QUICK MECHANISM DETERMINATION FROM NEAR-REAL TIME WAVEFORM DATA OF DATA MANAGEMENT SYSTEM IN CWB

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ABSTRACT

The Taiwan Strong Motion Instrumentation Program(TSMIP) have been operated since July of 1991. This program consists of 600 strong motion instruments and data management system(DMS).This system mainly do the service for the requests of the waveform data from the academia institutions.

Since a good quality waveform data is an essential element for doing seismology study,personally I am very impressed by this program and its DMS. After my requests of data for the events I am interested in,I almost had no problems to receive the data. Since the DMS is not completed yet, the data was usually obtained in person but not through FTP. However, It has been very convenience for me.

Figure 1a shows the recordings from DMS of an ML=5.5 earthquake in southeastern offshore of Taiwan island. The acceleration records are very clear for TAW station.Since my mainly interests for this earthquake is to understand its mechanism, I integrated the waveform twice into displacement and rotated it into radial and transverse components as shownin Figure 1b. The clear P,SV and SH waveforms were used for the mechanism determination of body wave inversion. The mechanism thus determined is shown in Figure 2 to compare with that from traditional first-motion mechanism. This waveform solution satisfies the first -motion data and waveform data; and can give some constrains for the mechanism determination from first-motion data which is sometimes ambiguous for less or sparse of first motions as shown in Figure 2.Since the mechanism determination of bodywave inversion only need two stations even one station only,this method can be used for the earthquake early warning system which is also a main program for TSMIP.

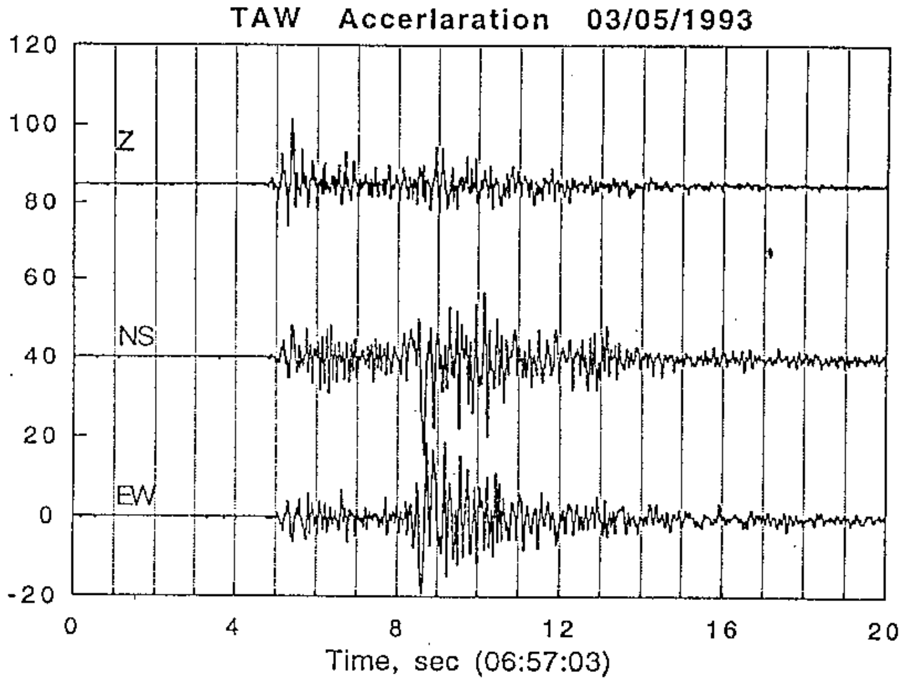
For the convenience of the data requests from DMS , we investigated waveforms of the earthquakes with ML >4 in Chia-Nai plain areas recorded by nearby stations (epicentral distance < 50 km) from 1992 to Sept. of 1993. Figure 3 shows the distribution of the earthquakes and stations used in this study for

1993. The acceleration data thus obtained for each earthquake were shown in Figure 4. Because of the limitation of the instruments,most of the earthquakes have only one station recording the on-scale waveform.A method described above will apply to these waveforms to obtained the mechanism and seismic moments of the earthquake. The results will be compared with those from first-motion mechanism to help us to have a better understanding of the characteristics of the earthquakes in Chia-Nai plain which was considered as a candidate for occurring large earthquake with magnitude larger than 7.

