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Catalogue of U.S. Geological Survey Strong-Motion Records, 1989

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Catalogue of U.S. Geological Survey Strong-Motion Records, 1989

Compiled by JOSEPHINE C. SWITZER and
RONALD L. PORCELLA

U.S. GEOLOGICAL SURVEY CIRCULAR 1084

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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 National Earthquake Hazards Reduction Program. The current Federal seismic engineering program operates the National Cooperative Strong-Motion Network (NCSMN) with more than 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 1989. Unless otherwise noted, event data are from the "Preliminary Determination of Epicenters," published monthly by the U.S. Geological Survey.

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Catalogue of U.S. Geological Survey Strong-Motion Records, 1989

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

INTRODUCTION

Nearly 400 accelerograph records were recovered from the National Cooperative Strong-Motion Network (NCSMN) during 1989. Stations in California, Hawaii, and Washington recorded eight earthquakes of M=5.0 or greater including the M_L=7.0 Loma Prieta earthquake in northern California on October 17.

An M_L=5.0 earthquake in the Malibu area of southern California triggered 14 accelerographs at 10 stations on January 19. A peak acceleration of 0.15 *g* was recorded at the sixth level of the Wadsworth VA hospital in west Los Angeles (Johnson and Acosta, 1989).

On April 3 an M_L=4.7 earthquake triggered five strong-motion stations along the Calaveras Fault zone in northern California. The peak horizontal acceleration recorded was 0.16 *g* at Cherry Flat Reservoir (Salsman and Switzer, 1990).

Two earthquakes on June 12 in southern California, M_L= 4.4 and 4.1, produced records at 13 and 8 NCSMN stations, respectively. Maximum ground accelerations of 0.15 *g* were recorded in East Los Angeles and at the abutment of Garvey Reservoir in Monterey Park during the 4.4 event; during the 4.1 event, maximum ground motions at these two stations were 0.08 *g* and 0.05 *g*, respectively.

An M_L=4.8 earthquake near Eureka in northern California on September 21 produced significant ground motions at two of five stations triggered by this event; peak motions and their locations were 0.16 *g* at Centerville Beach Navy Facility and 0.12 *g* at Ferndale Fire Station.

Accelerographs at 41 NCSMN stations in the San Francisco Bay area were triggered by the October 17 Loma Prieta main shock and produced 59 records; these data include recordings from extensively instrumented structures such as high-rise buildings in San Francisco, Berkeley, Hayward, and Emeryville, and a dam east of Morgan Hill. The closest USGS accelerograph station was Anderson Dam, located at an epicentral distance of 27 km, which produced peak accelerations of 0.08, 0.23, and 0.26 *g*, at the abutment, toe, and downstream stations, respectively (Maley and others, 1989).

A companion project at the USGS has published a report containing the computer processed results of 17 film records and a digital record recovered from this event (Brady and Mork, 1990). A companion tape containing all processed results is available, together with tapes for the remainder of this event's processed records, from the National Geophysical Data Center, 325 Broadway (Mail E/GC1), Boulder, Colorado 80303; phone (303) 497-6084.

An M_L=4.2 earthquake on December 2 triggered seven stations of the Anza strong-motion array in southern California; a peak horizontal ground acceleration of 0.18 *g* was recorded on granitic rock at the Keenwild Forest Station site.

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Additionally, six magnitude 5 or greater earthquakes were recorded at NCSMN stations in 1989. The date, location, magnitude, number of records recovered, and maximum recorded ground motion are as follows: June 26, Hawaii, 6.2, 14 records, 0.19 *g*; Aug. 8, central California. 5.4, eight records, 0.08 *g*; Oct. 18, central California, 5.1, three records, less than 0.05 *g*; Oct. 25, central California, 5.0, two records, less than 0.05 *g*; Dec. 24, Washington state, 5.1, one record, 0.08 *g* (on crest of dam); and Dec. 28, Hawaii, 5.0, two records, less than 0.05 *g*.

REFERENCES

Brady, A.G., and Mork, P.N., 1990, Loma Prieta, California, earthquake October 18 (GMT), 1989, processed strong-motion records, Volume I: U.S. Geological Survey Open-File Report 90-247, 274 p.

Johnson, D.A., and Acosta, A.V., 1989, Strong-motion data from the Malibu, California, earthquake of January 19, 1989: U.S. Geological Survey Open-File Report 89-186, 21 p.

Maley, R.P., Acosta, A.V., Ellis, F., Etheredge, E.C., Foote, L., Johnson, D.A., Porcella, R.L., Salsman, M., and Switzer, J.C., 1989, U.S. Geological Survey strong-motion records from the northern California (Loma Prieta) earthquake of October 17, 1989: U.S. Geological Survey Open-File Report 89-0568, 85 p.

Salsman, M.J., and Switzer, J.C., 1990, Strong-motion records from earthquakes of June 13, 1988, November 10, 1988, and April 3, 1989, on the Calaveras Fault, central California: U.S. Geological Survey Open-File Report 90-481, 36 p.

