United States Department of the Interior
Geological Survey
Strong-Motion Network Data Report

PRELIMINARY REPORT ON RECORDS FROM THE USGS-MAINTAINED STRONG-MOTION NETWORK IN THE HOLLISTER AREA JANUARY 26, 1986

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Introduction

On January 26, 1986, 1920:50.9 GMT, a moderate earthquake (magnitude M_L 5.5, Berkeley; M_L 5.5 Caltech; Mb 5.2, NEIS) occurred approximately 12 km SE of Hollister, California. The coordinates of the earthquake's epicenter were 36° 48.32' North and 121° 16.94' West, which is located along the southern end of the Quien Sabe fault of D. Herd (unpubl.), 7 km east of the Calaveras Fault. The event occurred at a depth of 8.2 km and its movement was right-lateral strike slip. (Rob Cockerham, USGS, oral communication, 1986).

Among the stations operated by the United States Geological Survey (USGS) (Switzer and others, 1981) that recorded this event are (see Table 1):

1. Stations in the Hollister vicinity.
2. the Hollister Digital Differential Array, located at the airport 4 km north of Hollister (Maley and Etheredge, 1984).
3. the Bear Valley array, spreading over an area reaching 46 km south of Hollister (Dielman and others, 1975)

The main purpose of this report is to bring to the attention of the earthquake engineering and scientific communities the existence of a set of film and digital recordings of the earthquake from strong motion accelerographs operated and maintained by the USGS. Although the report is not complete, the earthquake occurred sufficiently close to the Western Region Headquarters of the USGS in Menlo Park that most of the triggered records were recovered within a few days, and some preliminary analysis was possible on the digital recordings.

Updated information on the earthquake, records, and processing will be provided in subsequent data reports. Further study of the set of records from the Bear Valley array will be required before a decision is made on their digitization. As for all earthquakes (for example, San Fernando, 1971) the more remote triggered stations are of much less interest, and their digitization and processing is less cost-efficient than those with accelerations of 10% g or higher.

This report contains copies of the film records obtained from 11 of these stations and processed records from the Hollister array. The stations at Anderson Dam and Pinnacles did not trigger. The San Justo Dam instruments are maintained by the USGS under a cooperative agreement with the Bureau of Reclamation.

The Hollister array (located 11 km from the San Andreas Fault) is a 24-channel, two-dimensional system with two legs at 33° separation with accelerometers placed at 0, 61, 457, and 610 m on one leg, and 244 and 305 m on the second. The sensors are Kinemetrics triaxial force balance accelerometers mounted at the center of a 2.1 m diameter concrete pad, well coupled to the soil. The system has a 2.5 second pre-event memory (allowing the recording of pre-triggering onset motions) and is triggered by vertical motions exceeding 0.01 g in the range of 1 to 10 Hz. The data are digitized

at a rate of 200 samples per second with a total recording time capability of 20 minutes. Two additional triaxial accelerographs, including the Differential Array film recorder, are mounted on an isolated pier in the recorder house.

Description of Records

Epicentral and hypocentral distances for the stations, rounded to the nearest kilometer, are given in Table 1. Table 2 lists the scaled peak accelerations for each component.

Film records from the Hollister area have epicentral distances ranging from 11 to 16 km, with peak horizontal acceleration of 0.17 g (Damler Residence) and vertical acceleration of 0.29 g (Hollister City Hall Annex). Copies of the first 20-25 seconds of these film records are shown in Figure 3. Half-second time marks appear at the lower edge.

Digital records from the Hollister Differential Digital Array, 15 km from the epicenter, have peak horizontal accelerations ranging from 0.09 to 0.12 g, and vertical, 0.08 to 0.17 g. Station 2 failed to operate correctly (A/D converter problem) and one horizontal channel of Station 4 failed. Computer plots of the first 20 seconds of the uncorrected data are shown in Figure 4.

Film records from the Bear Valley Array, with epicentral distances ranging from 17 to 37 km, exhibit peak horizontal accelerations ranging from 0.12 g down to the approximate triggering level at 0.01 g. Copies of these records are included in Figure 3.

The Pinnacles and Anderson Dam stations did not trigger. Further distant stations have not been visited for this report.

Digitization and Processing

The digital records from the Differential Array are processed by the following steps. Further details may be found in Converse (1984).

1. The uncorrected data are prepared by subtracting the mean. The instrument sensitivities, determined by peak-to-peak voltages, are used to scale the ordinates to acceleration.

2. The data are passed through a correction algorithm that applies a 50 Hz (high-frequency) low-pass filter, instrument correction, base-line correction in the form of a 0.2 Hz low-frequency (5 second, long-period) filter, and decimation to 200 sps. Plots of the first 20 seconds of corrected acceleration, velocity, and displacement for all available components of each record are shown in Figure 5. This initial preliminary selection of 5 seconds for the long-period filter is based on the convention of retaining a period content somewhat longer than the strong-motion duration of the records (Basili and Brady, 1978), here estimated at 2-3 seconds.

3. A tripartite response spectrum plot for each of the components of Station 1 is shown in Figure 6.

Summary

Although in this preliminary report the quoted values for the earthquake epicenter may eventually be altered, it appears that a significant set of records has been obtained from the magnitude 5.5 event. Current epicentral distances indicate five records to the west within 15 km. A set of five digital records obtained at the Hollister array are 15 km from the epicenter. A further set of film records to the southeast has been recovered at epicentral distances in the range 17-37 km.

Digitization and further processing of the film records will await a decision on the overall significance of the event. Further corrections applied to the digital recordings, and investigations on the total ground motion at the Hollister array will be described in subsequent reports.

Acknowledgements

We appreciate the kindness of the property owners, where the Bear Valley Array instruments are located, for permission originally to install the array and subsequently annually to maintain it. The cooperative agreement with the Bureau of Reclamation has resulted in the San Justo Dam records, from instruments installed prior to the dam being built.

Attributions

A. G. Brady leads the Data Management project with P. N. Mork and B. L. Silverstein; R. P. Maley heads the Network Operations project with E. C. Etheredge and technicians D. A. Johnson, A. V. Acosta, R. D. Forshee and M. J. Salsman. Text, figures, tables, and records were prepared through the efforts of all.

Appendix

The appendix contains three tables listing processed records since 1978.

References

Basili, M., and Brady, A. G., 1978; Low Frequency Filtering and the Selection of Limits for Accelerogram Corrections: Sixth European Conference on Earthquake Engineering, Dubrovnik, Yugoslavia.

Converse, A. M., 1984; AGRAM: A Series of Computer Programs for Processing Digitized Strong-Motion Accelerograms, Version 2.0: U.S. Geological Survey Open-File Report 81-525, 118 p.

Dielman, R. J., Hanks, T. C., and Trifunac, M. D., 1975; An array of strong-motion accelerographs in Bear Valley, California; BSSA, v. 65 no. 1.

Maley, R. P., and Etheredge, E. C., 1984; The Development of Ground and Structural Response Strong-Motion Instrumentation Arrays in the United States: Eighth World conference on Earthquake Engineering, San Francisco, California, 8 p.

Switzer, L., Johnson, D., Maley, R., and Matthiesen, R., 1981; Western Hemisphere Strong-Motion Station List - 1980; U.S. Geological Open-File Report No. 81-664, 162 p.

Table 1.- Epicentral and Hypocentral Distances

Earthquake coordinates: 36.805°N, 121.282°W
depth: 8.2 kilometers

Station Name	Latitude (North)	Longitude (West)	Epicentral Distance(km)	Hypocentral Distance(km)	Azimuth from Epicenter
Bear Valley 5 Callens Ranch	36.673	121.195	17	19	152.10
Bear Valley 1 CDF Fire Station	36.573	121.184	27	28	161.22
Bear Valley 6 James Ranch	36.504	121.101	37	38	154.18
Bear Valley 7 Pinnacles (a)	36.483	121.184	37	38	165.68
Bear Valley 2 Stone Canyon West	36.636	121.234	19	21	167.10
Bear Valley 14 (b) Upper Butts Ranch	36.569	121.043	34	35	140.85
Bear Valley 10 Webb Residence	36.532	121.143	33	34	157.72
Bear Valley 12 Williams Ranch	36.658	121.249	17	19	169.71
Anderson Dam (a)	37.166	121.626	50	51	322.83
Hollister City Hall Annex	36.851	121.402	12	14	295.53
Hollister SAGO Vault	36.765	121.446	16	18	251.40
Hollister Damler Residence	36.807	121.408	11	14	272.65
Hollister Differential Array	36.888	121.413	15	17	308.37
San Justo Damsite Abutment	36.815	121.447	15	17	274.37
San Justo Damsite Dike	36.827	121.445	15	17	279.45

Notes: (a) No trigger
(b) Not yet visited

Table 2.- Peak Accelerations, scaled from original film or preliminary digital processing

Station Name	Station Number	Components			Scaled peaks (g)			
		L	V	T	L	V	T	
Bear Valley Array:								
Callens Ranch	1474	310	Up	220	0.05	0.06	0.04	
CDF Fire Station	1210	310	Up	220	0.04	0.02	0.04	
James Ranch	1475	310	Up	220	0.02	0.01	0.01	
Pinnacles (a)	1476	310	Up	220				
Stone Canyon West	1343	130	Up	040	0.03	0.02	0.04	
Upper Butts Ranch (b)	1483	310	Up	220				
Webb Residence	1479	310	Up	220	0.04	0.01	0.04	
Williams Ranch	1481	310	Up	220	0.12	0.06	0.12	
Hollister								
City Hall Annex	1575	180	Up	090	0.10	0.29	0.12	
SAGO Vault	1032	360	Up	270	0.04	0.04	0.04	
Damler Residence	1657	360	Up	270	0.17	0.09	0.14	
Hollister Differential Array	1656							
Station 1		255	Up	345	0.09	0.17	0.11	
Station 2		255	Up	345	---	---	---	(c)
Station 3		255	Up	345	0.10	0.12	0.10	
Station 4		255	Up	345	0.10	0.08	---	(d)
Station 5		255	Up	345	0.11	0.17	0.12	
Station 6		255	Up	345	0.10	0.15	0.11	
Recorder building		255	Up	165	0.10	0.15	0.10	
San Justo Damsite	1655							
Abutment		360	Up	270	0.16	0.07	0.14	
Dike		360	Up	270	0.09	0.04	0.08	

Notes: (a) No trigger
(b) Not yet visited
(c) No operation
(d) No op, one channel

Figure captions

1.- Instrument locations coded with Station Numbers from Table 1, epicenter, and adjacent faults.

2.- Instrument locations at Hollister Digital Differential Array.

3.- Copies of the first 20-25 seconds of the film records. Most ran for at least 60 seconds for the WWVB time record. Refer to Table 1 for peak values.

4.- Computer plots of the uncorrected data from the Hollister Digital Differential Array. The first 20 seconds of a full length of at least 80 seconds are included.

5.- Preliminary correction using band pass from 50 Hz to 5 seconds, and instrument correction, for the Hollister Digital Differential Array.

6. Response spectrum for Station 1 of the Hollister array.

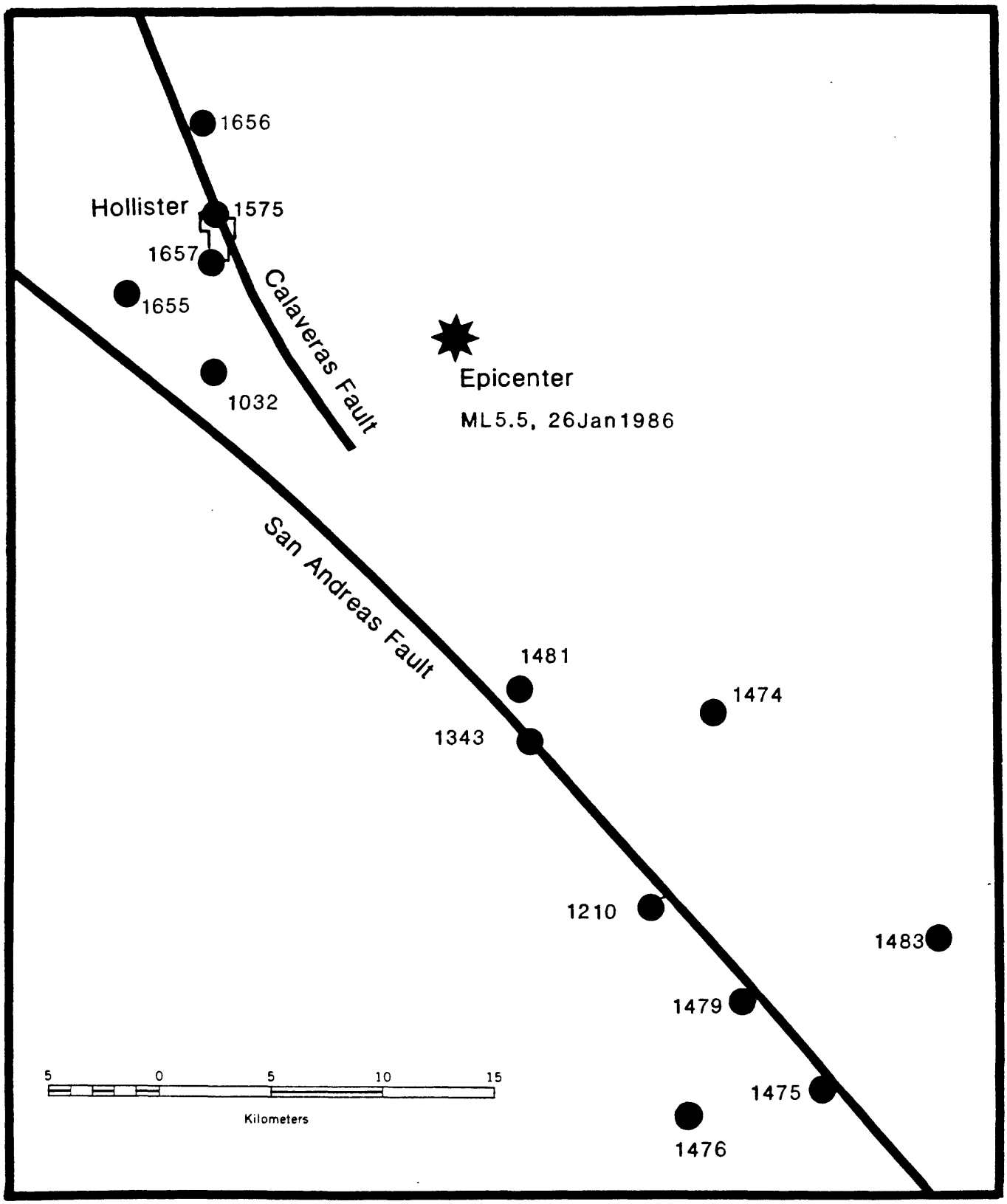

1656
Hollister
1575
1657
1655
1032
Calaveras Fault
Epicenter
ML5.5, 26Jan1986
San Andreas Fault
1481
1474
1343
1210
1483
1479
1475
1476
5
0
5
10
15
Kilometers

Figure 1.

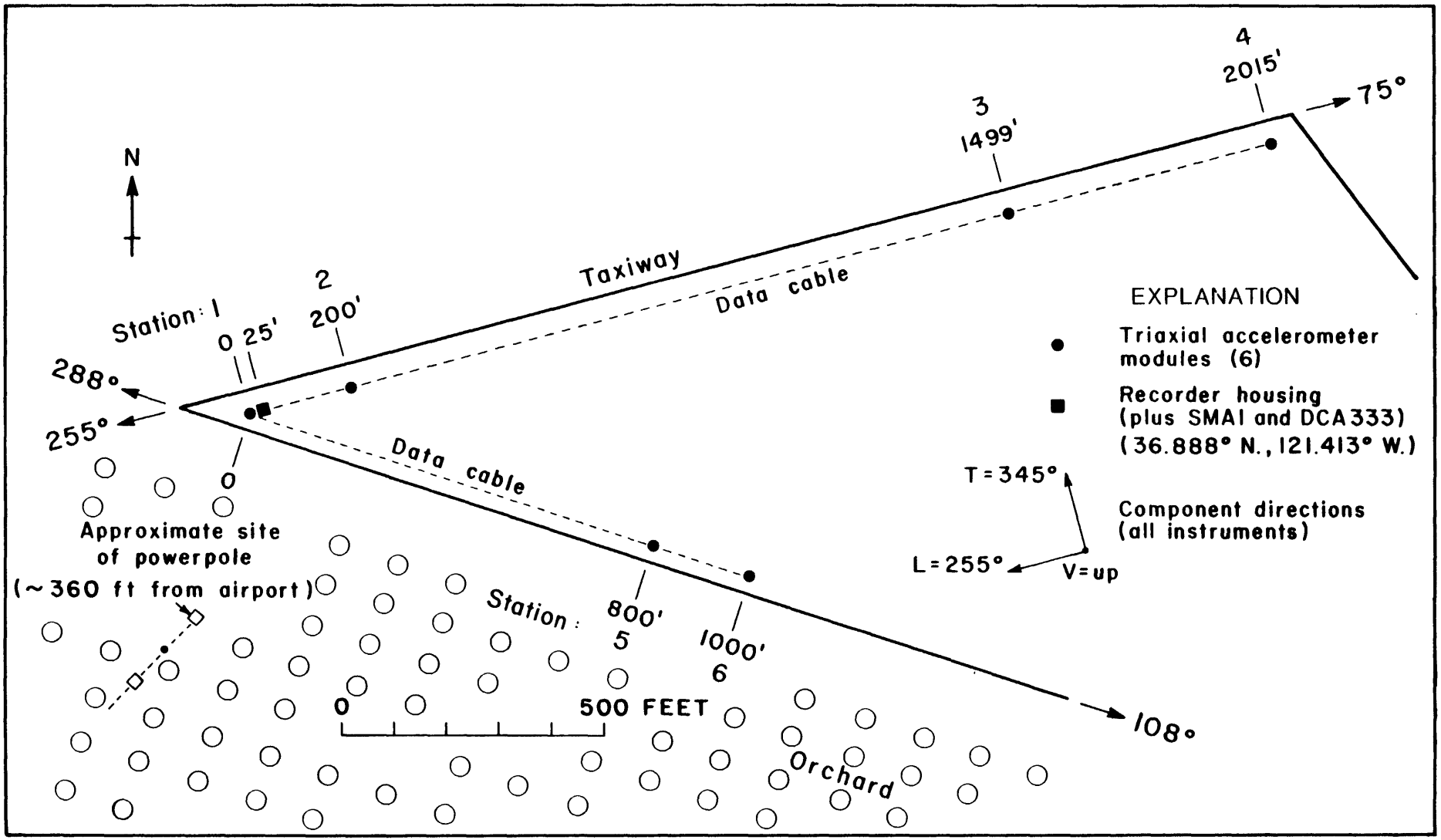

N
Station: 1
0
25'
2
200'
3
1499'
4
2015'
75°
Taxiway
Data cable
288°
255°
0
Data cable
Approximate site
of powerpole
(~360 ft from airport)
Station:
800'
5
1000'
6
0
500 FEET
108°
Orchard
EXPLANATION
Triaxial accelerometer
modules (6)
Recorder housing
(plus SMA1 and DCA333)
(36.888° N., 121.413° W.)
T=345°
L=255°
V=up
Component directions
(all instruments)

Figure 2.

