DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Digital Seismograms of the Superstition Hills, California, Aftershock Sequence: November 24 to December 8, 1987

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INTRODUCTION

On November 24, 1987, two moderate earthquakes (M_S=6.0 at 0154 GMT; M_S=6.6 at 1315 GMT) shook the Imperial Valley of southern California. The earthquakes were located in the Superstition Hills, along a segment of the San Jacinto fault zone lying southeast of the Coyote Creek fault and northwest of the Imperial fault (Fig. 1). The ground surface ruptured extensively during the earthquakes both along the Superstition Hills fault, where right-lateral displacements as great as one-half meter were observed, and along dozens of left-lateral conjugate faults (Kahle, 1988; Budding and Sharp, 1988). A network of analog strong-motion accelerographs recorded the events at 33 stations within 60 kilometers of the epicenters (Porcella and others, 1987; Huang and others, 1987).

Shortly after the two Superstition Hills mainshocks, the U.S. Geological Survey deployed GEOS digital event recorders at 21 stations in the Imperial Valley (Fig. 1). The stations were occupied for a two-week-long period during which we recorded more than 450 aftershocks with magnitudes ranging from less than 1.0 to 4.7 (Fig. 2). This report describes how we acquired the digital recordings of the Superstition Hills aftershock sequence and is intended to facilitate analysis of the data. Station locations, instrument parameters, and clock corrections are included, together with seismograms of several aftershocks and a list of events recorded at three or more stations.

THE STATIONS

Between November 25 and December 8, 1987 (329 to 342 GMT), we installed GEOS digital event recorders at a total of 21 stations. The stations are plotted on the map in Figure 1; and their co-ordinates and elevations are listed in Table 1. Throughout the two-week-long deployment, we maintained nine to 14 stations simultaneously; and relocated stations when the sites were noisy or when we had recorded enough data at a site. The deployment periods of the stations are shown in Figure 3.

Stations Co-sited with Strong Motion Accelerographs

Ten of the 21 GEOS stations were sited at strong-motion accelerograph stations that recorded the Superstition Hills mainshocks as well as the previous large events in this area (Porcella and others, 1987). Some of these stations were free-field, while others were in various types of structures. Since the GEOS data and the strong motion data may be analyzed together, the co-sited GEOS stations and their proximity to the accelerographs are briefly described below. Station numbers of the permanent accelerographs are in parentheses.

ST5, ST6, and ST9 were co-sited with three of the thirteen permanent strong-motion accelerograph stations that constitute the El Centro Array (Porcella and others, 1982). ST5 and ST6 were co-sited with free-field strong-motion stations (#952 and #5158), so the GEOS sensors were buried in the ground within a few meters of the accelerograph huts. ST9 was co-sited with the original El Centro strong-motion station (#117) in the basement of a massive, 15 by 25 meter, two-story, reinforced concrete building. The GEOS sensors were placed within a few meters of the accelerograph and caulked to the floor with silicone.

SUP was co-sited with the permanent strong-motion accelerograph station at the peak of Superstition Mountain (#286). The accelerograph and the GEOS instrument both were located in a garage-sized, one-story, reinforced concrete building. The GEOS sensors were placed within a few meters of the accelerograph and caulked to the floor with silicone. It should be noted that Superstition Mountain is an exposed granitic pluton, and that SUP is one of the few hard rock sites in the area.

PTS and PTO were co-sited with the permanent strong-motion accelerograph station at the Parachute Test Site headquarters (#5051). PTS and the accelerograph both were located inside a 15 by 40 meter reinforced concrete building of widely varying height. The GEOS sensors were placed (uncaulked) on the ground floor of the building within a few meters of the accelerograph. PTO was installed outside the building in an unpaved corner of the parking lot. The sensors were buried in the ground, approximately 50 meters southeast of the accelerograph station. Both PTS and PTO were located at the top of a small knoll that stands five to six meters above the surrounding flatlands; and both stations were located about 50 meters southwest of the surface rupture associated with the Superstition Hills fault.

MUD was co-sited with the two permanent strong-motion accelerographs at the Imperial Wildlife Liquefaction Array on the floodplain of the Alamo River (#5210) (Bennett and others, 1984). From November 28 to December 5, the GEOS instrument at MUD recorded three channels of acceleration and three channels of velocity (as did the instruments at all other stations, and as described in the next section). The sensors were buried in the ground within a few meters of the borehole that houses the liquefaction array. From December 6 to December 8, we kept the velocity transducer from MUD in place, but replaced the FBA with a second velocity transducer, which we buried in a sand boil about three meters away from the original site. The station name MUK refers to seismograms recorded by the additional velocity transducer at MUD.

BAP was co-sited with the permanent strong-motion accelerograph station in the main hanger of the Brawley Airport (#5060). The hanger is a 35 by 50 meter steel frame building, approximately 10 meters high. The GEOS sensors were placed (uncaulked) on a corner of the slab foundation, within a few meters of the accelerograph.

WLR was co-sited with the permanent strong-motion accelerograph station at the Salton Sea Wildlife Refuge (#5062). The accelerograph was located in a 30 by 30 meter storage shed, but the GEOS instrument was deployed outside the shed. The GEOS sensors were buried in the ground approximately 30 meters from the accelerograph.

POE was co-sited with a temporary free-field strong-motion accelerograph station that had been installed by the California Institute of Technology a few hours after the first of the M 6+ earthquakes. The accelerograph was located on Poe Road near the southwest shore of the Salton Sea. The GEOS station was located 25 meters east of the accelerograph, where the sensors were buried in the ground.

Stations Not Sited with Strong Motion Accelerographs

The remaining stations -- TFR, DBT, JTR, GRV, SPH, PLR, GPS, PTF, EPI, SNE, AND SNW -- were deployed at free-field sites where the sensors were buried in the ground. These stations were intended to provide azimuthal coverage of the aftershock sequence and near-field recordings of ground motion. The two stations that require further description are SNE and SNW, which were both located on the flanks of Superstition Mountain above the alluvial fan. At these stations, the sensors were placed on granitic bedrock and covered with sand to improve coupling. The purpose of this arrangement was to investigate topographic amplification by recording ground motions both at the top of the mountain (SUP) and at lower elevations.

Site Geology

All but three stations were sited on unconsolidated sediments, which have been mapped as three separate units according to their age, origin, and degree of saturation. The thickness of the units varies considerably, and we describe here only the type of sediment at the surface. MUD, POE, and WLR were located on highly saturated, recent alluvial deposits. TFR, DBT, BAP, EPI, PTS, PTO, GRV and the El Centro Array stations were on dry, somewhat older alluvial deposits which range in age from Holocene to Pleistocene. JTR, SPH, PLR, GPS, and PTF were located on desiccated

Pleistocene lake bed sediments consisting of silt, sand, and clay. The three hard rock sites --SUP, SNE, and SNW-- were located on the Mesozoic granitic bedrock that is exposed on Superstition Mountain.

Complete descriptions of the near-surface geology at the strong-motion accelerograph stations and measurements of shear-wave velocities in the unconsolidated sediments have been reported by Porcella (1984).

GEOS INSTRUMENTATION

The stations were equipped with GEOS digital event recorders, each recording six channels of ground motion at 200 samples per second per channel (Borcherdt and others, 1984). Channels 1 through 3 recorded three components of acceleration with a 50 Hz Kinemetrics FBA-13 force balance accelerometer; and channels 4 through 6 recorded three components of velocity with a 2 Hz Mark Products L-22 3-D velocity transducer. Except where noted in Table 3, the sensors were oriented so that positive amplitudes correspond to Up on channels 1 and 4, to North on channels 2 and 5, and to East on channels 3 and 6.

The standard GEOS instrument parameters that were used at all stations are listed in Table 2. The GEOS recording parameters that were subject to change are listed in Table 3. Recording parameters, such as gain settings and trigger ratios, were changed to compensate for the cultural noise level, the site response, the distance from the station to the source, and the variations in the level of seismic activity. In most cases, gain settings were 6 dB for acceleration and 30 dB for velocity, which provided both a reasonable number of triggers and an adequate dynamic range. The largest earthquakes clipped the near-field velocity records, but were well-recorded in acceleration; while the smallest earthquakes were well-recorded in velocity but only marginally above the noise level in acceleration.

INSTRUMENT TIMING

The GEOS recorders were programmed to compare their internal clocks with WWVB signals every six hours, and to write a WWVB clock correction in the header of each record whenever the instruments triggered. This method for tracking clock corrections was reliable at stations with good radio reception; but it was not reliable at stations with poor radio reception or at stations located in buildings. Consequently, we also compared the internal clocks with a master clock each time we visited a station.

Whenever we deployed or re-started an instrument, we tried to synchronize the internal clock to WWVB. At a few stations, the internal clocks remained synchronized throughout the deployment, so the WWVB clock corrections in the header of each record provide a reliable time standard. At other stations, the internal clocks synchronized to WWVB intermittently; so WWVB corrections can be used when available, but master clock corrections must be used during intervals when WWVB reception was poor. At stations that did not receive WWVB, master clock corrections provide the sole time standard. The point is that at all stations clock corrections are available from either WWVB or the master clock or both.

The WWVB and master clock corrections are plotted for each station in Appendix 1. Also plotted are "corrected" master clock corrections, which compensate for master clock drift. The master clock drifted 83.2 ms ahead of the rubidium clock in Menlo Park during the two-week-long deployment. Drift corrections were calculated for every six hour interval and are accurate to ±1.2 ms. For all three types of clock corrections shown in Appendix 1, positive values indicate the internal clock was fast with respect to the time standard; and negative values indicate the internal clock was slow. According to this sign convention:

GEOS time - clock correction = time standard

The plots in Appendix 1 show the intervals for which WWVB corrections are available and the extent to which the two time standards agree. For the most part, the WWVB and corrected master clock corrections are consistent, except at stations JTR and PLR where the corrections are somewhat scattered. It should be noted that even under optimal circumstances the WWVB corrections are not infallible; and that spurious corrections occasionally occur even at the well-behaved stations like GRV, SNW, and DBT. The spurious WWVB corrections are easily identified and are generally on the order of 200 or 300 ms.

More significant timing errors occurred on our first day in the field, primarily because of a shortage of master clocks. When SUP and PTS were installed on November 25, the internal clocks did not synchronize to WWVB and were manually synchronized to a wristwatch. At SUP, we synchronized the internal clock to the master clock on November 26, and found that during the first field tape the internal clock was approximately eleven seconds fast. At PTS, the instrument had failed overnight: consequently, we have no clock correction for the first field tape at this station.

THE DATA

We retrieved more than 2500 six-component records from the field tapes, and more than 1500 of the records were confirmed as aftershocks either by

CALNET or by visual inspection of the data. Many aftershocks, particularly in the early part of the sequence, were recorded at only one or two stations because the events were small and the stations were widely spaced. The 260 aftershocks that were recorded at three or more stations are listed in Table 4; and of these, approximately 100 aftershocks were recorded at five or more stations. Preliminary CALNET locations of the aftershocks are shown in Figure 2.

To illustrate the quality of the GEOS digital data, examples of the Superstition Hills aftershocks are shown in Appendix 2. The first four sections of the appendix show six-component seismograms of four well-recorded M 4+ earthquakes. The last eight sections of the appendix show seismograms of typical magnitude two and three earthquakes recorded by several near-field stations.

ACKNOWLEDGEMENTS

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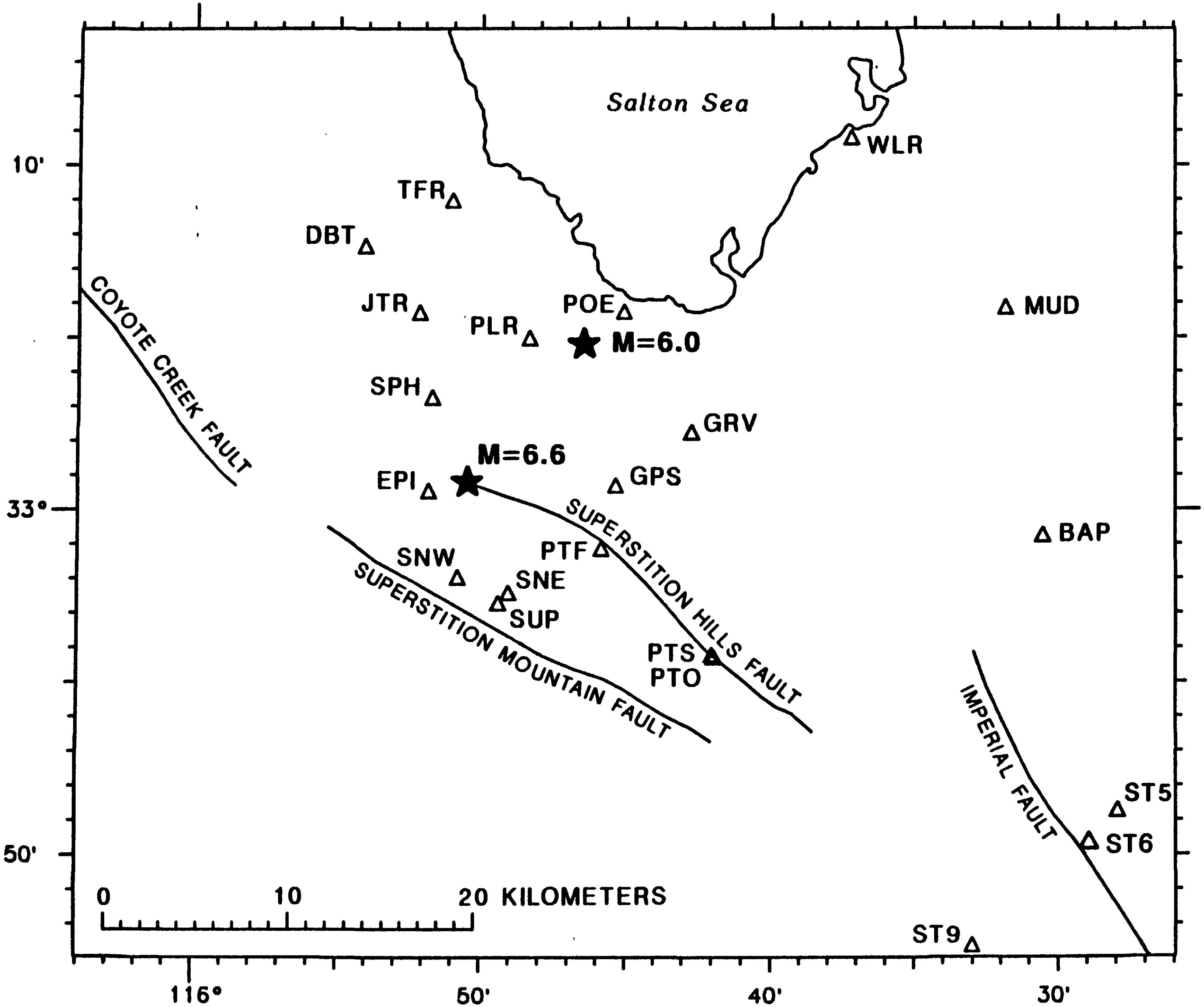


FIGURE 1. Map of the Superstition Hills region showing station locations, mapped faults, and epicenters of the two November 24, 1987 M>6 earthquakes.

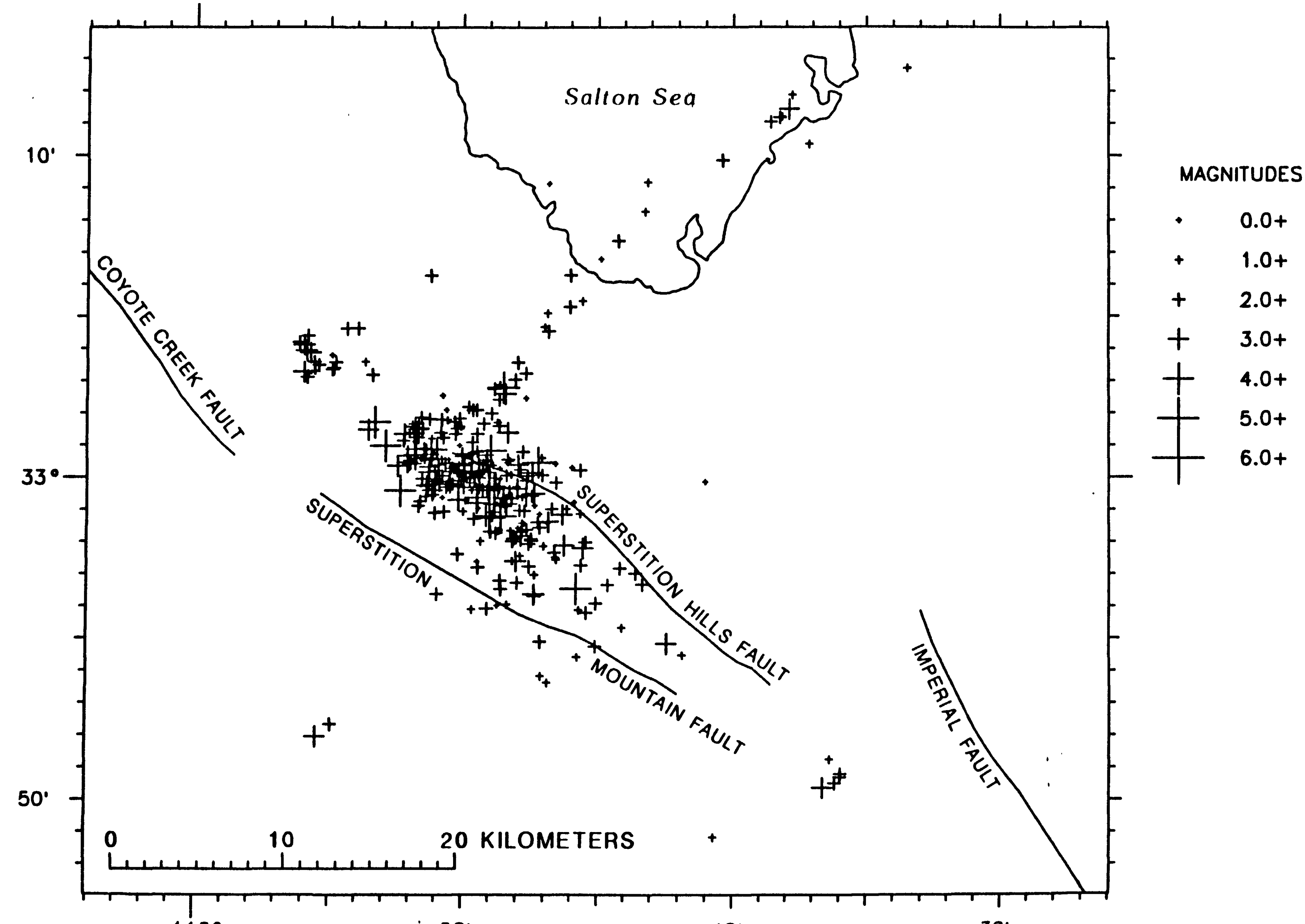


FIGURE 2. Map of the Superstition Hills region showing epicenters of events recorded between November 25 and December 8, 1987.

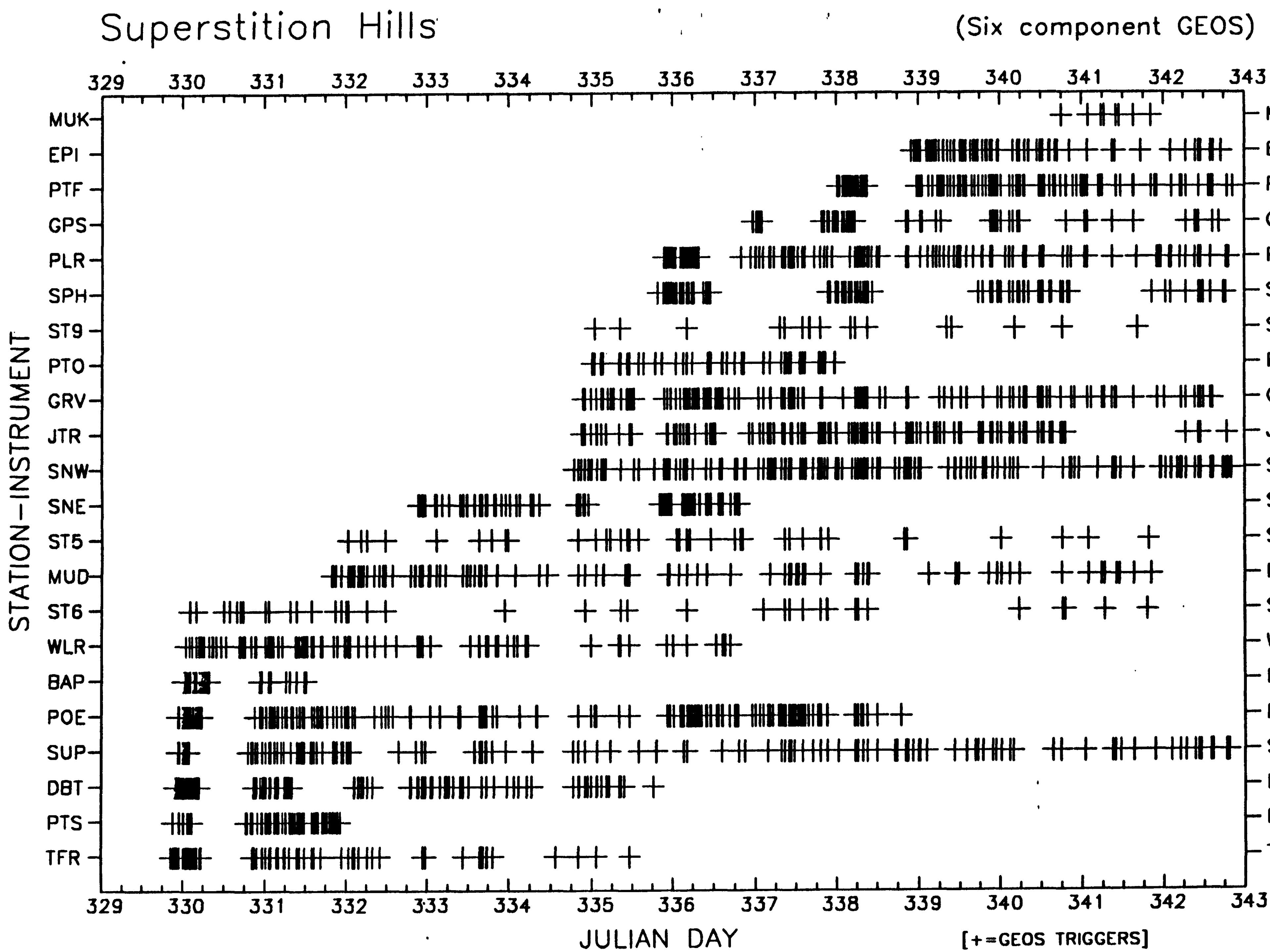


FIGURE 3. Station deployment periods indicated by GEOS trigger times.

TABLE 1. GEOS STATION LOCATIONS

STATION	LATITUDE (N)	LONGITUDE (W)	ELEVATION (ft)
ST5	32° 51.30	115° 27.96	-95
ST6	32° 50.34	115° 29.22	-100
ST9	32° 47.64	115° 32.94	-47
SUP	32° 57.30	115° 49.38	+759
SNE	32° 57.60	115° 49.04	+362
SNW	32° 58.05	115° 50.79	+360
MUD	33° 5.88	115° 31.86	-186
WLR	33° 10.80	115° 37.20	-255
POE	33° 5.74	115° 45.06	-217
PTS	32° 55.80	115° 42.00	+55
PTO	32° 55.74	115° 41.94	+55
BAP	32° 59.28	115° 30.54	-133
DBT	33° 7.65	115° 54.08	-82
TFR	33° 8.98	115° 51.02	-181
JTR	33° 5.73	115° 52.16	-72
GRV	33° 2.25	115° 42.70	-152
SPH	33° 3.26	115° 51.71	+45
PLR	33° 4.99	115° 48.36	-108
GPS	33° 0.71	115° 45.34	+65
PTF	32° 58.87	115° 45.84	+170
EPI	33° 0.55	115° 51.81	+57

TABLE 2. STANDARD GEOS INSTRUMENT PARAMETERS

Channel 1,2,3 = UP,N,E acceleration (except at MUK where 1,2,3 = UP,N,E velocity)

Channel 4,5,6 = UP,N,E velocity

Digitizing Constant = 3276.8 count/V

Sample Rate = 200 samples/second/channel

Trigger Channel = 4

Pre-event Memory = 2.06 seconds

Duration = 10 seconds

Anti-Alias Corner Frequency = 50 hz

Anti-Alias Rolloff = 42 dB/octave

Sensor	Sensitivity	Natural Frequency	Damping
FBA -13	0.0051 V/cm/s/s	50 Hz	0.7
L-22	0.5 V/cm/s	2Hz	0.7

TABLE 3. RECORDING PARAMETERS BY STATION

ST5

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3320033	40	.2 sec	6. sec	2^3	6 dB	30 dB	Station installed
2	3332258	40	.2 sec	6. sec	2^3	6 dB	30 dB	Tape changed
3	3372121	40	.2 sec	6. sec	2^3	6 dB	30 dB	Tape changed
	3411918							End of station

FBA NO. 11 ORIENTATION (UP,000,090)
L-22 NO. 305 ORIENTATION (UP,000,090)

ST6

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3300149	63	.2 sec	10. sec	2^5	6 dB	36 dB	Station installed
2	3320003	63	.2 sec	10. sec	2^5	6 dB	30 dB	Tape changed
	3342157		.2	10. sec	2^4	6 dB	30 dB	Site visit-changed trigger ratio
3	3372106	63	.2 sec	10. sec	2^4	6 dB	30 dB	Tape changed
	3411853							End of station

FBA NO. 32 ORIENTATION (UP,000,090)
L-22 NO. 196 ORIENTATION (UP,000,090)

ST9

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3350045	6	.3 sec	10. sec	2^3	6 dB	30 dB	Station installed
2	3371550	6	.3 sec	10. sec	2^3	6 dB	30 dB	Tape changed
	3411607							End of station

FBA NO. 56 ORIENTATION (UP,000,090)
L-22 NO. 310 ORIENTATION (UP,000,090)

SUP

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3292217	43	.2 sec	10. sec	2^2	6 dB	36 dB	Station installed
	3300531							End of tape
2	3301901	43	.2 sec	6. sec	2^3	6 dB	36 dB	Tape changed
3	3312304	43	.2 sec	6. sec	2^3	6 dB	30 dB	Tape changed
4	3331903	43	.2 sec	6. sec	2^3	6 dB	30 dB	Tape changed
5	3351906	43	.2 sec	6. sec	2^3	6 dB	36 dB	Tape changed
6	3382000	43	.2 sec	6. sec	2^2	6 dB	30 dB	Tape changed
	3421916							End of station

FBA NO. 24 ORIENTATION (UP,000,090)
L-22 NO. 304 ORIENTATION (UP,000,090)

SNE

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3322112	26	.3 sec	6. sec	2^5	6 dB	30 dB	Station installed
2	3331935	26	.3 sec	6. sec	2^5	6 dB	30 dB	Tape changed
3	3341923	26	.3 sec	6. sec	2^4	6 dB	30 dB	Tape changed
	3340836							Instrument crashed
4	3351957	26	.3 sec	6. sec	2^4	6 dB	30 dB	Tape changed
	3361905							End of station

FBA NO. 55 ORIENTATION (UP,000,090)
L-22 NO. 190 ORIENTATION (UP,000,090)

SNW

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3341839	11	.2 sec	6. sec	2^4	6 dB	30 dB	Station installed
2	3351827	11	.2 sec	6. sec	2^4	6 dB	30 dB	Tape changed
3	3361830	11	.2 sec	6. sec	2^4	6 dB	30 dB	Tape changed
4	3381936	11	.2 sec	6. sec	2^4	6 dB	30 dB	Tape changed
5	3402138	11	.2 sec	6. sec	2^4	6 dB	30 dB	Tape changed
	3422001							End of station

FBA NO. 54 ORIENTATION (UP,000,090)
L-22 NO. 197 ORIENTATION (UP,000,090)

POE

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3292223	2	.2 sec	6. sec	2^4	6 dB	36 dB	Station installed
	3300537							End of tape
2	3302055	2	.2 sec	6. sec	2^5	6 dB	36 dB	Tape changed
3	3320234	2	.2 sec	6. sec	2^6	6 dB	30 dB	Tape changed
4	3331644	2	.2 sec	6. sec	2^6	6 dB	30 dB	Tape changed
5	3352300	2	.2 sec	6. sec	2^4	6 dB	30 dB	Tape changed
6	3361843	2	.2 sec	6. sec	2^4	6 dB	30 dB	Tape changed
7	3371909	2	.2 sec	6. sec	2^5	6 dB	30 dB	Tape changed
	3381854							End of station

FBA NO. 45 ORIENTATION (UP,000,090)
L-22 NO. 154 ORIENTATION (UP,000,090)

WLR

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3300048	42	.2 sec	6. sec	2^3	6 dB	36 dB	Station installed
2	3302124	42	.2 sec	6. sec	2^3	6 dB	36 dB	Tape changed
3	3312019	42	.2 sec	6. sec	2^3	6 dB	30 dB	Tape changed
4	3331519	42	.2 sec	6. sec	2^3	6 dB	30 dB	Tape changed
5	3360009	42	.2 sec	6. sec	2^3	6 dB	42 dB	Tape changed
	3361641							End of station

FBA NO. ? ORIENTATION (UP,000,090)
L-22 NO. ? ORIENTATION (UP,000,090)

MUD

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3311942	19	.3 sec	6. sec	2^3	6 dB	36 dB	Station installed
2	3322009	19	.3 sec	6. sec	2^3	6 dB	30 dB	Tape changed
3	3332037	19	.3 sec	6. sec	2^3	6 dB	30 dB	Tape changed
4	3352228	19	.3 sec	6. sec	2^3	6 dB	30 dB	Tape changed
5	3401753	19	.3 sec	6. sec	2^3	None	*30 dB 30 dB	Tape changed
	3412005							End of station

FBA NO. 21 ORIENTATION (UP,000,090)
L-22 NO. channels 4, 5, 6 = 182 ORIENTATION (UP,000,090)
channels 1, 2, 3 = 162
* All channels recorded velocity on fifth field tape.

PTS

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3292059	26	.2 sec	10. sec	2^4	6 dB	36 dB	Station installed
	3300244							Instrument crashed
2	3301819	40	.2 sec	4. sec	2^3	6 dB	36 dB	Tape changed - Instrument changed
	3312206							End of station

FBA NO. ? ORIENTATION (UP,000,090)
L-22 NO. ? ORIENTATION (UP,000,090)

PTO

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3342356	39	.3 sec	6. sec	2^4	6 dB	30 dB	Station installed
2	3352039	39	.3 sec	6. sec	2^4	6 dB	30 dB	Tape changed
3	3361955	39	.3 sec	6. sec	2^4	6 dB	30 dB	Tape changed
	3372319							End of station

FBA NO. 58 ORIENTATION (UP,000,090)
L-22 NO. 302 ORIENTATION (UP,000,090)

BAP

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3292350	19	.2 sec	10. sec	2^2	6 dB	36 dB	Station installed
	3300723							End of tape
2	3302215	19	.2 sec	6. sec	2^3	6 dB	36 dB	Tape changed
	3311213							End of station

FBA NO. 21 ORIENTATION (UP,000,090)
L-22 NO. 182 ORIENTATION (UP,000,090)

TFR

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3292019	15	.2 sec	10. sec	2^4	6 dB	36 dB	Station installed
	3300521							End of tape
2	3302010	15	.2 sec	10. sec	2^5	6 dB	36 dB	Tape changed
3	3320153	15	.2 sec	10. sec	2^5	6 dB	30 dB	Tape changed
4	3331618	15	.2 sec	10. sec	2^5	6 dB	30 dB	Tape changed
	3351436							End of station

FBA NO. 34 ORIENTATION (UP,000,090)
L-22 NO. 184 ORIENTATION (UP,000,090)

DBT

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3292132	13	.2 sec	6. sec	2^3	6 dB	36 dB	Station installed
	3300442							End of tape
2	3302033	13	.2 sec	6. sec	2^3	6 dB	36 dB	Tape changed
3	3320211	13	.2 sec	4. sec	2^3	6 dB	30 dB	Tape changed
4	3322115	13	.2 sec	4. sec	2^3	6 dB	30 dB	Tape changed
5	3331558	13	.2 sec	4. sec	2^3	6 dB	30 dB	Tape changed
	3351805							End of station

FBA NO. 46 ORIENTATION (UP,000,090)
L-22 NO. 189 ORIENTATION (UP,000,090)

JTR

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3342047	10	.3 sec	6. sec	2^5	6 dB	30 dB	Station installed
2	3352203	10	.3 sec	8. sec	2^4	6 dB	30 dB	Tape changed
	3361216							End of tape
3	3362157	42	.3 sec	6. sec	2^3	6 dB	30 dB	Tape changed
4	3372206	42	.3 sec	6. sec	2^3	6 dB	36 dB	Tape changed
5	3391756	42	.3 sec	6. sec	2^3	6 dB	36 dB	Tape changed
6	3401900	42	.3 sec	6. sec	2^4	6 dB	36 dB	Tape changed
	3421843							End of station

FBA NO. 53 ORIENTATION (UP,000,090)
L-22 NO. 157 ORIENTATION (UP,000,090)

GRV

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3341800	41	.3 sec	6. sec	2^4	6 dB	30 dB	Station installed
2	3352120	41	.3 sec	10. sec	2^3	6 dB	30 dB	Tape changed
3	3361900	41	.3 sec	10. sec	2^4	6 dB	30 dB	Tape changed
4	3371933	41	.3 sec	10. sec	2^4	6 dB	30 dB	Tape changed
	3421429							End of station

FBA NO. 57 ORIENTATION (UP,000,090)
L-22 NO. 200 ORIENTATION (UP,000,090)

SPH

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3351928	15	.3 sec	8. sec	2^4	6 dB	30 dB	Station installed
	3361054							Instrument crashed
2	3372115	10	.2 sec	6. sec	2^5	6 dB	36 dB	Instrument changed
	3381030							End of tape
3	3391719	10	.2 sec	6. sec	2^6	6 dB	36 dB	Tape changed
4	3401818	10	.2 sec	6. sec	2^8	6 dB	36 dB	Tape changed
	3421820							End of station

FBA NO. 47 ORIENTATION (UP,000,090)
L-22 NO. 184 ORIENTATION (UP,000,090)

PLR

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3352115	13	.3 sec	8. sec	2^3	6 dB	30 dB	Station installed
	3360790							End of tape
2	3361945	13	.3 sec	8. sec	2^4	6 dB	30 dB	Tape changed
3	3372235	13	.3 sec	8. sec	2^4	6 dB	30 dB	Tape changed
4	3391828	13	.3 sec	8. sec	2^4	6 dB	30 dB	Tape changed
5	3401939	13	.3 sec	8. sec	2^4	6 dB	30 dB	Tape changed
	3421915							End of station

FBA NO. 46 ORIENTATION (UP,000,090)
L-22 NO. 189 ORIENTATION (UP,000,090)

GPS

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3362258	26	.2 sec	6. sec	2^4	6 dB	36 dB	Station installed
	3370147							Field tape becomes unreadable
2	3371922	26	.2 sec	6. sec	2^4	6 dB	36 dB	Tape changed
	3380355							Field tape becomes unreadable
3	3382018		?	?	2^5	6 dB	?	Tape changed-only 3 files readable
4			Tapes 3 and 4 virtually unreadable					
5	3401550	26	.3 sec	8. sec	2^7	6 dB	36 dB	Tape changed-only a few files readable
	3421623							End of station

FBA NO. 55 ORIENTATION (UP,000,090)
L-22 NO. 190 ORIENTATION (UP,000,090)

PTF

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3380003	39	.3 sec	8. sec	2^4	6 dB	36 dB	Station installed
	3380857							End of tape
2	3382317	39	.3 sec	8. sec	2^5	6 dB	36 dB	Tape changed
3	3392230	39	.3 sec	8. sec	2^5	6 dB	36 dB	Tape changed
4	3402109	39	.3 sec	8. sec	2^6	6 dB	36 dB	Tape changed
	3422019							End of station

FBA NO. 58 ORIENTATION (UP,000,090)
L-22 NO. 302 ORIENTATION (UP,000,090)

EPI

Field Tape	Time (UTC)	GEOS	Shortterm Average	Longterm Average	Trigger Ratio	FBA-13 Gain	L-22 Gain	Comments
1	3382150	2	.3 sec	8. sec	2^5	6 dB	36 dB	Station installed
2	3392106	2	.3 sec	8. sec	2^5	6 dB	36 dB	Tape changed
3	3401645	2	.3 sec	8. sec	2^7	6 dB	36 dB	Tape changed
	3421700							End of station

FBA NO. 45 ORIENTATION (UP,000,090)
L-22 NO. 154 ORIENTATION (UP,000,090)

TABLE 4. EVENTS RECORDED AT THREE OR MORE STATIONS

The following table lists the events recorded at three or more stations and the stations that recorded each event. The left-hand column lists the time of the first recorded sample of an event as specified by the Julian day, hour, minute and letter code. The letter codes correspond to seconds where A=0-3 seconds, B=3-6 seconds,...,T=57-60 seconds.

TABLE 4. EVENTS RECORDED AT THREE OR MORE STATIONS

	TFR	PTS	DBT	SUP	POE	BAP	WLR	ST6	MUD	ST5	SNE	SNW	JTR	GRV	PTO	ST9	SPH	PLR	GPS	PTF	EPI	MUK
3292245S	T		S	C	T																	
3292251O	Q		Q	T	Q																	
3300000T	T		T	C	T																	
3300019K	L		K	N	K	M																
3300022F	F		F	I	F	G																
3300041A	A		A	D	A																	
3300051Q	C		C		B	Q																
3300119R	R		R	A	R																	
3300126M	M		N		M	O																
3300149I			O		O																	
3300149Q				R		T		Q														
3300151Q	Q		Q		Q			B														
3300156G	J		J	M	J	K	K	G														
3300307Q	R		R		Q																	
3300326E	E		E		E																	
3300340R	R		R		R																	
3300342S	S		S		S																	
3300358T	T		T		T	C	A	B														
3300405O	P		O		O																	
3300450O	O		O		O	P	O															
3300501N	O				N	O	N															
3300530D					D	E	D															
3300532R					C	E	R															
3300534B					B	C	B															
3302001F		G		F			G															
3302259L	L		L	L																		
3302301D		E	E	D																		
3302318J	K	K	J	J	J																	
3310010P	Q	P	Q	P	P		Q	R														
3310110C	E	D	D	C	D	E	E	F														
3310117F	F	F	F	F																		
3310138B	B	B	B	B	B	D	B															
3310235T		T		T	A																	
3310252F		F	G	F	F																	
3310338G		G	G	G	G																	

TABLE 4. EVENTS RECORDED AT THREE OR MORE STATIONS (CONT.)

	TFR	PTS	DBT	SUP	POE	BAP	WLR	ST6	MUD	ST5	SNE	SNW	JTR	GRV	PTO	ST9	SPH	PLR	GPS	PTF	EPI	MUK
3310348C	D	D	D		C		D															
3310350B			C		B		C															
3310526N	N		N	N																		
3310549T	A	T	A		T																	
3310733K		L	L	K	L																	
3310922S	T	T		S	T	A	A	A														
3311005P	Q	R		R	P		Q															
3311101S		S		S	S																	
3311133F	F	F		F	F																	
3311346I	J	I		I	I		J	K														
3311425L	L	M		L			M															
3311515A		B		A	B																	
3311652D		E		D	D																	
3312001E		F		E	F				G													
3312228I	J			I	J			K	J													
3320039D	E			D	E		E	F	F	F												
3320224L	M		L						N													
3320336G	H		G				I		I													
3320425O			O						Q	Q												
3320610B	C		C				C	B	C	C												
3321138A					A		A	A	A	B												
3321906M			M		M				M													
3322218T			A	T					B		T											
3322233Q	Q		Q				Q		Q													
3322320T	A		A	T							T											
3330239C									D	D	C											
3330340C			D		C				D													
3330940C			D		D						C											
3331025R	R		R						S		R											
3331352E				E					G		E											
3331512P							P		P	P												
3331520G	H			G					H		G											
3331523E				E	F				G		E											
3331546T	A			T	A				B		T											
3331704B				B					C		B											

TABLE 4. EVENTS RECORDED AT THREE OR MORE STATIONS (CONT.)

	TFR	PTS	DBT	SUP	POE	BAP	WLR	ST6	MUD	ST5	SNE	SNW	JTR	GRV	PTO	ST9	SPH	PLR	GPS	PTF	EPI	MUK
3331719P	Q		Q	P	Q		R		R		P											
3341954P	R		Q	P	Q				R	R	P	P										
3342150J			K	K					L		J	K	K	K								
3342152N			N								N	N										
3342334H			H		H							H	H	H								
3350111D	D		E		D				E				D	D								
3350130I			J	J								I	J									
3350239G			H									G	G	H								
3350243J			K									J	K	K	K							
3350309O									P					O	O							
3350757O			P		O								O									
3350823D			E				F	E		E		D		E	D	D						
3351023M								N	N	N				M	M							
3351100C	C				C		D		D	E			C	C	D							
3351348F				G						I		F			G							
3352111K											L	K					L					
3352148I											I	I					O	J				
3352210O					O								P	P			P	P				
3352224O									S				O				O	O				
3352229D											D	D	E				E	E				
3352258K											K	K						L				
3352329M											M						M	M				
3360009H							I										M	I				
3360014R					R								R				R	R				
3360049C												C		C	C			D				
3360050R													R				R	R				
3360105J										L			J				J					
3360204D					E								D				D	E				
3360208C												C		D				D				
3360214S													S				S	T				
3360231B					C						B							C				
3360303F				G	G						F	F	G	G			G	G				
3360335M											M	M		N								
3360400B								B		B	C	C	D		C		C	D				
3360402Q				B	C						B	B	C	C	C		Q	C				

TABLE 4. EVENTS RECORDED AT THREE OR MORE STATIONS (CONT.)

	TFR	PTS	DBT	SUP	POE	BAP	WLR	ST6	MUD	ST5	SNE	SNW	JTR	GRV	PTO	ST9	SPH	PLR	GPS	PTF	EPI	MUK
3360403D							D	D	D	D						D						
3360421R					S						R							S				
3360437N											N						N	O				
3360442G					H						G		H	G			G	G				
3360529D					D												D	D				
3360544E														F			E	F				
3360544S					T									T	S			T				
3360550P											P	P					Q	Q				
3360613H											H			I			H	I				
3360615N					O						N							O				
3360626T					A						T							A				
3360631M					M								M	M				M				
3360700H					H									I				I				
3360723L					L									L				L				
3360740G					H						G			H				H				
3360939A					B						A	A	B	B			B					
3360957Q					Q				R					Q								
3361054J					K						J		K	K			J					
3361059R					S					T	R	R	S	S	S							
3361312S					T						S			T								
3361329G											G	H		H								
3361408J				J	K						J	J		K	K							
3361421M					N						M			N	N							
3361753G					I					H	G	H		H	H							
3370045K												K		L					K			
3370109P					P								P					P	P			
3370205I					J			K				J	J	J	I			J				
3370328N				O								N	O									
3370409A					A				B			B	B	A	B			A				
3370423E												E	F	F				F				
3370724R				S	S							R		S	S							
3370740D													D	E				D				
3370757R					R								R					R				
3370825N				N	O			P	P	P		O	O	O	O	Q		O				
3370840J					K							J						J				

TABLE 4. EVENTS RECORDED AT THREE OR MORE STATIONS (CONT.)

	TFR	PTS	DBT	SUP	POE	BAP	WLR	ST6	MUD	ST5	SNE	SNW	JTR	GRV	PTO	ST9	SPH	PLR	GPS	PTF	EPI	MUK
3370937K					K									K				K				
3370943C				C	D				E			C		D	C			D				
3370950C				C	D			E		E		C		D	D			D				
3371011M					M				O				N	N				M				
3371018O				O	P				Q			O	P	P	P			P				
3371038C					C								D	D				C				
3371115F				G	G									G				F				
3371226I					I				J				I	I				I				
3371345T				T	T			A	A	A		T	T	T	T			T				
3371429G					H				I			G	H		G			H				
3371644J				J	K							J										
3371829F												F	G		H							
3371904L				L				O	N	O		L	M	M	M	P		M				
3372013A												A						B	B			
3372016B													B					B	B			
3372109B				B	C							C						C	C			
3372130K													K				K		K			
3372330A												A					A		A			
3372337L												L	L				L					
3372353C												C	C				C		D			
3380019C				C								C					D		C	C		
3380127G												G					H		H			
3380140T														A			T		T	T		
3380208I																	I		J	J		
3380330R													R				R			S		
3380345S																	S		T	T		
3380355Q																		Q	Q	R		
3380400A																A			B	A		
3380420K																	K		K	K		
3380422F												F	F				F		F	F		
3380523R				R	S			T	T			R	S	S		A	S	S	R	R		
3380600O																	O	P		O		
3380604N				N	O			P	P			O	O	O			O	O		O		
3380605N				N										O						N		
3380700B					C							C	C	C			C	C		B		

TABLE 4. EVENTS RECORDED AT THREE OR MORE STATIONS (CONT.)

	TFR	PTS	DBT	SUP	POE	BAP	WLR	ST6	MUD	ST5	SNE	SNW	JTR	GRV	PTO	ST9	SPH	PLR	GPS	PTF	EPI	MUK
3380736T				T	A				B			T	A	A			A	A		T		
3380741Q												Q		R						Q		
3380756G												G	H				G			G		
3380810J												J	J	K			J	J		J		
3380844A														B			A			A		
3380850J					J				K											K		
3380856T				T	A			B	B			T	T	A		C	T	A		A		
3381030K												K	L				K					
3381153L				M	M							L	M					M				
3381237E												E	F	F				F				
3381653F				F								F	F									
3382018C				C						F		C	D	D				D	D			
3382045K				K								K	K	L				K	K			
3382052H												H						H	H			
3382347I				I								I								J		
3390020L												L								M	M	
3390024G												G	G					H	H		G	
3390231M													N					N			M	
3390452J																		K	K		J	
3390502N													N					O			N	
3390714L													L	L				L		L	L	
3390823O												O								O	O	
3391014T												T								T	T	
3391015M				N								M						N			M	
3391017F				F								F	F					F		F	F	
3391202E												E						F		E		
3391342R				R										S						R	R	
3391347S				S								S		S				S		S		
3391622A				A								A								A	A	
3391840S				S								S	T	T			S	S		S	S	
3392052S													T				S	T	T		S	
3392135S				S								S	T				T	T	T	T	T	
3392304D												D	E				D				D	
3392306E												E	F	F			E		F	E	E	
3392309D													D						D	D		

TABLE 4. EVENTS RECORDED AT THREE OR MORE STATIONS (CONT.)

	TFR	PTS	DBT	SUP	POE	BAP	WLR	ST6	MUD	ST5	SNE	SNW	JTR	GRV	PTO	ST9	SPH	PLR	GPS	PTF	EPI	MUK
3400008B				B					D				C	C			C		C	B		
3400238R				R					T			R	S	S			S	S	S	R		
3400340O				O								O	O	P			O	P	P	O	O	
3400504R												R							S	R		
3400532Q								Q	Q					Q								
3400538D													D				D		E		D	
3400642S													S	S			S	S		S		
3400711J														J				J			J	
3400741B													B	B				B				
3400812M																	M				T	
3401134S																	S	S			S	
3401205O													O				O				O	
3401227O												O					O	O		O	O	
3401431Q													R	Q			Q			Q	Q	
3401737K				L									L	L			L			K		
3401803N								N		O			N			N						
3402013G												H					H				G	
3402041T												T		A				A				
3410040Q				Q														Q	Q	Q		
3410122O														O				O	O	O		
3410142T									T	T												T
3410627L								L	L					L								L
3410849E				E								E						F	E		E	
3410930A				A								A		B							A	
3410951C									C					C								C
3411109C				C								C								C		
3411457F				F					H			F		G					G	G		H
3420157E												E					E	E			E	
3420211K				P								P						Q		Q		
3420445J				J								J						K		J		
3420636B				B								B	C	C			B	C	B	B	B	
3420920H				H								H		I				I	I			
3421026L				L								L	L	L			L	L	L	L	L	
3421058M				M								N	N	N			M	N			M	
3421353A				A								A		A				A				

TABLE 4. EVENTS RECORDED AT THREE OR MORE STATIONS (CONT.)

	TFR	PTS	DBT	SUP	POE	BAP	WLR	ST6	MUD	ST5	SNE	SNW	JTR	GRV	PTO	ST9	SPH	PLR	GPS	PTF	EPI	MUK
3421356M				M								M		N			M	M		M	M	
3421411L				L								L		M								
3421428I				I															I	I		
3421429O				O								O		O								
3421828L				M								L						M				
3421845K				K								K						L		L		

APPENDIX 1. CLOCK EVENTS

The following types of clock corrections are plotted:
1) the observed master clock corrections read from the master clock in the field; 2) the corrected master clock corrections, which have been corrected for master clock drift; 3) the WWVB corrections read from the header of each record when the data were played back.

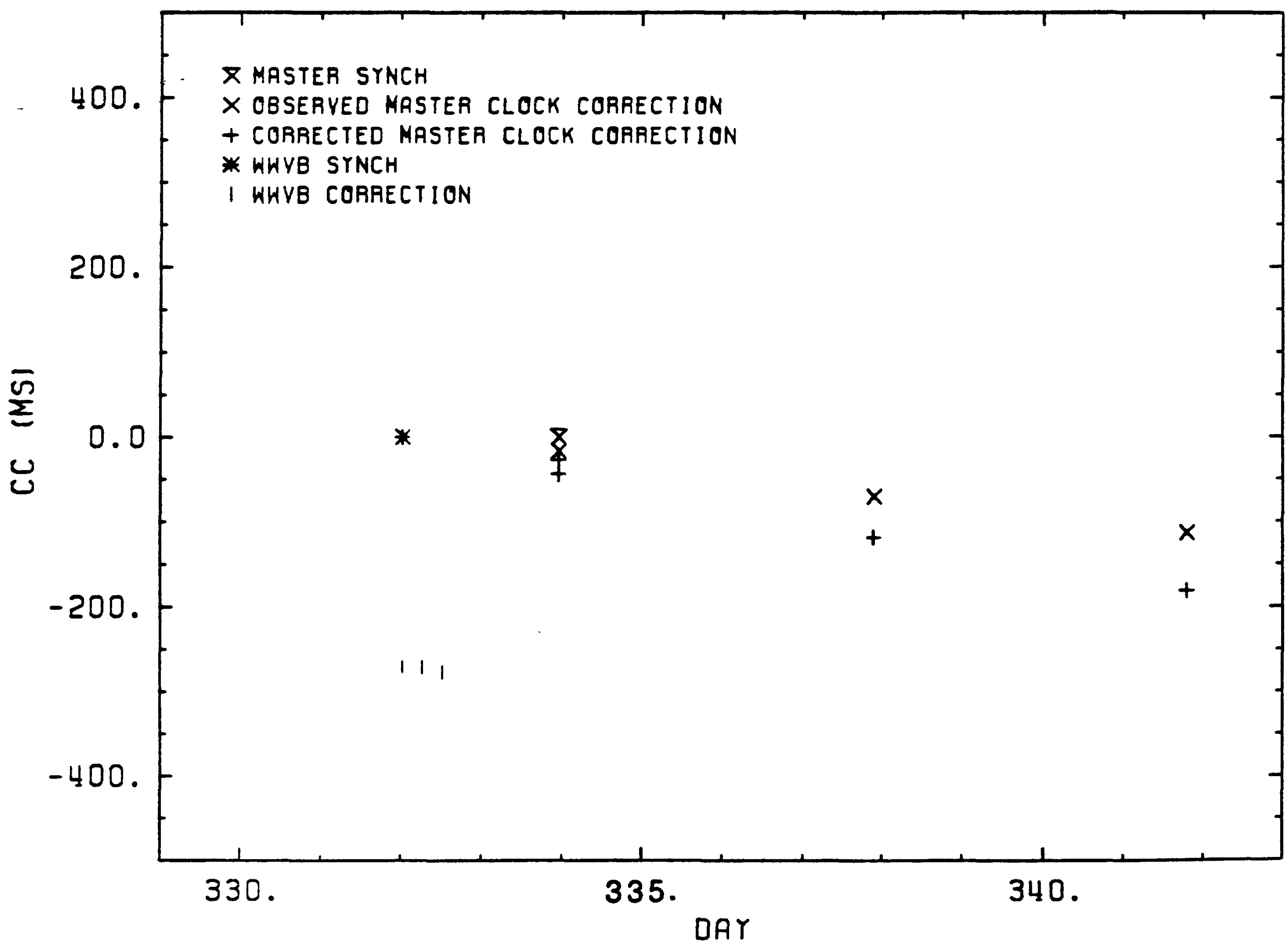
For all three type of clock corrections, positive values indicate the GEOS clock was fast with respect to the time standard; and negative values indicate the GEOS clock was slow. According to this sign convention,

GEOS time - clock correction = time standard

ST5

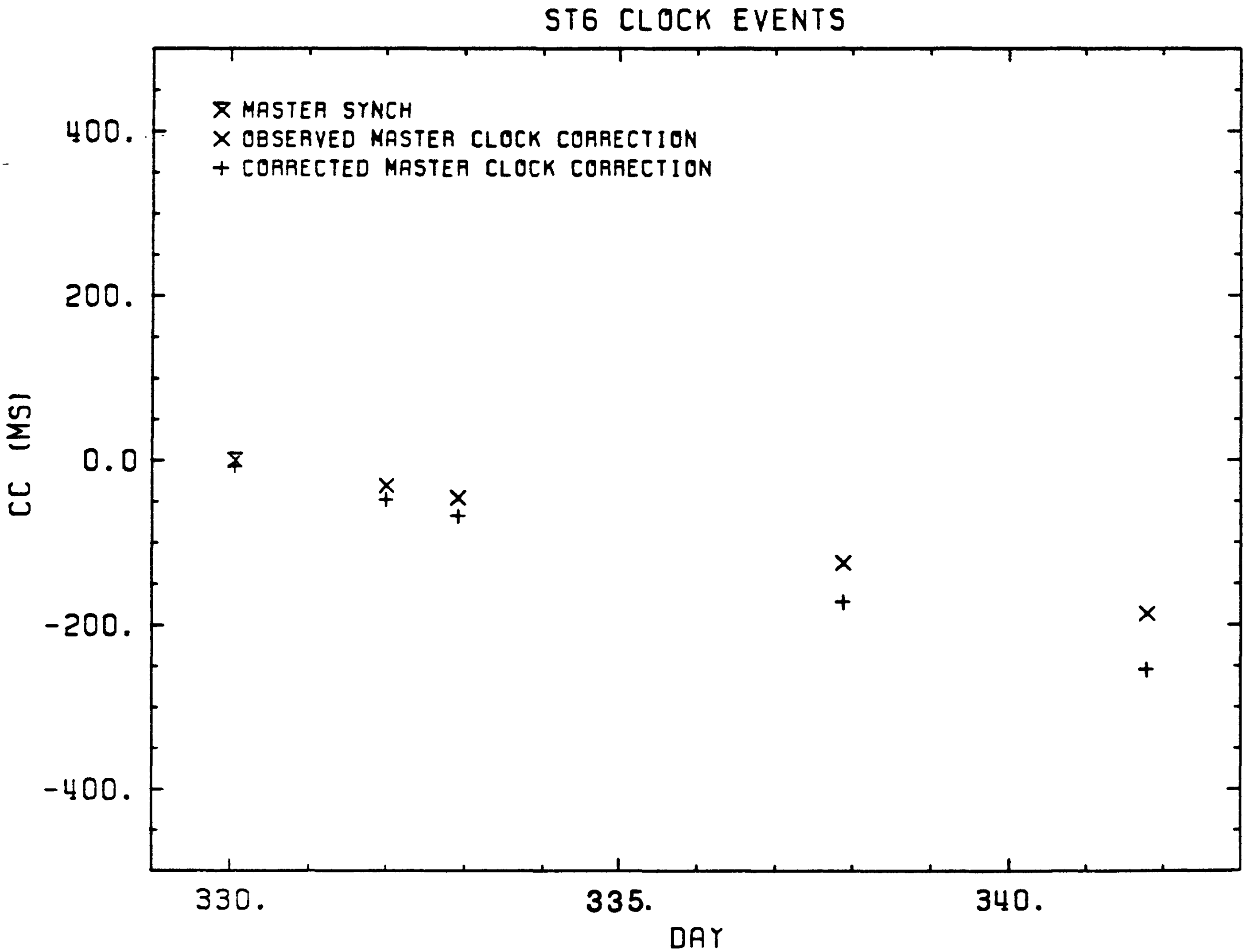
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
332 0028	WWVB Synch			Clock synched to WWVB when station installed.
333 2256	MC Correction	-16.6	-43.9	
333 2258	Master Synch	0.0	-27.3	Clock resynched to master clock.
337 2115	MC Correction	-70.4	-118.5	
341 1914	MC Correction	-113.6	-181.12	

ST5 CLOCK EVENTS



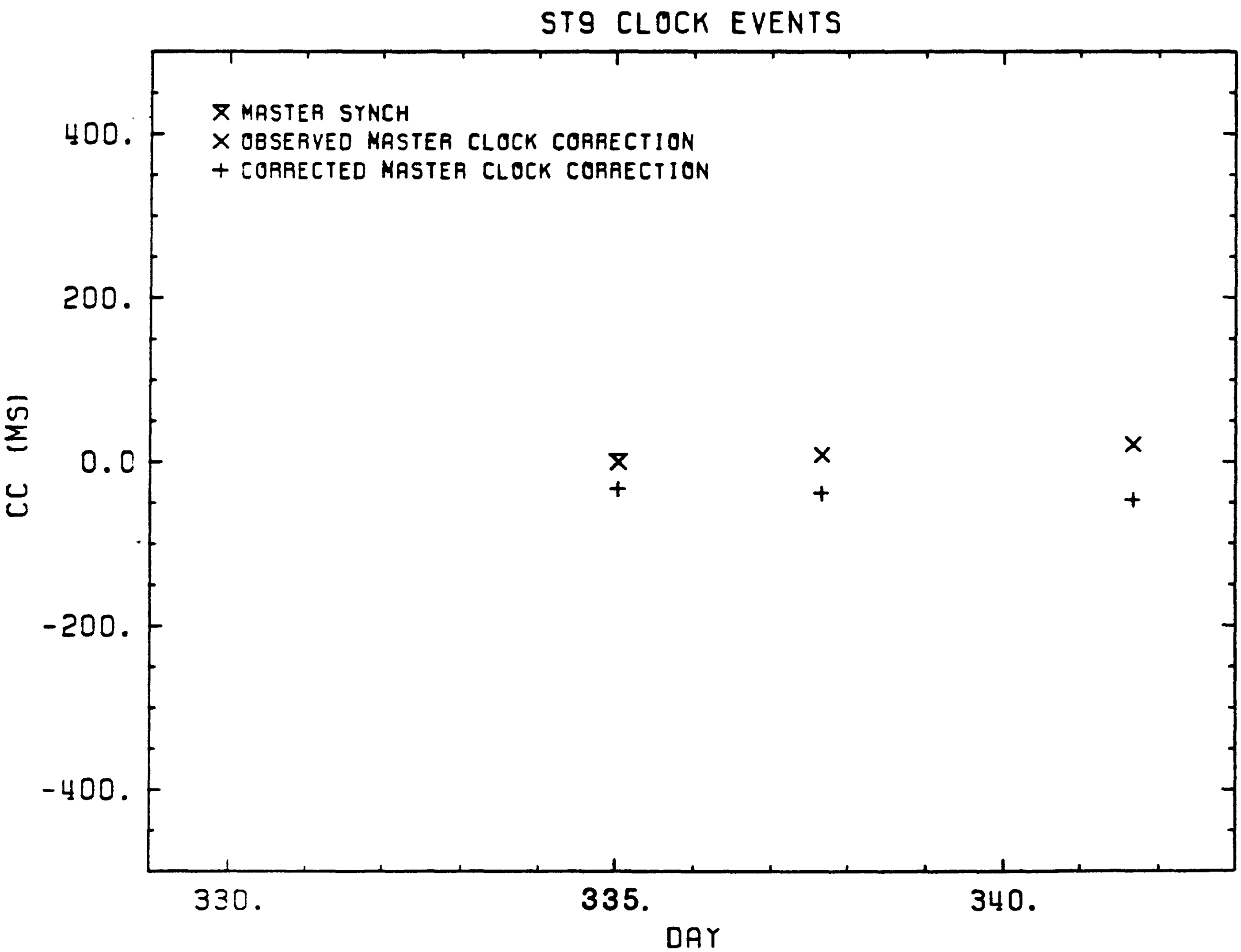
ST6

Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
330 0133	Master Synch	0.0	-6.7	Clock synched to master clock when station installed.
332 0005	MC Correction	-30.9	-47.8	
332 2200	MC Correction	-45.5	-67.6	
337 2055	MC Correction	-124.9	-172.4	
341 1852	MC Correction	-186.7	-254.3	



ST9

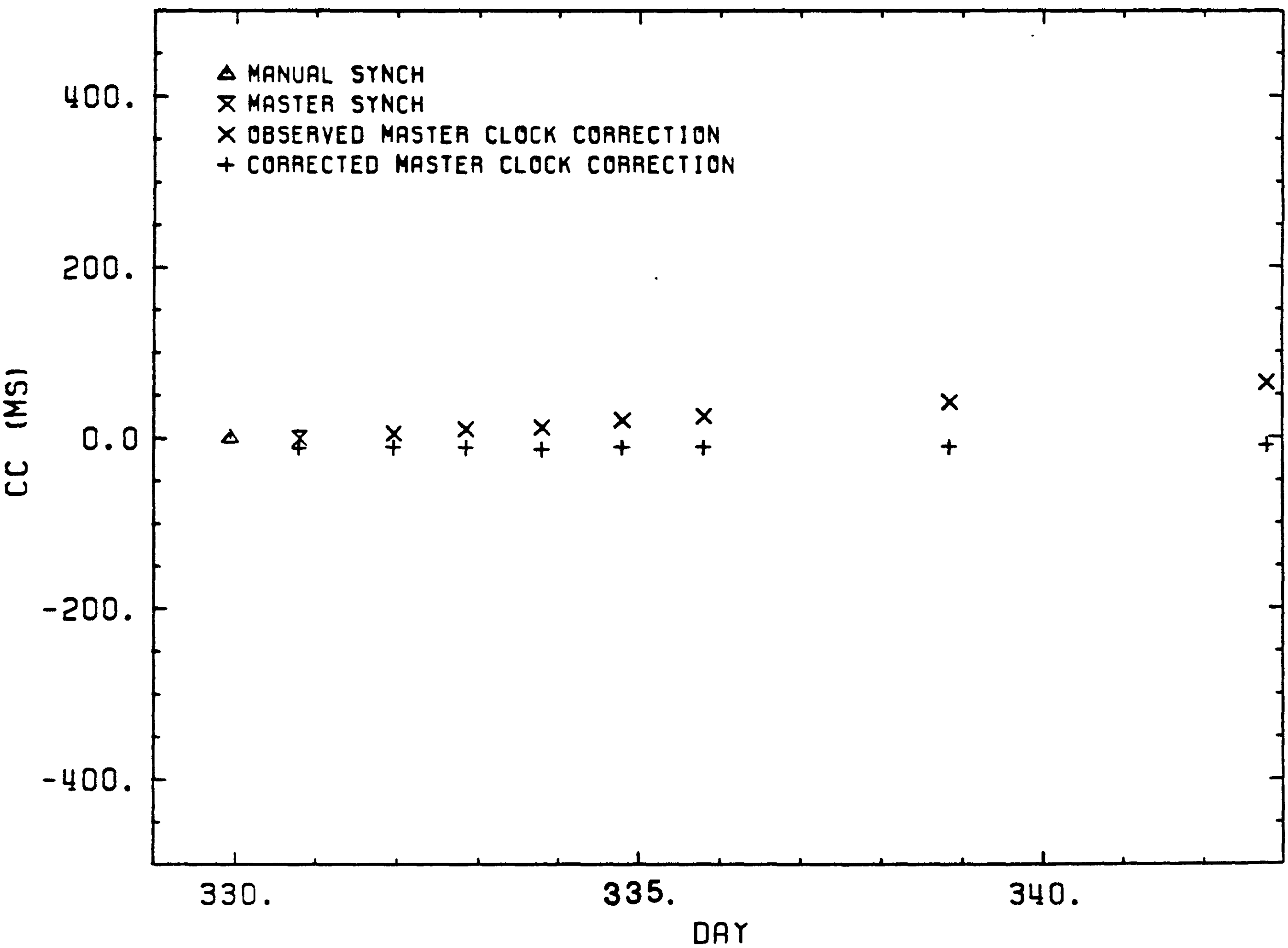
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
335 0040	Master Synch	0.0	-32.7	Clock synched to master clock when station installed.
337 1547	MC Correction	+8.6	-38.2	
341 1605	MC Correction	+21.4	-46.2	



SUP

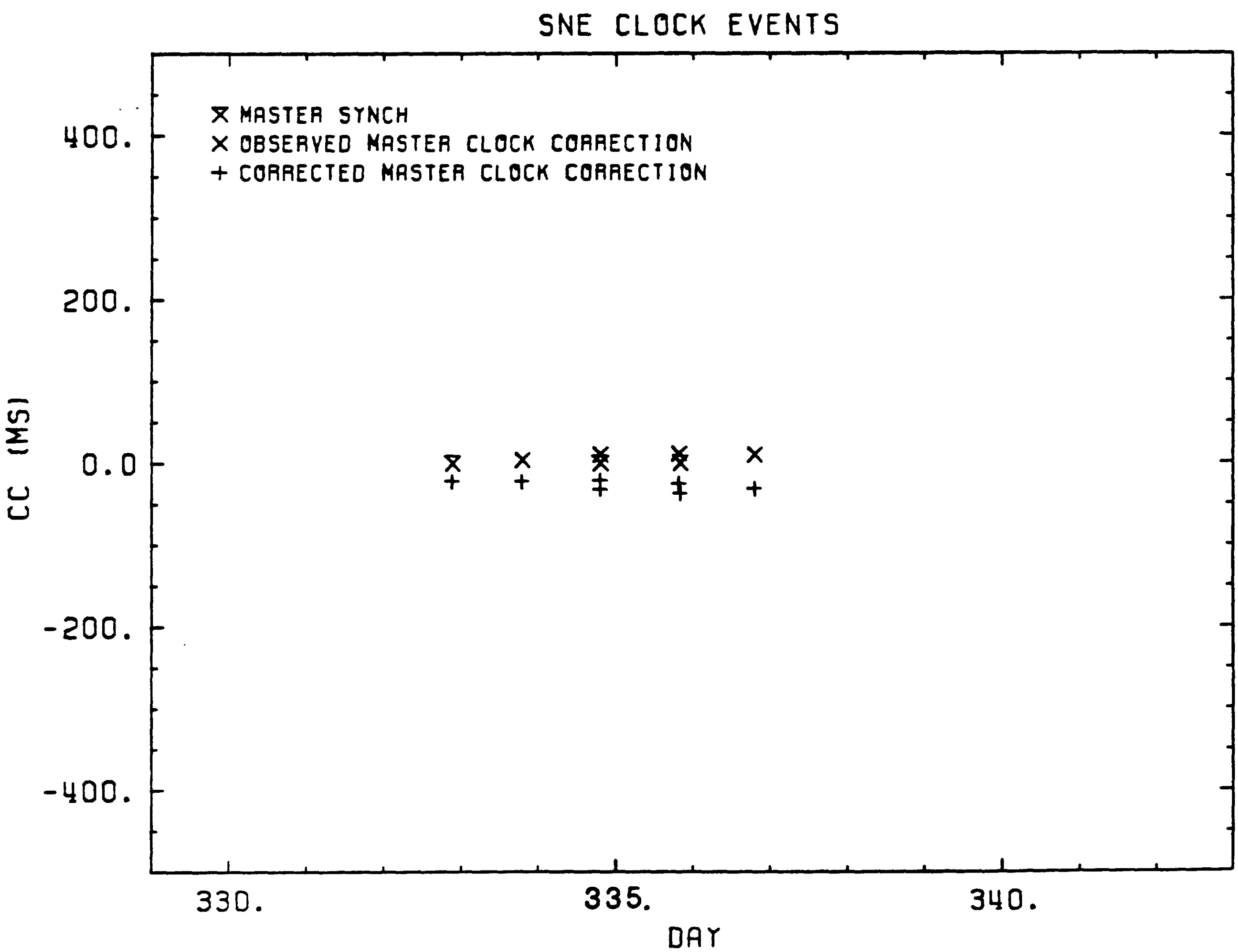
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
329 2217	Manual Synch			Clock set by wristwatch.
330 0531	MC Correction	+11.0 seconds!	---	
330 1901	Master Synch	0.0	-10.8	Clock synched to master clock.
331 2151	MC Correction	+6.1	-10.4	
332 2017	MC Correction	+10.7	-10.8	
333 1856	MC Correction	+13.2	-13.0	
334 1902	MC Correction	+21.1	-10.3	
335 1900	MC Correction	+26.0	-10.6	
336 1815	MC Correction	---	---	
338 1955	MC Correction	+41.5	-10.7	
342 1912	MC Correction	+63.4	-9.6	

SUP CLOCK EVENTS



SNE

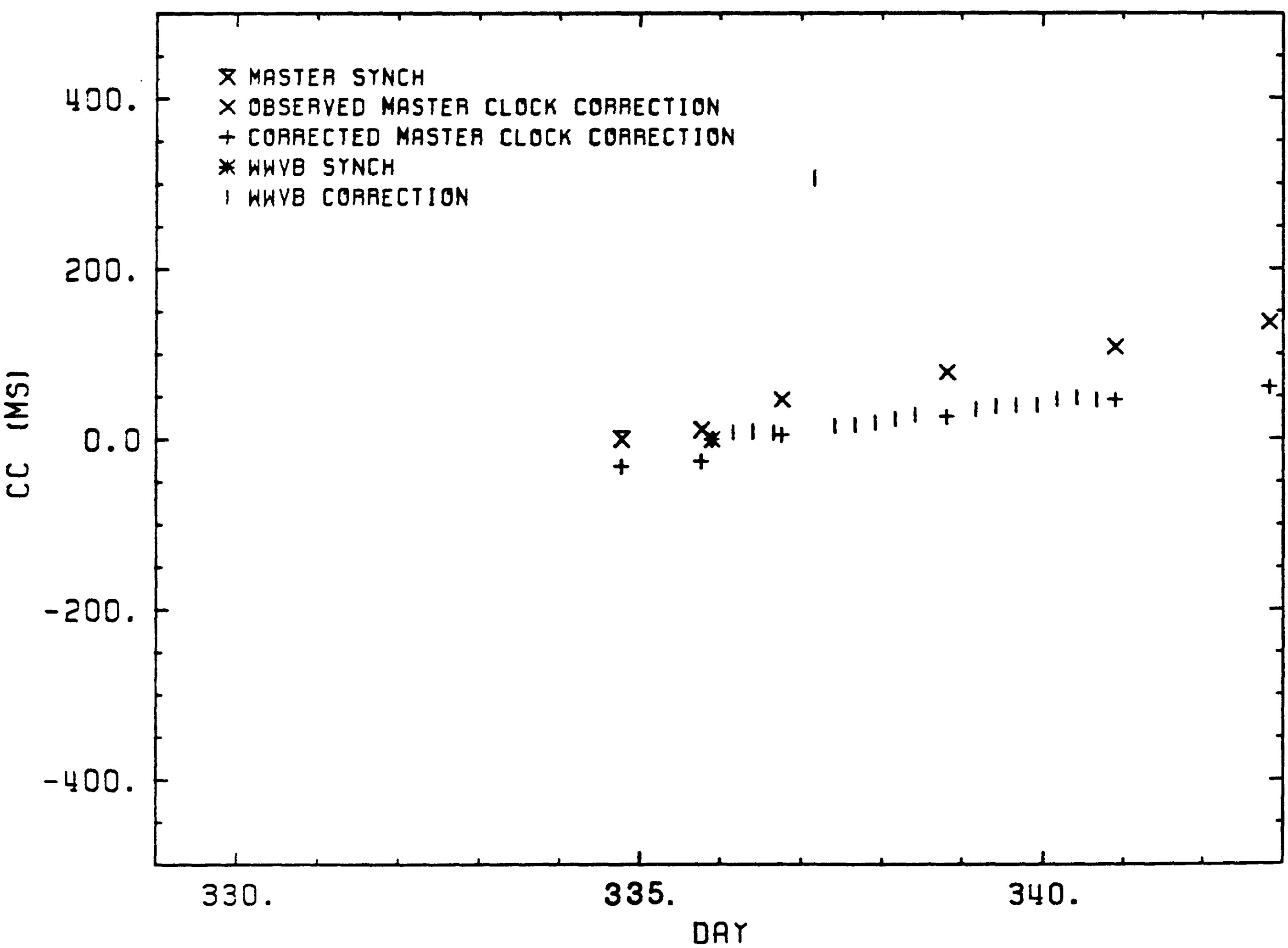
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
332 2112	Master Synch	0.0	-21.7	Clock synched to master clock when station installed.
333 1915	MC Correction	+4.2	-21.8	77 PC error
334 1915	MC Correction	+10.4	-20.8	77 PC error
334 1923	Master Synch	0.0	-31.6	Clock resynched to master clock.
335 1923	MC Correction	+11.4	-25.0	GEOS DOA. No display, no cursor.
335 1955	Master Synch	0.0	-36.8	GEOS rebooted; clock resynched to master clock.
336 1914	MC Correction	+10.4	-31.2	



SNW

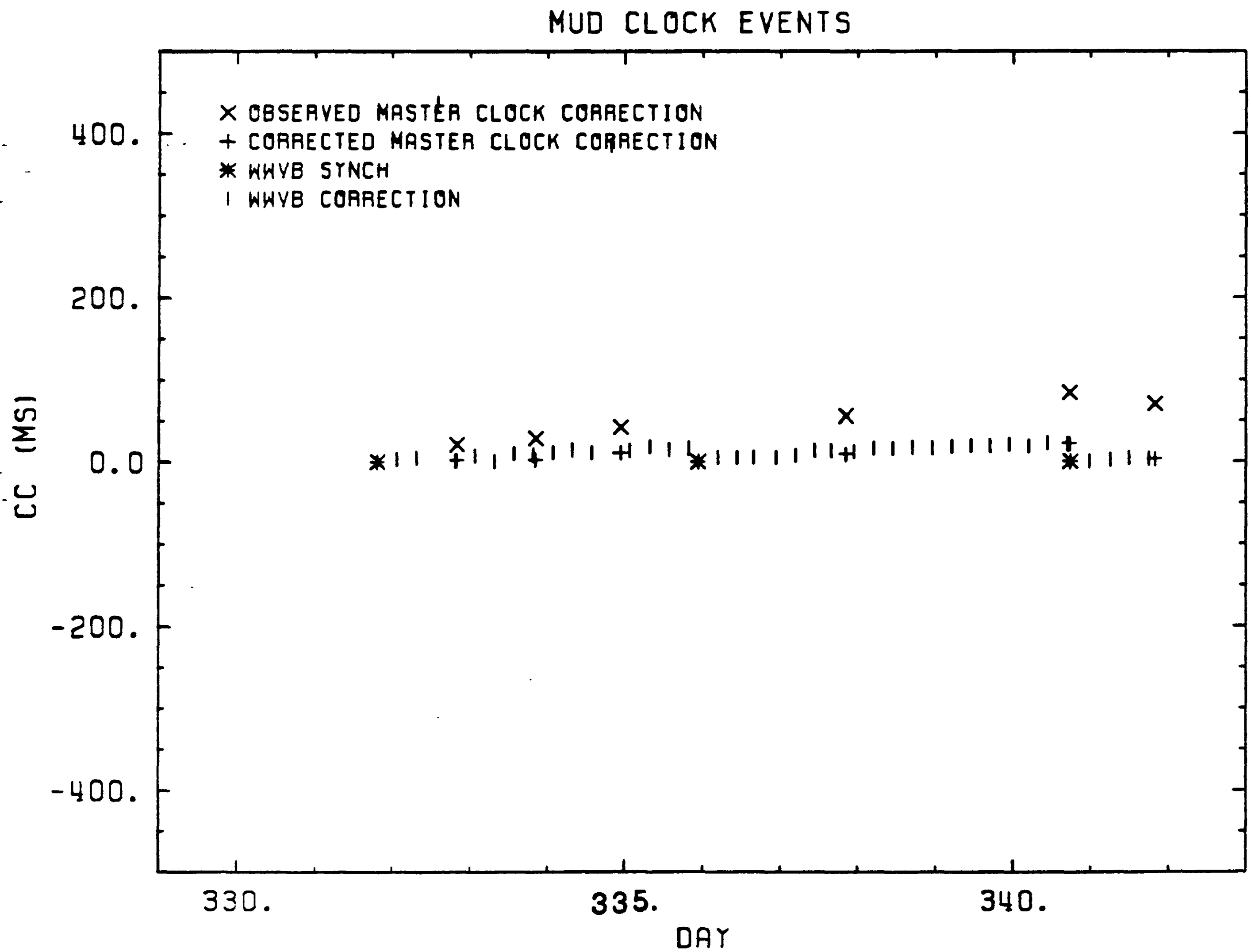
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
334 1835	Master synch	0.0	-31.4	Clock synched to master clock when station installed.
335 1825	MC Correction	+11.1	-25.3	
335 2137	WWVB Synch			Clock synched to WWVB 3 hrs after site visit.
336 1819	MC Correction	+46.4	+4.8	
338 1930	MC Correction	+78.3	+26.3	
340 2132	MC Correction	+107.9	+45.5	
342 1957	MC Correction	+136.9	+61.1	

SNW CLOCK EVENTS



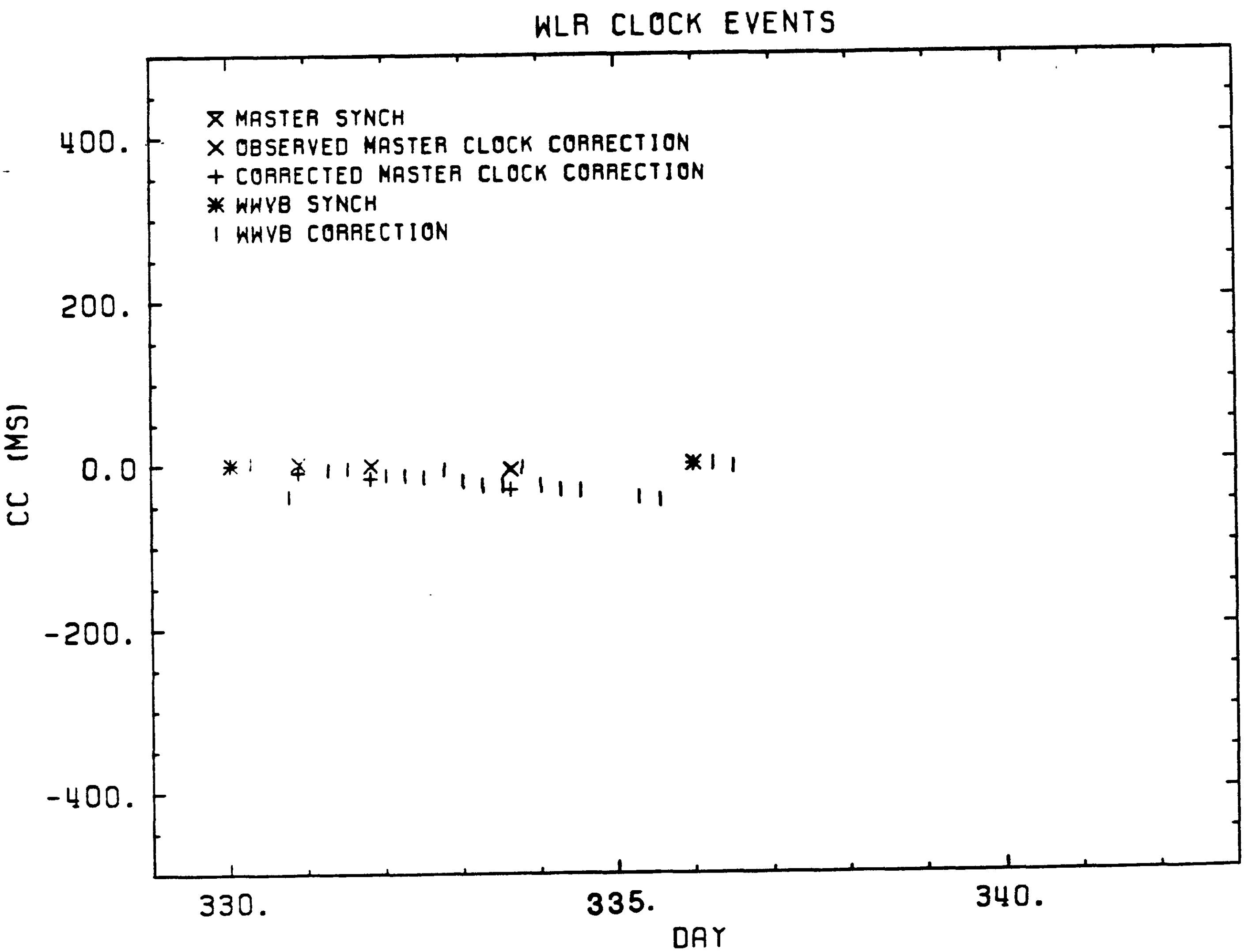
MUD

Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
331 1933	WWVB Synch			Clock synched to WWVB when station installed.
332 2003	MC Correction	+21.0	+.20	
333 2030	MC Correction	+28.8	+2.8	
334 2241	MC Correction	+42.5	+11.3	
335 2228	MC Correction	---	---	
335 2228	WWVB Synch			Clock resynched to WWVB.
337 2022	MC Correction	+56.3	+9.5	
340 1730	MC Correction	+84.5	+21.1	
340 1750	WWVB Synch			Clock resynched to WWVB.
341 2004	MC Correction	+70.8	+3.2	



WLR

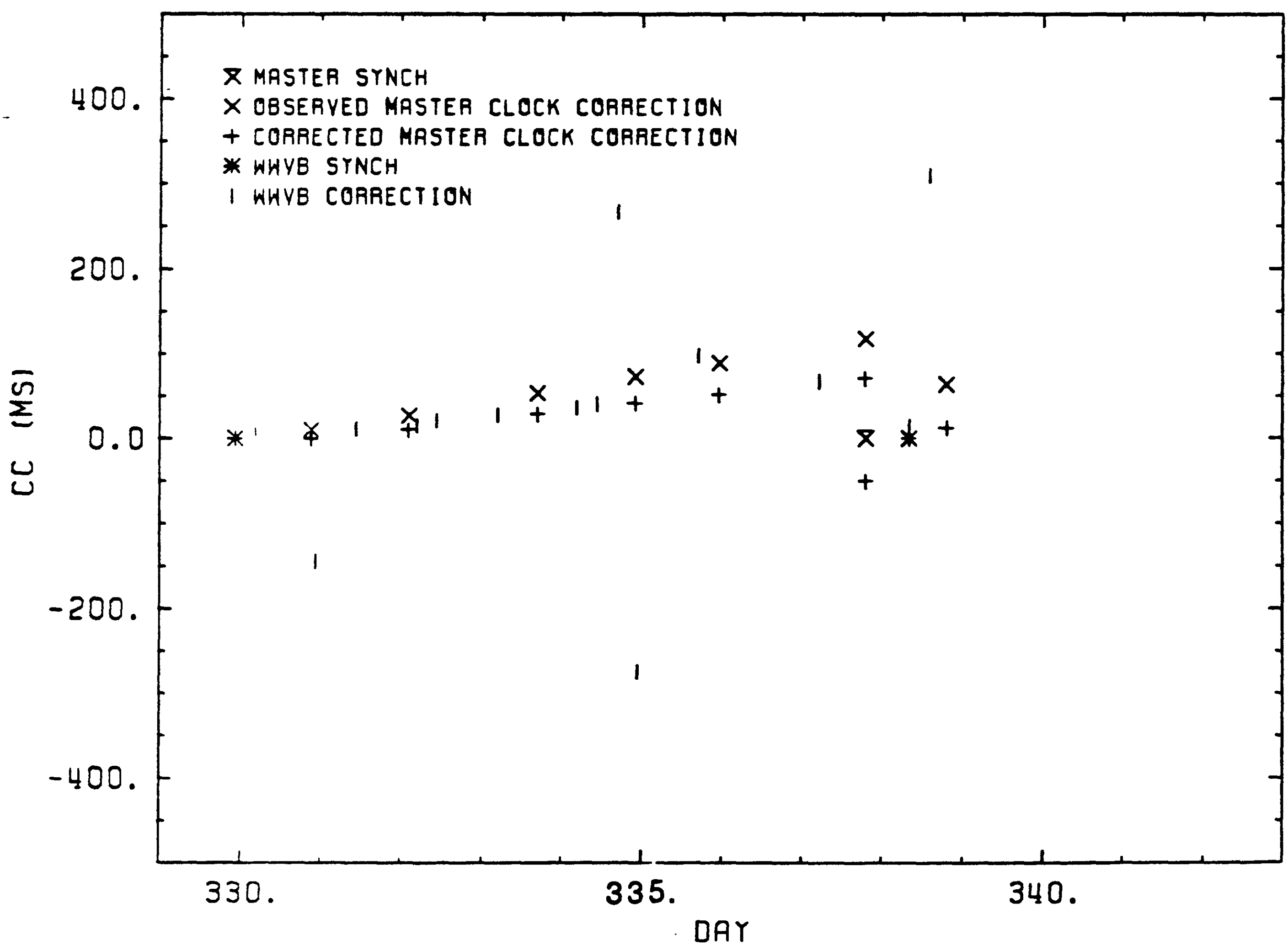
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
330 0044	WWVB Synch			Clock synched to WWVB when station installed.
330 2130	MC Correction	+1.6	-8.8	
331 2015	MC Correction	-0.9	-16.5	
333 1515	MC Correction	-5.7	-30.4	
336 0000	MC Correction	---	---	
336 0004	WWVB Synch			Clock resynched to VB at site visit.



