Catalogue of U.S. Geological Survey Strong-Motion Records, 1990

Compiled by Josephine C. Switzer, and
Ronald L. Porcella

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PREFACE

The first seismic engineering program in the United States was administered by the Seismological Field Survey (SFS) of the Coast and Geodetic Survey. This program was begun in 1931 and essentially remained the responsibility of the SFS until 1973, when the U.S. Geological Survey (USGS) assimilated the program into its Earthquake Hazards Reduction Program. The current Federal seismic engineering program operates the National Cooperative Strong-Motion Network (NCSMN) with nearly 1,000 stations in 40 States and Puerto Rico. This network is administered by the USGS in cooperation with both private industry and numerous Federal, State, and local agencies and organizations. Major contributors include the Army Corps of Engineers, the Veterans Administration, and the Metropolitan Water District of Southern California. Primary objectives of the program are to record strong ground motions and the response of representative engineered structures during moderate to large earthquakes, and to disseminate the resultant data and information about the records, sites, and structures to the earthquake engineering research and design community.

This catalogue continues in a revised format the yearly publication "Strong-Motion Program Report, January-December [year]"; it is a continuation of the table 1 summary of accelerograms recovered at NCSMN stations that had been published in that format since 1974. This report includes all accelerograms recovered during 1990. Unless otherwise noted, event data are from the "Preliminary Determination of Epicenters," published weekly by the U.S. Geological Survey.

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INTRODUCTION

During January-December 1990, 266 accelerograph records were recovered from the National Cooperative Strong-Motion Network (NCSMN). Eighty of these records are from the main shock of the M_L = 5.2 Upland, California, earthquake of February 28. A maximum horizontal ground acceleration of 0.58 *g* was recorded at the crest of San Antonio Dam at an epicentral distance of 3 km, and a maximum vertical ground acceleration of 0.83 *g* was recorded at the right abutment (Etheredge and others, 1990). A magnitude 4.6 aftershock on April 17 triggered nine accelerographs at 5 dam or reservoir facilities in the main shock epicentral region. At San Antonio Dam (epicentral distance approx. 7 km) peak horizontal accelerations of 0.36 *g*, 0.14 *g*, and 0.33 *g* were recorded at the crest, right abutment, and downstream stations, respectively.

Additional magnitude 5 or greater earthquakes recorded at NCSMN stations in 1990, including the date, location, magnitude, and number of records recovered, are as follows: January 15, Montgomery Pass, Nevada, M=5.0, one record; January 16, northern California, M=5.3, two records; April 18, Hollister/Morgan Hill, California region, M=5.4, five records; and, October 24, eastern California, M=5.7, eight records.

Five accelerograph records were recovered from the Big Island of Hawaii during a magnitude 4.7 event on August 2. Maximum recorded horizontal ground motion was 0.38 *g* at Waimea.

REFERENCE

Etheredge, E.C., Acosta, A.V., Foote, L.J., Johnson, D.A., Maley, R.P., Porcella, R.L., and Switzer, J.C., 1990, Strong-motion recordings from the ML=5.5 Upland, California, earthquake of February 28, 1990: U.S. Geological Survey Open-File Report 90-311, 100 p.

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990

[Station owners: ACOE, U.S. Army Corps of Engineers; BECH, Bechtel Power Corporation; CDOT, California Department of Transportation; MWD, Metropolitan Water District of Southern Calif.; OWNR, Owner of building; USGS, U.S. Geological Survey; VA, U.S. Veterans Administration. Instrument trigger time in minutes and seconds after the hour listed in earthquake column. S-minus trigger denotes *S*-wave-arrival-minus-trigger-time (*S*-*t*) or *S*-wave-minus-*P*-wave-arrival time interval. Direction is of case acceleration for upward trace deflection on accelerogram; horizontal components are listed as azimuth, and vertical components as "up" or "down." Maximum amplitude is peak acceleration recorded on one vertical and two horizontal orthogonal components unless otherwise noted. Duration is interval between first and last peaks of acceleration greater than 0.10 *g*. Numbers in parentheses refer to footnotes at end of table.]

