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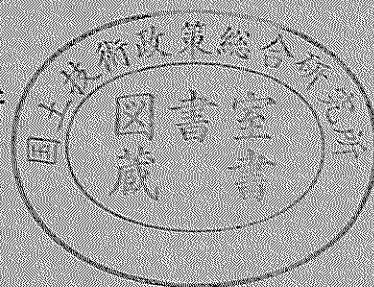
ANNUAL REPORT ON STRONG-MOTION EARTHQUAKE RECORDS  
IN JAPANESE PORTS (1992 & 1993)

By Yasuo MATSUNAGA, Hirotaka SAKURAI,  
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港灣地域強震觀測年報 (1992 & 1993)

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ANNUAL REPORT ON STRONG-MOTION EARTHQUAKE RECORDS  
IN JAPANESE PORTS (1992 & 1993)

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Abbreviations used above:

- AR : Analog Records of Reproduced Accelerograms
- IR : Integrated Velocities and displacements
- RS : Response Spectra
- FS : Fourier Spectra
- LO : Loci of Accelerations, Velocities and displacements



# 港湾地域強震観測年報 (1992 & 1993)

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井 合 進 \*\*

## 要 旨

1962年より実施されている港湾地域強震観測網においては、1993年12月現在、4646個の強震記録が蓄積されるに至っている。この内、1992年中には174個、1993年中には256個の強震記録が得られている。強震計の台数としては、1993年12月現在、87台の強震計が56港に設置されており、設置状況としては、63台が地盤上に、10台が地中に、14台が構造物上となっている。本強震観測網では、機械式アナログ記録方式のSMAC-B2型強震計、電気式アナログ記録方式のERS-B,-C,-D型強震計および電気式デジタル記録方式のERS-F,-G型強震計の6種類の強震計が使用されている。ただし、SMAC-B2型強震計については、数地点の例外を除いて最新型のERS-G型強震計に数年の内に更新される予定となっている。

本報告は、1992年および1993年に港湾地域強震観測網で得られた記録について報告するものである。本観測網で得られた記録は、地震毎に分類され、地震諸元、観測地点、記録番号、最大加速度等とともに、本報告に掲載されている強震観測表(Strong-Motion Earthquake Observation Results)にまとめられている。強震観測表の地震諸元は、気象庁地震津波監視課発行の「地震月報」および「地震火山概況」に基づいている。また、強震記録の記録番号は、各観測地点から記録が送られてきた順番に付けられており、記録の分類として、頭文字「S」で始まる記録はSMAC-B2型強震計で得られた記録、「M」はERS-B,-C,-D型強震計で得られた記録、「F」はERS-F,-G型強震計で得られた記録をそれぞれ示している。強震観測表にまとめられている記録の中で、最大加速度が20Galを越える記録については、観測結果として再生した加速度記録波形を示している。また、最大加速度が50Galを越える比較の大きな記録については、さらに、補正加速度記録波形、速度波形、変位波形、応答スペクトル、フーリエスペクトル、水平面内の加速度・速度・変位の軌跡も併せて示している。

1993年中には、1月15日20時06分に釧路沖地震(M=7.8)、7月12日22時17分に北海道南西沖地震(M=7.8)の被害地震がそれぞれ発生し、港湾地域強震観測網においても多くの記録を観測することができた。また、2月4日23時43分には釧路沖地震の余震が、7月12日23時04分、7月13日01時01分、8月8日04時42分には北海道南西沖地震の余震がそれぞれ発生し、これらの余震の記録も観測することに成功した。これらの地震から得られた記録については、強震観測表にその結果を掲載するが、記録波形等については、別報の「1993年釧路沖地震の港湾地域における強震記録」、  
「1993年北海道南西沖地震の港湾地域における強震記録」にて詳細に報告する。

1992年および1993年における港湾地域強震観測は、以下に示す諸機関の協力の下に実施された。

運輸省港湾局	運輸省港湾建設局	北海道開発局港湾部	沖縄開発庁沖縄総合事務局
東京都港湾局	静岡県港湾課	宮崎県港湾課	大阪市港湾局

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また、本年報の作成には、各観測地点での強震観測担当者の努力に負うところが非常に大きい。担当者各位に敬意と謝意を表すとともに、各観測地点で実際に強震計の点検ならびに記録の取扱いに携わった方々の氏名を以下に掲載する。

キーワード： 地震、 強震観測、 数値化加速度記録、 応答スペクトル、 港湾

### 平成4年強震観測担当者（1992年1月～12月）

#### 第一港湾建設局

秋田港	工事事務所	松淵 知	神原 晋	山崎一雄	加賀谷宏基
酒田港	"	小野寺悌介	高橋幸夫	東海林恭一	
新潟港	"	高橋信幸	田中 敏	菅原英男	松村高司
伏木富山港	"	田中 敏	竹田敏之	寺田篤史	
金沢港	"	田中 智	高野忠志	吉井信也	
敦賀港	"	広木智秀	阿原 進	寺崎賢次	

#### 第二港湾建設局

青森港	工事事務所	今 国守	対馬康一	神山 豊	滝沢洋一
		工藤昭光	安達充		
八戸港	"	中元武直	三浦匠		
宮古港	"	阿部二郎	得田静郎	吉田静夫	
宮古港	" 釜石工場	佐々木 等	原田久志	千葉 仁	似内敏行
塩釜港	"	菅原豊明	片寄 誠	瀬川 哲	佐藤久和
		青木謙二	奈良 智		
小名浜港	"	篠原邦彦	小野出則雄		
小名浜港	" 相馬工場	小野出則雄	大野 勝	家子清吉	西塚 登
		菅原豊明	斉藤利勝		
鹿島港	"	橋本光寿	志鎌幸英	上原正光	及川修一
		木田幸一			
鹿島港	" 常陸那珂工場	平野孝雄	佐藤和敏	杉田章二	
千葉港	"	似内敏行	猪股 勉	佐野幸保	菅谷文彦
京浜港	"	花田邦幸	桜田武光	高木 保	藤原 茂
		田口 昇	川島秀美智	渡部昌治	遠藤一幸
		三浦 健			

#### 第三港湾建設局

和歌山港	工事事務所	大月克己	浦 輝孝	篠原真三	
神戸港	"	森尾茂夫	藤井宗一	峰久政信	坂井 彰
神戸港	" 尼崎工場	松崎忠彦	山田昭光	野村 守	
広島港	"	岡本有司	浅川圭一	山本順一	水口直仁
		石橋祐二			
小松島港	"	斉藤安立	松本次男		
松山港	"	宮本武紀	金崎哲也		
高知港	"	松崎 宏	中田隆史	梅本創一	藤原敏晴
		渡部隆雄			

境	港	”	山田真理	福永幹雄	浜田泰広	
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第四港湾建設局

別府港	工事事務所	山下保彦	二原和教	大前 修	三好一喜
宮崎港	”	山本政孝	吉田豊成	宗 勇一	
志布志港	”	木村信之	樋口 晃	矢野米生	富ヶ原隆一
鹿児島港	”	木村良司	村上和之		

第五港湾建設局

清水港	工事事務所	中井 章	村上裕幸	込山敏夫	
清水港	” 御前崎工場	中津川哲司	加藤道康	村松佳春	
清水港	” 下田工場	金子英久	江崎竜夫	高橋裕司	小川徹記
三河港	”	宇野清助	佐野一三	石見 剛	
名古屋港	”	古田喜代志	中山 務		
四日市港	”	鈴木和政	牛場茂友	大塚尚志	宮原祐二

北海道開発局

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十勝港	”	前田宗文	加藤 誠	佐藤良雄	井上芳郎
浦河港	”	鈴木泰弘	山下豊司	松本隆一	佐藤 亘
苫小牧港	”	森木 亮	原田達夫	大野啓晃	根本任宏
		松良精三			
室蘭港	”	伊藤継夫	佐伯輝夫		
小樽港	”	森 信幸	窪内 篤	北川國廣	
函館港	”	矢本鉄也	阿部 勝	猪股宇一	

沖縄総合事務局

那覇港	工事事務所	上谷 修	進 明男	前原弘海	
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石垣港	”	菅原雄二	橋本雷士	知花包信	

都道府県

東京都港湾局		羽瀧 剛	高瀬偉季雄	後藤栄逸	
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宮崎県北部港湾事務所		桑畑正仁	新地 卓	黒木 巧	岩浦祥太郎

平成5年強震観測担当者(1993年1月~12月)

第一港湾建設局

秋田港	工事事務所	山崎一雄	遠藤 源	加賀谷宏基	伴 孝宏
酒田港	”	小野寺倂介	東海林恭一		
新潟港	”	菅原英男	松村高司	田中 敏	斉藤幸男
		清水 毅			

伏木富山港	"	竹田敏之	寺田篤史	佐々木豊喜
金沢港	"	高野忠志	吉井信也	高村進
敦賀港	"	寺崎賢次	広木智秀	渡辺淳一

第二港湾建設局

青森港	工事事務所	神山豊	安達充	多田和正	小林雅幸
八戸港	"	三浦匠	伊勢博		
宮古港	"	阿部二郎	奈良透	吉田静夫	
宮古港	" 釜石工場	佐々木等	原田久志	似内敏行	斉藤二郎
塩釜港	"	佐藤久和	青木謙二		
小名浜港	"	菅原豊明	祐川英明		
小名浜港	" 相馬工場	家子清吉	斉藤利勝	神浩之	菅原豊明
		佐藤敏則			
鹿島港	"	志鎌幸英	及川修一	木田幸一	住吉康男
		福川順			
鹿島港	" 常陸那珂工場	平野孝雄	佐藤和敏	工藤昭光	杉田章二
千葉港	"	猪股勉	小野寺美昭	菅谷文彦	三浦匠
京浜港	"	高木保	遠藤一幸	花田邦幸	渡部昌治
		川島秀美智	石原清道	今輝蔵	仙田孝一
		菊池正剛	進藤武		

第三港湾建設局

和歌山港	工事事務所	大月克己	田村節雄	篠原真三	松本貴之
神戸港	"	峰久政信	山本正男	坂井彰	
神戸港	" 尼崎工場	藤原敏晴	野村守	津田行男	
広島港	"	山本順一	浅川圭一		
小松島港	"	斉藤安立	久本忠則	松本次男	山本幹夫
松山港	"	金崎哲也			
高知港	"	渡部隆雄	中田隆史	中脇詠一	
境港	"	福永幹雄	山田眞理	浜田泰広	辻村幸弘

第四港湾建設局

別府港	工事事務所	山下保彦	三好一喜	大前修	
宮崎港	"	吉田豊成	宗勇一	坂本隆一	
志布志港	"	樋口晃	渡瀬真一	富ヶ原隆一	横手敏弘
鹿児島港	"	木村良司	村上和之	木村長正	

第五港湾建設局

清水港	工事事務所	村上裕幸	本多宗隆	松永洋明	下田義治
清水港	" 御前崎工場	中津川哲司	村松佳春	櫻井日出伸	
清水港	" 下田工場	金子英久	小川徹記	高橋裕司	渋谷和之
三河港	"	佐野一三	赤石正廣	石見剛	
名古屋港	"	中山務			
四日市港	"	牛場茂友	宮原祐二	浅倉弘敏	

北海道開発局

根室港	湾建設事務所	黒萩徳昭	廣田正俊	鈴木勝晴	
釧路港	〃	秋葉洋一	金子敏志	山本 剛	
十勝港	〃	佐藤良雄	井上芳郎	本間久雄	加藤 誠
浦河港	〃	松本隆一	佐藤 亘	京野勇一	
苫小牧港	〃	根本任宏	松良精三	大野啓晃	渥美洋一
室蘭港	〃	新潟博文			
		伊藤継夫	佐伯輝夫	渡部 優	渡部壮史
		千葉弘一			
小樽港	〃	森 信幸	佐藤紀美夫	北川國廣	
函館港	〃	矢本欽也	阿部 勝	成田芳徳	権藤宗高

沖縄総合事務局

那覇港	工事事務所	進 明男	栗田一昭		
那覇港	工事事務所 中城湾港出張所	金子和寿			
平良港	工事事務所	與儀成也	當銘正秀	名嘉康行	
石垣港	〃	松浦利昭	橋本雷士		

都道府県

東京都港湾局		高瀬偉季雄	白石一晶		
大阪市港湾局		山本忠正	小林靖仁	岡 崇	坂東道子
静岡県田子の浦港管理事務所		小林 剛	大島新一		
宮崎県北部港湾事務所		桑畑正仁			



# ANNUAL REPORT ON STRONG-MOTION EARTHQUAKE RECORDS IN JAPANESE PORTS (1992 & 1993)

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## Synopsis

Since 1962, strong-motion earthquakes and earthquake responses of structures have been observed in the major ports in Japan. By the end of December 1993, 4646 accelerograms had been accumulated and analyzed at the Geotechnical Earthquake Engineering Laboratory of the Port and Harbour Research Institute.

The strong-motion earthquake observation network in port areas in Japan consists of 87 strong-motion accelerographs installed at 56 ports as of December 1993. 63 accelerographs out of 87 are installed at ground surface, 10 accelerographs are in ground by using bore-hole and the rest (14 accelerographs) are on structures such as quay walls. In the network, two types of accelerographs have been used; one is the SMAC-B2 accelerograph and the other is the ERS accelerograph. The SMAC-B2 accelerograph is of a mechanical type and the ERS accelerograph is of an electrical type equipped with either analogue or digital recorder.

This report presents results of observation and preliminary analysis of records obtained in 1992 and 1993, which are listed in the tables of Strong-Motion Earthquake Observation Results with their maximum accelerations, being classified in accordance with earthquakes. For the records of ground motions with maximum accelerations exceeding 20 Gals ( $=\text{cm}/\text{sec}^2$ ), computer plots of reproduced acceleration are presented. For the records of ground motions with maximum acceleration exceeding 50 Gals, computer plots of corrected acceleration, integrated velocity and displacement, response spectra, Fourier spectra, and loci of accelerations, velocities and displacements in horizontal plane are also presented.

In 1993, two great earthquakes occurred in northern part of Japan; one is the 1993 Kushiro-Oki Earthquake on January 15 and another is the 1993 Hokkaido-Nansei-Oki Earthquake on July 12, and many after shocks were followed. Many records were observed by these earthquakes in the network. The records obtained by these earthquakes are compiled into reports entitled 'Strong-Motion Earthquake Records on the 1993 Kushiro-Oki Earthquake in Port Areas' and 'Strong-Motion Earthquake Records on the 1993 Hokkaido-Nansei-Oki Earthquake in Port Areas' besides this annual report.

**Key Words:** Earthquake, Strong-Motion Earthquake Observation, Digitized Acceleration Records, Response Spectra, Port

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## 1. Introduction

The observation of the strong-motion earthquake in major ports in Japan was started in 1962 by the Geotechnical Earthquake Engineering Laboratory of the Port and Harbour Research Institute. The observation network was expanded year by year and 82 accelerographs had been installed in 54 ports as of December 1992, 87 accelerographs in 56 ports as of December 1993. 4390 accelerograms had been obtained in the network by the end of 1992 and 4646 accelerograms by the end of 1993. The number of accelerograms obtained in 1992 was 174 and that in 1993 was 256. Two types of accelerographs have been used in the network, namely the SMAC-B2 accelerograph and the ERS accelerograph. As of December 1993, 2534 accelerograms out of 4646 had been obtained by the SMAC-B2 accelerograph and 2112 accelerograms by the ERS accelerograph.

The records had been published as annual reports after preliminary processing and analyses which will be explained later. The records from 1963 to 1975 had been published in the preceding annual reports which had similar format to the present one<sup>11-13</sup>. Because digitized data of vertical components of the records from 1963 to 1975 were not included in those reports, the data were reported separately<sup>12</sup>. After the annual report for the records of 1976 and 1977, a new data processing procedure was introduced, and accelerations with instrument correction, integrated velocities and displacements, Fourier spectra and response spectra had been reported in the annual reports<sup>13-26</sup>. When disastrous earthquakes occurred, special reports had been published for the earthquake records besides annual reports<sup>27-35</sup>.

In 1968, there occurred an earthquake of JMA Magnitude 7.9 in south-east off Hokkaido island. This earthquake was named the 1968 Tokachi-Oki Earthquake, and large number of after shocks followed. Many damage took place to buildings, roads, port facilities and many other types of structures, and many accelerograms were obtained in the network. In particular, an accelerogram with the maximum acceleration of 259 Gals (=cm/sec<sup>2</sup>) was recorded at Hachinohe Port in northern part of Honshu island. Because of the large magnitude of the earthquake and the damage to structures, the records were of great interest and importance, and a special report was published for the records<sup>27</sup>. In 1978, Japan was hit by two great earthquakes which were the 1978 Izu-Oshima-Kinkai Earthquake of JMA Magnitude 7.0 in south-central off Honshu island and the 1978 Miyagi-Ken-Oki Earthquake of JMA Magnitude 7.4 in north-east off Honshu island. Records of these earthquakes were compiled into two special reports<sup>28,29</sup>. In 1982, port structures were damaged by the 1982 Urakawa-Oki Earthquake of JMA Magnitude 7.1 in south-east off Hokkaido island, and records of the earthquake were also compiled into a special report<sup>30</sup>. In 1983, serious damage was brought about in the Japan Sea side of north-west off Honshu island by the 1983 Nipponkai-Chubu Earthquake of JMA Magnitude 7.7, and records of the earthquake were compiled into a special report<sup>31</sup>. In 1984, an earthquake of JMA Magnitude 7.1 occurred off east coast of Kyushu island in Hyuga-nada, and brought slight damage to port facilities. Records of the earthquake were compiled into a special report<sup>32</sup>. In 1987, an earthquake of JMA Magnitude 6.7 hit the metropolitan area. The earthquake caused some damages to structures and reclaimed lands area also liquefied slightly by this earthquake. Records of the earthquake are compiled into a special report<sup>33</sup>.

In 1993, two great earthquakes occurred in Hokkaido island, which were the 1993 Kushiro-Oki Earthquake of JMA Magnitude 7.8 in east off Hokkaido on January 15 and the

1993 Hokkaido-Nansei-Oki Earthquake of JMA Magnitude 7.8 in south-west off Hokkaido on July 12 and many after shocks were followed. Serious damage was brought about in Hokkaido and many accelerograms were recorded in the network. The records obtained by these two big earthquakes and its after shocks are compiled into special reports besides this report<sup>30,35)</sup>

This report presents the strong-motion earthquake records observed in 1992 and 1993. The records obtained in the network in 1992 and 1993 are listed in tables of Strong-Motion Earthquake Observation Results with their maximum accelerations, being classified by earthquakes. For the ground acceleration records with maximum accelerations exceeding 20 Gals, computer plots of reproduced accelerograms are prepared. For the records with maximum acceleration exceeding 50 Gals, computer plots of reproduced accelerograms, integrated velocities and displacements, response spectra, Fourier spectra and loci of accelerations, velocities and displacements in horizontal plane are prepared. Digitized data table of accelerograms and calculated data table of response spectra had been listed in the preceding annual reports but those data are not included in this report because those printed digital data tables are not often used any more.

Following organizations cooperated with the Port and Harbour Research Institute in the strong-motion earthquake observation in port area;

- (a) The Bureau for Ports and Harbours of the Ministry of Transport
- (b) The Regional Bureaus for Port Construction of the Ministry of Transport
- (c) The Port and Harbour Division, Hokkaido Development Bureau of the Hokkaido Development Agency
- (d) The Okinawa General Office of the Okinawa Development Agency
- (e) The Harbour Bureaus of Tokyo Metropolitan Governments
- (f) The Harbour Bureaus of Osaka Municipal Governments
- (g) The Harbour Sections of Shizuoka Prefectural Governments
- (h) The Harbour Sections of Miyazaki Prefectural Governments

## 2. Network and Instruments

### (1) Network

The network of the Port and Harbour Research Institute covered the whole coast line of Japan with 82 strong-motion accelerographs in 54 ports at the end of 1992 and with 87 accelerographs in 56 ports at the end of 1993. The locations of ports where accelerographs were installed as of December 1993 are shown in Figure 1. The numbers attached to the ports in Figure 1 correspond to the numbers of ports in Table 1.

The stations in the network are listed in Table 1 with the type of accelerometer and the installation condition, being classified by ports. Mikawa port (No.55) and Nakagusuku port (No.56) in Figure 1 and Table 1 are the ports where accelerographs were newly installed in 1993. The detailed information of the stations is described in the reports on the site characteristics<sup>30-40)</sup>. At the end of 1993, the accelerographs at 28 stations out of 87 stations were the SMAC-B2 accelerographs and the rest (59 stations) were the ERS accelerographs.

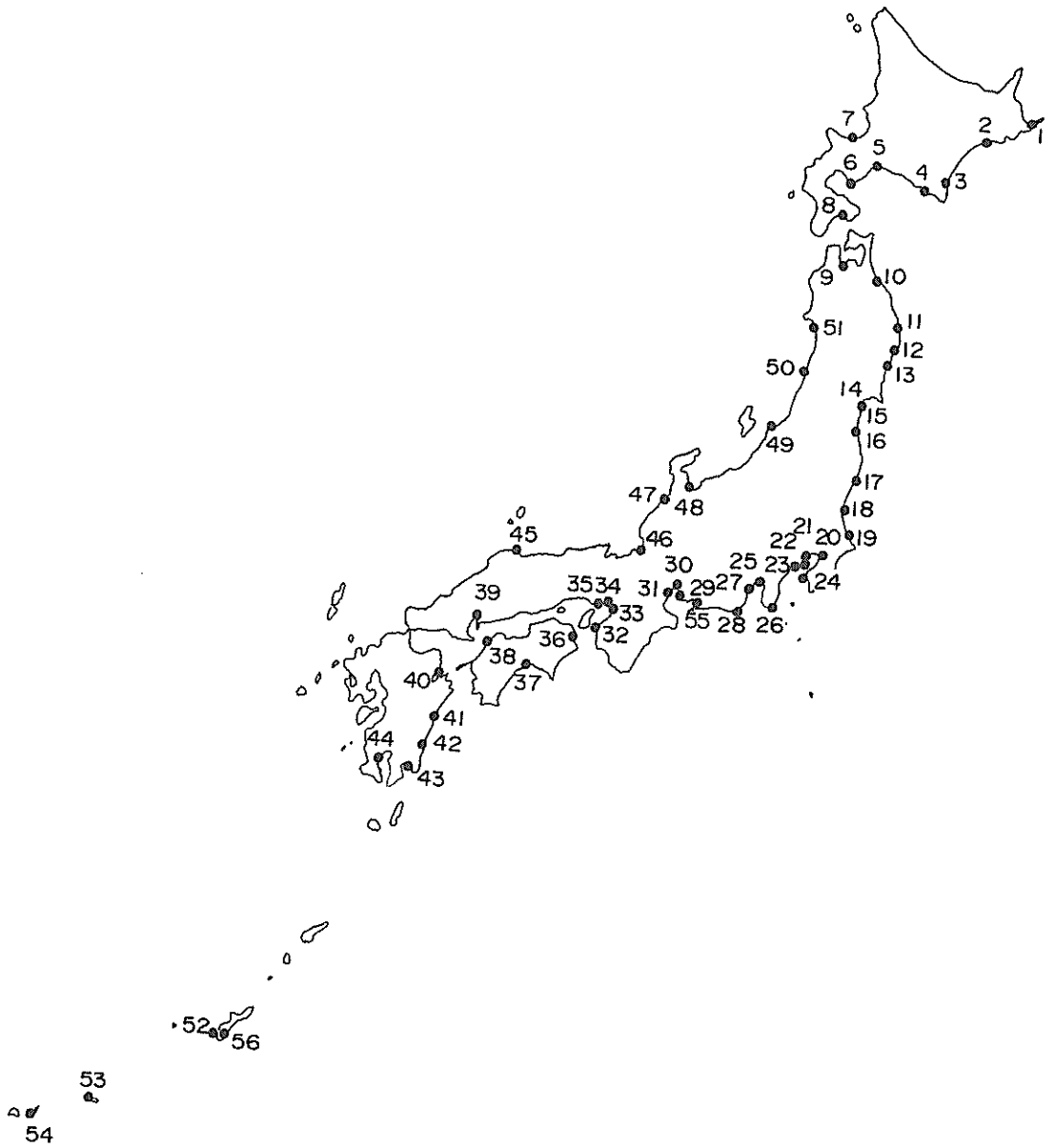


Figure 1 Location of ports where accelerographs were installed as of December 1993

Table 1 List of Strong-Motion Earthquake Stations

(December 1993)

No. of port*	Name of port	Name of station	Type of accelerometer	Installation condition	Ref. No.**
1	Hanasaki	1 Hanasaki-F	ERS-F	on ground	
2	Kushiro	2 Kushiro-G	ERS-G	on ground	
		3 Kushiro-GB	ERS-G	in ground	
3	Tokachi	4 Tokachi-M	ERS-C	on ground	298
4	Urakawa	5 Urakawa-S	SMAC-B2	on ground	
5	Tomakomai	6 Tomakomai-S	SMAC-B2	on ground	107
6	Muroran	7 Muroran-G	ERS-G	on ground	34, 107
7	Otaru	8 Otaru-G	ERS-G	on ground	107
8	Hakodate	9 Hakodate-M	ERS-C	on ground	298
		10 Hakodate-FB	ERS-F	in ground	
		11 Hakodate-F	ERS-F	on ground	
		12 Hakodate-FR	ERS-F	on structure	
9	Aomori	13 Aomori-S	SMAC-B2	on ground	107, 156
10	Hachinohe	14 Hachinohe-ji-S	SMAC-B2	on ground	34, 107
11	Miyako	15 Miyako-G	ERS-G	on ground	34, 107
12	Kamaishi	16 Kamaishi-M	ERS-C	on ground	351
		17 Kamaishi-MB	ERS-D	in ground	351
13	Ofunato	18 Ofunato-bochi-S	SMAC-B2	on ground	34, 107
		19 Ofunato-bo-S	SMAC-B2	on structure	34, 107
		20 Ofunato-mound-M	ERS-C	on structure	
14	Shiogama	21 Shiogama-kojyo-S	SMAC-B2	on ground	34, 107, 156
15	Sendai	22 Sendai-M	ERS-C	on ground	351
		23 Sendai-MB	ERS-D	in ground	351
16	Soma	24 Soma-S	SMAC-B2	on ground	
17	Onahama	25 Onahama-ji-S	SMAC-B2	on ground	351
18	Hitachinaka	26 Hitachinaka-F	ERS-F	on ground	
19	Kashima	27 Kashima-zokan-S	SMAC-B2	on ground	156
20	Chiba	28 Chiba-S	SMAC-B2	on ground	107
21	Tokyo	29 Shinagawa-S	SMAC-B2	on ground	34, 107
		30 Shinagawa-MB	ERS-D	in ground	

(to be continued)



Table 1 continued

No. of port*	Name of port	Name of station	Type of accelerograph	Installation condition	Ref. No.**
22	Kawasaki	31 Kawasaki-FB	ERS-F	in ground	
		32 Kawasaki-F	ERS-F	on ground	
		33 Kawasaki-FR	ERS-F	on structure	
23	Yokohama	34 Keihin-ji-S	SMAC-B2	on ground	34
		35 Yamashita-FB	ERS-F	in ground	
		36 Yamashita-F	ERS-F	on ground	
		37 Yamashita-FR	ERS-F	on structure	
24	Yokosuka	38 Koken-G	ERS-G	on ground	34
		39 Koken-S	SMAC-B2	on ground	34
25	Tagonoura	40 Tagonoura-S	SMAC-B2	on ground	107
26	Shimoda	41 Shimoda-F	ERS-F	on ground	
27	Shimizu	42 Shimizu-kojyo-S	SMAC-B2	on ground	34, 156
		43 Okitsu-S	SMAC-B2	on ground	34, 156
		44 Shimizu-miho-S	SMAC-B2	on ground	298
28	Omaezaki	45 Omaezaki-M	ERS-C	on ground	351
29	Kinuura	46 Kinuura-ji-S	SMAC-B2	on ground	298
30	Nagoya	47 Nagoya-zokan-S	SMAC-B2	on ground	34, 156
		48 Nagoya-inae-S	SMAC-B2	on structure	34
		49 Inae-sanbashi-M	ERS-B	on structure	34
		50 Inae-yaita-M	ERS-B	on structure	34
		51 Yokka-chitose-S	SMAC-B2	on ground	107
31	Yokkaichi	52 Yokka-sekitan-M	ERS-B	on structure	34
		53 Yokka-dai2-M	ERS-B	on structure	34
		54 Wakayama-G	ERS-G	on ground	298
32	Wakayama	54 Wakayama-G	ERS-G	on ground	298
33	Osaka	55 Osaka-ji-S	SMAC-B2	on ground	34
		56 Osaka-minami-S	SMAC-B2	on ground	34
34	Amagasaki	57 Amagasaki-G	ERS-G	on ground	156
35	Kobe	58 Kobe-ji-S	SMAC-B2	on ground	34
		59 Kobe-dai6-S	SMAC-B2	on structure	34
		60 Kobe-dai8-G	ERS-G	on structure	34

(to be continued)

Table 1 continued

No. of port*	Name of port	Name of station	Type of accelerograph	Installation condition	Ref. No. **
		61 Kobe-maya-M	ERS-C	on ground	298
		62 Maya-dail-M	ERS-B	on structure	34
		63 Maya-dai2-M	ERS-B	on structure	34
36	Komatsujima	64 Komatsujima-G	ERS-G	on ground	107
37	Kochi	65 Kochi-G	ERS-G	on ground	298
38	Matsuyama	66 Matsuyama-G	ERS-G	on ground	156
39	Hiroshima	67 Hiroshima-G	ERS-G	on ground	
40	Oita	68 Oita-G	ERS-G	on ground	156
41	Hososhima	69 Hososhima-F	ERS-F	on ground	
42	Miyazaki	70 Miyazaki-M	ERS-C	on ground	298
43	Shibushi	71 Shibushi-G	ERS-G	on ground	
44	Kagoshima	72 Kagoshima-G	ERS-G	on ground	34
45	Sakaiminato	73 Sakaiminato-G	ERS-G	on ground	
46	Tsuruga	74 Tsuruga-G	ERS-G	on ground	34
47	Kanazawa	85 Kanazawa-G	ERS-G	on ground	107
48	Toyama	76 Toyama-G	ERS-G	on ground	34
		77 Toyama-GB	ERS-G	in ground	
49	Niigata	78 Niigata-G	ERS-G	on ground	298
50	Sakata	79 Sakata-S	SMAC-B2	on ground	34
51	Akita	80 Akita-S	SMAC-B2	on ground	34, 351
52	Naha	81 Naha-G	ERS-G	on ground	298
		82 Naha-GB	ERS-G	in ground	298
53	Hirara	83 Hirara-G	ERS-G	on ground	298
54	Ishigaki	84 Ishigaki-G	ERS-G	on ground	298
55	Mikawa	85 Mikawa-G	ERS-G	on ground	
		86 Mikawa-GB	ERS-G	in ground	
56	Nakagusuku	87 Nakagusuku-G	ERS-G	on ground	

\* The numbers correspond to those in Figure 1.

\*\* The numbers correspond to those of the Technical Note of the Port and Harbour Research Institute, in which site characteristics of the stations are given.

## (2) Servicing

Installation and servicing of the accelerographs have been made by the port construction offices of the previously described organizations under the guidance of the Geotechnical Earthquake Engineering Laboratory. It is directed that accelerographs should be checked at least once a month and after an earthquake larger than the JMA seismic intensity scale II shown in Table 2. Immediately after earthquakes, the accelerograms are sent to the Laboratory by mail without any treatment or reading to avoid possible damage to the records.

The Geotechnical Earthquake Engineering Laboratory has also been offering a training course of about 5 days every year to the engineers who are in charge of the accelerographs at the stations. During the training course, the Laboratory offers lectures on procedure to maintain the accelerograph and to handle the accelerogram. The Laboratory also offers introductory lectures on earthquake engineering.

## (3) Station

There are three kinds of stations in the network. The first is to record accelerations at ground surface, the second is in ground by using bore-hole and the third is to record earthquake response of structures. The station which records earthquake response of structures is always accompanied with another station which records ground acceleration in its vicinity.

Table 2 JMA Seismic Intensity Scale

0 : NO FEELING	Shocks too weak to cause human feelings and registered only by a seismograph.
I : SLIGHT	Extremely feeble shocks only felt by persons at rest or by those who are observant to an earthquake.
II : WEAK	Shocks felt by most persons, slight shaking of doors and Japanese latticed sliding doors(shoji).
III : RATHER STRONG	Slight shaking of houses and buildings, rattling of doors and Japanese latticed sliding doors (shoji), swinging of hanging objects like electric lamps, moving of liquids in vessels.
IV : STRONG	Strong shaking of houses and buildings, overturning of unstable objects, spilling of liquids out of vessels.
V : VERY STRONG	Cracks in the walls, overturning of gravestones, stone lanterns, etc., damage to chimneys and mud-and-plaster warehouses.
VI : DISASTROUS	Demolition of houses by less than 30% in total number, landslips, fissures in the ground, etc.
VII : VERY DISASTROUS	Demolition of houses by more than 30%, intense landslips, large fissures in the ground, faults.

In the stations which record the ground acceleration, one of the horizontal components of the accelerograph is directed to the due north except a few accelerographs. Some of the accelerographs are installed in parallel with the structures because most of port facilities such as quay walls or piers have two-dimensional-structure and it is desirable to record the components of the ground acceleration parallel and perpendicular to the principal axis of the structure. In the stations which record structural response and the accompanying stations which record the ground acceleration in its vicinity, accelerographs are installed parallel to the structure in which earthquake response is needed.

Two horizontal components of the accelerograph are usually corresponding to North-South (NS) and East-West (EW) direction, respectively. However, if the direction of the component of the accelerograph is different from the geometric direction, the deviation angle in degree is used to represent components direction. For example, N10E component means that the direction deviates 10 degrees eastward from the due north.

Each station in the network has its own abbreviated name listed in Table 1. The name consists of the location, the type of the accelerograph and the installation condition. For instance, the stations in Kushiro port in Hokkaido island are named Kushiro-G and Kushiro-GB, respectively. 'Kushiro' means the location of the station. The suffix 'G' represents type of acceleration and means that the ERS-G type accelerograph is installed at Kushiro port. If the SMAC-B2 accelerograph is installed, this suffix becomes 'S', if the ERS-B, -C and -D type accelerograph; 'M', and if the ERS-F type accelerograph, 'F'. The suffix 'B' after 'G' in Kushiro-GB represents installation condition and means that the accelerograph is installed in ground using bore-hole. If there is no suffix representing installation condition such as Kushiro-G, that means the accelerograph is being installed at ground surface. If the suffix representing installation condition becomes 'R', that means the accelerograph is being installed on the structure.

#### (4) Accelerograph

##### a) SMAC-B2 accelerograph

The SMAC-B2 accelerograph was developed by the Committee for the Standard Strong Motion Accelerograph. It is a three component mechanical type accelerograph which scratches records on a rolled waxed paper. The specifications of the SMAC-B2 accelerograph are shown in Table 3. Inside view and theoretical frequency characteristics are also shown in Figure 2 and Figure 3, respectively.

The SMAC-B2 accelerograph has been one of the standard accelerographs in the network of the Port and Harbour Research Institute. At the earlier stage of the strong-motion observation, the SMAC-B2 accelerograph was one of the standard models and suitable for the observation condition in port areas. After the SMAC-B2 accelerograph, several types of accelerograph were developed by the Committee. In the network, however, the SMAC-B2 accelerograph has only been used as a mechanical type accelerograph because it was inconvenient to use many types of accelerographs from the view point of instrument correction procedure and maintenance. As of December 1993, total number of SMAC-B2 accelerograph being used is 28.

5 Gals ( $=\text{cm}/\text{sec}^2$ ) is adopted as a triggering level of the accelerograph in places where ground noise is small, and 8 Gals in places where ground noise is relatively large because of heavy motor trucks for construction work or cargo transportation. A few number of the

**Table 3** Specifications of the SMAC-B2 accelerograph

Component	2 horizontal and 1 vertical
Natural period	0.14 sec.
Sensitivity	12.5 Gal/mm
Damping	Critical
Damping mechanism	Air piston
Maximum recording acceleration	500 Gal
Recording speed	10 mm/sec.
Recording medium	Waxed paper
Driving mechanism for recorder	Hand-wound spring motor
Recording duration	3 min.
Recording capacity	5 earthquakes/roll
Starter	Electric contact made by vertical motion
Period of starter pendulum	0.3 sec.
Starter threshold	5 Gal
Auxiliary starter	Mechanical, works at 100 gal
Time marking	1 sec.
Power supply	4 dry cells
Size	54×54×37 in cm
Net weight	100 kg

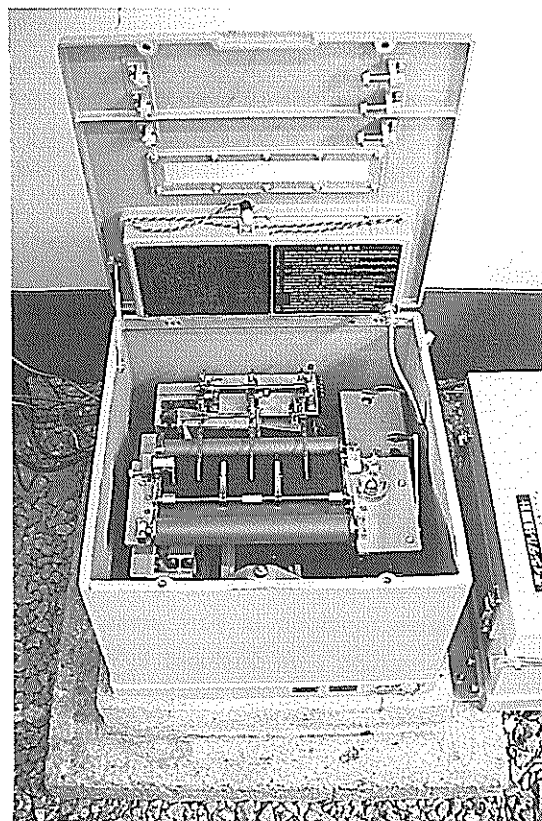
accelerographs located beside roads carrying very heavy traffic are triggered at 11 Gals.

At present, an action program is going on to replace the SMAC-B2 accelerographs with digital type accelerographs.

#### b) ERS accelerograph

The SMAC-B2 accelerograph has been very widely used in the network. However, there exist some places where the SMAC-B2 accelerograph can not be installed, such as on structures or in ground. For that reason, the ERS accelerograph was developed by the Geotechnical Earthquake Engineering Laboratory to observe earthquake motions in a specific condition. Transducers and a recorder of the ERS accelerograph are separately installed for the observation.

First, the accelerograph with magnetic tape data recorders was developed. This accelerograph was called the ERS-A accelerograph. After some period of operation, the magnetic tape data recorders were replaced by an oscillograph. The model with



**Figure 2** Inside view of the SMAC-B2 accelerograph



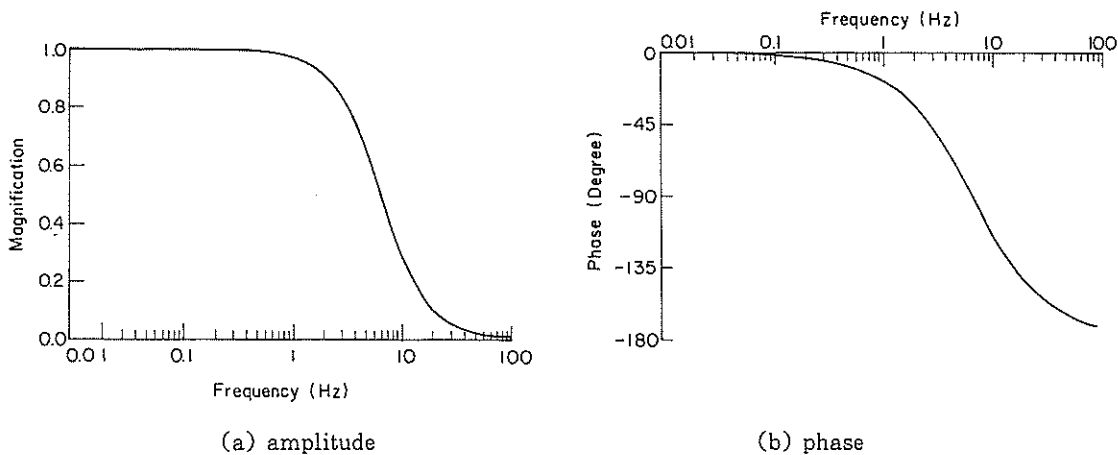


Figure 3 Frequency characteristics of the SMAC-B2 accelerograph

an oscillograph was named as the ERS-B accelerograph. The ERS-A and -B accelerograph records only two horizontal components of acceleration. The specifications of the ERS-B accelerograph are shown in Table 4 and the transducer of the ERS-A and -B are shown in Figure 4. The ERS-B accelerographs are used at 6 stations at present as shown in Table 1.

After that, the ERS-C accelerograph was developed and installed. While the ERS-B accelerograph records accelerations in two horizontal components, the ERS-C accelerograph records acceleration of vertical component as well as two horizontal ones. The transducer of the ERS-C accelerograph is shown in Figure 5. The ERS-C accelerographs are working at 8 stations at present as shown in Table 1.

The ERS-D accelerograph was also developed for recording acceleration in ground. Accelerographs of this type had been installed at 3 stations in the network as shown in Table 1. The transducers of the ERS-D accelerograph are installed in bore-hole and they have the same specifications as those of the ERS-C accelerograph. The specifications of the ERS-C and -D accelerographs are shown in Table 5. The transducers of the ERS-D accelerograph are shown in Figure 6.

In the ERS-B, -C and -D accelerographs, the transducers are almost directly connected with galvanometers in the oscillograph. There exist only resistor circuits to adjust sensitivity and impedance matching between them. No electronic amplifier is used to attain maximum reliability of the instrument. The overall sensitivity is more than 10 mm per Gals ( $=\text{cm}/\text{sec}^2$ ) and it is easily adjusted by changing resistors of the circuit. Therefore, the ERS-B, -C and -D accelerograph have advantage to start the observation in its maximum sensitivity and to readjust the sensitivity into the appropriate one for the strong-motion after obtaining some records. The frequency characteristics of these accelerographs are shown in Figure 7. The triggering levels of these ERS accelerographs are similar to those of the SMAC-B2 accelerographs. If the ERS-B, -C and -D accelerographs are installed at the station, the suffix which represents type of accelerograph becomes 'M' in the name of the station. For instance, the name of the station at Tokachi port becomes Tokachi-M because the ERS-C accelerograph is installed.

Table 4 Specifications of the ERS-B accelerograph

Transducer	
Type	Moving coil type
Component	2 horizontal
Natural period	0.5 sec.
Damping factor	.17
Damping mechanism	Electro-magnetic
Capacity	250 Gal
Coil impedance	320 ohm
Sensitivity	about 2mv/Gal(circuit open)
Water tightness	over 200 kg/cm <sup>2</sup>
Recorder	
Type	Electro magnetic oscillograph
Natural frequency of galvanometer	100 Hz
Sensitivity	166 mm/mA
Recording paper	92 mm(width)×30 m(length) (visible without processing)
Paper speed	2 cm/sec.
Time mark	0.1 sec.
Power supply ... Rechargeable battery, Charged automatically when it is necessary.	

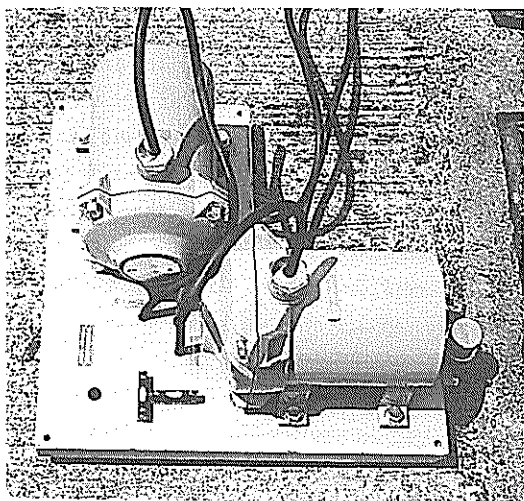


Figure 4 Transducers of the ERS-A and-B accelerograph

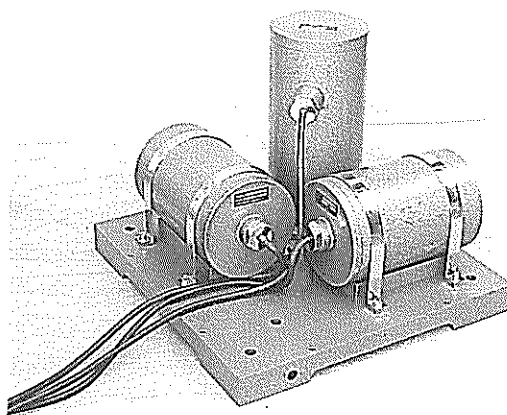


Figure 5 Transducers of the ERS-C accelerograph

c) ERS-F accelerograph

The ERS-F accelerograph is a digital type strong-motion accelerograph equipped with non-volatile, solid state magnetic bubble memories. The main unit of the recording system, shown in Figure 8, consists of four non-volatile, solid-state magnetic bubble memories of

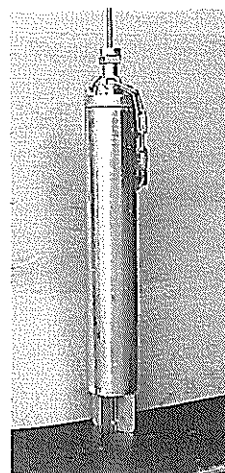
**Table 5** Specifications of the ERS-C(D) accelerograph

Transducer	
Type	Moving coil type
Component	2 horizontal and 1 vertical
Natural frequency	3 Hz(5 Hz)
Damping factor	17(10)
Damping mechanism	Electro-magnetic
Capacity	500 Gal
Water tightness	over 20 kg/cm <sup>2</sup>
Recorder	
Type	Electro magnetic oscillograph
Natural frequency of galvanometer	270 Hz
Recording paper	198 mm(width)×30m(length) (visible without processing)
Paper speed	4 cm/sec.
Time mark	0.1 sec.
Sensitivity (overall)	2 Gal/mm, or 10 Gal/mm
Power supply ... Rechargeable battery, Charged automatically when it is necessary.	

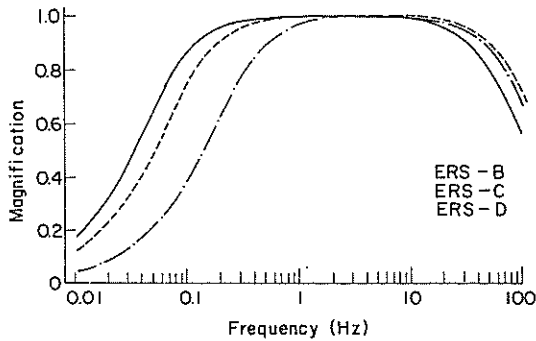
the total memory size of 1 Mbytes and the controlling parts, of which dimensions are 240 x 240 x 35 mm, weighing about 1 kg. Double units can be installed in a recording system, but single unit is installed for the recording system at Hakodate Port and Hitachinaka Port. Time signal is recorded by using one channel in this system and the recording time of three components of acceleration and one time signal is about 40 minutes in double bubble memories.

There are several types of the ERS-F accelerographs. The standard type shown in **Figure 9** is a self-contained box type which contains transducers and a recorder with magnetic bubble memories all in one. The other is a separated type in which transducers and a recorder are separated with each other. **Figure 10** shows the transducers which is to be installed in ground by using bore-hole and to observe earthquake motions at base or in ground. The transducers shown in **Figure 11** is to be attached to structures. The front view of the recording system of the ERS-F accelerograph including the magnetic bubble memories is shown in **Figure 12**. Total number of the ERS-F accelerograph is 13 at present as shown in **Table 1**.

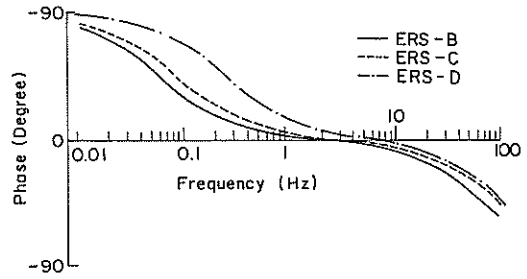
The ERS-F accelerograph has a system shown by a block-diagram in **Figure 13**, and satisfies the specification shown in **Table 6**. The frequency characteristics of the transducers are shown in **Figure 14**. Recording duration of an earthquake motions is one minute at minimum, and the duration can be extended up to 10 minute at a step of one minute by monitoring the level of the acceleration. The recording duration is extended if the level of the monitored



**Figure 6** Transducers of the ERS-D accelerograph



(a) amplitude



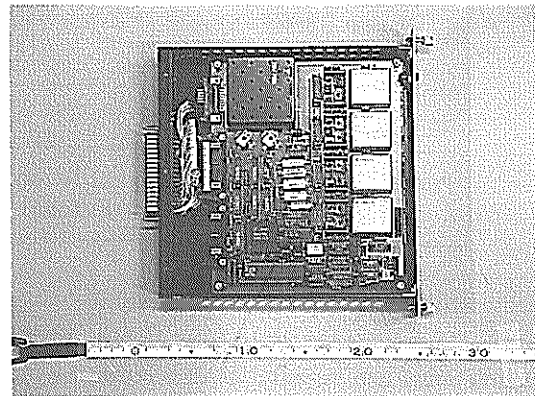
(b) phase

**Figure 7** Frequency characteristics of the ERS-B,-C and-Daccelerograph

acceleration after each 40 seconds from the trigger or extension is higher than the trigger level of the acceleration. The main unit of the recording system can record ten earthquake motions by 60 seconds of three components at the maximum. If earthquakes occur successively and the earthquake motion data should over flow the recording system, records of the greatest maximum accelerations are retained. As exception to this, however, records of 180 seconds are stored in the first-come first-serve basis.

d) ERS-G accelerograph

The ERS-G accelerograph is an improved version over the ERS-F accelerograph. Transducers of the accelerographs are almost the same to those of the ERS-F accelerograph. In the ERS-G accelerograph, IC-CARD memory as shown in **Figure 15** is used for the recording system and some improvements are done for the controlling system. The memory size of the IC-CARD is 2 Mbytes. The recording time of three components of acceleration is about 52 minutes in one card. The triggering level of acceleration can be set at several steps. The capacity of accelerograph is 2G, and the level of maximum acceleration (sensitivity) can be set at appropriate value from 0.008G to 2G. Total number of the ERS-G accelerograph is 29 at present.



**Figure 8** Inside view of the memory of the ERS-F accelerograph



**Figure 9** Standard type of the ERS-F accelerograph

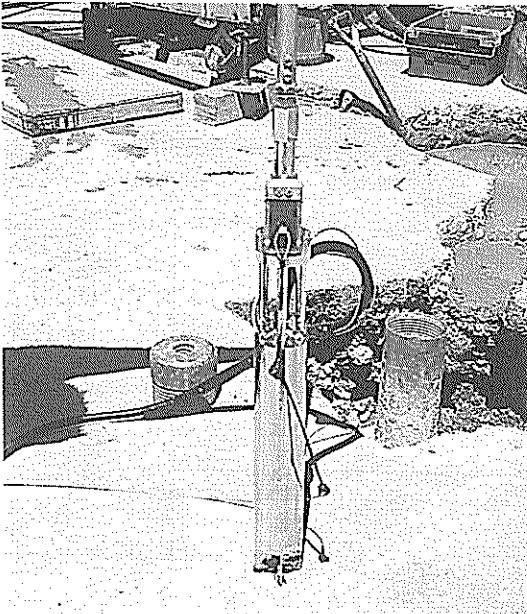


Figure 10 Transducers of the ERS-F and-G accelerograph installed in ground

The specification of the ERS-G acceleration is shown in Table 6 with the specifications of the ERS-F accelerograph and frequency characteristics of the transducers which are the same as the transducers of ERS-F accelerograph are shown in Figure 14. Standard type of the ERS-G accelerograph is shown in Figure 16 in which transducers and recording system with IC-CARD are contained all in one. The type of the transducer of the ERS-F and -G accelerograph installed at ground surface is usually force-balance type. However, the velocity-balance type is recently adopted for the transducers installed in ground because of the safety against lightning.

After recording earthquakes, the main unit (memory) of the recording system is pulled out from the recording system of the ERS-F and -G accelerograph and replaced by the another memory ready for recording the coming earthquakes. The pulled out unit, bubble memory with a static eliminator on the connector to the unit of the ERS-F accelerograph and IC-CARD of the ERS-G accelerograph, is packed in a case and sent to the Laboratory. The unit is set on the reproducer which is connected to a computer and digital time histories of earthquake motions are reproduced in the Laboratory. Absolute time at the trigger of the record is also obtained from the record of the internal clock of the accelerograph. As shown in Table 6, these recording system have digital delay memory for 10 seconds. If the recording started before the first motion of the earthquake, some of the portion of the

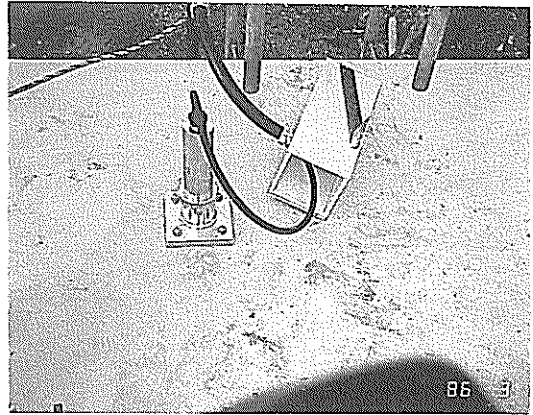


Figure 11 Transducers of the ERS-F and-G accelerograph attached to structures

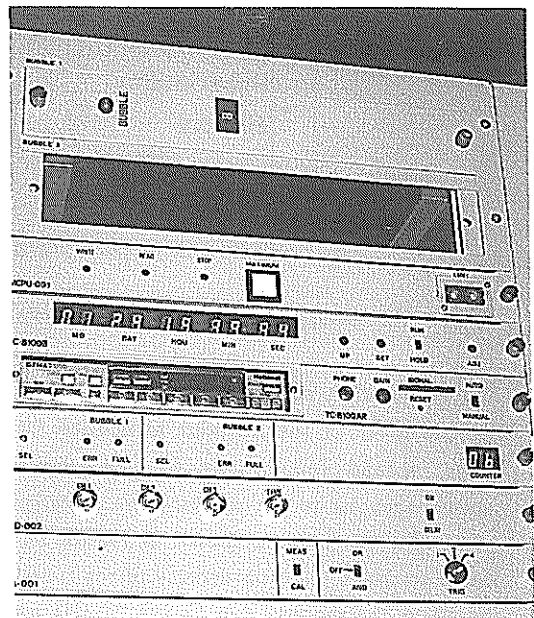


Figure 12 Front view of the recording system of the ERS-F accelerograph

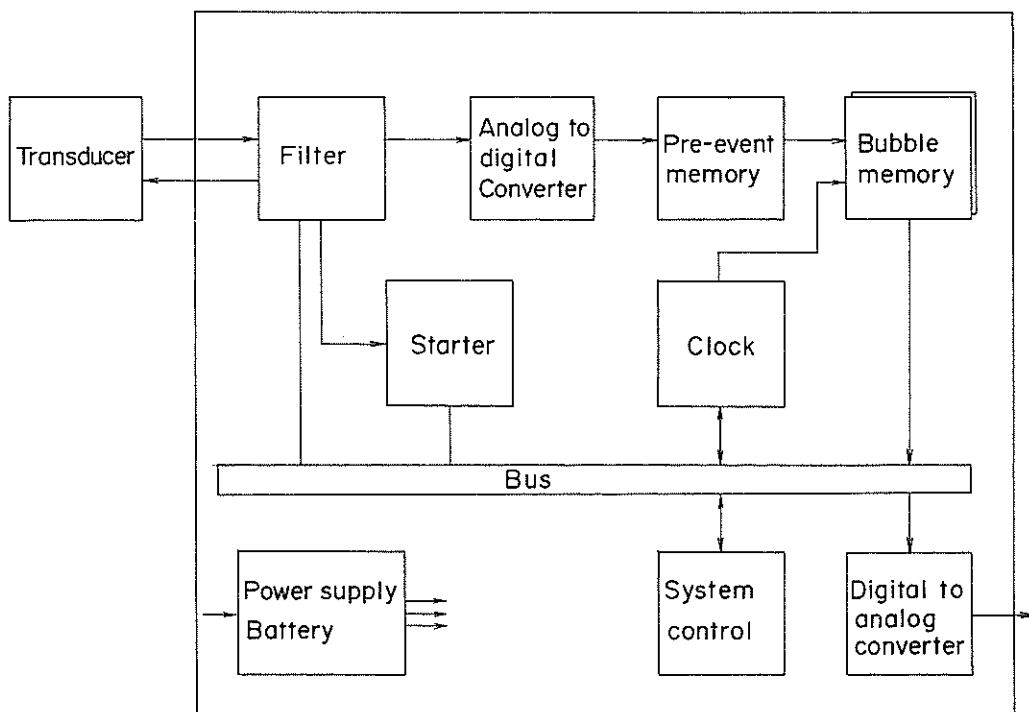


Figure 13 Block-diagram of the ERS-F accelerograph

record preceding the first motion is omitted.

#### (5) Foundation and House

As most of the harbour structures have shallow foundations and do not rest on bed rock, spread foundations for the accelerographs are being used. All the SMAC-B2 accelerographs in the network are installed on simple spread foundations which are made of reinforced concrete shown in Figure 17. The hollow space under the foundation is allocated to make the bulk density of the foundation equal to that of the soil, so that the disturbance to the records due to the foundation can be minimized. The foundations are also used for the ERS-F and -G accelerographs which were installed after the SMAC-B2 accelerograph for replacement.

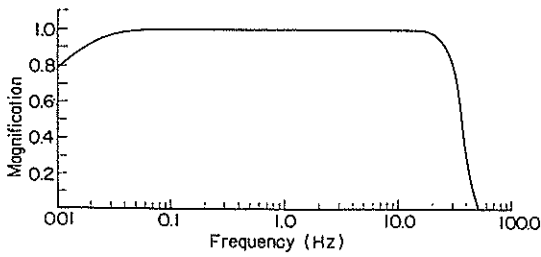
The standard foundation for the ERS-B and -C accelerograph has not been established. Shape and size of a foundation for transducers of the ERS-C accelerograph are illustrated in Figure 18.

Usually, no pile is used to support the accelerograph and its foundation, but in the stations on very soft soil or very loose sand, concrete piles or wooden piles are used. For example, the foundation at the Niigata-G station is supported by piles. All the foundations are isolated from houses covering the accelerographs.

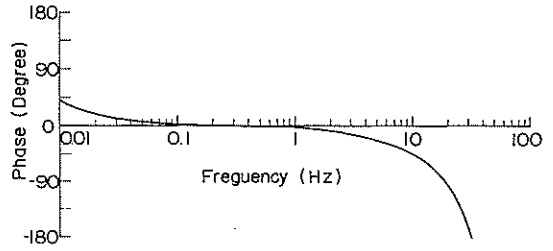
Most of the accelerographs are covered with houses which were built for the accelerographs. Some of the accelerographs are installed in houses which were built for other purposes. The houses built for covering accelerographs are made of reinforced concrete or concrete blocks, and some are prefabricated houses. The house of the Onahama-ji-S station is shown in Figure 19 as an example.

Table 6 Specifications of the ERS-F and-G accelerograph

Overall Capabilities	Maximum acceleration capacity (-F) 2G (-G) 0.008G~2G, variable Frequency characteristics 0.01Hz~35Hz Dynamic range 86 dB over
Transducer	Accelerometer Component 2 horizontal, 1 vertical Maximum capacity (-F) 2G (-G) 0.008G~2G, variable Sensitivity $10^{-5}$ Type Force-balance servo or Velocity-balance servo
Filter	High pass 0.007 Hz -6 dB/octave Low pass 35 Hz -18 dB/octave
A/D conversion	Resolution 16 bits Conversion rate 100 Hz
Pre-Event Memory	10 seconds.
Clock	Accuracy of internal clock 1/100 seconds corrected every an hour by NHK time signal
Starter	Trigger levels : 0.5, 1, 2% of maximum acceleration
Recorder	No. of channel (-F) 4~10 channel (1 time signal) (-G) 3~12 channel Memory size (-F) Bubble Memory : 1 Mbytes x 2 (-G) IC-CARD Memory: 2 Mbytes Record length 1 ~ 10 minutes/record Maximum Recording Length (-F) 40 minutes/4ch. (-G) 52 minutes/3ch. Record of greatest maximum acceleration secured
Related Informations	Observation station, Number of records, Start time of each data, Maximum accelerations of each component
Calibration	Overall calibration are possible
Buckup Power Supply	2 hour after power storage
Container	Alluminum box, Water-Proof, Size (-F) : 54(L), 54(W), 38(H)cm (-G) : 54(L), 54(W), 33(H)cm

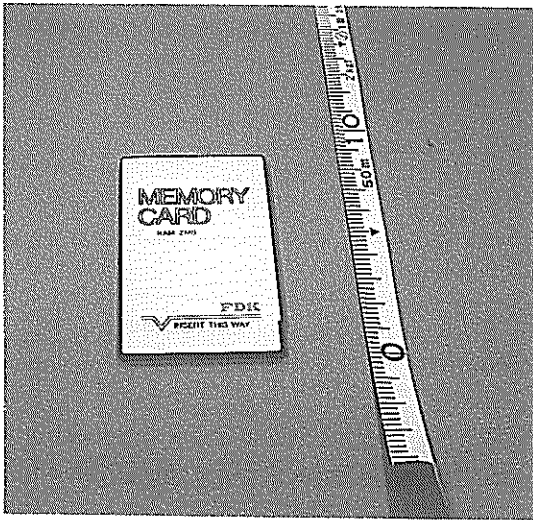


(a) amplitude

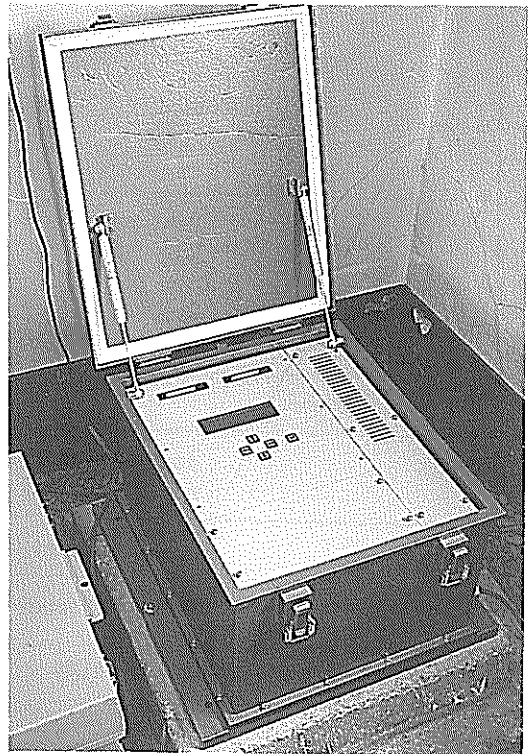


(b) phase

**Figure 14** Frequency characteristics of the ERS-F and -G accelerograph



**Figure 15** Memory(IC-CARD) of the ERS-G accelerograph



**Figure 16** Inside view of the ERS-G accelerograph

### 3. Preliminary Processing

All the accelerograms collected at the Geotechnical Earthquake Engineering Laboratory of the Port and Harbour Research Institute are listed in the tables on Strong-Motion Earthquake Observation Results, which are classified by earthquakes and listed in the later part of this report. They undergo the following preliminary processing.

At first, each accelerogram is given a record number according to the order of its arrival at the Laboratory. The record number for the accelerogram by the SMAC-B2 accelerograph begins with the capital letter 'S', that by the ERS-B, -C and -D accelerograph, with the capital letter 'M' and that by the ERS-F and ERS-G, with the capital letter 'F'.

Then, an earthquake which corresponds to each accelerogram is confirmed or



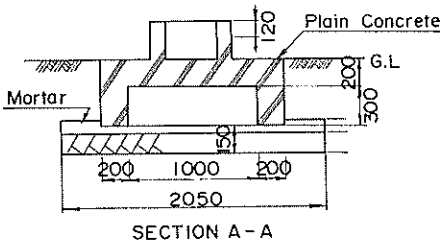
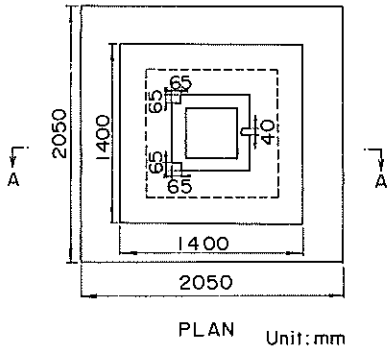


Figure 17 Foundation for the SMAC-B2 accelerograph

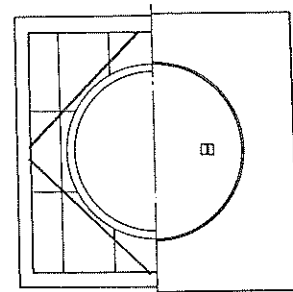
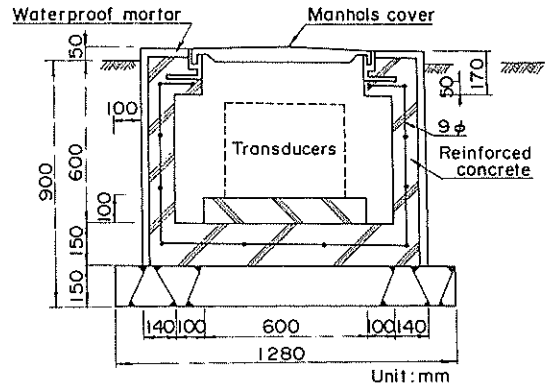


Figure 18 Foundation for the ERS-C accelerograph

determined. There is no time information in the accelerograms obtained by the SMAC-B2 accelerograph and the ERS-B, -C and -D accelerograph because those accelerographs are not equipped with an internal clock. Therefore, most of the accelerograms are sent to the Laboratory with the earthquake information from the stations. However, there are a few of the accelerograms without such information because the accelerograms were found in the regular servicing and it was difficult to find the corresponding earthquake at the station. For such accelerograms without time information, the earthquake is determined by consid-

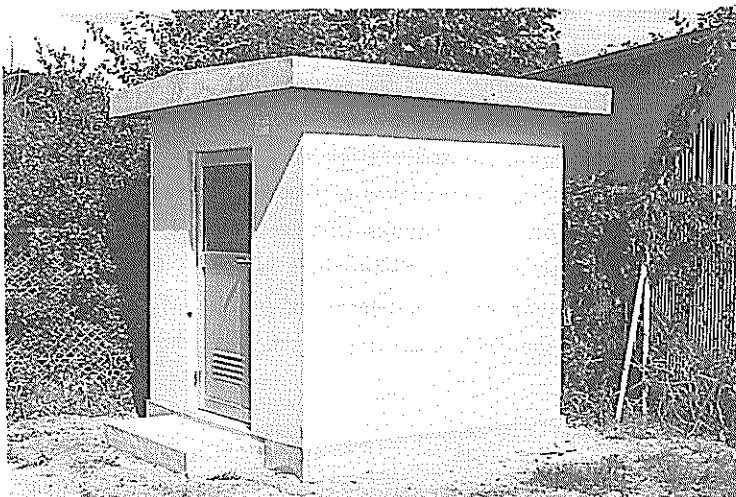


Figure 19 House of the Station(Onahama-ji-S Station)

ering both the possible period of the recording and the earthquake occurred in that area at that period.

The determination or the confirmation of the corresponding earthquake is based on the Seismological Bulletin by the Japan Meteorological Agency (JMA)<sup>(1), (2)</sup>. If the Seismological Bulletins on the earthquakes are not available because of time lag of the publication after earthquakes, the preliminary reports on earthquakes by the JMA are used to determine the earthquakes. Some of the accelerograms, however, remain without matching earthquakes. In this case, those earthquakes are treated as earthquake unknown. The accelerogram whose earthquake is unknown is not listed in the tables if both of its maximum horizontal accelerations are smaller than 20 Gals. It will be noted that the reliability of the earthquake determination based on such procedure for accelerograms with small acceleration is limited in the case that accelerograms do not have accurate time information.

Accelerograms by the SMAC-B2 accelerograph are recorded on a rolled waxed paper which has dark red background. The recording by scratching the waxed paper with a stylus leaves the semi-translucent trace on the waxed paper. Because the waxed paper is not stable against scratching and is not appropriate to be used for the digitization, the photographic contact print of the original accelerogram is made on a special photographic sheet. This sheet is made of mylar film and stable against temperature change, humidity, and mechanical distortion. The sizes of the sheet are 55 cm in length and 30 cm in width. If the significant portion of the record is longer than 30 to 45 cm, the copy will be made on two sheets or more and the portion of about 10 cm at the end of each sheet is overlapped with each other for confirming data continuity in the successive sheets. After this processing, the record becomes black traces and semi-translucent background in the copy sheet and they are in good contrast for the digitization. The record by the ERS-B, -C and -D accelerograph is only chemically stabilized by sensitization before being used for digitization.

From the photographic copy or the stabilized original record, the maximum acceleration of each component is read by using a magnifying glass. In this reading, the base-line setting is not so accurate as that made in digitizing the accelerogram and these maximum accelerations are not so accurate and different from those processed through digitization, standard data processing and preliminary analyses which will be explained later. The maximum accelerations, which are listed in the tables of Strong-Motion Earthquake Observation Results and are not processed through preliminary analyses, are those determined by this preliminary processing. For the records by the ERS-F and -G accelerograph, acceleration data are directly read by a computer and the time information is included in the record. Therefore, the maximum acceleration and the time of triggering are obtained accurately, and the corresponding earthquakes of records are easily determined.

In the tables of Strong-Motion Earthquake Observation Results, the time in the earthquake data refers to the Japan Standard Time which is earlier than GMT by 9 hours, the magnitude is the JMA Magnitude which is determined by the JMA and the seismic intensity of the shock is estimated by the JMA according to the scale shown in Table 2.

#### 4. Digitization

##### (1) Digitizer

Two types of digitizers are used in the Laboratory. One is for digitization of records by the SMAC-B2 accelerograph and the other is for digitization of records by the ERS-B, -C

and -D accelerograph.

The digitizer for the accelerograms obtained by the SMAC-B2 accelerograph is a semi-automatic instrument. The view and the specifications of the digitizer are shown in **Figure 20** and **Table 7**, respectively. The digitizer works in the following way.

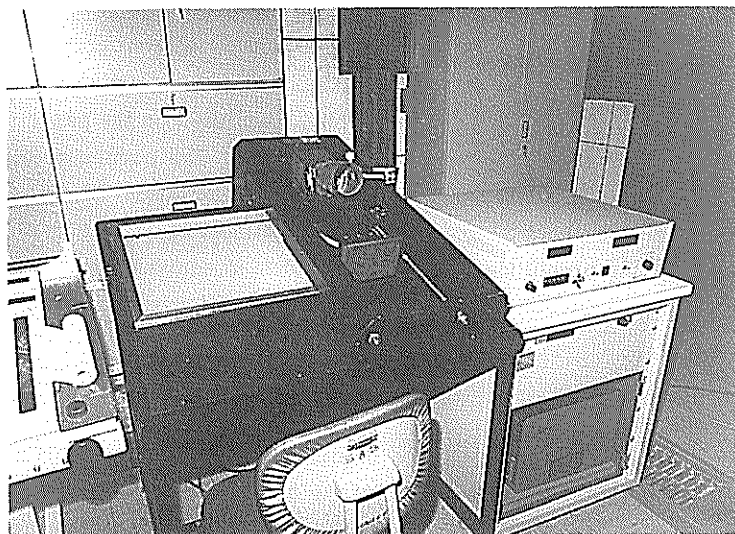
On the digitizer table, there is a magnifying glass which can be moved along the transverse (vertical) axis by rotating a small wheel near the glass. A magnescale is connected to the wheel, and the electric digital output corresponding to the position of the magnifying glass is produced from the magnescale. The magnifying glass has a cross-hair and a lamp to illuminate the accelerogram within its range. The operator places the cross-hair on the trace of an acceleration record and pushes a button, then the digital output from the magnescale is displayed on the panel and is stored in the memories of the computer. After this step, the magnifying glass is automatically shifted along the longitudinal (horizontal) axis by 0.1 mm.

The records obtained by the ERS-B, -C and -D accelerographs are processed with an on-line oscillogram digitizer connected to a computer which is shown in **Figure 21**. A record is placed on the digitizer table and an operator traces earthquake wave forms with a cursor of the digitizer. The travels of the cursor along horizontal and vertical axis are digitally counted and the coordinates of the cursor are transferred into memories of the computer at a step of 0.1 mm along the horizontal axis.

After the necessary portions of the record are digitized, digitized values in the memories are processed by computer programs. According to the directions given to the computer through the keyboard, printed list, magnetic tape and analog reproduction etc. are obtained as outputs of the digitized records in the memories.

## (2) Digitization

The digitization procedure, which is shown in **Figure 22** and described here, has been applied for records obtained since 1976.



**Figure 20** Digitizer for records by the SMAC-B2 accelerograph

Table 7 Specifications of digitizer for records by the SMAC-B2 accelerograph

Digitizer Table	
Size of table	750 mm(X)×660 mm(Y)
Effective area	430 mm(X)×300 mm(Y)
Magnifying glass	5x, with a cross hair and illumination
Translation of magnifying glass	
Y-axis (vertical)	manual by rotating a wheel
X-axis (horizontal)	automatic, at intervals of 0.1 mm
Analog to Digital Converter and Control	
Resolution(overall)	1000 counts per a millimeter
Indication	
Y-axis (vertical)	sign and 4 digits
X-axis (horizontal)	4 digits

a) SMAC-B2 accelerograph

The records by the SMAC-B2 accelerograph consist of acceleration records, fixed traces, timing marks, arc traces and free vibration traces for calibration of the characteristic periods and damping factors of the accelerograph. Among them, traces to be digitized are the recorded accelerations, the fixed traces and the arc traces. Digitized fixed traces and digitized arc traces are used for the standard data processing described later.

The fixed traces are recorded by the pens fixed to the accelerograph frame. The arc traces are recorded manually with the recording pens supported by pivots while the paper drive mechanism is stopped. The arc traces show offset of the pens from the normal position where the pens are parallel to the direction of paper driving. The timing marks are pulses at intervals of one second. The timing marks are used only to obtain the average recording speed because fluctuation of the timing marks are estimated as small as the digital unit of the digitizer (0.1 mm) according to the results of the tests of the SMAC-B2 accelerographs<sup>49</sup>. The average error in the time marking is expected to be less than 1 % and the fluctuation is less than 0.5 % according to the results of the tests of the SMAC-B2 accelerographs. In order to obtain the average paper speed, intervals of 30 pulses is measured by the digitizer for a record by the ERS-B, -C and -D accelerographs.