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989

[Station owners: ACOE, U.S. Army Corps of Engineers; BECH, Bechtel Power Corporation; CDOT, California Department of Transportation; CDWR, California Department of Water Resources; JCG, JCG Finance Corporation of America; MWD, Los Angeles Metropolitan Water District; OWNR, Owner of building; UCB, University of California at Berkeley; USGS, U.S. Geological Survey; VA, U.S. Veterans Administration. Instrument trigger time in seconds after the minute or the following minute listed in earthquake column. S-minus trigger denotes S-wave-arrival-minus-trigger-time (S-t) or S-wave-minus-P-wave-arrival time (S-P, in brackets) 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 at ground level on one vertical and two orthogonal horizontal 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)
9 January 1989 0803:26.1 G.m.t. Eastern Calif. 37.548N, 118.779W Magnitude 3.2 ML	McGee Creek Mammoth Lakes (USGS) SMA-1	37.550 118.811	(4)	1.0		(1)	
	McGee Creek Mammoth Lakes (USGS) CRA-1	37.550 118.811	(4)	1.0			
	166 m Downhole					(1)	
	35 m Downhole					(1)	
	Surface					(1)	
	1 m Downhole					(1)	
11 January 1989 2334:26.5 G.m.t. Southern Calif. 33.185N, 115.593W Magnitude 3.2 ML	Salton Sea Wildlife Refuge (USGS) SMA-1	33.178 115.615	34:25.6	1.1	315 Up 225	.05 .04 .03	--- --- ---
19 January 1989 0653:28.8 G.m.t. Southern Calif. 33.920N, 118.630W Magnitude 5.0 ML	Jensen Filter Plant Balboa Ave. (MWD)	34.312 118.496	(3)	6.7			
	Basement Admin. Bldg.				(1)		
	Generator Bldg.					(1)	
	Reservoir Roof					(1)	
	Lawndale 15000 Aviation Blvd. (USGS)	33.895 118.377	(3)	3.5	360 Up 270	.10 .03 .05	1 peak --- ---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
19 January 1989 0653:28.8 G.m.t. Southern Calif. 33.920N, 118.630W Magnitude 5.0 ML *(Continued)*	Los Angeles Brentwood VA Hospital (VA)	34.063 118.462	(3)	3.6		(1)	
	Los Angeles Wadsworth VA Hospital (VA)	34.053 118.452	53:33.8	3.8			
	Ground Site South				325	.03	---
					Up	.02	---
					235	.07	---
	Structure Array:						
	Ch. 1- 6th Floor, North				235	.15	1.0
	Ch. 2- 6th Floor, North-center				235	.11	1 peak
	Ch. 3- 6th Floor, Center				235	.13	0.3
	Ch. 4- 6th Floor, Center				055	.11	0.3
	Ch. 5- 6th Floor, South				055	.05	---
	Ch. 6- 6th Floor, South				325	.05	---
	Ch. 7- Basement, North-center				325	.10	0.2
	Ch. 8- Basement, North-center				235	.07	---
	Ch. 9- Basement, North-center				Down	.03	---
	Malibu Kilpatrick School (USGS)	34.093 118.836	53:36.6	1.2		(1)	
	Malibu Canyon Monte Nido Fire Stn (USGS)	34.087 118.693	53:32.8	2.5	090	.07	---
					Up	.05	---
					360	.05	---
	Sepulveda Canyon Control Facility (USGS)	34.097 118.478	(3)	3.3		(1)	
	Sepulveda Dam San Fernando Valley (ACOE)	34.167 118.469	(3)	4.4			
	Crest					(1)	
	Downstream					(1)	
	Sepulveda VA Hospital Bldg. 40 (VA)	34.249 118.475	(3)	5.3		(1)	
	Topanga Fire Station (USGS)	34.084 118.600	53:32.8	2.8	270	.10	1 peak
					Up	.09	---
					180	.06	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
1 February 1989 0803 G.m.t. Hawaii Epicenter and magnitude unknown	Waimea, Hawaii Fire Station (USGS)	20.026 155.664	(4)	(2)		(1)	
3 February 1989 2348:46.7 G.m.t. Southern Calif. 33.180N, 115.600W Magnitude 3.4 ML	Salton Sea Wildlife Refuge (USGS) SMA-1	33.178 115.615	48:47.7	0.8	315 Up 225	.03 .04 .10	--- --- 1 peak
7 February 1989 1112 G.m.t. Southern Calif. Epicenter and magnitude unknown	Salton Sea Wildlife Refuge (USGS) SMA-1	33.178 115.615	12:47.8	0.9		(1)	
16 February 1989 1917:07.7 G.m.t. Southern Calif. 33.170N, 115.600W Magnitude 3.4 ML	Salton Sea Wildlife Refuge (USGS) SMA-1	33.178 115.615	17:08.7	1.1	315 Up 225	.08 .06 .17	--- --- 0.1
	Imperial Wildlife Liquefaction Array (USGS)	33.097 115.530	17:12.0	1.4		(1)	
22 February 1989 0419:53.2 G.m.t. Central Calif. 36.907N, 121.363W Magnitude 2.9 ML	Hollister Differential Array (USGS)	36.88 121.413	19:55.2	1.9		(1)	
27 February 1989 1903:09.4 G.m.t. Eastern Calif. 37.596N, 118.886W Magnitude 3.4 ML	McGee Creek Mammoth Lakes (USGS) SMA-1	37.55 118.811W	(4)	(2)		(1)	
	McGee Creek Mammoth Lakes (USGS) CRA-1	37.550 118.811	(4)	(2)			
	166 m Downhole					(1)	
	35 m Downhole					(1)	
	Surface					(1)	
	1 m Downhole					(1)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
6 March 1989	Salton Sea	33.178	16:48.3	1.1	315	.27	1.0
2216:47.6 G.m.t.	Wildlife Refuge	115.615			Up	.25	2.1
Southern Calif.	(USGS) SMA-1				225	.34	2.1
33.180N, 115.600W							
Magnitude 4.3 ML	Imperial Wildlife	33.097	(3)	1.8			
	Liquefaction Array	115.530					
	(USGS)						
	Channel 1- Surface				360	.15	1 peak
	Channel 2- Surface				Up	.11	0.6
	Channel 3- Surface				090	.10	1 peak
	Channel 4- 7.5-m Downhole				*	.06	---
	Channel 5- 7.5-m Downhole				*	.05	---
	Channel 6- 7.5-m Downhole				*	.05	---
	* Unknown						
	Note: Channels 7-12 non-functional piezometers.						
6 March 1989	Salton Sea	33.178	20:39.3	1.1	315	.05	---
2220:38.6 G.m.t.	Wildlife Refuge	115.615			Up	.03	---
Southern Calif.	(USGS) SMA-1				225	.09	---
33.180N, 115.620W							
Magnitude 3.3 ML	Imperial Wildlife	33.097	20:47.5	1.5		(1)	
	Liquefaction Array	115.530					
	(USGS)						
6 March 1989	Salton Sea	33.178	45:56.4	0.4		(1)	
2245 G.m.t.	Wildlife Refuge	115.615					
Southern Calif.	(USGS) SMA-1						
Epicenters and magnitudes unknown	Note: One additional record[1] recovered at Salton Sea Wildlife Refuge SMA-1.						
6 March 1989	Salton Sea	33.178	57:34.8	1.0	315	.16	0.2
2257:34.2 G.m.t.	Wildlife Refuge	115.615			Up	.20	0.5
Southern Calif.	(USGS) SMA-1				225	.15	0.3
33.200N, 115.600W							
Magnitude 3.2 ML							
6 March 1989	Salton Sea	33.178	58:33.1	[1.2]	315	.06	---
2258:32.5 G.m.t.	Wildlife Refuge	115.615			Up	.06	---
Southern Calif.	(USGS) SMA-1				225	.09	---
33.180N, 115.600W							
Magnitude 3.6 ML							

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
7 March 1989 0024:58.1 G.m.t. Southern Calif. 33.180N, 115.610W Magnitude 4.1 ML	Imperial Wildlife Liquefaction Array (USGS)	33.097 115.530	25:02.5	1.3		(1)	
	Channel 1- Surface				360	.05	---
	Channel 2- Surface				Up	.03	---
	Channel 3- Surface				090	.07	---
	Channel 4- 7.5-m Downhole				*	.03	---
	Channel 5- 7.5-m Downhole				*	.01	---
	Channel 6- 7.5-m Downhole				*	.02	---
	* Unknown Note: Channels 7-12 non-functional piezometers.						
7 March 1989 0147:27.5 G.m.t. Southern Calif. 33.180N, 115.610W Magnitude 3.4 ML	Imperial Wildlife Liquefaction Array (USGS)	33.097 115.530	47:31.8	1.4		(1)	
7 March 1989 0743:44.1 G.m.t. Southern Calif. 33.180N, 115.590W Magnitude 4.2 ML	Imperial Wildlife Liquefaction Array (USGS)	33.097 115.530	43:48.5	1.3		(1)	
27 May 1988- 8 March 1989 Northern Calif. Epicenter and magnitude unknown	Eel River Valley Array Centerville Beach (USGS)	40.563 124.348	(3)	4.5		(1)	
	Eel River Valley Array Loleta Fire Station (USGS)	40.644 124.219	(3)	(2)		(1)	
25 November 1988- 10 March 1989 Southern Calif. Epicenters and magnitudes unknown	Calipatria Fire Station (USGS)	33.13 115.52	(3)	1.5	315 Up 225	.05 .09 .06	--- --- ---
	Note: Two additional records[1] recovered at Calipatria Fire Station.						
10 March 1989 0140:25.4 G.m.t. Eastern Calif. 37.525N, 118.874W Magnitude 3.3 ML	McGee Creek Mammoth Lakes (USGS) SMA-1	37.550 118.811	(4)	(2)		(1)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
10 March 1989 0140:25.4 G.m.t. Eastern Calif. 37.525N, 118.874W Magnitude 3.3 ML *(Continued)*	McGee Creek Mammoth Lakes (USGS) CRA-1	37.550 118.811	(4)	(2)			
	166 m Downhole					(1)	
	35 m Downhole					(1)	
	Surface					(1)	
	1 m Downhole					(1)	
10 March 1989 0153:21.1 G.m.t. Eastern Calif. 37.525N, 118.873W Magnitude 3.2 ML	McGee Creek Mammoth Lakes (USGS) SMA-1	37.550 118.811	(4)	(2)		(1)	
	McGee Creek Mammoth Lakes (USGS) CRA-1	37.550 118.811	(4)	(2)			
	166 m Downhole					(1)	
	35 m Downhole					(1)	
	Surface					(1)	
	1 m Downhole					(1)	
24 March 1989 2228:10.0 G.m.t. Southern Calif. 33.180N, 115.590W Magnitude 3.2 ML	Salton Sea Wildlife Refuge (USGS) SMA-1	33.178 115.615	28:11.0	1.0		(1)	
24 March 1989 2316:48.0 G.m.t. Southern Calif. 33.030N, 115.580W Magnitude 4.0 ML	Calipatria Fire Station (USGS)	33.13 115.52	(3)	1.7		(1)	
	Salton Sea Wildlife Refuge (USGS) SMA-1	33.178 115.615	16:49.9	1.1	315 Up 225	.08 .16 .08	--- 0.4 ---
3 April 1989 1746:34.4 G.m.t. Central Calif. 37.422N, 121.795W Magnitude 4.7 ML	Calaveras Array Calaveras Res. South (USGS)	37.452 121.807	(3)	1.2	180 Up 090	.07 .02 .08	--- --- ---
	Calaveras Array Cherry Flat Reservoir (USGS)	37.396 121.756	46:36.8	1.3	360 Up 270	.09 .07 .16	--- --- 0.5