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
2 January 1990 0950:53.1 G.m.t. Southern Calif. 33.650N, 116.770W Magnitude 3.4 ML	Anza Array Garner Valley Fire Station (USGS)	33.616 116.627	50:56.9	1.9		(*1*)	
15 January 1990 0529:03.4 G.m.t. Eastern Calif. 37.988N, 118.210W Magnitude 5.0 ML	Montgomery Pass Nevada (USGS)	37.977 118.318	(*3*)	(*2*)	360 Up 270	.29 .16 .29	1.1 1.2 1.6
16 January 1990 2008:22.0 G.m.t. Northern Calif. 40.232N, 124.138W Magnitude 5.3 ML	Eel River Valley Array Ferndale Fire Station (USGS)	40.58 124.26	(*4*)	(*2*)		(*1*)	
	Eel River Valley Array Fortuna Fire Station (USGS)	40.599 124.154	(*3*)	(*2*)		(*1*)	
30 January 1990 0507:18.6 G.m.t. Central Calif. 36.543N, 121.177W Magnitude 2.8 ML	Bear Valley Station 5 Callens Ranch (USGS)	36.673 121.195	07:21.9	(*2*)		(*1*)	
	Bear Valley Station 1 CDF Fire Station (USGS)	36.573 121.184	07:19.4	0.6		(*1*)	
	Bear Valley Station 10 Webb Residence (USGS)	36.532 121.143	07:19.8	(*2*)		(*1*)	
18 February 1990 1552:59.9 G.m.t. Southern Calif. 33.510N, 116.450W Magnitude 4.1 ML	Anza Array Garner Valley Fire Station (USGS)	33.616 116.627	53:04.0	2.4		(*1*)	
	Anza Array Pine Meadow Ranch (USGS)	33.578 116.589	53:05.6	(*2*)	360 Up 270	.03 .04 .06	--- --- ---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 February 1990 1552:59.9 G.m.t. Southern Calif. 33.510N, 116.450W Magnitude 4.1 ML *(Continued)*	Anza Array Pinyon Flat Observatory (USGS)	33.61 116.46	(*3*)	(*2*)		(*1*)	
	Anza Array Rarick Springs (USGS)	33.568 116.510	53:02.1	1.2	360 Up 270	.10 .05 .13	1 peak --- 1.5
	Note: One additional record[1] recovered at Rarick Springs.						
	Anza Array Tule Canyon (USGS)	33.47 116.64	53:06.8	(*2*)		(*1*)	
26 February 1990 Approx. 2100 G.m.t. Eastern Calif. Epicenter and magnitude unknown	Chalfant Valley Fire Station (USGS)	37.53 118.37	(*4*)	0.8		(*1*)	
20 June 1989-28 February 1990 Southern Calif. Epicenter and magnitude unknown	Live Oak Reservoir LaVerne (MWD)	34.137 117.753	(3)				
	Abutment					(*1*)	
12 January 1990-28 February 1990 Southern Calif. Epicenter and magnitude unknown	San Antonio Dam Upland (ACOE)	34.157 117.676	(*3*)	(*2*)			
	Crest					(*1*)	
	Right Abutment					(*1*)	
28 February 1990 1307:00.8 G.m.t. Eastern Calif. 37.560N, 118.455W Magnitude 3.1 ML	Chalfant Valley Fire Station (USGS)	37.53 118.37	(*4*)	(*2*)		(*1*)	
28 February 1990 2343:36.6 G.m.t. Southern Calif. 34.140N, 117.700W Magnitude 5.2 ML *(Upland earthquake)*	San Antonio Dam Upland (ACOE)	34.157 117.676	(*3*)	0.3			
	Crest				090 Up 360	.46 .40 .58	4.9 4.9 8.0

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990	Right Abutment				090	.40	3.4
2343:36.6 G.m.t.					Up	.83	3.9
Southern Calif.					360	.48	4.3
34.140N, 117.700W							
Magnitude 5.2 ML	Downstream				090	.47	4.1
(Continued)					Up	.43	4.2
					360	.43	4.7
	Live Oak Reservoir	34.137	(*3*)	0.4			
	LaVerne	117.753					
	(MWD)						
	Abutment				180	.34	3.2
					Up	.24	3.4
					090	.28	3.1
	Structure Array:						
	Ch. 1- Center Crest				155	.25	3.2
	Ch. 2- Center Crest				Up	.28	3.0
	Ch. 3- Center Crest				245	.44	4.0
	Ch. 4- Left Crest				155	.29	3.5
	Ch. 5- Left Crest				245	.53	4.4
	Ch. 6- Left Slope				245	.36	3.6
	Ch. 7- Center Slope				155	.22	2.8
	Ch. 8- Center Slope				Up	.13	2.3
	Ch. 9- Center Slope				245	.32	3.9
	Ch. 10- Center Toe				155	.18	2.8
	Ch. 11- Center Toe				Up	.18	2.3
	Ch. 12- Center Toe				245	.19	2.9
	Weymouth Filter Plant	34.114	(*3*)	0.3			
	LaVerne	117.778					
	(MWD)						
	Bldg., Ground Level				015	.31	3.2
					Up	.26	4.4
					285	.23	2.8
	Water Tank, Top				015	.83	8.8
					Up	.87	14.7
					285	1.05	10.3

Note: Peak motions listed for top of Water Tank are approx.; record contains extremely high-frequency accelerations that are not fully discernible.