A record is digitized from the starting point of recording. Portion of the record to be digitized is determined so as to include discernible acceleration on the paper. This determination is done by observation of a record to be digitized. The portion of the record to be digitized is divided into some sections because of the limitation of the digitizer table. Length of each section is about 30 to 45 cm which is almost equivalent to 30 to 45 seconds. Digitization unit in the amplitude is 0.008 mm which is equivalent to 0.1 Gal. Contact prints are made for each section as described previously. Digitization procedure is summarized as follows;

—Setting of the copy

A photographic copy of a record to be digitized is fixed on the table of the digitizer with tape. The table is rotated by an adjusting screw so that the fixed trace on the copy is parallel to horizontal axis of the digitizer. Two points on the fixed trace located on both ends of section are used for this adjustment and vertical coordinate value of the

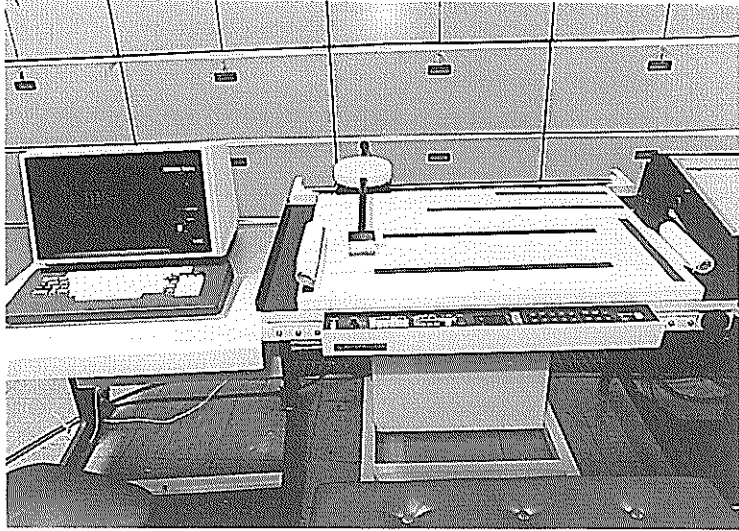


Figure 21 Digitizer for records by the ERS-B, -C and -D accelerograph

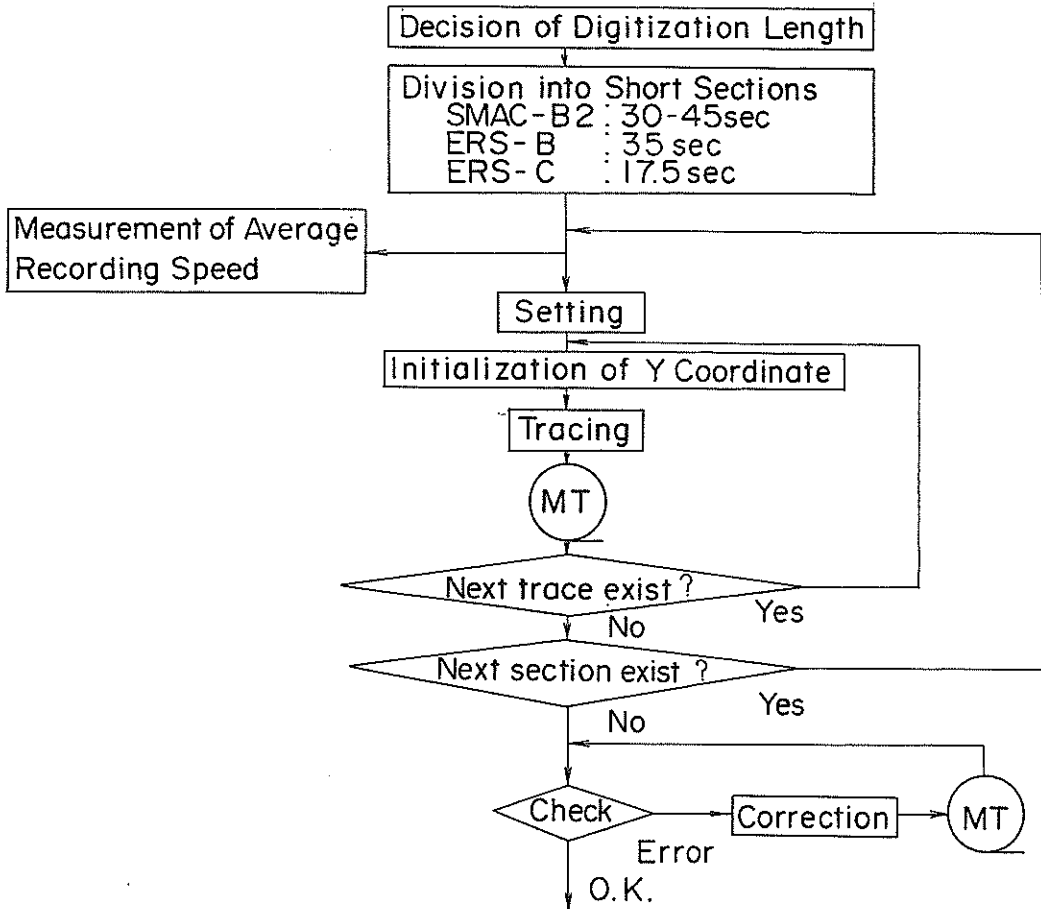


Figure 22 Digitization procedure

two points are made to coincide with each other.

-Initialization of transverse coordinate

The origin of vertical coordinate of each sheet is tentatively set in the digitization procedure because Sectional Base-Line Location described later is to be applied in the standard data processing. Transverse coordinate of a first point to be digitized is usually set to zero.

-Tracing

The traces are digitized by an operator in the way described in the preceding section. Three components of accelerations, two fixed traces, and three arc traces are digitized at the intervals of 0.1 mm along horizontal axis. The intervals are almost equivalent to 0.001 second. Because accelerations are recorded in a cylindrical coordinate system, the digitized amplitude values do not correspond to equal time intervals.

-Recording of Digitized Data

Digitized data in the memory of the computer are recorded in the magnetic disk with such data as record number, component, station, date and time of the earthquake, time intervals, etc.

b) ERS-B, -C and -D accelerograph

The records by the ERS-B, -C and -D accelerograph consist of recorded accelerations, fixed traces and timing marks. The fixed traces are recorded by light beams reflected from fixed mirrors attached to the oscillograph frame. They are parallel lines at intervals of 2 mm drawn in the whole breadth of the recording paper. The recorded accelerations and one of the fixed traces located in the center of the oscillogram are digitized. The record to be digitized is divided into some sections because of the limitation of the digitizer table. Length of each section is about 70 cm, which corresponds to about 35 seconds on a record by the ERS-B accelerograph and about 17.5 seconds on a record by the ERS-C and -D accelerograph.

Procedure of setting of a record by the ERS-B, -C and -D accelerograph and the initialization of transverse (vertical) coordinate is similar to that for a record by the SMAC-B2 accelerograph. The record is digitized by an operator in the way described in the preceding section. The accelerations are digitized at intervals of 0.1 mm, which corresponds to 0.005 second on a record by the ERS-B accelerograph and about 0.0025 second on a record by the ERS-C and D accelerograph. The fixed trace is digitized at intervals of about 5 cm, which corresponds to 2.5 seconds on a record by the ERS-B accelerograph and 1.25 seconds on a record by the ERS-C and -D accelerograph. Then the digitized data of the fixed trace are obtained by linear interpolation at intervals of 0.1 mm. The digital unit in the amplitude is 0.1 mm, which corresponds to about 0.1 Gal ( $=\text{cm}/\text{sec}^2$ ) on a record by the ERS-B accelerograph and about 0.2 Gal or about 1.0 Gal on a record by the ERS-C and -D accelerograph. In the case of the ERS-C and -D accelerographs, sensitivities of the galvanometers are calibrated for each recording with a calibration signal before resetting paper drive.

Timing marks of the records by the ERS-C and -D accelerograph, which are pulses at

intervals of 0.1 second generated by a crystal timer, are used only to measure the average recording speed because fluctuation of the timing marks is expected as small as that of the digital unit of the digitizer (0.1 mm) according to the results of the tests of the ERS-C and -D accelerographs<sup>40)</sup>. In the case of a record by the ERS-B accelerograph, timing marks are not used because accuracy of the timer depends on that of the frequency of the power supply which consists of batteries and a DC-AC inverter.

## 5. Standard Data Processing

The procedure for the standard data processing, which is shown in Figure 23 and described here, has been applied for records obtained since 1976, although the correction for start up of recording paper drive of the SMAC-B2 accelerograph was slightly modified for the improvement of the accelerograph<sup>40)</sup>. The acceleration processed through the standard data processing will be called '*Original Acceleration*' hereafter.

Standard data processing for a record by the SMAC-B2 accelerograph is performed under following procedures;

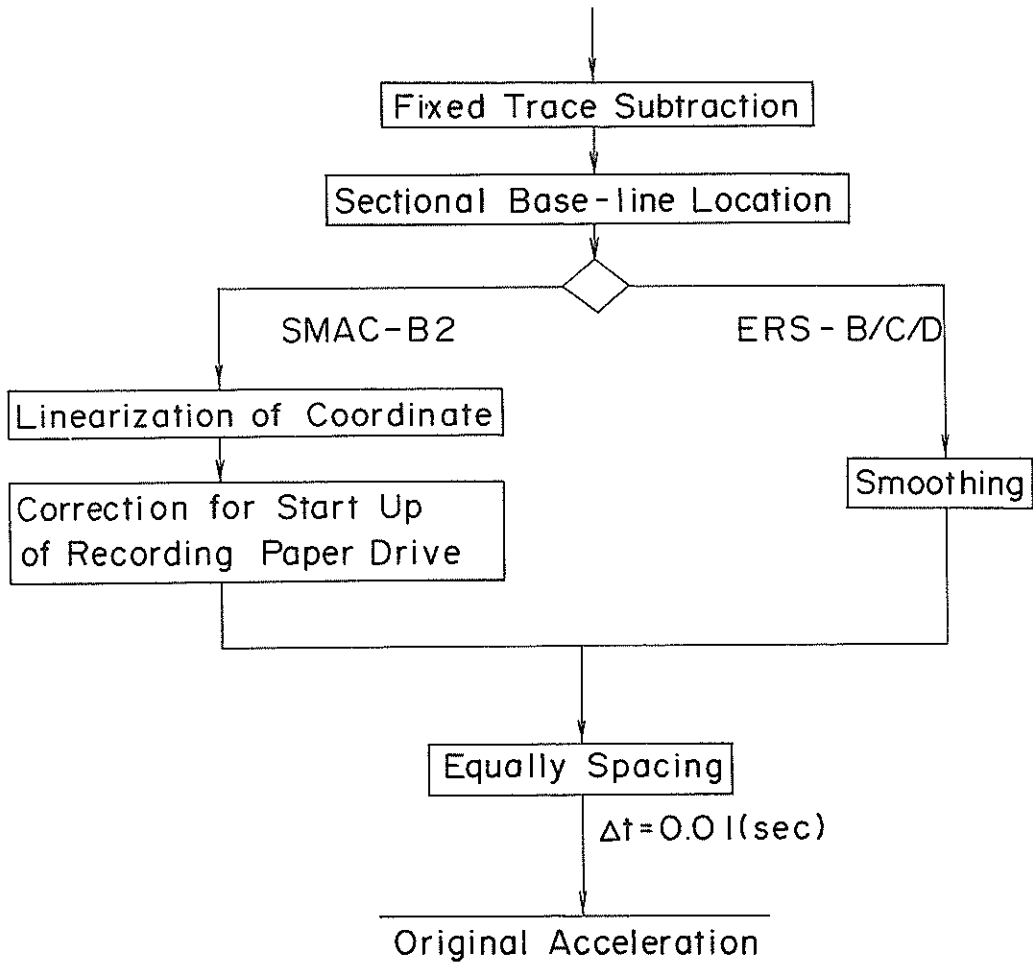


Figure 23 Procedure of standard data processing

- (1) Fixed Trace Subtraction
- (2) Sectional Base-line Location
- (3) Linearization of Coordinate
- (4) Correction for Start up of Recording Paper Drive
- (6) Equal Spacing

Standard data processing for a record by the ERS-B, -C and -D accelerograph is performed under following procedures;

- (1) Fixed Trace Subtraction
- (2) Sectional Base-line Location
- (5) Smoothing
- (6) Equal Spacing

Standard data processing for the records by the ERS-F and -G accelerograph are described in item (7). Each correction procedure is described briefly as follows.

(1) Fixed Trace Subtraction

This correction is applied in order to eliminate the following errors.

- i) errors caused by the transverse motion of recording paper in the drive mechanism of the accelerograph
- ii) systematic errors caused by an imperfect transverse moving mechanism of the digitizer cross-hair system
- iii) errors of sectional rotation of the record on the digitizer table at the setting

The systematic errors of the digitizer cross-hair system were found to be negligible according to the tests with a straight line made of a stretched steel wire and a stretched gut.

Digitized fixed traces are smoothed by a weighted running average scheme before subtracted from the accelerogram. The weight function is defined as follows;

$$w(t) = \begin{cases} \Delta t \sqrt{\alpha/\pi} \exp(-\alpha t^2) & \text{if } |t| \leq t_0 \\ 0 & \text{otherwise} \end{cases} \dots\dots\dots (1)$$

where  $\Delta t$  is time interval,  $\alpha = (\pi/2)^2$  and  $t_0 = \sqrt{5/\alpha} = 1.42(s)$

At both ends of a section for digitization,  $\alpha$  and  $t_0$  in Eq.(1) are redefined by  $\alpha = 5/S^2$  and  $t_0 = S$ , where  $S(s)$  is the distance from the end of a section. This weighted running average corresponds to low pass filter of the cut off frequency of about 0.5Hz. The smoothed fixed traces are subtracted from the accelerogram. In the case of a record by the SMAC-B2 accelerographs, subtraction is made as follows;

- An upper trace is corrected by an upper fixed trace,
- A lower trace is corrected by a lower fixed trace and
- A center trace is corrected by an average of an upper and a lower fixed traces.



In the case of records by the ERS-B, -C and D accelerograph, one fixed trace is subtracted from all the components of an accelerogram.

(2) Sectional Base-line Location

As described previously, base-line is arbitrarily inserted for each section by the initialization of transverse coordinate. Sectional translation brings mainly low frequency errors into the accelerogram and produces an natural response of a low cut filter for integration around a point of junction of digitized sections. Base-line is located so as to make an ideal average of acceleration over almost infinite length zero. On the sectional base-line location, the authors assume that low frequency components up to about  $1/T$ , where  $T$  is the minimum length of sections, is almost none if calculation of spectrum is done over the infinite length for the accelerogram which have been corrected by the fixed trace subtraction and which have an ideal true base-line for each section. Based on the detailed study of the base-line location in the frequency space, the base-line is located sectionally so as to make a weighted average of each sectional acceleration zero. The weight function is defined by

$$u(t) = \Delta t \sqrt{\beta/\pi} \exp(-\beta t^2) \dots\dots\dots (2)$$

where  $\Delta t$  is time interval,  $\beta=20/T^2$  and  $T(s)$  is length of each section

The expected error of the location is almost proportional to the quantities of low frequency components up to about  $1/T(Hz)$ . Because the authors do not have enough space to describe the detailed study, the authors introduce an example calculation to illustrate the difference between the proposed base-line location and the base-line location of least square fit scheme for each section. A sine wave generated by a computer of 100 Gal, 5 Hz and 5000 data with time intervals of 0.01 second is divided into two sections; one section is the first 2510 data and the other is the last 2490 data, which are looked upon as a sectionally digitized accelerogram. Sectional base-lines are located by the two method. Displacements are calculated from the two accelerations by the fixed filter method described later and a portion of the results including the junction of two sections are shown in **Figure 24** and **Figure 25**, respectively. The time of 10.1 seconds is the junction in these figures. These figures indicate that the proposed base-line location is much better in this case because true displacement is a sine wave.

(3) Linearization of Coordinate

This correction is applied to a record by the SMAC-B2 accelerograph to obtain a corrected longitudinal ( $X$ ) coordinate of each datum. Transverse ( $Y$ ) coordinate of the pivot of the recording pen is calculated from the digitized arc trace as shown in **Figure 26**. Let  $r(mm)$  denotes the radius of the arc which is the length of the arm of the recording pen,  $y(mm)$  denotes  $Y$  coordinate of a point whose  $X$  coordinate is to be corrected,  $a(mm)$  denotes  $Y$  coordinate of the center of the arc which is the pivot of the pen and  $e$  denotes error of  $X$  coordinate of the point to be corrected, then we have the following equation.

$$e = r - \sqrt{r^2 - (y - a)^2} \dots\dots\dots (3)$$

Although the arc trace is digitized with arbitrarily determined base-line, the linearization of coordinate is uniformly performed because  $(y - a)$  in the equation remains constant for any base-line.  $a(mm)$  in the equation will be set to zero if arc traces are accidentally not drawn or length of the arc trace is short which means the case the maximum difference of  $X$  coordinates of the arc trace is less than 0.5 mm.

(4) Correction for start up of recording paper drive

The variation of recording paper speed of the SMAC-B2 accelerograph is represented by the following equation which is based on the tests conducted at the Laboratory shown in Figure 27.

$$\nu = \begin{cases} [1 - 1/b^2(t - t_0)^2] \cdot \nu_s & \text{if } 0 \leq t \leq t_0 \\ \nu_s & \text{if } t_0 < t \end{cases} \dots\dots\dots (4)$$

- where  $\nu$  : paper speed at time  $t$  (cm/s)
- $\nu_s$ : paper speed after reaching constant speed(cm/s)
- $t$  : time after triggering (s)
- $t_0$  : constant (s)
- $b$  : constant (s)

If  $t_0$  and  $b$  are given, the correction for the start up of recording paper drive is simple problem. For the correction of the digitized records in the preceding annual report,  $t_0=2.0(s)$  and  $b=2.0(s)$  were used. After the annual report had been published, it was found that more appropriate correction would be possible with a slight modification of  $t_0$  value. For the correction of the most of the digitized records in this report,  $t_0=1.9(s)$  is used.

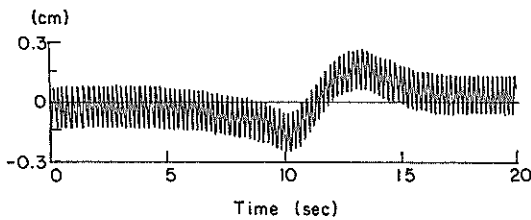


Figure 24 Integrated displacement from the acceleration record with sectionally base-line by a least square fit scheme

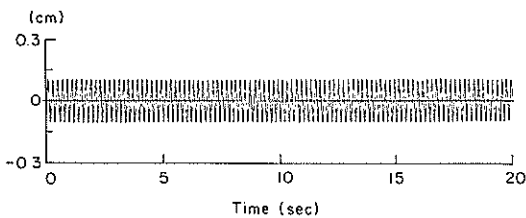


Figure 25 Integrated displacement from the acceleration record with sectionally located base-lines by the proposed method

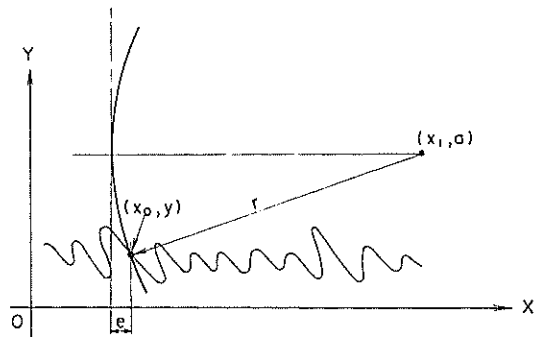


Figure 26 Linearization of coordinate

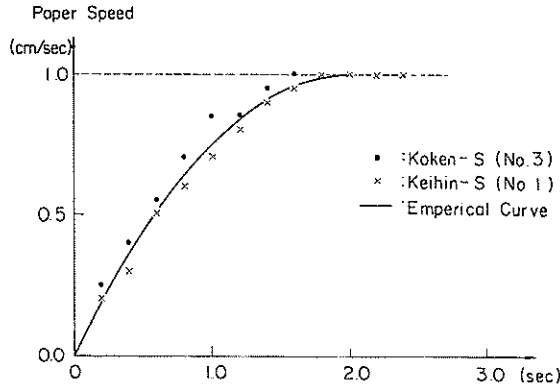


Figure 27 Variable recording speed on start up of recording paper drive

(5) Smoothing

Smoothing is applied to a record by the ERS-B, -C and -D accelerograph. A record by the ERS-B, -C and -D accelerograph is digitized at intervals of 0.1 mm which correspond to about 0.005 second on a record by the ERS-B accelerograph and corresponds to about 0.0025 second on a record by the ERS-C and -D accelerograph. Frequency components higher than about 50 Hz are eliminated because there are almost no significant components of seismic acceleration over 50 Hz for the most of the record obtained by the ERS-B, -C and -D accelerograph so far. The weight function is defined by

$$g(t) = \begin{cases} \Delta t \cdot (f_0 + f_1) & \text{if } t = 0 \\ \frac{2\Delta t}{f_1 - f_0} \cdot \frac{\cos(2\pi f_0 t) - \cos(2\pi f_1 t)}{(2\pi t)^2} & \text{if } 0 < |t| \leq 0.5 \\ 0 & \text{otherwise} \end{cases} \quad \dots\dots\dots (5)$$

where  $\Delta t$  is time interval,  $f_0=45(\text{Hz})$  and  $f_1=55(\text{Hz})$

The filter corresponding to this weighted running average, which is shown in Figure 28, is approximately expressed as follows. Errors of the approximation are less than 0.3 %.

$$G(f) = \begin{cases} 1 & \text{if } |f| \leq f_0 \\ \frac{f_1 - |f|}{f_1 - f_0} & \text{if } f_0 < |f| \leq f_1 \\ 0 & \text{if } f_1 < |f| \end{cases} \quad \dots\dots\dots (6)$$

where  $f_0=45(\text{Hz})$  and  $f_1=55(\text{Hz})$

(6) Equal Spacing

Data are equally spaced at intervals of 0.01 second by means of linear interpolation. A record by the SMAC-B2 accelerograph is digitized at intervals of 0.1 mm and is processed through the linearization of coordinate. The data processed through the linearization of coordinate are unequally spaced data, whose interval of data are longer than 0.01 second on

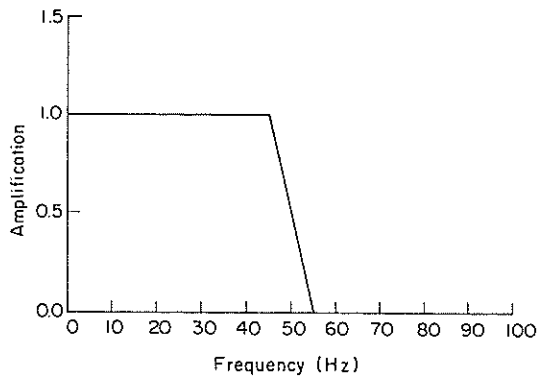


Figure 28 Filter for the smoothing

portions of accelerogram where absolute value of acceleration decreases and intervals of data are shorter than 0.01 second elsewhere.

A record by the ERS-B, -C and -D accelerograph is digitized at intervals of 0.1 mm, which corresponds to about 0.005 second on a record by the ERS-B accelerograph and about 0.0025 second on a record by the ERS-C and -D accelerograph. There is no possibility of aliasing by the equal spacing at the interval of 0.01 seconds because their high frequency components over 50 Hz are eliminated by the smoothing. High density of sampling at digitization enables us to separate high frequency components which are possibly contaminated by digitization errors and assures us much accuracy of the interpolation.

(7) Processing for the records by the ERS-F and -G accelerograph

Standard data processing and preliminary analyses described later for the records by the ERS-F and -G accelerograph are almost the same as those by ERS-B, -C and -D accelerograph. The differences are as follows;

- Overall base-line correction is applied for the data at the standard data processing.
- No smoothing is applied for the data at the standard data processing.
- As an instrument correction at the preliminary analyses, correction for the phase is applied but no correction is applied for the amplitude at the preliminary analyses.
- Low pass filter with cut-off frequency of 25 Hz and roll-off frequency of 40 Hz are applied by using a digital filter of cosine shape in frequency domain at the preliminary analyses.
- As the high pass filtering at the preliminary analyses, parameter E for the Variable Filter in Eq.(20), which is to be described later, is determined by the following equation;

$$E = ( p \cdot 0.001 ) \cdot 0.02236 \dots\dots\dots (7)$$

in which  $p (=1000 \text{ Gal}/2'')$  is the sensitivity of the ERS-F and -G accelerograph.

The factors in Eq.(7) was obtained by the study on the noise level obtained by the power spectra of the noise under the conditions with connectors of signal conditioner in short circuit.

## 6. Preliminary Analyses

The Standard procedures of the preliminary analyses described here have been applied for records obtained since 1976<sup>(20,40)</sup>. The standard procedures of preliminary analyses consist of filtering for instrument correction, filtering for correction of low or high frequency components, integration, calculation of response spectra and Fourier spectra. The flow of the preliminary analyses is shown in Figure 29.

### (1) Methods of Correction and Integration

Instrument correction, filtering, integration are applied in frequency domain. FFT is applied for the accelerogram which is extended with a section of zero outside the digitized portion in order to avoid link effect. The length of section of zero  $L$  (s) is determined so as to meet the following condition.

$$L > \max [ 2/3T, 10.0 ] \quad \dots\dots\dots (8)$$

where  $T$  (s) is the minimum length of sections made by the division of an accelerogram for the digitization. This condition is based on the examination of impulse responses of the high pass filters for integration to be described later. Length of the section of zero  $L$  is decided so as to make calculation time of FFT short as much as possible in the given memory size of the computer.

### (2) Filters for Instrument Correction and Supplementary Filter

#### a) Filters for a record by the SMAC-B2 accelerograph

The filter for instrument correction  $A_s(f)$  is defined by the inverse of the frequency characteristics of the transducer of the SMAC-B2 accelerograph as follows.

$$A_s(f) = 1 - \left(\frac{f}{f_s}\right)^2 + 2h_s\left(\frac{f}{f_s}\right) i \quad \dots\dots\dots (9)$$

where  $f_s = 1/0.14 = 7.1(\text{Hz})$  and  $h_s = 1.0$

The supplementary filter  $B_s(f)$  is defined by

$$B_s(f) = \begin{cases} 1 & \text{if } |f| \leq f_0 \\ \left[ 1 + (|A_s(f)| - 1) \exp\left(-\frac{(|f| - f_0)^2}{20}\right) \right] \frac{1}{|A_s(f)|} & \text{otherwise} \end{cases} \quad \dots\dots(10)$$

where  $f_0 = 10(\text{Hz})$

The supplementary filter is designed to suppress high frequency digitization noise and at the same time preserve high frequency components of an accelerogram in order to lessen an abnormal response of the filter to discontinuities at both ends of digitized portion of the accelerogram. The filter for instrument correction  $A_s(f)$  and the supplementary filter  $B_s(f)$

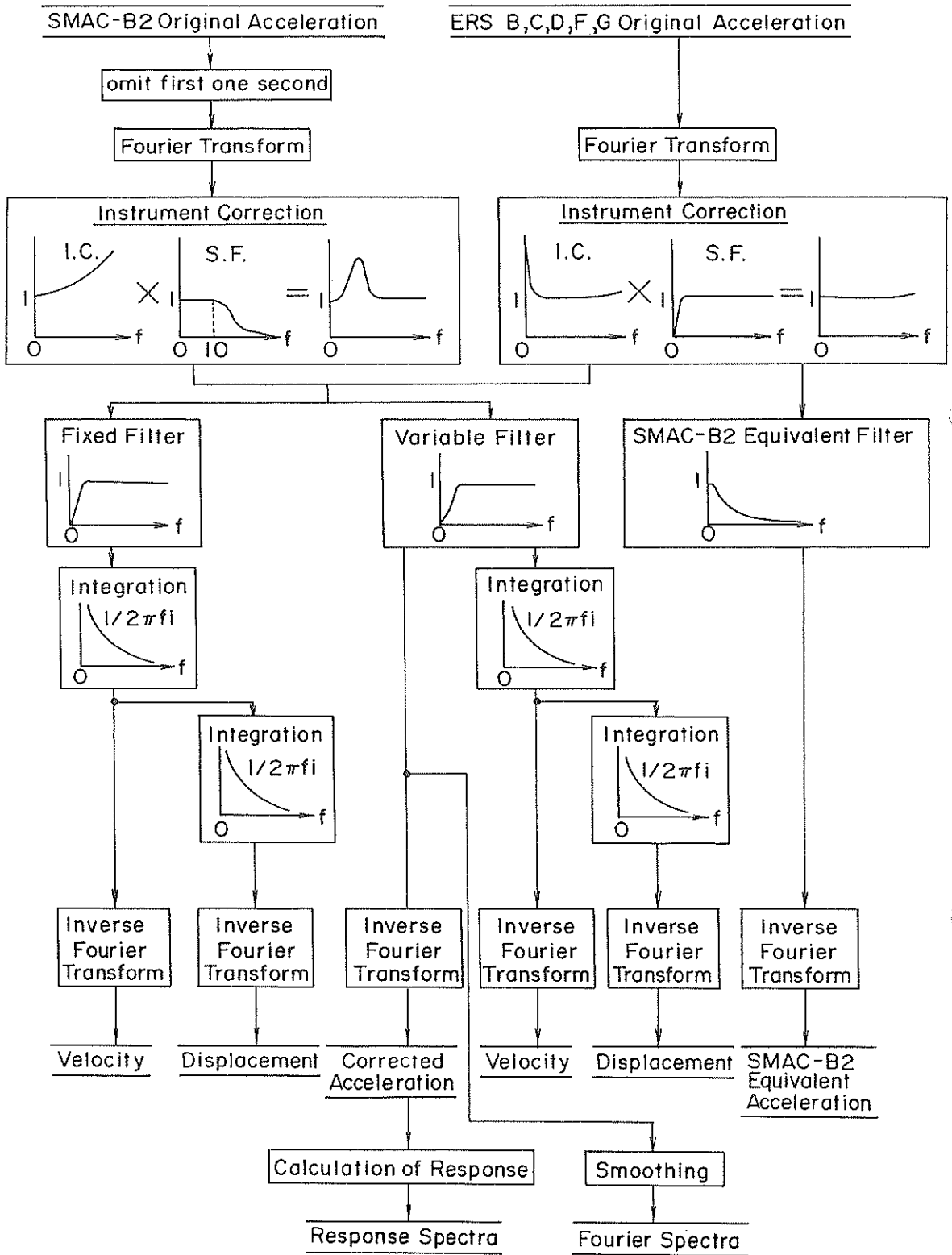


Figure 29 Procedure of preliminary analyses

are shown in **Figure 30** and **Figure 31**, respectively. Combined filter by  $A_s(f)$  and  $B_s(f)$ , which is shown in **Figure 32**, is applied for overall instrument correction for records by the SMAC-B2 accelerograph.

b) Filters for a record by the ERS-B, -C and -D accelerograph

The filter for the instrument correction  $A_s(f)$  is defined by following equations;

$$A_s(f) = A_p(f) \cdot A_G(f) \quad \dots\dots\dots (11)$$

$$A_p(f) = 1 + \frac{i}{2h_p} \left( \frac{f}{f_p} - \frac{f_p}{f} \right) \quad \dots\dots\dots (12)$$

$$A_G(f) = 1 - \left( \frac{f}{f_G} \right)^2 + 2h_G \left( \frac{f}{f_G} \right) i \quad \dots\dots\dots (13)$$

where for a record by the ERS-B accelerograph

$$f_p = 2.0 \text{ (Hz)}, h_p = 17, f_G = 100 \text{ (Hz)} \text{ and } h_G = 0.7$$

for a record by the ERS-C accelerograph

$$f_p = 3.0 \text{ (Hz)}, h_p = 17, f_G = 270 \text{ (Hz)} \text{ and } h_G = 0.7$$

for a record by the ERS-D accelerograph

$$f_p = 5.0 \text{ (Hz)}, h_p = 10, f_G = 100 \text{ (Hz)} \text{ and } h_G = 0.7$$

In the above equations,  $1/A_p(f)$  means frequency characteristics of the pick up of the accelerograph and  $1/A_G(f)$  mean those of the galvanometer. Filters for instrument correction  $A_s(f)$  are shown in **Figure 33** for 3 types of accelerograph.

The supplementary filter  $B_s(f)$  is defined by

$$B_s(f) = \begin{cases} 1 / |A_p(f)| & \text{if } |f| \leq f_p \\ 1 & \text{otherwise} \end{cases} \quad \dots\dots\dots (14)$$

where  $A_p(f)$  : Filter for the instrument correction of the pick up

$f_p$  : Characteristic frequency of the pick up of each accelerograph

The supplementary filter is designed to suppress low frequency digitization errors. The supplementary filters  $B_s(f)$  are shown in **Figure 34**. For overall instrument correction of records obtained by ERS-B, -C and -D accelerograph, combined filters by  $A_s(f)$  and  $B_s(f)$ , which is shown in **Figure 35**, are applied.

c) Filters for a record by the ERS-F and -G accelerograph

As mentioned earlier, correction for the frequency characteristics of phase, shown in **Figure 14 (b)**, is only applied for the data as a instrument correction and no correction is applied for the amplitude. As for the amplitude, however, components in high frequency range is cut off by the following equations because there is no significant information found in high frequency range so far.

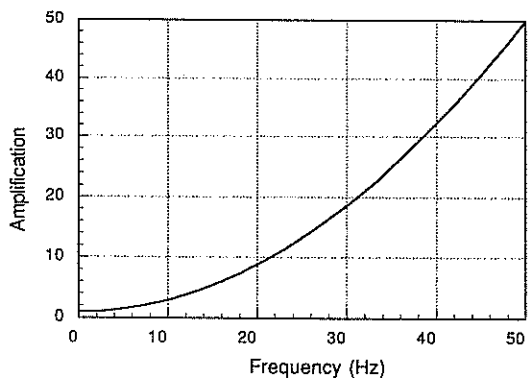


Figure 30 The filter for instrument correction for records by the SMAC-B2 accelerograph

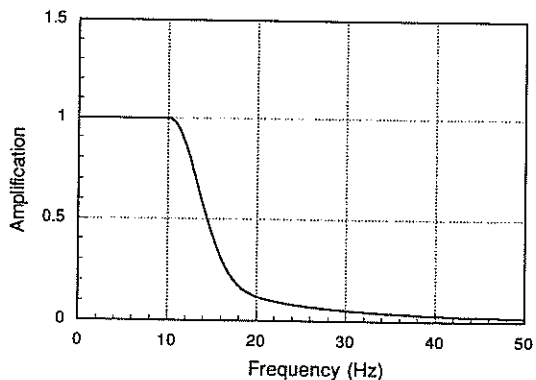


Figure 31 The supplementary filter for records by the SMAC-B2 accelerograph

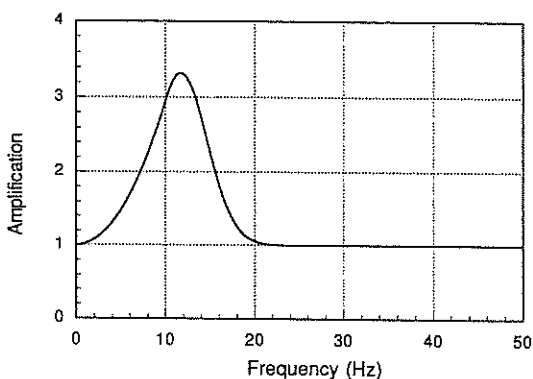


Figure 32 The combined filter for records by the SMAC-B2 accelerograph

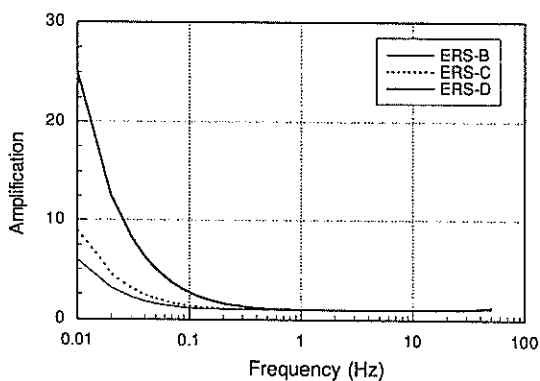


Figure 33 The filter for instrument correction for records by the ERS-B,-C and -D accelerograph

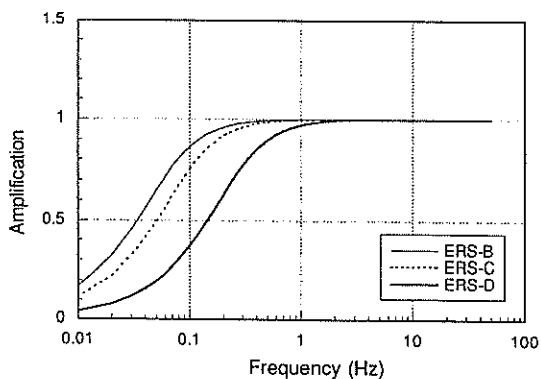


Figure 34 The supplementary filter for records by the ERS-B,-C and -D and accelerograph

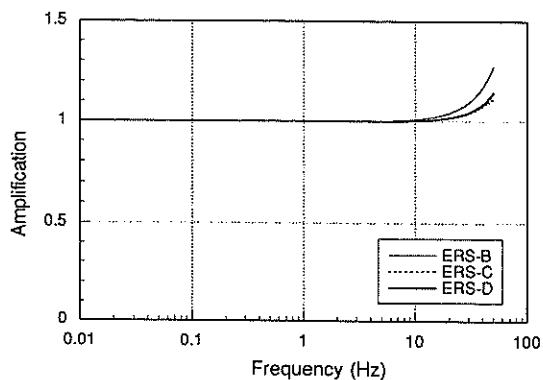


Figure 35 The combined filter for records by the ERS-B,-C and-D accelerograph



$$A_s(f) = \begin{cases} 1 & \text{if } |f| \leq f_1 \\ \frac{1}{2} \left[ \cos\left(\pi \frac{f - f_1}{f_2 - f_1}\right) + 1 \right] & \text{if } f_1 < |f| \leq f_2 \\ 0 & \text{if } |f| > f_2 \end{cases} \dots\dots\dots (15)$$

where  $f_1=25(\text{Hz})$  and  $f_2=40(\text{Hz})$

(3) SMAC-B2 Equivalent Filter

Frequency characteristics of SMAC-B2 accelerograph are different from those of ERS type accelerograph. In order to make it easy to compare the accelerograms by these different types of accelerographs, a filter defined in the following equation is applied for records by the ERS type accelerograph.

$$S(f) = \frac{1}{1 - \left(\frac{f}{f_s}\right)^2 + 2h_s\left(\frac{f}{f_s}\right) i} \dots\dots\dots (16)$$

where  $f_s= 1/0.14 = 7.1(\text{Hz})$  and  $h_s=1.0$

This filter is shown in Figure 36 and has the same frequency characteristics as that of the SMAC-B2 accelerograph. The filter is applied for the acceleration records by the ERS type accelerograph processed through the filter for instrument correction and the supplementary filter. Acceleration processed through this filter will be called '*SMAC-B2 Equivalent Acceleration*' in this report. This acceleration can be compared with the '*Original Acceleration*' by the SMAC-B2 accelerograph. Although acceleration processed by this filter can not represent accurate acceleration and its maximum acceleration will be smaller than that of a record through instrument correction especially in high frequency range, all the accelerograms by this procedure can be directly compared with each other.

(4) High pass filters for integration

Processed through the preliminary correction procedure, a digitized accelerogram is expected to have only such errors as random digitization errors and errors of sectional base-line location. Errors of sectional base-line location affect mainly to frequency components lower than about  $1/T$ , where  $T$  is the length of a section of an accelerogram divided for digitization.

As a result of the examination of random digitization errors, frequency characteristics of Signal-to-Noise (SN) ratio calculated for each frequency are found to be similar to those of digitized acceleration. In other words, ratio of digitized acceleration to digitization errors calculated for each frequency is large if the corresponding frequency components of the digitized acceleration is large. For the frequency components higher than about  $1/T$ , the result of the examination of digitization errors may remain valid. The result implies that SN ratio of a frequency component varies with the frequency characteristics of accelerogram

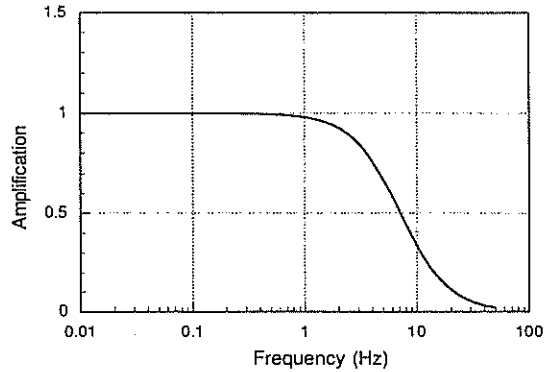


Figure 36 The SMAC-B2 equivalent filter

to be digitized.

The cut-off frequency of a high pass filter for integration of a digitized accelerogram should be varied in accordance with frequency characteristics of an accelerogram from such a point of view that SN ratio should be kept higher than some constant level for every frequency component and at the same time the physically real signals should be preserved as much as possible. On the other hand, cut-off frequency of the filter should be kept constant for any accelerograms from such a point of view that the preserved real seismic signals should be filtered out by the same filter for the purpose of comparison between two or more velocities or displacements even if integrated errors are more or less included in them.

In order to satisfy a wide range of applications of the strong-motion records from the various view points, the authors proposed two methods of correction of an accelerogram to obtain integrated velocities and displacements. One is a method with a fixed filter and the other is a method with a variable filter.

a) Fixed filter

This filter is defined by the following equation.

$$H_i(f) = \frac{1}{1 - \left(\frac{f_0}{f}\right)^2 + 2h\left(\frac{f_0}{f}\right)i} \cdot \frac{1}{\sqrt{1 + \left(\frac{f_1}{f}\right)^2}} \quad \dots\dots\dots (17)$$

where  $f_0=1/6(\text{Hz})$ ,  $h=0.552$  and  $f_1=0.1(\text{Hz})$

This filter is designed to make it easy to compare the integrated displacement with records obtained by the one magnification strong-motion seismometer ( $T=6$  seconds and  $h=0.552$ ) deployed by the Japan Meteorological Agency (JMA). Cut-off frequency (3 dB down) of this filter is 0.154 Hz. This filter is shown in Figure 37.

b) Variable filter

This filter is defined by the following equation;

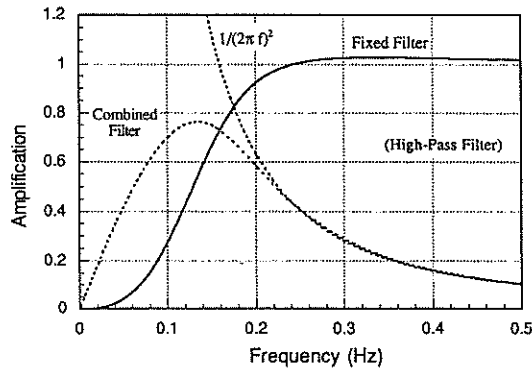


Figure 37 The Fixed filter and the combined filter for double integral

$$H_i(f) = [ 1 - \exp\{ -(\frac{f}{f_c})^2 \} ]^2 \dots\dots\dots (18)$$

The parameter  $f_c$  in the equation varies so as to make  $\sigma$  equal to  $E$ , where  $\sigma$  is defined by

$$\sigma^2 = \frac{1}{Mc} \int_{-\infty}^{\infty} |X(f)|^2 \cdot [ 1 - \exp\{ -(fT)^2 \} ]^2 \cdot [ 1 - H_i(f) ]^2 df \dots\dots (19)$$

where  $M$  is the length of whole digitized portion,

$T$  is the minimum length of a section of accelerogram,

$X(f)$  is Fourier Transform of the original acceleration and

$E$  is the value listed below;

for a record by the SMAC-B2 accelerograph

$$E = 0.5 \text{ (Gal)}$$

for a record by the ERS-B, -C and -D accelerograph

$$E = p \cdot 0.05 \text{ (Gal)}$$

where  $p$  (Gal/mm) is the sensitivity of the ERS-B, -C and -D accelerograph

for a record by the ERS-F and -G accelerograph

$$E = ( p \cdot 0.001 ) \cdot 0.02236 \text{ (Gal)}$$

where  $p$  (1000 Gal/2") is the sensitivity of the ERS-F and -G accelerograph

Cut-off frequency (3 dB down) of this filter is  $1.36f_c$ . This filter is shown in Figure 38 and Figure 39.

Decision procedure of  $f_c$  is illustrated in Figure 40.  $f_c$  is fundamentally determined so as to filter out some constant amount of low frequency components of an accelerogram higher than about  $1/T$ . The greater low frequency components of an accelerogram are, the lower  $f_c$  should be. Because the greater low frequency components of an accelerogram are, the higher SN ratio of these components are. Low frequency components lower than about

$1/T$  are eliminated for the decision procedure of  $f_c$  because they are possible to be contaminated by the errors at sectional base-line location and the relation between the SN ratio and the quantity of a frequency component of an accelerogram is afraid no longer remaining valid.

This decision procedure of  $f_c$  is, however, a compromise between such a view point as to keep SN ratio over some constant level for every frequency component and keep  $f_c$  to be a constant. The reason why such a compromised method is proposed is that the compromise makes decision procedure of  $f_c$  more stable against possible fluctuation of the relation between quantity of a frequency component of an accelerogram and the SN ratio. The relation may, to some extent, depend on frequency characteristics of an accelerogram to be digitized, digitized length of an accelerogram non-stationarity of an accelerogram, etc. and the relation itself if valid only in a stochastic sense.

The reason why a fixed low pass supplementary filter is proposed instead of a variable one for a record by the SMAC-B2 accelerograph is that the possible fluctuation of the relation is expected to be greater for high frequency components. Slope of both of the high pass filters proposed here are designed to be mild in order to lessen an artificial predominant frequency component around the cut-off frequency.

#### (5) Outputs of Preliminary Analyses

##### a) Acceleration, Velocity and Displacement

A portion of first one second of the original acceleration of the SMAC-B2 accelerograph is omitted for the instrument correction and the integration because even a slight difference of start up of recording paper drive between SMAC-B2 accelerographs and even a small difference of selection of starting point of digitization may sensitively affect accuracy of the portion of first short section processed through the correction of start up of the recording paper drive. In the case of the original acceleration of the ERS type accelerograph, no data is omitted. These accelerations are processed by the methods of correction and integration described previously. The calculated results are shown in figures and tables as results of preliminary analyses shown in the later part of this report.

In this report, '*Corrected Acceleration*' denotes acceleration with instrument correction processed through the variable filter and '*SMAC-B2 Equivalent Acceleration*' denotes acceleration obtained by the SMAC-B2 equivalent filter as shown in **Figure 29**. Integrated veloci-

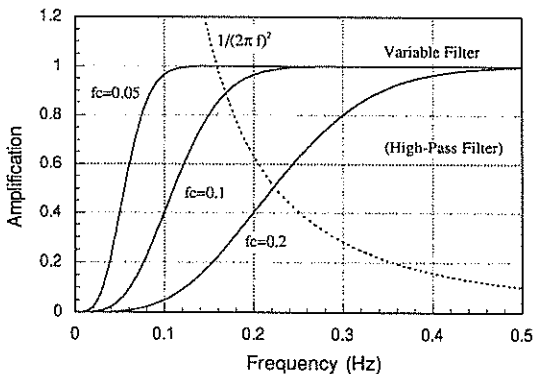


Figure 38 The variable filter and double integral

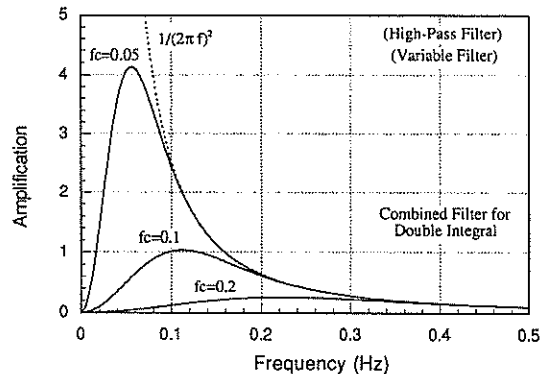


Figure 39 The combined filter of the variable filter for double integral

ties and displacements are calculated with both the fixed filter and the variable filter. The parameter  $f_c$  for cut-off frequency of the variable filter is shown in the tables on the results of preliminary analyses.

The corrected acceleration of the different types of accelerographs can not necessarily be compared with each other because the difference of the supplementary filters produces difference mainly on the high frequency components over 10 Hz of the filtered accelerations. Instead of comparison of the corrected accelerations, SMAC-B2 equivalent acceleration can be freely compared with the original acceleration of the SMAC-B2 accelerograph except for the low frequency components lower than about 0.1 Hz.

#### b) Response Spectra

Response spectra are calculated from the corrected acceleration, which is an acceleration with instrument correction processed through the variable filter as described previously. The response spectra in the previous annual reports before 1968 were calculated from the digitized records by a digital computer using Runge-Kuta-Gill method to integrate numerically the equation of motion of the oscillator. The response spectra in the present report are calculated with a step by step calculation of the exact solution to the governing differential equation<sup>(4)</sup>. No significant difference was seen in the results calculated by the both methods, according to the trial calculations.

The time interval of each step of the calculation is 0.01 second for the oscillators of natural periods longer than 0.2 second. For the oscillators of shorter periods, the small time intervals are selected to that one cycle of the undamped free oscillation of the oscillator is covered at least by 20 steps of the numerical calculation to maintain the necessary accuracy. In these calculation, the digitized records at smaller time intervals are made by means of the interpolation in the computer.

To calculate response spectra, entire length of the record is not necessary and the last part of the record after the maximum response have appeared is in effect meaningless in the calculation. Besides, the shorter record is more preferable from view point of the calculation time. On some long records, their beginning parts of small acceleration are not used in the calculation so far as it is thought that the neglected parts do not affect the results of the calculation. In this report, the whole record length is adopted as length of calculating response spectra for the records less than 60 seconds. For the records of which time duration is more than 60 seconds, the length of 60 seconds which includes portions of main strong-motion is adopted as length of calculation. Acceleration ratio, absolute acceleration response, relative velocity response and relative displacement response are presented in this report as results of response spectra of 0%, 1% and 5% damping.

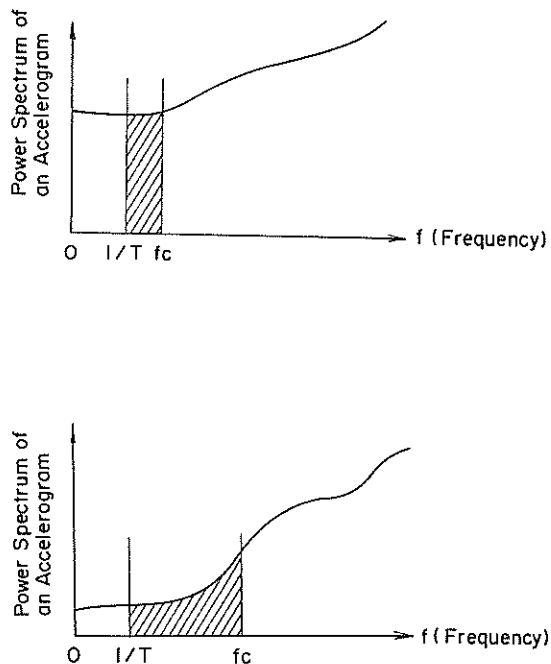


Figure 40 Simplified illustration of decision procedure of  $f_c$

As response spectra of the period longer than about  $1/f_c$  are influenced by the high pass filter ( $1.36/f_c$  is the period of 3 dB down of the filter; i.e.), calculated response spectra is true if real seismic signals do not exist in the period longer than about  $1/f_c$  and calculated response spectra are smaller than the true value if real seismic signals do exist. In the case of the corrected acceleration by the SMAC-B2 accelerograph, response spectra of the period shorter than about 0.1 sec is also influenced by the low pass filter. Users of the response spectra should be careful about these characteristics of the response spectra calculated for the corrected acceleration and difference between the response spectra for the corrected acceleration and those for the uncorrected acceleration which had been calculated so far.

#### c) Fourier Spectrum

The Fourier spectra are calculated by the FFT from the corrected acceleration. The time length for calculation is identical with the time length for calculating response spectra. The spectra in this report, however, are multiplied by the length of the record for calculation and then smoothed with the Parzen window of 1 Hz band width.

#### d) Loci

The loci of accelerations, velocities and displacements in horizontal plane are included in this report. The records used for plotting loci are corrected accelerations, integrated velocities and displacements processed through the variable filter.

### 7. Summary of Observation

Strong-motion earthquakes and earthquake responses of structures have been observed in the major ports in Japan since 1962. 4390 accelerograms have been obtained by the end of 1992, 4646 accelerograms obtained by the end of 1993 in the network of the Port and Harbour Research Institute. As of December 1993, 87 strong-motion accelerographs have been installed in 56 ports in Japan. 63 accelerographs out of 87 are installed at ground surface, 10 accelerographs are in ground by using bore-hole and the rest (14 accelerographs) are on structures such as quay walls.

This report presents all the records obtained in 1992 and 1993, which are listed in the tables of Strong-Motion Earthquake Observation Results with their maximum accelerations, being classified in accordance with earthquakes. For the records of ground motions with maximum accelerations exceeding 20 Gals ( $=\text{cm}/\text{sec}^2$ ), computer plots of reproduced acceleration are presented. For the records of ground motions with maximum accelerations exceeding 50 Gals, computer plots of reproduced accelerograms, integrated velocities and displacements, response spectra, Fourier spectra and loci of accelerations, velocities and displacements in horizontal plane are also presented.

In Table 8, a statistical summary (total number of records) of the strong-motion observation in the network is given at the end of 1993. In Table 9, record numbers of accelerograms of which digitized records and spectra have been published by the end of 1993 are shown. The number in the parentheses behind each record number shows the number of the Technical Note of the Port and Harbour Research Institute in which the record is presented.

Table 8 Statistical Summary of Records

(December 1993)

Name of Station	Total Number of Records	Number of Records ( $20 \leq \text{Max. Accel.} < 50 \text{Gals}$ )	Number of Records ( $\text{Max. Accel.} \geq 50 \text{Gals}$ )
AKITA-S	34	7	2
AMAGASAKI-G	0	0	0
AMAGASAKI-S*	9	2	0
AOMORI-S	48	16	6
CHIBA-S	92	18	4
HACHINOHE-S*	111	16	5
HACHINOHE-JI-S	17	7	4
HAKODATE-FB	13	1	1
HAKODATE-F	13	1	1
HAKODATE-FR	14	1	1
HAKODATE-M	48	12	6
HANASAKI-M	36	21	7
HANASAKI-F	13	3	2
HIRARA-G	1	0	0
HIRARA-S*	5	1	0
HIROSHIMA-G	2	0	0
HIROSHIMA-S*	9	5	4
HIROSHIMA-JI-S*	5	0	0
HITACHINAKA-F	180	92	27
HOSOSHIMA-S*	54	19	7
HOSOSHIMA-F	9	0	0
ISHIGAKI-G	2	0	0
ISHIGAKI-S*	5	1	0
INAE-S	21	6	0
INAE-SANBASHI-M	20	10	1
INAE-YAITA-M	27	12	2
KAGOSHIMA-G	1	0	0
KAGOSHIMA-S*	26	4	0
KAMAISHI-M	38	16	1
KAMAISHI-MB	37	2	1

(to be continued)

(Table 8 Continued)

(December 1993)

Name of Station	Total Number of Records	Number of Records	
		( $20 \leq \text{Max. Accel.} < 50 \text{Gals}$ )	( $\text{Max. Accel.} \geq 50 \text{Gals}$ )
KANAZAWA-G	0	0	0
KANAZAWA-S*	9	2	1
KASHIMA-S*	32	9	3
KASHIMA-JI-S*	30	6	3
KASHIMA-ZOKAN-S	129	31	10
KAWASAKI-CHI-M*	187	22	2
KAWASAKI-KO-M*	107	28	6
KAWASAKI-FB	36	4	3
KAWASAKI-F	36	8	4
KAWASAKI-FR	36	14	5
KEIHIN-JI-S	133	19	2
KINUURA-S*	8	4	2
KINUURA-JI-S	22	4	0
KOBE-DAI6-S	13	3	0
KOBE-DAI8-S	18	2	1
KOBE-JI-S	15	4	0
KOBE-MAYA-DAI1-M	16	7	2
KOBE-MAYA-DAI2-M	20	7	0
KOBE-MAYA-M	22	4	1
KOCHI-G	0	0	0
KOCHI-S*	21	3	1
KOCHI-JI-S*	13	3	0
KOKEN-G	0	0	0
KOKEN-M*	60	5	0
KOKEN-S	34	5	2
KOMATSUJIMA-G	0	0	0
KOMATSUJIMA-S*	17	2	0
KUSHIRO-G	8	1	1
KUSHIRO-GB	8	0	1
KUSHIRO-S*	50	16	6

(to be continued)



(Table 8 Continued)

(December 1993)

Name of Station	Total Number of Records	Number of Records (20 ≤ Max. Accel. < 50Gals)	Number of Records (Max. Accel. ≥ 50Gals)
KUSHIRO-JI-S*	13	7	3
MATSUYAMA-G	2	2	0
MATSUYAMA-S*	25	4	2
MIKAWA-GB	3	0	0
MIKAWA-G	3	0	0
MINAMATA-M*	3	0	0
MIYAKO-G	14	4	3
MIYAKO-S*	49	28	12
MIYAZAKI-M	49	10	4
MURORAN-G	29	3	2
MURORAN-S*	69	14	6
NAGOYA-ZOKAN-S	24	5	2
NAHA-GB	5	0	0
NAHA-G	5	0	0
NAHA-S*	1	0	0
NAHA-ZOKAN-S*	2	1	0
NAKAGUSUKU-G	1	0	0
NIIGATA-G	3	1	0
NIIGATA-S*	12	1	0
NIIGATA-JI-S*	5	1	0
OFUNATO-S*	21	3	2
OFUNATO-BOCHI-S	69	15	5
OFUNATO-BO-S	113	36	20
OFUNATO-MOUND-M	73	20	5
OITA-G	0	0	0
OITA-S*	13	7	4
OKITSU-S	27	4	0
OMAEZAKI-M	28	2	0
ONAHAMA-S*	67	13	4
ONAHAMA-JI-S	34	25	8

(to be continued)

(Table 8 Continued)

(December 1993)

Name of Station	Total Number of Records	Number of Records ( $20 \leq \text{Max. Accel.} < 50\text{Gals}$ )	Number of Records ( $\text{Max. Accel.} \geq 50\text{Gals}$ )
OSAKA-CHUO-S*	8	1	0
OSAKA-JI-S	11	1	0
OSAKA-MINAMI-S	0	0	0
OTARU-G	5	1	1
OTARU-S*	13	0	0
SAKAIMINATO-G	0	0	0
SAKAIMINATO-S*	0	0	0
SAKAIMINATO-JI-S*	13	6	3
SAKATA-S	54	6	0
SENDAI-M	83	15	3
SENDAI-MB	82	2	0
SHIBUSHI-G	2	0	0
SHIBUSHI-S*	15	0	0
SHIMIZU-KOJYO-S	24	7	3
SHIMIZU-MIHO-S	25	4	1
SHIMI.-SEKITAN-M*	23	11	5
SHIMI.-SEKITAN-S*	10	5	2
SHINAGAWA-M*	1	1	1
SHINAGAWA-MB	88	2	0
SHINAGAWA-S	124	29	8
SHIOGAMA-S*	19	1	0
SHIOGAMA-KOJYO-S	94	17	6
SHIMODA-F	9	1	0
SOMA-S	59	13	6
TAGONOURA-S	59	8	0
TOKACHI-M	100	52	21
TOMAKOMAI-S	32	7	5
TOYAMA-GB	0	0	0
TOYAMA-G	0	0	0
TOYAMA-S*	8	2	2

(to be continued)

(Table 8 Continued)

(December 1993)

Name of Station	Total Number of Records	Number of Records (20 ≤ Max. Accel. < 50Gals)	Number of Records (Max. Accel. ≥ 50Gals)
TSURUGA-G	0	0	0
TSURUGA-S*	33	3	1
URAKAWA-S	114	12	5
WAKA. -GANPEKI-S*	7	2	0
WAKAYAMA-G	10	2	2
WAKAYAMA-S*	41	19	3
WAKAYAMA-JI-S*	12	5	4
WAKA. -SUMIKEN-S*	0	0	0
YAMASHI. -DAI7-M*	81	6	1
YAMASHI. -DAI6-S*	102	31	11
YAMASHITA-HEN-M*	199	19	6
YAMASHITA-FB	50	2	0
YAMASHITA-F	50	12	3
YAMASHITA-FR	50	19	10
YAMASHITA-HEN-S*	119	24	8
YOKKA. -CHITOSE-S	11	5	1
YOKKA. -DAI2-M	20	4	2
YOKKA. -SEKITAN-M	51	10	2
YOKKAICHI-JI-S*	5	2	0
TOTAL	4646	1061	346
ERS	2112	472	147
SMAC	2534	589	199

\* Strong-motion observation of the stations had already been stopped.

Table 9 Summary of Analyzed Record Numbers

(December 1993)

Name of Station	Record Numbers which had been digitized and analyzed (Ref. No.**)				
AKITA-S	S-655(160)	S-1200(319)	S-1567(458)	S-1585(458)	S-1586(458)
AOMORI-S	S-235(80)	S-264(80)	S-304(80)	S-400(80)	S-670(160)
	S-1192(319)	S-1573(458)	S-1592(458)	S-2488(779)	S-2523(780)
	S-2530(780)				
CHIBA-S	S-1195(319)	S-1378(374)	S-1545(487)	S-1884(547)	S-2107(619)
HACHINOHE-S*	S-252(80)	S-310(80)	S-401(80)	S-669(160)	S-857(202)
	S-1202(319)	S-1453(426)	S-1575(458)		
HACHINOHE-JI-S	S-1968(618)	S-2261(676)	S-2486(779)		
HAKODATE-FB	F-508(779)	F-541(780)	F-542(780)	F-544(780)	
HAKODATE-F	F-545(780)	F-546(780)	F-548(780)	F-603(780)	
HAKODATE-FR	F-509(779)	F-549(780)	F-550(780)	F-552(780)	F-604(780)
HAKODATE-M	M-357(374)	M-523(442)	M-630(458)	M-639(458)	M-1444(779)
	M-1472(780)	M-1473(780)	M-1476(780)		
HANASAKI-F	F-478(778)	F-510(779)			
HANASAKI-M	M-106(287)	M-262(338)	M-496(426)	M-887(547)	M-1014(588)
	M-1017(588)				
HIROSHIMA-S*	S-364(98)	S-1306(338)	S-1623(487)		
HITACHINAKA-F	F-12(588)	F-15(588)	F-19(588)	F-34(618)	F-36(618)
	F-43(618)	F-46(618)	F-107(649)	F-174(649)	F-358(705)
	F-384(705)	F-423(727)	F-456(727)	F-483(778)	F-525(779)
HOSOSHIMA-S*	S-213(98)	S-453(100)	S-544(116)	S-545(116)	S-1231(338)
	S-1625(487)	S-1729(503)			
KAMAISHI-M	M-1447(779)				
KAMAISHI-MB	M-1448(779)				
KANAZAWA-S*	S-2506(778)				
KASHIMA-S*	S-196(64)	S-612(136)	S-647(136)		
KASHIMA-JI-S*	S-770(181)	S-813(202)	S-845(202)	S-882(202)	
KASHIMA-ZOKAN-S	S-1206(319)	S-1506(446)	S-1678(519)	S-1867(547)	S-1910(588)
	S-1957(588)	S-2110(619)	S-2196(676)	S-2206(676)	S-2492(779)
KAWASAKI-CHI-M*	M-186(317)	M-220(319)	M-406(374)		
KAWASAKI-FB	F-461(778)				
KAWASAKI-F	F-98(619)	F-123(649)	F-462(778)	F-516(778)	
KAWASAKI-FR	F-463(778)	F-517(778)			
KEIHIN-JI-S	S-1188(319)	S-1390(374)	S-2112(619)		

(to be continued)

(Table 9 Continued)

(December 1993)

Name of Station	Record Numbers which had been digitized and analyzed (Ref. No.**)				
KINUURA-S*	S-480(100)	S-585(136)			
KOBE-MAYA-M	M-704(487)				
KOCHI-S*	S-211(98)				
KOCHI-JI-S*	S-1730(503)				
KOKEN-S	S-1046(317)	S-2106(619)	S-2417(778)		
KOKEN-M*	M-170(317)				
KUSHIRO-G	F-507(779)	F-528(779)			
KUSHIRO-GB	F-506(779)	F-527(779)			
KUSHIRO-S*	S-98(62)	S-369(98)	S-634(136)	S-674(160)	S-733(181)
	S-741(181)				
KUSHIRO-JI-S*	S-1976(618)	S-2171(649)	S-2390(727)		
MATSUYAMA-S*	S-1303(338)	S-1731(503)	S-1624(487)		
MIYAKO-G	F-582(778)	F-584(778)	F-514(779)	F-587(780)	
MIYAKO-S*	S-236(80)	S-271(80)	S-312(80)	S-273(98)	S-420(98)
	S-537(116)	S-1204(319)	S-1104(338)	S-1317(338)	S-1972(618)
	S-2255(676)				
MIYAZAKI-M	M-228(338)	M-877(547)	M-1107(618)		
MURORAN-G	F-505(779)	F-554(780)	F-560(780)	F-568(780)	
MURORAN-S*	S-234(80)	S-241(80)	S-399(80)	S-1425(426)	S-1474(442)
	S-1571(458)	S-1599(458)	S-1979(618)		
NAGOYA-ZOKAN-S	S-1(55)	S-20(55)	S-578(136)		
NIIGATA-S*	S-107(62)				
NIIGATA-JI-S*	S-1203(319)				
OFUNATO-S*	S-140(64)	S-282(98)	S-361(98)		
OFUNATO-BO-S	S-2547(778)				
OFUNATO-BOCHI-S	S-554(116)	S-786(181)	S-1022(287)	S-1210(319)	S-1120(338)
OFUNATO-MOUND-M	M-1493(778)	M-1450(779)			
OITA-S*	S-924(236)	S-1629(487)	S-1734(503)	S-2021(618)	
OKITSU-S	S-1071(317)				
ONAHAMA-S*	S-111(62)	S-1043(287)	S-1191(317)		
ONAHAMA-JI-S	S-1330(338)	S-1505(446)	S-1602(487)	S-1633(487)	S-1946(588)
OTARU-G	F-536(779)	F-538(780)	F-539(780)	F-540(780)	
SAKAIMINATO-JI-S*	S-2248(676)	S-2251(676)	S-2383(727)		
SAKATA-S	S-1568(458)				

(to be continued)

(Table 9 Continued)

(December 1993)

Name of Station	Record Numbers which had been digitized and analyzed (Ref. No.**)					
SENDAI-M	M-1127(618)	M-1498(778)	M-1445(779)			
SENDAI-MB	M-1446(779)					
SHIMIZU-KOJYO-S	S-74(62)	S-1063(317)	S-1064(317)			
SHIMIZU-MIHO-S	S-1066(317)	S-1069(317)				
SHINAGAWA-S	S-192(64)	S-340(98)	S-1394(374)	S-1787(519)	S-1885(547)	
	S-2111(619)	S-2130(649)	S-2419(778)			
SHIOGAMA-S*	S-138(64)					
SHIOGAMA-KOJYO-S	S-782(181)	S-1118(338)	S-1201(319)	S-2006(618)	S-2029(618)	
	S-2551(778)					
SOMA-S	S-1872(547)	S-2001(618)	S-2031(618)	S-2051(618)	S-2096(618)	
	S-2220(676)	S-2487(779)				
TAGONOURA-S	S-1055(317)					
TOKACHI-M	M-125(287)	M-145(287)	M-247(338)	M-260(338)	M-340(338)	
	M-341(374)	M-439(426)	M-521(442)	M-522(442)	M-540(446)	
	M-636(487)	M-703(487)	M-911(547)	M-972(547)	M-1078(618)	
	M-1200(649)	M-1242(649)	M-1383(727)	M-1416(778)	M-1459(778)	
	M-1443(779)					
TOMAKOMAI-S	S-877(202)	S-1418(426)	S-1472(442)	S-1977(618)	S-2491(779)	
	S-2528(780)	S-2531(780)				
TOYAMA-S*	S-1892(547)	S-2502(778)				
TSURUGA-S*	S-1549(487)					
URAKAWA-S	S-1978(618)	S-2186(676)	S-2401(727)	S-2548(778)	S-2490(779)	
WAKAYAMA-G	F-497(778)	F-503(778)				
WAKAYAMA-S*	S-945(236)	S-1028(287)				
WAKAYAMA-JI-S*	S-187(64)	S-265(98)	S-266(98)	S-788(181)		
YAMASHITA-F	F-95(619)	F-168(649)	F-325(676)			
YAMASHITA-HEN-S*	S-412(98)	S-658(160)	S-1058(317)	S-1189(319)	S-1362(374)	
	S-1386(374)	S-1614(487)	S-2113(619)			
YAMASHITA-HEN-M*	M-217(319)	M-403(374)	M-1022(588)	M-1056(588)	M-1183(619)	
	M-1195(649)	M-1226(649)				
YOKKA. -CHITOSE-S	S-577(136)					

\* Strong-motion observation of the stations had already been stopped.

\*\* The numbers correspond to those of the Technical Note of the Port and Harbour Research Institute, in which results of preliminary analysis are presented.