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
3 April 1989	Sunnyvale	37.402	46:39.3	3.2		(1)	
1746:34.4 G.m.t.	Colton Avenue	122.024					
Central Calif.	(USGS)						
37.422N, 121.795W							
Magnitude 4.7 ML	Anderson Dam	37.166	46:46.2	(2)			
(Continued)	(USGS)	121.628					
	Crest					(1)	
	Structure Array:						
	Ch. 1-12					(1)	
	San Jose, 101/280/680	37.340	(4)	1.0	322	.09	---
	Freeway Interchange	121.851			Up	.04	---
	(USGS/CDOT)				232	.06	---
7 April 1989	Santa Ana	33.7517	(3)	2.4	360	.04	---
2007:30.2 G.m.t.	400 Civic Center Dr.	117.870W			Up	.04	---
Southern Calif.	(USGS)				270	.19	0.4
33.620N, 117.900W							
Magnitude 4.5 ML	Newport Beach	33.618	(3)	1.5			
	840 Newport Center Dr.	117.878					
	(USGS)						
	Structure Array						
	Ch. 1- Tower 2, Level 1, Center				360	.43	0.5
	Ch. 2- Tower 2, Level 1, Center				Up	.11	0.1
	Ch. 3- Tower 2, Level 1, Center				090	.30	0.3
	Ch. 4- Tower 2, Level 2, West				360	*	
	Ch. 5- Tower 2, Level 2, Center				360	.66	0.4
	Ch. 6- Tower 2, Level 2, Center				090	.50	0.5
	Ch. 7- Tower 2, Level 9, South				090	.18	0.2
	Ch. 8- Tower 2, Level 10, Center				360	*	
	Ch. 9- Tower 2, Level 10, Center				090	*	
	Ch. 10- Tower 1, Level 9, East				360	.37	0.3
	Ch. 11- Tower 1, Level 10, Center				270	.30	3.2
	Ch. 12- Tower 1, Level 10, Center				360	.67	3.6
	* Transducer inoperative						
14 April 1989	Bear Valley Station 10	36.532	45:57.0	1.5		(1)	
0645:55.0 G.m.t.	Webb Residence	121.143					
Central Calif.	(USGS)						
36.563N, 121.202W							
Magnitude 3.3 ML							

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
27 April 1989	Blytheville, Ark.	35.92	(3)	0.7		(1)	
1647:49.8 G.m.t.	Fire Station	89.92					
New Madrid, Mo.	(USGS)						
36.006N, 89.768W							
Magnitude 4.6 MB							
	Hayti, Mo.	36.237	(3)	0.5	360	.02	---
	Pemiscot Co. Hosp.	89.740			Up	.04	---
	(USGS)				270	.11	1 peak
20 May 1989	Bear Valley Station 1	36.57	57:27.5	0.7	310	.07	---
0857:26.8 G.m.t.	CDF Fire Station	121.18			Up	.02	---
Central Calif.	(USGS)				220	.07	---
36.578N, 121.212W							
Magnitude 2.8 ML							
5 October 1988-	Orange Co. Reservoir	33.93	(3)	(2)			
25 May 1989	(MWD)	117.88					
Southern Calif.							
Epicenter and	Abutment					(1)	
magnitude unknown							
25 May 1989	Parkfield	35.79	40:14.3	1.0	315	.09	---
1240:09.3 G.m.t.	Liquefaction Array	120.33			Up	.13	1 peak
Central Calif.	(USGS)				225	.14	1 peak
35.862N, 120.398W							
Magnitude 3.6 ML	Array 1:						
	1. AC-1, 38'					(1)	
	2. AC-1, 38'					(1)	
	3. AC-1, 38'					(1)	
	4. AC-4, 9'					(1)	
	5. AC-4, 9'					(1)	
	6. AC-4, 9'					(1)	
	7. Pressure Transducer, A-1, 16.7'					*	
	8. Pressure Transducer, A-3, 16.9'					*	
	9. Pressure Transducer, A-4, 13.1'					*	
	10. Pressure Transducer, B-2, 17'					*	
	11. Pressure Transducer, B-4, 31.1'					*	
	12. Pressure Transducer, C-3, 20.7'					*	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
25 May 1989	Array 2:						
1240:09.3 G.m.t.	1. AC-3, 96'					(1)	
Central Calif.	2. AC-3, 96'					(1)	
35.862N, 120.398	3. AC-3, 96'					(1)	
Magnitude 3.6 ML	4. AC-2, 13'					(1)	
(Continued)	5. AC-2, 13'					(1)	
	6. AC-2, 13'					(1)	
	7. Surface				315	.08	---
	8. Surface				Up	.08	---
	9. Surface				045	.12	1 peak
	10. Pressure Transducer, D-1, 30.6'					*	
	11. Pressure Transducer, D-3, 41.2'					*	
	12. Pressure Transducer, C-1, 20'					*	
	* Piezometer trace.						
12 June 1989	Los Angeles	34.081	(3)	1.1	130	.15	0.1
1657:18.4 G.m.t.	Jasper St.	118.188			Up	.08	---
Southern Calif.	(USGS)				040	.08	---
34.030N, 118.180W							
Magnitude 4.4 ML	Los Angeles	33.996	(3)	2.5		(1)	
	Bulk Mail Facility	118.162					
	(USGS)						
	Garvey Reservoir	34.050	(3)	1.6			
	Monterey Park	118.114					
	(MWD)						
	Crest				114	.06	---
					Up	.02	---
					024	.06	---
	Abutment Bldg.				114	.15	1 peak
					Up	.08	---
					024	.13	1 peak
	Los Angeles	34.067	(3)	(2)			
	1111 Sunset Blvd.	118.248					
	(MWD)						
	Basement				348	.07	---
					Up	.03	---
					258	.18	0.1
	4th Floor				348	.06	---
					Up	.06	---
					258	.15	0.2
	Roof (8th)				348	.05	---
					Up	.18	0.8
					258	.05	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
12 June 1989 1657:18.4 G.m.t. Southern Calif. 34.030N, 118.180W Magnitude 4.4 ML *(Continued)*	Jensen Filter Plant Balboa Ave. (MWD)	34.309 118.499	(3)	4.0			
	Basement Admin. Bldg.					(1)	
	Generator Bldg.					(1)	
	Reservoir Roof					(1)	
	Los Angeles 1100 Wilshire Blvd. (JCG/USGS)	34.052 118.263	57:21.9	2.6			
	Basement 4 NW					(1)	
	Basement 3 NE				298	.06	---
					Up	.03	---
					208	.03	---
	Basement 3 SE				298	.05	---
					Up	.03	---
					208	.04	---
	Structure Array:						
	Ch. 1- 12th Floor, North				298	.05	---
	Ch. 2- 12th Floor, North				208	.04	---
	Ch. 3- 12th Floor, South				208	.02	---
	Ch. 4- 13th Floor, North				298	.04	---
	Ch. 5- 13th Floor, North				208	.07	---
	Ch. 6- 13th Floor, South				208	.03	---
	Ch. 7- 32nd Floor, North				298	.02	---
	Ch. 8- 32nd Floor, North				208	.04	---
	Ch. 9- 32nd Floor, South				208	.05	---
	Ch. 10- Ground Floor, North				298	.05	---
	Ch. 11- Ground Floor, North				208	.06	---
	Ch. 12- Ground Floor, South				208	.03	---
	Whittier Narrows Dam Pico Rivera (ACOE)	34.020 118.053	(3)	0.9			
	Crest				028	.08	---
					Up	.05	---
					298	.07	---
	Upstream				152	.08	---
					Up	.03	---
					062	.05	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
12 June 1989 1657:18.4 G.m.t. Southern Calif. 34.030N, 118.180W Magnitude 4.4 ML *(Continued)*	Norwalk 12400 Imperial Hwy (USGS/BECH)	33.92 118.07	(3)	0.8			
	Basement					(1)	
	4th Floor				090	.02	---
					Up	.01	---
					360	.06	---
	Roof (8th Floor)				090	.02	---
					Up	.02	---
					360	.06	---
	South Ground Site	33.915 118.067	(3)	(2)		(1)	
	North Ground Site	33.917 118.067	(3)	3.0		(1)	
	Prado Dam Corona (ACOE)	33.890 117.641	(3)	(2)			
	Crest					(1)	
	Downstream		(3)	0.3	090	.08	---
					Up	.03	---
					360	.08	---
	Brea Dam Fullerton (ACOE)	33.890 117.925	(3)	0.8			
	Crest					(1)	
	Left Abutment					(1)	
	Alhambra 900 S. Fremont (USGS)	34.085 118.149	(3)				
	12th Floor			2.6	090	.04	---
					Up	.07	---
					360	.07	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
12 June 1989 1657:18.4 G.m.t. Southern Calif. 34.030N, 118.180W Magnitude 4.4 ML *(Continued)*	Whittier 7215 Bright Ave. (USGS)	33.977 118.036	(3)	2.9			
	Basement				180	.03	---
					Up	.02	---
					090	.06	---
	Carbon Canyon Dam Brea (ACOE)	33.914 117.839	(3)	(2)			
	Crest					(1)	
12 June 1989 1722:25.5 G.m.t. Southern Calif. 34.020N, 118.180W Magnitude 4.1 ML	Los Angeles 4407 Jasper St. (USGS)	34.081 118.188	(3)	2.3	130	.08	---
					Up	.05	---
					040	.06	---
	Los Angeles Bulk Mail Facility (USGS)	33.996 118.162	(3)	2.4		(1)	
	Garvey Reservoir Monterey Park (MWD)	34.050 118.114	(3)	2.4			
	Crest					(1)	
	Abutment Bldg.				114	.05	---
					Up	.03	---
					024	.04	---
	Los Angeles 1111 Sunset Blvd. (MWD)	34.067 118.248	(3)	2.1			
	Basement				348	.05	---
					Up	.02	---
					258	.09	---
	4th Floor				348	.03	---
					Up	.03	---
					258	.08	---
	Roof (8th)				348	.05	---
					Up	.18	0.8
					258	.05	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
12 June 1989 1722:25.5 G.m.t. Southern Calif. 34.020N, 118.180 Magnitude 4.1 ML *(Continued)*	Jensen Filter Plant Balboa Ave. (MWD)	34.309 118.499	(3)	(2)			
	Administration Bldg. Basement					(1)	
	Generator Bldg.					(1)	
	Reservoir Roof					(1)	
	Los Angeles 1100 Wilshire Blvd. (JCG/USGS)	34.052 118.499	22:29.1	2.2			
	Basement 4 NW					(1)	
	Basement 3 NE				298	.04	---
					Up	.02	---
					208	.05	---
	Basement 3 SE					(1)	
	Structure Array:						
	Ch. 1- 12th Floor, North				298	.03	---
	Ch. 2- 12th Floor, North				208	.04	---
	Ch. 3- 12th Floor, South				208	.02	---
	Ch. 4- 13th Floor, North				298	.04	---
	Ch. 5- 13th Floor, North				208	.06	---
	Ch. 6- 13th Floor, South				208	.02	---
	Ch. 7- 32nd Floor, North				298	.01	---
	Ch. 8- 32nd Floor, North				208	.02	---
	Ch. 9- 32nd Floor, South				208	.01	---
	Ch. 10- Ground Floor, North				298	.03	---
	Ch. 11- Ground Floor, North				208	.03	---
	Ch. 12- Ground Floor, South				208	.04	---
	Alhambra 900 S. Fremont (USGS)	34.085 118.149	(3)	2.8			
	12th Floor					(1)	
	Whittier Narrows Dam Pico Rivera (ACOE)	34.031 118.054	(3)	2.3			
	Upstream				152	.05	---
					Up	.02	---
					062	.03	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
26 June 1989 0327:03.9 G.m.t. Hawaii 19.362N, 155.083W Magnitude 6.2 Ms	Hawaii National Park HVO Admin. Bldg. (USGS)	19.423 155.291	(4)	(2)		(1)	
	Hawaii National Park HVO Warehouse (USGS)	19.434 155.264	(4)	(2)		(1)	
	Hilo, Hawaii Hilo Hospital (USGS)	19.72 155.12	(4)	5.7	352 Up 262	.16 .05 .07	0.5 --- ---
	Hilo, Hawaii Sewage Plant (USGS)	19.734 155.050	(4)	(2)	360 Up 270	.07 .03 .05	--- --- ---
	Hilo, Hawaii University of Hawaii (USGS)	19.707 155.083	(4)	5.3	360 Up 270	.11 .04 .04	2 peaks --- ---
	Honokaa, Hawaii Police Station (USGS)	20.080 155.465	(4)	(2)		(1)	
	Honomalino, Hawaii Macadamia Orchard (USGS)	19.169 155.169	(4)	(2)		(1)	
	Laupahoehoe, Hawaii Post Office (USGS)	19.987 155.236	(4)	(2)		(1)	
	Mauna Kea, Hawaii State Park (USGS)	19.752 155.530	(4)	(2)		(1)	
	Mauna Kea Summit U.K. Observatory (USGS)	19.826 155.473	(4)	(2)		(1)	
	Pahala, Hawaii Kau Hospital (USGS)	19.20 155.47	(4)	(2)	360 Up 270	.05 .02 .05	--- --- ---
	Pahoa, Hawaii Fire Station (USGS)	19.498 155.951	(4)	(2)	087 Up 357	.19 .07 .21	5.1 --- 4.4