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990 2343:36.6 G.m.t. Southern Calif. 34.140N, 117.700W Magnitude 5.2 ML *(Continued)*	Morris Dam (MWD)	34.173 117.879	(*3*)	2.0			
	Left Abutment				245 Up 155	.05 .04 .08	--- --- ---
	Lytle Creek Mann Residence (USGS)	34.26 117.50	43:41.6	3.2	315 Up 225	.12 .07 .11	1 peak --- 0.3
	Note: One additional record[1] recovered at Lytle Creek.						
	Sycamore Forest Station (USGS)	34.193 117.426	43:43.1	2.3	315 Up 225	.06 .03 .04	--- --- ---
	Orange County Reservoir (MWD)	33.936 117.884	(*3*)	3.2			
	Abutment				090 Up 360	.09 .05 .10	--- --- 0.6
	Crest				090 Up 360	.17 .08 .11	1.0 --- 1 peak
	Diemer Filter Plant Yorba Linda (MWD)	33.913 117.819	(*3*)	2.7			
	Reservoir Roof				280 Up 190	.10 .03 .06	1 peak --- ---
	Carbon Canyon Dam Brea (ACOE)	33.914 117.839	(*3*)	3.5			
	Crest				130 Up 040	.11 .08 .14	1 peak --- 0.2
	Left Abutment				130 Up 040	.06 .05 .05	--- --- ---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990	Prado Dam	33.890	(*3*)	4.0			
2343:36.6 G.m.t.	Corona	117.641					
Southern Calif.	(ACOE)						
34.140N, 117.700W							
Magnitude 5.2 ML	Crest				090	.08	---
(Continued)					Up	.06	---
					360	.07	---
	Left Abutment				090	.03	---
					Up	.04	---
					360	.05	---
	Downstream				090	.20	2.2
					Up	.11	2 peaks
					360	.11	0.9
	San Bernardino Array	34.235	43:43.1	2.4	360	.06	---
	Devore Water Department	117.407			Up	.04	---
	(USGS)				270	.07	---
	Note: One additional record[1] recovered at Devore Water Department.						
	Paradise Springs Camp	34.40	(*3*)	2.8	120	.03	---
	(USGS)	117.80			Up	.04	---
					030	.07	---
	Riverside	33.968	(*3*)	2.5			
	Santa Ana River Bridge	117.447					
	(MWD/USGS)						
	North Abutment				165	.08	---
	Recorder Building				Up	.05	---
					075	.06	---
	Structure Array:						
	Ch. 1- North Abutment				345	.02	---
	Ch. 2- North Abutment				Down	.02	---
	Ch. 3- North Abutment				075	.03	---
	Ch. 4- Mid Span				345	.07	---
	Ch. 5- Mid Span				Down	.05	---
	Ch. 6- Mid Span				075	.06	---
	Ch. 7- Below Isolator Bearing				345	.09	---
	Ch. 8- Below Isolator Bearing				Down	.02	---
	Ch. 9- Below Isolator Bearing				075	.03	---
	Ch. 10- Above Isolator Bearing				345	.07	---
	Ch. 11- Above Isolator Bearing				Down	.03	---
	Ch. 12- Above Isolator Bearing				075	.08	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990	San Bernardino Array	34.134	(*3*)	3.3	360	.07	---
2343:36.6 G.m.t.	Rialto Fire Station	117.368			Up	.05	---
Southern Calif.	(USGS)				270	.06	---
34.140N, 117.700W							
Magnitude 5.2 ML	Note: One additional record[1] recovered at Rialto Fire Station.						
(Continued)							
	Whittier Narrows Dam	34.020	(*3*)	4.5			
	Pico Rivera	118.053					
	(ACOE)						
	Crest				120	.05	---
					Up	.05	---
					030	.05	---
	Upstream					(*1*)	
	Brea Dam	33.890	(*3*)	4.3			
	Fullerton	117.925					
	(ACOE)						
	Crest				130	.08	---
					Up	.04	---
					040	.09	---
	Left Abutment				130	.06	---
					Up	.02	---
					040	.04	---
	Downstream				130	.06	---
					Up	.04	---
					040	.06	---
	Note: One additional record[1] recovered at Brea Dam Crest.						
	Whittier	33.977	(*3*)	(*2*)			
	7215 Bright Ave.	118.036					
	(USGS)						
	Basement					(*1*)	
	5th floor					Inoperative	
	10th Floor					(*1*)	
	Valyermo Forest Station	34.44	(*3*)	4.9	300	.07	---
	Ground Level	117.85			Up	.04	---
	(USGS)				210	.06	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990	San Bernardino Array	34.086	(*3*)	5.1	360	.05	---
2343:36.6 G.m.t.	S.B. Valley College	117.309			Up	.05	---
Southern Calif.	(USGS)				270	.05	---
34.140N, 117.700W							
Magnitude 5.2 ML	Colton Interchange	34.064	(*3*)	4.7			
(Continued)	I-10/215	117.297					
	(CDOT)						
	Ground Site				080	.07	---
					Up	.03	---
					350	.07	---
	Bridge Cell				080	.25	4.7
					Up	.06	---
					350	.07	---
	San Bernardino Array	34.183	43:48.6	(*2*)		(*1*)	
	'F' Street	117.295					
	(USGS)						
	San Bernardino	34.106	43:44.6	4.1			
	County Government Center	117.287					
	(USGS)						
	Basement, SW					(*1*)	
	Ground Site					(*1*)	
	Structure Array:						
	Ch. 1- 2nd Floor Level, NW				360	.04	---
	Ch. 2- 2nd Floor Level, NE				090	.04	---
	Ch. 3- 2nd Floor Level, NE				360	.04	---
	Ch. 4- 2nd Floor Level, SW				090	.05	---
	Ch. 5- 4th Floor Level, SW				090	.05	---
	Ch. 6- 4th Floor Level, NW				360	.07	---
	Ch. 7- 6th Floor Level, (Roof) NE				090	.09	---
	Ch. 8- 6th Floor Level, (Roof) NW				360	.09	---
	Ch. 9- 6th Floor Level, (Roof) SW				090	.08	---
	Ch. 10- 6th Floor Level, (Roof) NE				360	.07	---
	Ch. 11- 4th Floor Level, NE				090	.07	---
	Ch. 12- 4th Floor Level, NE				360	.05	---
	Lake Mathews	33.852	(*3*)	2.2	252	.05	---
	Dike Toe	117.451			Up	.04	---
	(MWD)				162	.06	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990 2343:36.6 G.m.t. Southern Calif. 34.140N, 117.700W Magnitude 5.2 ML *(Continued)*	Garvey Reservoir Monterey Park (MWD)	34.050 118.114	(*3*)	(*2*)			
	Abutment Bldg.					(*1*)	
	Crest					(*1*)	
	Pasadena, CIT 525 S. Wilson Ave. (USGS)	34.137 118.127	(*3*)	4.3	360 Up 270	.05 .02 .03	--- --- ---
	Norwalk 12400 Imperial Highway (USGS/BECH)	33.916 118.067	(*3*)	2.2			
	North Ground Site					(*1*)	
	South Ground Site					(*1*)	
	Basement					(*1*)	
	4th Floor					(*1*)	
	8th Floor				090 Up 360	.06 .03 .06	--- --- ---
	Norwalk 12440 Imperial Highway (USGS/BECH)	33.917 118.066	43:51.1	1.4			
	North Ground Site					(*1*)	
	South Ground Site					(*1*)	
	Basement					(*1*)	
	Structure Array 1:						
	Ch. 1- 9th Level (Roof), Bldg. Center				090	.05	---
	Ch. 2- 6th Level, Bldg. Center				090	.02	---
	Ch. 3- 3rd Level, Bldg. Center				090	.02	---
	Ch. 4- 2nd Level, Bldg. Center				090	.02	---
	Ch. 5- 1st Level (Basement), East End				180	.03	---
	Ch. 6- 6th Level, Bldg. West-Center				180	.04	---
	Ch. 7- 1st Level (Basement), Bldg. Center				Up	.01	---
	Ch. 8- 1st Level (Basement), Bldg. Center				090	.02	---
	Ch. 9- 1st level (Basement), Bldg. Center				180	.03	---
	Ch. 10- Downhole (30'), Bldg. Center				Up	.01	---
	Ch. 11- Downhole (30'), Bldg. Center				090	.01	---
	Ch. 12- Downhole (30'), Bldg. Center				180	.03	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990	Structure Array 2:						
2343:36.6 G.m.t.	Ch. 13- 9th Level (Roof), East End				180	.06	---
Southern Calif.	Ch. 14- 6th Level, East End				180	.03	---
34.140N, 117.700W	Ch. 15- 3rd Level, East End				180	.03	---
Magnitude 5.2 ML	Ch. 16- 2nd Level, East End				180	.03	---
(Continued)	Ch. 17- 9th Level (Roof), Bldg. Center				180	.06	---
	Ch. 18- 6th Level, Bldg. Center				180	.04	---
	Ch. 19- 3rd Level, Bldg. Center				180	.04	---
	Ch. 20- 2nd Level, Bldg. Center				180	.03	---
	Ch. 21- 9th Level (Roof), West End				180	.06	---
	Ch. 22- 6th Level, West End				180	.03	---
	Ch. 23- 3rd Level, West End				180	.02	---
	Ch. 24- 2nd Level, West End				180	.03	---
	Loma Linda Medical Center Basement (USGS)	34.050 117.263	(*3*)	5.3		(*1*)	
	Alhambra 900 S. Fremont Ave. (USGS)	34.085 118.149	43:45.4	5.0			
	Structure Array:						
	Ch. 1- 12th Floor, Center				360	.04	---
	Ch. 2- 12th Floor, Center				090	.03	---
	Ch. 3- 12th Floor, North End				090	.02	---
	Ch. 4- 6th Floor, Center				090	.03	---
	Ch. 5- 6th Floor, Center				360	.02	---
	Ch. 6- 6th Floor, North End				090	.02	---
	Ch. 7- 2nd Floor, Center				090	.06	---
	Ch. 8- 2nd Floor, Center				360	.03	---
	Ch. 9- 2nd Floor, North End				090	.05	---
	Ch. 10- Basement, Center				360	.02	---
	Ch. 11- Basement, Center				Up	.02	---
	Ch. 12- Basement, Center				090	.03	---
	Loma Linda VA Hospital (VA/USGS)	34.050 117.249	(*3*)	5.6			
	Building 1 Structure Array:						
	Ch. 1- Ground Floor, Center				Down	.02	---
	Ch. 2- Ground Floor, Center				180	.04	---
	Ch. 3- Ground Froor, Center				270	.06	---
	Ch. 4- 4th Floor, Center				270	.15	1.0
	Ch. 5- Ground Floor, North				270	.07	---
	Ch. 6- 4th Floor, Center				180	.11	1 peak
	Ch. 7- 4th Floor, North				270	.12	1.0
	Ch. 8- Ground Floor, South				180	.04	---
	Ch. 9- 4th Floor, South				270	.11	0.2