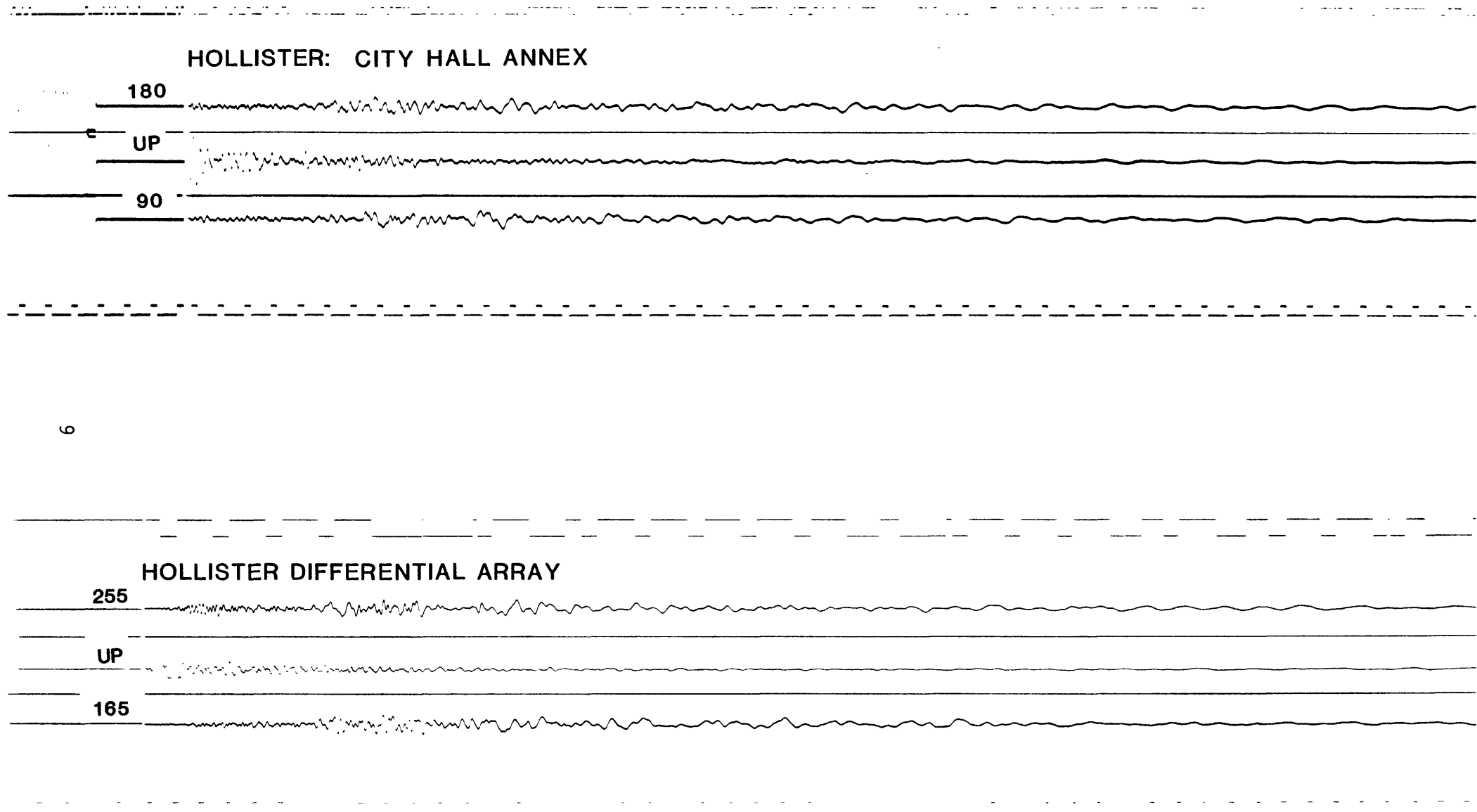

HOLLISTER: CITY HALL ANNEX
180
UP
90
HOLLISTER DIFFERENTIAL ARRAY
255
UP
165

Figure 3.

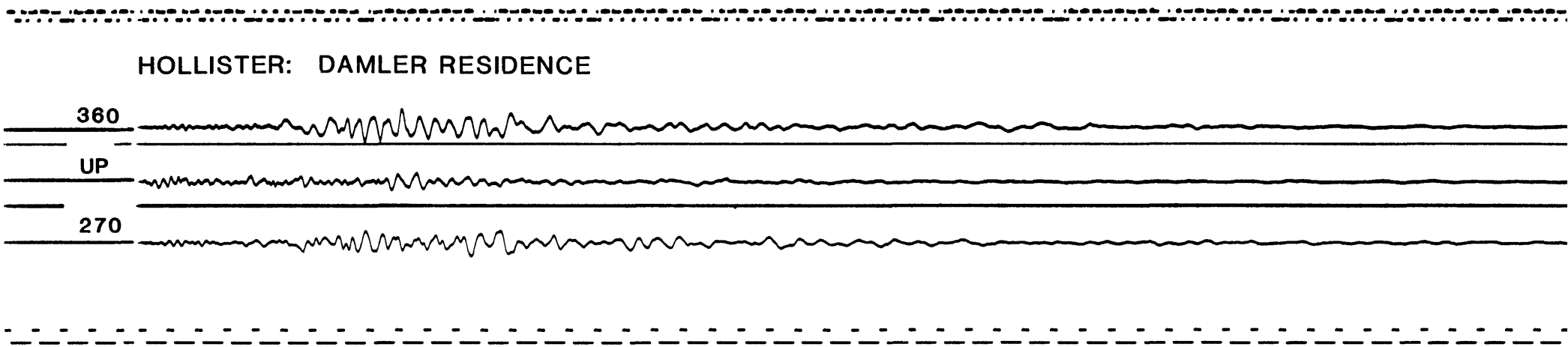


Figure 3 (continued)

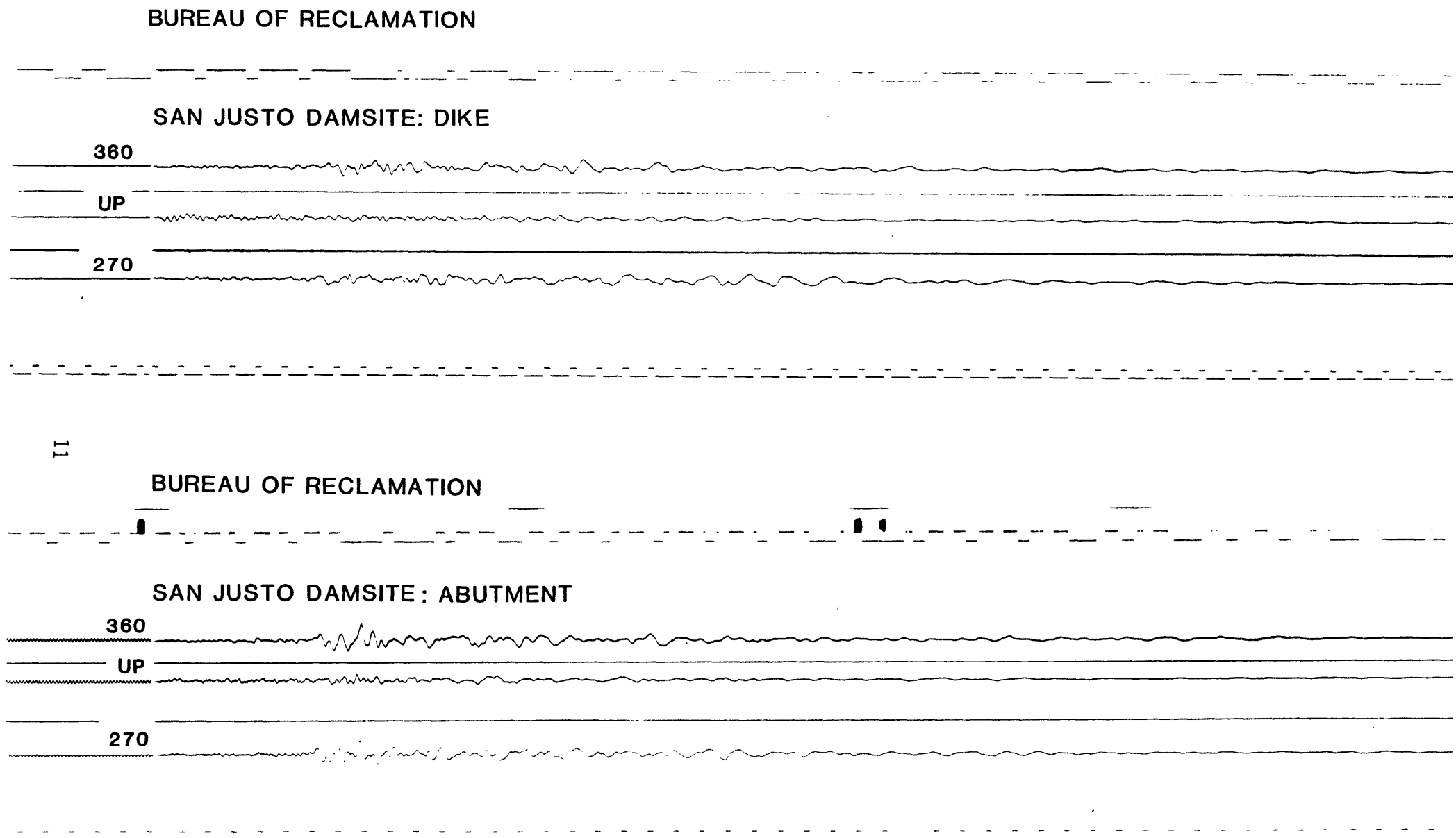


Figure 3. (continued)

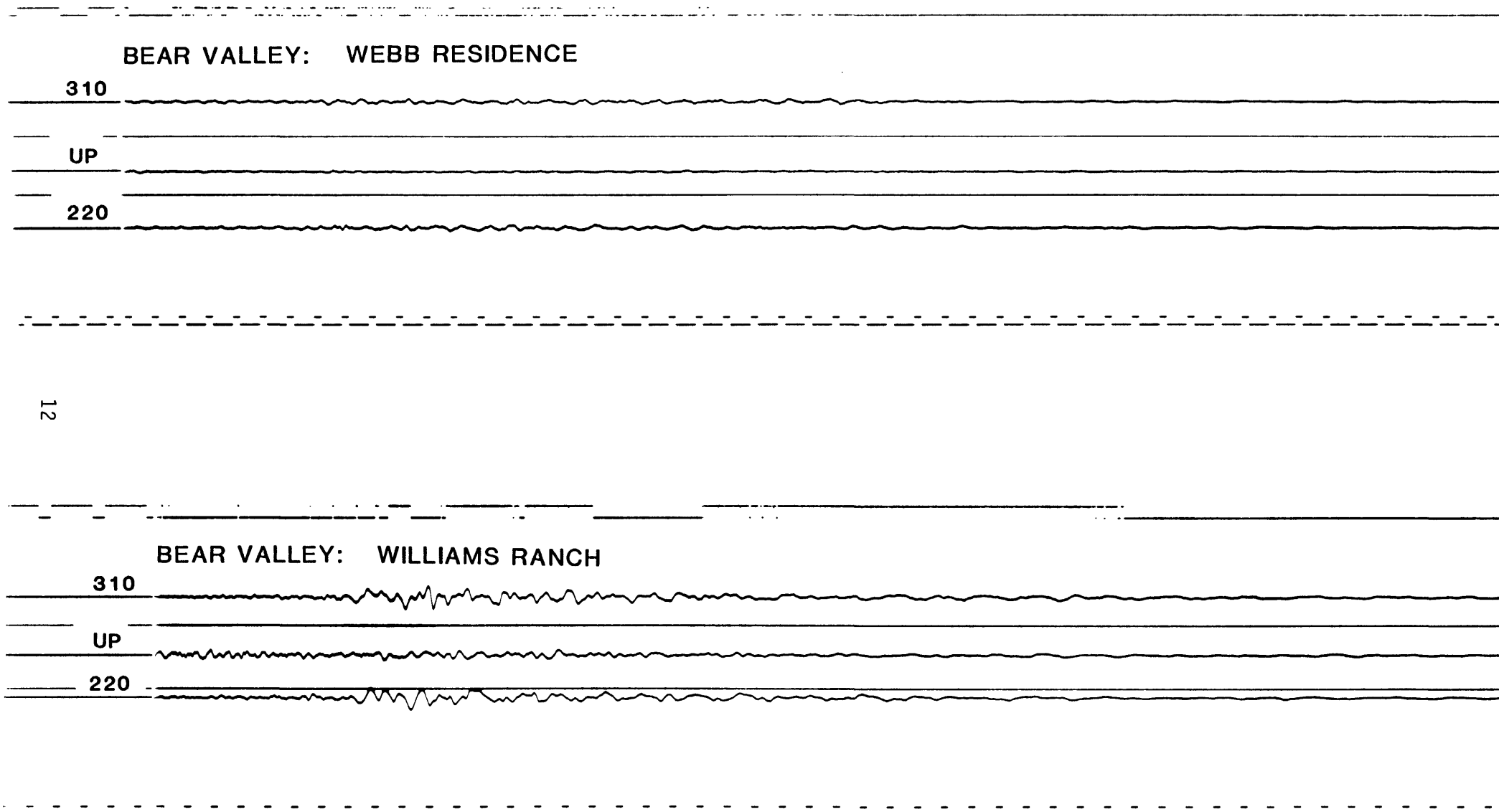


Figure 3. (continued)