POE

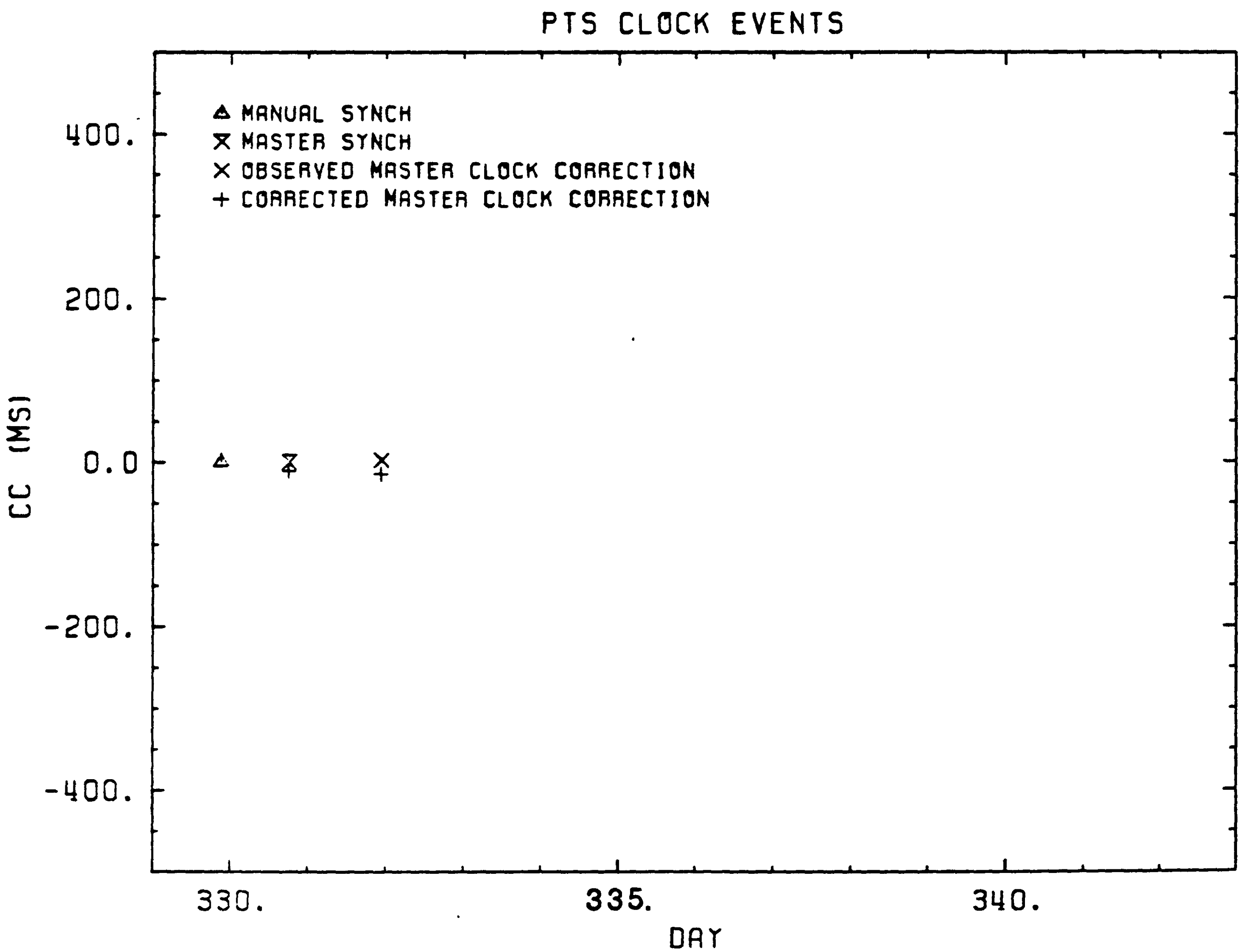
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
329 2219	WWVB Synch			Clock synched to WWVB when station installed.
330 2050	MC Correction	+10.3	-.10	
332 0230	MC Correction	+27.0	+10.1	
333 1640	MC Correction	+53.6	+28.9	
334 2206	MC Correction	+73.2	+42.0	
335 2256	MC Correction	+89.5	+52.0	
337 1850	MC Correction	+118.0	+71.2	
337 1908	Master Synch	0.0	-50.1	Clock resynched to master clock.
338 0754	WWVB Synch			Clock resynched to WWVB 11 hrs. after site visit.
338 1852	MC Correction	+63.9	+11.9	

POE CLOCK EVENTS



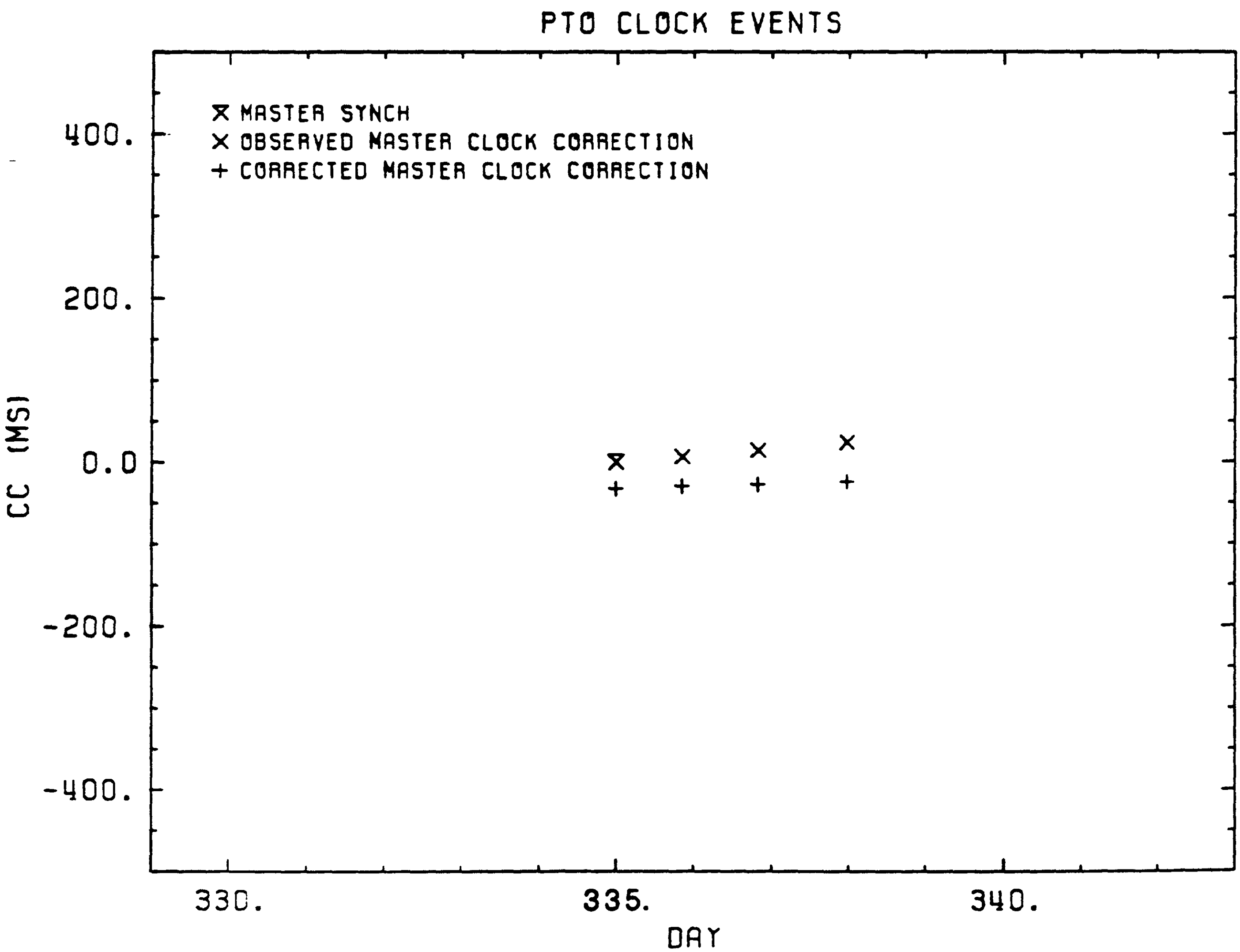
PTS

Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
329 2059	Manual Synch			Clock set to wristwatch when station installed.
330 0244	GEOS Crash	No clock corrections available		
330 1810	Master Synch	0.0	-10.5	New GEOS installed, clock synched to master clock.
331 2229	MC Correction	+2.3	-14.6	



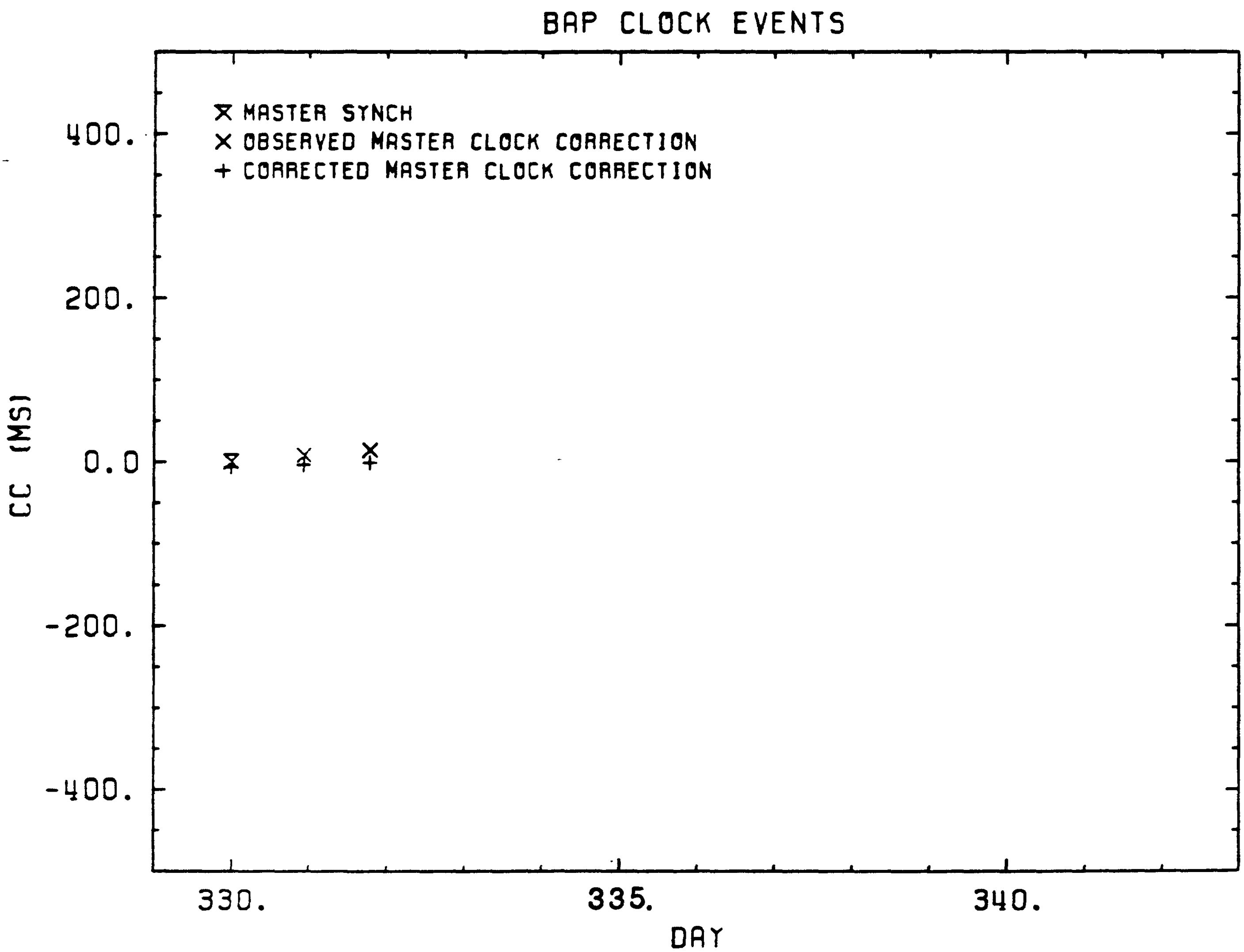
PTO

Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
334 2355	Master Synch	0.0	-32.5	Clock synched to master clock when station installed.
335 2035	MC Correction	+7.2	-29.2	
336 1943	MC Correction	+14.9	-26.7	
337 2317	MC Correction	+24.0	-24.1	



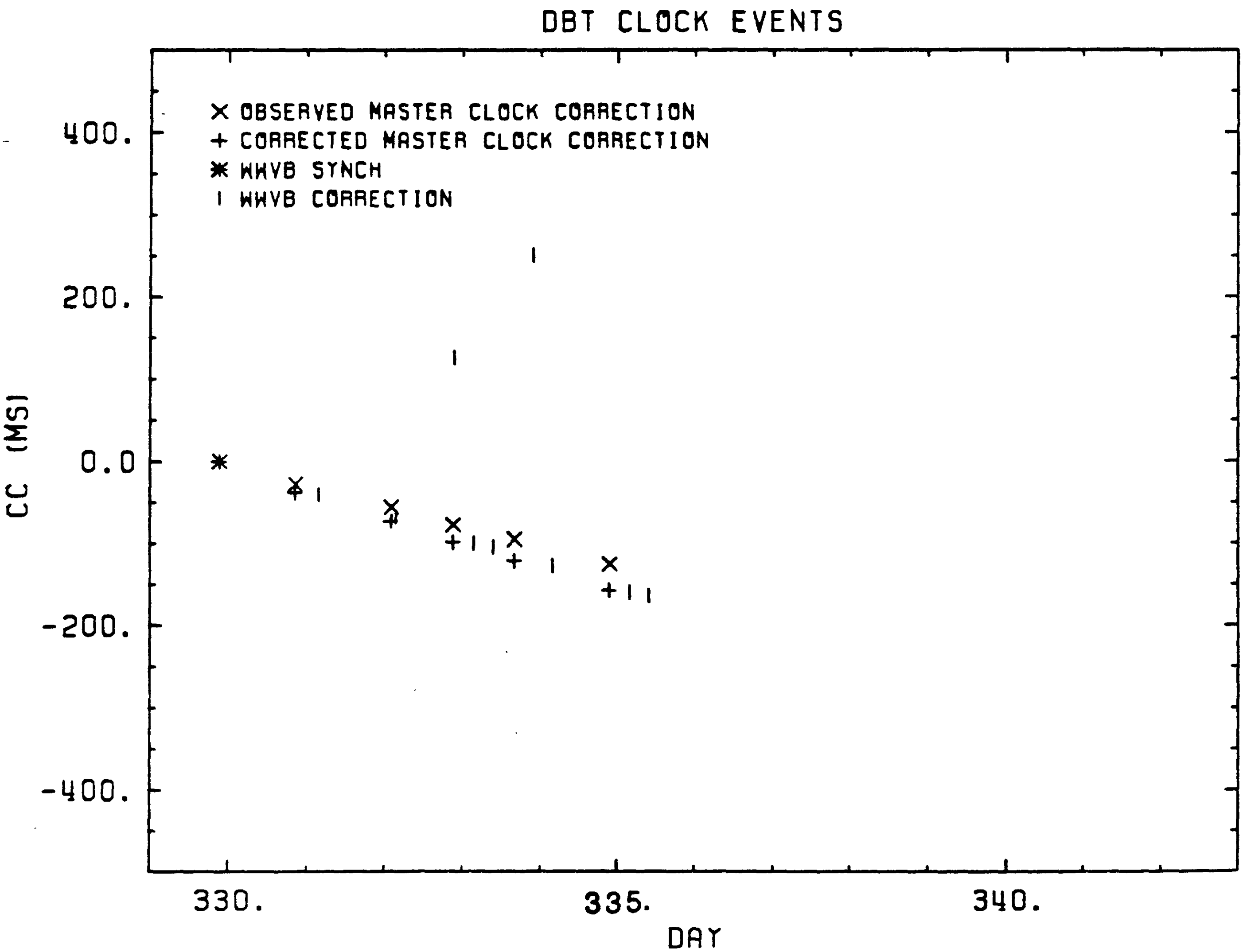
BAP

Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
329 2350	Master Synch	0.0	-6.5	Clock synched to master clock when station installed.
330 2215	MC Correction	+7.9	-3.8	
331 1840	MC Correction	+14.4	-1.2	



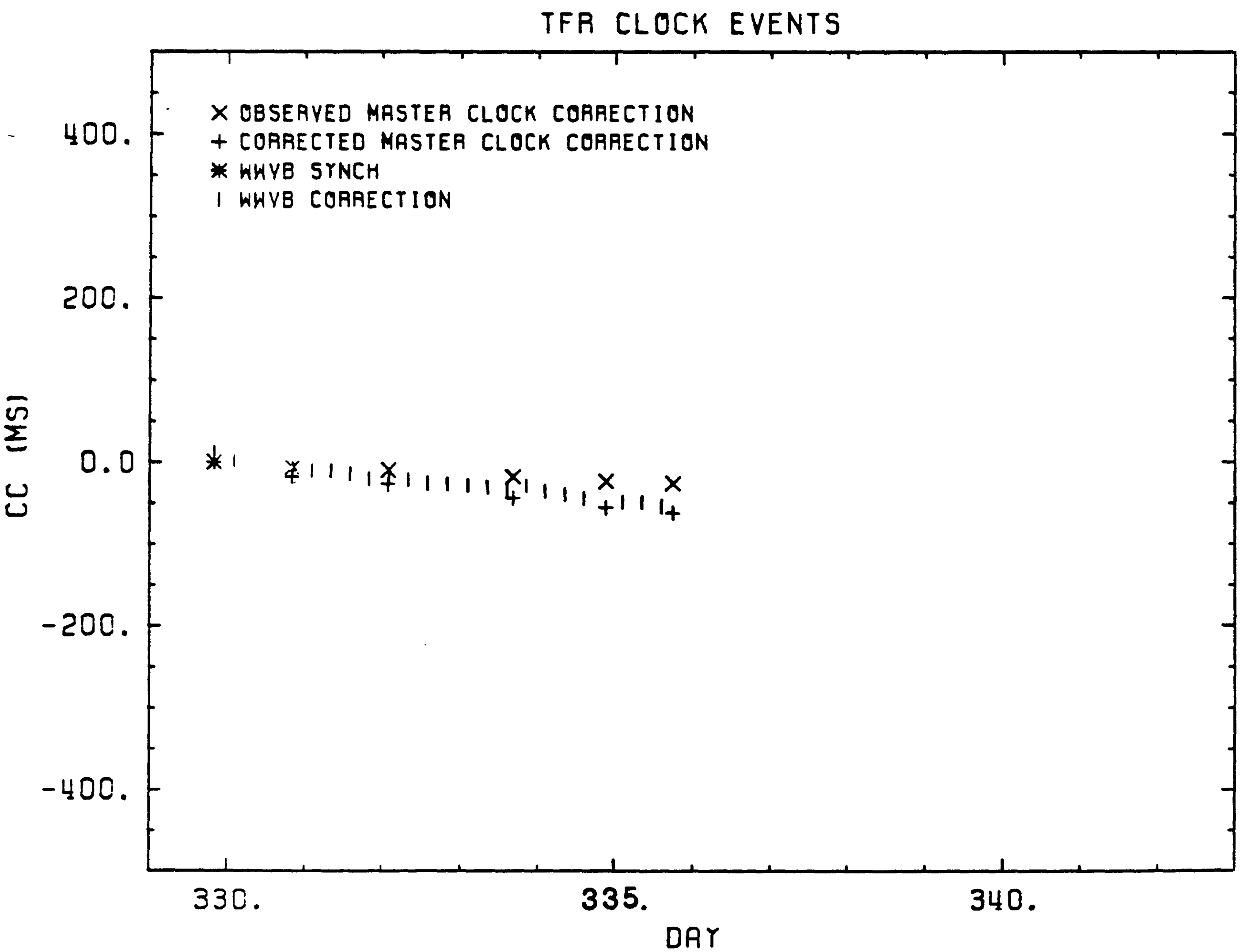
DBT

Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
329 2120	WWVB Synch			Clock synched to WWVB when station installed.
330 2025	MC Correction	-27.4	-37.8	
332 0208	MC Correction	-55.2	-72.1	
332 2109	MC Correction	-77.0	-97.8	
333 1600	MC Correction	-94.5	-120.5	
334 2132	MC Correction	-124.6	-156.6	
335 2000	MC Correction	---		



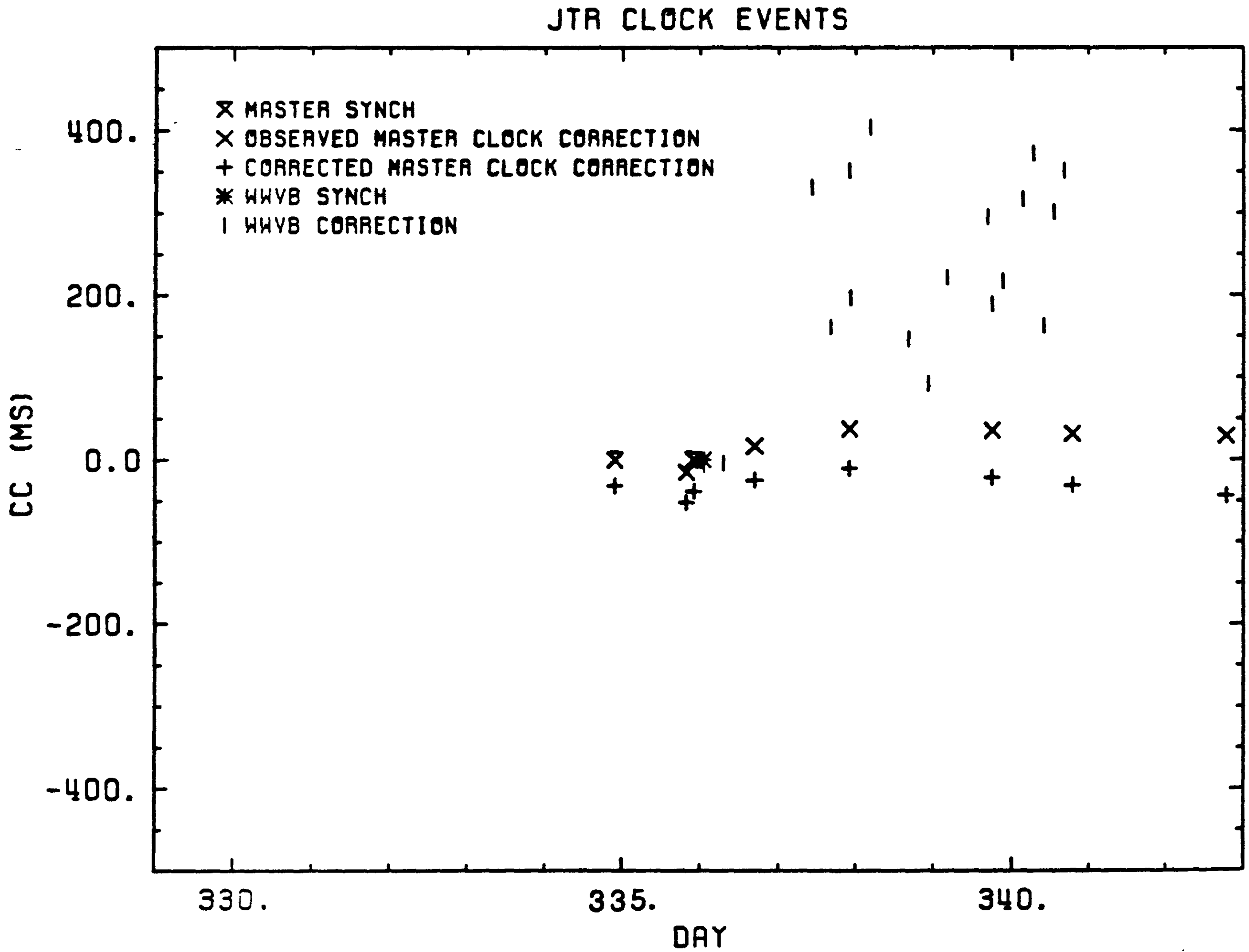
TFR

Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
329 2007	WWVB Synch			Clock synched to WWVB when station installed.
330 2000	MC Correction	-6.8	-17.7	
332 0150	MC Correction	-9.7	-26.6	
333 1615	MC Correction	-17.7	-43.6	
334 2112	MC Correction	-23.3	-55.3	
335 1748	MC Correction	-26.0	-62.4	



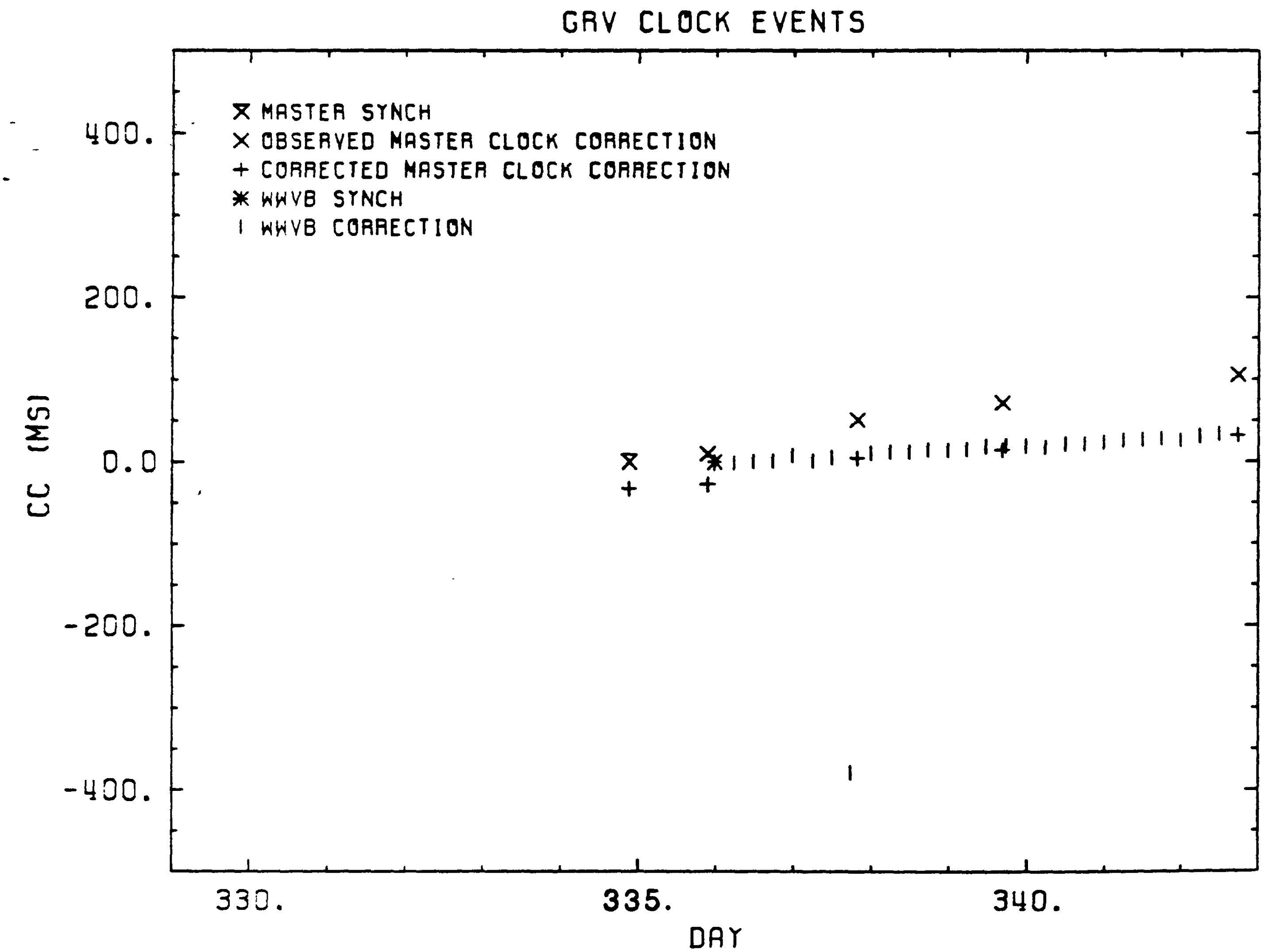
JTR

Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
334 2041	Master Synch	0.0	-31.8	Clock synched to master clock when station installed.
335 2000	MC Correction	-15.0	-52.0	77 PC error
335 2202	Master Synch	0.0	-37.5	
336 0114	WWVB Synch			GEOS clock resynched to VB 3 hrs after site visit.
336 1648	MC Correction	+16.7	-24.8	New GEOS installed.
336 2200				New GEOS installed.
337 2201	MC Correction	+37.5	-10.5	
339 1751	MC Correction	+35.2	-22.0	
340 1852	MC Correction	+31.3	-31.1	
342 1843	MC Correction	+28.8	-44.0	



GRV

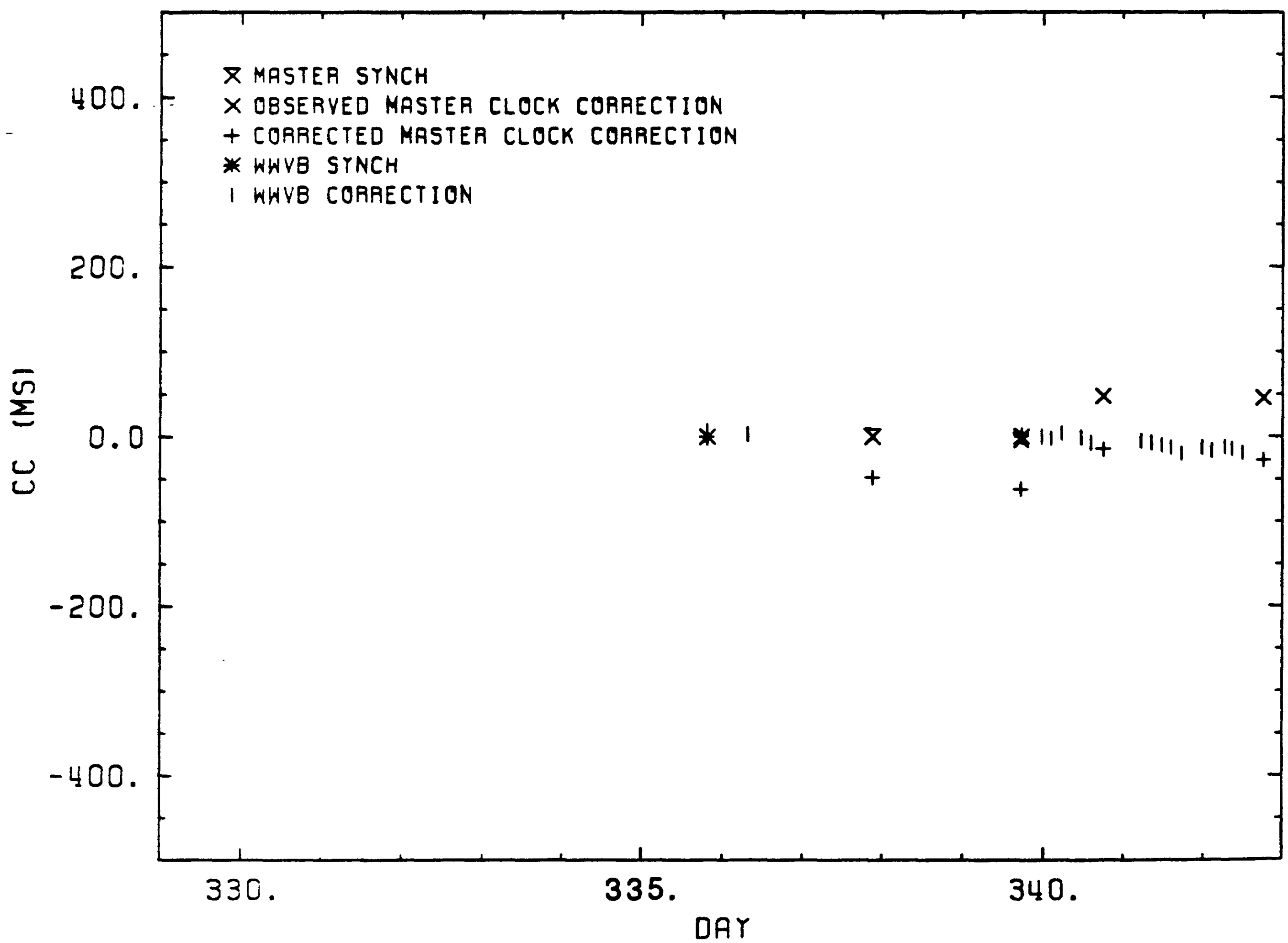
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
334 2106	Master Synch	0.0	-32.0	Clock synched to master clock when station installed.
335 2116	MC Correction	+9.8	-27.2	
335 2321	WWVB Synch			Clock resynched to WWVB after trying for 26 hrs.
336 1855	MC Correction	---		
337 1924	MC Correction	+51.3	+4.3	
339 1626	MC Correction	+71.1	+13.9	
342 1733	MC Correction	+105.0	+32.2	



SPH

Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
335 1920	WWVB Synch			Clock synched to WWVB when station installed.
336 1800	GEOS Crash			
337 2111	Master Synch	0.0	-47.7	GEOS rebooted, clock synched to master clock.
339 1713	MC Correction	-4.4	-61.6	
339 1719	WWVB Synch			GEOS Clock resynched to WWVB.
340 1810	MC Correction	+47.8	-14.6	
342 1820	MC Correction	+45.3	-27.5	

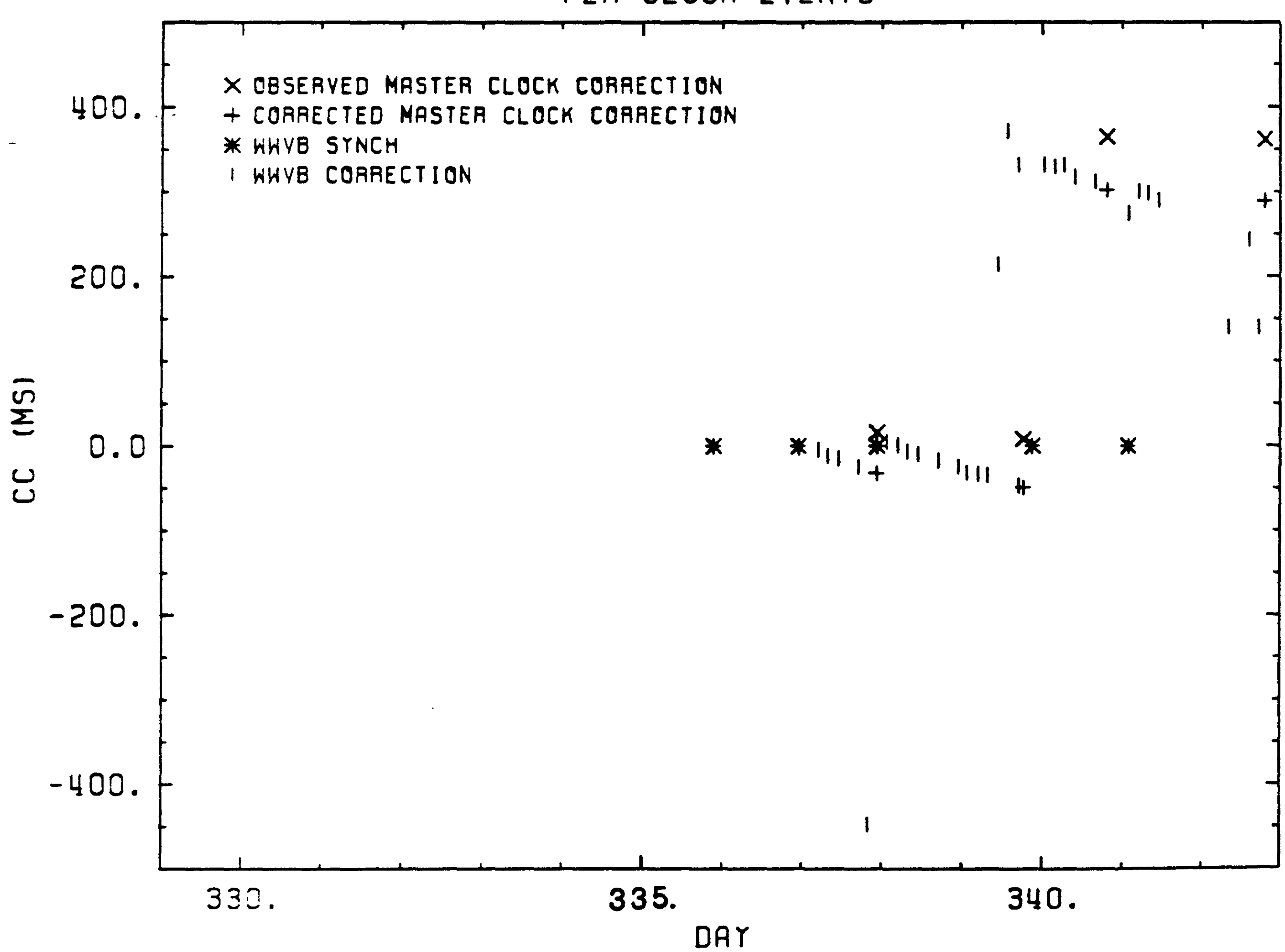
SPH CLOCK EVENTS



PLR

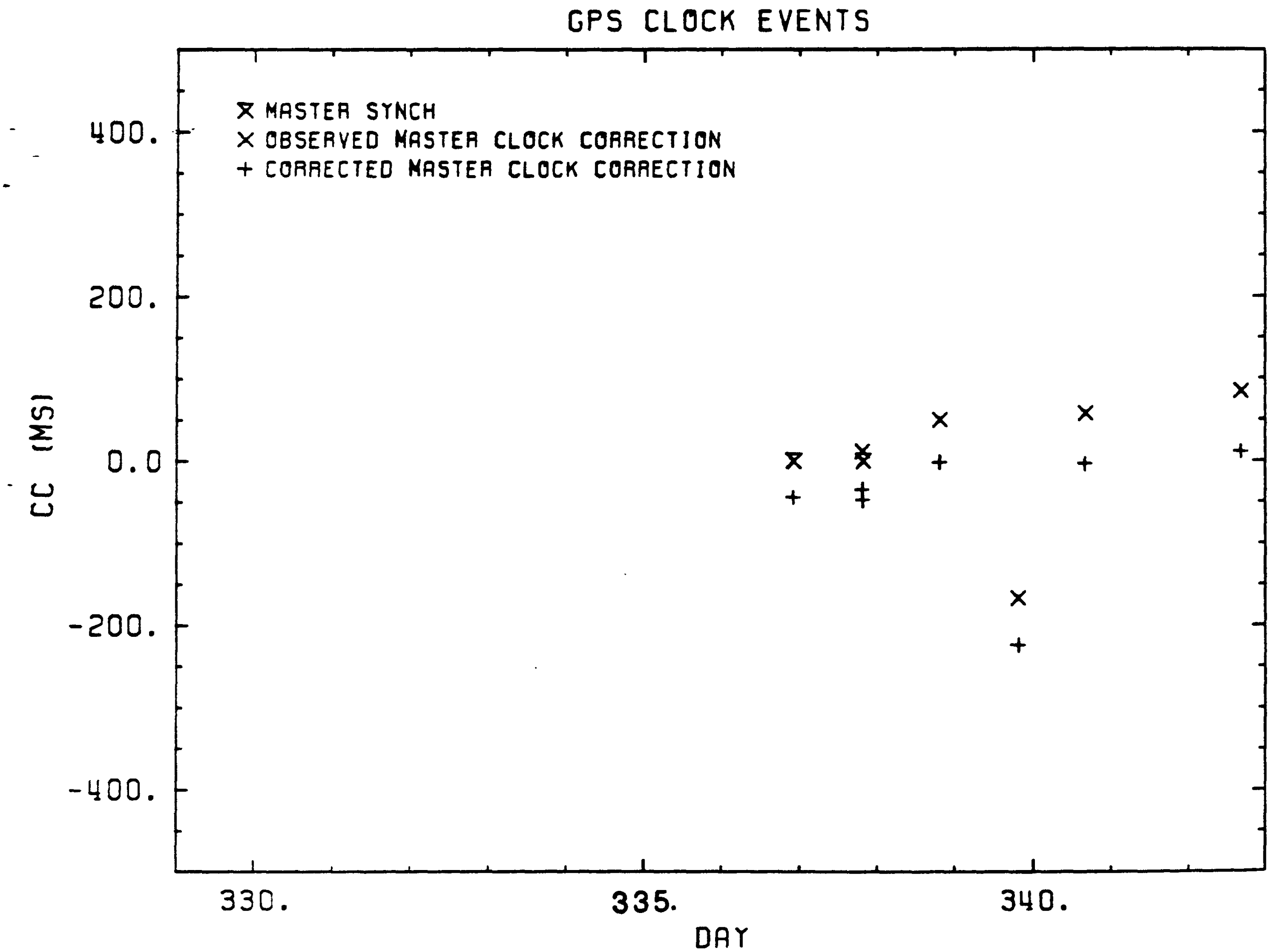
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
335 2110	WWVB Synch			Clock synched to WWVB when station installed.
336 1943	MC Correction	---	---	
336 2256	WWVB Synch			Clock resynched to WWVB 3 hrs after site visit.
337 2232	MC Correction	+16.3	-31.8	
337 2236	WWVB Synch			Clock resynched to WWVB at site visit
339 1823	MC Correction	+8.0	-49.2	
3392138	WWVB Synch			Clock resynched to WWVB 3 hrs after site visit.
340 1923	MC Correction	+364.8	+302.4	
341 0159	WWVB Synch			Clock resynched to WWVB 1 hr after site visit.
342 1915	MC Correction	+362.1	+289.3	

PLR CLOCK EVENTS



GPS

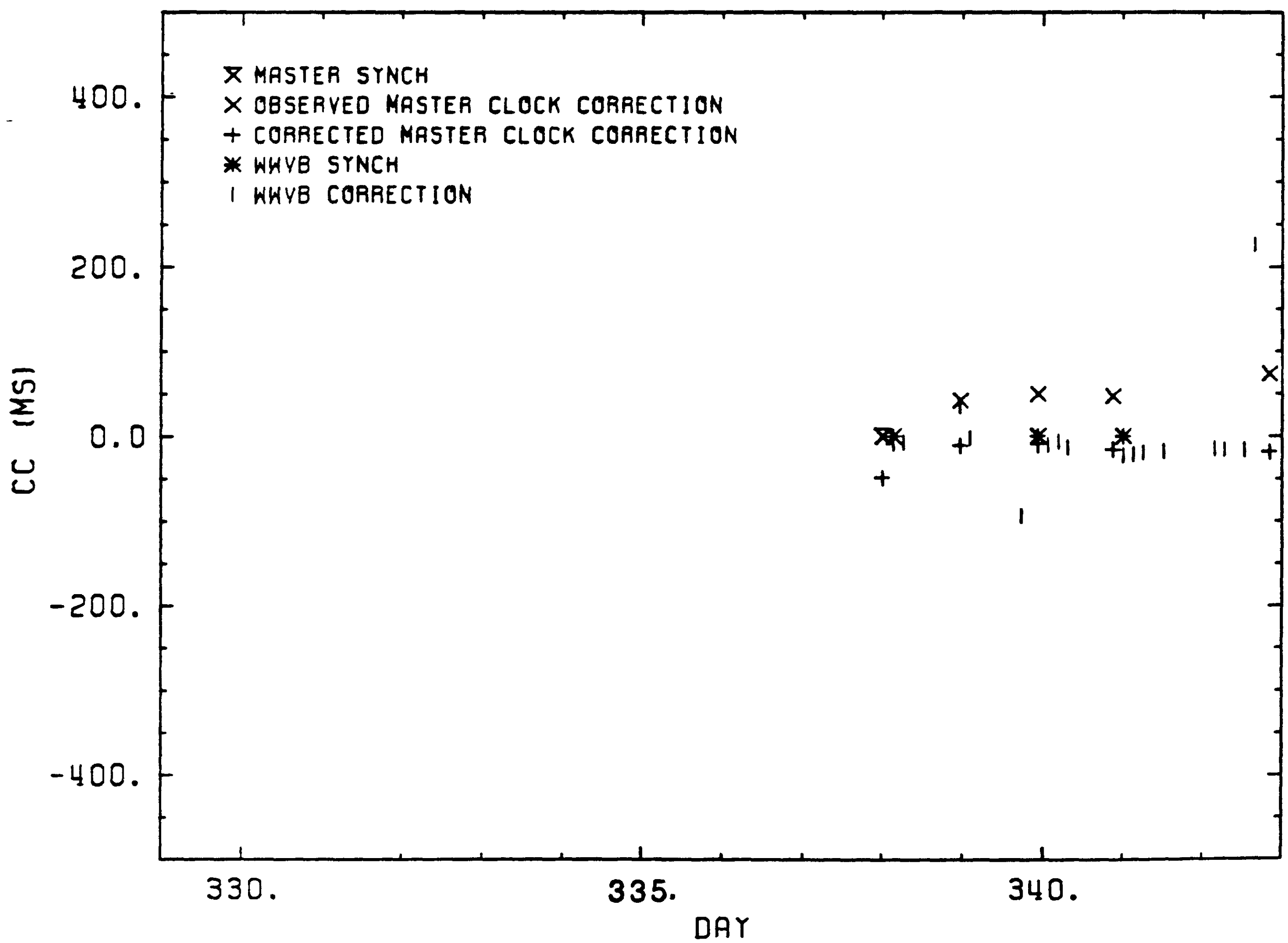
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
336 2252	Master Synch	0.0	-42.8	Clock synched to master clock when station installed.
337 1909	MC Correction	+12.3	-34.5	
337 1919	Master Synch	0.0		Clock resynched to master clock at site visit.
338 1932	MC Correction	+50.1	-1.9	
339 1934	MC Correction	-166.7	-224.1	
340 1550	MC Correction	+57.8	-3.7	
342 1622	MC Correction	+84.1	+11.3	



PTF

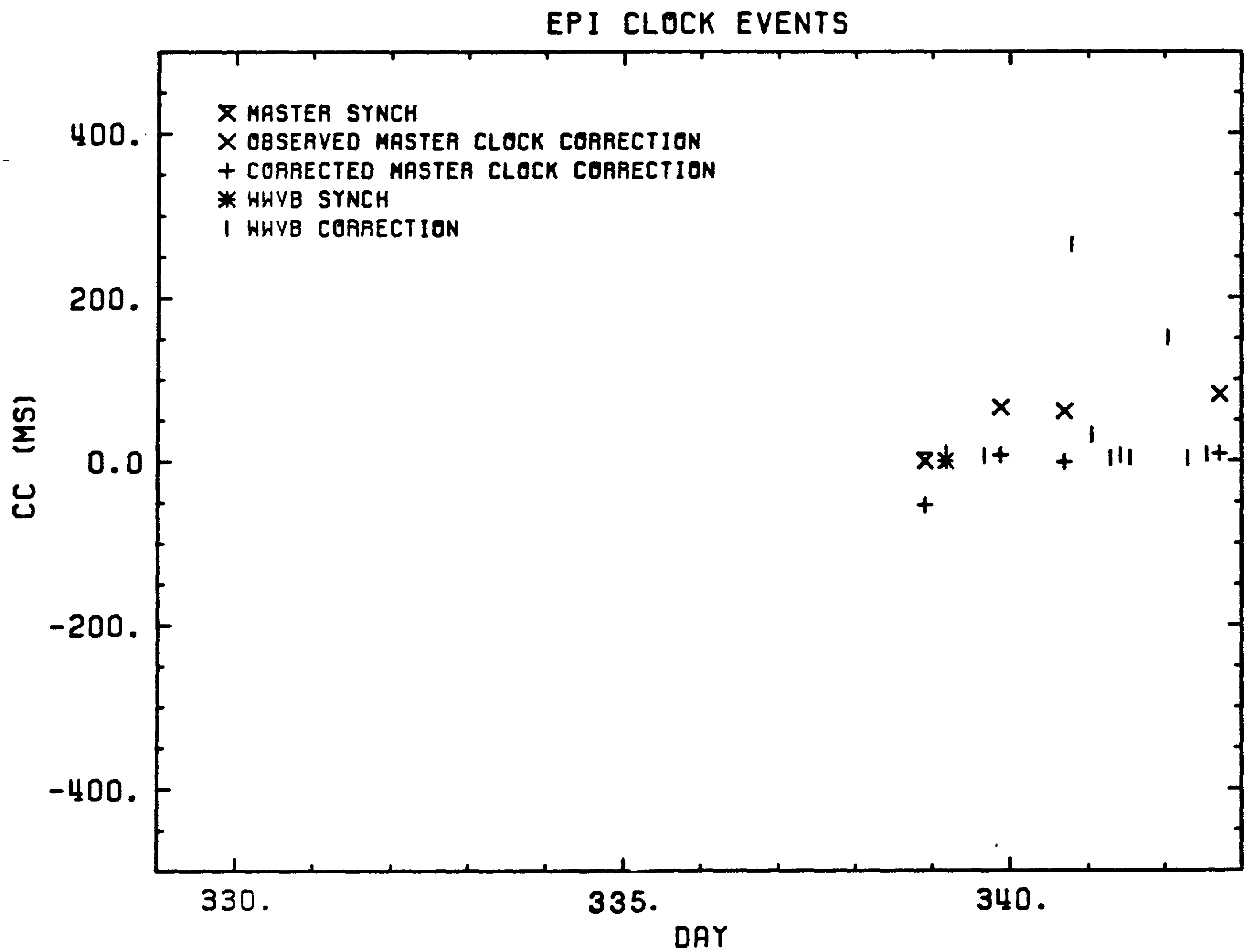
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
338 0002	Master Synch	0.0	-48.0	Clock synched to master clock when station installed.
338 0313	WWVB Synch			Clock resynched to WWVB 3 hrs after installation.
338 2312	MC Correction	+42.2	-11.1	
339 2225	MC Correction	+49.8	-8.7	
339 2231	WWVB Synch			Clock resynched to WWVB at site visit
340 2102	MC Correction	+47.5	-16.0	
341 0016	WWVB Synch			Clock resynched to WWVB at site visit
342 2017	MC Correction	+55.5	-18.0	

PTF CLOCK EVENTS

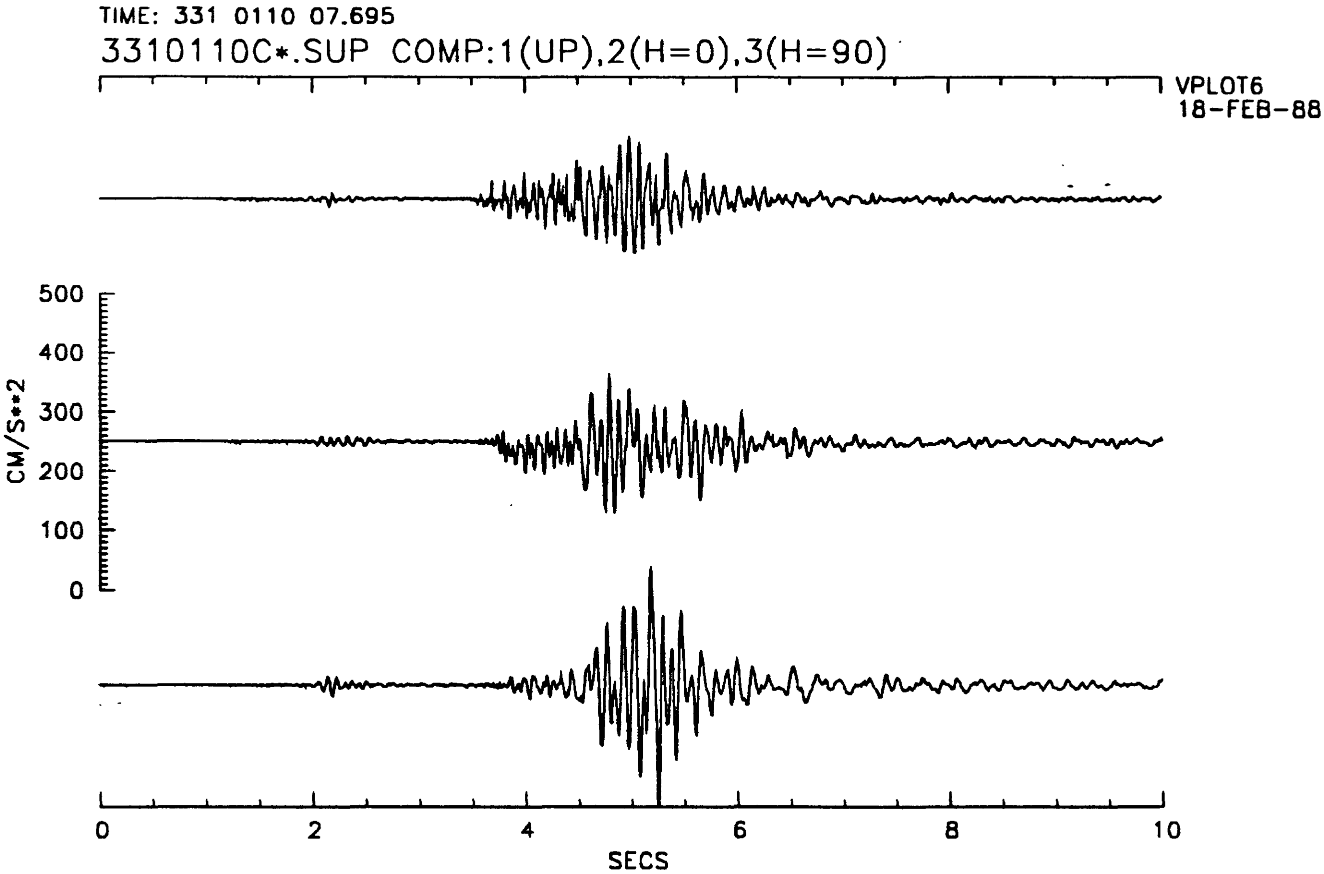


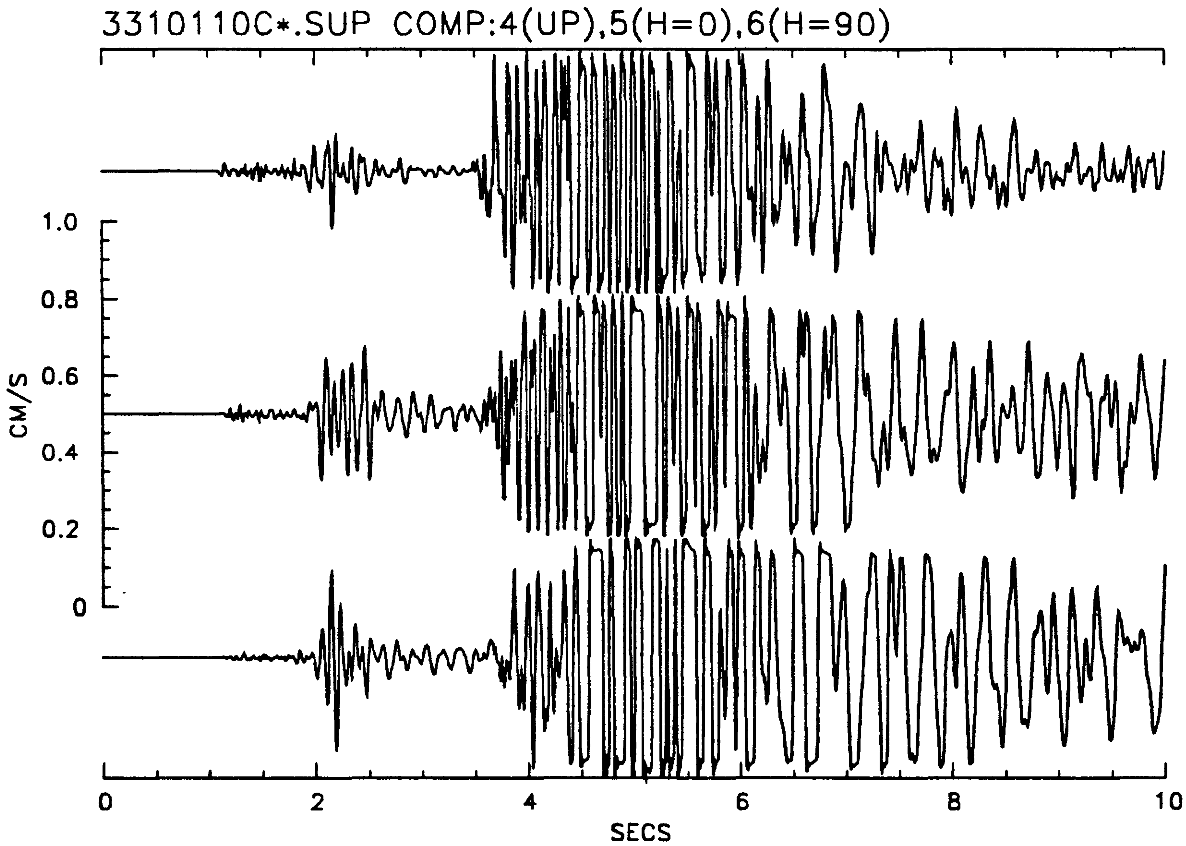
EPI

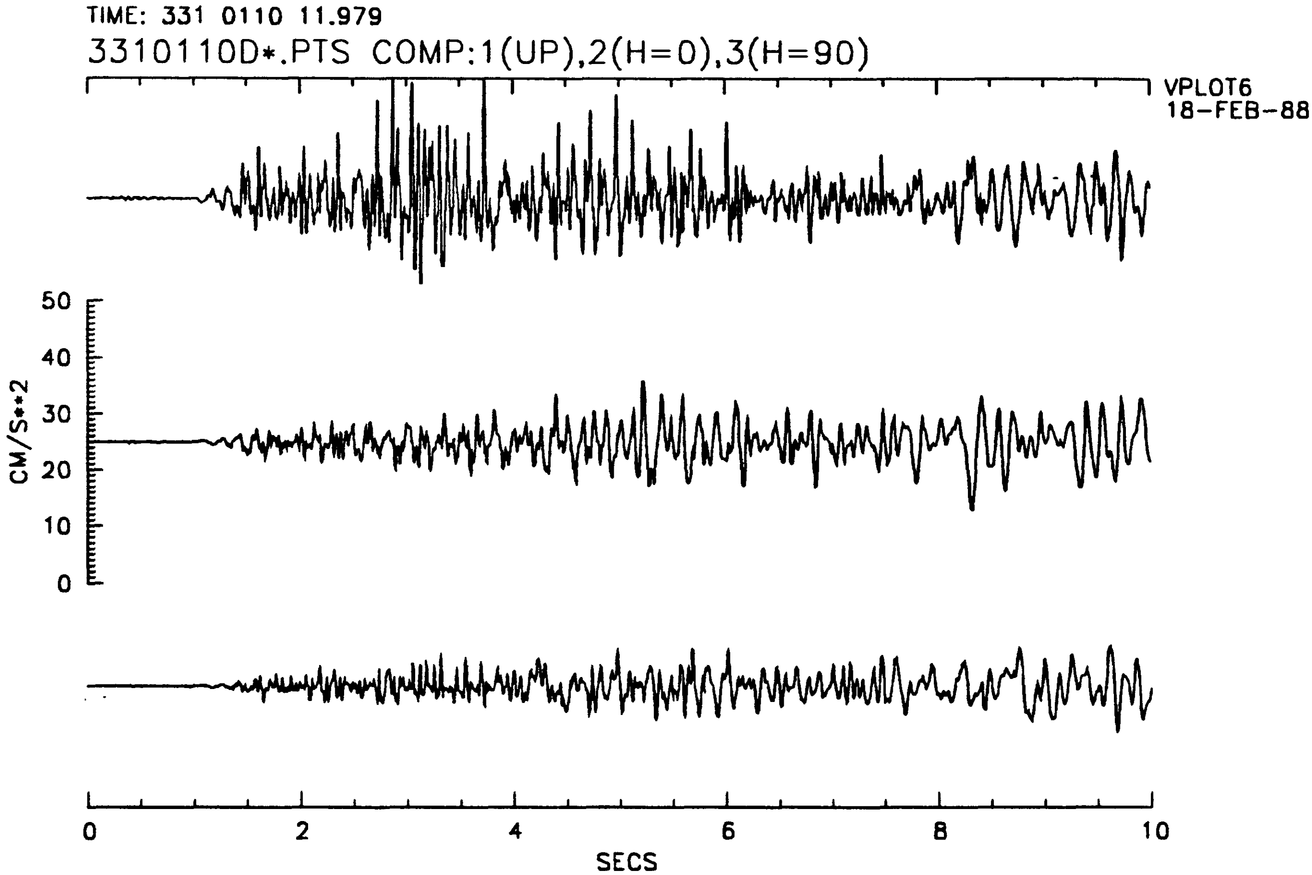
Time	Clock Event	Observed Master Clock Correction	Corrected Master Clock Correction	Comments
338 2138	Master Synch	0.0	-52.9	Clock synched to master clock when station installed.
339 0400	WWVB Synch			Clock resynched to WWVB 5 hrs after site visit.
339 2101	MC Correction	+65.4	+6.9	
340 0945	WWVB Synch			Clock resynched to WWVB 12 hrs after site visit.
340 1637	MC Correction	+61.1	-1.3	
342 1700	MC Correction	+80.8	+8.5	

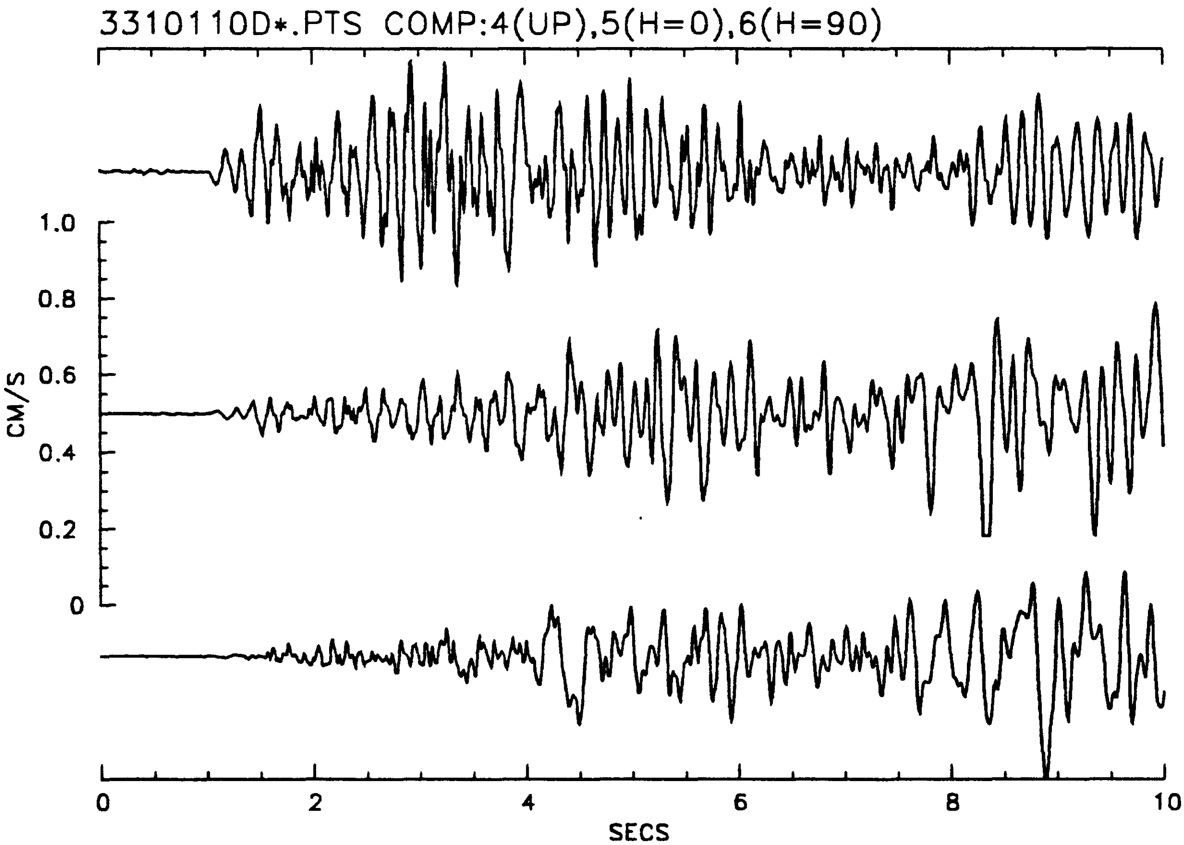


APPENDIX 2.1 Seismograms of the M=4.7 earthquake at 3310110


TIME: 331 0110 07.695
3310110C*.SUP COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
500
400
300
200
100
0
CM/S**2
0
2
4
6
8
10
SECS

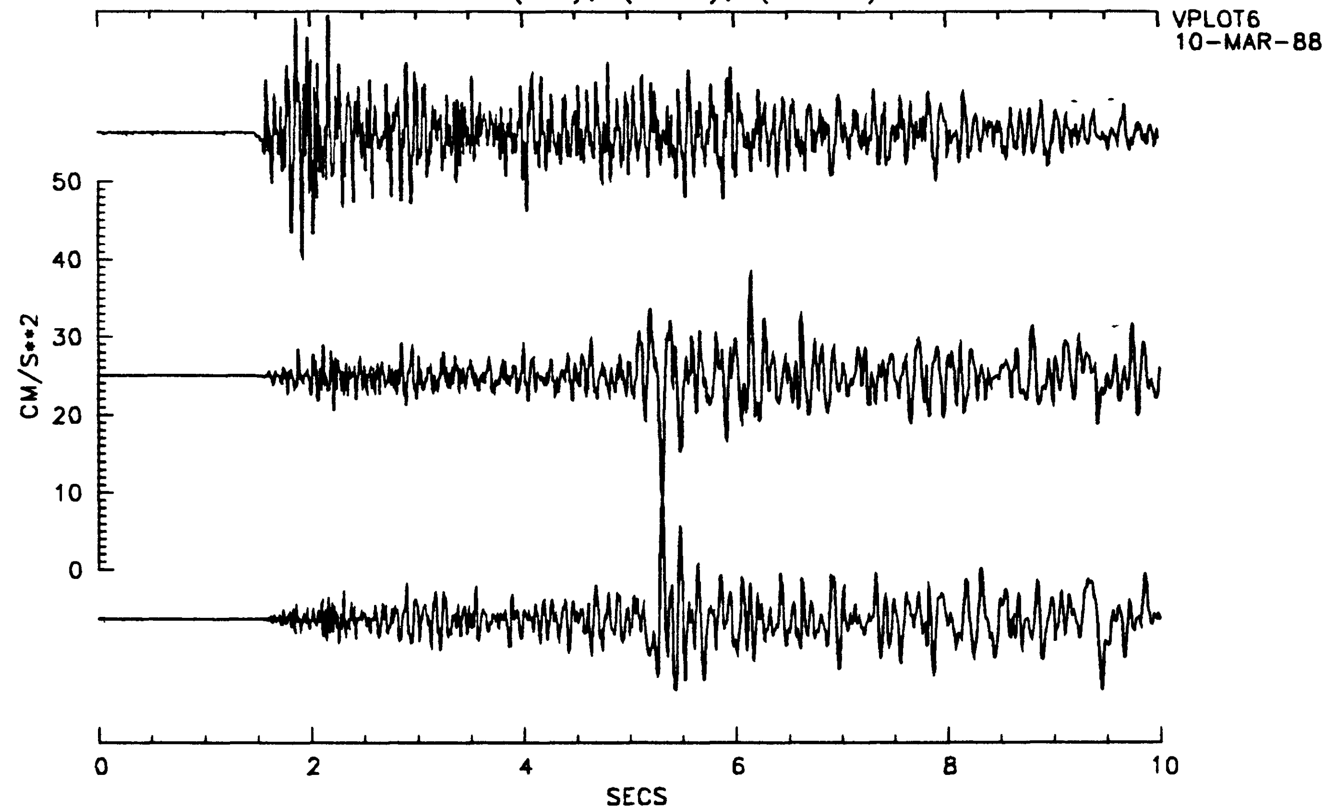

3310110C*.SUP COMP:4(UP),5(H=0),6(H=90)
1.0
0.8
0.6
0.4
0.2
0
CM/S
0
2
4
6
8
10
SECS


TIME: 331 0110 11.979
3310110D*.PTS COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
50
40
30
20
10
0
0
2
4
6
8
10
SECS

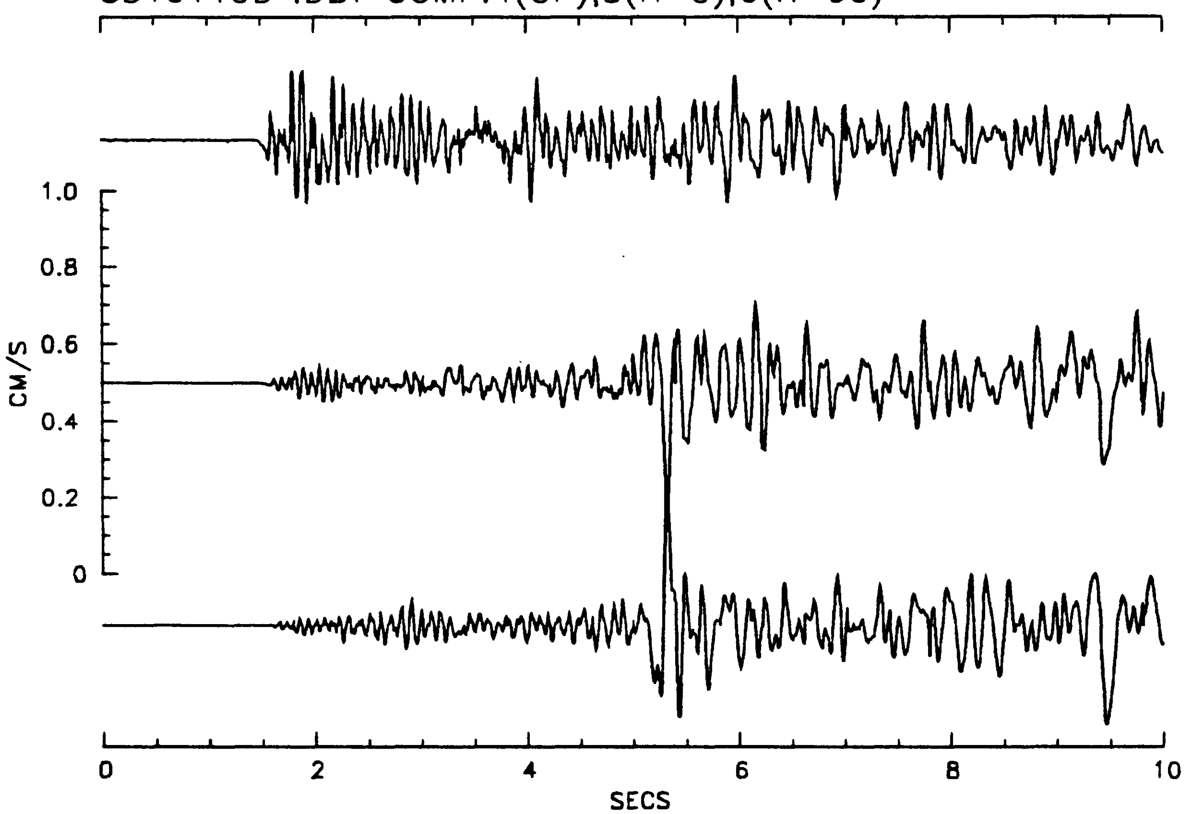

3310110D*.PTS COMP:4(UP),5(H=0),6(H=90)
CM/S
1.0
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
SECS

TIME: 331 0110 12.459

3310110D*.DBT COMP:1(UP),2(H=0),3(H=90)

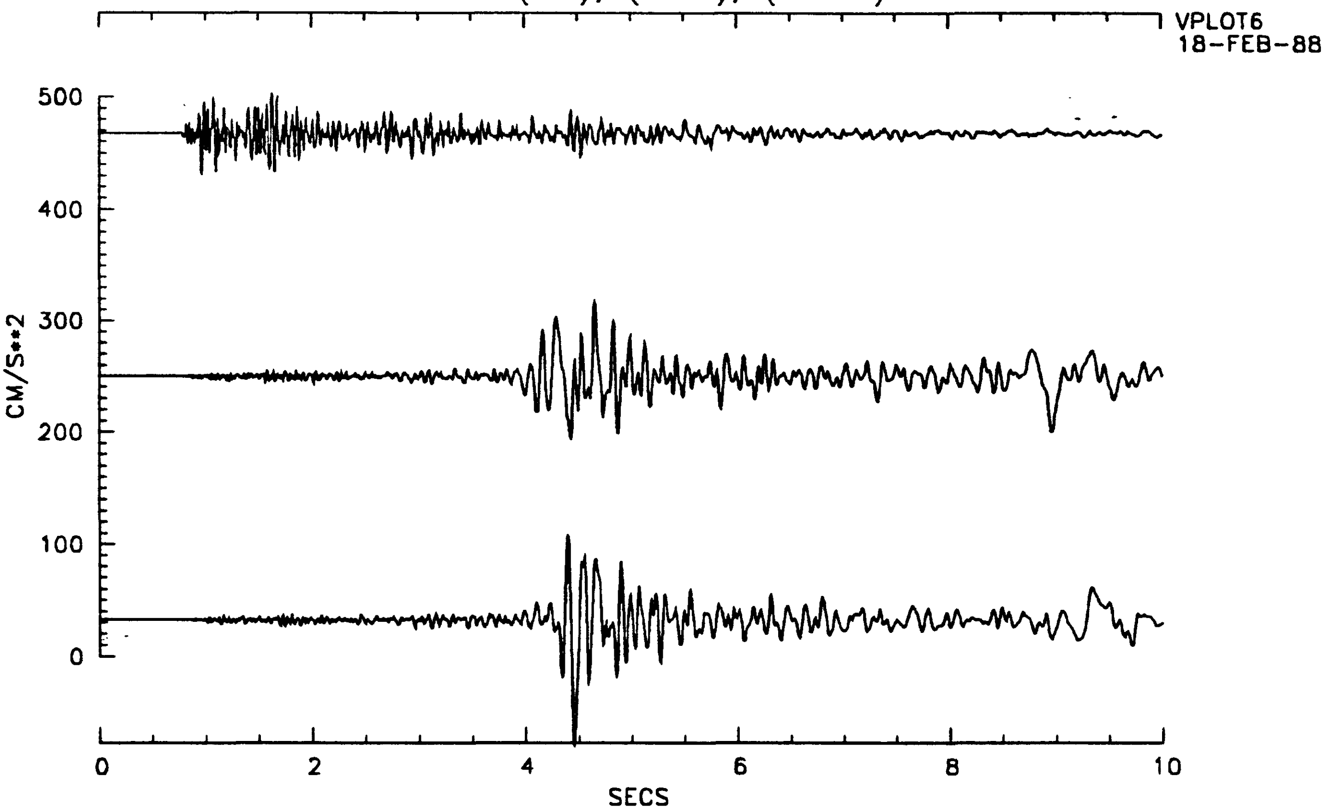


3310110D*.DBT COMP:4(UP),5(H=0),6(H=90)

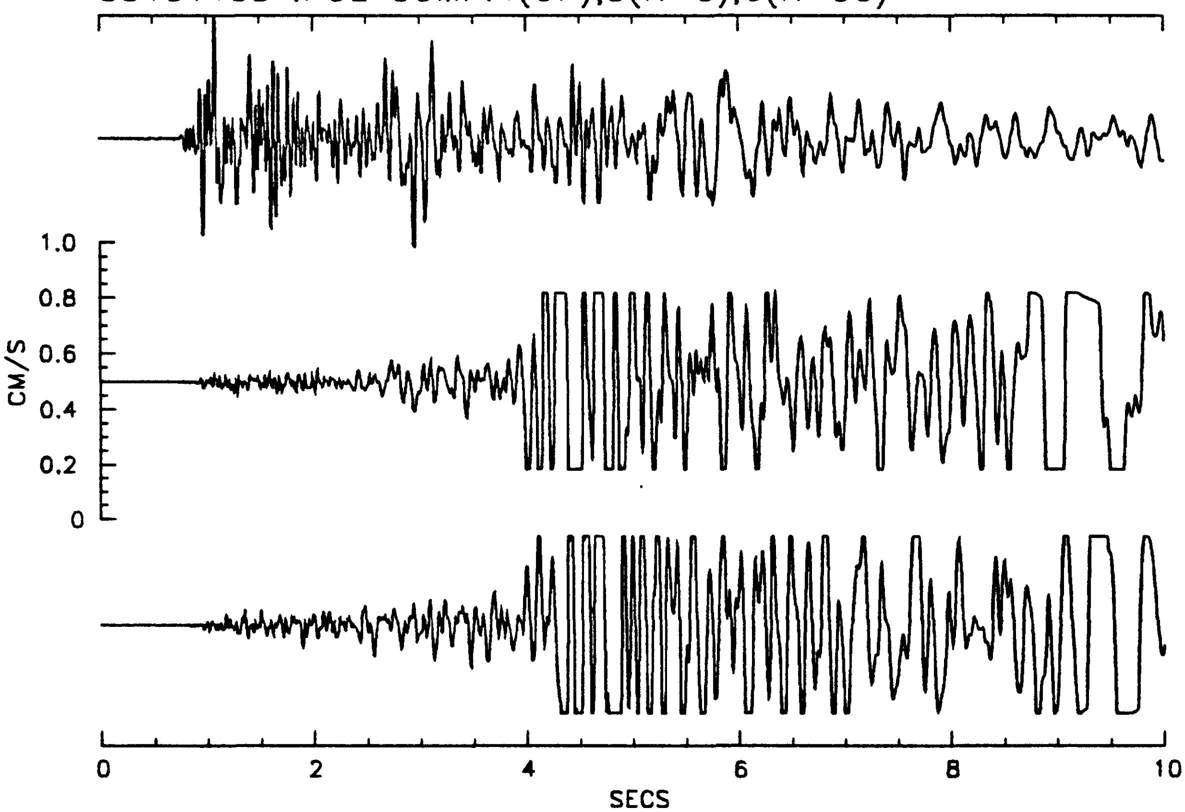


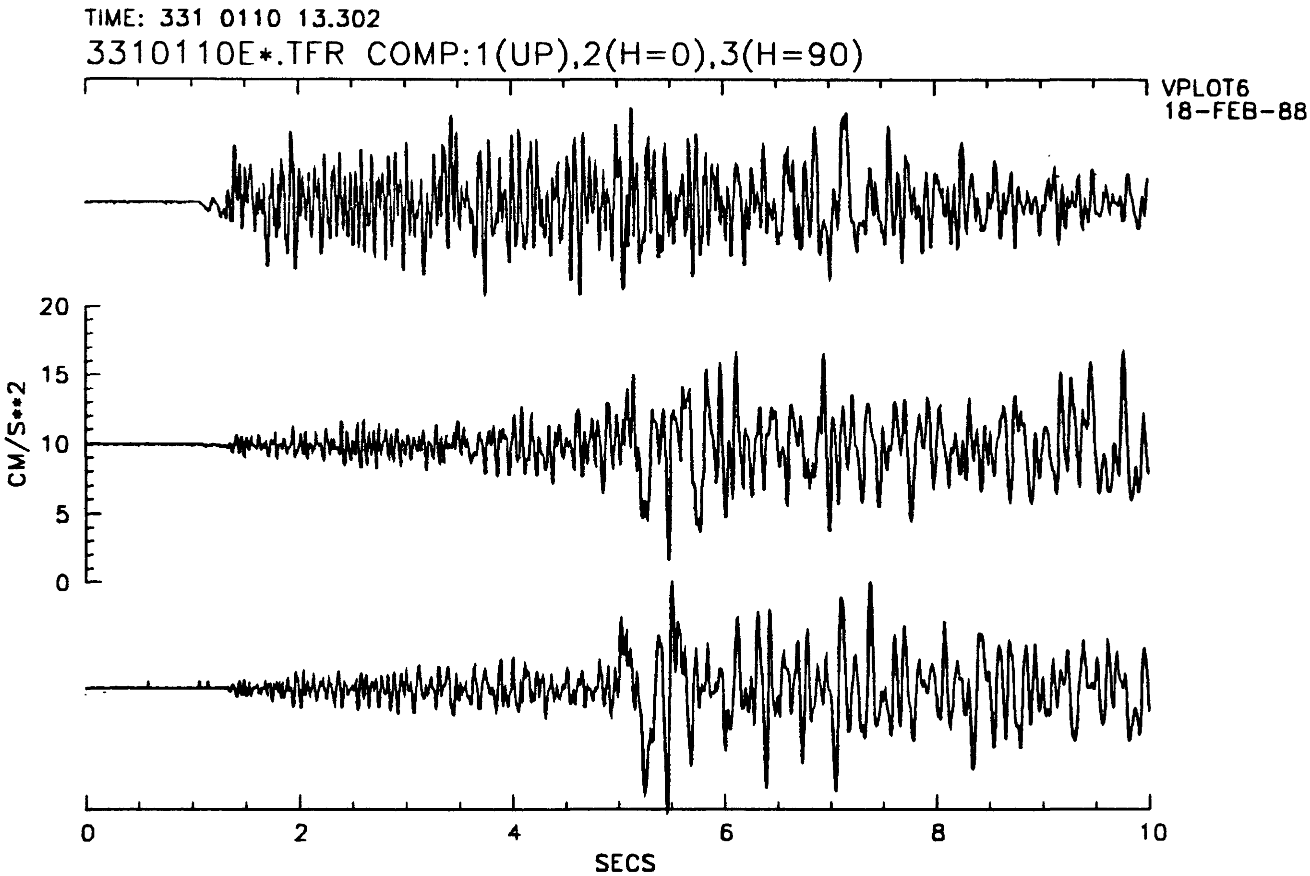
TIME: 331 0110 12.915

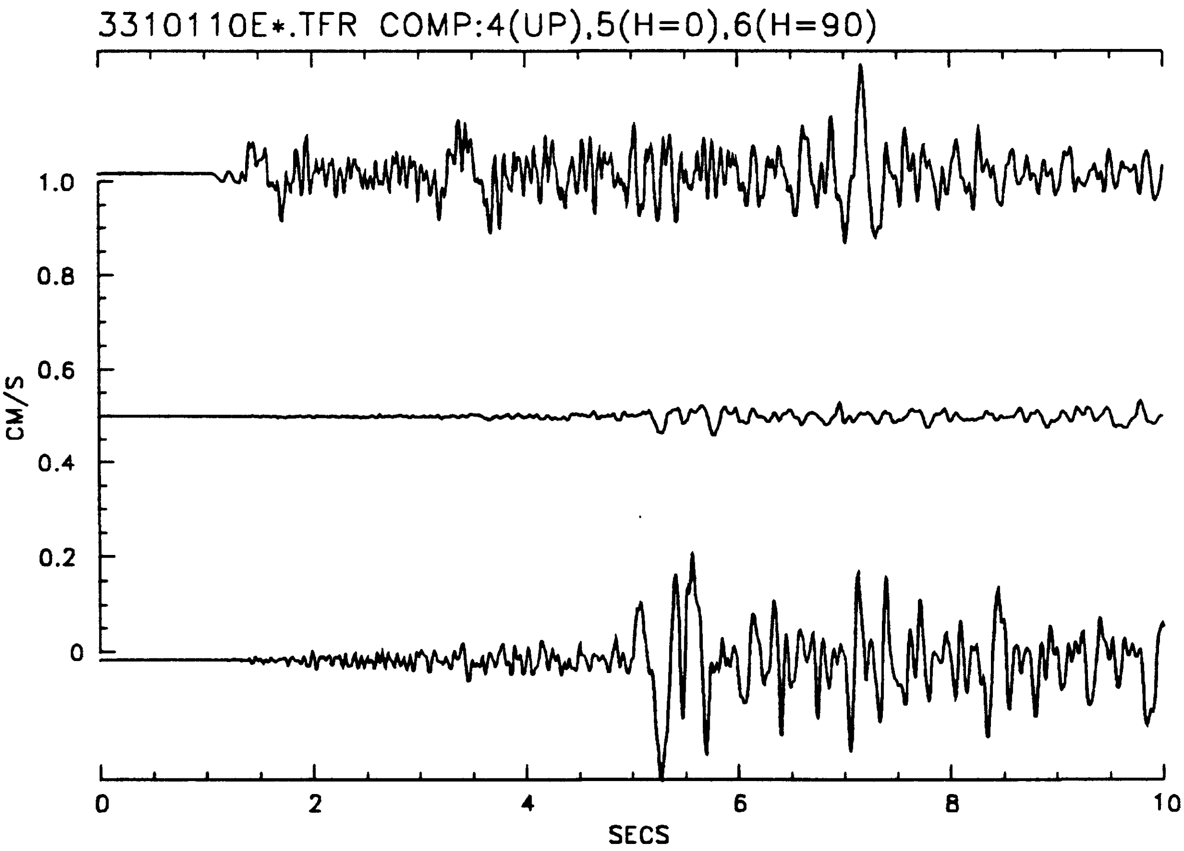
3310110D*.POE COMP:1(UP),2(H=0),3(H=90)

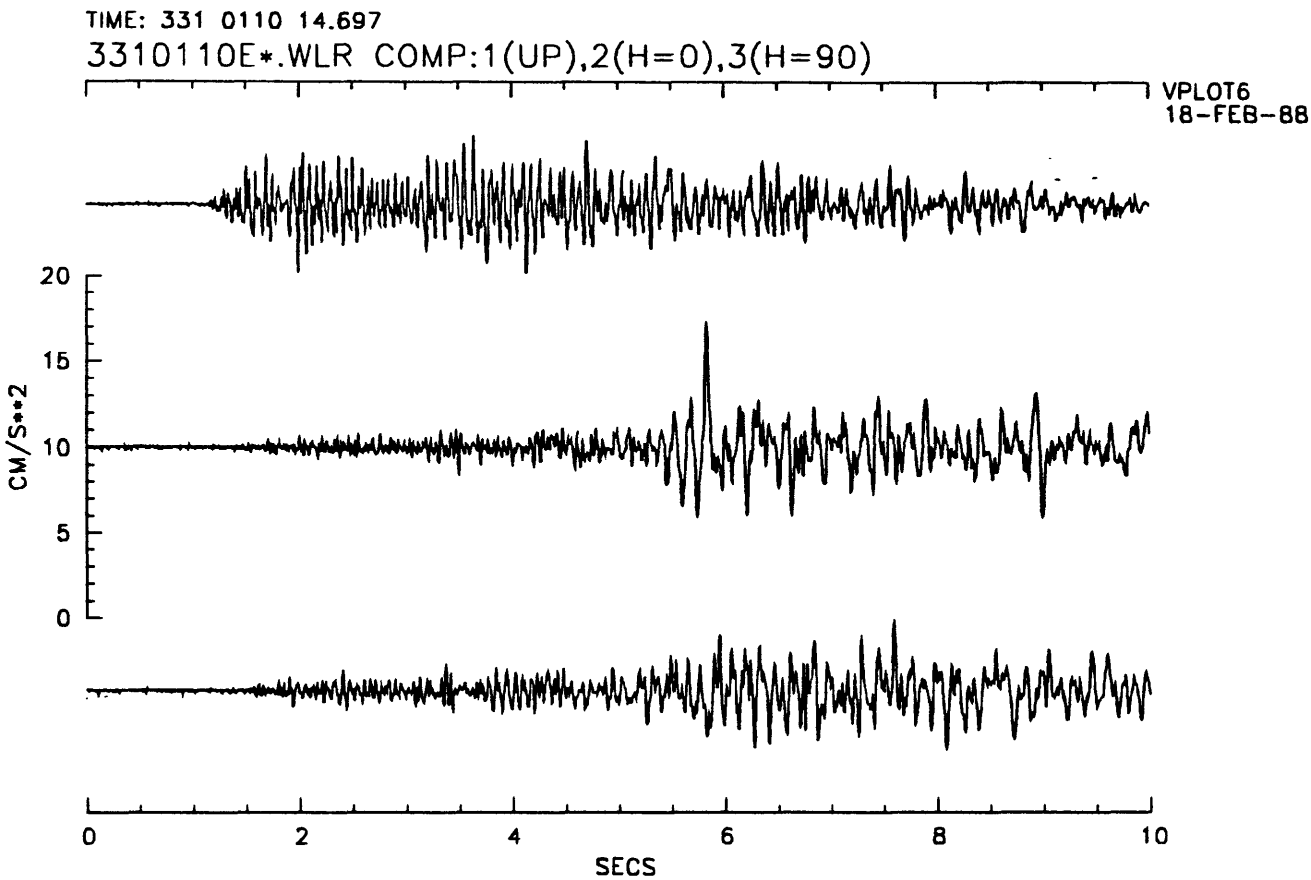


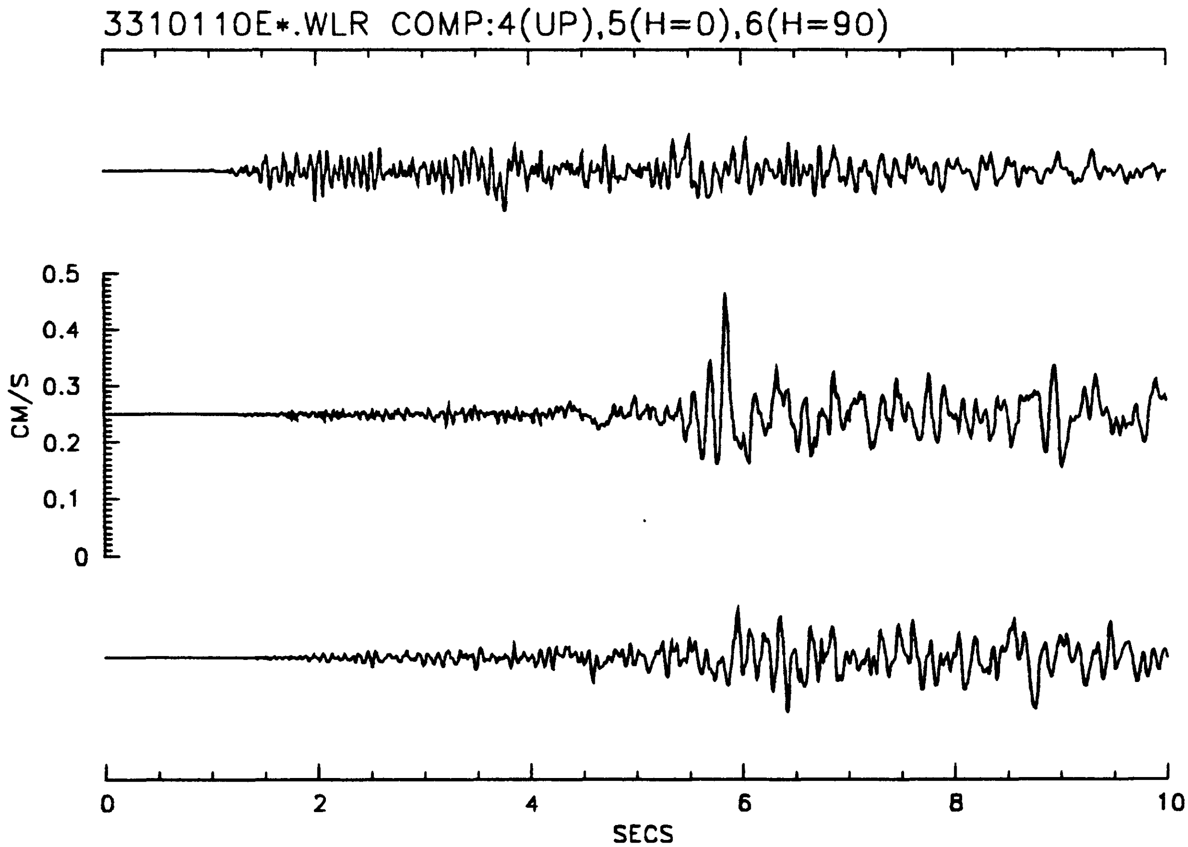
3310110D*.POE COMP:4(UP),5(H=0),6(H=90)

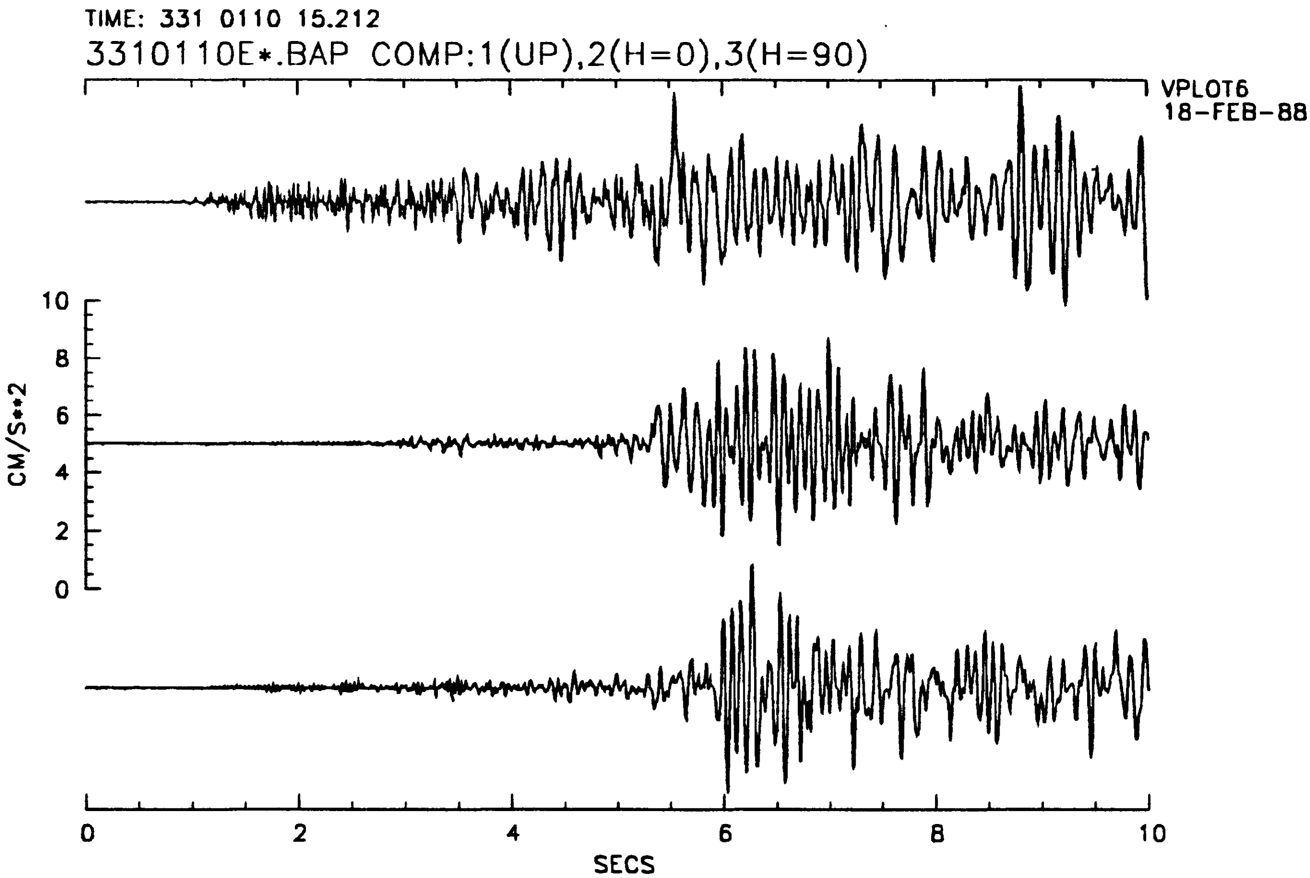


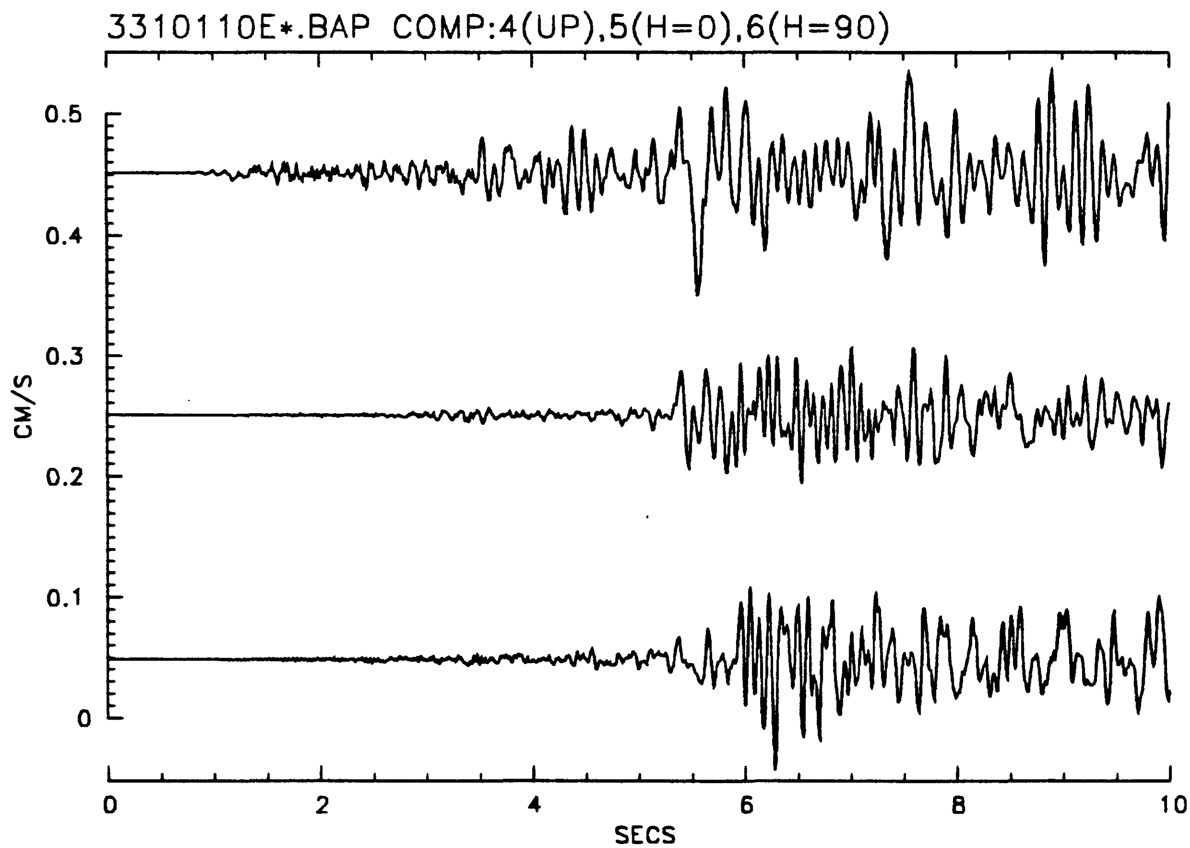

TIME: 331 0110 13.302
3310110E*.TFR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
20
15
10
5
0
CM/S**2
0
2
4
6
8
10
SECS