Since the main topic of TSMIP is for earthquake disaster alleviation, the recording for acceleration is in general clear except for some noise in the beginning of the records as shown in Figure 4. For some stations which had smaller intensity, the noise is usually too big to destroy the signal and the records can not be used in our study.Since our study mainly uses the displacement records, this noise will effect our study in processing the data. Station site is also an important factor to effect the quality of the waveform data.As shown in Figure 1, even though we can still identify the phase of P, SV and SH wave from this record, the quality of the waveform is not good due to the site effect shown between P and SV phase.

Since the TSMIP will install about 600 strong motion instruments over the entire island of Taiwan.This dense network could provide us a very good opportunity to understand the characteristic of the earthquake in Taiwan region. However, from my experience, the quality of the data limited our study.To make the data more useful, it is necessary to make a better quality data to obtain more information about the earthquake.

(a)



(b)

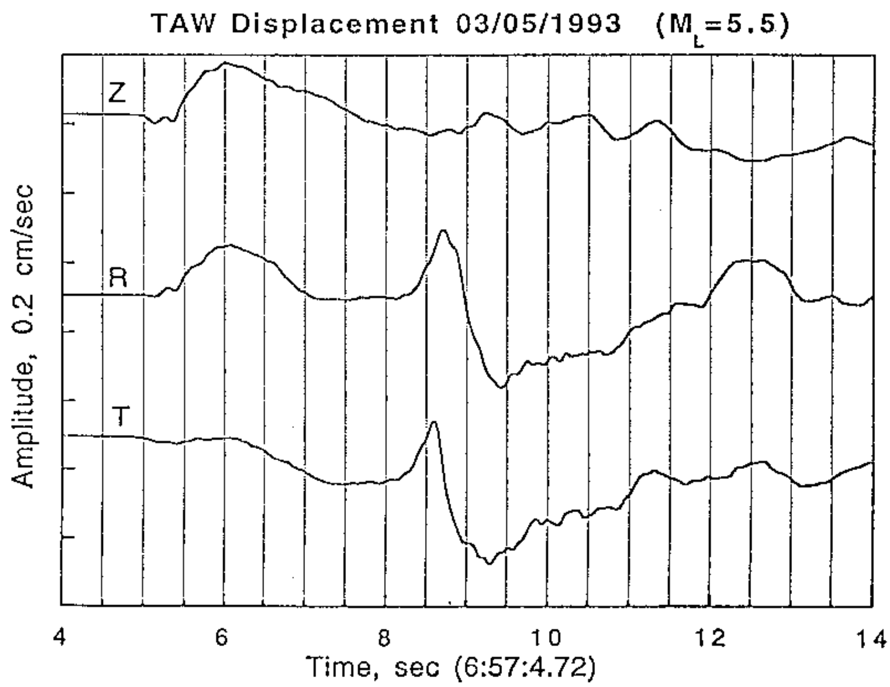


Fig.1 Waveforms of an ML=5.5 earthquake in Southeastern offshore of Taiwan recorded at TAW station (a):acceleration (b):displacement.