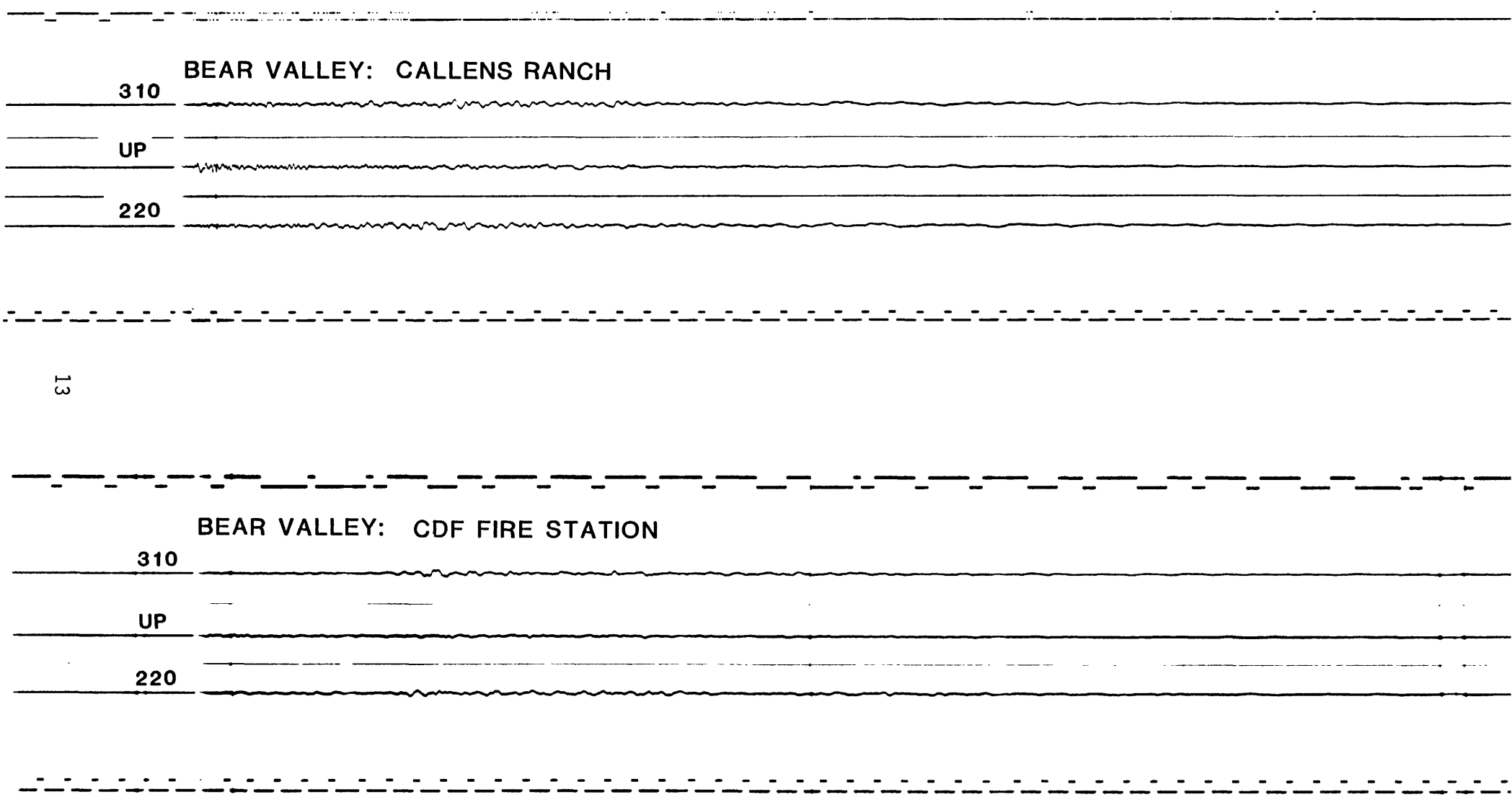


Figure 3. (continued)

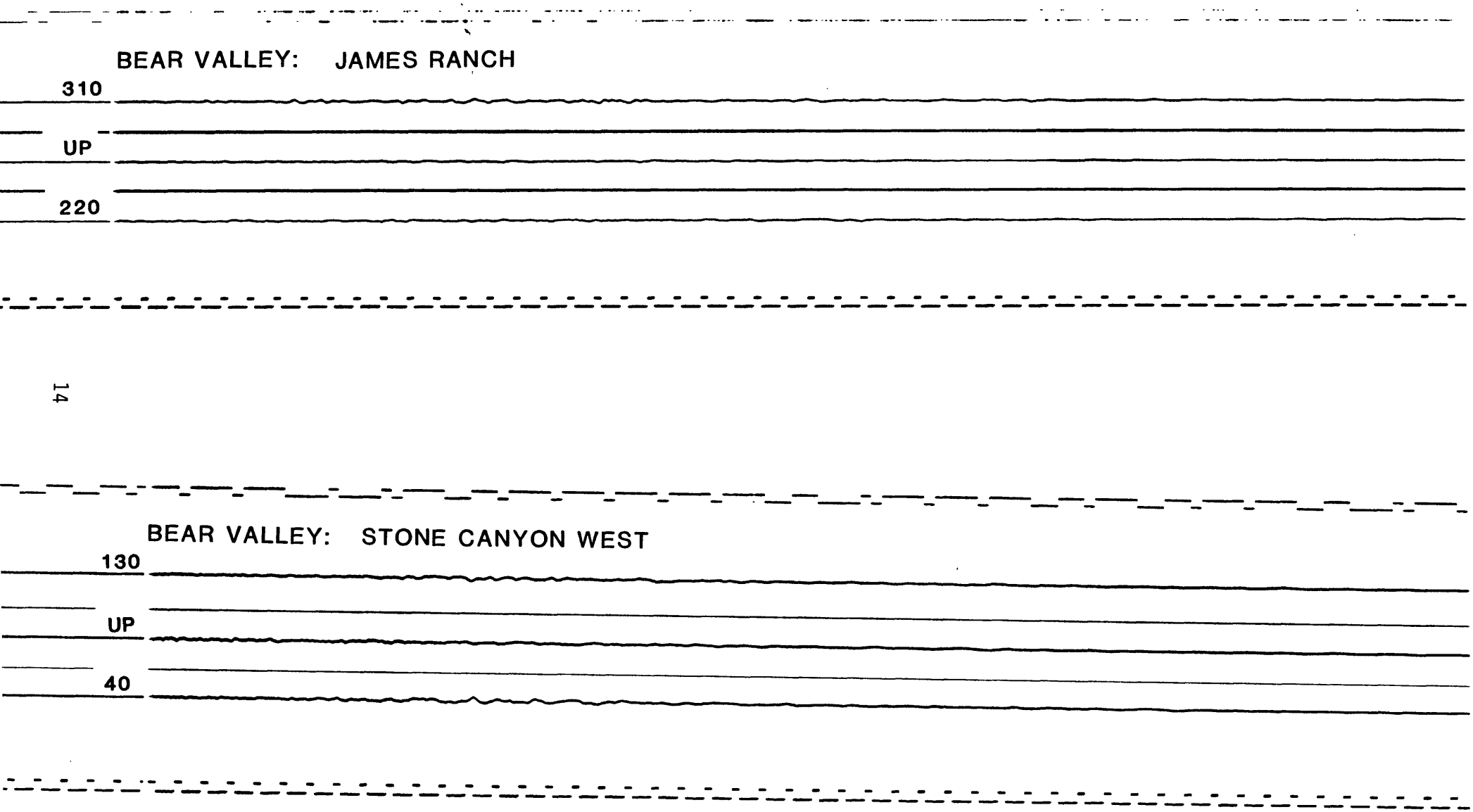


Figure 3. (continued)

Figure 4

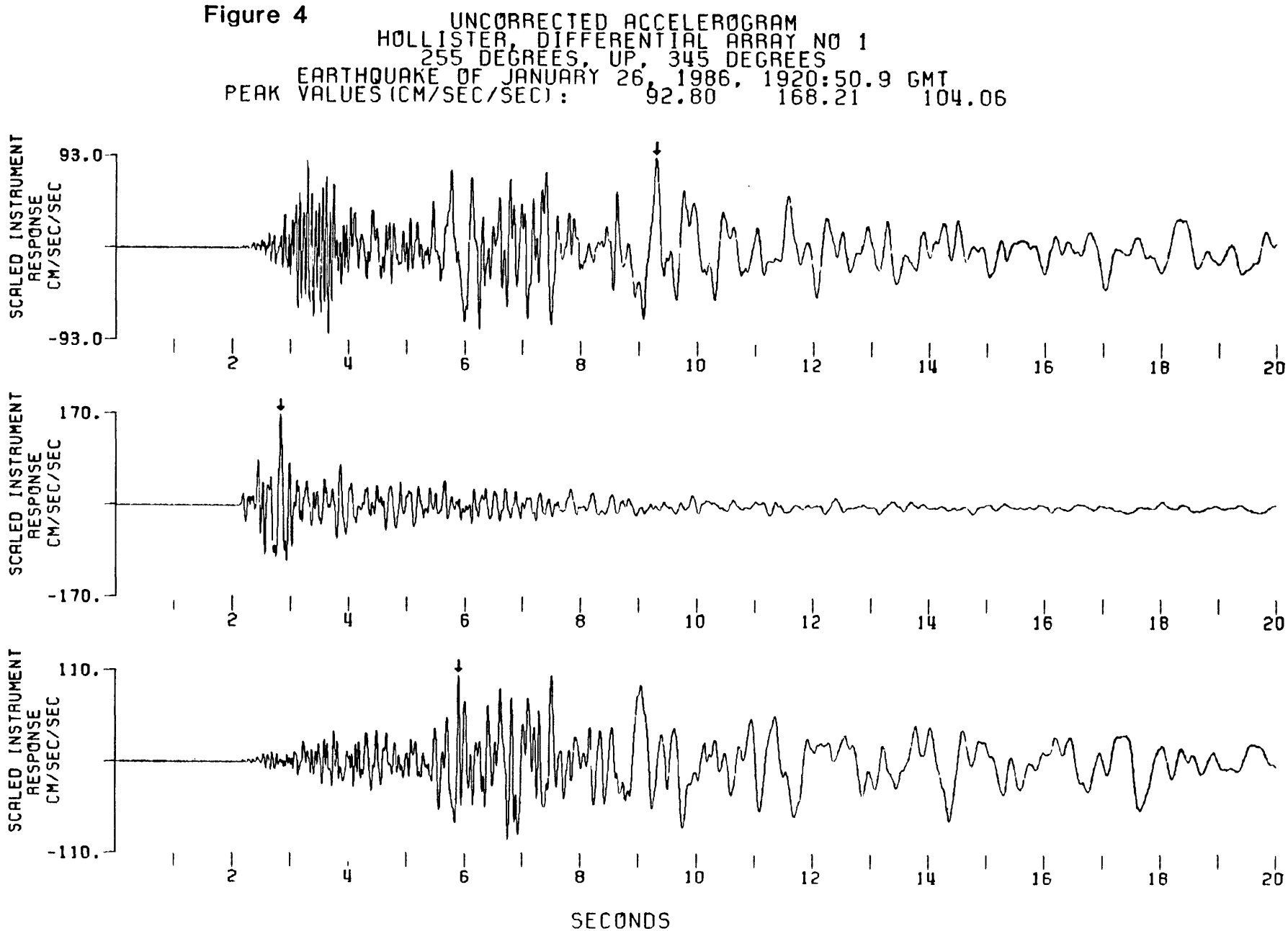

UNCORRECTED ACCELEROGRAM
HOLLISTER, DIFFERENTIAL ARRAY NO 1
255 DEGREES, UP, 345 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
PEAK VALUES(CM/SEC/SEC): 92.80 168.21 104.06
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
93.0
-93.0
170.
-170.
110.
-110.
2
4
6
8
10
12
14
16
18
20
SECONDS

Figure 4 (continued)

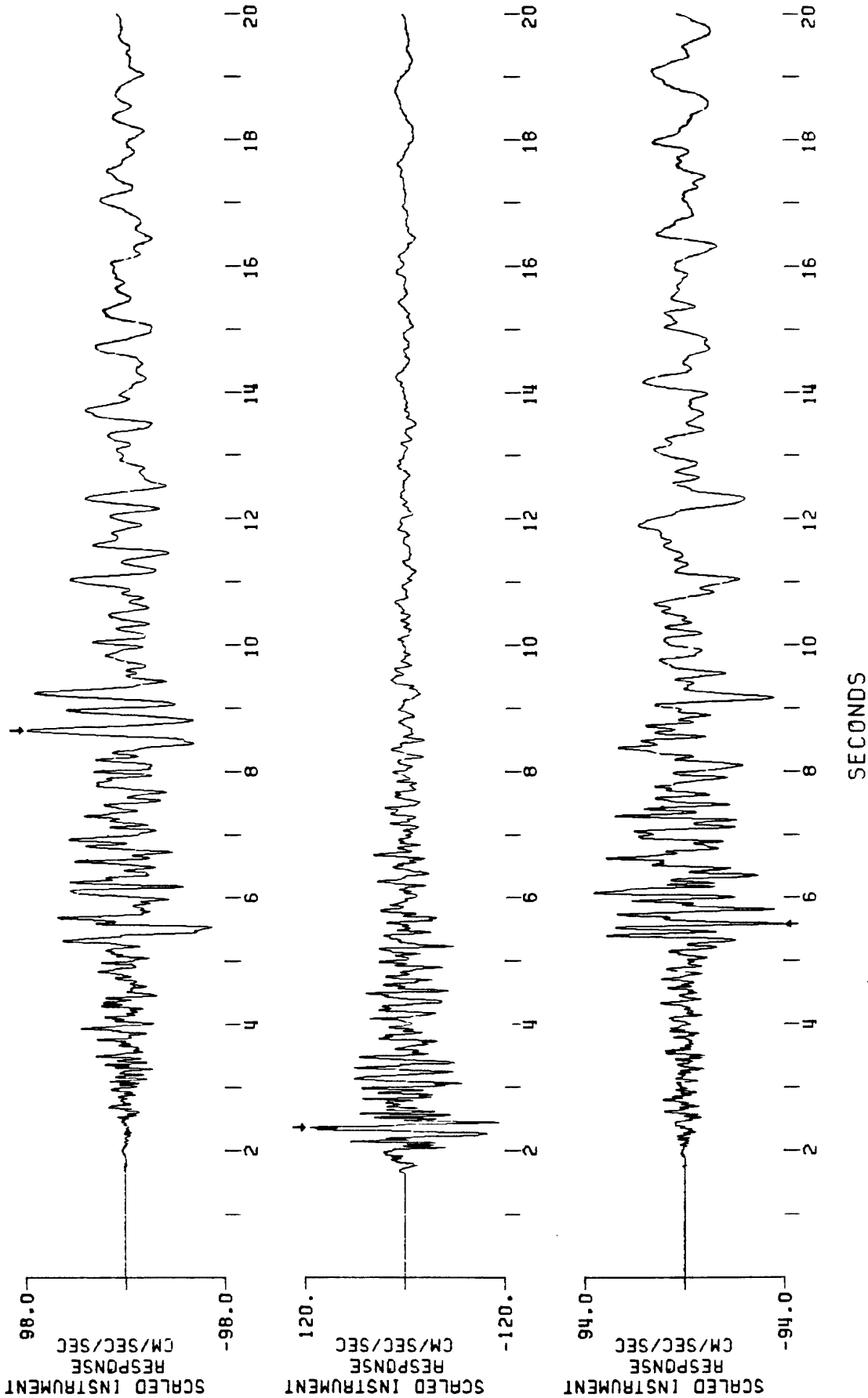
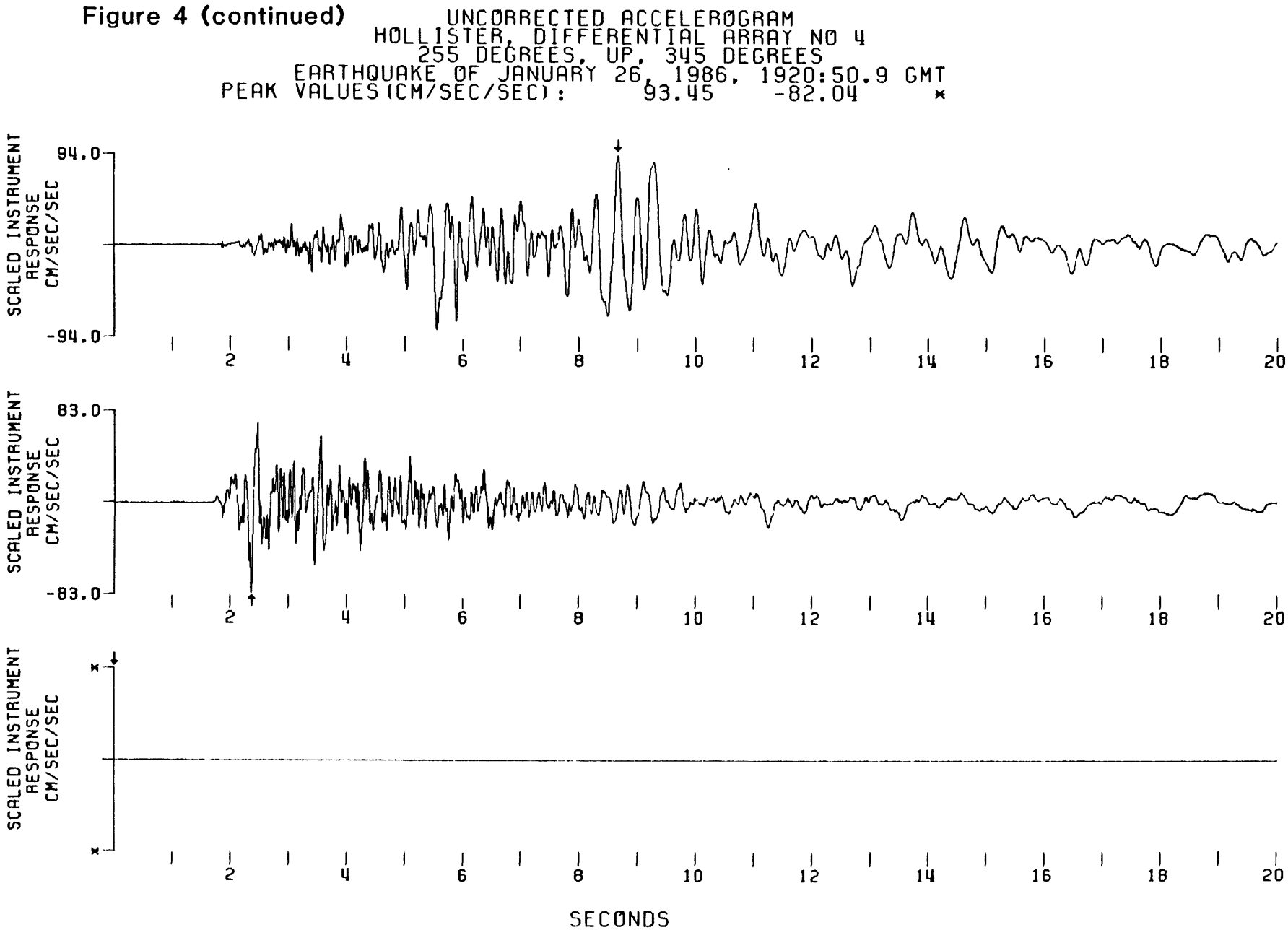


