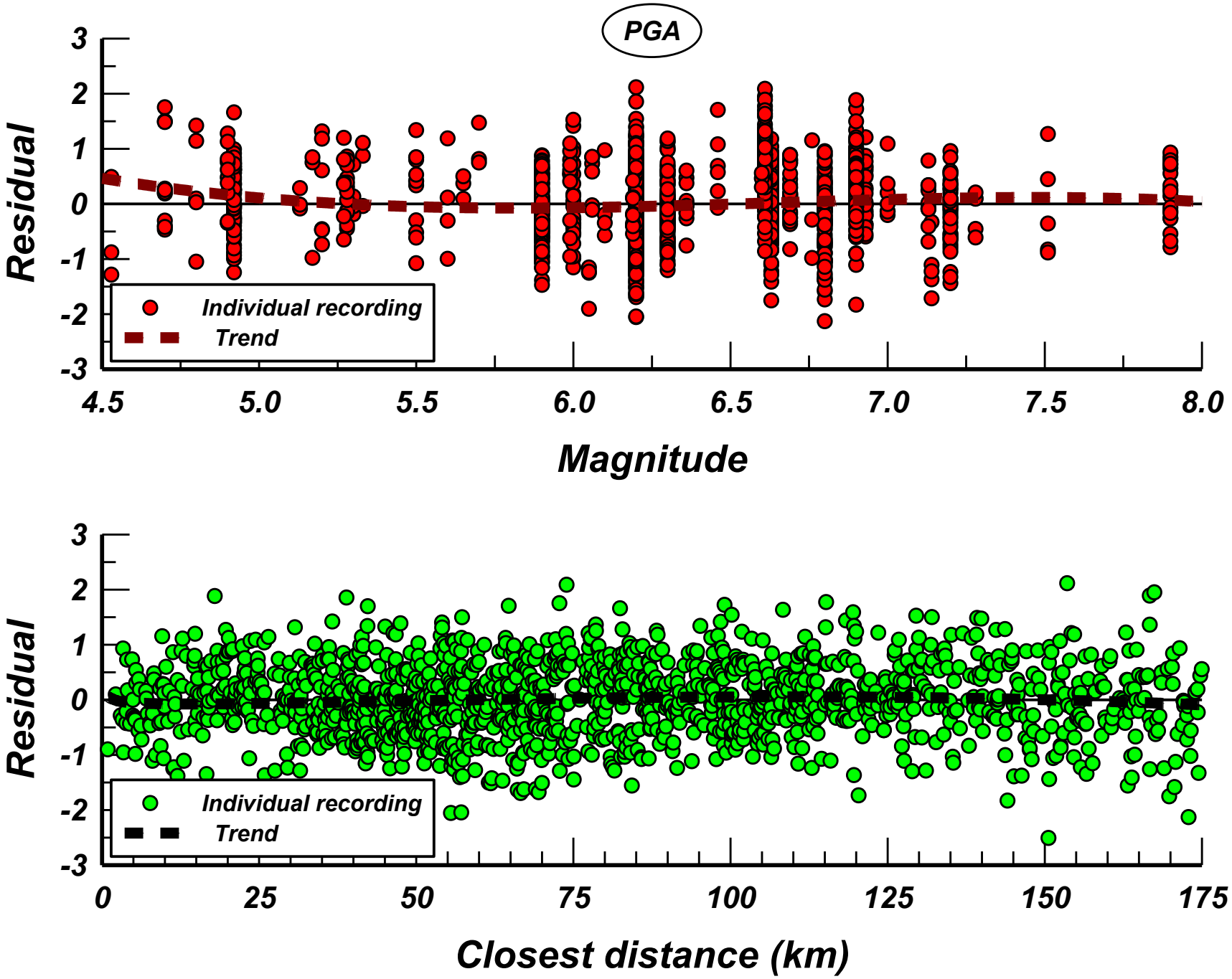
Data used

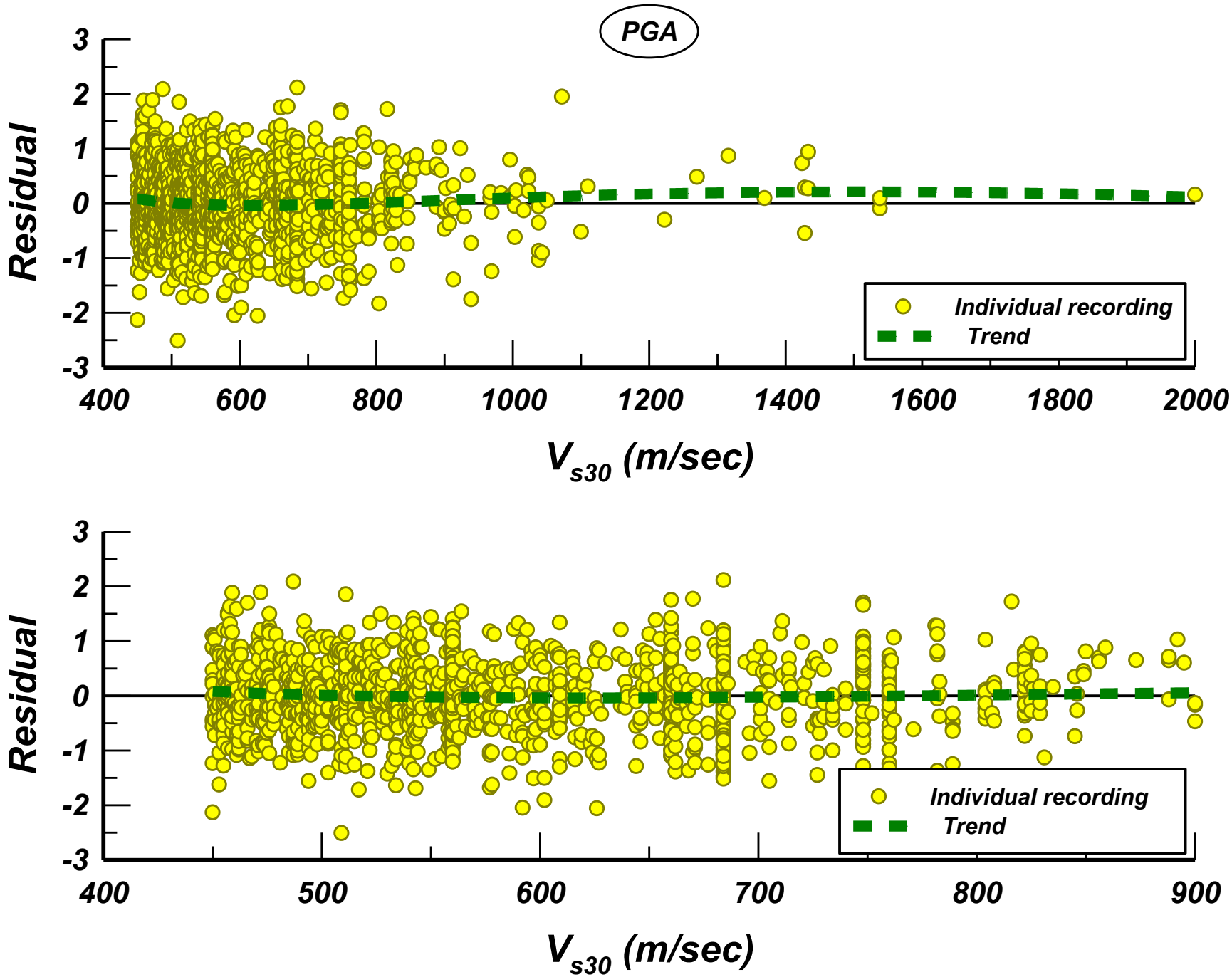
M = 4.5 to 7.9; Dist < 175 