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
26 June 1989 0327:03.9 G.m.t. Hawaii 19.362N, 155.083W Magnitude 6.2 Ms *(Continued)*	Waimea, Hawaii Fire Station (USGS)	20.026 155.664	(4)	(2)		(1)	
	Waiohinu, Hawaii K'au Baseyard (USGS)	19.070 155.615	(4)	(2)		(1)	
30 June 1989 0250:11.5 G.m.t. Central Alaska 64.897N, 147.707W Magnitude 3.6 ML	Fairbanks University Duckering Hall (USGS)	64.86 147.83	(3)	(2)		(1)	
	Fairbanks University USGS Observatory (USGS)	64.86 147.83	(3)	(2)		(1)	
11 July 1989 0413:34.2 G.m.t. Eastern Calif. 37.418N, 118.642 Magnitude 4.4 ML	Chalfant Valley Array Fire Station (USGS)	37.53 118.37	(4)	4.1		(1)	
	Chalfant Valley Array Laws (USGS)	37.402 118.346	(4)	3.7		(1)	
	McGee Creek Mammoth Lakes (USGS) SMA-1	37.550 118.811	(4)	(2)	180 Up 090	.06 .03 .03	--- --- ---
	McGee Creek Mammoth Lakes (USGS) CRA-1	37.550 118.811	(4)	(2)			
	166 m Downhole					(1)	
	35 m Downhole					(1)	
	Surface					(1)	
	1 m Downhole					(1)	
11 July 1989 0754:54.2 G.m.t. Eastern Calif. 37.543N, 118.438W Magnitude 3.6 ML	Chalfant Valley Array Fire Station (USGS)	37.53 118.37	(4)	0.9		(1)	
	Chalfant Valley Array White Mountain Ranch (USGS)	37.62 118.39	(4)	1.1	360 Up 270	.06 .02 .07	--- --- ---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 July 1989 1107:22.1 G.m.t. Central Calif. 36.907N, 121.348W Magnitude 3.7 ML	Hollister Differential Array (USGS)	36.888 121.413	07:24.1	2.0		(1)	
18 July 1989 1535:36.0 G.m.t. Central Calif. 36.903N, 121.342W Magnitude 2.8 ML	Hollister Differential Array (USGS)	36.888 121.413	35:37.9	2.0		(1)	
20 July 1989 0558:44.0 G.m.t. Central Calif. 36.898N, 121.343W Magnitude 3.1 ML	Hollister Differential Array (USGS)	36.888 121.413	58:46.0	2.0		(1)	
2 August 1988- 3 August 1989 Southern Calif. Epicenters and magnitudes unknown	Los Angeles 3000 Leeward Ave. (OWNR)	34.06 118.29	(3)				
	Roof (13)			2.3	090	.05	---
					Up	.07	---
					360	.12	1 peak
				2.2	090	.14	0.4
					Up	.06	---
					360	.11	1 peak
				2.9	090	.10	1 peak
					Up	.05	---
					360	.11	1 peak
	Note: One additional record[1] recovered at 3000 Leeward Ave.						
18 August 1988- 4 August 1989 Southern Calif. Epicenters and magnitudes unknown	Los Angeles 10550 Wilshire Blvd. (OWNR)	34.063 118.431	(3)				
	Roof (14)			3.8	287	.05	---
					Up	.04	---
					197	.08	---
	Note: Two additional records[1] recovered at 10550 Wilshire Boulevard.						