Figure 4 (continued)



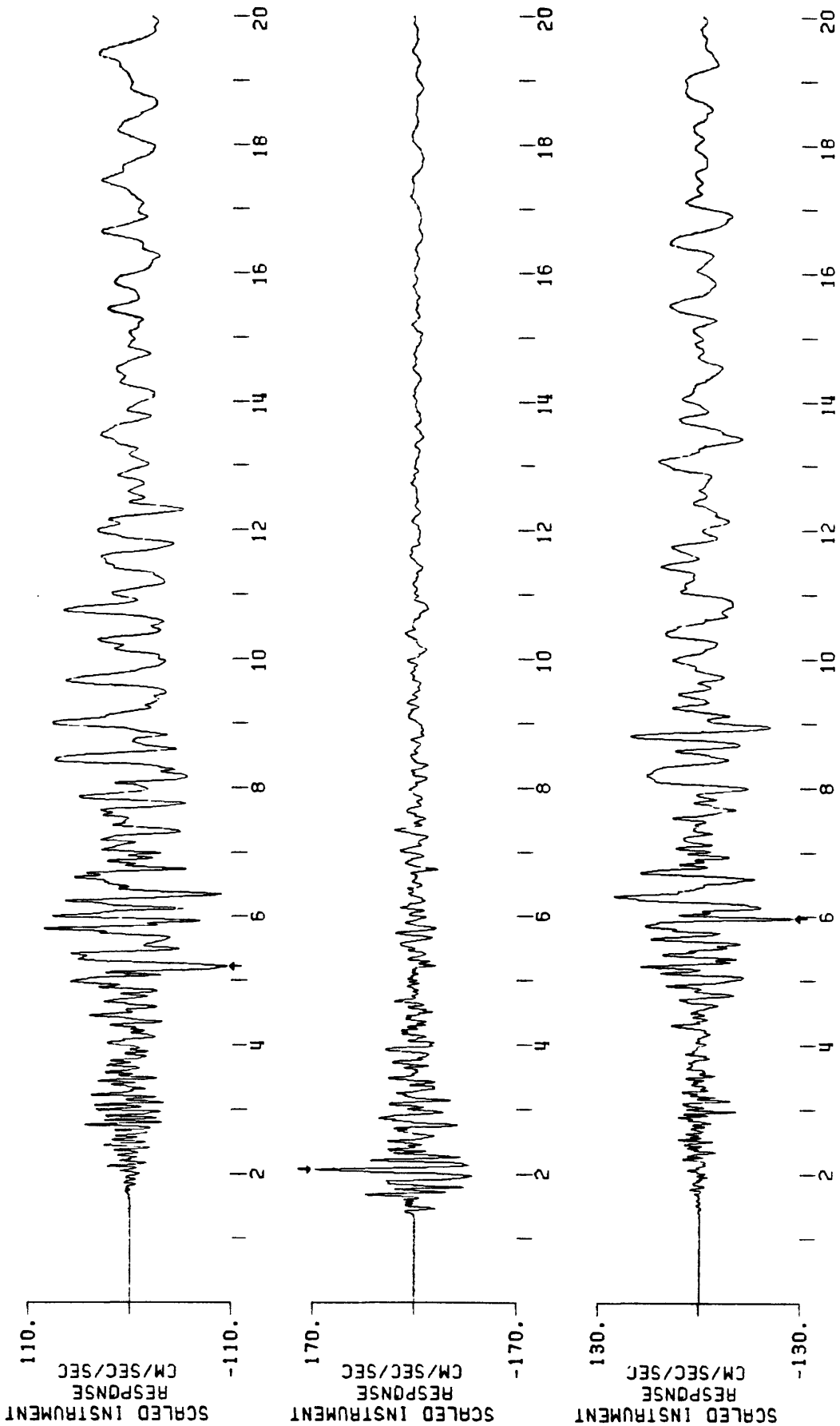


Figure 4 (continued).

Figure 4 (continued).

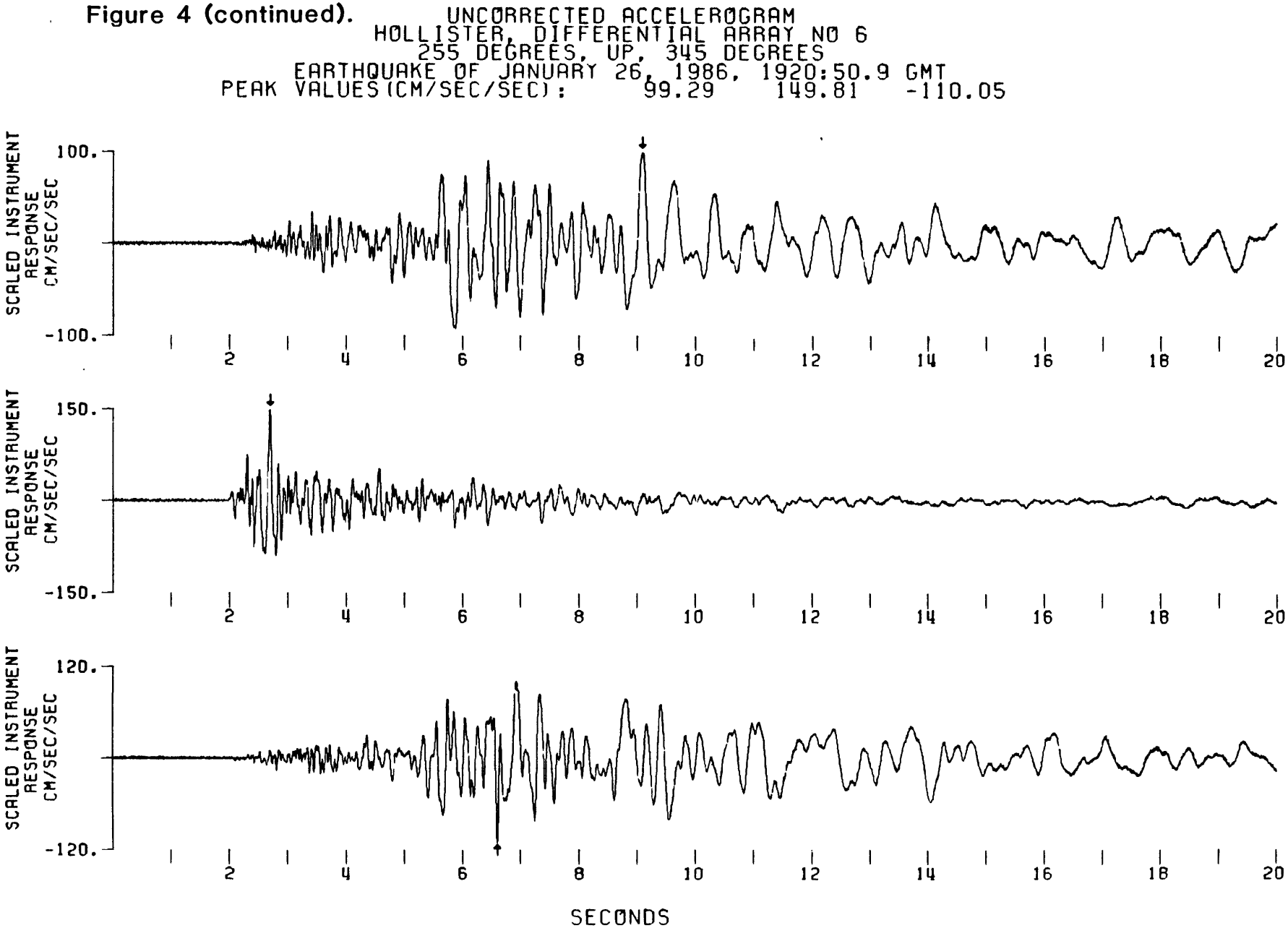


Fig. 5

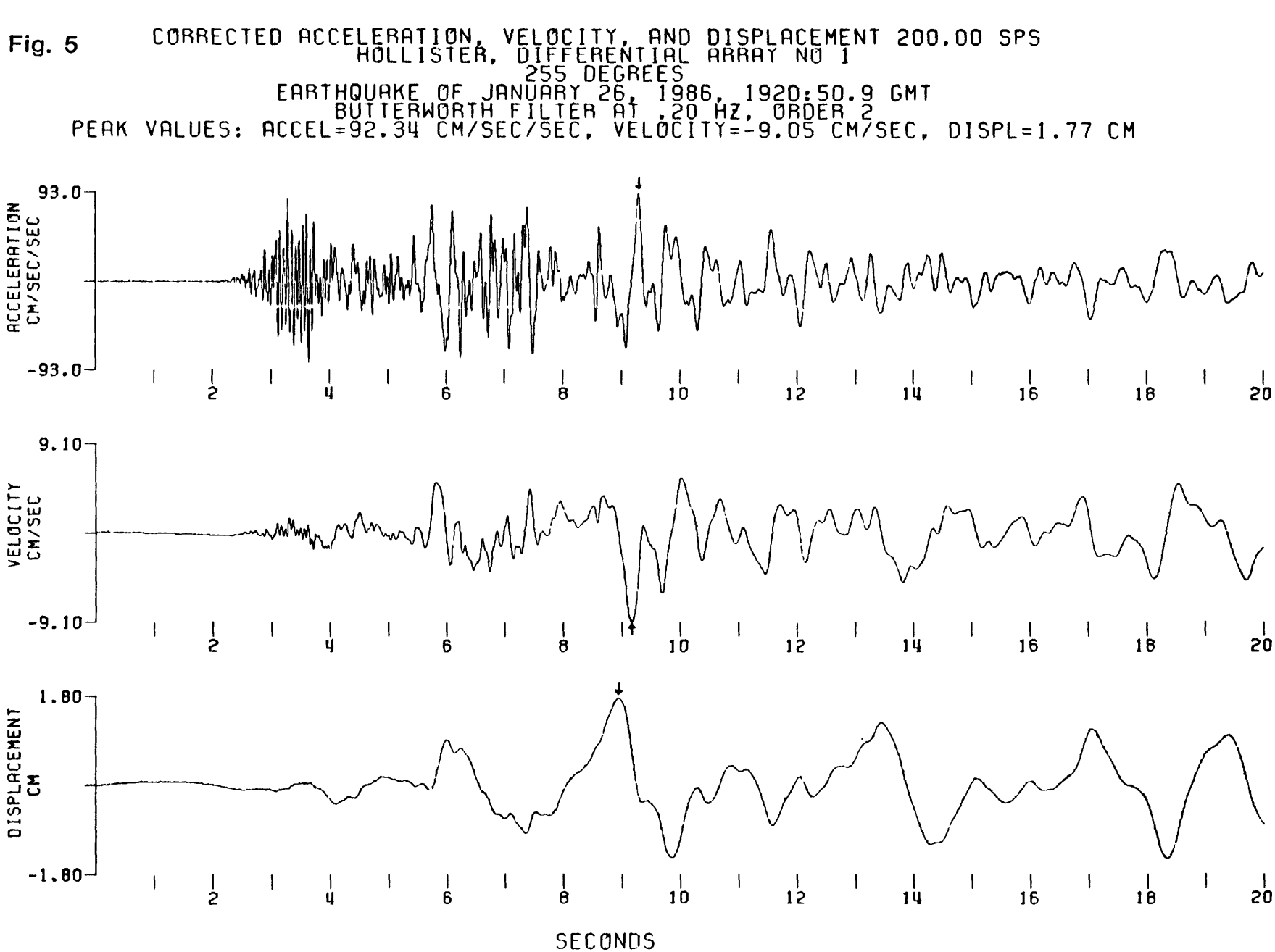

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 1
255 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=92.34 CM/SEC/SEC, VELOCITY=-9.05 CM/SEC, DISPL=1.77 CM
ACCELERATION CM/SEC/SEC
93.0
-93.0
VELOCITY CM/SEC
9.10
-9.10
DISPLACEMENT CM
1.80
-1.80
2
4
6
8
10
12
14
16
18
20
SECONDS

Fig. 5 (cont.) CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 1
UP
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=167.05 CM/SEC/SEC, VELOCITY=-4.12 CM/SEC, DISPL=-0.61 CM

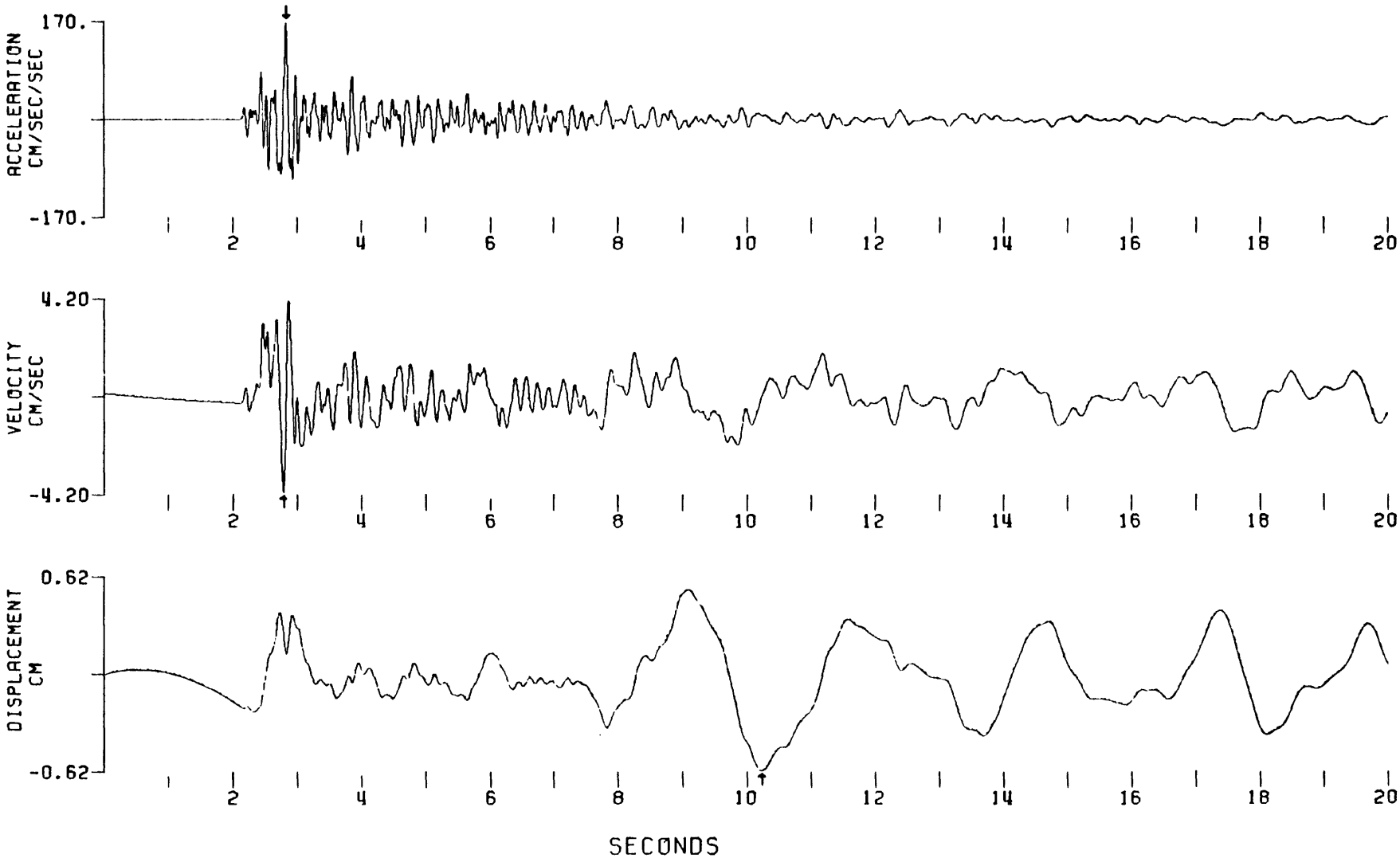


Fig. 5 (cont.) CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 1
345 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=103.39 CM/SEC/SEC, VELOCITY=-8.61 CM/SEC, DISPL=2.07 CM