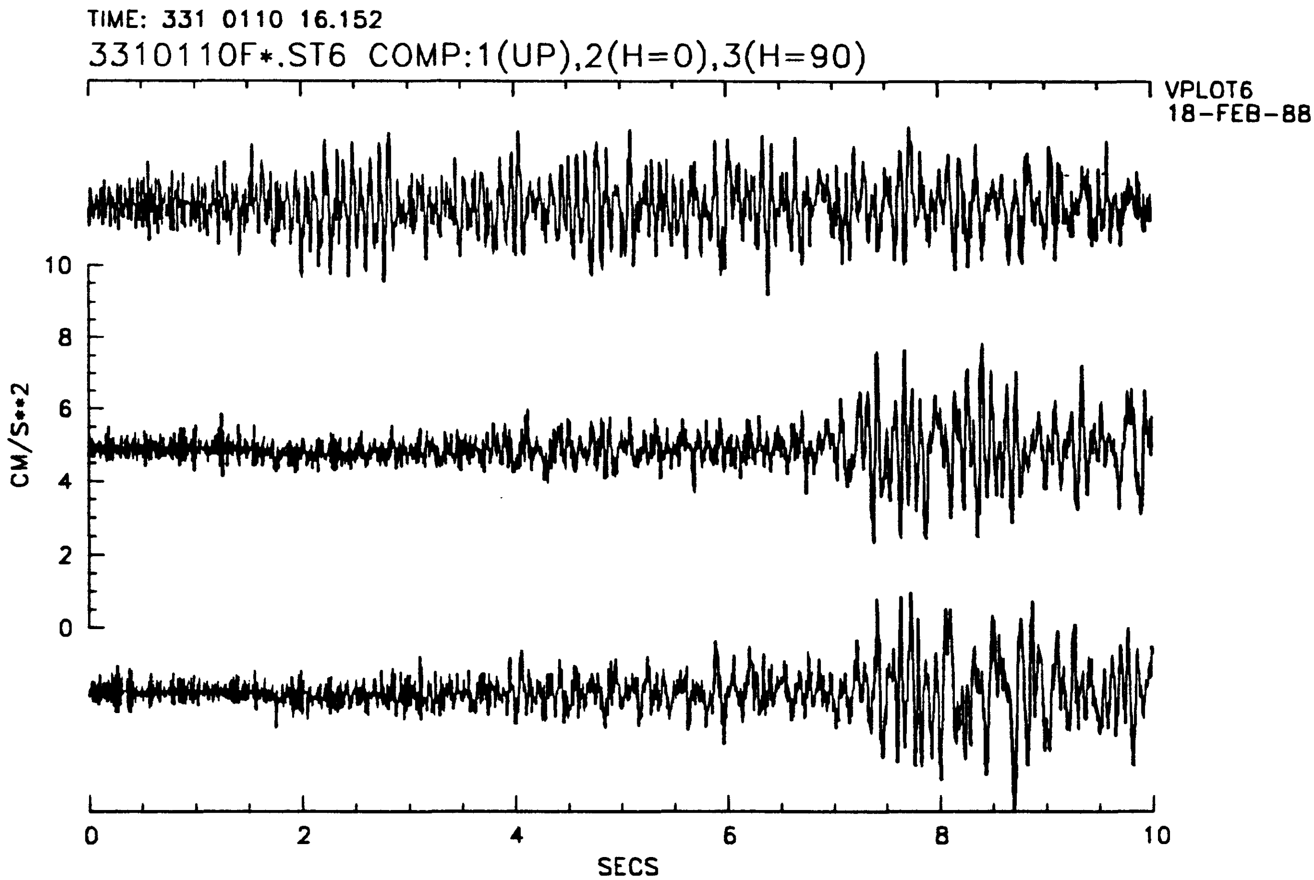

3310110E*.TFR COMP:4(UP),5(H=0),6(H=90)
1.0
0.8
0.6
0.4
0.2
0
CM/S
0
2
4
6
8
10
SECS

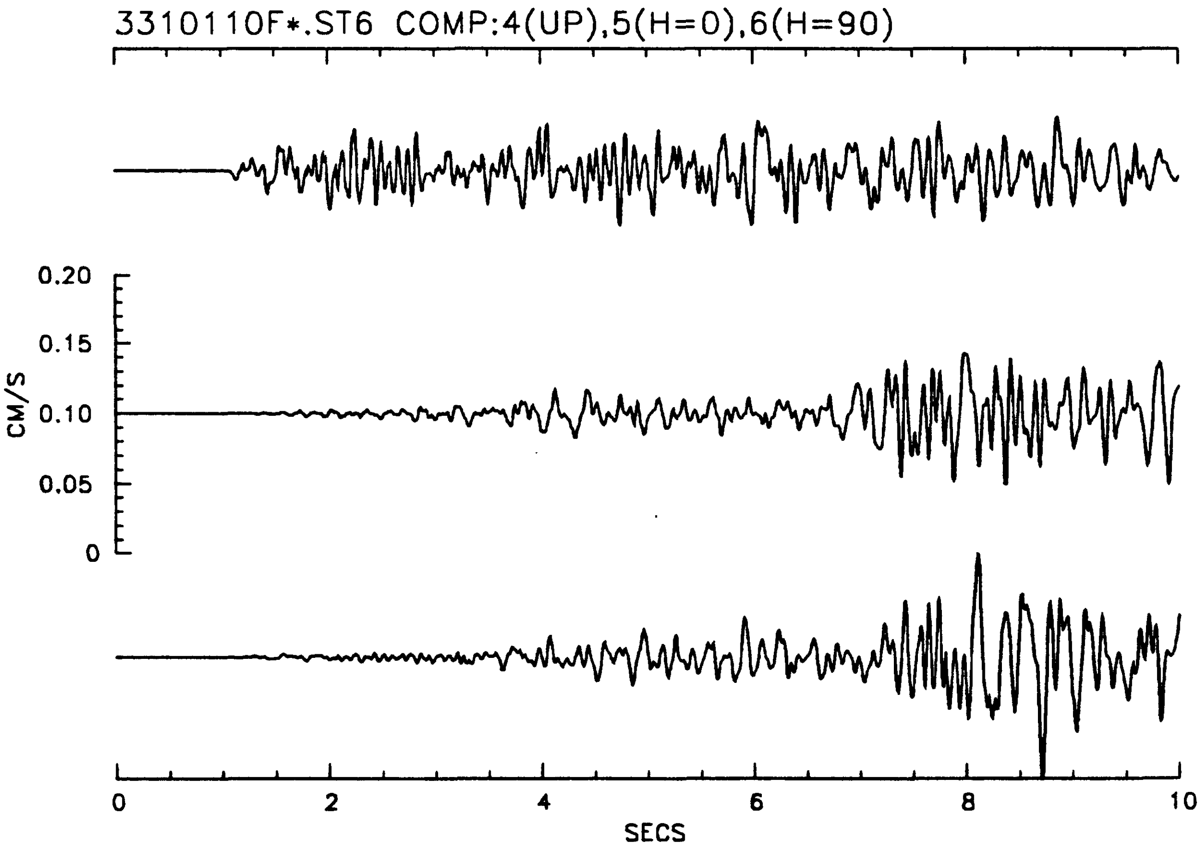

TIME: 331 0110 14.697
3310110E*.WLR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
20
15
10
5
0
0
2
4
6
8
10
SECS


3310110E*.WLR COMP:4(UP),5(H=0),6(H=90)
CM/S
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
SECS

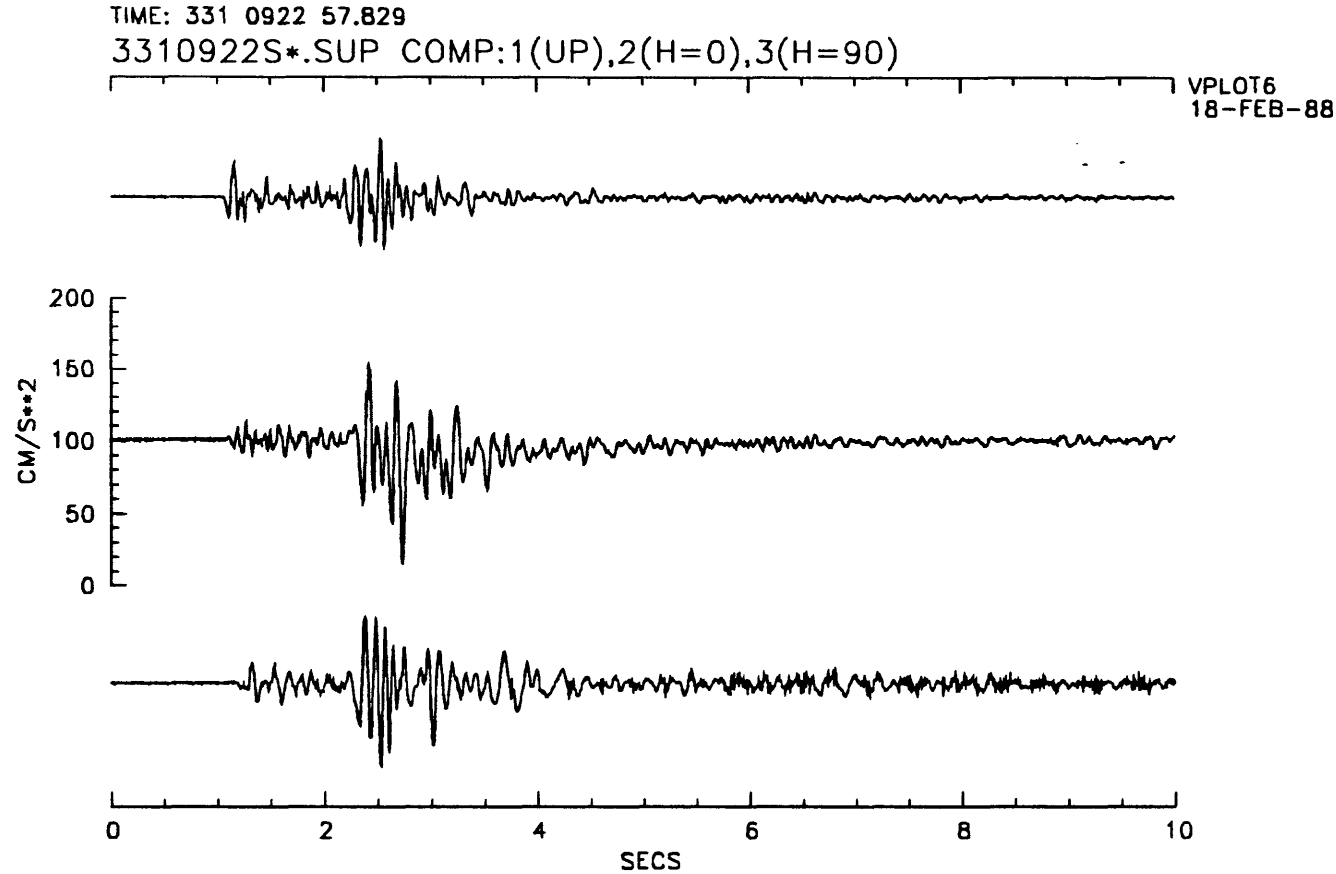

TIME: 331 0110 15.212
3310110E*.BAP COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
8
10
SECS

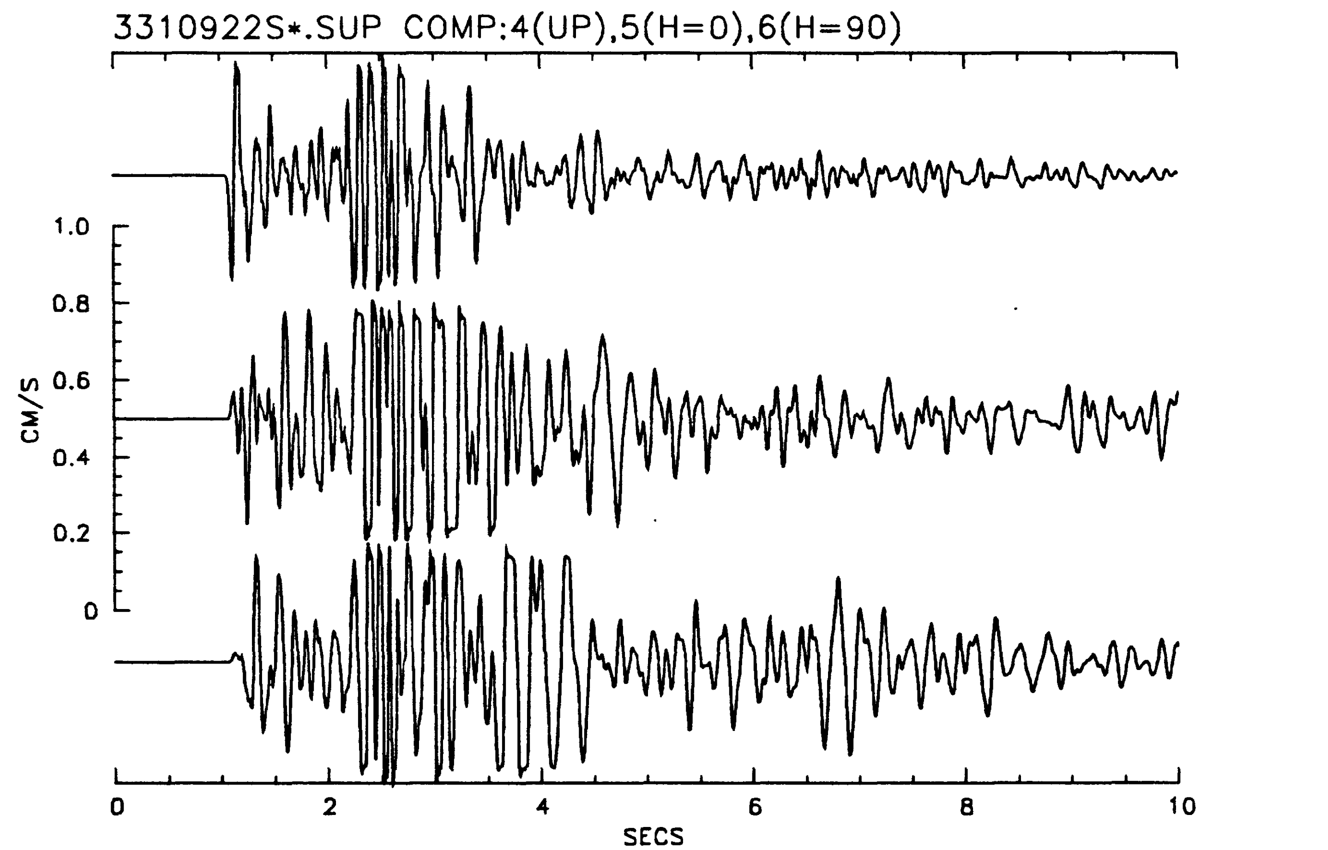

3310110E*.BAP COMP:4(UP),5(H=0),6(H=90)
CM/S
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
SECS

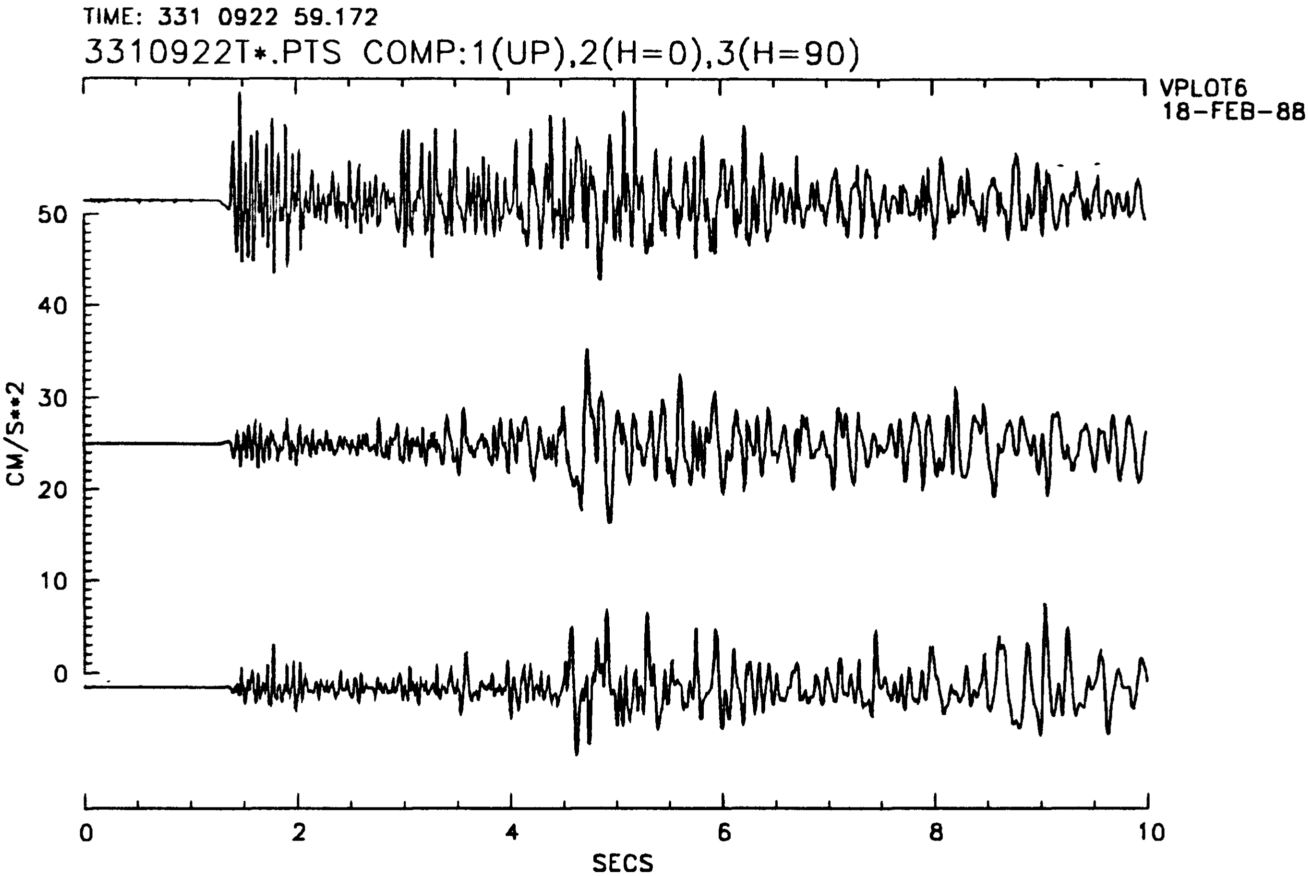

TIME: 331 0110 16.152
3310110F*.ST6 COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
8
10
SECS

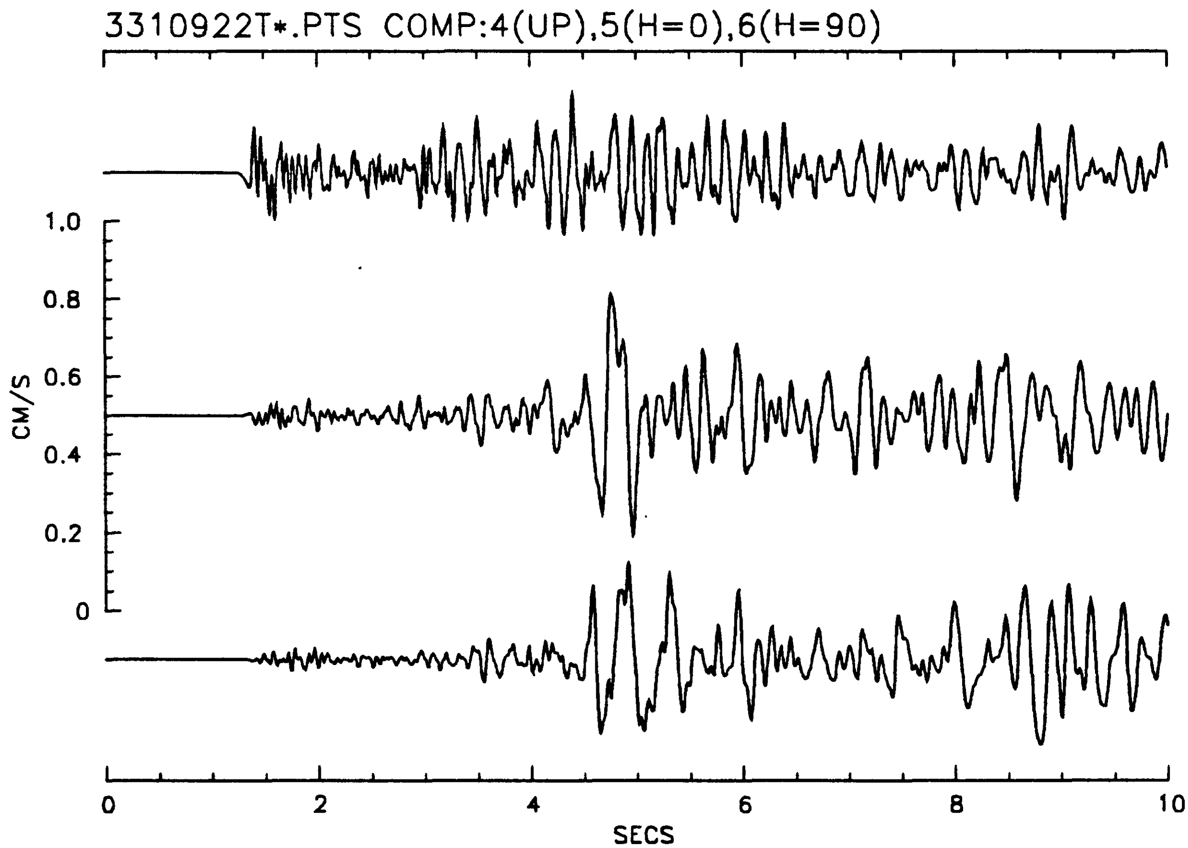

3310110F*.ST6 COMP:4(UP),5(H=0),6(H=90)
CM/S
0.20
0.15
0.10
0.05
0
0
2
4
6
8
10
SECS

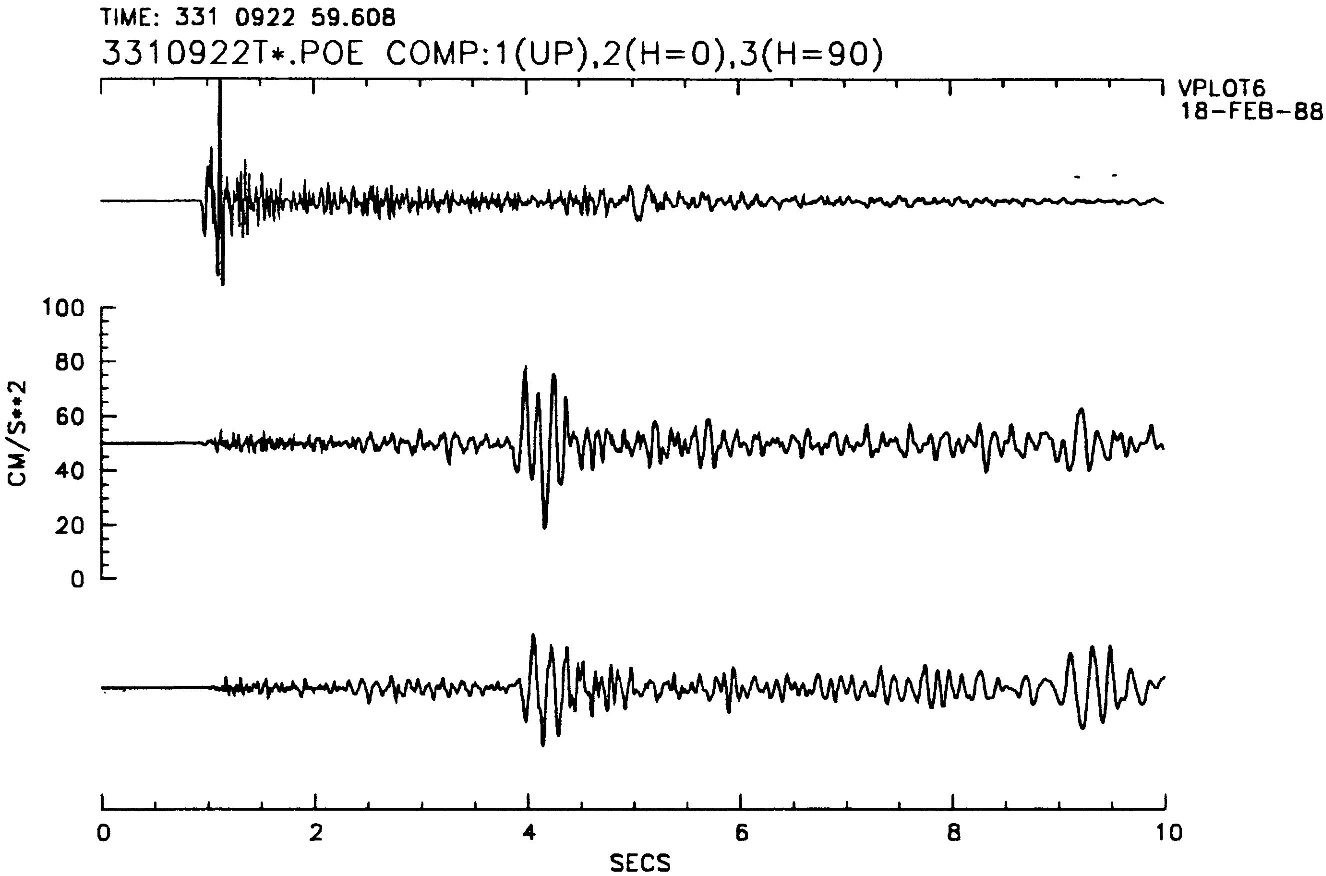
APPENDIX 2.2 Seismograms of the $M=4.1$ earthquake at 3310922

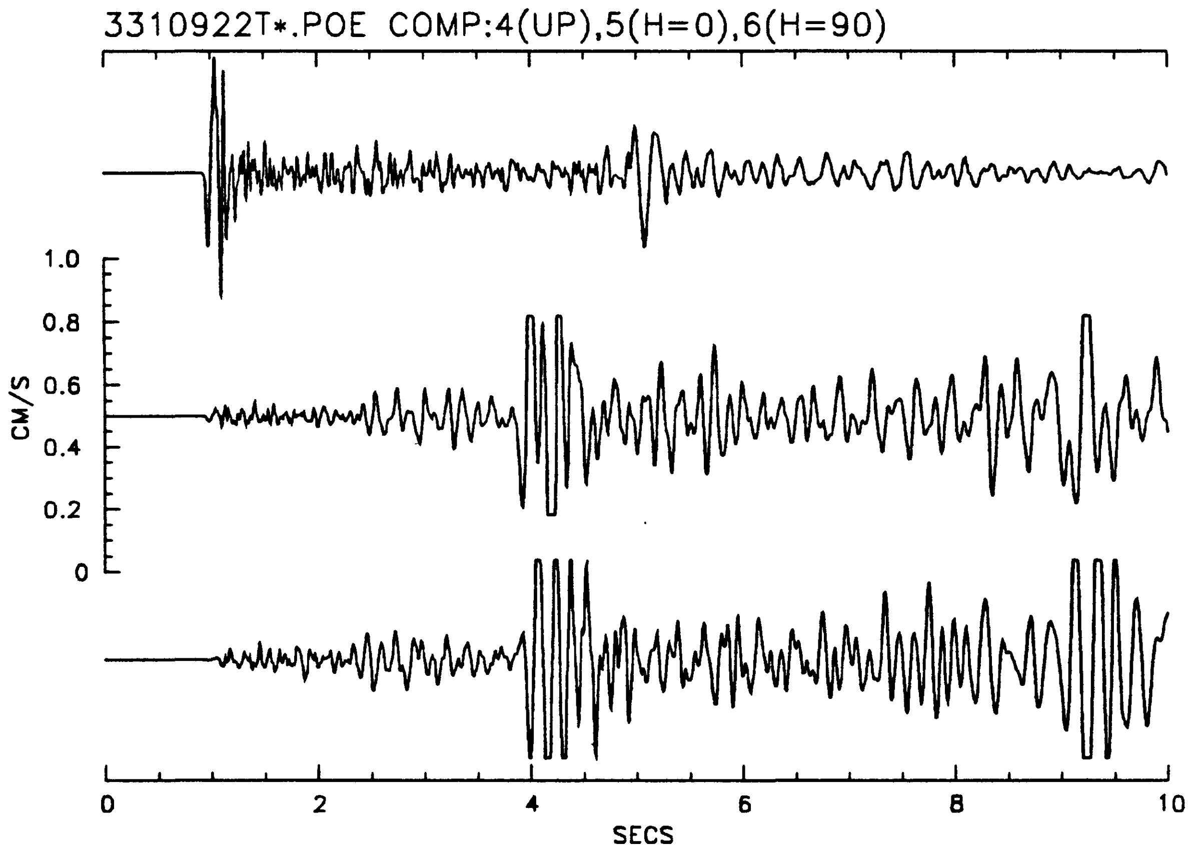

TIME: 331 0922 57.829
3310922S*.SUP COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
200
150
100
50
0
CM/S**2
0
2
4
6
8
10
SECS


3310922S*.SUP COMP:4(UP),5(H=0),6(H=90)
1.0
0.8
0.6
0.4
0.2
0
CM/S
0
2
4
6
8
10
SECS

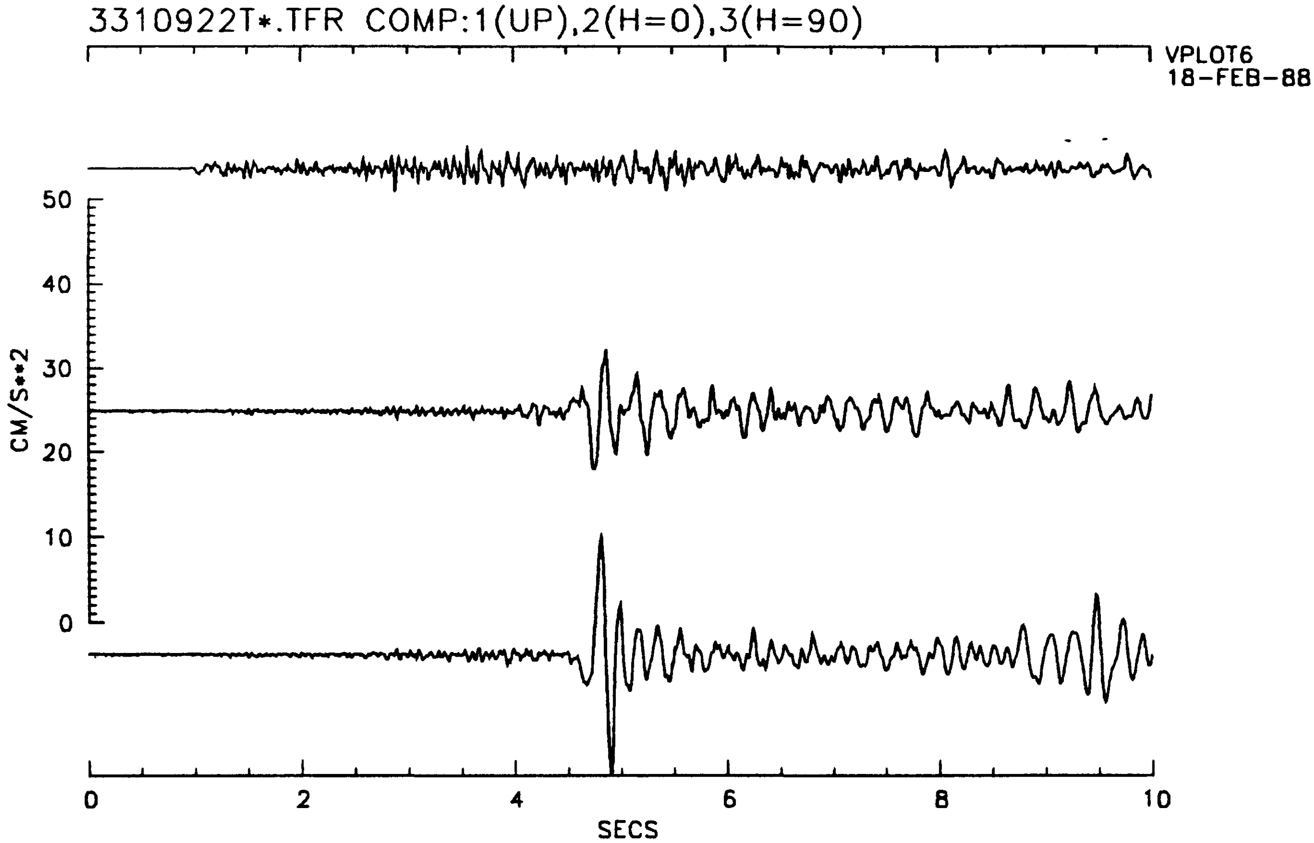

TIME: 331 0922 59.172
3310922T*.PTS COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
50
40
30
20
10
0
CM/S**2
0
2
4
6
8
10
SECS

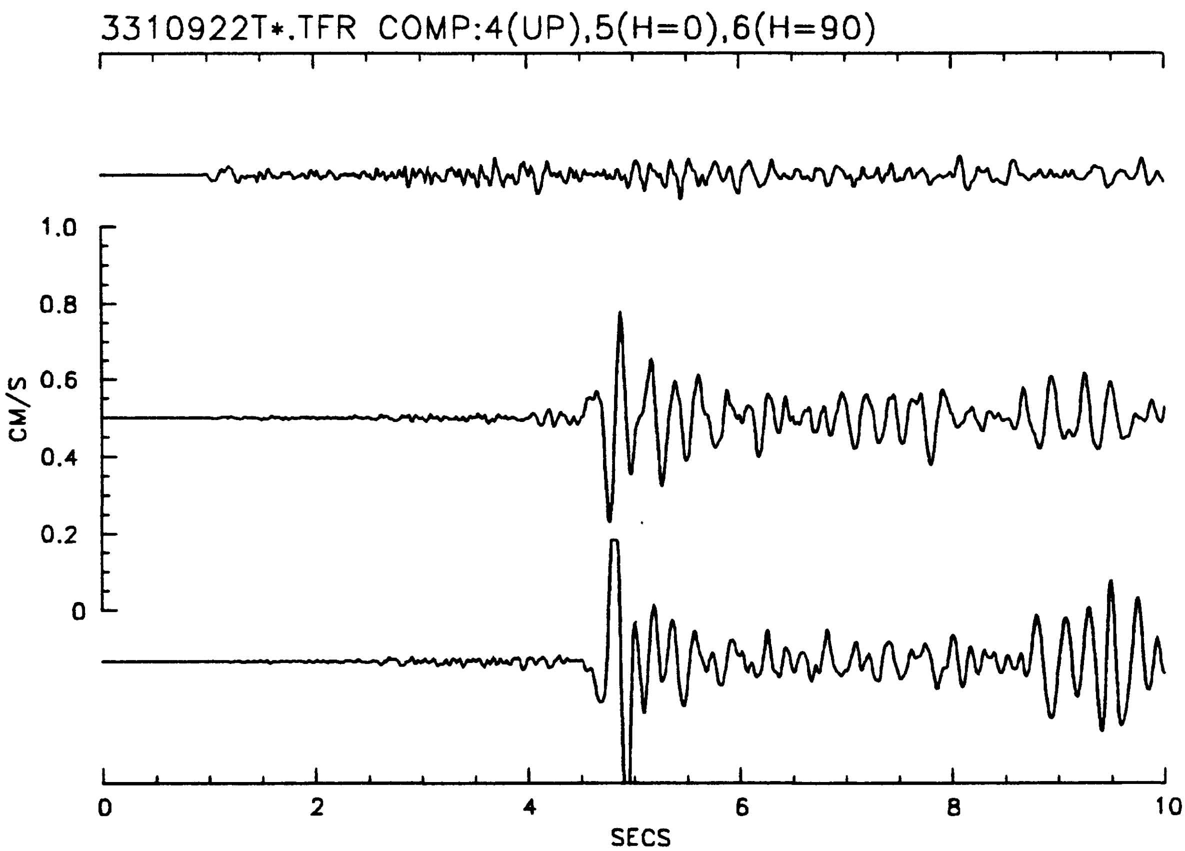

3310922T*.PTS COMP:4(UP),5(H=0),6(H=90)
1.0
0.8
0.6
0.4
0.2
0
CM/S
0
2
4
6
8
10
SECS

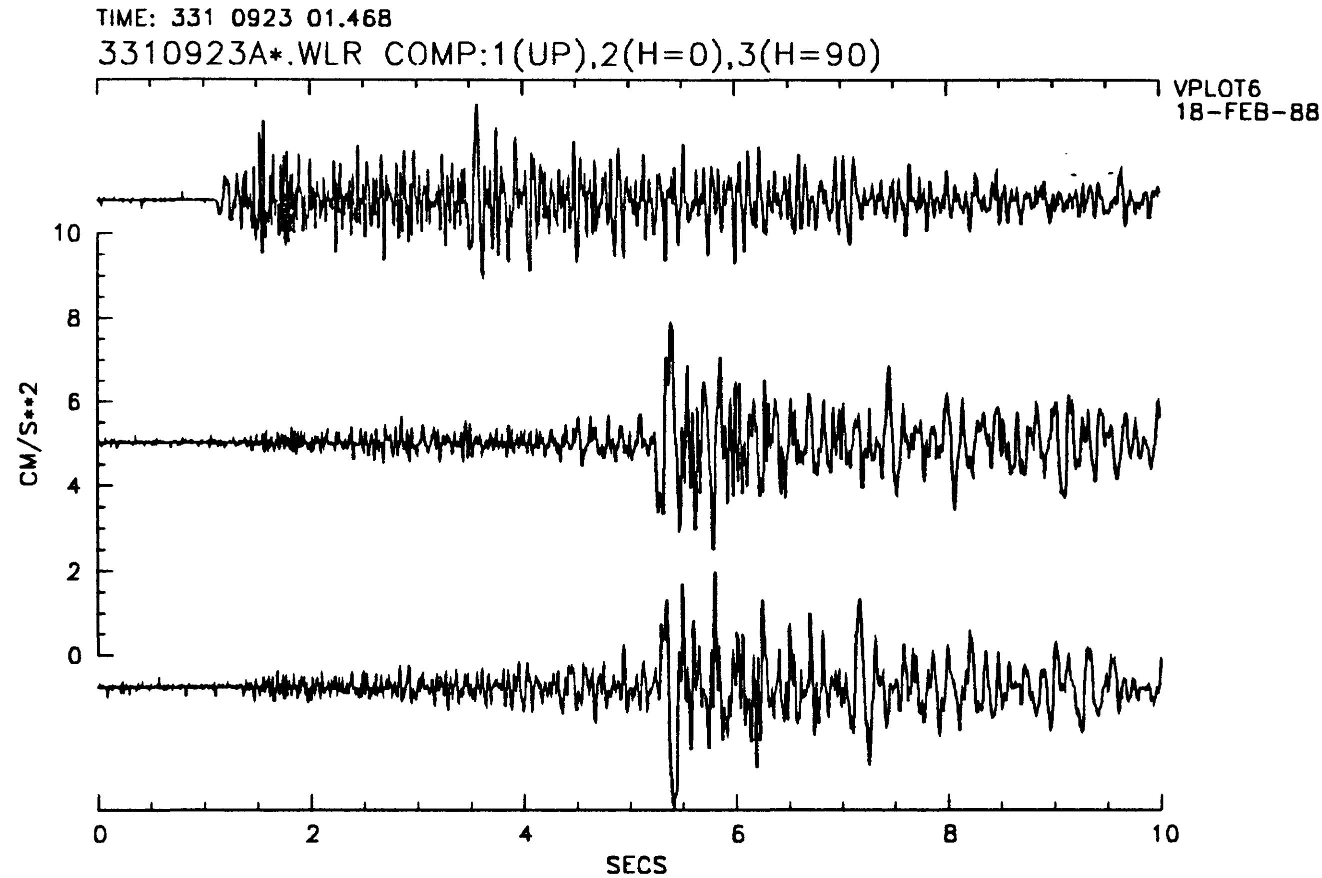

TIME: 331 0922 59.608
3310922T*.POE COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
100
80
60
40
20
0
CM/S**2
0
2
4
6
8
10
SECS


3310922T*.POE COMP:4(UP),5(H=0),6(H=90)
1.0
0.8
0.6
0.4
0.2
0
CM/S
0
2
4
6
8
10
SECS

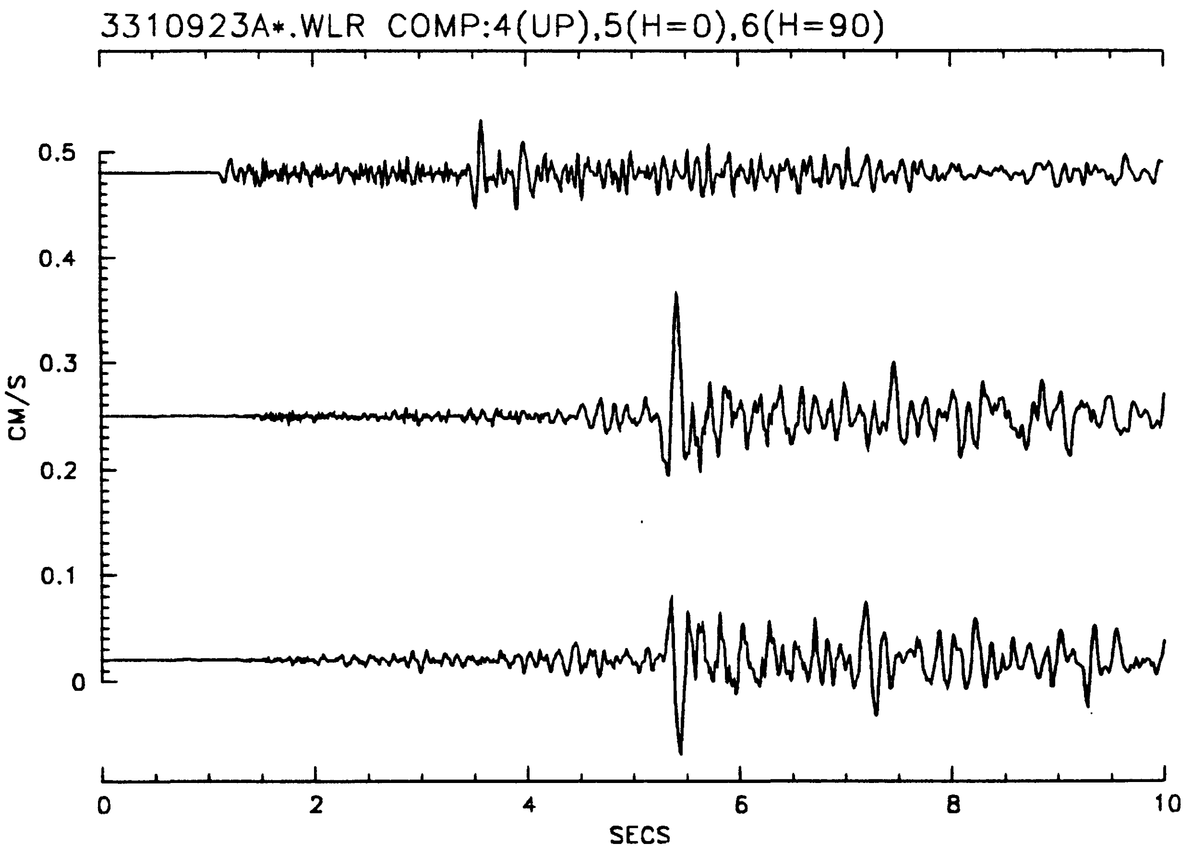
TIME: 331 0923 00.495







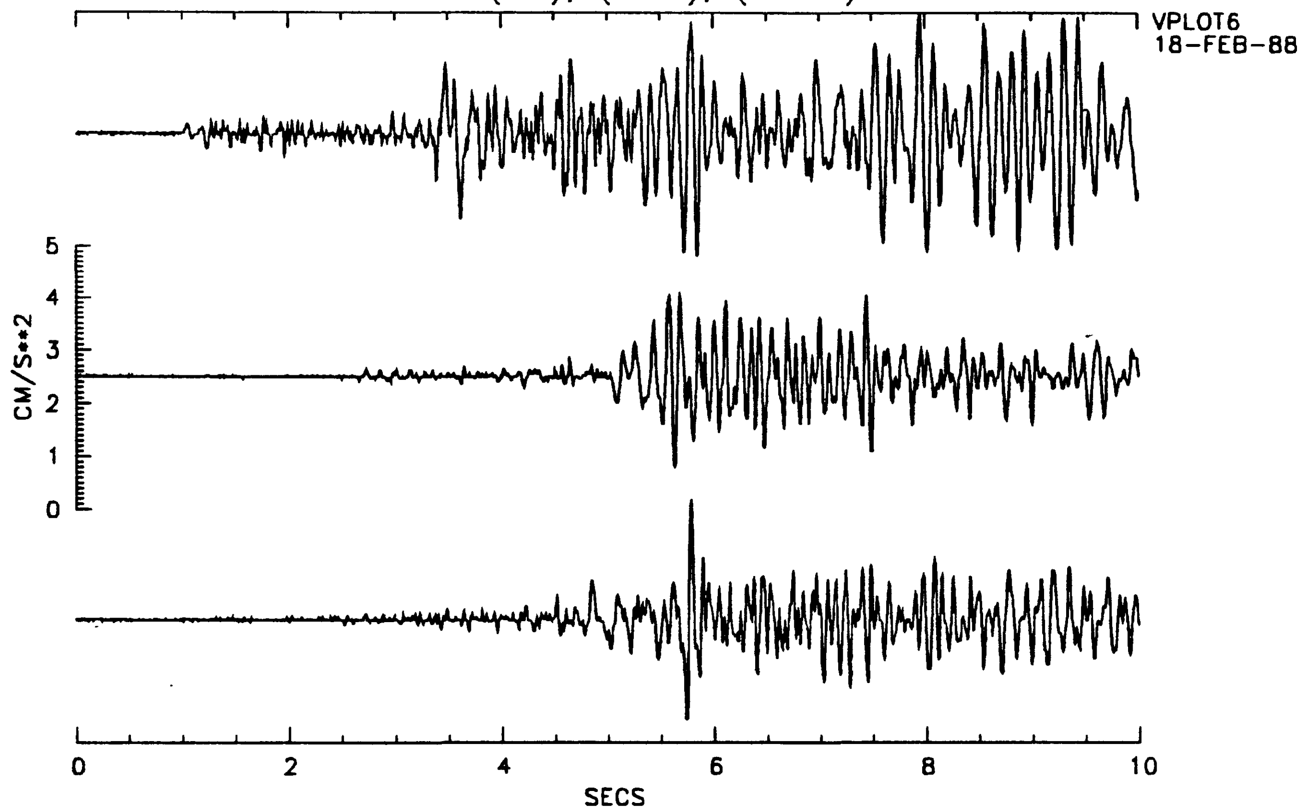
TIME: 331 0923 01.468
3310923A*.WLR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
0
2
4
6
8
10
SECS



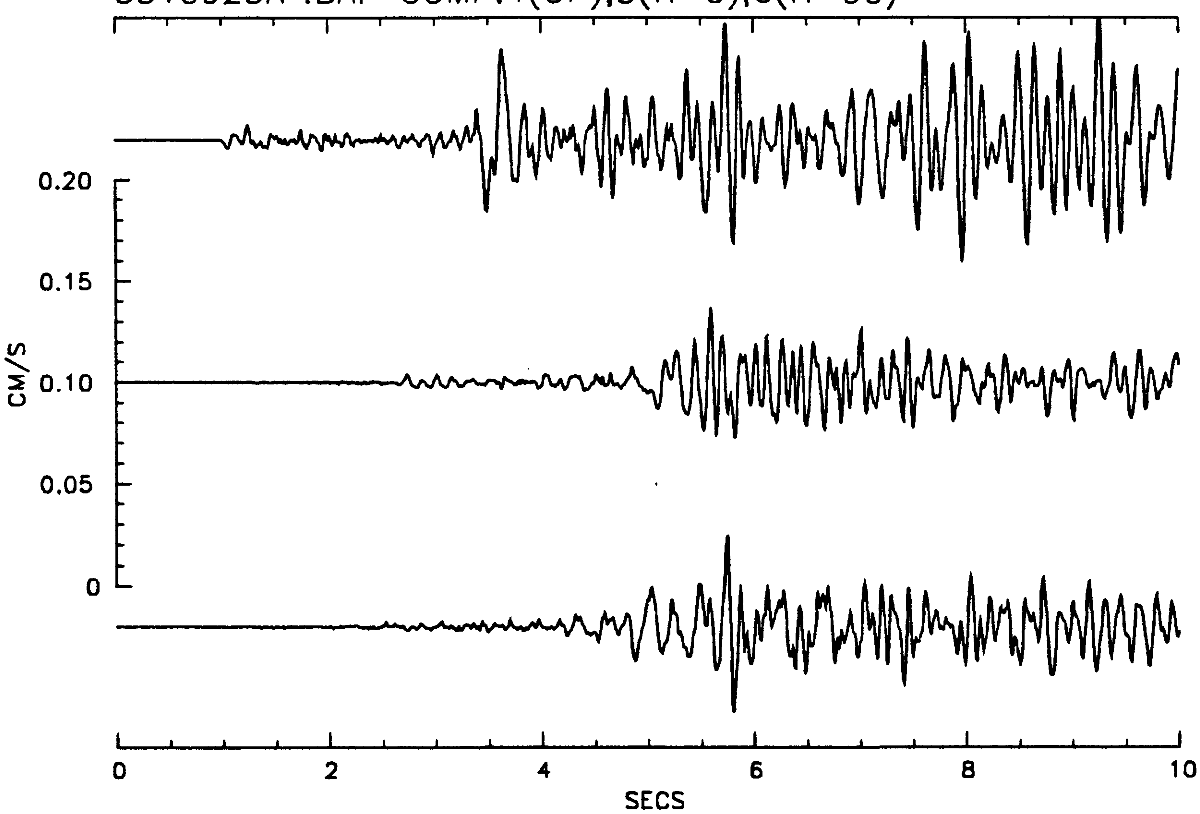
3310923A*.WLR COMP:4(UP),5(H=0),6(H=90)
CM/S
0
0.1
0.2
0.3
0.4
0.5
SECS

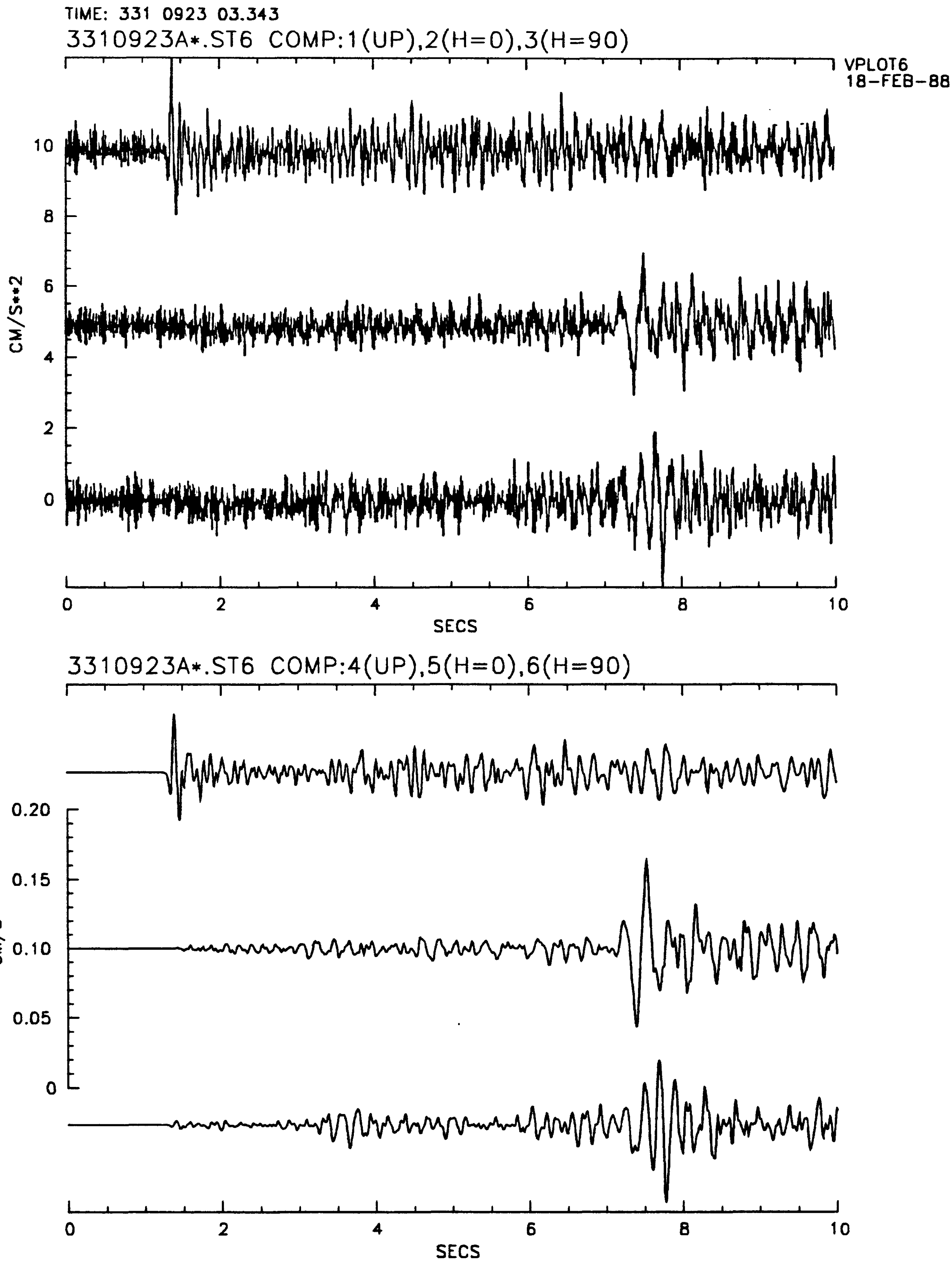
TIME: 331 0923 01.989

3310923A*.BAP COMP:1(UP),2(H=0),3(H=90)



3310923A*.BAP COMP:4(UP),5(H=0),6(H=90)





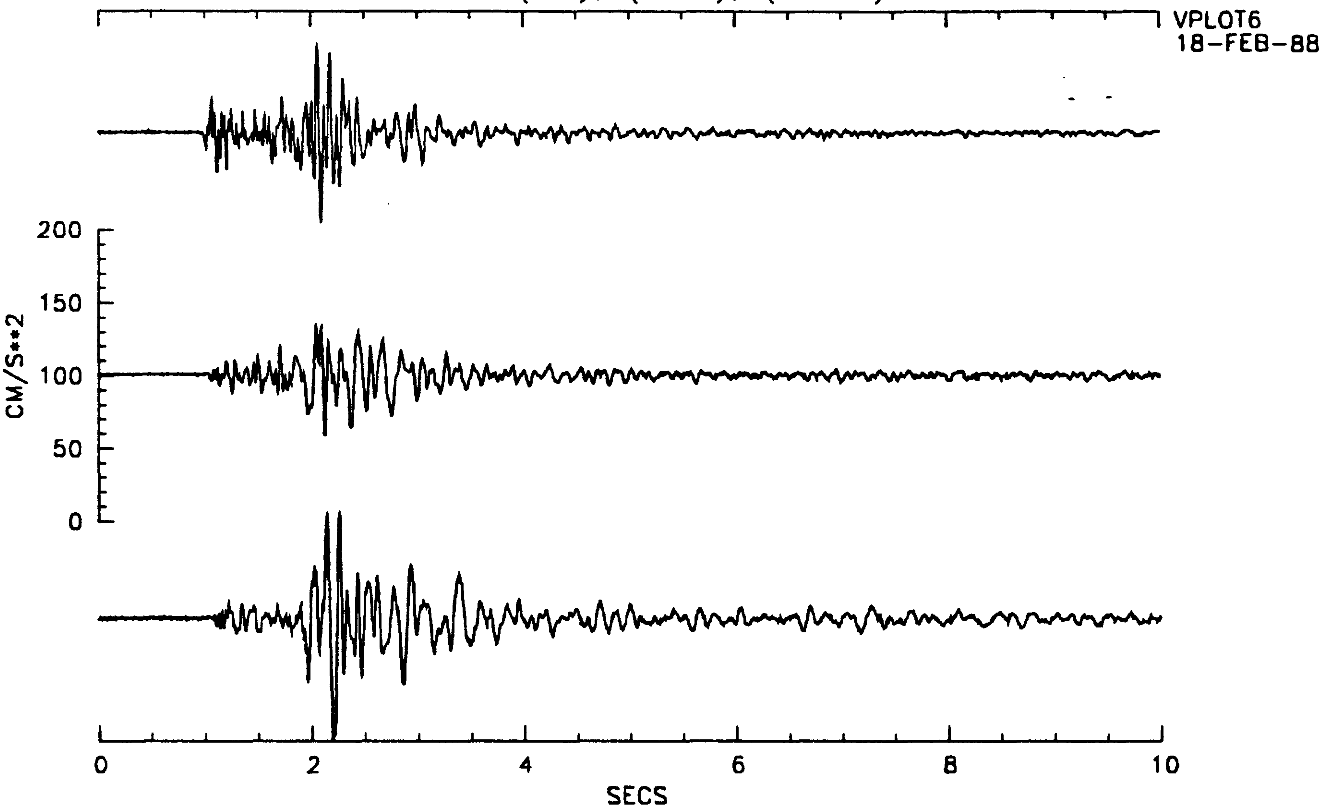
TIME: 331 0923 03.343
3310923A*.ST6 COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
8
10
SECS
3310923A*.ST6 COMP:4(UP),5(H=0),6(H=90)
CM/S
0.20
0.15
0.10
0.05
0
0
2
4
6
8
10
SECS

APPENDIX 2.3 Seismograms of the M=4.2 earthquake

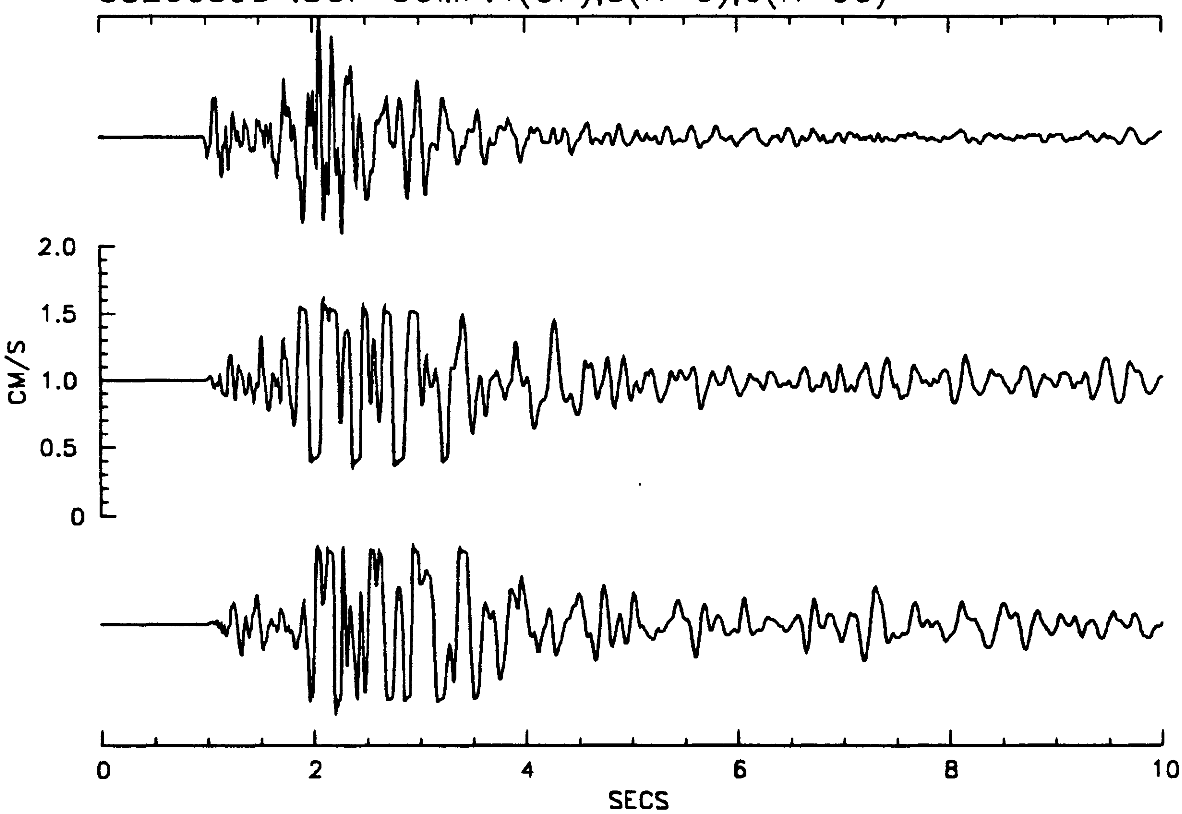
at 3320039

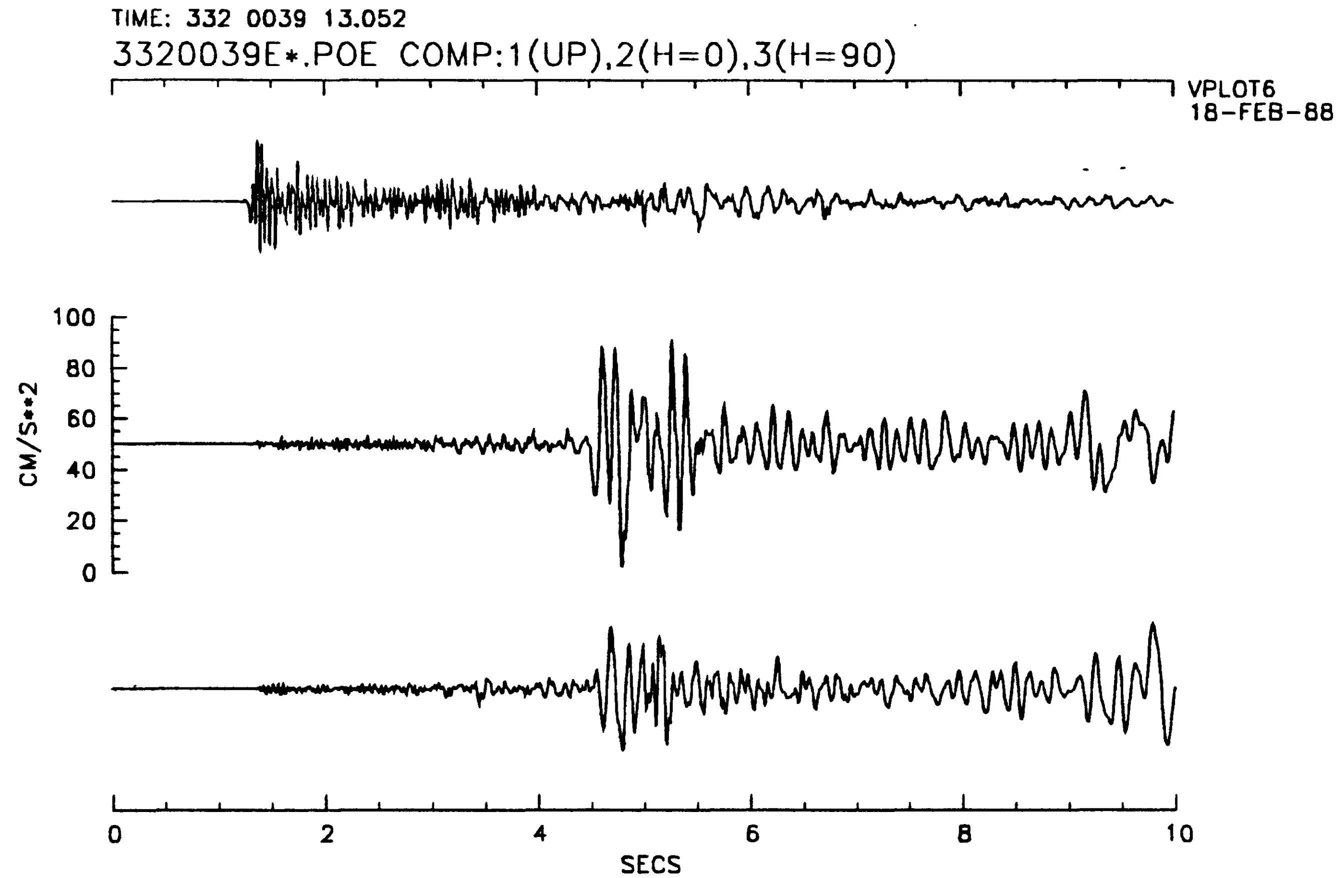
TIME: 332 0039 10.803

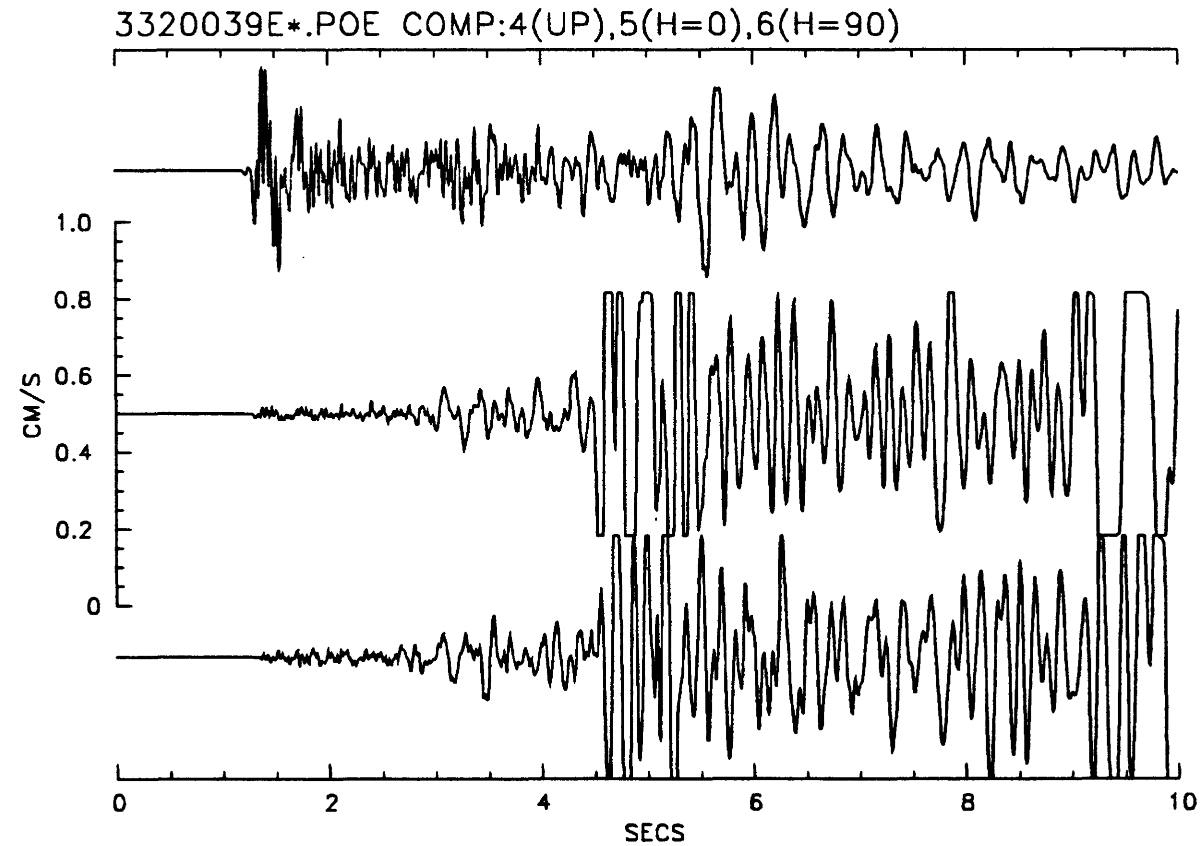
3320039D*.SUP COMP:1(UP),2(H=0),3(H=90)

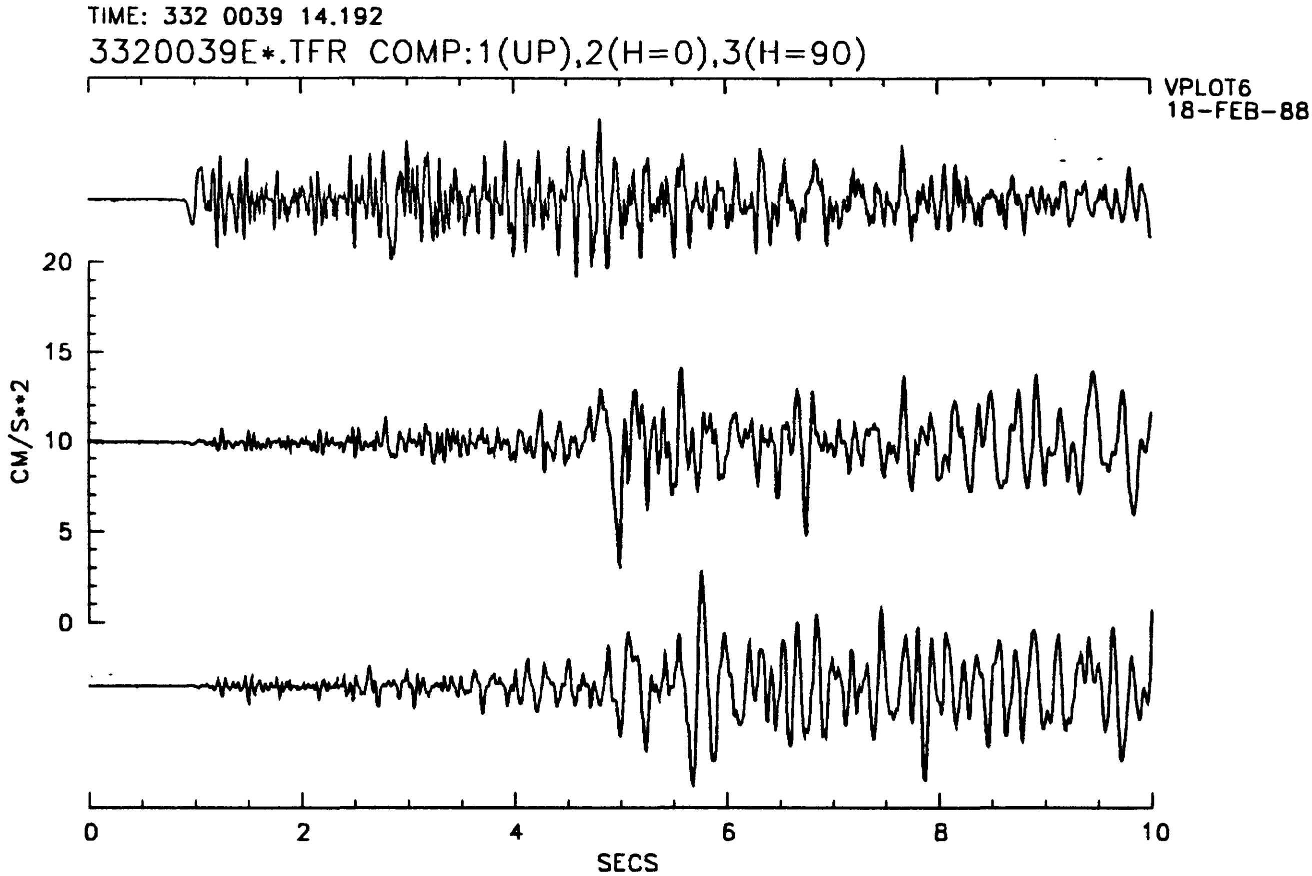


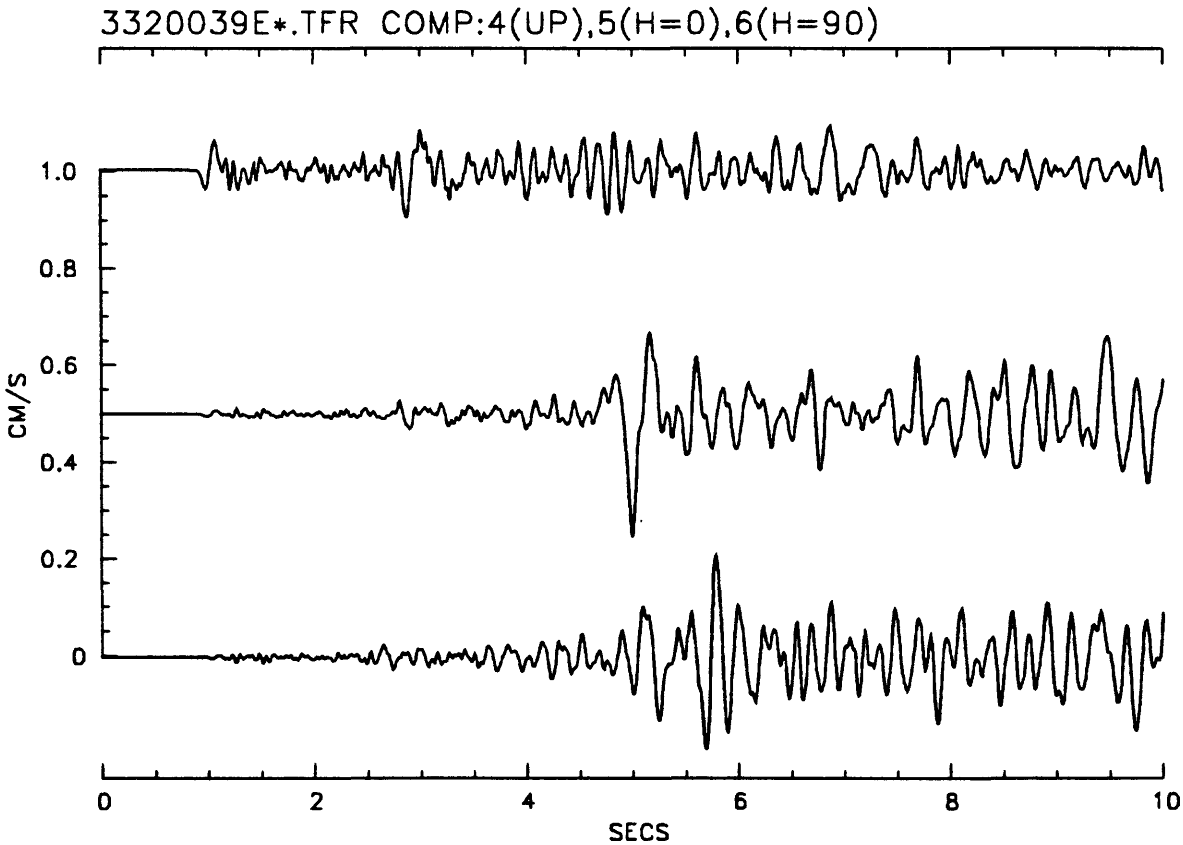
3320039D*.SUP COMP:4(UP),5(H=0),6(H=90)

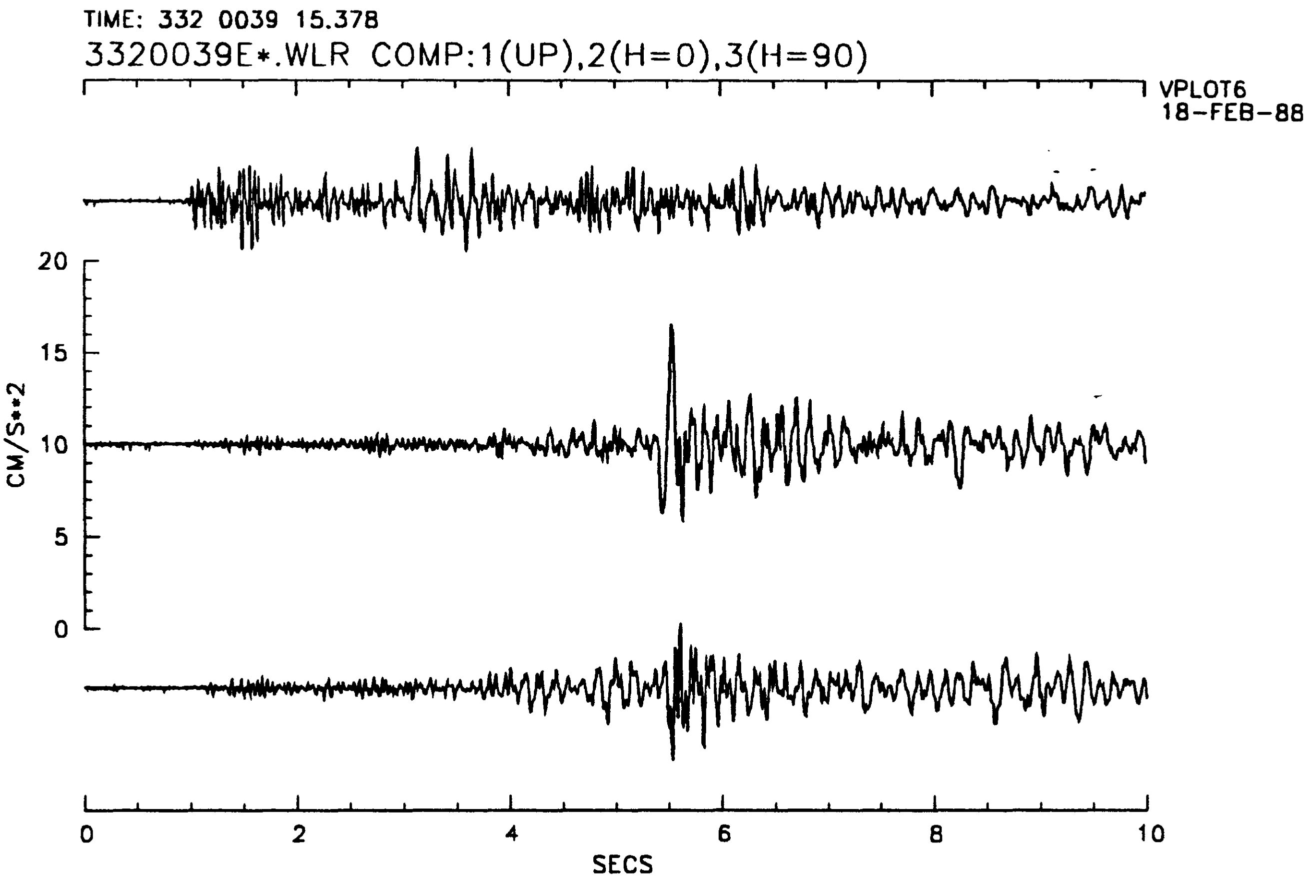


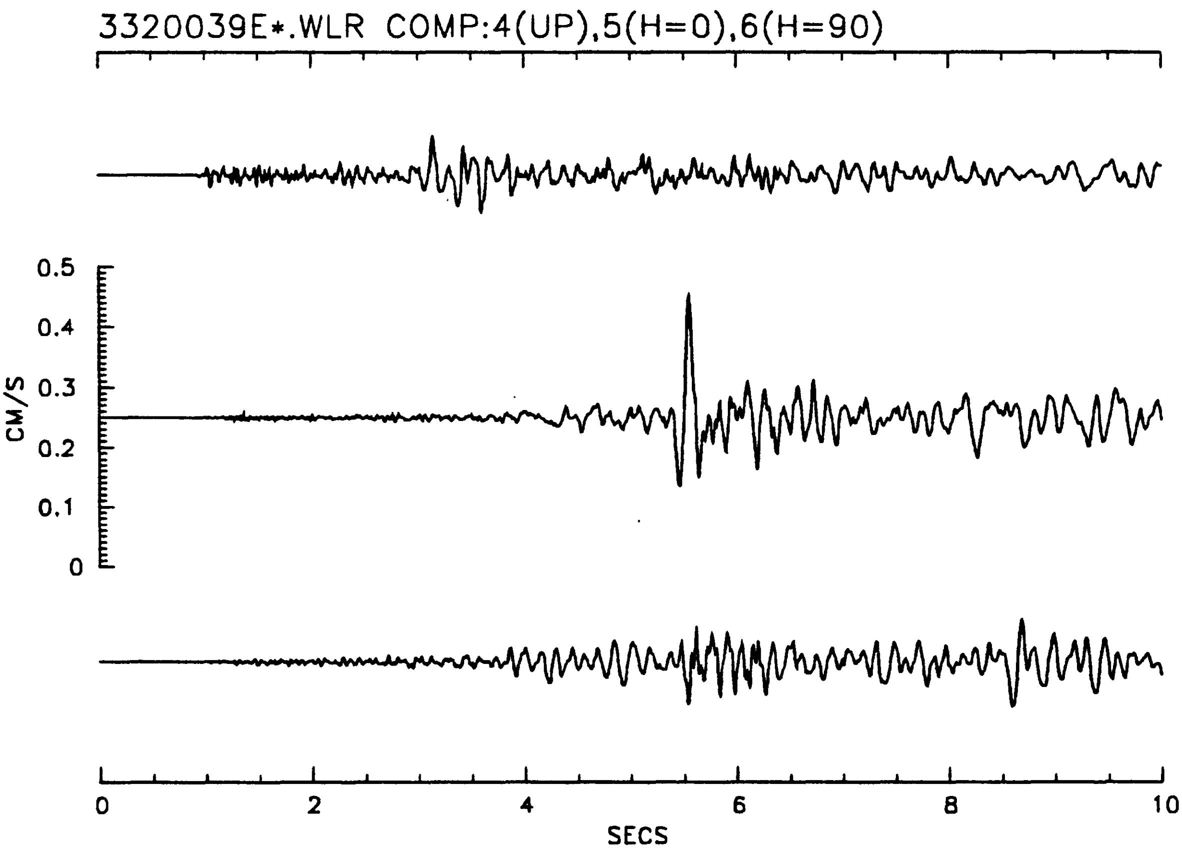

TIME: 332 0039 13.052
3320039E*.POE COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
100
80
60
40
20
0
CM/S**2
0
2
4
6
8
10
SECS

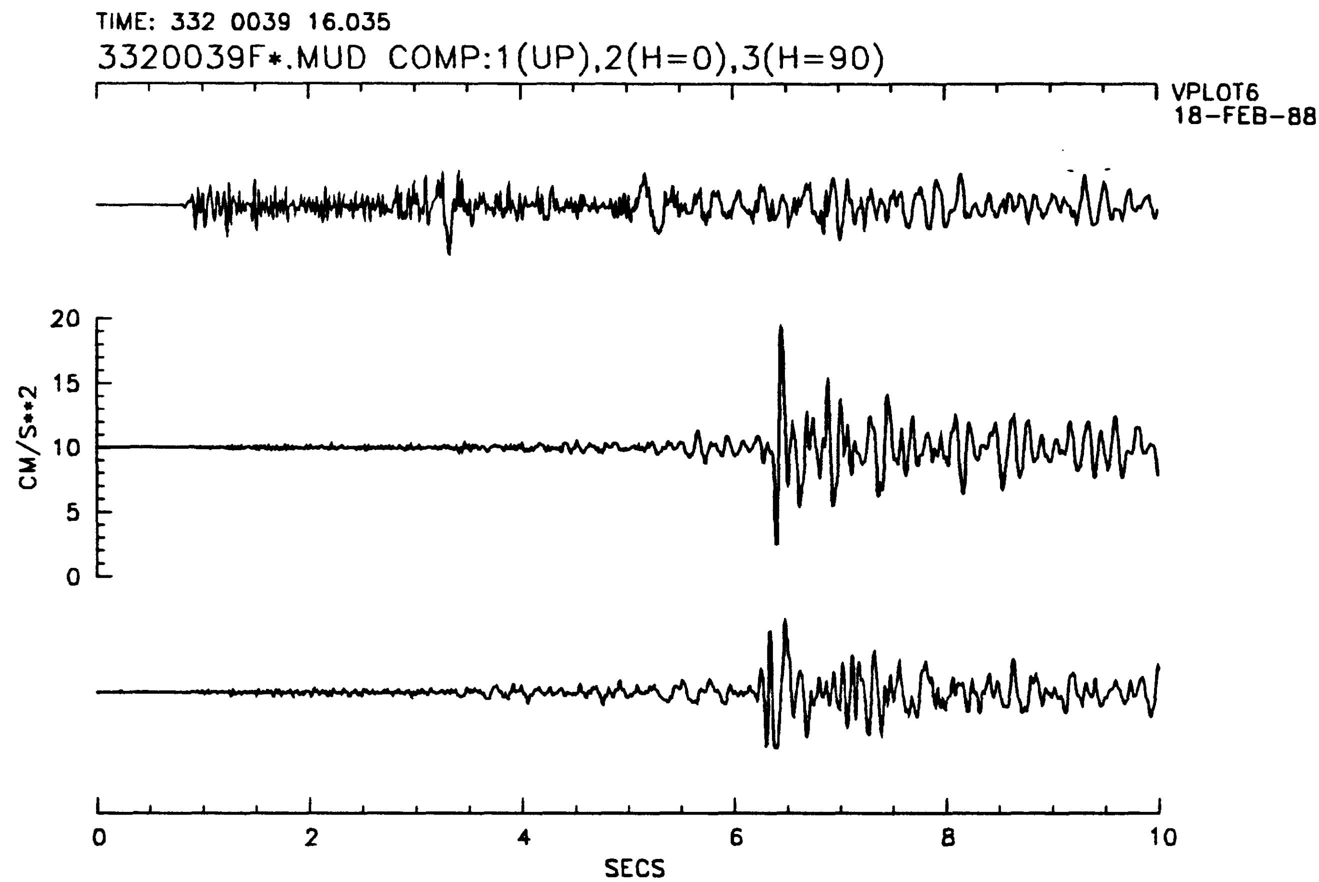

3320039E*.POE COMP:4(UP),5(H=0),6(H=90)
1.0
0.8
0.6
0.4
0.2
0
CM/S
0
2
4
6
8
10
SECS

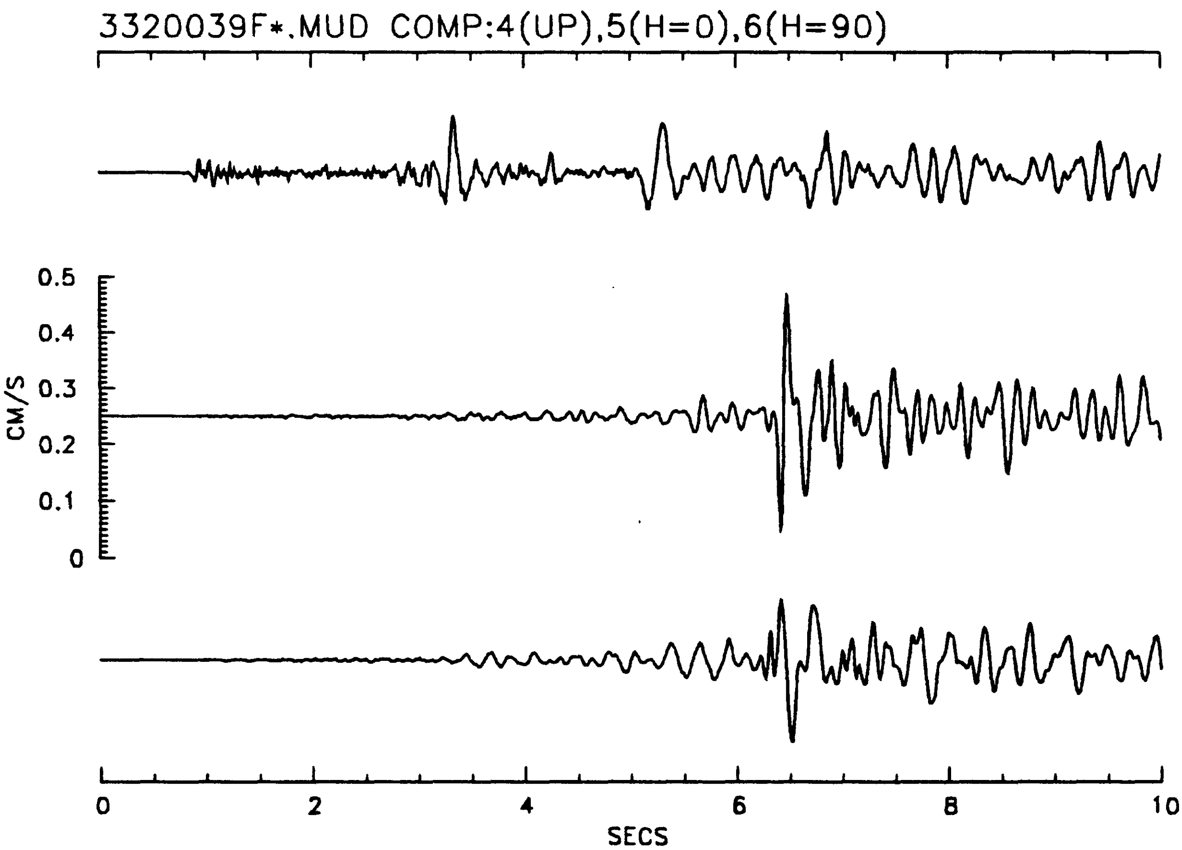

TIME: 332 0039 14.192
3320039E*.TFR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
20
15
10
5
0
0
2
4
6
8
10
SECS

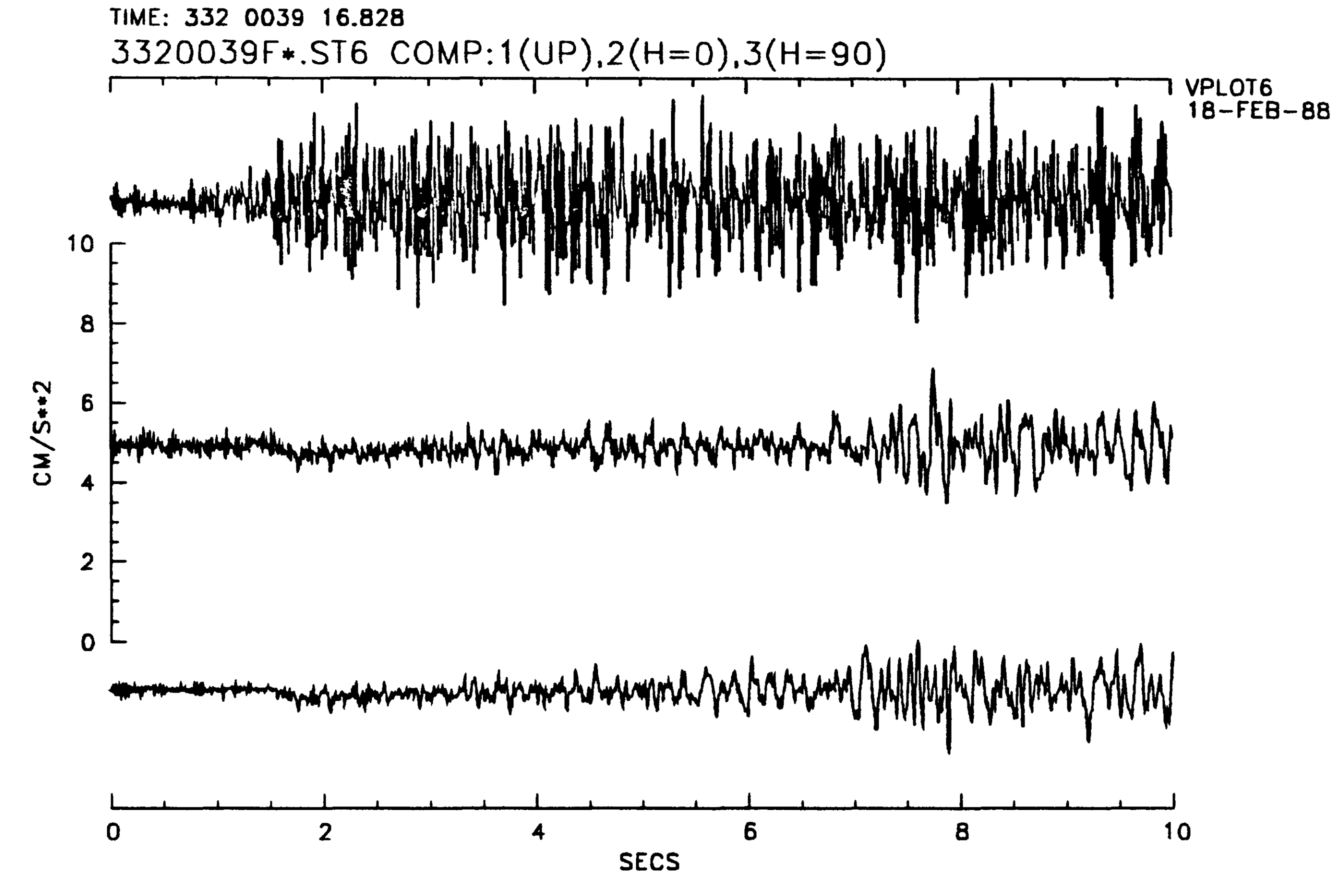

3320039E*.TFR COMP:4(UP),5(H=0),6(H=90)
CM/S
1.0
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
SECS