km; V_{s30} = 450 – 1200 m/sec

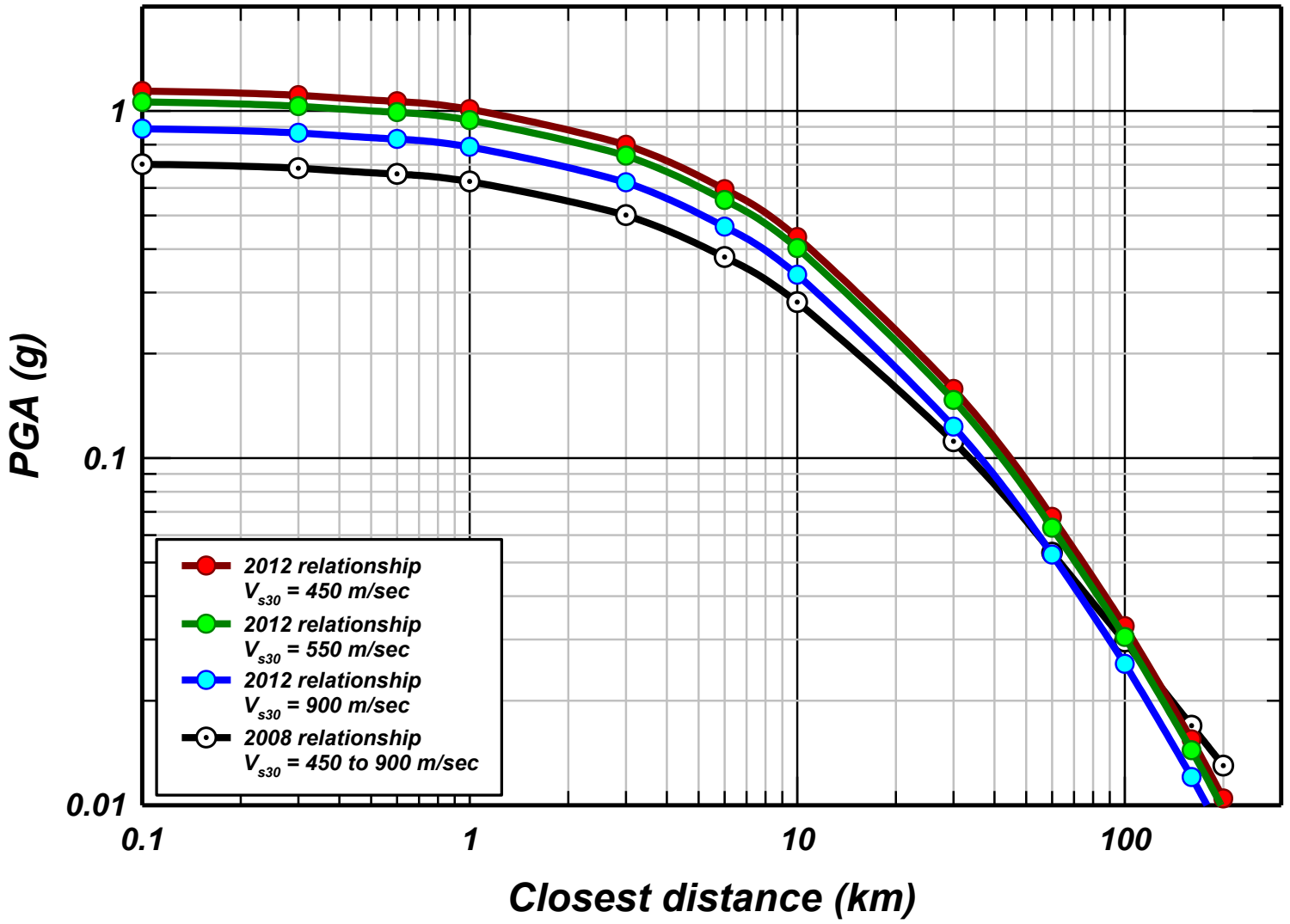
[recordings from Chi-Chi main shock not included]