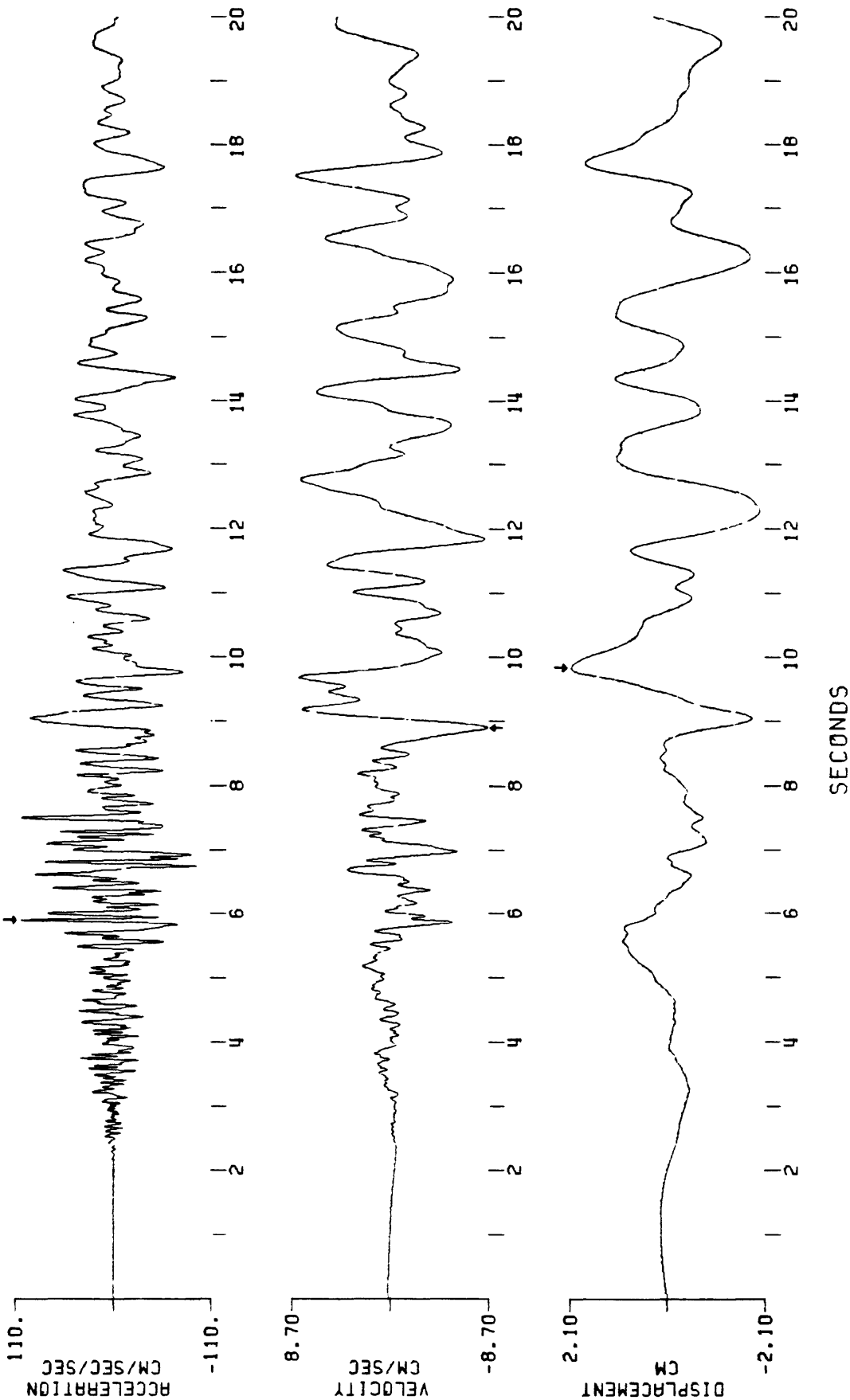


Fig. 5 (cont.) CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 3
255 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=96.50 CM/SEC/SEC, VELOCITY=-7.60 CM/SEC, DISPL=1.49 CM

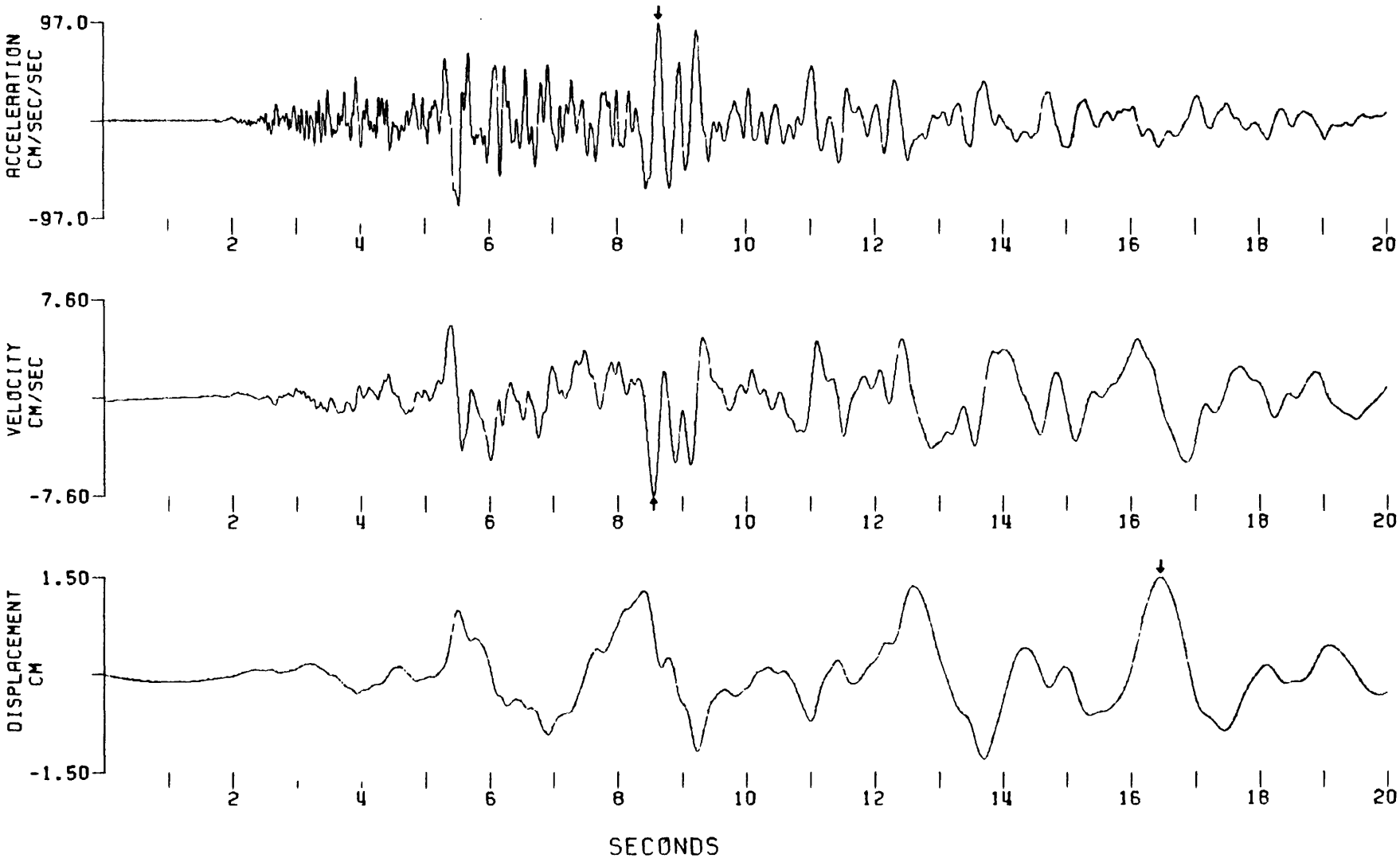


Fig. 5 (cont.) CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 3
UP
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=114.95 CM/SEC/SEC, VELOCITY=-3.55 CM/SEC, DISPL=-0.57 CM

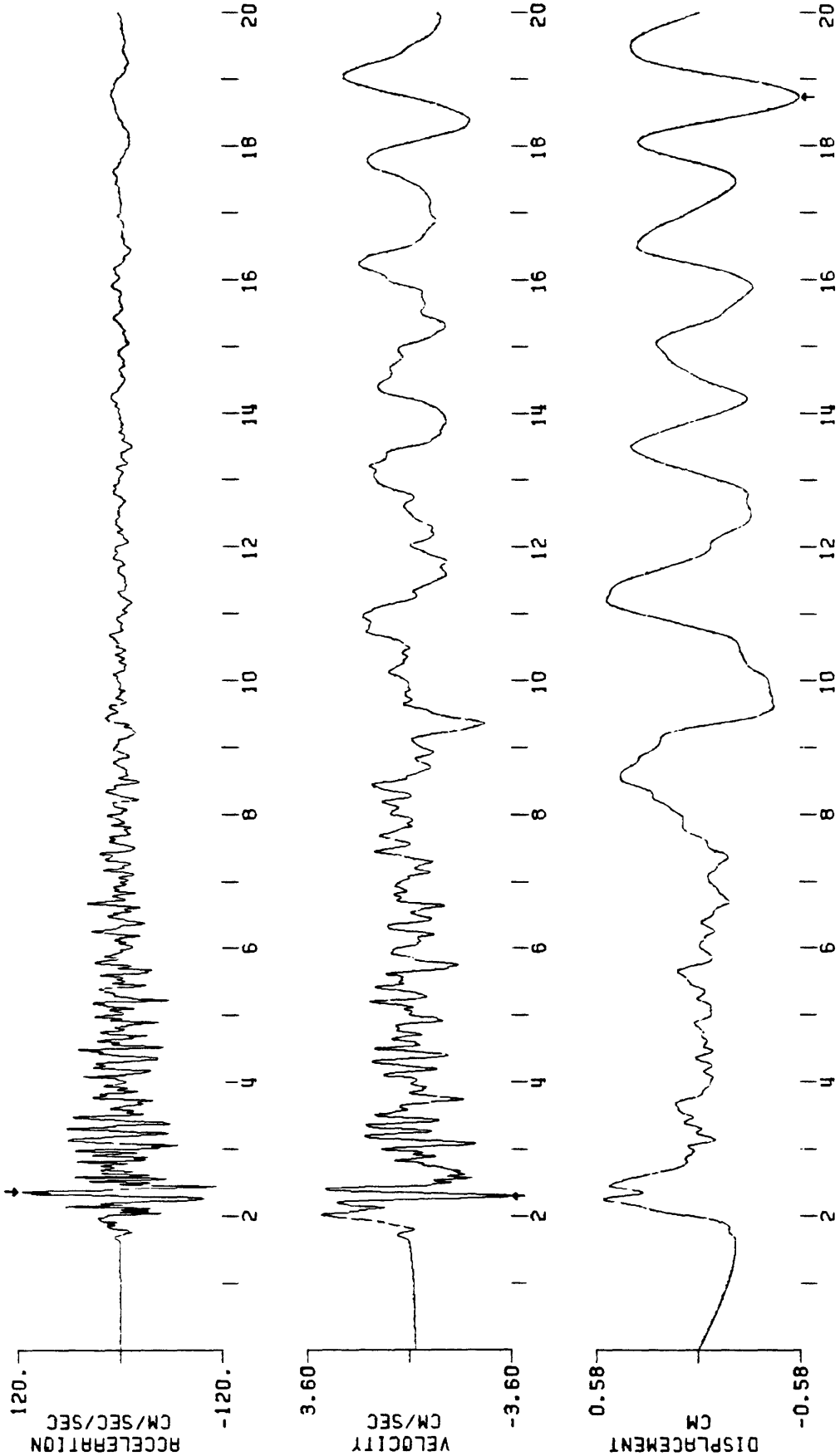


Fig. 5 (cont.) CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 3
345 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=-92.20 CM/SEC/SEC, VELOCITY=9.77 CM/SEC, DISPL=-2.37 CM

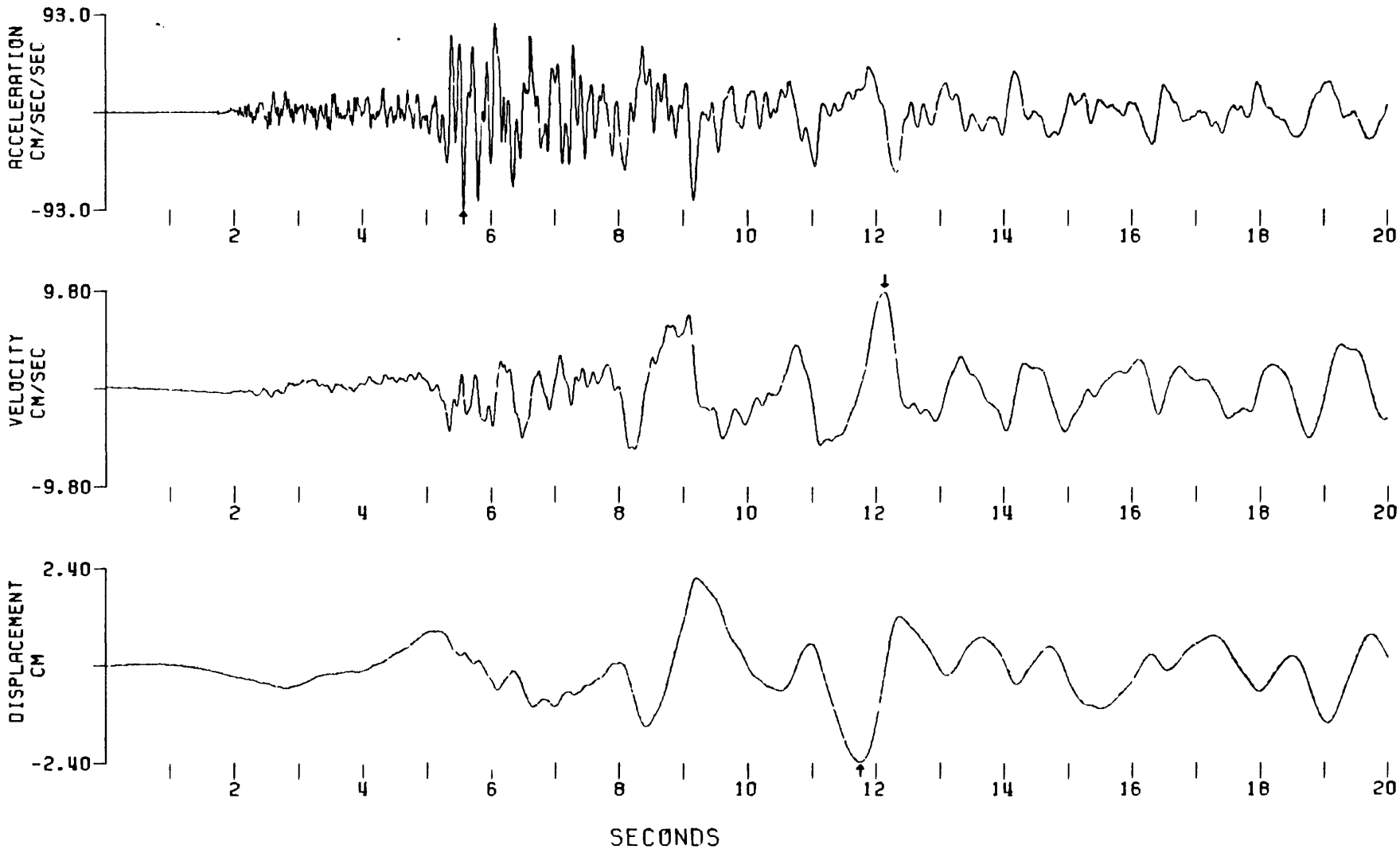


Fig. 5 (cont.) CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 4
255 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=93.38 CM/SEC/SEC, VELOCITY=7.17 CM/SEC, DISPL=1.39 CM

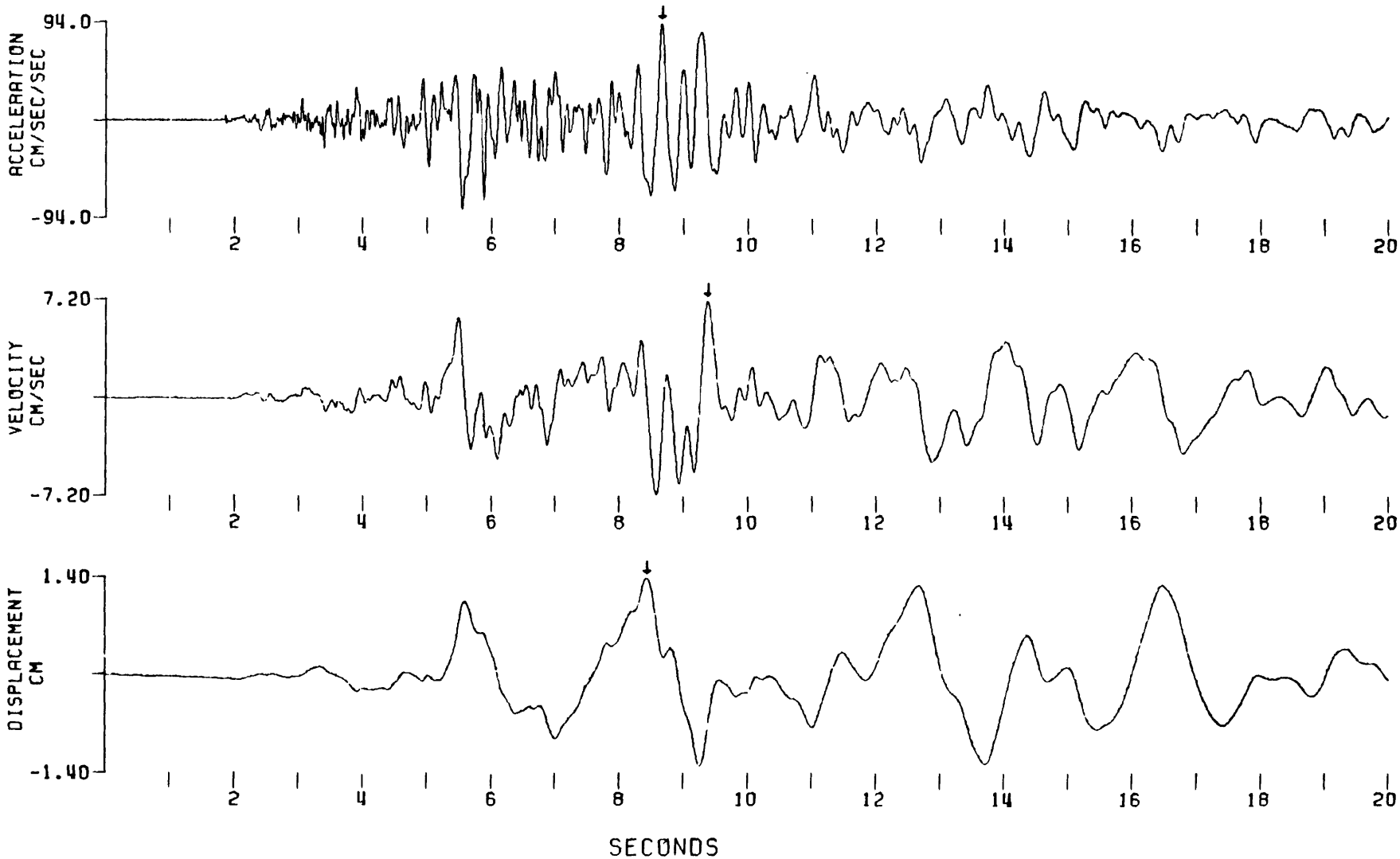


Fig. 5 (cont.)