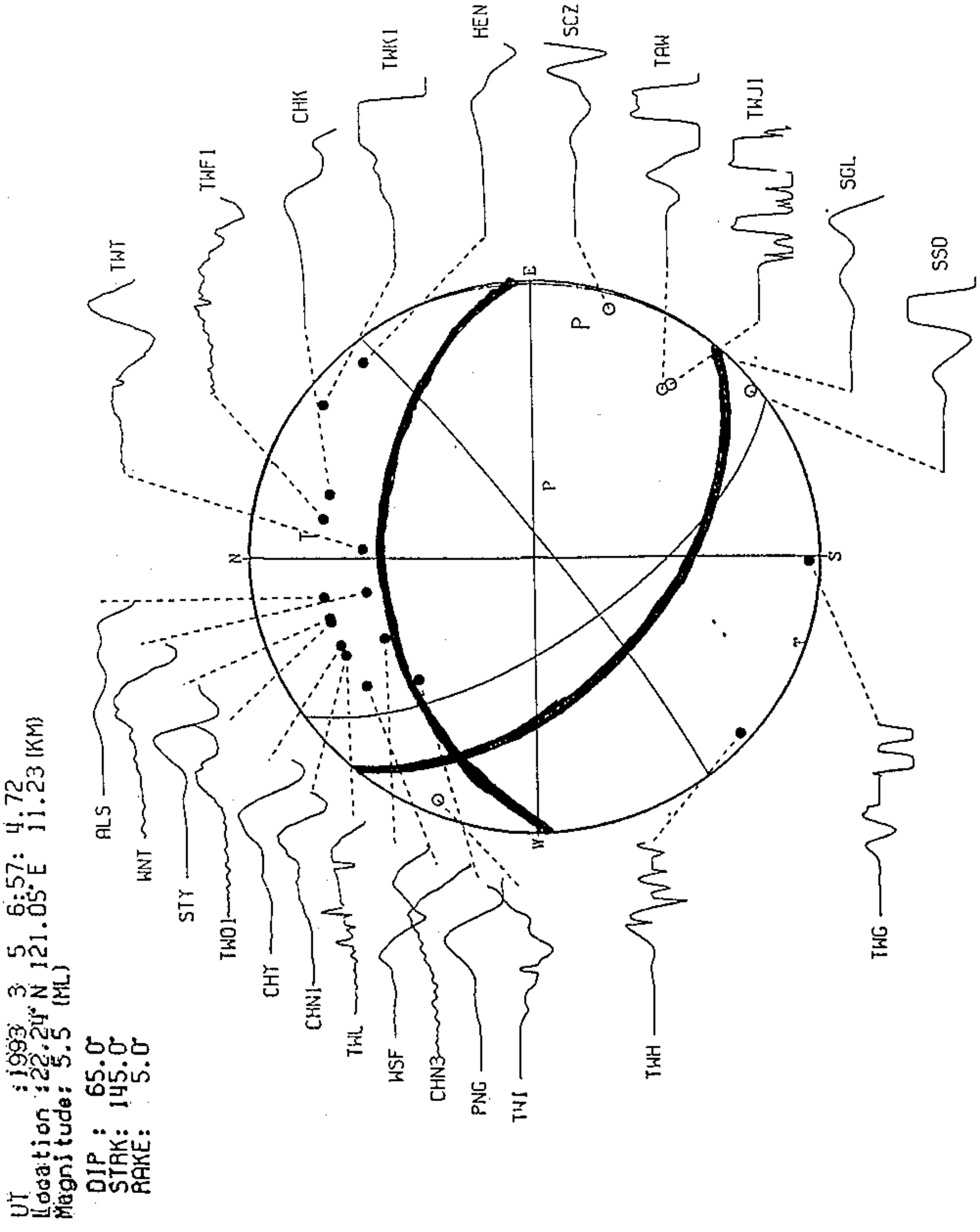


Fig.2 The comparison of the mechanisms determined from the body wave form(bold line)and first-motion data(thin line). The solid circle and open circle represent the compression and dilation of first motion respectively. (first-motion data solution from CWB)