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990 2343:36.6 G.m.t. Southern Calif. 34.140N, 117.700W Magnitude 5.2 ML *(Continued)*	North Ground Site		(*3*)	5.8	360	.05	---
					Up	.04	---
					270	.06	---
	South Ground Site		(*3*)	5.2	360	.06	---
					Up	.03	---
					270	.06	---
	Alhambra Norwich Ave. (USGS)	34.084 118.159	(*3*)	5.4		(*1*)	
	Mills Filter Plant (MWD)	33.920 117.320	(*3*)	0.6		(*1*)	
	Los Angeles Bulk Mail Center (USGS)	33.996 118.162	(*3*)	1.0	360	.03	---
					Up	.02	---
					270	.06	---
	Santa Ana, Orange County Engineering Bldg., Basement (USGS)	33.751 117.870	(*3*)	4.8		(*1*)	
	Reche Canyon Olive Dell Ranch (USGS)	34.004 117.223	(*3*)	5.2		(*1*)	
	Littlerock Post Office (USGS)	34.521 117.991	(*3*)	(*2*)	300	.09	---
					Up	.02	---
					210	.10	1 peak
	Orange County John Wayne Airport (USGS)	33.677 117.869	(*3*)	0.4		(*1*)	
	Los Angeles Griffith Park Observatory (USGS)	34.118 118.299	(*3*)	5.1		(*1*)	
	Long Beach VA Hospital (VA)	33.778 118.118	(*3*)	0.8			
	Ground Site					(*1*)	
	Basement					(*1*)	
	6th Floor					(*1*)	
	11th Floor				360	.04	---
					Up	.03	---
					270	.07	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990 2343:36.6 G.m.t. Southern Calif. 34.140N, 117.700W Magnitude 5.2 ML *(Continued)*	San Joaquin Reservoir (MWD)	33.620 117.842	(*3*)	(*2*)			
	Abutment					(*1*)	
	Crest					(*1*)	
	Newport Beach 840 Newport Center Dr. (USGS)	33.618 117.878	(*3*)	5.8			
	Structure Array:						
	Ch. 1- Tower 2, Level 1, Center				360	.05	---
	Ch. 2- Tower 2, Level 1, Center				Up	.02	---
	Ch. 3- Tower 2, Level 1, Center				090	.03	---
	Ch. 4- Tower 2- Level 2, West				360	Inoperative	
	Ch. 5- Tower 2- Level 2, Center				360	.07	---
	Ch. 6- Tower 2, Level 2, Center				090	.07	---
	Ch. 7- Tower 2, Level 9, South				090	.02	---
	Ch. 8- Tower 2, Level 10, Center				360	Inoperative	
	Ch. 9- Tower 2, Level 10, Center				090	Inoperative	
	Ch. 10- Tower 1, Level 9, East				360	.02	---
	Ch. 11- Tower 1, Level 10, Center				270	.05	---
	Ch. 12- Tower 1, Level 10, Center				360	.04	---
	Palos Verdes Reservoir (MWD)	33.772 118.319	(*3*)	(*2*)			
	Crest					(*1*)	
	Abutment					(*1*)	
	Sepulveda VA Hospital (VA)	34.249 118.478	(*3*)	7.8		(*1*)	
	Jensen Filter Plant Balboa Park (MWD)	34.312 118.496	(*3*)	(*2*)			
	Administration Bldg. Basement					(*1*)	
	Generator Room					(*1*)	
	Reservoir Roof					(*1*)	
	Leona Valley Fire Station (USGS)	34.62 118.29	(*3*)	(*2*)		(*1*)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990 2343:36.6 G.m.t. Southern Calif. 34.140N, 117.700W Magnitude 5.2 ML *(Continued)*	Anza Array Red Mountain (USGS)	33.630 116.847	44:06.7	(*2*)		(*1*)	
28 February 1990- 1 March 1990 Southern Calif. Epicenters and magnitudes unknown *(aftershock)*	Weymouth Filter Plant LaVerne (MWD)	34.114 117.778	(*3*)				
	Bldg., Ground Level			1.2	015 Up 285	.07 .03 .06	--- --- ---
				1.4	015 Up 285	.07 .03 .05	--- --- ---
	Note: Two additional records[1] recovered at Weymouth Filter Plant Bldg., ground level.						
28 February 1990- 2 March 1990 Southern Calif. Epicenters and magnitudes unknown *(aftershocks)*	Live Oak Reservoir LaVerne (MWD)	34.137 117.753	(*3*)				
	Abutment			1.1	180 Up 090	.08 .06 .08	--- --- ---
				(*2*)	180 Up 090	.06 .03 .04	--- --- ---
	Note: Four additional records[1] recovered at Live Oak Reservoir Abutment.						
	Structure Array:			(*2*)			
	Ch. 1- Center Crest				155	.05	---
	Ch. 2- Center Crest				Up	.03	---
	Ch. 3- Center Crest				245	.03	---
	Ch. 4- Left Crest				155	.06	---
	Ch. 5- Left Crest				245	.03	---
	Ch. 6- Left Slope				245	.03	---
	Ch. 7- Center Slope				155	.04	---
	Ch. 8- Center Slope				Up	.01	---
	Ch. 9- Center Slope				245	.03	---
	Ch. 10- Center Toe				155	.04	---
	Ch. 11- Center Toe				Up	.02	---
	Ch. 12- Center Toe				245	.02	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990-	Structure Array:			(*2*)			
2 March 1990	Ch. 1- Center Crest				155	.09	---
Southern Calif.	Ch. 2- Center Crest				Up	.05	---
Epicenters and	Ch. 3- Center Crest				245	.07	---
magnitudes unknown	Ch. 4- Left Crest				155	.09	---
(aftershocks continued)	Ch. 5- Left Crest				245	.07	---
	Ch. 6- Left Slope				245	.05	---
	Ch. 7- Center Slope				155	.07	---
	Ch. 8- Center Slope				Up	.02	---
	Ch. 9- Center Slope				245	.06	---
	Ch. 10- Center Toe				155	.07	---
	Ch. 11- Center Toe				Up	.02	---
	Ch. 12- Center Toe				245	.05	---
	Structure Array:			(*2*)			
	Ch. 1- Center Crest				155	.07	---
	Ch. 2- Center Crest				Up	.06	---
	Ch. 3- Center Crest				245	.05	---
	Ch. 4- Left Crest				155	.06	---
	Ch. 5- Left Crest				245	.05	---
	Ch. 6- Left Slope				245	.04	---
	Ch. 7- Center Slope				155	.06	---
	Ch. 8- Center Slope				Up	.05	---
	Ch. 9- Center Slope				245	.04	---
	Ch. 10- Center Toe				155	.05	---
	Ch. 11- Center Toe				Up	.03	---
	Ch. 12- Center Toe				245	.03	---
	Note: One additional record[1] recovered at Live Oak Reservoir Structure Array.						
	San Antonio Dam Upland (ACOE)	34.157 117.676	(*3*)				
	Crest			(*2*)	090	.04	---
					Up	.03	---
					360	.06	---
				0.7	090	.07	---
					Up	.04	---
					360	.06	---
				1.3	090	.04	---
					Up	.02	---
					360	.09	---
				(*2*)	090	.05	---
					Up	.03	---
					360	.09	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990-2 March 1990 Southern Calif. Epicenters and magnitudes unknown *(aftershocks continued)*	Crest *(Continued)*			0.8	090	.07	---
					Up	.06	---
					360	.12	2 peaks
				1.4	090	.22	0.6
					Up	.04	---
					360	.15	1.6
				(*2*)	090	.04	---
					Up	.04	---
					360	.10	0.2
				(*2*)	090	.04	---
					Up	.04	---
					360	.11	1 peak
				(*2*)	090	.07	---
					Up	.03	---
					360	.09	---
				0.7	090	.21	0.8
					Up	.12	1.1
					360	.43	1.8
	Note: Five additional records[1] recovered at San Antonio Dam Crest.						
	Right Abutment			(*2*)	090	.04	---
					Up	.06	---
					360	.05	---
				1.2	090	.06	---
					Up	.07	---
					360	.09	---
				0.6	090	.16	0.5
					Up	.18	1.0
					360	.16	1.1
	Note: Fourteen additional records[1] recovered at San Antonio Dam Right Abutment.						
	Downstream			0.8	090	.06	---
					Up	.04	---
					360	.08	---
				1.5	090	.16	0.3
					Up	.07	---
					360	.13	0.4