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
8 August 1989	Fremont	37.535	(3)	0.7	180	.06	---
0813:27.5 G.m.t.	Emerson Court	121.929			Up	.01	---
Central Calif.	(USGS)				090	.03	---
37.130N, 121.952W							
Magnitude 5.4 ML	Milpitas	37.450	(3)	4.9		(1)	
	Rivera St.	121.896					
	(USGS)						
	Palo Alto	37.400	(3)	4.5			
	VA Hospital, Bldg. 1	122.140					
	(VA)						
	Basement					(1)	
	Roof (7th level)				302	.15	3.6
					Up	.06	---
					212	.16	0.6
	Sunnyvale	37.402	(3)	4.5	360	.06	---
	Colton Ave.	122.024			Up	.03	---
	(USGS)				270	.05	---
	Sunnyvale	37.418	(3)	4.2	090	.05	---
	1111 Lockheed Way	122.031			Up	.02	---
	(USGS)				360	.05	---
	Stanford University	37.419	(4)	5.4	360	.08	---
	SLAC Test Lab.	122.205			Up	.07	---
	(USGS)				270	.06	---
	San Francisco	37.806	(4)	(2)		(1)	
	Golden Gate Bridge	122.472					
	(USGS)						
Events prior to	Los Angeles	34.044	(3)				
9 August 1989	12121 Wilshire Blvd.	118.467					
Southern Calif.	(OWNR)						
Epicenters and							
magnitudes unknown	Roof (15)			(2)	225	.05	---
					Up	.11	1 peak
					135	.07	---
					225	.05	---
					Up	.05	---
					135	.08	---

Note: Five additional records[1] recovered at 12121 Wilshire Boulevard.

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
4 June 1988-	Mauna Kea, Hawaii	19.752	(3)	(2)	360	.06	---
21 August 1989	State Park	155.530			Up	.05	---
Hawaii	(USGS)				270	.05	---
Epicenters and magnitudes unknown	Note: One additional record[1] recovered at Mauna Kea State Park.						
	Mauna Loa, Hawaii	19.539	(3)	(2)	360	.04	---
	Weather Observatory	155.580			Up	.02	---
	(USGS)				270	.07	---
2 August 1988-	Los Angeles	34.039	(3)				
25 August 1989	1150 S. Hill St.	118.259					
Southern Calif.	(OWNR)						
Epicenters and magnitudes unknown	10th floor			3.5	307	.01	---
					Up	.07	---
					217	.02	---
	Note: Three additional records[1] recovered at 1150 S. Hill St.						
21 September 1989	Eel River Valley Array	40.498	41:26.3	5.7		(1)	
1741:18.0 G.m.t.	Bunker Hill FAA	124.294					
Northern Calif.	(USGS)						
40.327N, 124.705W							
Magnitude 4.8 ML	Eel River Valley Array	40.563N	41:26.6	6.3	360	.16	1 peak
	Centerville Beach	134.348W			Up	.03	---
	Navy Facility				270	.09	---
	(USGS)						
	Eel River Valley Array	40.58	(4)	7.1	360	.12	1 peak
	Ferndale Fire Station	124.26			Up	.03	---
	(USGS)				270	.08	---
	Eel River Valley Array	40.599	(3)	7.8	360	.05	---
	Fortuna Fire Station	124.154			Up	.02	---
	(USGS)				270	.04	---
	Eel River Valley Array	40.644	(3)	7.7	360	.08	---
	Loleta Fire Station	124.219			Up	.07	---
	(USGS)				270	.05	---
30 September 1989	Chalfant Valley Array	37.402	(4)	(2)		(1)	
2349 G.m.t.	Laws	118.346					
Eastern Calif.	(USGS)						
Epicenter and magnitude unknown							

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
1 October 1989 2208:36.0 G.m.t. Central Calif. 36.555N, 121.177W Magnitude 3.1 ML	Bear Valley Station 1 CDF Fire Station (USGS)	36.573 121.184	08:37.1	0.7		(1)	
	Bear Valley Station 10 Webb Residence (USGS)	36.532 121.143	08:37.2	1.0		(1)	
30 August 1987-17 October 1989 Central Calif. Epicenters and magnitudes unknown	Bear Valley Station 12 Williams Ranch (USGS)	36.658 121.249	(3)	(2)		(1)	
	Note: Seven additional records[1] recovered at Williams Ranch.						
22 February 1988-17 October 1989 Central Calif. Epicenter and magnitude unknown	Bear Valley Station 5 Callens Ranch (USGS)	36.673 121.195	(3)	2.2	310 Up 220	.09 .03 .05	--- --- ---
	Bear Valley Station 6 James Ranch (USGS)	36.504 121.101	(3)	(2)		(1)	
22 February 1989-17 October 1989 Central Calif. Epicenter and magnitude unknown	San Francisco VA Hospital (VA)	37.783 122.504	(3)	(2)			
	7th floor				185 Up 095	.09 .03 .06	--- --- ---
18 October 1989 0004:15.2 G.m.t. Northern Calif. 37.036N, 121.883W Magnitude 7.0 ML	Anderson Dam Morgan Hill (USGS)	37.166 121.628					
	Crest		(3)	2.0	340 Up 250	.26 .19 .39	10.4 6.1 13.2
	Downstream		04:22.9	3.4	340 Up 250	.25 .17 .26	7.3 6.9 8.5
	Left Abutment		(3)	2.3	340 Up 250	.08 .05 .07	--- --- ---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989	Structure Array:						
0004:15.2 G.m.t.	Ch. 1- Mid-dam, Center		(4)	3.3	153	.11	5.9
Northern Calif.	Ch. 2- Mid-dam, Center				243	.14	8.8
37.036N, 121.883W	Ch. 3- Mid-dam, Right				063	.14	6.4
Magnitude 7.0 ML	Ch. 4- Toe				333	.18	4.7
(Continued)	Ch. 5- Toe				Up	.16	3.9
	Ch. 6- Toe				063	.23	5.6
	Ch. 7- Right Crest				333	.32	11.6
	Ch. 8- Right Crest				Up	.16	5.6
	Ch. 9- Right Crest				063	.43	12.3
	Ch. 10- Center Crest				333	.32	10.6
	Ch. 11- Center Crest				Up	.23	9.6
	Ch. 12- Center Crest				063	.38	12.2
	San Jose, 101/280/680	37.340	(4)	3.2	322	.18	10.5
	Freeway Interchange	121.851			Up	.08	---
	(USGS, CDOT)				232	.13	8.9
	Calaveras Array	37.396	(3)	5.7	360	.09	---
	Cherry Flat Reservoir	121.756			Up	.06	---
	(USGS)				270	.07	---
	Sunnyvale	37.402	04:24.8	5.7	360	.22	9.8
	Colton Avenue	122.024			Up	.10	4.8
	(USGS)				270	.19	9.5
	Hollister Airport	36.888	04:26.5	5.6	255	.29	8.0
	Differential Array	121.413			Up	.16	3.9
	(USGS)				165	.27	4.6
	Palo Alto	37.40	(3)	3.5			
	VA Hospital, Bldg. 1	122.14					
	(VA)						
	Basement				302	.34	2.2
					Up	.20	1.4
					212	.38	5.0
	Roof (7th level)				302	1.09	13.0
					Up	.64	12.0
					212	.79	13.0
	Hollister	36.851	04:27.5	5.8	180	.23	7.7
	City Hall Annex	121.402			Up	.22	6.2
	Basement (USGS)				090	.25	6.4
	Calaveras Array	37.452	(3)	6.5	180	.13	3.5
	Calaveras Res. South	121.807			Up	.07	---
	(USGS)				090	.08	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989	Hollister	36.765	(4)	3.4	360	.06	---
0004:15.2 G.m.t.	SAGO Vault	121.446			Up	.05	---
Northern Calif.	(USGS)				270	.04	---
37.036N, 121.883W							
Magnitude 7.0 ML	Bear Valley Station 14	36.569	04:36.5	7.2	310	.10	1 peak
(Continued)	Upper Butts Ranch	121.431			Up	.08	---
	(USGS)				220	.10	1 peak
	Milpitas	37.437	04:25.0	4.6	360	.09	---
	Rivera St.	121.879			Up	.20	2.0
	(USGS)				270	.11	2 peaks
	Stanford University	37.419	(4)	6.2	360	.29	6.7
	SLAC Test Lab.	122.205			Up	.10	2 peaks
	(USGS)				270	.19	2.6
	Menlo Park	37.468	(3)	3.2	110	.12	9.5
	VA Hospital, Bldg. 37	122.157			Up	.11	0.9
	(VA)				020	.27	3.3
	Fremont	37.535	(3)	7.2	180	.15	5.2
	Emerson Court	121.929			Up	.07	---
	(USGS)				090	.20	5.1
	APEEL Array Station 9	37.47	04:31.1	4.7	227	.11	1 peak
	Crystal Springs Res.	122.32			Up	.06	---
	(USGS)				137	.12	1 peak
	Calaveras Array	37.597	(3)	5.5	180	.07	---
	Sunol Fire Station	121.880			Up	.03	---
	(USGS)				090	.10	1 peak
	APEEL Array Station 2	37.52	(3)	3.5	133	.23	3.2
	Redwood City	122.25			Up	.08	---
	(USGS)				043	.28	4.4
	Foster City	37.555	(3)	4.8	360	.12	3.7
	Menhaden Court	122.248			Up	.09	---
	(USGS)				270	.11	0.2
	Del Valle Dam	37.615	(3)				
	(CDWR)	121.745					
	Crest			5.4	065	.08	---
					Up	.07	---
					335	.08	---
	Toe			5.1	065	.06	---
					Up	.03	---
					335	.04	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989 0004:15.2 G.m.t. Northern Calif. 37.036N, 121.883W Magnitude 7.0 ML *(Continued)*	Livermore VA Hospital, Bldg. 62 (VA)	37.625 121.762	(3)	6.7			
	Basement				125	.06	---
					Up	.03	---
					035	.05	---
	Roof (7th)				125	.08	---
					Up	.03	---
					035	.15	4.8
	Bear Valley Station 12 Williams Ranch (USGS)	36.658 121.249	(3)	9.3	310	.17	5.7
					Up	.10	1 peak
					220	.16	6.6
	APEEL Array Station 2E Hayward, Muir School (USGS)	37.66 122.08			054	.13	4.1
					Up	.06	---
					324	.16	4.4
	Bear Valley Station 5 Callens Ranch (USGS)	36.673 121.195	04:33.0	6.6	310	.07	---
					Up	.04	---
					220	.07	---
	Bear Valley Station 1 CDF Fire Station (USGS)	36.573 121.184	04:36.5	3.3	310	.08	---
					Up	.05	---
					220	.08	---
	Hayward City Hall (USGS)	37.679 122.082					
	Ground Floor		04:34.0	6.4	064	.05	---
					Up	.03	---
					334	.06	---
	Ground Site North		04:33.8	6.9	064	.06	---
					Up	.02	---
					334	.06	---
	Ground Site South		04:32.5	6.7	064	.09	---
					Up	.03	---
					334	.10	1 peak