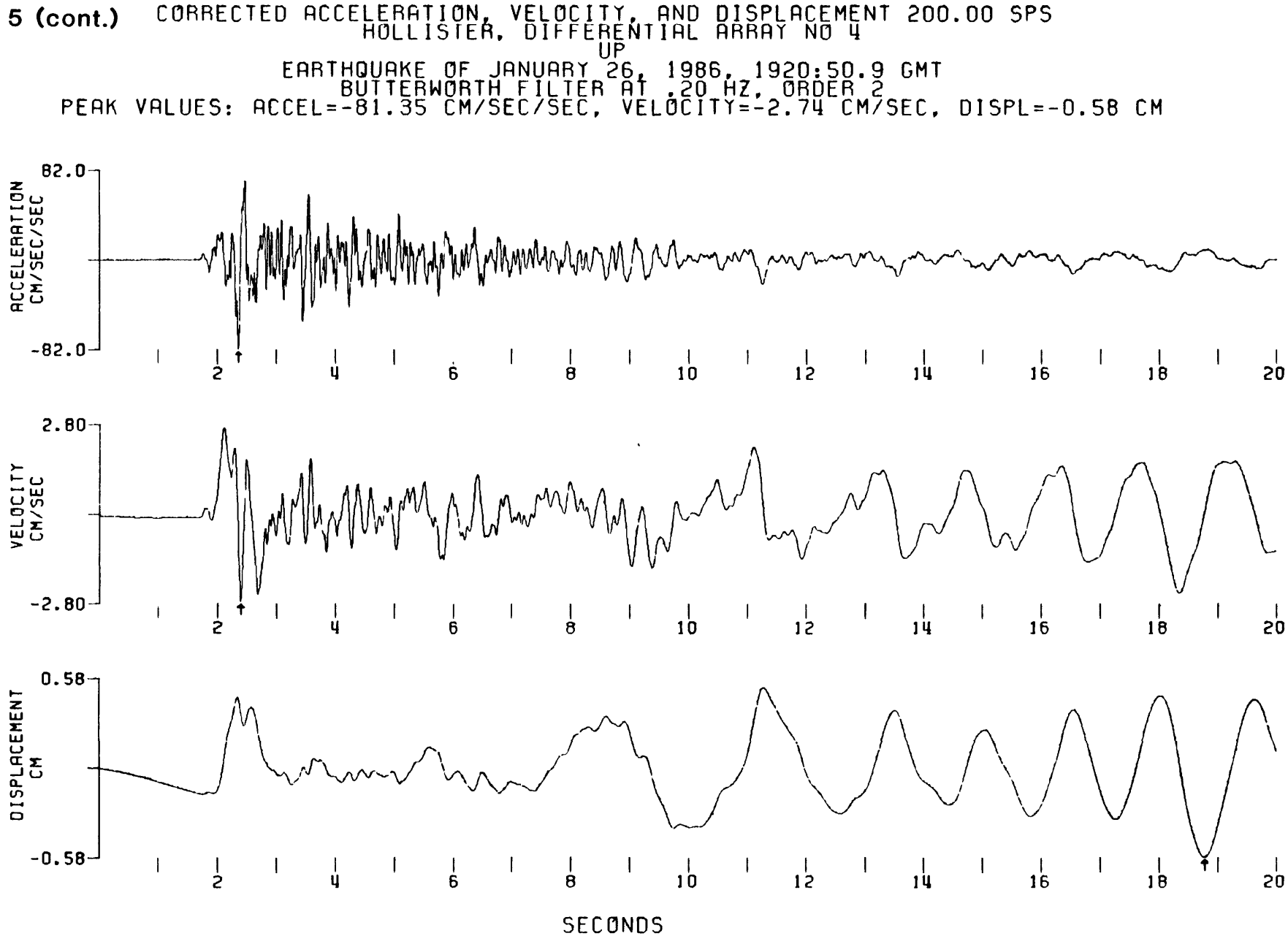

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 4
UP
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=-81.35 CM/SEC/SEC, VELOCITY=-2.74 CM/SEC, DISPL=-0.58 CM
ACCELERATION CM/SEC/SEC
82.0
-82.0
VELOCITY CM/SEC
2.80
-2.80
DISPLACEMENT CM
0.58
-0.58
2
4
6
8
10
12
14
16
18
20
SECONDS

Fig. 5 (cont.)

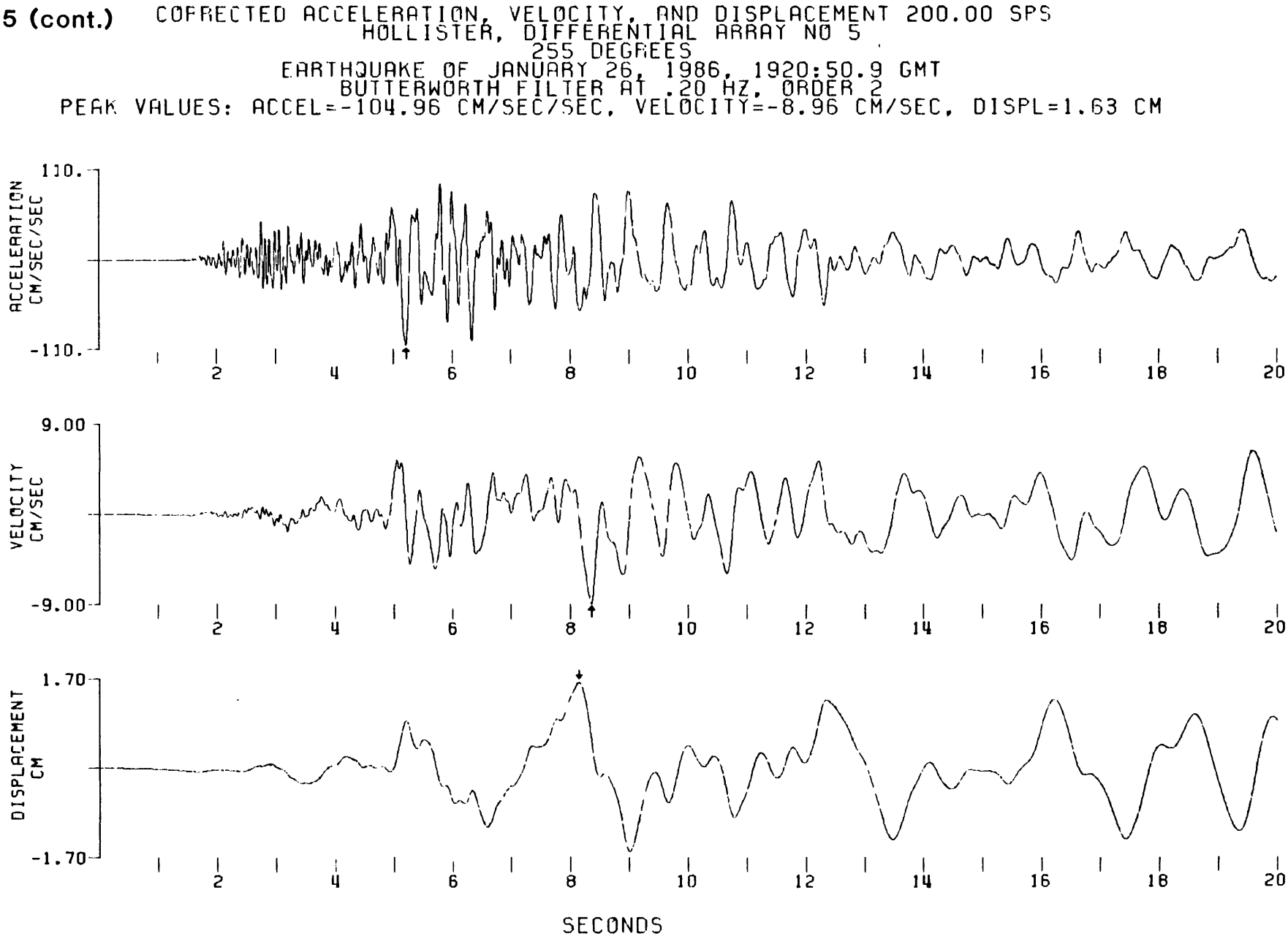

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 5
255 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=-104.96 CM/SEC/SEC, VELOCITY=-8.96 CM/SEC, DISPL=1.63 CM
ACCELERATION CM/SEC/SEC
110.
-110.
VELOCITY CM/SEC
9.00
-9.00
DISPLACEMENT CM
1.70
-1.70
2
4
6
8
10
12
14
16
18
20
SECONDS

Fig. 5 (cont.)

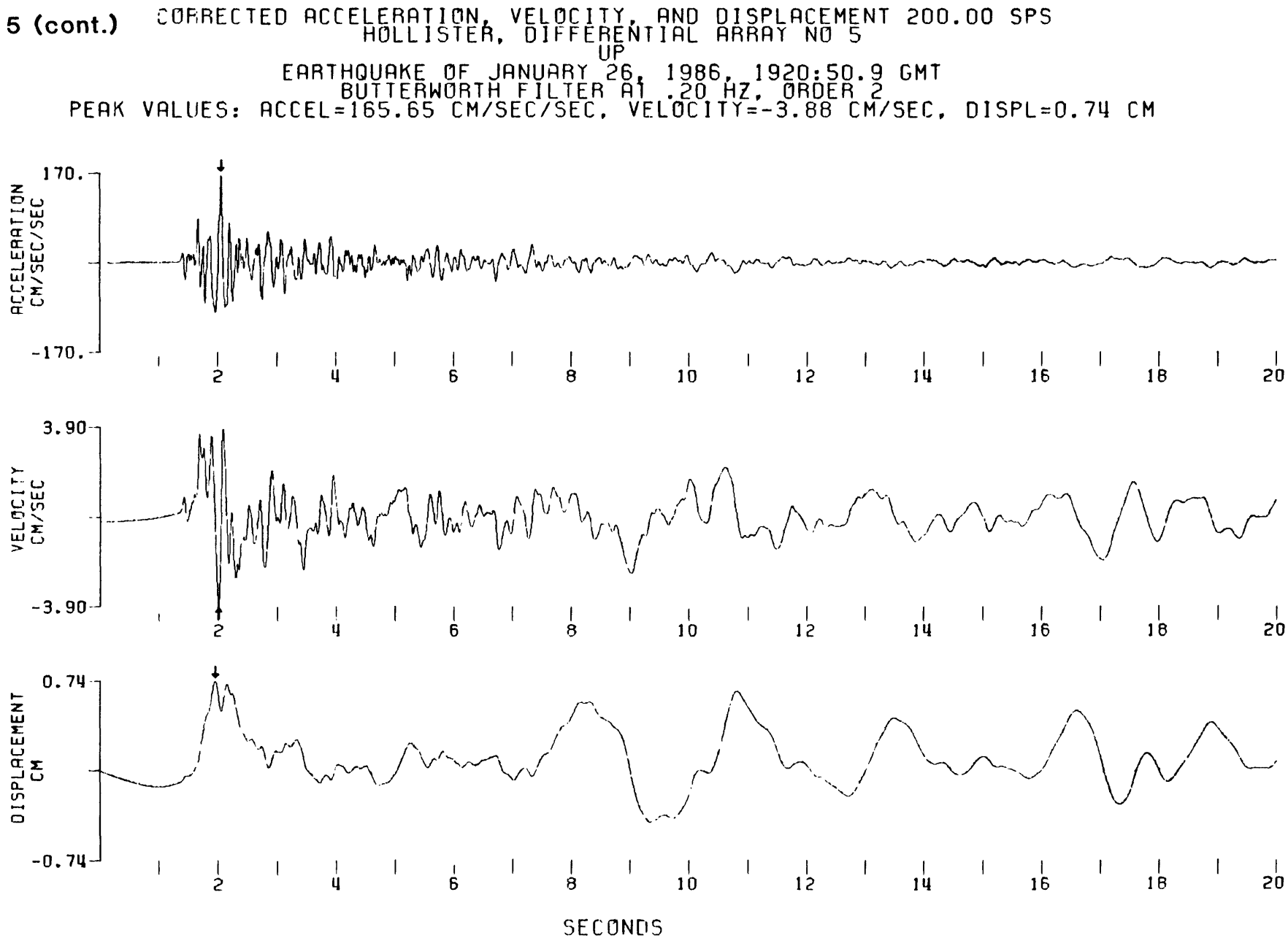

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 5
UP
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER A1 .20 HZ, ORDER 2
PEAK VALUES: ACCEL=165.65 CM/SEC/SEC, VELOCITY=-3.88 CM/SEC, DISPL=0.74 CM
ACCELERATION CM/SEC/SEC
170.
-170.
VELOCITY CM/SEC
3.90
-3.90
DISPLACEMENT CM
0.74
-0.74
2
4
6
8
10
12
14
16
18
20
SECONDS

Fig. 5 (cont.)

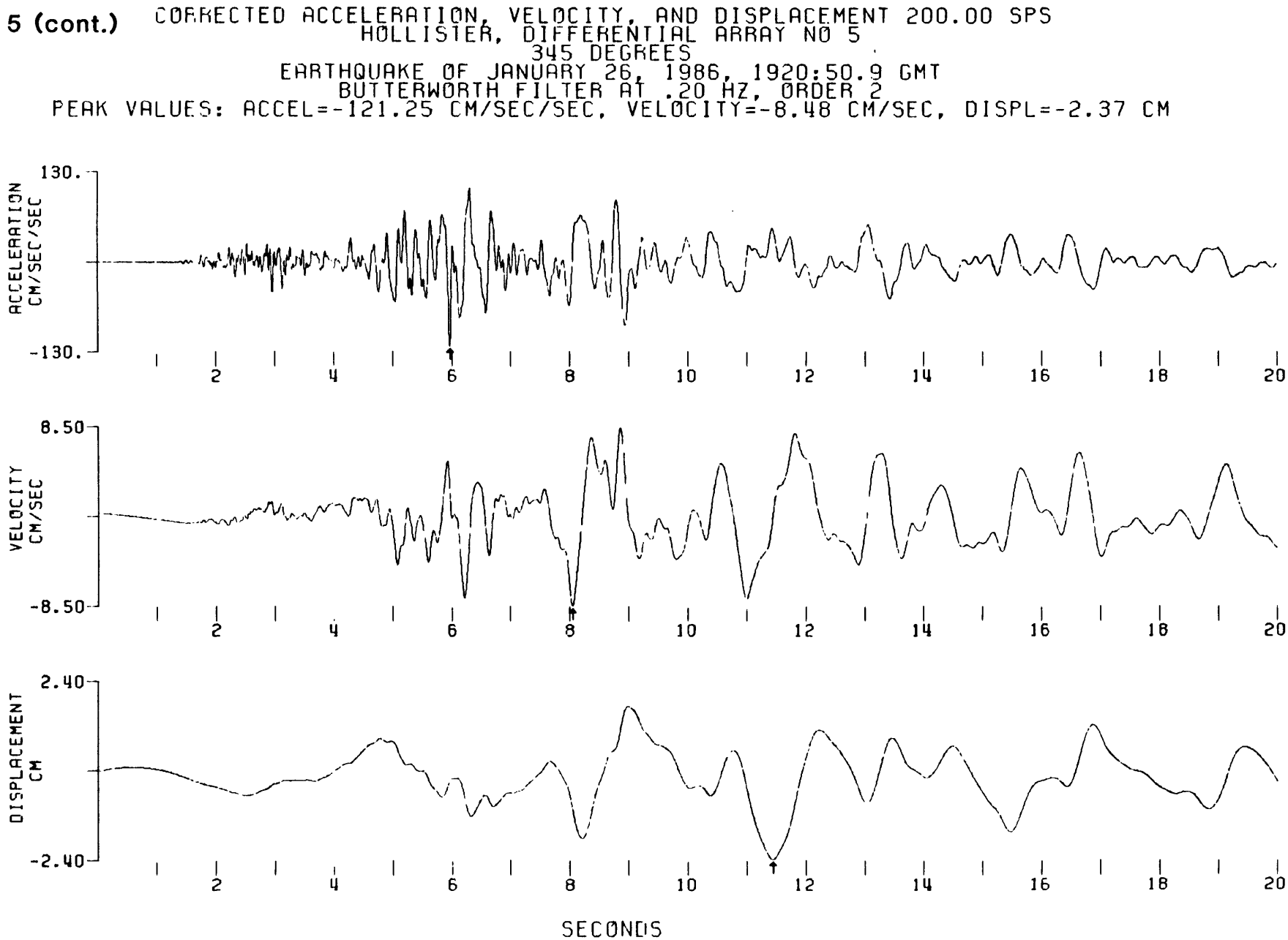

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 5
345 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=-121.25 CM/SEC/SEC, VELOCITY=-8.48 CM/SEC, DISPL=-2.37 CM
ACCELERATION CM/SEC/SEC
130.
-130.
VELOCITY CM/SEC
8.50
-8.50
DISPLACEMENT CM
2.40
-2.40
2
4
6
8
10
12
14
16
18
20
SECONDS

Fig. 5 (cont.)