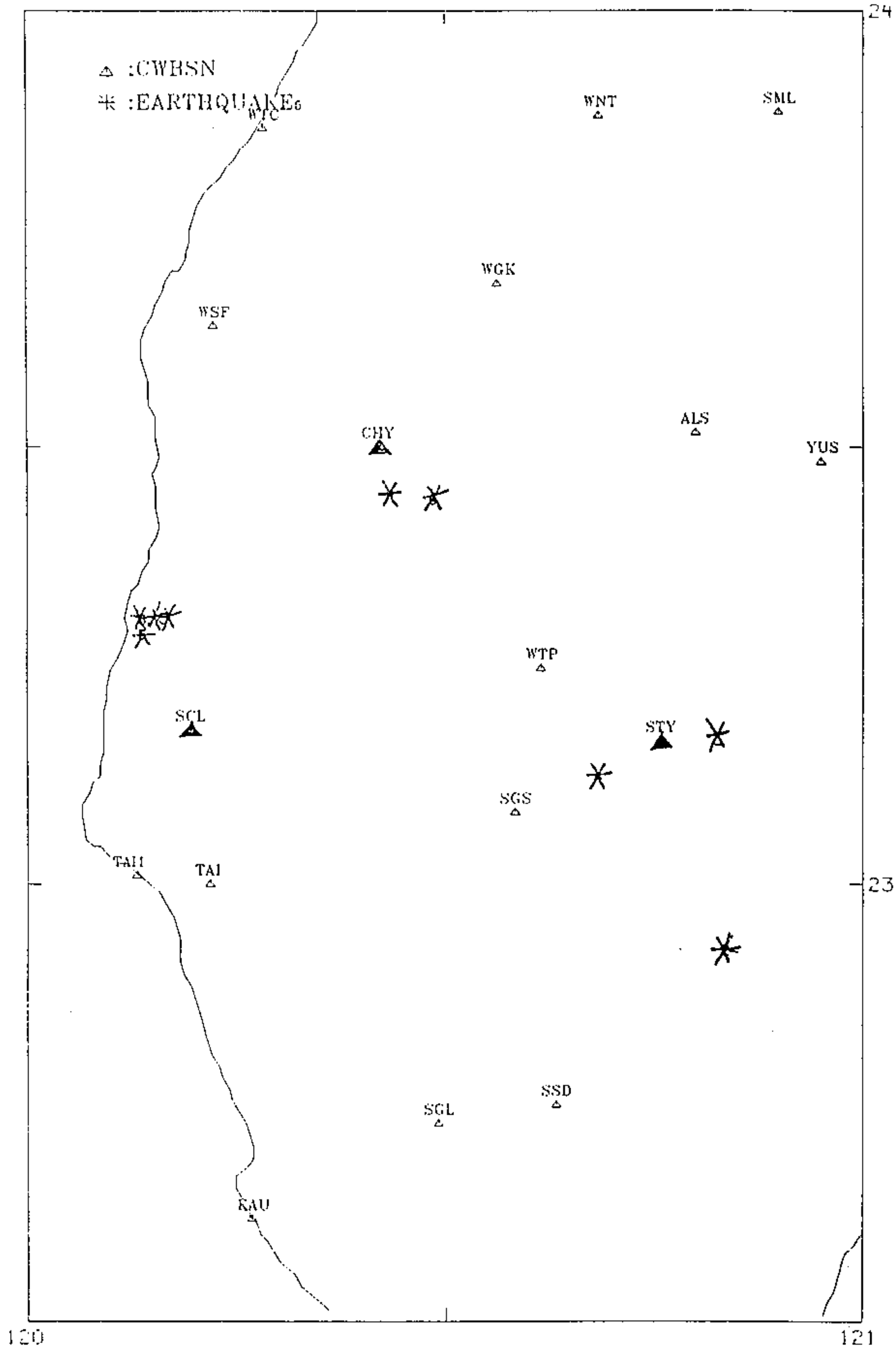


Fig.3 The selected earthquake and station distribution with ML > 4 in Chia-Naiarea from 1992 to Sept. of 1993. The solid triangles show the stations used in this study.