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- 21) Eiichi Kurata, Susumu Iai and Setsuo Noda: Annual Report on Strong-Motion Earthquake Records in Japanese Ports (1986), Technical Note of the Port and Harbour Research Institute, No.588, June 1987.
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- 33) Eiichi Kurata, Setsuo Noda and Toyoshi Higuchi: Strong-Motion Earthquake Records on the 17 December 1987 Chiba-ken-Toho-Oki Earthquake in Port Areas, Technical Note of the Port and Harbour Research Institute, No.619, June 1988.
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## Strong-Motion Earthquake Observation Results (1992)

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

03:46 JAN. 17, 1992

E OFF AOMORI PREF

EPICENTER : 41°29.4'N 141°56.6'E

DEPTH : 74.2KM MAGNITUDE : 5.4

JMA INTENSITIES

III : HACHINOHE

II : HIROO, TOMAKOMAI, MIYAKO,

URAKAWA

I : OFUNATO, MORIOKA, AOMORI,

KUSHIRO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2413	2 3 1	101

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

14:47 JAN. 18, 1992

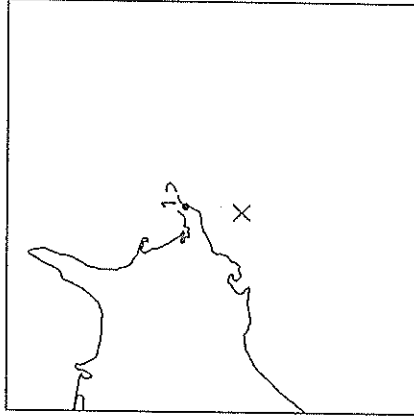
JMA INTENSITIES

OFF NEMURO PENINSULA

II : NEMURO

EPICENTER : 42°55.1'N 145°28.3'E

DEPTH : 39.7KM MAGNITUDE : 4.2

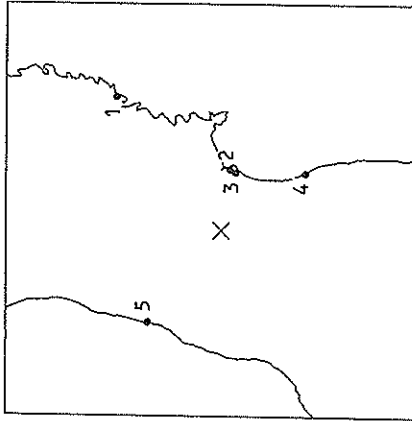


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HANASAKI-F	ON GROUND	F-475	7 22 6	41

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

10:06 JAN. 22, 1992  
 SOUTHERN YAMAGATA PREF  
 EPICENTER : 38°24.5'N 140°32.4'E  
 DEPTH : 120.0KM MAGNITUDE : 5.7

JMA INTENSITIES  
 III : OFUNATO, ISHINOMAKI  
 II : SENDAI, MIYAKO, AKITA,  
 MORIOKA, SAKATA  
 I : TOKYO, ONAHAMA, HACHINOHE,  
 KUSHIRO, URAKAWA

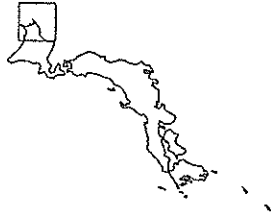
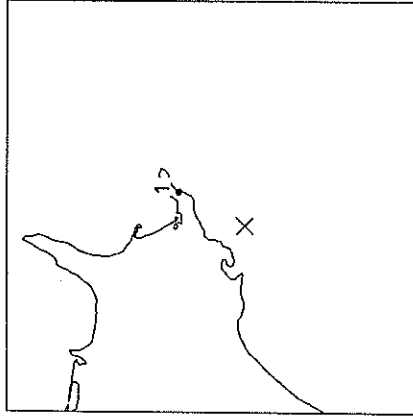


STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 OFUNATO-MOUND-M	ON STRUC.	M-1391	11 7 7	123
2 SHIOGAMA-KOJYO-S	ON GROUND	S-2414	7 19 6	45
3 SENDAI-MB	IN GROUND	M-1388	2 2 2	43
3 SENDAI-M	ON GROUND	M-1387	9 9 6	43
4 SOMA-S	ON GROUND	S-2416	7 6 1	74
5 SAKATA-S	ON GROUND	S-2415	4 3 2	85

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

13:14 JAN. 29, 1992  
 OFF NEMURO PENINSULA  
 EPICENTER : 42°52.6'N 145°12.6'E  
 DEPTH : 43.7KM MAGNITUDE : 4.3

JMA INTENSITIES  
 II : NEMURO  
 I : KUSHIRO

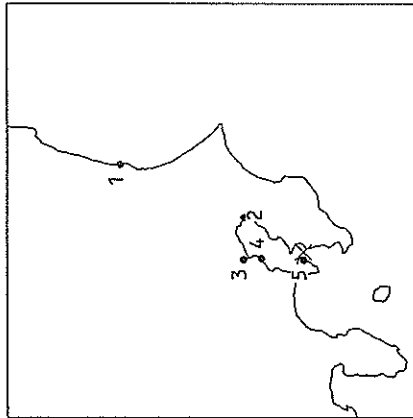


STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 HANASAKI-F	ON GROUND	F-476	12 16 8	54

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

04:04 FEB. 2, 1992  
 TOKYO BAY REGION  
 EPICENTER : 35°13.6'N 139°47.5'E  
 DEPTH : 92.3KM MAGNITUDE : 5.9

JMA INTENSITIES  
 V : TOKYO  
 IV : CHIBA  
 III : YOKOHAMA  
 II : ONAHAMA, ISHINOMAKI  
 I : SENDAI, OFUNATO

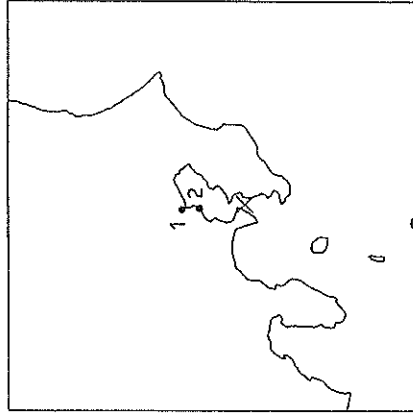


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EH) (UD)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F- 460	21 18 8	148
2 CHIBA-S	ON GROUND	S-2418	32 17 50	50
3 SHINAGAWA-MB	IN GROUND	M-1389	23 31 19	44
3 SHINAGAWA-S	ON GROUND	S-2419	74 80 29	44
4 KAWASAKI-FR	ON STRUC.	F- 463	100 131 48	31
4 KAWASAKI-F	ON GROUND	F- 462	94 118 37	31
4 KAWASAKI-FB	IN GROUND	F- 461	43 52 12	31
5 KOKEN-S	ON GROUND	S-2417	69 24 12	6

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

07:47 FEB. 3, 1992  
 TOKYO BAY REGION  
 EPICENTER : 35°12.6'N 139°46.2'E  
 DEPTH : 92.3KM MAGNITUDE : 4.1

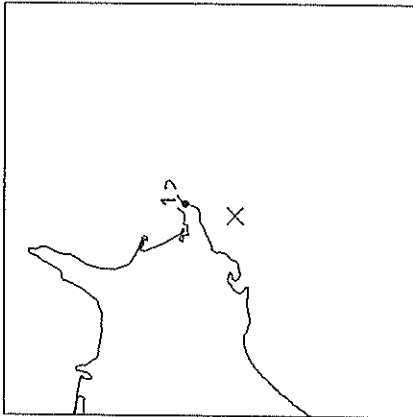
JMA INTENSITIES  
 II : TOKYO  
 I : CHIBA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EH) (UD)	DIST. (KM)
1 SHINAGAWA-MB	IN GROUND	M-1390	1 1 1	45
1 SHINAGAWA-S	ON GROUND	S-2420	3 3 2	45
2 KAWASAKI-FR	ON STRUC.	F- 466	7 13 2	32
2 KAWASAKI-F	ON GROUND	F- 465	6 9 2	32
2 KAWASAKI-FB	IN GROUND	F- 464	3 3 1	32

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

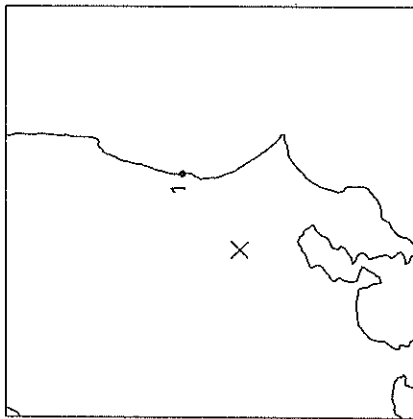
11:15 FEB. 8, 1992 JMA INTENSITIES  
 OFF NEMURO PENINSULA III : NEMURO  
 EPICENTER : 42°57.7'N 145°25.6'E I : KUSHIRO  
 DEPTH : 44.3KM MAGNITUDE : 4.2



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HANASAKI-F	ON GROUND	F- 477	14 11 4	37

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

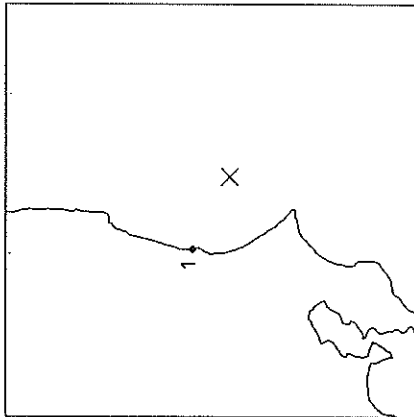
10:54 FEB. 26, 1992 JMA INTENSITIES  
 SW IBARAKI PREF I : TOKYO  
 EPICENTER : 36°3.2 'N 139°57.1'E  
 DEPTH : 56.6KM MAGNITUDE : 3.9



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F- 467	6 15 3	70

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

08:32 FEB. 28, 1992  
 E OFF IBARAKI PREF  
 EPICENTER : 36°6.2'N 141°10.6'E  
 DEPTH : 45.8KM MAGNITUDE : 3.2

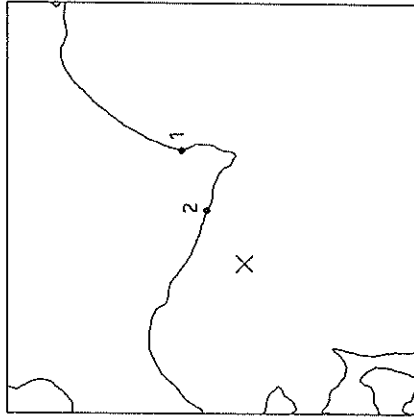


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F-468	17 21 7	59

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

21:19 MAR. 2, 1992  
 S OFF URAKAWA  
 EPICENTER : 41°57.4'N 142°16.9'E  
 DEPTH : 68.5KM MAGNITUDE : 4.8

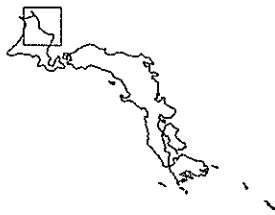
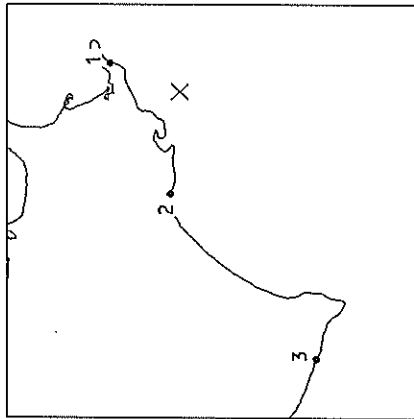
JMA INTENSITIES  
 III : URAKAWA  
 II : HIROO, TOMAKOMAI  
 I : KUSHIRO, MURORAN, OBIHIRO, HACHINOHE



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 TOKACHI-M	ON GROUND	M-1392	23 15 9	93
2 URAKAWA-S	ON GROUND	S-2421	3 6 3	46

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

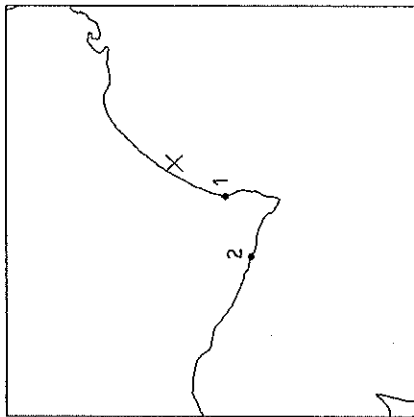
05:45 MAR. 31, 1992 JMA INTENSITIES  
 OFF NEMURO PENINSULA III : KUSHIRO, NEMURO  
 EPICENTER : 42°51.1'N 145°15.1'E II : HIROO  
 DEPTH : 45.5KM MAGNITUDE : 5.3 I : URAKAWA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HANASAKI-F	ON GROUND	F-478	42 70 16	54
2 KUSHIRO-JI-S	ON GROUND	S-2424	8 7 3	74
3 URAKAWA-S	ON GROUND	S-2422	1 1 1	216

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

10:05 APR. 7, 1992 JMA INTENSITIES  
 SE OFF TOKACHI III : HIROO  
 EPICENTER : 42°35.8'N 143°40.1'E II : NEMURO, HACHINOHE,  
 DEPTH : 75.7KM MAGNITUDE : 4.9 KUSHIRO, URAKAWA

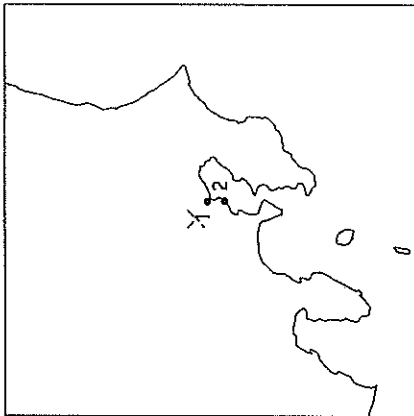


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 TOKACHI-M	ON GROUND	M-1393	26 29 9	44
2 URAKAWA-S	ON GROUND	S-2423	3 3 1	87



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

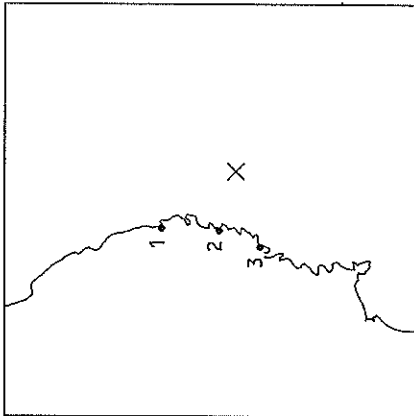
23:31 APR. 10,1992  
 TOKYO PREF  
 JMA INTENSITIES  
 III : TOKYO-YOKOHAMA  
 II : CHIBA  
 EPICENTER : 35°42.4'N 139°37.8'E  
 DEPTH : 89.0KM MAGNITUDE : 4.9



STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SHINAGAWA-MB	IN GROUND	M-1394	2 2 2	15
1 SHINAGAWA-S	ON GROUND	S-2427	9 9 5	15
2 KAWASAKI-FR	ON STRUC.	F- 517	91 75 28	25
2 KAWASAKI-F	ON GROUND	F- 516	88 60 27	25
2 KAWASAKI-FB	IN GROUND	F- 515	42 26 10	25

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

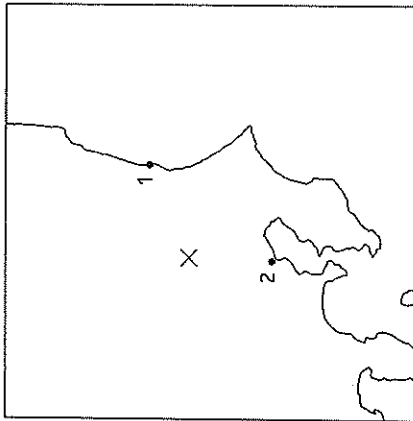
14:58 APR. 13,1992  
 E OFF IWATE PREF  
 JMA INTENSITIES  
 IV : OFUNATO  
 III : MIYAKO,ISHINOMAKI,  
 MORIOKA  
 II : HACHINOHE  
 I : SENDAI,AKITA,SAKATA,  
 KUSHIRO  
 EPICENTER : 39°7.1 'N 142°23.7'E  
 DEPTH : 51.0KM MAGNITUDE : 5.1



STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-S	ON GROUND	S-2425	17 21 10	68
2 KAMAISHI-MB	IN GROUND	M-1398	10 13 8	45
2 KAMAISHI-M	ON GROUND	M-1397	22 28 18	45
3 OFUNATO-MOUND-M	ON STRUC.	M-1396	27 36 13	58

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

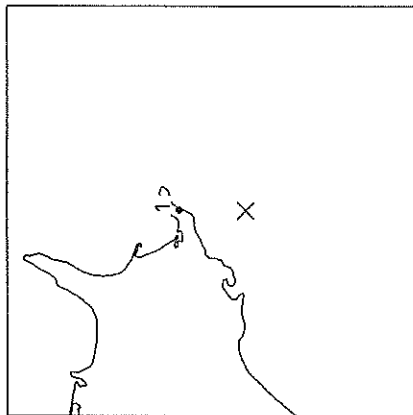
12:03 APR. 14, 1992  
 SW IBARAKI PREF  
 JMA INTENSITIES  
 IV : MITO  
 III : TOKYO, ONAHAMA  
 II : CHIBA, YOKOHAMA  
 I : ISHINONAKI  
 EPICENTER : 36°10.5'N 139°50.0'E  
 DEPTH : 62.0KM MAGNITUDE : 4.9



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F-482	20 30 11	74
2 SHINAGAWA-MB	IN GROUND	M-1395	3 3 2	61
2 SHINAGAWA-S	ON GROUND	S-2428	8 11 3	61

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

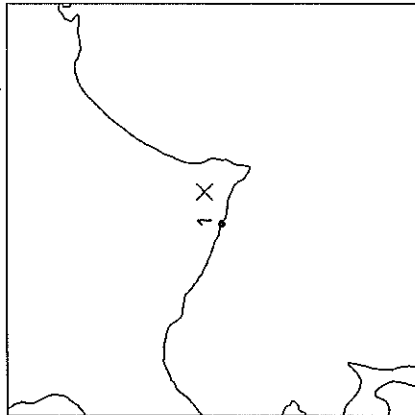
11:47 APR. 17, 1992  
 OFF NEMURO PENINSULA  
 JMA INTENSITIES  
 III : NEMURO  
 EPICENTER : 42°50.9'N 145°30.3'E  
 DEPTH : 44.0KM MAGNITUDE : 4.0



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HANASAKI-F	ON GROUND	F-479	7 13 4	48

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

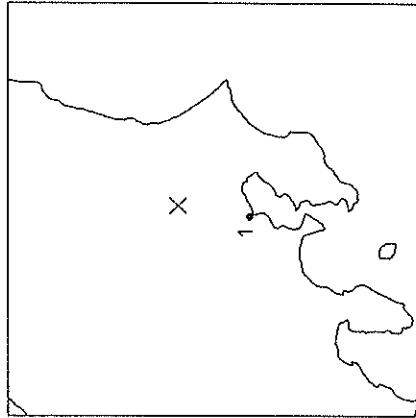
05:36 APR. 20, 1992  
 HIDAKA MOUNTAINS REGION  
 EPICENTER : 42°15.2'N 143°4.3 'E  
 DEPTH : 66.7KM MAGNITUDE : 5.0  
 JMA INTENSITIES  
 III : OBIHIRO  
 II : HIROO, TONAKONAI, OTARU,  
 URAKAWA, KUSHIRO  
 I : NEMURO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2426	6 12 3	26

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

01:21 APR. 23, 1992  
 SW IBARAKI PREF  
 EPICENTER : 36°5.7 'N 139°53.2'E  
 DEPTH : 57.6KM MAGNITUDE : 4.3  
 JMA INTENSITIES  
 II : TOKYO, YOKOHAMA  
 I : CHIBA, ONAHAMA



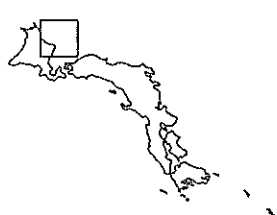
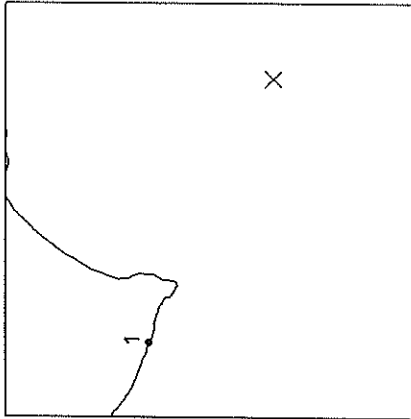
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL)	DIST. (KM)
1 SHINAGAWA-MB	IN GROUND	M-1399	2 2 1	53
1 SHINAGAWA-S	ON GROUND	S-2429	6 6 3	53

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

15:23 MAY 7, 1992  
 FAR SE OFF HOKKAIDO  
 EPICENTER : 41°8.9' N 144°56.6' E  
 DEPTH : 73.0KM MAGNITUDE : 5.9

JMA INTENSITIES

- III : KUSHIRO
- II : URAKAWA-NEMURO,  
TOMAKOMAI, OFUNATO
- I : MIYAKO, OTARU, IISHINOMAKI,  
AOMORI



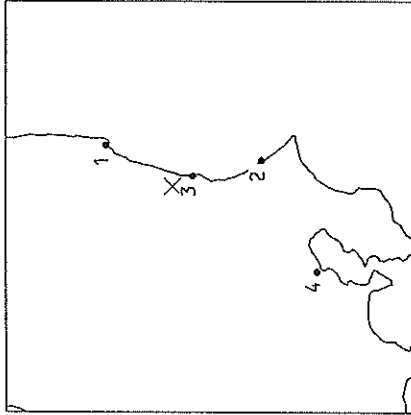
STATION	CONDITION	RECORD NUMBER	MAX.-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2431	2 3 1	212

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

19:07 MAY 11, 1992  
 NORTHERN IBARAKI PREF  
 EPICENTER : 36°31.8' N 140°32.4' E  
 DEPTH : 56.2KM MAGNITUDE : 5.6

JMA INTENSITIES

- IV : MITO
- III : ONAHAMA
- II : CHIBA, TOKYO, YOKOHAMA,  
OFUNATO
- I : SENDAI



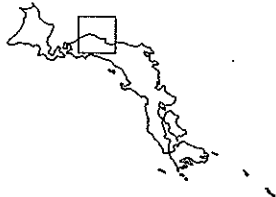
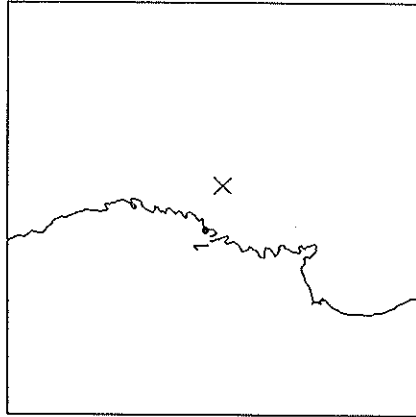
STATION	CONDITION	RECORD NUMBER	MAX.-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 ONAHAMA-JI-S	ON GROUND	S-2430	19 14 6	56
2 KASHIMA-ZOKAN-S	ON GROUND	S-2432	8 6 4	68
3 HITACHINAKA-F	ON GROUND	F-483	94 152 62	17
4 SHINAGAWA-MB	IN GROUND	M-1400	2 2 1	122
4 SHINAGAWA-S	ON GROUND	S-2433	6 4 2	122

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

12:03 MAY 16,1992  
 KINKAZAN REGION  
 EPICENTER : 38°52.7'N 142°6.4 'E  
 DEPTH : 50.5KM MAGNITUDE : 4.6

JMA INTENSITIES

III : OFUNATO,ISHINOMAKI  
 II : MIYAKO,MORIOKA



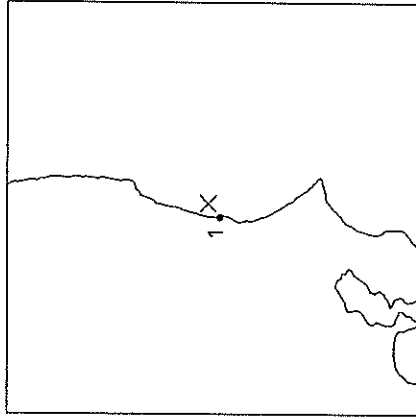
STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1	OFUNATO-MOUND-M ON STRUC.	M-1401	8 5 6	35

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

11:54 MAY 16,1992  
 NORTHERN IBARAKI PREF  
 EPICENTER : 36°27.2'N 140°44.0'E  
 DEPTH : 93.6KM MAGNITUDE : 4.2

JMA INTENSITIES

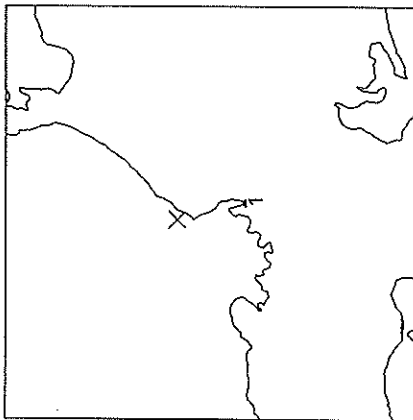
II : MITO



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1	HITACHINAKA-F ON GROUND	F-484	16 19 6	12

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

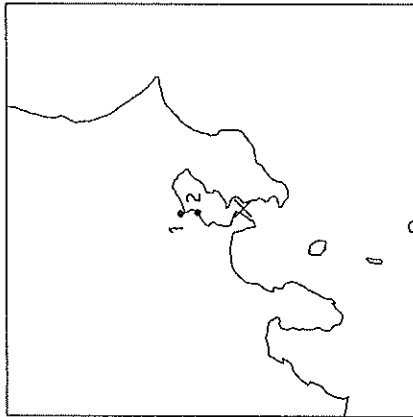
12:29 MAY 20,1992  
 NW OFF HOKURIKU DISTRICT  
 JMA INTENSITIES II : FUKUI I : KANAZAWA,TOYAMA,NAGOYA  
 EPICENTER : 36°6.7 'N 135°56.9'E  
 DEPTH : 9.8KM MAGNITUDE : 4.9



STATION	CONDITION	RECORD NUMBER	MAX.-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 TSURUGA-S	ON GROUND	S-2434	4 6 2	51

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

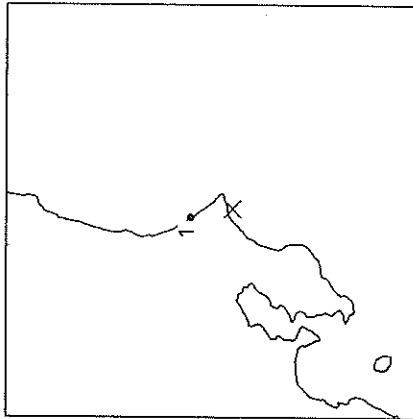
17:23 MAY 20,1992  
 TOKYO BAY REGION  
 JMA INTENSITIES III : TOKYO II : YOKOHAMA,CHIBA  
 EPICENTER : 35°12.3'N 139°46.4'E  
 DEPTH : 91.7KM MAGNITUDE : 4.8



STATION	CONDITION	RECORD NUMBER	MAX.-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SHINAGAWA-MB	IN GROUND	M-1403	2 2 2	46
1 SHINAGAWA-S	ON GROUND	S-2435	12 13 5	46
2 KAWASAKI-FR	ON STRUC.	F- 520	45 33 7	33
2 KAWASAKI-F	ON GROUND	F- 519	25 34 9	33
2 KAWASAKI-FB	IN GROUND	F- 518	11 12 3	33

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

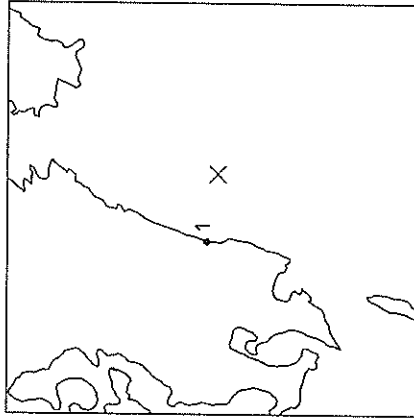
02:58 MAY 29, 1992 JMA INTENSITIES  
 NEAR CHOSHI CITY II : CHIBA-YOKOHAMA  
 EPICENTER : 35°39.0'N 140°44.2'E I : TOKYO  
 DEPTH : 54.4KM MAGNITUDE : 5.2



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 KASHIMA-ZOKAN-S	ON GROUND	S-2436	3 4 3	31

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

06:08 MAY 29, 1992  
 HYUGANADA REGION  
 EPICENTER : 31°50.3'N 131°58.0'E  
 DEPTH : 20.0KM MAGNITUDE : 4.8

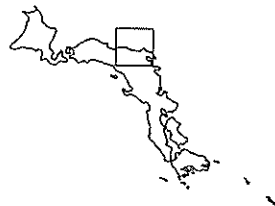
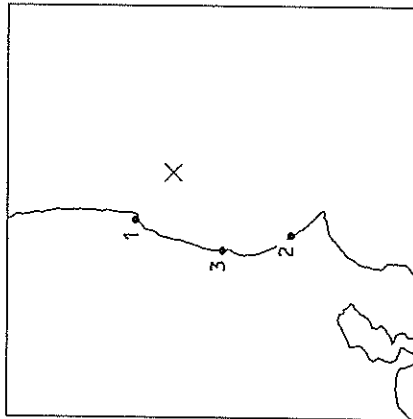


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAZAKI-M	ON GROUND	M-1402	4 6 5	48

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

22:51 JUNE 1, 1992  
 E OFF IBARAKI PREF  
 EPICENTER : 36°40.2'N 141°16.4'E  
 DEPTH : 43.8KM MAGNITUDE : 5.7

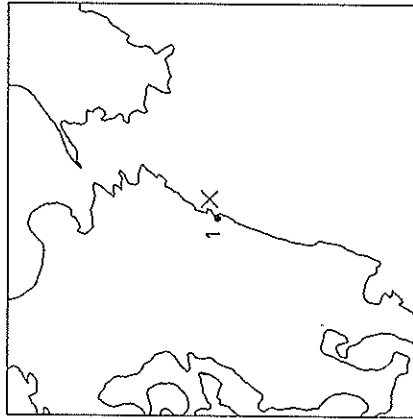
JMA INTENSITIES  
 III : ONAHAMA  
 II : CHIBA, TOKYO, YOKOHAMA,  
 SENDAI  
 I : MORIOKA, MIYAKO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 ONAHAMA-JI-S	ON GROUND	S-2437	18 18 7	43
2 KASHIMA-ZOKAN-S	ON GROUND	S-2438	19 18 6	97
3 HITACHINAKA-F	ON GROUND	F- 485	37 43 16	66

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

17:48 JUNE 3, 1992  
 HYUGANADA REGION  
 EPICENTER : 32°29.2'N 131°48.3'E  
 DEPTH : 51.7KM MAGNITUDE : 3.6

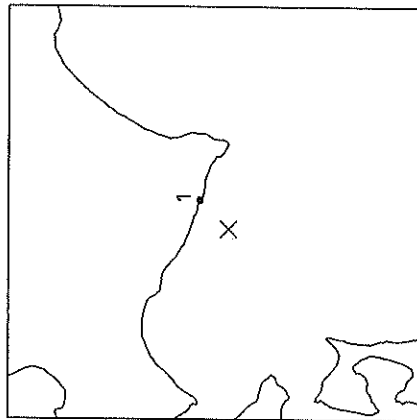


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HOSOSHIMA-F	ON GROUND	F- 492	8 7 3	15



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

21:52 JUNE 5, 1992  
 S OFF URAKAWA  
 JMA INTENSITIES  
 II : URAKAWA  
 I : HIROO  
 EPICENTER : 42°0.0 'N 142°30.1'E  
 DEPTH : 64.0KM MAGNITUDE : 4.5

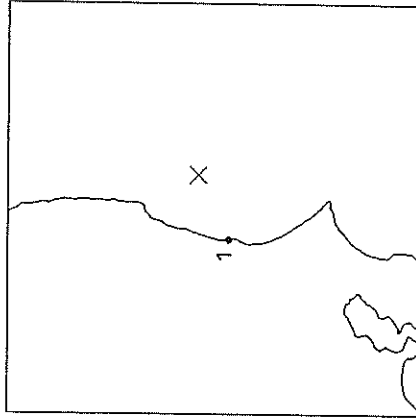


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2439	5 6 2	28



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

06:41 JUNE 19, 1992  
 E OFF IBARAKI PREF  
 JMA INTENSITIES  
 II : MITO  
 I : ONAHAMA-TOKYO  
 EPICENTER : 36°33.1'N 141°9.5 'E  
 DEPTH : 43.2KM MAGNITUDE : 4.4

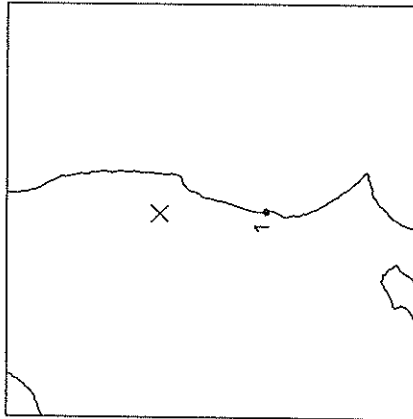


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F-486	17 .15 7	51



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

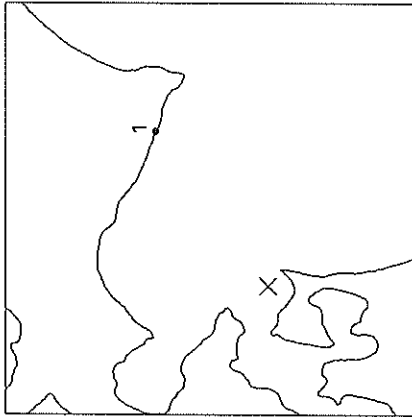
11:08 JUNE 23, 1992 JMA INTENSITIES  
 EASTERN FUKUSHIMA PREF II : MITO  
 EPICENTER : 37°5.3 'N 140°40.0'E I : ONAHAMA  
 DEPTH : 104.6KM MAGNITUDE : 4.6



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F-487	18 21 10	78

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

14:47 JUNE 29, 1992 JMA INTENSITIES  
 TSUGARU STRAIT REGION I : URAKAWA-HACHINOHE,  
 EPICENTER : 41°31.5'N 141°20.6'E KUSHIRO-HIROO  
 DEPTH : 92.7KM MAGNITUDE : 4.9



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-244D	2 3 1	138

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

18:31 JULY 10, 1992

SE OFF ETOROFU

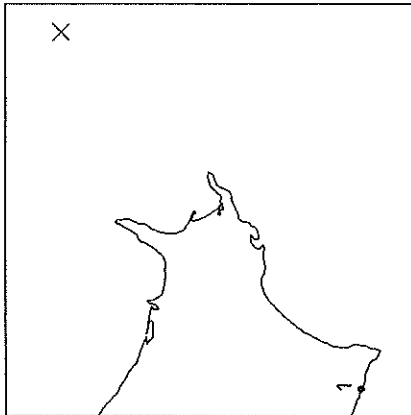
EPICENTER : 44°35.9'N 150°0.4 'E

DEPTH : 55.0KM MAGNITUDE : 6.4

JMA INTENSITIES

II : NEMURO, KUSHIRO, URAKAWA

I : HIROO, AOMORI, MORIOKA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EH) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2443	3 4 1	643

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

20:08 JULY 12, 1992

E OFF AOMORI PREF

EPICENTER : 41°27.7'N 142°2.3 'E

DEPTH : 64.0KM MAGNITUDE : 6.3

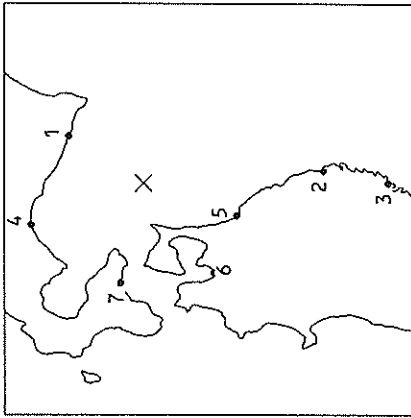
JMA INTENSITIES

IV : HACHINOHE

III : URAKAWA, AOMORI, TONAKONAI, MIYAKO

II : MURORAN, OTARU, KUSHIRO, OFUNATO

I : AKITA, SENDAI

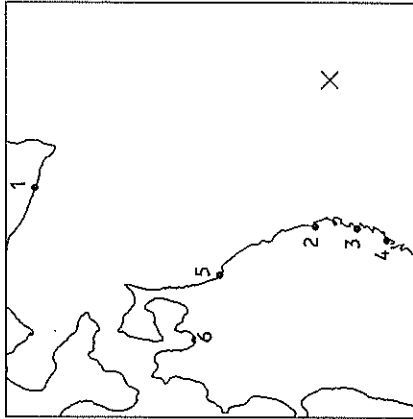


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EH) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2444	6 7 5	98
2 MIYAKO-S	ON GROUND	S-2441	12 9 3	202
3 OFUNATO-MOUND-M	ON STRUC.	M-1408	6 6 6	273
4 TOMAKOMAI-S	ON GROUND	S-2446	15 19	134
5 HACHINOHE-JI-S	ON GROUND	S-2442	31 31 7	110
6 AOMORI-S	ON GROUND	S-2445	9 13 6	128
7 HAKODATE-M	ON GROUND	M-1404	15 16 9	114
7 HAKODATE-FR	ON STRUC.	F- 471	14 13 5	114
7 HAKODATE-F	ON GROUND	F- 470	17 15 7	114
7 HAKODATE-FB	IN GROUND	F- 469	7 7 5	114

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

17:36 JULY 18,1992 JMA INTENSITIES  
 FAR E OFF SANRIKU  
 III : SAKATA,HACHINOHE,  
 OFUNATO,MIYAKO  
 II : NEMURO,KUSHIRO,AKITA  
 I : ONAHAMA,TOMAKOMAI

EPICENTER : 39°22.1'N 143°40.6'E  
 DEPTH : 0.0KM MAGNITUDE : 6.9



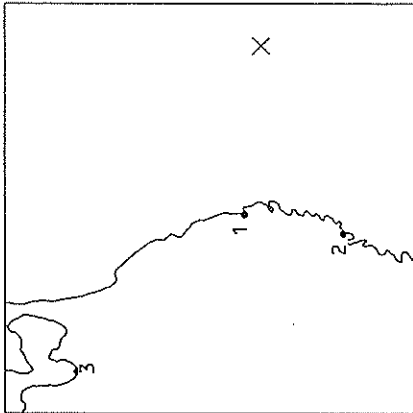
STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2449	1 1 1	319
2 MIYAKO-S	ON GROUND	S-2450	19 13 6	149
3 KAMAISHI-MB	IN GROUND	M-1412	3 3 2	152
3 KAMAISHI-M	ON GROUND	M-1411	3 3 2	152
4 OFUNATO-MOUND-M	ON STRUC.	M-1409	9 9 7	171
4 OFUNATO-BO-S	ON STRUC.	S-2454	7 13 3	171
4 OFUNATO-BOCHI-S	ON GROUND	S-2453	4 4 3	171
5 HACHINOHE-JI-S	ON GROUND	S-2452	6 6 1	228
6 AOMORI-S	ON GROUND	S-2447	6 6 3	296



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

19:20 JULY 18,1992 JMA INTENSITIES  
 FAR E OFF SANRIKU  
 III : MIYAKO,AOMORI,AKITA,  
 OFUNATO  
 II : SENDAI,KUSHIRO,  
 HACHINOHE,SAKATA  
 I : URAKAWA,ONAHAMA,OTARU,  
 NEMURO

EPICENTER : 39°25.0'N 143°22.6'E  
 DEPTH : 0.0KM MAGNITUDE : 6.4

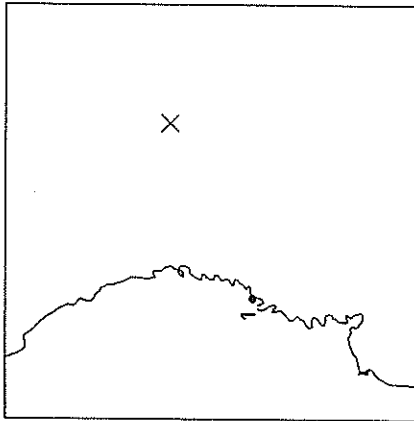


STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-S	ON GROUND	S-2451	9 6 2	122
2 OFUNATO-MOUND-M	ON STRUC.	M-1410	7 11 8	148
2 OFUNATO-BO-S	ON STRUC.	S-2455	12 18 4	148
3 AOMORI-S	ON GROUND	S-2448	6 6 3	272



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

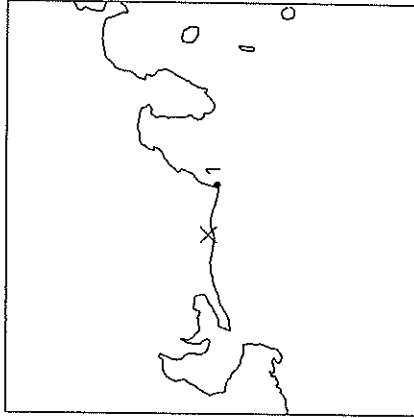
22:56 JULY 18, 1992  
 FAR E OFF SANRIKU  
 JMA INTENSITIES  
 III : OFUNATO, MIYAKO  
 II : SAKATA, HACHINOHE,  
 KUSHIRO, SENDAI  
 I : AKITA, ONAHAMA  
 EPICENTER : 39°26.0'N 143°17.5'E  
 DEPTH : 0.0KM MAGNITUDE : 6.2



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 OFUNATO-BO-S	ON STRUC.	S-2456	7 29 3	141

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

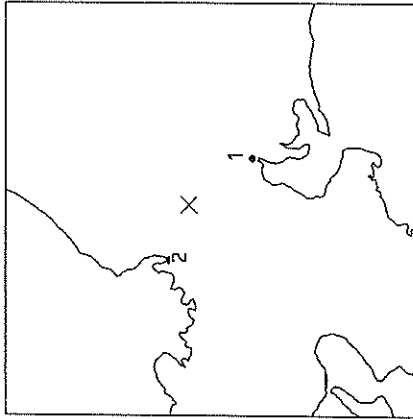
15:04 JULY 21, 1992  
 HAMANAKO LAKE REGION  
 JMA INTENSITIES  
 I : OMAEZAKI  
 EPICENTER : 34°41.0'N 137°49.2'E  
 DEPTH : 41.1KM MAGNITUDE : 3.7



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 OMAEZAKI-M	ON GROUND	M-1413	2 3 1	37

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

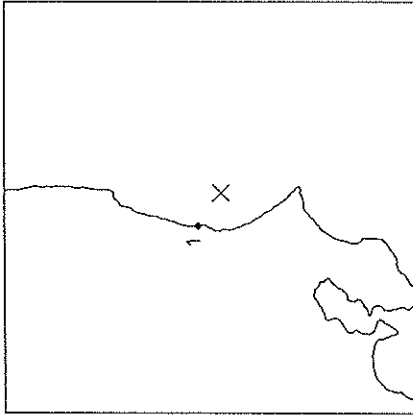
20:16 JULY 30, 1992  
 SW GIFU PREF  
 JMA INTENSITIES  
 III : NAGOYA-FUKUI  
 II : YOKKAICHI  
 I : OSAKA  
 EPICENTER : 35°30.6'N 136°30.5'E  
 DEPTH : 37.7KM MAGNITUDE : 5.3



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 INAE-SANBASHI-M	ON STRUC.	M-1414	23	58
1 INAE-YAITA-M	ON STRUC.	M-1415	29	58
2 TSURUGA-S	ON GROUND	S-2457	13 9 4	43

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

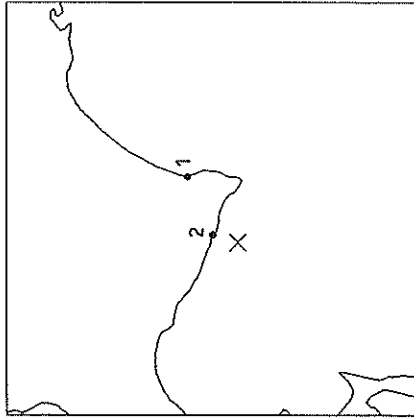
14:39 AUG. 3, 1992  
 E OFF IBARAKI PREF  
 JMA INTENSITIES  
 II : MITO  
 EPICENTER : 36°13.1'N 140°52.3'E  
 DEPTH : 40.8KM MAGNITUDE : 3.5



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F-488	20 9 5	29

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

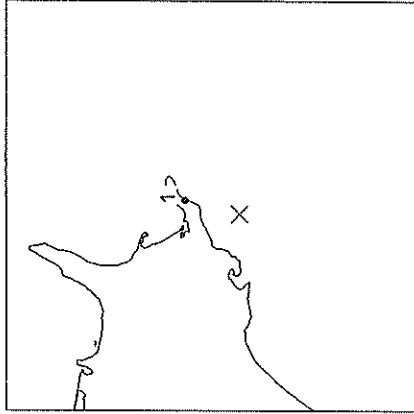
23:52 AUG. 8, 1992  
 S OFF URAKAWA  
 JMA INTENSITIES  
 IV : URAKAWA  
 III : HIROO  
 II : TOMAKOHAI, KUSHIRO  
 I : OTARU, AOMORI  
 EPICENTER : 42°0.6'N 142°41.1'E  
 DEPTH : 46.4KM MAGNITUDE : 5.1



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	DIST. (KM)
1 TOKACHI-M	ON GROUND	M-1416	30 63 20	61
2 URAKAWA-S	ON GROUND	S-2458	42 53 8	18

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

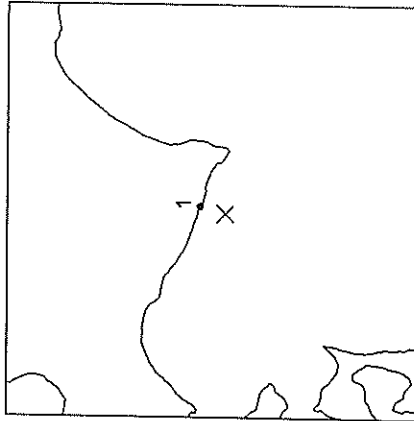
06:06 AUG. 12, 1992  
 OFF NEMURO PENINSULA  
 JMA INTENSITIES  
 II : NEMURO  
 I : KUSHIRO  
 EPICENTER : 42°56.2'N 145°24.3'E  
 DEPTH : 43.6KM MAGNITUDE : 4.1



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	DIST. (KM)
1 HANASAKI-F	ON GROUND	F-480	10 8 3	41

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

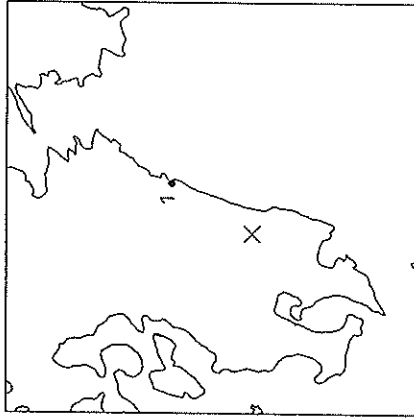
05:40 AUG. 15, 1992  
 S OFF URAKAWA  
 JMA INTENSITIES  
 II : URAKAWA  
 I : HIROO  
 EPICENTER : 42°0.1'N 142°41.5'E  
 DEPTH : 43.8KM MAGNITUDE : 3.7



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2459	1 1 1	19

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

11:29 AUG. 16, 1992  
 SOUTHERN MIYAZAKI PREF  
 JMA INTENSITIES  
 I : MIYAZAKI  
 EPICENTER : 31°53.5'N 131°16.0'E  
 DEPTH : 62.0KM MAGNITUDE : 4.3

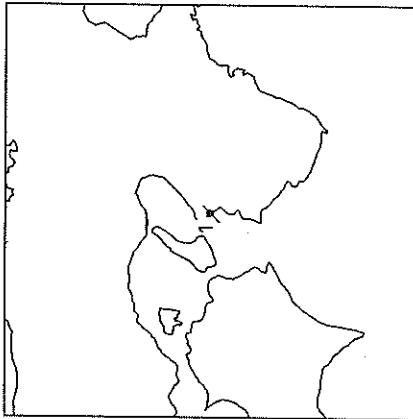


STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 HOSOSHIMA-F	ON GROUND	F-493	5 7 3	69



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

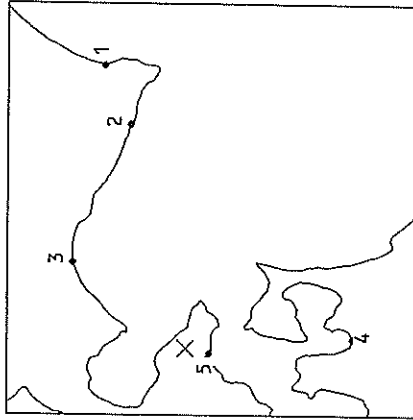
19:11 AUG. 20, 1992  
 NW WAKAYAMA PREF  
 JMA INTENSITIES  
 II : WAKAYAMA  
 EPICENTER : 34°12.4'N 135°08.0'E  
 DEPTH : 7.3KM MAGNITUDE : 3.2



STATION	CONDITION	RECORD NUMBER	MAX.-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F- 497	11 11 52	1

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

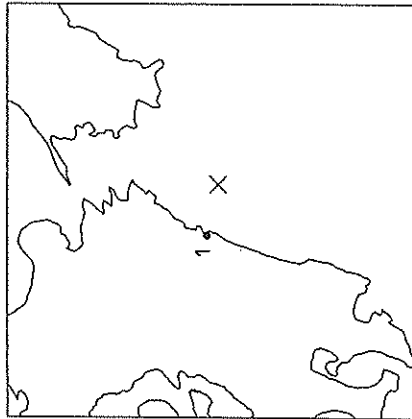
15:59 AUG. 24, 1992  
 OSHIMA PEN REG HOKKAIDO  
 JMA INTENSITIES  
 IV : OBIHIRO  
 III : HIROO, KUSHIRO, HACHINOHE  
 II : TOMAKOMAI, URAKAWA,  
 MIYAKO  
 I : SENDAI, ONAHAMA  
 EPICENTER : 41°56.2'N 140°47.4'E  
 DEPTH : 121.0KM MAGNITUDE : 6.3



STATION	CONDITION	RECORD NUMBER	MAX.-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 TOKACHI-M	ON GROUND	M-1417	1.6 15 10	212
2 URAKAWA-S	ON GROUND	S-2460	4 3 3	165
3 TOMAKOMAI-S	ON GROUND	S-2461	6 8 1	102
4 AOMORI-S	ON GROUND	S-2462	6 6 6	123
5 HAKODATE-FR	ON STRUC.	F- 474	7 7 8	18
5 HAKODATE-F	ON GROUND	F- 473	9 7 7	18
5 HAKODATE-FB	IN GROUND	F- 472	3 3 9	18

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

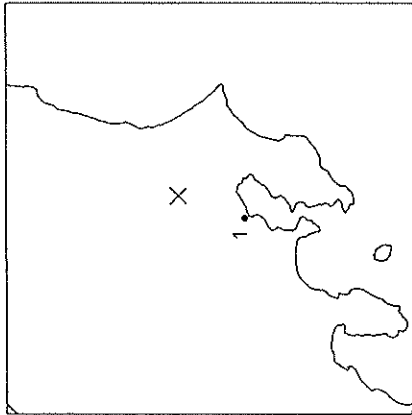
14:03 AUG. 25, 1992  
 HYUGANADA REGION  
 EPICENTER : 32°21.8'N 132°2.7 'E  
 DEPTH : 39.4KM MAGNITUDE : 3.2



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HOSOSHIMA-F	ON GROUND	F-494	5 11 2	37

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

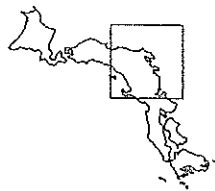
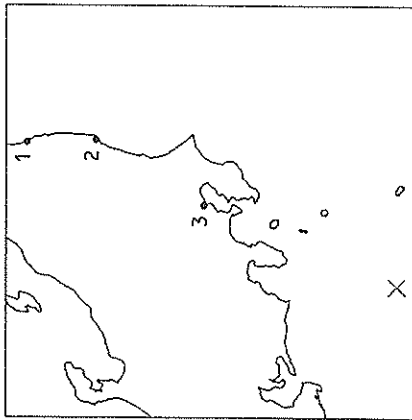
13:09 AUG. 27, 1992  
 JMA INTENSITIES  
 SW IBARAKI PREF  
 III : MITO  
 II : TOKYO-YOKOHAMA  
 I : CHIBA  
 EPICENTER : 36°3.2 'N 139°58.8'E  
 DEPTH : 57.1KM MAGNITUDE : 4.7



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SHINAGAWA-MB	IN GROUND	M-1418	2 2 2	51
1 SHINAGAWA-S	ON GROUND	S-2463	6 6 3	51

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

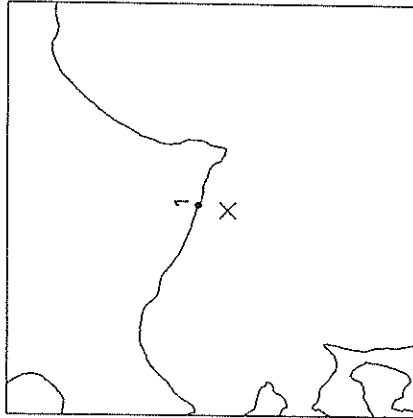
04:19 AUG. 30, 1992  
 FAR S OFF TOKAI DISTRICT  
 JMA INTENSITIES  
 III : TOKYO, YOKOHAMA, MITO  
 II : CHIBA, ONAHAMA, SENDAI  
 I : MIYAKO, ISHINOMAKI  
 EPICENTER : 33°12.4'N 138°20.4'E  
 DEPTH : 325.0KM MAGNITUDE : 6.6



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SOMA-S	ON GROUND	S-2468	5 4 1	565
2 ONAHAMA-JI-S	ON GROUND	S-2465	9 6 6	476
3 SHINAGAWA-MB	IN GROUND	M-1419	3 3 2	298
3 SHINAGAWA-S	ON GROUND	S-2464	12 9 4	298

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

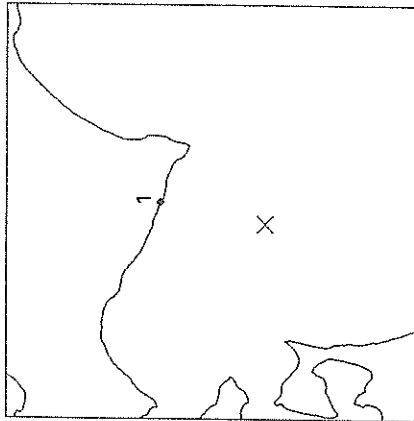
15:13 AUG. 31, 1992  
 S OFF URAKAWA  
 JMA INTENSITIES  
 I : URAKAWA  
 EPICENTER : 41°58.5'N 142°42.4'E  
 DEPTH : 44.3KM MAGNITUDE : 3.8



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2466	1 1 1	21

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

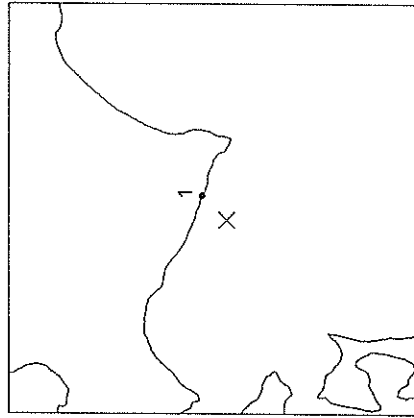
18:14 SEP. 5 /1992 JMA INTENSITIES  
 E OFF AOMORI PREF  
 II : URAKAWA-HACHINGHE  
 I : TOMAKOMAI  
 EPICENTER : 41°29.5'N 142°29.6'E  
 DEPTH : 45.0KM MAGNITUDE : 4.6



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2467	1 1 1	78

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

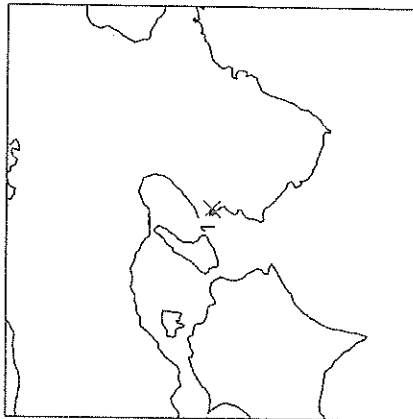
02:20 SEP. 14,1992 JMA INTENSITIES  
 S OFF URAKAWA  
 II : URAKAWA  
 I : HIROO  
 EPICENTER : 42°1.2 'N 142°32.5'E  
 DEPTH : 65.5KM MAGNITUDE : 4.6



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2469	2 3 1	24

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

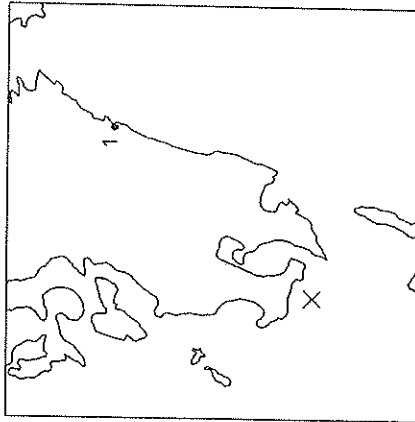
23:18 SEP. 21,1992 JMA INTENSITIES  
 NW WAKAYAMA PREF II : WAKAYAMA  
 EPICENTER : 34°12.9'N 135°10.3'E  
 DEPTH : 4.1KM MAGNITUDE : 2.9



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F- 503	25 19 54	2

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

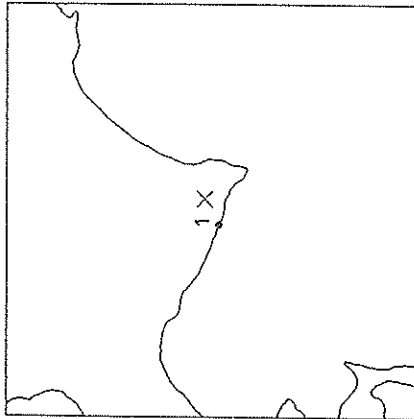
22:38 SEP. 23,1992 JMA INTENSITIES  
 SATSUMA PENINSULA REGION II : KAGOSHIMA,MIYAZAKI  
 EPICENTER : 31°5.9'N 130°21.3'E I : KOCHI  
 DEPTH : 160.4KM MAGNITUDE : 5.9



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 HOSOSHIMA-F	ON GROUND	F- 495	5 6 2	192

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

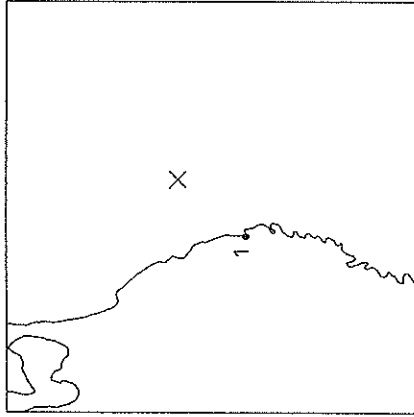
08:53 SEP. 26, 1992 JMA INTENSITIES  
 HIDAKA MOUNTAINS REGION II : URAKAWA-HIROO  
 EPICENTER : 42°14.3'N 143°0.9 'E  
 DEPTH : 64.9KM MAGNITUDE :



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2470	1 1 1	21

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

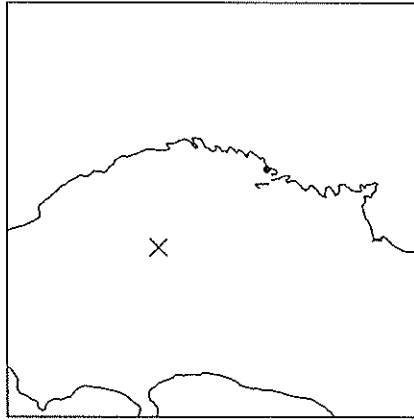
03:43 SEP. 30, 1992 JMA INTENSITIES  
 NE OFF IWATE PREF II : MIYAKO  
 EPICENTER : 40°3.1 'N 142°30.5'E  
 DEPTH : 25.2KM MAGNITUDE : 4.0



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F-498	12 7 5	64

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

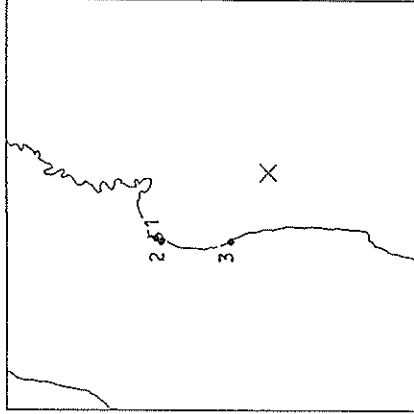
05:41 OCT. 5 /1992 JMA INTENSITIES  
 NORTHERN IMATE PREF  
 III : OFUNATO  
 II : MORIOKA, MIYAKO  
 I : HACHINOHE, SAKATA  
 EPICENTER : 39°45.6'N 141°9.0 'E  
 DEPTH : 95.9KM MAGNITUDE : 4.6



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 OFUNATO-BO-S	ON STRUC.	S-2472	2 5 1	96
1 OFUNATO-ROUND-M	ON STRUC.	M-1420	3 4 3	96

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

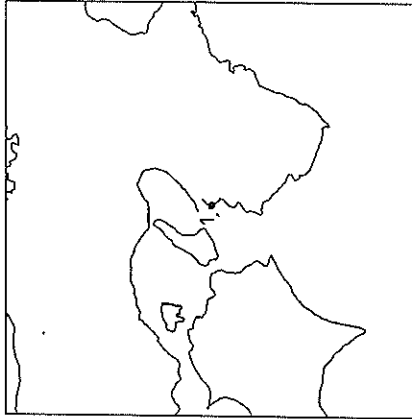
03:58 OCT. 7 /1992 JMA INTENSITIES  
 E OFF FUKUSHIMA PREF  
 II : SENDAI, OFUNATO  
 I : MITO, MORIOKA  
 EPICENTER : 37°32.8'N 141°30.4'E  
 DEPTH : 75.7KM MAGNITUDE : 4.7



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 SHIOGAMA-KOJYO-S	ON GROUND	S-2481	8 8 6	94
2 SENDAI-MB	IN GROUND	M-1436	10 6 5	92
2 SENDAI-M	ON GROUND	M-1433	2 2 2	92
3 SOMA-S	ON GROUND	S-2471	6 6 1	57

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

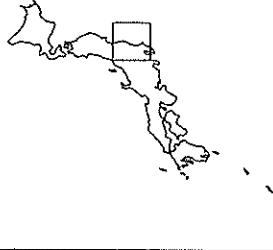
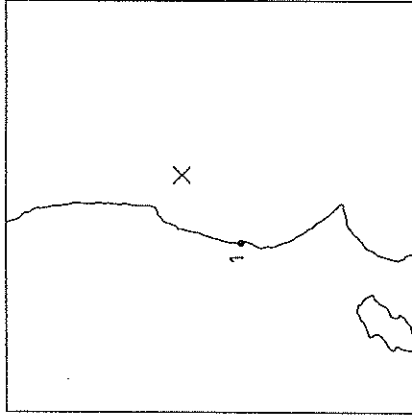
00:57 OCT. 23,1992 JMA INTENSITIES  
 NW WAKAYAMA PREF  
 EPICENTER : 34°13.3'N 135°7.6 'E  
 DEPTH : 8.1KM MAGNITUDE : 3.1



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F- 504	32 19 13	2

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

23:41 OCT. 31,1992  
 E OFF IBARAKI PREF  
 EPICENTER : 36°44.4'N 141°12.4'E  
 DEPTH : 44.6KM MAGNITUDE : 3.8

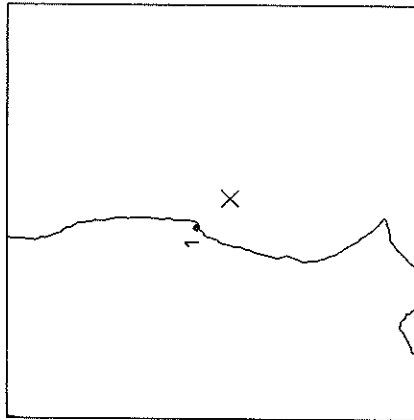


STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F- 489	23 26 12	65



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

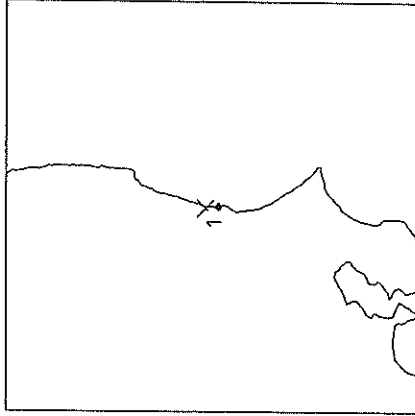
00:10 NOV. 1, 1992  
 E OFF IBARAKI PREF  
 JMA INTENSITIES  
 III : MITO  
 II : ONAHAMA, TOKYO  
 I : YOKOHAMA, CHIBA  
 EPICENTER : 36°42.5'N 141°8.0'E  
 DEPTH : 49.0KM MAGNITUDE : 4.8



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 ONAHAMA-JI-S	ON GROUND	S-2473	13 14 6	32

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

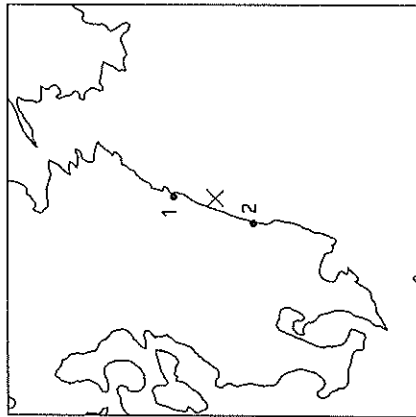
07:35 NOV. 6, 1992  
 NORTHERN IBARAKI PREF  
 JMA INTENSITIES  
 III : MITO  
 I : ONAHAMA  
 EPICENTER : 36°28.5'N 140°36.5'E  
 DEPTH : 52.2KM MAGNITUDE : 4.1



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F-490	22 19 20	9

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

17:39 NOV. 9, 1992  
 HYUGANADA REGION  
 JMA INTENSITIES  
 II : MIYAZAKI  
 I : OITA  
 EPICENTER : 32°9.3 'N 131°38.5'E  
 DEPTH : 57.7KM MAGNITUDE : 4.2

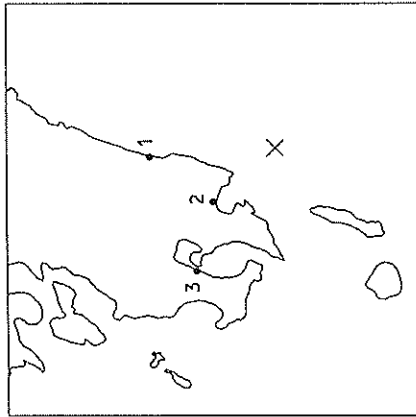


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	DIST. (KM)
1 HOSOSHIMA-F	ON GROUND	F-496	10 8 7	30
2 MIYAZAKI-M	ON GROUND	M-1421	10 13 8	33



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

09:49 NOV. 19, 1992  
 SE OFF OSUMI PEN  
 JMA INTENSITIES  
 II : MIYAZAKI, KAGOSHIMA  
 EPICENTER : 31°4.3 'N 131°32.2'E  
 DEPTH : 56.0KM MAGNITUDE : 5.2

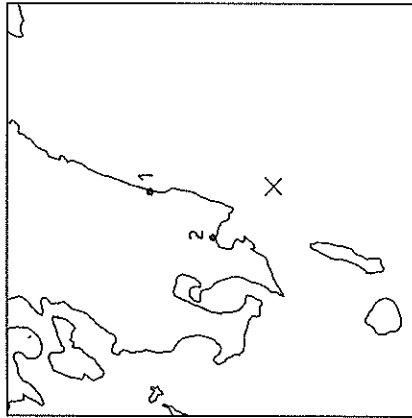


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	DIST. (KM)
1 MIYAZAKI-M	ON GROUND	M-1422	3 3 4	92
2 SHIBUSHI-S	ON GROUND	S-2474	4 4 2	60
3 KAGOSHIMA-G	ON GROUND	F-501	6 5 3	108



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

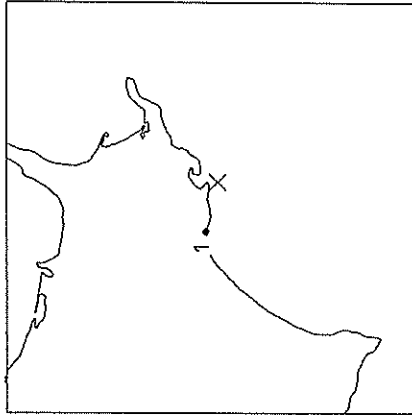
09:53 NOV. 19, 1992 JMA INTENSITIES  
 SE OFF OSUMI PEN II : MIYAZAKI  
 EPICENTER : 31°4.8 'N 131°30.5'E I : KAGOSHIMA  
 DEPTH : 57.0KM MAGNITUDE : 5.3



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (E) (UD)	(GAL)	DIST. (KM)
1 MIYAZAKI-M	ON GROUND	M-1423	5	4	91
2 SHIBUSHI-S	ON GROUND	S-2475	5	5	57

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

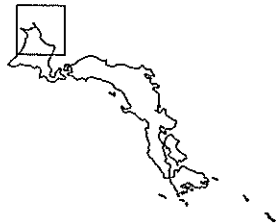
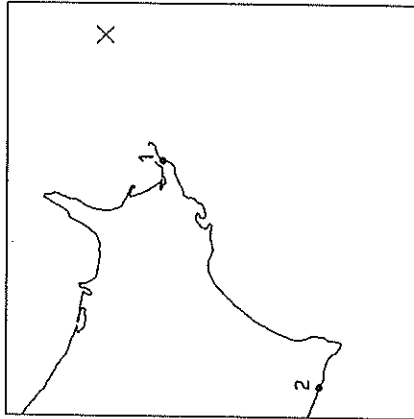
09:20 NOV. 30, 1992 JMA INTENSITIES  
 OFF NEMURO PENINSULA III : KUSHIRO  
 EPICENTER : 42°52.6'N 144°46.6'E II : NENURO  
 DEPTH : 57.6KM MAGNITUDE : 4.9 I : HIROO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (E) (UD)	(GAL)	DIST. (KM)
1 KUSHIRO-G	ON GROUND	F-500	14	28	36
1 KUSHIRO-GB	IN GROUND	F-499	5	8	36

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

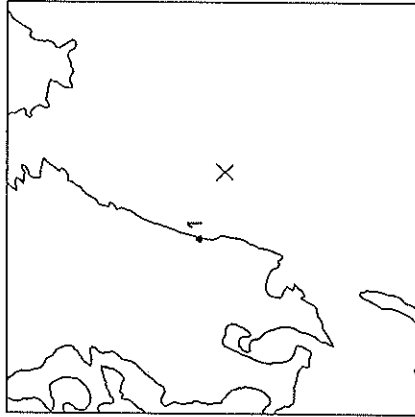
11:11 DEC. 7, 1992  
 E OFF HOKKAIDO  
 JMA INTENSITIES  
 III : KUSHIRO  
 II : URAKAWA, MORIOKA  
 I : TOMAKOMAI, HACHINOHE,  
 SAKATA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HANASAKI-F	ON GROUND	F-481	10 13 7	131
2 URAKAWA-S	ON GROUND	S-2476	1 1 1	391

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

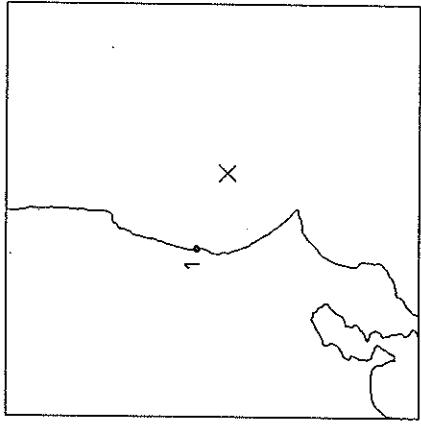
08:08 DEC. 12, 1992  
 HYUGANADA REGION  
 JMA INTENSITIES  
 I : MIYAZAKI  
 EPICENTER : 31°44.4'N 131°58.6'E  
 DEPTH : 23.0KM MAGNITUDE : 4.1



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAZAKI-M	ON GROUND	M-1439	2 2	52

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

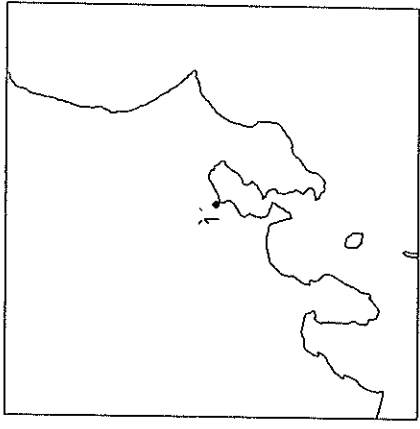
04:03 DEC. 23,1992 JMA INTENSITIES  
 E OFF IBARAKI PREF II : MITO  
 EPICENTER : 36°8.5 'N 141°12.3'E  
 DEPTH : 43.2KM MAGNITUDE : 3.9



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 HITACHINAKA-F	ON GROUND	F- 491	9 8 3	59

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

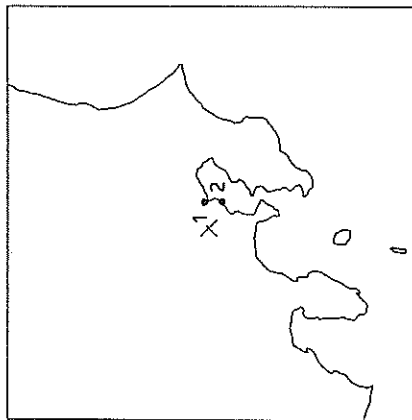
15:10 DEC. 26,1992 JMA INTENSITIES  
 TOKYO PREF II : TOKYO  
 EPICENTER : 35°41.6'N 139°40.7'E  
 DEPTH : 38.2KM MAGNITUDE : 3.3



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 SHINAGAWA-MB	IN GROUND	M-1431	1 1 1	10

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

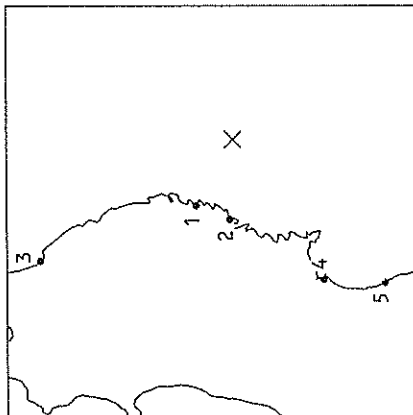
07:13 DEC. 27, 1992  
 TOKYO PREF  
 JMA INTENSITIES  
 II : TOKYO, YOKOHAMA  
 EPICENTER : 35°36.3'N 139°33.1'E  
 DEPTH : 37.4KM MAGNITUDE : 4.0



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	DIST. (KM)
1 SHINAGAWA-MB	IN GROUND	M-1432	1 2 1	19
2 KAWASAKI-FR	ON STRUC.	F- 523	24 28 7	21
2 KAWASAKI-F	ON GROUND	F- 522	15 17 7	21
2 KAWASAKI-FB	IN GROUND	F- 521	6 6 4	21

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

01:21 DEC. 28, 1992  
 E OFF MIYAGI PREF  
 JMA INTENSITIES  
 IV : OFUNATO, MIYAKO  
 III : SENDAI, HACHINOHE,  
 MORIOKA  
 II : AKITA, SAKATA, ONAHAMA  
 I : URAKAWA, KUSHIRO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	DIST. (KM)
1 KAMAISHI-MB	IN GROUND	M-1428	11 9 9	67
1 KAMAISHI-M	ON GROUND	M-1427	25 24 22	67
2 OFUNATO-MOUND-M	ON STRUC.	M-1424	47 29 26	71
2 OFUNATO-BO-S	ON STRUC.	S-2478	10 13 5	71
3 HACHINOHE-JI-S	ON GROUND	S-2477	9 13 5	202
4 SHIOGAMA-KOJYO-S	ON GROUND	S-2480	13 11 13	147
4 SENDAI-MB	IN GROUND	M-1435	16 11 3	151
4 SENDAI-M	ON GROUND	M-1437	21 23 5	151
5 SOMA-S	ON GROUND	S-2483	11 8 3	184

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

11:08 DEC. 29, 1992

E OFF MIYAGI PREF

EPICENTER : 38°38.2'N 142°28.7'E

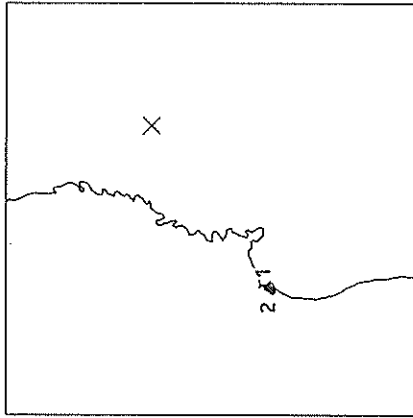
DEPTH : 31.0KM MAGNITUDE : 4.7

JMA INTENSITIES

III : OFUNATO

II : MORIOKA

I : MIYAKO, SENDAI, SAKATA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	MAX. ACC. (GAL) (EW) (UD)	DIST. (KM)
1 SHIOGAMA-KOJYO-S	ON GROUND	S-2482	11 8 6	144	144
2 SENDAI-MB	IN GROUND	M-1438	4 5 2	148	148
2 SENDAI-M	ON GROUND	M-1434	7 7 4	148	148

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

16:02 DEC. 31, 1992

E OFF MIYAGI PREF

EPICENTER : 38°55.5'N 142°33.7'E

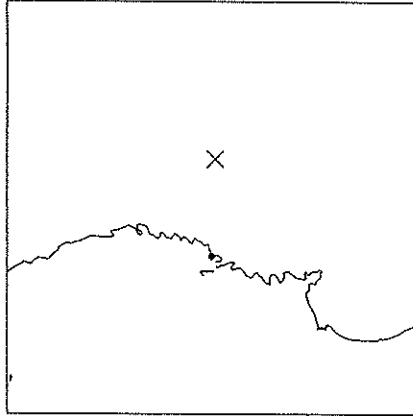
DEPTH : 32.0KM MAGNITUDE : 5.7

JMA INTENSITIES

III : OFUNATO, MIYAKO, MORIOKA

II : SENDAI, HACHINOHE, AKITA,

SAKATA, ONAHAMA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	MAX. ACC. (GAL) (EW) (UD)	DIST. (KM)
1 OFUNATO-MOUND-M	ON STRUC.	M-1425	8 5 7	72	72

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

16:26 DEC. 31, 1992

E OFF MIYAGI PREF

EPICENTER : 38°55.9'N 142°35.9'E

DEPTH : 29.8KM MAGNITUDE : 5.8

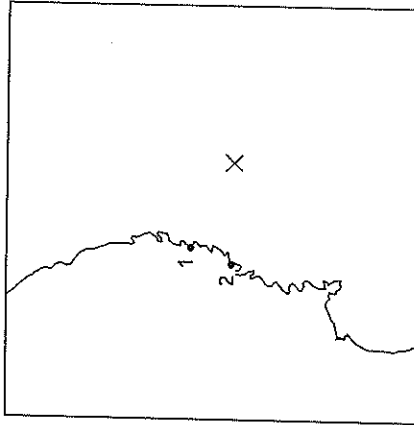
JMA INTENSITIES

IV : OFUNATO, MIYAKO, MORIOKA

III : HACHINOHE

II : SENDAI, AKITA, SAKATA

I : ONAHAMA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 KAMAISHI-MB	IN GROUND	M-1430	7 7 7	70
1 KAMAISHI-M	ON GROUND	M-1429	17 16 17	70
2 OFUNATO-MOUND-M	ON STRUC.	M-1426	13 10 8	75
2 OFUNATO-BO-S	ON STRUC.	S-2479	22 34 8	75



## Results of Preliminary Analyses (1992)

RECORD NUMBER : F-475  
 STATION : HANASAKI-F  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 14:47 JAN. 18, 1992

LOCATION OF HYPOCENTER

OFF NEMURO PENINSULA

LATITUDE 42°55.1' N

LONGITUDE 145°28.3' E

DEPTH 39.7KM

MAGNITUDE 4.2

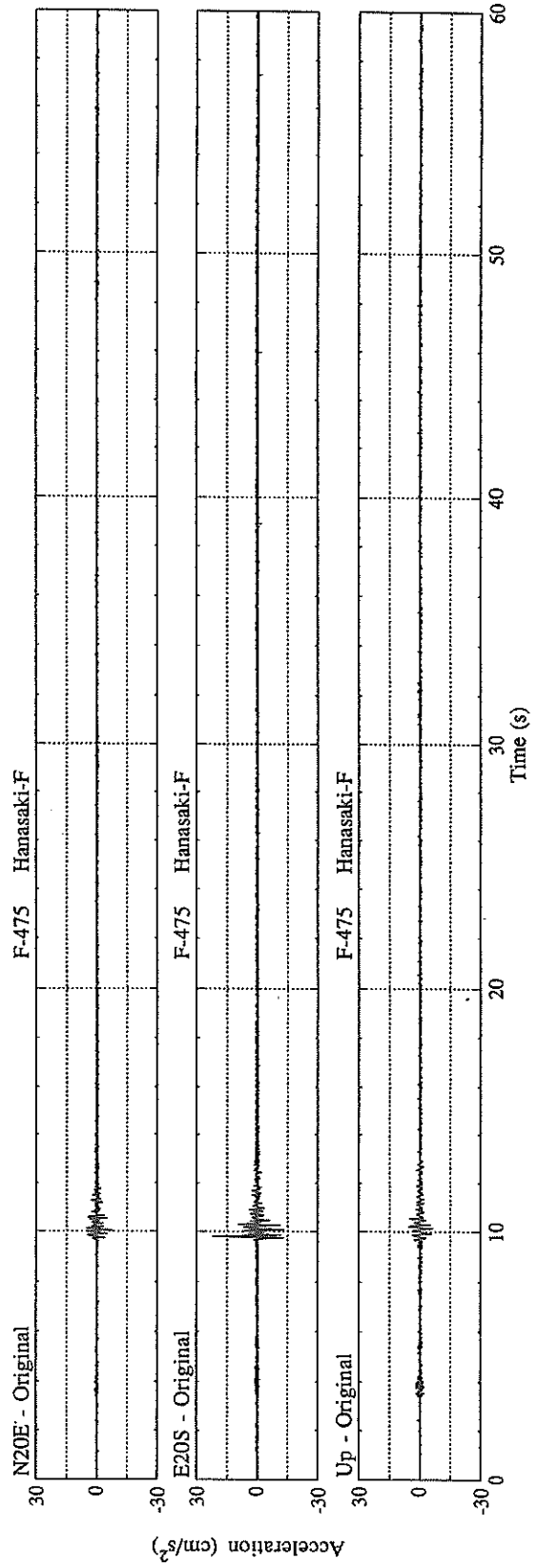
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*

ORIGINAL ACCELERATION (GAL) 7.3 21.7 6.2 22.0

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2417

STATION : KOKEN-S

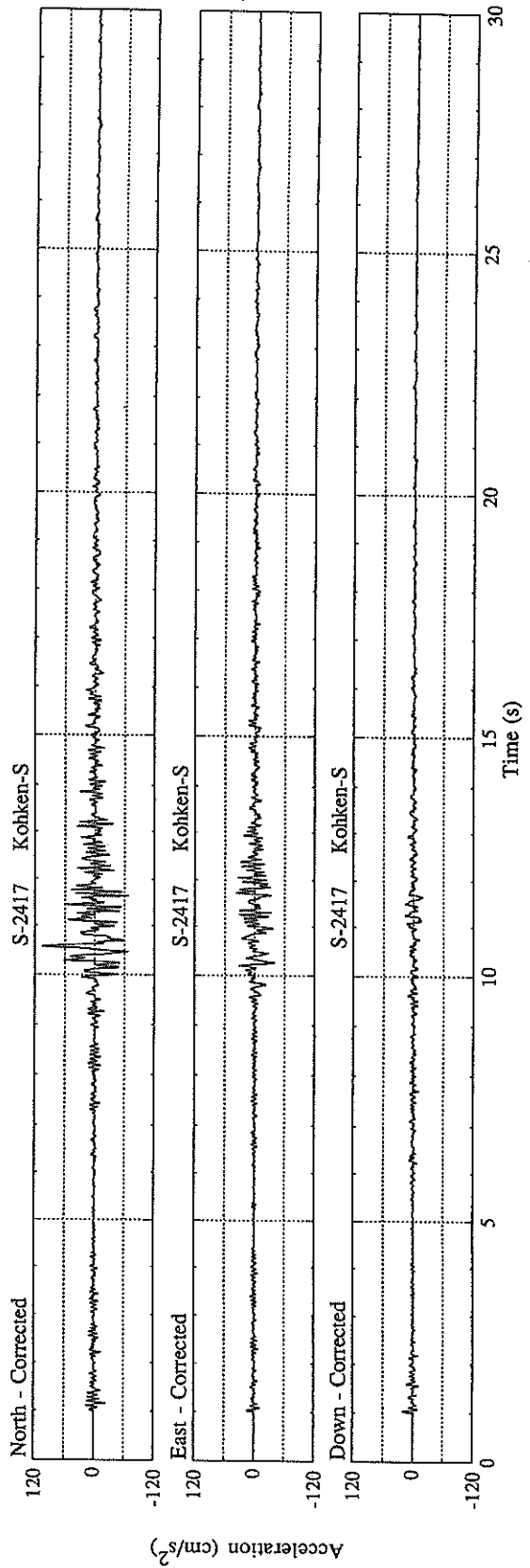
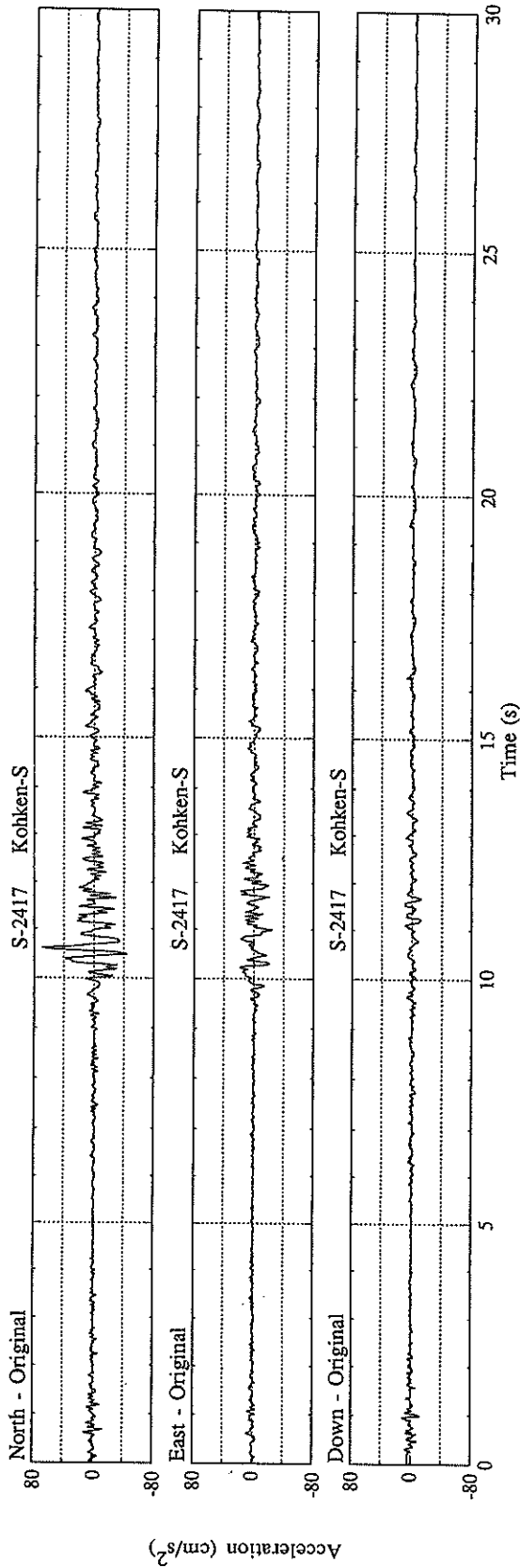
EARTHQUAKE DATA