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989	Structure Array:						
0004:15.2 G.m.t.	Ch. 1- 12th Floor, West				334	.10	4.2
Northern Calif.	Ch. 2- 12th Floor, Center				334	.10	1 peak
37.036N, 121.883W	Ch. 3- 12th Floor, Center				064	.13	4.5
Magnitude 7.0 ML	Ch. 4- 7th Floor, West				334	.09	---
(Continued)	Ch. 5- 7th Floor, Center				334	.08	---
	Ch. 6- 7th Floor, Center				064	.09	---
	Ch. 7- 3rd Floor, West				334	Inoperative	
	Ch. 8- 3rd Floor, Center				334	.07	---
	Ch. 9- 3rd Floor, Center				064	.08	---
	Ch. 10- 3rd Floor, Southwest				Up	.05	---
	Ch. 11- 3rd Floor, Southwest				Up	.04	---
	Ch. 12- Ground Floor, West				334	.07	---
	Calaveras Array	37.709	(3)	6.8	360	.08	---
	Dublin Fire Station	121.932			Up	.03	---
	(USGS)				270	.09	---
	Bear Valley Station 10	36.532	04:34.0	8.5	310	.10	1 peak
	Webb Residence	121.143			Up	.05	---
	(USGS)				220	.13	3.6
	Bear Valley Station 7	36.483	04:36.4	5.1	310	.04	---
	Pinnacles Nat'l Mon.	121.180			Up	.03	---
	(USGS)				220	.06	---
	San Francisco	37.728	(4)	7.1	360	.11	1 peak
	1295 Shafter St.	122.385			Up	.05	---
	(USGS)				270	.07	---
	San Francisco State U.	37.724	(4)	8.8	270	.14	3.3
	Thornton Hall	122.475			Up	.04	---
	(USGS)				180	.11	0.9
	San Francisco	37.79	(3)	8.5			
	575 Market St.	122.40					
	(USGS)						
	Basement				135	.08	---
					Up	.06	---
					045	.11	1 peak

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989 0004:15.2 G.m.t. Northern Calif. 37.036N, 121.883W Magnitude 7.0 ML *(Continued)*	Structure Array:						
	Ch. 1- 42nd Level, Northwest				045	.22	6.4
	Ch. 2- 42nd Level, Center				225	.19	6.9
	Ch. 3- 42nd Level, Center				135	.14	2.3
	Ch. 4- 34th Level, Northwest				045	.15	6.9
	Ch. 5- 34th Level, Center				225	.16	7.0
	Ch. 6- 34th Level, Center				135	.19	5.0
	Ch. 7- 25th Level, Northwest				045	.19	6.6
	Ch. 8- 25th Level, Center				225	.23	7.0
	Ch. 9- 25th Level, Center				135	.16	4.1
	Ch. 10- Ground Level				045	.12	1.4
	Ch. 11- Ground Level				315	.13	3.9
	San Francisco 600 Montgomery St. (USGS)	37.80 122.40	(4)	8.7			
	Basement				261	.12	0.9
					Up	.05	---
					171	.11	1.2
	29th Floor				261	.15	4.5
					Up	.11	2.1
					171	.17	5.1
	49th Floor				261	.31	6.4
					Up	.14	5.8
					171	.29	11.2
	Structure Array:						
	Ch. 1- 21st Floor, West Central				351	.20	7.1
	Ch. 2- 21st Floor, South Central				351	.17	3.0
	Ch. 3- 21st Floor, South Central				081	.22	11.8
	Ch. 4- 5th Floor, West Central				351	.27	7.2
	Ch. 5- 5th Floor, South Central				351	.28	7.1
	Ch. 6- 5th Floor, South Central				081	.24	4.6
	Ch. 7- SE Corner, Foundation				Up	.07	---
	Ch. 8- Ground Level, West Central				351	.17	3.1
	Ch. 9- Ground Level, Center				351	.15	3.1
	Ch. 10- Ground Level, Center				081	.18	2.6
	Ch. 11- Foundation, NW Corner				351	.10	1 peak
	Ch. 12- Foundation, West Side				351	.09	---
	Ch. 13- Foundation, SW Corner				Up	.05	---
	Emeryville 6363 Christie Ave. (USGS)	37.844 122.295	(3)	9.2			
	Ground Site South				350	.22	5.2
					Up	.06	---
					260	.26	5.1

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989	Structure Array 1:						
0004:15.2 G.m.t.	Ch. 1- Roof (31st), West Wing				350	.27	9.2
Northern Calif.	Ch. 2- Roof (31st), South Wing				050	.31	11.1
37.036N, 121.883W	Ch. 3- Roof (31st), North Wing				290	.39	19.8
Magnitude 7.0 ML	Ch. 4- Roof (31st), Central Core				350	.25	11.4
(Continued)	Ch. 5- Roof (31st), Central Core				260	.38	16.5
	Ch. 6- 21st Floor, Central Core				350	.20	4.9
	Ch. 7- 21st Floor, West Wing				350	.19	1.7
	Ch. 8- 21st Floor, South Wing				050	.18	3.7
	Ch. 9- 21st Floor, North Wing				290	.24	6.0
	Ch. 10- 13th Floor, Central Core				350	.27	5.4
	Ch. 11- 13th Floor, Central Core				260	.26	7.0
	Ch. 12- 21st Floor, Central Core				260	.23	5.9
	Structure Array 2:						
	Ch. 1- 13th Floor, West Wing				350	.22	4.4
	Ch. 2- 13th Floor, South Wing				050	.23	4.8
	Ch. 3- 13th Floor, North Wing				290	.32	7.4
	Ch. 4- Ground Floor, West Wing				Up	.06	---
	Ch. 5- Ground Floor, South Wing				Up	.06	---
	Ch. 6- Ground Floor, Central Core				Up	.05	---
	Ch. 7- Ground Floor, North Wing				260	.22	1.9
	Ch. 8- Ground Floor, North Wing				Up	.05	---
	Ch. 9- Ground Floor, North Wing				350	.17	4.5
	Ch. 10- Ground Site, North				350	.20	1.7
	Ch. 11- Ground Site, North				Up	.09	---
	Ch. 12- Ground Site, North				260	.22	2.7
	Berkeley, U.C. Strawberry Cyn. (UCB)	37.87 122.24	04:38.6	9.8	135	.04	---
					Up	.02	---
					045	.08	---
	Berkeley, U.C. Haviland Hall Basement (UCB)	37.87 122.26	04:48.2	(2)	135	.03	---
					Up	.02	---
					045	.06	---
	Berkeley 2168 Shattuck Ave. (USGS)	37.87 122.27					
	Basement, East		04:38.3	6.9	261	.09	---
					Up	.02	---
					171	.11	1 peak
	Basement, West		04:38.2	6.8	261	.10	1 peak
					Up	.03	---
					171	.09	---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989	Structure Array:						
0004:15.2 G.m.t.	Ch. 1- 13th Floor, East Core				171	.13	1.1
Northern Calif.	Ch. 2- 13th Floor, East Core				261	.23	2.1
37.036N, 121.883W	Ch. 3- 13th Floor, Center				171	.13	2.0
Magnitude 7.0 ML	Ch. 4- 13th Floor, Roof West Core				171	.19	2.0
(Continued)	Ch. 5- 13th Floor, Roof West Core				081	.21	2.4
	Ch. 6- 13th Floor, Southwest				081	.23	2.6
	Ch. 7- 13th Floor, Southwest				171	.16	2.0
	Ch. 8- 4th Floor, Southwest				171	.23	2.4
	Ch. 9- 4th Floor, Southwest				081	.11	0.2
	Ch. 10- 4th Floor, West Core				081	.08	---
	Ch. 11- 4th Floor, West Core				171	.11	1 peak
	Ch. 12- 4th Floor, East Core				171	.08	---
	San Francisco VA Hospital (VA)	37.783 122.504	(3)	(2)			
	Basement				185	.08	---
					Up	.05	---
					095	.16	1.8
	7th Floor				185	.34	14.5
					Up	.08	---
					095	.22	5.6
	San Francisco Golden Gate Bridge Abutment (USGS)	37.806 122.472	(4)	8.5	360	.12	3.1
					Up	.06	---
					270	.24	2.9
	Richmond Bulk Mail 2501 Rydin Road (USGS)	37.884 122.302	(4)	7.7	057	.08	---
					Up	.04	---
					327	.11	0.3
	Martinez VA Hospital Basement (VA)	37.993 122.115	(3)	8.9	020	.07	---
					Up	.03	---
					290	.05	---
	Larkspur Ferry Terminal (USGS)	37.946 122.508	(4)	9.1	360	.10	2 peaks
					Up	.06	---
					270	.14	5.4