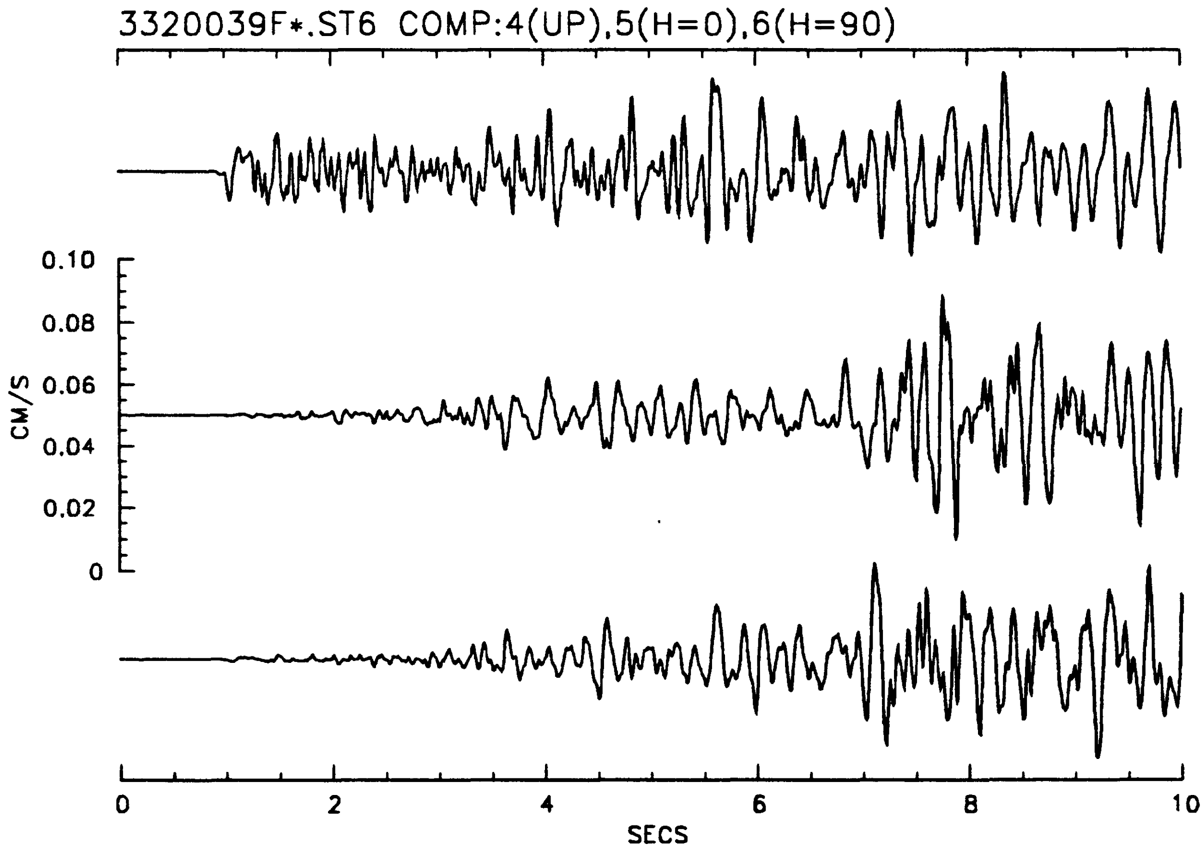

TIME: 332 0039 15.378
3320039E*.WLR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
20
15
10
5
0
CM/S**2
0
2
4
6
8
10
SECS


3320039E*.WLR COMP:4(UP),5(H=0),6(H=90)
0.5
0.4
0.3
0.2
0.1
0
CM/S
0
2
4
6
8
10
SECS


TIME: 332 0039 16.035
3320039F*.MUD COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
20
15
10
5
0
0
2
4
6
8
10
SECS

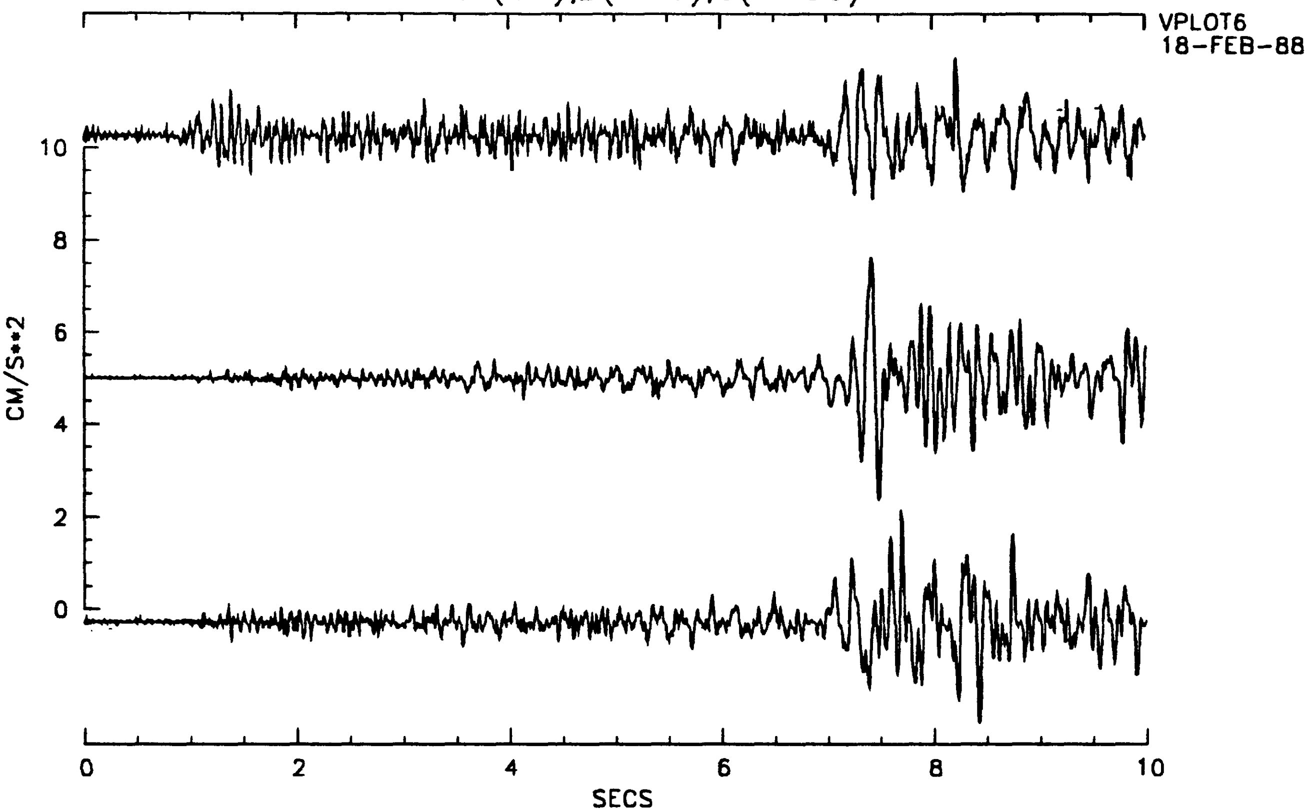

3320039F*.MUD COMP:4(UP),5(H=0),6(H=90)
CM/S
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
SECS


TIME: 332 0039 16.828
3320039F*.ST6 COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
8
10
SECS

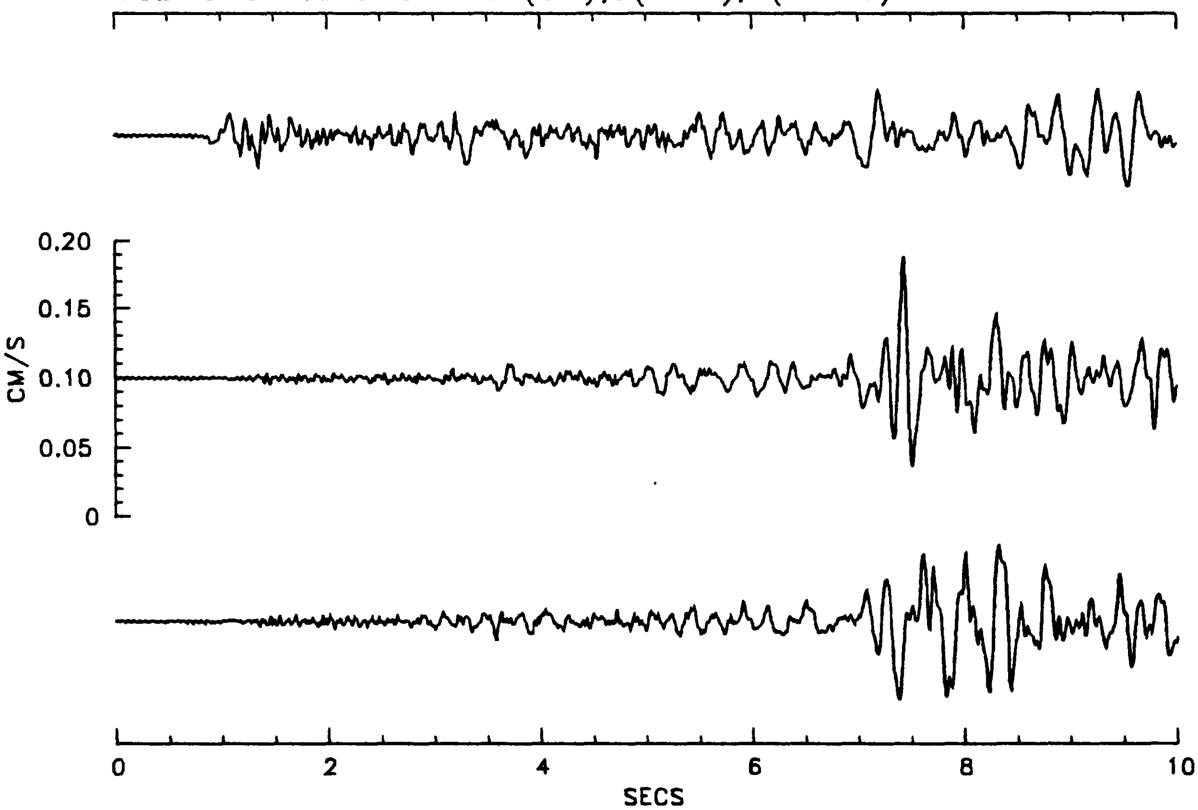

3320039F*.ST6 COMP:4(UP),5(H=0),6(H=90)
CM/S
0.10
0.08
0.06
0.04
0.02
0
0
2
4
6
8
10
SECS

TIME: 332 0039 17.973

3320039F*.ST5 COMP:1(UP),2(H=0),3(H=90)



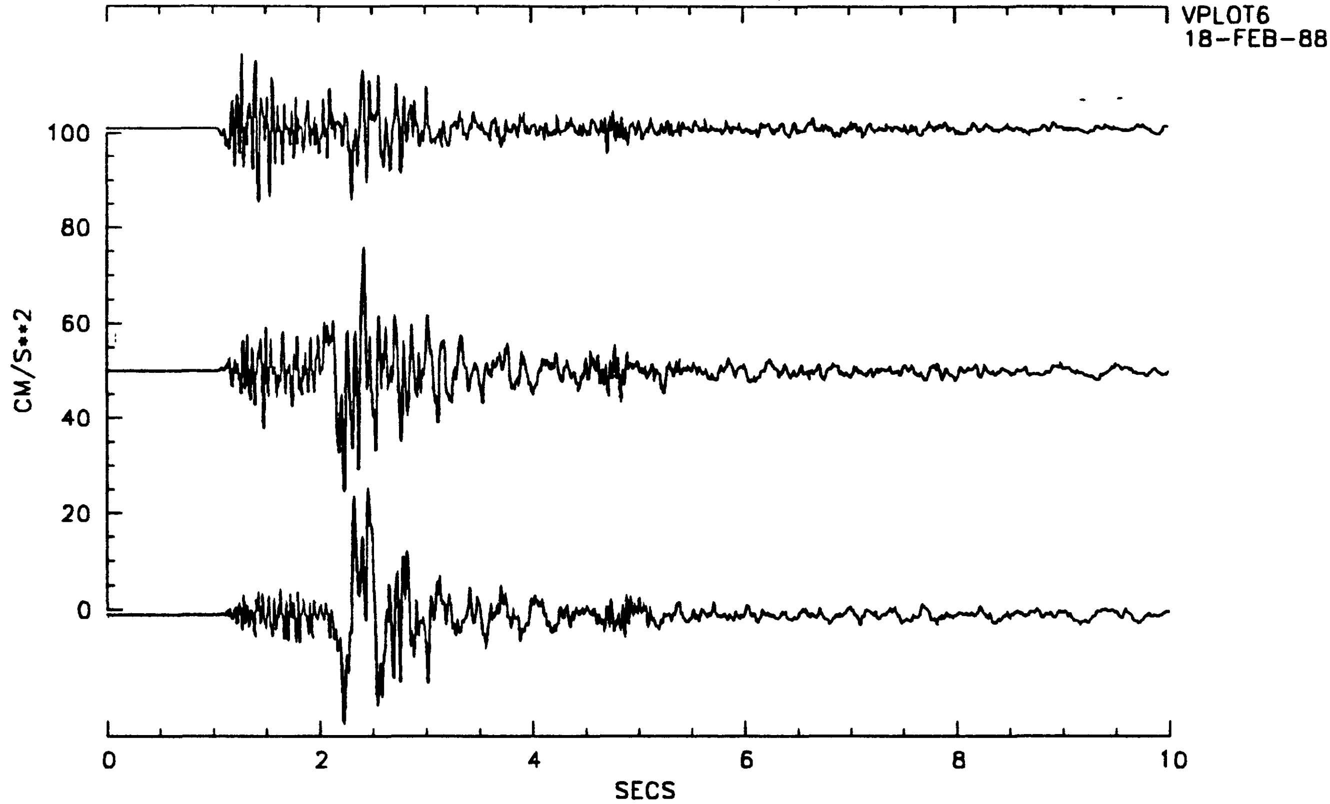
3320039F*.ST5 COMP:4(UP),5(H=0),6(H=90)



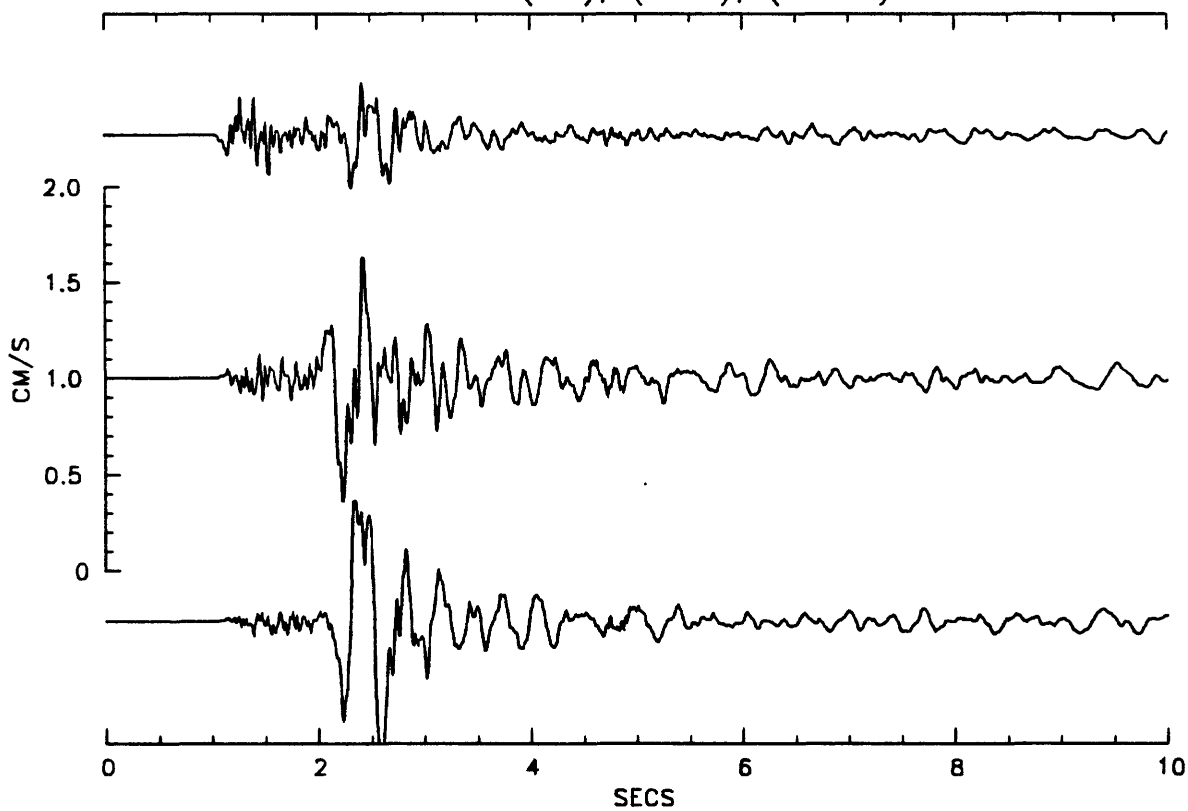
APPENDIX 2.4 Seismograms of the M=4.0 earthquake at 3360403

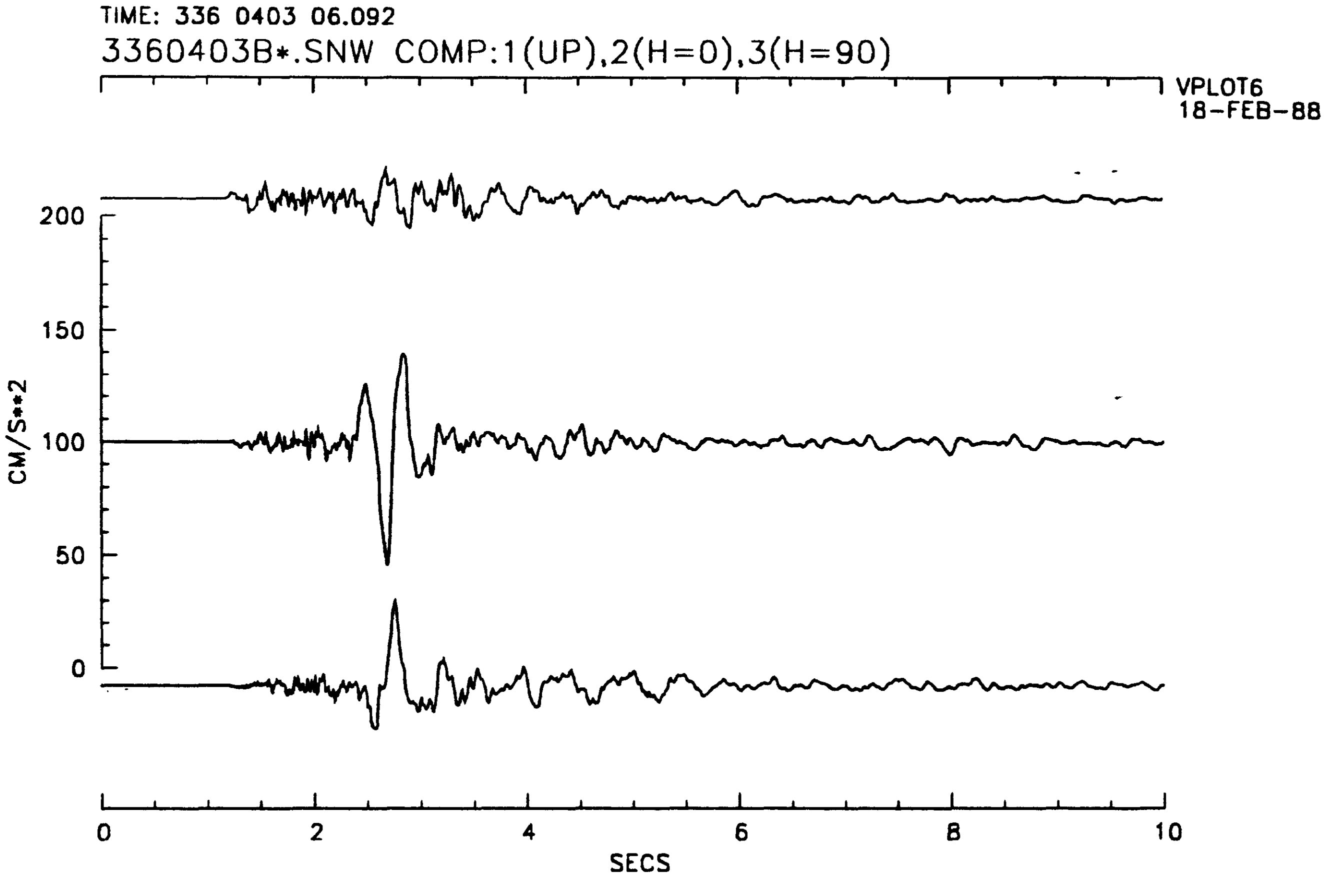
TIME: 336 0403 06.019

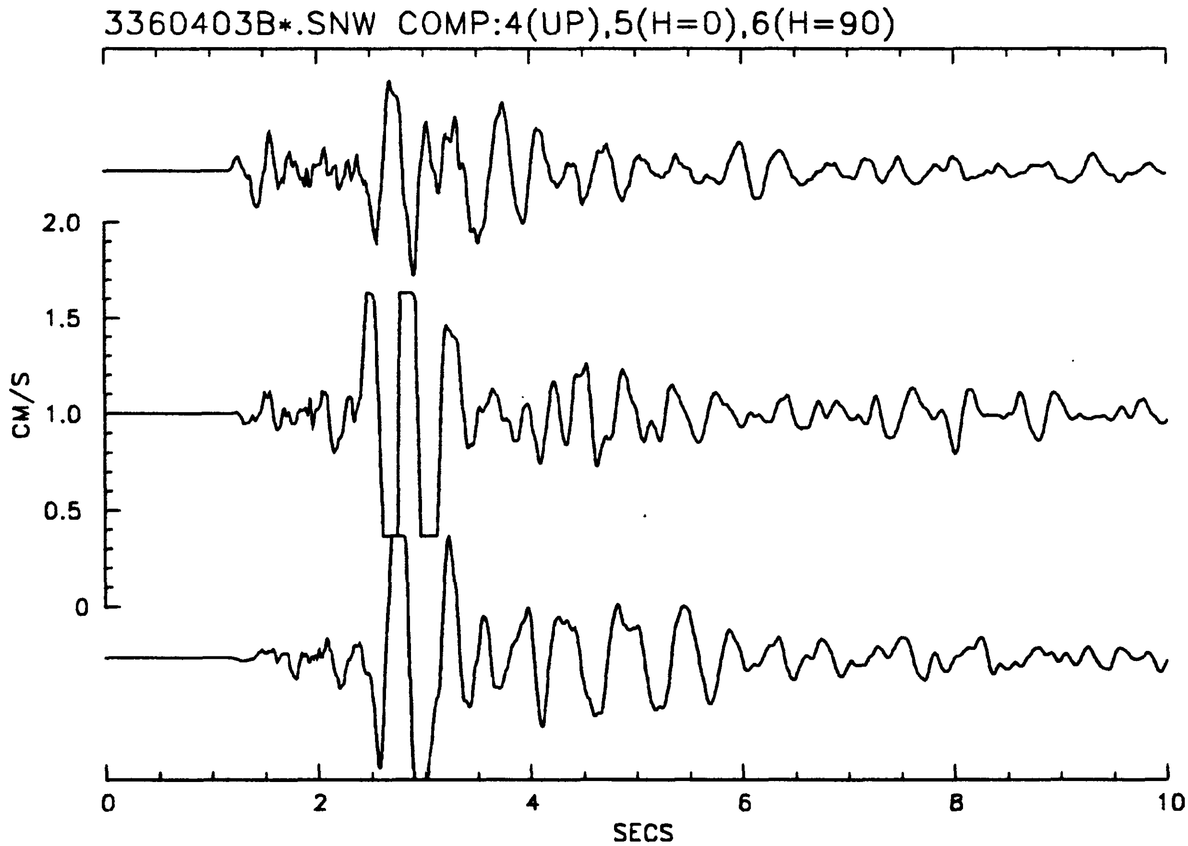
3360403B*.SNE COMP:1(UP),2(H=0),3(H=90)



3360403B*.SNE COMP:4(UP),5(H=0),6(H=90)

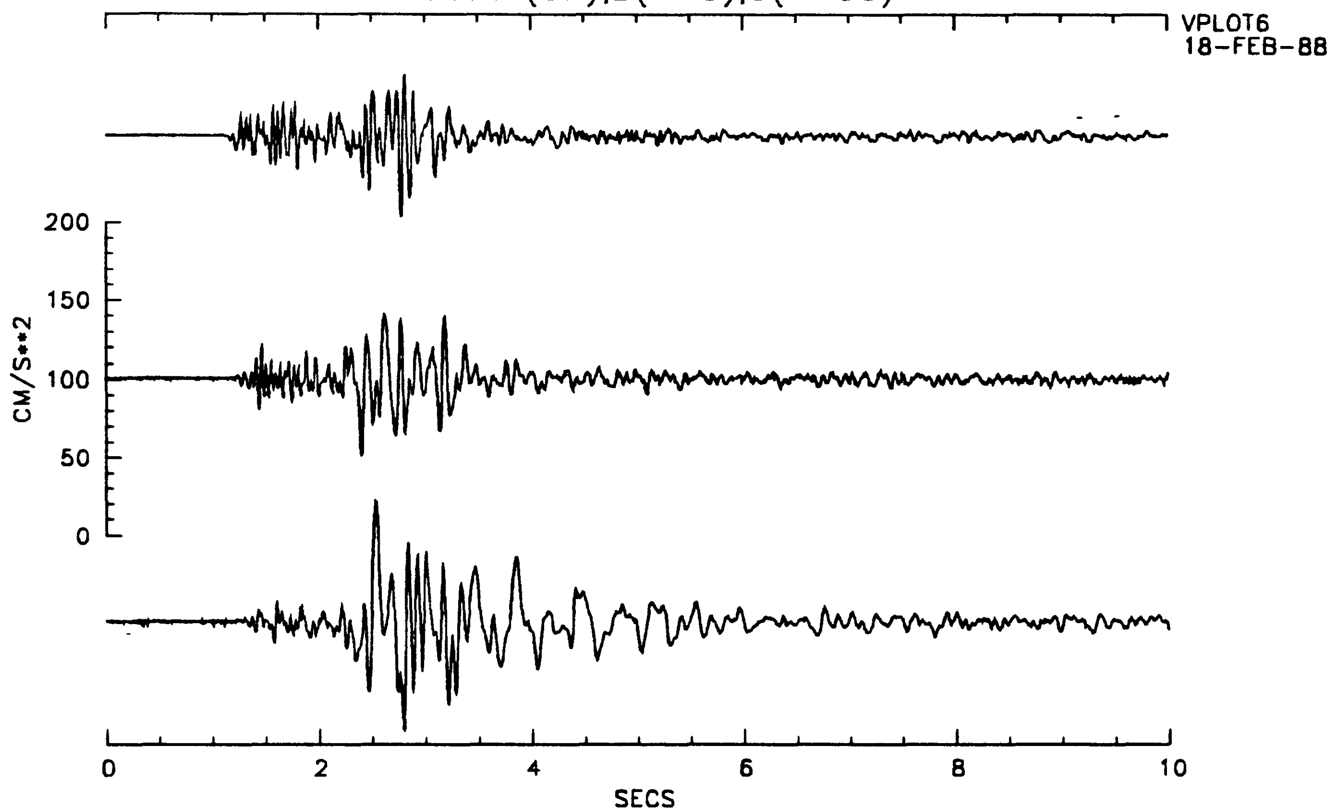



TIME: 336 0403 06.092
3360403B*.SNW COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
200
150
100
50
0
CM/S**2
0
2
4
6
8
10
SECS

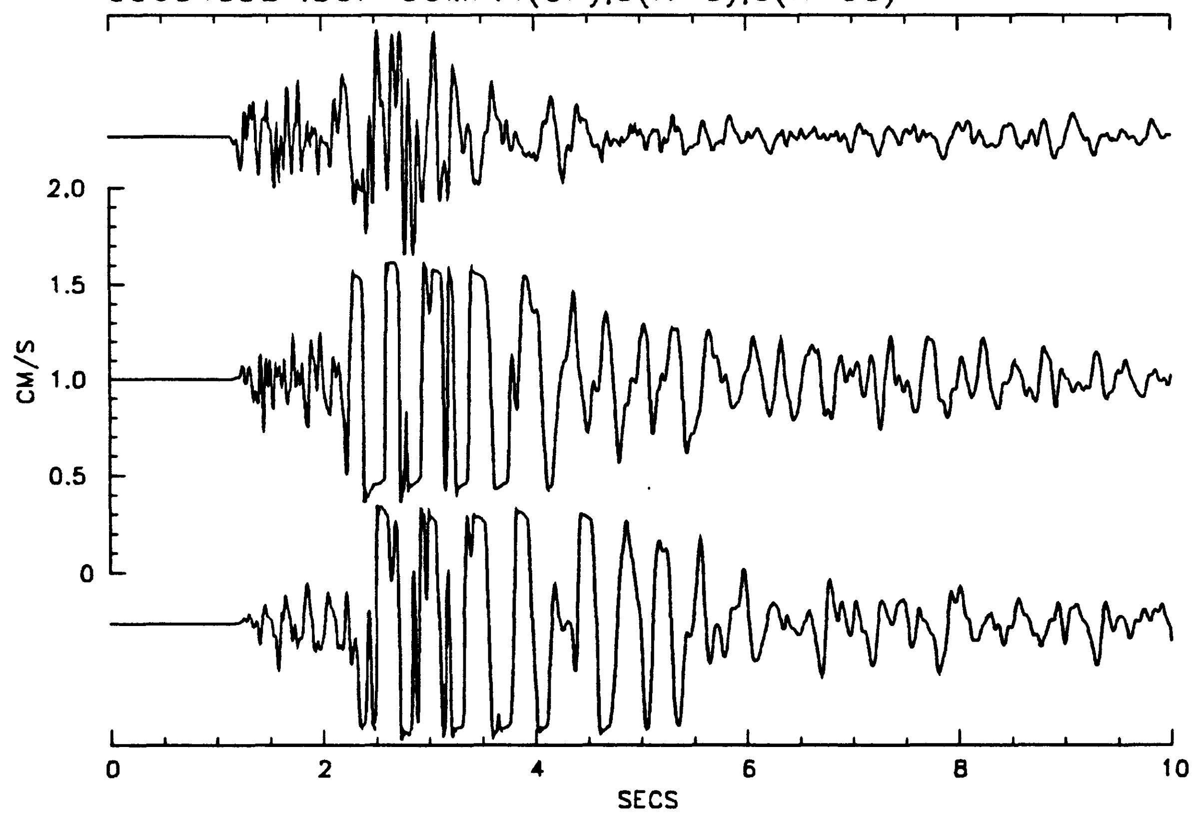

3360403B*.SNW COMP:4(UP),5(H=0),6(H=90)
2.0
1.5
1.0
0.5
0
CM/S
0
2
4
6
8
10
SECS

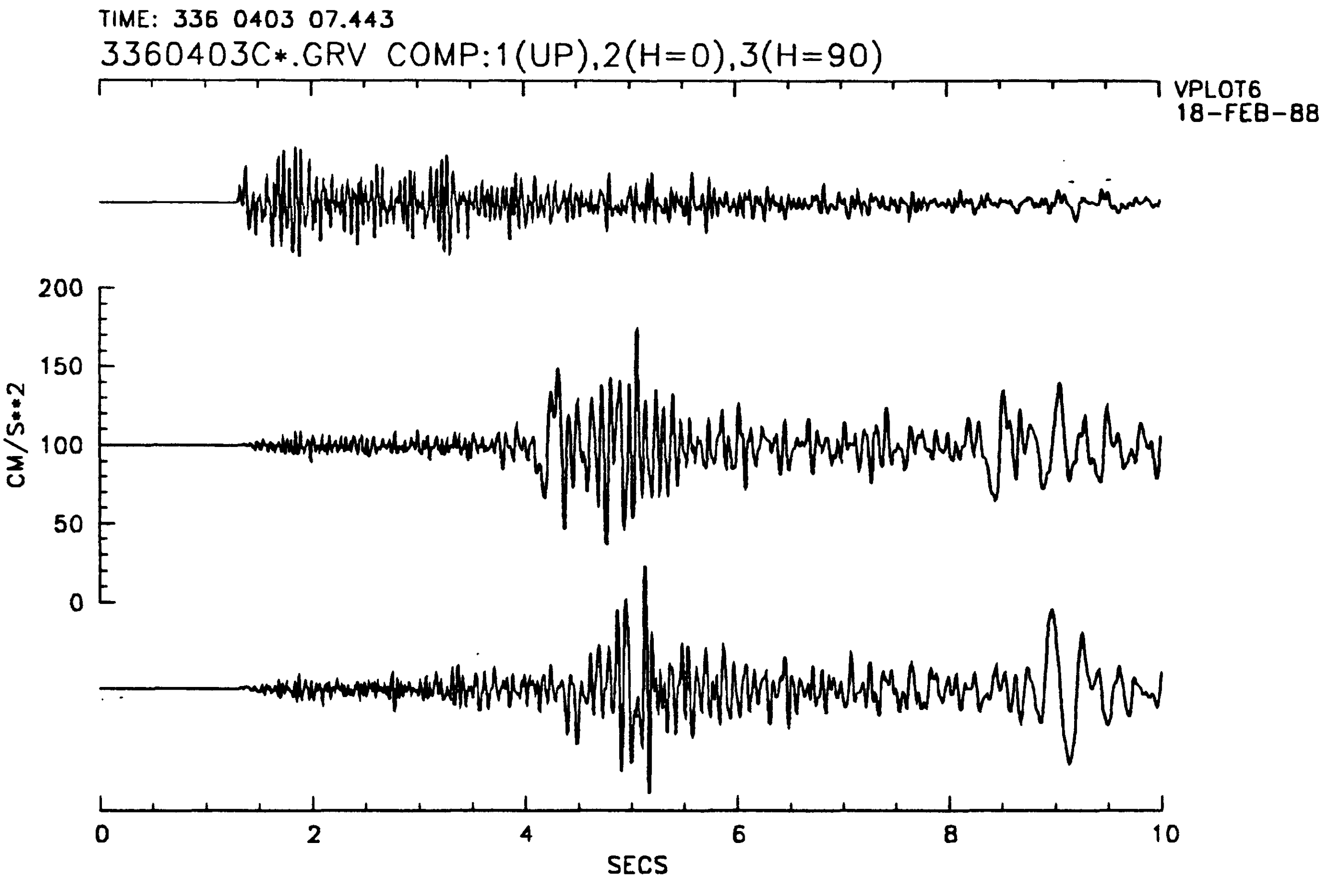
TIME: 336 0403 06.116

3360403B*.SUP COMP:1(UP),2(H=0),3(H=90)

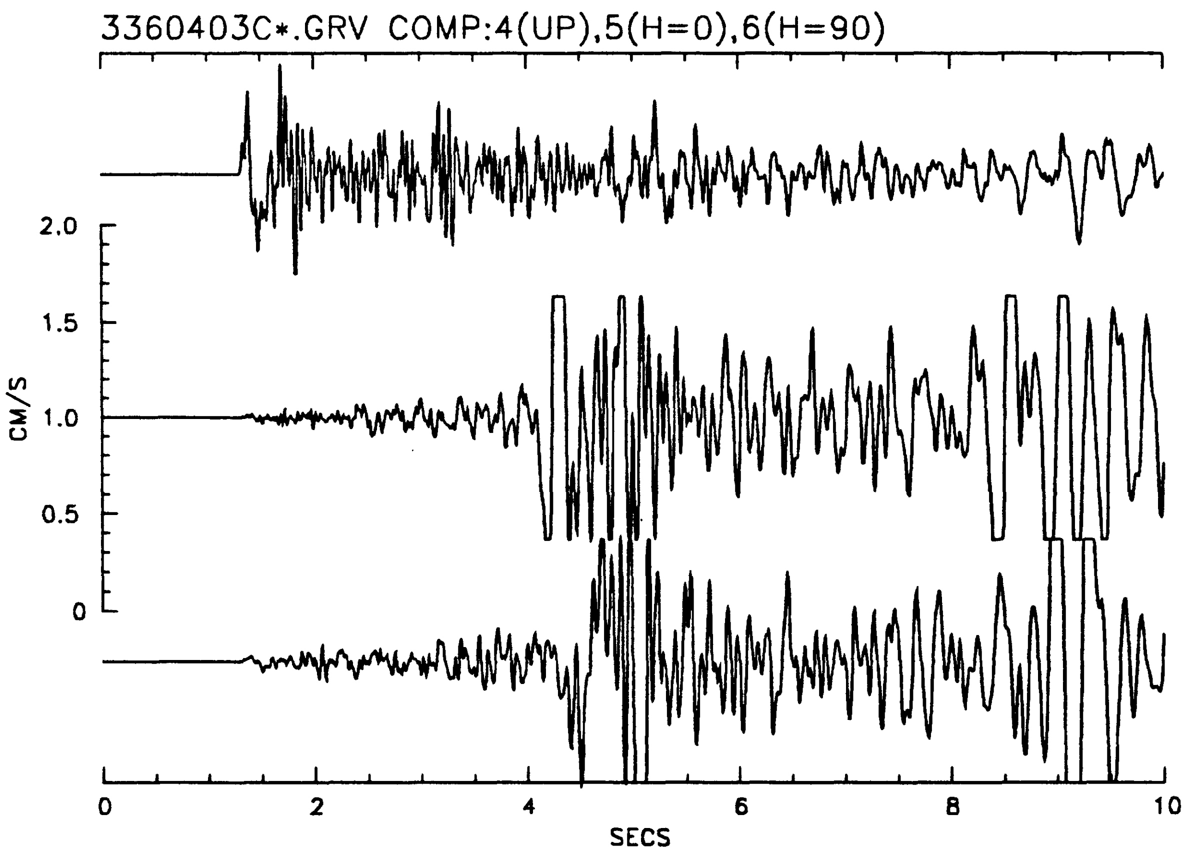


3360403B*.SUP COMP:4(UP),5(H=0),6(H=90)



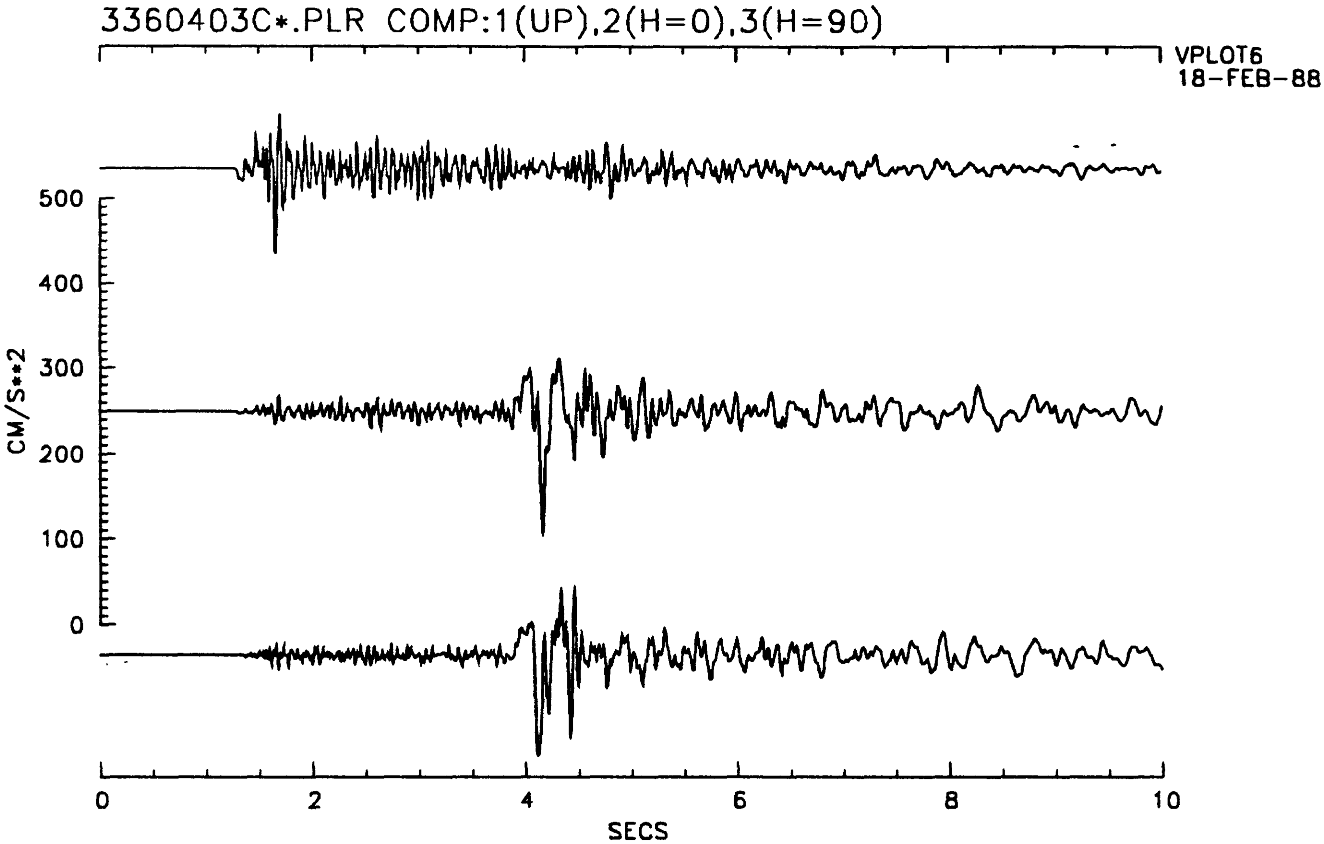


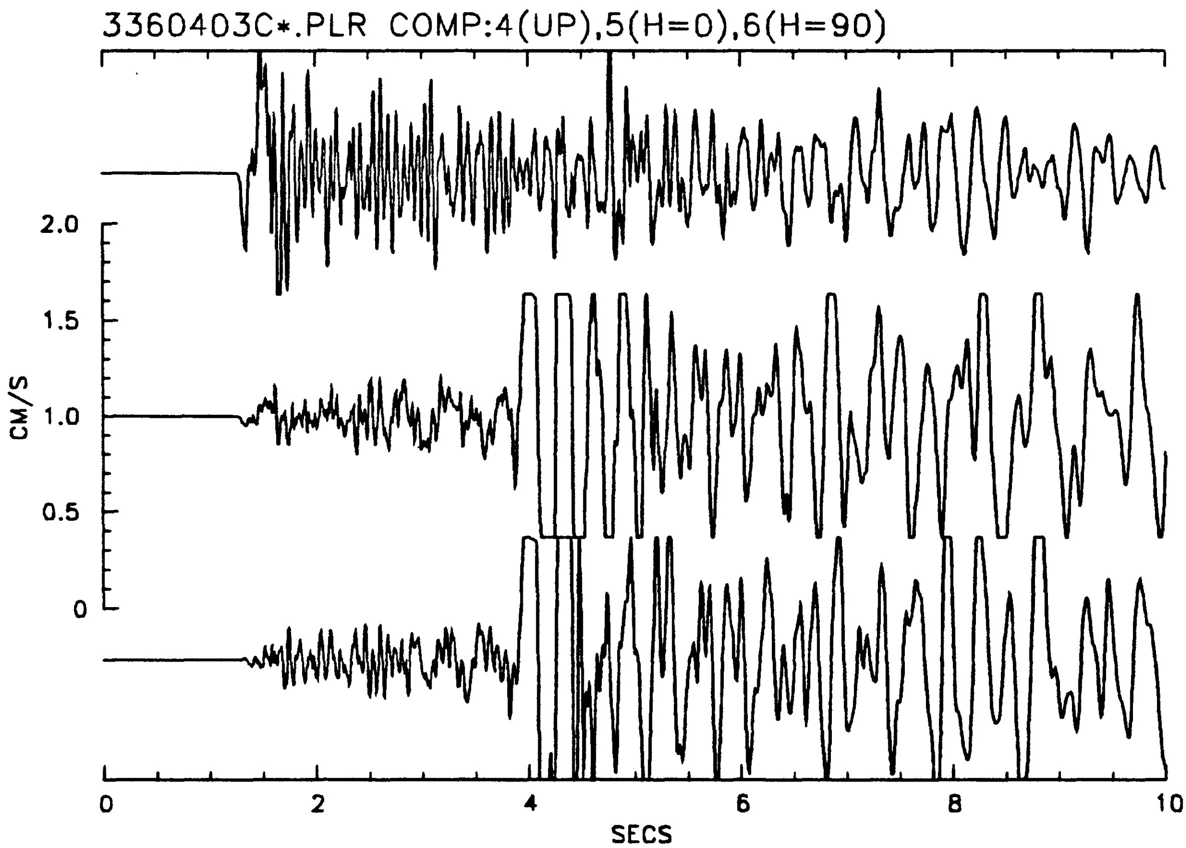
TIME: 336 0403 07.443
3360403C*.GRV COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
200
150
100
50
0
0
2
4
6
8
10
SECS

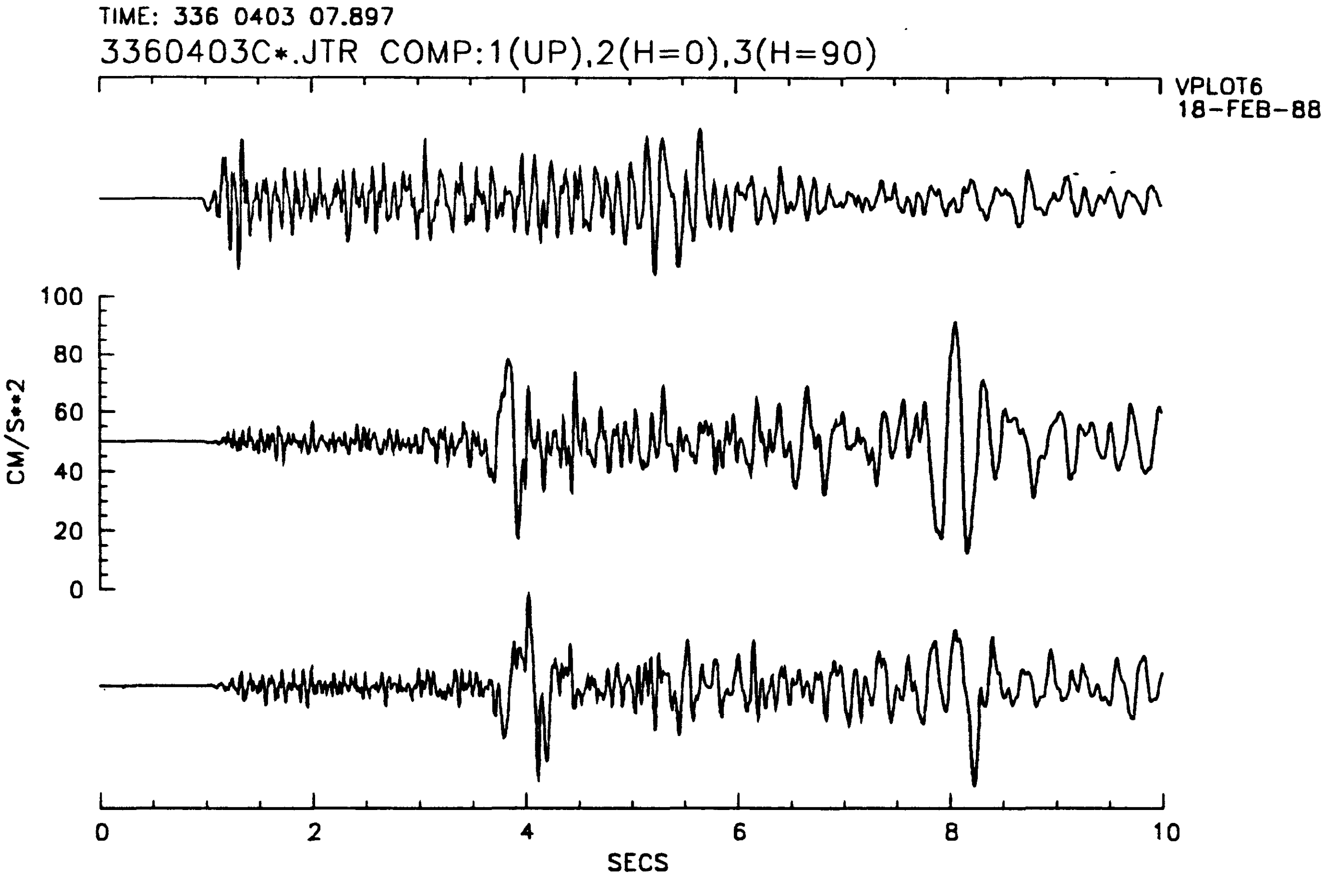


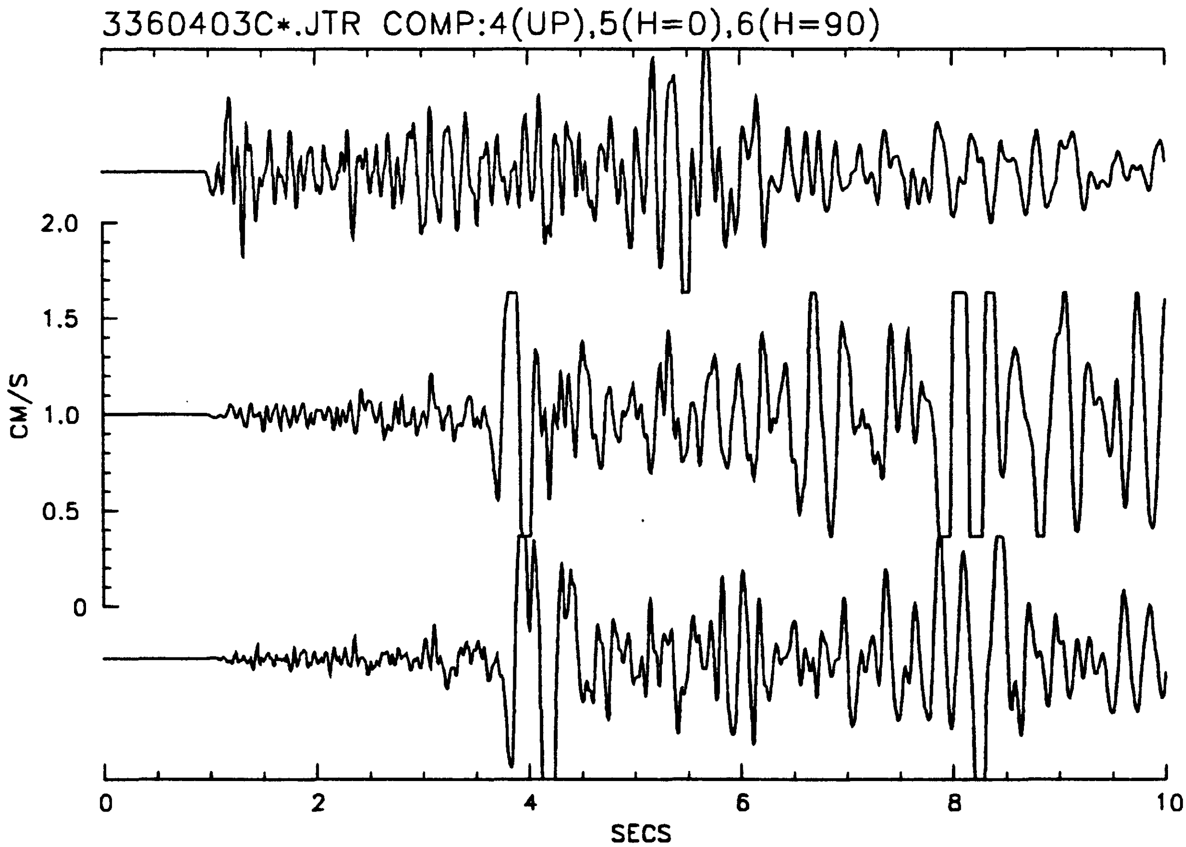
3360403C*.GRV COMP:4(UP),5(H=0),6(H=90)
CM/S
2.0
1.5
1.0
0.5
0
0
2
4
6
8
10
SECS

TIME: 336 0403 07.843



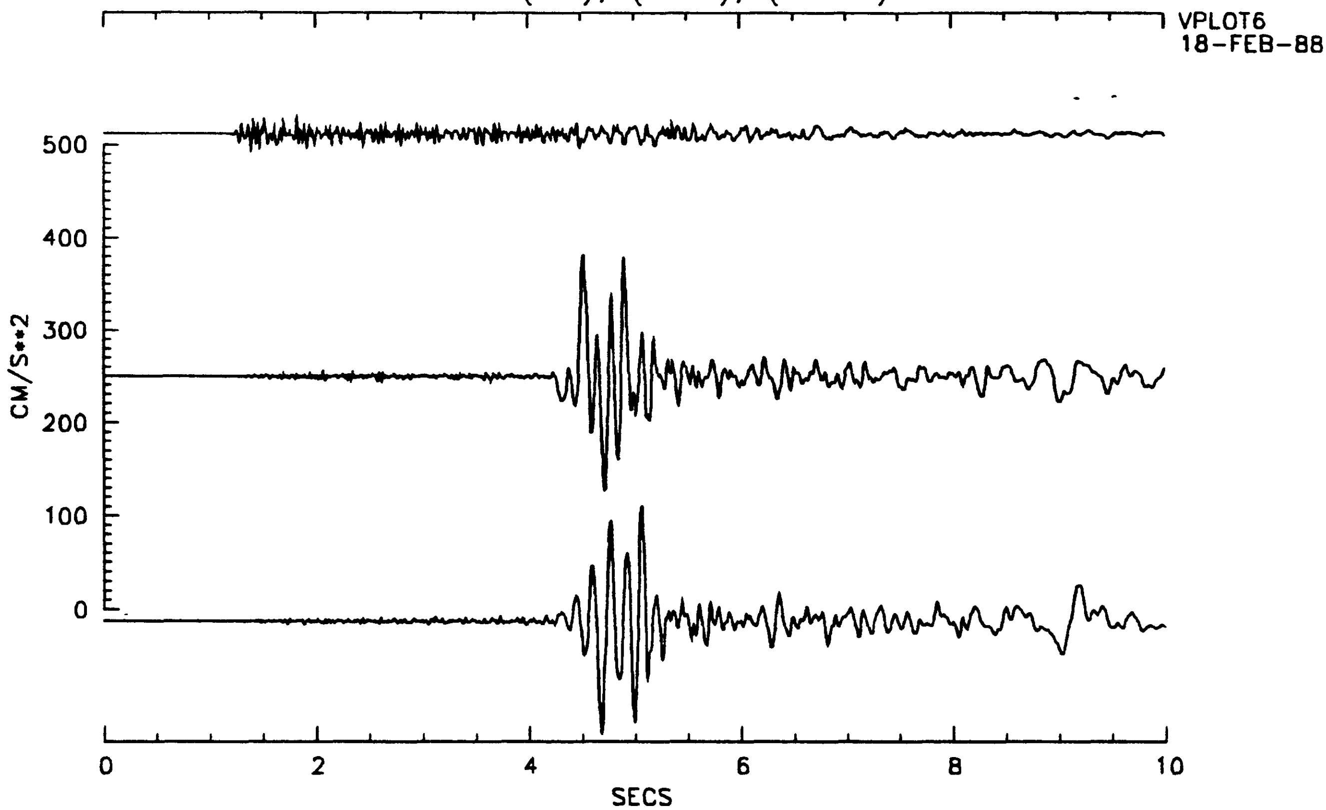



TIME: 336 0403 07.897
3360403C*.JTR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
100
80
60
40
20
0
CM/S**2
0
2
4
6
8
10
SECS

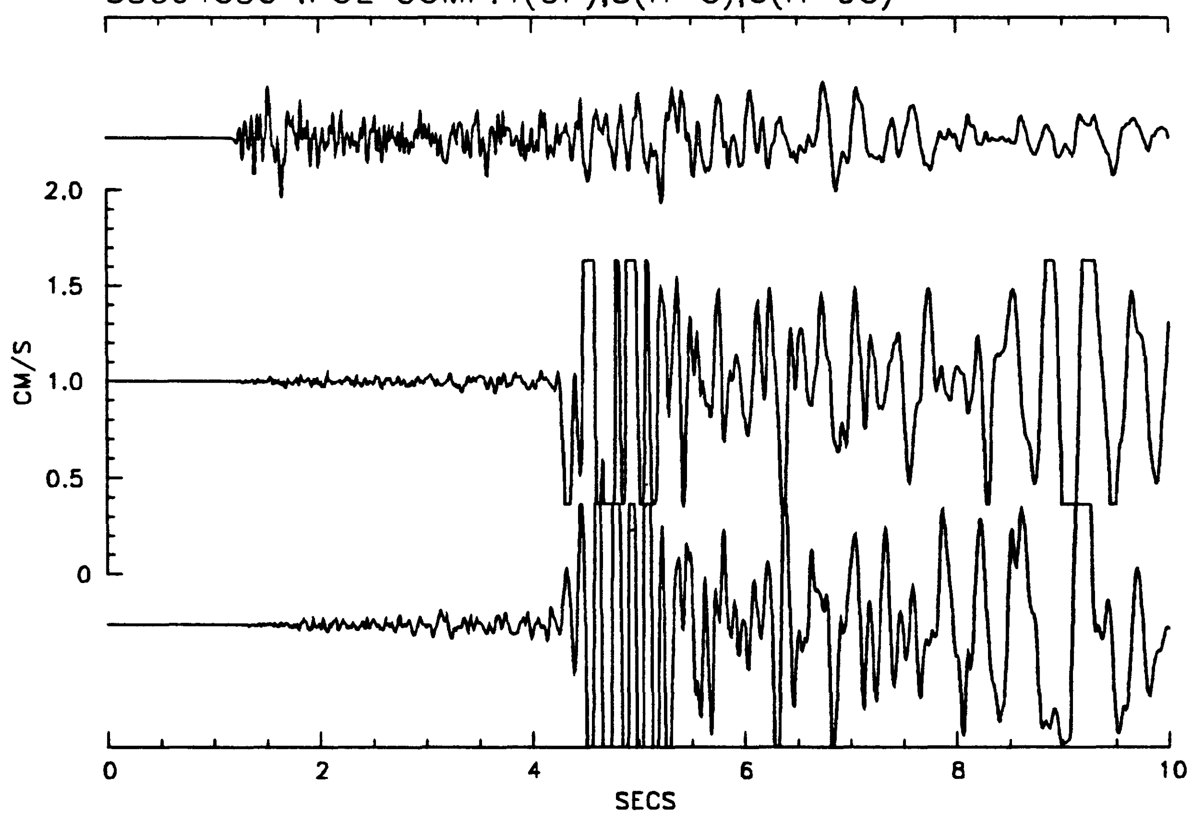

3360403C*.JTR COMP:4(UP),5(H=0),6(H=90)
2.0
1.5
1.0
0.5
0
CM/S
0
2
4
6
8
10
SECS

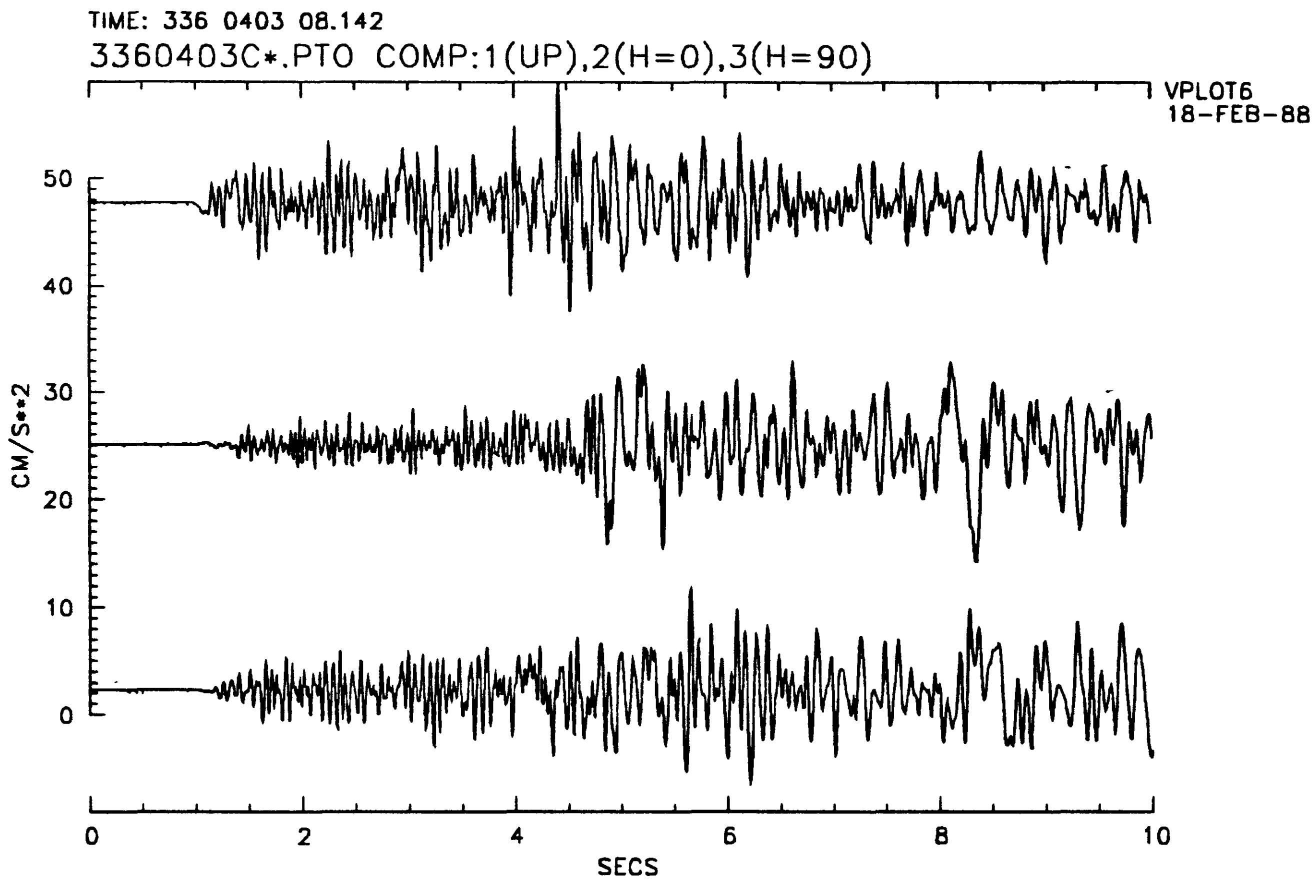
TIME: 336 0403 08.052

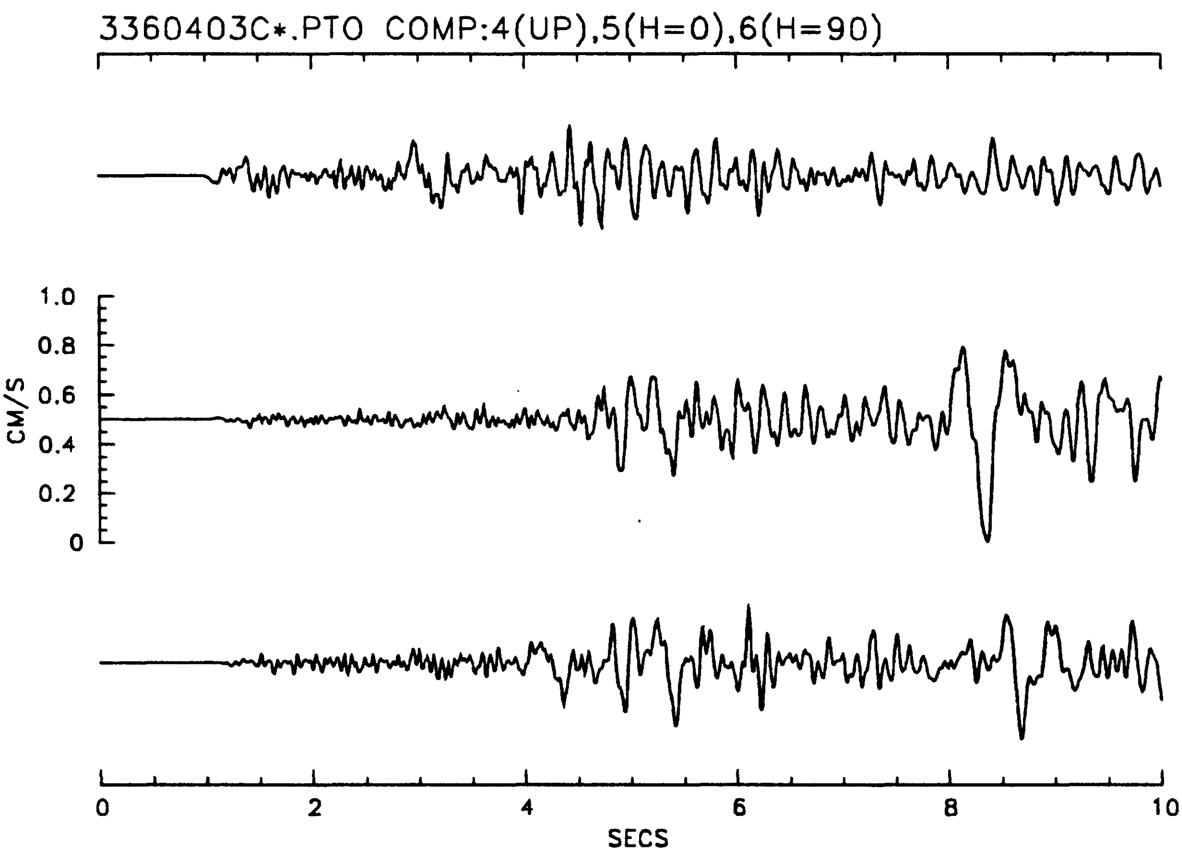
3360403C*.POE COMP:1(UP),2(H=0),3(H=90)



3360403C*.POE COMP:4(UP),5(H=0),6(H=90)

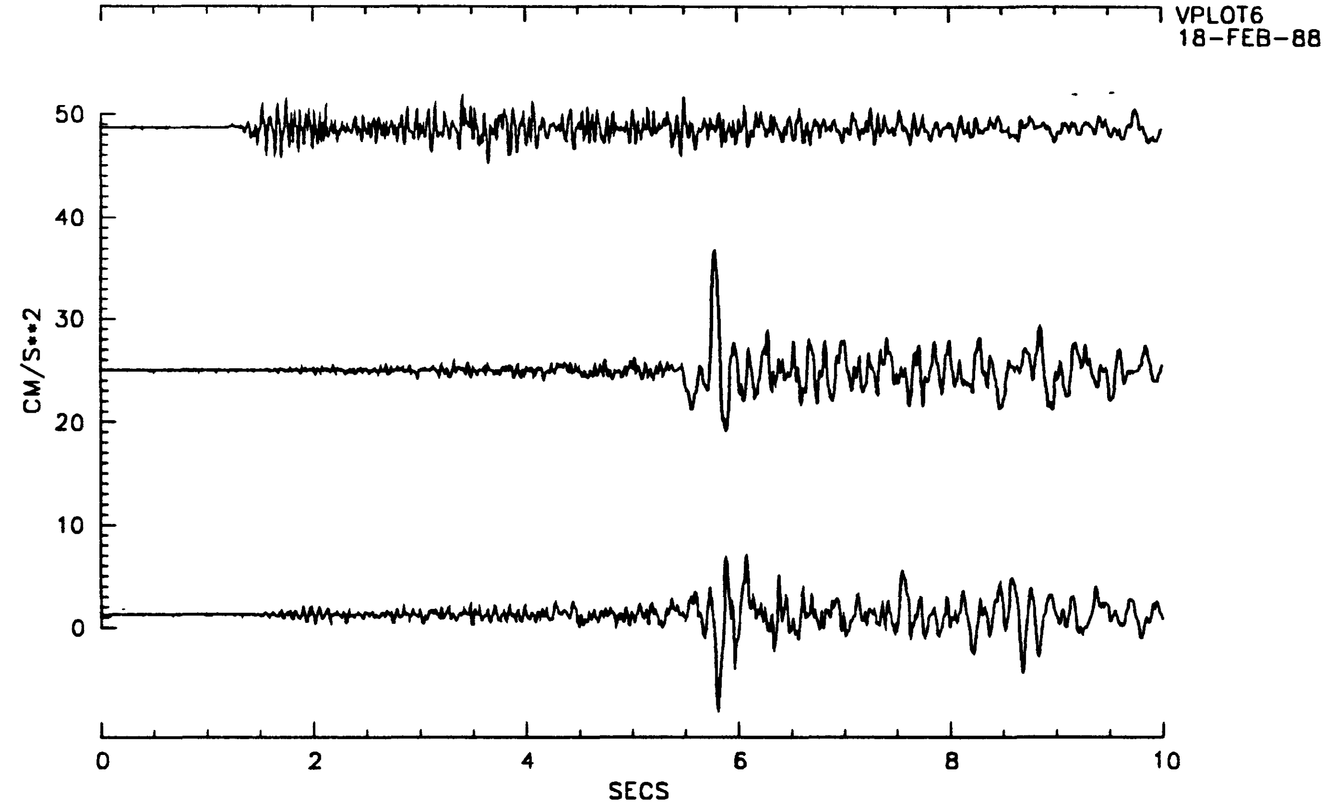



TIME: 336 0403 08.142
3360403C*.PTO COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
50
40
30
20
10
0
0
2
4
6
8
10
SECS

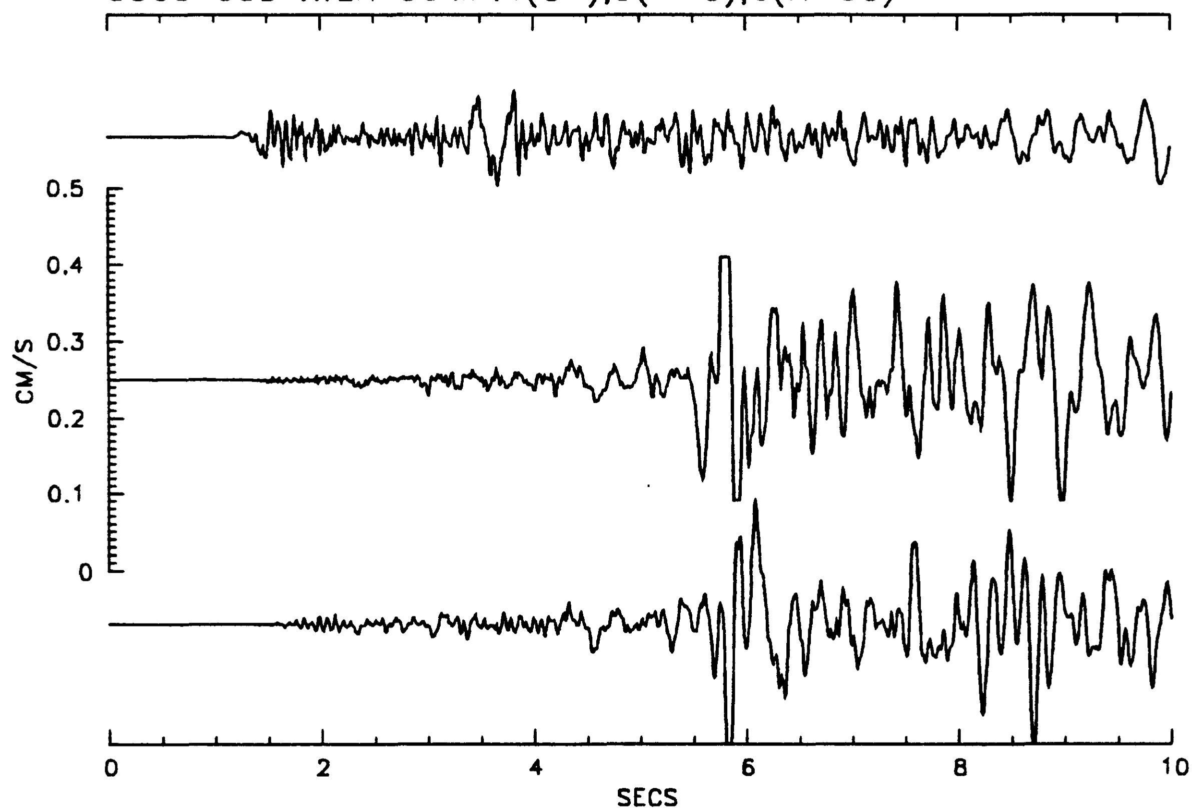

3360403C*.PTO COMP:4(UP),5(H=0),6(H=90)
CM/S
1.0
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
SECS

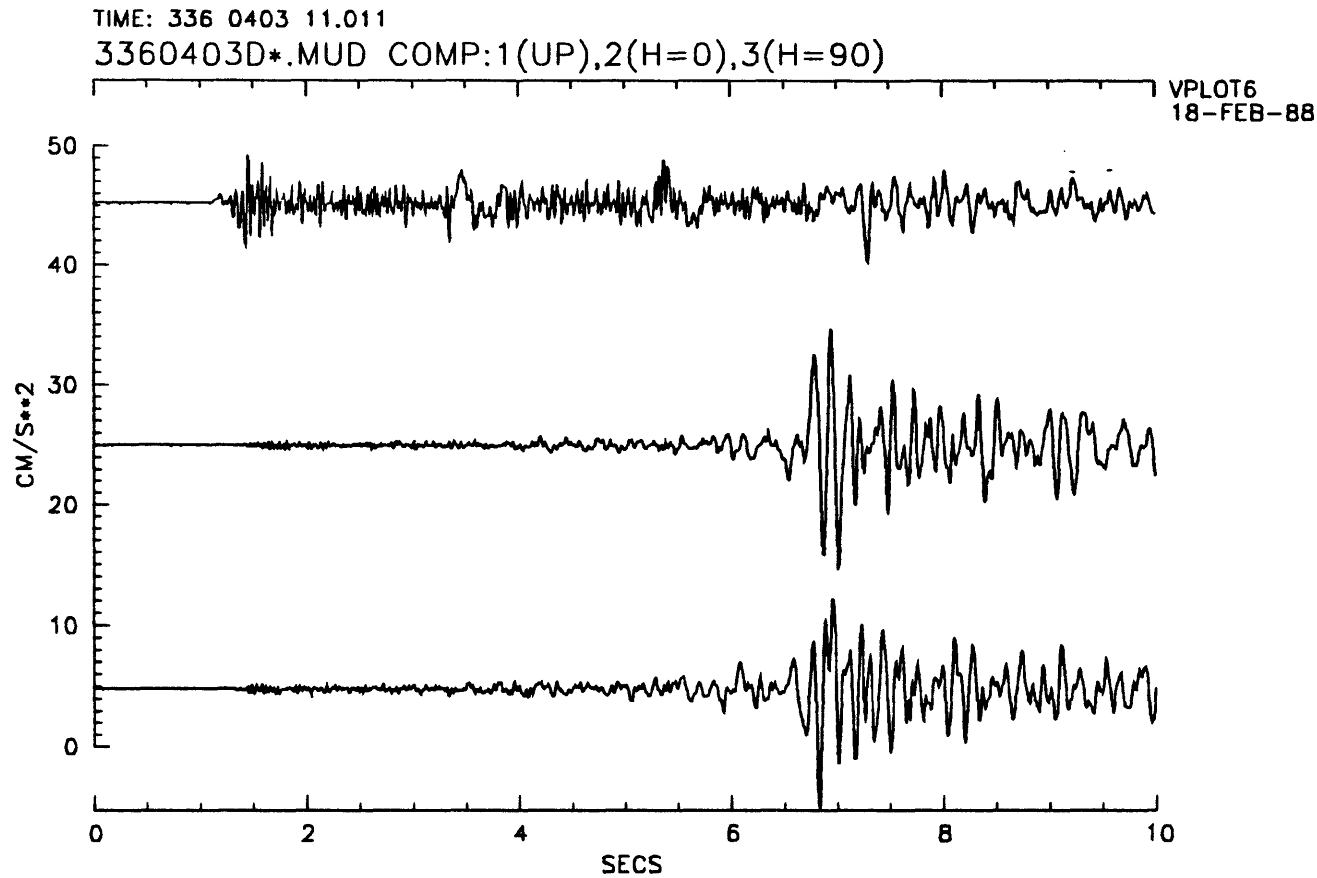
TIME: 336 0403 10.239

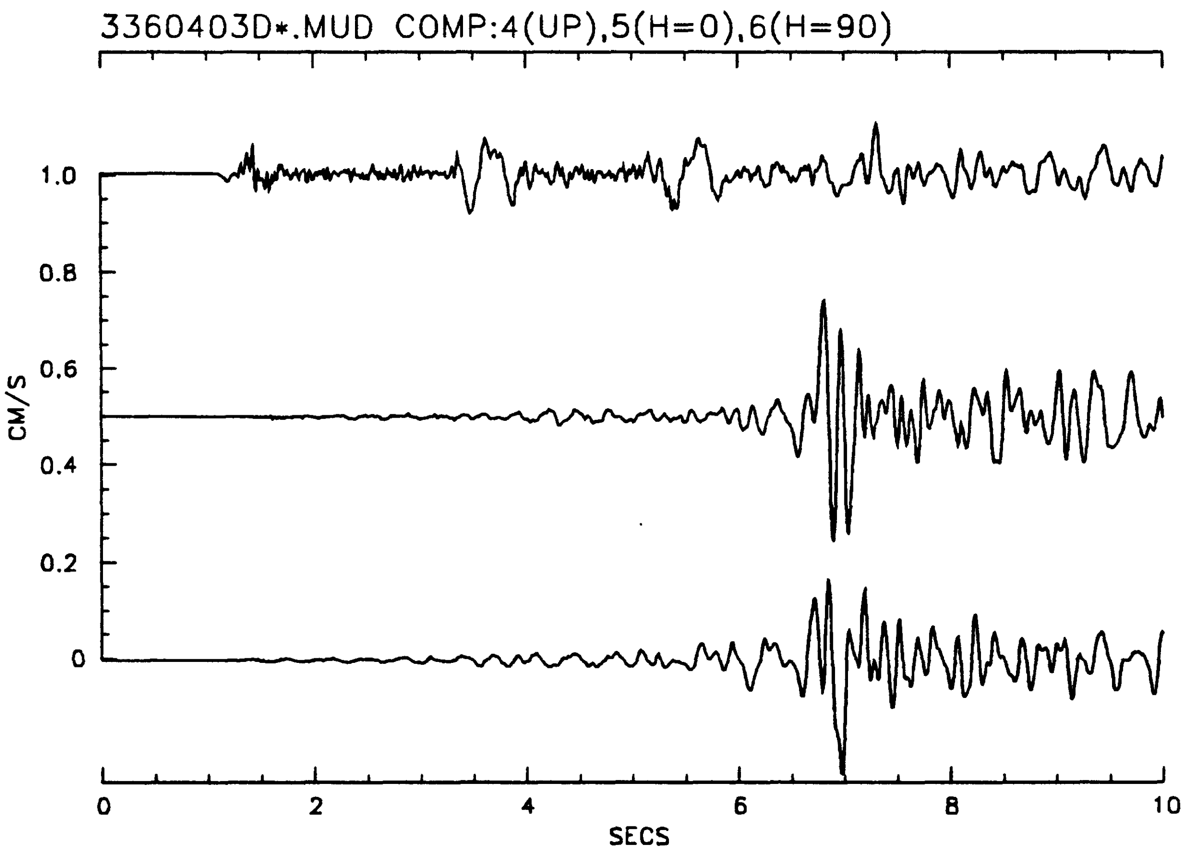
3360403D*.WLR COMP:1(UP),2(H=0),3(H=90)



3360403D*.WLR COMP:4(UP),5(H=0),6(H=90)

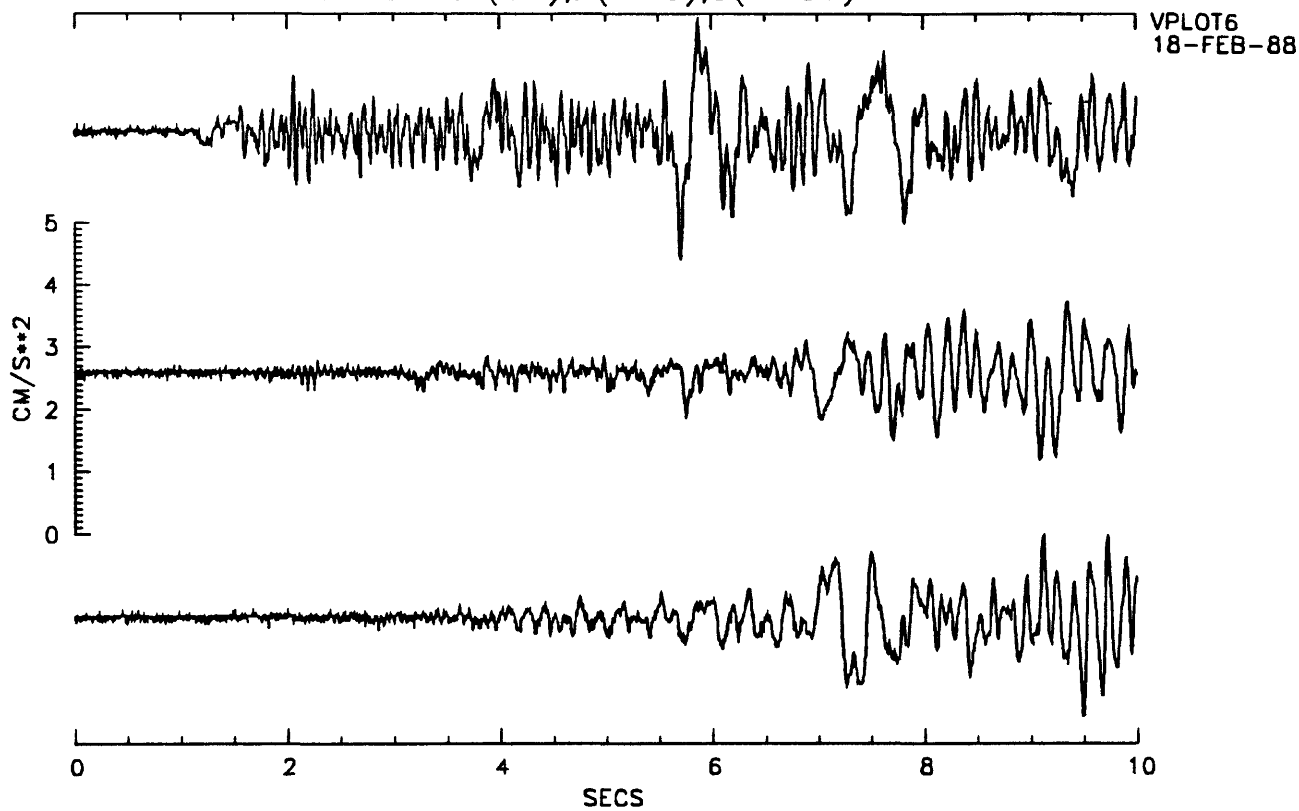



TIME: 336 0403 11.011
3360403D*.MUD COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
50
40
30
20
10
0
0
2
4
6
8
10
SECS

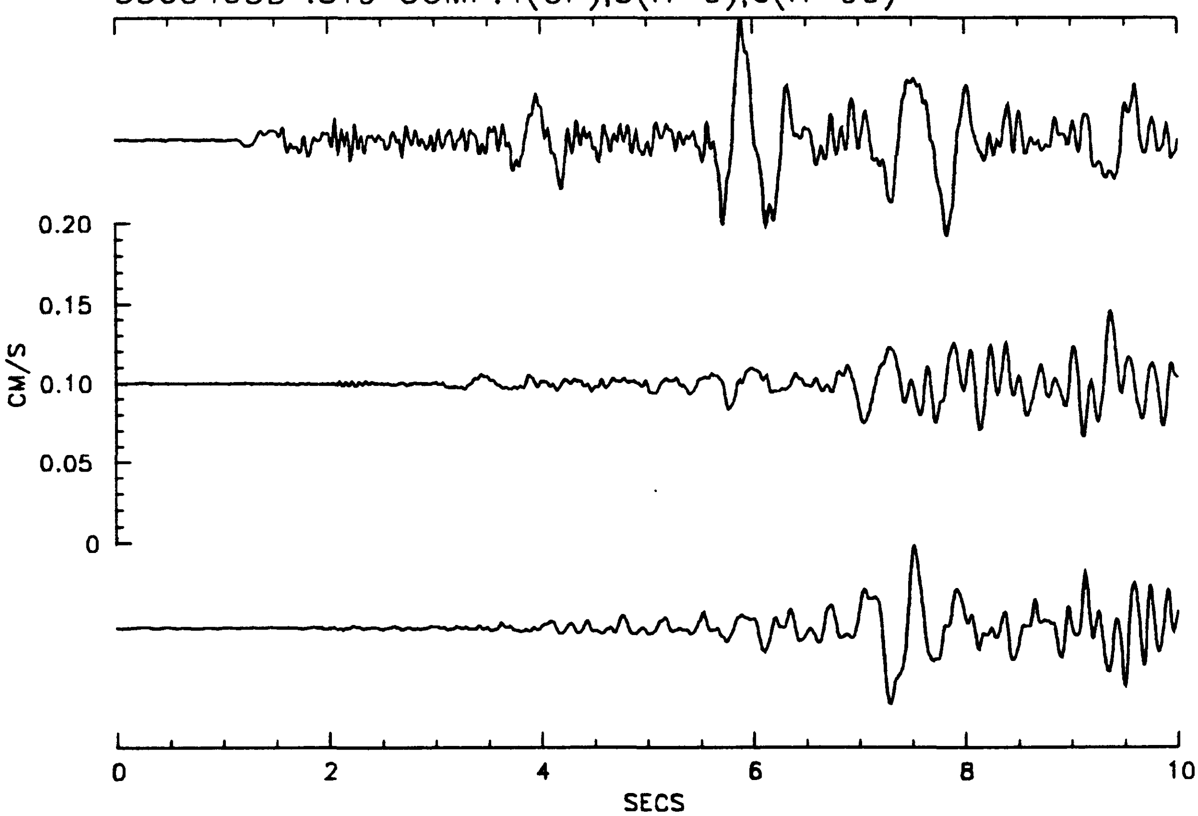

3360403D*.MUD COMP:4(UP),5(H=0),6(H=90)
CM/S
1.0
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
SECS

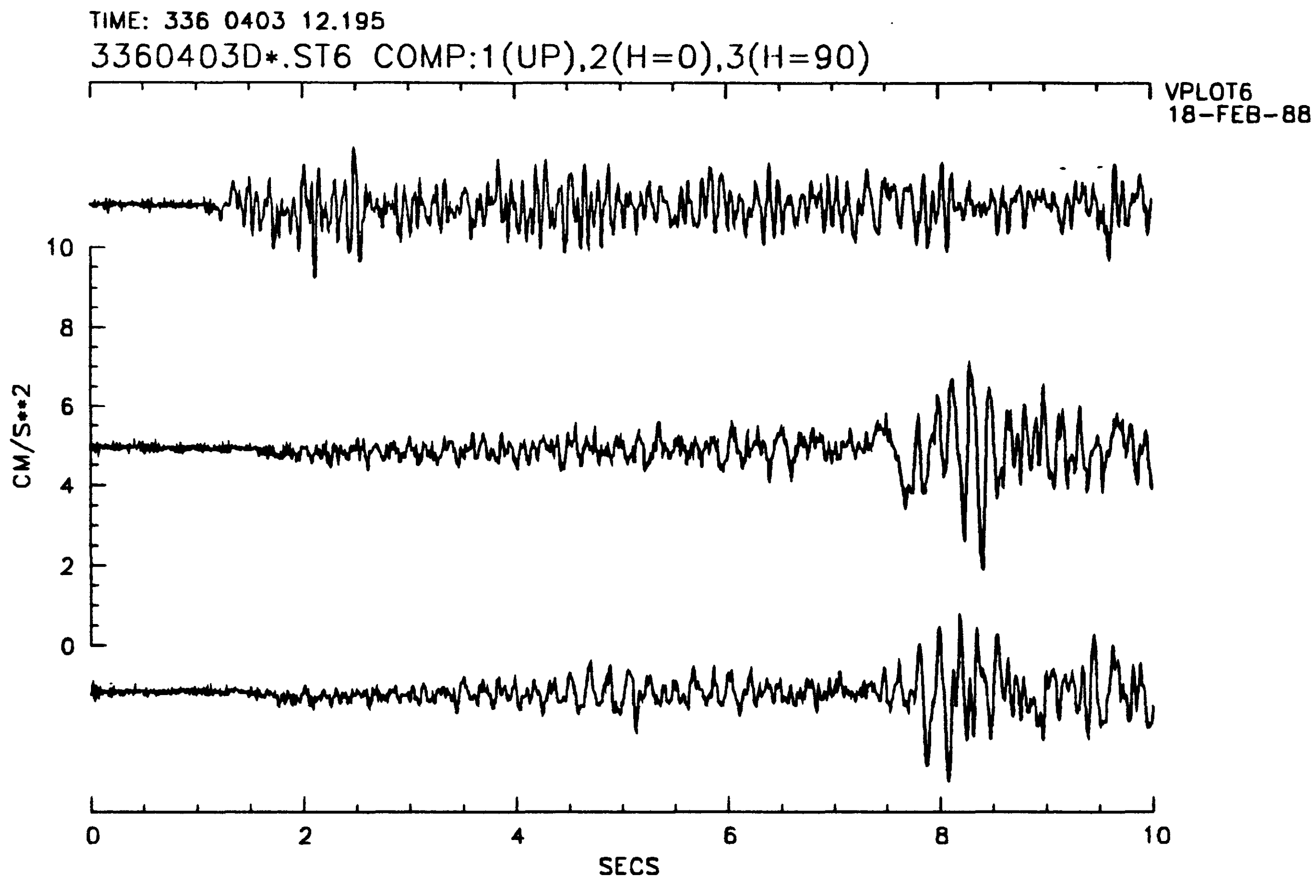
TIME: 336 0403 11.735

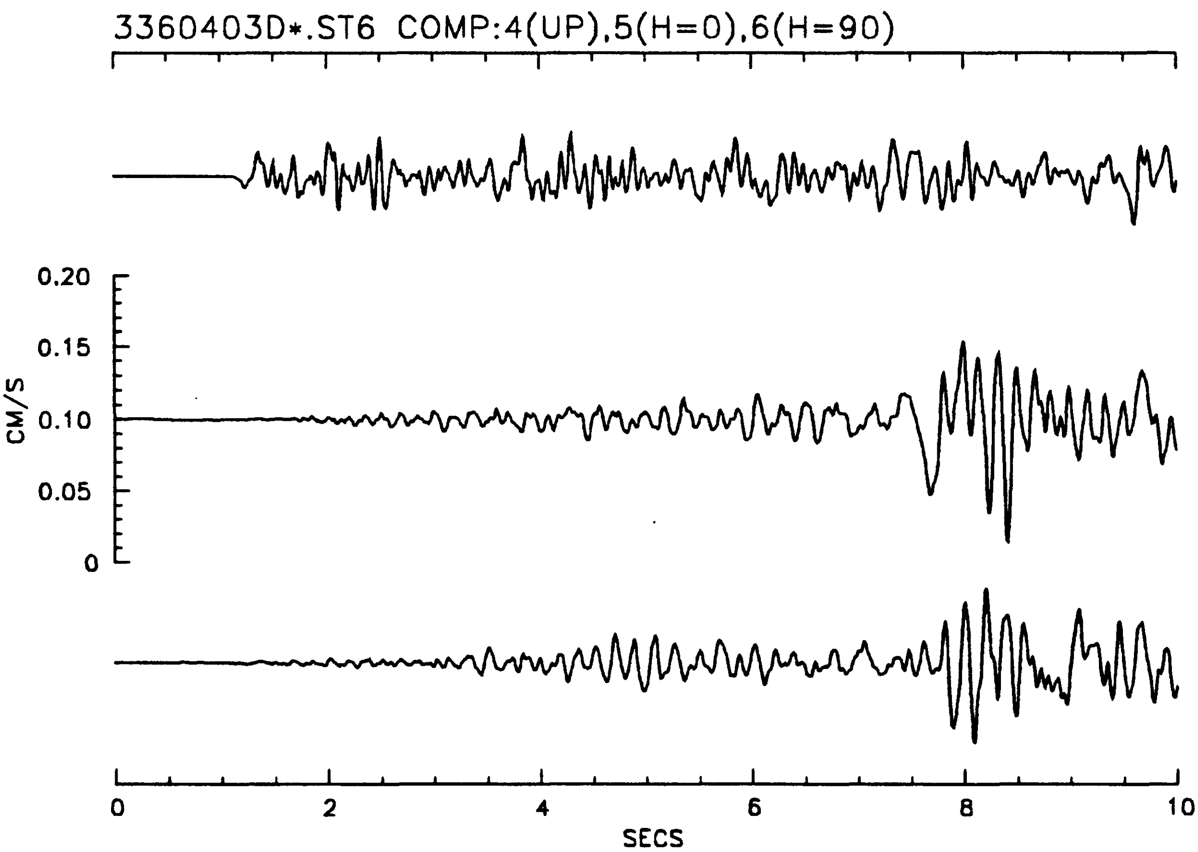
3360403D*.ST9 COMP:1(UP),2(H=0),3(H=90)