M ≤ 6.75

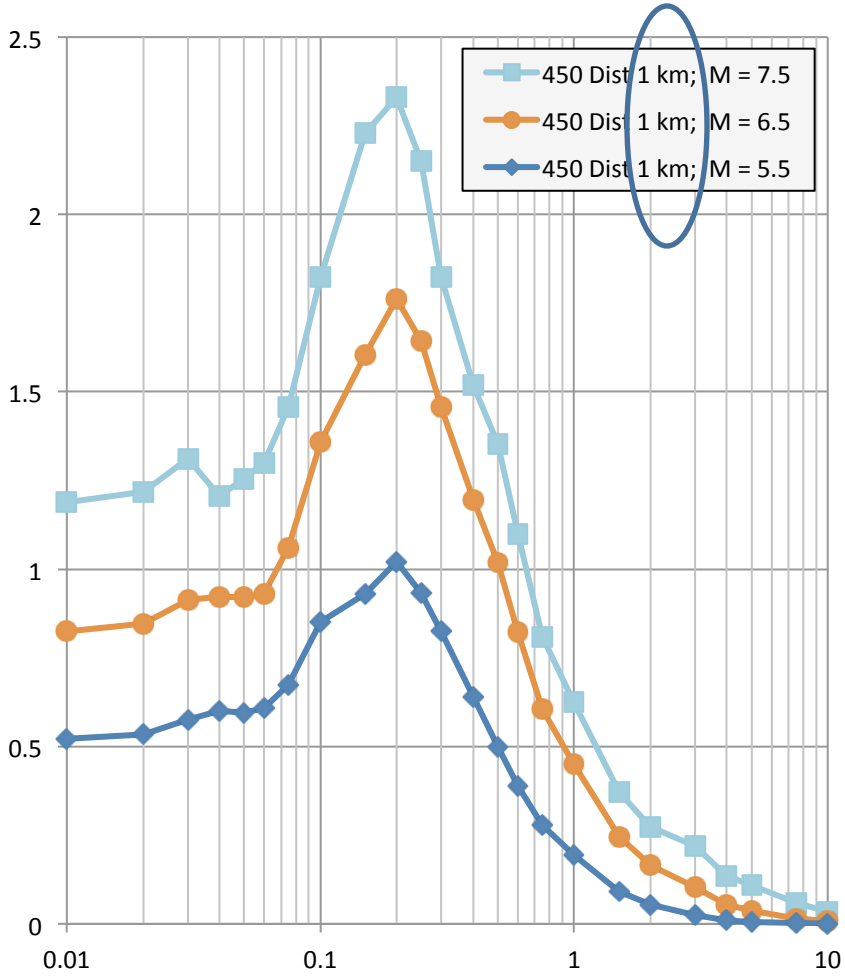
Period (sec)	α_1	α_2	α_3	β_1	β_2	ξ	γ	φ
0.01	4.0246	0.2058	0.0589	2.9827	-0.2287	-0.36	-0.0025	0.08
0.02	4.0496	0.2058	0.0589	2.9827	-0.2287	-0.36	-0.0025	0.08
0.03	4.1246	0.2058	0.0589	2.9827	-0.2287	-0.36	-0.0025	0.08
0.04	4.3982	-0.0113	0.0265	2.9239	-0.2390	-0.20	-0.0040	0.08
0.05	3.6009	0.0625	0.0417	2.9629	-0.2418	-0.15	-0.0038	0.08
0.06	2.9811	0.1044	0.0573	3.0174	-0.2535	-0.11	-0.0040	0.08
0.075	2.8770	0.1128	0.0527	3.0486	-0.2513	-0.06	-0.0030	0.08
0.1	4.4729	0.0848	0.0442	3.0899	-0.2516	-0.23	-0.0026	0.08
0.15	5.0966	0.1713	0.0329	2.8296	-0.2236	-0.42	-0.0038	0.08
0.2	6.6070	0.1041	0.0188	2.8792	-0.2229	-0.55	-0.0027	0.08
0.25	7.2428	0.0875	0.0095	2.8389	-0.2200	-0.65	-0.0027	0.08
0.3	7.9132	0.0003	-0.0039	2.8378	-0.2284	-0.70	-0.0029	0.08
0.4	7.6416	0.0027	-0.0133	2.8191	-0.2318	-0.70	-0.0032	0.08
0.5	7.6753	0.0399	-0.0224	2.8196	-0.2337	-0.77	-0.0032	0.08
0.6	7.5708	0.0544	-0.0253	2.8094	-0.2354	-0.81	-0.0028	0.08
0.75	7.3511	0.0689	-0.0267	2.7802	-0.2392	-0.86	-0.0025	0.08
1	6.2227	0.1600	-0.0198	2.7707	-0.2398	-0.83	-0.0026	0.06
1.5	4.1900	0.2429	-0.0367	2.7388	-0.2417	-0.69	-0.0022	0.04
2	3.1218	0.3966	-0.0291	2.7343	-0.2450	-0.76	-0.0021	0.02
3	0.1913	0.7560	-0.0214	2.7339	-0.2389	-0.73	-0.0020	0.02
4	-2.2774	0.9283	-0.0240	2.6448	-0.2514	-0.68	-0.0033	0
5	-4.3775	1.1209	-0.0202	2.6208	-0.2541	-0.62	-0.0037	0
7.5	-7.3922	1.4016	-0.0219	2.5649	-0.2593	-0.60	-0.0023	0
10	-8.8253	1.5574	-0.0035	2.5454	-0.2586	-0.65	-0.0020	0