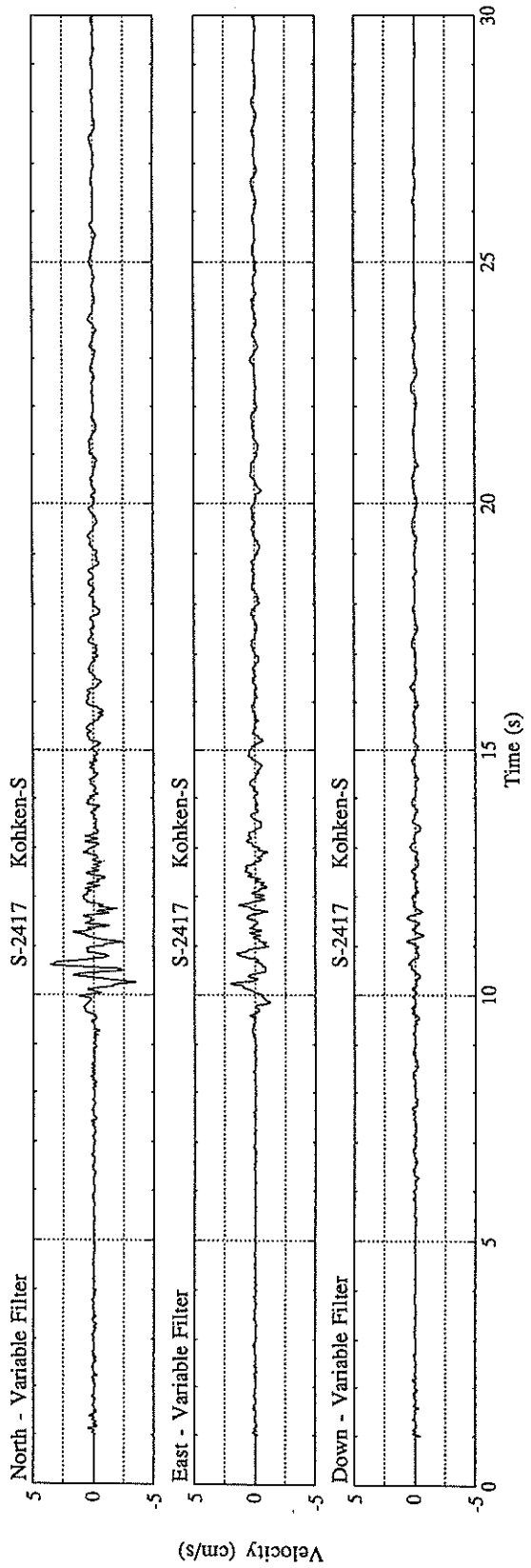
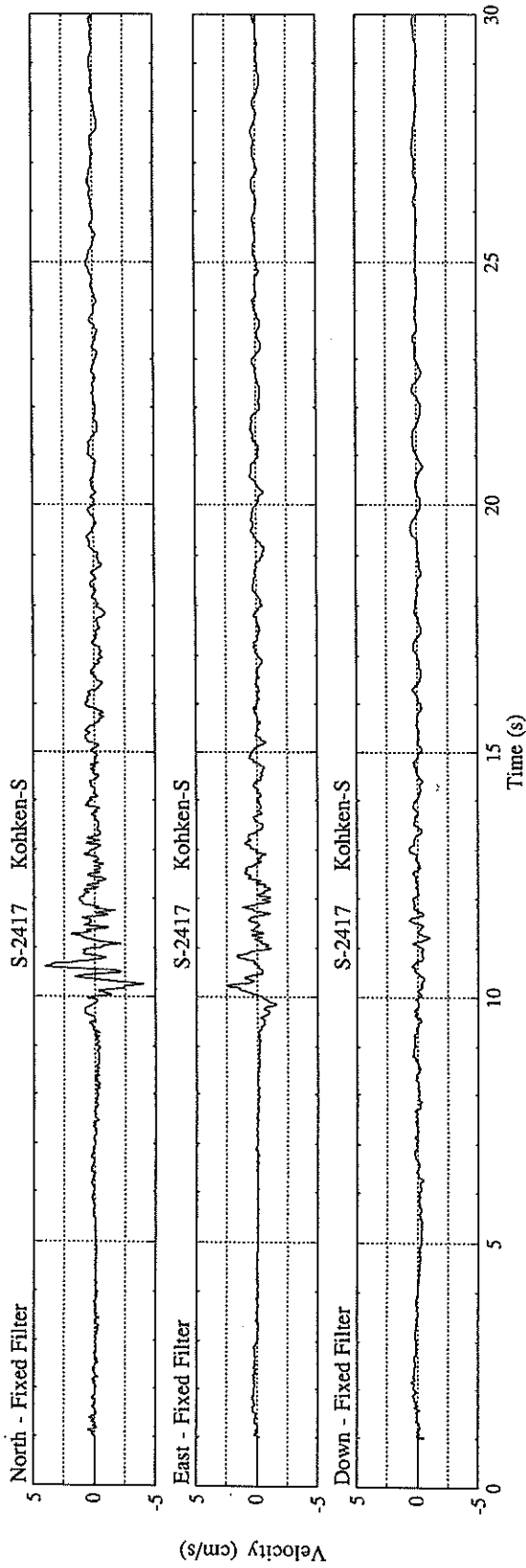
\*\*\*\*\*  
DATE AND TIME 4: 4 FEB. 2, 1992  
LOCATION OF HYPOCENTER  
EPICENTRAL REGION TOKYO BAY REGION  
LATITUDE 35° 13.6' N  
LONGITUDE 139° 47.5' E  
DEPTH 92.3KM  
JMA MAGNITUDE 5.9  
\*\*\*\*\*

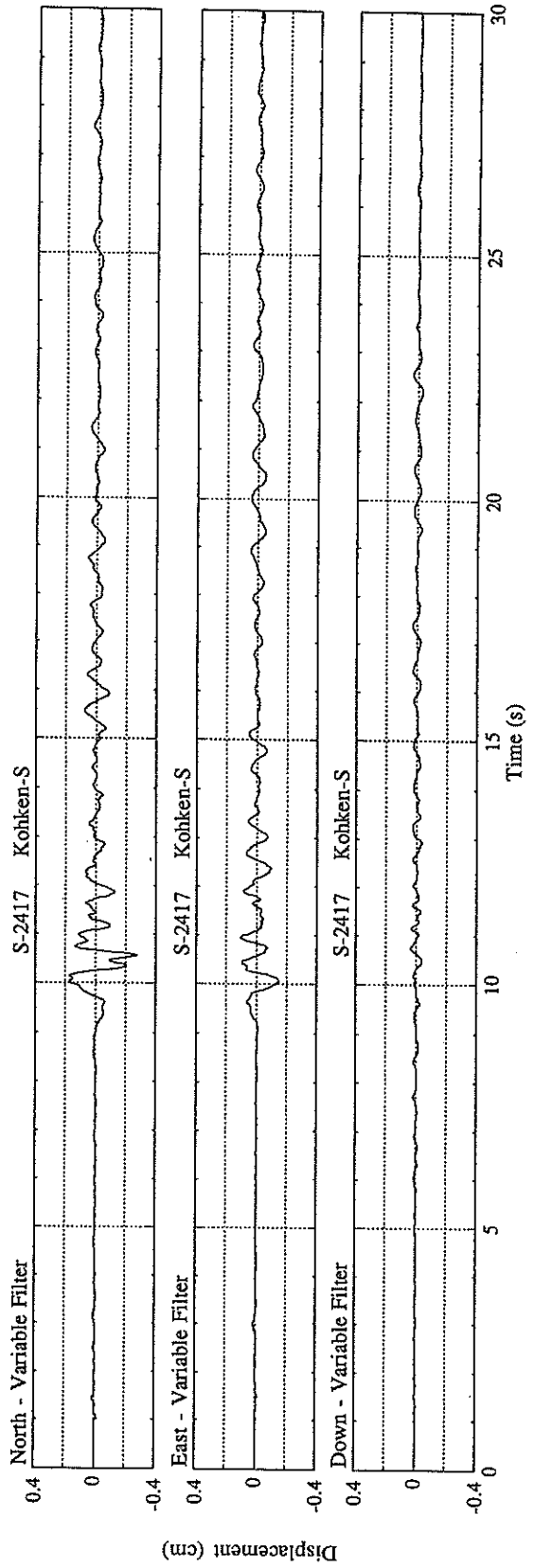
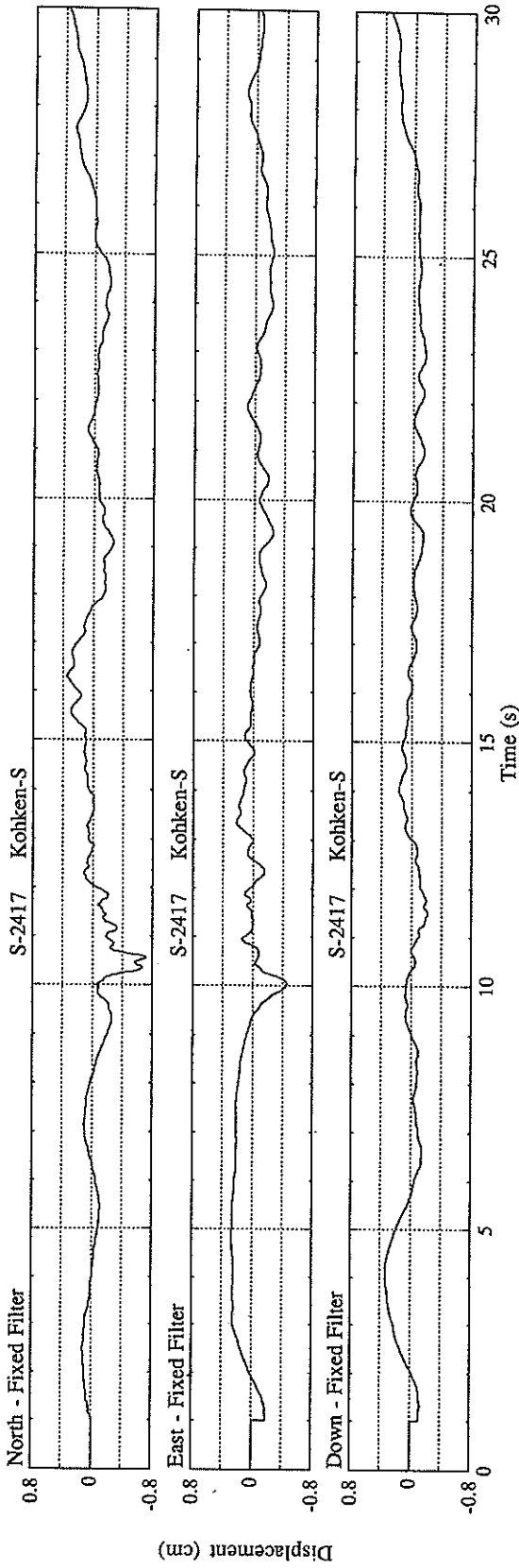
PEAK VALUES OF COMPONENTS

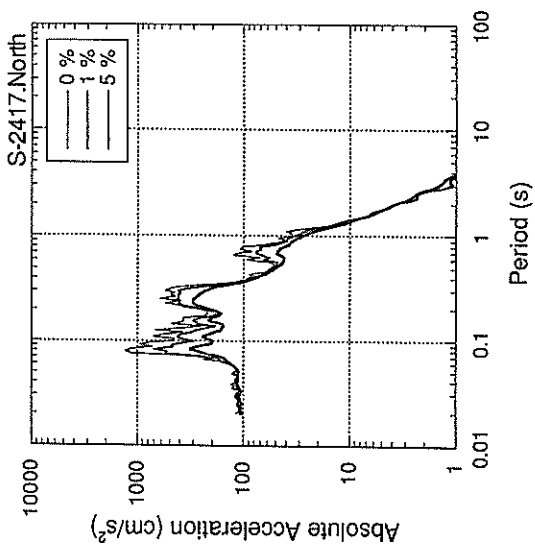
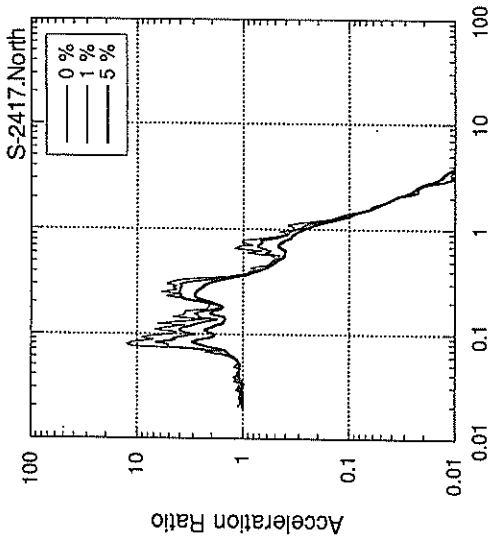
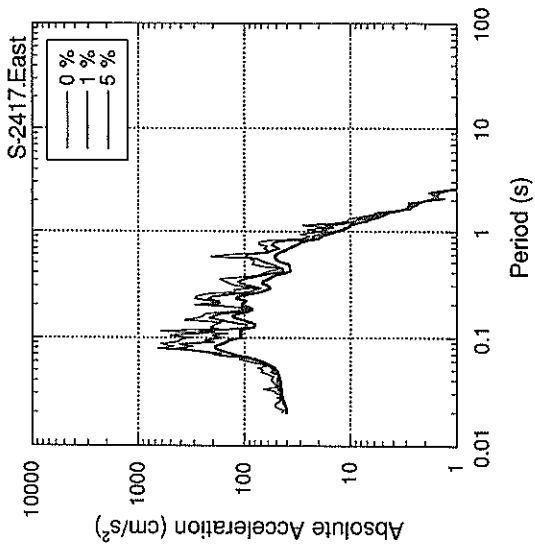
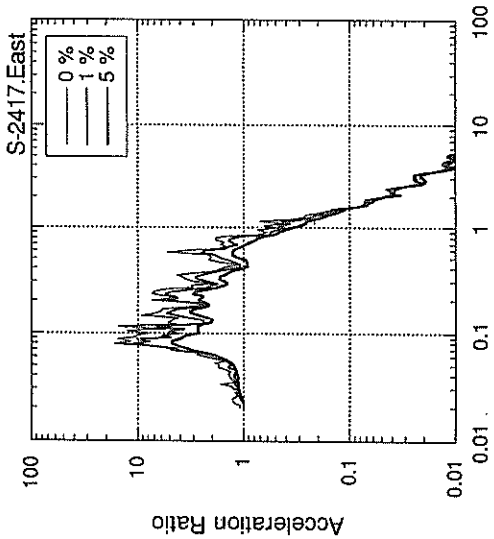
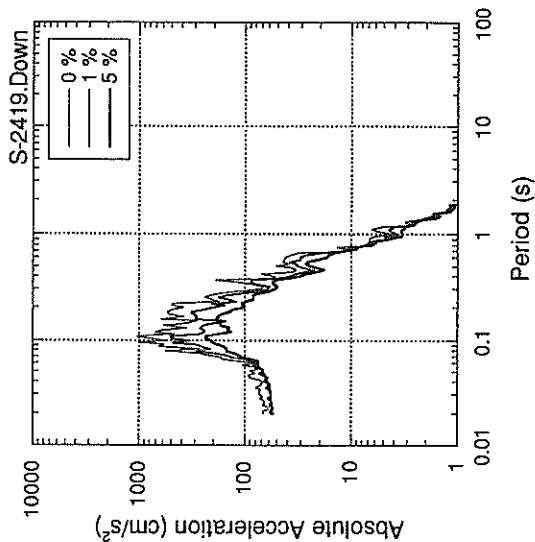
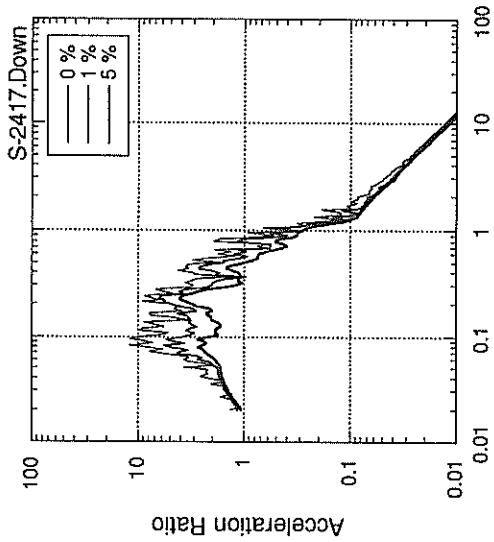
	N S	E W	U D	HORIZONTAL*
PARAMETER OF THE VARIABLE FILTER				
FC (HZ)	0.682	0.743	0.975	
MAXIMUM ACCELERATION (GAL)				
ORIGINAL	69.3	23.8	12.4	69.4
CORRECTED	104.6	40.0	20.2	105.0
MAXIMUM VELOCITY (CM/SEC)				
FIXED FILTER	4.06	2.48	0.98	4.35
VARIABLE FILTER	3.60	1.99	0.70	3.65
MAXIMUM DISPLACEMENT (CM)				
FIXED FILTER	0.71	0.45	0.34	0.72
VARIABLE FILTER	0.27	0.15	0.04	0.27

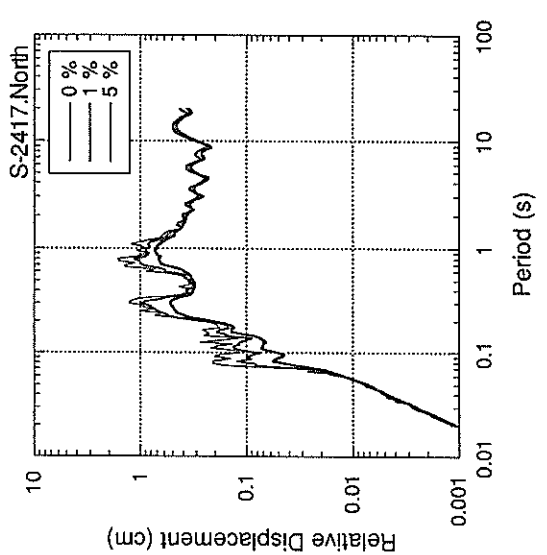
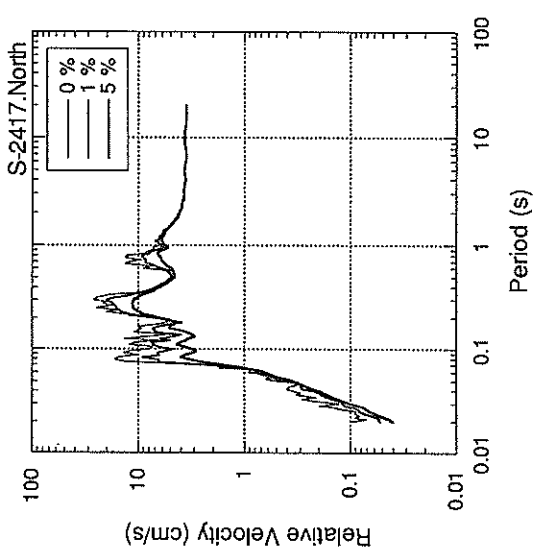
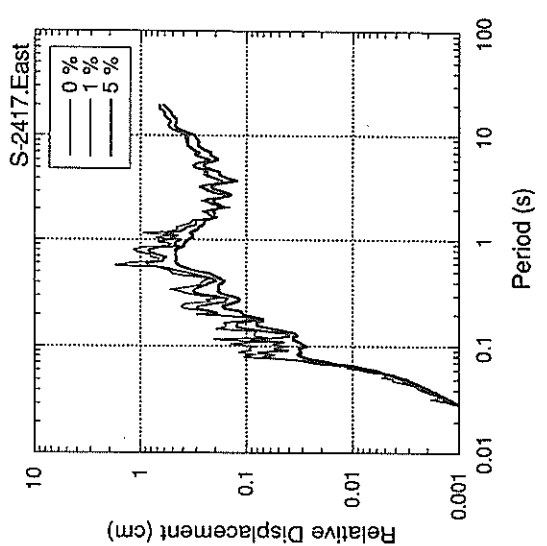
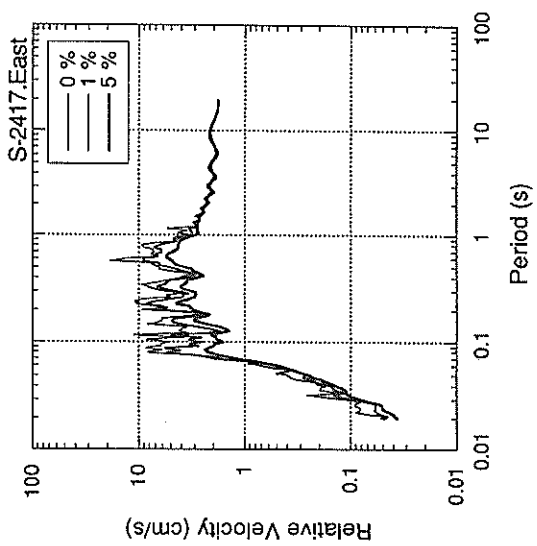
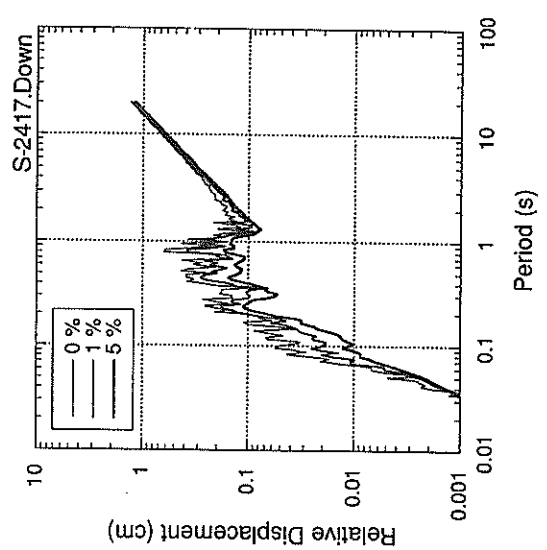
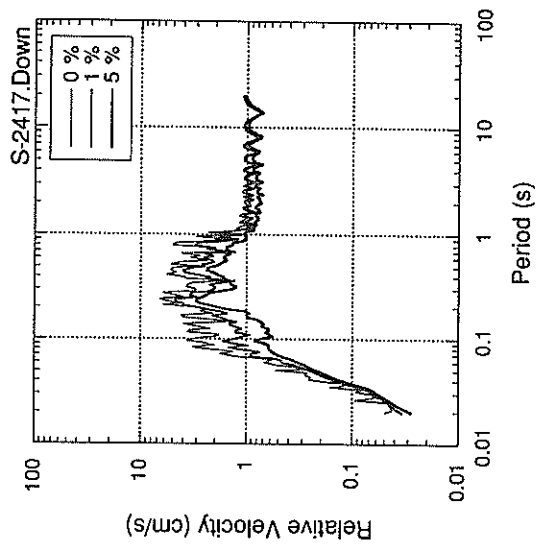
\* RESULTANT OF HORIZONTAL COMPONENTS



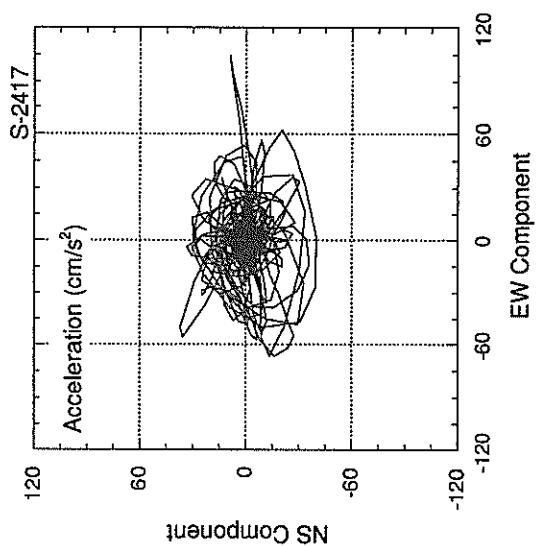
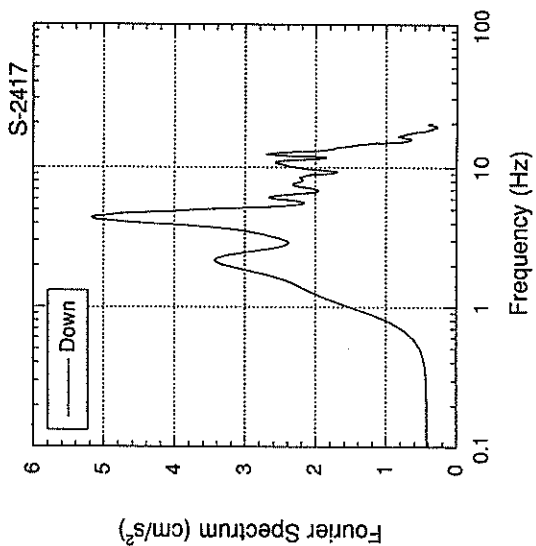
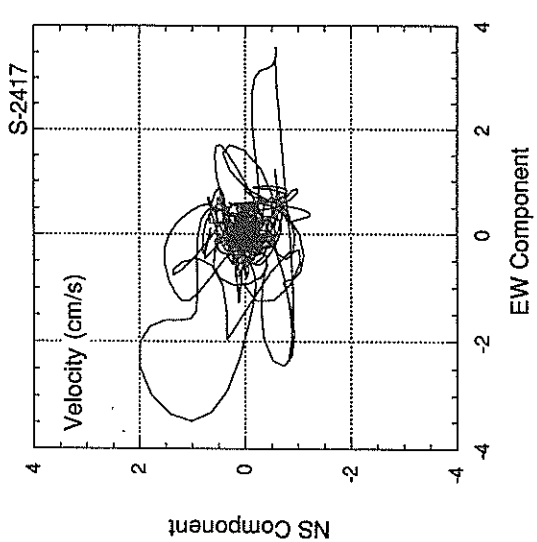
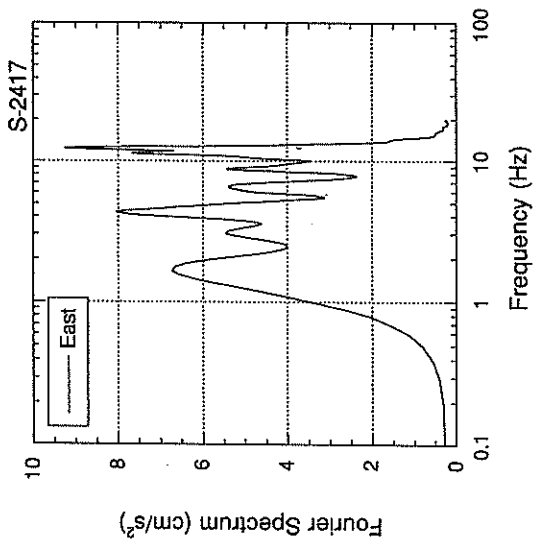
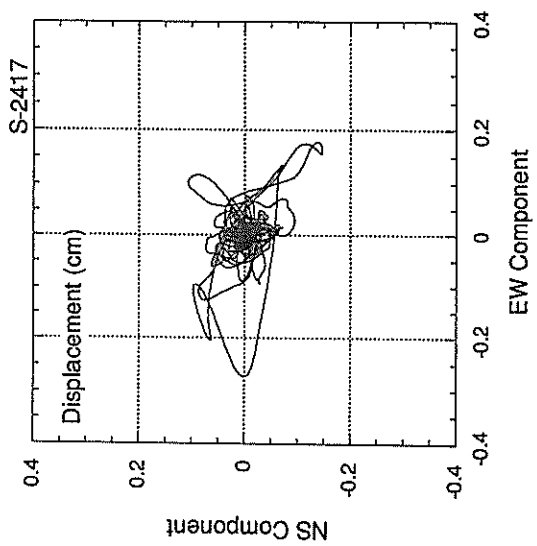
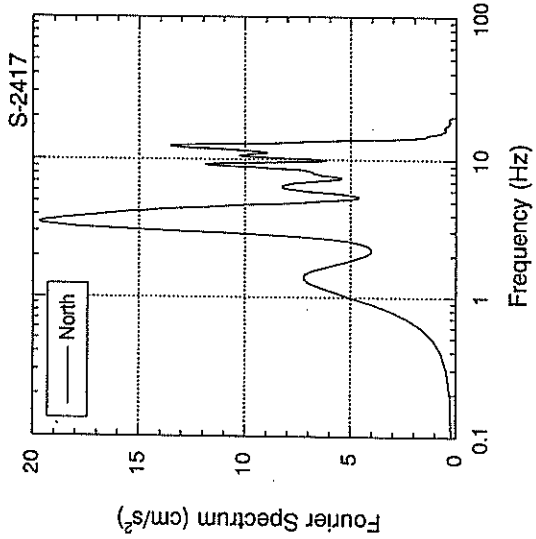












RECORD NUMBER : S-2418  
 STATION : CHIBA-S  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 4: 4 FEB. 2, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION TOKYO BAY REGION

LATITUDE 35° 13.6' N

LONGITUDE 139° 47.5' E

DEPTH 92.3KM

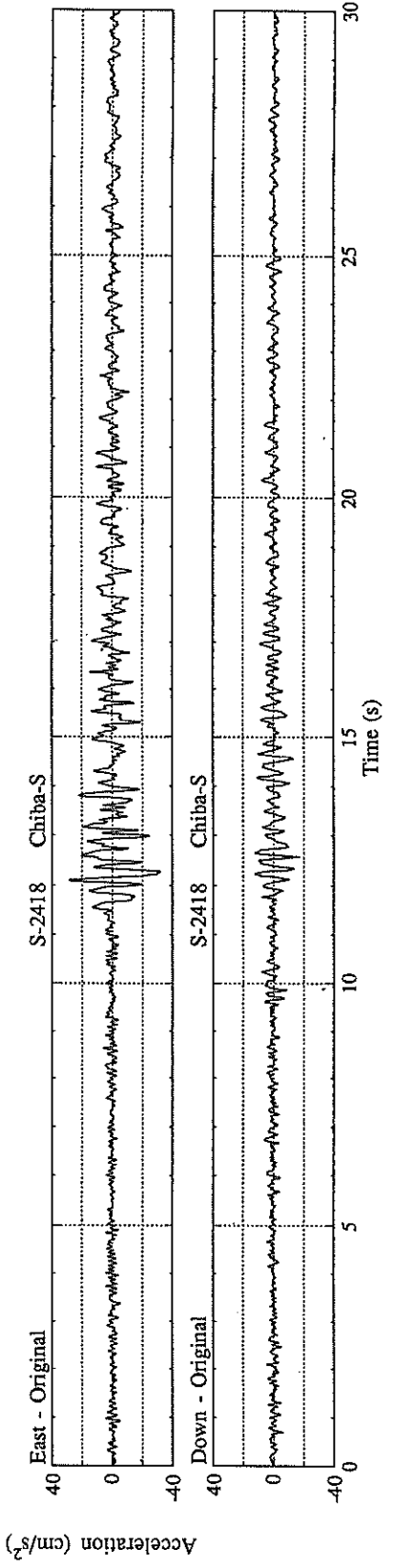
JMA MAGNITUDE 5.9

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 31.7 16.8  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2419

STATION : SHINAGAWA-S

EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 4: 4 FEB. 2, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION TOKYO BAY REGION

LATITUDE 35° 13.6' N

LONGITUDE 139° 47.5' E

DEPTH 92.3KM

JMA MAGNITUDE 5.9

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
N S            E W            U D            HORIZONTAL\*  
-----

PARAMETER OF THE VARIABLE FILTER

-----

FC (HZ)                    0.528            0.247            1.089

MAXIMUM ACCELERATION (GAL)

-----

ORIGINAL                    74.4            80.0            29.1            91.0  
CORRECTED                   129.9           133.5           53.0            151.7

MAXIMUM VELOCITY (CM/SEC)

-----

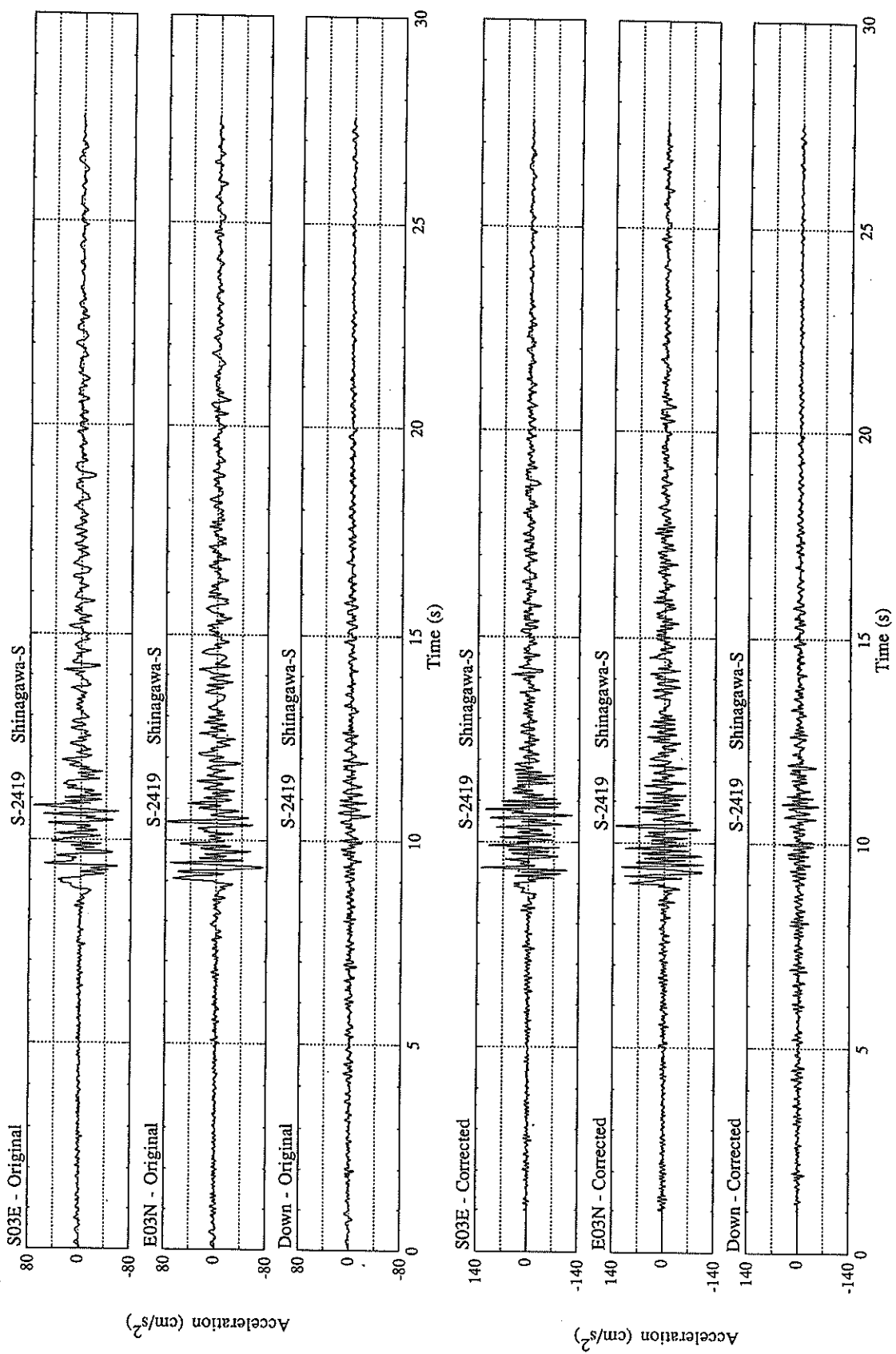
FIXED FILTER                5.44            7.26            1.41            7.34  
VARIABLE FILTER              5.41            5.95            1.50            6.00

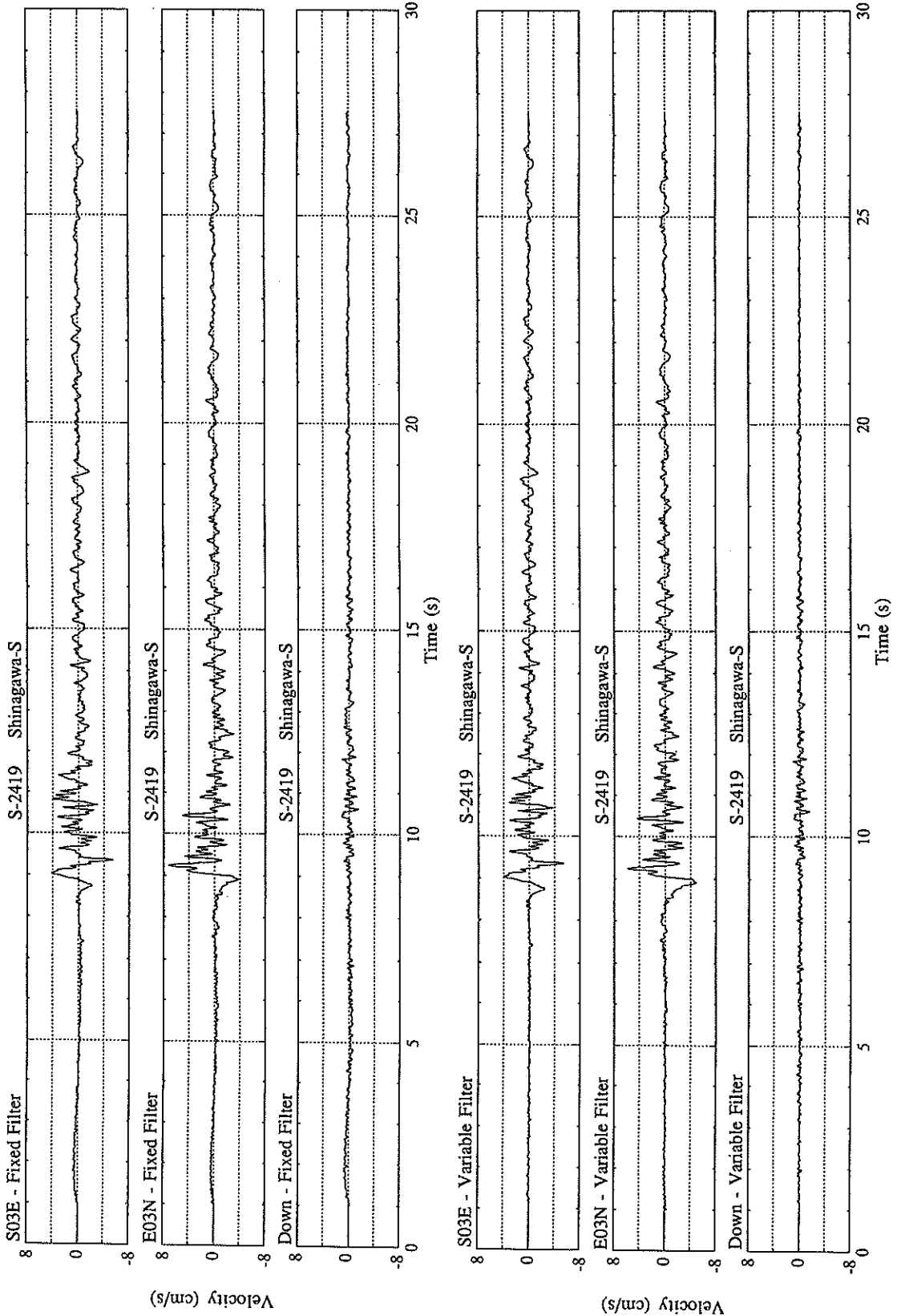
MAXIMUM DISPLACEMENT (CM)

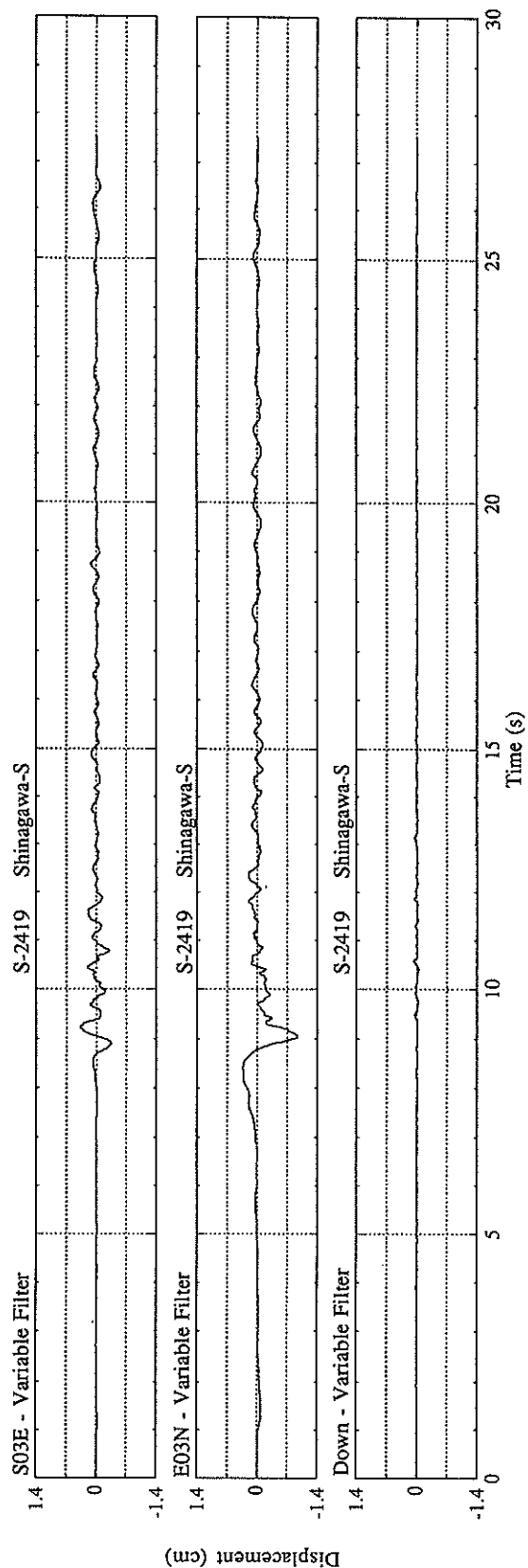
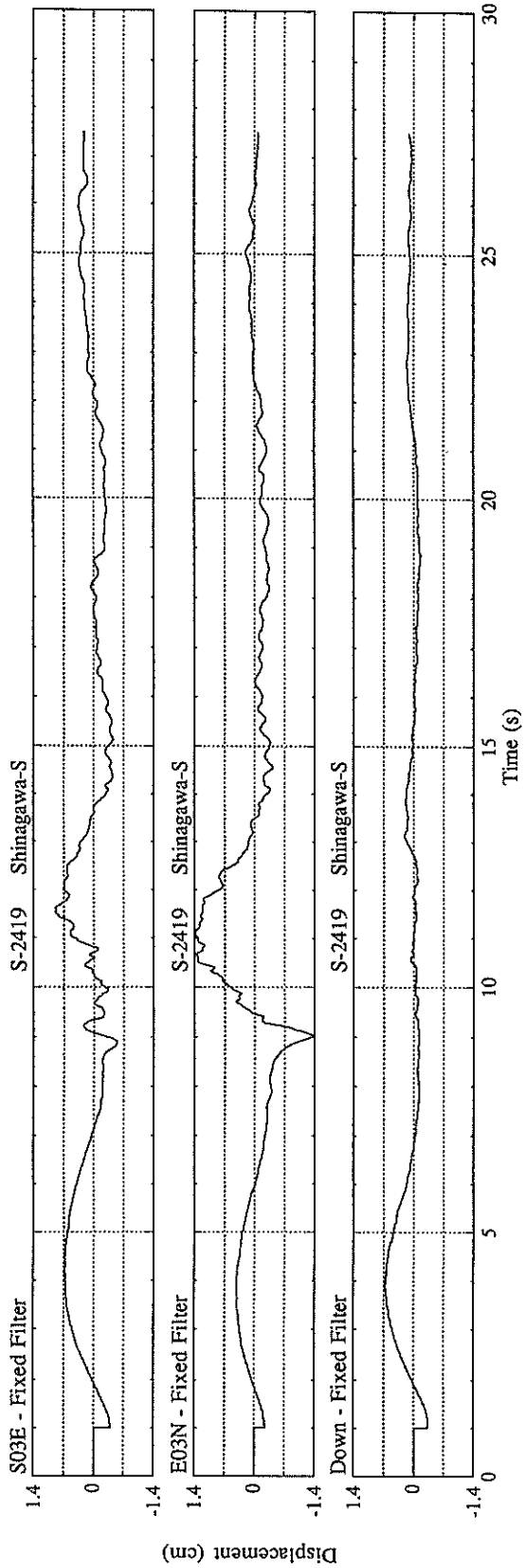
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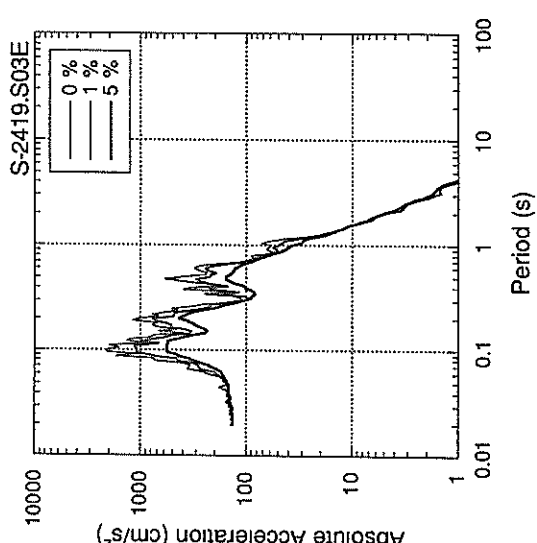
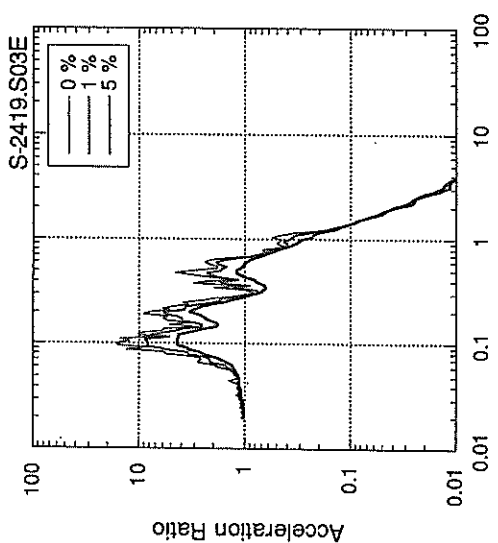
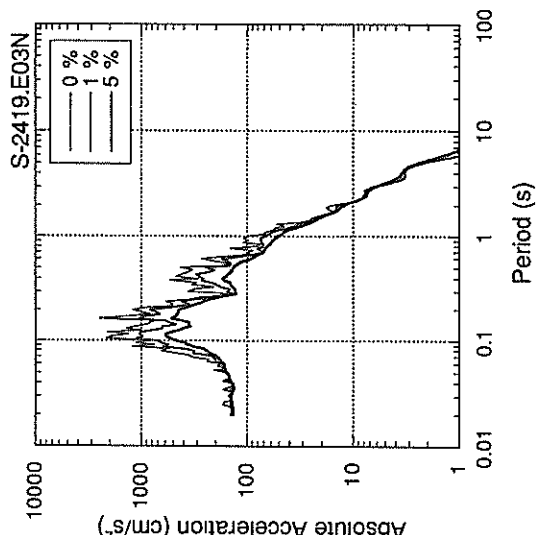
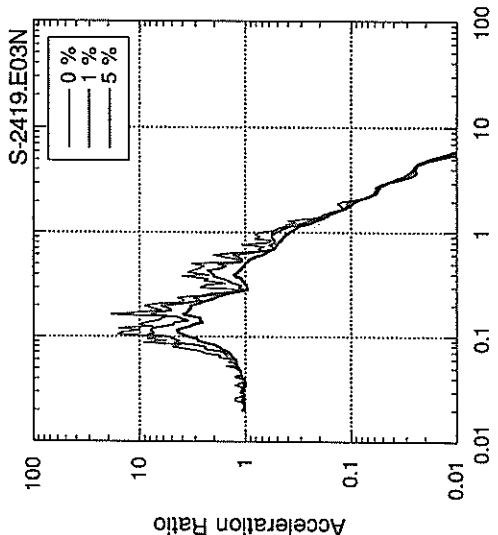
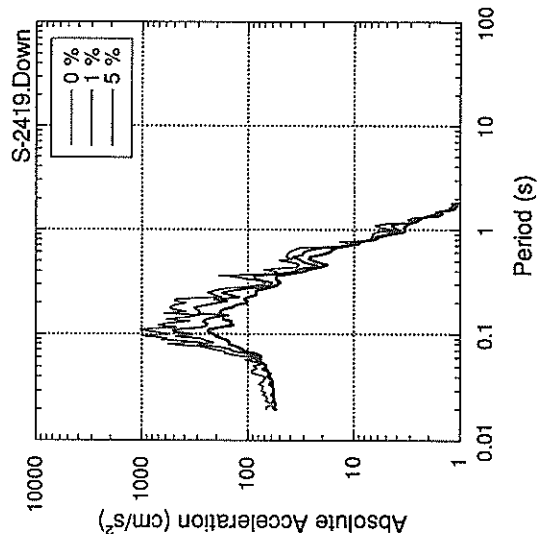
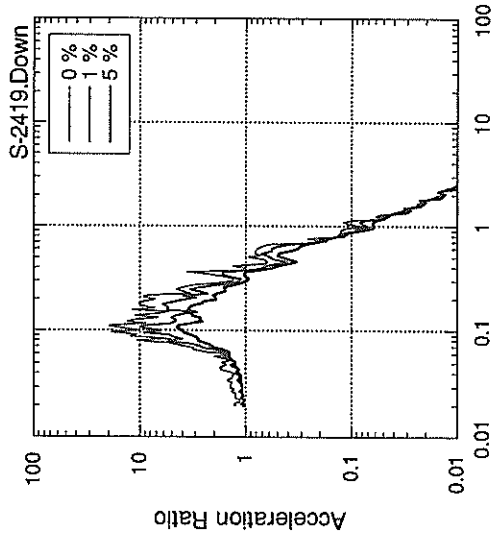
FIXED FILTER                0.89            1.38            0.67            1.52  
VARIABLE FILTER              0.38            0.94            0.07            0.94

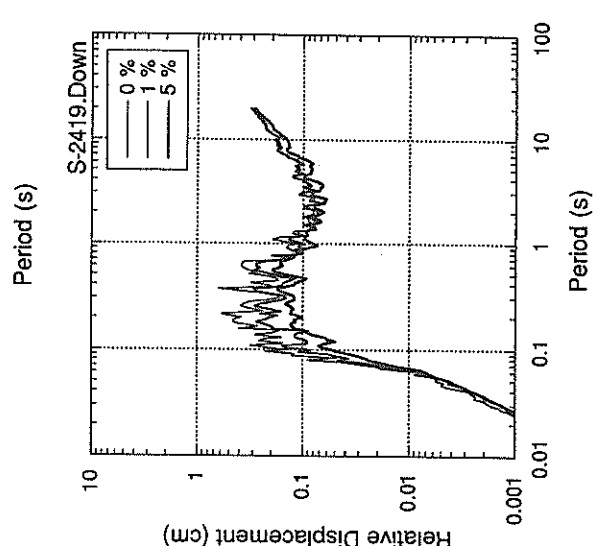
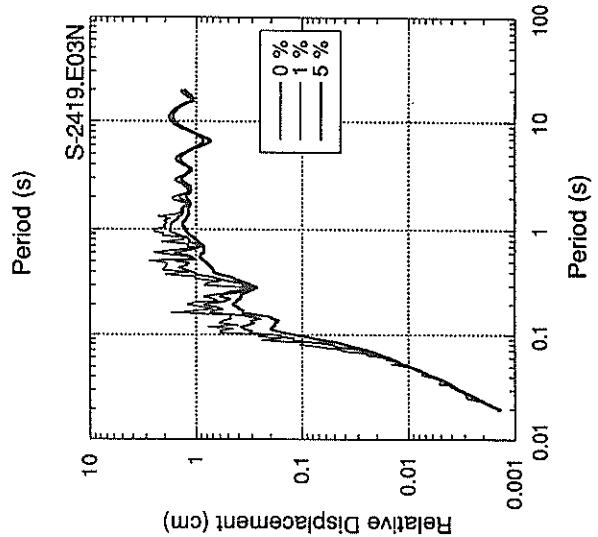
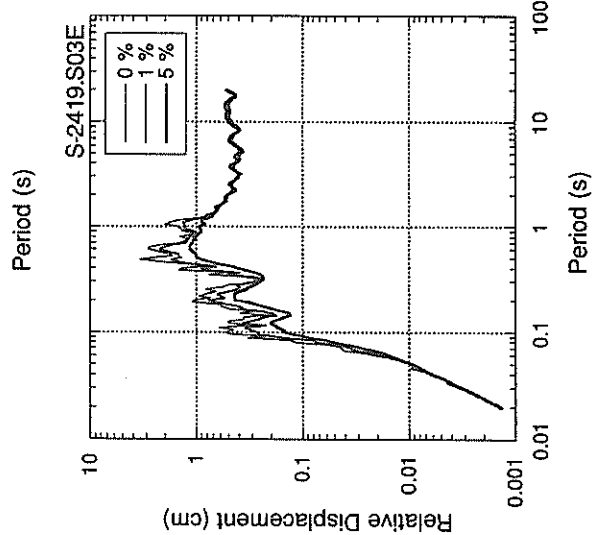
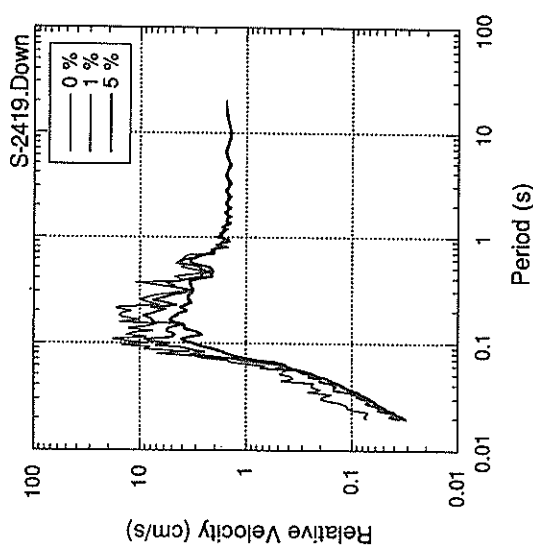
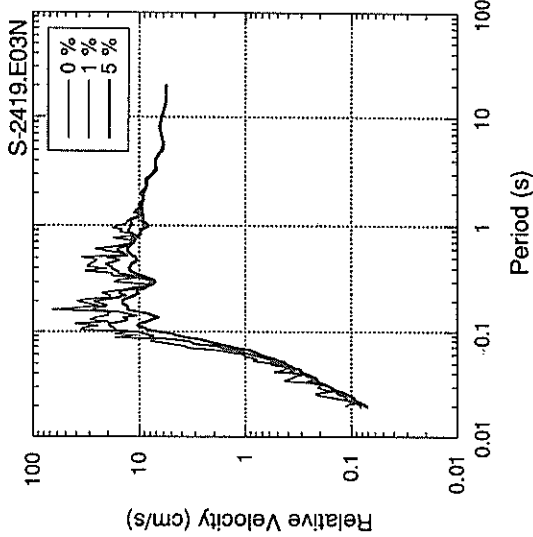
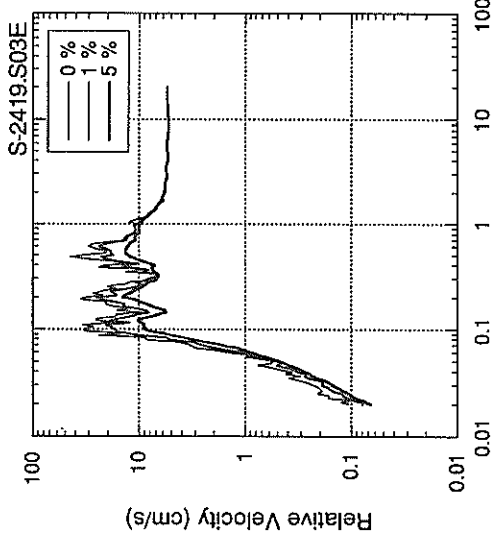
\* RESULTANT OF HORIZONTAL COMPONENTS



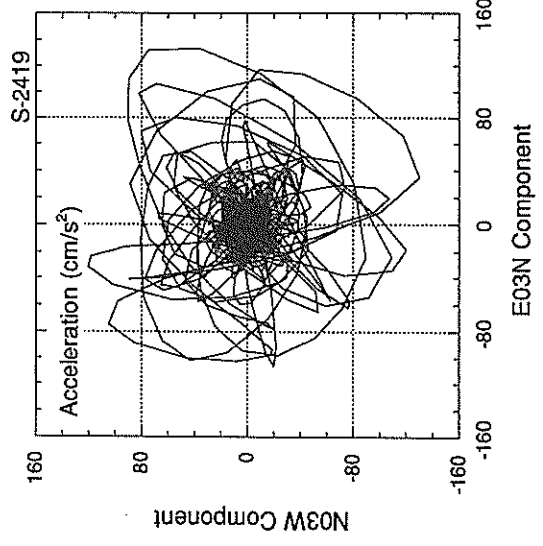
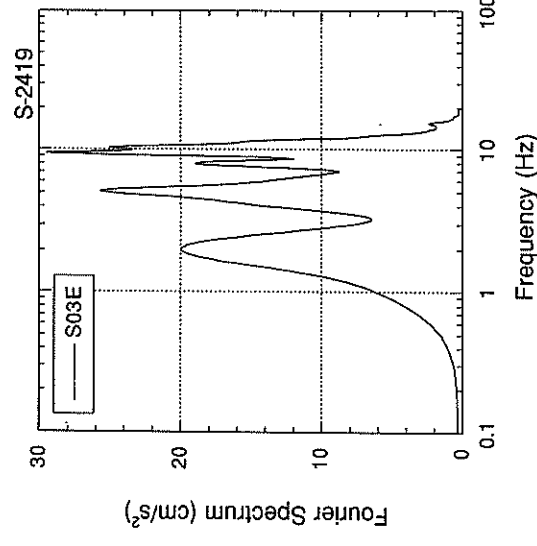
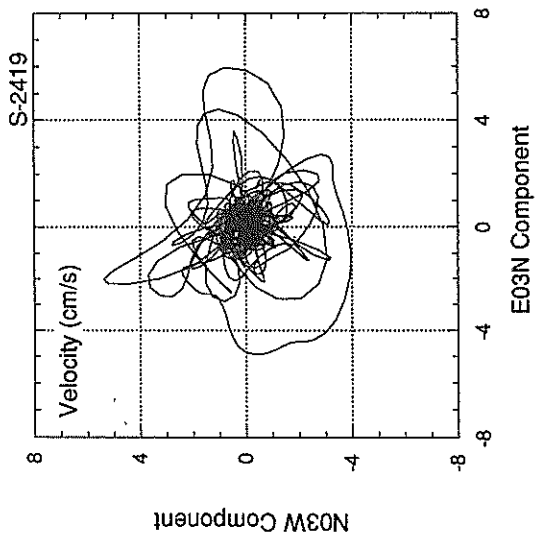
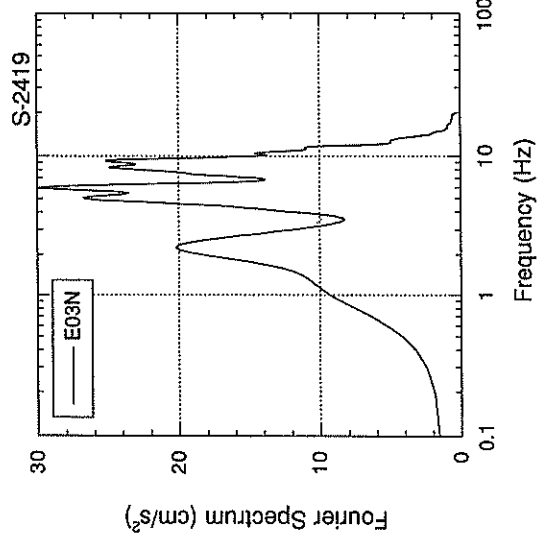
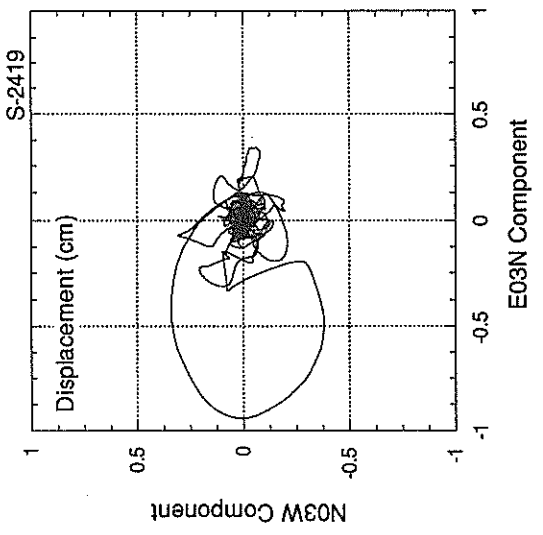
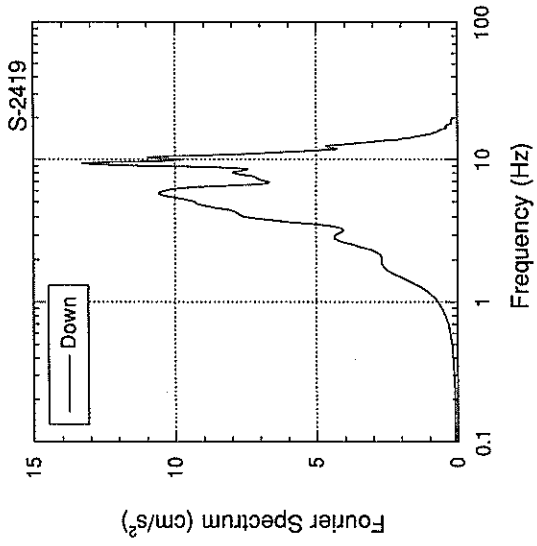












RECORD NUMBER : M-1389  
 STATION : SHINAGAWA-MB  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 4: 4 FEB. 2, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION TOKYO BAY REGION

LATITUDE 35° 13.6' N

LONGITUDE 139° 47.5' E

DEPTH 92.3KM

JMA MAGNITUDE 5.9

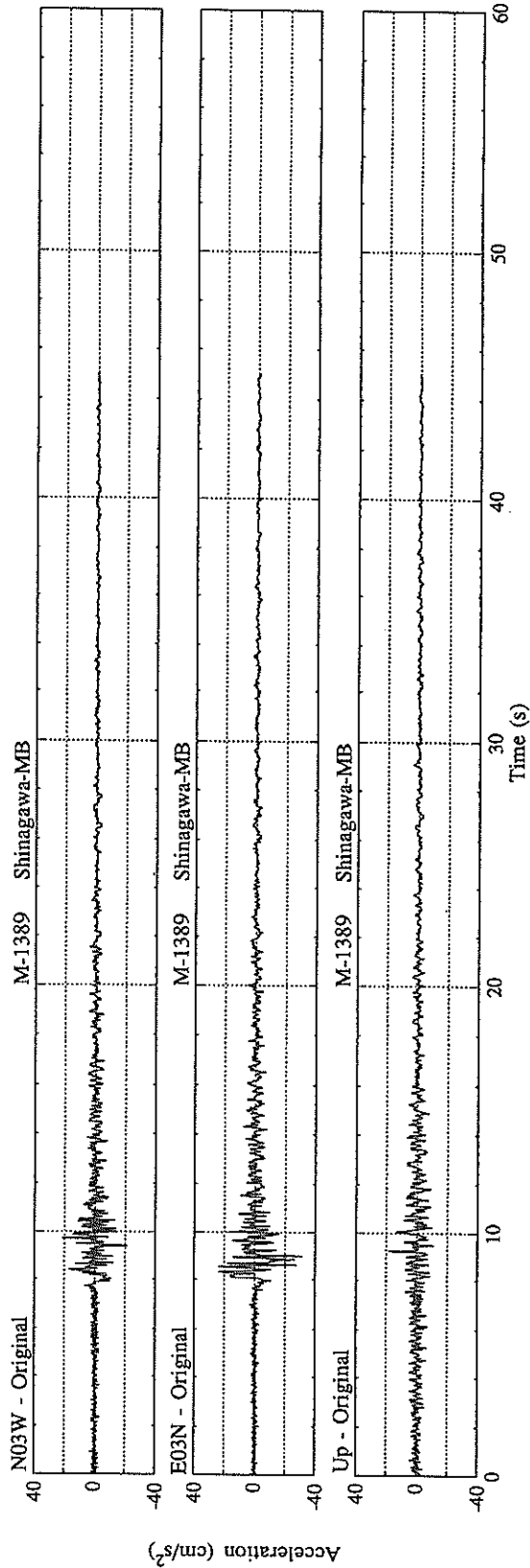
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 21.7 31.3 18.3 31.7

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-460  
 STATION : HITACHINAKA-F  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 4: 4 FEB. 2, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION TOKYO BAY REGION

LATITUDE 35° 13.6' N

LONGITUDE 139° 47.5' E

DEPTH 92.3KM

JMA MAGNITUDE 5.9

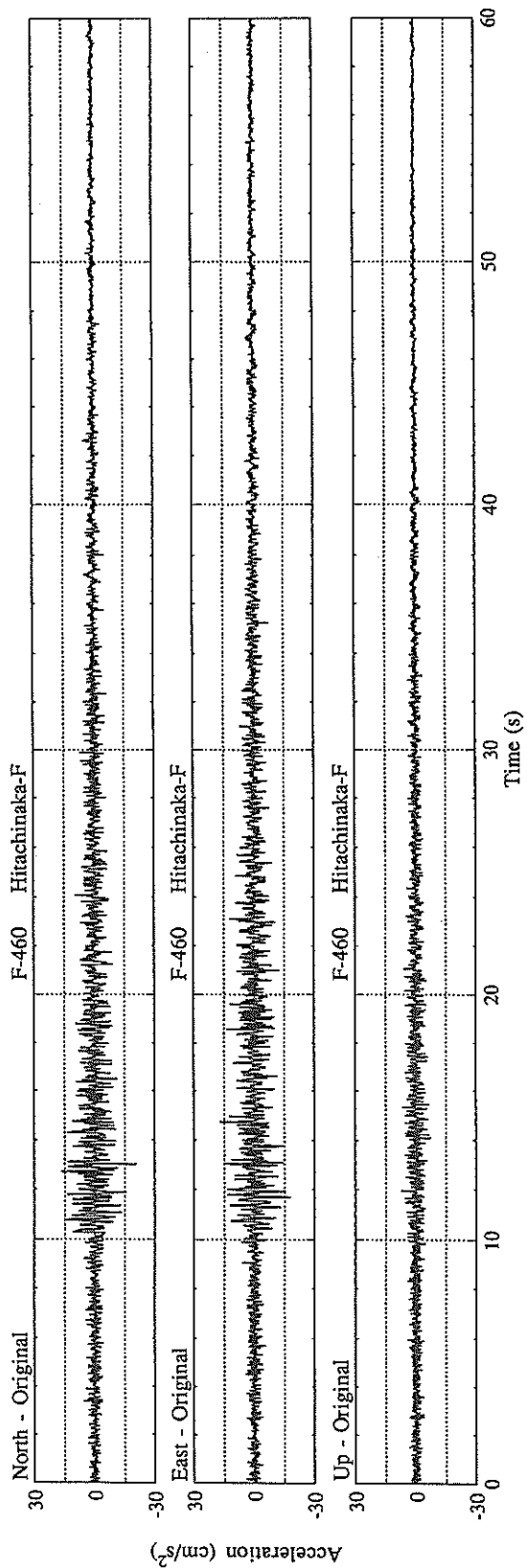
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 20.8 17.7 7.5 21.5

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-461

STATION : KAWASAKI-FB

EARTHQUAKE DATA

\*\*\*\*\*  
DATE AND TIME 4: 4 FEB. 2, 1992  
LOCATION OF HYPOCENTER  
EPICENTRAL REGION TOKYO BAY REGION  
LATITUDE 35° 13.6' N  
LONGITUDE 139° 47.5' E  
DEPTH 92.3KM  
JMA MAGNITUDE 5.9  
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
N S E W U D HORIZONTAL\*  
-----

PARAMETER OF THE VARIABLE FILTER

-----  
FC (HZ) 0.304 0.219 0.463

MAXIMUM ACCELERATION (GAL)

-----  
SMAC-B2 EQUIVALENT 33.7 36.7 7.6 39.8  
ORIGINAL 42.5 52.2 11.9 54.2  
CORRECTED 42.5 51.7 11.5 54.0

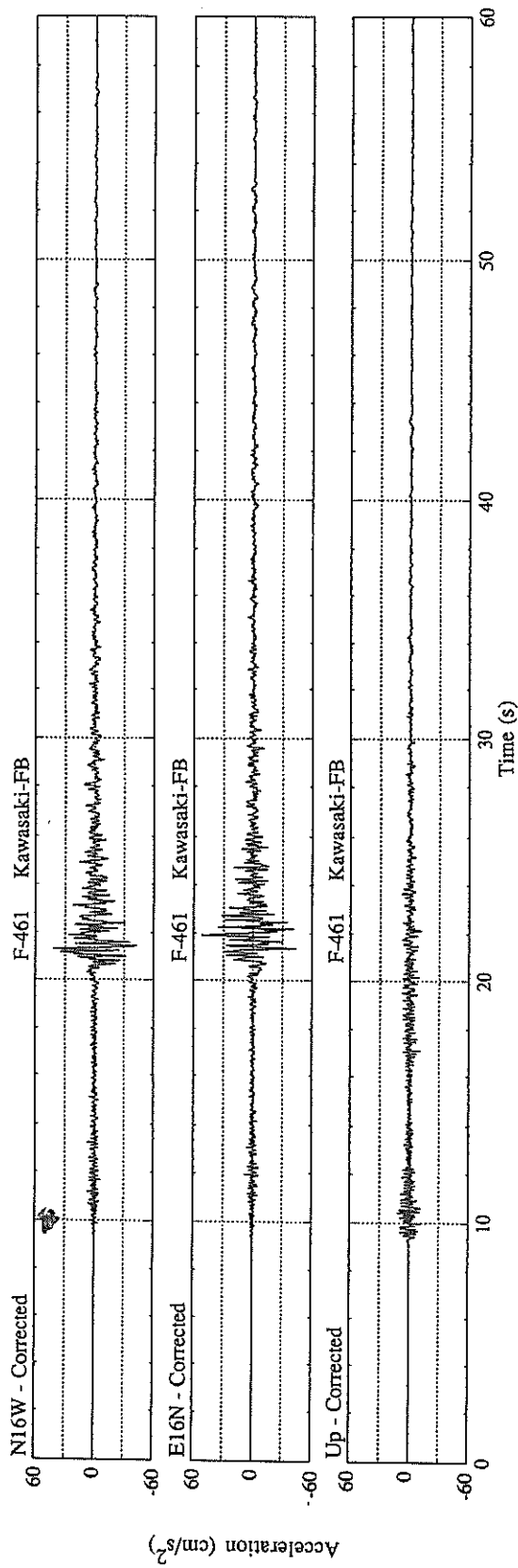
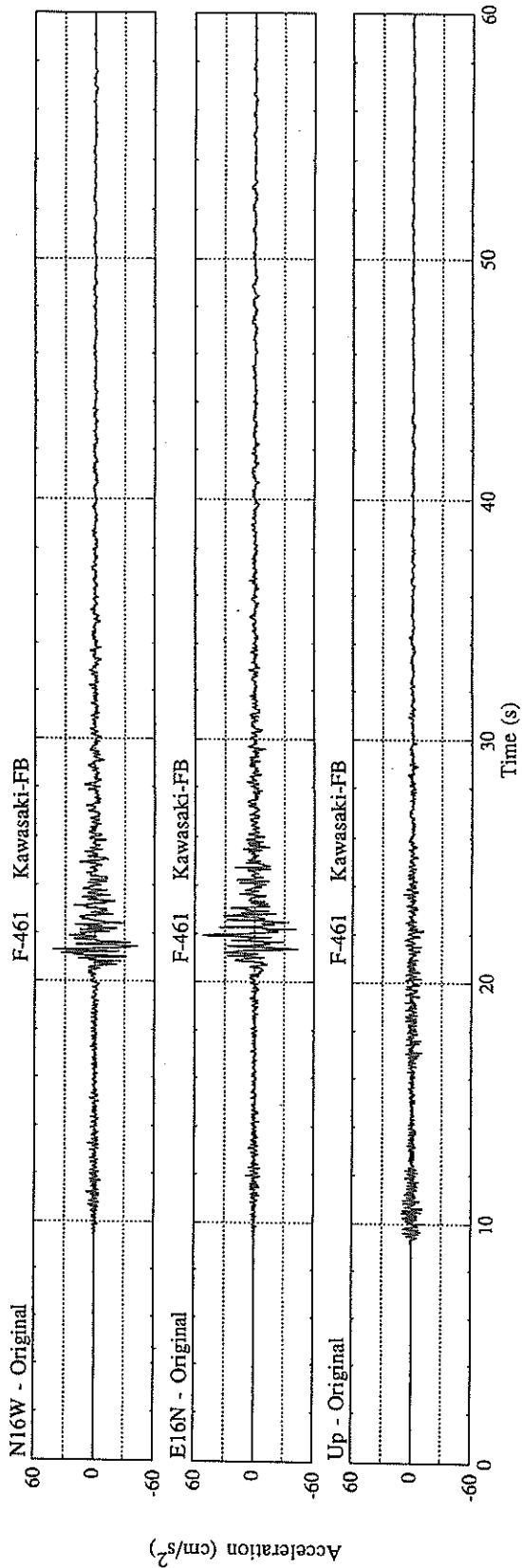
MAXIMUM VELOCITY (CM/SEC)