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
28 February 1990- 2 March 1990 Southern Calif. Epicenters and magnitudes unknown *(aftershocks continued)*	Downstream *(Continued)*			0.8	090 Up 360	.19 .07 .18	0.3 --- 0.3
	Note: Eleven additional records[1] recovered at San Antonio Dam Downstream.						
8 November 1989- 8 March 1990 Southern Calif. Epicenter and magnitude unknown	Skinner Dam (MWD) Left Abutment	33.58 117.07	(*3*)	(*2*)	 180 Up 090	 .04 .01 .07	 --- --- ---
26 March 1990 1228:47.2 G.m.t. Central Calif. 36.568N, 121.198W Magnitude 2.8 ML	Bear Valley Station 10 Webb Residence (USGS)	36.532 121.143	28:48.6	1.3	310 Up 220	.07 .05 .07	--- --- ---
9 April 1990 Approx. 1600 G.m.t. Eastern Calif. Epicenter and magnitude unknown	Chalfant Valley Fire Station (USGS)	37.53 118.37	(*4*)	1.6		(*1*)	
11 April 1990 Approx. 1200 G.m.t. Eastern Calif. Epicenter and magnitude unknown	Chalfant Valley Fire Station (USGS)	37.53 118.37	(*4*)	0.7		(*1*)	
2 March 1990- 17 April 1990 Southern Calif. Epicenters and magnitudes unknown	San Antonio Dam Upland (ACOE) Crest	34.157 117.676	(*3*)	 (*2*)	 090 Up 360	 .03 .05 .05	 --- --- ---
				0.9	090 Up 360	.08 .07 .16	--- --- 0.6
				0.9	090 Up 360	.02 .04 .08	--- --- ---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
2 March 1990- 17 April 1990 Southern Calif. Epicenters and magnitudes unknown *(Continued)*	Crest *(Continued)*			(*2*)	090 Up 360	.05 .04 .08	--- --- ---
	Note: Four additional records[1] recovered at San Antonio Dam Crest.						
	Right Abutment			(*2*)	090 Up 360	.04 .07 .05	--- --- ---
	Note: Eight additional records[1] recovered at San Antonio Dam Right Abutment.						
	Downstream			(*2*)	090 Up 360	.02 .06 .02	--- --- ---
				0.8	090 Up 360	.09 .05 .08	--- --- ---
	Note: Five additional records[1] recovered at San Antonio Dam Downstream.						
17 April 1990 2232:27.2 G.m.t. Southern Calif. 34.110N, 117.720W Magnitude 4.6 ML *(aftershock)*	Carbon Canyon Dam Brea (ACOE)	33.914 117.839	(*3*)	3.3			
	Crest					(*1*)	
	Diemer Filter Plant Yorba Linda (MWD)	33.913 117.819	(*3*)	(*2*)			
	Basement					(*1*)	
	Reservoir Roof					(*1*)	
	Live Oak Reservoir LaVerne (MWD)	34.137 117.753	(*3*)	0.3			
	Abutment				180 Up 090	.11 .04 .19	1 peak --- .02