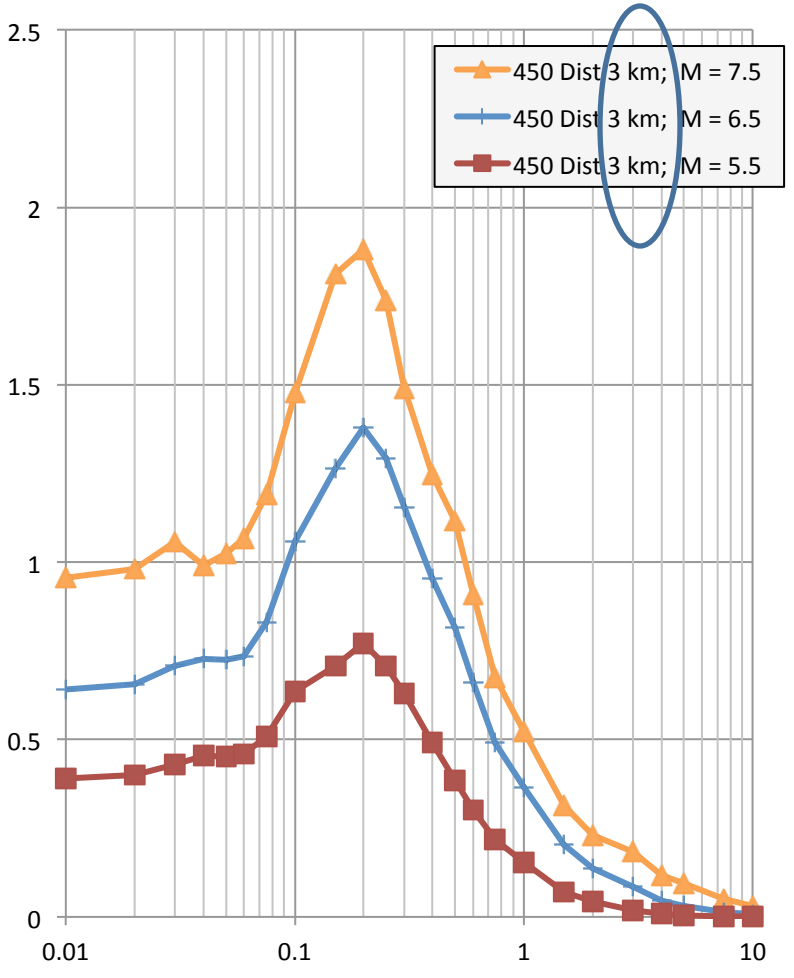

PGA
Residual
Individual recording
Trend
Magnitude
Residual
Individual recording
Trend
Closest distance (km)


PGA
Residual
3
2
1
0
-1
-2
-3
400
600
800
1000
1200
1400
1600
1800
2000
V_{s30} (m/sec)
Individual recording
Trend
Residual
3
2
1
0
-1
-2
-3
400
500
600
700
800
900
V_{s30} (m/sec)
Individual recording
Trend