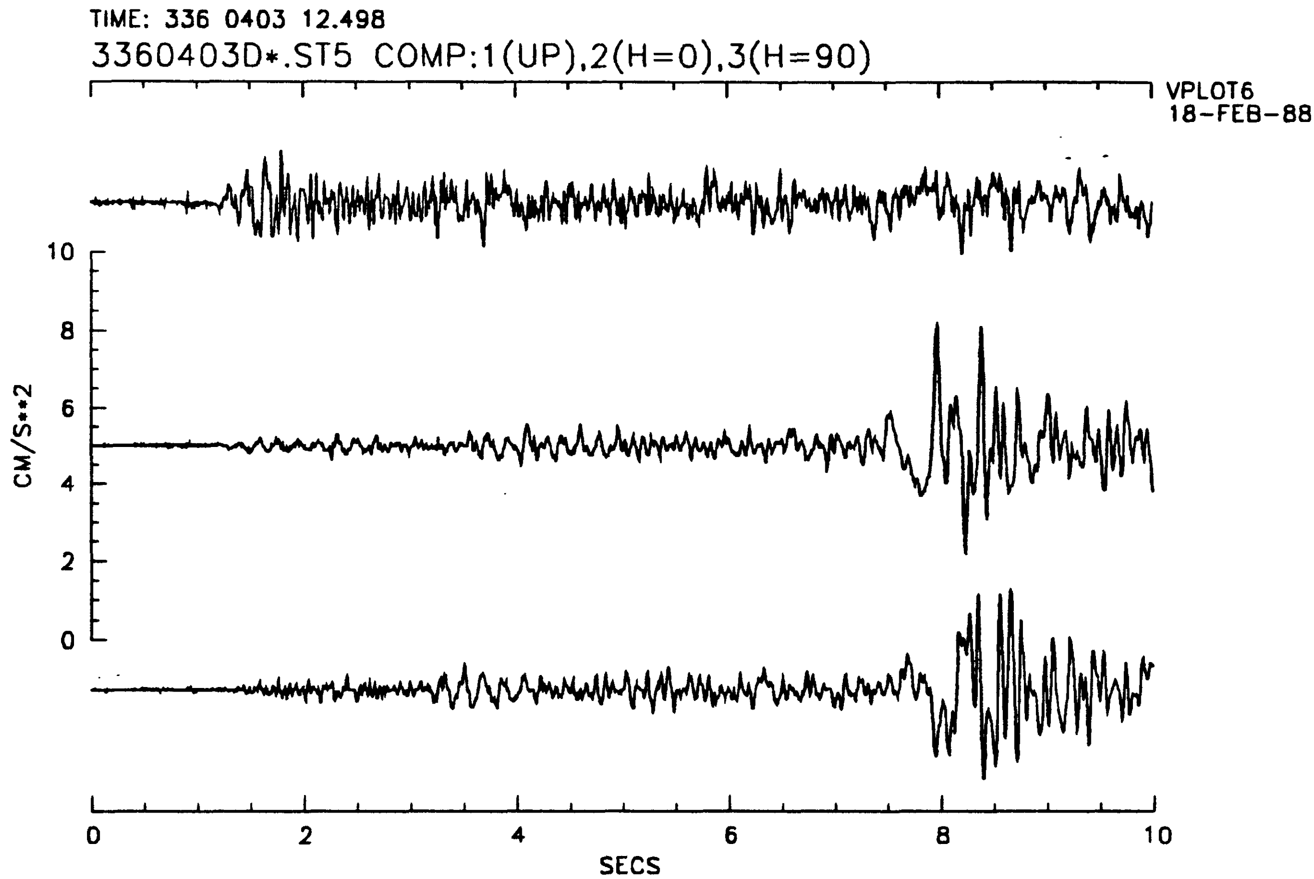


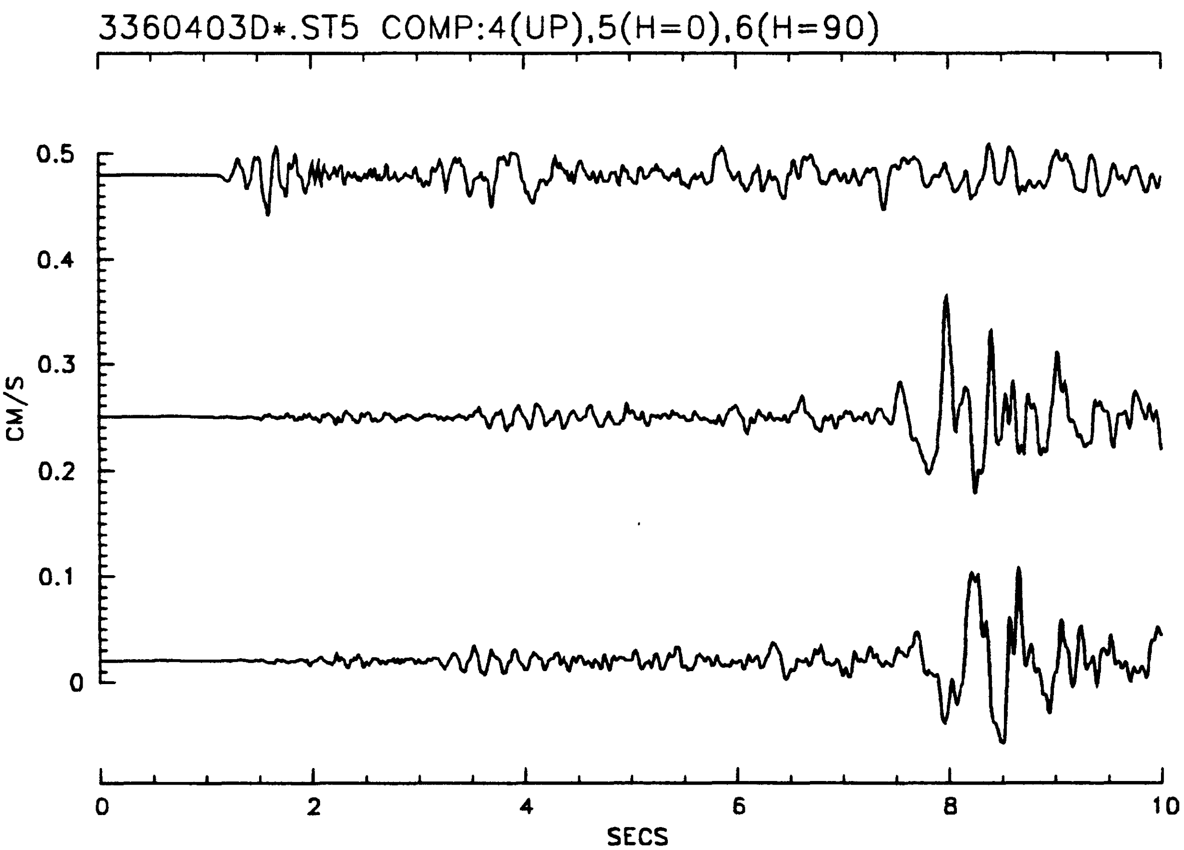
3360403D*.ST9 COMP:4(UP),5(H=0),6(H=90)




TIME: 336 0403 12.195
3360403D*.ST6 COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
8
10
SECS


3360403D*.ST6 COMP:4(UP),5(H=0),6(H=90)
CM/S
0.20
0.15
0.10
0.05
0
0
2
4
6
8
10
SECS


TIME: 336 0403 12.498
3360403D*.ST5 COMP:1(UP),2(H=0),3(H=90)
VPLOT6
18-FEB-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
8
10
SECS

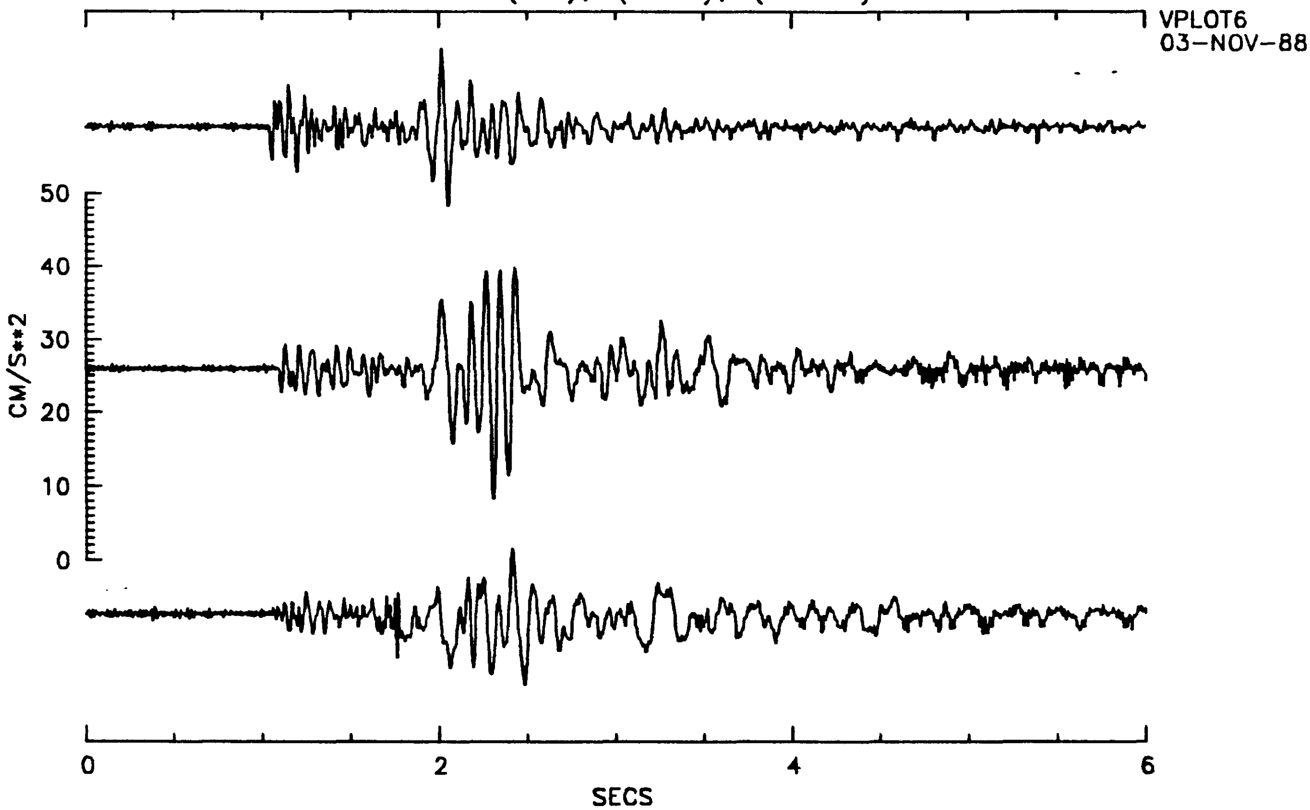

3360403D*.ST5 COMP:4(UP),5(H=0),6(H=90)
CM/S
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
SECS

APPENDIX 2.5 Seismograms of the M=2.9 earthquake

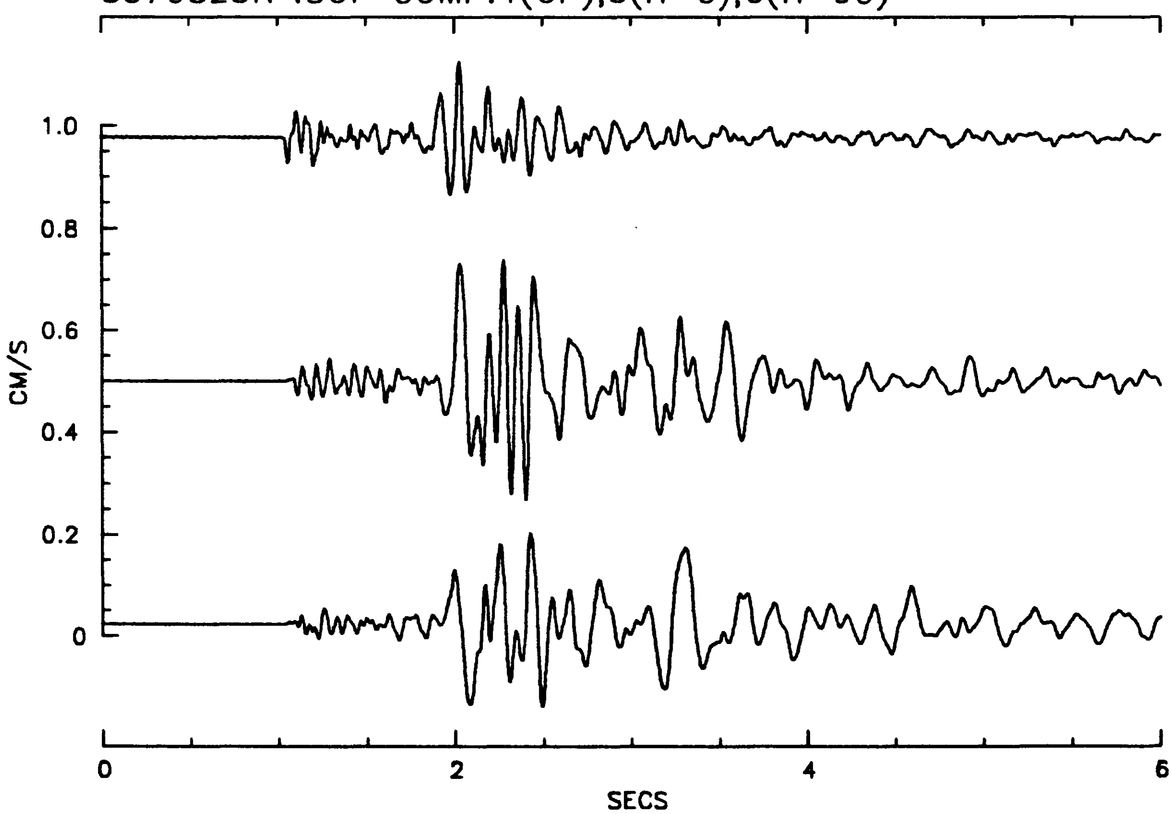
at 3370825

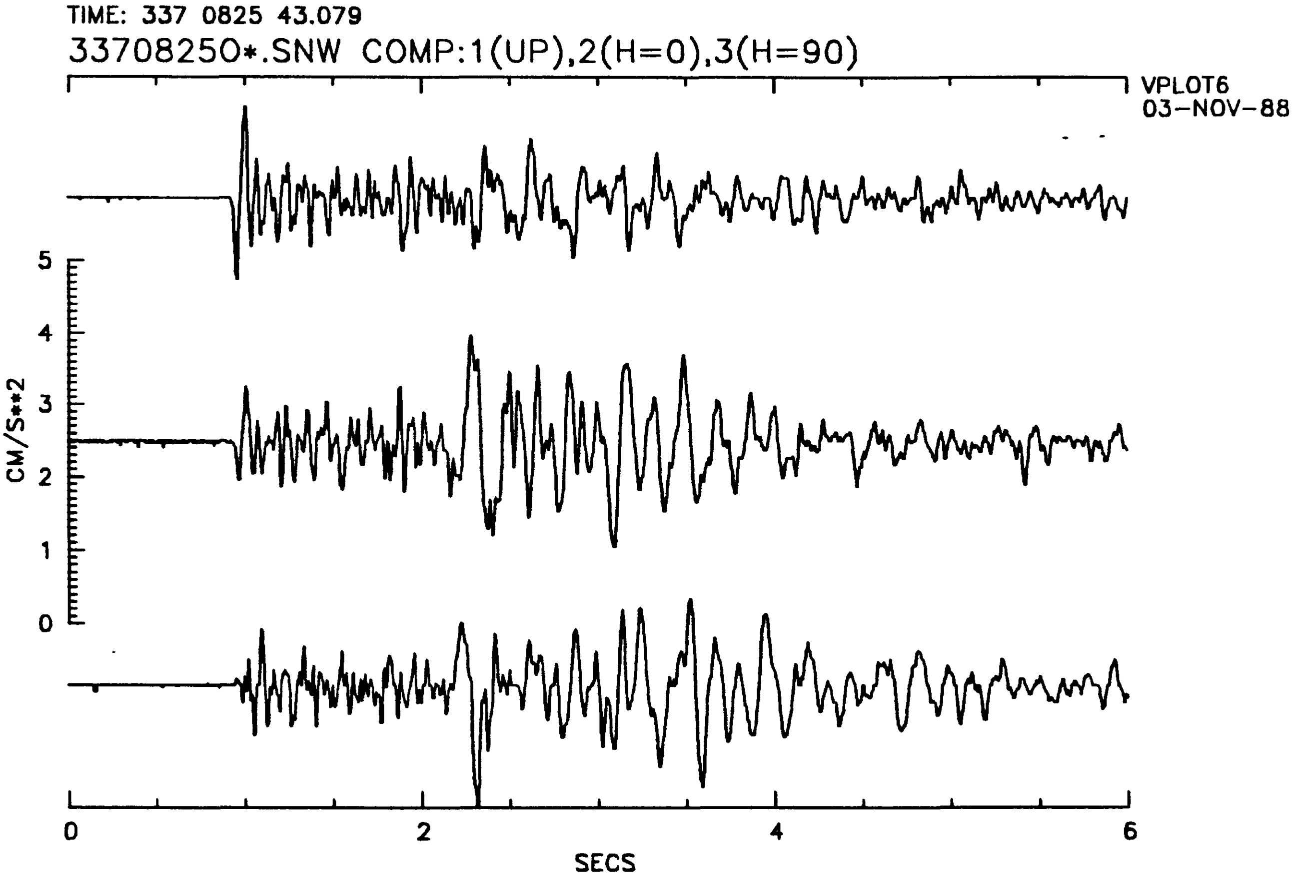
TIME: 337 0825 42.619

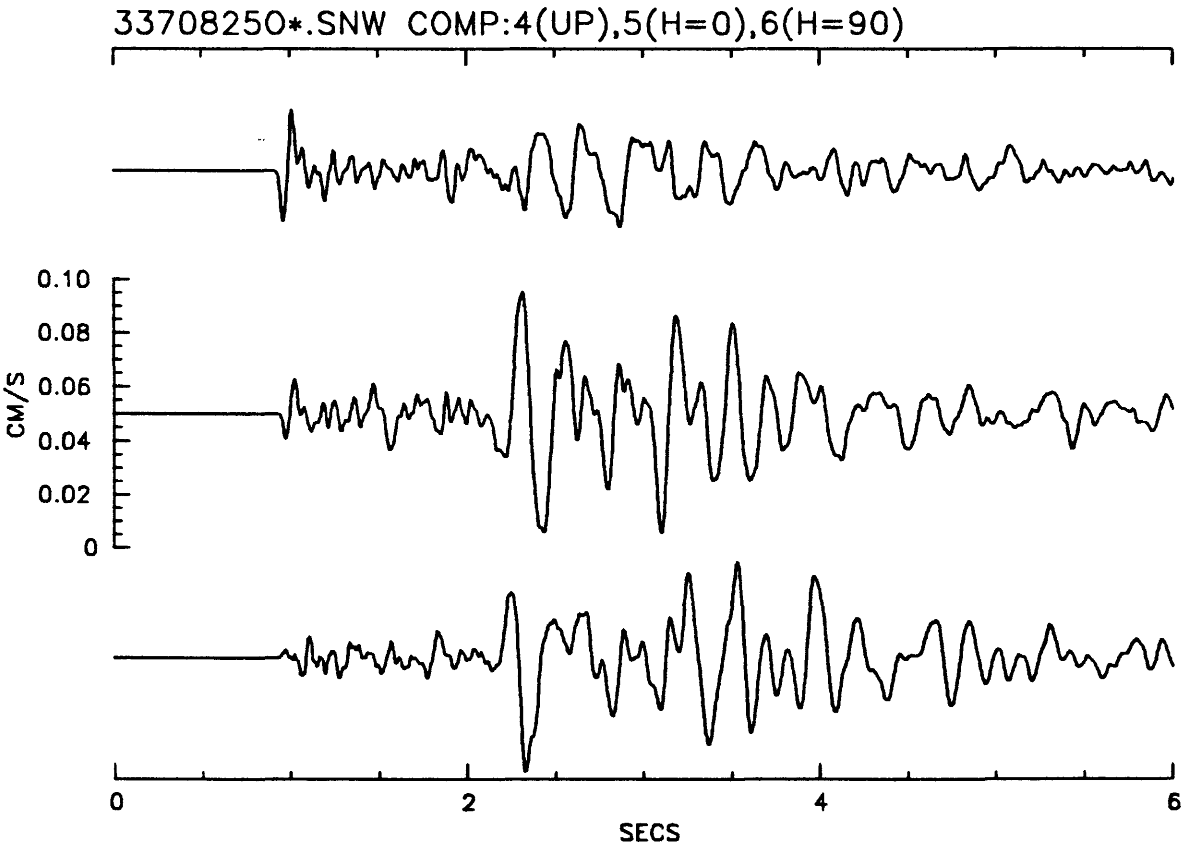
3370825N*.SUP COMP:1(UP),2(H=0),3(H=90)



3370825N*.SUP COMP:4(UP),5(H=0),6(H=90)

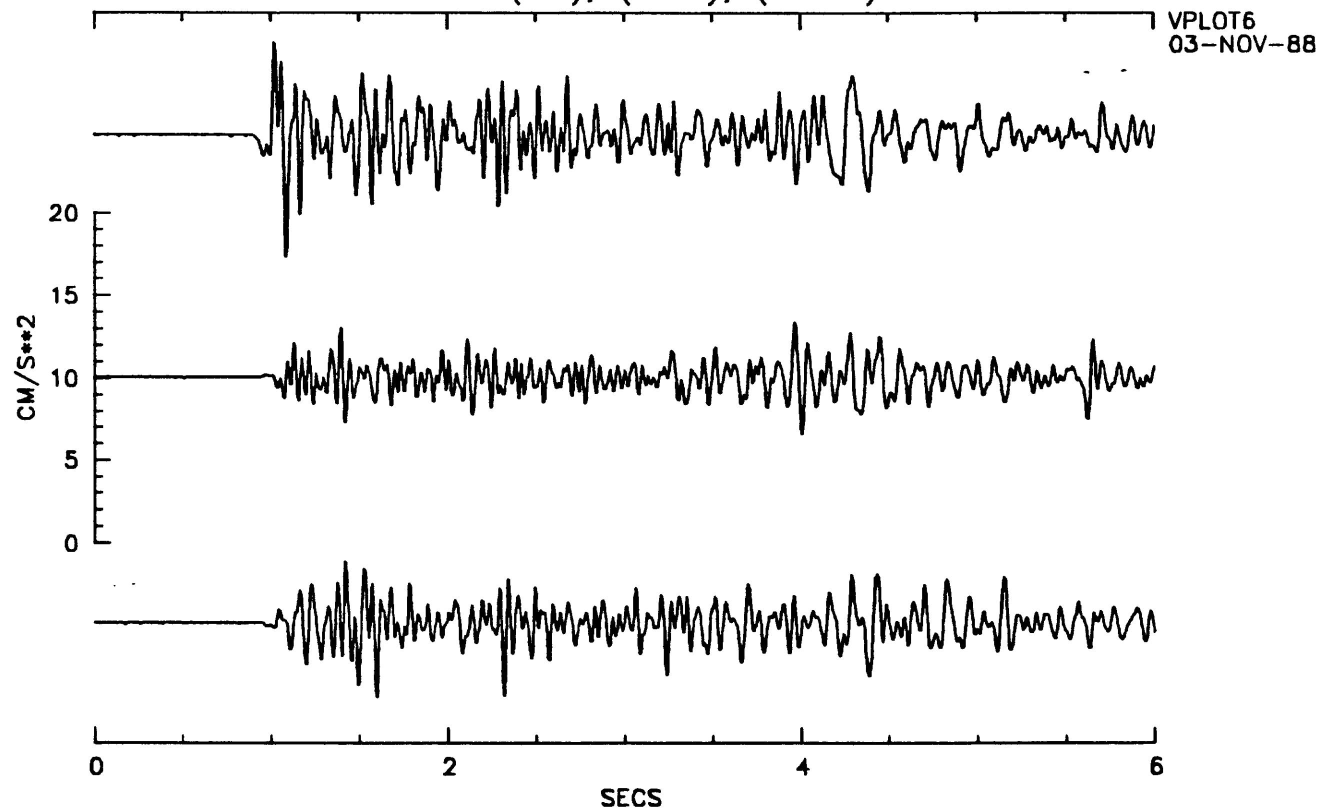



TIME: 337 0825 43.079
33708250*.SNW COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
CM/S**2
0
1
2
3
4
5
0
2
4
6
SECS

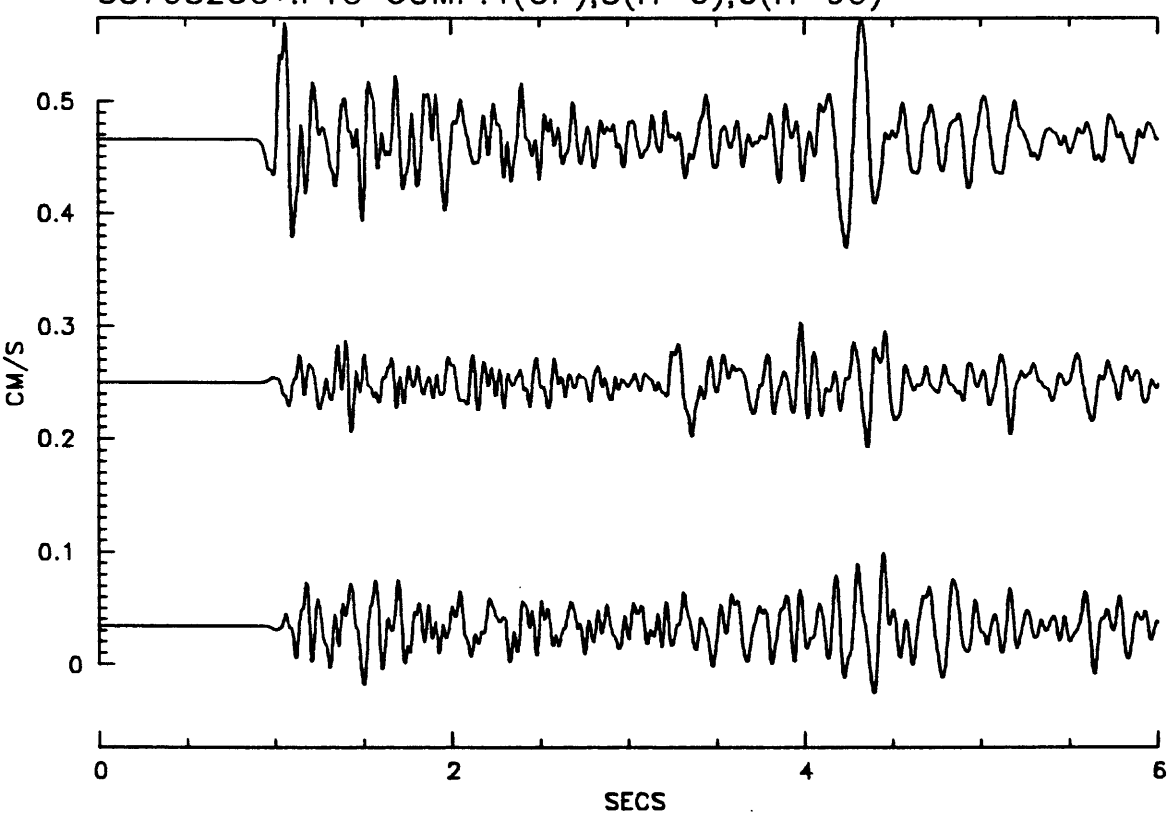

33708250*.SNW COMP:4(UP),5(H=0),6(H=90)
CM/S
0
0.02
0.04
0.06
0.08
0.10
0
2
4
6
SECS

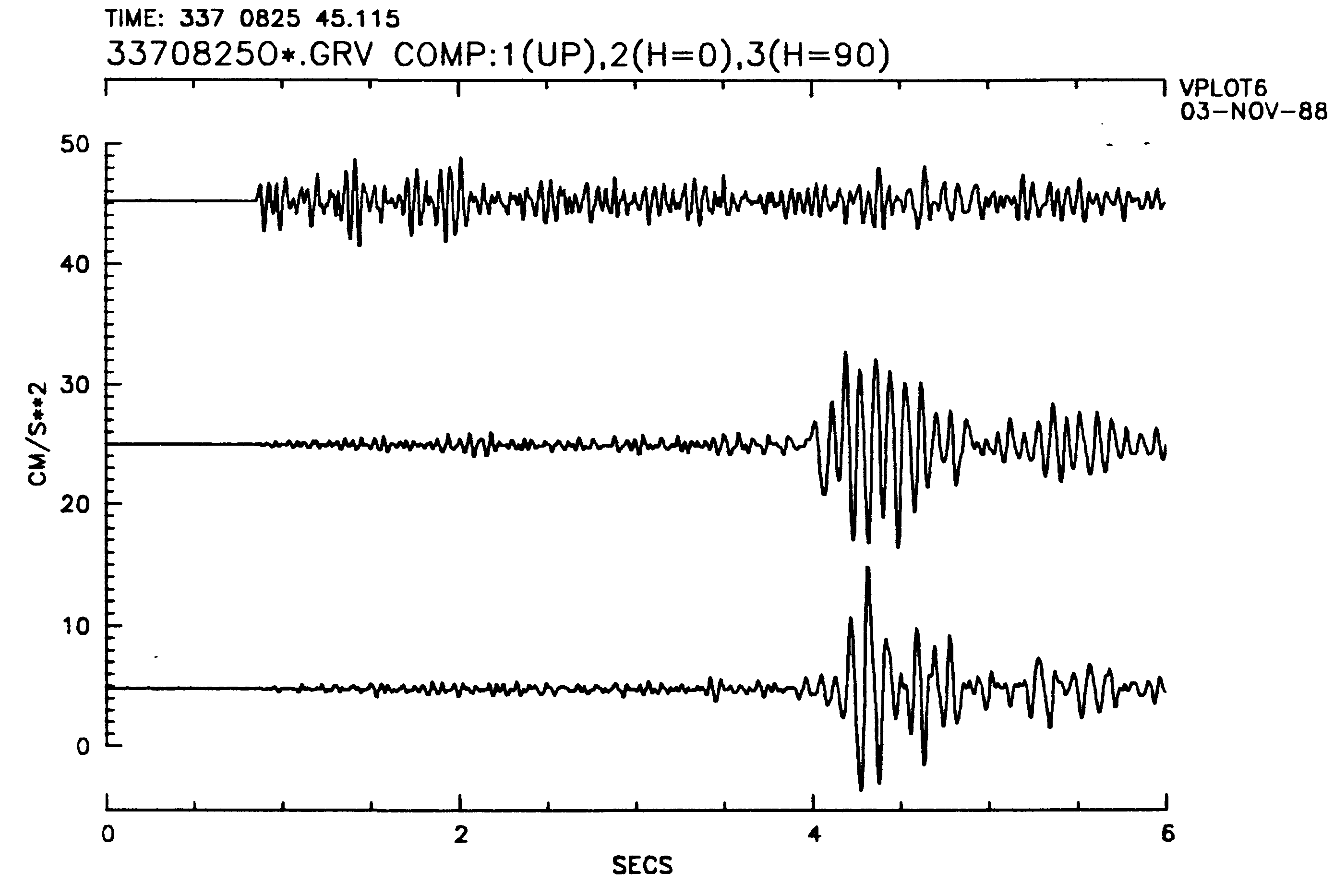
TIME: 337 0825 44.155

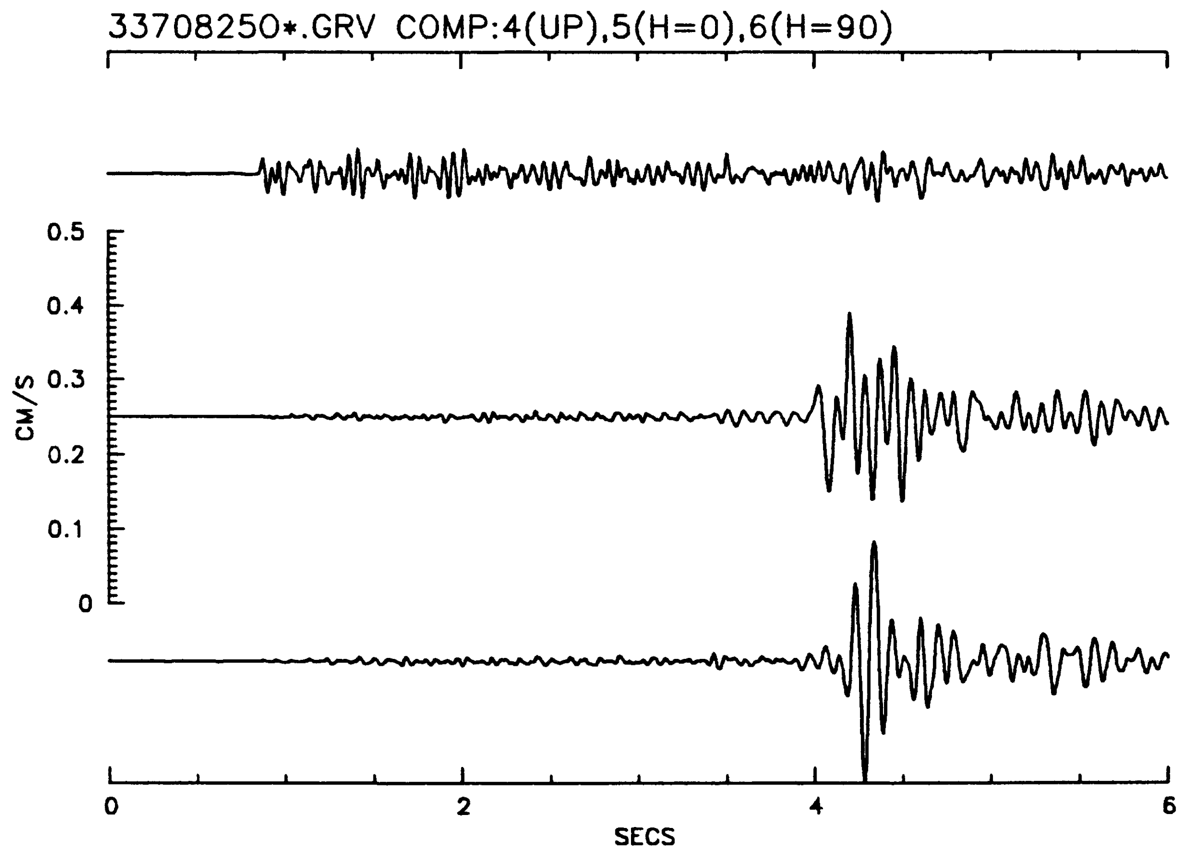
33708250*.PTO COMP:1(UP),2(H=0),3(H=90)

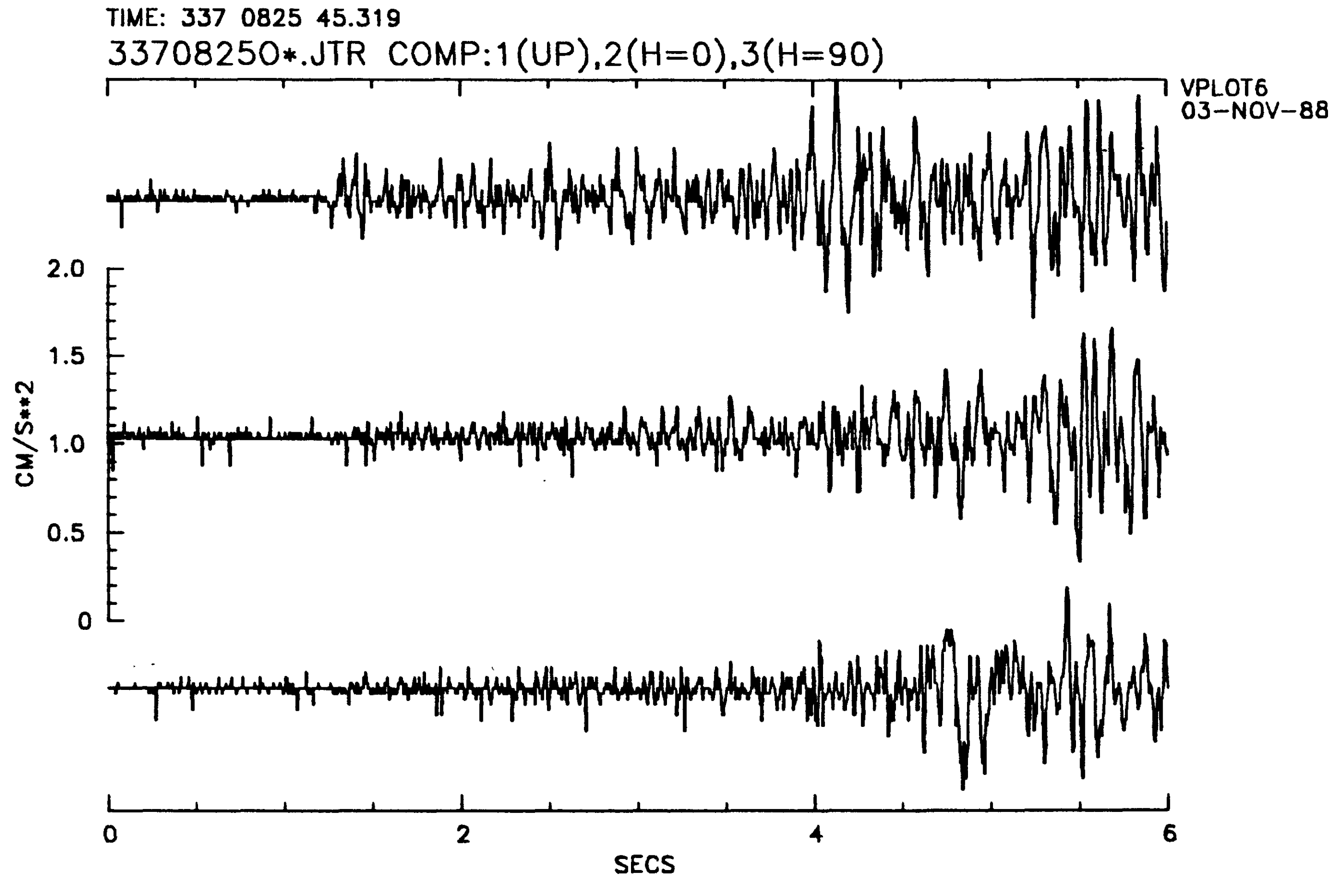


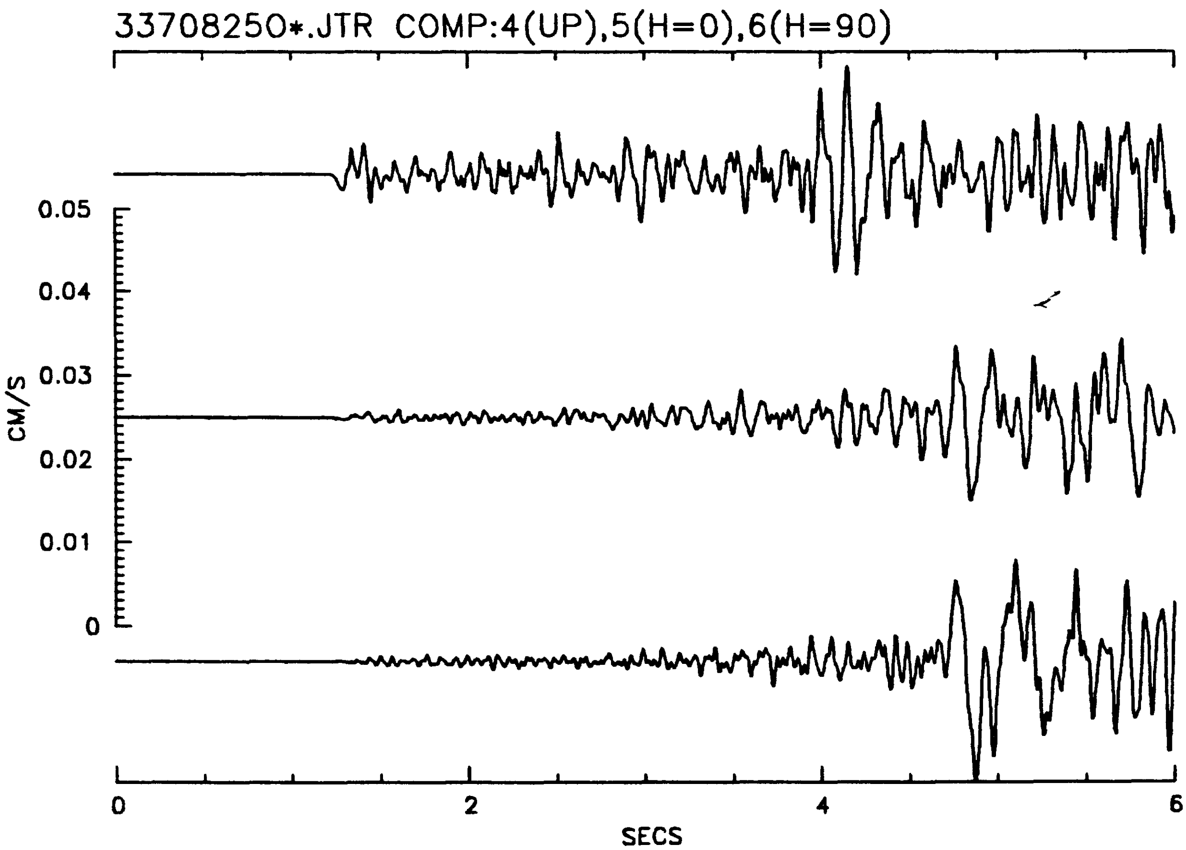
33708250*.PTO COMP:4(UP),5(H=0),6(H=90)




TIME: 337 0825 45.115
33708250*.GRV COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
50
40
30
20
10
0
CM/S**2
0
2
4
6
SECS

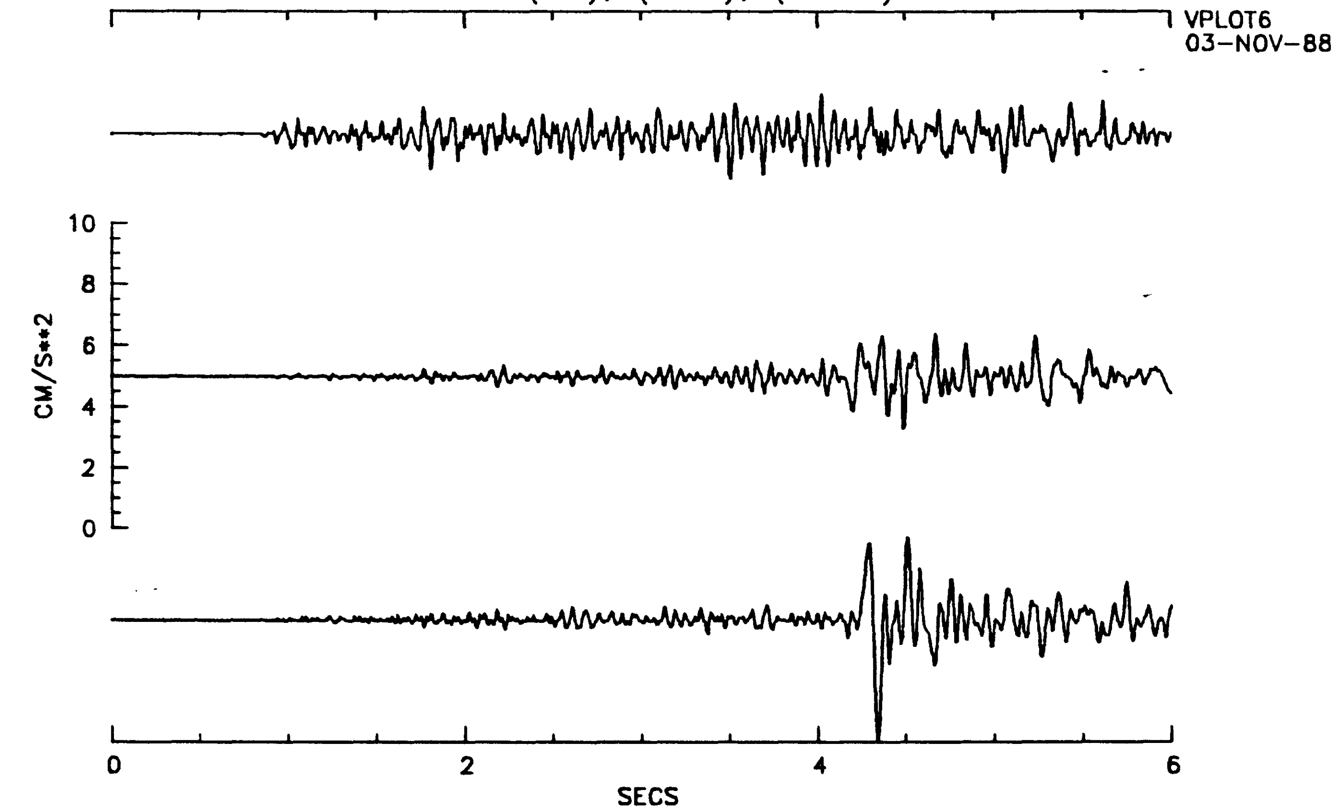

33708250*.GRV COMP:4(UP),5(H=0),6(H=90)
0.5
0.4
0.3
0.2
0.1
0
CM/S
0
2
4
6
SECS


TIME: 337 0825 45.319
33708250*.JTR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
2.0
1.5
1.0
0.5
0
CM/S**2
0
2
4
6
SECS

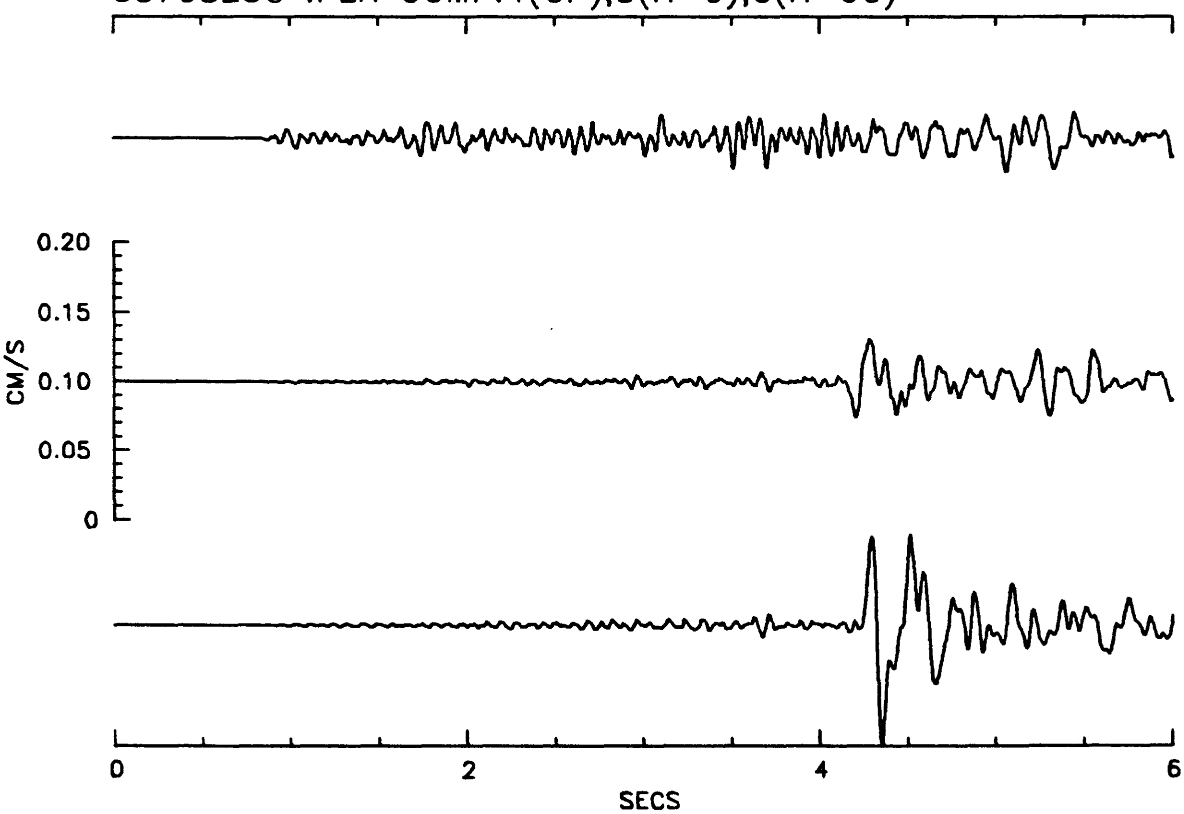

33708250*.JTR COMP:4(UP),5(H=0),6(H=90)
0.05
0.04
0.03
0.02
0.01
0
CM/S
0
2
4
6
SECS

TIME: 337 0825 45.543

33708250*.PLR COMP:1(UP),2(H=0),3(H=90)



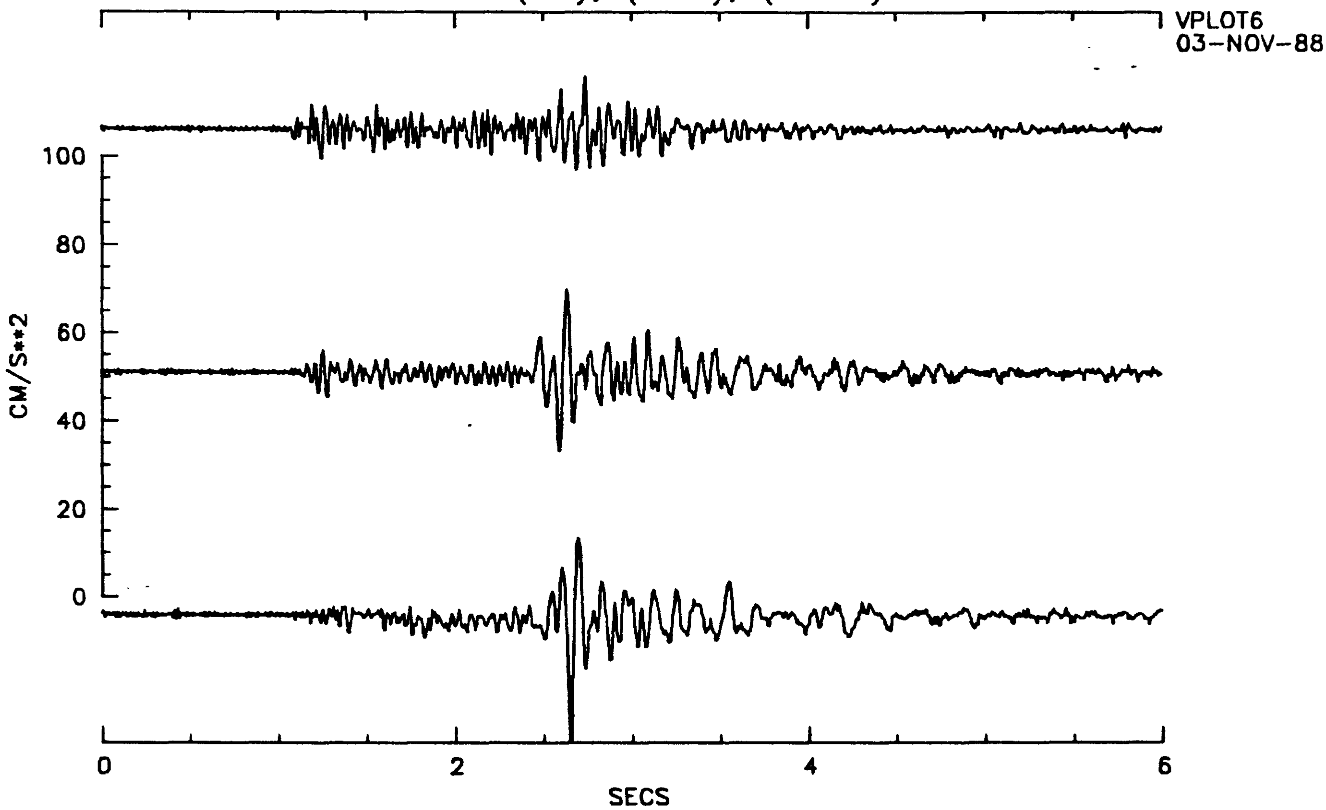
33708250*.PLR COMP:4(UP),5(H=0),6(H=90)



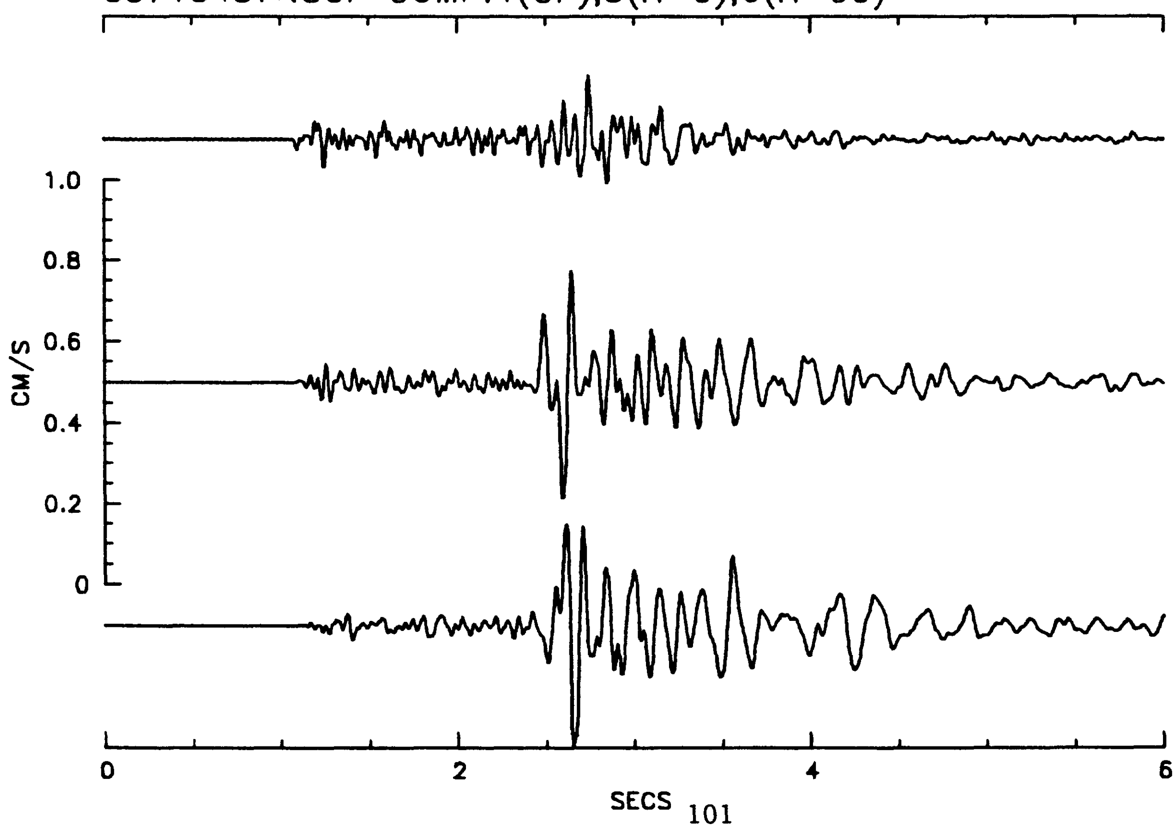
APPENDIX 2.6 Seismograms of the M=3.0 earthquake at 3371345

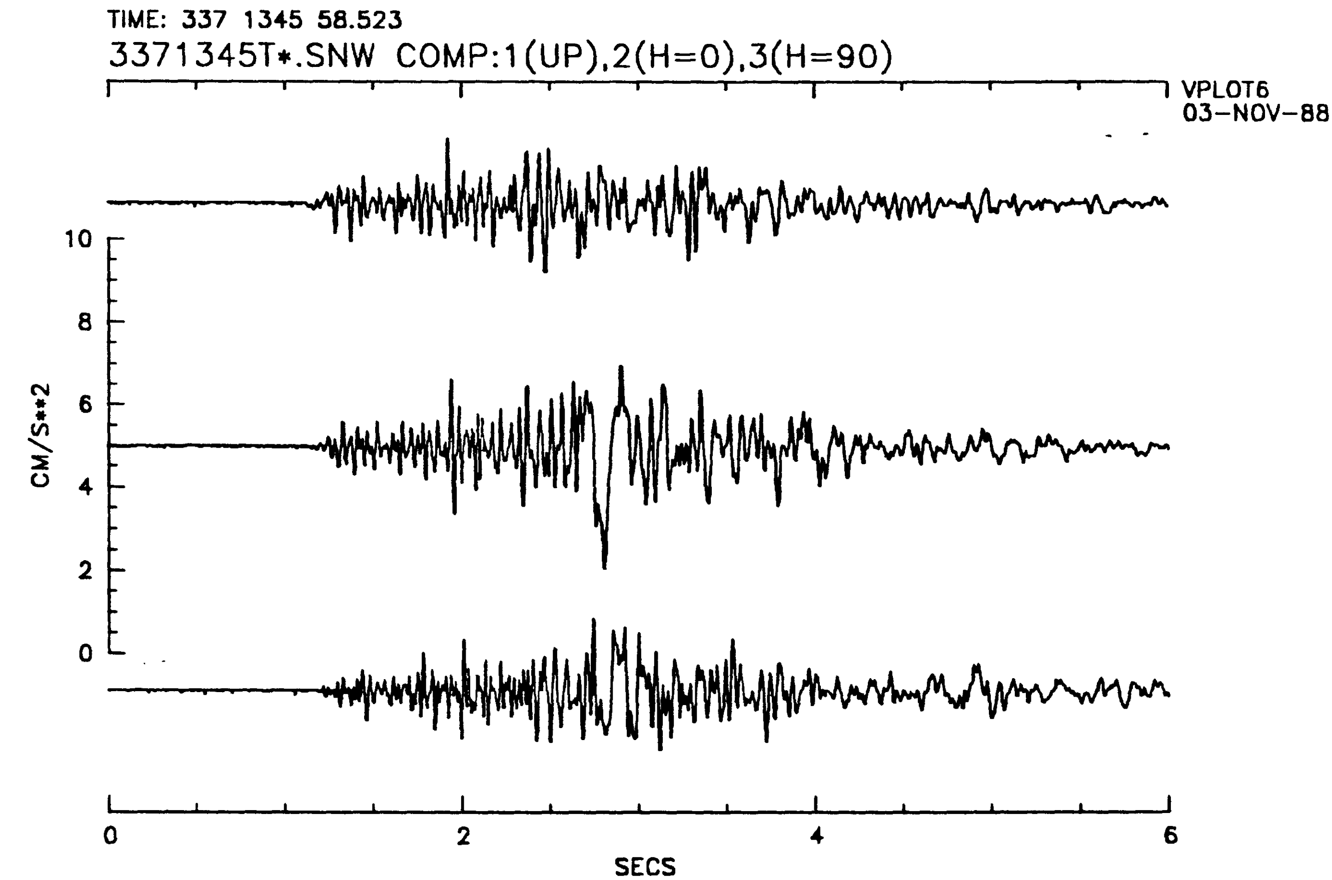
TIME: 337 1345 58.479

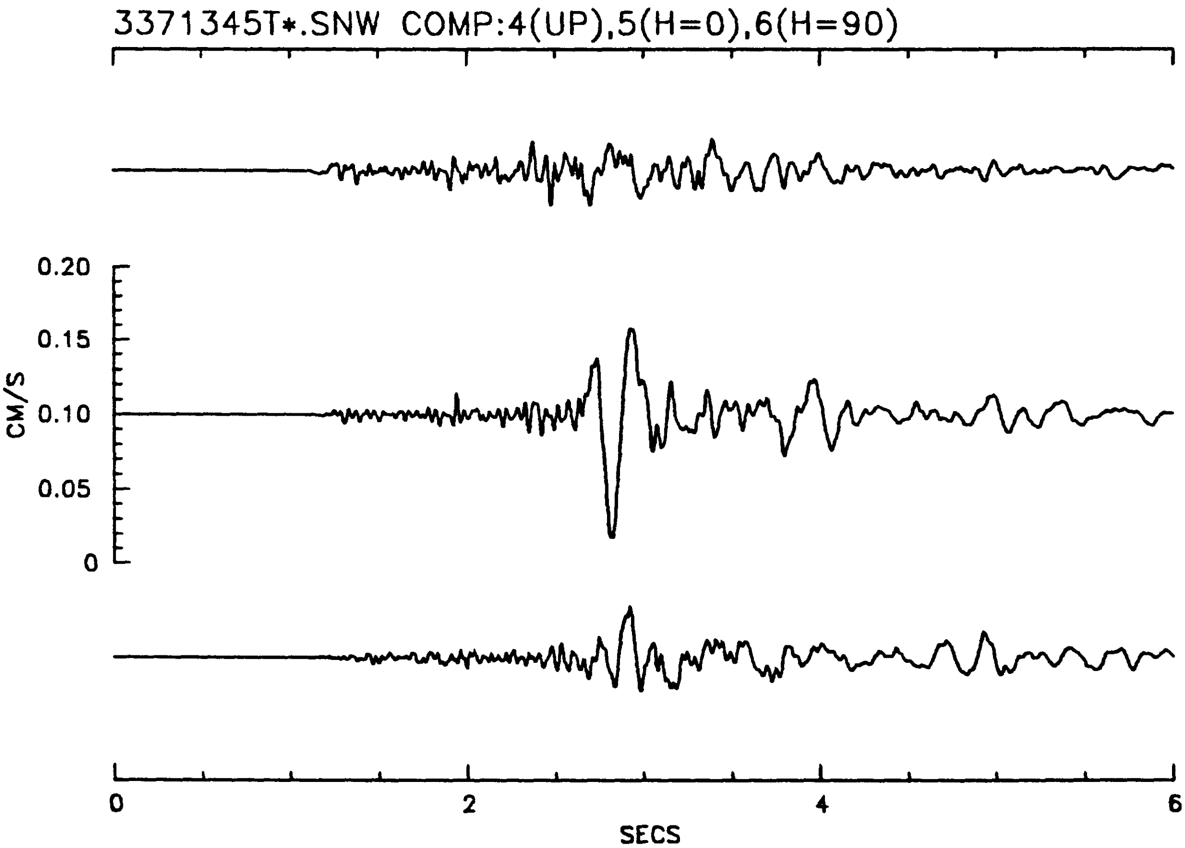
3371345T*.SUP COMP:1(UP),2(H=0),3(H=90)

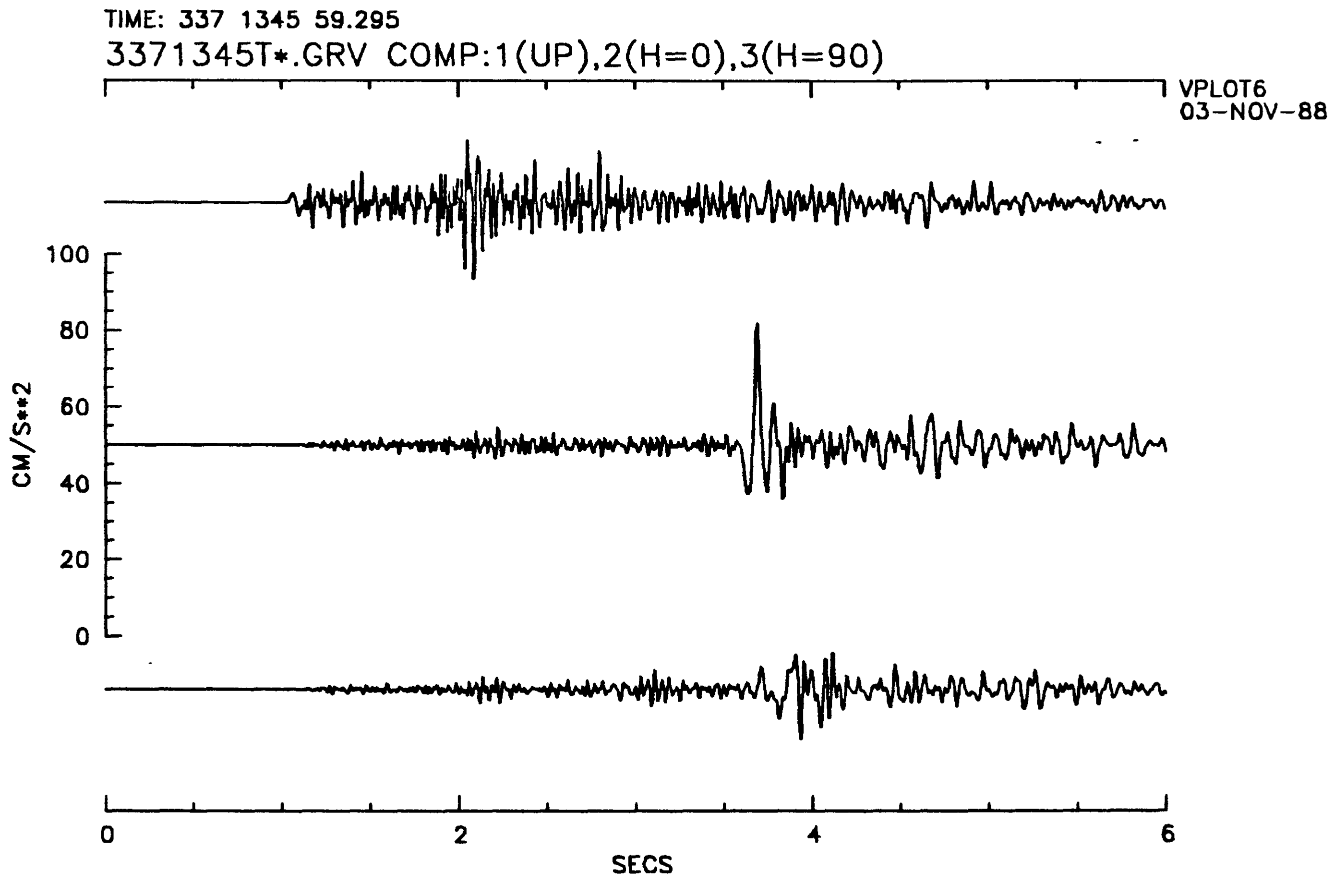


3371345T*.SUP COMP:4(UP),5(H=0),6(H=90)

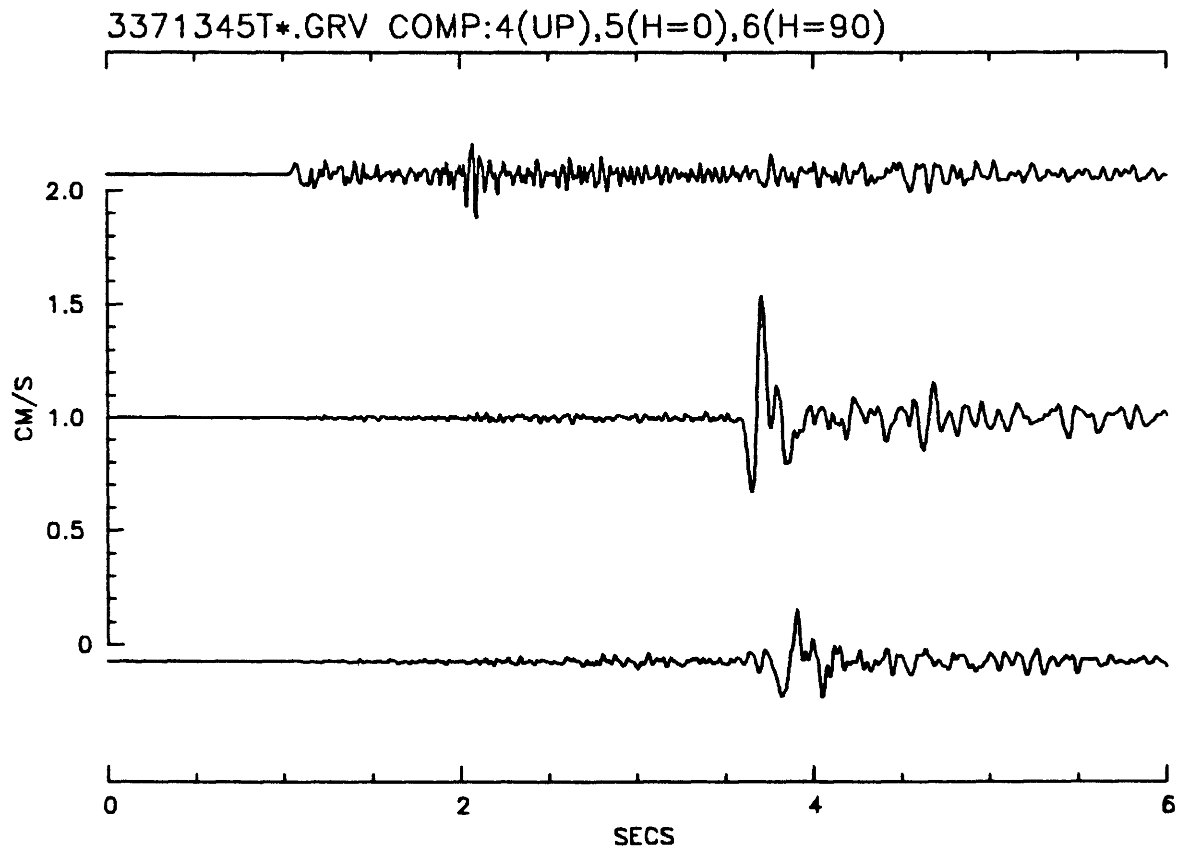



TIME: 337 1345 58.523
3371345T*.SNW COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
10
8
6
4
2
0
CM/S**2
0
2
4
6
SECS

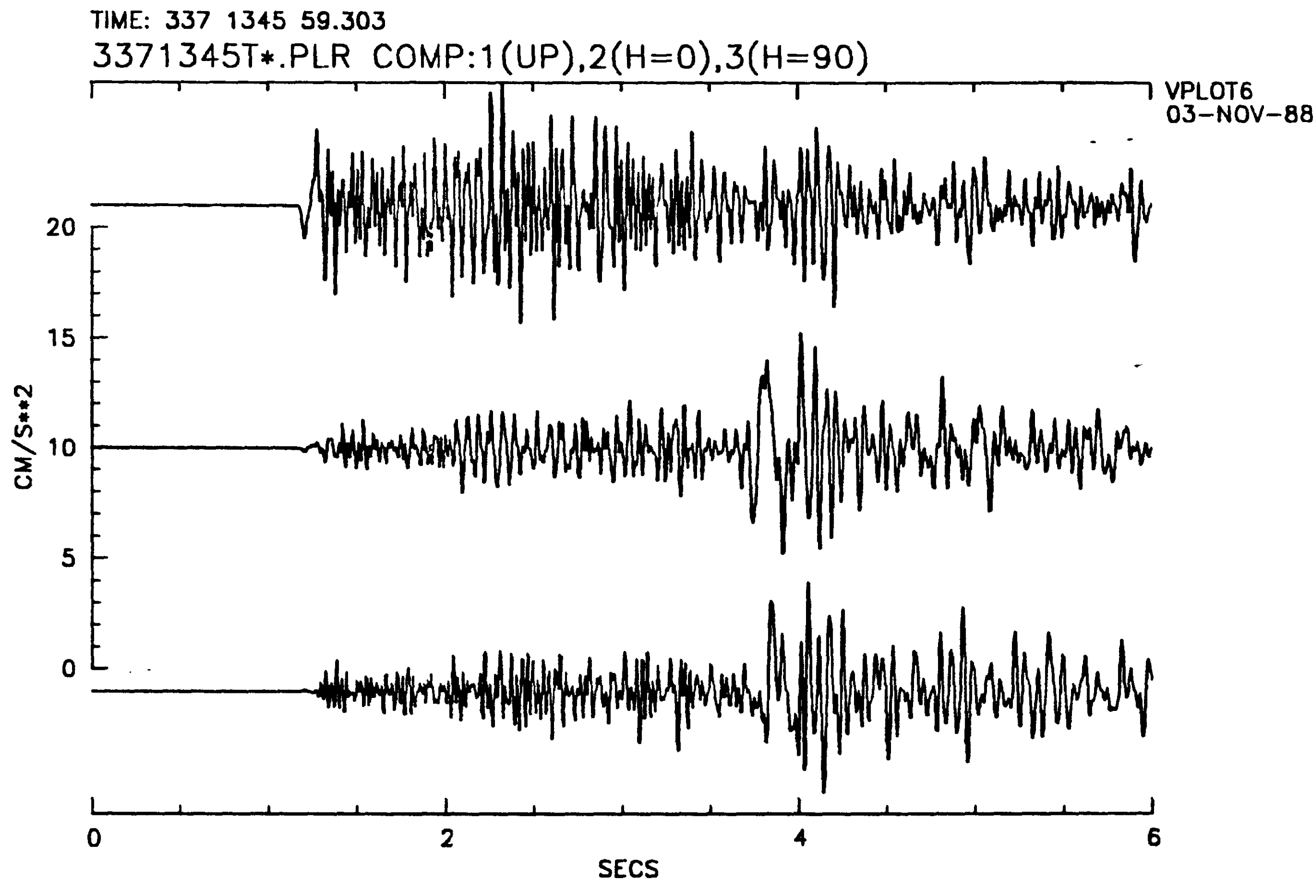

3371345T*.SNW COMP:4(UP),5(H=0),6(H=90)
0.20
0.15
0.10
0.05
0
CM/S
0
2
4
6
SECS

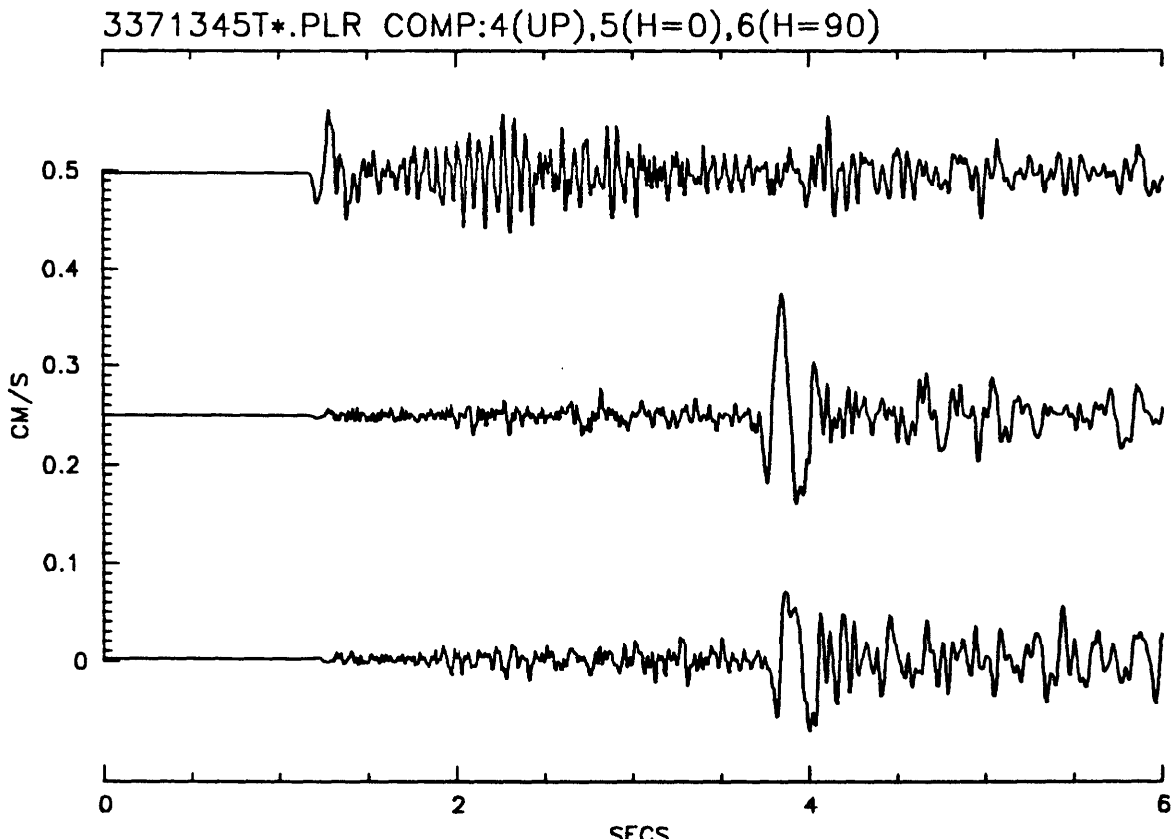


TIME: 337 1345 59.295
3371345T*.GRV COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
CM/S**2
100
80
60
40
20
0
0
2
4
6
SECS



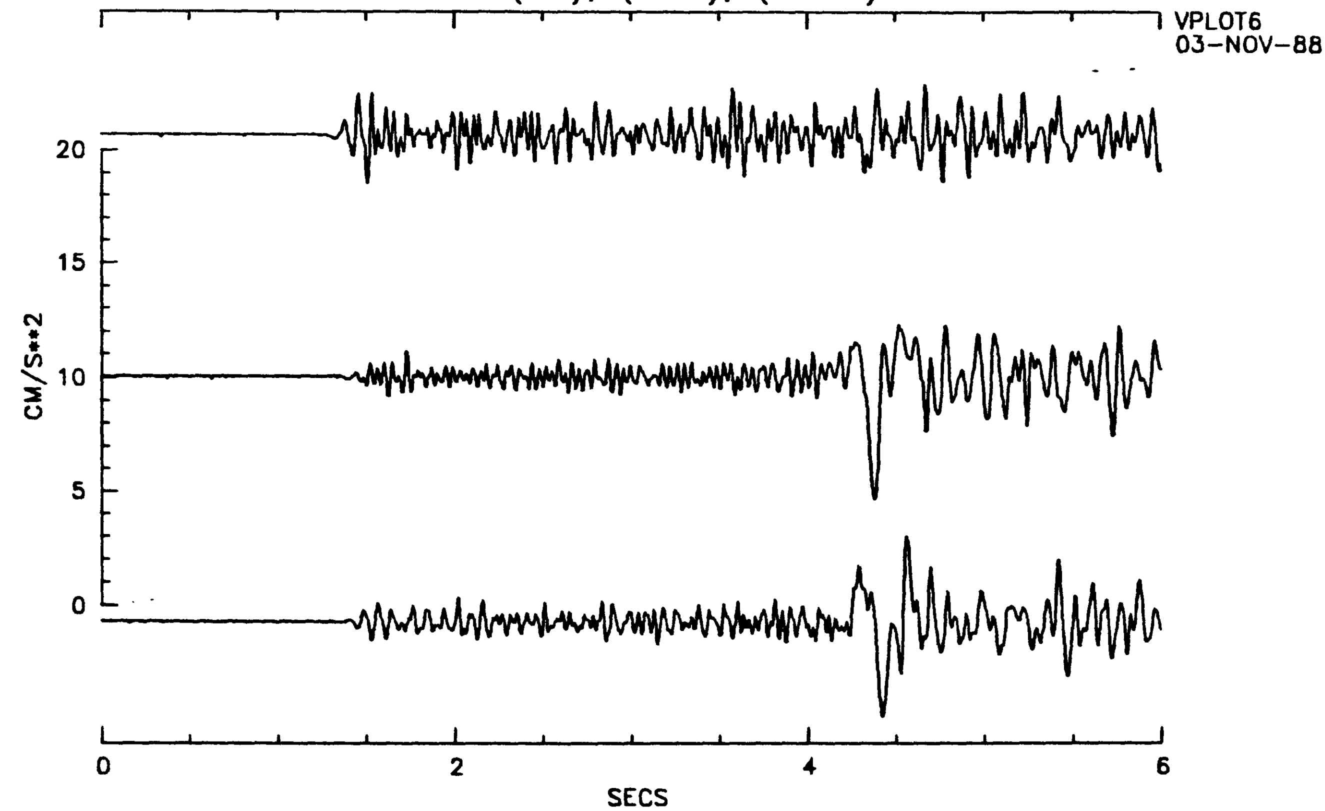
3371345T*.GRV COMP:4(UP),5(H=0),6(H=90)
CM/S
2.0
1.5
1.0
0.5
0
0
2
4
6
SECS


TIME: 337 1345 59.303
3371345T*.PLR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
CM/S**2
20
15
10
5
0
0
2
4
6
SECS

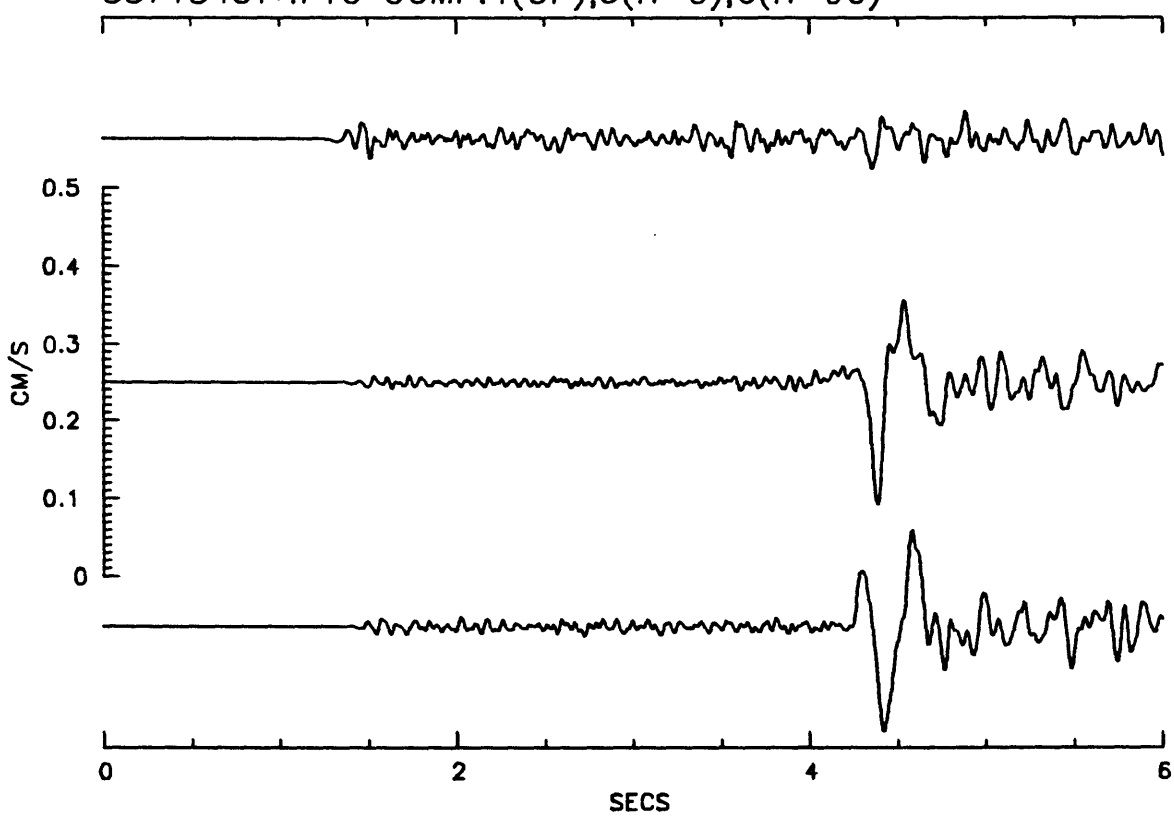

3371345T*.PLR COMP:4(UP),5(H=0),6(H=90)
CM/S
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
SECS

TIME: 337 1345 59.595

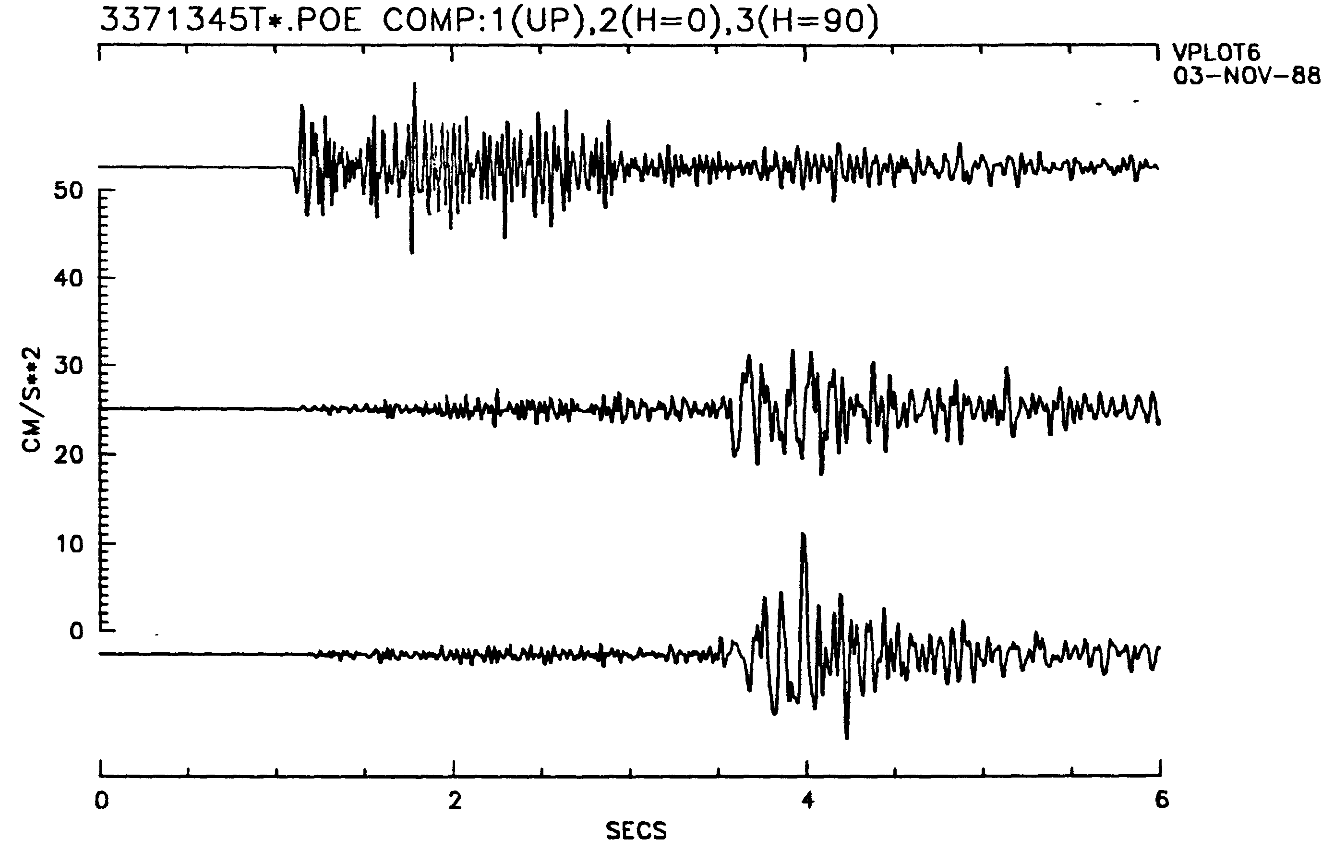
3371345T*.PTO COMP:1(UP),2(H=0),3(H=90)

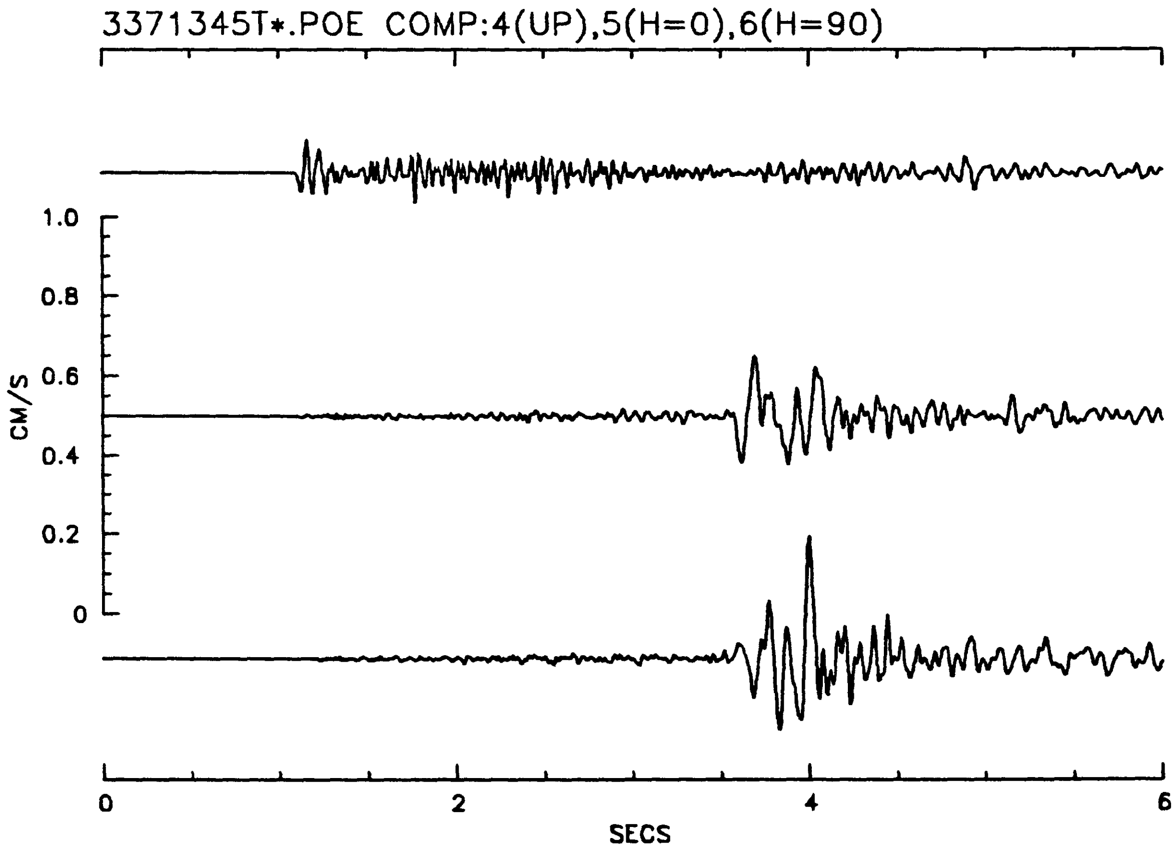


3371345T*.PTO COMP:4(UP),5(H=0),6(H=90)