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989 0007 G.m.t. Central Calif. Epicenter and magnitude unknown	Anderson Dam Morgan Hill (USGS) SMA-1	37.166 121.628	(4)	(2)			
	Downstream				340	.03	---
					Up	.02	---
					250	.05	---
	Structure Array:						
	Ch. 1- Mid-dam, Center				153	.04	---
	Ch. 2- Mid-dam, Center				243	.04	---
	Ch. 3- Mid-dam, Right				063	.05	---
	Ch. 4- Toe				333	.03	---
	Ch. 5- Toe				Up	.03	---
	Ch. 6- Toe				063	.03	---
	Ch. 7- Right Crest				333	.04	---
	Ch. 8- Right Crest				Up	.04	---
	Ch. 9- Right Crest				063	.09	---
	Ch. 10- Center Crest				333	.06	---
	Ch. 11- Center Crest				Up	.04	---
	Ch. 12- Center Crest				063	.07	---
	Note: One additional record[1] recovered at Anderson Dam Structure Array.						
	Hollister City Hall Annex Basement (USGS)	36.851 121.402	07:55.25	1.5		(1)	
	Hollister Airport Differential Array (USGS)	36.888 121.413	07:54.5	1.1		(1)	
18 October 1989 0008 G.m.t. Central Calif. Epicenter and magnitude unknown	Anderson Dam Morgan Hill (USGS)	37.166 121.628	(4)	(2)			
	Structure Array:						
	Ch. 1-12					(1)	
18 October 1989 0041:24.7 G.m.t. Central Calif. 37.198N, 122.105W Magnitude 5.1 ML	Anderson Dam Morgan Hill (USGS)	37.166 121.628	(4)	(2)			
	Downstream					(1)	
	Structure Array:						
	Ch. 1-12					(1)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989 0041:24.7 G.m.t. Central Calif. 37.198N, 122.105W Magnitude 5.1 ML *(Continued)*	Milpitas Rivera St. (USGS)	37.437 121.879	41.31.0	(2)		(1)	
18 October 1989 0323:57.0 G.m.t. Central Calif. 37.163N, 121.995W Magnitude 4.0 ML	Anderson Dam Morgan Hill (USGS)	37.166 121.628	(4)	(2)			
	Structure Array Ch. 1-12					(1)	
18 October 1989 0518:34.1 G.m.t. Central Calif. 36.980N, 121.847W Magnitude 4.2 ML	Anderson Dam Morgan Hill (USGS)	37.166 121.628	(4)	(2)			
	Structure Array: Ch. 1-12					(1)	
18 October 1989 0639:10.1 G.m.t. Central Calif. 36.932N, 121.712W Magnitude 4.3 ML	Hollister City Hall Annex Basement (USGS)	36.851 121.402	39:16.6	5.3		(1)	
	Hollister Airport Differential Array (USGS)	36.888 121.413	39:15.5	4.9		(1)	
18 October 1989- 19 October 1989 Central Calif. Epicenters and magnitudes unknown	Anderson Dam Morgan Hill (USGS)	37.166 121.628	(3)	(2)			
	Crest					(1)	
	Note: Five additional records[1] recovered at Anderson Dam Crest.						
19 October 1989 1014:35.1 G.m.t. Central Calif. 36.963N, 121.843W Magnitude 4.6 ML	Bear Valley Station 14 Upper Butts Ranch (USGS)	36.569 121.043	15:04.8	(2)		(1)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

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 2214:57.0 G.m.t. Central Calif. 37.057N, 121.905W Magnitude 4.9 ML	Anderson Dam Morgan Hill (USGS)	37.166 121.628	15:05.5	0.3			
	Downstream					(1)	
	Crest				340	.03	---
					Up	.03	---
					250	.06	---
25 October 1989 0127:26.6 G.m.t. Central Calif. 37.078N, 121.832W Magnitude 5.0 ML	Anderson Dam Morgan Hill (USGS)	37.166 121.628	27:34.1	(2)			
	Downstream					(1)	
	Crest					(1)	
31 October 1989 1905 G.m.t. Central Calif. Epicenter and magnitude unknown	San Jose, 101/280/680 Freeway Interchange (USGS)	37.340 121.851	05:17.6	(2)		(1)	
3 November 1989 1604:49.2 G.m.t. Central Calif. 36.512N, 121.120W Magnitude 2.5 ML	Bear Valley Station 6 James Ranch (USGS)	36.504 121.101	04:50.7	(2)		(1)	
7 November 1989 2342:37.7 G.m.t. Central Calif. 37.227N, 122.037W Magnitude 4.3 ML	Cupertino Pichetti Winery (USGS) Temporary	37.294 122.089	(4)	(2)		(1)	
	Los Gatos, Los Altos Rod & Gun Club (USGS) Temporary	37.239 122.106	(4)	1.6		(1)	
10 November 1989 1718 G.m.t. Central Calif. Epicenter and magnitude unknown	San Jose, 101/280/680 Freeway Interchange (USGS/CDOT)	37.340 121.851	(4)	(2)		(1)	
10 November 1989 2002 G.m.t. Central Calif. Epicenter and magnitude unknown	Cupertino Pichetti Winery (USGS) Temporary	37.294 122.089	(4)	(2)		(1)	
	Los Gatos, Los Altos Rod & Gun Club (USGS) Temporary	37.239 122.106	(4)	1.6		(1)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
18 October 1989-16 November 1989 Central Calif. Epicenters and magnitudes unknown	Palo Alto VA Hospital Bldg. 1 (VA)	37.40 122.14	(3)	(2)			
	Basement					(1)	
	Roof (7th level)					(1)	
	Note: Two additional records[1] recovered at Palo Alto VA Hospital roof level.						
19 November 1989 0128 G.m.t. Central Calif. Epicenter and magnitude unknown	Bear Valley Station 10 Webb Residence (USGS)	36.532 121.143	28:59.7	1.5		(1)	
20 November 1989 1339 G.m.t. Central Calif. Epicenter and magnitude unknown	San Jose, 101/280/680 Freeway Interchange (USGS/CDOT)	37.340 121.851	(4)	(2)		(1)	
25 October 1989-21 November 1989 Central Calif. Epicenters and Magnitudes unknown	Anderson Dam Morgan Hill (USGS)	37.166 121.628	(3)	(2)			
	Downstream					(1)	
	Crest				340	.02	---
					Up	.02	---
					250	.06	---
	Note: One additional record[1] recovered at Anderson Dam crest.						
	Structure Array:						
	Ch. 1- Mid-dam, Center				153	.03	---
	Ch. 2- Mid-dam, Center				243	.04	---
	Ch. 3- Mid-dam, Right				063	.04	---
	Ch. 4- Toe				333	.03	---
	Ch. 5- Toe				Up	.02	---
	Ch. 6- Toe				063	.03	---
	Ch. 7- Right Crest				333	.05	---
	Ch. 8- Right Crest				Up	.04	---
	Ch. 9- Right Crest				063	.06	---
	Ch. 10- Center Crest				333	.03	---
	Ch. 11- Center Crest				Up	.04	---
	Ch. 12- Center Crest				063	.06	---
	Note: Three additional records[1] recovered at Anderson Dam structure array.						