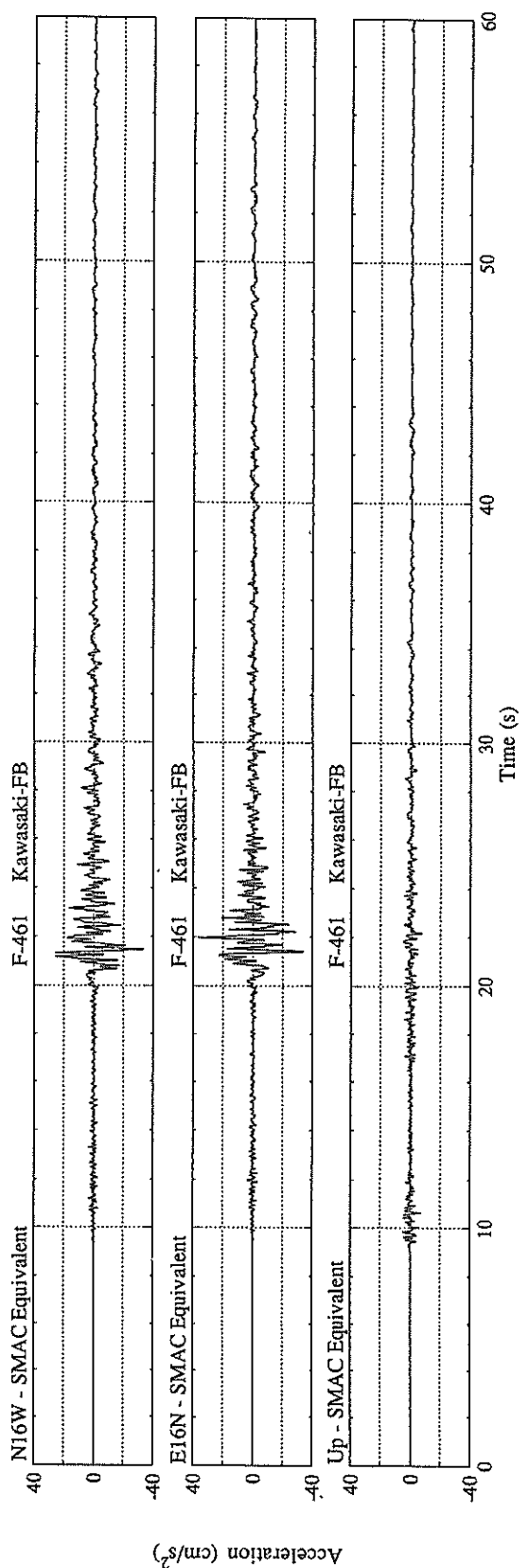
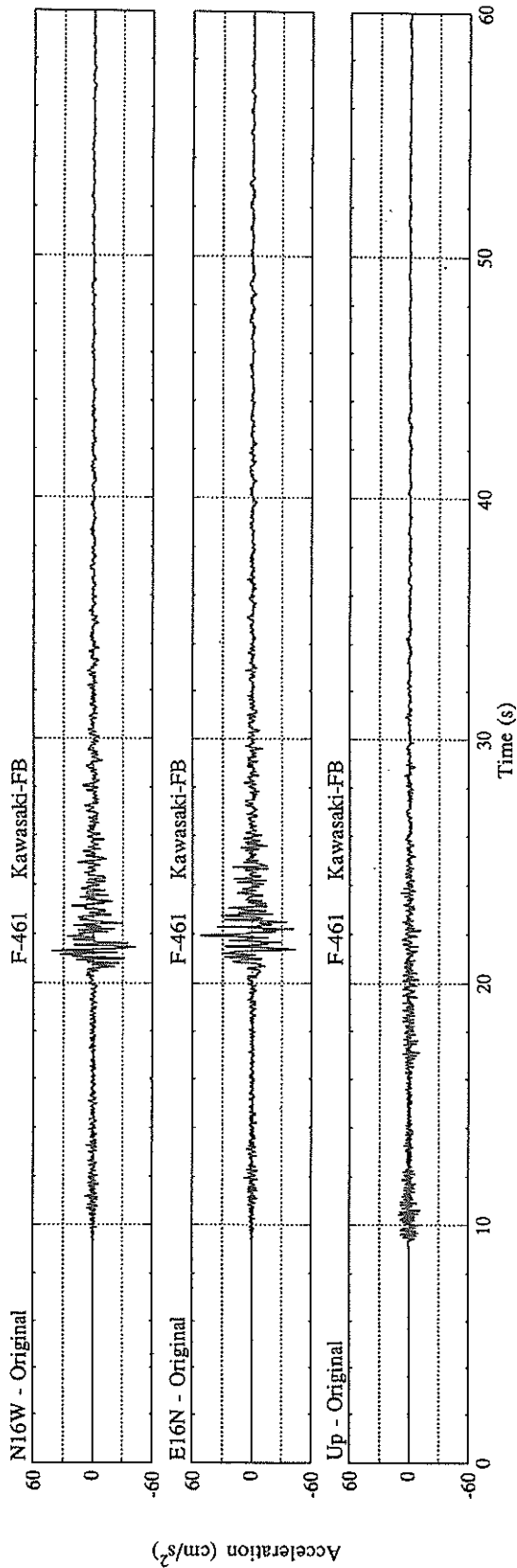
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FIXED FILTER 2.45 3.55 0.46 4.03  
VARIABLE FILTER 2.71 3.25 0.45 3.73

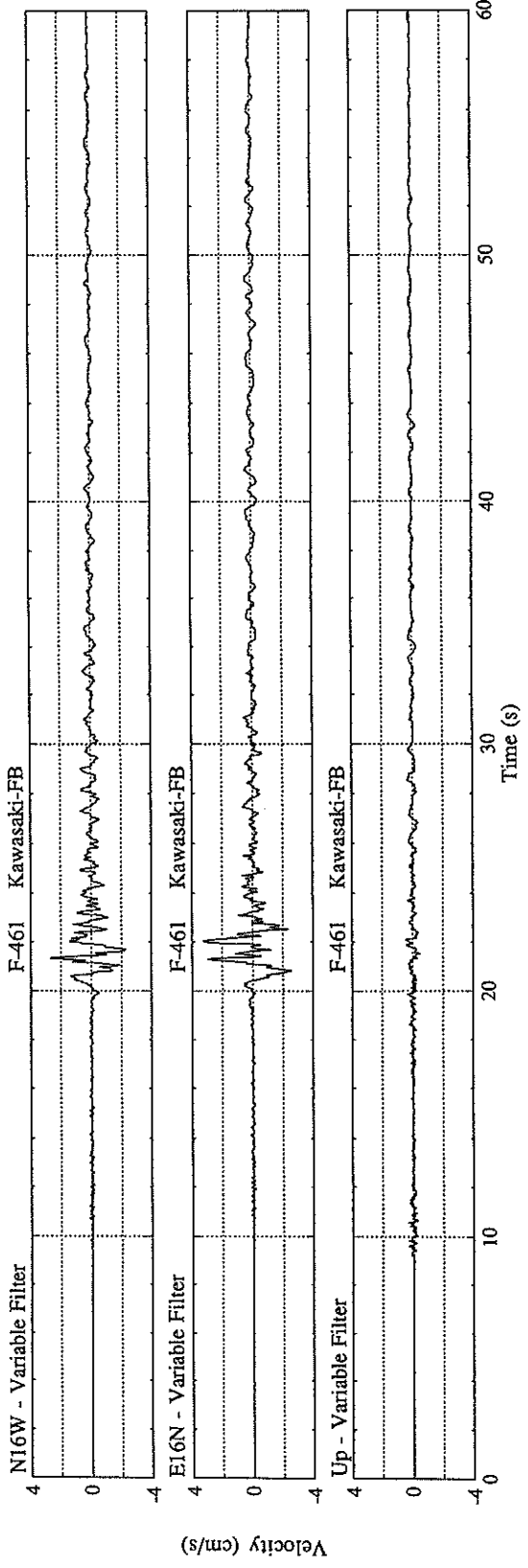
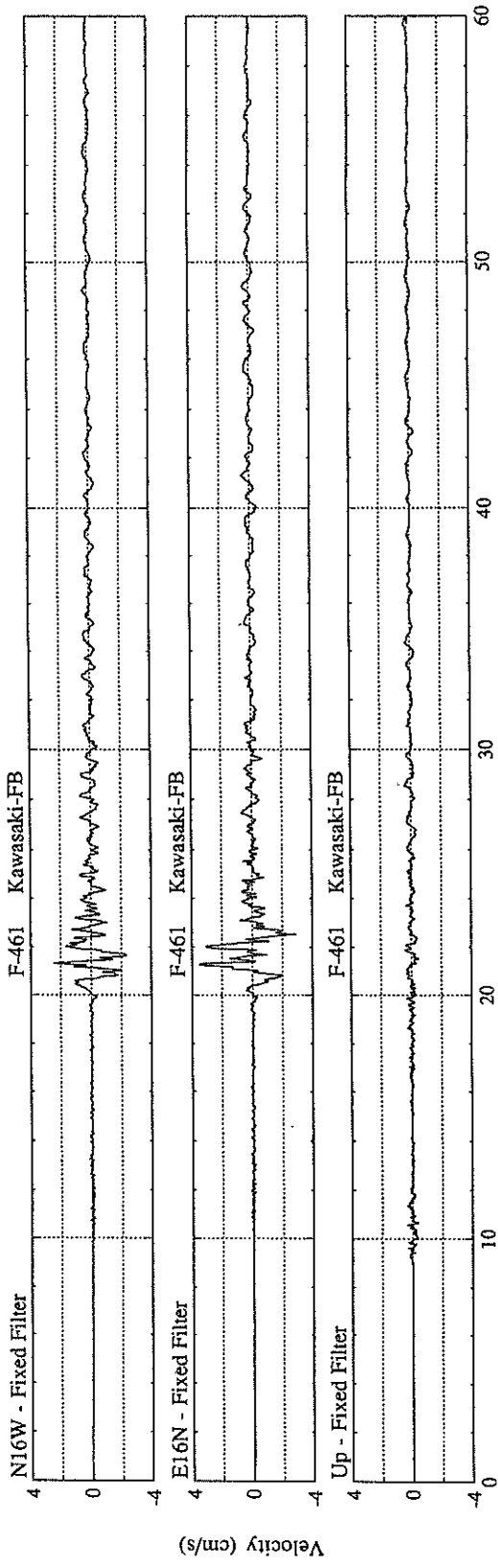
MAXIMUM DISPLACEMENT (CM)

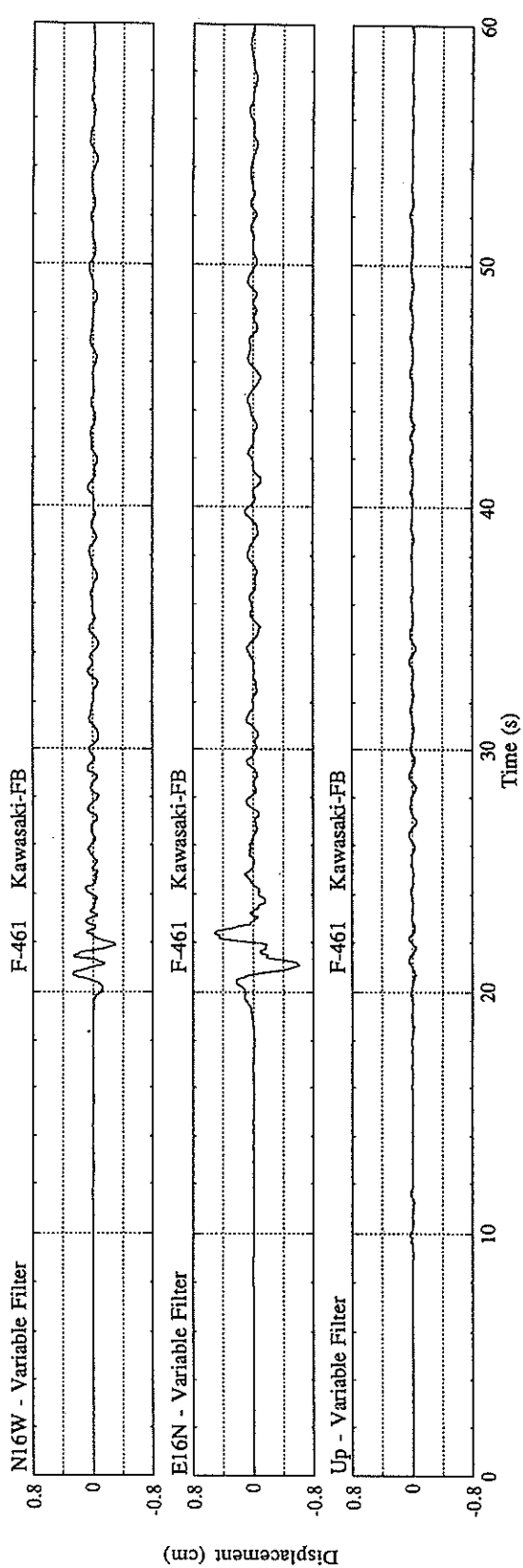
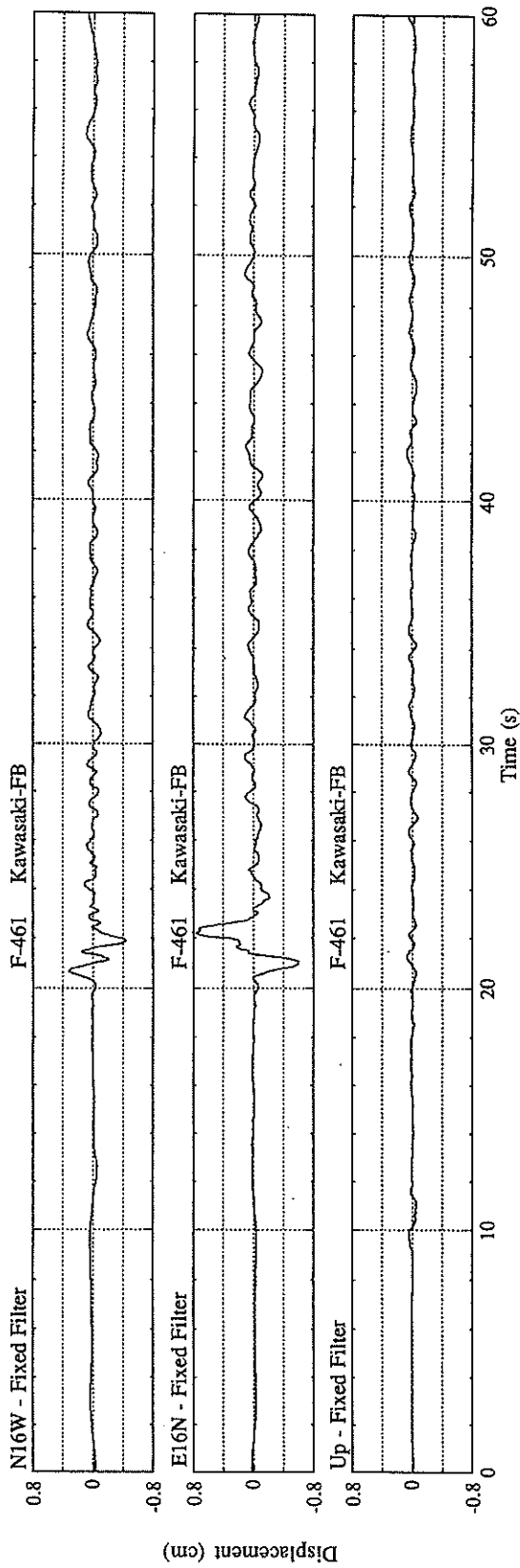
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FIXED FILTER 0.44 0.77 0.08 0.78  
VARIABLE FILTER 0.30 0.61 0.05 0.62

\* RESULTANT OF HORIZONTAL COMPONENTS

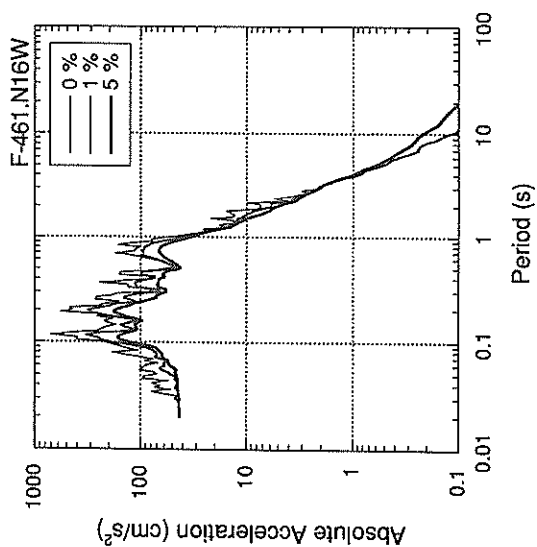
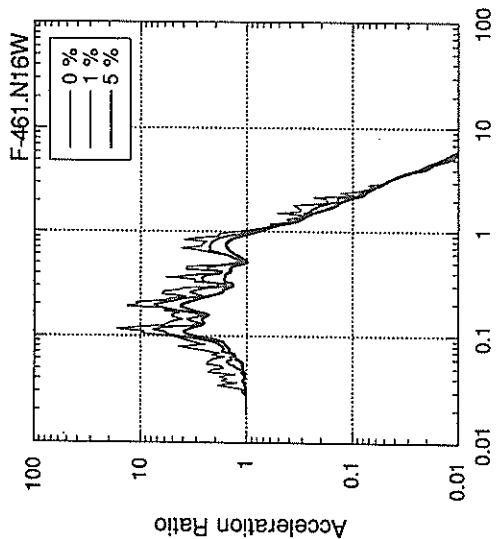
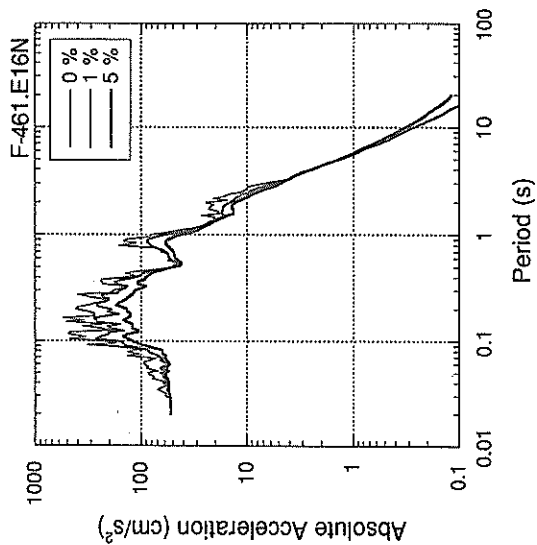
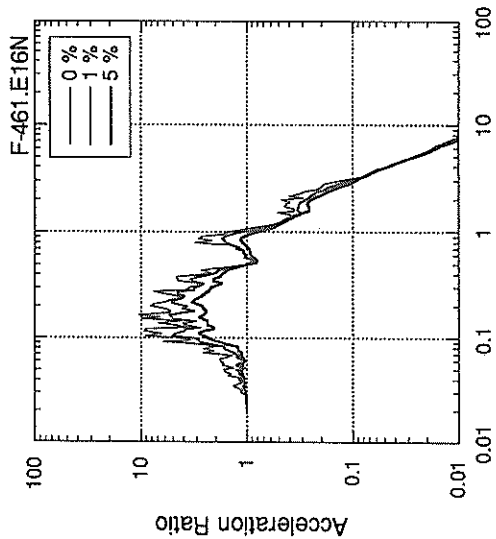
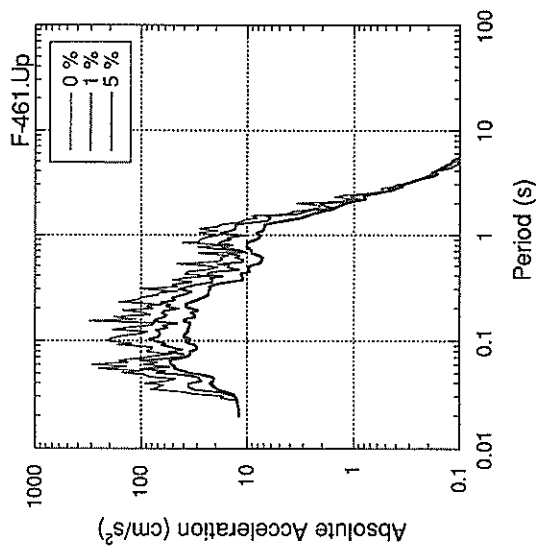
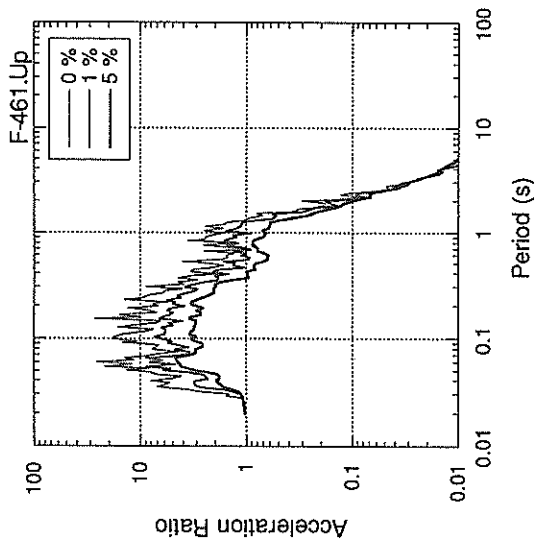


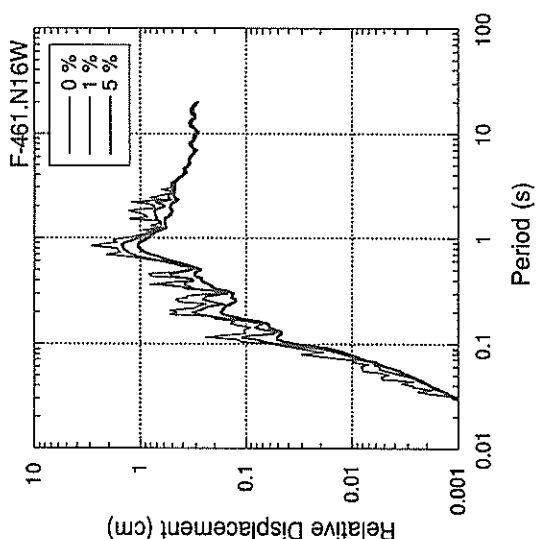
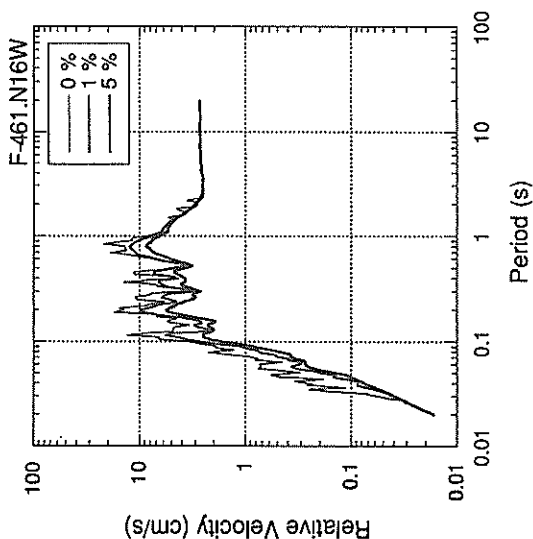
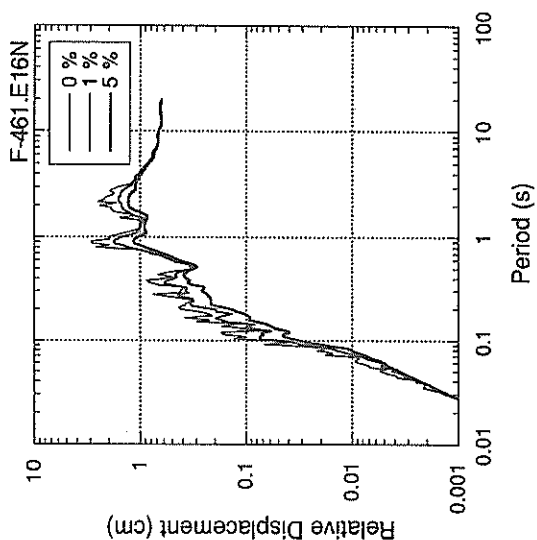
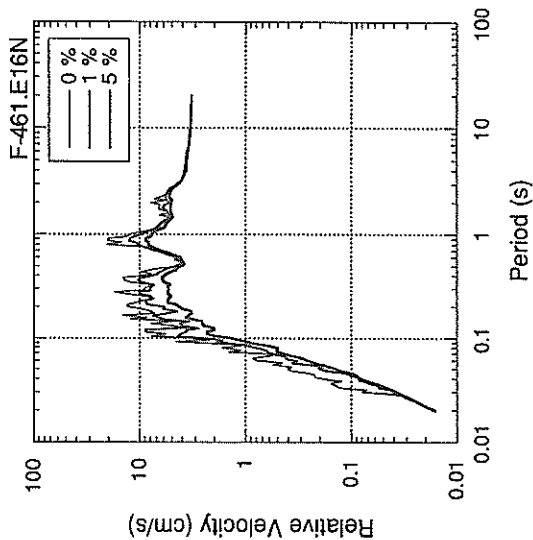
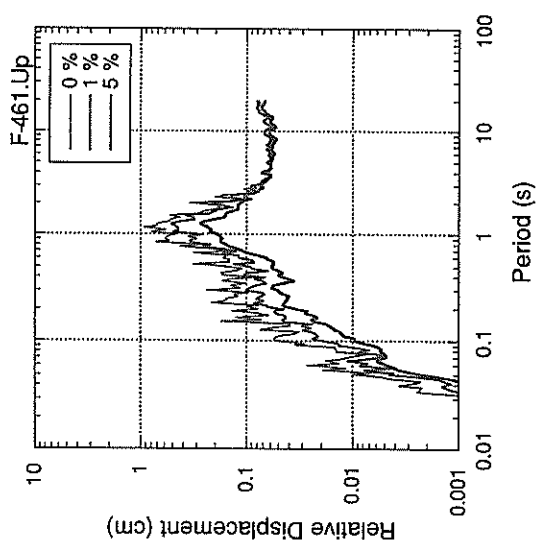
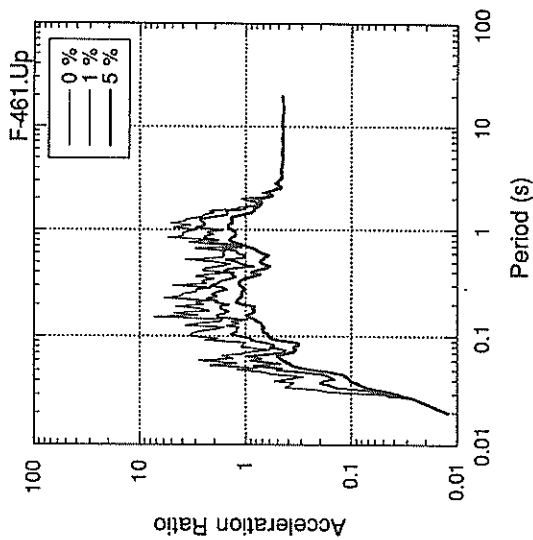


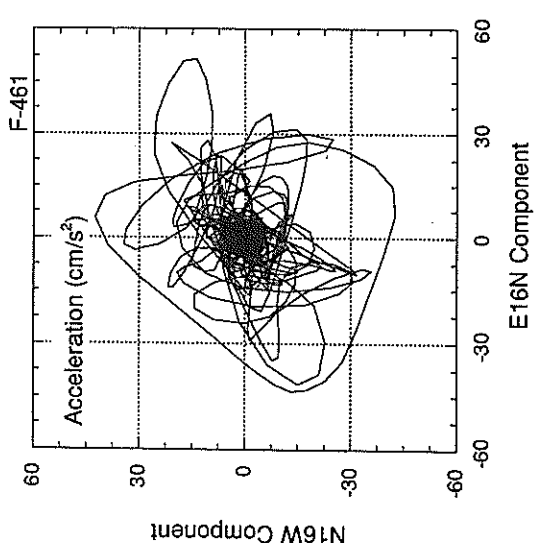
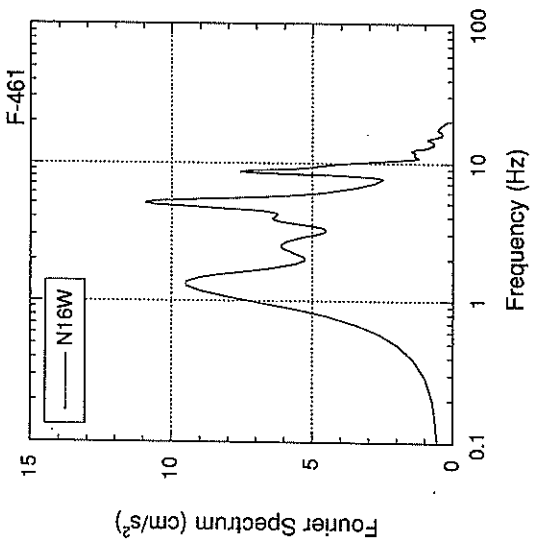
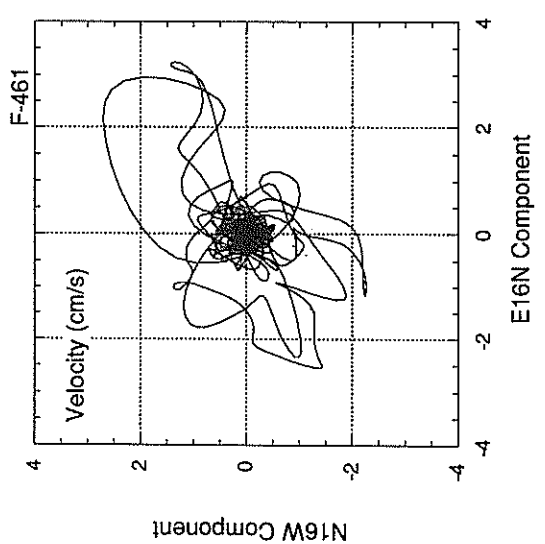
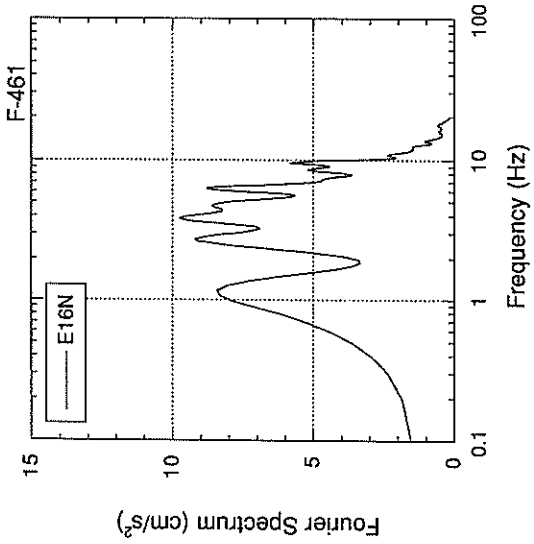
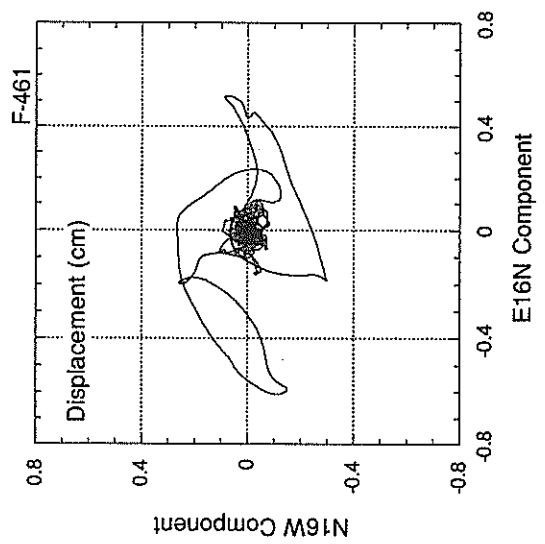
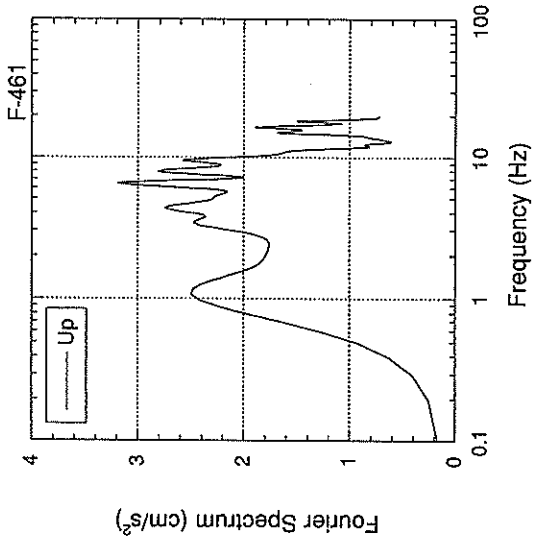












RECORD NUMBER : F-462

STATION : KAWASAKI-F

EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 4: 4 FEB. 2, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION TOKYO BAY REGION

LATITUDE 35° 13.6' N

LONGITUDE 139° 47.5' E

DEPTH 92.3KM

JMA MAGNITUDE 5.9

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
N S E W U D HORIZONTAL\*  
-----

PARAMETER OF THE VARIABLE FILTER

-----  
FC (HZ) 0.250 0.201 0.427

MAXIMUM ACCELERATION (GAL)

-----  
SMAC-B2 EQUIVALENT 70.5 90.8 22.8 93.4  
ORIGINAL 94.2 118.3 36.9 124.5  
CORRECTED 95.0 118.3 37.0 123.5

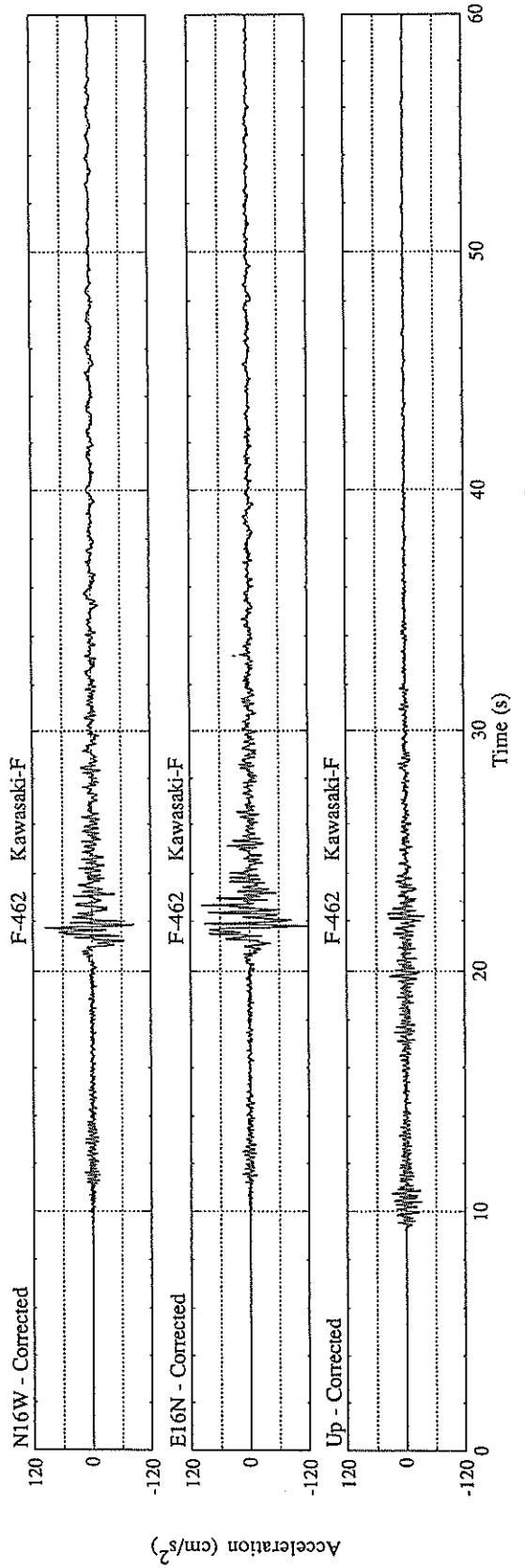
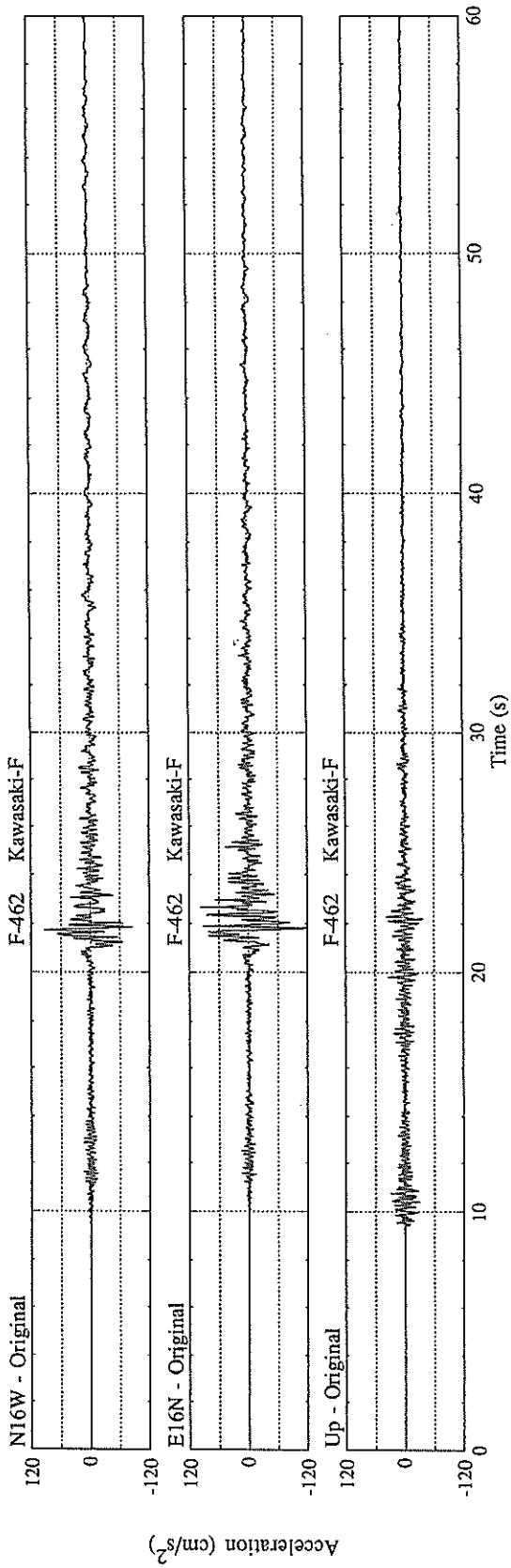
MAXIMUM VELOCITY (CM/SEC)

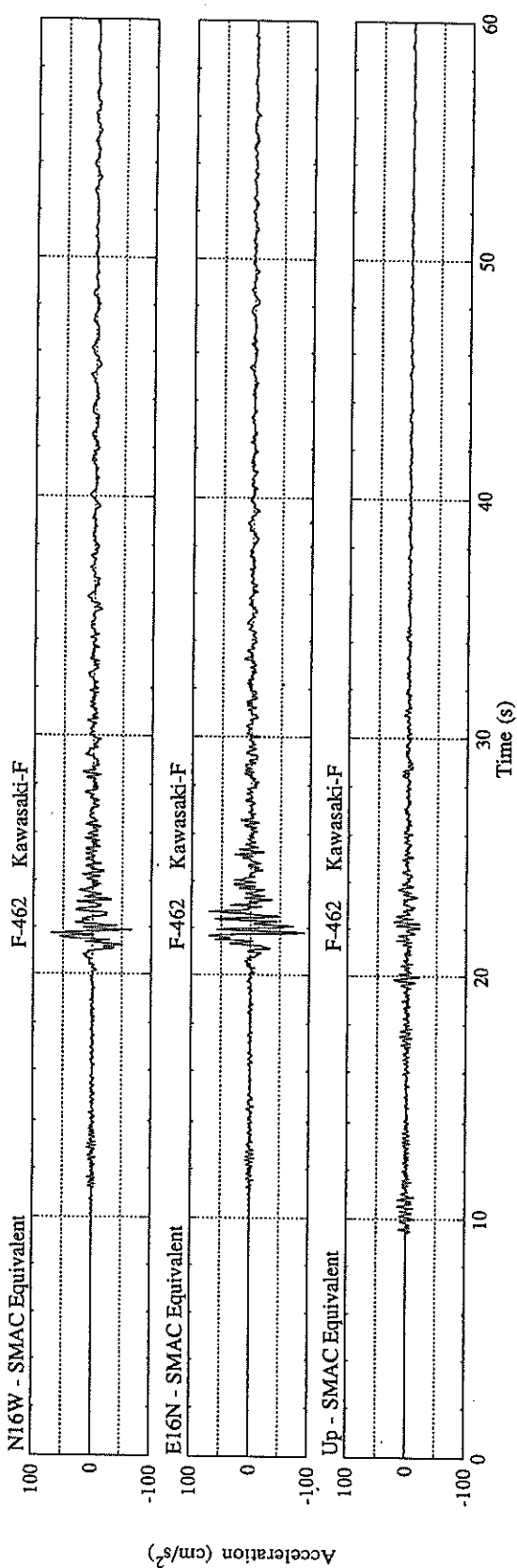
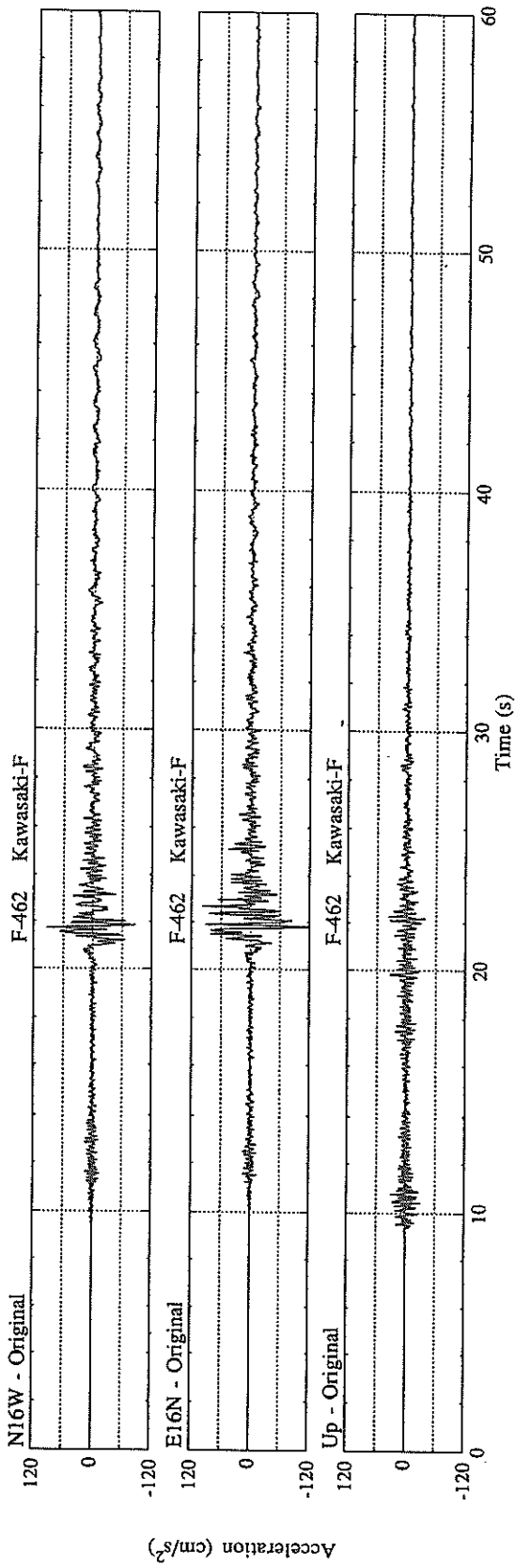
-----  
FIXED FILTER 6.91 12.38 2.12 13.04  
VARIABLE FILTER 6.71 11.90 2.13 12.54

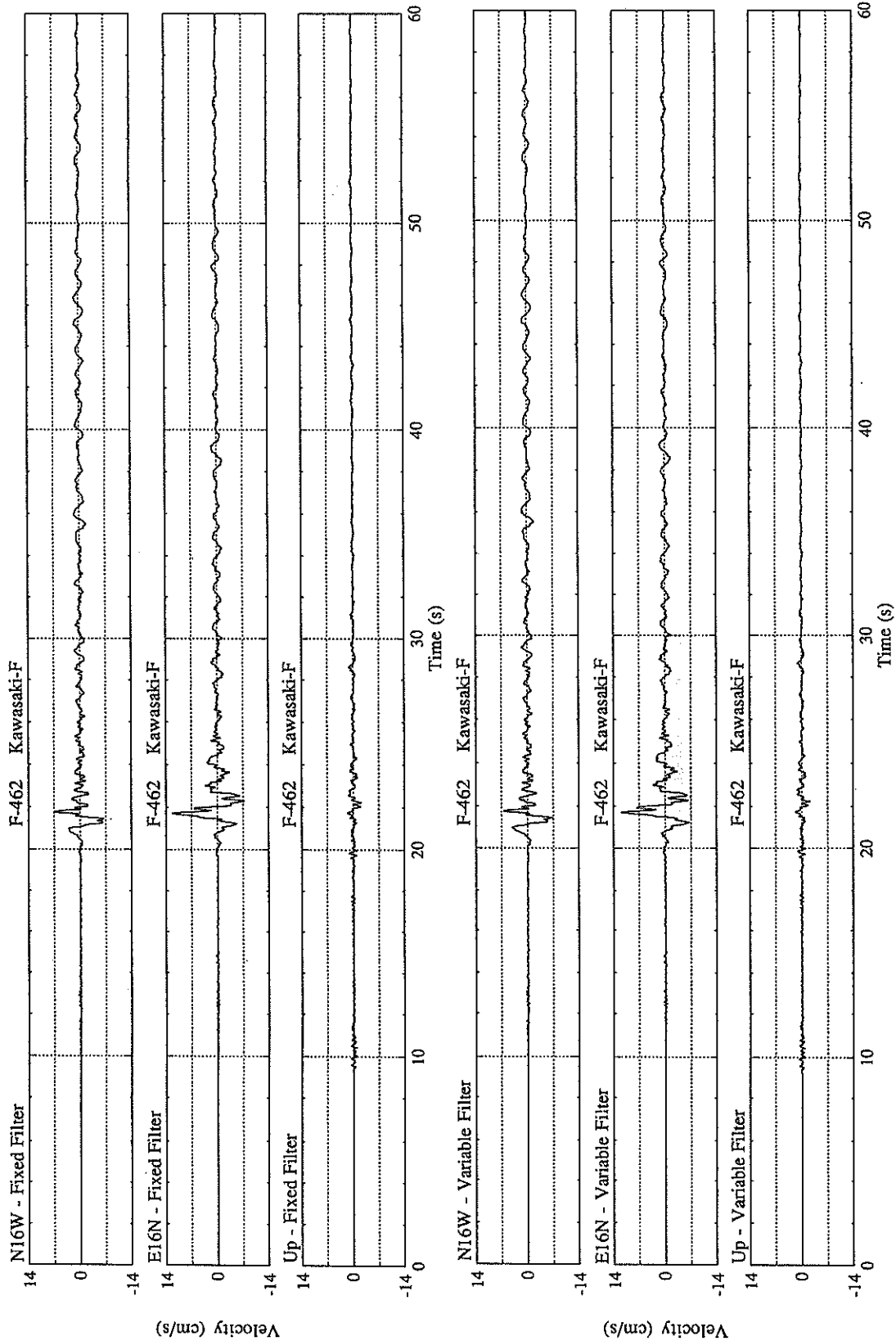
MAXIMUM DISPLACEMENT (CM)

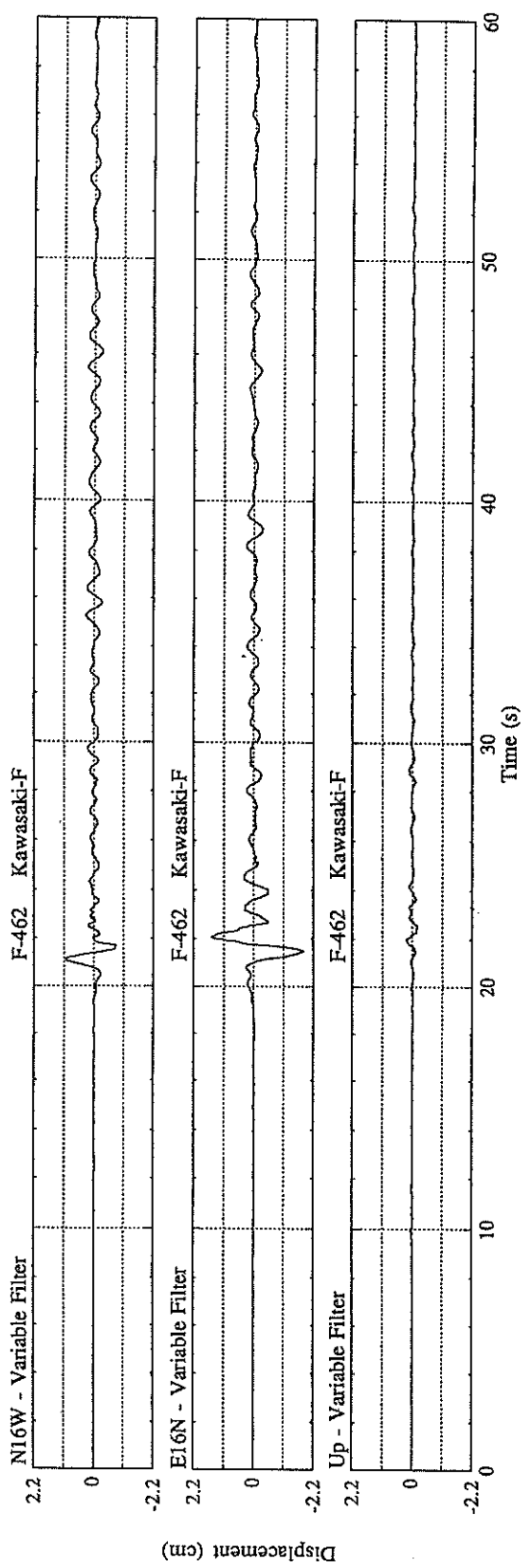
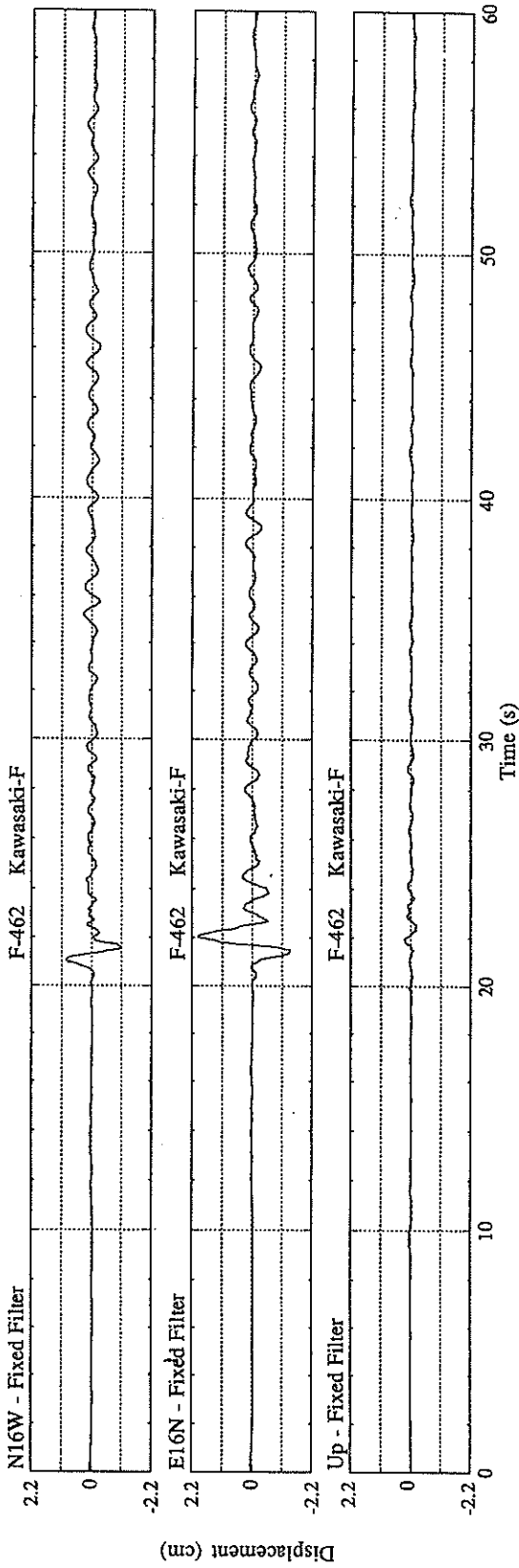
-----  
FIXED FILTER 1.06 2.01 0.22 2.01  
VARIABLE FILTER 1.02 1.81 0.22 1.90

\* RESULTANT OF HORIZONTAL COMPONENTS

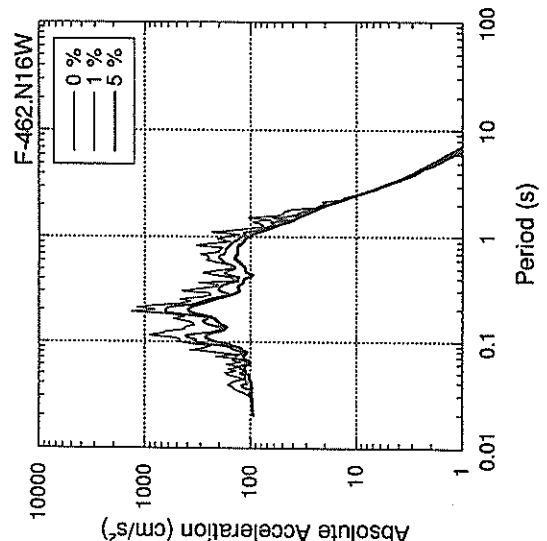
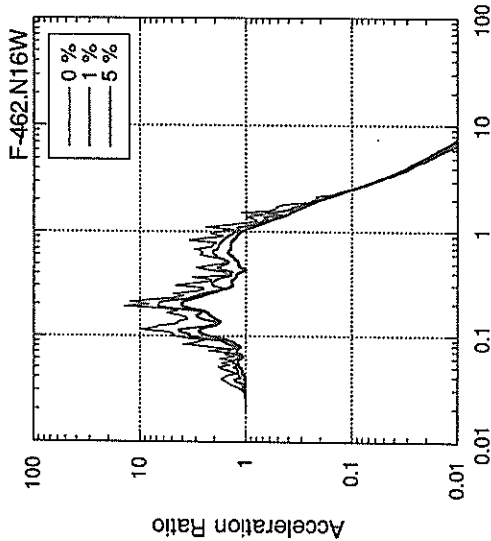
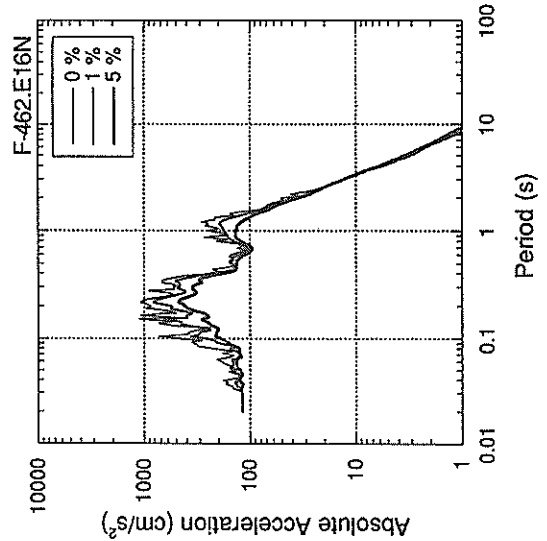
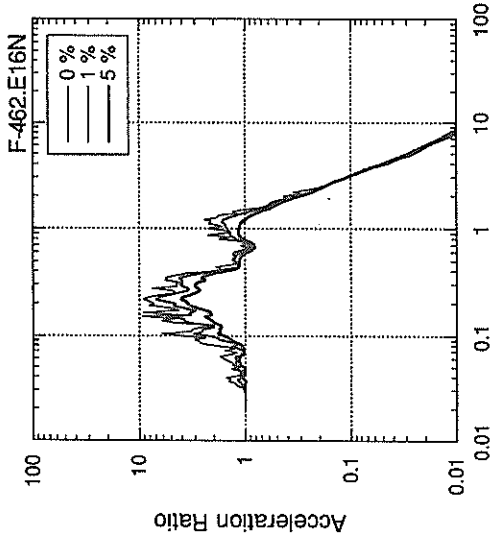
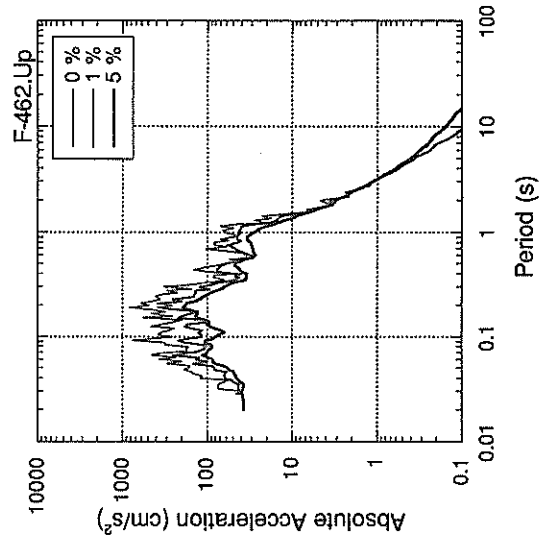
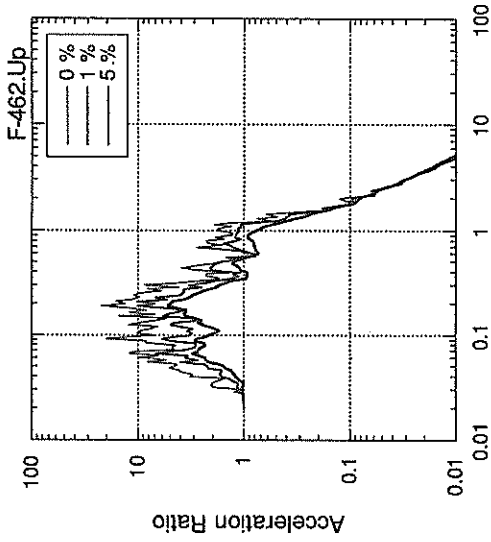


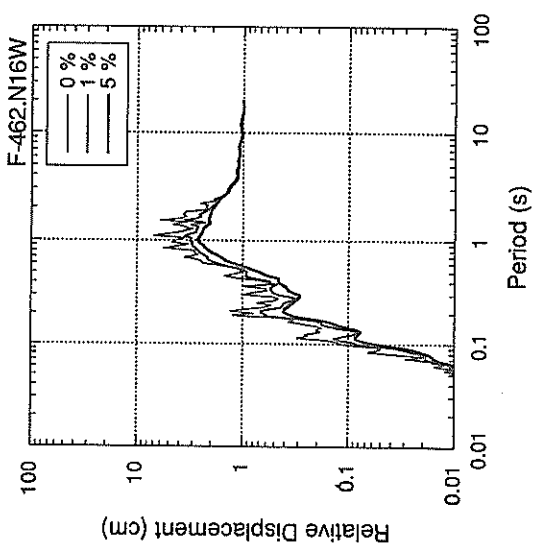
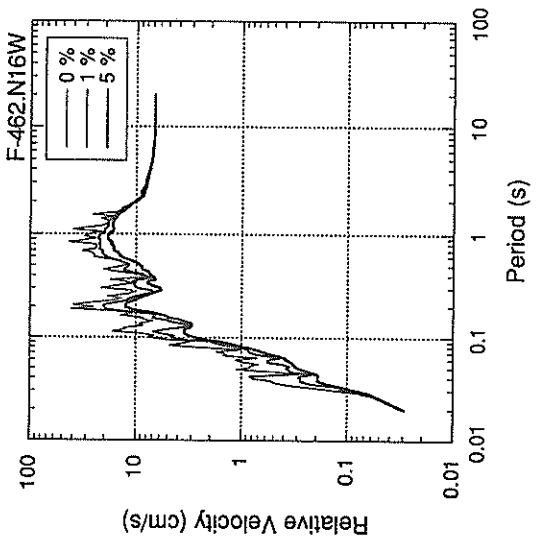
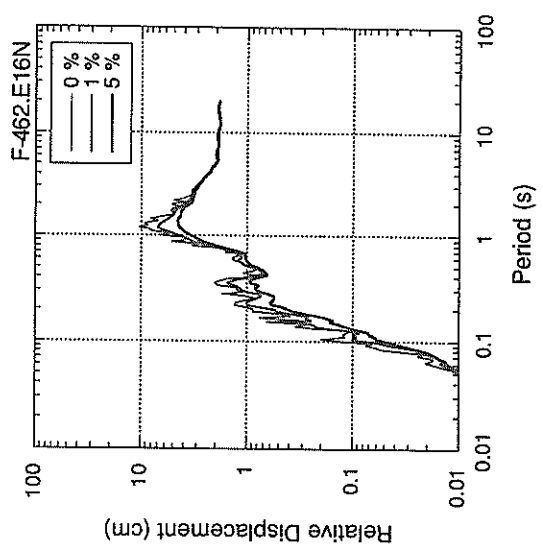
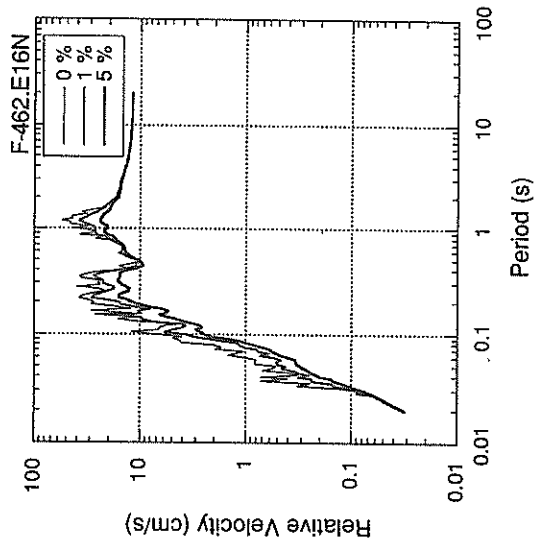
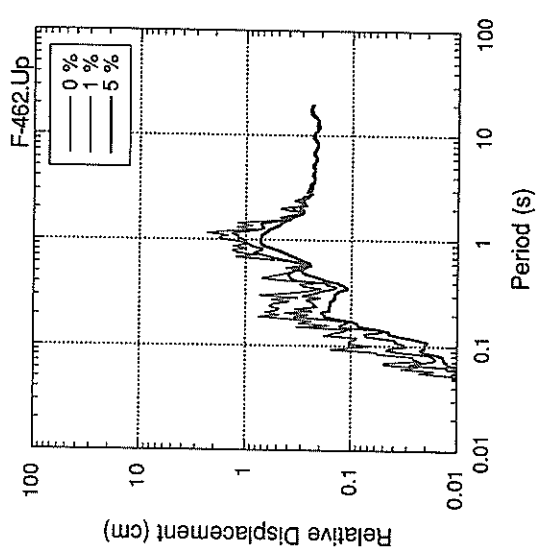
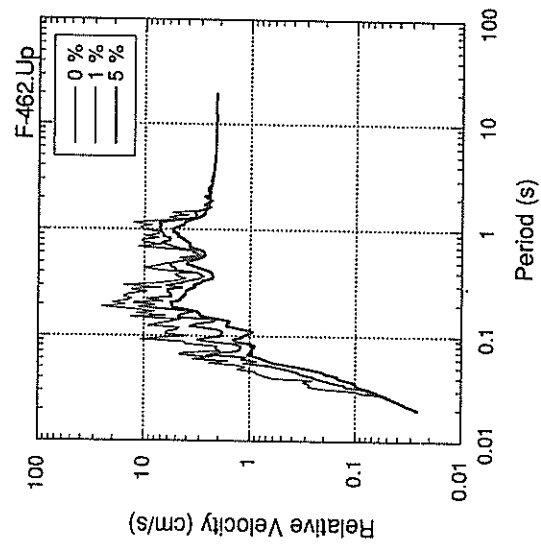


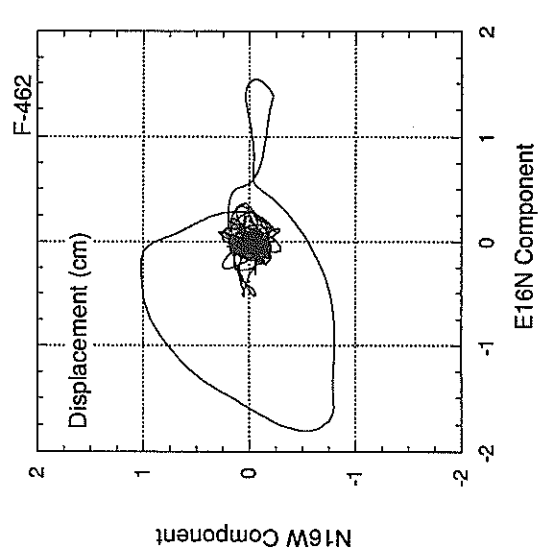
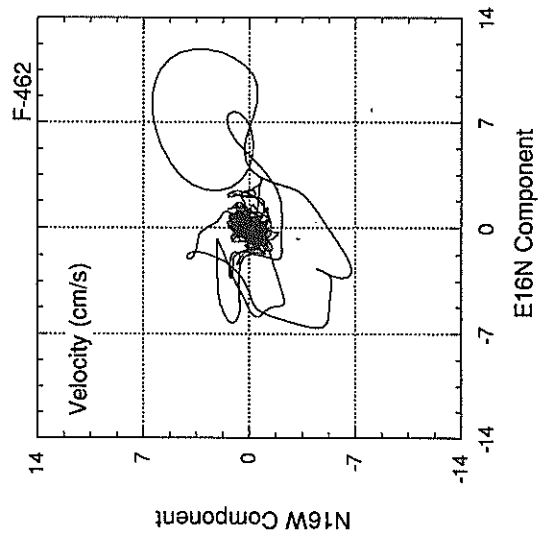
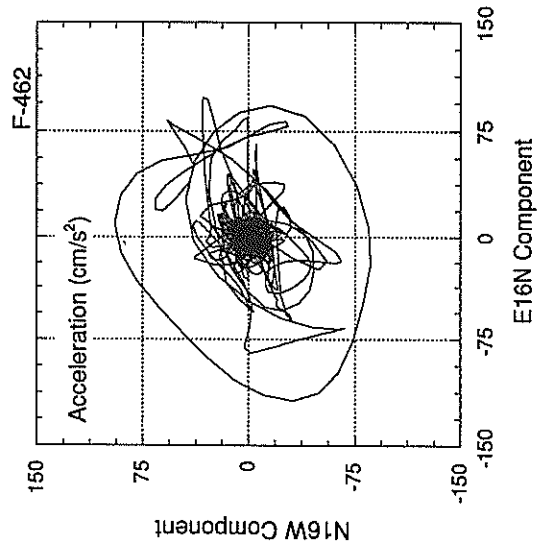
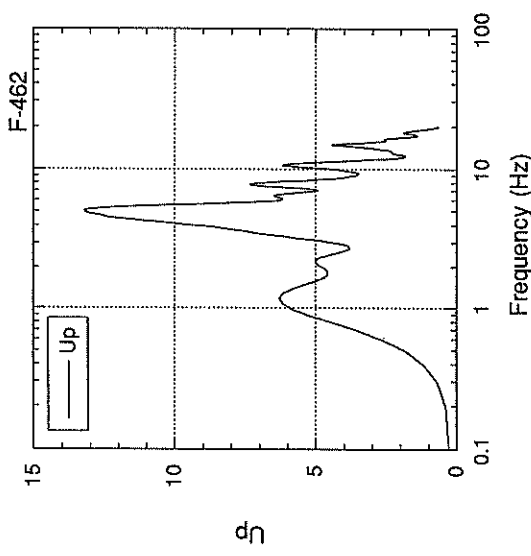
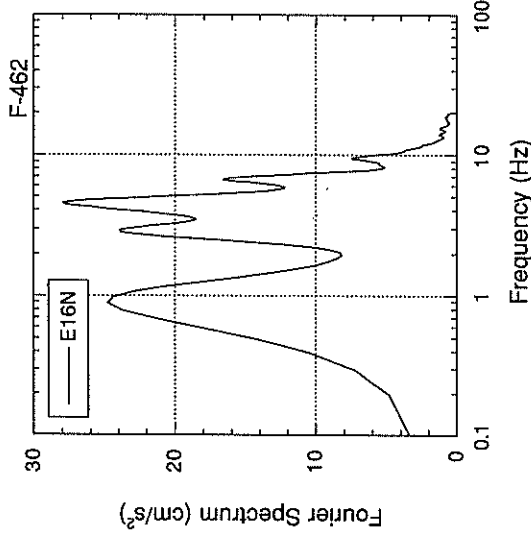
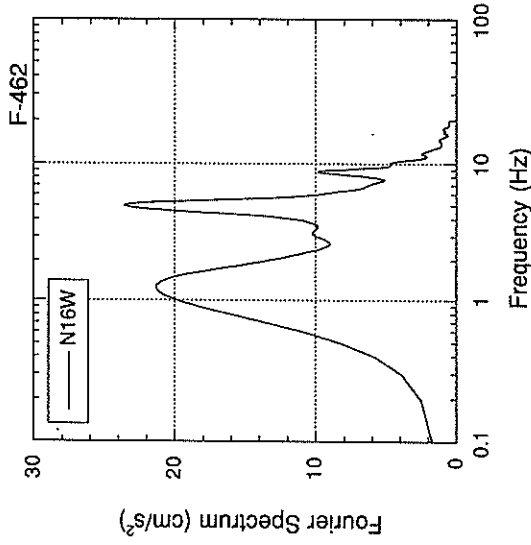












RECORD NUMBER : F-463  
 STATION : KAWASAKI-FR

EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME 4: 4 FEB. 2, 1992  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION TOKYO BAY REGION  
 LATITUDE 35° 13.6' N  
 LONGITUDE 139° 47.5' E  
 DEPTH 92.3KM  
 JMA MAGNITUDE 5.9  
 \*\*\*\*\*

PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
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PARAMETER OF THE VARIABLE FILTER

FC (HZ)	0.274	0.201	0.451	
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MAXIMUM ACCELERATION (GAL)

SMAC-B2 EQUIVALENT	83.0	111.2	18.4	120.7
ORIGINAL	99.9	131.3	48.0	144.8
CORRECTED	100.5	131.8	45.0	144.5

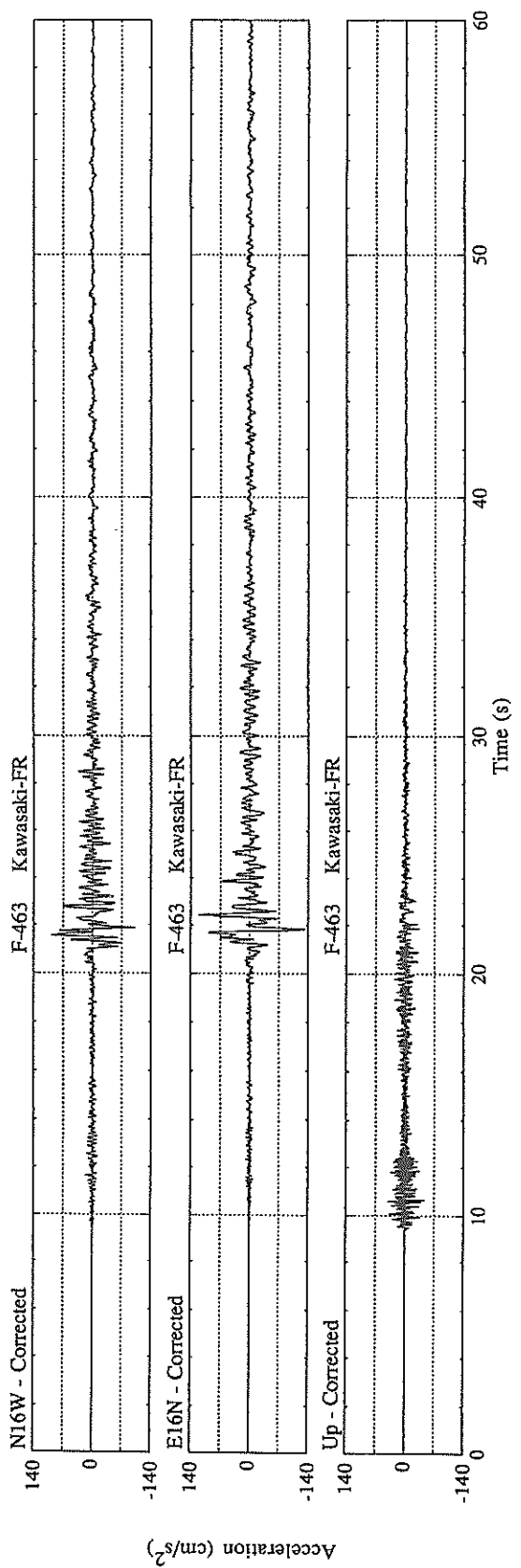
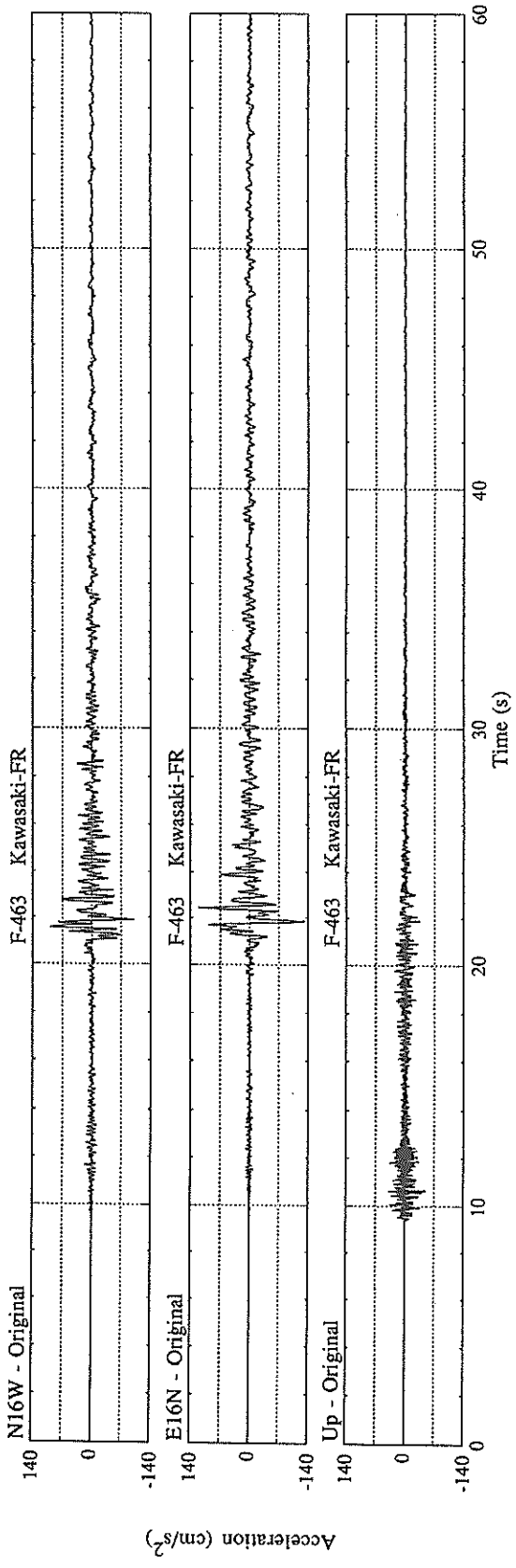
MAXIMUM VELOCITY (CM/SEC)