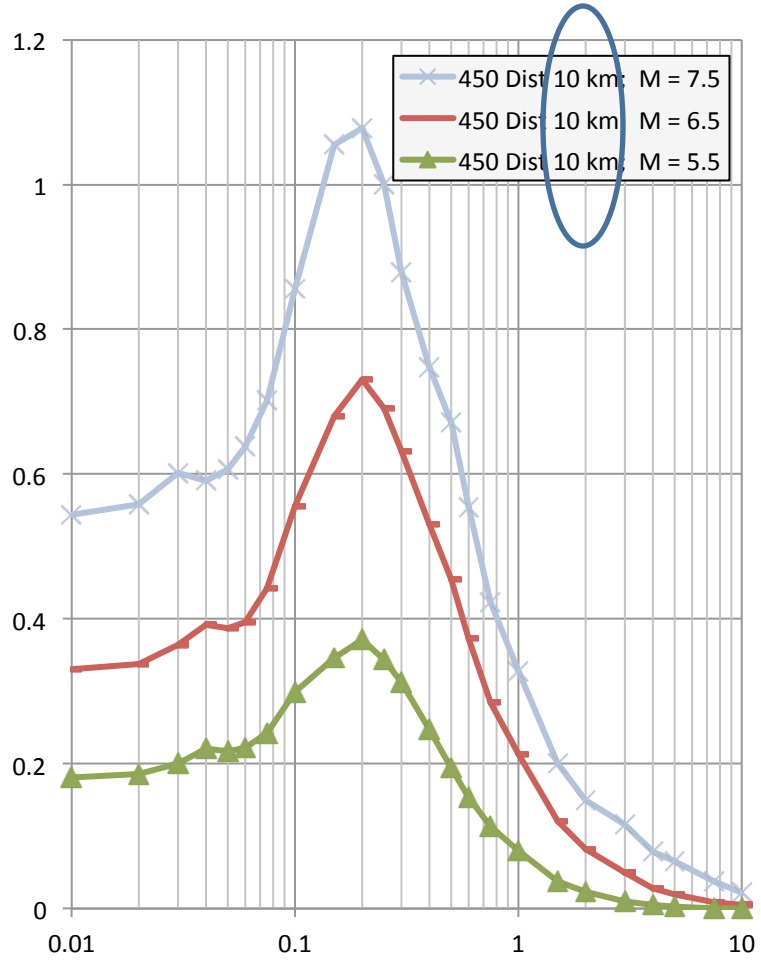
Comparison with 2008 relationships

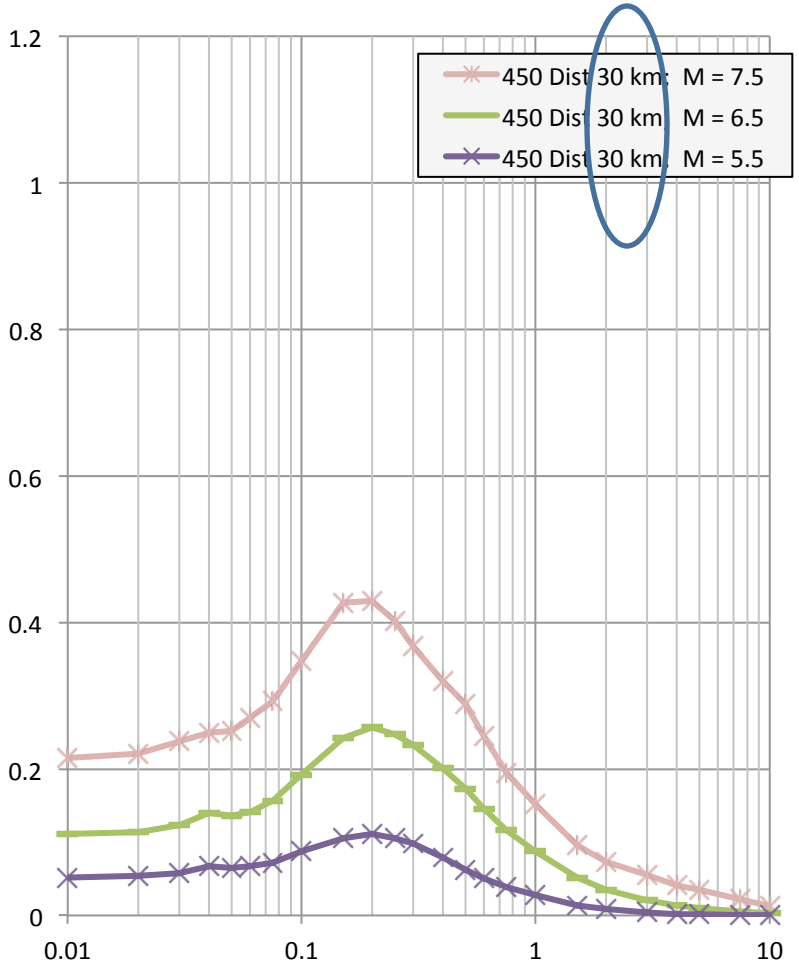




2012 relationship for PSA versus period

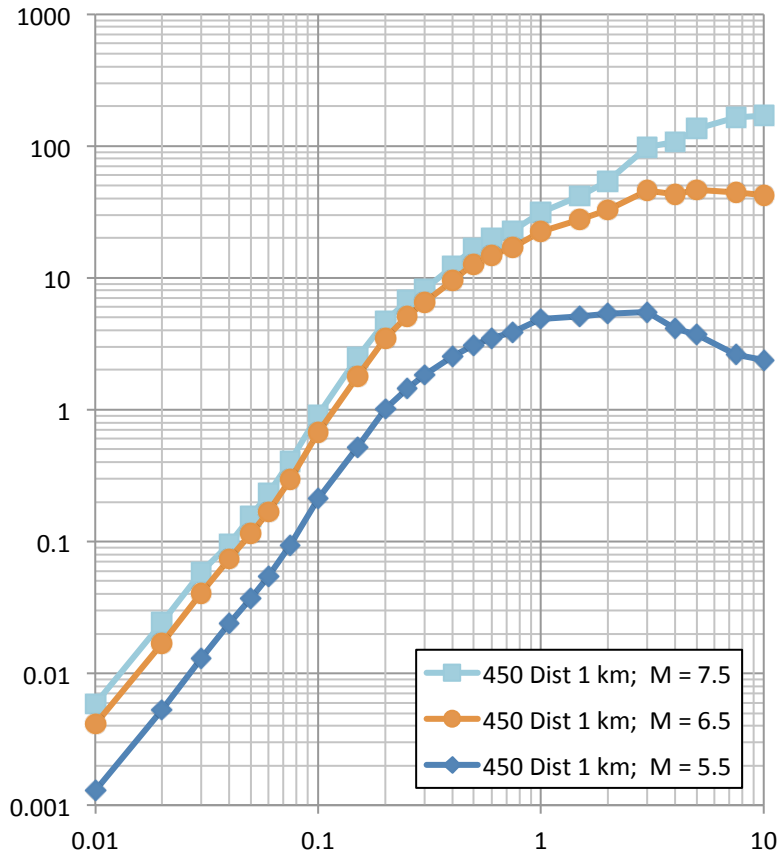
V_{s30} = 450 m/sec; M = 7.5. 6.5 & 5.5; Dist = 1 & 3 km