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
17 April 1990 2232:27.2 G.m.t. Southern Calif. 34.110N, 117.720W Magnitude 4.6 ML *(aftershock continued)*	San Antonio Dam Upland (ACOE)	34.157 117.676	(*3*)	1.2			
	Crest				090 Up 360	.33 .19 .36	0.8 0.5 2.5
	Right Abutment				090 Up 360	.14 .08 .08	0.2 --- ---
	Downstream				090 Up 360	.33 .13 .22	0.6 1 peak 0.3
	Weymouth Filter Plant LaVerne (MWD)	34.114 117.778	(*3*)				
	Ground Level				015 Up 285	.11 .12 .07	0.2 1 peak ---
	Tank Top				015 Up 285	.20 .22 .19	0.7 2.3 2.4
18 April 1990 1353:51.4 G.m.t. Central Calif. 36.917N, 121.675W Magnitude 5.4 ML	Hollister City Hall Annex Basement (USGS)	36.851 121.402	(*3*)	4.0		(*1*)	
	Hollister Airport Differential Array (USGS)	36.888 121.413	(*3*)	5.2		(*1*)	
	Anderson Dam Morgan Hill (USGS)	37.166 121.628	(*3*)	(*2*)			
	Crest				340 Up 250	.05 .03 .07	--- --- ---
	Left Abutment					(*1*)	
	Downstream					(*1*)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 April 1990- 20 April 1990 Southern Calif. Epicenter and magnitude unknown	San Antonio Dam Upland (ACOE)	34.157 117.676	(*3*)				
	Crest			1.2	090 Up 360	.04 .02 .06	--- --- ---
	Right Abutment			(*2*)		(*1*)	
	Downstream			(*2*)		(*1*)	
22 April 1990 1402:04.4 G.m.t. Central Calif. 36.575N, 121.218W Magnitude 3.1 ML	Bear Valley Station 10 Webb Residence (USGS)	36.532 121.143	02:06.8	1.9		(*1*)	
20 October 1989- 25 April 1990 Central Calif. Epicenter and magnitude unknown	Calaveras Array Pleasant Hill Contra Costa Fire Station #2 (USGS)	37.927 122.078	(*3*)	(*2*)		(*1*)	
28 April 1990 0441:48.0 G.m.t. Central Calif. 37.885N, 121.983W Magnitude 4.6 ML	Calaveras Array Danville Fire Station (USGS)	37.810 121.992	(*3*)	1.8		(*1*)	
28 April 1990 0447:41.8 G.m.t. Central Calif. 37.863N, 122.003W Magnitude 3.9 ML	Calaveras Array Pleasant Hill Contra Costa Fire Station #2 (USGS)	37.927 122.078	(*4*)	(*2*)		(*1*)	
	Calaveras Array Danville Fire Station (USGS)	37.810 121.992	(*3*)	2.0	360 Up 270	.05 .03 .06	--- --- ---
28 April 1990 0545:04.2 G.m.t. Central Calif. 37.870N, 122.018W Magnitude 3.4 ML	Calaveras Array Danville Fire Station (USGS)	37.810 121.992	(*3*)	(*2*)		(*1*)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
21 May 1990	Chalfant Valley	37.53	(*4*)	0.9	360	.05	---
1049:16.7 G.m.t.	Fire Station	118.37			Up	.04	---
Eastern Calif.	(USGS)				270	.06	---
37.500N, 118.420W							
Magnitude 3.6 ML	Chalfant Valley	37.402	(*4*)	0.6		(*1*)	
	Laws, Calif.	118.346					
	(USGS)						
10 January 1989-	Los Angeles	34.056	(*3*)	4.0			
31 May 1990	2055 Avenue of the Stars	118.413					
Southern Calif.	(OWNR)						
Epicenters and							
magnitudes unknown	Roof (31)				320	.07	---
					Up	.07	---
					230	.03	---
	Note: Five additional records[1] recovered at 2055 Avenue of the Stars Roof.						
26 August 1985-	Los Angeles	43.050	(*3*)				
31 May 1990	11645 Wilshire Blvd.	118.459					
Southern Calif.	(OWNR)						
Epicenters and							
magnitudes unknown	11th Floor			3.1	315	.11	1 peak
					Up	.04	---
					225	.14	1.2
				(*2*)	315	.08	---
					Up	.03	---
					225	.07	---
17 June 1990	Kealakekua	19.523	(*4*)	(*2*)		(*1*)	
Approx. 1600 G.m.t.	Kona Hospital	155.879					
Hawaii	(USGS)						
Epicenter and							
magnitude unknown							
18 November 1989-	Palo Alto	37.40	(*3*)	(*2*)			
26 June 1990	VA Hospital, Bldg. 1	122.14					
Central Calif.	(VA)						
Epicenters and							
magnitudes unknown	Basement					(*1*)	
	Roof (7th)					(*1*)	
	Note: One each additional record[1] recovered at Palo Alto VA Hospital Basement and Roof.						