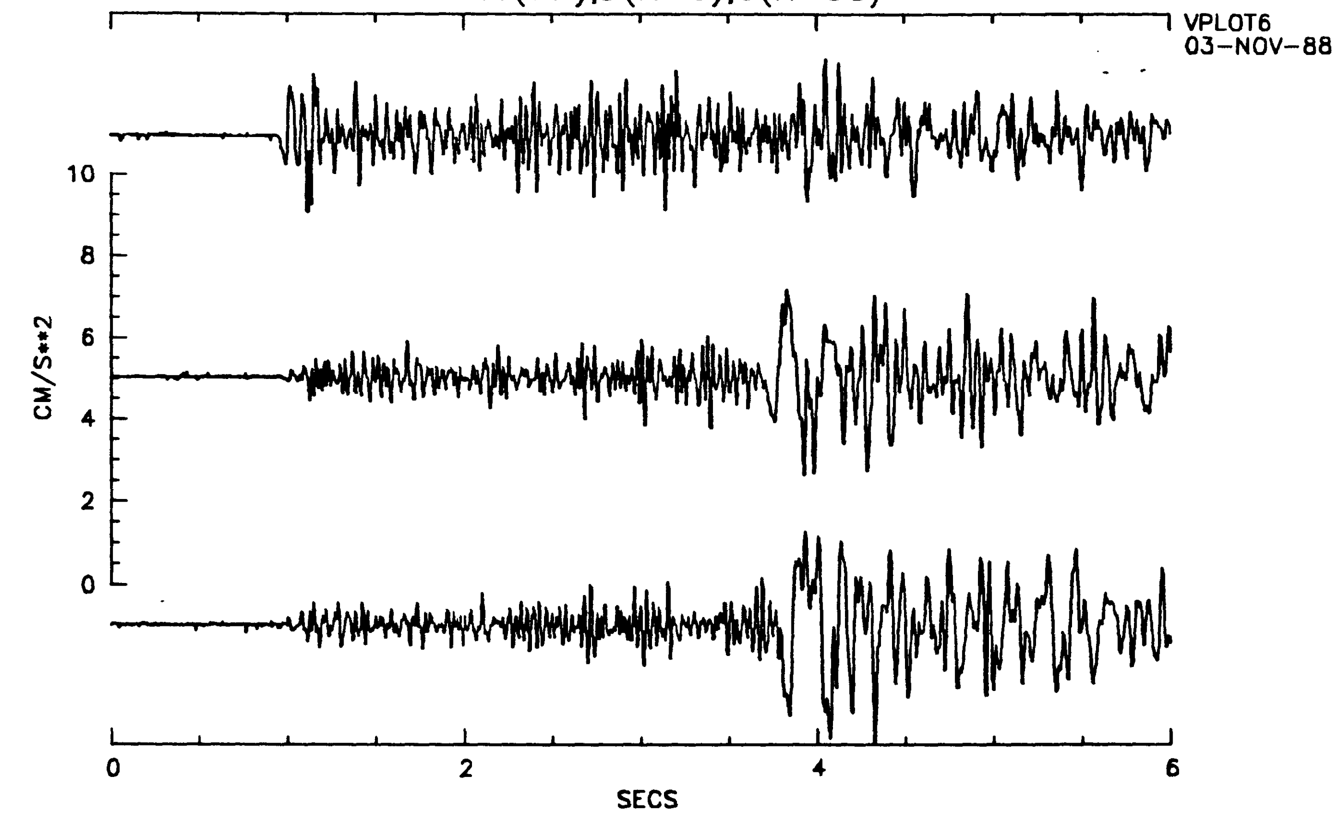
TIME: 337 1345 59.775



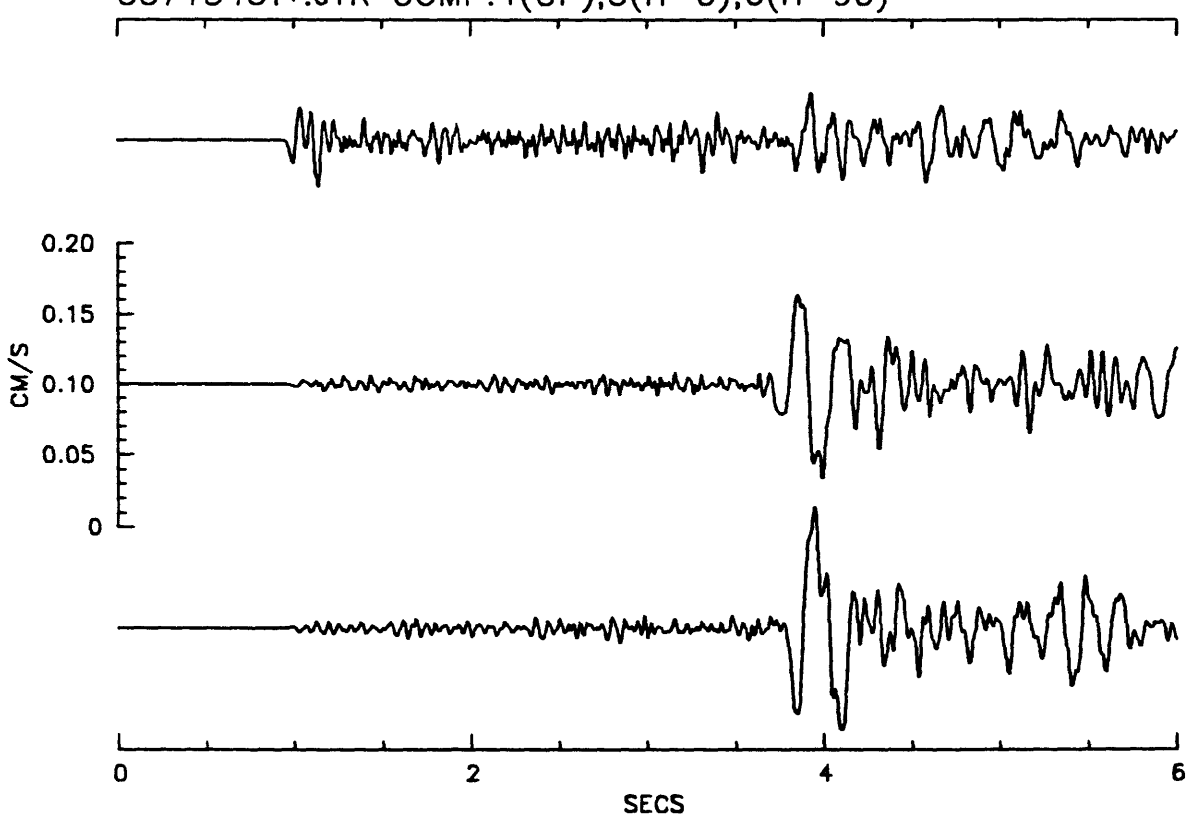


TIME: 337 1345 59.919

3371345T*.JTR COMP:1(UP),2(H=0),3(H=90)



3371345T*.JTR COMP:4(UP),5(H=0),6(H=90)

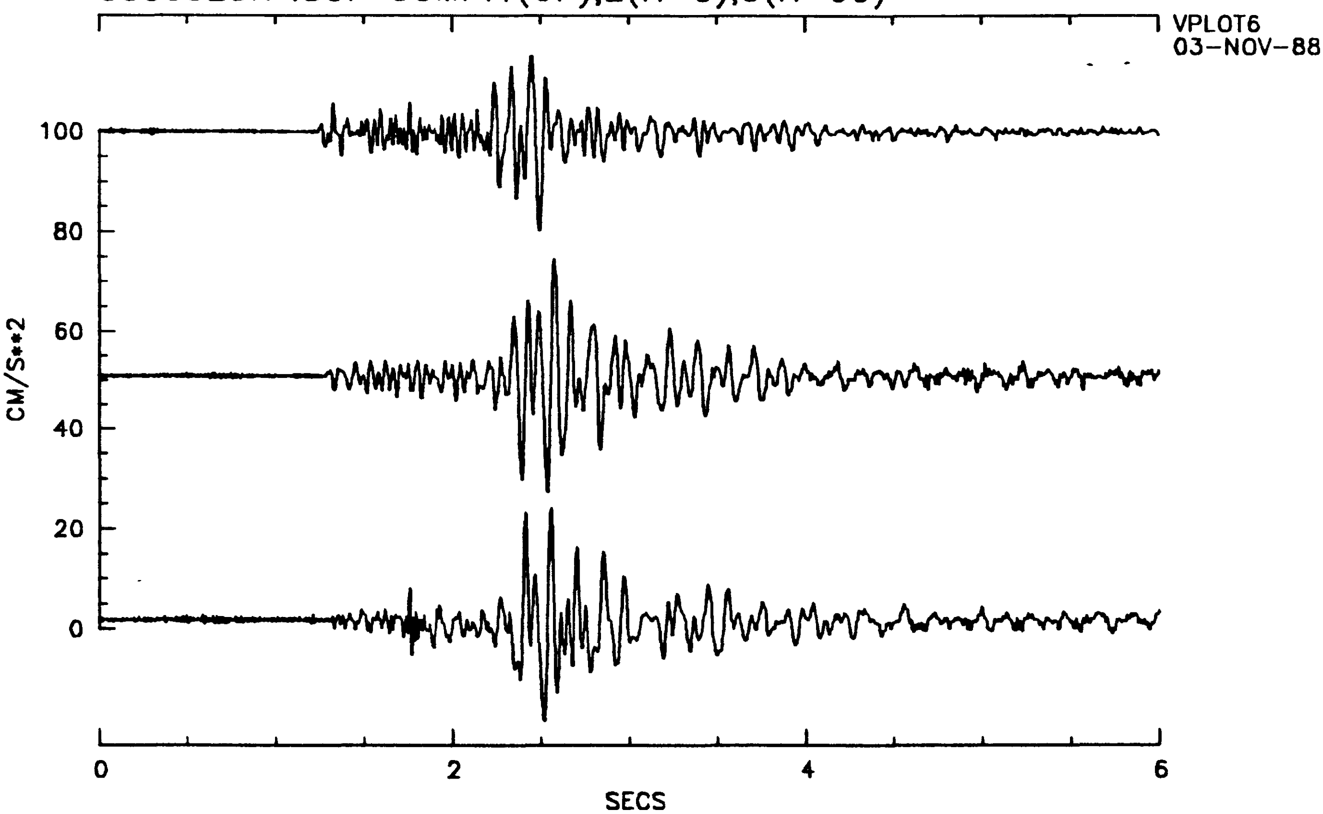


APPENDIX 2.7 Seismograms of the M=3.1 earthquake

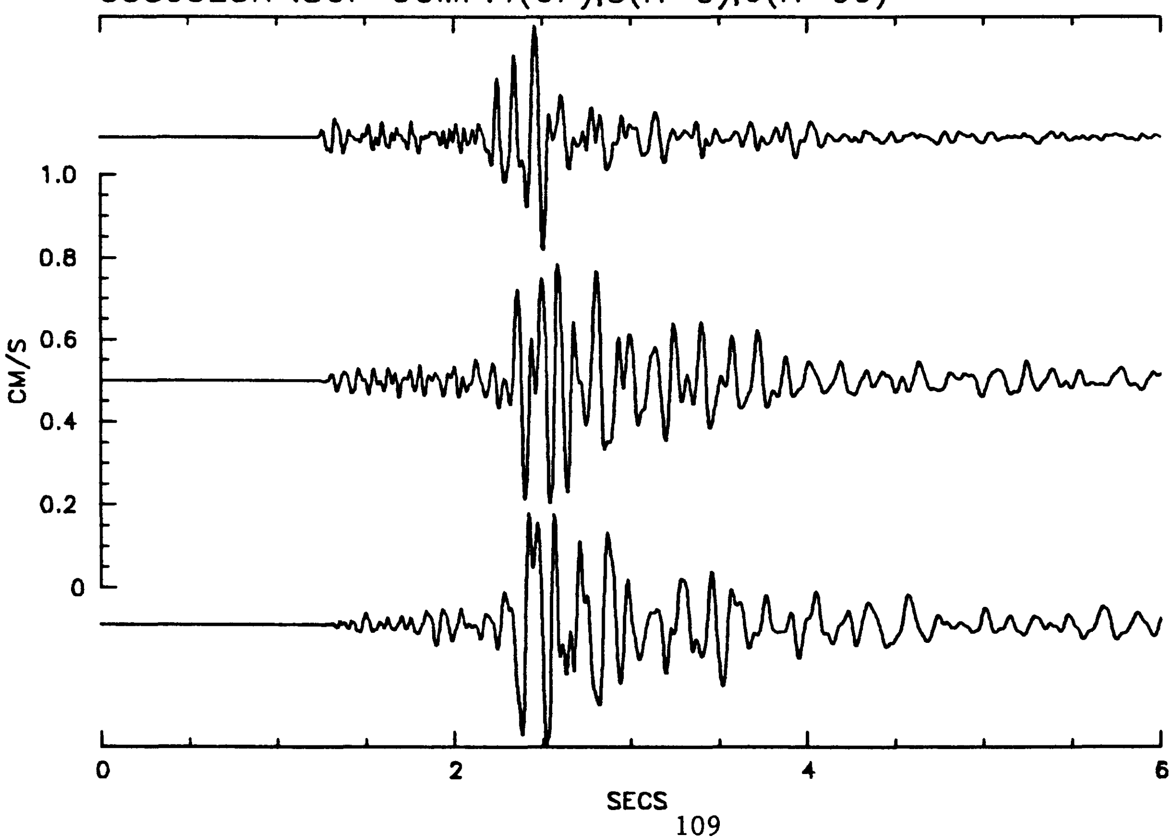
at 3380523

TIME: 338 0523 53.929

3380523R*.SUP COMP:1(UP),2(H=0),3(H=90)

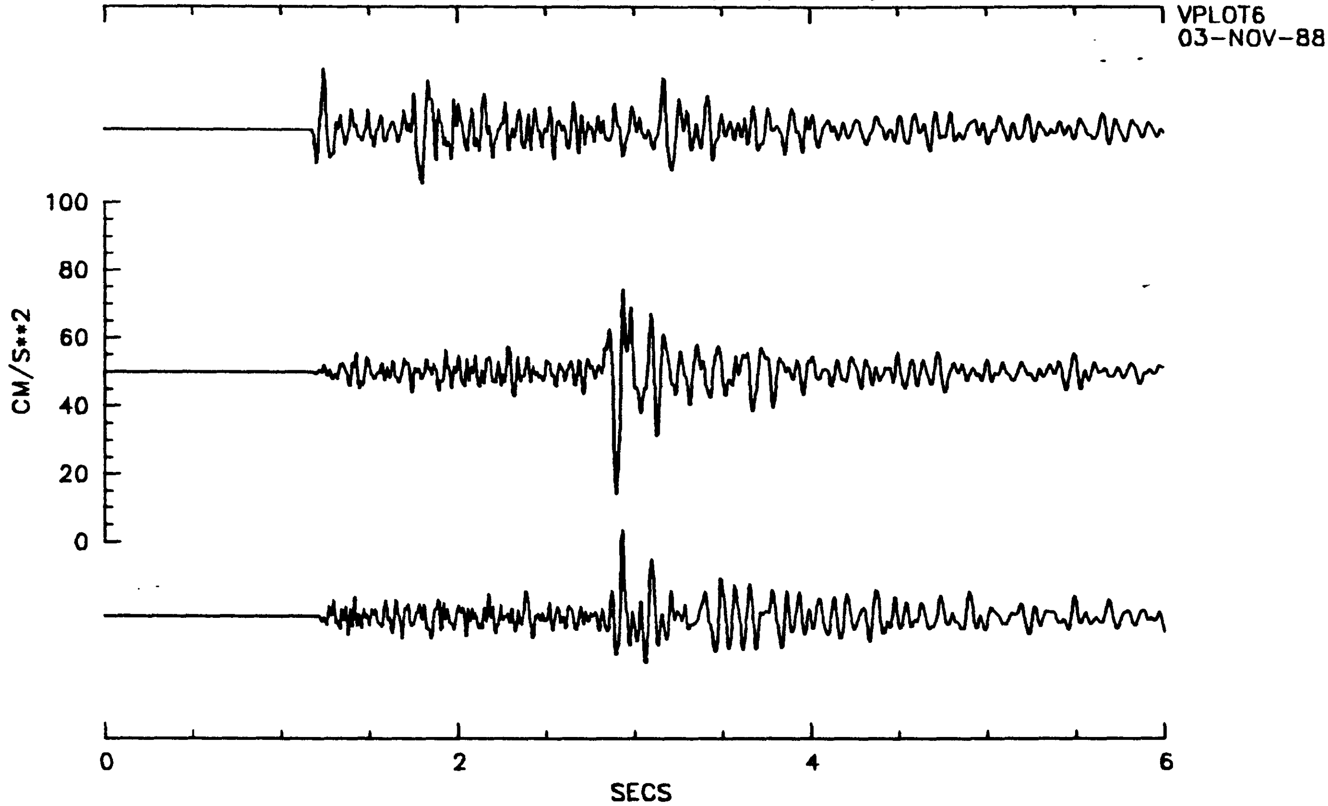


3380523R*.SUP COMP:4(UP),5(H=0),6(H=90)

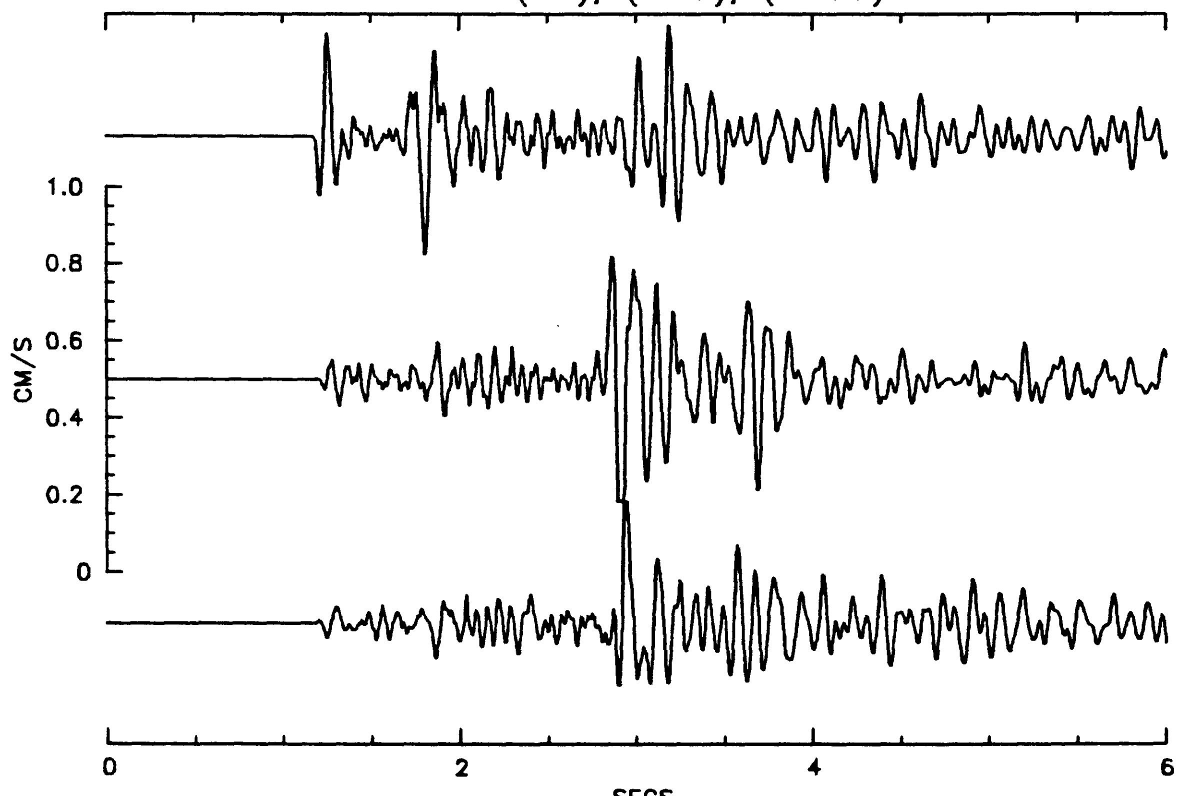


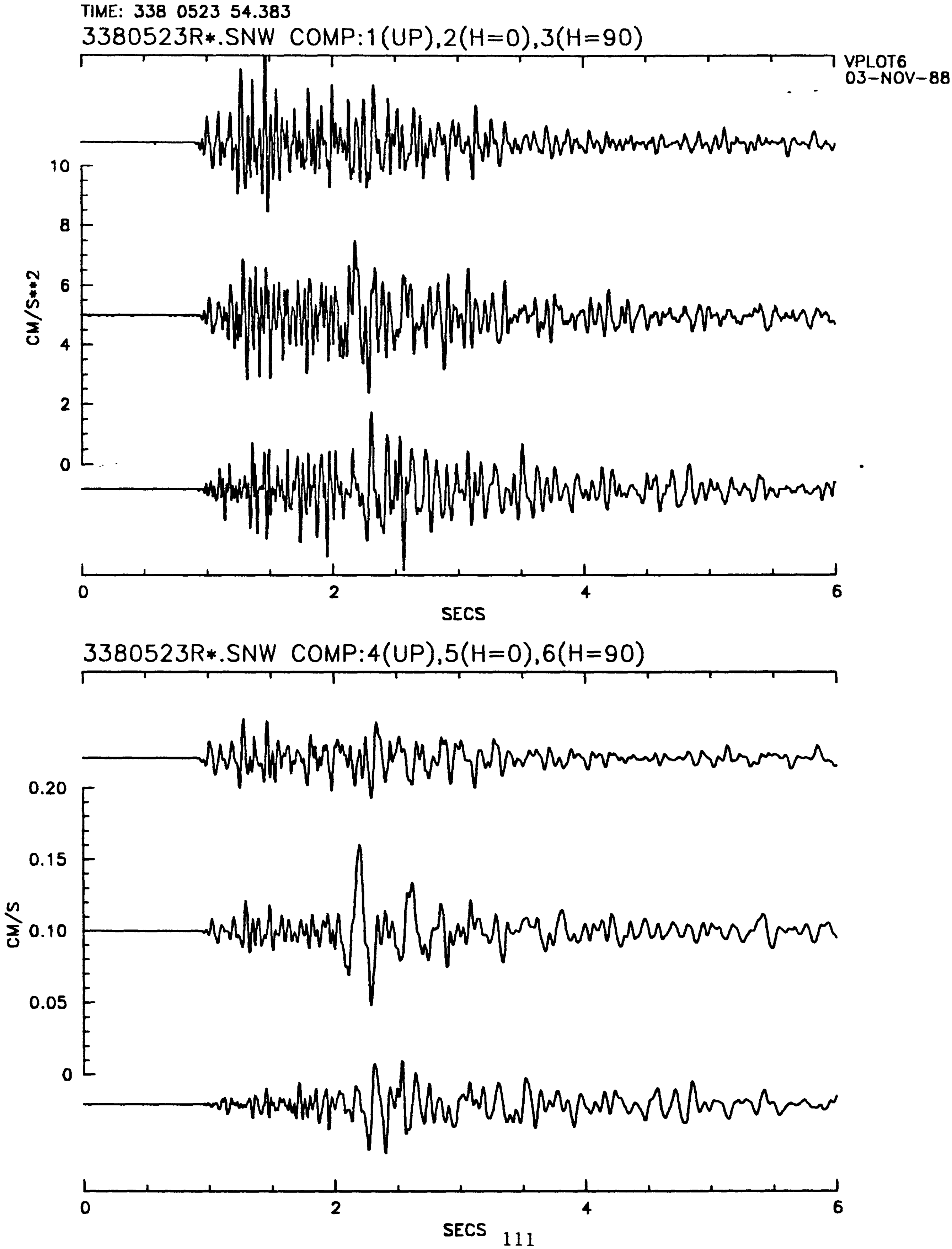
TIME: 338 0523 54.249

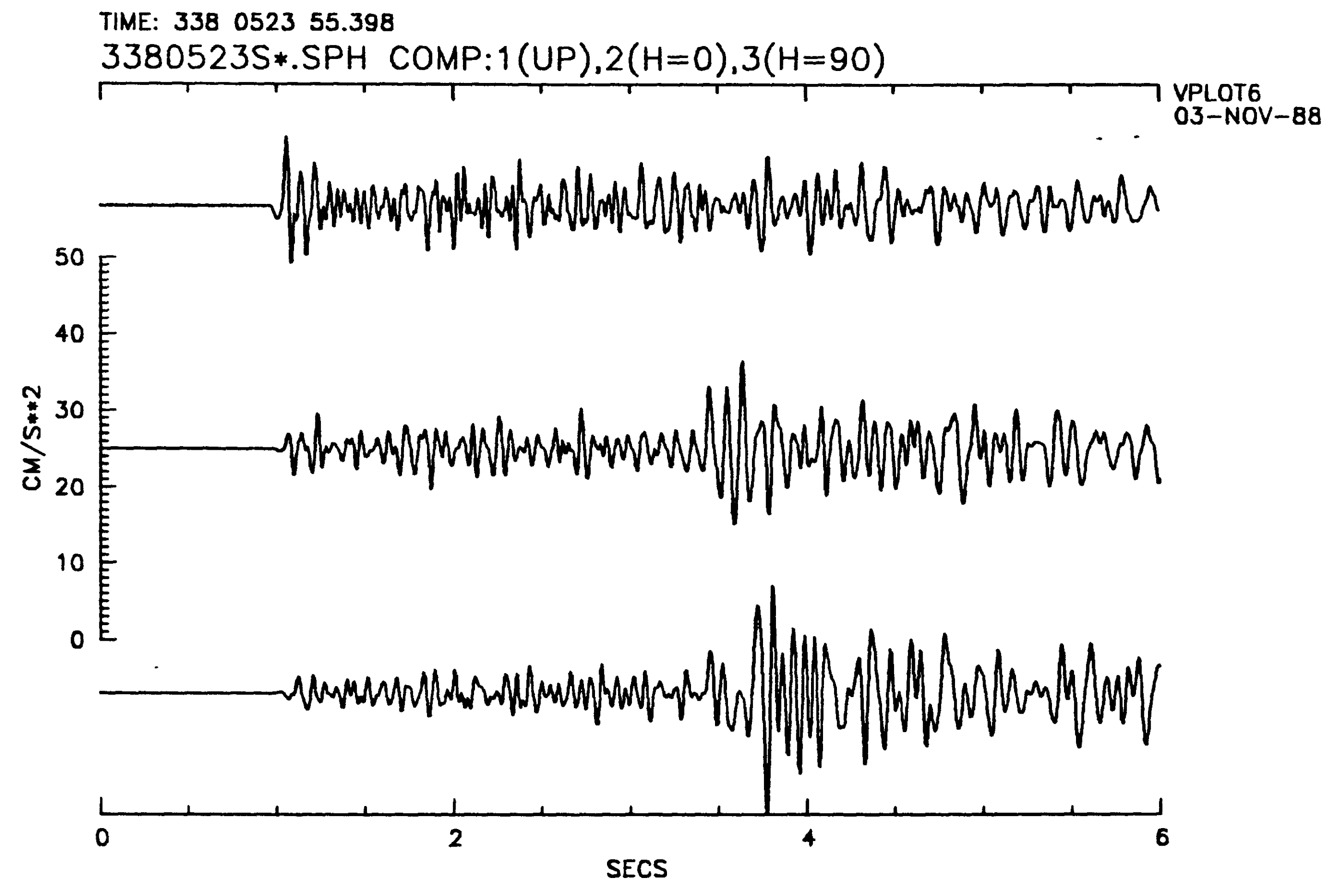
3380523R*.PTF COMP:1(UP),2(H=0),3(H=90)

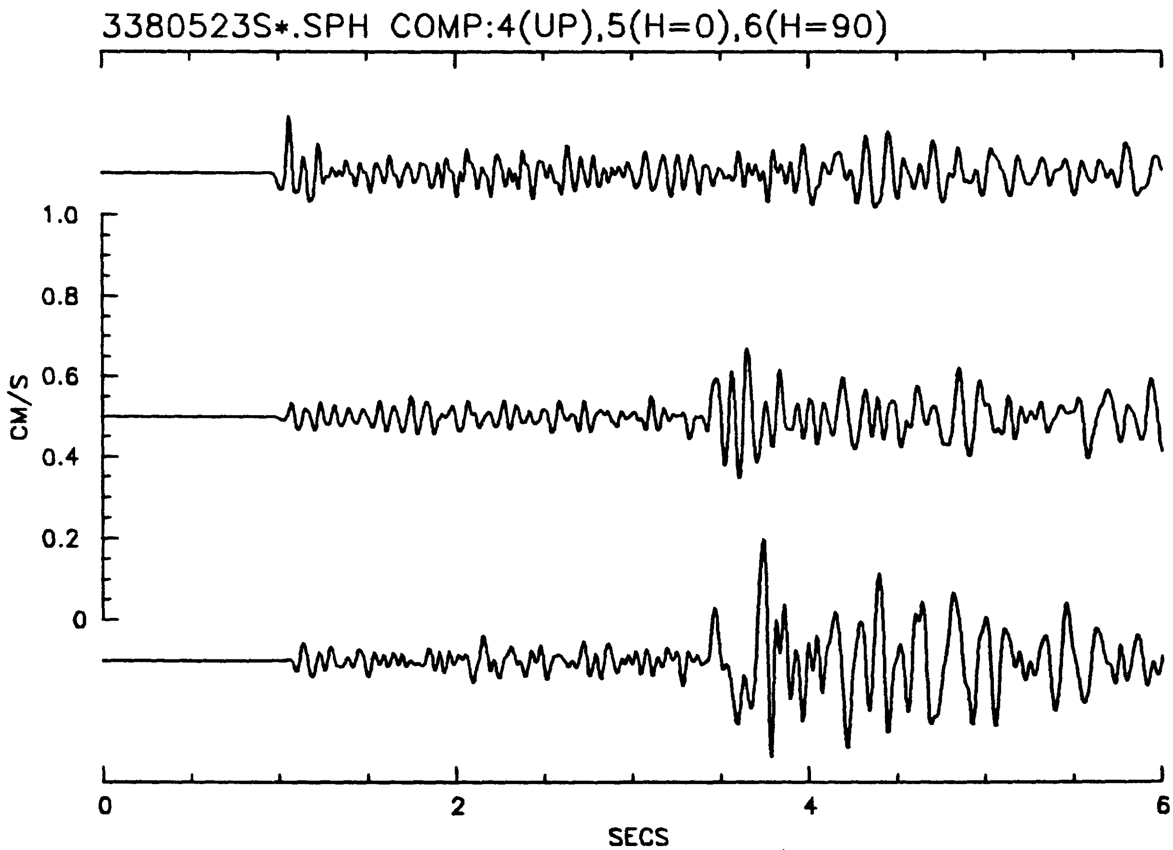


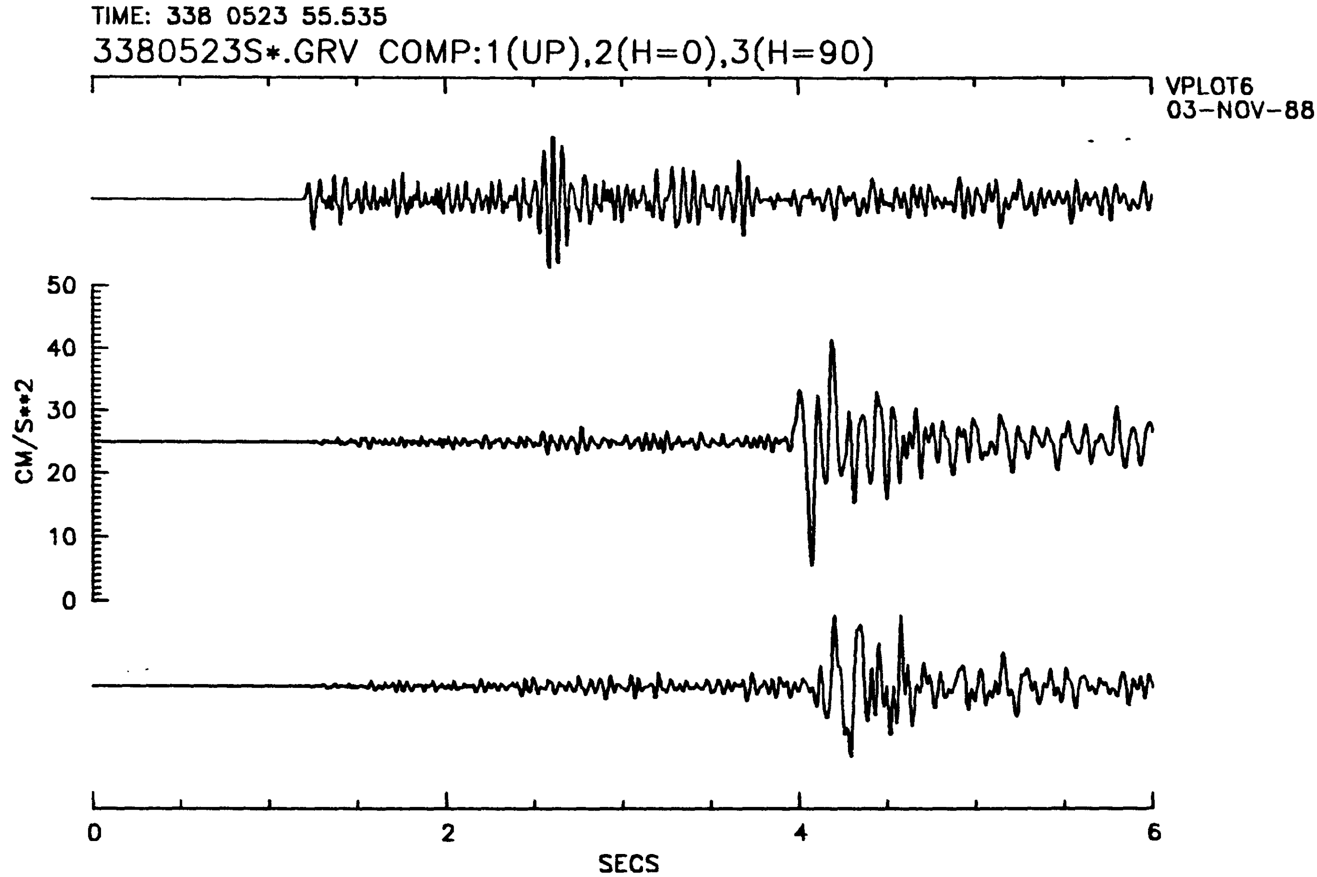
3380523R*.PTF COMP:4(UP),5(H=0),6(H=90)

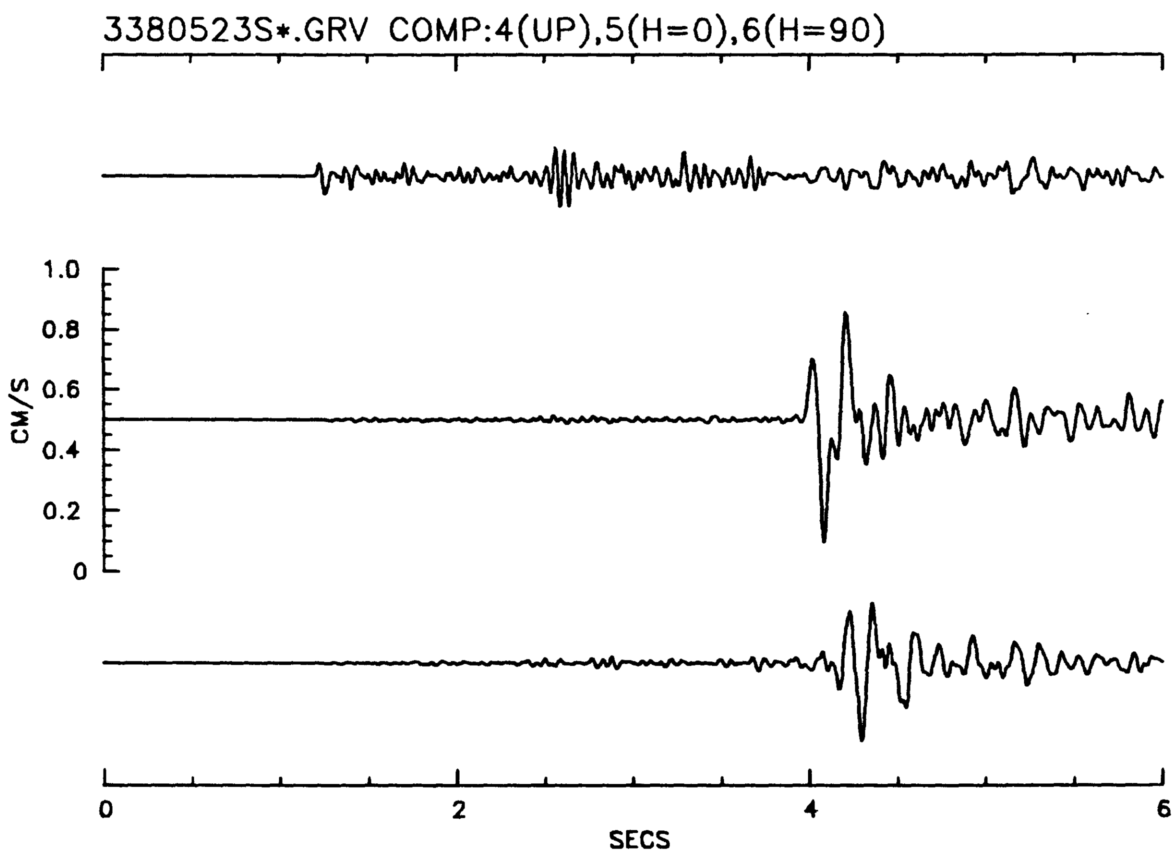


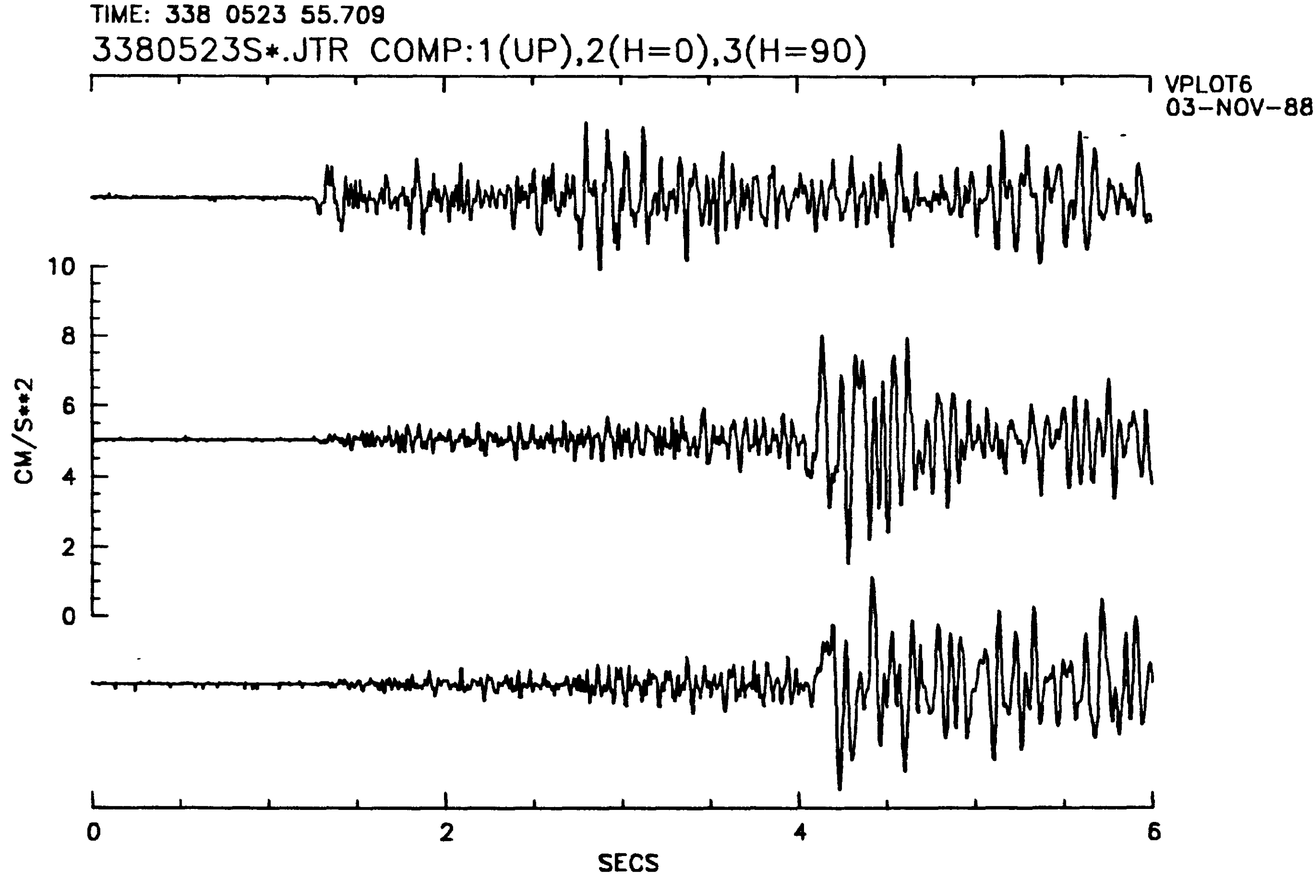

TIME: 338 0523 54.383
3380523R*.SNW COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
SECS
3380523R*.SNW COMP:4(UP),5(H=0),6(H=90)
CM/S
0.20
0.15
0.10
0.05
0
0
2
4
6
SECS

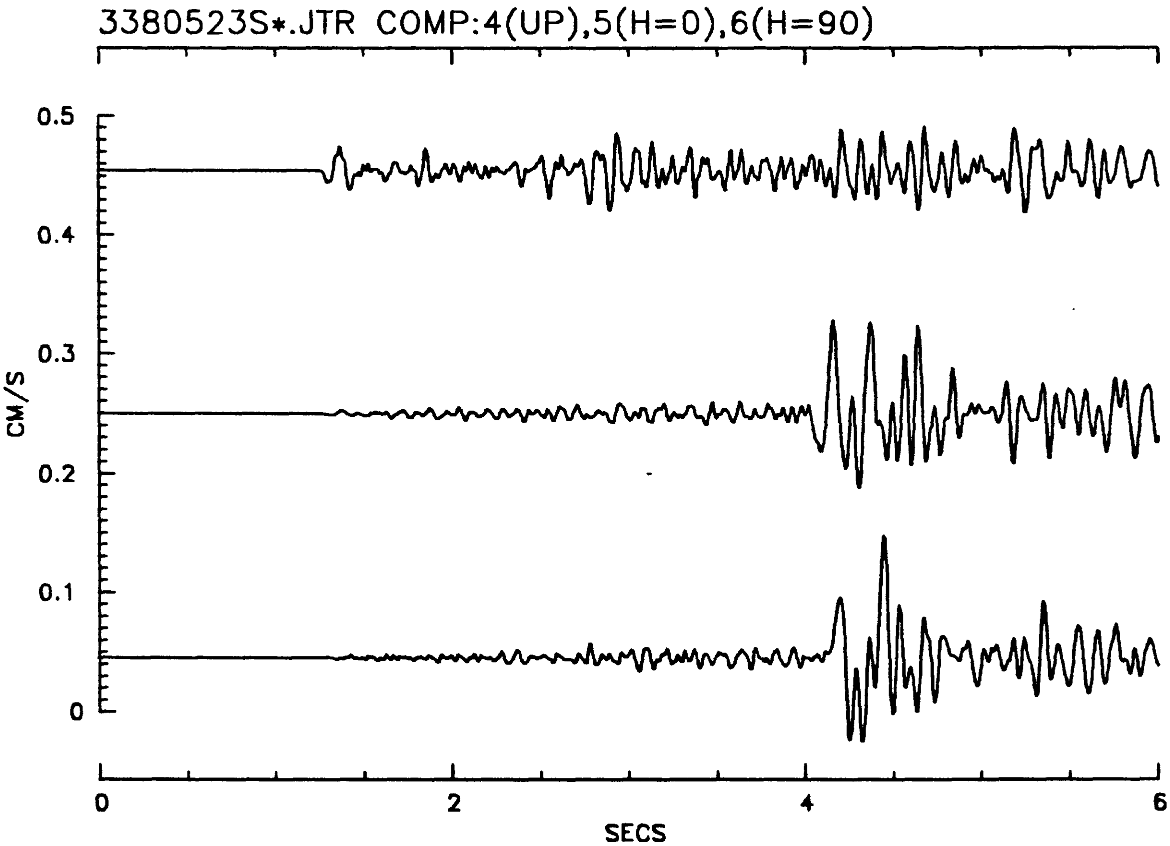

TIME: 338 0523 55.398
3380523S*.SPH COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
CM/S**2
50
40
30
20
10
0
0
2
4
6
SECS


3380523S*.SPH COMP:4(UP),5(H=0),6(H=90)
CM/S
1.0
0.8
0.6
0.4
0.2
0
0
2
4
6
SECS


TIME: 338 0523 55.535
3380523S*.GRV COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
50
40
30
20
10
0
CM/S**2
0
2
4
6
SECS

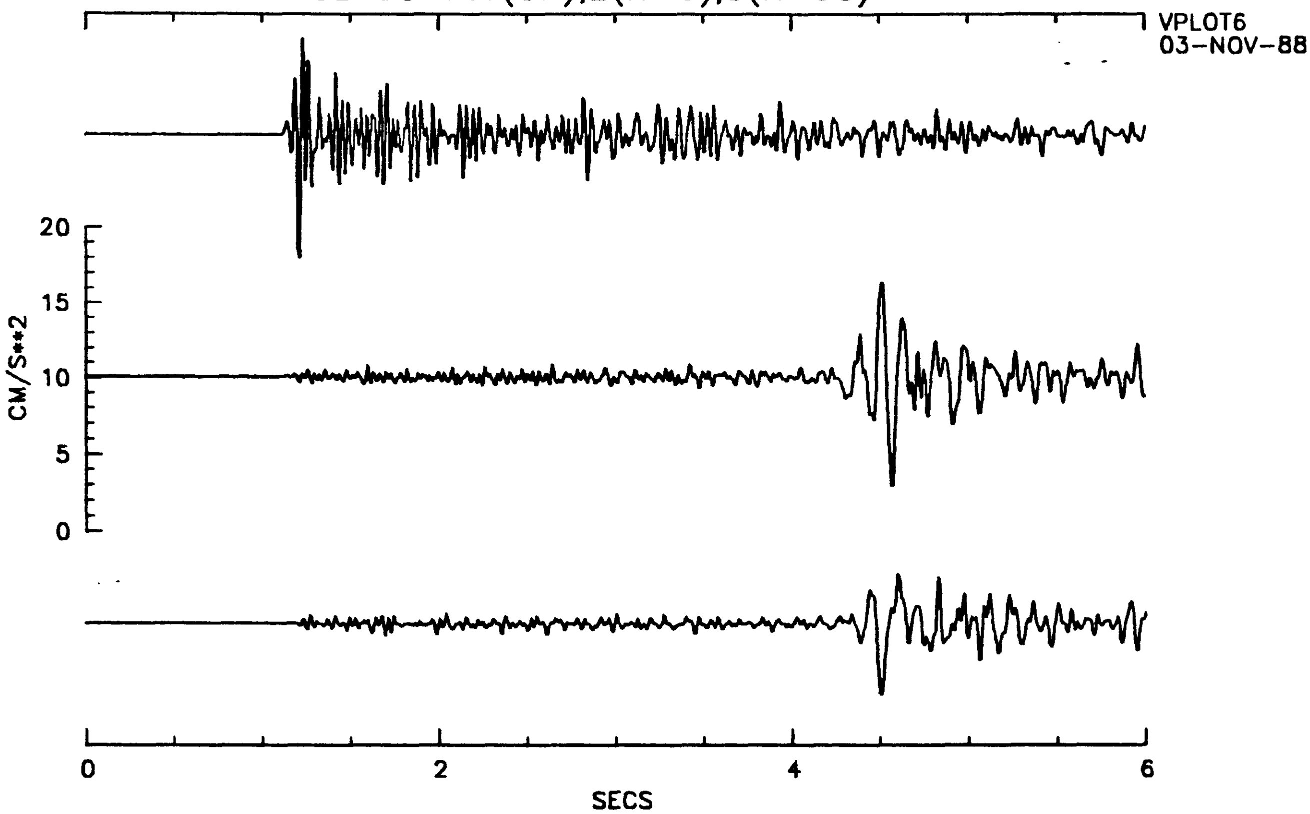

3380523S*.GRV COMP:4(UP),5(H=0),6(H=90)
1.0
0.8
0.6
0.4
0.2
0
CM/S
0
2
4
6
SECS


TIME: 338 0523 55.709
3380523S*.JTR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
10
8
6
4
2
0
CM/S**2
0
2
4
6
SECS

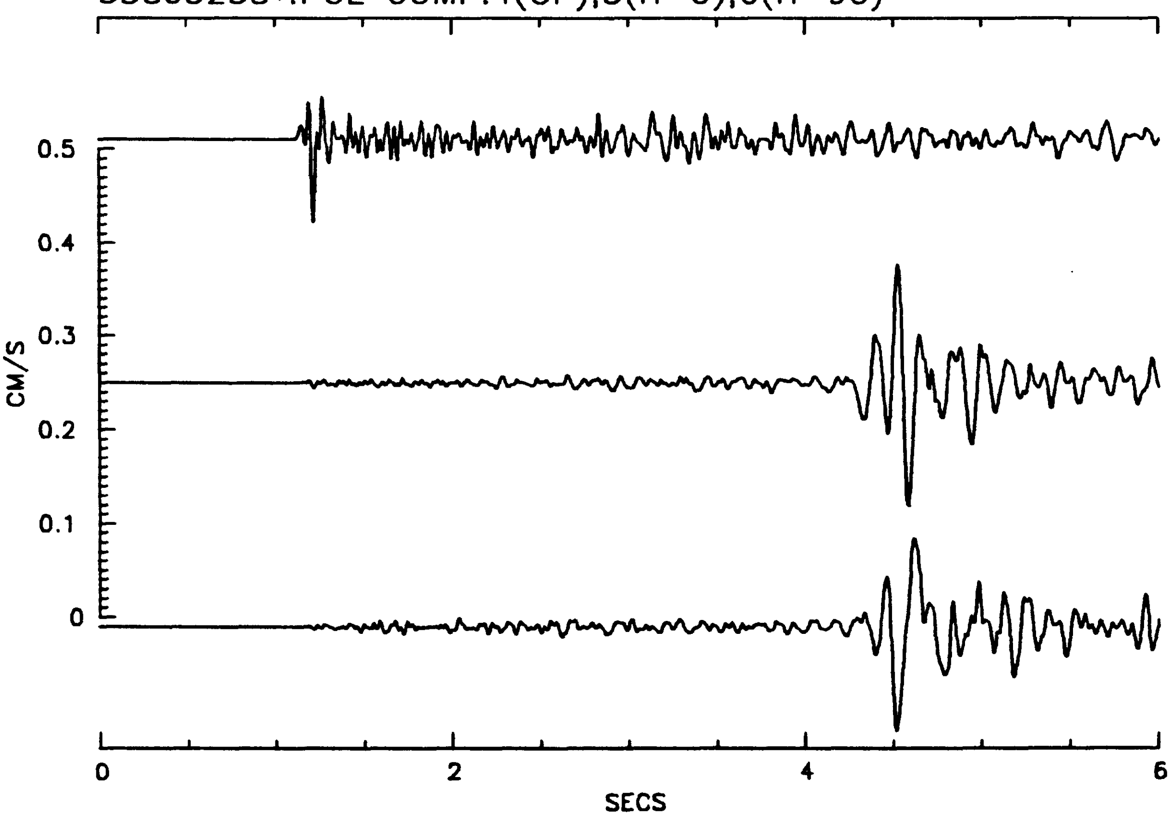

3380523S*.JTR COMP:4(UP),5(H=0),6(H=90)
0.5
0.4
0.3
0.2
0.1
0
CM/S
0
2
4
6
SECS

TIME: 338 0523 56.073

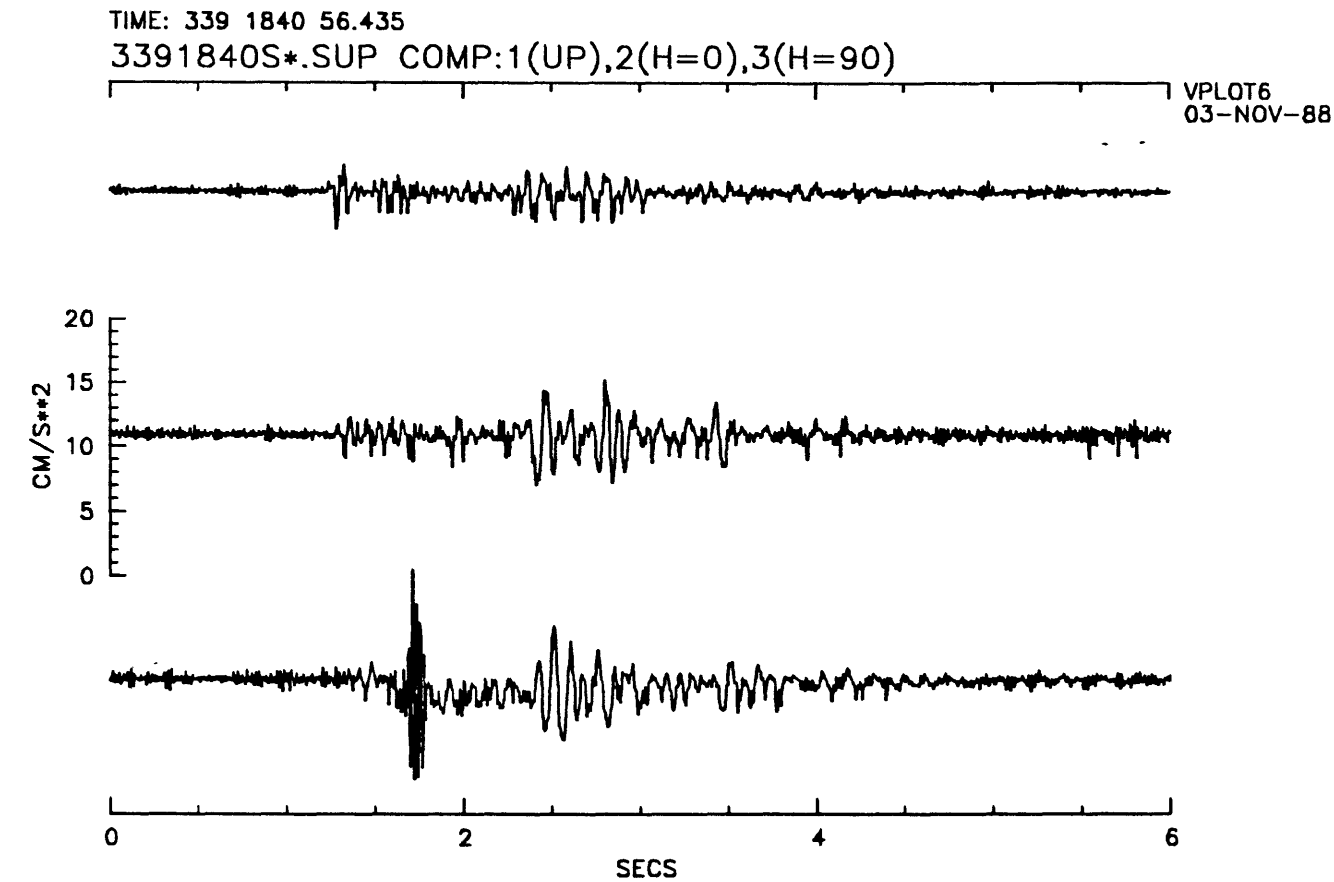
3380523S*.POE COMP:1(UP),2(H=0),3(H=90)

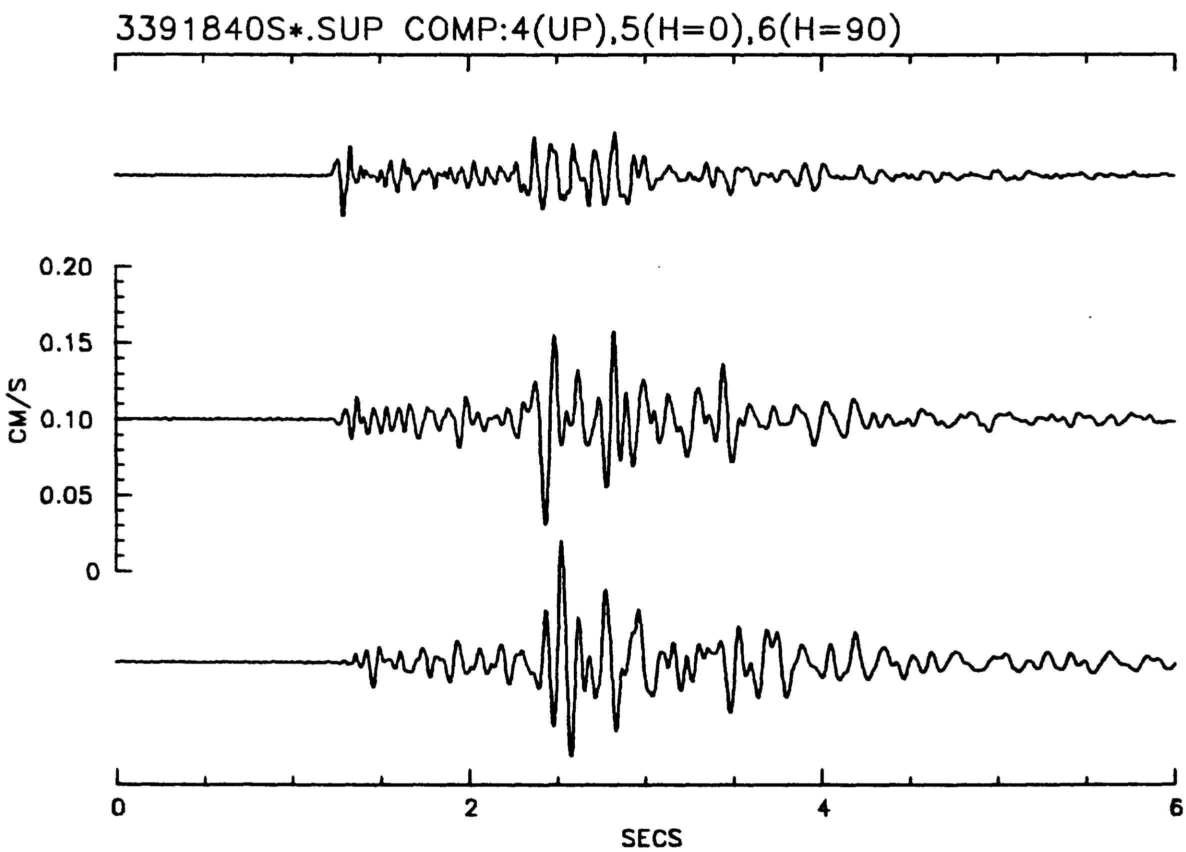


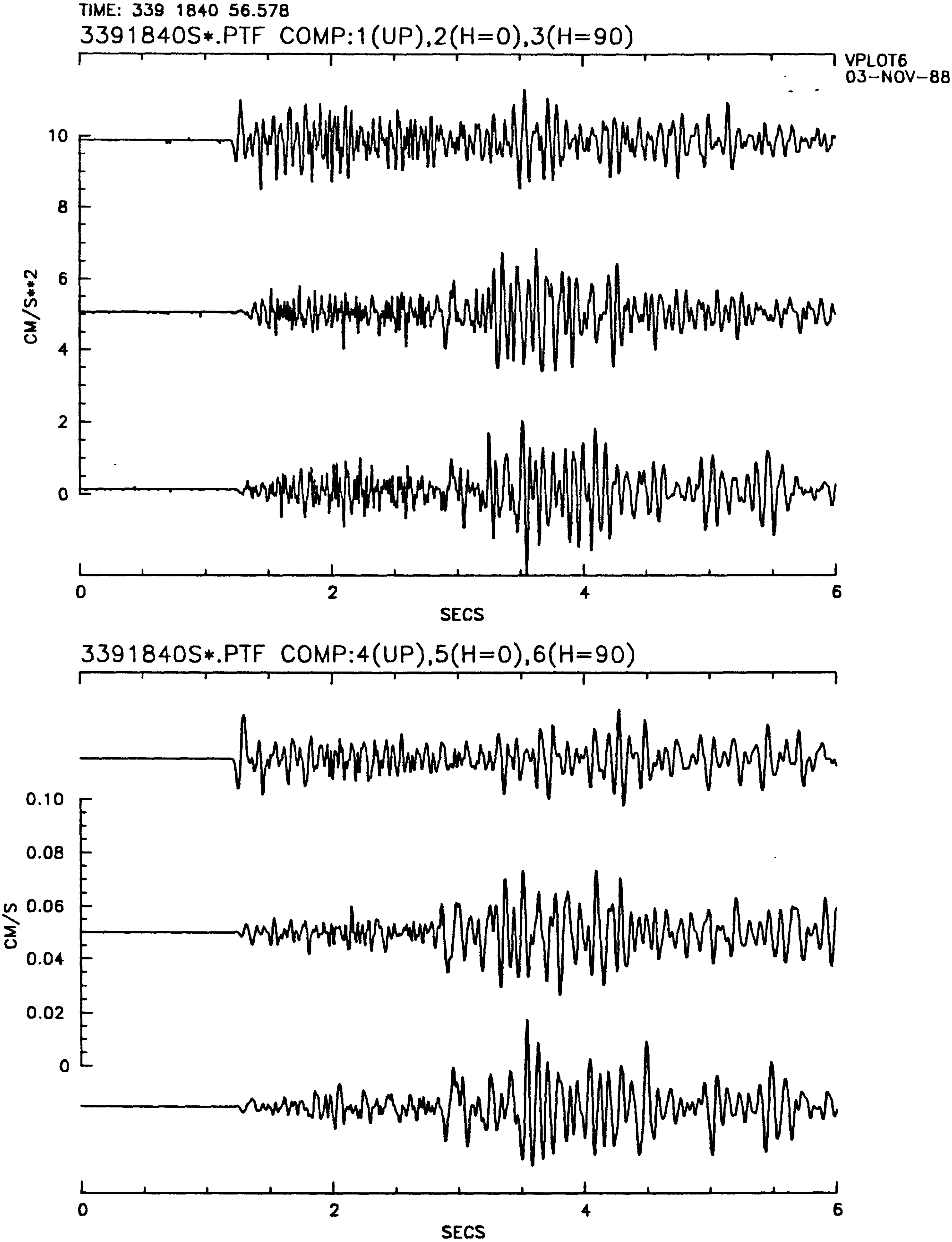
3380523S*.POE COMP:4(UP),5(H=0),6(H=90)

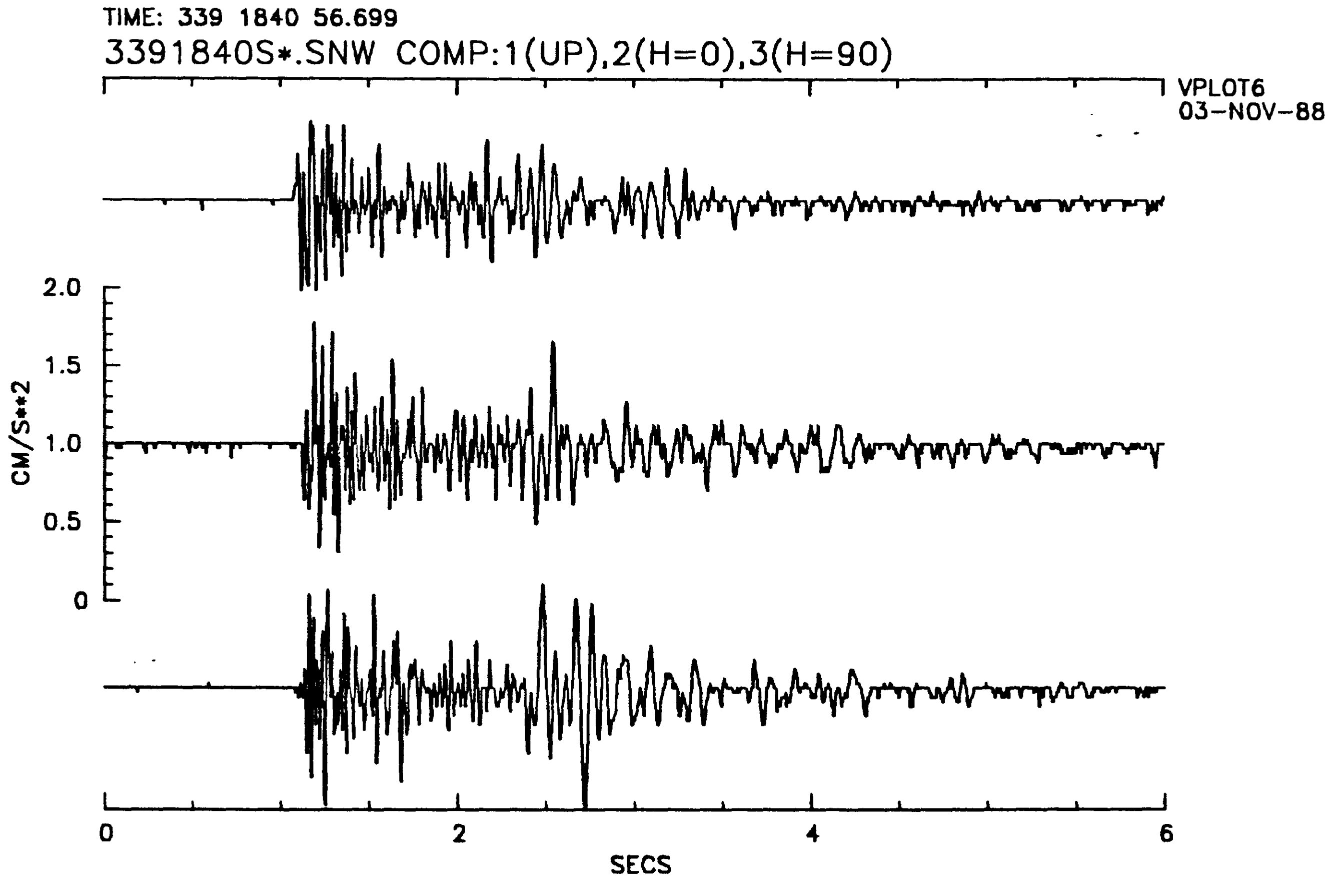


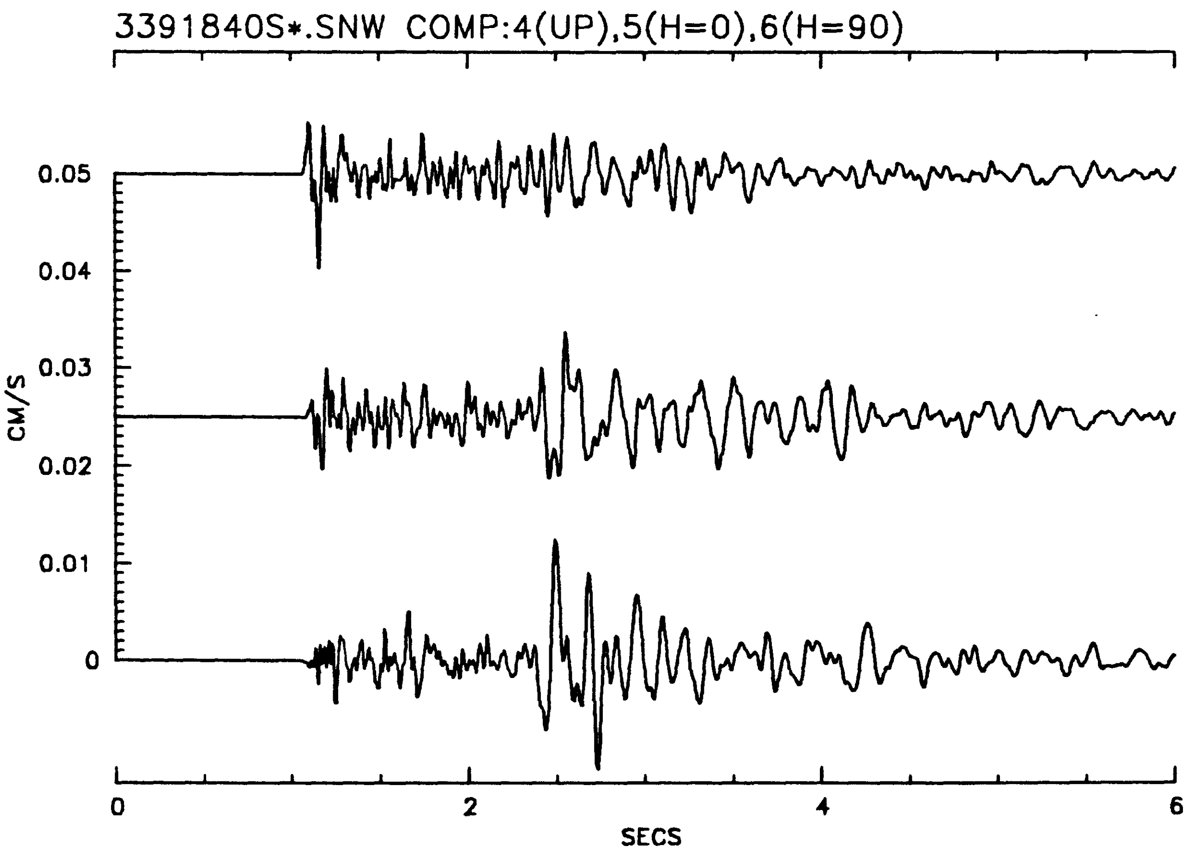
APPENDIX 2.8 Seismograms of the M=1.9 earthquake at 3391840

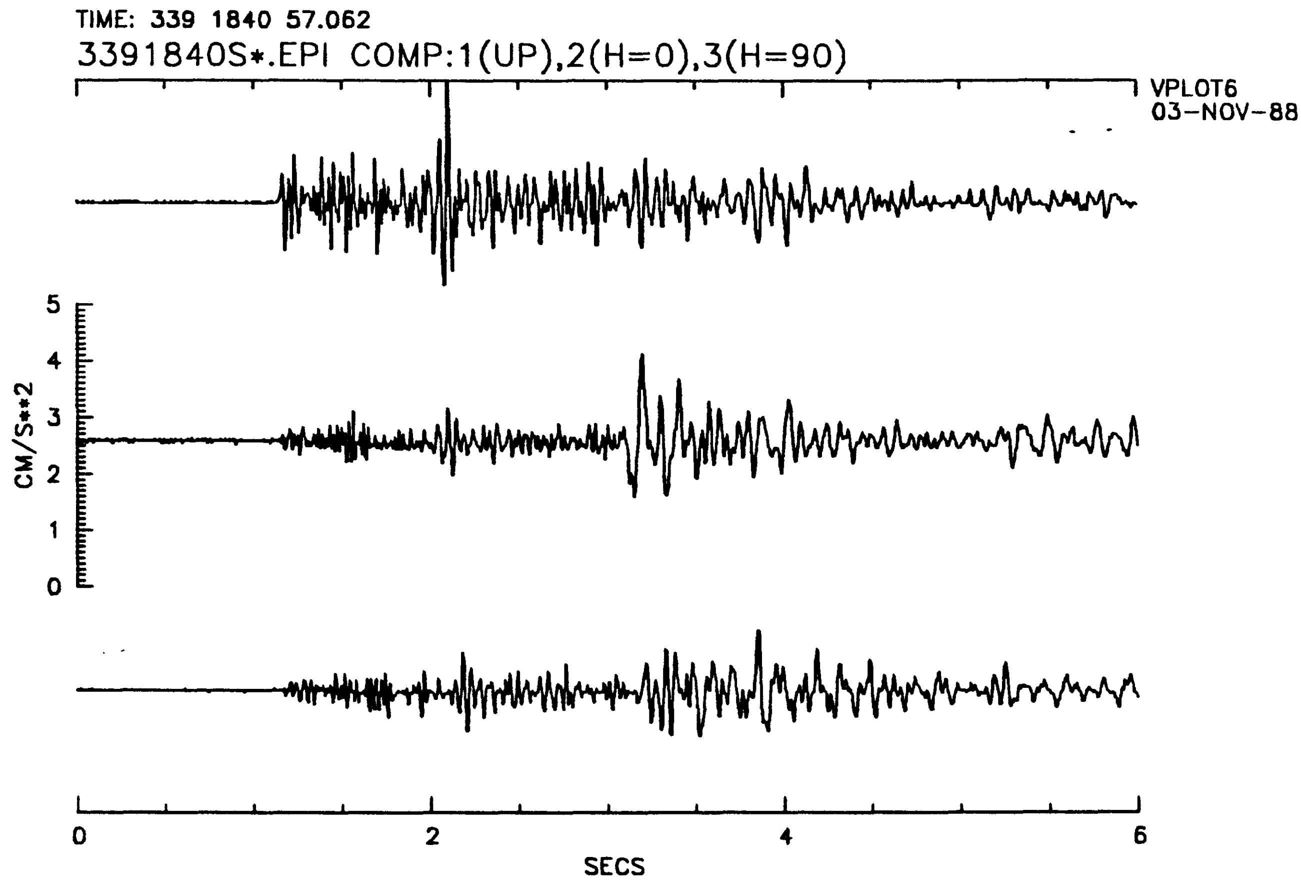

TIME: 339 1840 56.435
3391840S*.SUP COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
CM/S**2
20
15
10
5
0
0
2
4
6
SECS


3391840S*.SUP COMP:4(UP),5(H=0),6(H=90)
CM/S
0.20
0.15
0.10
0.05
0
0
2
4
6
SECS

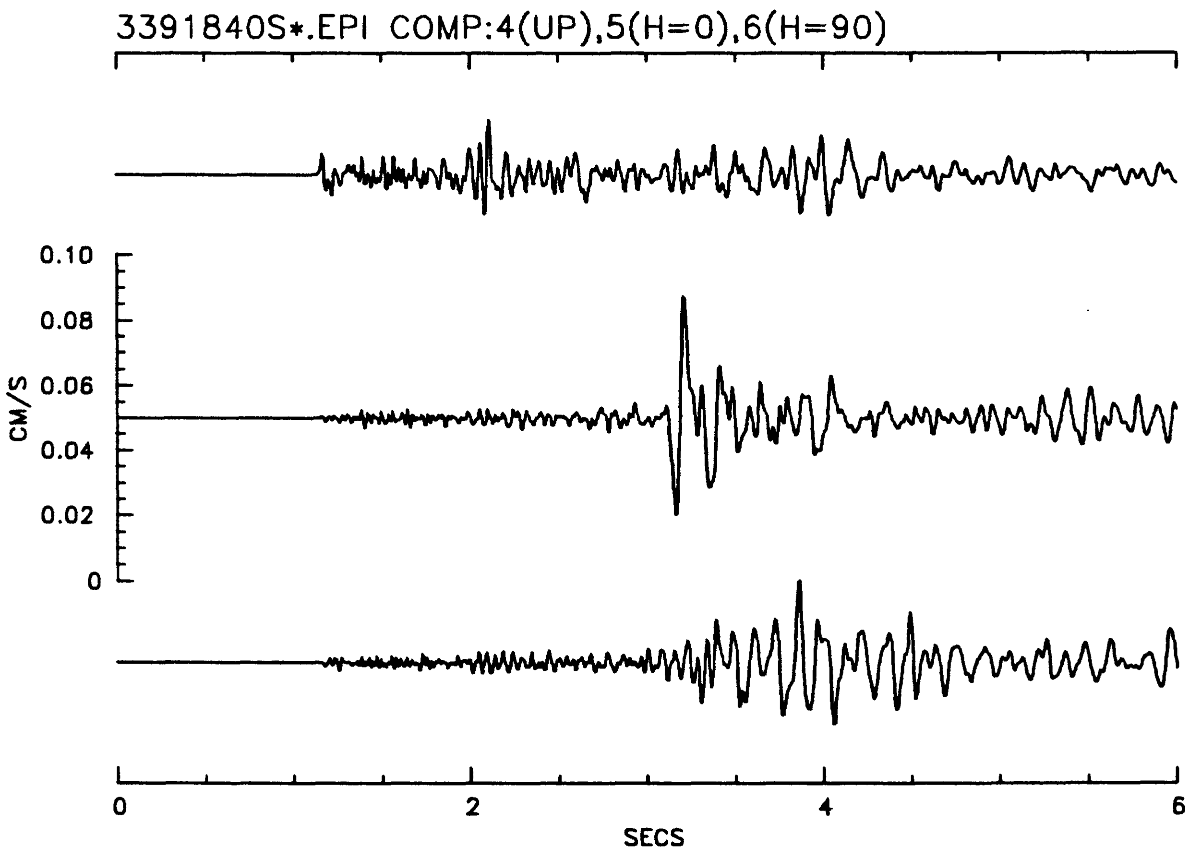

TIME: 339 1840 56.578
3391840S*.PTF COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
SECS
3391840S*.PTF COMP:4(UP),5(H=0),6(H=90)
CM/S
0.10
0.08
0.06
0.04
0.02
0
0
2
4
6
SECS


TIME: 339 1840 56.699
3391840S*.SNW COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
2.0
1.5
1.0
0.5
0
CM/S**2
0
2
4
6
SECS


3391840S*.SNW COMP:4(UP),5(H=0),6(H=90)
0.05
0.04
0.03
0.02
0.01
0
CM/S
0
2
4
6
SECS

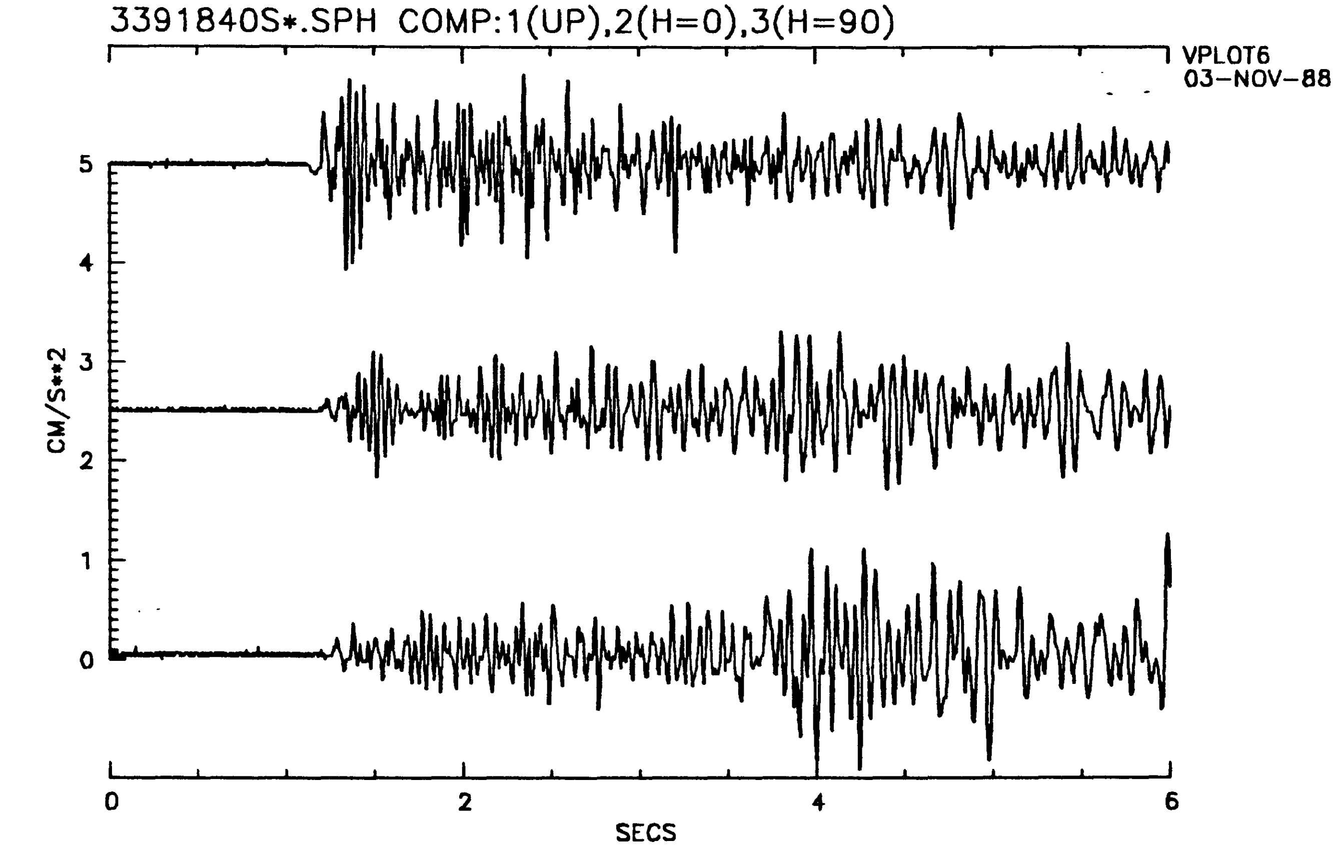


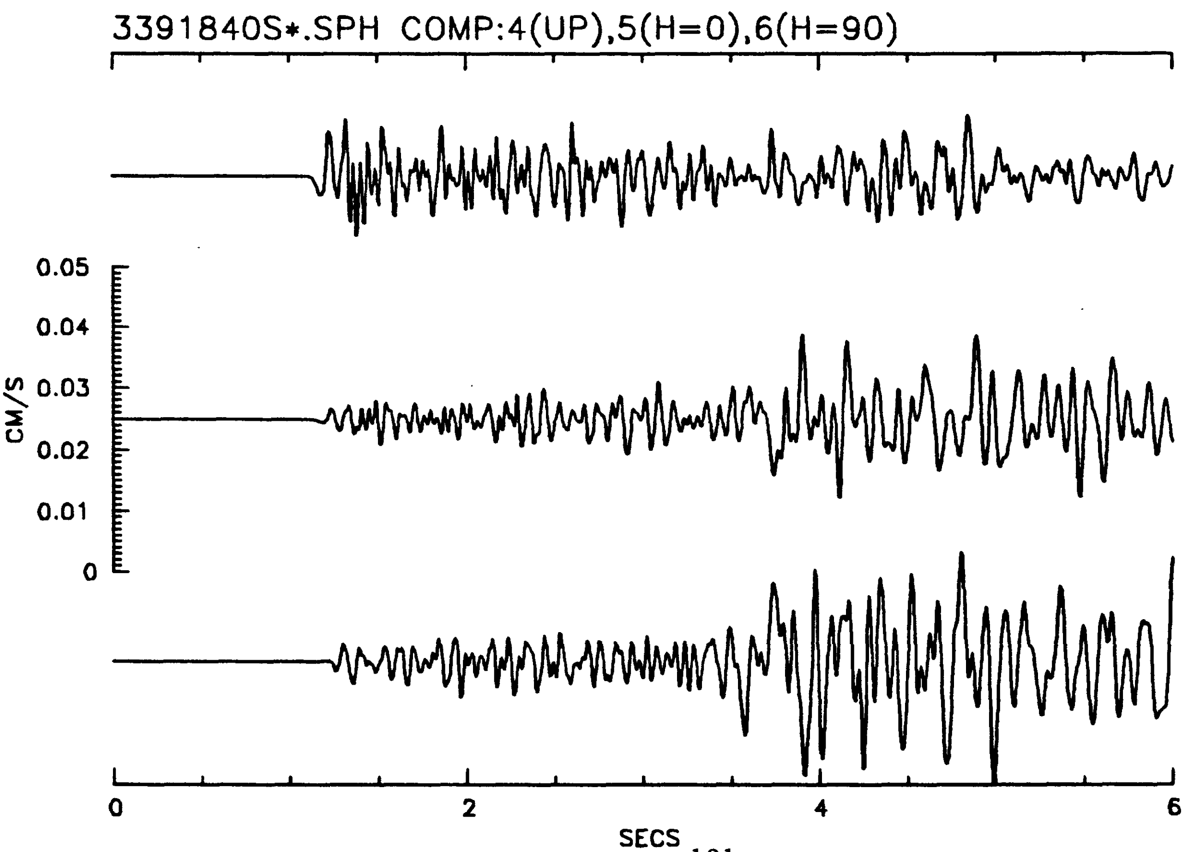
TIME: 339 1840 57.062
3391840S*.EPI COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
5
4
3
2
1
0
CM/S**2
0
2
4
6
SECS



3391840S*.EPI COMP:4(UP),5(H=0),6(H=90)
0.10
0.08
0.06
0.04
0.02
0
CM/S
0
2
4
6
SECS

TIME: 339 1840 57.602

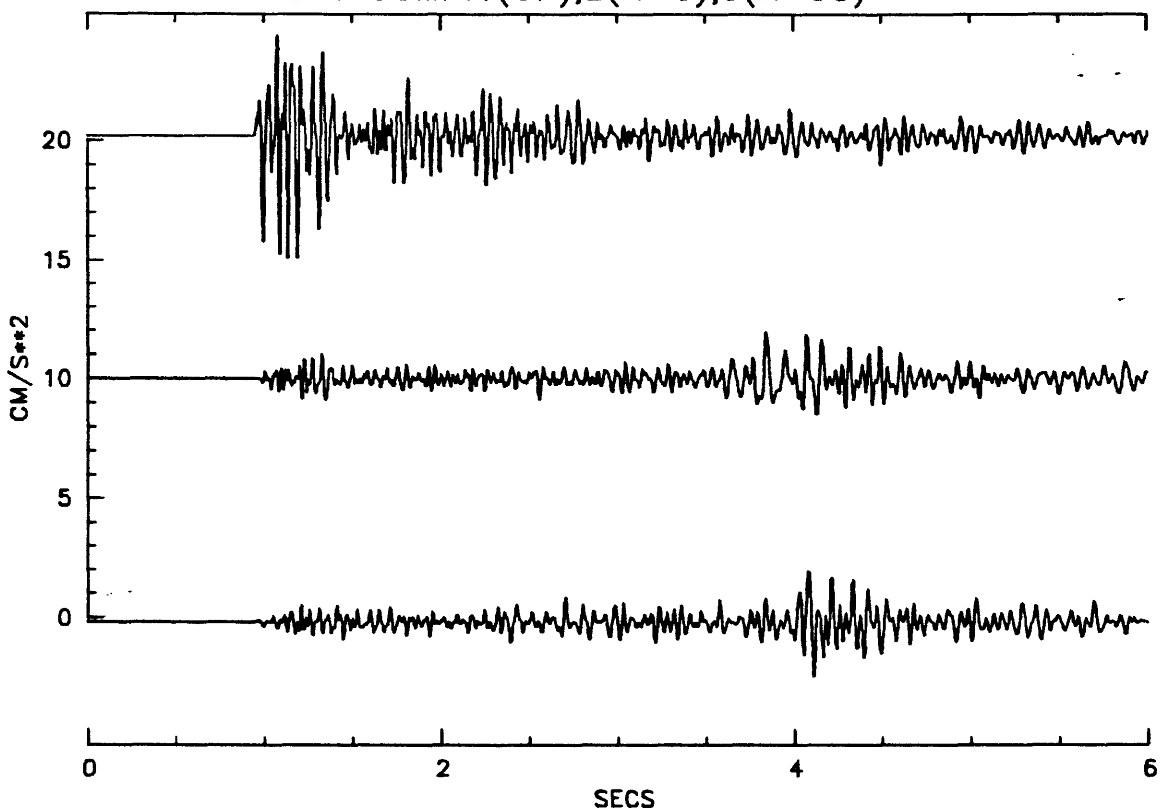




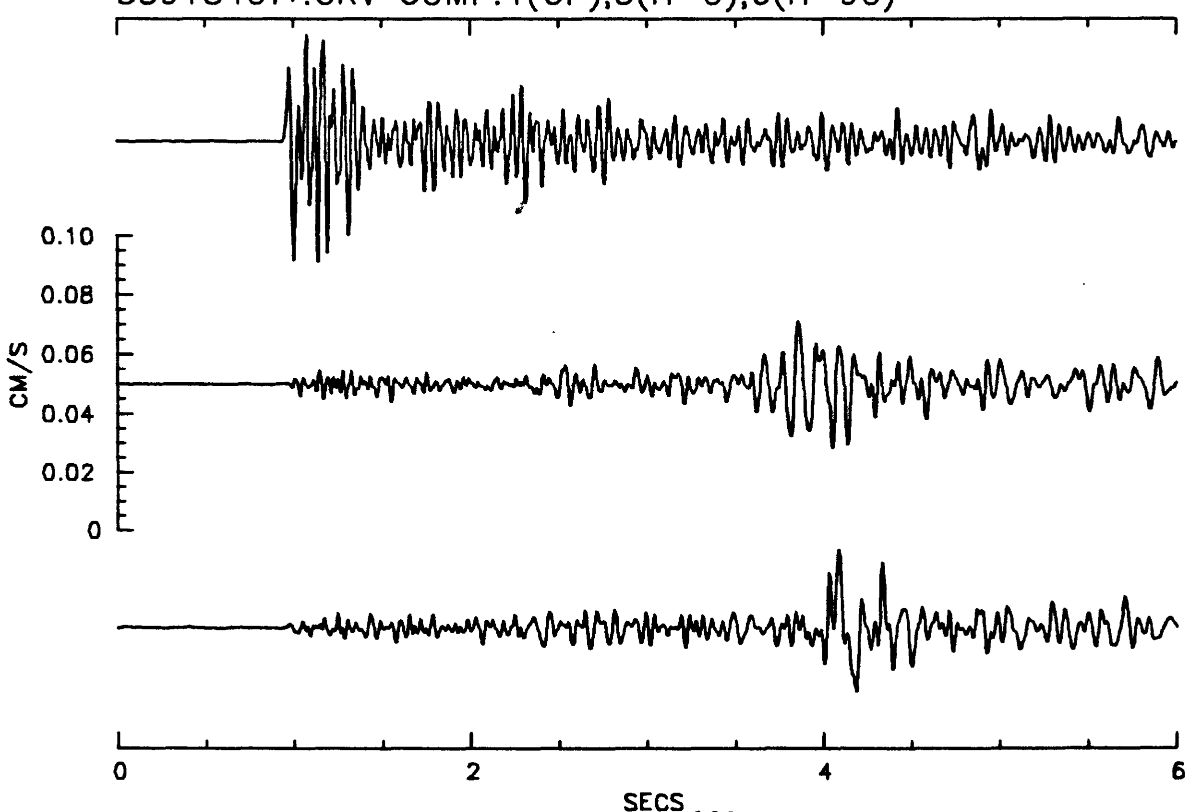
TIME: 339 1840 58.028

3391840T*.GRV COMP:1(UP),2(H=0),3(H=90)

VPLOT6
03-NOV-88

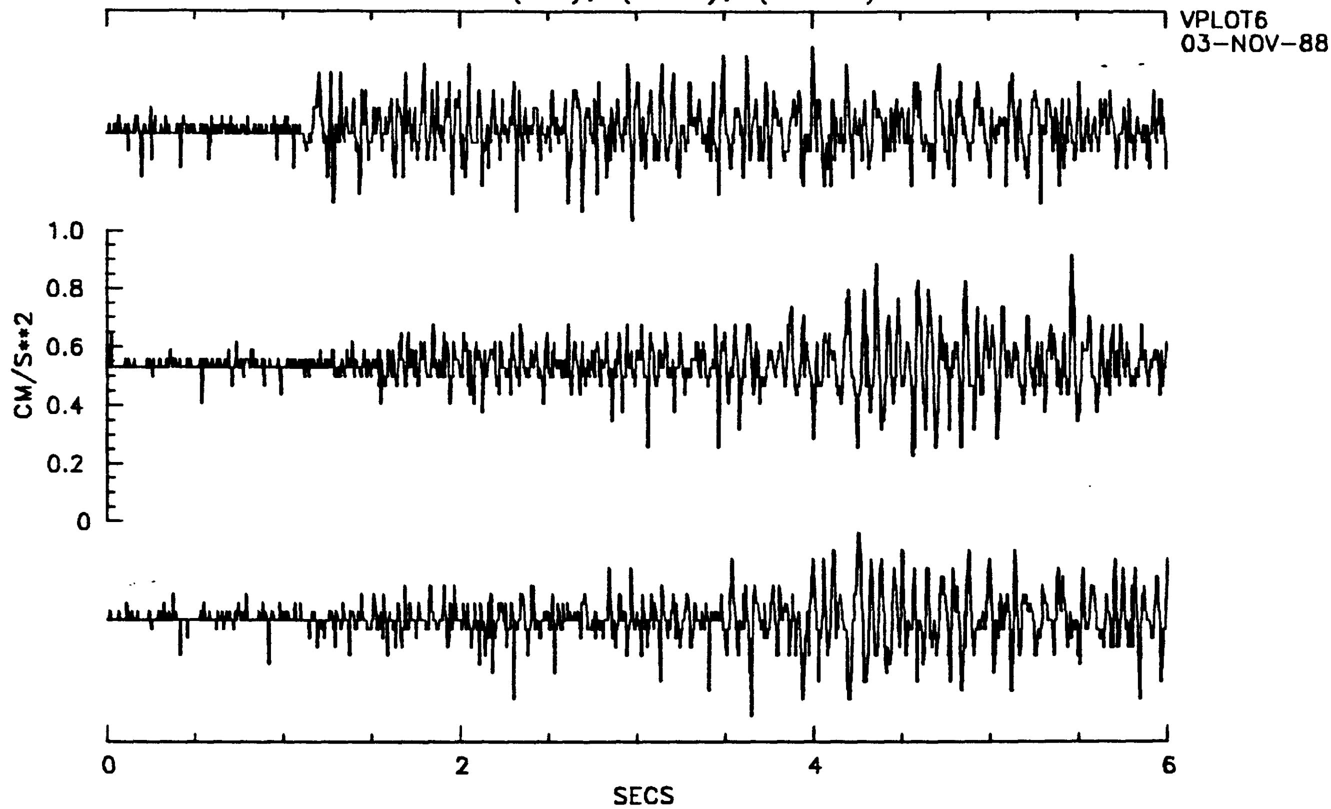


3391840T*.GRV COMP:4(UP),5(H=0),6(H=90)