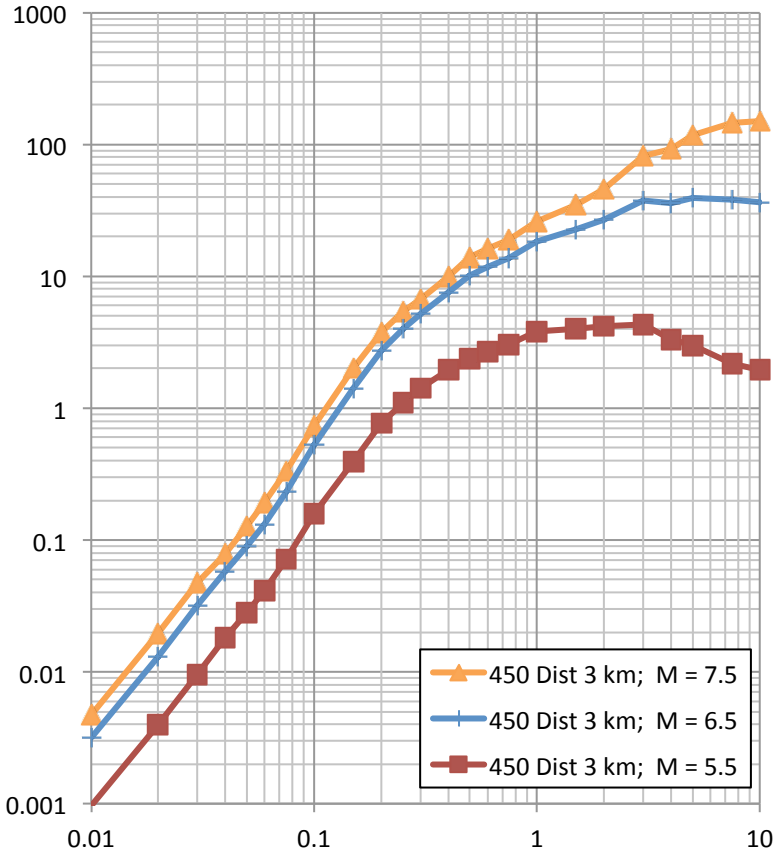




2012 relationship for PSA versus period

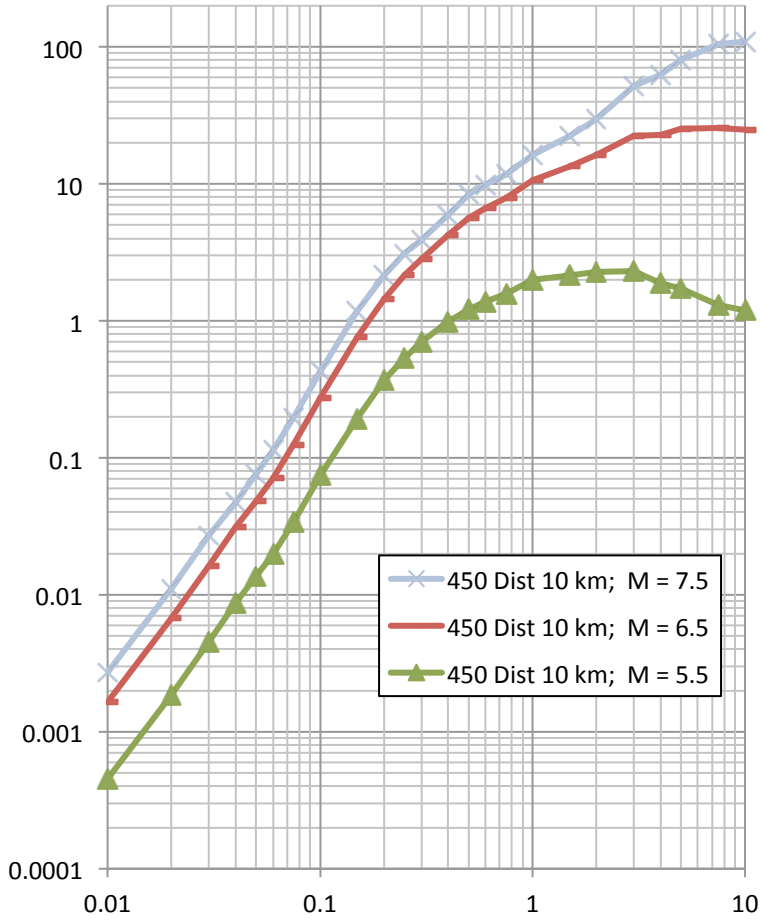
V_{s30} = 450 m/sec; M = 7.5. 6.5 & 5.5; Dist = 10 & 30 km