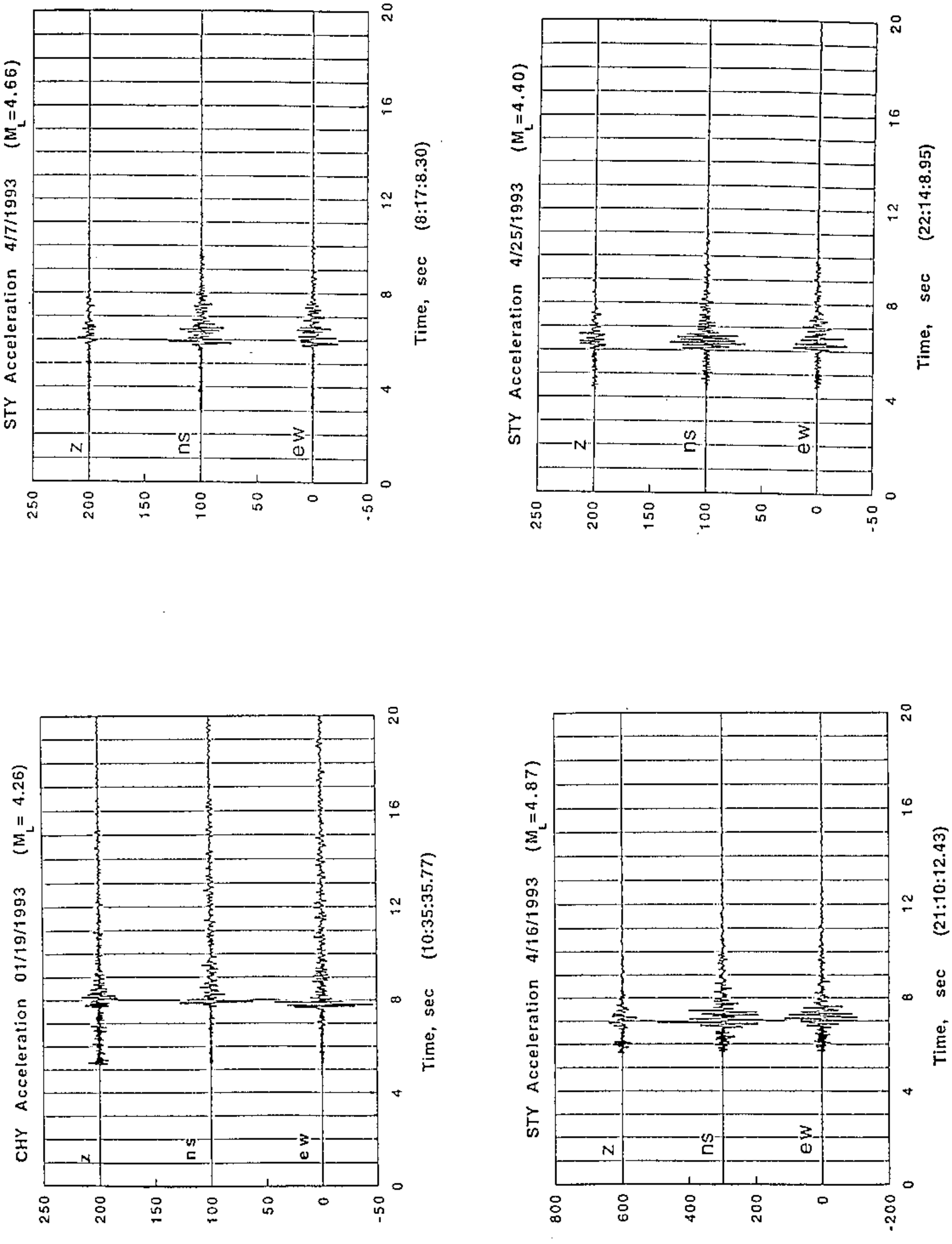


Fig.4 The acceleration records for the selected earthquakes.