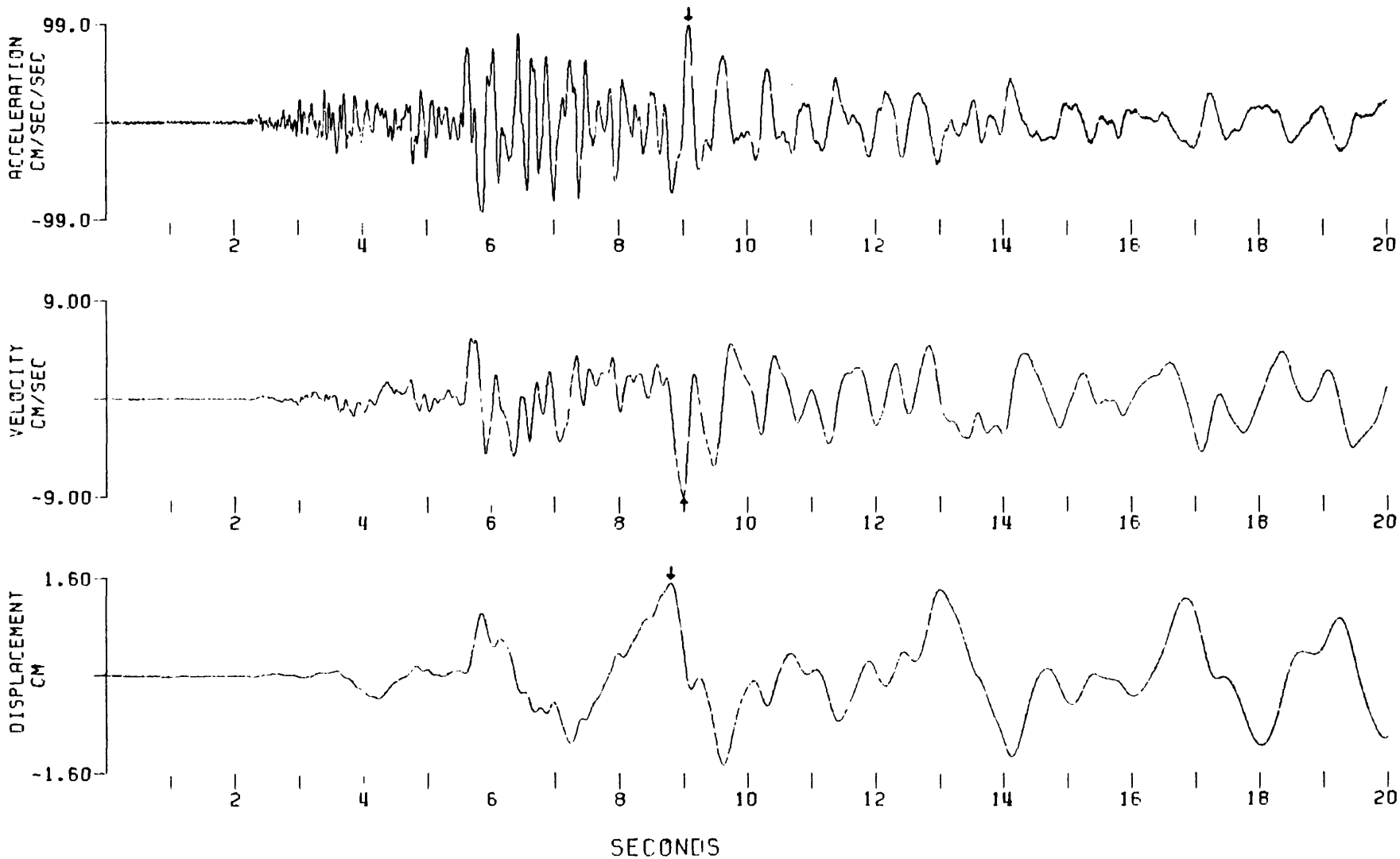

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 6
255 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=98.32 CM/SEC/SEC, VELOCITY=-8.93 CM/SEC, DISPL=1.52 CM
ACCELERATION CM/SEC/SEC
99.0
-99.0
VELOCITY CM/SEC
9.00
-9.00
DISPLACEMENT CM
1.60
-1.60
2
4
6
8
10
12
14
16
18
20
SECONDS

Fig. 5 (cont.) CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 6
UP
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=149.00 CM/SEC/SEC, VELOCITY=-3.88 CM/SEC, DISPL=-0.54 CM

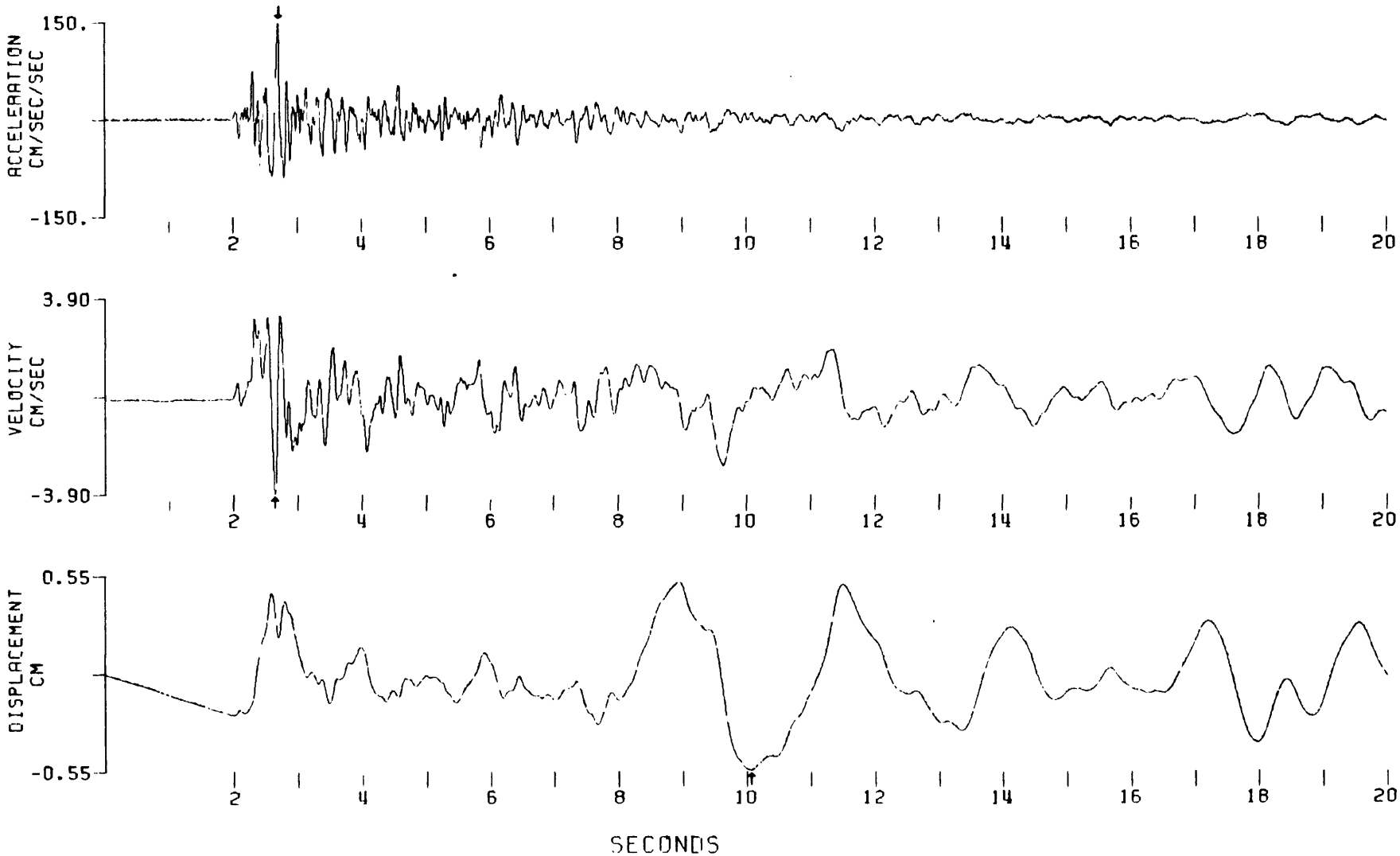
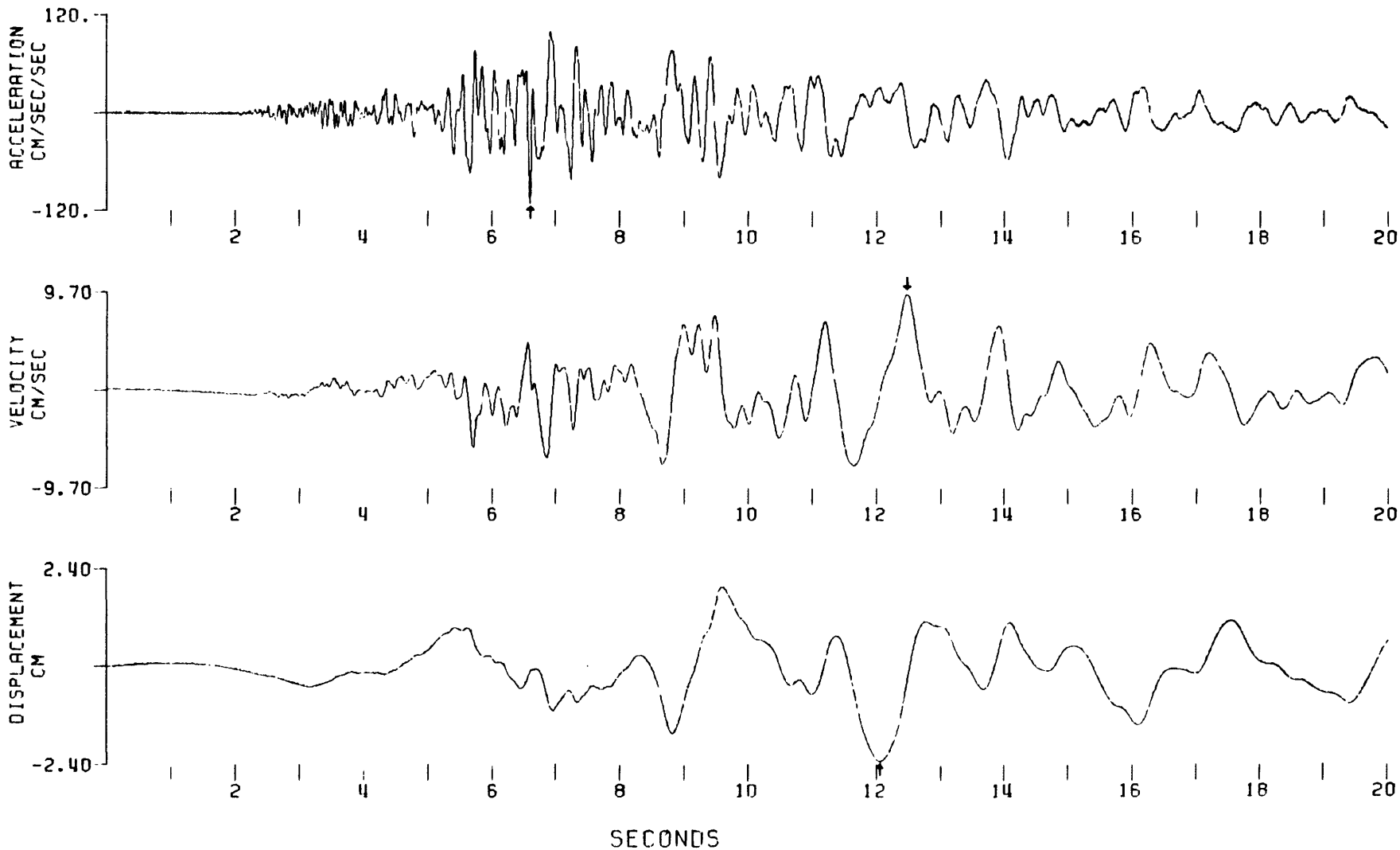


Fig. 5 (cont.) CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
HOLLISTER, DIFFERENTIAL ARRAY NO 6
345 DEGREES
EARTHQUAKE OF JANUARY 26, 1986, 1920:50.9 GMT
BUTTERWORTH FILTER AT .20 HZ, ORDER 2
PEAK VALUES: ACCEL=-110.81 CM/SEC/SEC, VELOCITY=9.60 CM/SEC, DISPL=-2.31 CM



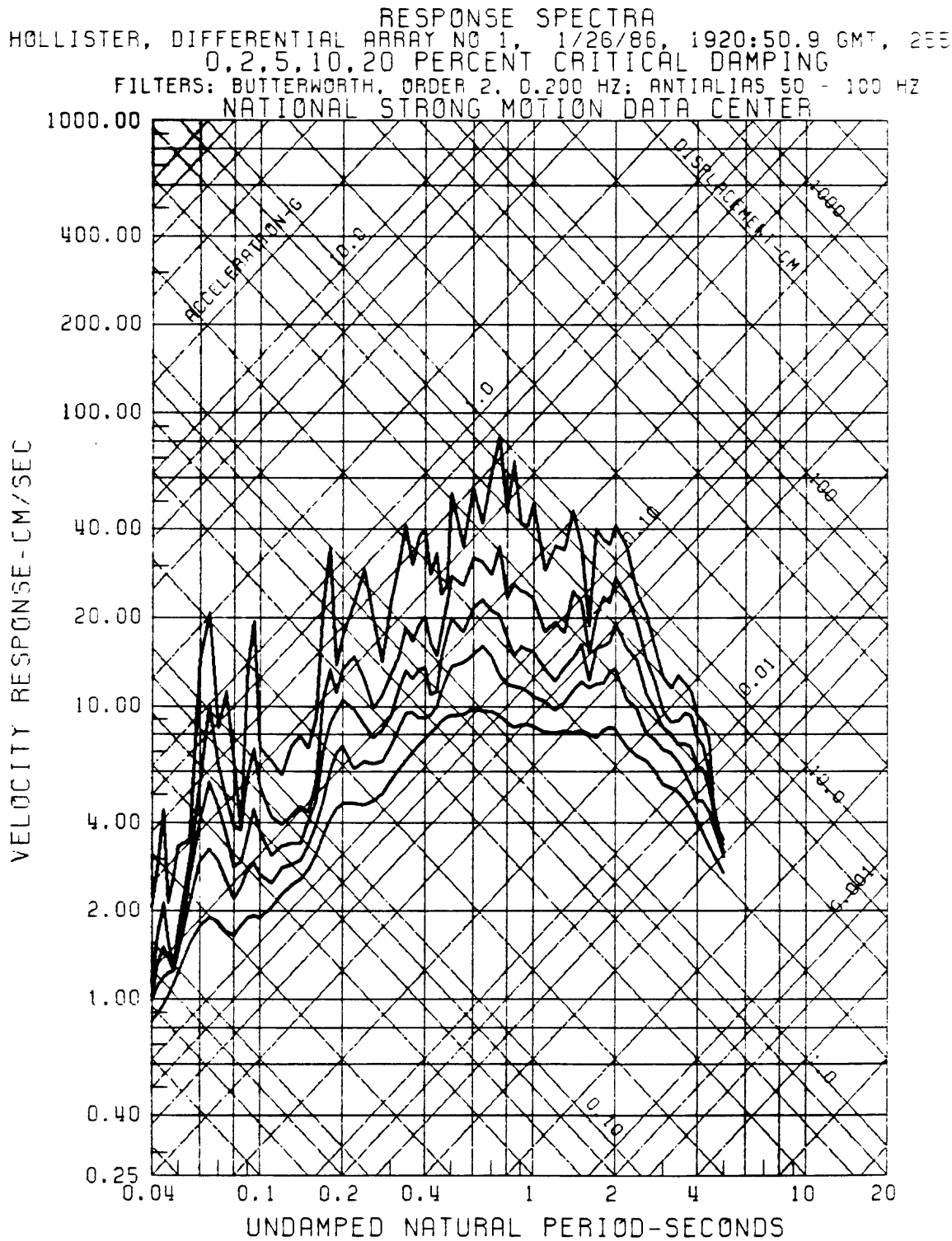

RESPONSE SPECTRA
HOLLISTER, DIFFERENTIAL ARRAY NO 1, 1/26/86, 1920:50.9 GMT, 255
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 2, 0.200 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.1
0.01
0.001
DISPLACEMENT-CM
1000
100
10.0
1.0
0.1
0.0
0.0
0.0
0.0
0.0