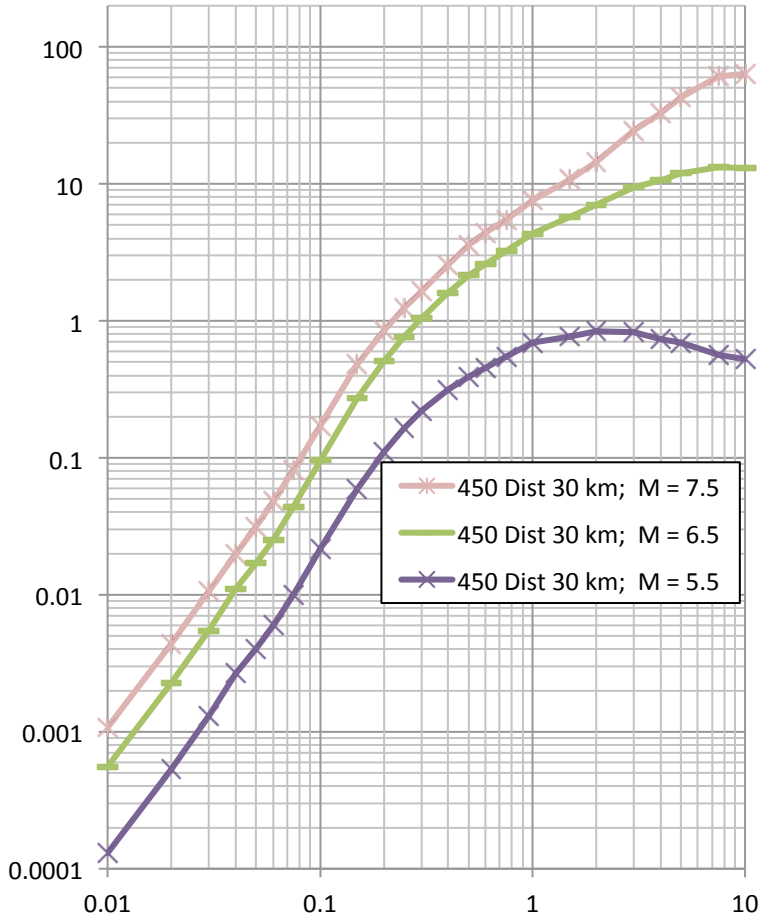




2012 relationship for Rel Disp versus period

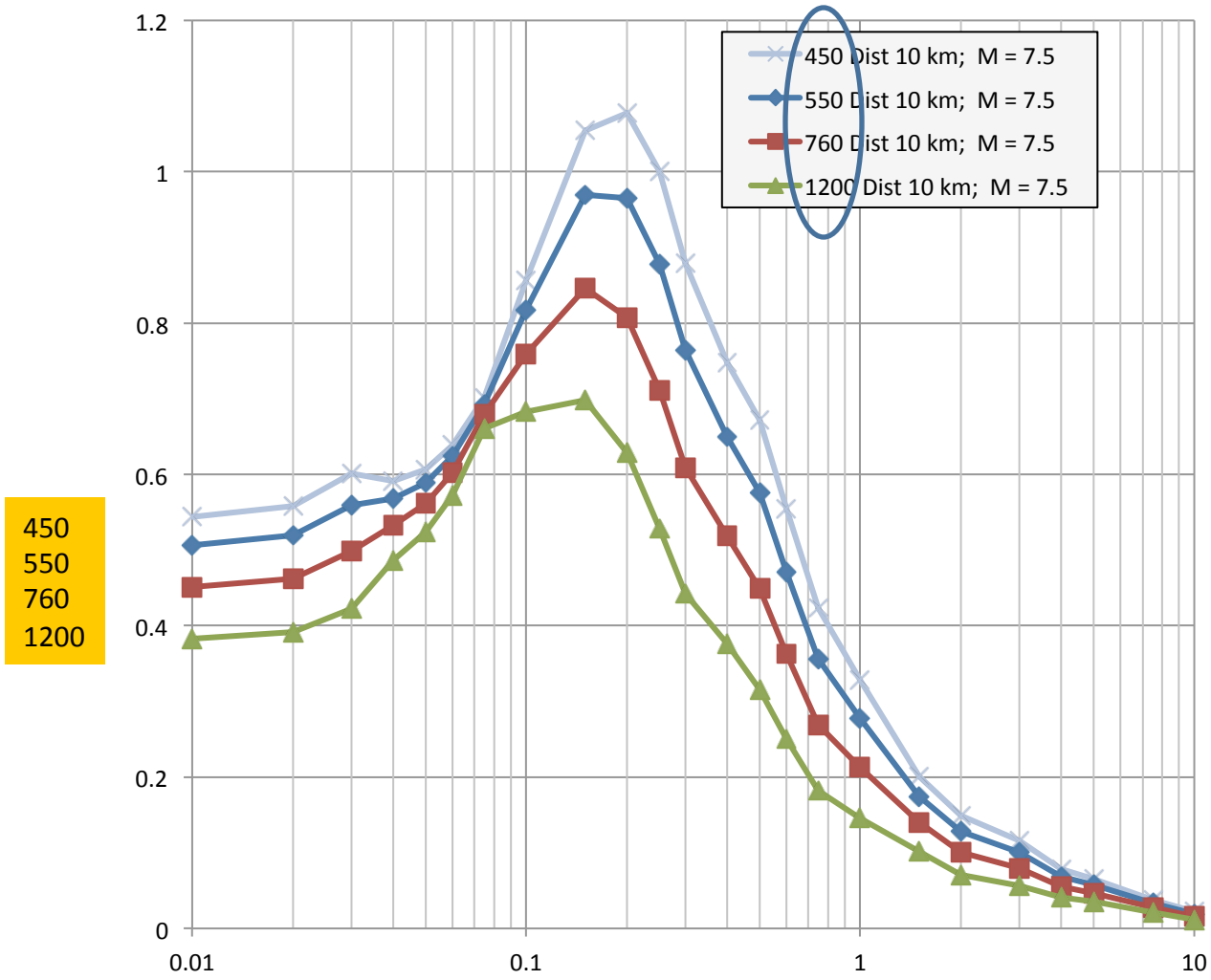
V_{s30} = 450 m/sec; M = 7.5. 6.5 & 5.5; Dist = 1 & 3 km