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
2 August 1990	Kealakekua, Hawaii	19.523	(*4*)	(*2*)		(*1*)	
0537:22.6 G.m.t.	Kona Hospital	155.879					
Hawaii	(USGS)						
19.843N, 155.617W							
Magnitude 4.7 ML	Laupahoehoe, Hawaii	19.987	(*4*)	(*2*)	360	.05	---
	Post Office	155.236			Up	.02	---
	(USGS)				270	.05	---
	Kohala, Hawaii	20.230	(*4*)	5.6	102	.05	---
	Police Station	155.801			Up	.06	---
	(USGS)				012	.07	---
	Mauna Kea, Hawaii	19.826	(*4*)	3.0	270	.09	---
	U.K. Summit Observatory	155.473			Up	.06	---
	(USGS)				180	.08	---
	Waimea, Hawaii	20.026	(*4*)	3.0	360	.38	1.6
	Fire Station	155.664			Up	.23	1.9
	(USGS)				270	.33	2.6
5 August 1990	Anza Array	33.348	27:06.5	(*2*)	360	.08	---
2127:03.7 G.m.t.	Rancho de Anza	116.400			Up	.06	---
Southern Calif.	(USGS)				270	.07	---
33.320N, 116.410W							
Magnitude 3.6 ML							
20 June 1988-	Los Angeles	33.946	(*3*)	3.6	270	.07	---
8 August 1989	6101 W. Century Blvd.	118.391			Up	.05	---
Southern Calif.	15th floor				180	.03	---
Epicenters and	(OWNR)						
magnitudes unknown							
	Note: Two additional records[1] recovered at 6101 W. Century Boulevard.						
	Los Angeles	34.061	(*3*)	1.1	160	.08	---
	10660 Wilshire Blvd.	118.434			Up	.09	---
	19th floor				070	.15	1.0
	(OWNR)						
			(*3*)	4.1	160	.10	1 peak
					Up	.11	0.1
					070	.23	.07
	Note: Four additional records[1] recovered at 10660 Wilshire Boulevard.						
9 August 1990	Hilo, Hawaii	19.731	(*4*)	(*2*)		(*1*)	
0206:36.1 G.m.t.	U.S.D.A. Laboratory	155.100					
Hawaii	(USGS)						
19.340N, 155.114W							
Magnitude 5.0 ML							