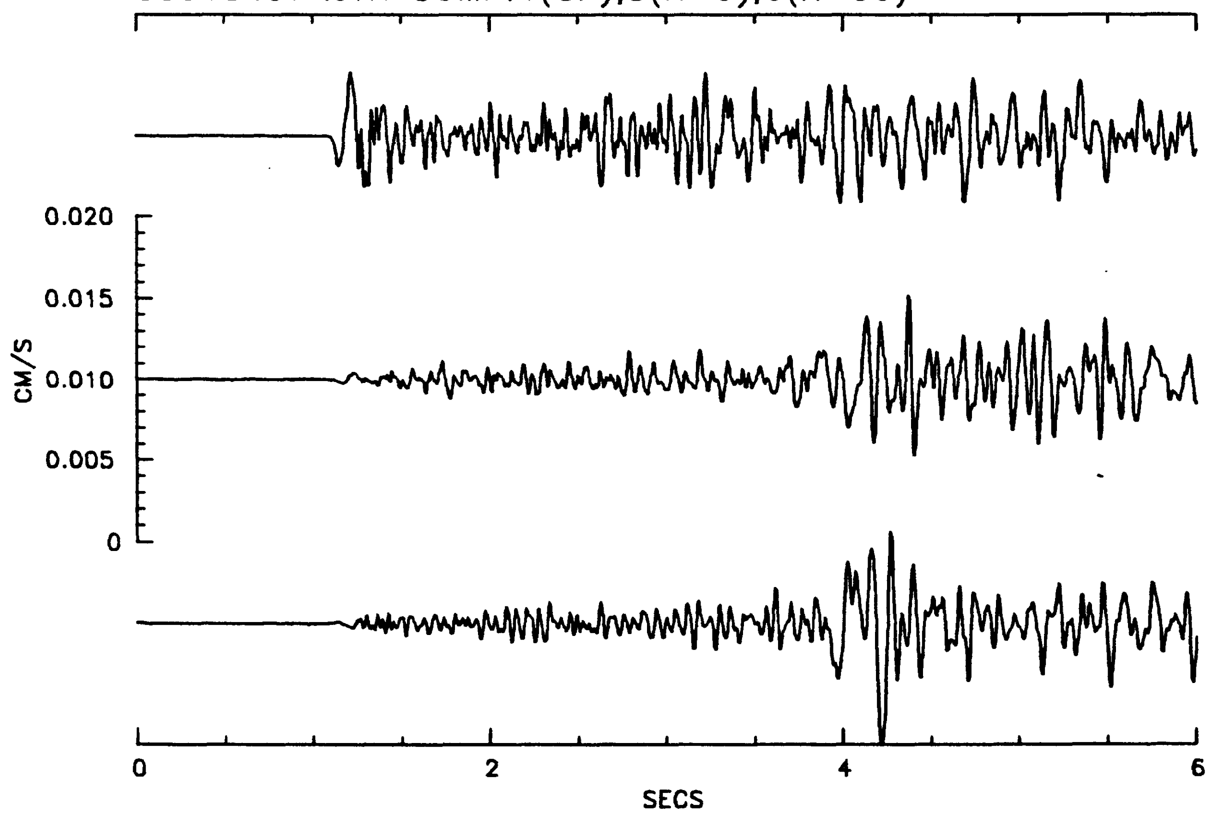


TIME: 339 1840 58.159

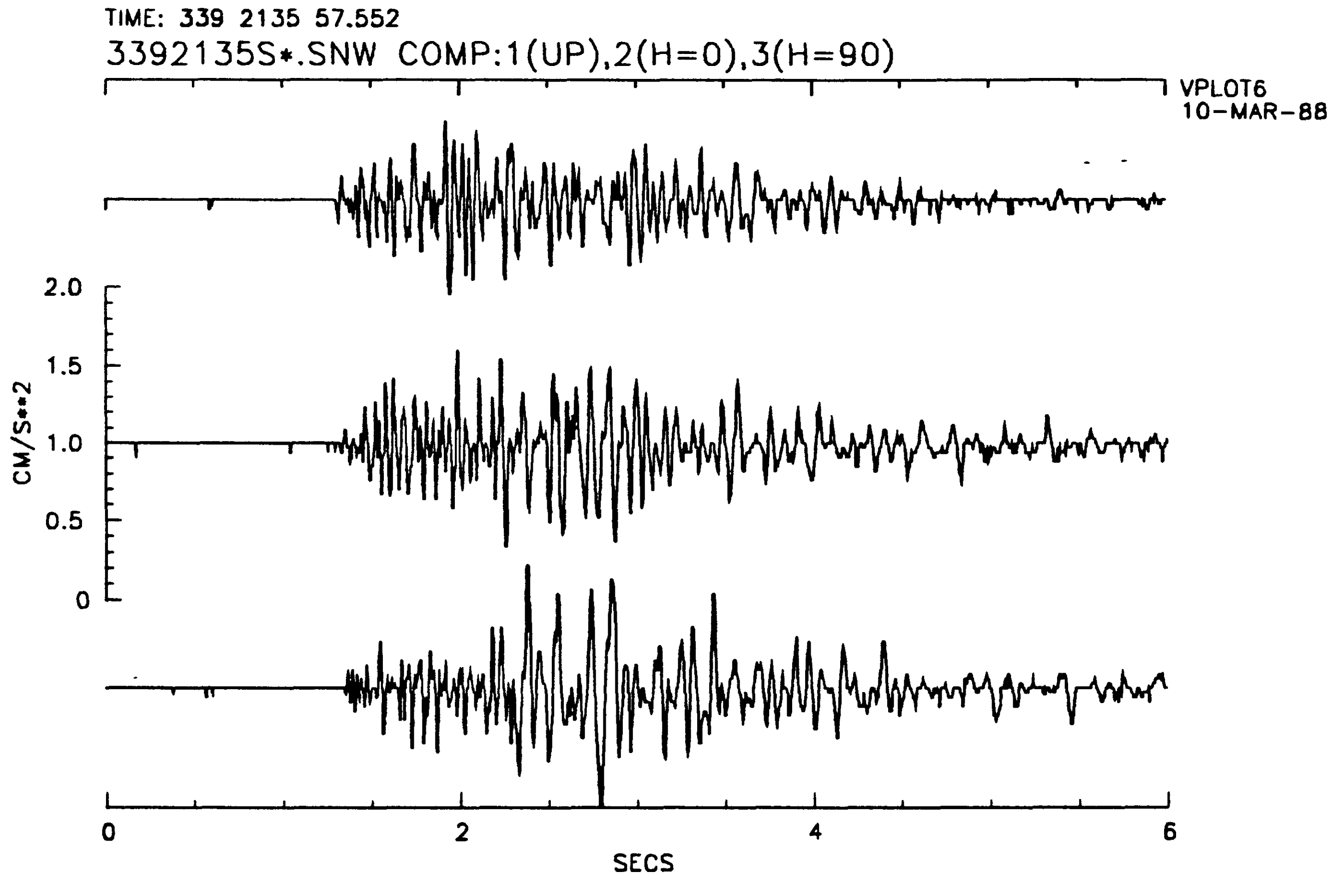
3391840T*.JTR COMP:1(UP),2(H=0),3(H=90)

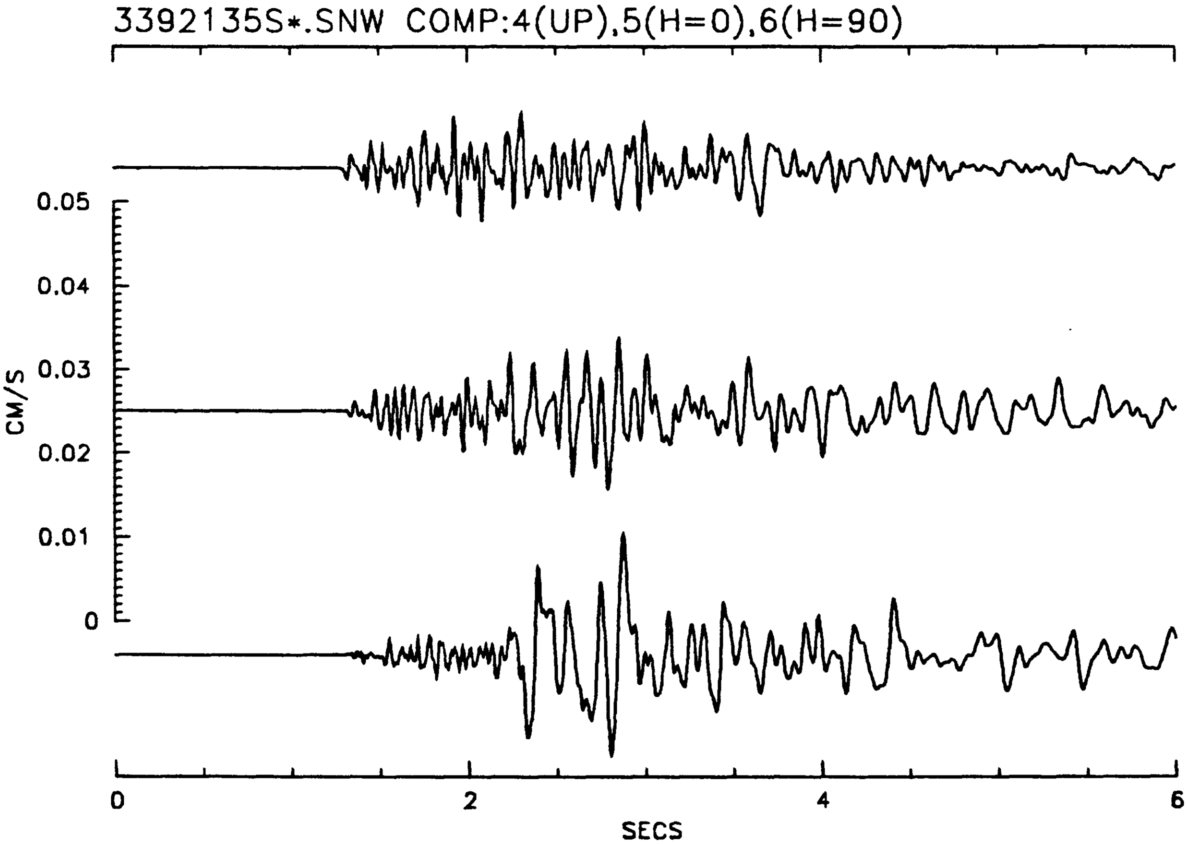


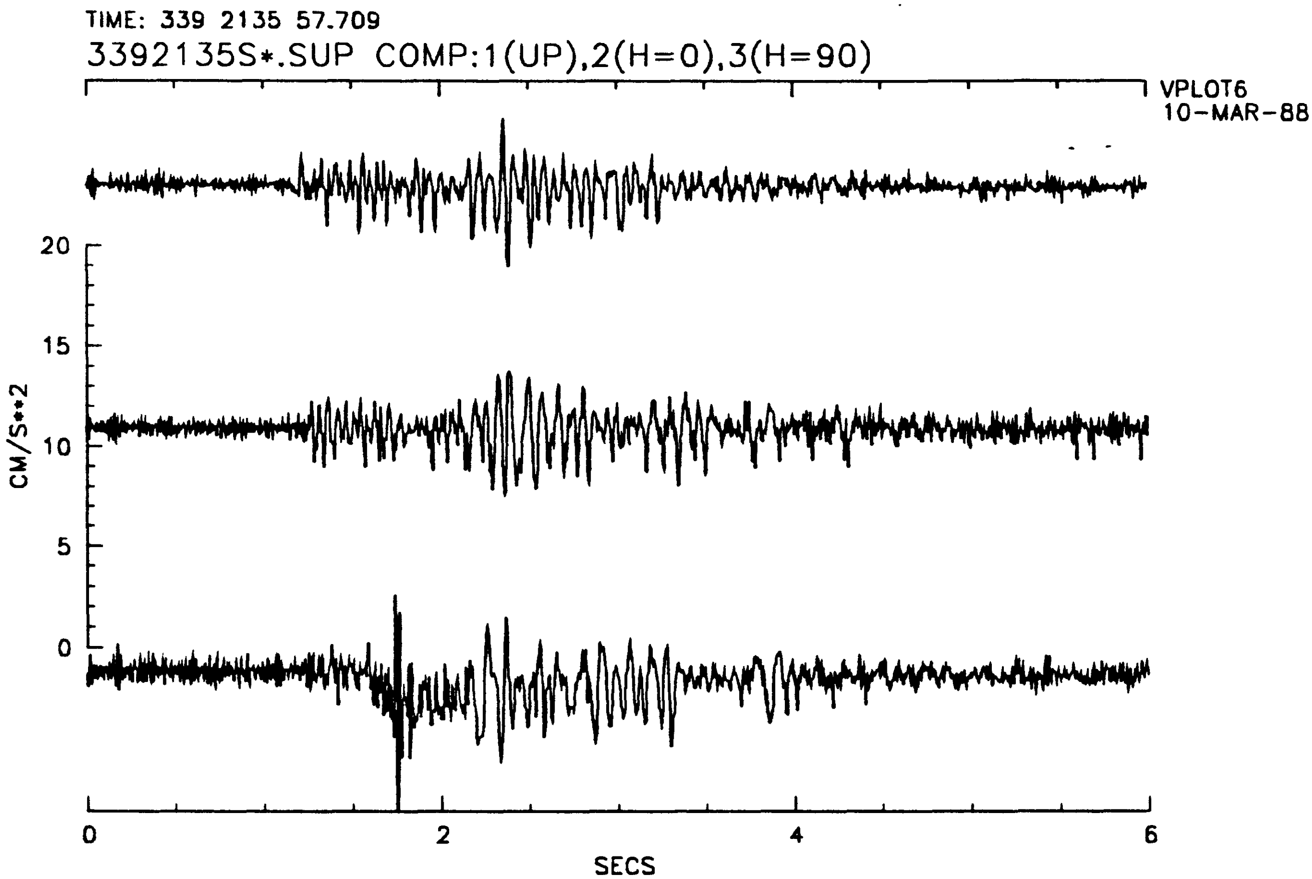
3391840T*.JTR COMP:4(UP),5(H=0),6(H=90)

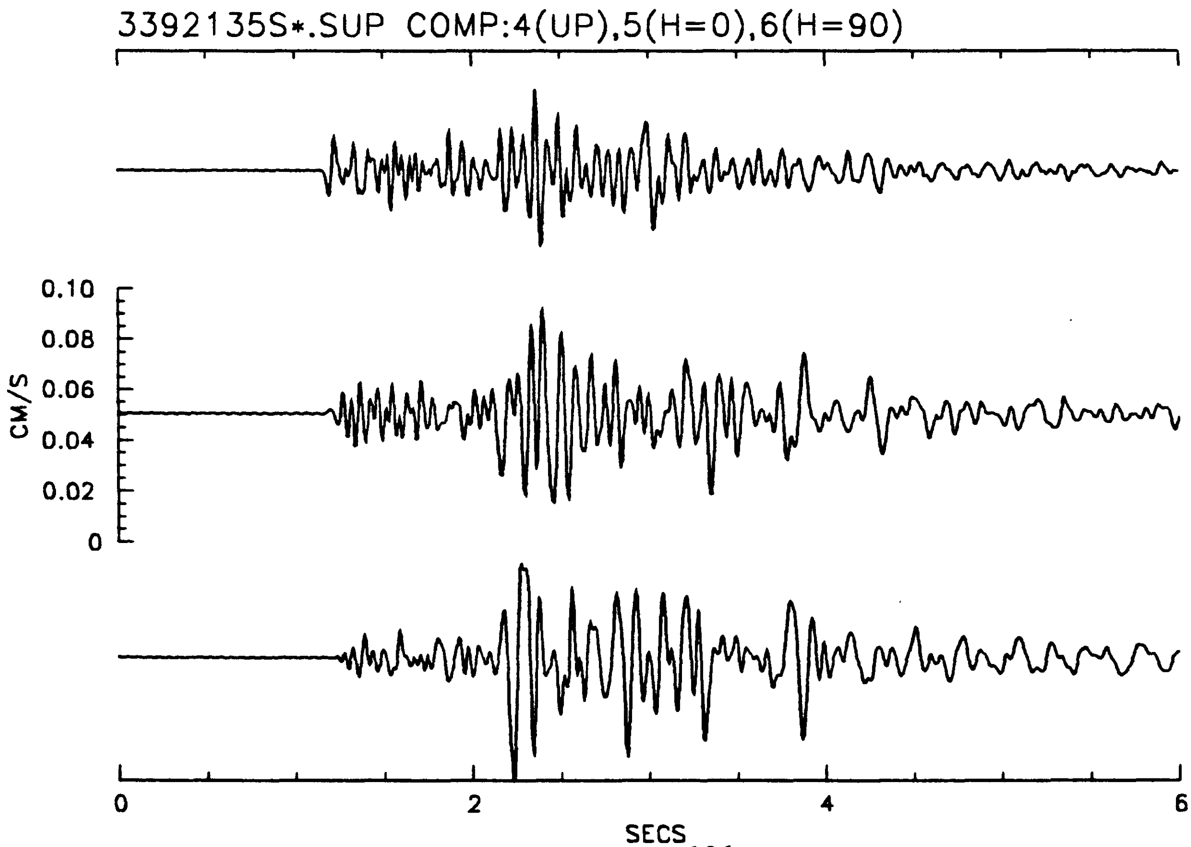


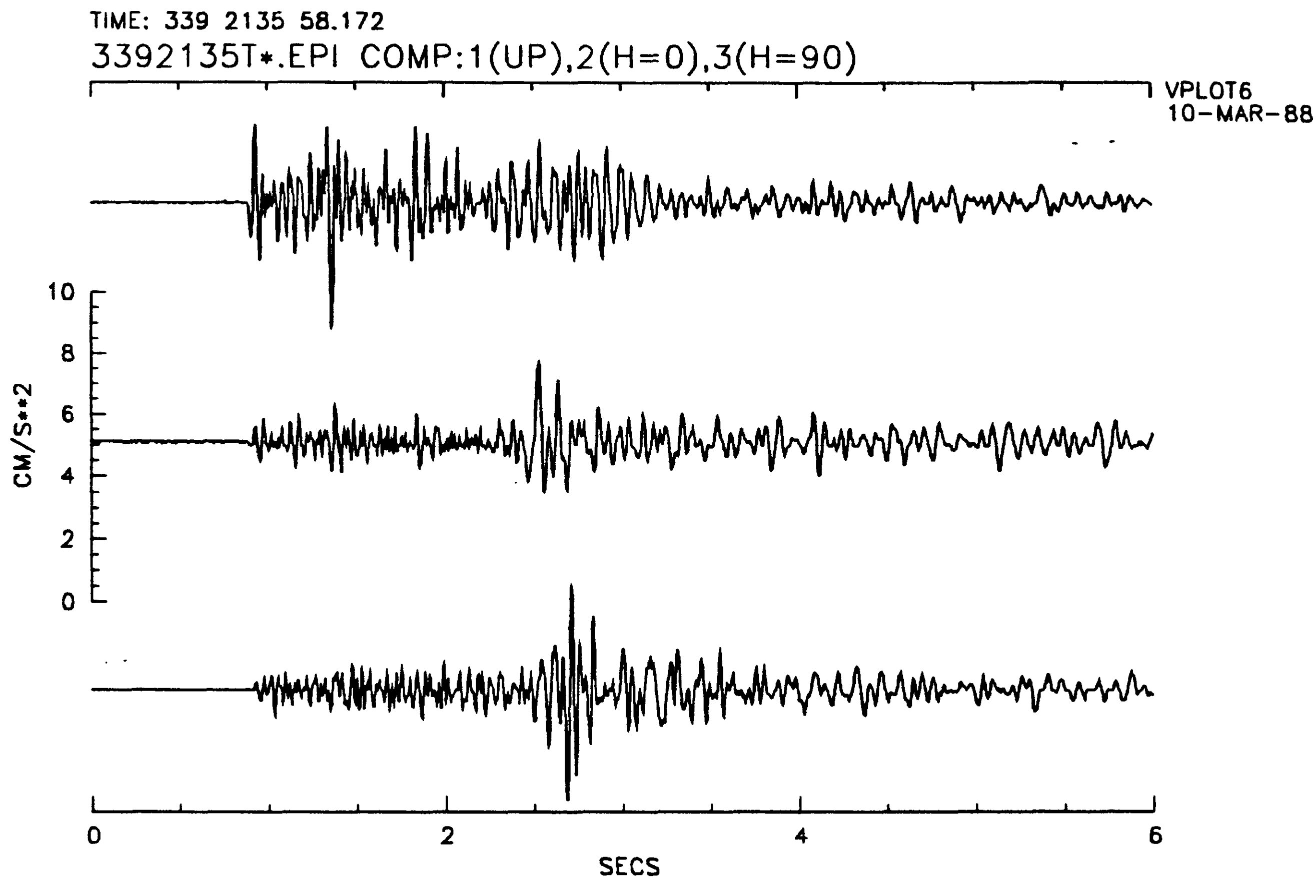
APPENDIX 2.9 Seismograms of the M=2.2 earthquake at 3392135

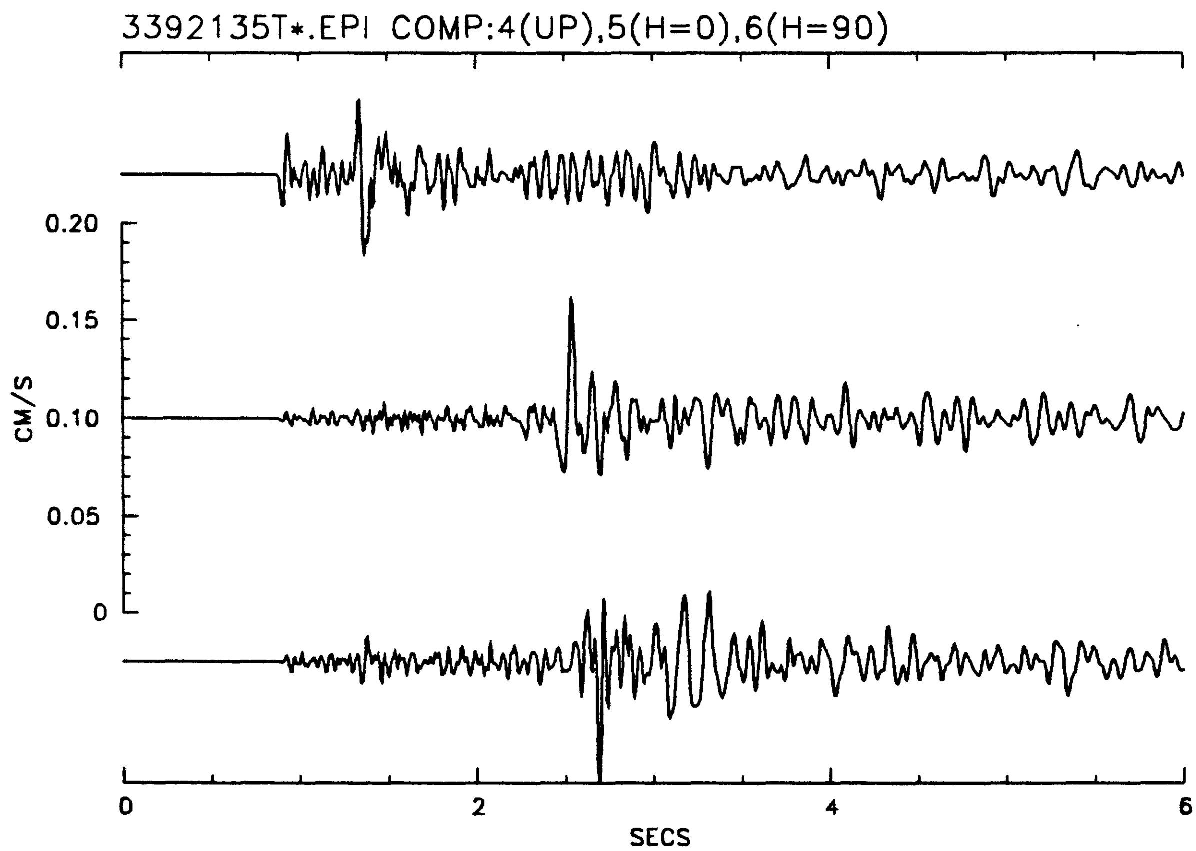

TIME: 339 2135 57.552
3392135S*.SNW COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
CM/S**2
2.0
1.5
1.0
0.5
0
0
2
4
6
SECS

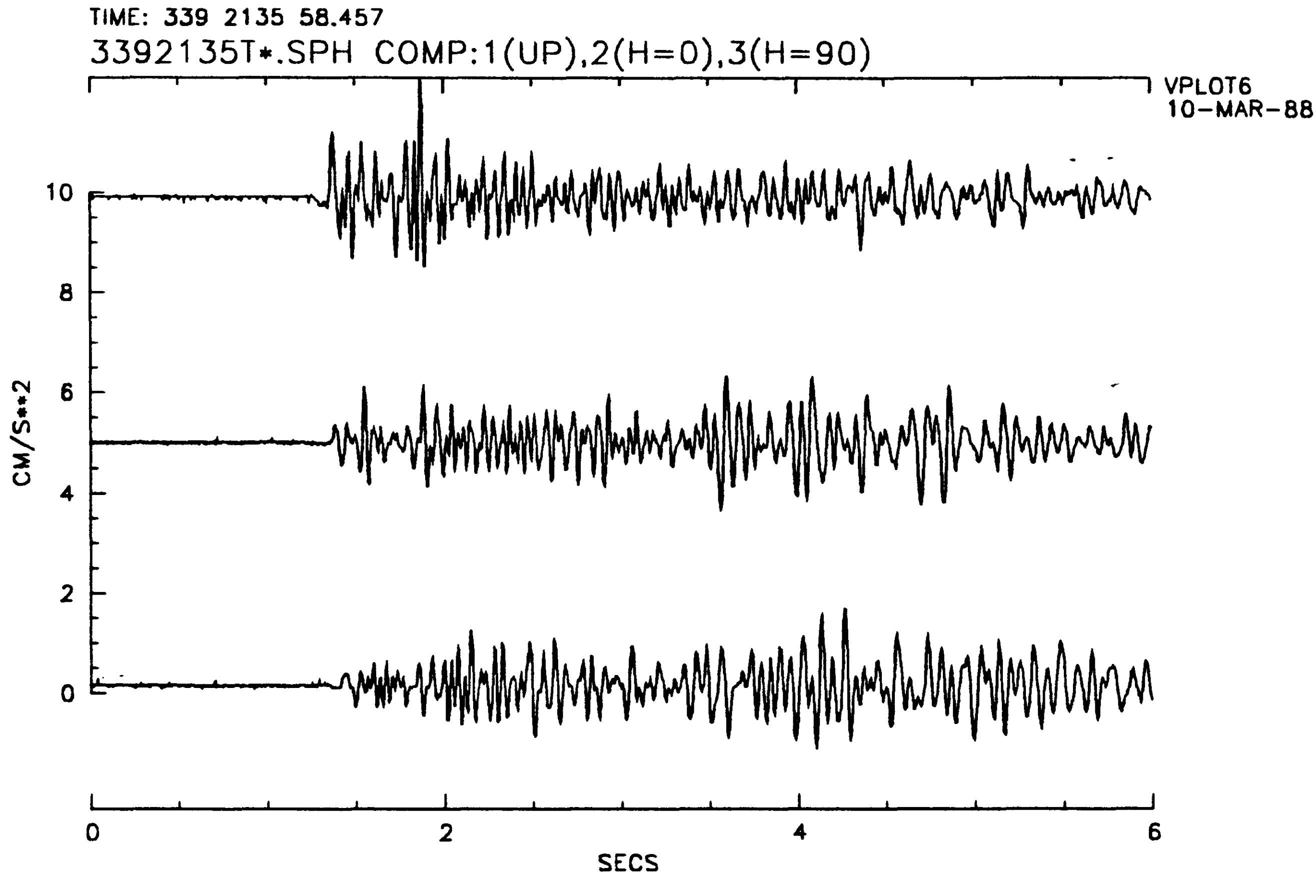

3392135S*.SNW COMP:4(UP),5(H=0),6(H=90)
CM/S
0.05
0.04
0.03
0.02
0.01
0
0
2
4
6
SECS

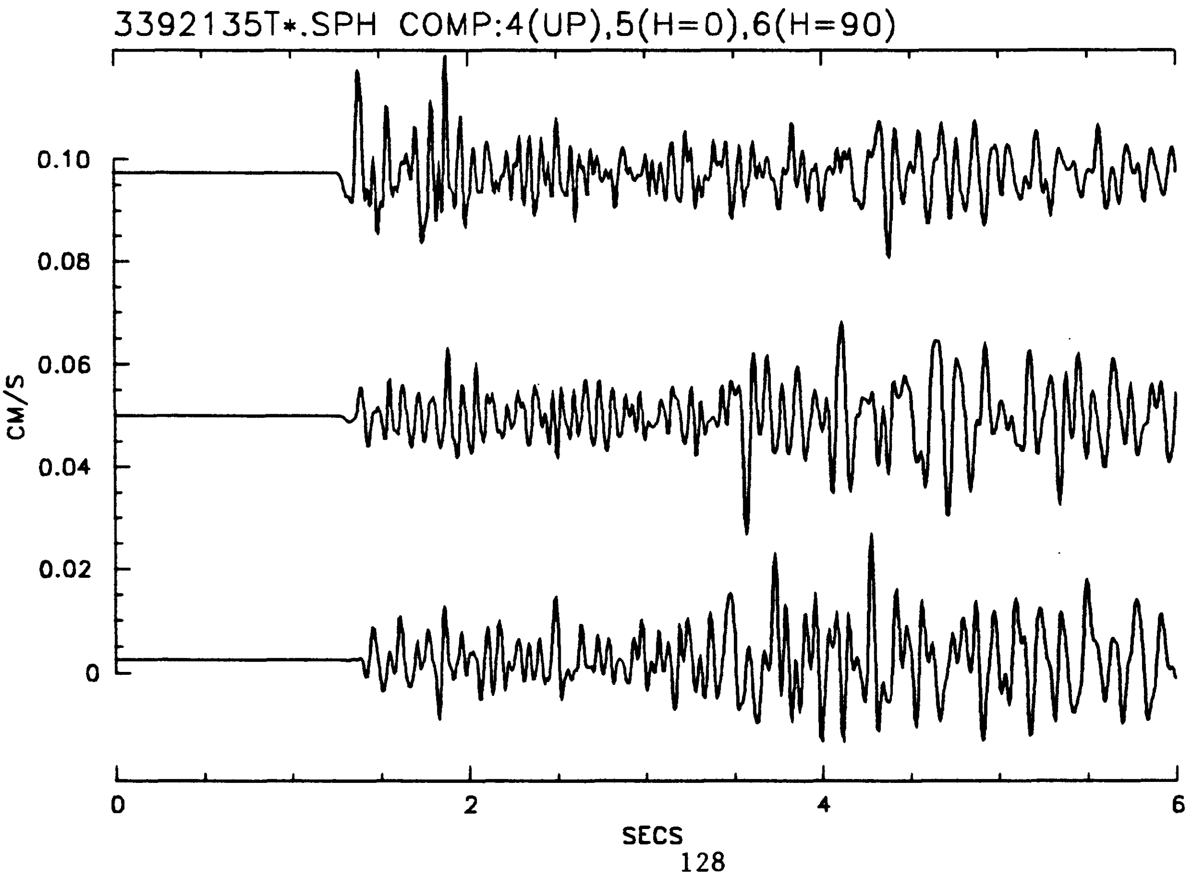

TIME: 339 2135 57.709
3392135S*.SUP COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
CM/S**2
20
15
10
5
0
0
2
4
6
SECS

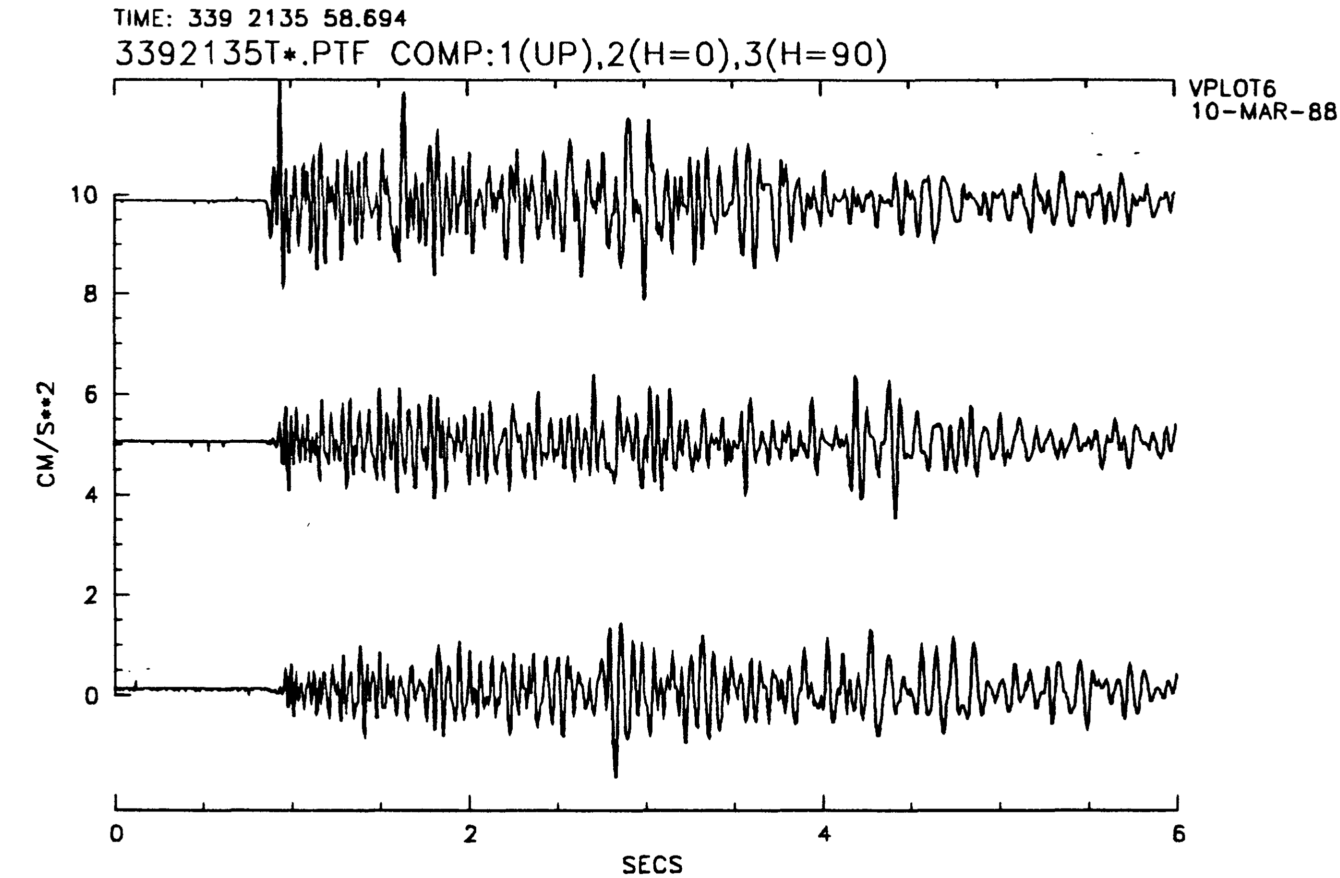

3392135S*.SUP COMP:4(UP),5(H=0),6(H=90)
CM/S
0.10
0.08
0.06
0.04
0.02
0
0
2
4
6
SECS

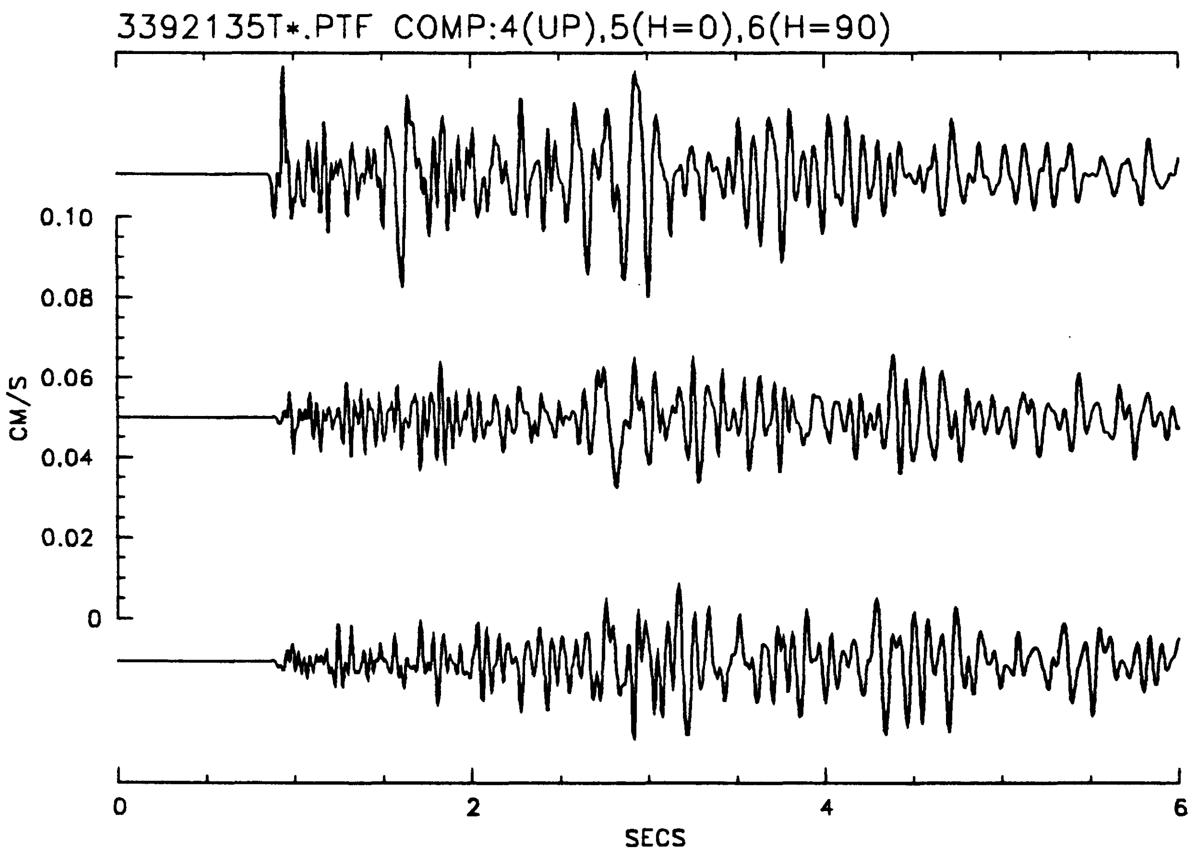

TIME: 339 2135 58.172
3392135T*.EPI COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
SECS

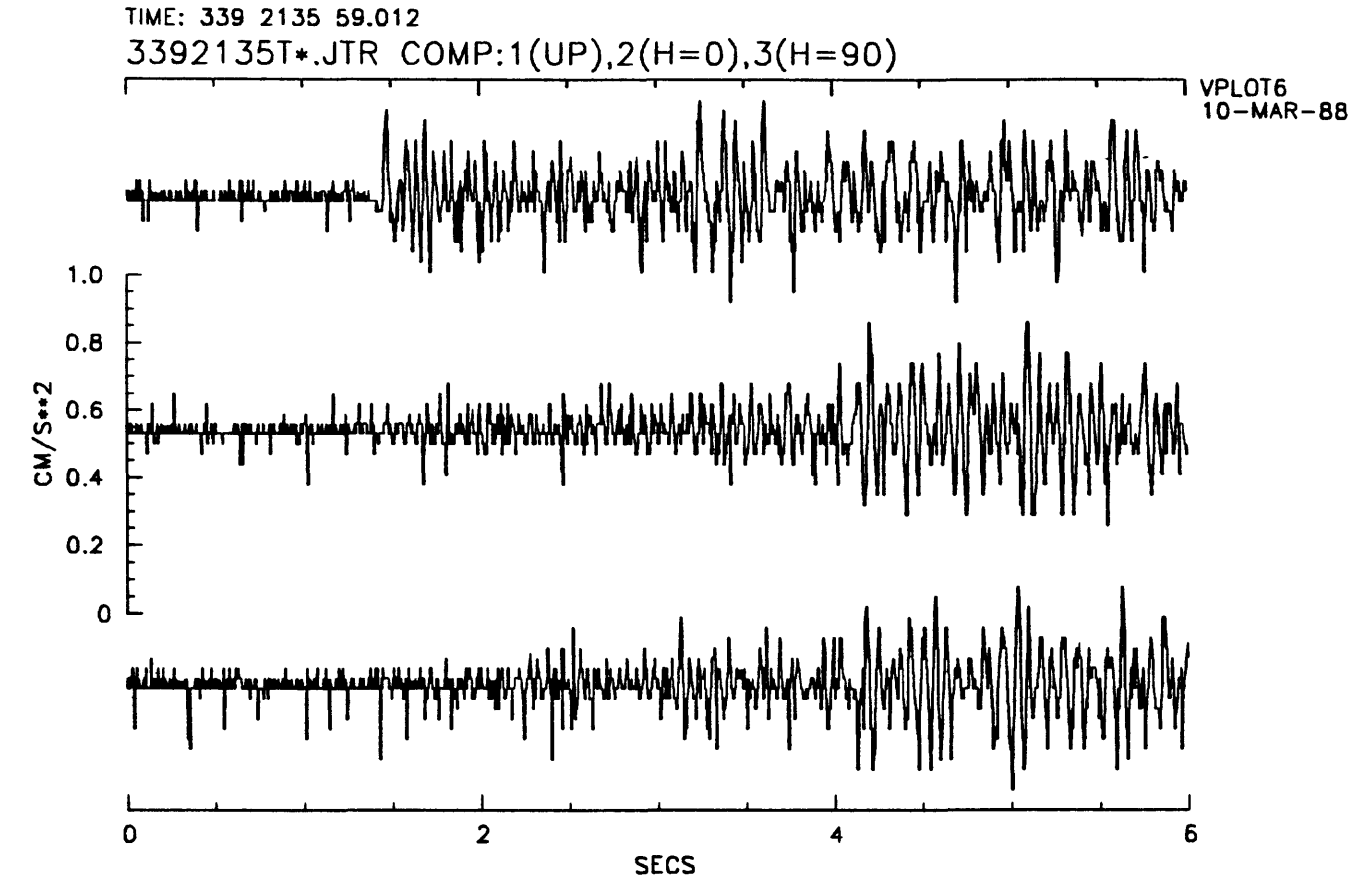

3392135T*.EPI COMP:4(UP),5(H=0),6(H=90)
CM/S
0.20
0.15
0.10
0.05
0
0
2
4
6
SECS

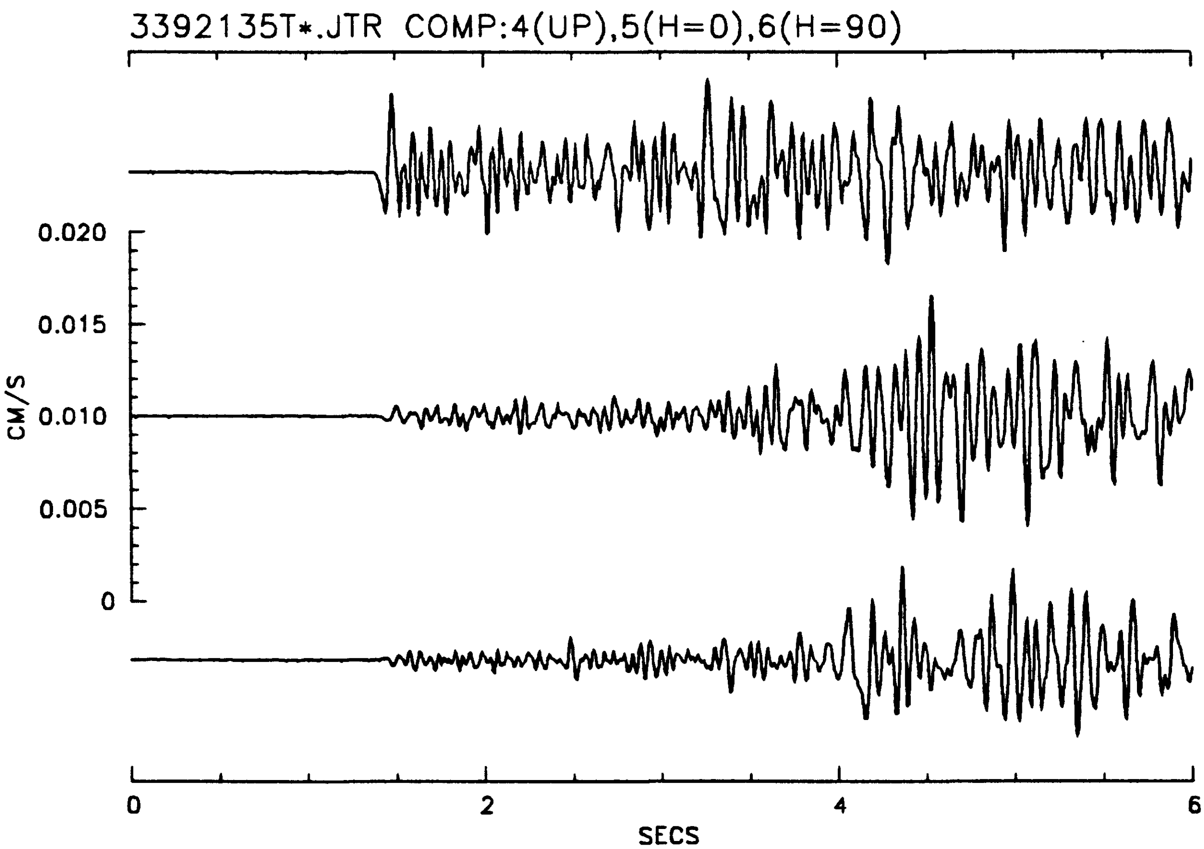

TIME: 339 2135 58.457
3392135T*.SPH COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
SECS


3392135T*.SPH COMP:4(UP),5(H=0),6(H=90)
CM/S
0.10
0.08
0.06
0.04
0.02
0
0
2
4
6
SECS


TIME: 339 2135 58.694
3392135T*.PTF COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
CM/S**2
10
8
6
4
2
0
0
2
4
6
SECS


3392135T*.PTF COMP:4(UP),5(H=0),6(H=90)
CM/S
0.10
0.08
0.06
0.04
0.02
0
0
2
4
6
SECS

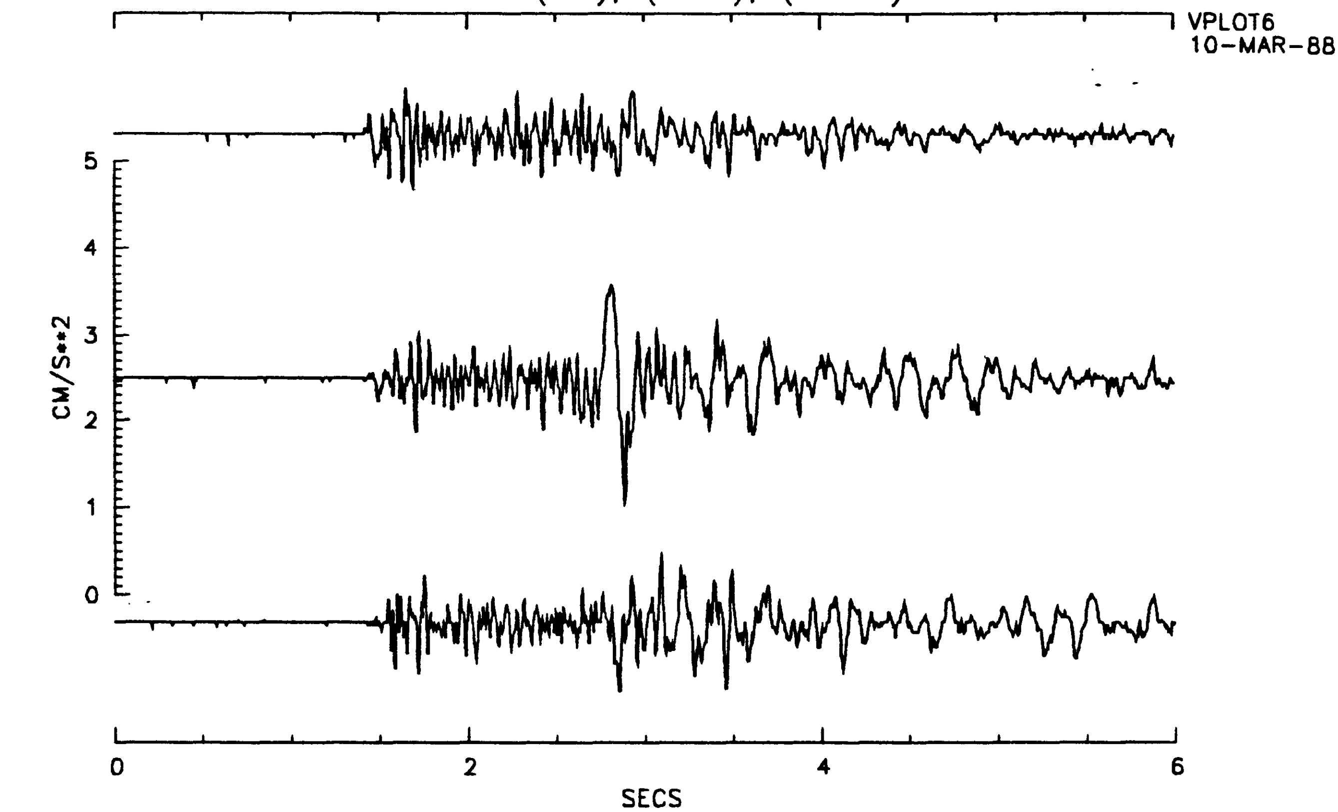

TIME: 339 2135 59.012
3392135T*.JTR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
1.0
0.8
0.6
0.4
0.2
0
CM/S**2
0
2
4
6
SECS


3392135T*.JTR COMP:4(UP),5(H=0),6(H=90)
0.020
0.015
0.010
0.005
0
CM/S
0
2
4
6
SECS

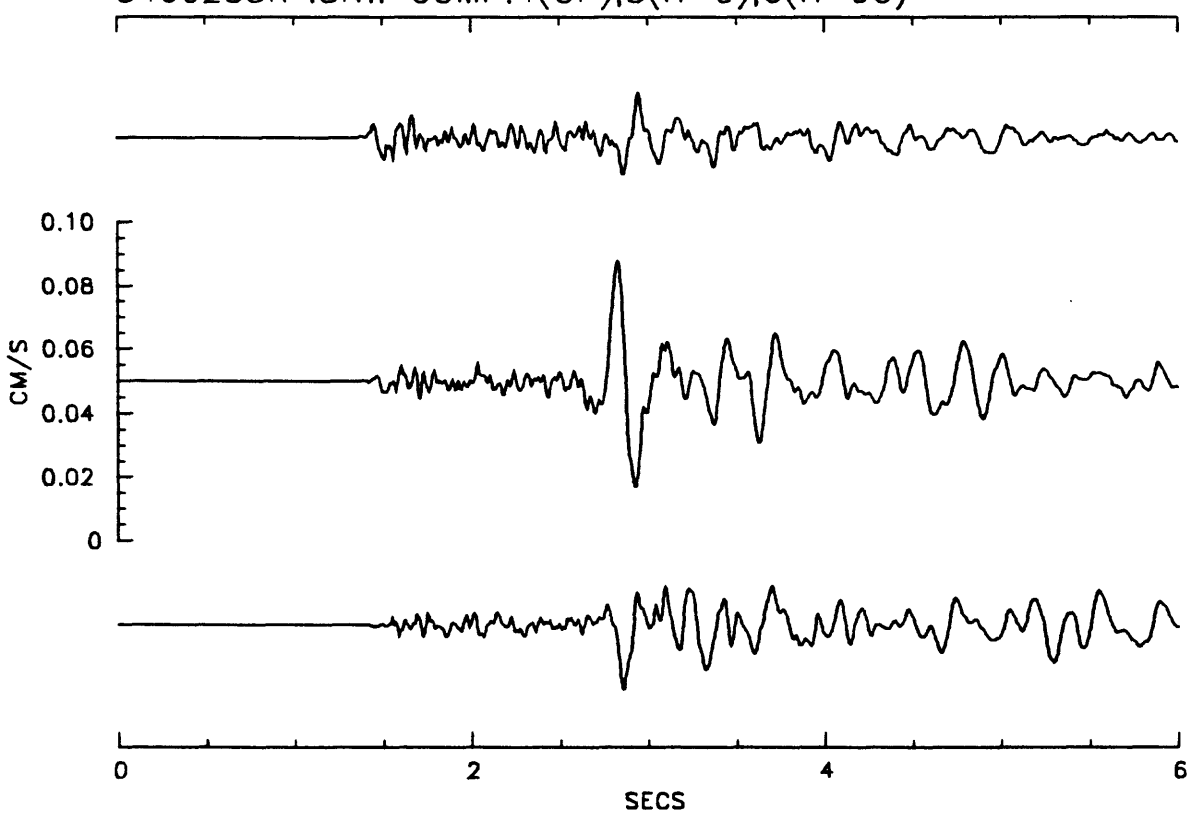
APPENDIX 2.10 Seismograms of the M=2.6 earthquake at 3400238

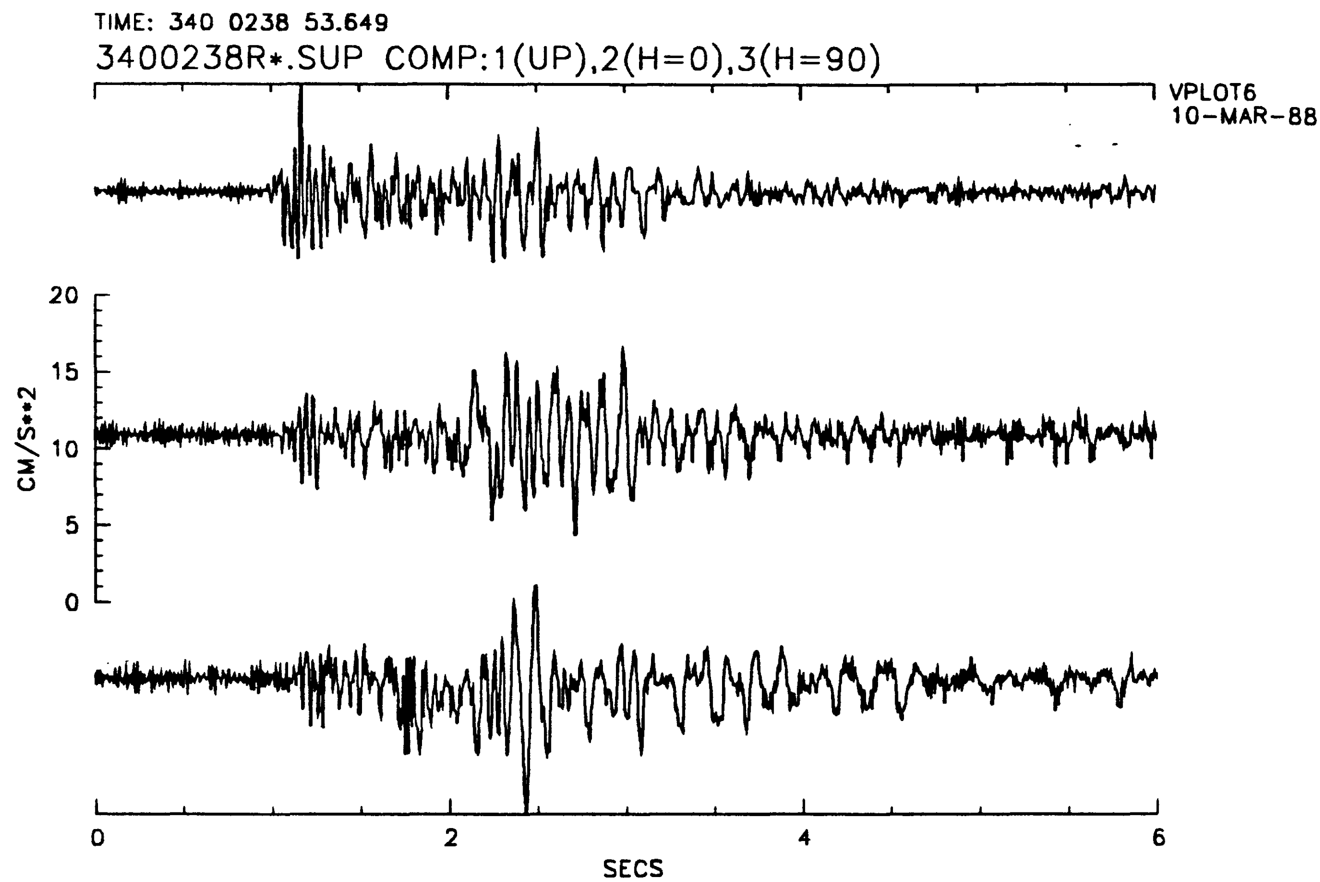
TIME: 340 0238 53.492

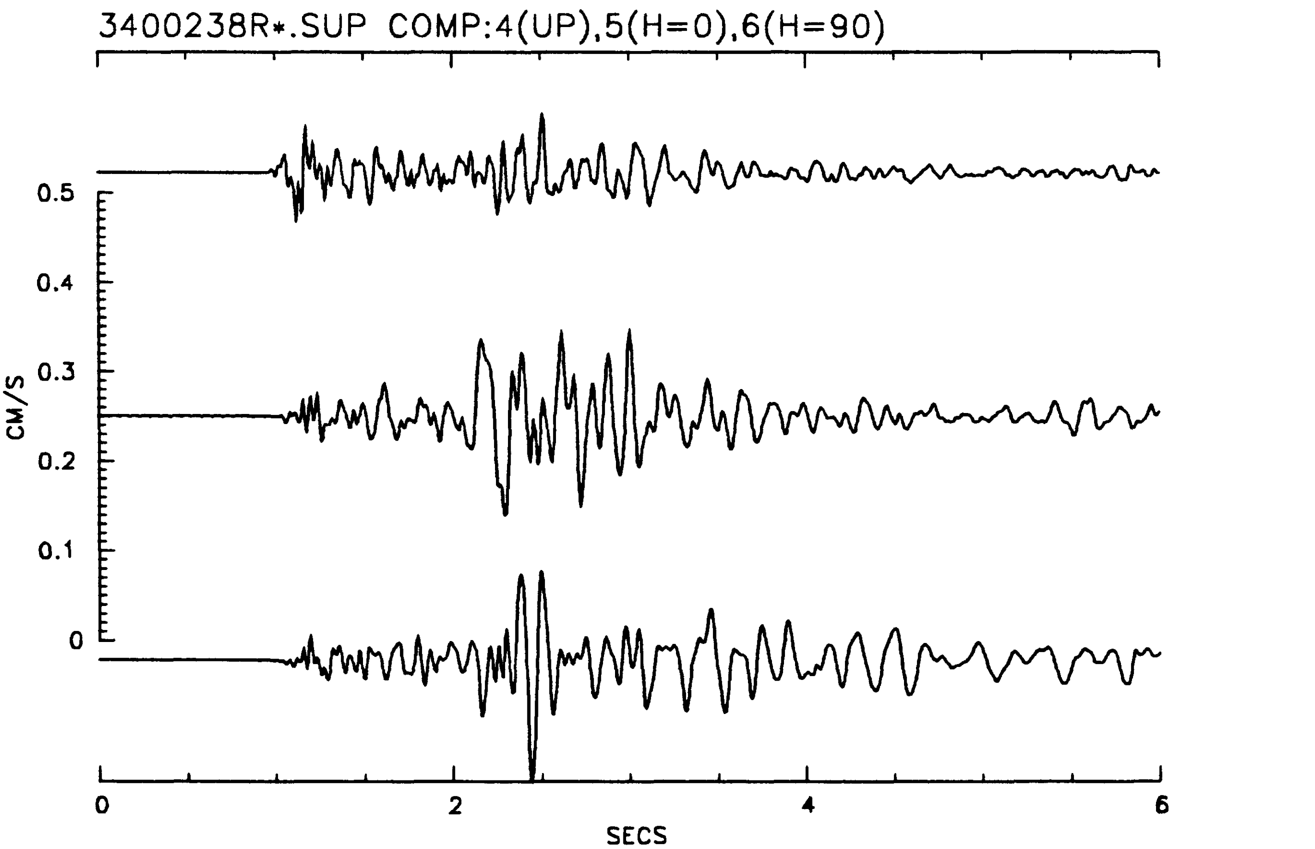
3400238R*.SNW COMP:1(UP),2(H=0),3(H=90)



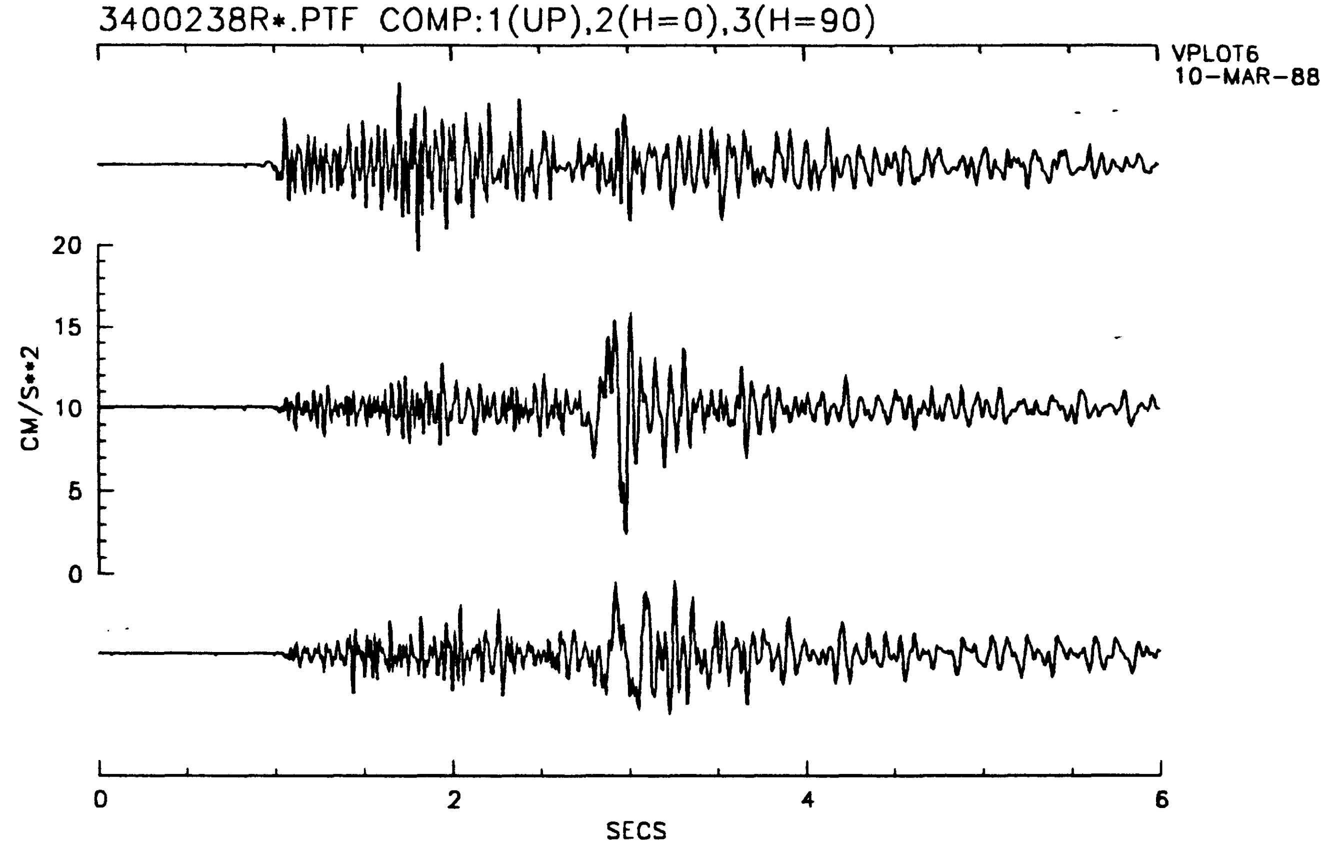
3400238R*.SNW COMP:4(UP),5(H=0),6(H=90)

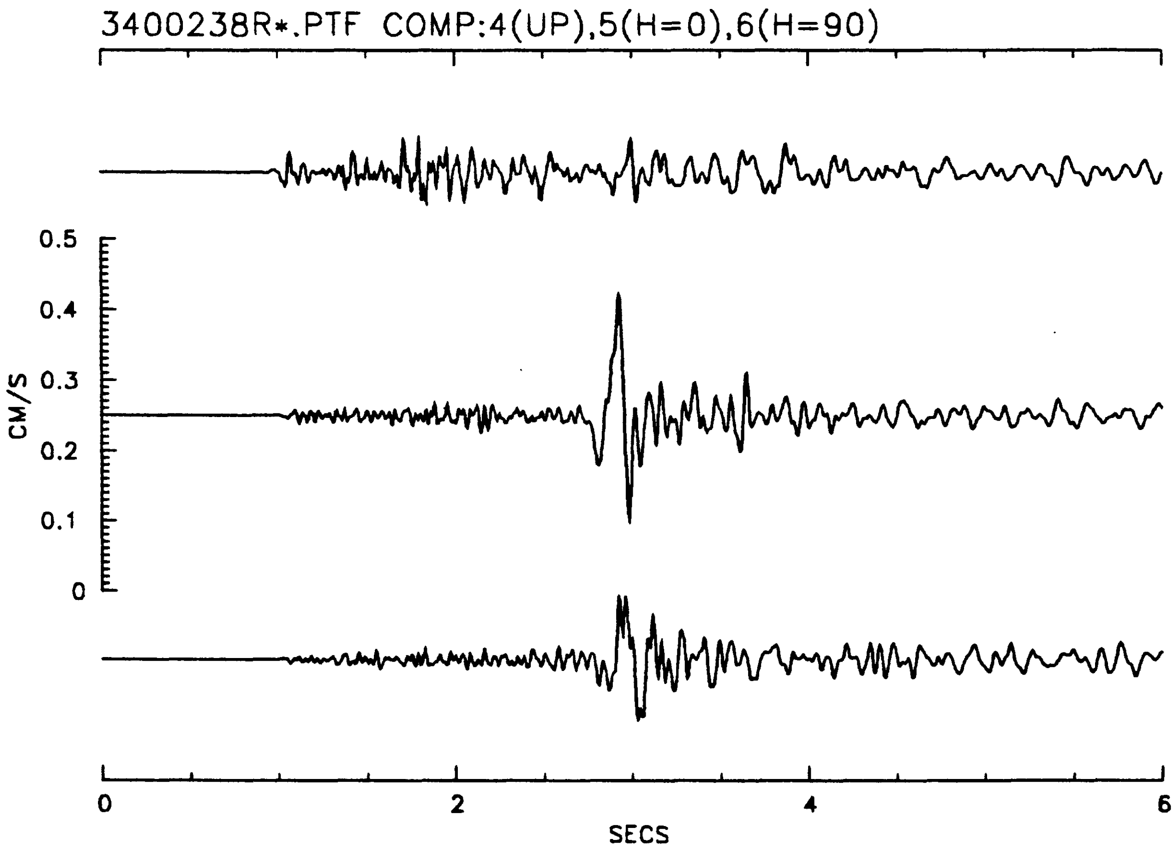


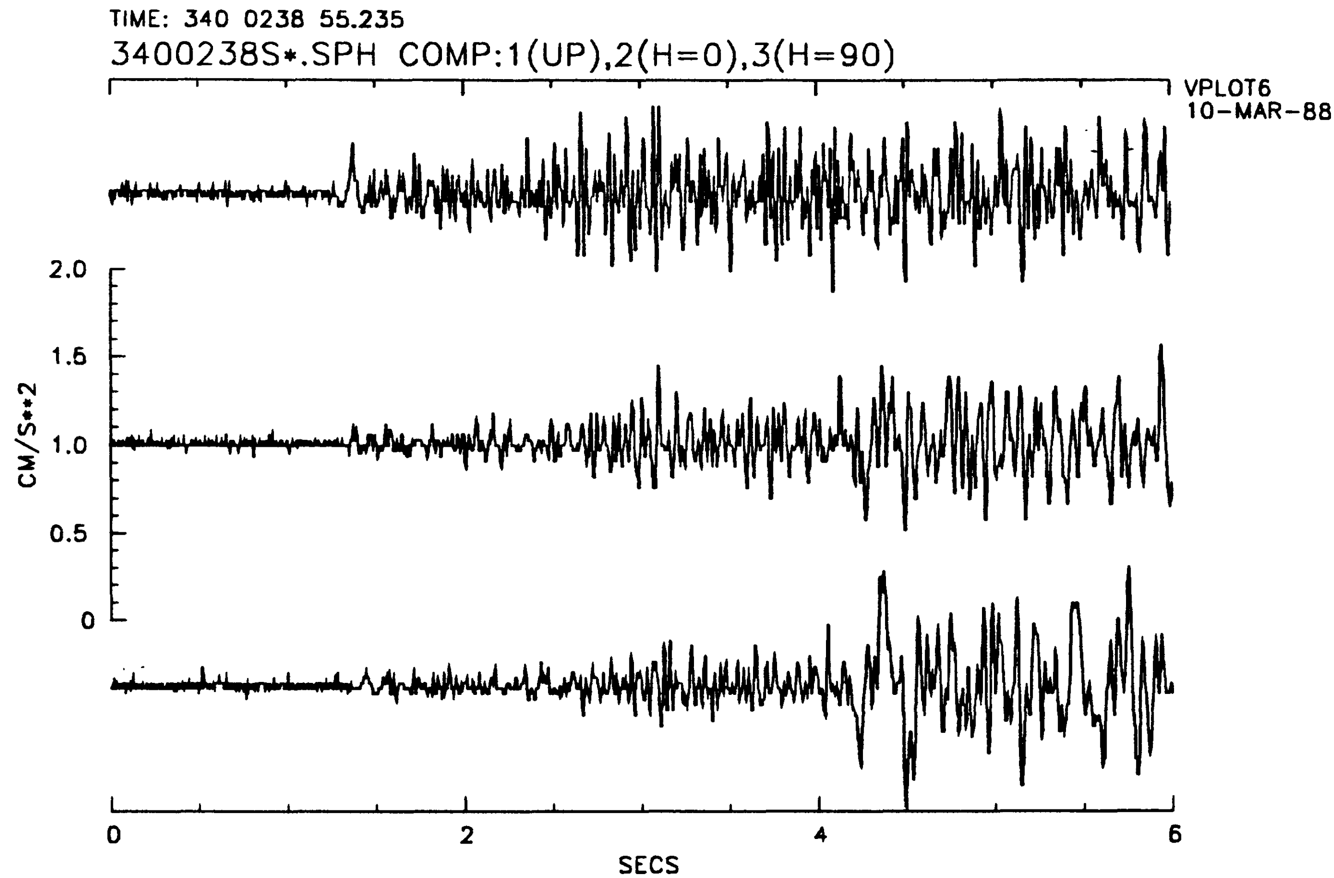

TIME: 340 0238 53.649
3400238R*.SUP COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
20
15
10
5
0
CM/S**2
0
2
4
6
SECS

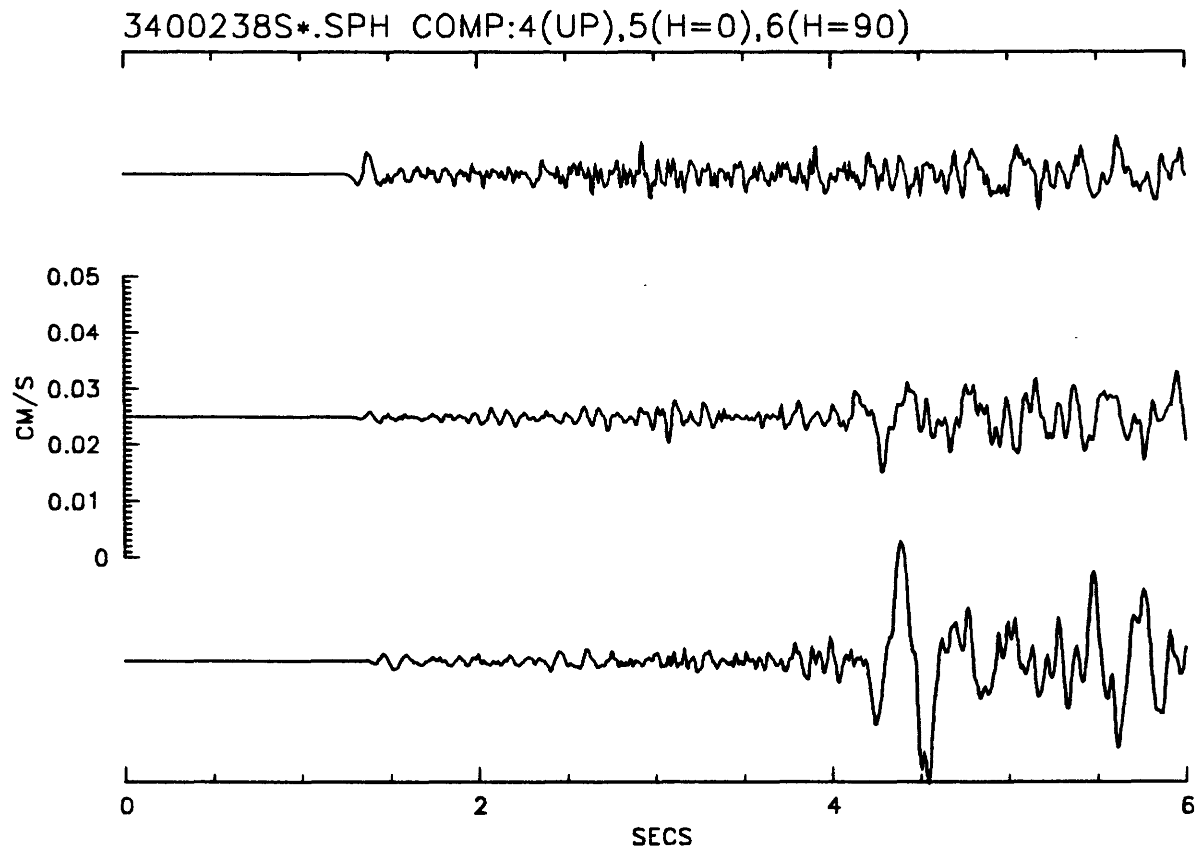

3400238R*.SUP COMP:4(UP),5(H=0),6(H=90)
0.5
0.4
0.3
0.2
0.1
0
CM/S
0
2
4
6
SECS

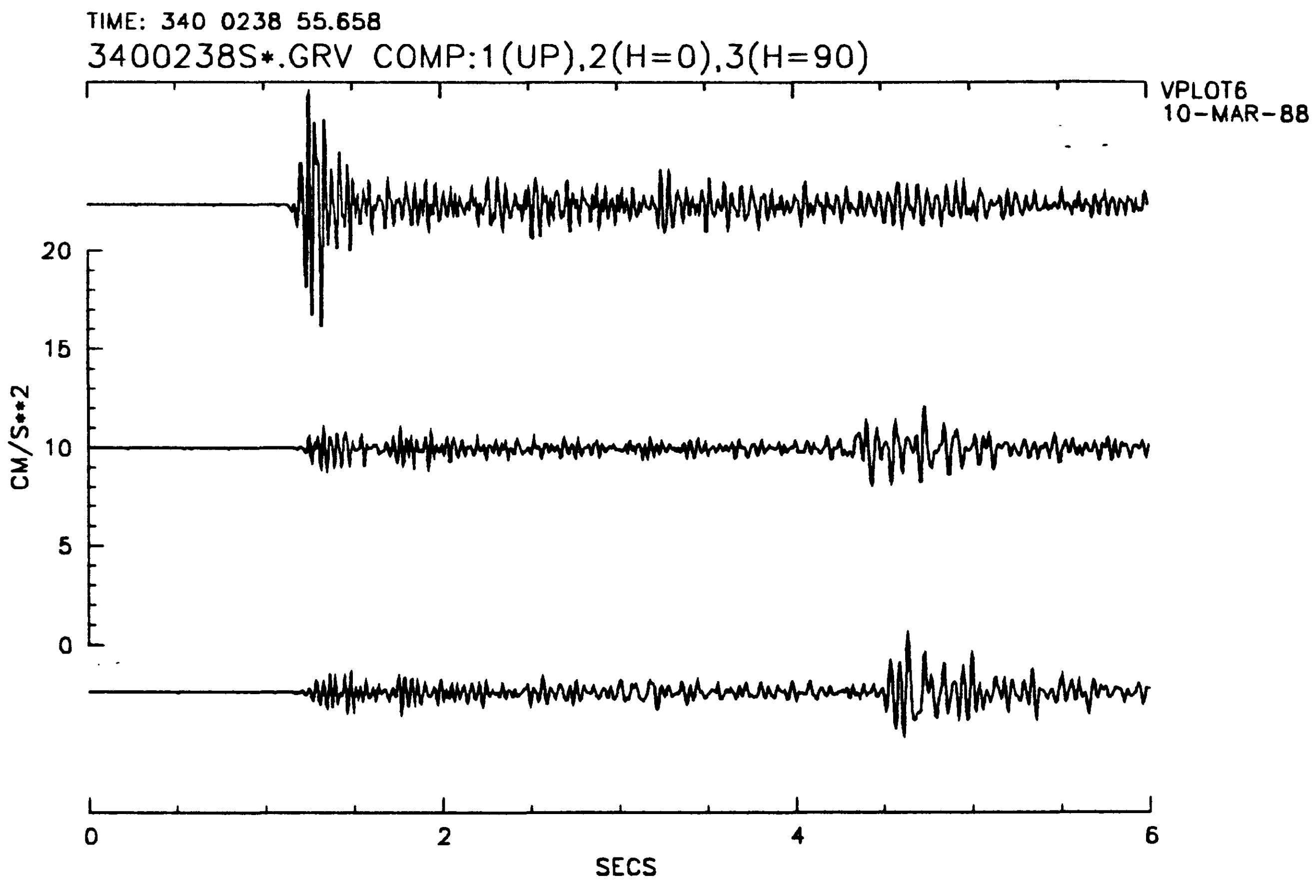
TIME: 340 0238 54.268

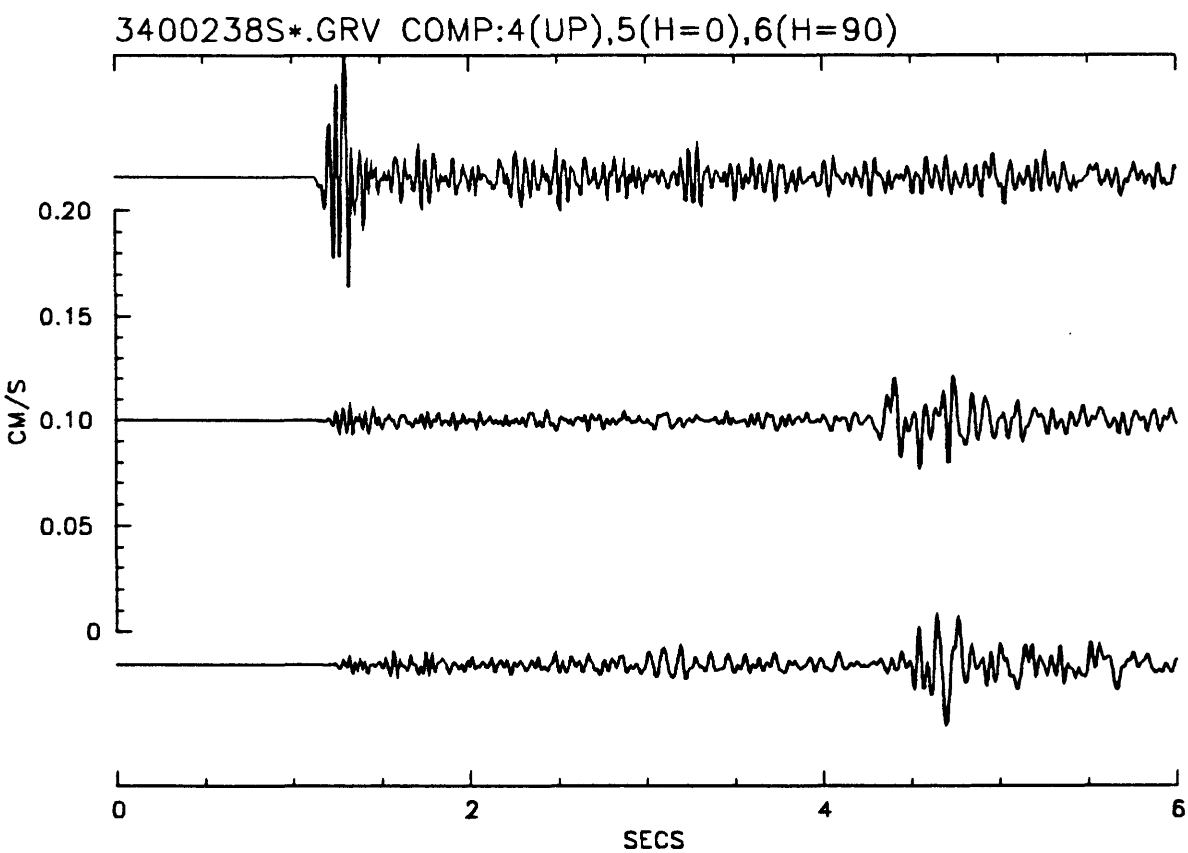


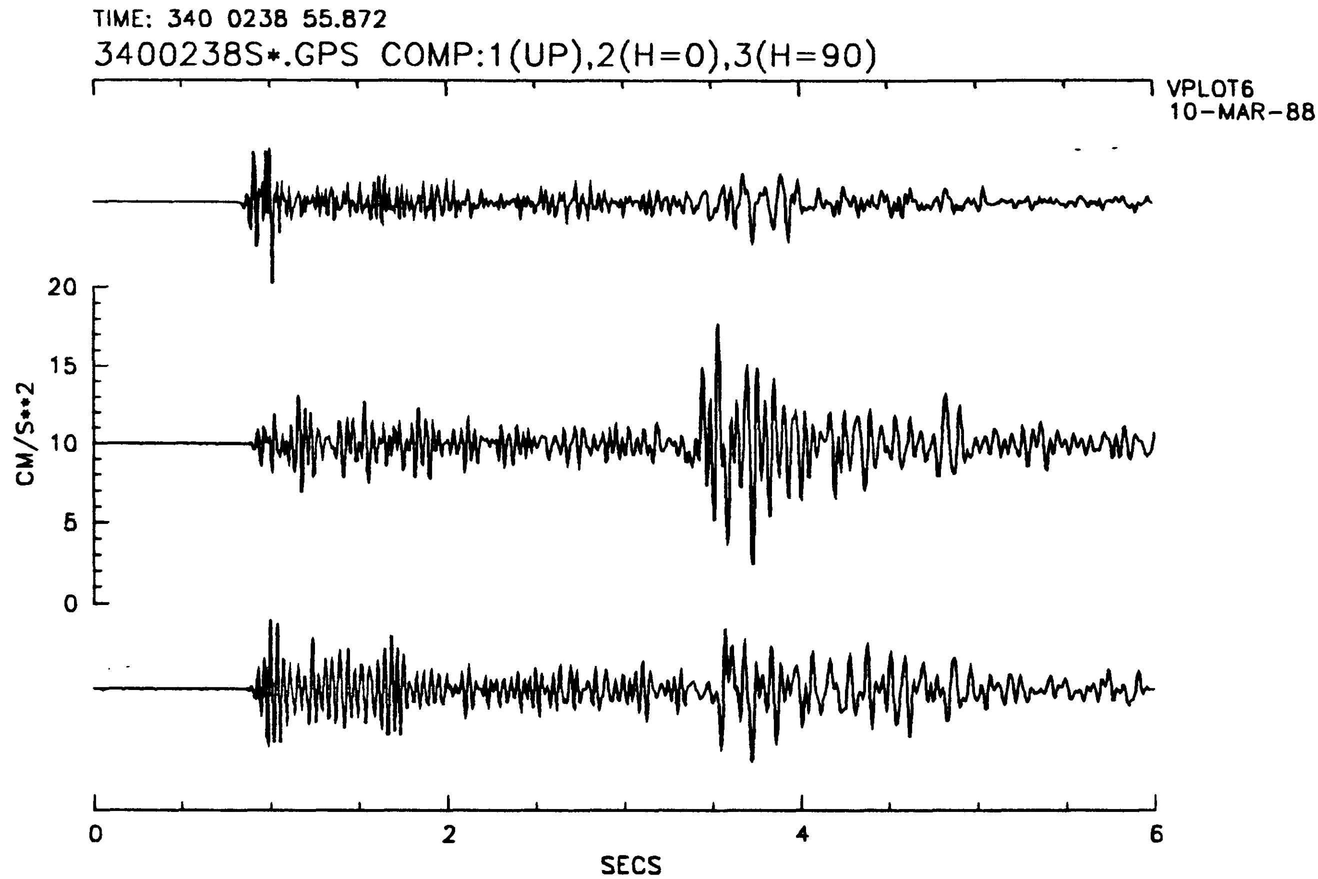


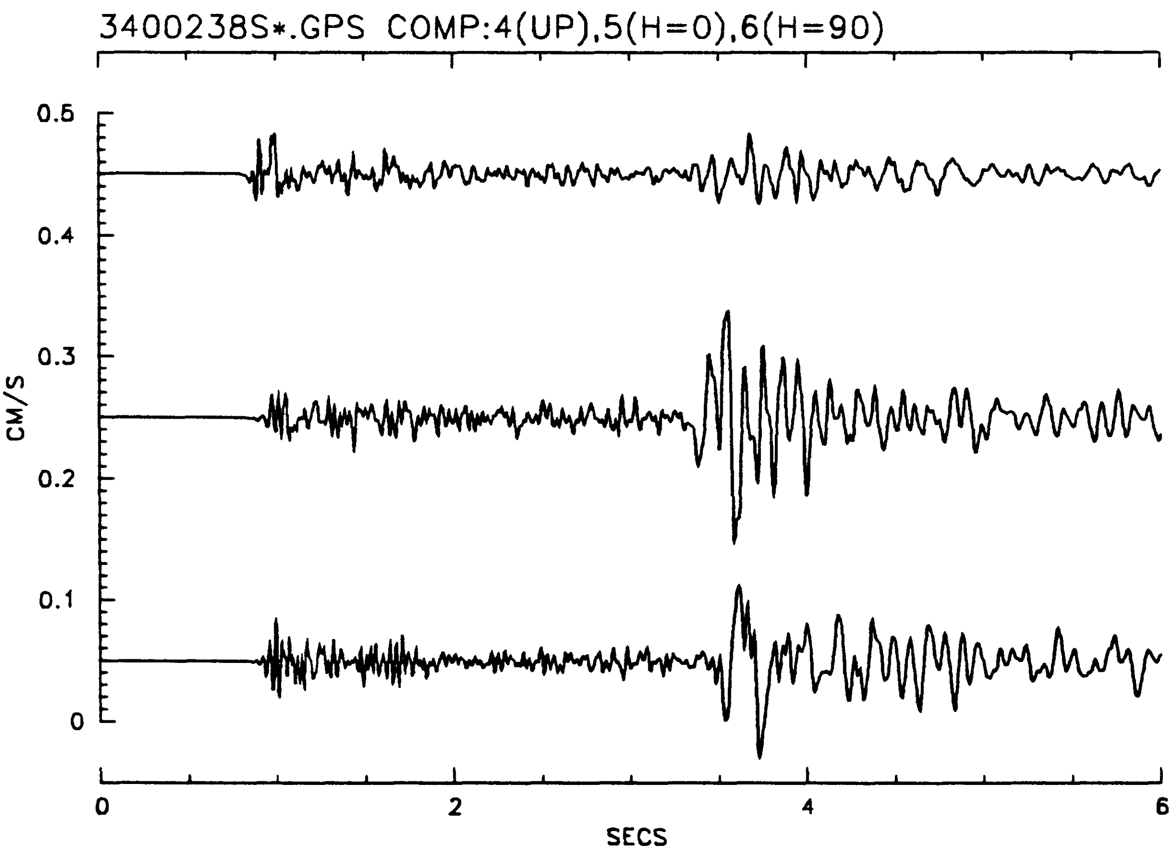

TIME: 340 0238 55.235
3400238S*.SPH COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
2.0
1.5
1.0
0.5
0
CM/S**2
0
2
4
6
SECS

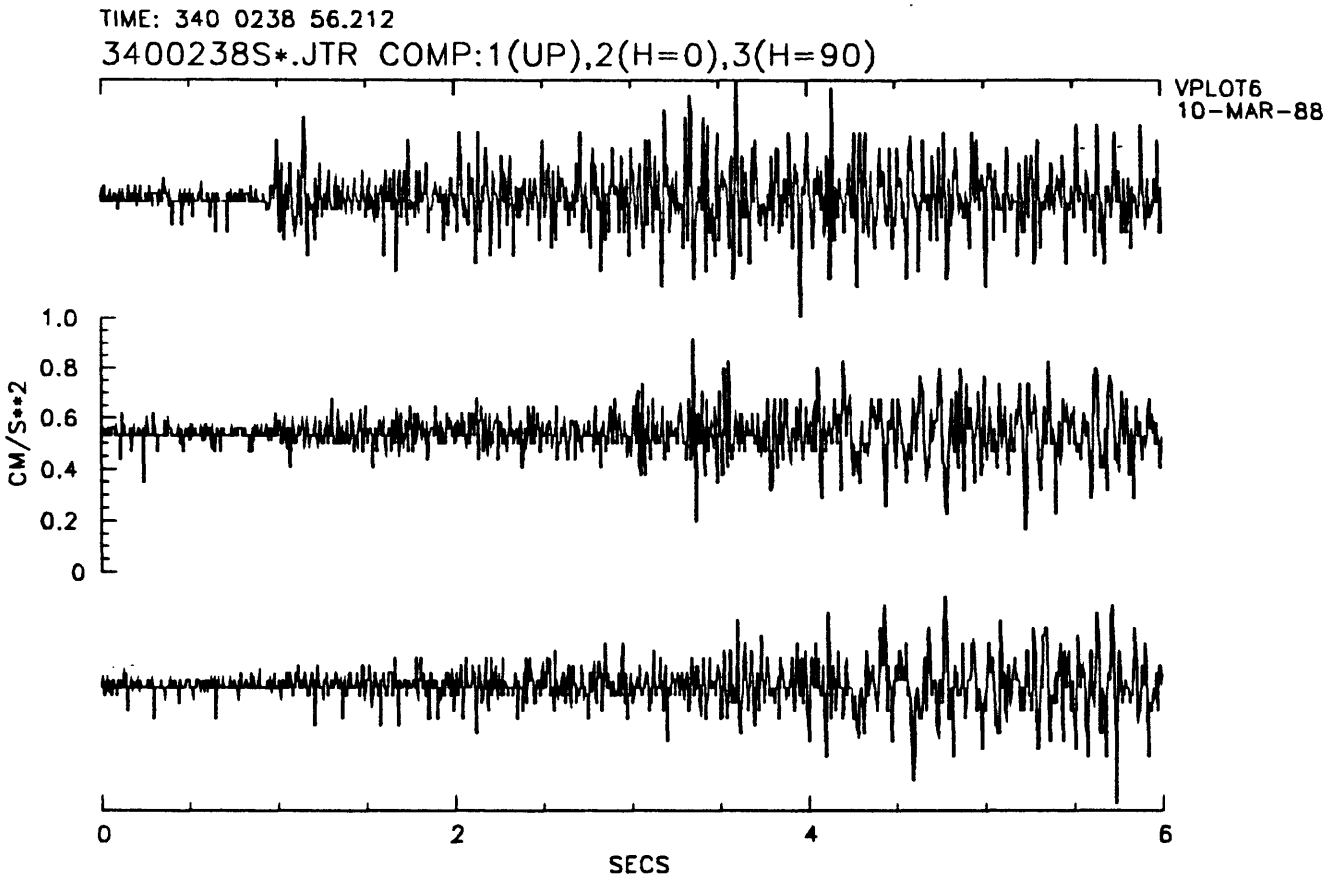

3400238S*.SPH COMP:4(UP),5(H=0),6(H=90)
0.05
0.04
0.03
0.02
0.01
0
CM/S
0
2
4
6
SECS


TIME: 340 0238 55.658
3400238S*.GRV COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
20
15
10
5
0
CM/S**2
0
2
4
6
SECS

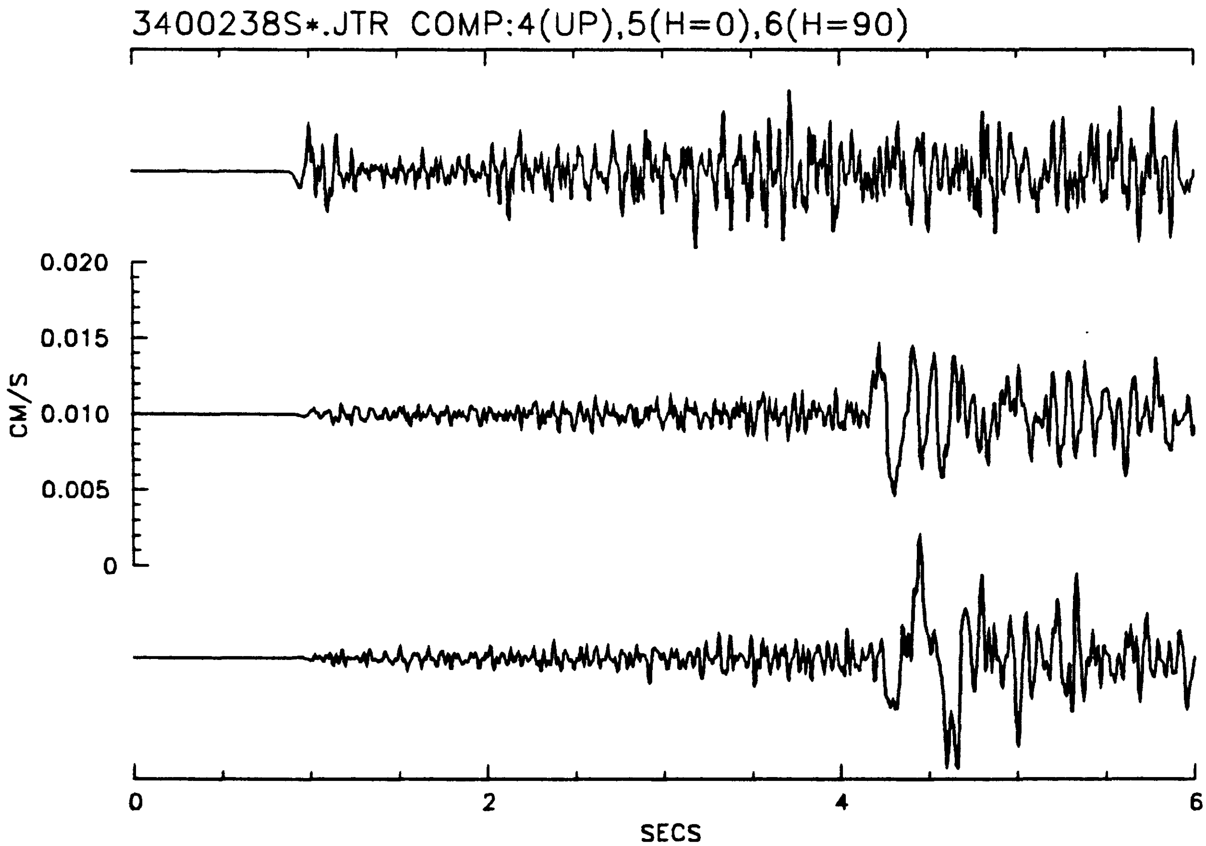

3400238S*.GRV COMP:4(UP),5(H=0),6(H=90)
0.20
0.15
0.10
0.05
0
CM/S
0
2
4
6
SECS


TIME: 340 0238 55.872
3400238S*.GPS COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
20
15
10
5
0
CM/S**2
0
2
4
6
SECS