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
24 November 1989 1445:14.6 G.m.t. Eastern Calif. 37.402N, 118.630W Magnitude 3.9 ML	Chalfant Valley Array Fire Station (USGS)	37.53 118.37	(4)	0.9		(1)	
29 November 1989 1645:13.8 G.m.t. Eastern Calif. 37.520N, 118.768W Magnitude 3.0 ML	McGee Creek Mammoth Lakes (USGS) SMA-1	37.550 118.811	(4)	(2)		(1)	
	McGee Creek Mammoth Lakes (USGS) CRA-1	37.550 118.811	(4)	(2)			
	166 m Downhole					(1)	
	35 m Downhole					(1)	
	Surface					(1)	
	1 m Downhole					(1)	
21 October 1988-1 December 1989 Southern Calif. Epicenters and magnitudes unknown	Los Angeles 444 S. San Vicente Blvd. (OWNR)	34.071 118.374	(3)				
	Roof (12th)			(2)		(1)	
	Note: Three additional records[1] recovered at 444 S. San Vicente Boulevard roof.						
5 December 1988-1 December 1989 Southern Calif. Epicenters and magnitudes unknown	Los Angeles 1526 N. Edgemont St. (OWNR)	34.098 118.294	(3)				
	Roof (8th)			2.9	090	.08	---
					Up	.05	---
					360	.13	1 peak
				2.9	090	.15	0.2
					Up	.04	---
					360	.09	---
13 December 1988-1 December 1989 Eastern Calif. Epicenter and magnitude unknown	Long Valley Dam Crowley Lake (USGS)	37.588N 118.705W	(3)	(2)			
	Left abutment					(1)	

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
14 December 1988- 1 December 1989 Southern Calif. Epicenters and magnitudes unknown	Los Angeles 2005 N. Highland Ave. (OWNR)	34.106N 118.336W	(3)				
	Roof (8th)					(1)	
	Note: One additional record[1] recovered at 2005 N. Highland Avenue roof.						
2 December 1989 2316:47.8 G.m.t. Southern Calif. 33.650N, 116.740W Magnitude 4.2 ML	Anza Array Garner Valley Fire Station (USGS)	33.616 116.627	(3)	2.0	010 Up 280	.05 .05 .04	--- --- ---
	Anza Array Hurkey Creek Park (USGS)	33.676 116.680	16:50.6	1.7	135 Up 045	.07 .07 .08	--- --- ---
	Anza Array Keenwild Forest Sta. (USGS)	33.714 116.711	(3)	1.8	180 Up 090	.16 .19 .18	0.2 0.1 0.2
	Anza Array Pinyon Flat Observ. (USGS)	33.61 116.46	(3)	3.2		(1)	
	Anza Array Red Mountain (USGS)	33.630 116.847	16:53.2	(2)	360 Up 270	.08 .02 .06	--- --- ---
	Anza Array Tripp Flats (USGS)	33.60 116.74	(3)	1.7	360 Up 270	.07 .03 .04	--- --- ---
	Anza Array Pine Meadow Ranch (USGS)	33.578 116.589	16:51.5	2.6	360 Up 270	.05 .03 .05	--- --- ---
17 August 1988- 4 December 1989 Southern Calif. Epicenters and magnitudes unknown	Los Angeles 2049 Century Park E. (OWNR)	34.058 118.412	(3)				
	43rd floor			4.9	320 Up 230	.05 .07 .03	--- --- ---

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
17 August 1988- 4 December 1989 Southern Calif. Epicenters and magnitudes unknown *(Continued)*	Los Angeles 2029 Century Park E. (OWNR)	34.059 118.413	(3)				
	43rd floor			4.8	320	.06	---
					Up	.09	---
					230	.02	---
30 July 1987- 5 December 1989 Southern Calif. Epicenters and magnitudes unknown	Los Angeles 19191 S. Vermont Ave. (OWNR)	33.855 118.291	(3)				
	10th floor			4.3	360	.09	---
					Up	.09	---
					270	.07	---
				10.8	360	.06	---
					Up	.03	---
					270	.07	---
	Note: Six additional records[1] recovered at 19191 S. Vermont Avenue 10th floor.						
3 August 1988- 6 December 1989 Southern Calif. Epicenters and magnitudes unknown	Los Angeles 5250 Century Blvd. (OWNR)	33.945 118.372	(3)				
	Roof (8th)			2.8	090	.02	---
					Up	.08	---
					360	.03	---
	Note: Four additional records[1] recovered at 5250 Century Boulevard roof.						
21 October 1988- 6 December 1989 Southern Calif. Epicenters and magnitudes unknown	Los Angeles 333 S. Hope St. (OWNR)	34.053 118.252	(3)				
	55th floor			3.0	353	.03	---
					Up	.10	1 peak
					083	.05	---
				2.8	353	.01	---
					Up	.07	---
					083	.02	---
	Note: Two additional records[1] recovered at 333 S. Hope Street 55th floor.						

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
7 July 1988-	Los Angeles	34.063	(3)				
12 December 1989	4929 Wilshire Blvd.	118.337					
Southern Calif.	(OWNR)						
Epicenters and							
magnitudes unknown	Roof (11th)			3.6	180	.11	1.5
					Up	.08	---
					090	.07	---
				3.0	180	.06	---
					Up	.08	---
					090	.06	---
				3.1	180	.07	---
					Up	.10	1 peak
					090	.05	---
	Note: Two additional records[1] recovered at 4929 Wilshire Boulevard roof.						
17 August 1988-	Los Angeles	34.061	(3)				
12 December 1989	10100 Santa Monica Blvd.	118.416					
Southern Calif.	(OWNR)						
Epicenters and							
magnitudes unknown	Roof (27th)			4.3	140	.08	---
					Up	.08	---
					050	.02	---
	Note: One additional record[1] recovered at 10100 Santa Monica Boulevard roof.						
16 September 1988-	Los Angeles	34.063	(3)				
13 December 1989	600 S. Commonwealth Ave.	118.285					
Southern Calif.	(OWNR)						
Epicenters and							
magnitudes unknown	19th floor			3.5	028	.06	---
					Up	.12	1 peak
					298	.07	---
				3.3	028	.04	---
					Up	.07	---
					298	.03	---
	Note: Two additional records[1] recovered at 600 S. Commonwealth Avenue 19th floor.						
22 December 1989	Anza Array	33.616	(3)	1.8		((1)	
0303:25.5 G.m.t.	Garner Valley	166.627					
Southern Calif.	Fire Station (USGS)						
33.620N, 116.690W							
Magnitude 3.4 ML							

Table 1. National Cooperative Strong-Motion Network Accelerograph Records Recovered During 1989-*Continued*

Earthquake	Station Name (Owner)	Coordinates (Lat. ° N Long. ° W)	Trigger time	S-minus trigger (s)	Direction (az)	Maximum amplitude (g)	Duration (s)
24 December 1989	Howard Hanson Dam	47.282	(3)	(2)			
0845:58.9 G.m.t.	(ACOE)	121.791					
Washington							
46.650N, 122.116W	Crest				050	.02	---
Magnitude 5.1 ML					Up	.02	---
					320	.08	---
28 December 1989	Kealakekua, Hawaii	19.523	(4)	(2)		(1)	
0913:17.3 G.m.t.	Kona Hospital	155.879					
Hawaii	(USGS)						
19.333N, 155.212W							
Magnitude 5.0 ML	Mauna Loa, Hawaii	19.539	(4)	(2)		(1)	
	Observatory	155.580					
	(USGS)						
28 December 1989	Loma Linda	34.050	(3)	(2)		(1)	
0941:08.1 G.m.t.	Medical Center	117.263					
Southern Calif.	(USGS)						
34.190N, 117.390W							
Magnitude 4.5 ML	San Bernardino Array	34.086	(3)	3.1		(1)	
	San Bernardino	117.309					
	Valley College (USGS)						
	San Bernardino County	34.106	41:12.0	2.6		(1)	
	Government Center	117.287					
	(USGS)						

[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.

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