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
20 August 1990 1410:47.8 G.m.t. Eastern Calif. 37.492N, 118.842W Magnitude 2.6 Ml	McGee Creek Mammoth Lakes (USGS) (Triaxial)	37.550 118.811	(*4*)	(*2*)		(*1*)	
	McGee Creek Mammoth Lakes (USGS) (Multi-channel)	37.550 118.811	(*4*)				
	166 m Downhole			(*2*)		(*1*)	
	35 m Downhole			(*2*)		(*1*)	
	1 m Downhole			(*2*)		(*1*)	
	Surface			(*2*)		(*1*)	
22 August 1990 2124:06.0 G.m.t. Central Calif. 37.202N, 122.075W Magnitude 3.7 ML	Los Gatos Los Altos Rod & Gun Club (USGS)	37.239 122.106	(*4*)	(*2*)		(*1*)	
28 August 1990 1824:02.3 G.m.t. Eastern Calif. 37.523N, 118.893W Magnitude 3.2 ML	McGee Creek Mammoth Lakes (USGS) (Triaxial)	37.550 118.811	(*4*)	(*2*)		(*1*)	
	McGee Creek Mammoth Lakes (USGS) (Multi-channel)	37.550 118.811	(*4*)				
	166 m Downhole			(*2*)		(*1*)	
	35 m Downhole			(*2*)		(*1*)	
	1 m Downhole			(*2*)		(*1*)	
	Surface			(*2*)		(*1*)	
1 September 1990 Approx. 2000 G.m.t. Hawaii Epicenter and magnitude unknown	Waimea, Hawaii Fire Station (USGS)	20.026 155.664	(*4*)	(*2*)		(*1*)	
7 September 1990 2329:26.1 G.m.t. Central Calif. 36.563N, 121.190W Magnitude 2.5 ML	Bear Valley Station 10 Webb Residence (USGS)	36.532 121.143	29:27.4	1.1		(*1*)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
23 September 1990 1335:47.6 G.m.t. Central Calif. 37.395N, 122.163W Magnitude 3.3 ML	Stanford University SLAC Test Lab (USGS)	37.419 122.205	35:50.8	(*2*)		(*1*)	
26 September 1990 0253:55.8 G.m.t. Central Calif. 37.380N, 122.182W Magnitude 3.6 ML	Stanford University SLAC Test Lab (USGS)	37.419 122.205	53:59.1	(*2*)	360 Up 270	.06 .02 .03	--- --- ---
24 October 1990 0615:20.7 G.m.t. Eastern Calif. 38.047N, 119.157W Magnitude 5.7 ML	Buchanan Dam (ACOE)	37.217 119.983	(*4*)	(*2*)			
	Left Crest					(*1*)	
	Center Crest					(*1*)	
	Lower Tower					(*1*)	
	Upper Tower					(*1*)	
	Hidden Dam (ACOE)	37.112 119.883	(*4*)	(*2*)			
	Downstream					(*1*)	
	Right Crest					(*1*)	
	Lower Tower					(*1*)	
	Upper Tower					(*1*)	
	Center Crest					(*1*)	
20 April 1990- 15 November 1990 Southern Calif. Epicenter and magnitude unknown	San Antonio Dam (ACOE)	34.157 117.676	(*3*)				
	Downstream			1.0		(*1*)	
	Right Abutment			(*2*)		(*1*)	
9 September 1989- 10 December 1990 Southern Calif. Epicenter and magnitude unknown	El Centro Differential Array (USGS)	32.796 115.535	(*3*)	0.8		(*1*)	
	Calexico Fire Station (USGS)	32.669 115.492	(*3*)	2.6		(*1*)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- *Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
23 May 1990- 12 December 1990 Southern Calif. Epicenters and magnitudes unknown	Salton Sea Wildlife Refuge (USGS) SMA-1	33.178 115.615	(*3*)	1.3		(*1*)	
	Note: Three additional records[1] recovered at Salton Sea Wildlife Refuge SMA-1.						

[1] Less than 0.05 *g* at ground-level or less than 0.10 *g* at non-ground-level stations.

[2] Questionable or indeterminable.

[3] WWVB time code illegible, or instrument not equipped with a radio receiver; correlation of accelerogram with event may be questionable or identity of event unknown.

[4] Contains internal clock for event correlation only (accuracy is widely variable).

Table 2. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1990 -- Errata
Event triggers not included in original published version of catalogue.

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
21 October 1989- 18 November 1990 Central Calif. Epicenters and magnitudes unknown	Bear Valley Array #10 Williams Ranch (USGS)	36.658 121.249	(*3*)	(*2*)	310 Up 220	.05 .04 .06	--- --- ---
			(*3*)	2.2	310 Up 220	.06 .05 .07	--- --- ---
			(*3*)	1.0	310 Up 220	.07 .02 .02	--- --- ---
			(*3*)	1.7	310 Up 220	.06 .03 .03	--- --- ---
	Note: Fifteen additional records[1] recovered at Williams Ranch.						