3400238S*.GPS COMP:4(UP),5(H=0),6(H=90)
0.5
0.4
0.3
0.2
0.1
0
CM/S
0
2
4
6
SECS

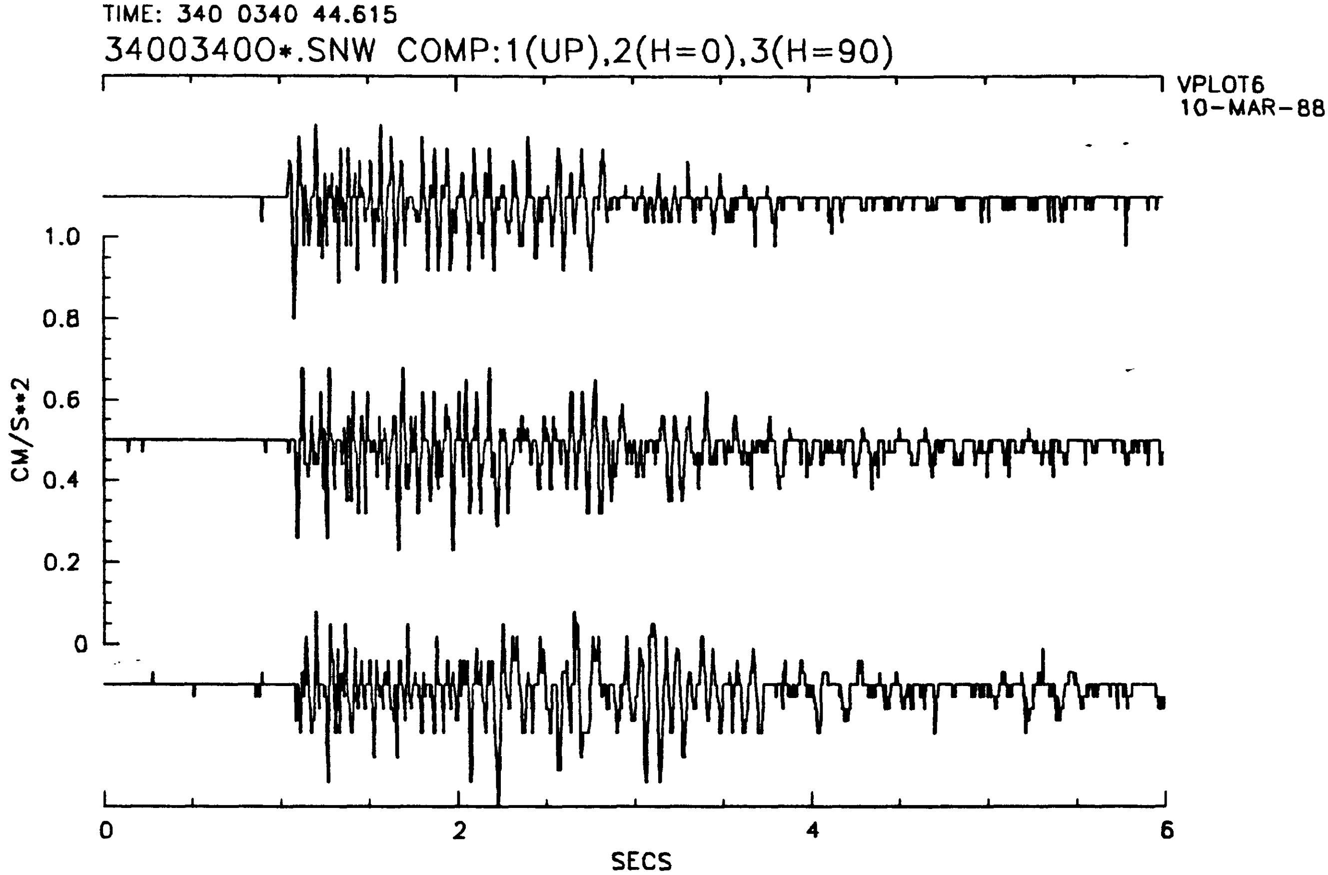


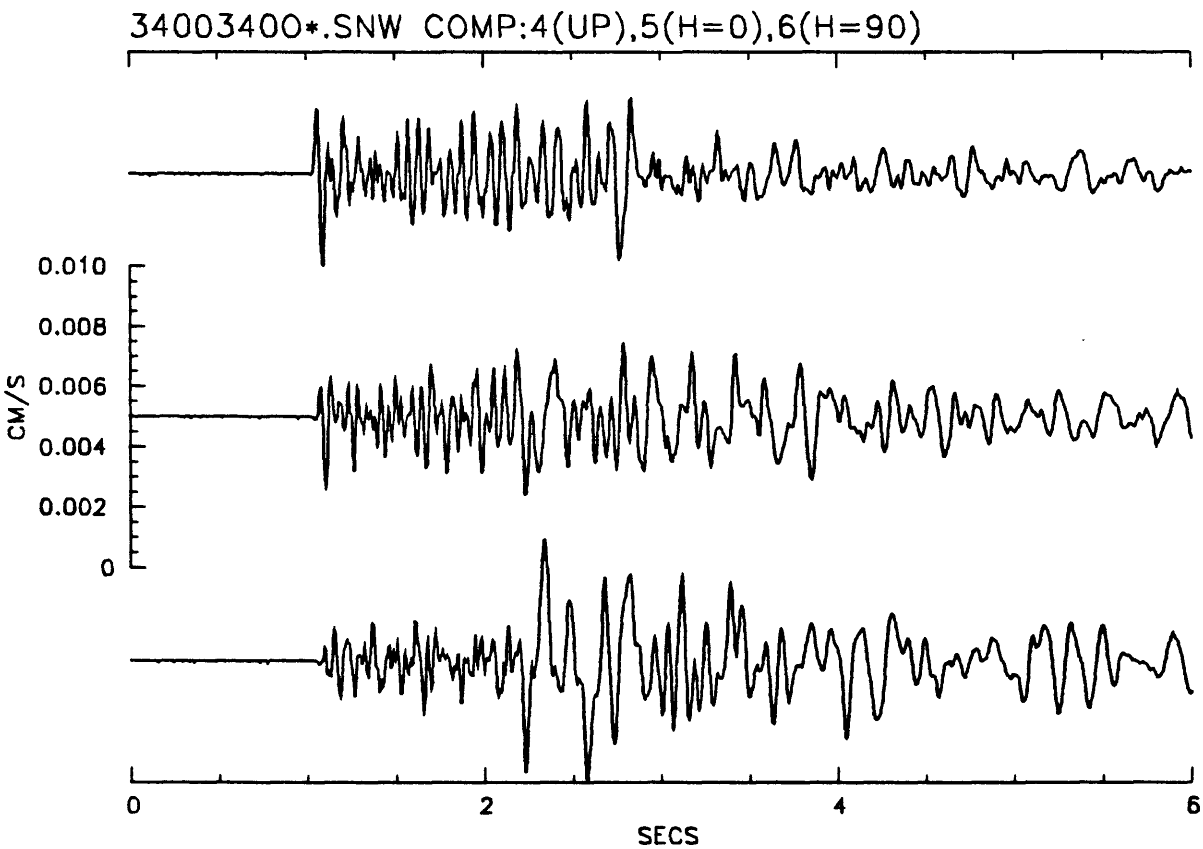
TIME: 340 0238 56.212
3400238S*.JTR COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
1.0
0.8
0.6
0.4
0.2
0
CM/S**2
0
2
4
6
SECS

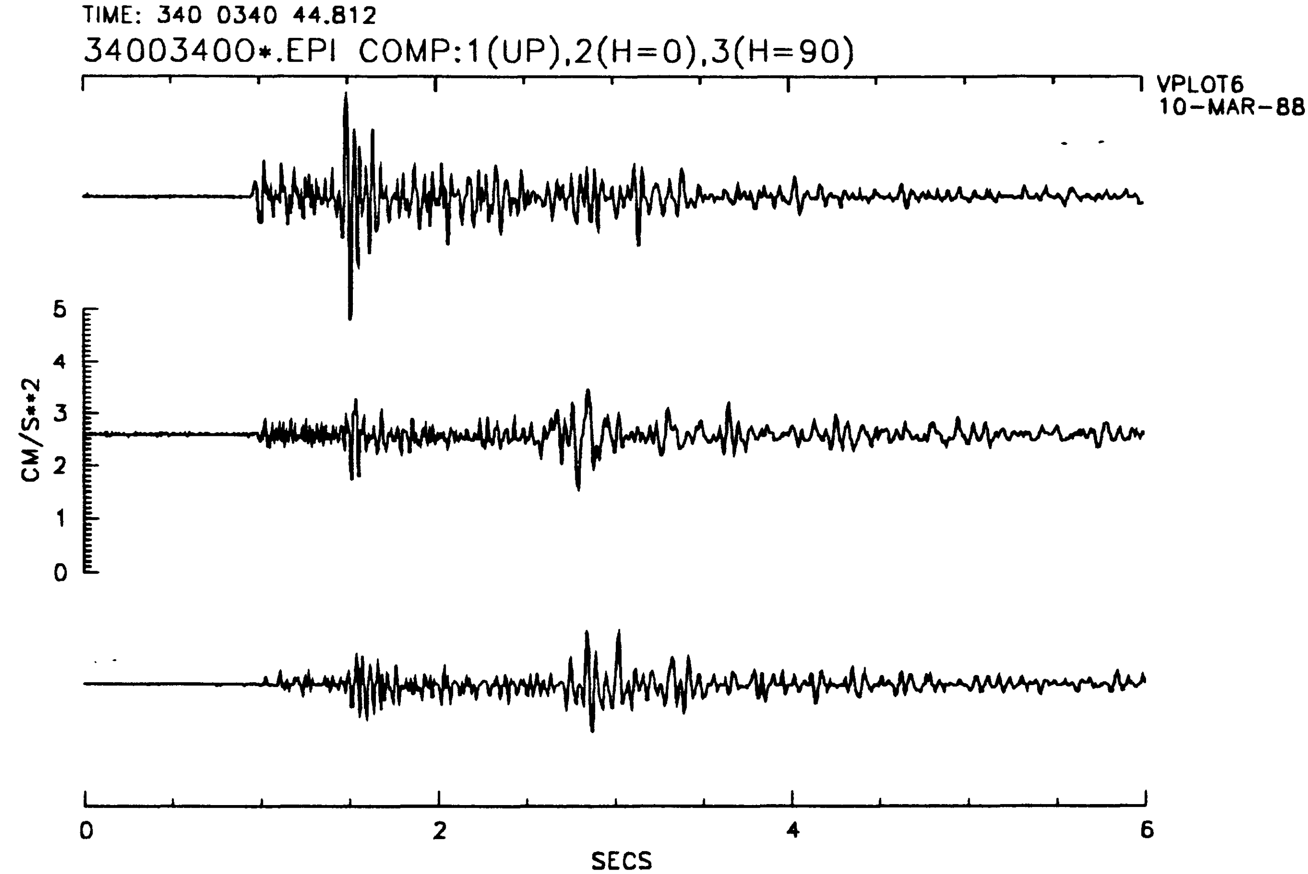


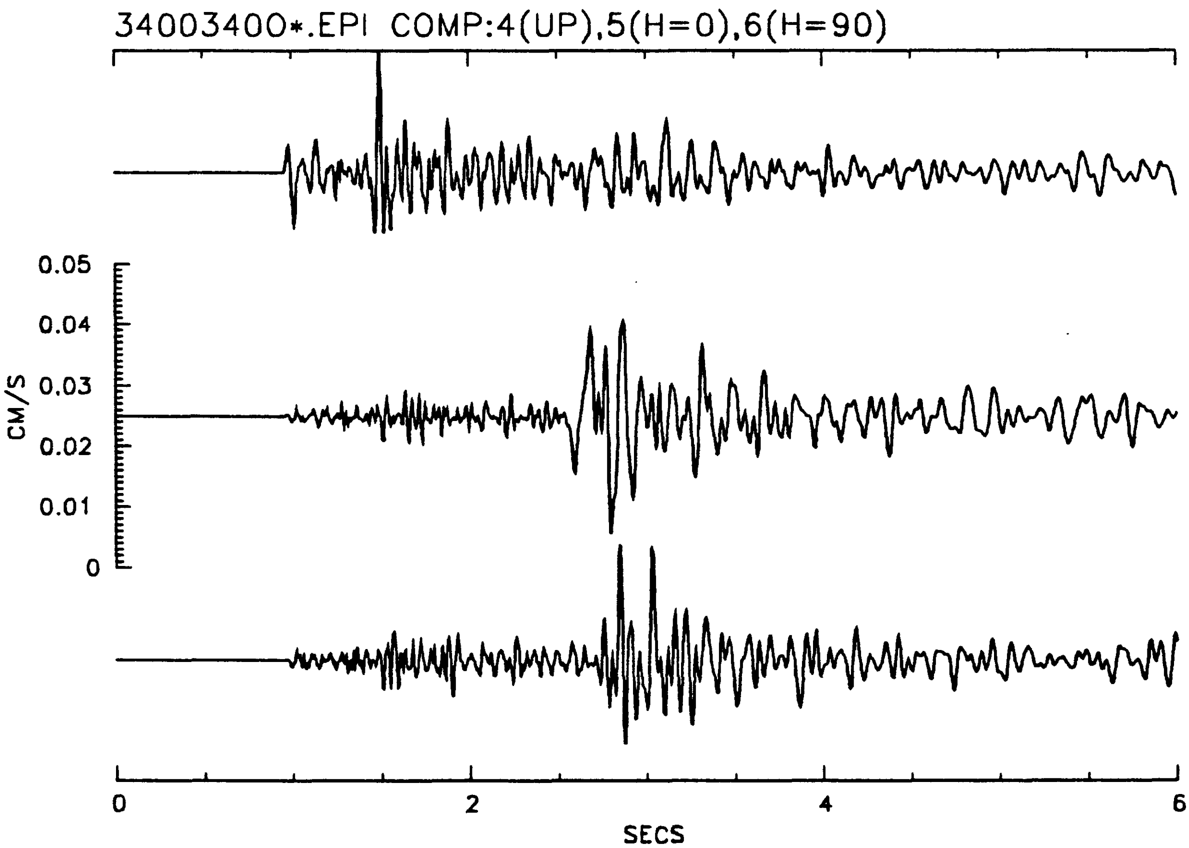
3400238S*.JTR COMP:4(UP),5(H=0),6(H=90)
0.020
0.015
0.010
0.005
0
CM/S
0
2
4
6
SECS

APPENDIX 2.11 Seismograms of the M=1.7 earthquake at 3400340


TIME: 340 0340 44.615
34003400*.SNW COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
1.0
0.8
0.6
0.4
0.2
0
CM/S**2
0
2
4
6
SECS

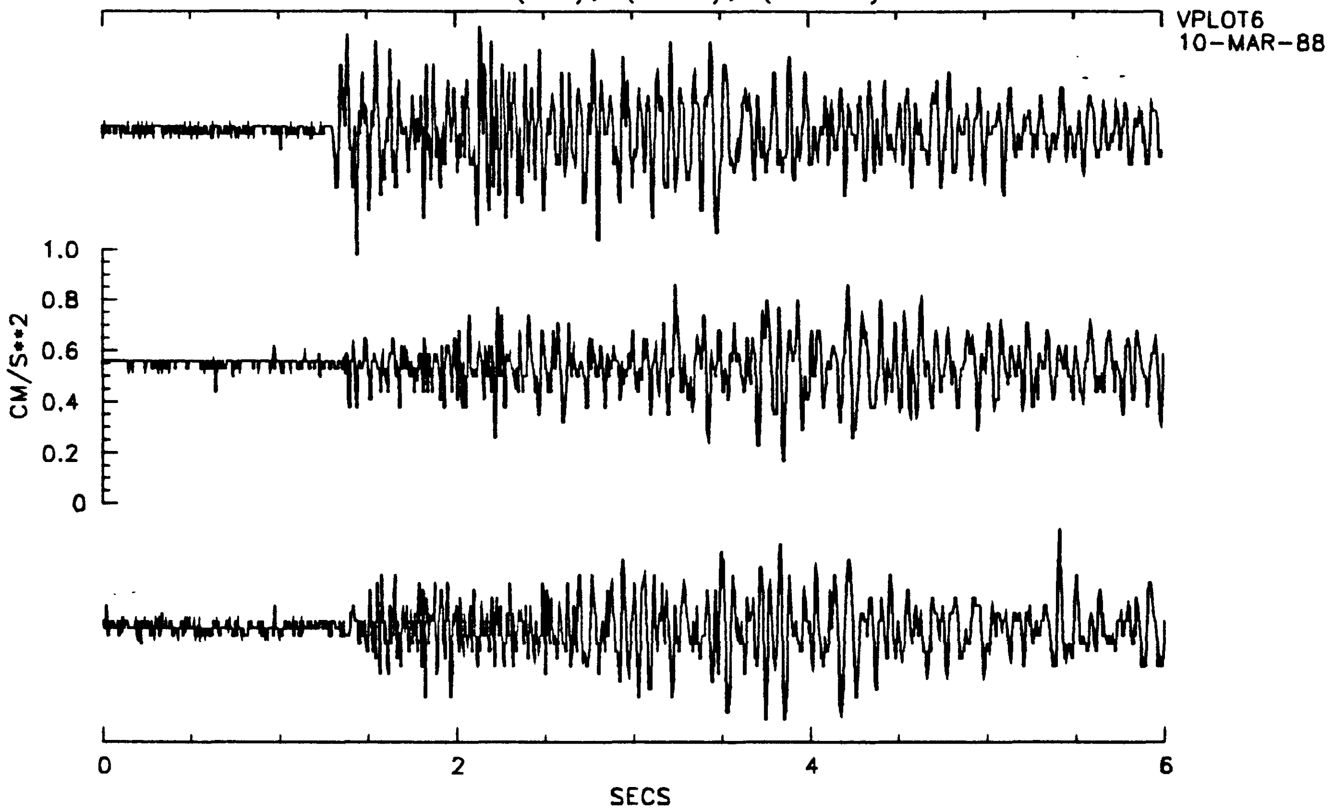

34003400*.SNW COMP:4(UP),5(H=0),6(H=90)
0.010
0.008
0.006
0.004
0.002
0
CM/S
0
2
4
6
SECS


TIME: 340 0340 44.812
34003400*.EPI COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
CM/S**2
0
1
2
3
4
5
0
2
4
6
SECS

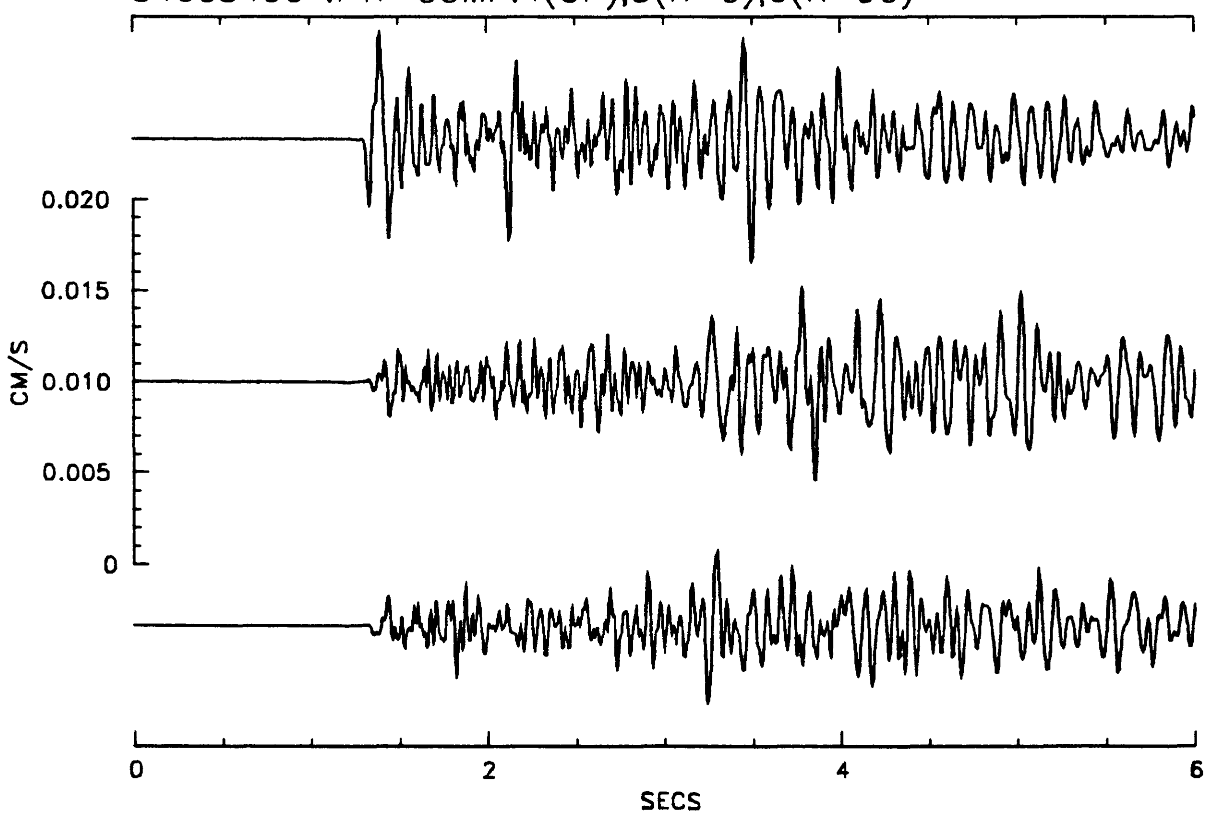

34003400*.EPI COMP:4(UP),5(H=0),6(H=90)
CM/S
0
0.01
0.02
0.03
0.04
0.05
0
2
4
6
SECS

TIME: 340 0340 44.972

34003400*.PTF COMP:1(UP),2(H=0),3(H=90)

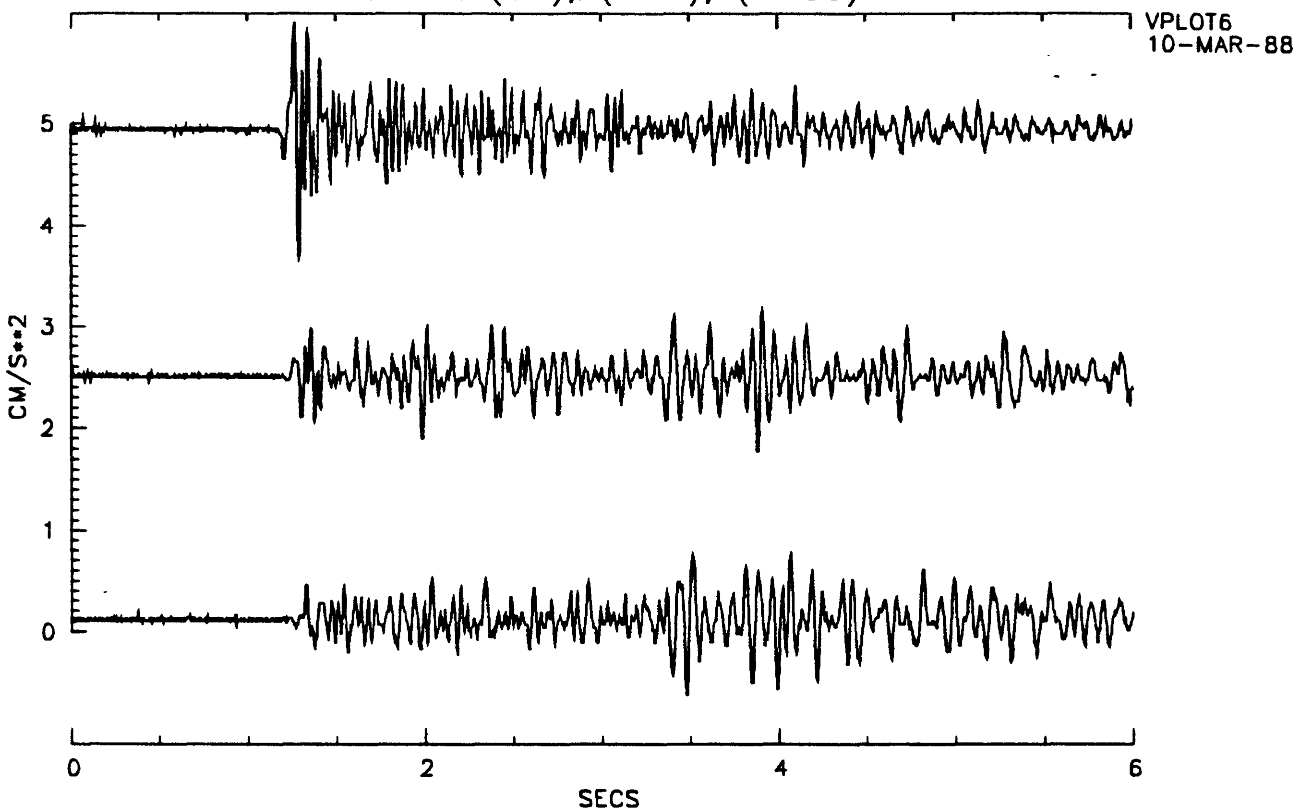


34003400*.PTF COMP:4(UP),5(H=0),6(H=90)

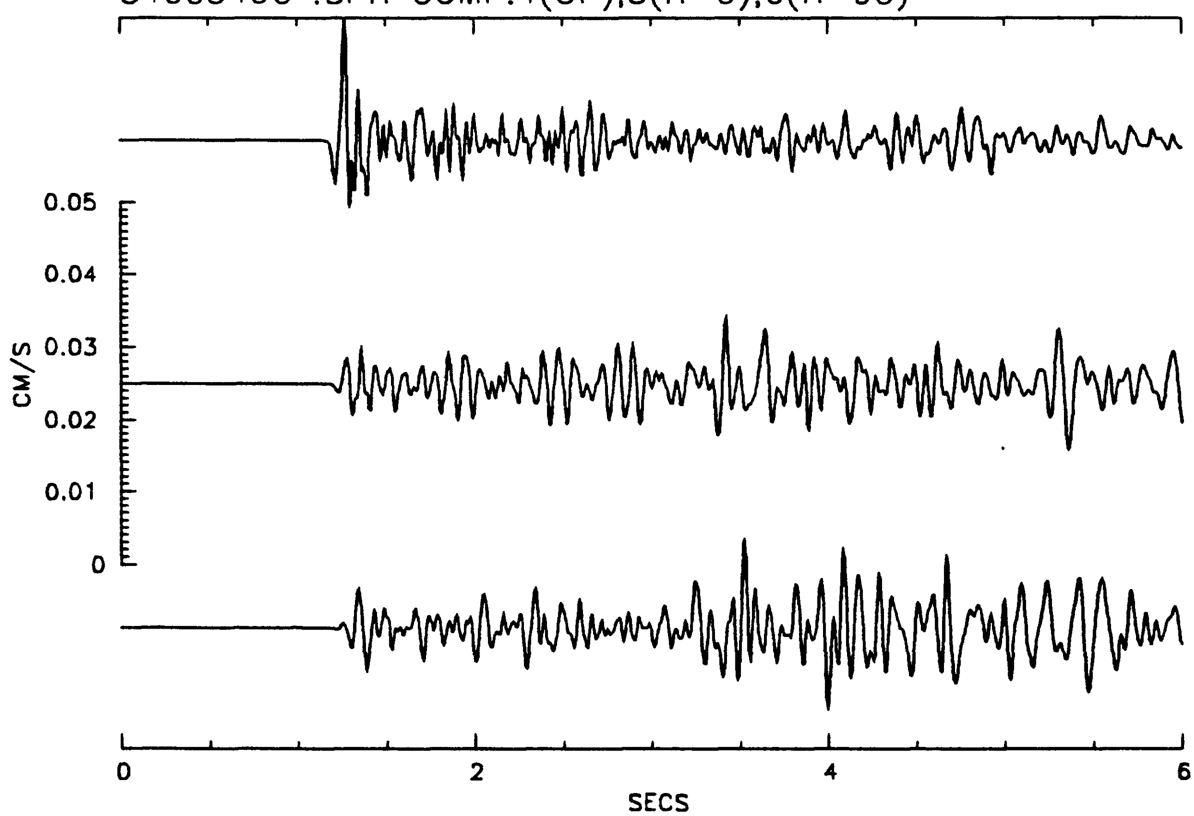


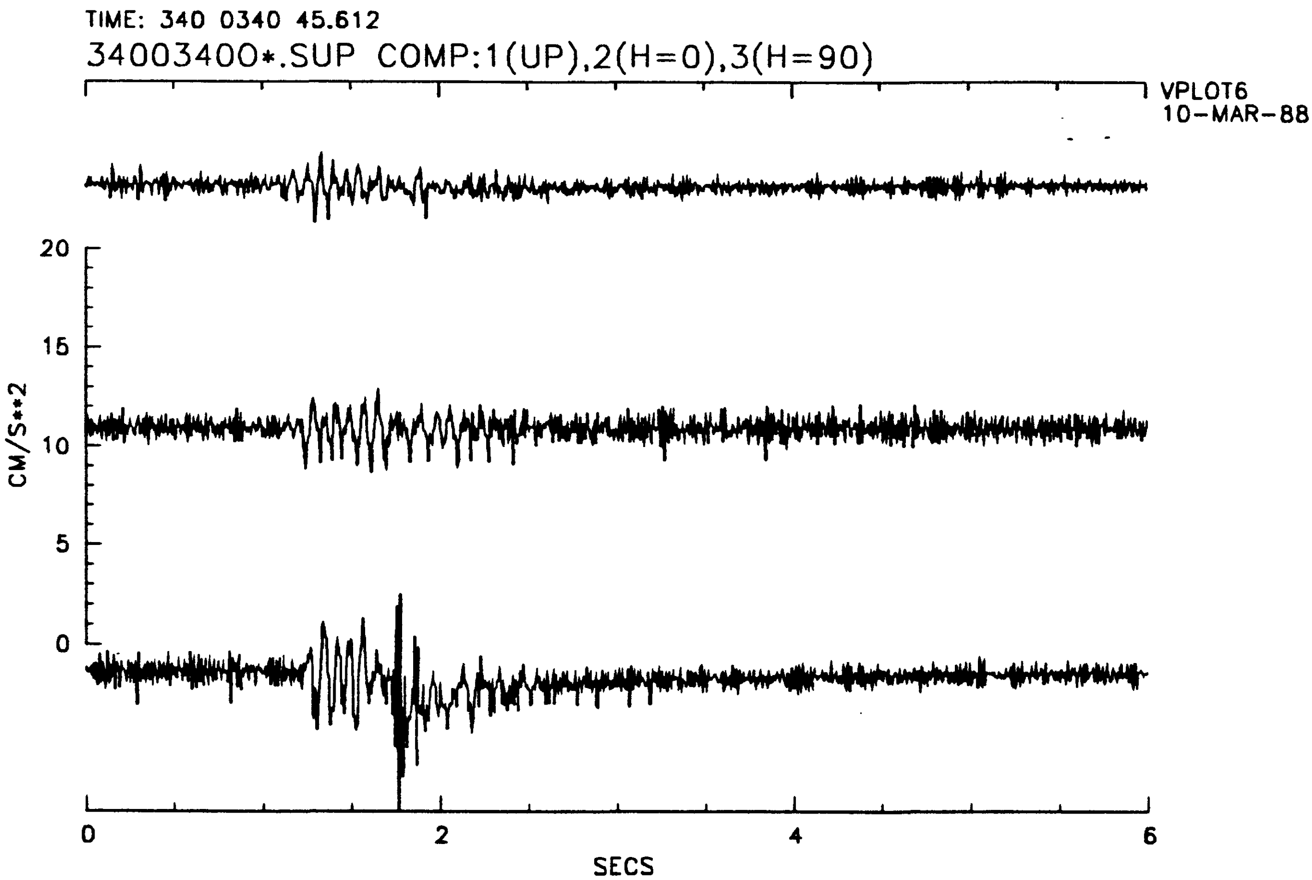
TIME: 340 0340 45.098

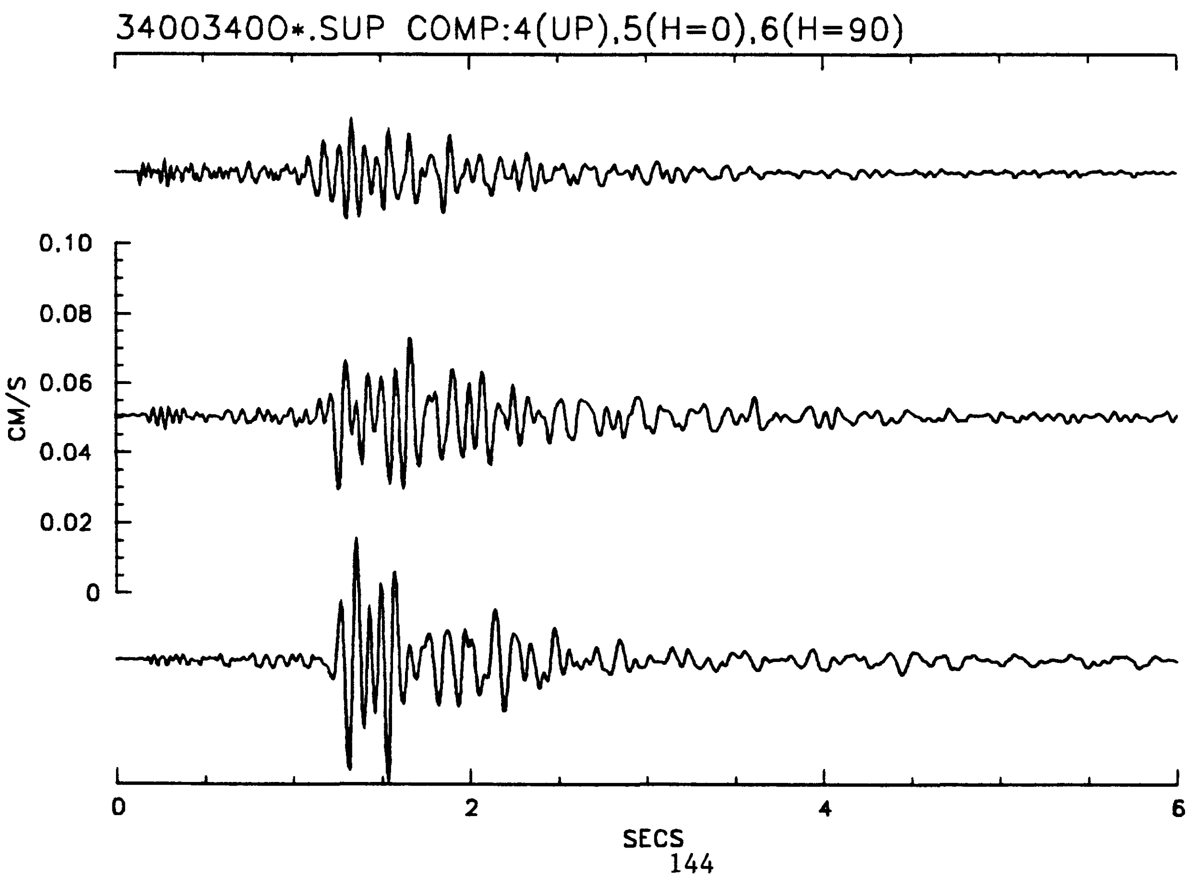
34003400*.SPH COMP:1(UP),2(H=0),3(H=90)



34003400*.SPH COMP:4(UP),5(H=0),6(H=90)

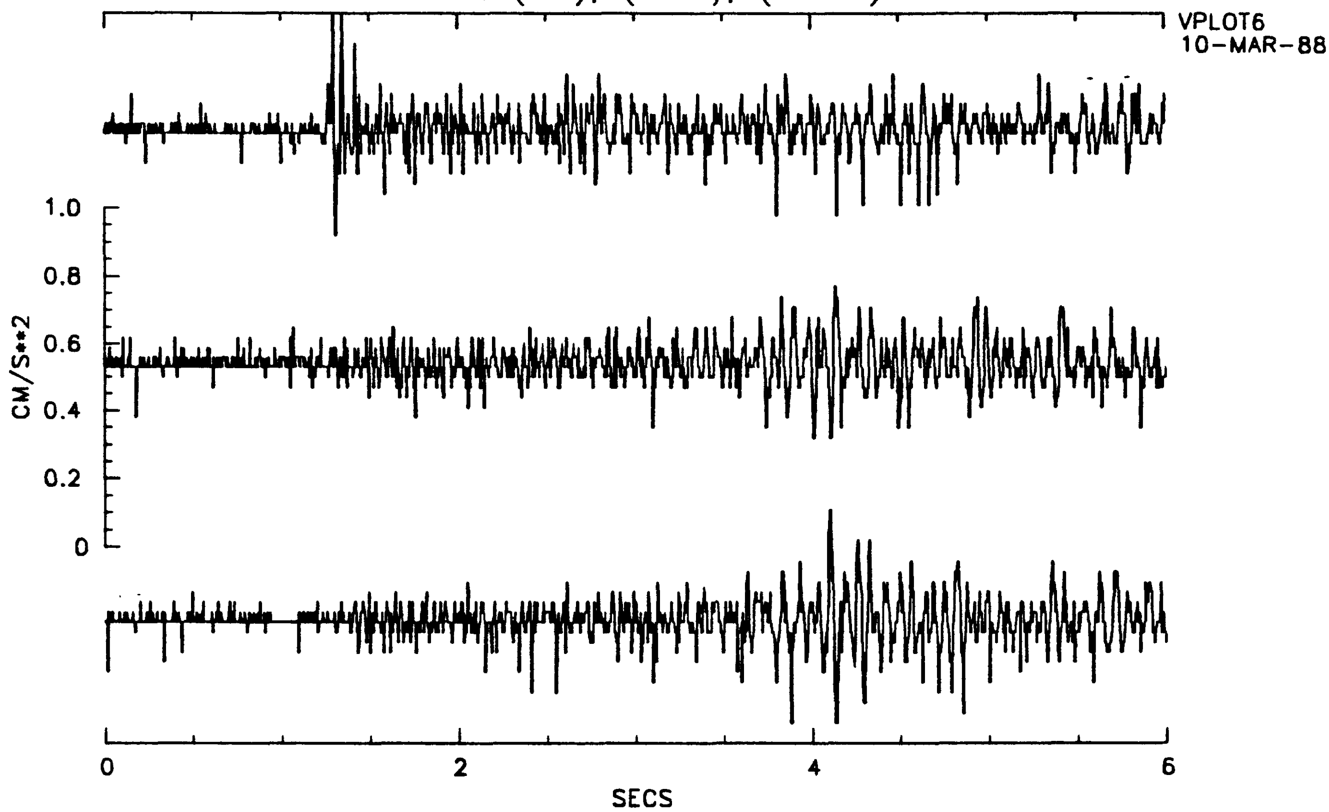



TIME: 340 0340 45.612
34003400*.SUP COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
20
15
10
5
0
CM/S**2
0
2
4
6
SECS

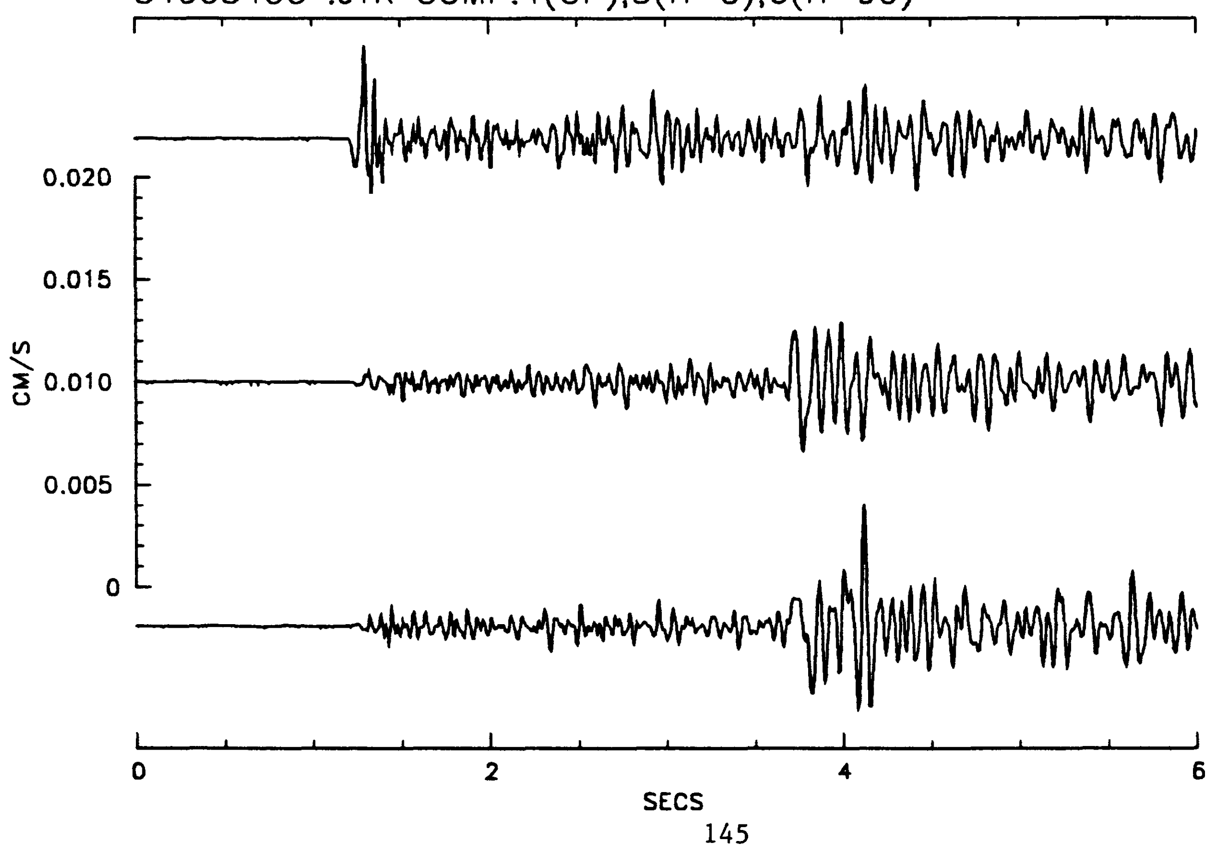

34003400*.SUP COMP:4(UP),5(H=0),6(H=90)
0.10
0.08
0.06
0.04
0.02
0
CM/S
0
2
4
6
SECS

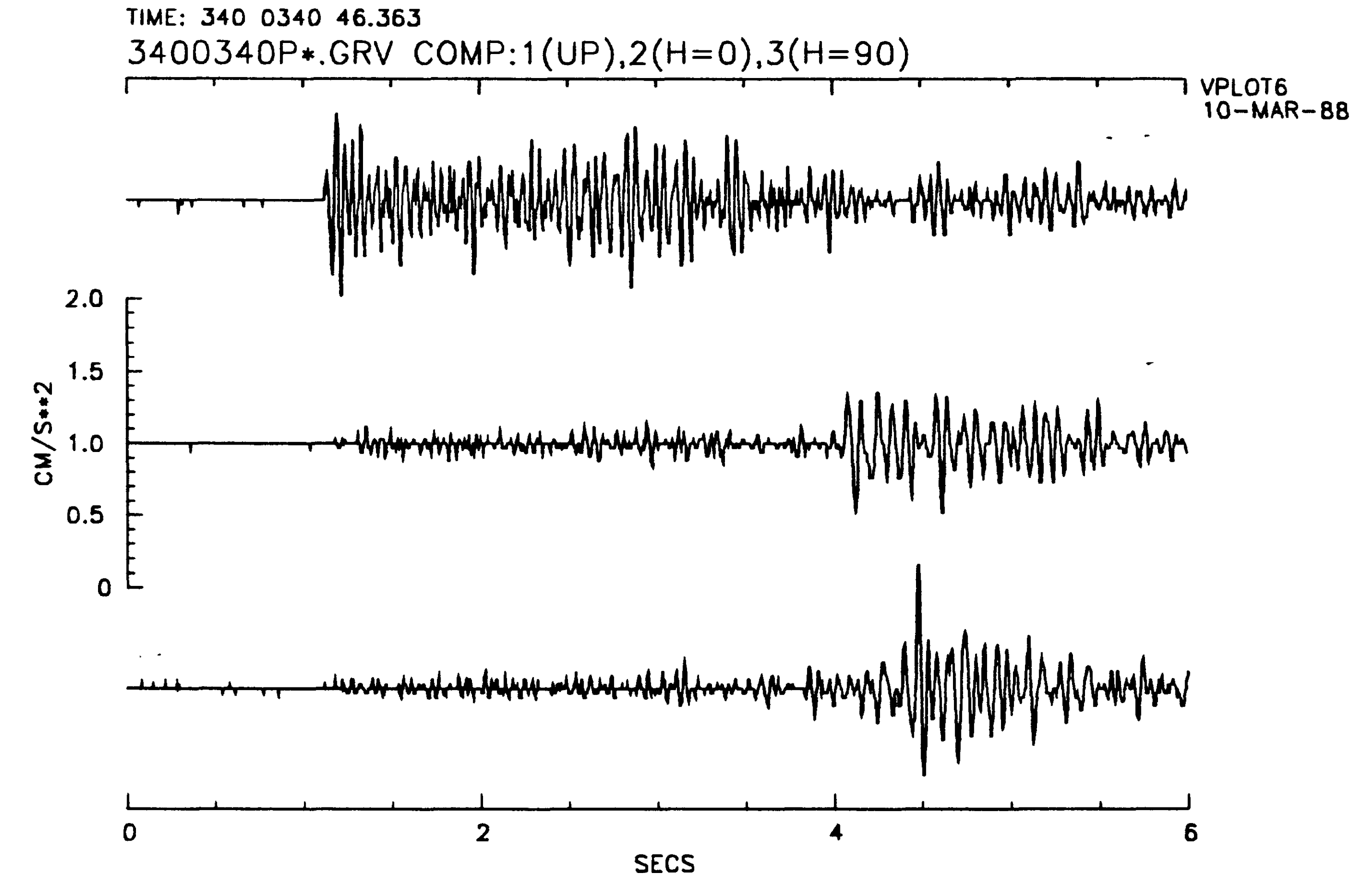
TIME: 340 0340 45.655

34003400*.JTR COMP:1(UP),2(H=0),3(H=90)

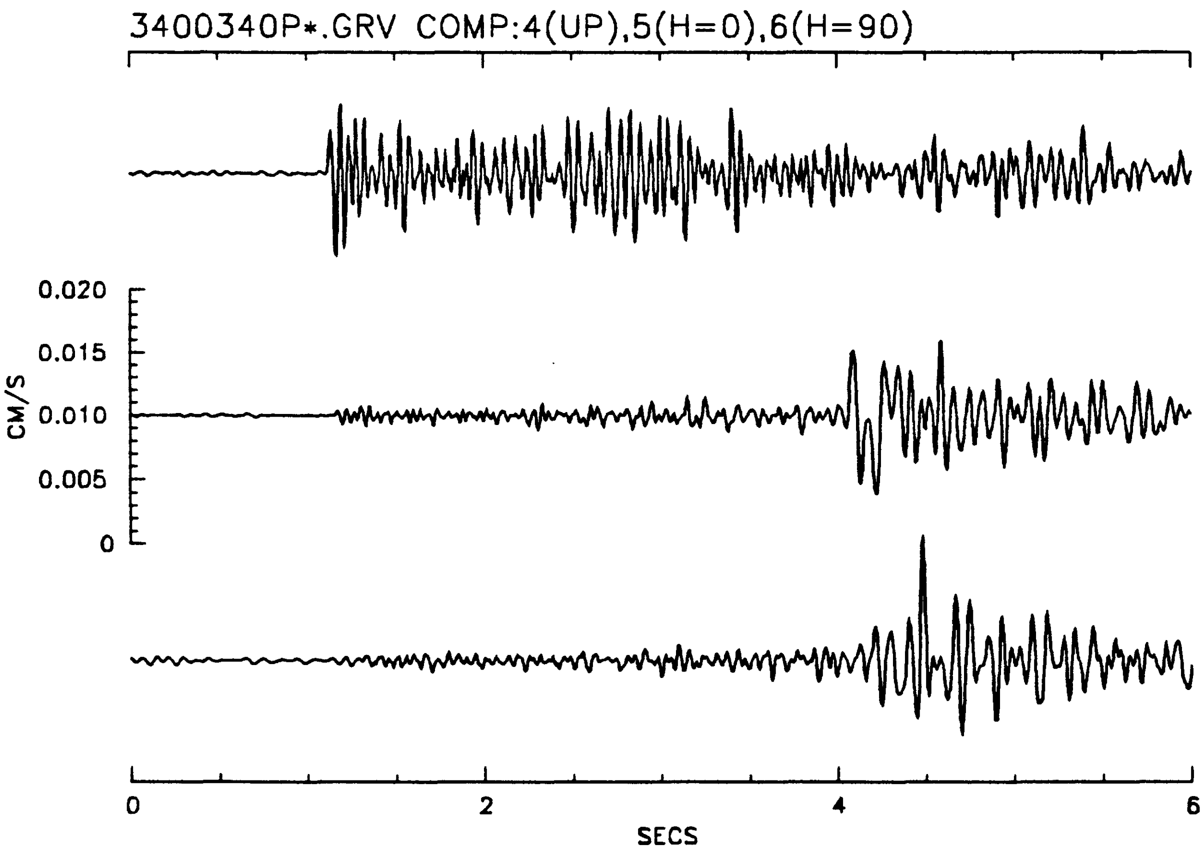


34003400*.JTR COMP:4(UP),5(H=0),6(H=90)





TIME: 340 0340 46.363
3400340P*.GRV COMP:1(UP),2(H=0),3(H=90)
VPLOT6
10-MAR-88
CM/S**2
2.0
1.5
1.0
0.5
0
0
2
4
6
SECS



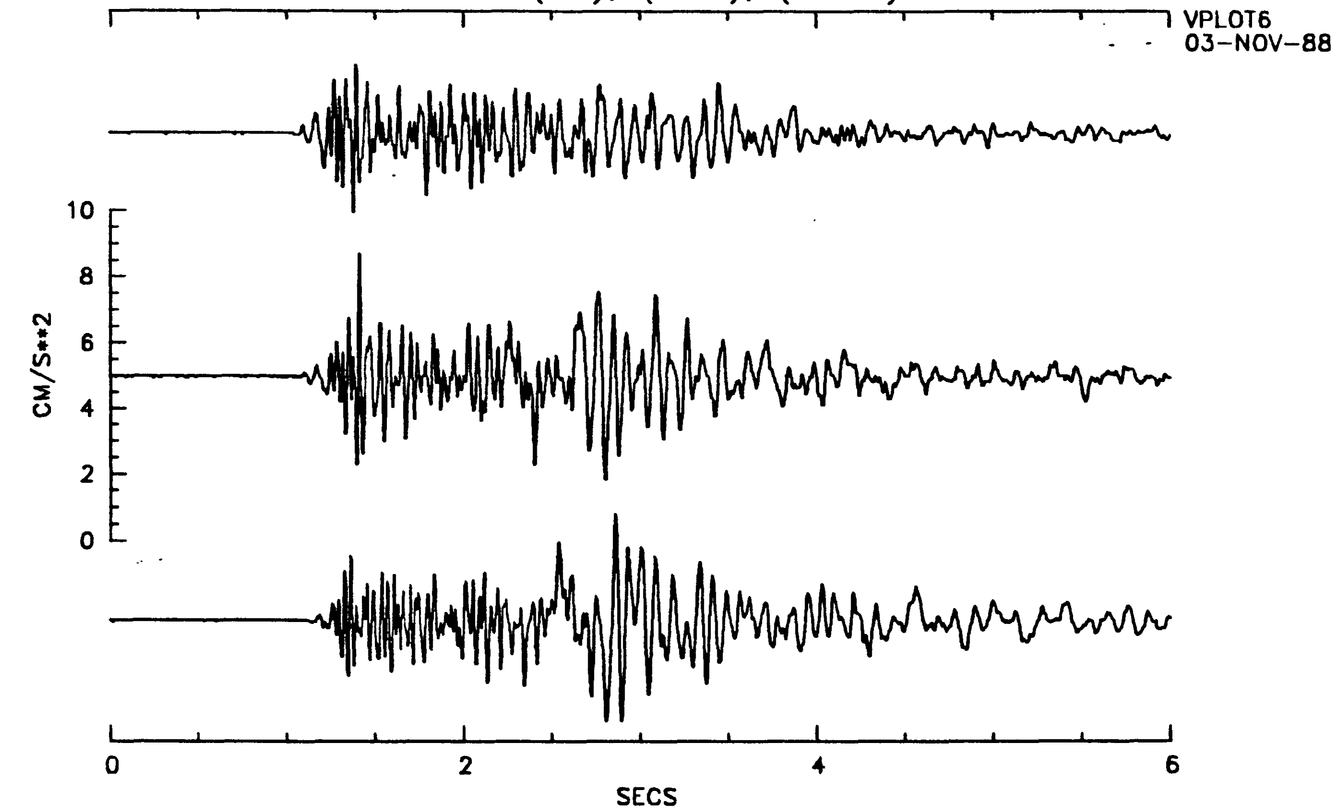
3400340P*.GRV COMP:4(UP),5(H=0),6(H=90)
CM/S
0.020
0.015
0.010
0.005
0
0
2
4
6
SECS

APPENDIX 2.12 Seismograms of the M=3.2 earthquake

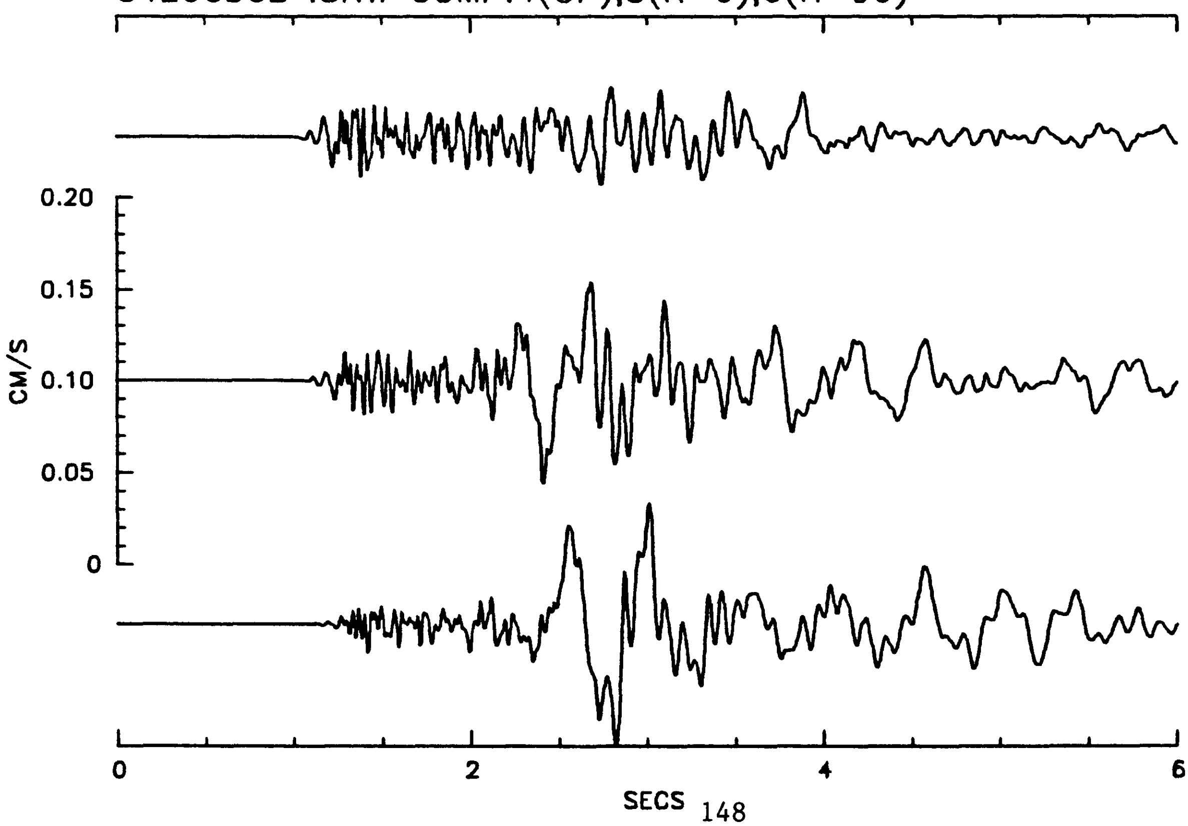
at 3420636

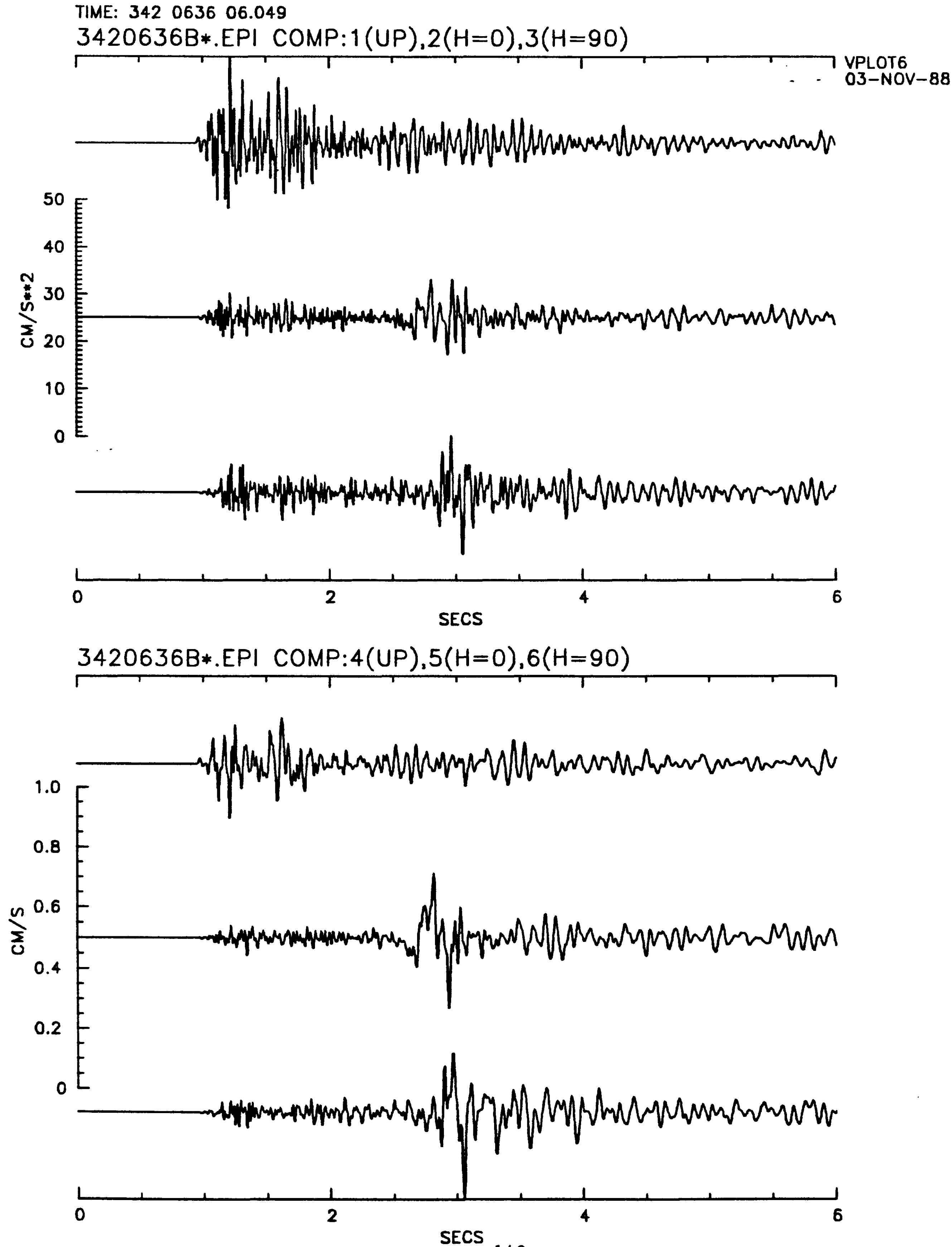
TIME: 342 0636 05.948

3420636B*.SNW COMP:1(UP),2(H=0),3(H=90)

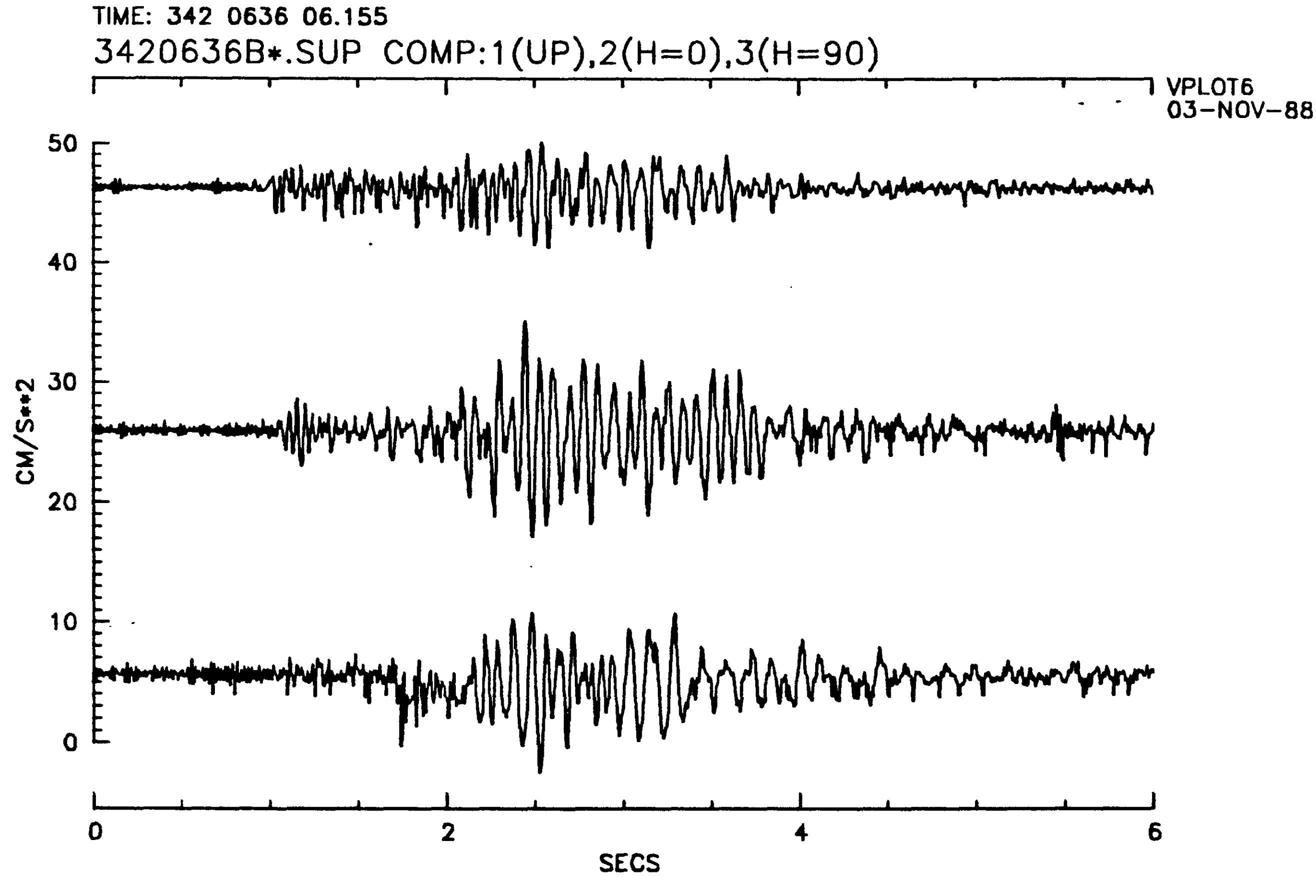


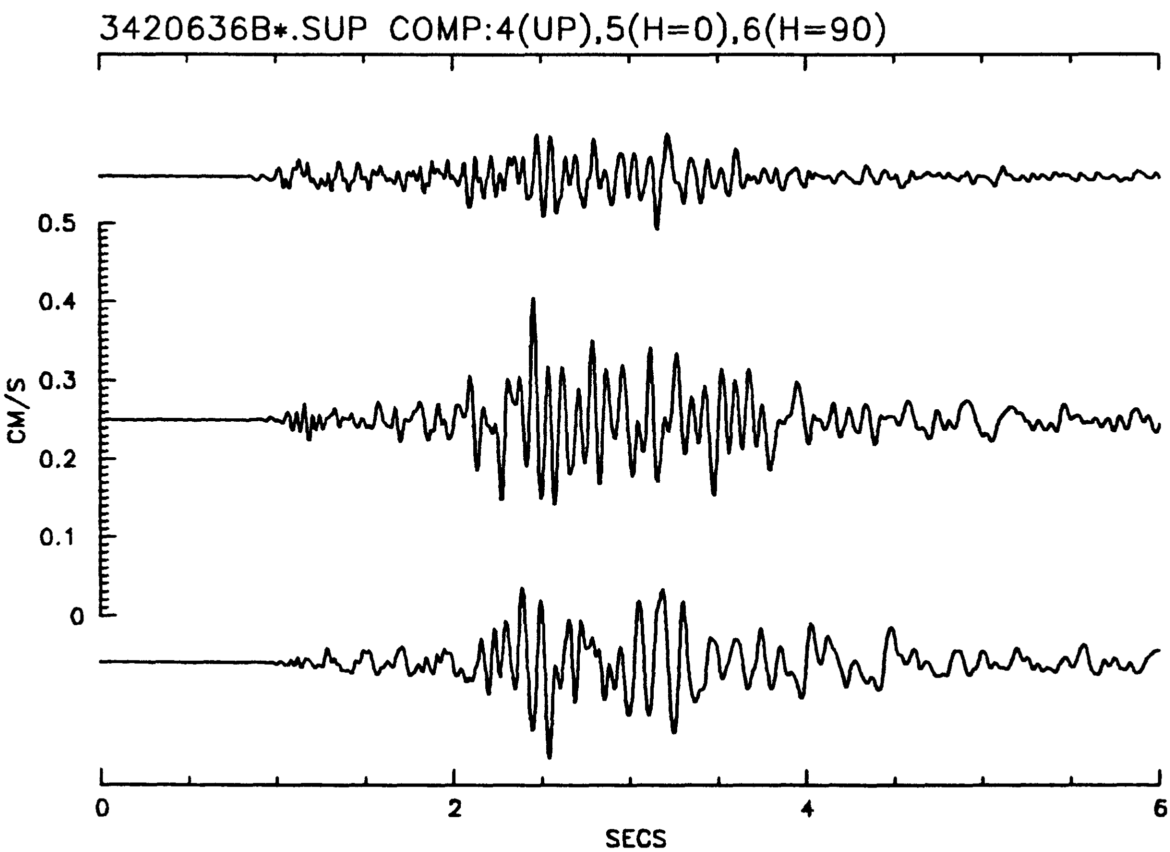
3420636B*.SNW COMP:4(UP),5(H=0),6(H=90)

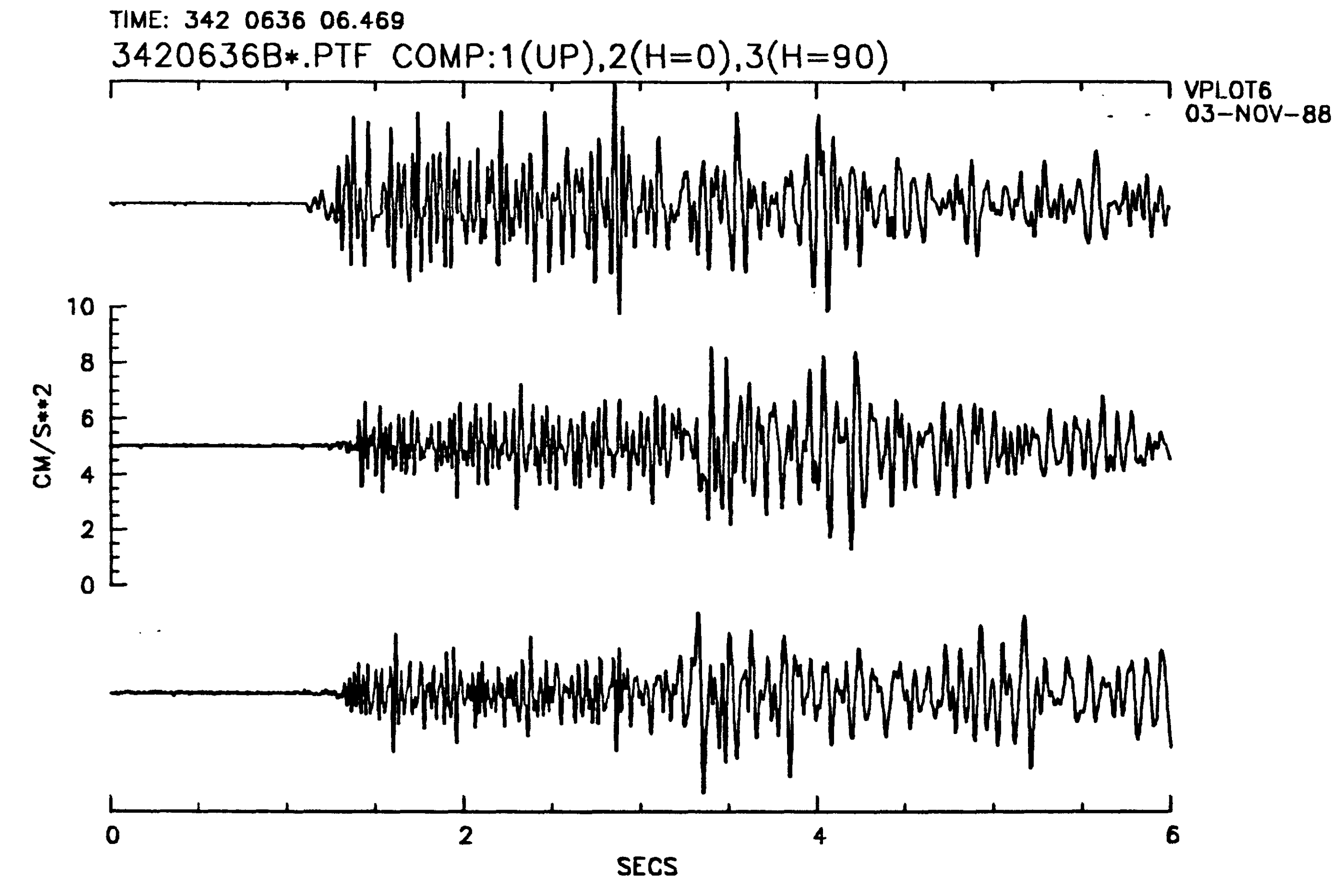


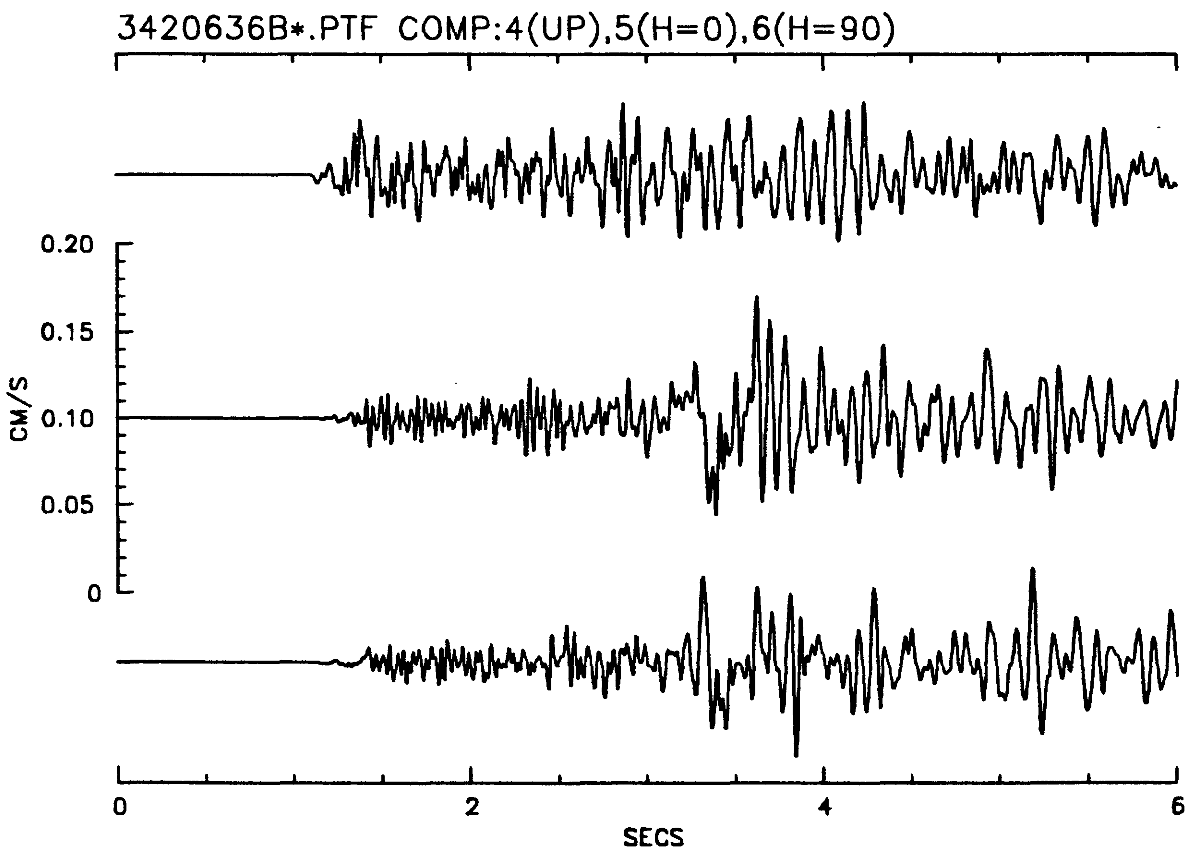


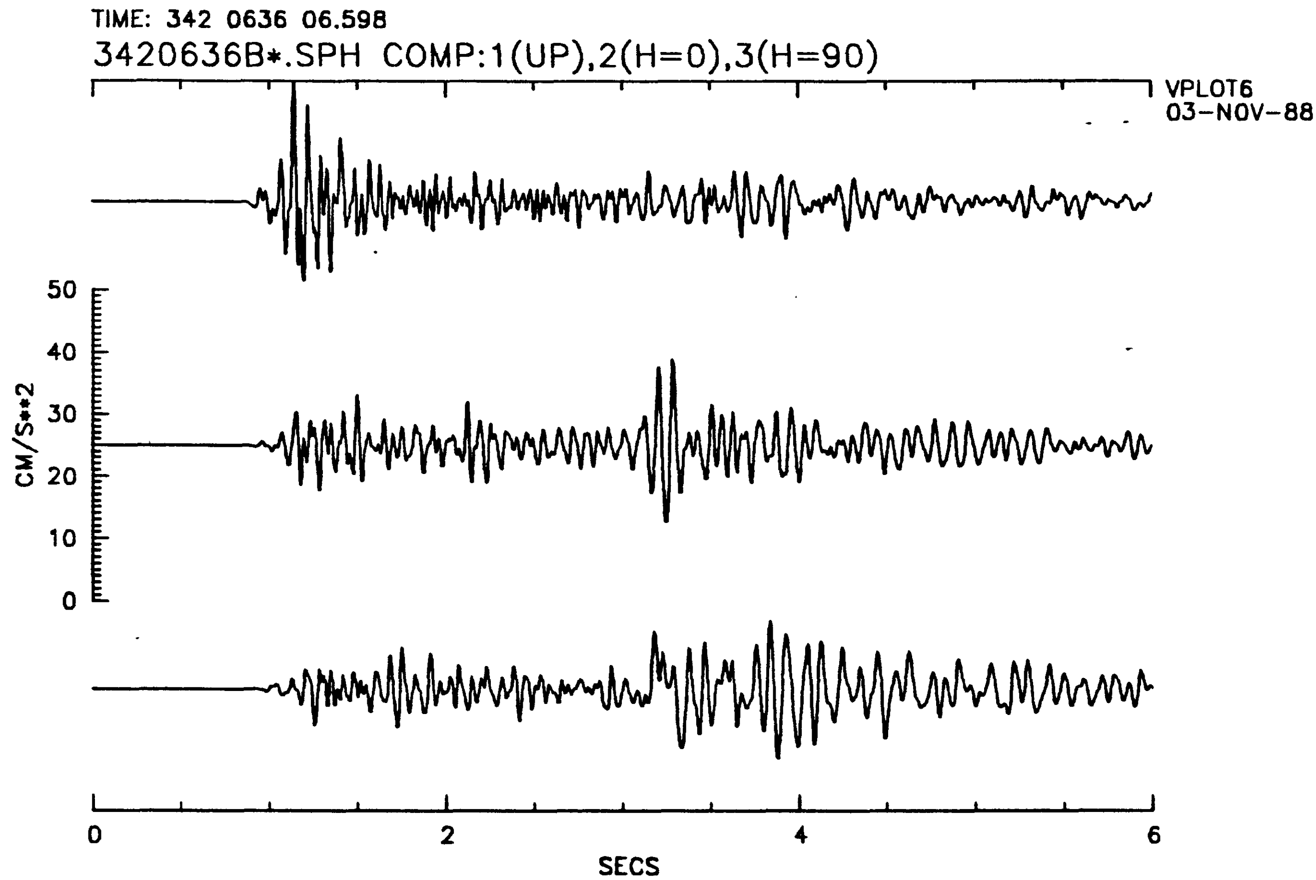
TIME: 342 0636 06.049
3420636B*.EPI COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
CM/S**2
50
40
30
20
10
0
0
2
4
6
SECS
3420636B*.EPI COMP:4(UP),5(H=0),6(H=90)
CM/S
1.0
0.8
0.6
0.4
0.2
0
0
2
4
6
SECS

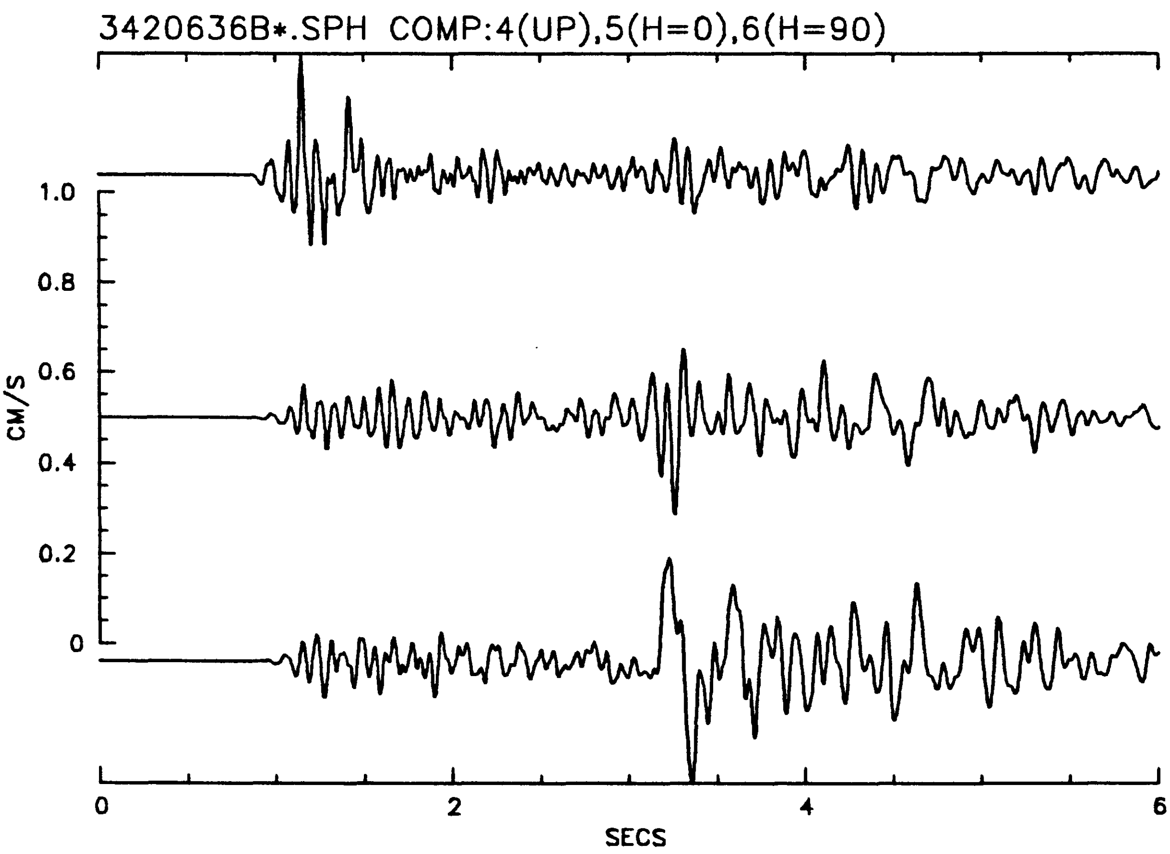

TIME: 342 0636 06.155
3420636B*.SUP COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
CM/S**2
50
40
30
20
10
0
0
2
4
6
SECS


3420636B*.SUP COMP:4(UP),5(H=0),6(H=90)
CM/S
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
SECS


TIME: 342 0636 06.469
3420636B*.PTF COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
10
8
6
4
2
0
CM/S**2
0
2
4
6
SECS

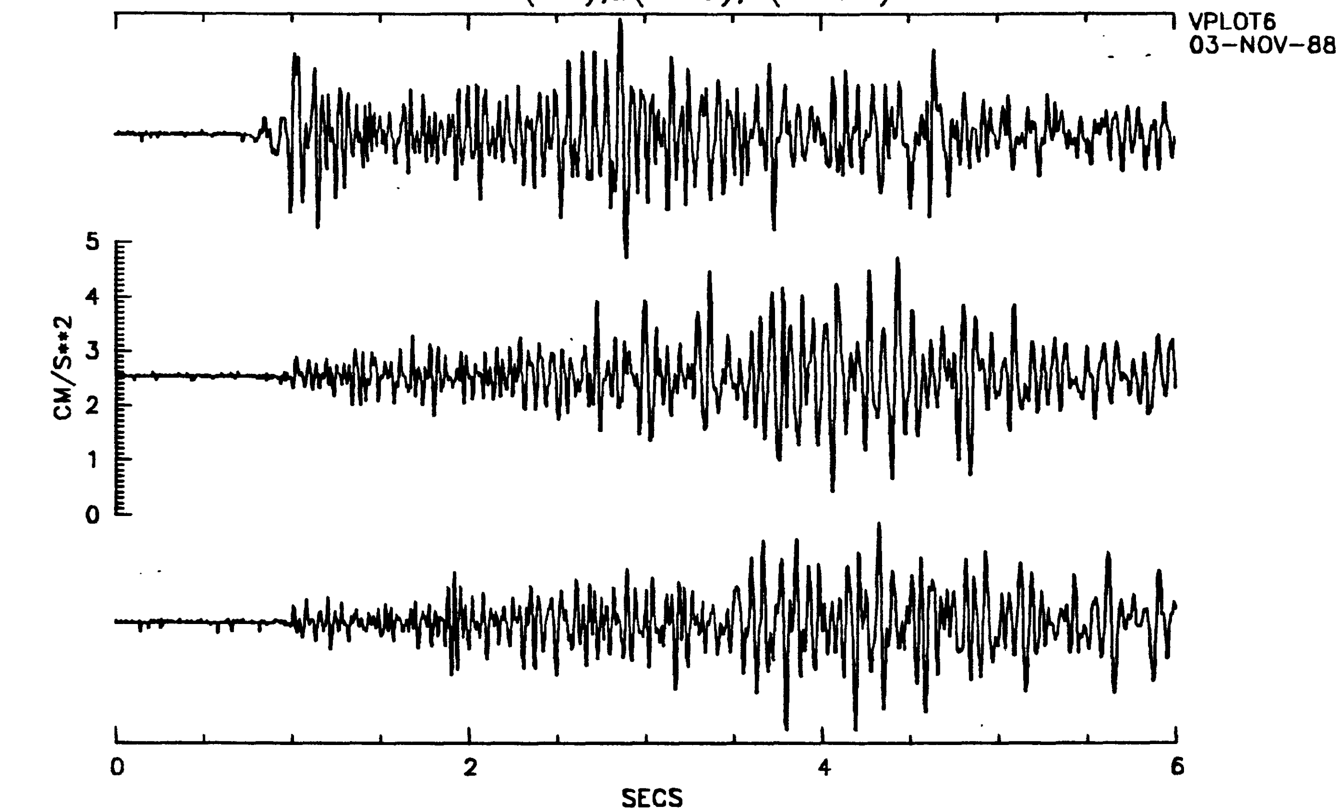

3420636B*.PTF COMP:4(UP),5(H=0),6(H=90)
0.20
0.15
0.10
0.05
0
CM/S
0
2
4
6
SECS


TIME: 342 0636 06.598
3420636B*.SPH COMP:1(UP),2(H=0),3(H=90)
VPLOT6
03-NOV-88
50
40
30
20
10
0
CM/S**2
0
2
4
6
SECS

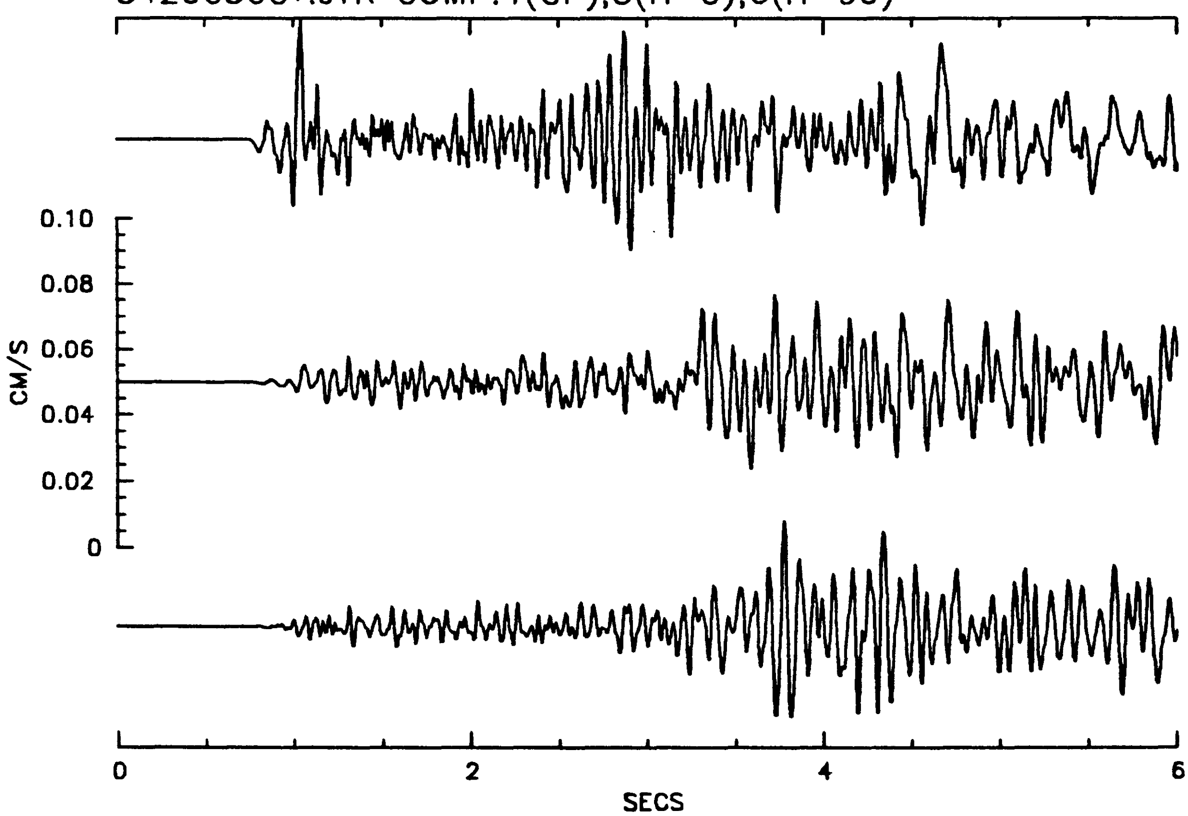

3420636B*.SPH COMP:4(UP),5(H=0),6(H=90)
1.0
0.8
0.6
0.4
0.2
0
CM/S
0
2
4
6
SECS

TIME: 342 0636 07.304

3420636C*.JTR COMP:1(UP),2(H=0),3(H=90)

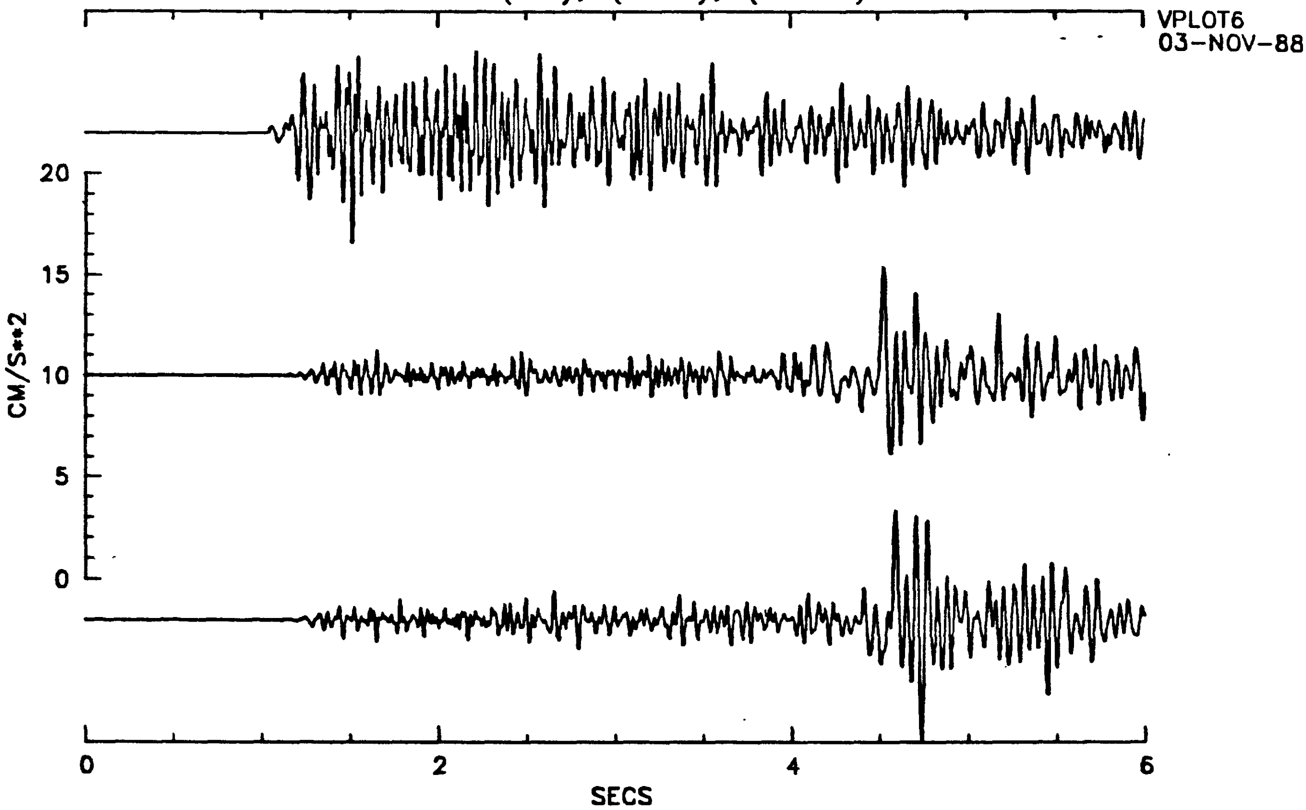


3420636C*.JTR COMP:4(UP),5(H=0),6(H=90)



TIME: 342 0636 07.748

3420636C*.GRV COMP:1(UP),2(H=0),3(H=90)



3420636C*.GRV COMP:4(UP),5(H=0),6(H=90)