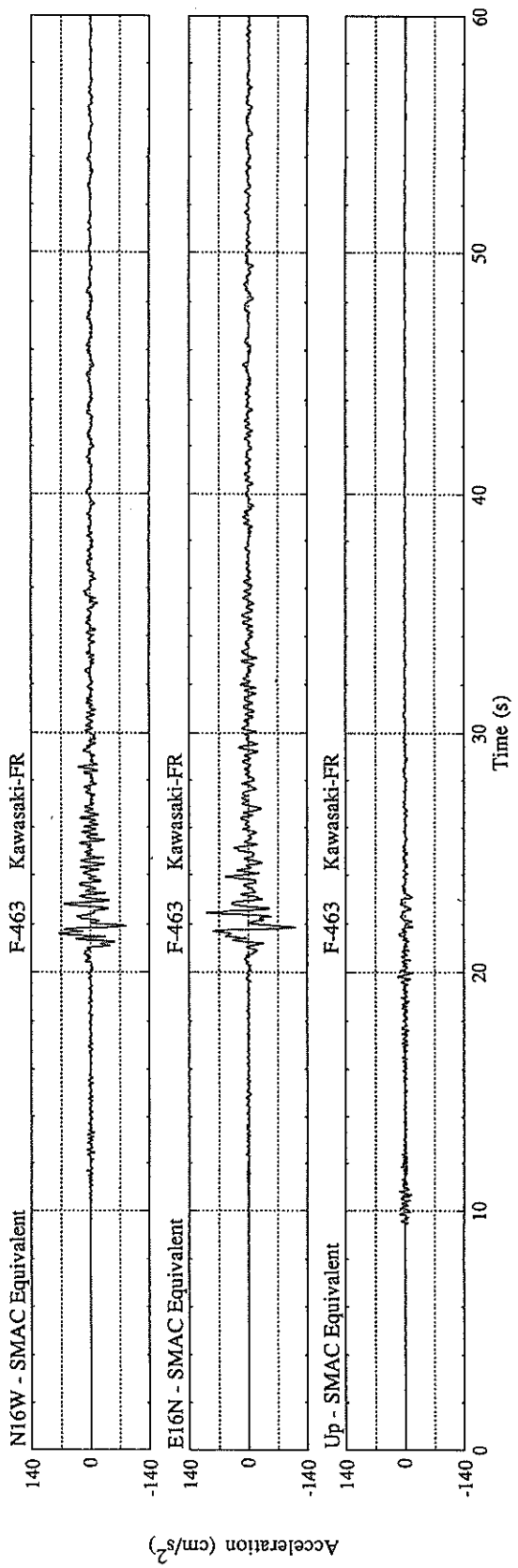
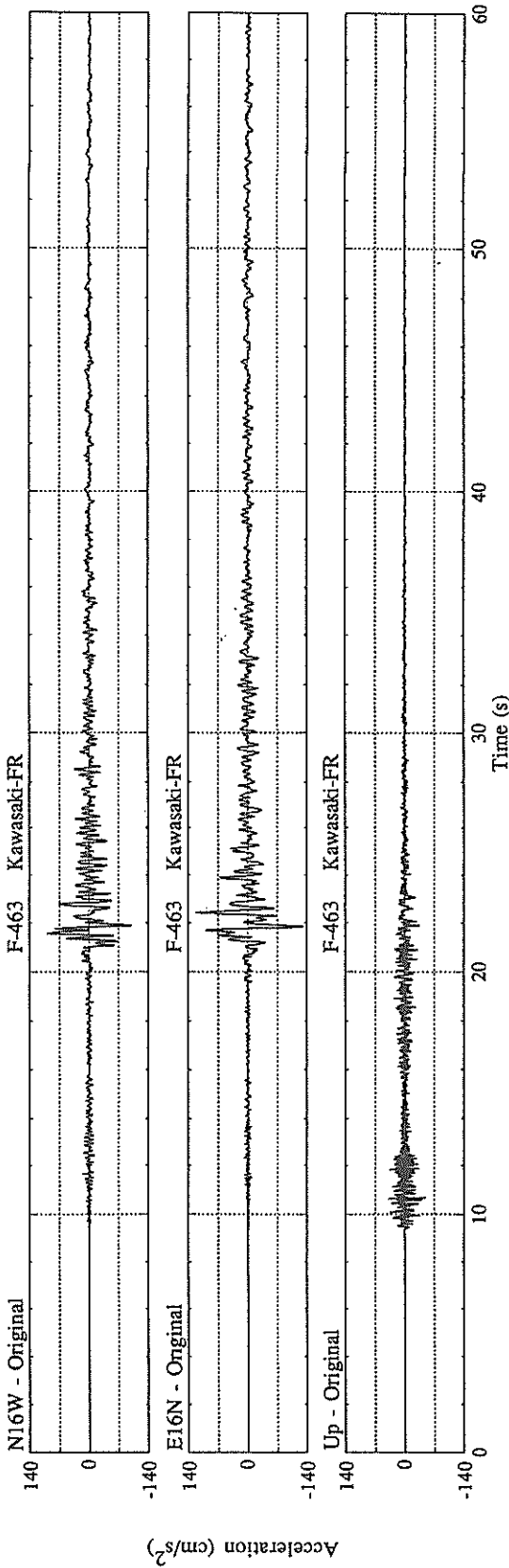
FIXED FILTER	9.42	15.53	1.76	16.85
VARIABLE FILTER	9.16	15.79	1.64	16.98

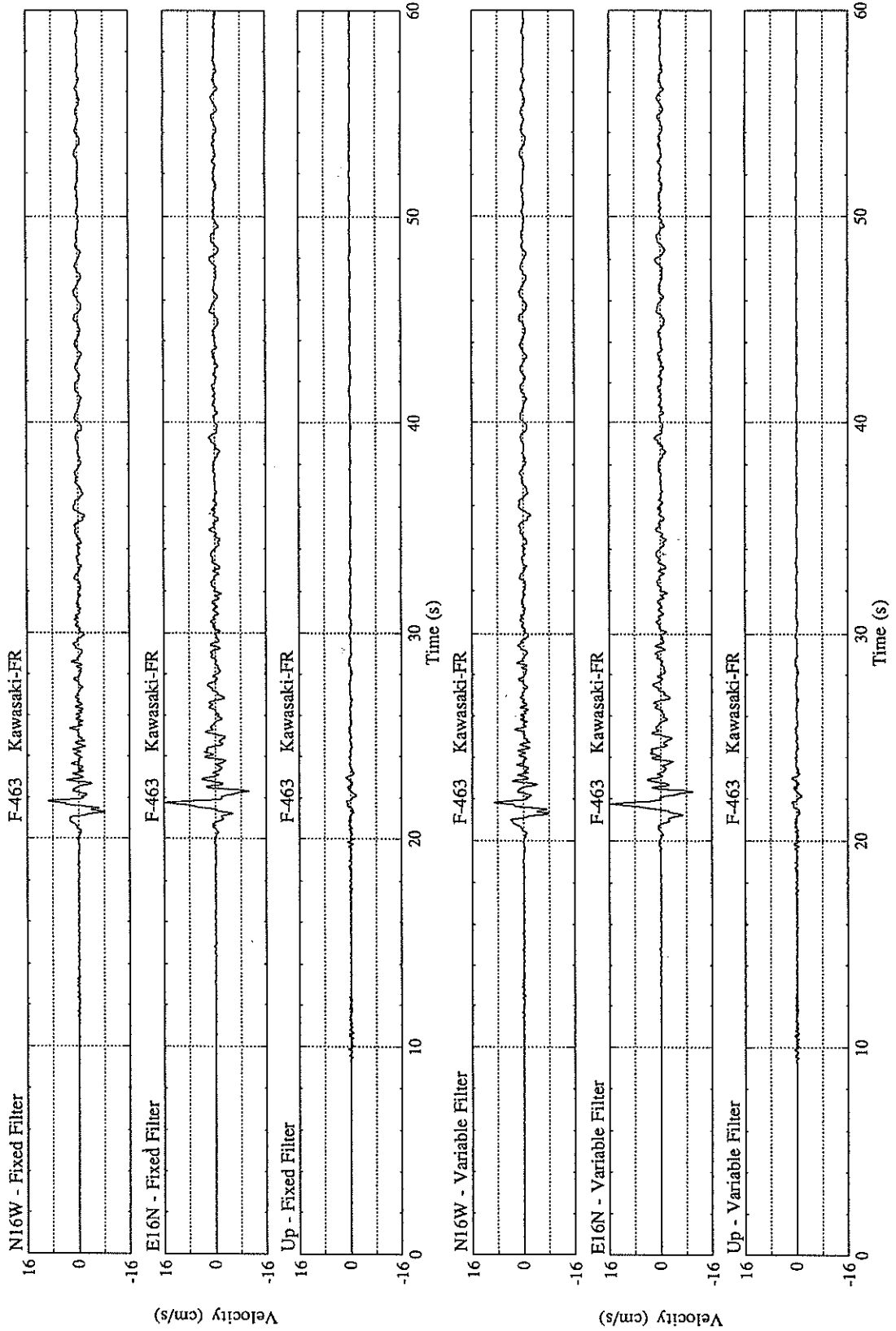
MAXIMUM DISPLACEMENT (CM)

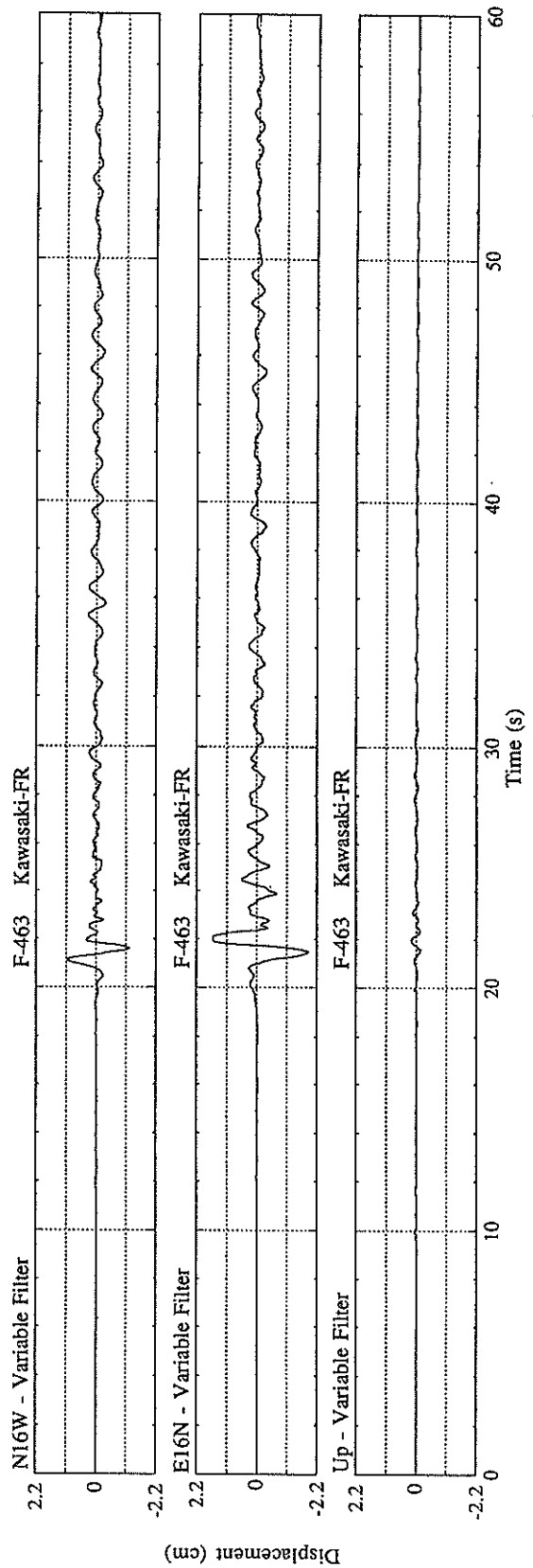
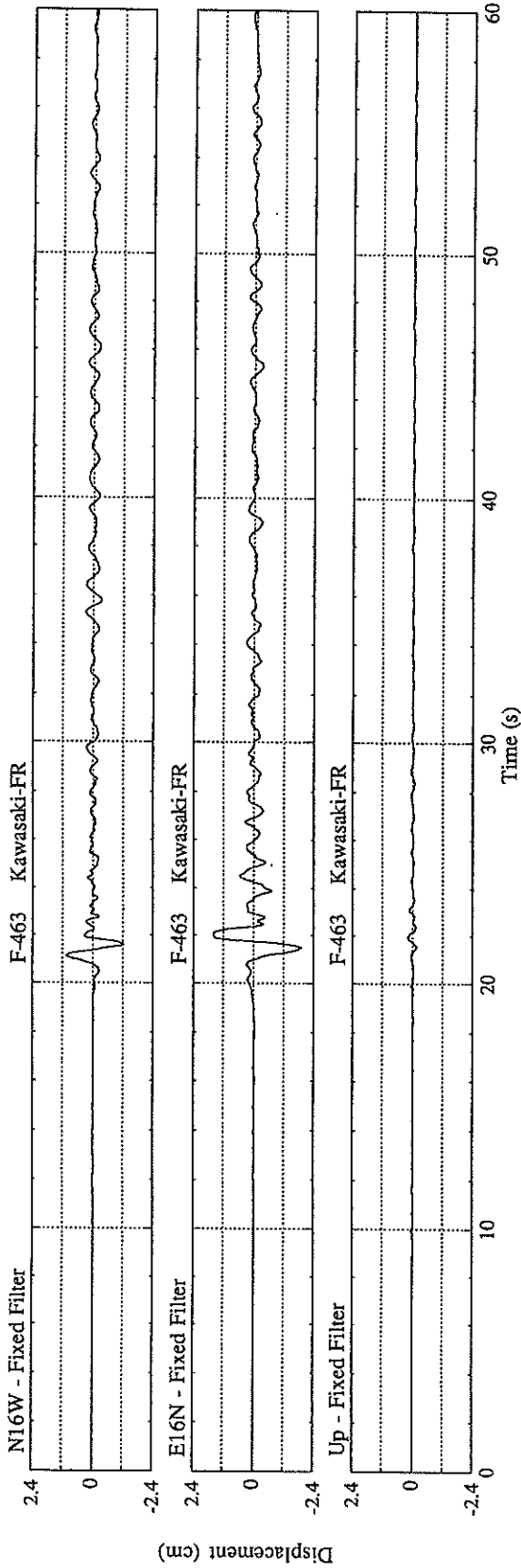
FIXED FILTER	1.40	2.20	0.21	2.22
VARIABLE FILTER	1.21	1.89	0.18	2.07

\* RESULTANT OF HORIZONTAL COMPONENTS

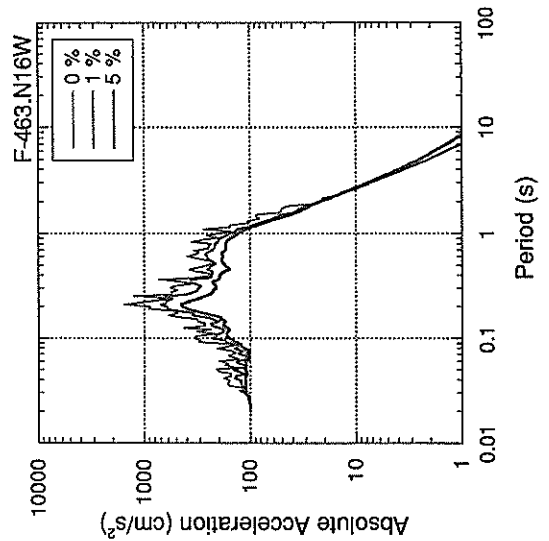
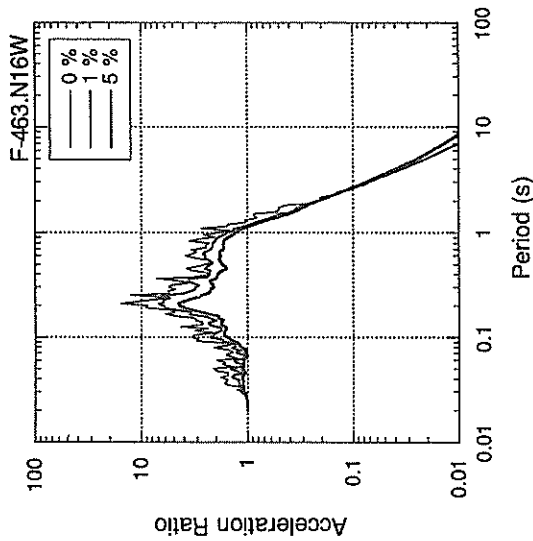
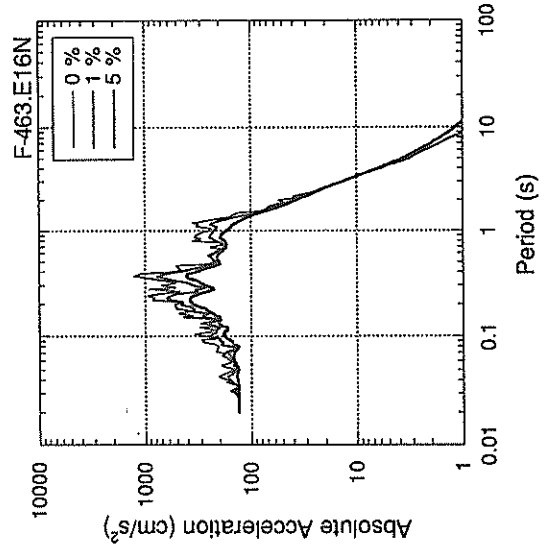
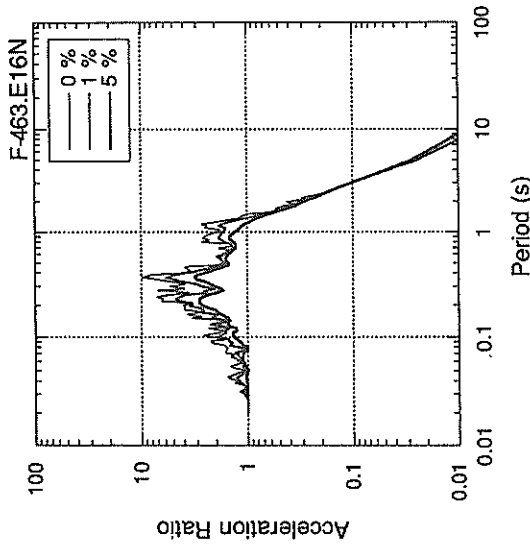
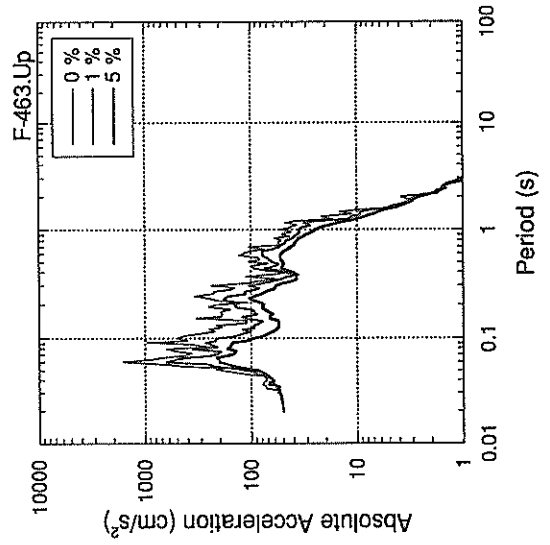
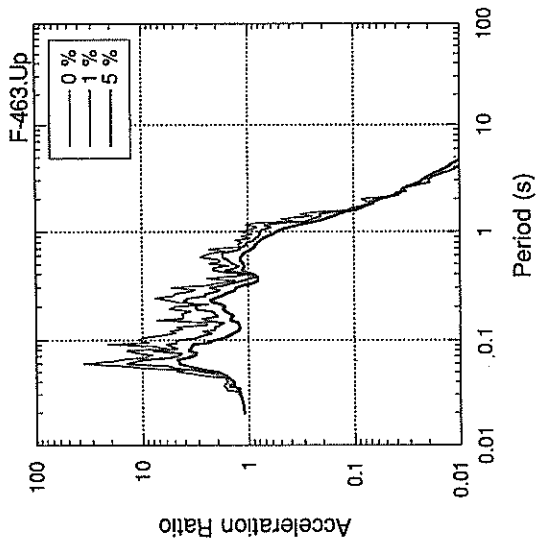


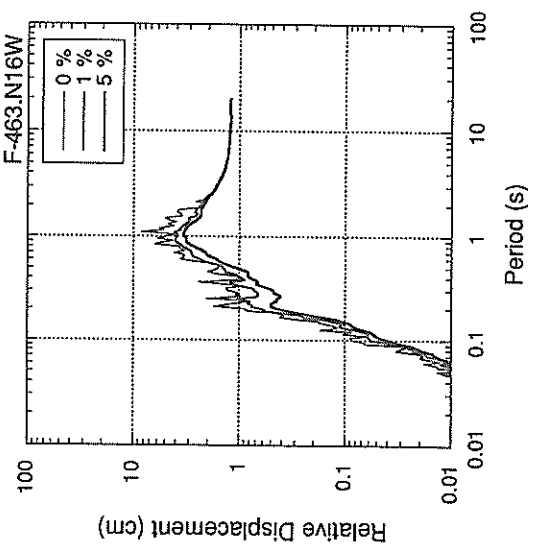
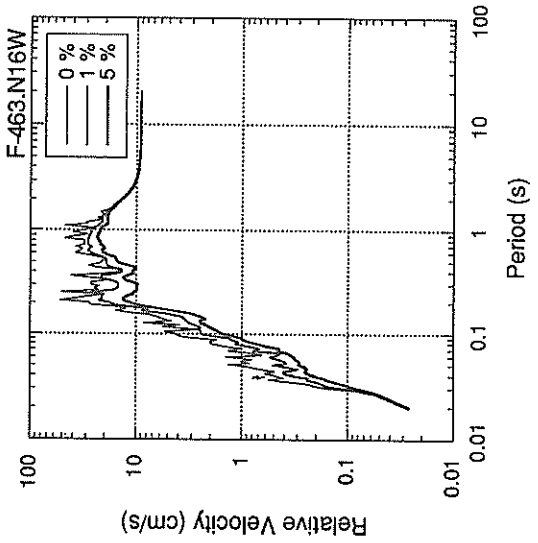
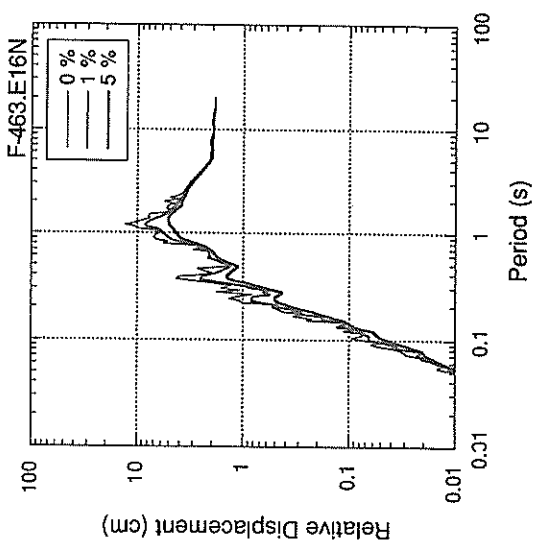
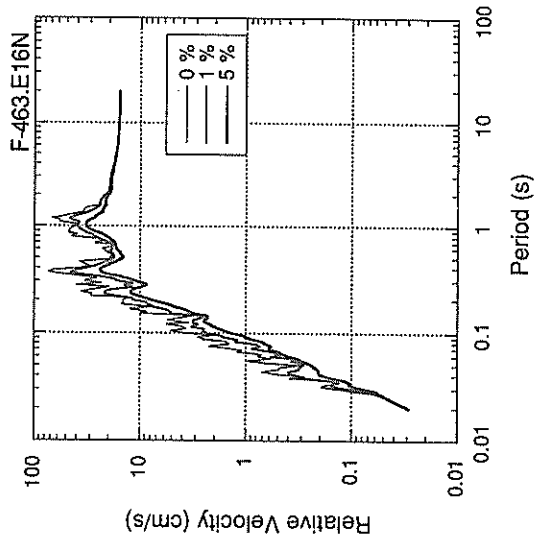
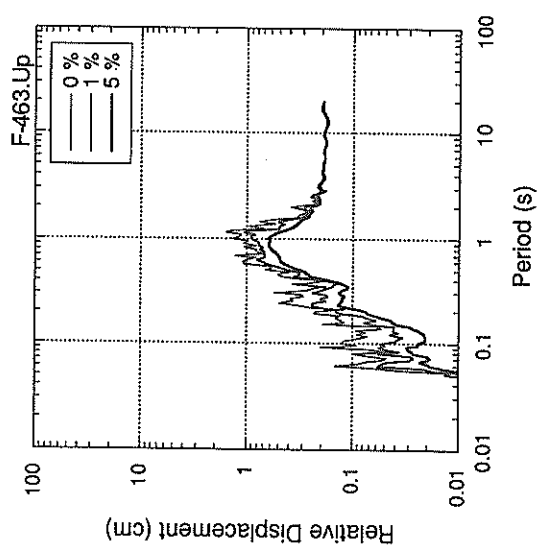
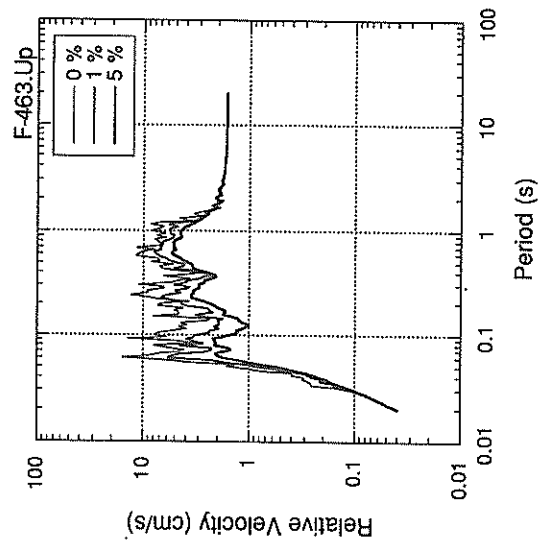


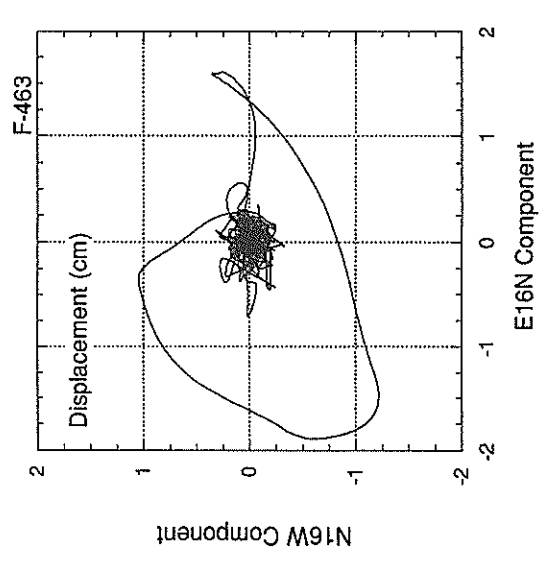
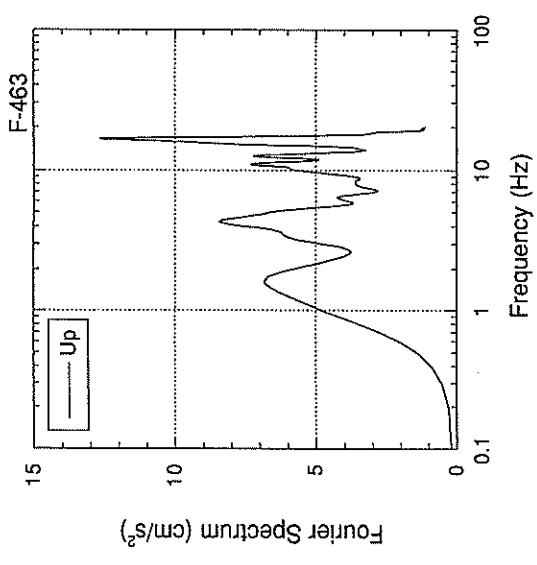
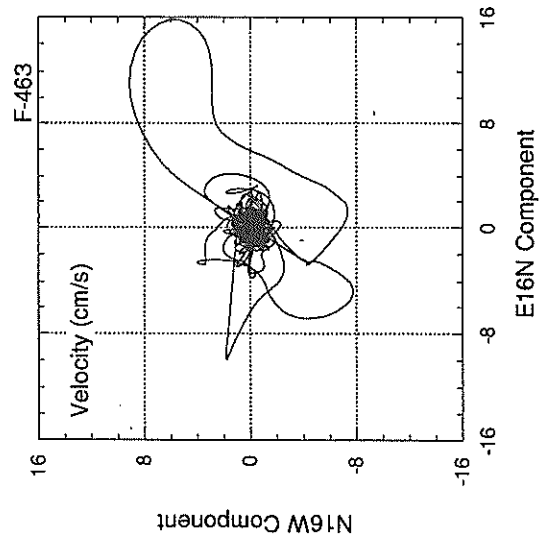
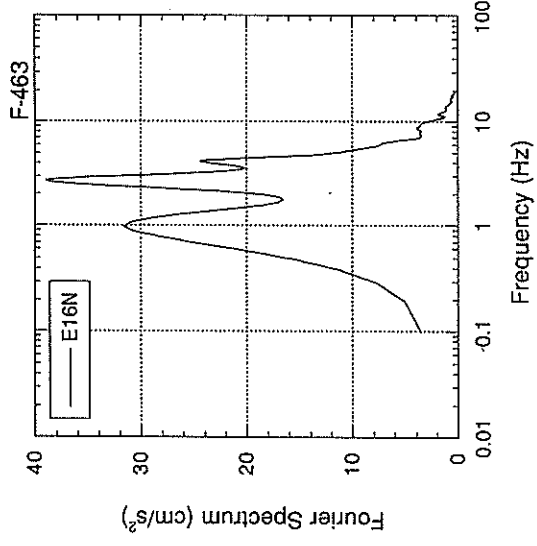
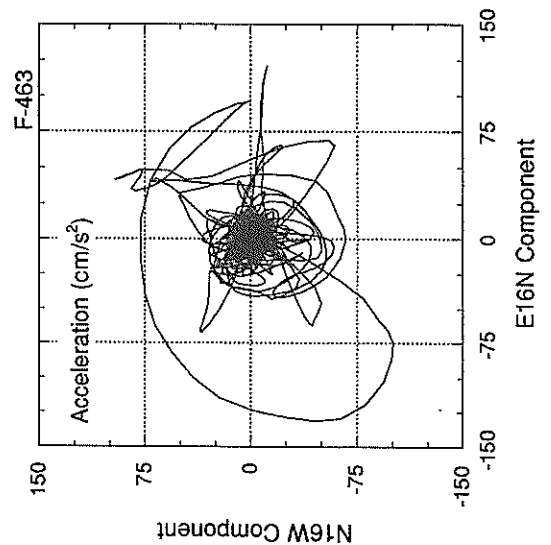
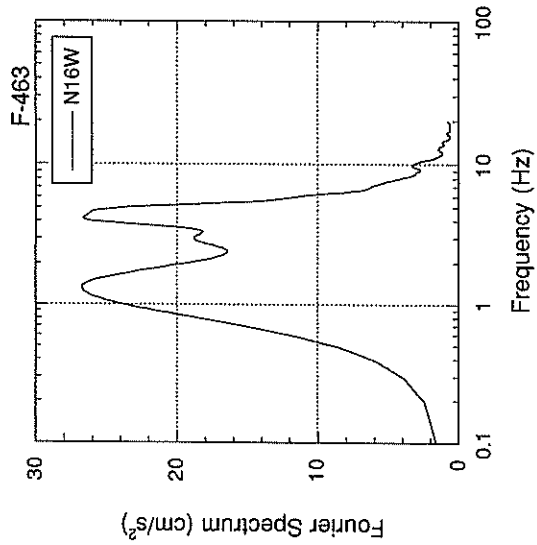






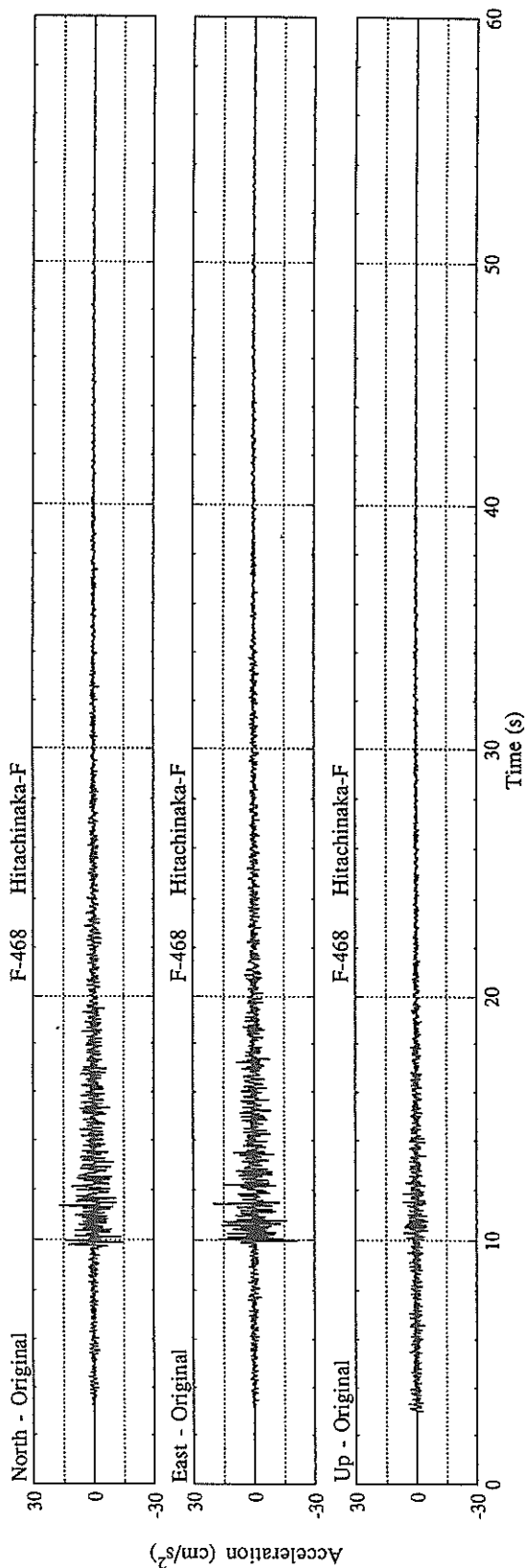






RECORD NUMBER : F-468  
 STATION : HITACHINAKA-F  
 EARTHQUAKE DATA  
 \*\*\*\*\*  
 DATE AND TIME : 8:32 FEB. 28, 1992  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION : E OFF IBARAKI PREF  
 LATITUDE : 36° 6.2' N  
 LONGITUDE : 141° 10.6' E  
 DEPTH : 45.8KM  
 JMA MAGNITUDE : 3.2  
 \*\*\*\*\*

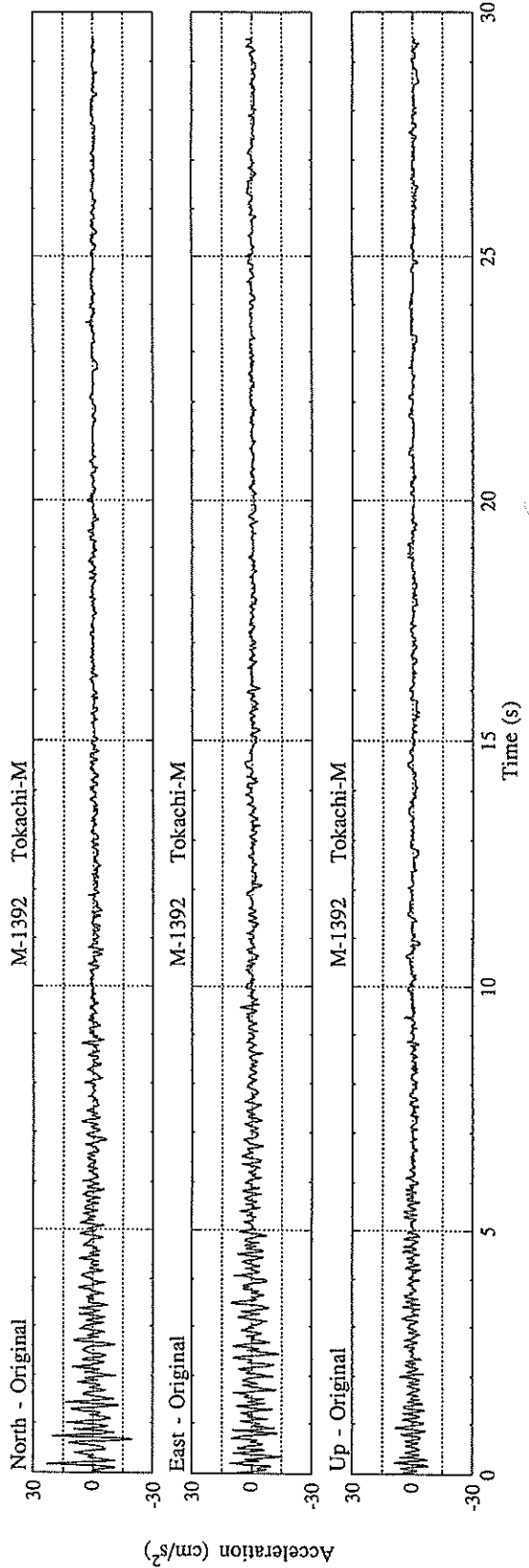
\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 -----  
 N S E W U D HORIZONTAL\*  
 17.1 21.2 6.6 22.1  
 \* RESULTANT OF HORIZONTAL COMPONENTS  
 \*\*\*\*\*



RECORD NUMBER : M-1392  
 STATION : TOKACHI-M  
 EARTHQUAKE DATA  
 \*\*\*\*\*  
 DATE AND TIME : 21:19 MAR. 2, 1992  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION : S OFF URAKAWA  
 LATITUDE : 41° 57.4' N  
 LONGITUDE : 142° 16.9' E  
 DEPTH : 68.5KM  
 JMA MAGNITUDE : 4.8  
 \*\*\*\*\*

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 -----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL)      23.1    15.4    9.0    23.3  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-478

STATION : HANASAKI-F

EARTHQUAKE DATA

\*\*\*\*\*  
DATE AND TIME 5:45 MAR. 31, 1992  
LOCATION OF HYPOCENTER  
EPICENTRAL REGION OFF NEMURO PENINSULA  
LATITUDE 42° 51.1' N  
LONGITUDE 145° 15.1' E  
DEPTH 45.5KM  
JMA MAGNITUDE 5.3  
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
N S E W U D HORIZONTAL\*  
-----

PARAMETER OF THE VARIABLE FILTER

-----  
FC (HZ) 0.573 0.683 0.927

MAXIMUM ACCELERATION (GAL)

-----  
SMAC-B2 EQUIVALENT 25.8 40.8 10.5 44.4  
ORIGINAL 42.0 69.5 15.7 73.4  
CORRECTED 42.0 68.8 16.2 71.8

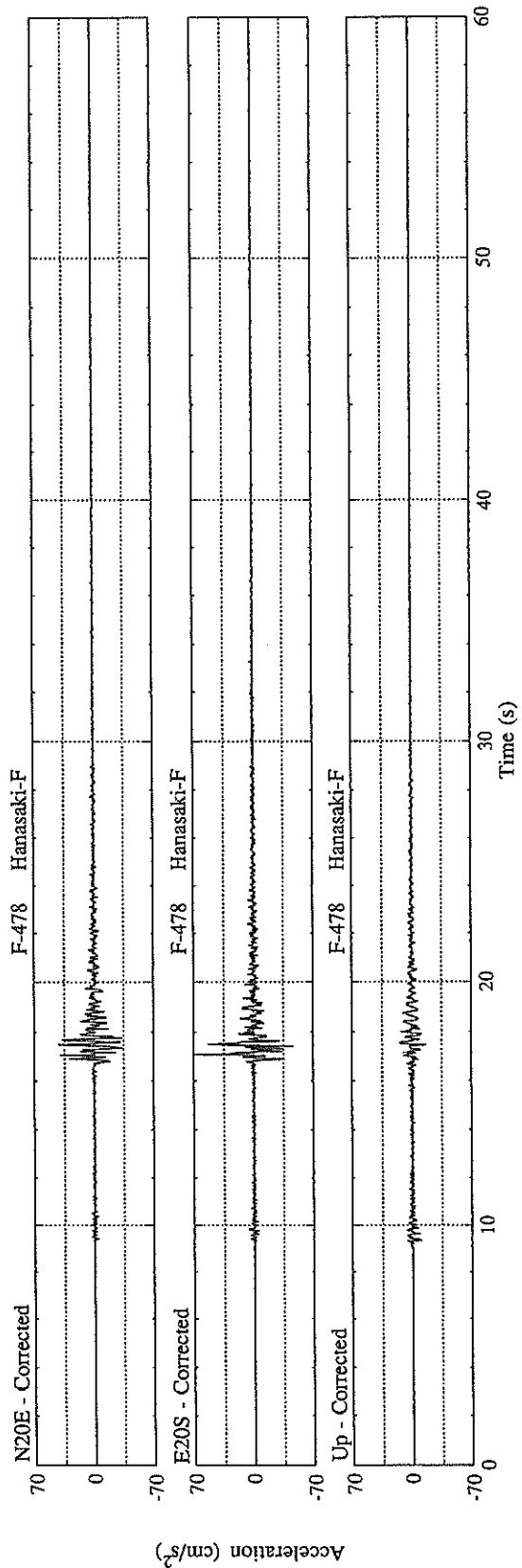
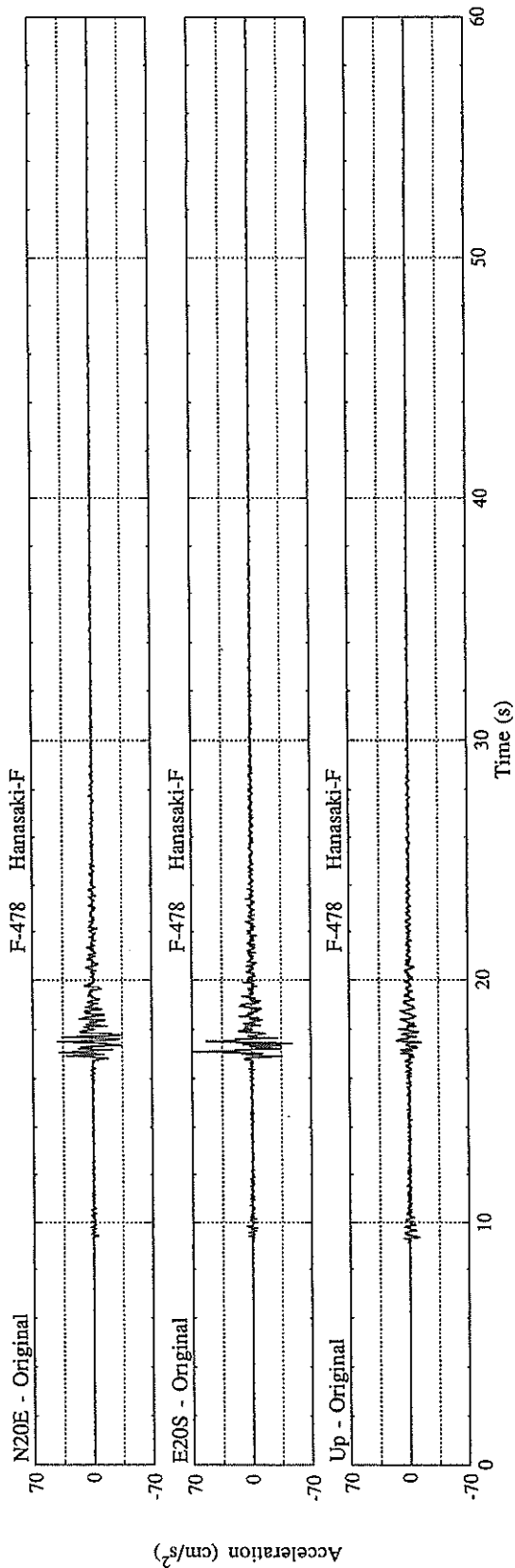
MAXIMUM VELOCITY (CM/SEC)

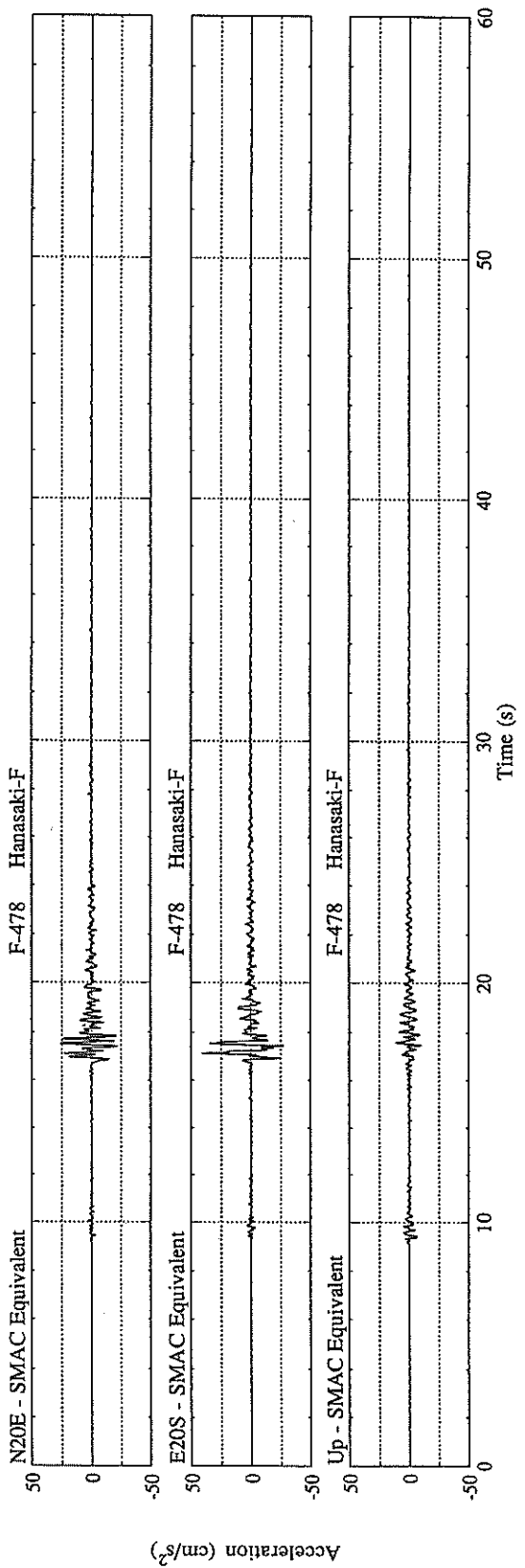
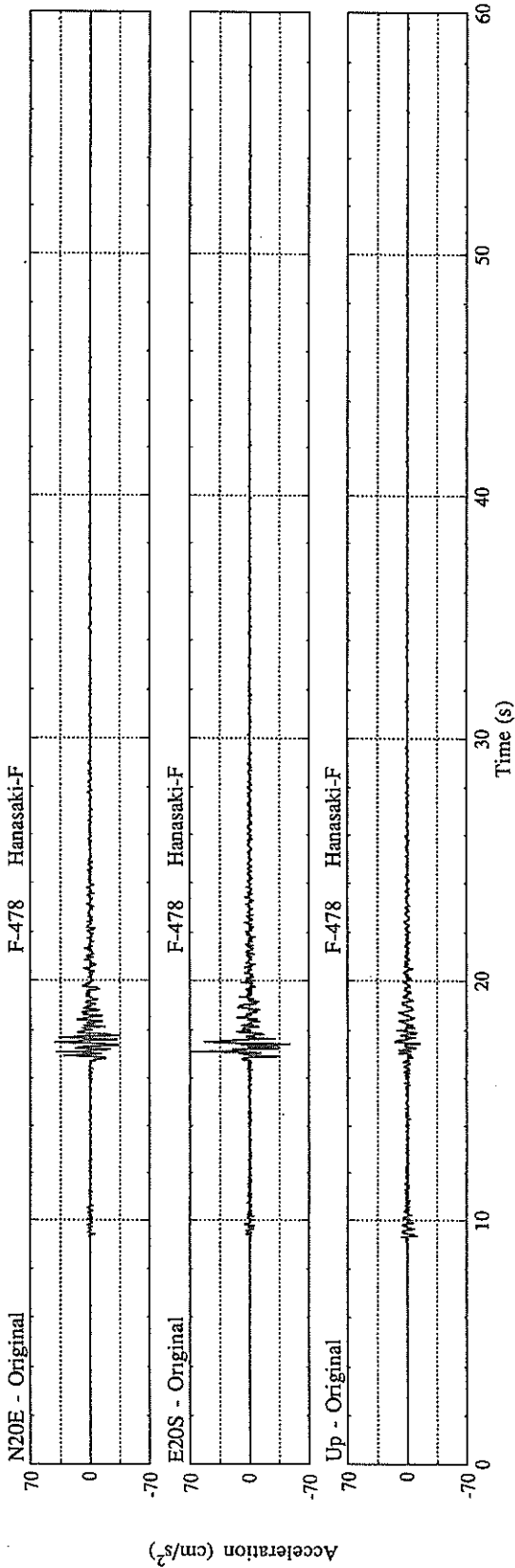
-----  
FIXED FILTER 1.59 2.37 0.77 2.49  
VARIABLE FILTER 1.57 2.40 0.75 2.71

MAXIMUM DISPLACEMENT (CM)

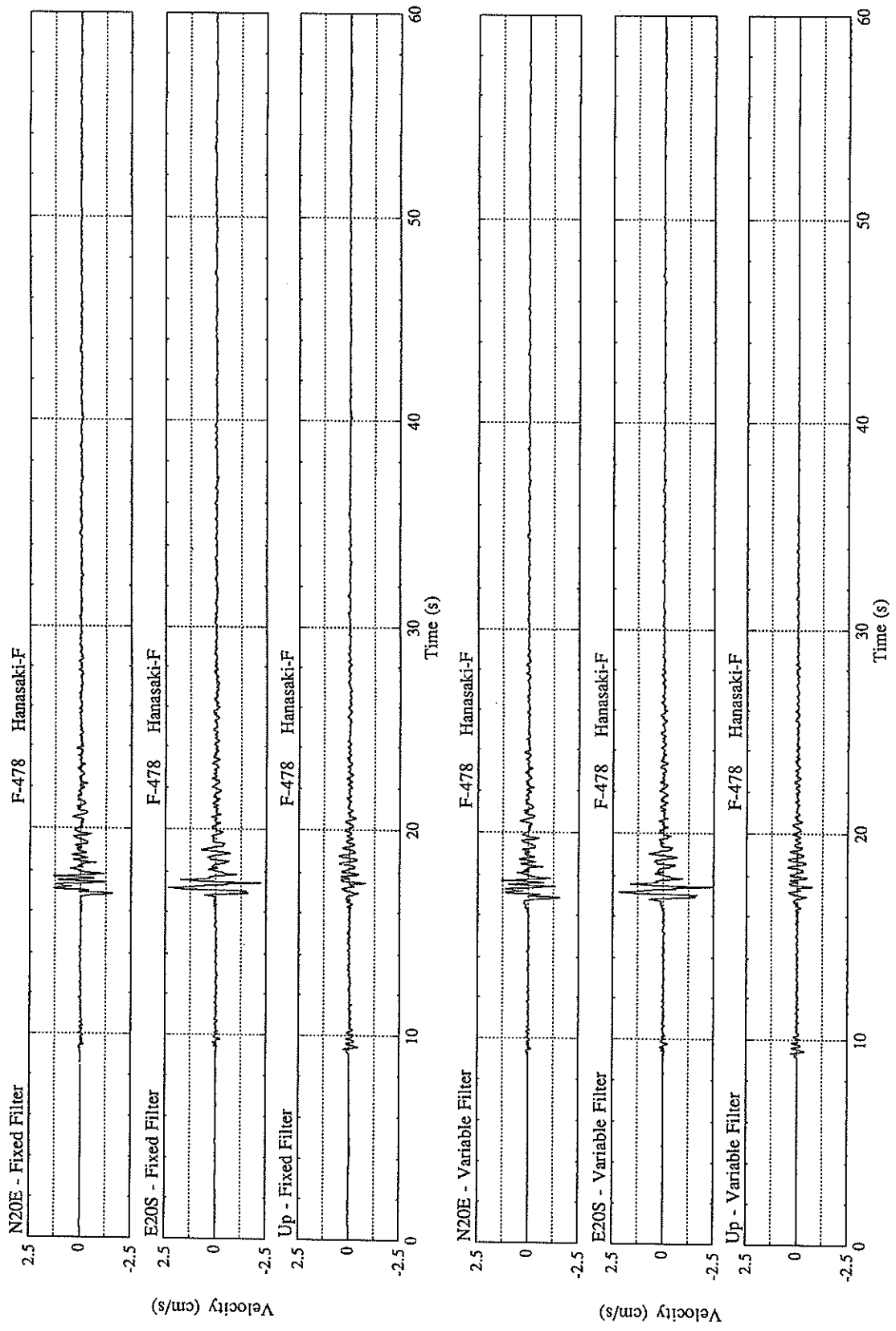
-----  
FIXED FILTER 0.20 0.20 0.10 0.28  
VARIABLE FILTER 0.14 0.19 0.04 0.23

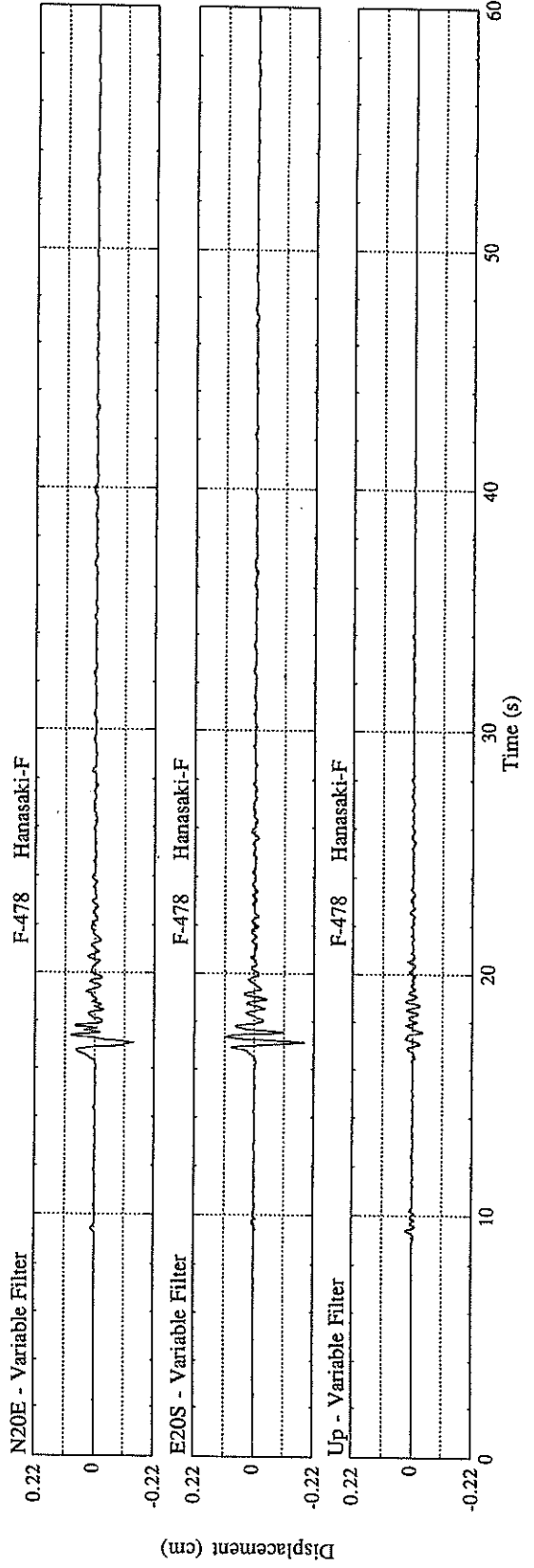
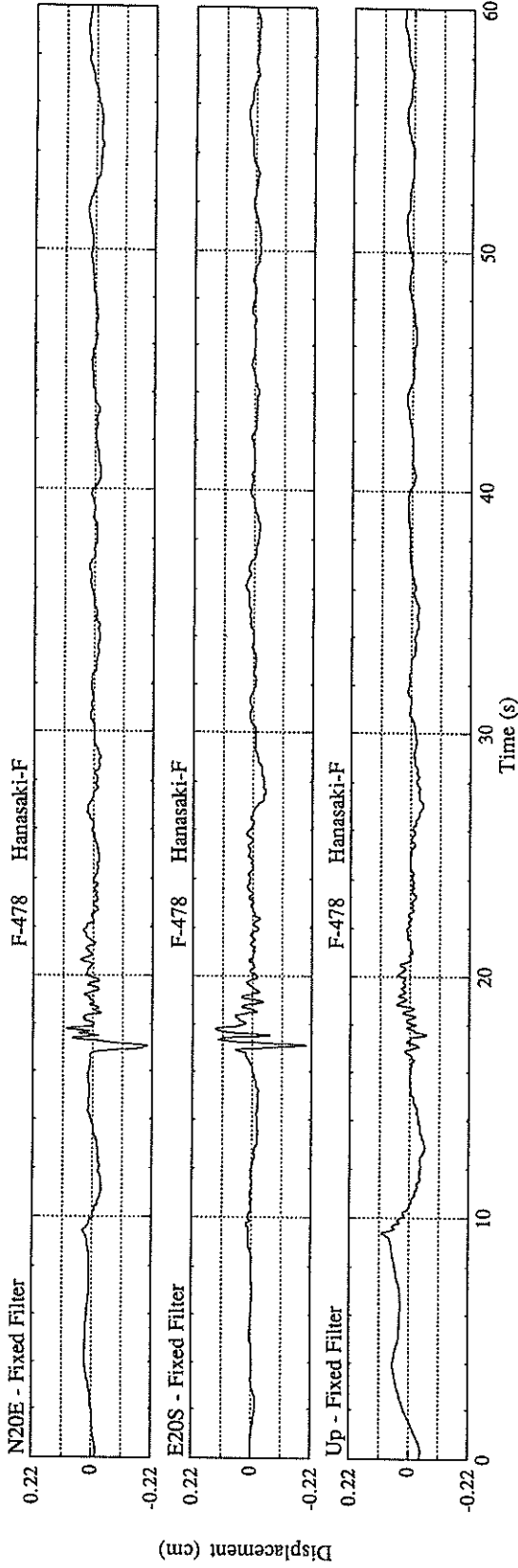
\* RESULTANT OF HORIZONTAL COMPONENTS

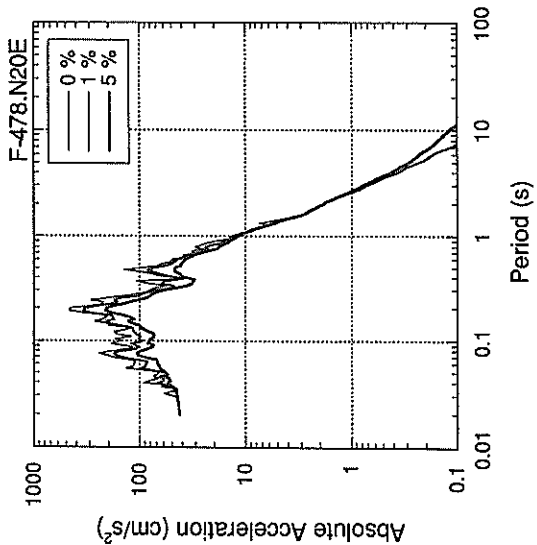
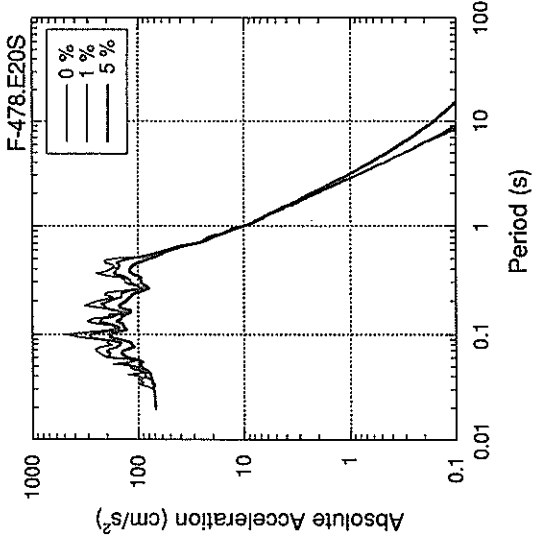
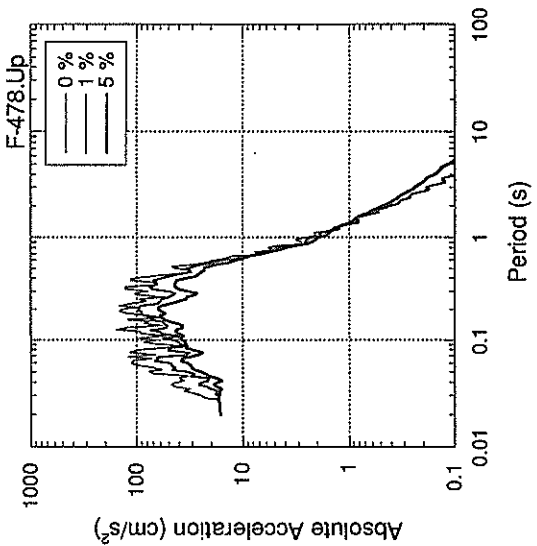
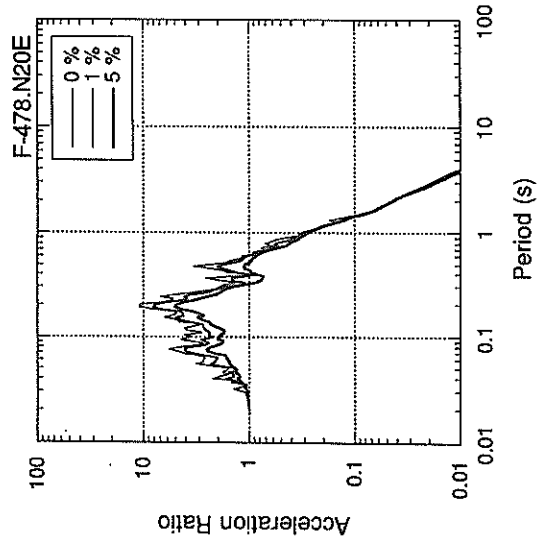
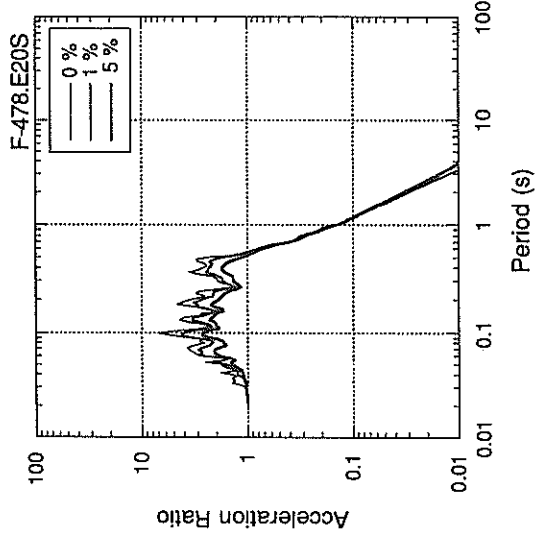
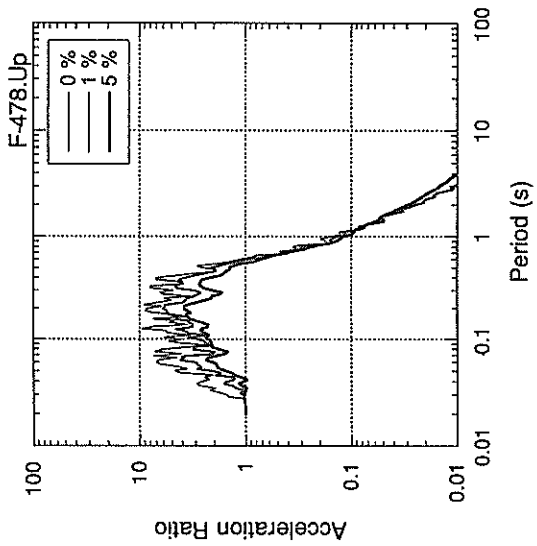


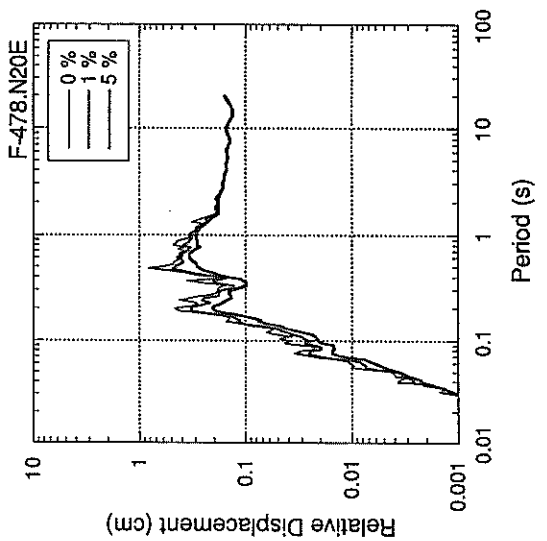
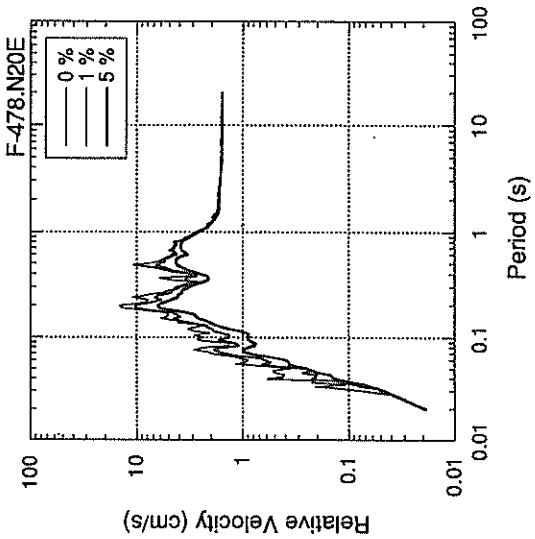
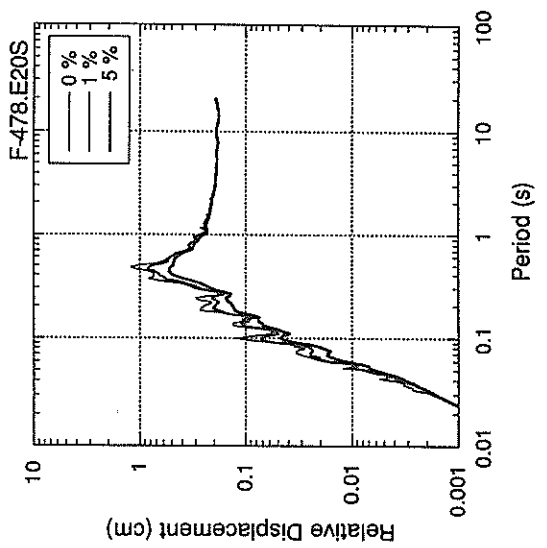
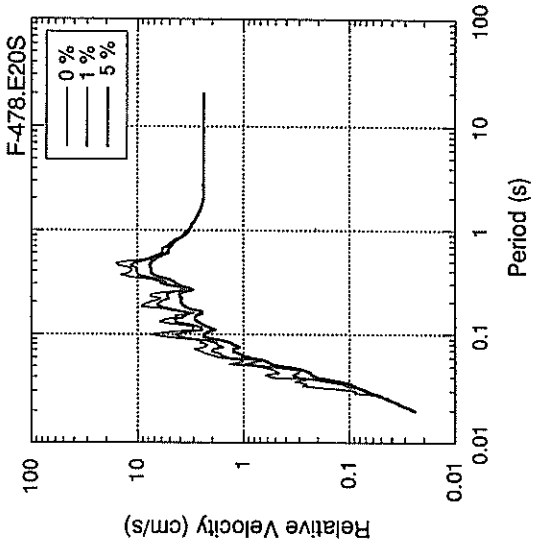
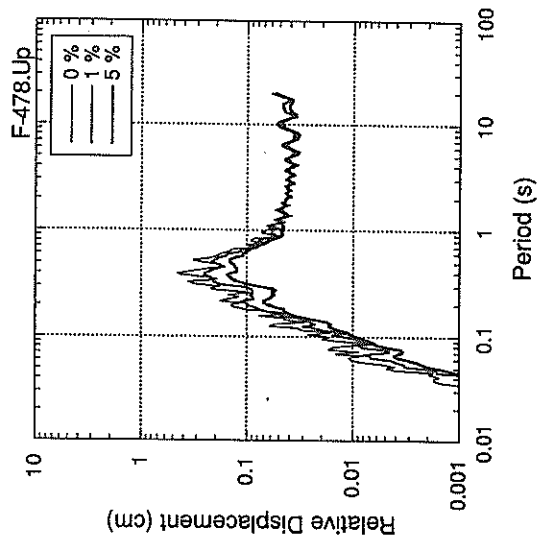
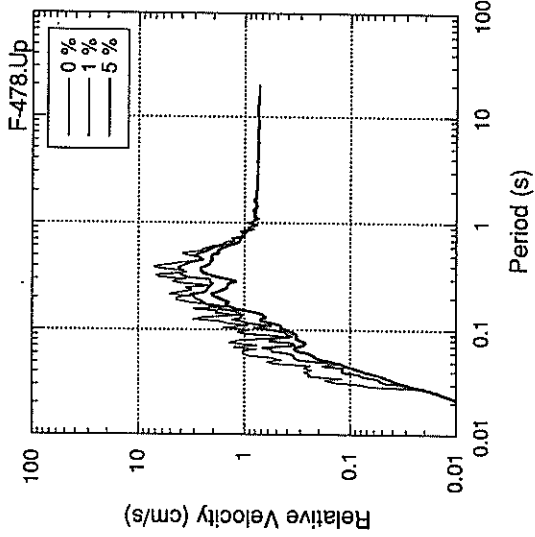


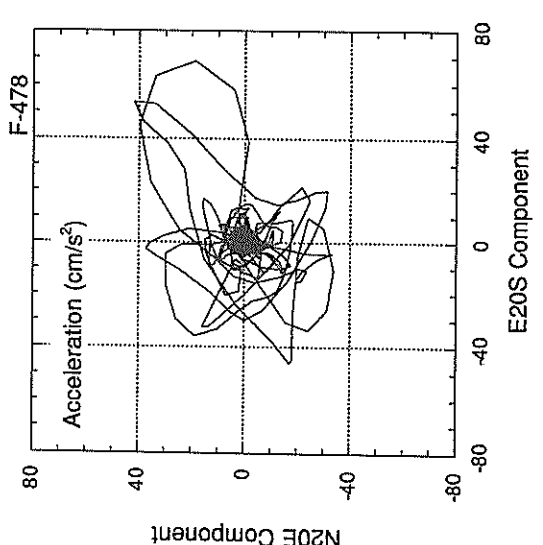
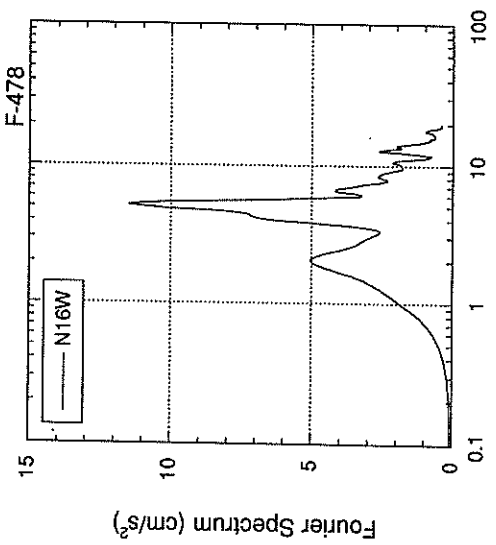
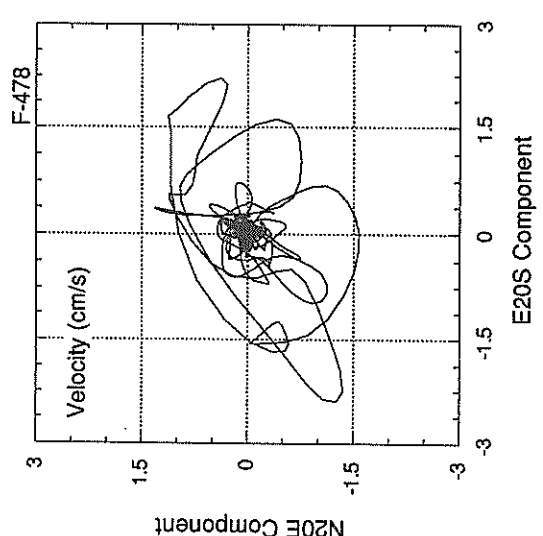
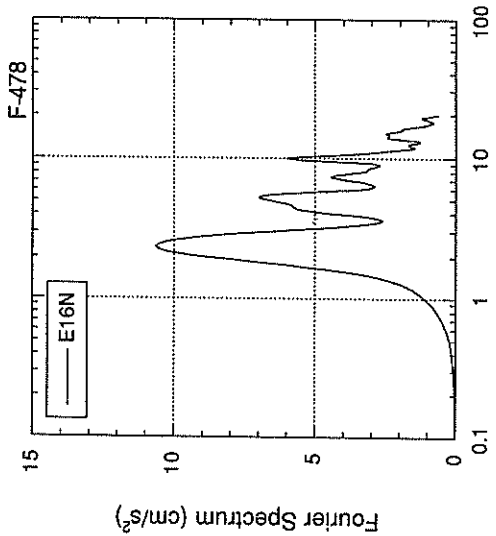
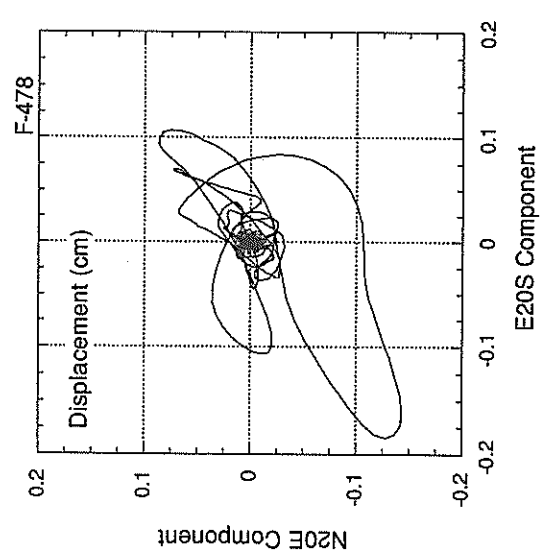
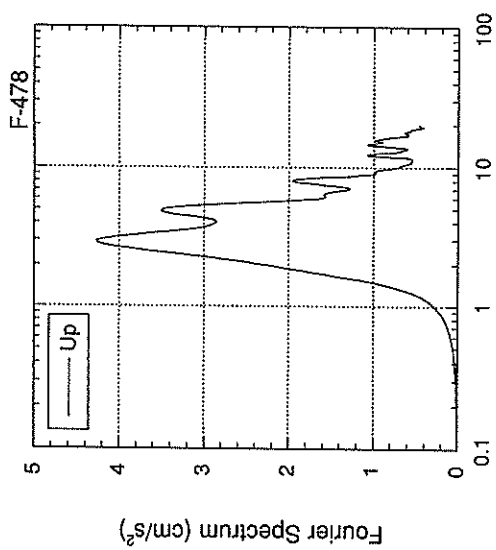












RECORD NUMBER : M-1393  
 STATION : TOKACHI-M  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 10: 5 APR 7, 1992  
 \*\*\*\*\*

LOCATION OF HYPOCENTER

EPICENTRAL REGION SE OFF TOKACHI

LATITUDE 42° 35. 8' N

LONGITUDE 143° 40. 1' E

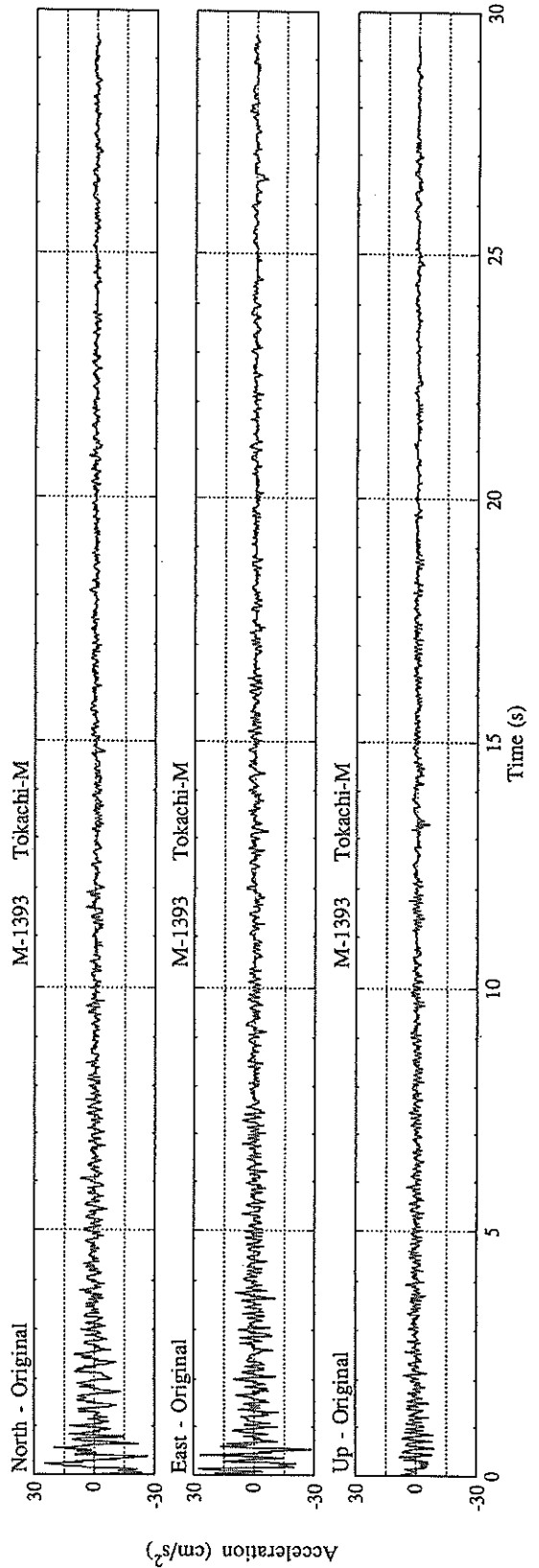
DEPTH 75. 7KM

JMA MAGNITUDE 4. 9

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 26. 4 28. 5 9. 1 33. 2  
 \* RESULTANT OF HORIZONTAL COMPONENTS