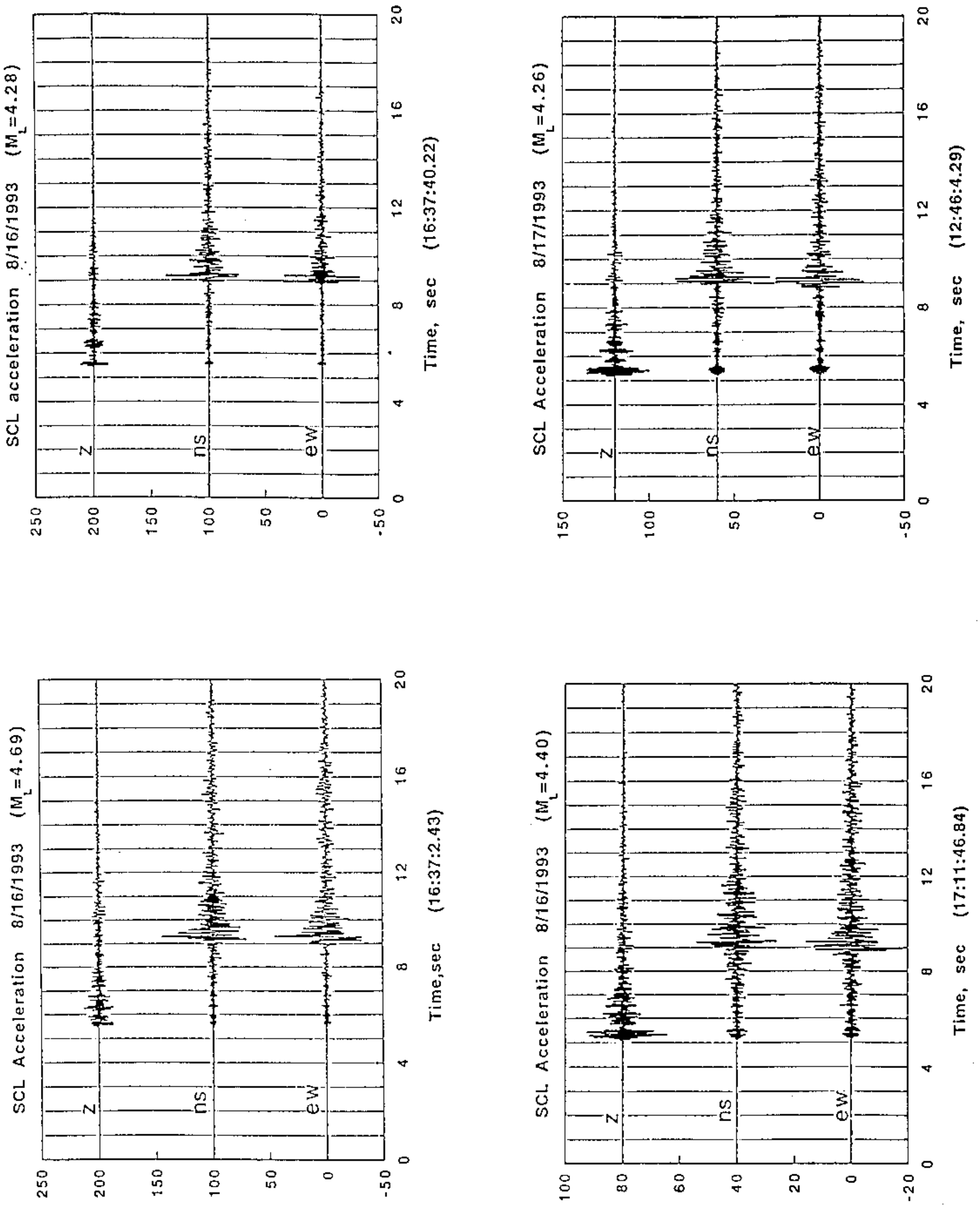


Fig.4 (continue).

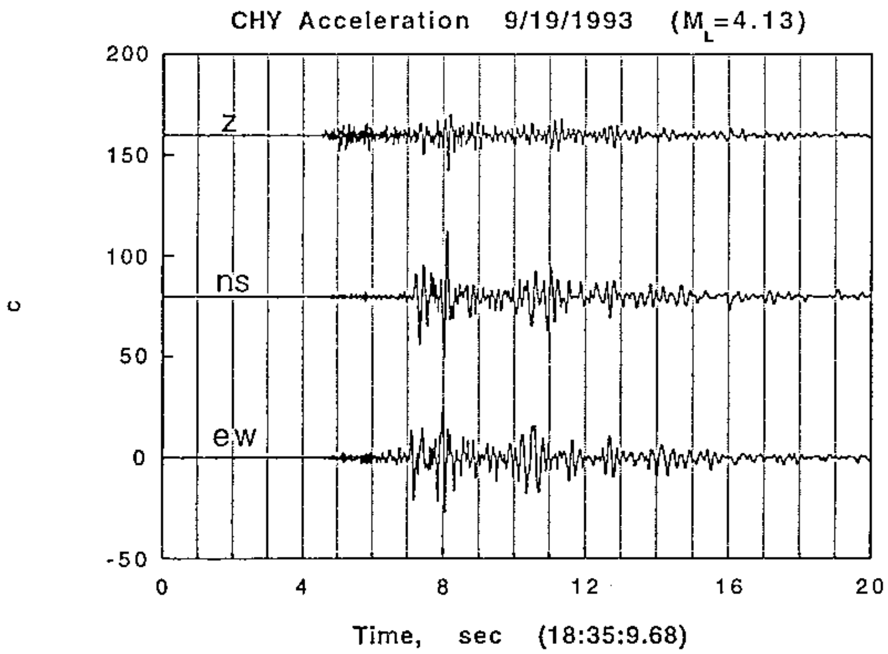


Fig.4 (continue).