Figure 6

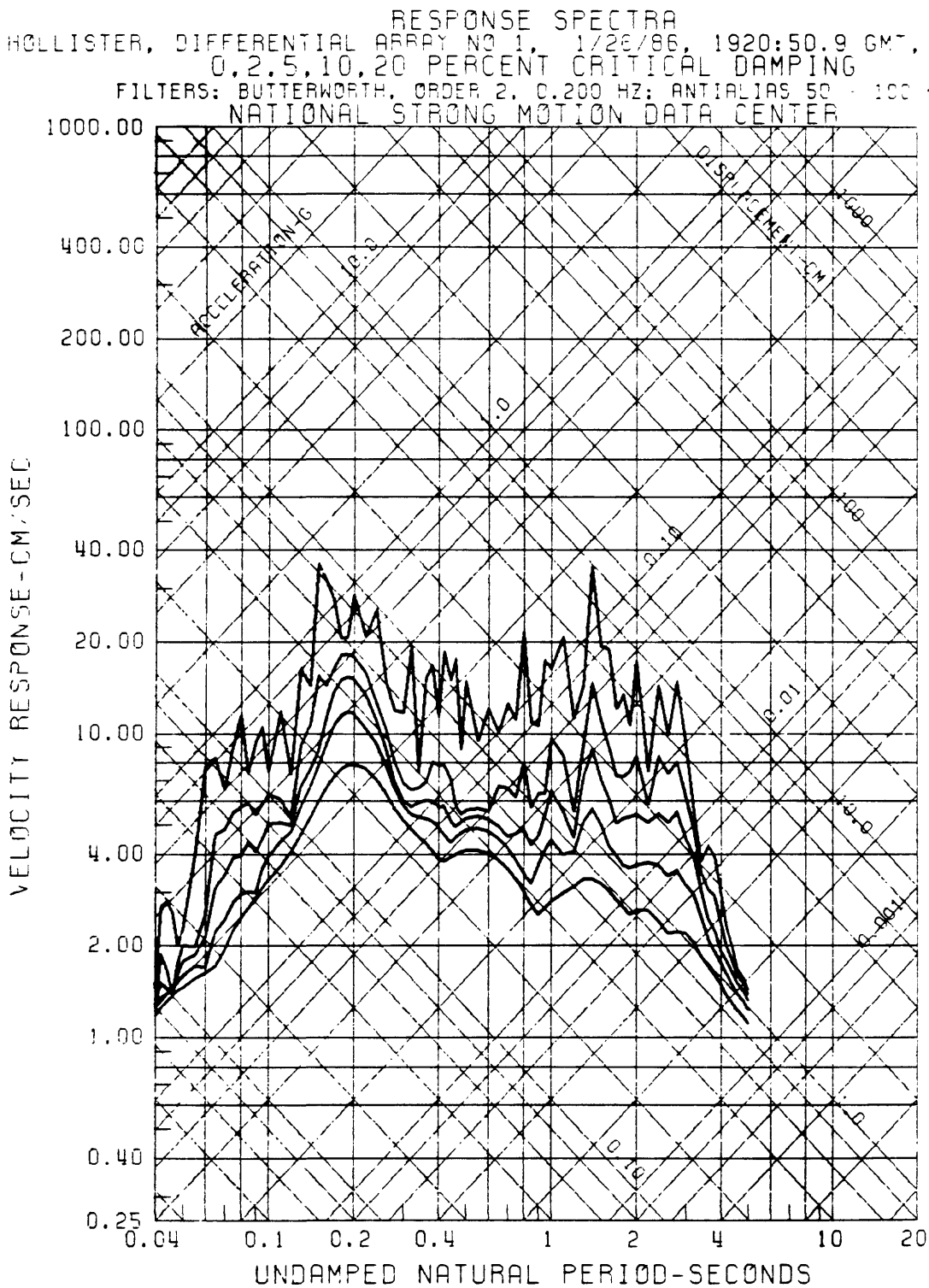


Figure 6 (cont.)

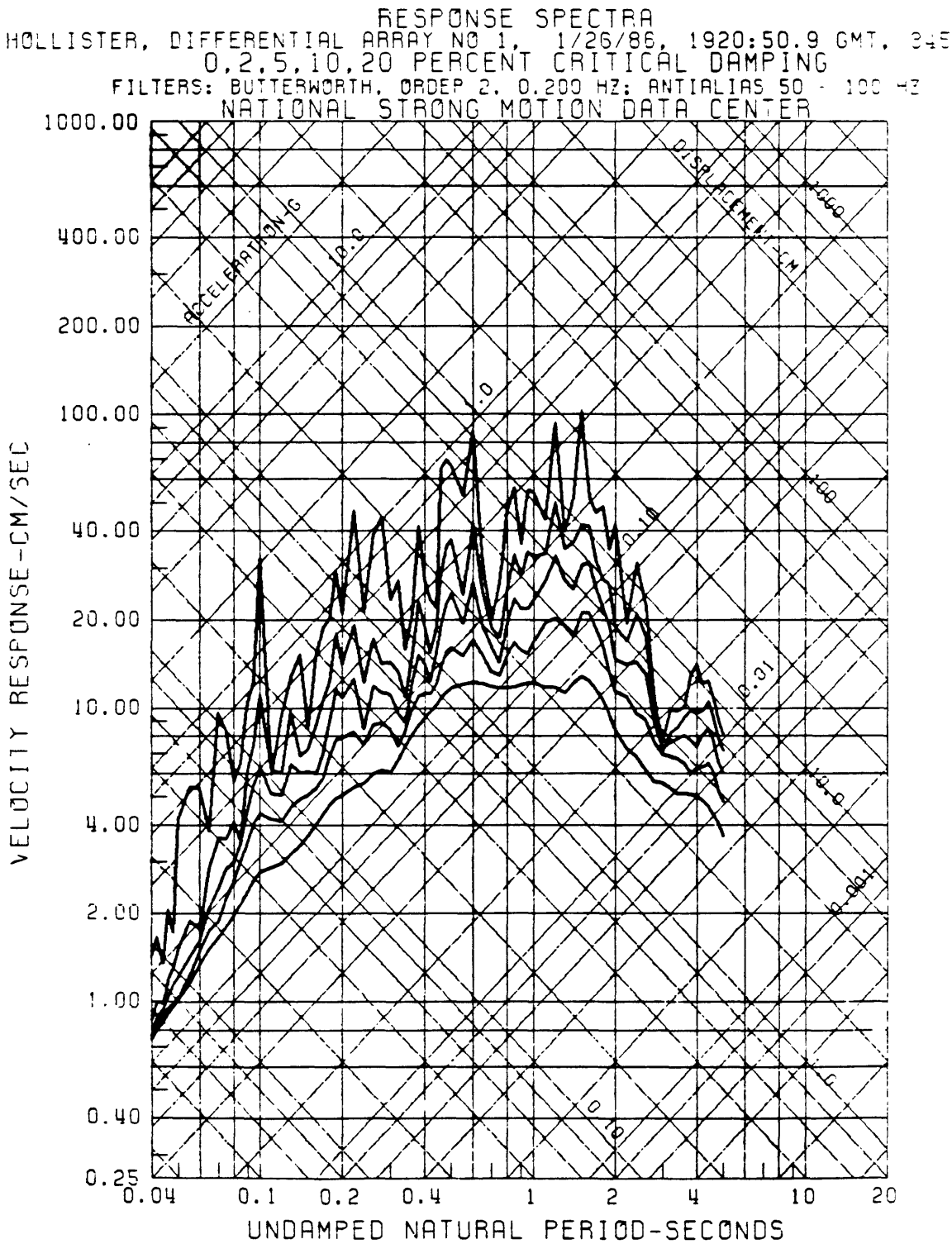


Figure 6 (cont.)

APPENDIX

CURRENT LISTS OF PROCESSED RECORDS

USGS processing of records from the USGS permanent network of strong-motion accelerographs and associated networks, since 1978. Isolated earlier events are included if recently processed.

TABLE 1. Chronological list of events and associated reports describing the existence, processing, and analysis of records; and the availability of digital data on tape from NGDC, NOAA, Boulder, Col., or from the National Strong Motion Data Center in Menlo Park

Date & Time (Gmt)	Earthquake	Reference (see attached list)
January 1, 1975; 0355	Southern Alaska;	OFR 86-____ (in preparation) (Silverstein, Brady, Mork, 1986b)
March 25, 1978;	Coyote Dam, California	OFR 83-166 (Brady & Perez, 1983)
August 27, 1978 and two later shocks;	Monticello Dam, Jenkinsville, South Carolina;	OFR 81-0448 (Brady & others, 1981)
August 6, 1979;	Coyote Lake, California	OFR 81-42 (Brady & otners, 1980)
October 15, 1979;	Imperial Valley, California;	OFR 80-703 (Brady, Perez & Mork, 1980)
October 15, 1979;	Imperial Valley, California;	OFR 82-183 (Perez, 1982)
October 15, 1979; 2317:41, 2318:20, 2318:40	Imperial Valley California aftershock	OFR 86-____ (in preparation) (Brady, Mork, Silverstein)
October 16, 1979, 0706;	Monticello Dam, Jenkinsville, South Carolina;	OFR 81-1241 (Mork & Brady, 1981)
December 13, 1981 and March 18, 1983;	Solomon Islands;	OFR 86-____ (in preparation) (Silverstein, Brady, Mork, 1986a)
February 13, 14, and 23, 1983;	Monasavu Dam, Fiji;	OFR 85-375 (Silverstein, 1985a)
May 2 and May 9, 1983;	Coalinga, California;	OFR 84-626 (Maley & others, 1984)
July 9, 1983; 0740;	Coalinga, California;	OFR 85-584 (Silverstein, 1985b)
July 22, 1983; 0239;	Coalinga, California;	OFR 85-250 (Silverstein and Brady, 1985)

TABLE 1. Chronological list of events and associated reports (continued)

Date & Time (Gmt)	Earthquake	Reference (see attached list)
April 24, 1984;	Morgan Hill, California;	OFR 84-498, Vol I and II (Compiled by Seena Hoose)
December 23, 1985; 0516 GMT and Nov. 9, Dec. 23, Dec 25	Northwest Territories, Canada	OFR 86-____, (Weichert and others, 1986)
January 26, 1986; 1920 GMT	Hollister, California	OFR 86-156, (Brady and others, 1986)

TABLE 2. Processed records in each report

January 1, 1975; 0355; southern Alaska; OFR 86-
Records (4): Anchorage, 500 W. Third St., Basement
Anchorage, Alaskan Methodist University
Anchorage, Government Hospital
Talkeetna, FAA-VOR Building

March 25, 1978; Coyote Dam, California; OFR 83-166.
Records (3): Coyote Dam, Ukiah, California: abutment, toe, crest.

August 27, 1978, 1023 and 2 later shocks; Monticello Dam, South Carolina, OFR 81-0448.
Records (3): Jenkinsville, S.C. Monticello Dam
Shared abutment (center crest)
August 27, 1978, 1023 GMT
Two later unidentified events

August 6, 1979, Coyote Lake, California; OFR 81-42
Records (6): Coyote Creek, San Martin, California
Gilroy Array: Station 6, San Ysidro, California
Gilroy Array: Station 4, San Ysidro School, California
Gilroy Array: Station 3, Sewage Treatment Plant, California
Gilroy Array: Station 2, Mission Trails Motel, California
Gilroy Array: Station 1, Gavilan College, California

October 15, 1979, 2317; The Imperial Valley Earthquake; OFR 80-703.
Records (22): El Centro Array 7, Imperial Valley College, California
El Centro Array 6, Huston Road
El Centro, Bonds Corner, Hiways 98 & 115
El Centro Array 8, Cruickshank Road
El Centro Array 5, James Road
El Centro Differential Array
El Centro Array 4, Anderson Road
Brawley, Brawley Municipal Airport
Holtville, California, Holtville Post Office
El Centro Array 10, Keystone Road
Calexico, California, Calexico Fire Station
El Centro Array 11, McCabe School
El Centro Array 3, Pine Union School
Parachute Test Facility
El Centro Array 2, Keystone Road
El Centro Array 12, Brockman Road
Calipatria, California, Calipatria Fire Station
El Centro Array 13, Strobel Residence
El Centro Array 1, Borchard Ranch
Superstition Mountain, California
Plaster City, California, Storehouse
Coachella Canal Number 4, California

TABLE 2. Processed records in each report. (continued)

October 15, 1979, 2317:41; Imperial Valley Aftershocks; OFR 86-___
Records (6) El Centro Array 5, James Road
El Centro Array 6, Huston Road
El Centro Array 7, Imperial Valley College
El Centro Array 8, Cruickshank Road
El Centro Array 9, Commercial Ave.
El Centro Differential Array

October 15, 1979, 2318:20; Imperial Valley Aftershocks; OFR 86-____
Records (6) El Centro Array 5, James Road
El Centro Array 6, Huston Road
El Centro Array 7, Imperial Valley College
El Centro Array 8, Cruickshank Road
El Centro Array 9, Commercial Ave.
El Centro Differential Array

October 15, 1979, 2318:40; Imperial Valley Afrershock; OFR 86-____
Records (7) El Centro Array 6, Huston Road
El Centro Array 7, Imperial Valley College
El Centro Array 8, Cruickshank Road
El Centro Array 9, Commercial Ave.
El Centro Differential Array
Bonds Corner, Highways 115 & 98
Holtville Post Office

October 15, 1979; The Imperial Valley, California; OFR 82-183;
Records (22): This report contains the time-dependent response spectrum plots for the same records as in OFR 80-703, above.

October 16, 1979, 0706 GMT, Monticello Dam, South Carolina, OFR 81-1214.
Records (1): Jenkinsville, South Carolina, Monticello Dam shared abutment (center crest)

December 13, 1981 and March 18, 1983; Solomon Islands, OFR 86-
Records (5): Dec. 13, 1981, 0129 GMT: 460 Beach, Panguna Mine, Bougainville Island.
Dec. 13, 1981, 1324 GMT: "
March 18, 1983: Arawa Town
Bato Bridge
BVE80, Panguna Mine.

February 13, 14, and 23, 1983; Monasavu Dam, Fiji; OFR 85-375
Records (3): Feb 13, 14, 23, 1983: Monasavu Dam.

TABLE 2. Processed records in each report. (continued)

May 2 and May 9, 1983; Coalinga, California; OFR 84-625.
Records (13): May 2, 1983, 2342 UTC:
Pleasant Valley Pump Plant: switchyard, basement

May 9, 1983, 0249 UTC
Anticline Ridge: freefield and pad
Burnett Construction
Oil City
Oil Fields Fire Station
Palmer Avenue
Skunk Hollow
Pleasant Valley Pump Plant: switchyard, basement, 1st floor, roof

July 9, 1983; 0740; Coalinga, California; OFR 85-584
Records (7): Anticline Ridge: freefield and pad
Burnett Construction
Oil City
Oil Fields Fire Station: freefield and pad
Palmer Avenue
Skunk Hollow
Transmitter Hill

July 22, 1983; 0239; Coalinga, California; OFR 85-250
Records (12): Anticline Ridge: pad site
Burnett Construction
Oil City
Oil Fields Fire Station: freefield and pad
Palmer Avenue
Pleasant Valley Pump Plant: 1st floor, basement, roof, switchyard, freefield
Skunk Hollow
Transmitter Hill

April 24, 1984; Morgan Hill, California; OFR 84-498B, Vol. II.
Records (11): Anderson Dam: downstream, crest
Hollister City Hall Annex
Hollister Differential Array
San Justo Damsite: right abutment, left abutment
San Jose 101/280/680 bridge
Hollister Differential Array No. 1, 3, 4, 5

December 23, 1985; with foreshock and aftershocks; Northwest Territories, Canada; OFR 86-___ (in preparation)
Records (6): Nov. 9, 1985; 0446 GMT: Nahanni Site 2
Dec. 23, 1985; 0516 GMT: Nahanni Sites 1, 2, 3
Dec. 23, 1985; 0548 GMT: Nahanni Site 1
Dec. 25, 1985; 1543 GMT: Nahanni Site 3

January 26, 1986; Hollister, California; OFR 86-156
Records (5): Hollister Digital Differential Array, Stations 1, 3, 4, 5, 6

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