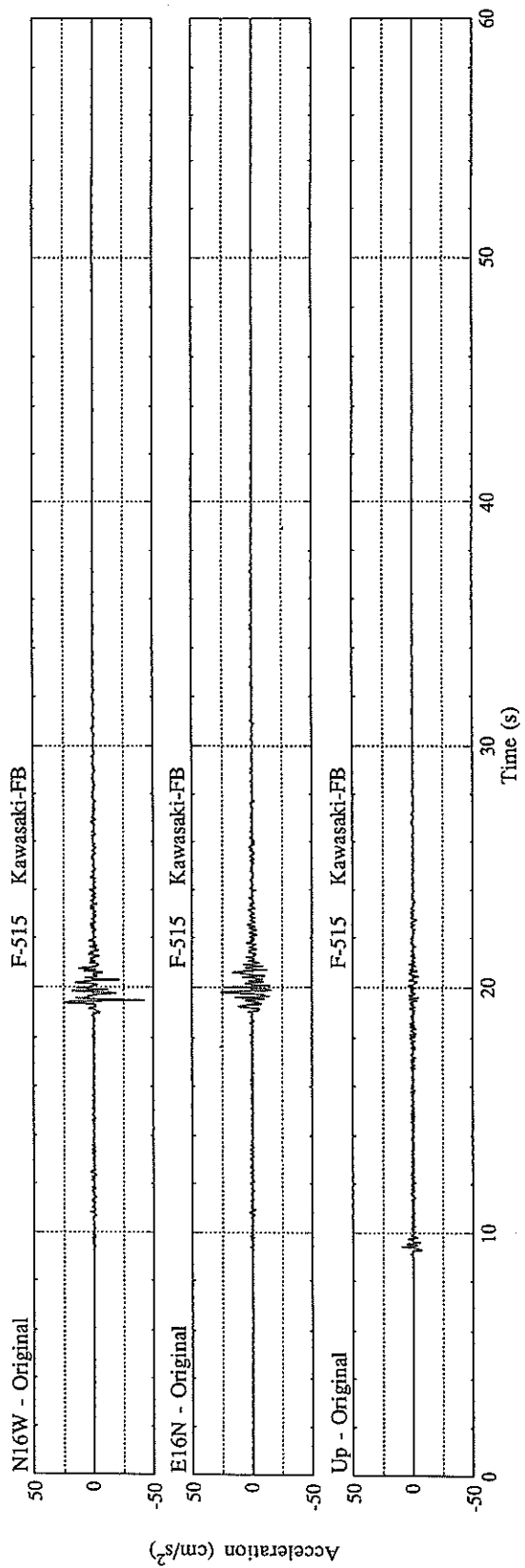
RECORD NUMBER : F-515  
 STATION : KAWASAKI-FB  
 EARTHQUAKE DATA  
 \*\*\*\*\*  
 DATE AND TIME : 23:31 APR 10, 1992  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION : TOKYO PREF  
 LATITUDE : 35° 42.4' N  
 LONGITUDE : 139° 37.8' E  
 DEPTH : 89.0KM  
 JMA MAGNITUDE : 4.9  
 \*\*\*\*\*  
 PEAK VALUES OF COMPONENTS

N S      E W      U D      HORIZONTAL\*  
 -----  
 42.4    26.1    9.5    42.7  
 \* RESULTANT OF HORIZONTAL COMPONENTS

ORIGINAL ACCELERATION (GAL)  
 \*\*\*\*\*  
 PEAK VALUES OF COMPONENTS

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS



RECORD NUMBER : F-516

STATION : KAWASAKI-F

EARTHQUAKE DATA

```

*****
DATE AND TIME                23:31 APR 10, 1992
LOCATION OF HYPOCENTER
  EPICENTRAL REGION          TOKYO PREF
  LATITUDE                   35° 42.4' N
  LONGITUDE                   139° 37.8' E
  DEPTH                       89.0KM
  JMA MAGNITUDE               4.9
*****

```

PEAK VALUES OF COMPONENTS

```

-----
      N S           E W           U D           HORIZONTAL*
-----

```

PARAMETER OF THE VARIABLE FILTER

```

-----
FC (HZ)                0.445        0.494        0.762

```

MAXIMUM ACCELERATION (GAL)

```

-----
SMAC-B2 EQUIVALENT     57.2         45.5         17.2         57.6
ORIGINAL                87.5         60.0         27.4         87.7
CORRECTED               87.5         59.6         25.8         87.7

```

MAXIMUM VELOCITY (CM/SEC)

```

-----
FIXED FILTER           4.78         2.62         0.86         4.78
VARIABLE FILTER        4.65         2.67         0.87         4.65

```

MAXIMUM DISPLACEMENT (CM)

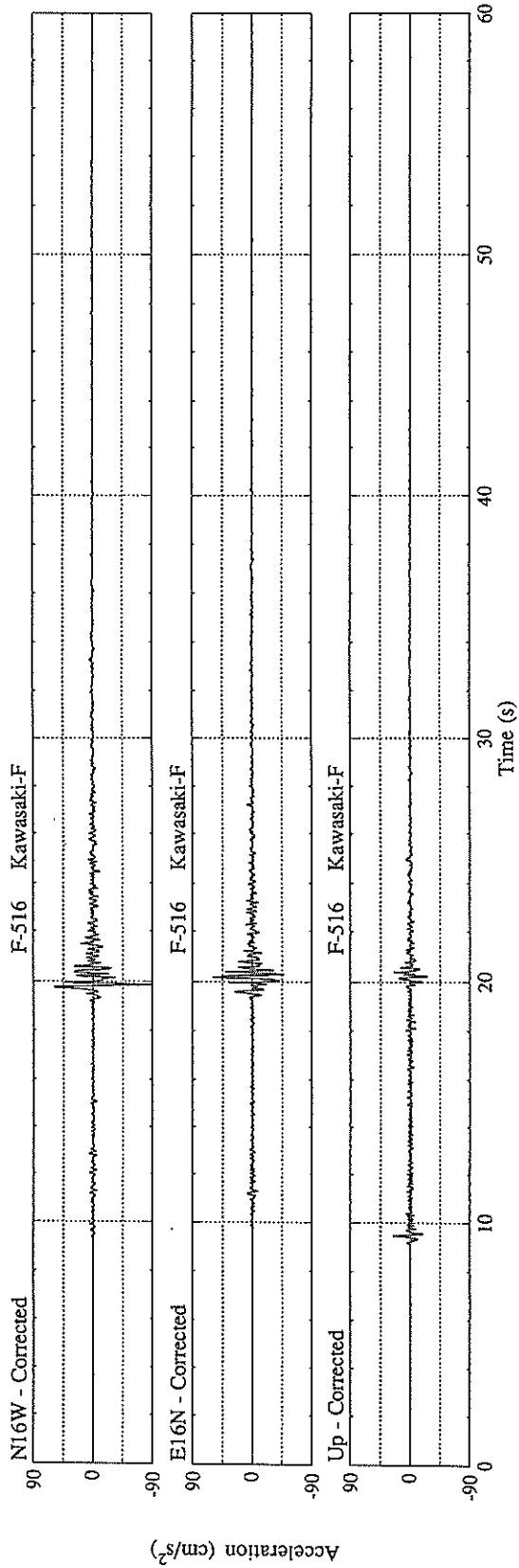
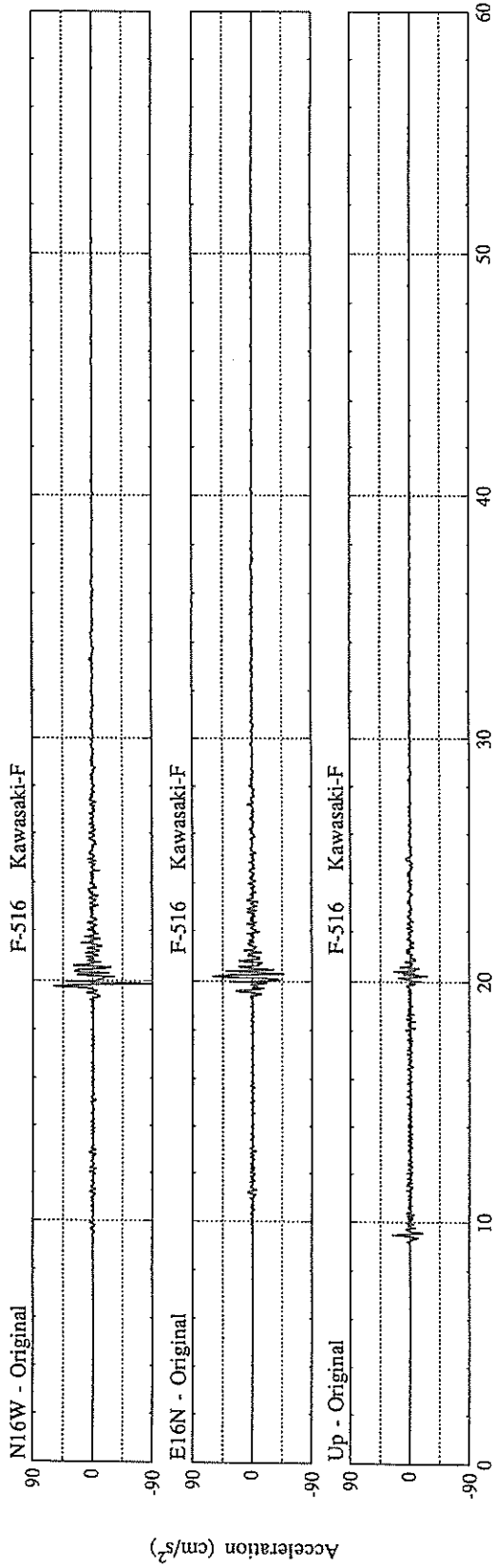
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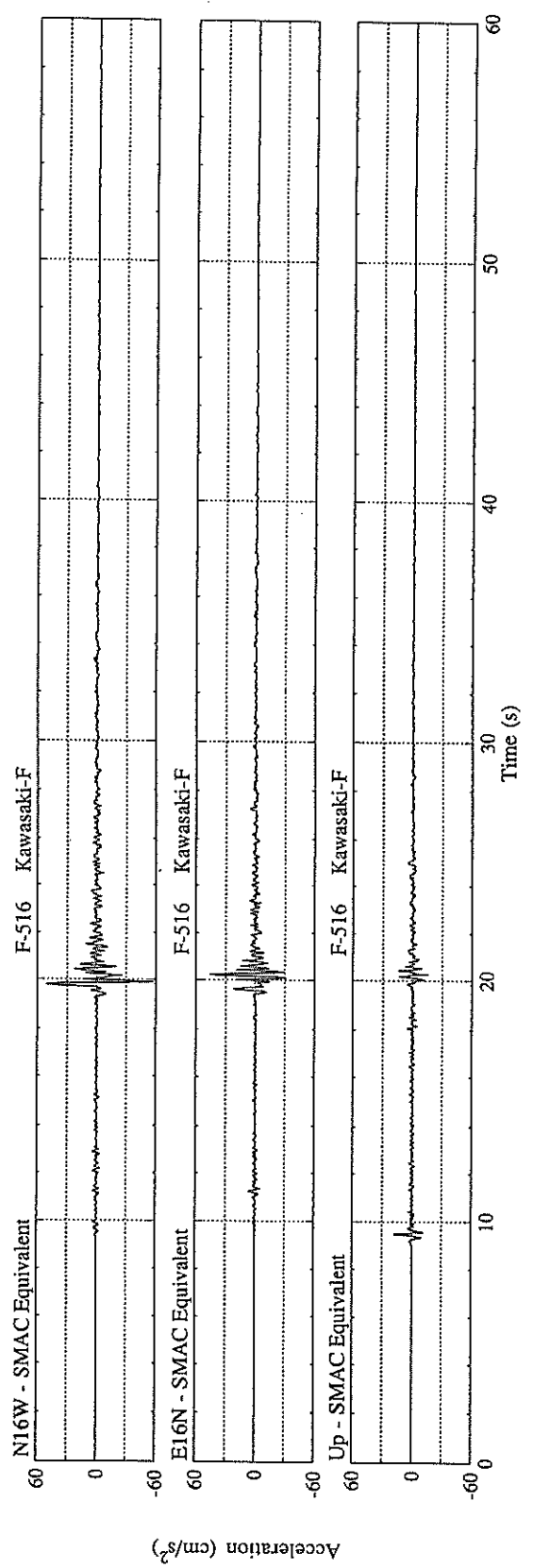
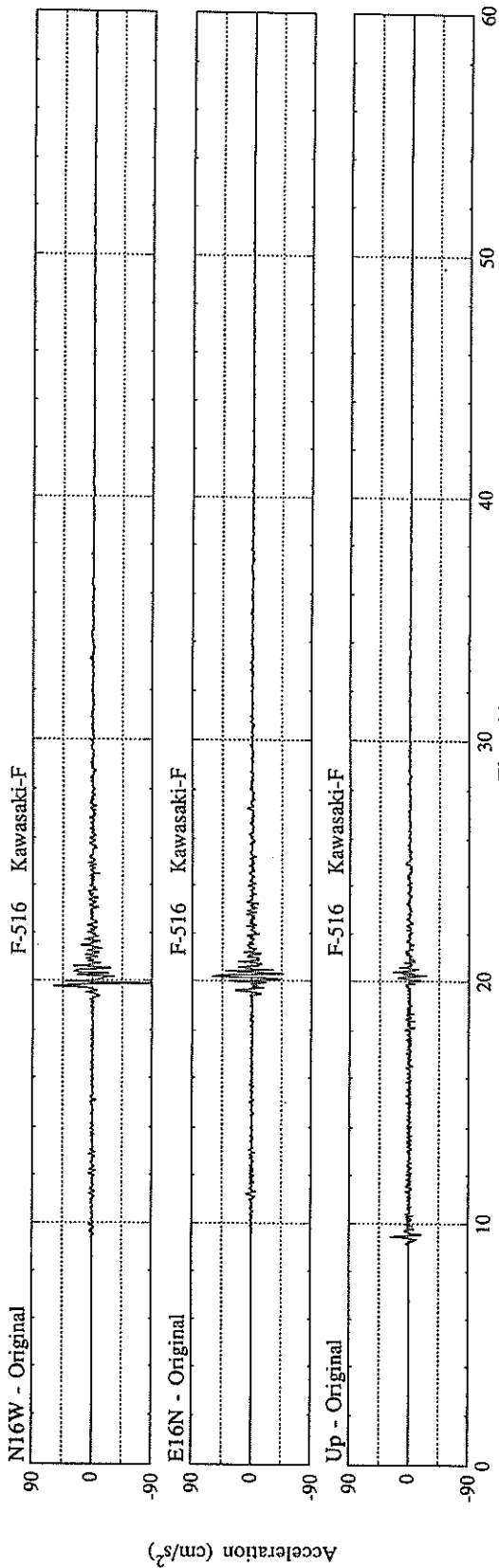
-----
FIXED FILTER           0.33         0.21         0.05         0.33
VARIABLE FILTER        0.30         0.19         0.05         0.30

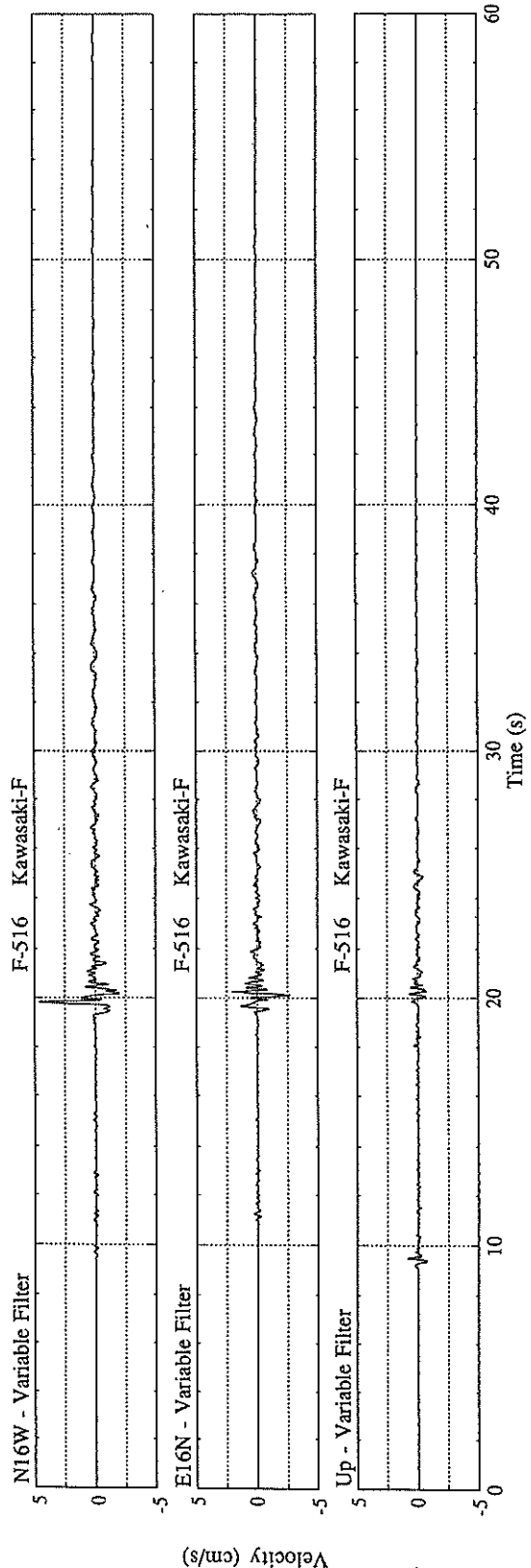
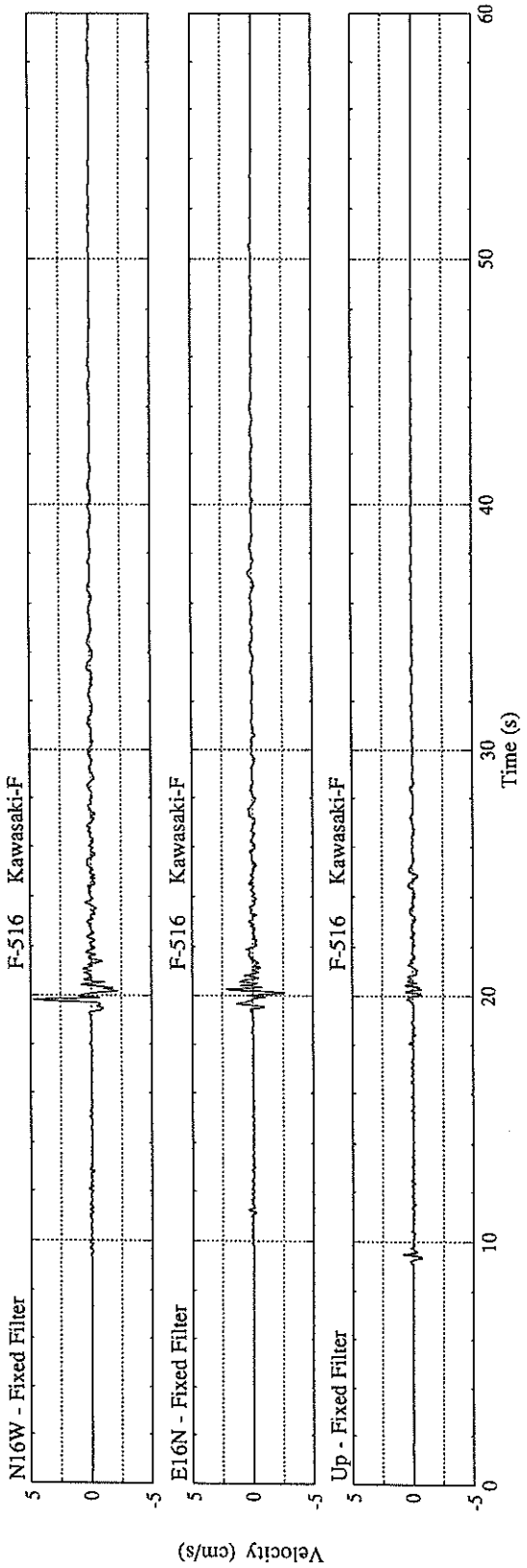
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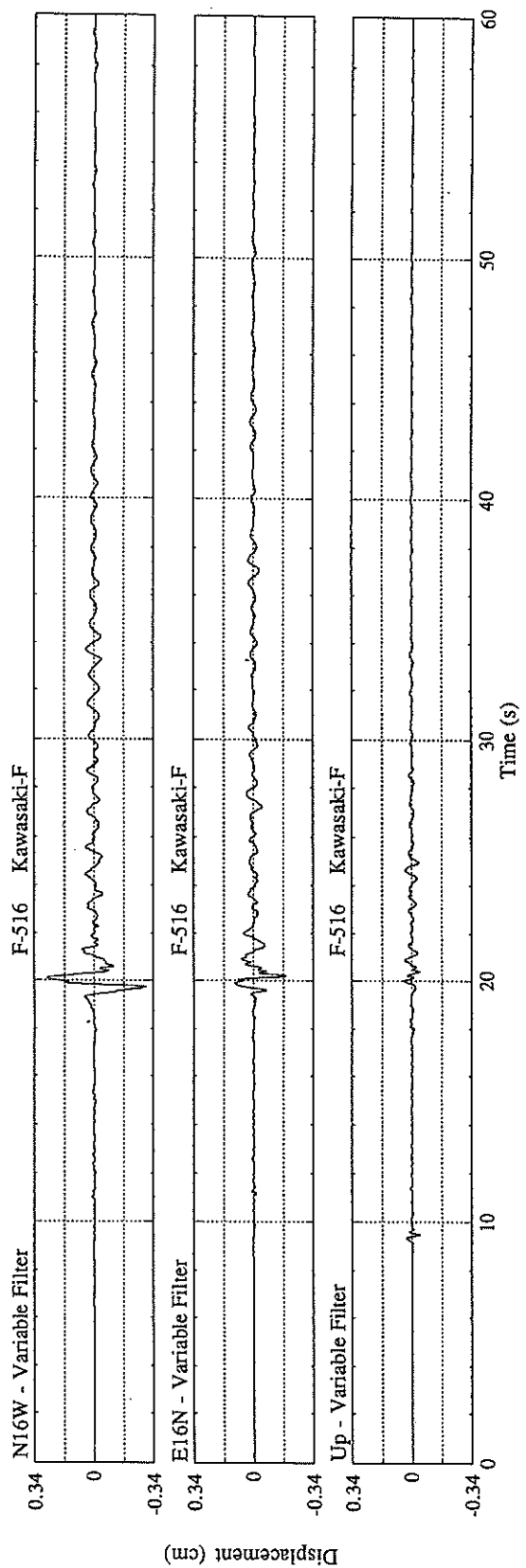
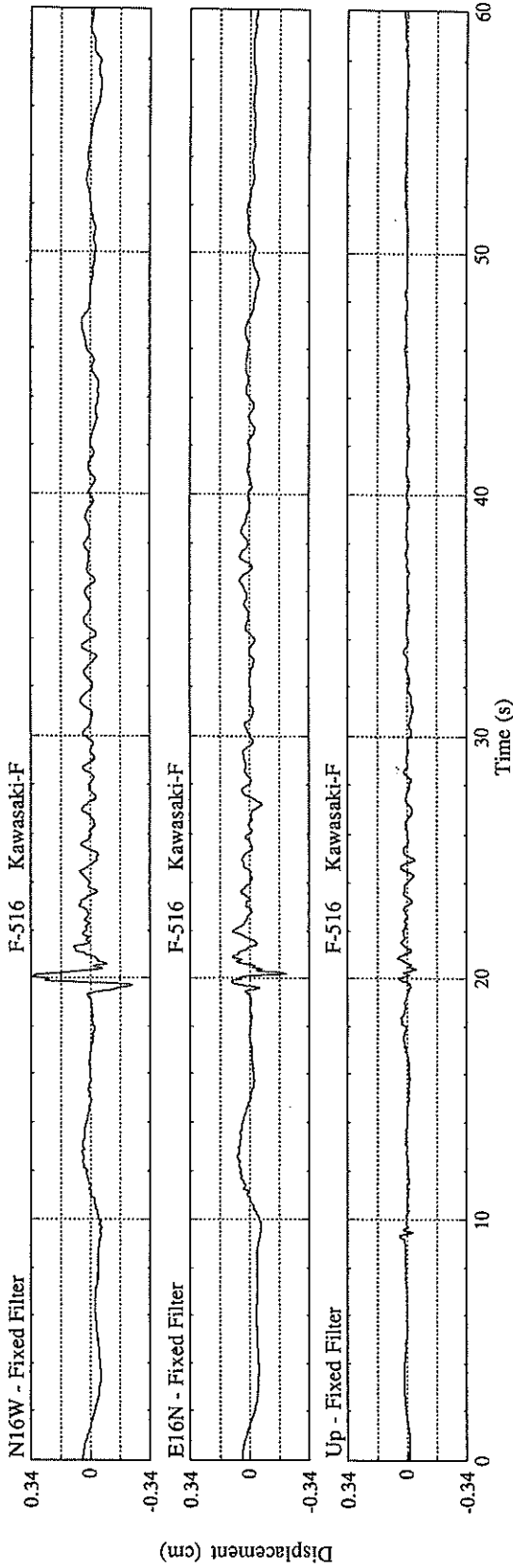
\* RESULTANT OF HORIZONTAL COMPONENTS

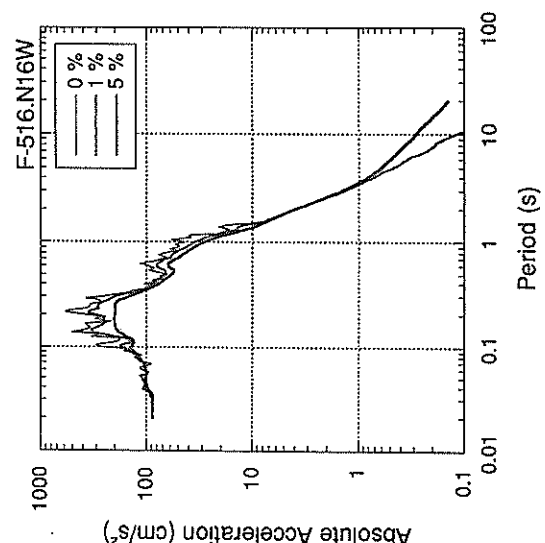
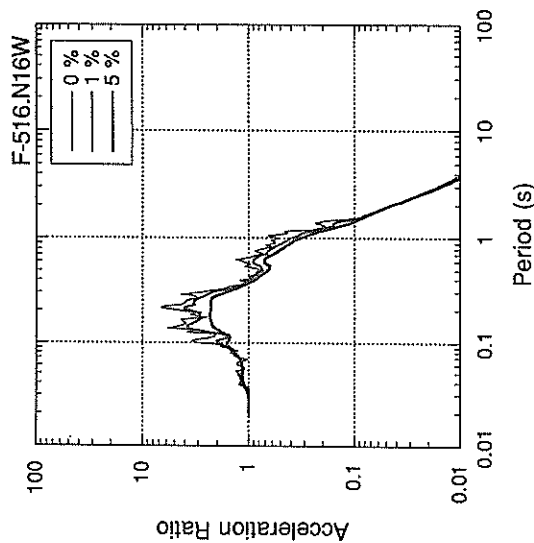
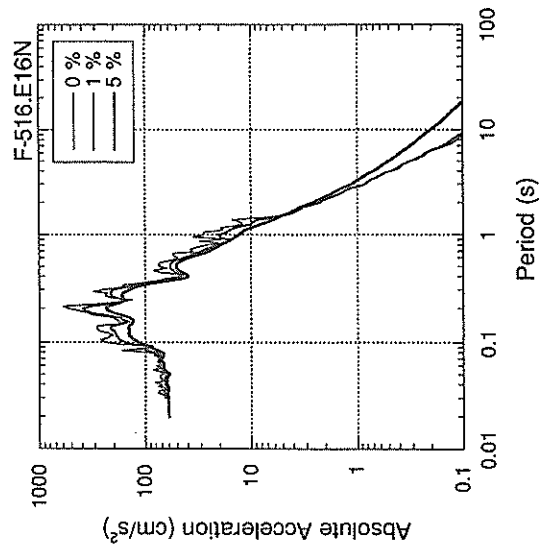
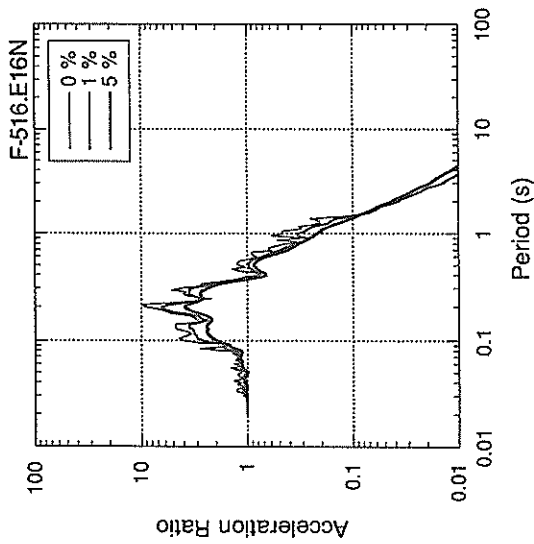
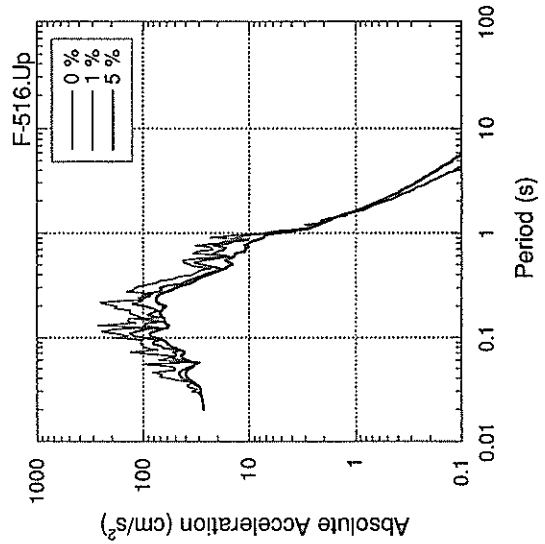
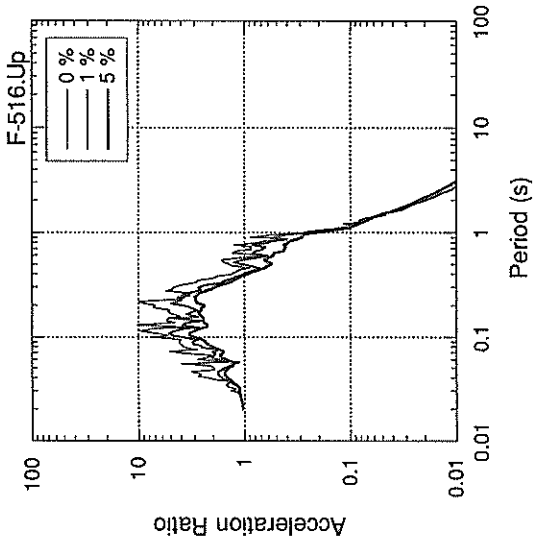


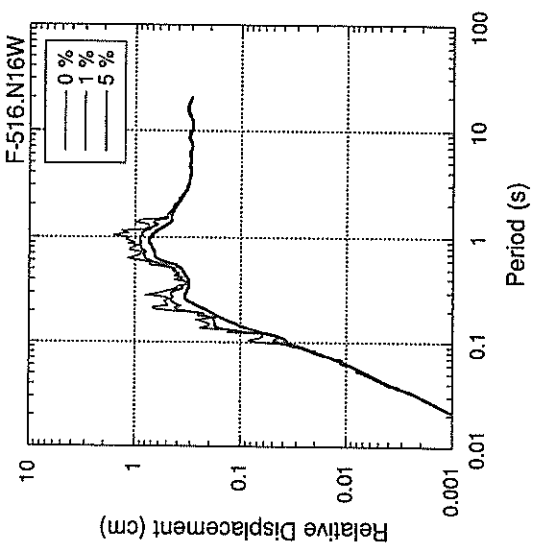
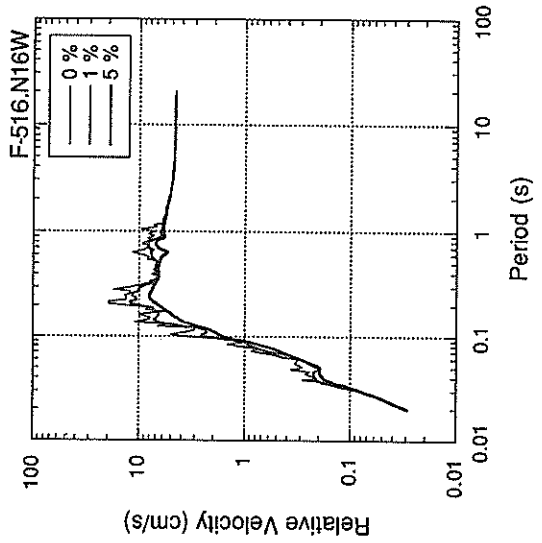
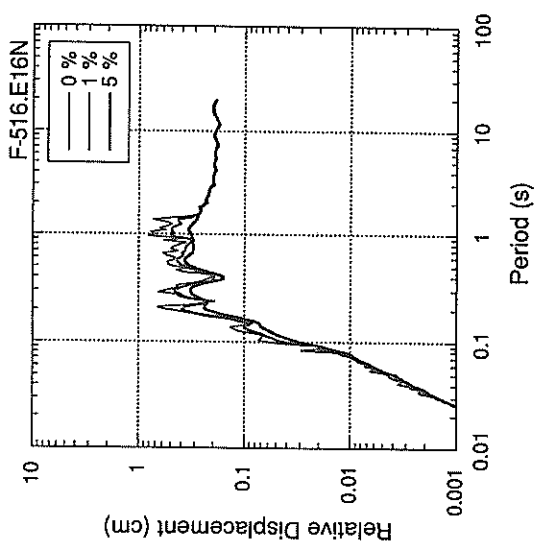
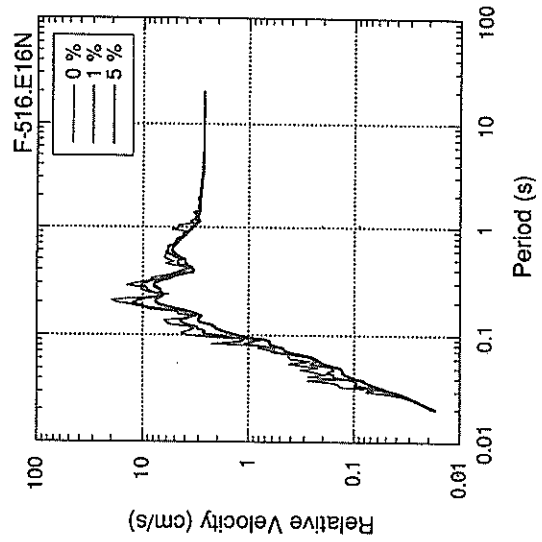
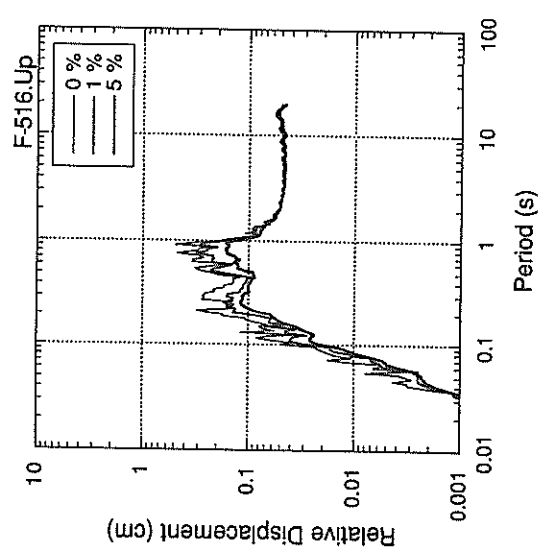
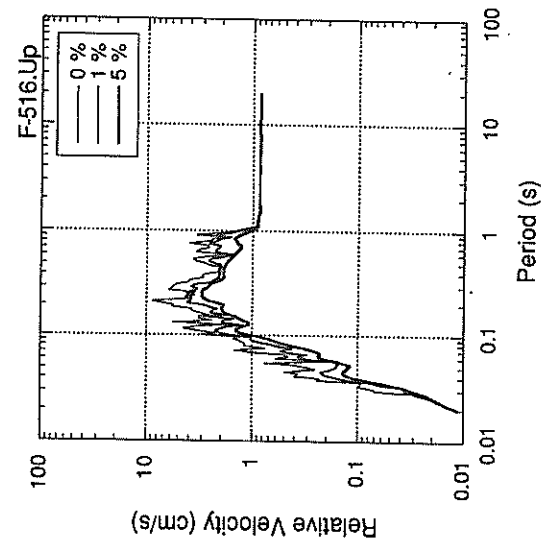


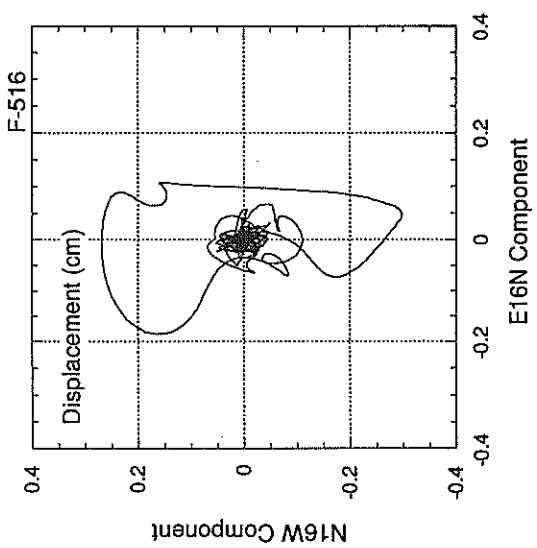
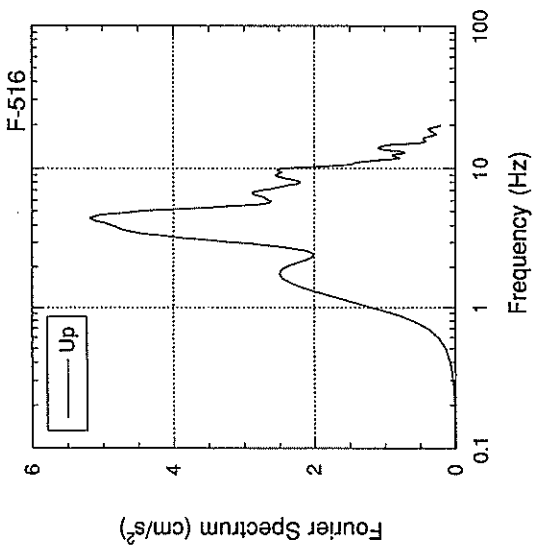
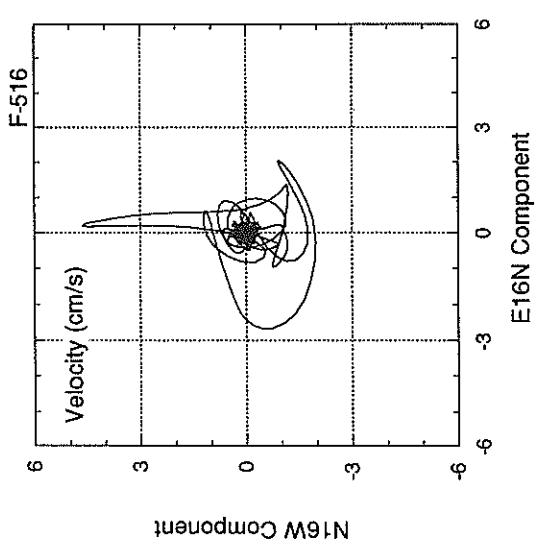
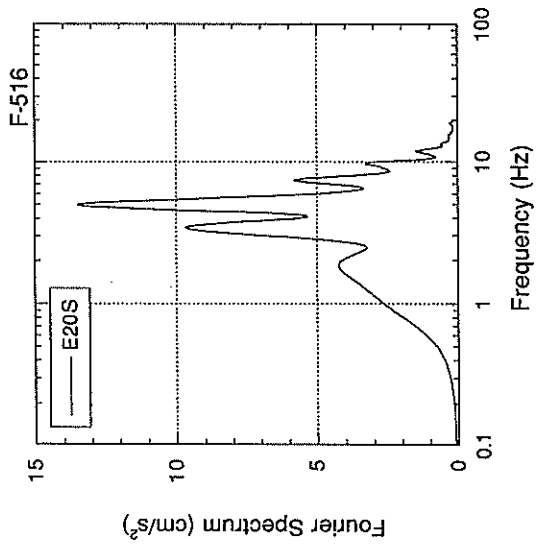
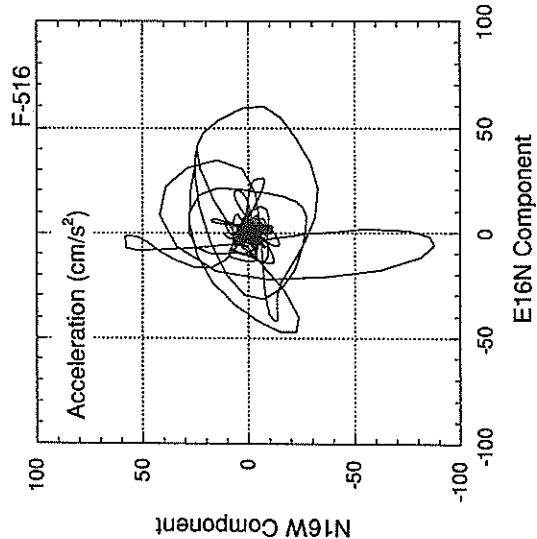
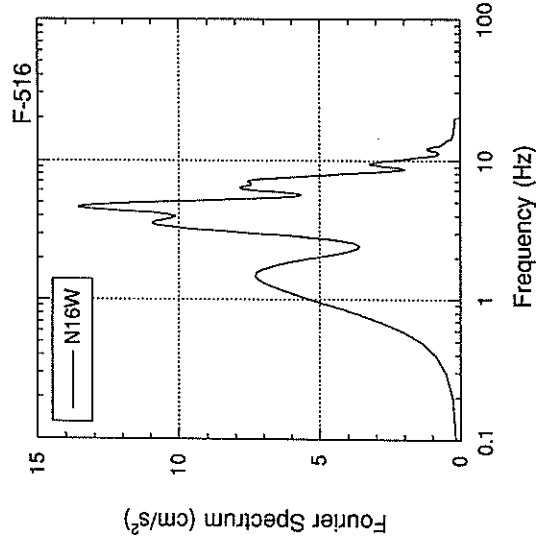