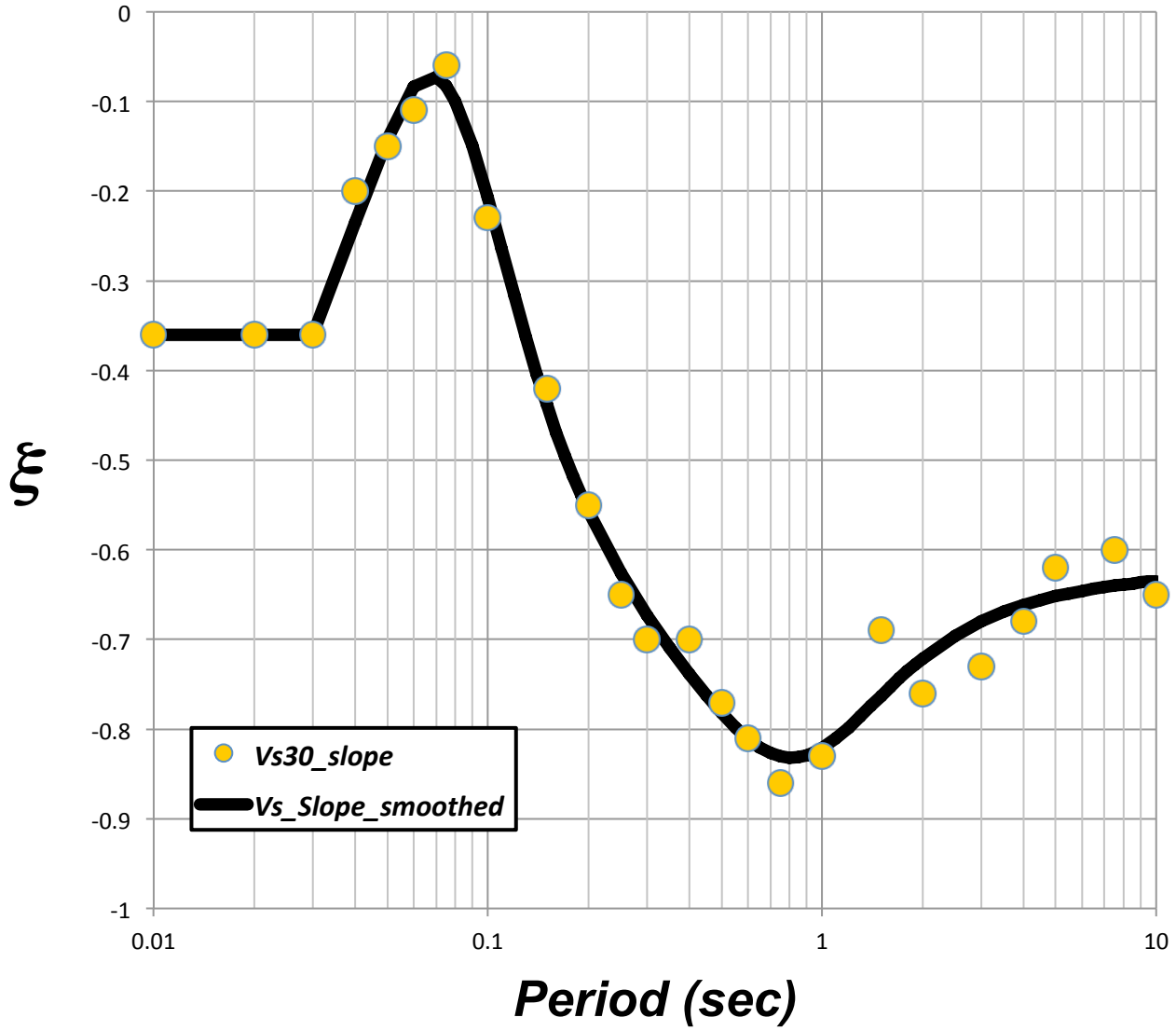
2012 relationship Rel Disp versus period

V_{s30} = 450 m/sec; M = 7.5. 6.5 & 5.5; Dist = 1 & 3 km



2012 relationship for PSA versus period

M = 7.5; Dist = 10; V_{s30} = 450, 550, 750 & 1200 m/sec



2012 relationship: V_{s30} slope (ξ) versus period

Questions and Comments are Welcome; Please Send Email to: imidriss@aol.com