RECORD NUMBER : F-517

STATION : KAWASAKI-FR

EARTHQUAKE DATA

```

*****
DATE AND TIME                23:31 APR 10, 1992
LOCATION OF HYPOCENTER
  EPICENTRAL REGION          TOKYO PREF
  LATITUDE                   35° 42.4' N
  LONGITUDE                  139° 37.8' E
  DEPTH                      89.0KM
  JMA MAGNITUDE              4.9
*****

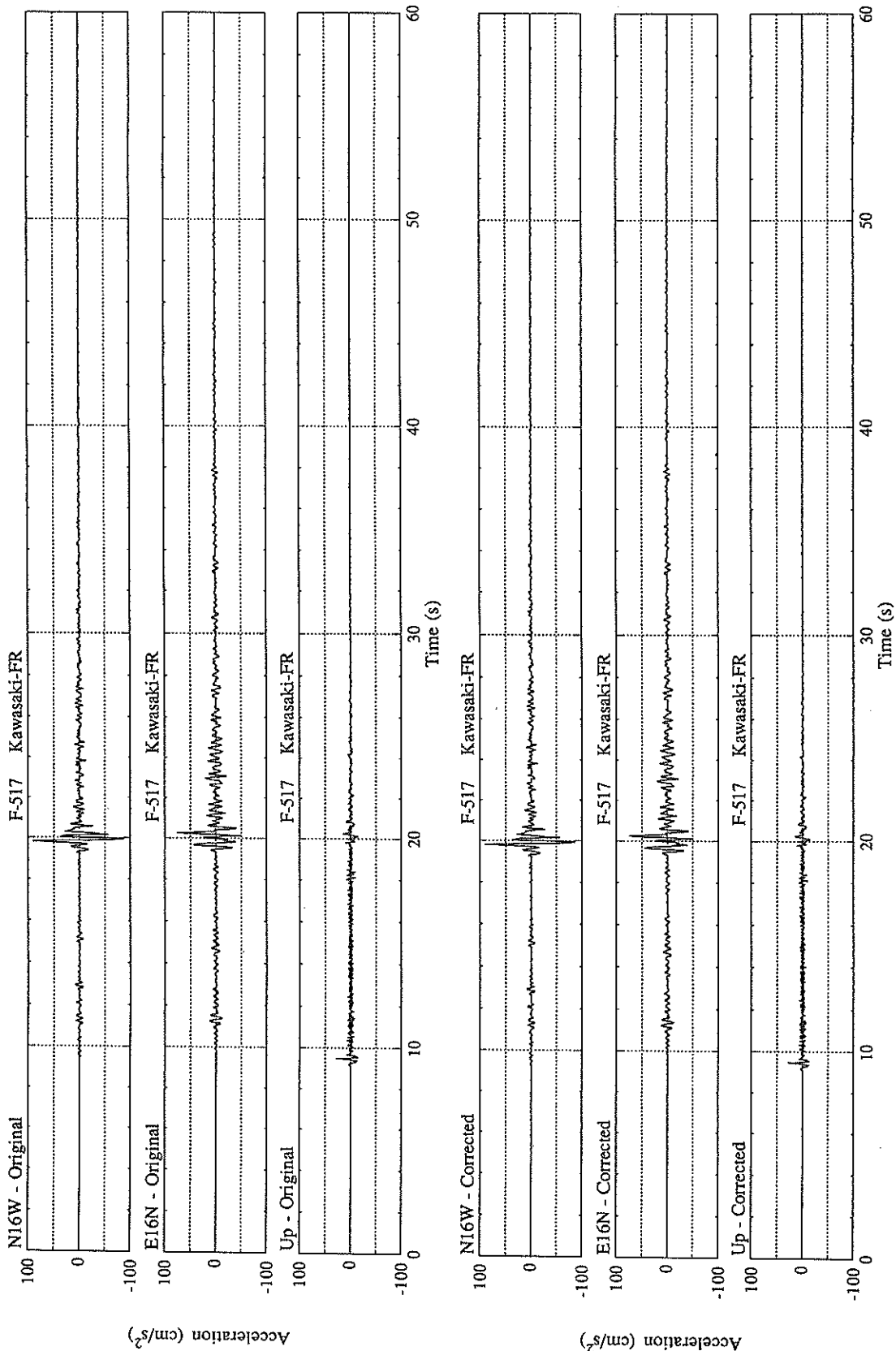
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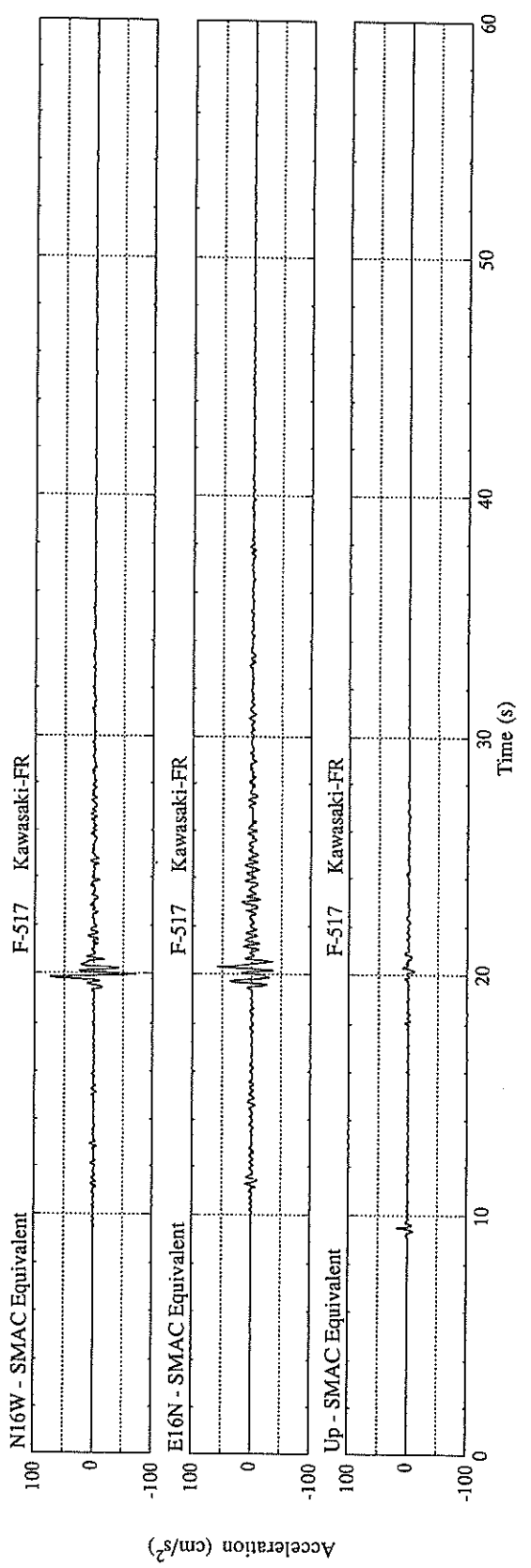
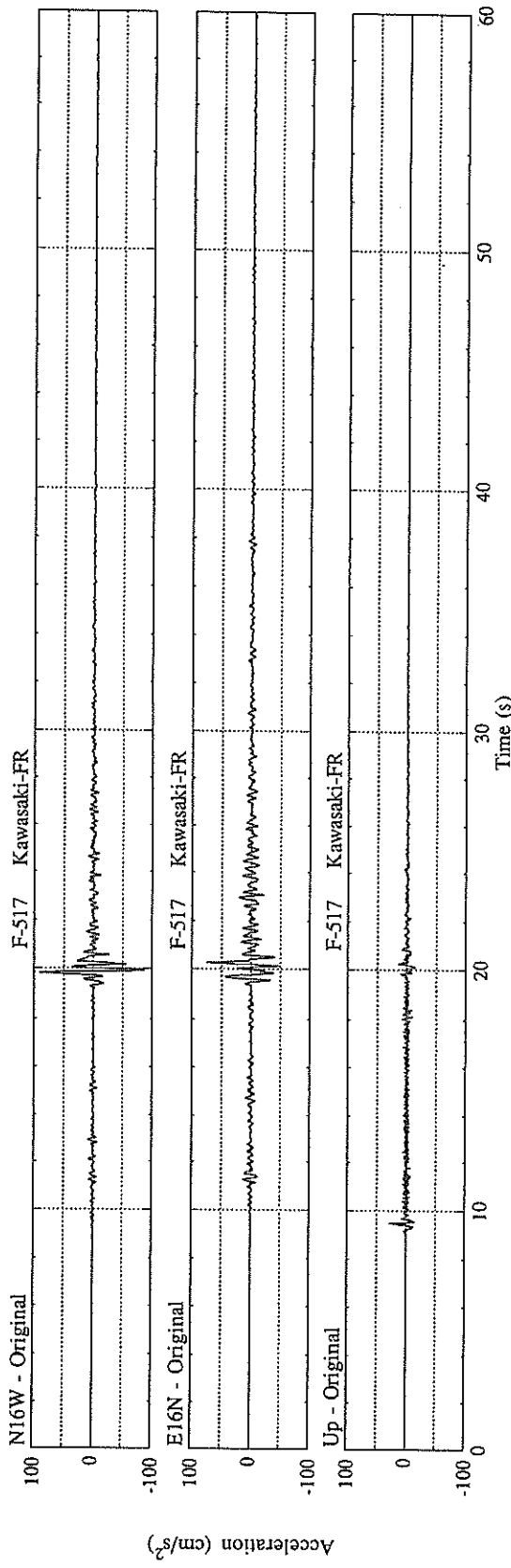
PEAK VALUES OF COMPONENTS

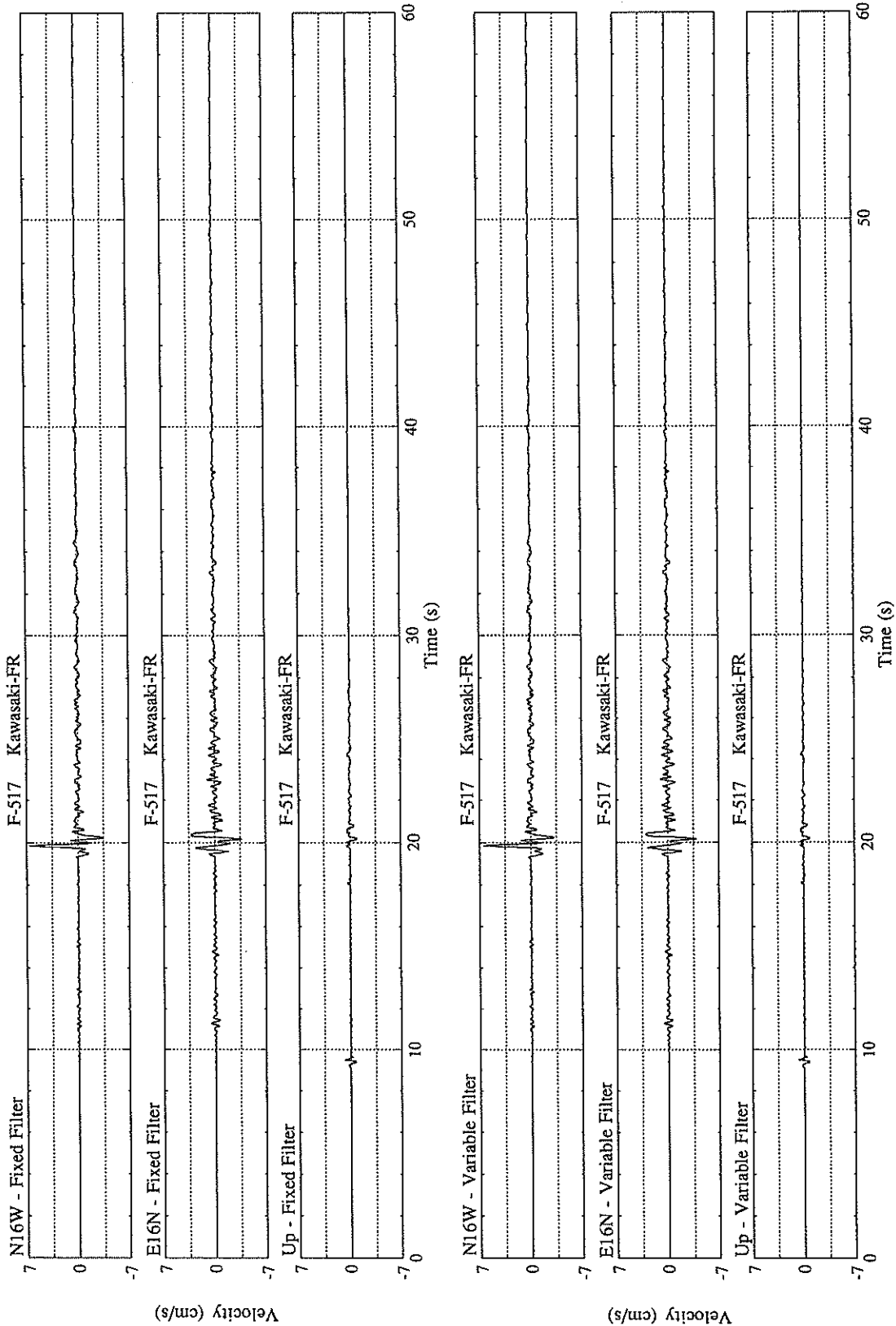
	N S	E W	U D	HORIZONTAL*
PARAMETER OF THE VARIABLE FILTER				
FC (HZ)	0.451	0.494	0.829	
MAXIMUM ACCELERATION (GAL)				
SMAC-B2 EQUIVALENT	73.6	59.5	18.0	77.9
ORIGINAL	90.9	75.1	27.7	97.5
CORRECTED	90.3	74.4	28.0	97.1
MAXIMUM VELOCITY (CM/SEC)				
FIXED FILTER	6.61	3.69	0.94	6.62
VARIABLE FILTER	6.50	3.90	0.88	6.50
MAXIMUM DISPLACEMENT (CM)				
FIXED FILTER	0.44	0.45	0.06	0.47
VARIABLE FILTER	0.35	0.41	0.06	0.42

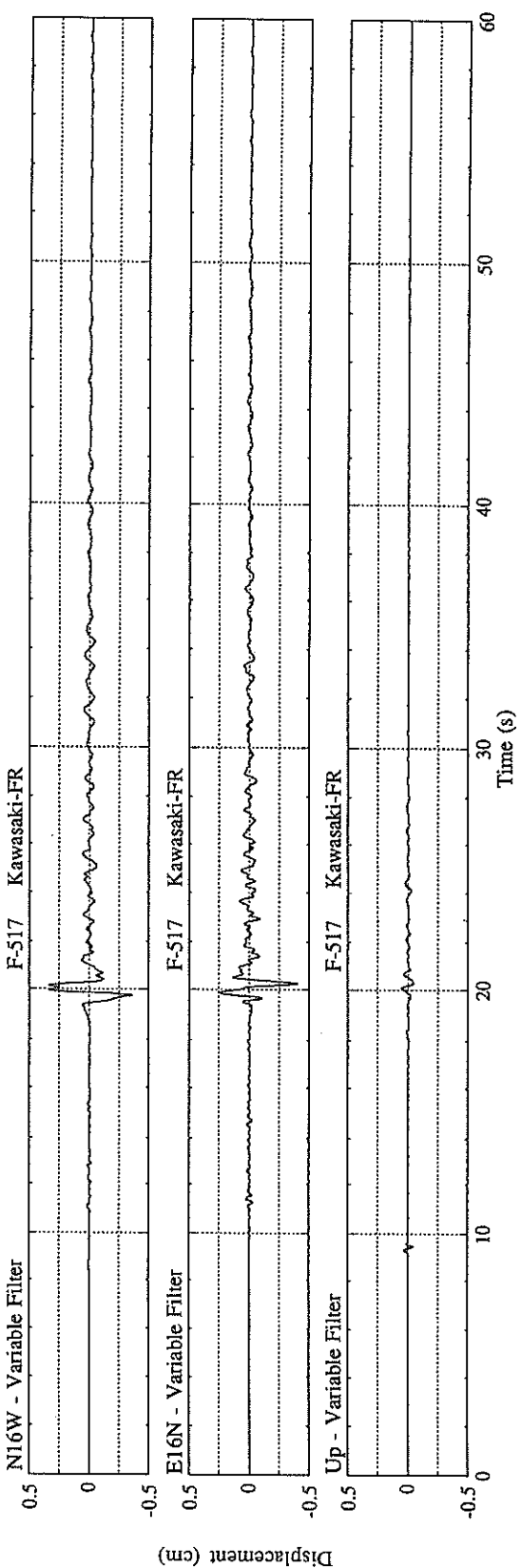
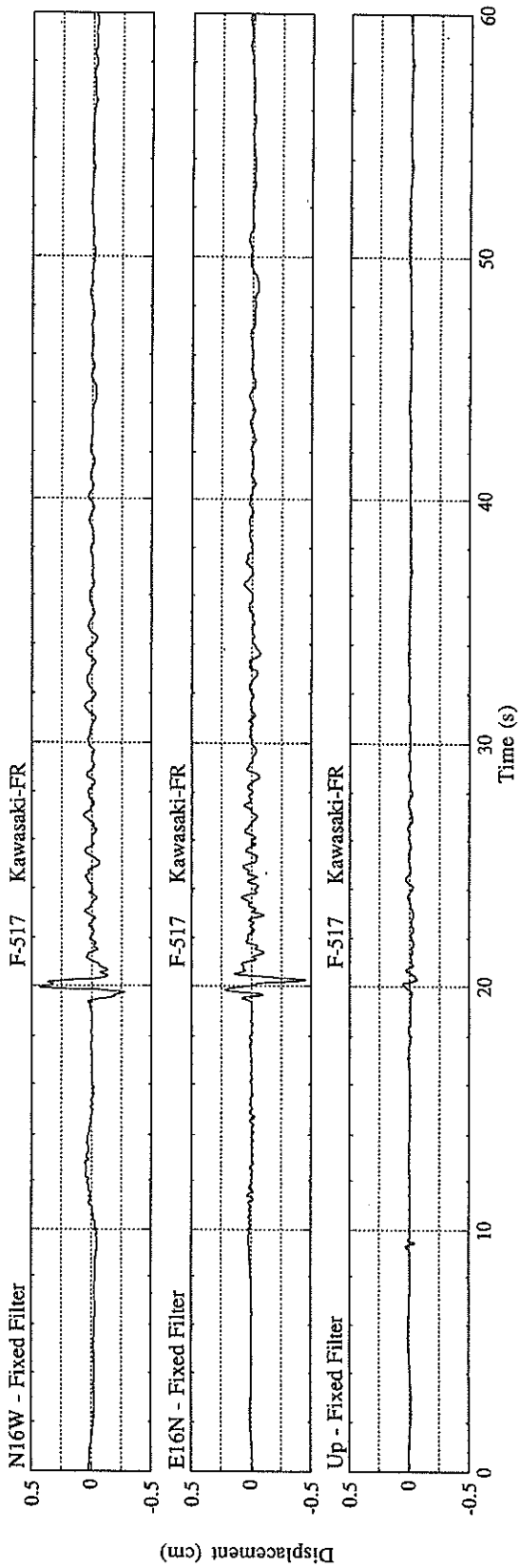
\* RESULTANT OF HORIZONTAL COMPONENTS

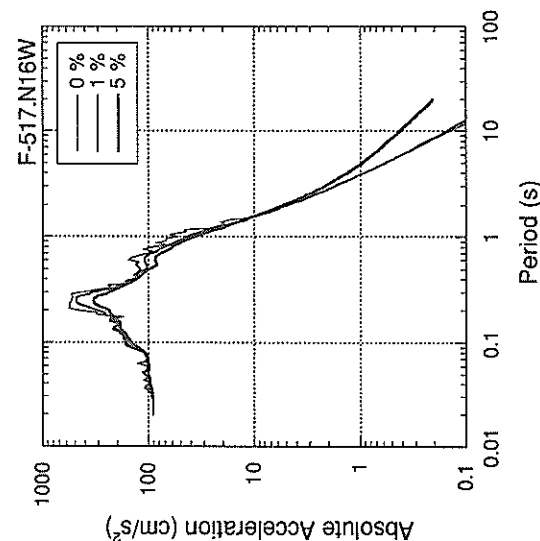
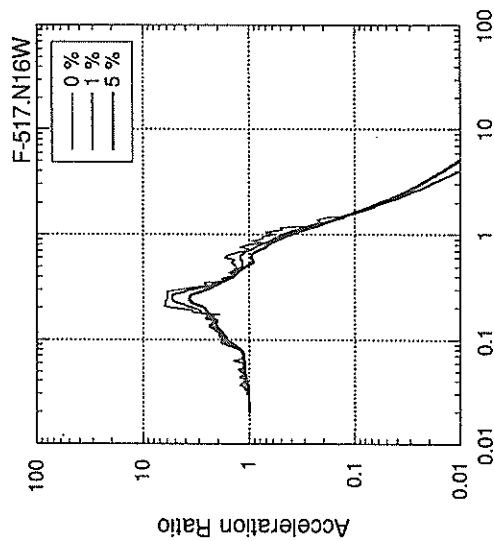
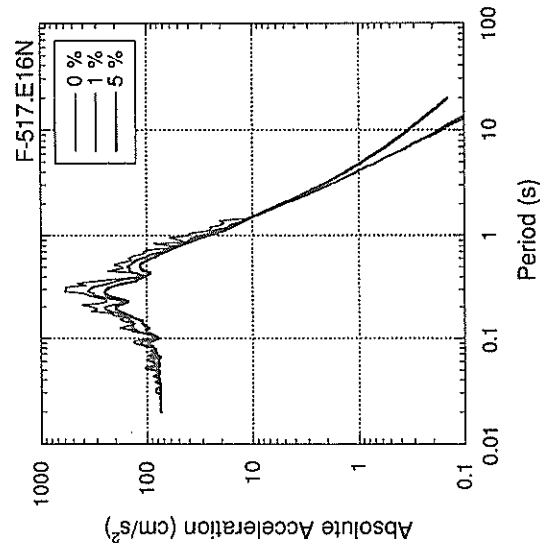
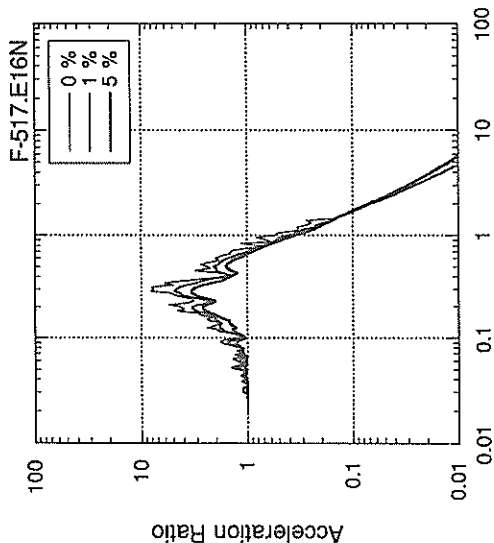
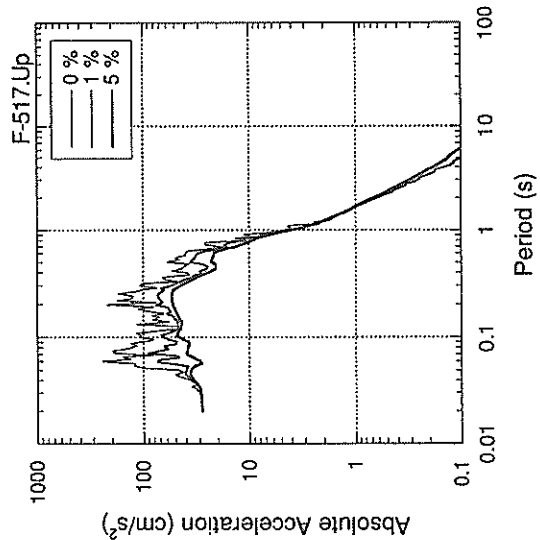
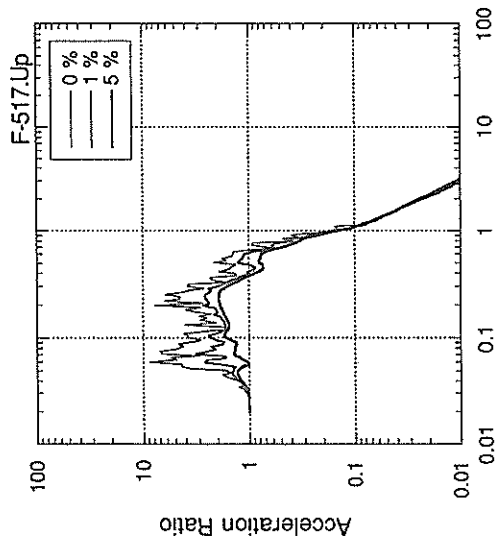


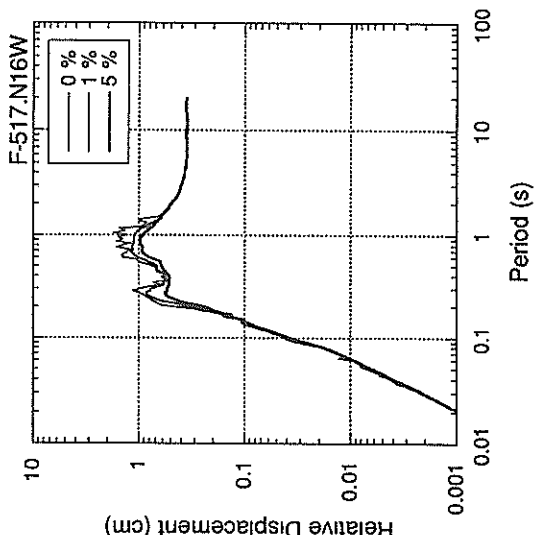
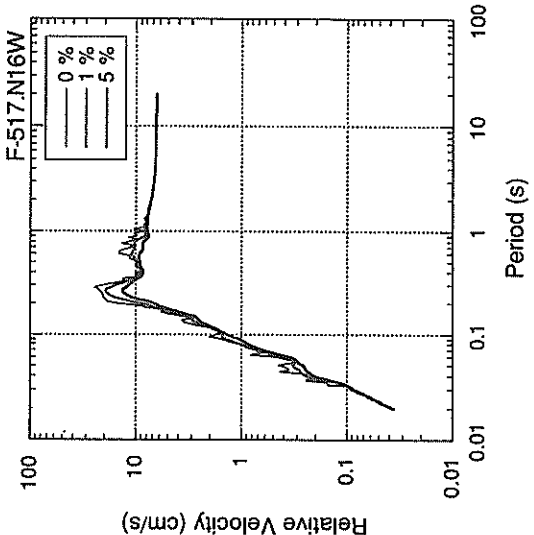
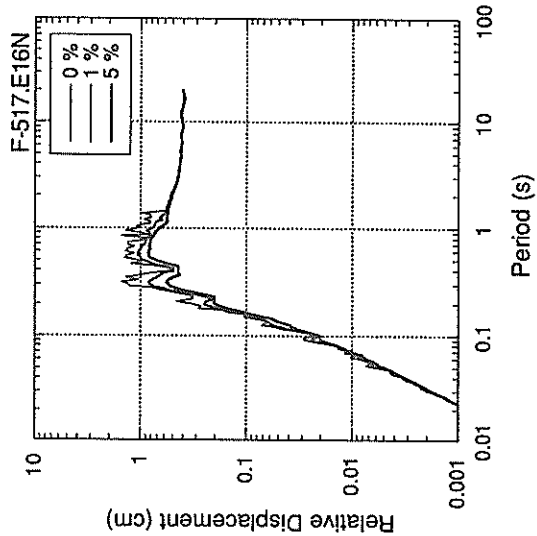
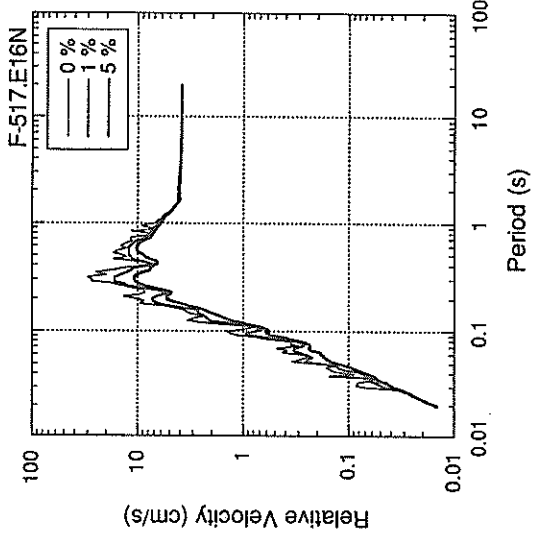
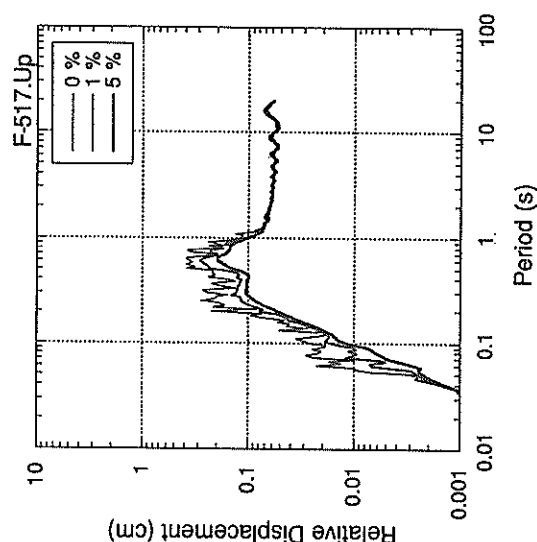
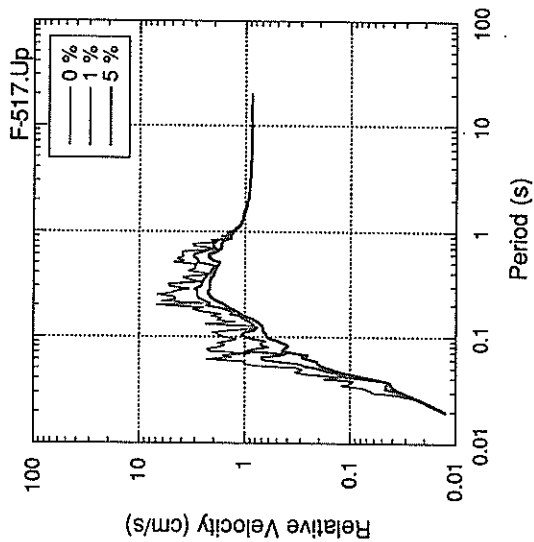


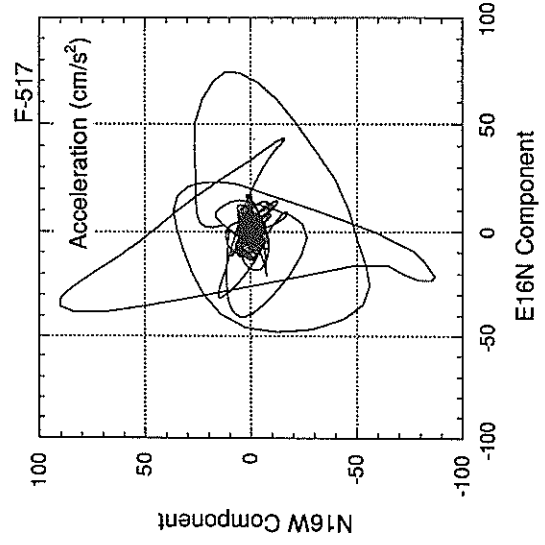
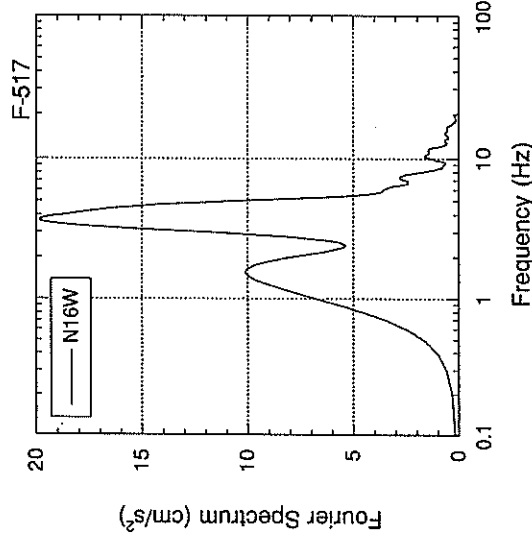
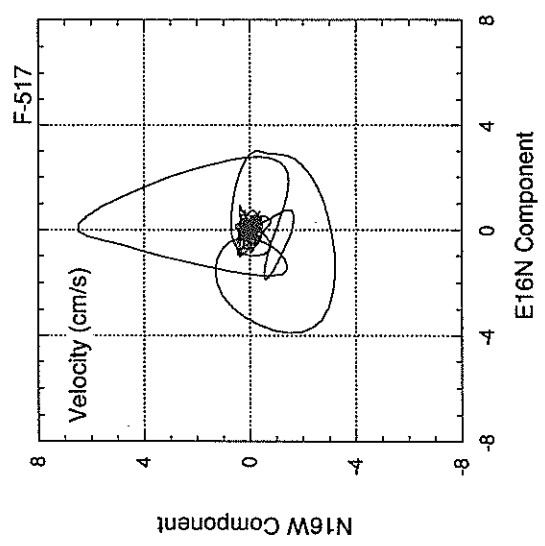
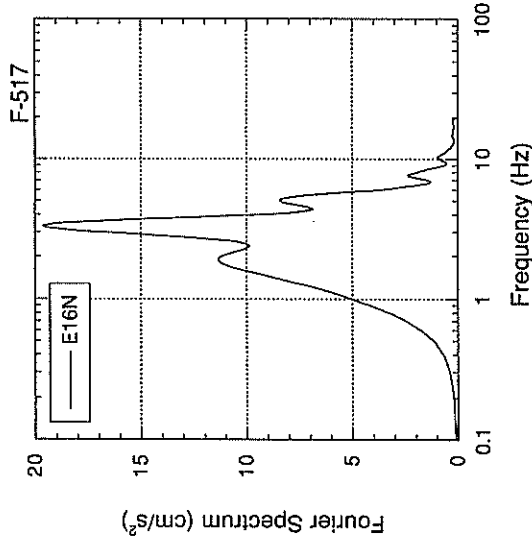
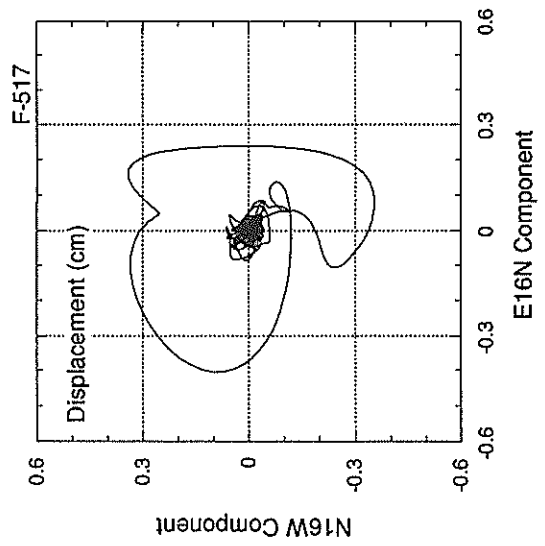
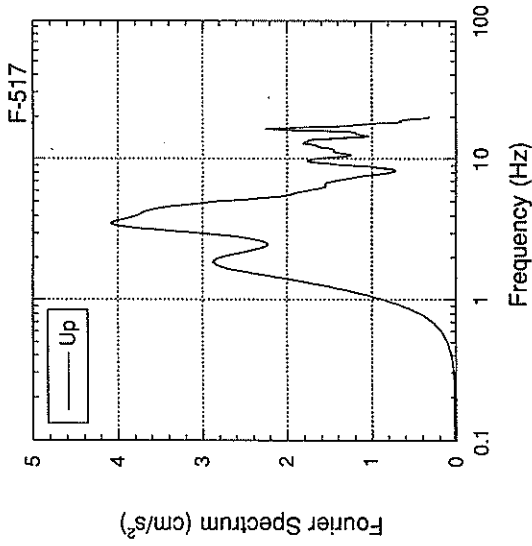












RECORD NUMBER : S-2425  
 STATION : MIYAKO-S  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME : 14:58 APR 13, 1992

LOCATION OF HYPOCENTER

E OFF IWATE PREF.

39° 7.1' N

142° 23.7' E

51.0KM

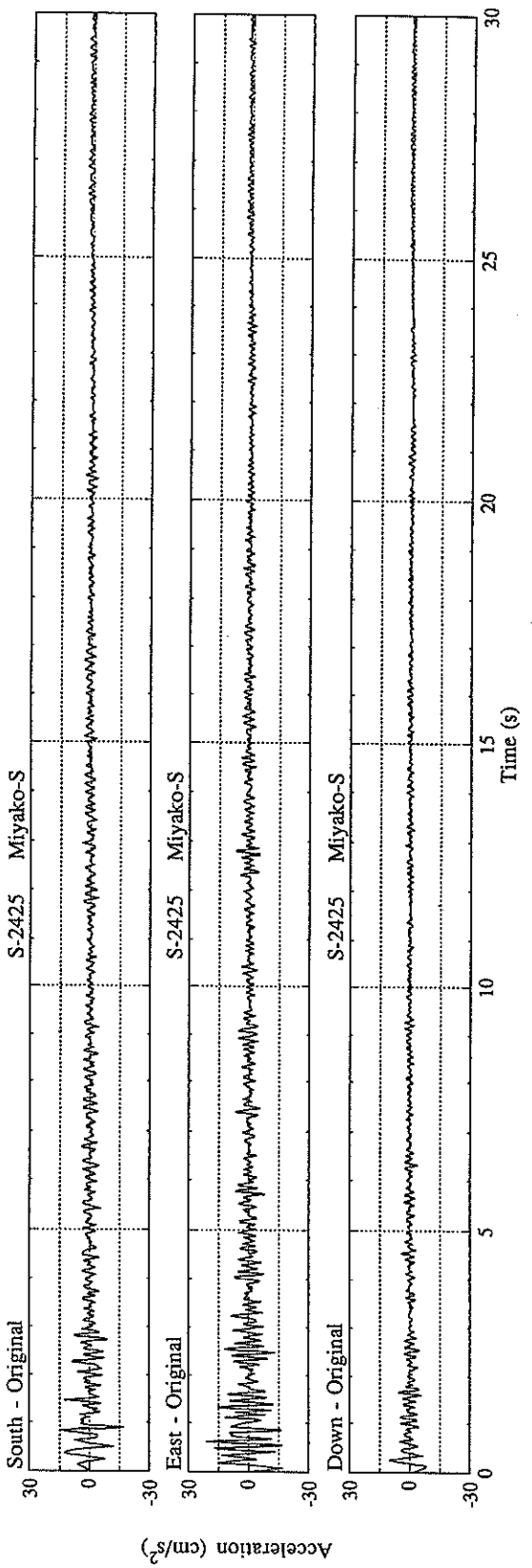
5.1

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

N S	E W	U D	HORIZONTAL*
17.0	21.1	10.2	22.0

ORIGINAL ACCELERATION (GAL) \* RESULTANT OF HORIZONTAL COMPONENTS

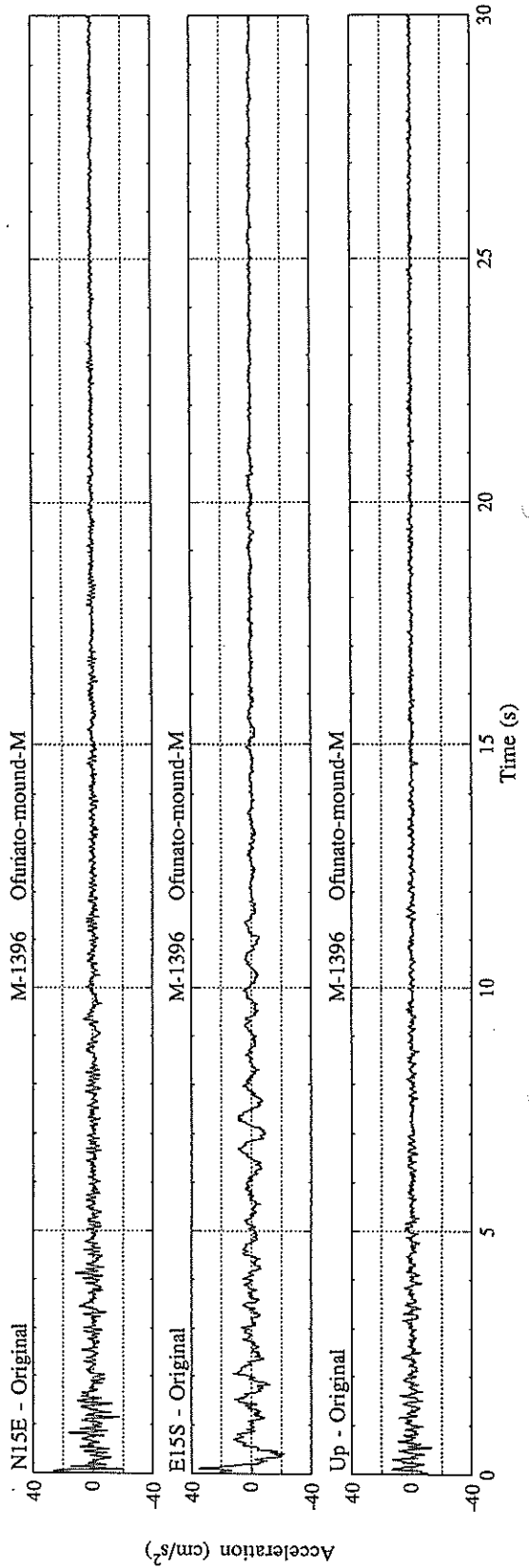




RECORD NUMBER : M-1396  
 STATION : OFUNATO-MOUND-M  
 EARTHQUAKE DATA  
 \*\*\*\*\*  
 DATE AND TIME : 14:58 APR 13, 1992  
 LOCATION OF HYPOCENTER : E OFF IWATE PREF  
 EPICENTRAL REGION : 39° 7.1' N  
 LONGITUDE : 142° 23.7' E  
 DEPTH : 51.0KM  
 JMA MAGNITUDE : 5.1  
 \*\*\*\*\*

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 -----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL)    26.7    35.5    13.2    36.6  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1397  
 STATION : KAMAISHI-M  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 14:58 APR 13, 1992

LOCATION OF HYPOCENTER

E OFF IWATE PREF

LATITUDE 39° 7.1' N

LONGITUDE 142° 23.7' E

DEPTH 51.0KM

JMA MAGNITUDE 5.1

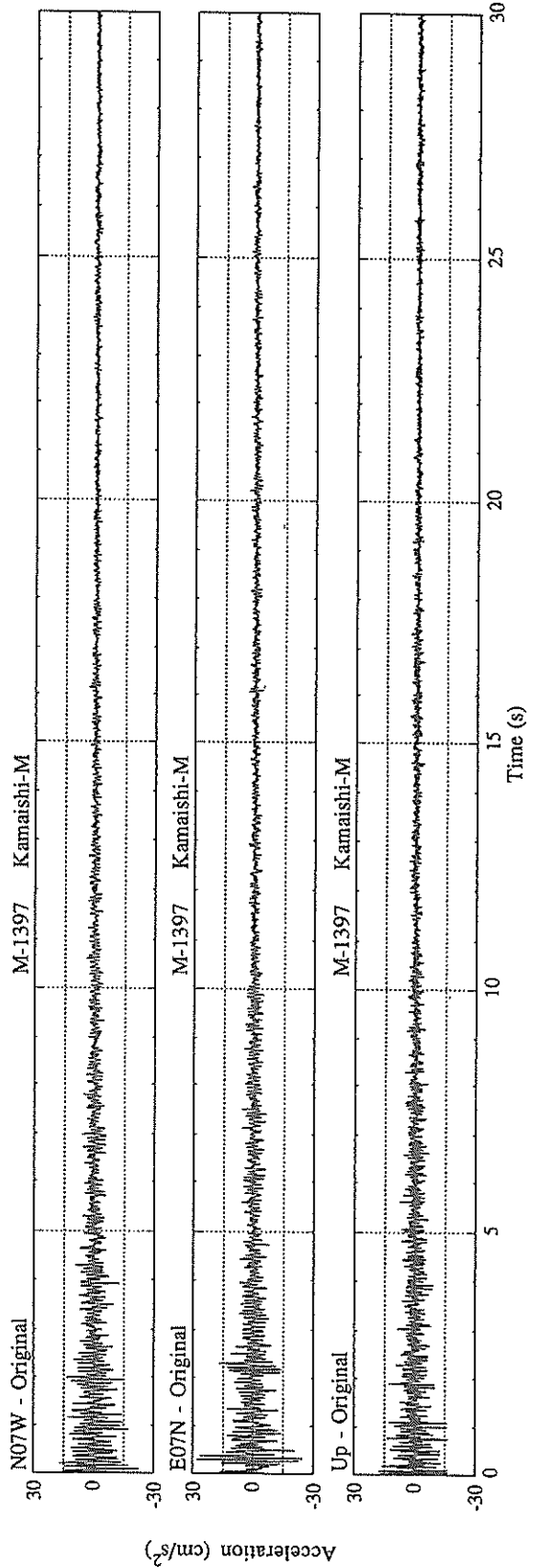
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 22.3 27.8 17.5 30.4

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-482  
 STATION : HITACHINAKA-F  
 EARTHQUAKE DATA

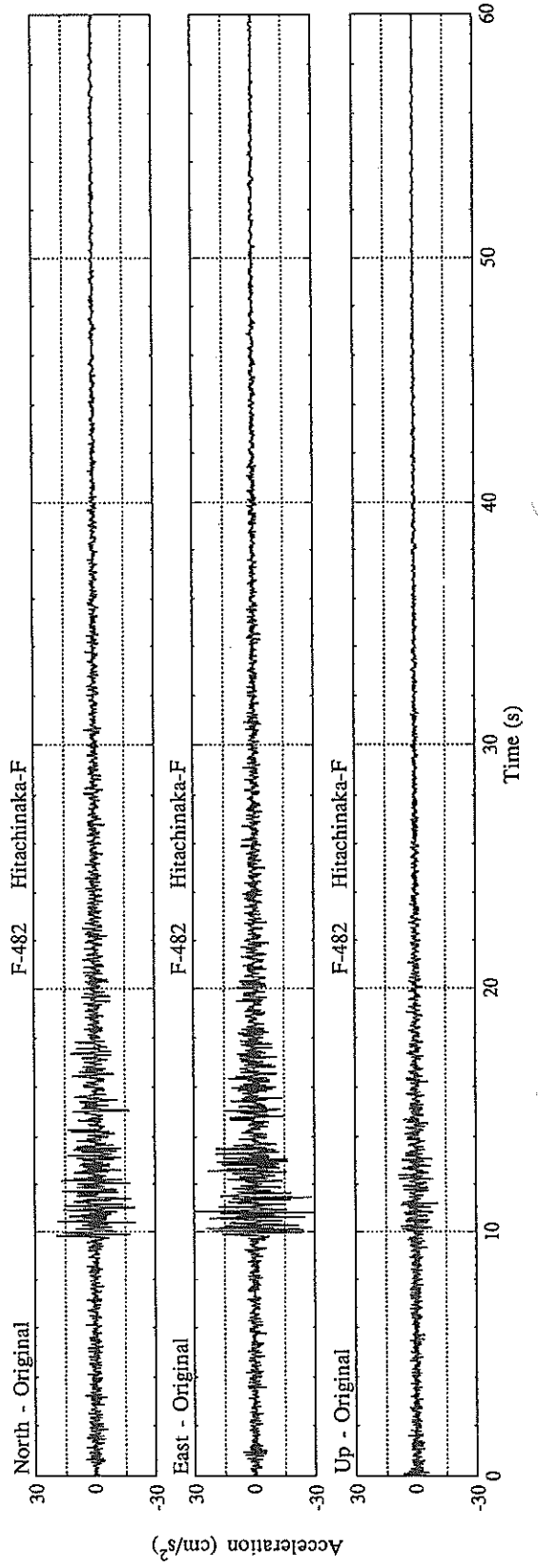
\*\*\*\*\*  
 DATE AND TIME : 12: 3 APR 14, 1992  
 \*\*\*\*\*

LOCATION OF HYPOCENTER  
 EPICENTRAL REGION  
 LATITUDE 36° 10.5' N  
 LONGITUDE 139° 50.0' E  
 DEPTH 62.0KM  
 JMA MAGNITUDE 4.9

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

	N S	E W	U D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)	20.1	29.8	10.7	30.7

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-483  
 STATION : HITACHINAKA-F

EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME 19: 7 MAY 11, 1992  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION NORTHERN IBARAKI PREF  
 LATITUDE 36° 31.8' N  
 LONGITUDE 140° 32.4' E  
 DEPTH 56.2KM  
 JMA MAGNITUDE 5.6  
 \*\*\*\*\*

PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
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PARAMETER OF THE VARIABLE FILTER

FC (HZ)	0.323	0.317	0.512	
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MAXIMUM ACCELERATION (GAL)

SMAC-B2 EQUIVALENT	32.0	68.7	14.9	68.8
ORIGINAL	94.4	151.9	61.7	153.0
CORRECTED	94.2	152.9	53.8	154.2

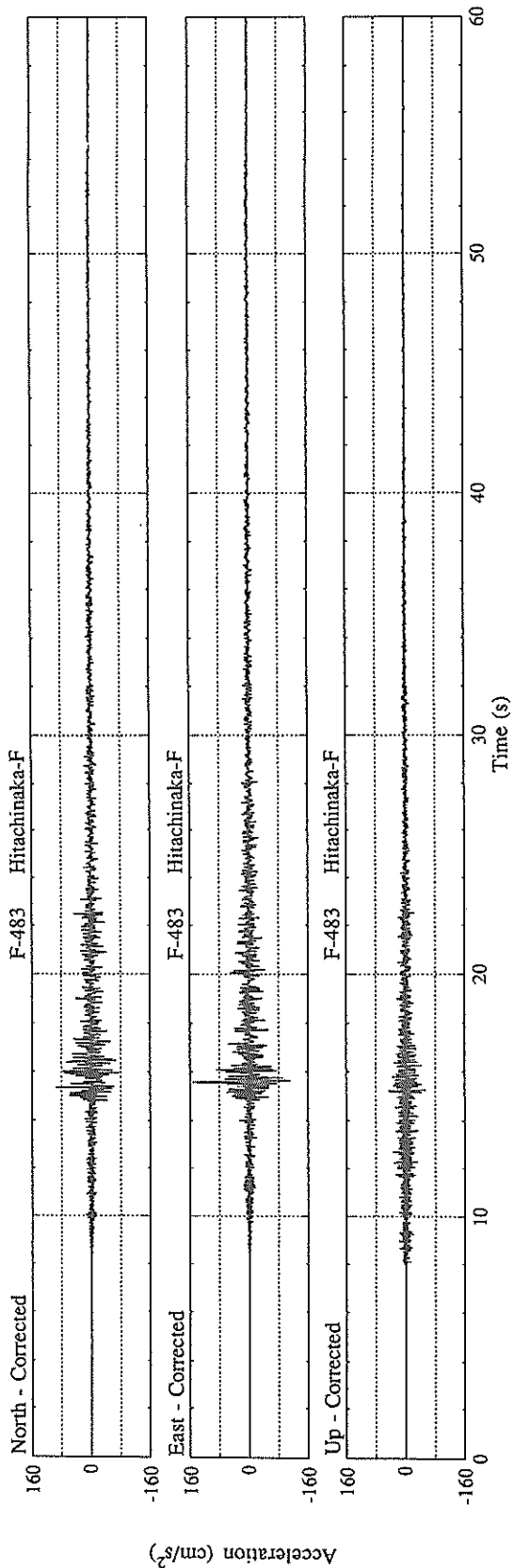
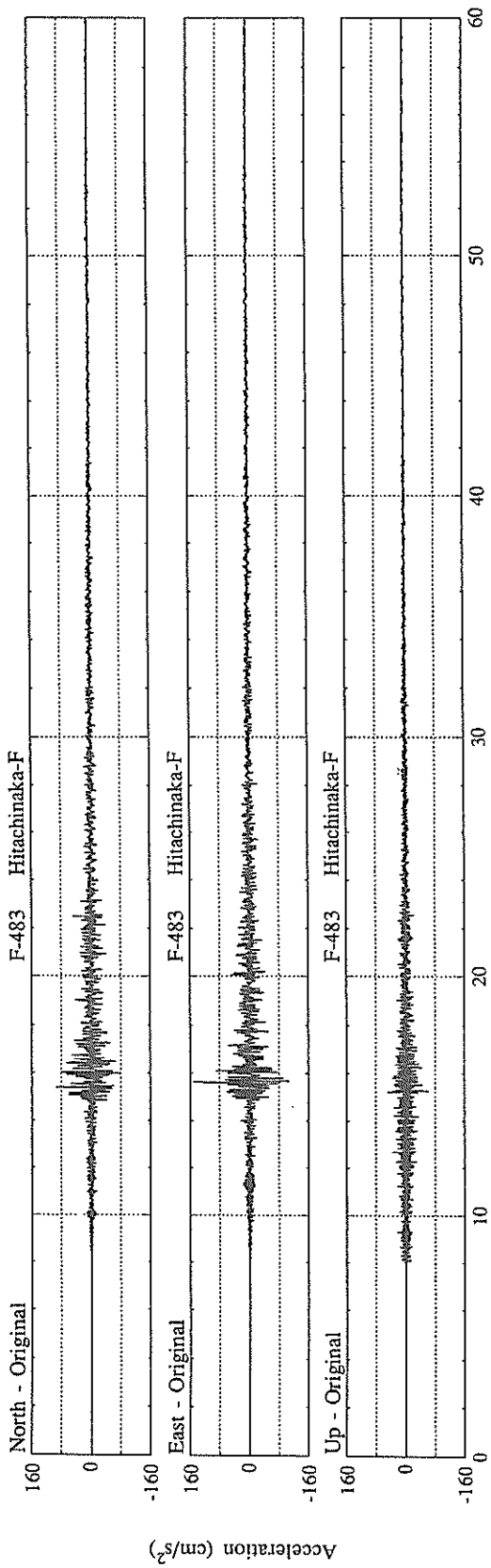
MAXIMUM VELOCITY (CM/SEC)

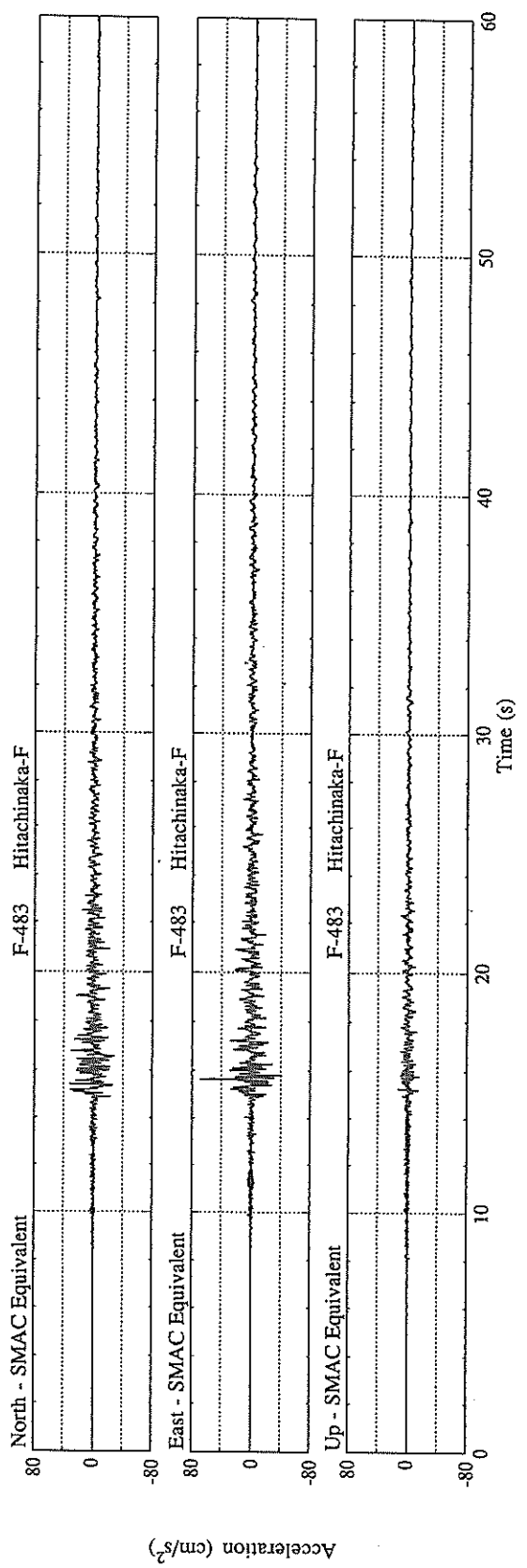
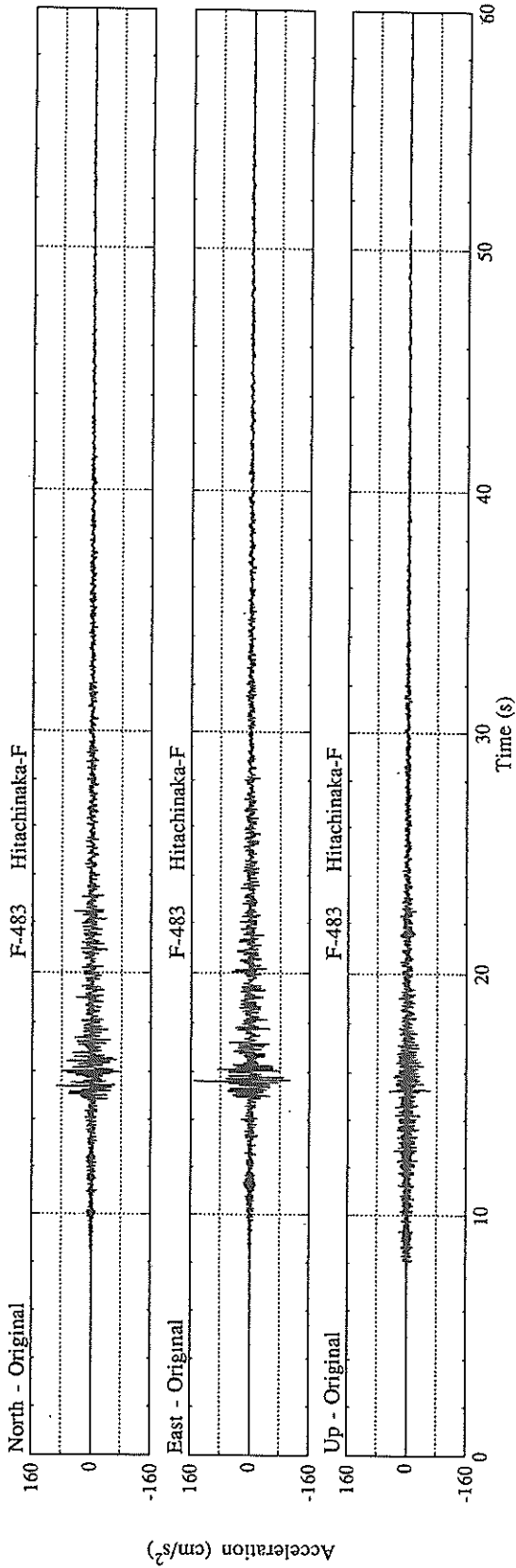
FIXED FILTER	2.46	3.45	0.98	3.67
VARIABLE FILTER	2.05	3.22	0.89	3.41

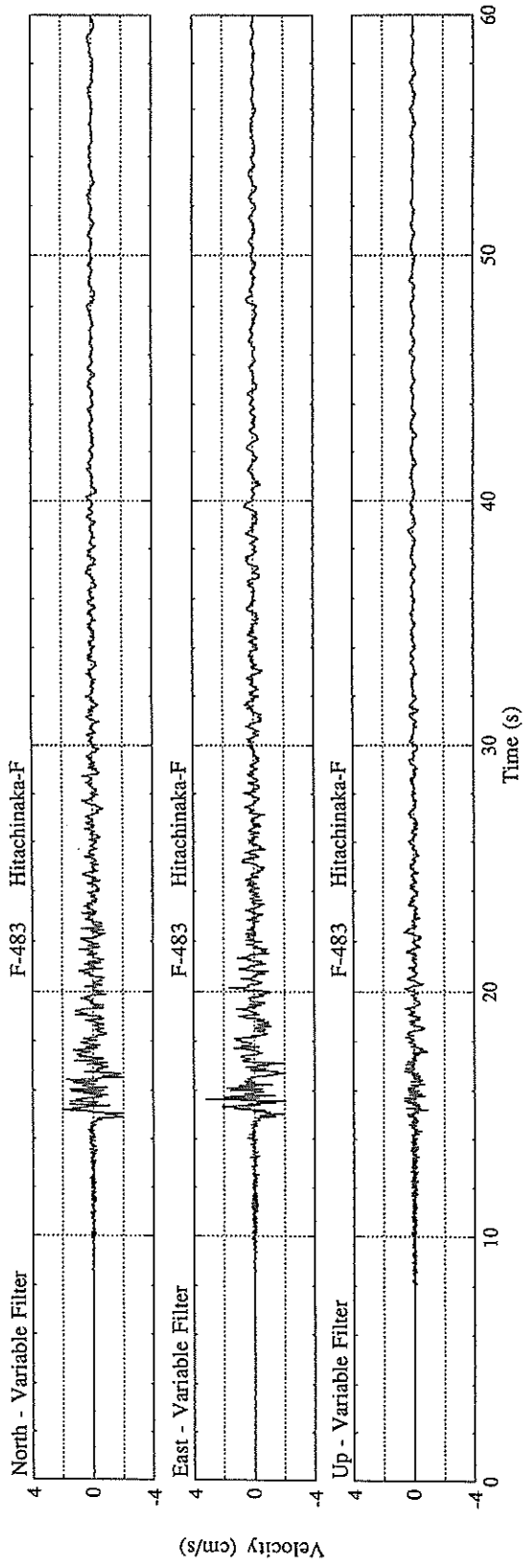
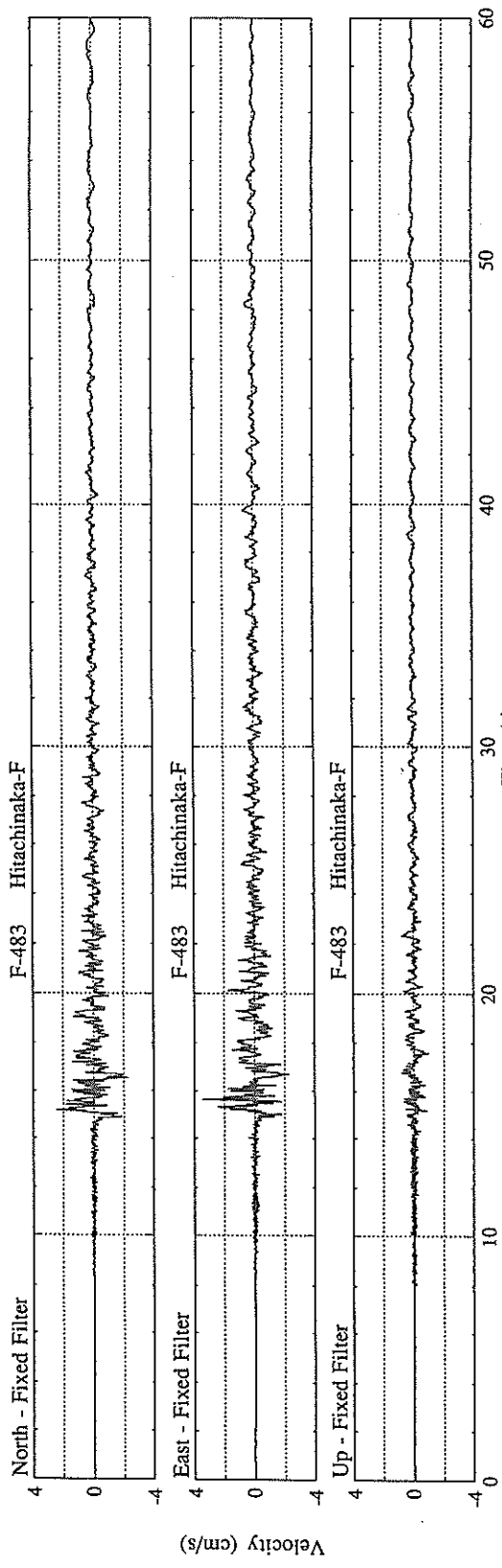
MAXIMUM DISPLACEMENT (CM)

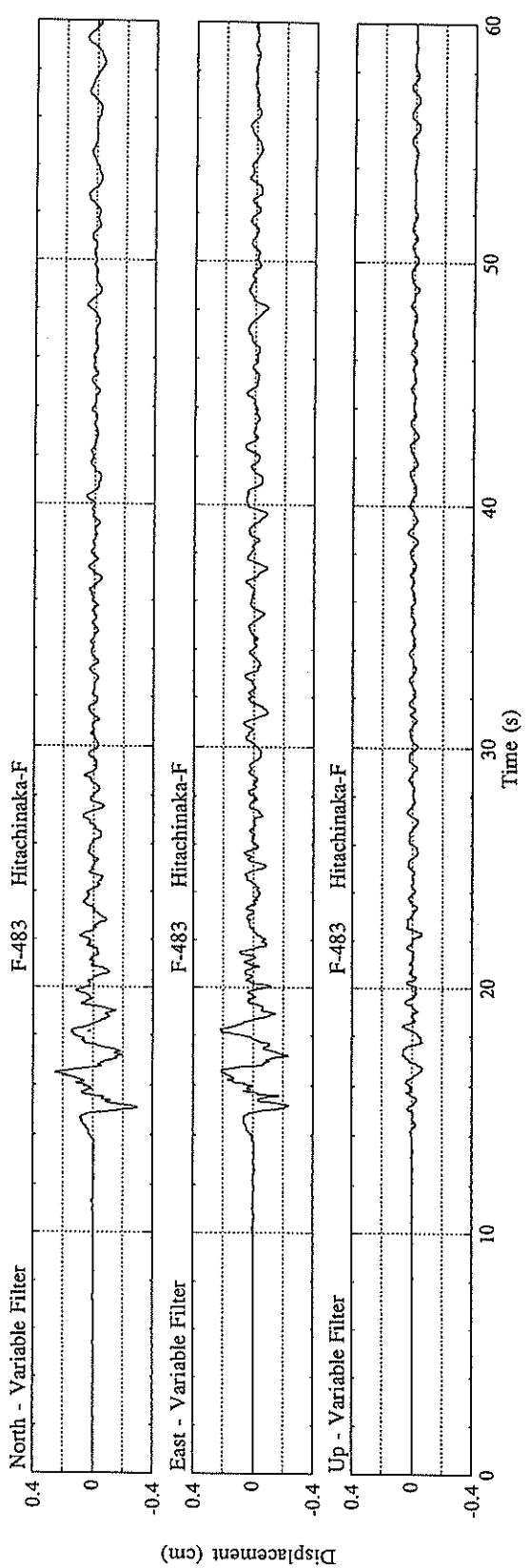
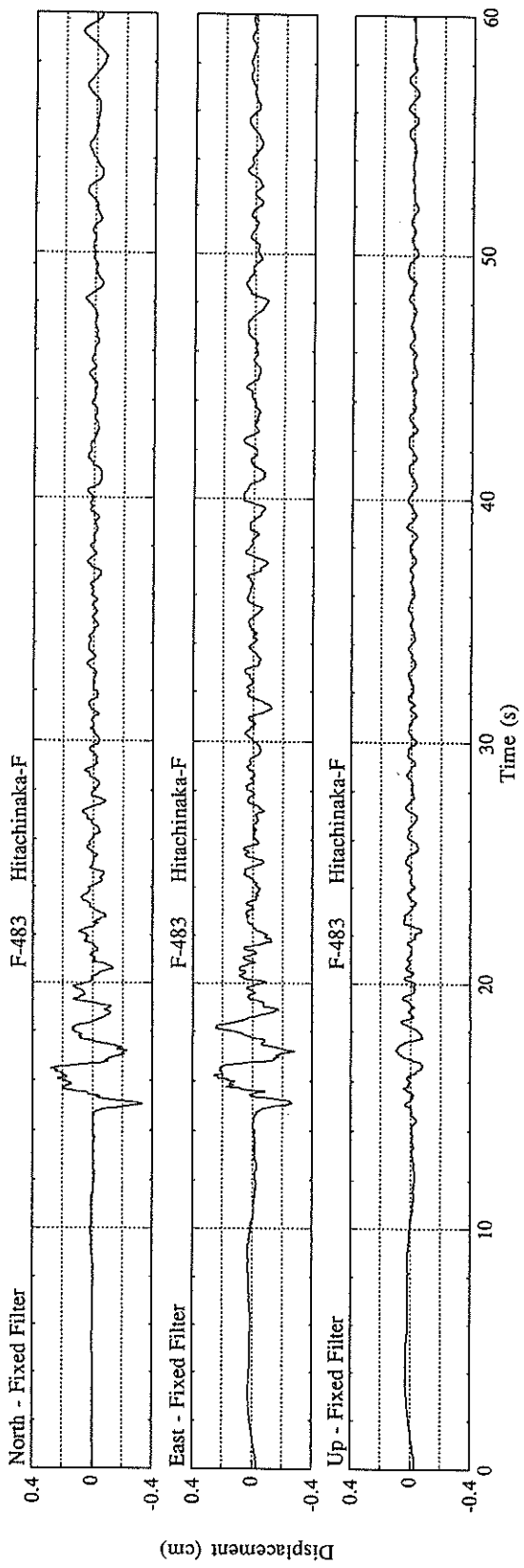
FIXED FILTER	0.33	0.28	0.10	0.41
VARIABLE FILTER	0.29	0.24	0.07	0.36

\* RESULTANT OF HORIZONTAL COMPONENTS

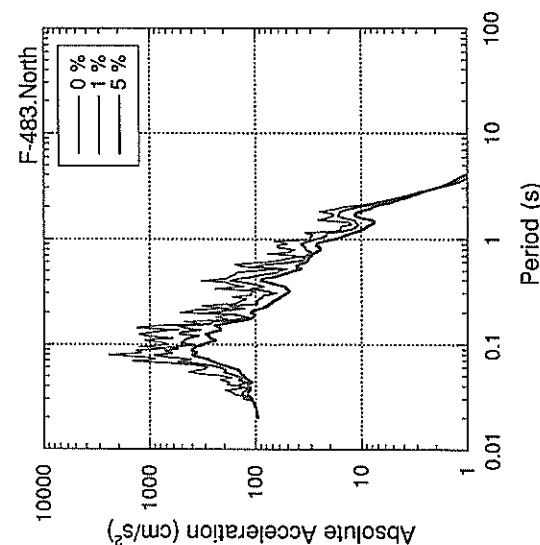
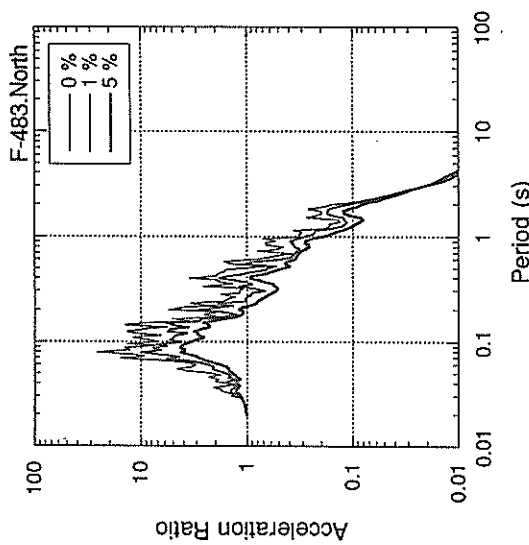
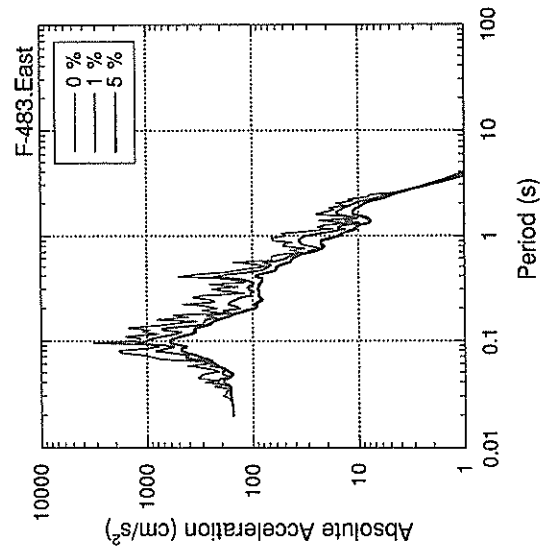
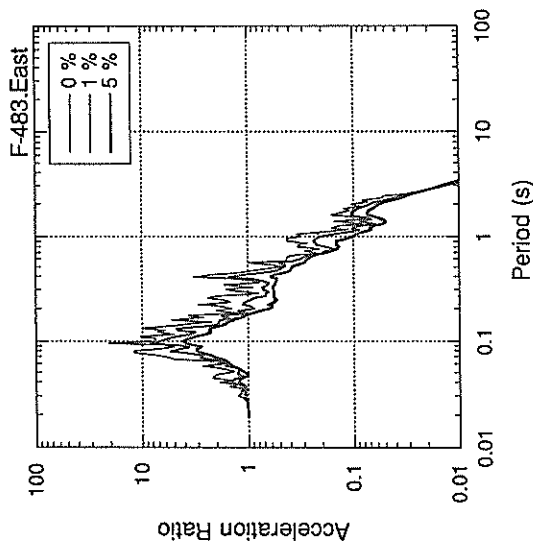
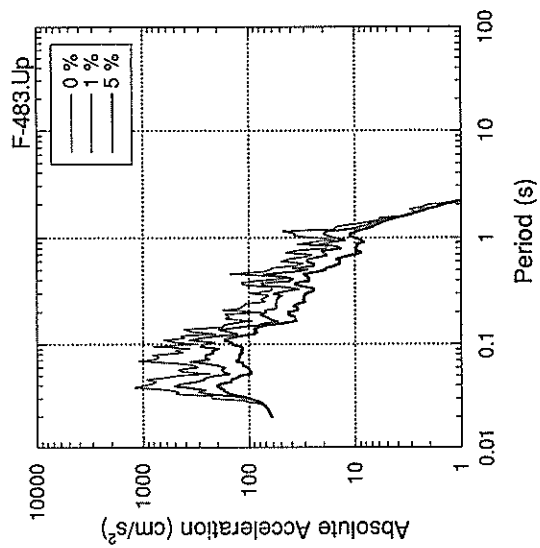
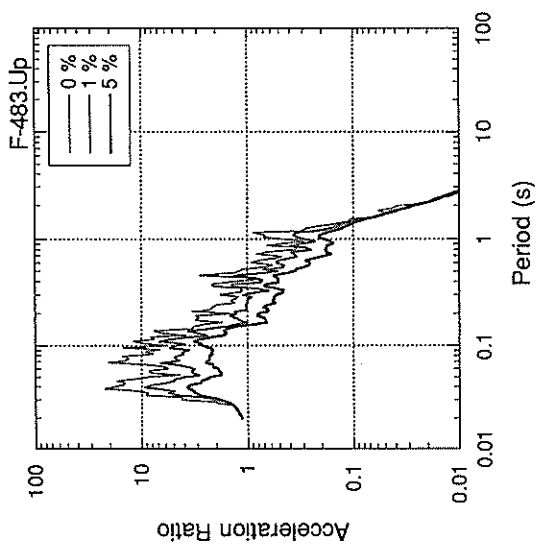


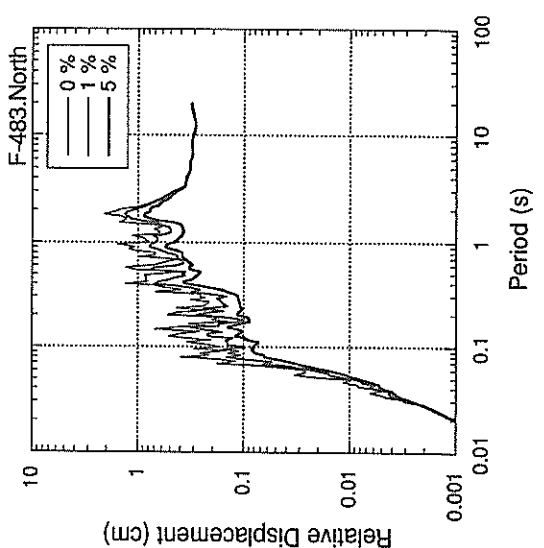
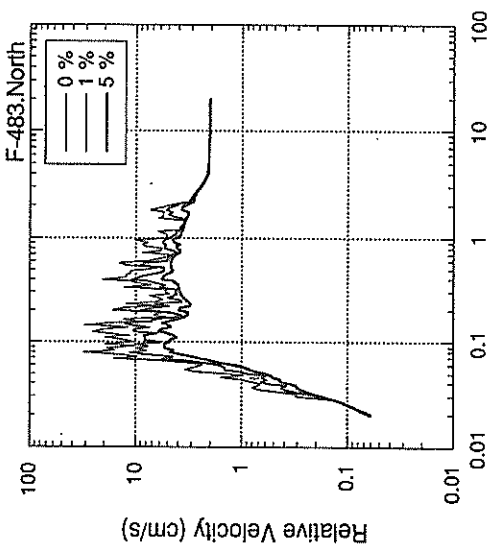
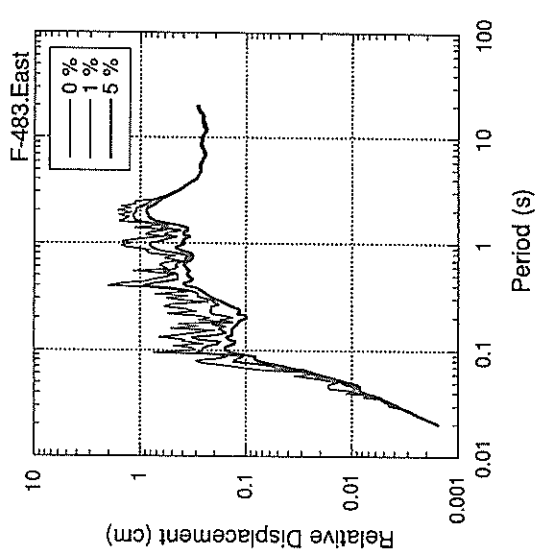
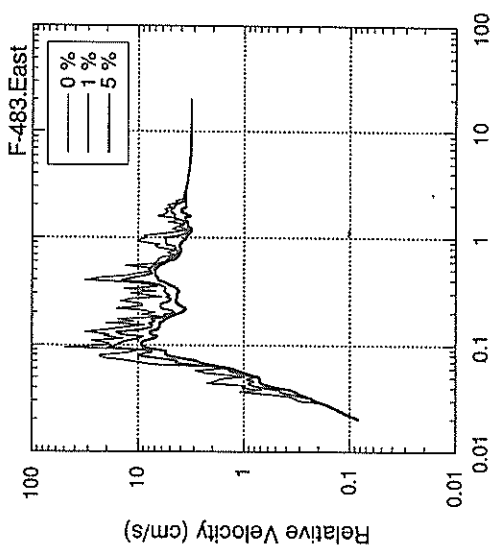
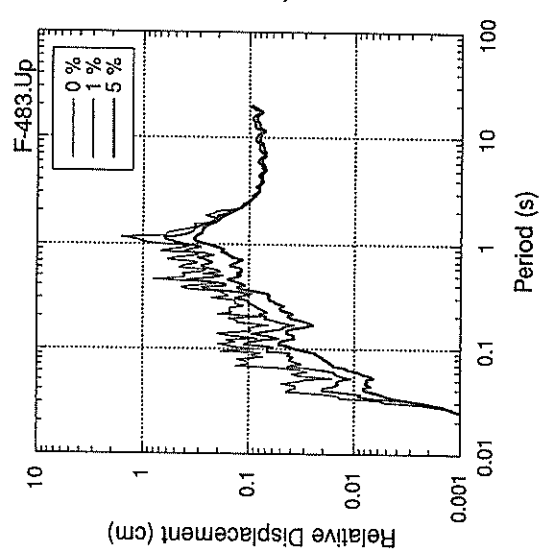
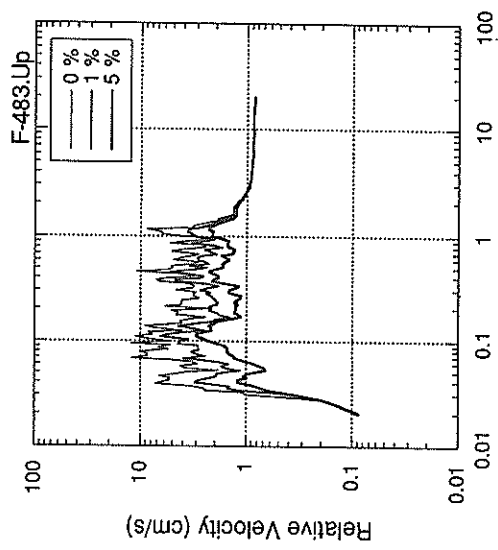


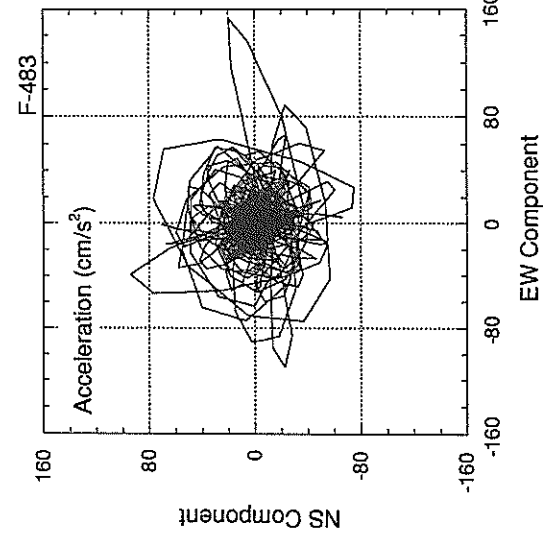
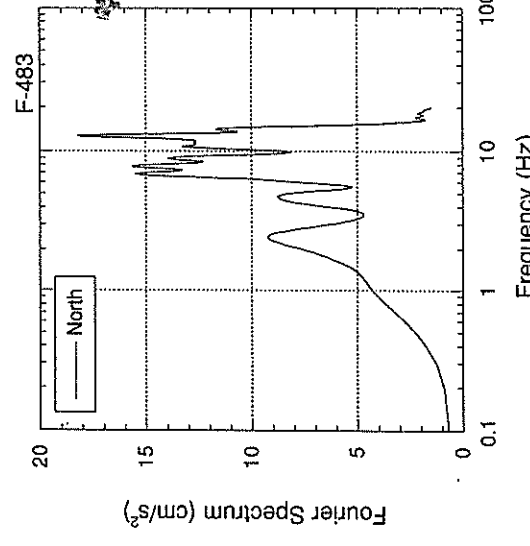
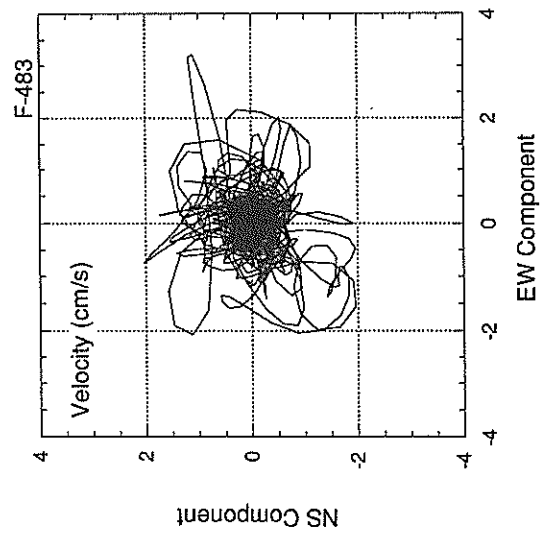
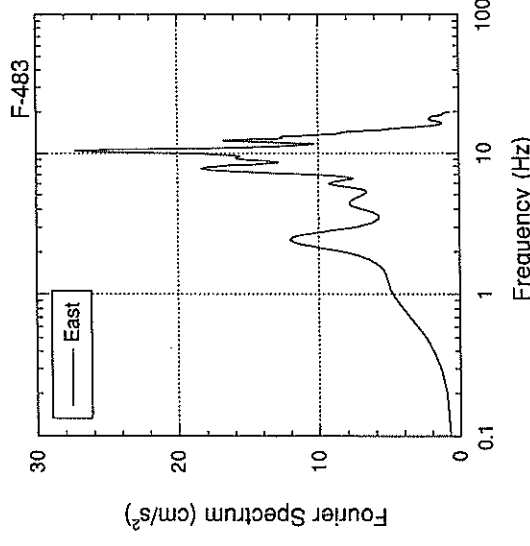
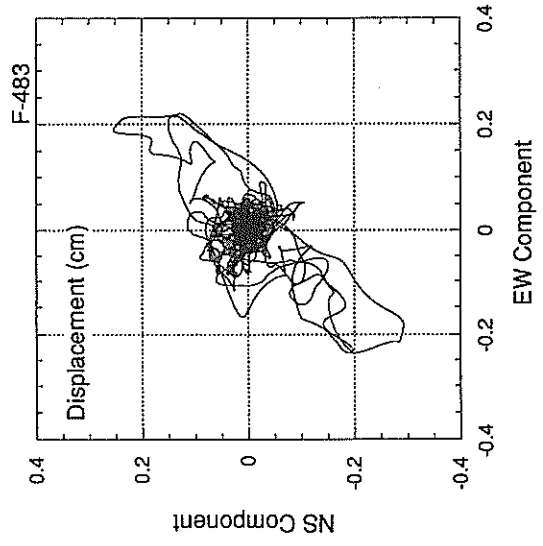
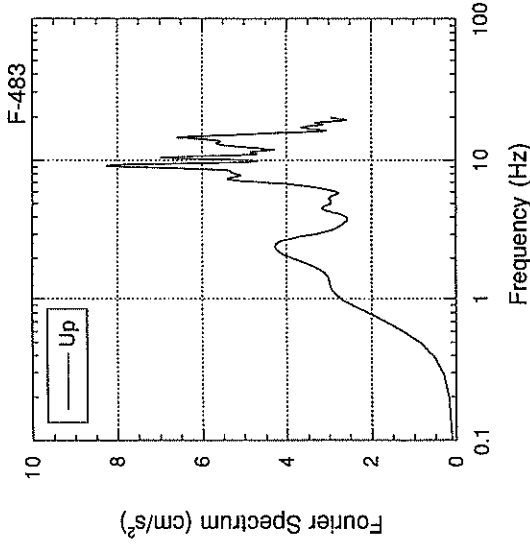












RECORD NUMBER : F-519  
 STATION : KAWASAKI-F  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME  
 17:23 MAY 20, 1992

LOCATION OF HYPOCENTER

TOKYO BAY REGION

LATITUDE  
 35° 12.3' N

LONGITUDE  
 139° 46.4' E

DEPTH  
 91.7KM

JMA MAGNITUDE  
 4.8

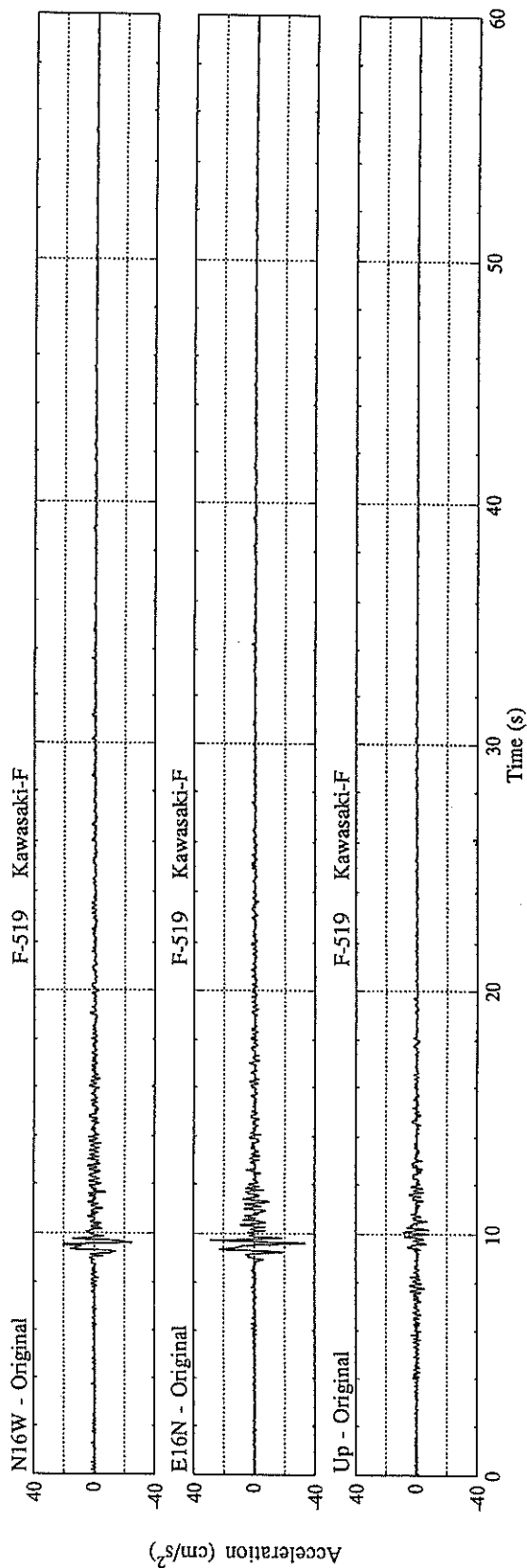
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL)      24.7    33.5    8.6    41.6

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-520  
 STATION : KAWASAKI-FR  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 17:23 MAY 20, 1992  
 \*\*\*\*\*

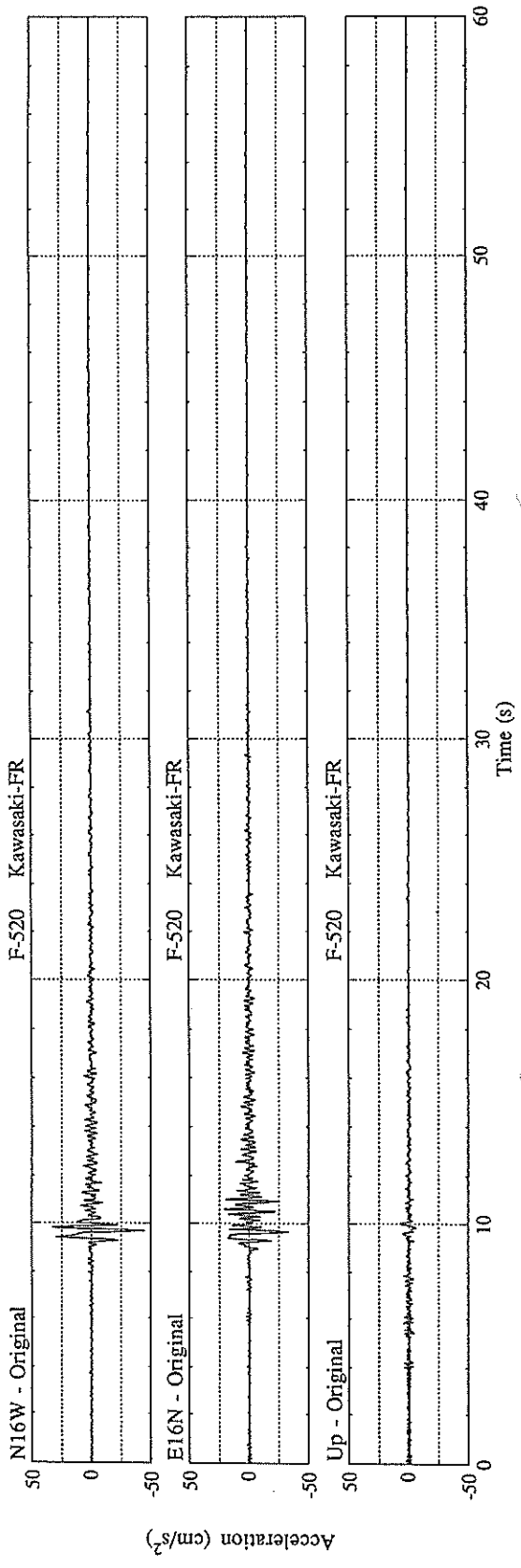
LOCATION OF HYPOCENTER

EPICENTRAL REGION : TOKYO BAY REGION  
 LATITUDE : 35° 12.3' N  
 LONGITUDE : 139° 46.4' E  
 DEPTH : 91.7KM  
 JMA MAGNITUDE : 4.8

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

	N	S	E	W	U	D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)	44.5		33.3		6.7		52.5

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-485  
 STATION : HITACHINAKA-F  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 22:51 JUNE 1, 1992  
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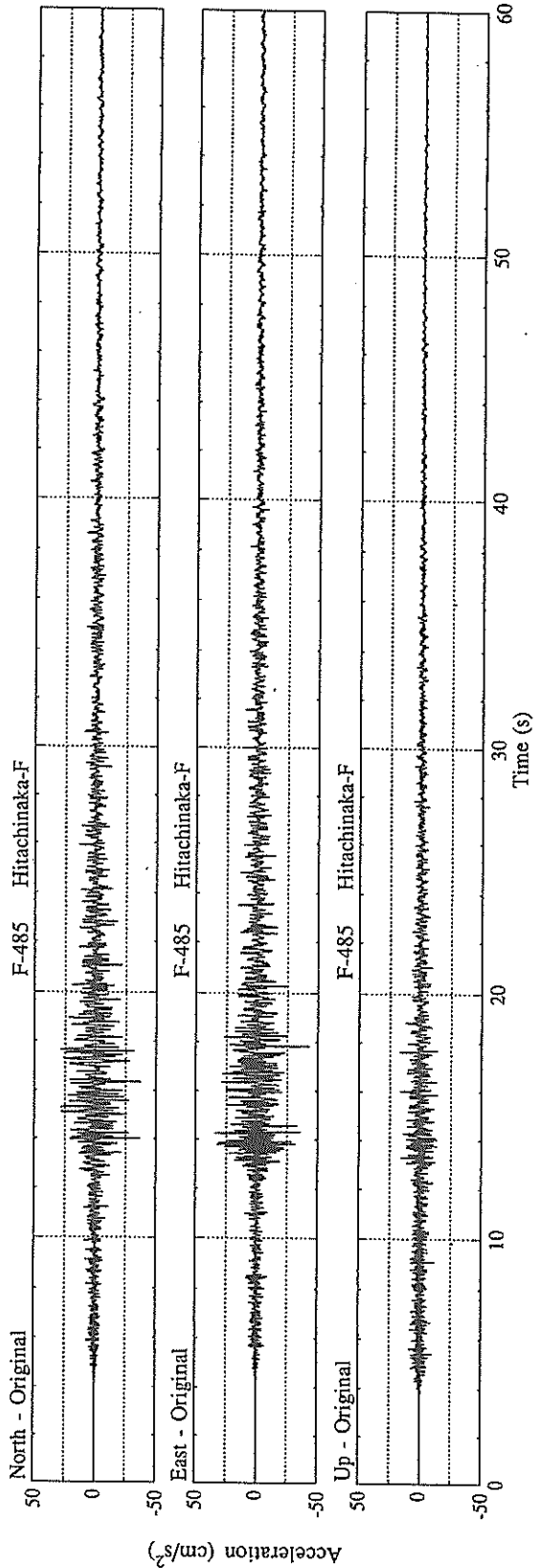
LOCATION OF HYPOCENTER

EPICENTRAL REGION : E OFF IBARAKI PREF  
 LATITUDE : 36° 40.2' N  
 LONGITUDE : 141° 16.4' E  
 DEPTH : 43.8KM  
 JMA MAGNITUDE : 5.7

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL)      36.7    42.8    16.3    42.8  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-487  
 STATION : HITACHINAKA-F  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 11: 8 JUNE23, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION EASTERN FUKUSHIMA PREF

LATITUDE 37° 5.3' N

LONGITUDE 140° 40.0' E

DEPTH 104.6KM

JMA MAGNITUDE 4.6

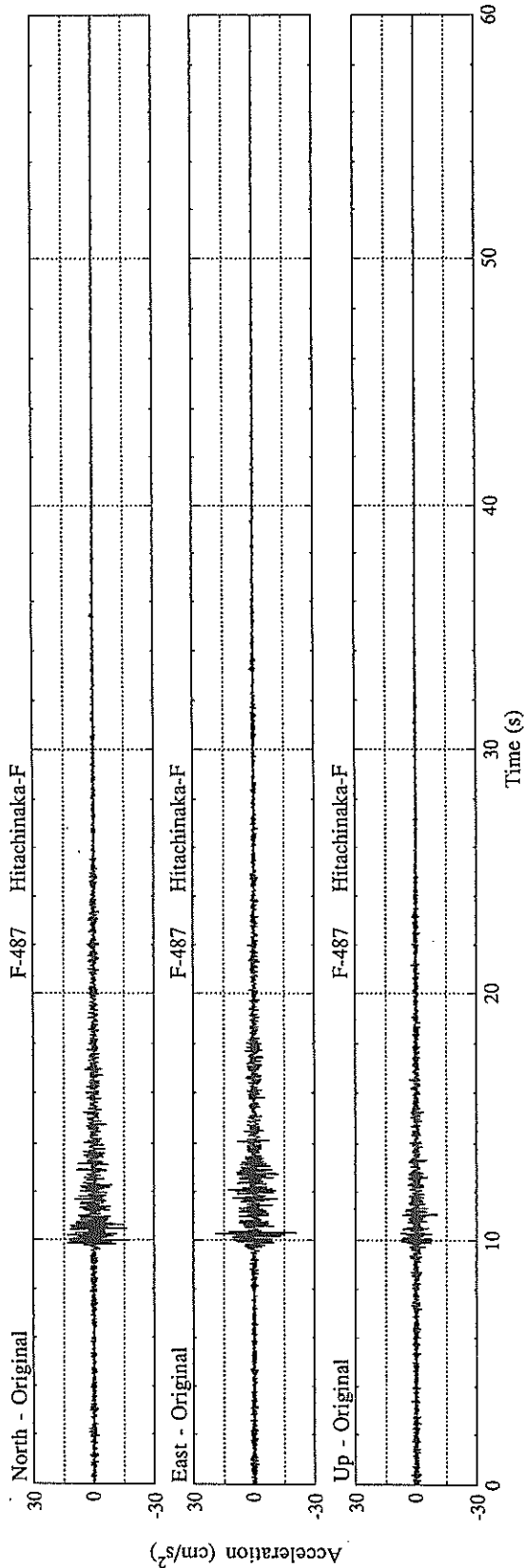
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*

ORIGINAL ACCELERATION (GAL) 17.5 20.9 10.1 21.1

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2442  
 STATION : HACHINOHE-JI-S  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 20: 8 JULY12, 1992  
 \*\*\*\*\*

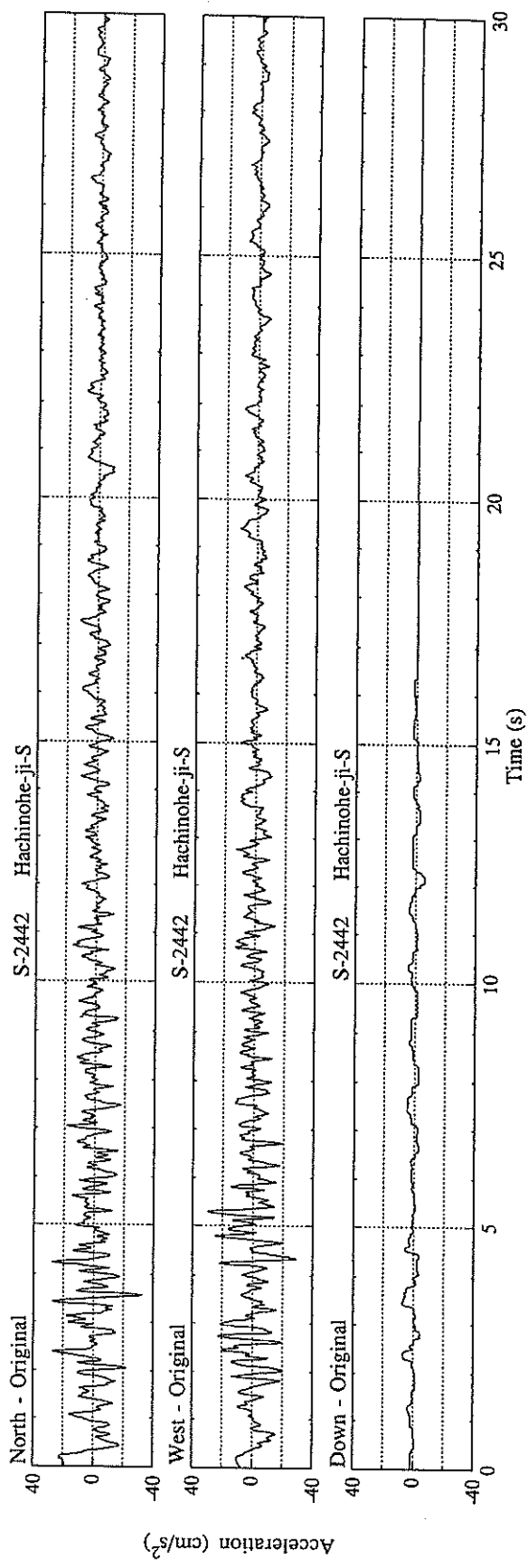
LOCATION OF HYPOCENTER  
 EPICENTRAL REGION : E OFF AOMORI PREF  
 LATITUDE : 41° 27. 7' N  
 LONGITUDE : 142° 2. 3' E  
 DEPTH : 64. 0KM  
 JMA MAGNITUDE : 6. 3

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)	32.5	30.1	7.6	35.5

\* RESULTANT OF HORIZONTAL COMPONENTS





RECORD NUMBER : S-2456  
 STATION : OFUNATO-BO-S  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 22:56 JULY18, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION FAR E OFF SANRIKU

LATITUDE 39°26.0' N

LONGITUDE 143°17.5' E

DEPTH 0.0KM

JMA MAGNITUDE

6.2

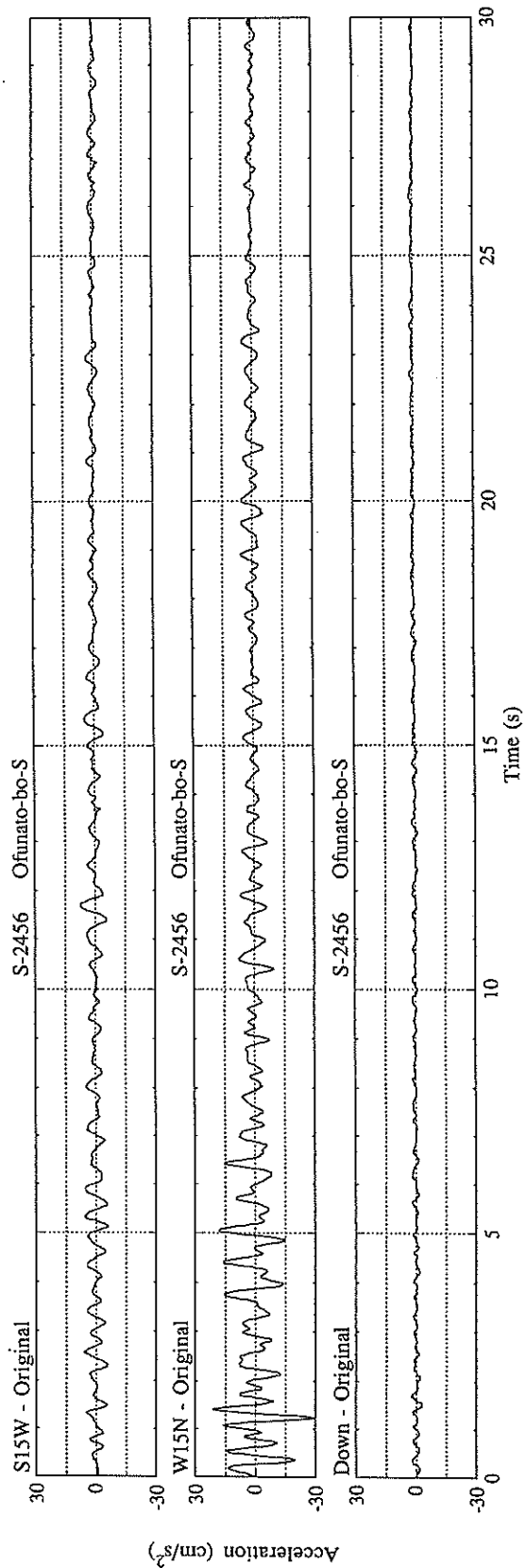
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

N S	E W	U D	HORIZONTAL*
7.3	29.2	2.9	29.3

ORIGINAL ACCELERATION (GAL)

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-488  
 STATION : HITACHINAKA-F  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 14:39 AUG. 3, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION E OFF IBARAKI PREF

LATITUDE 36° 13.1' N

LONGITUDE 140° 52.3' E

DEPTH 40.8KM

JMA MAGNITUDE 3.5

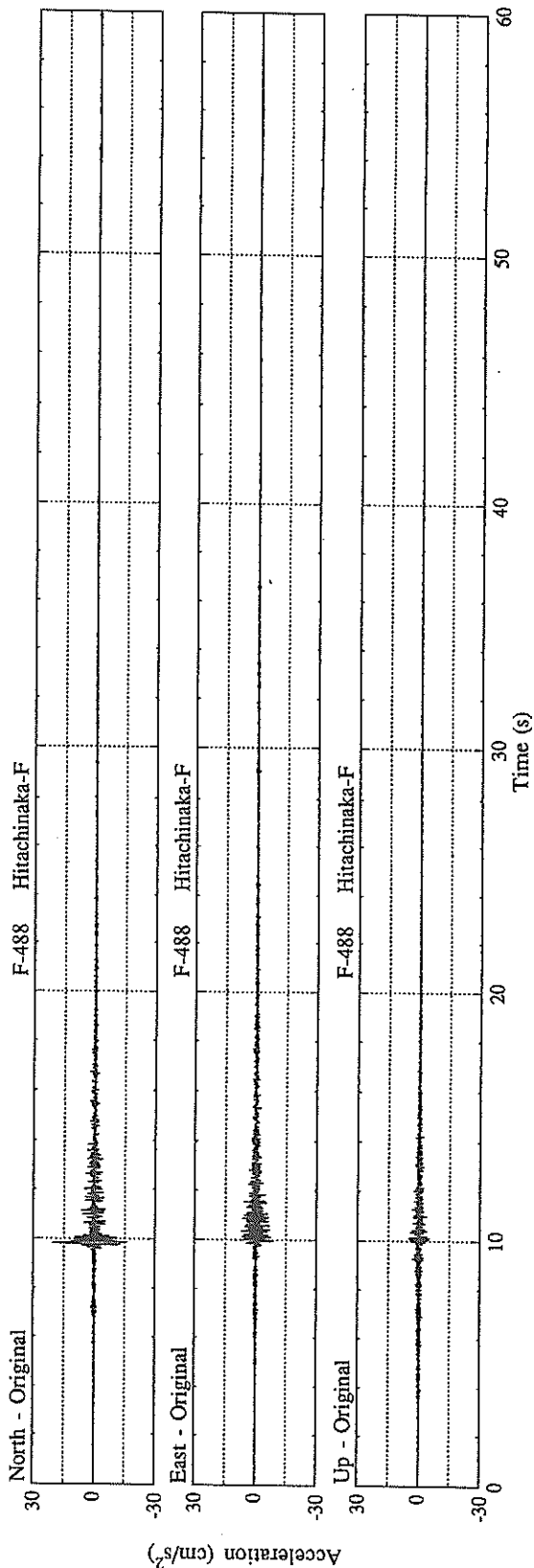
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 20.4 8.5 5.0 20.6

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2458  
 STATION : URAKAWA-S

EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME 23:52 AUG. 8, 1992  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION S OFF URAKAWA  
 LATITUDE 42° 0.6' N  
 LONGITUDE 142° 41.1' E  
 DEPTH 46.4KM  
 JMA MAGNITUDE 5.1  
 \*\*\*\*\*

PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
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PARAMETER OF THE VARIABLE FILTER

FC (HZ)	1.024	1.366	2.001	
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MAXIMUM ACCELERATION (GAL)

ORIGINAL	42.4	52.8	7.5	52.9
CORRECTED	70.4	71.0	9.7	83.5

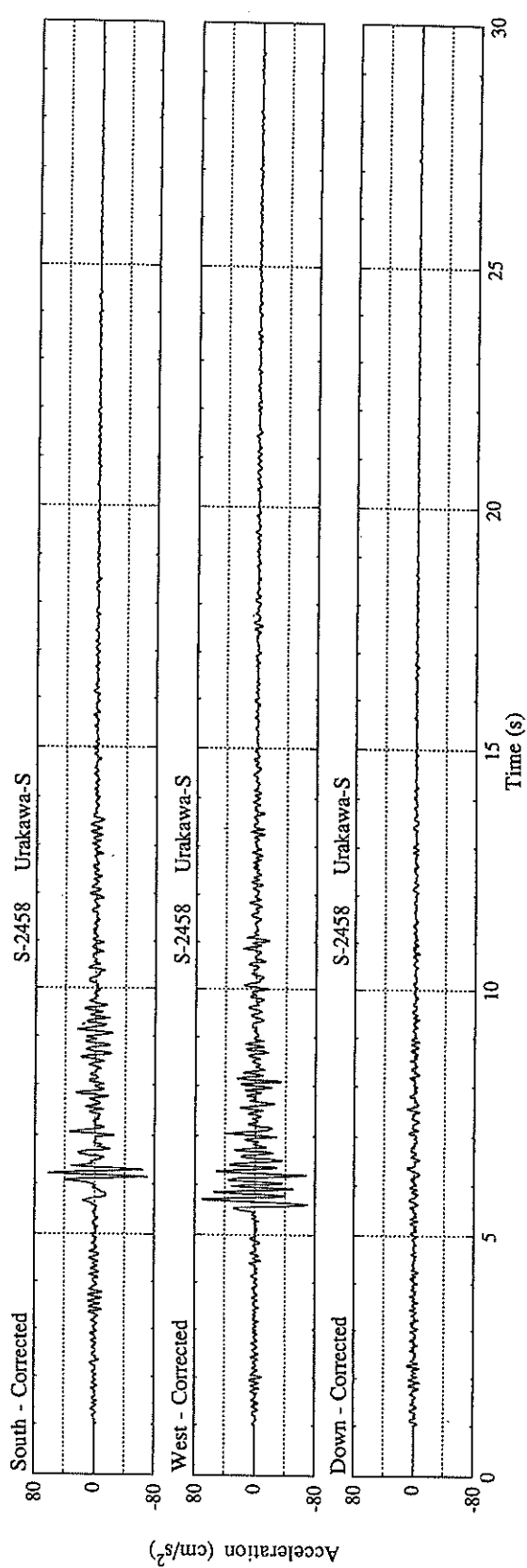
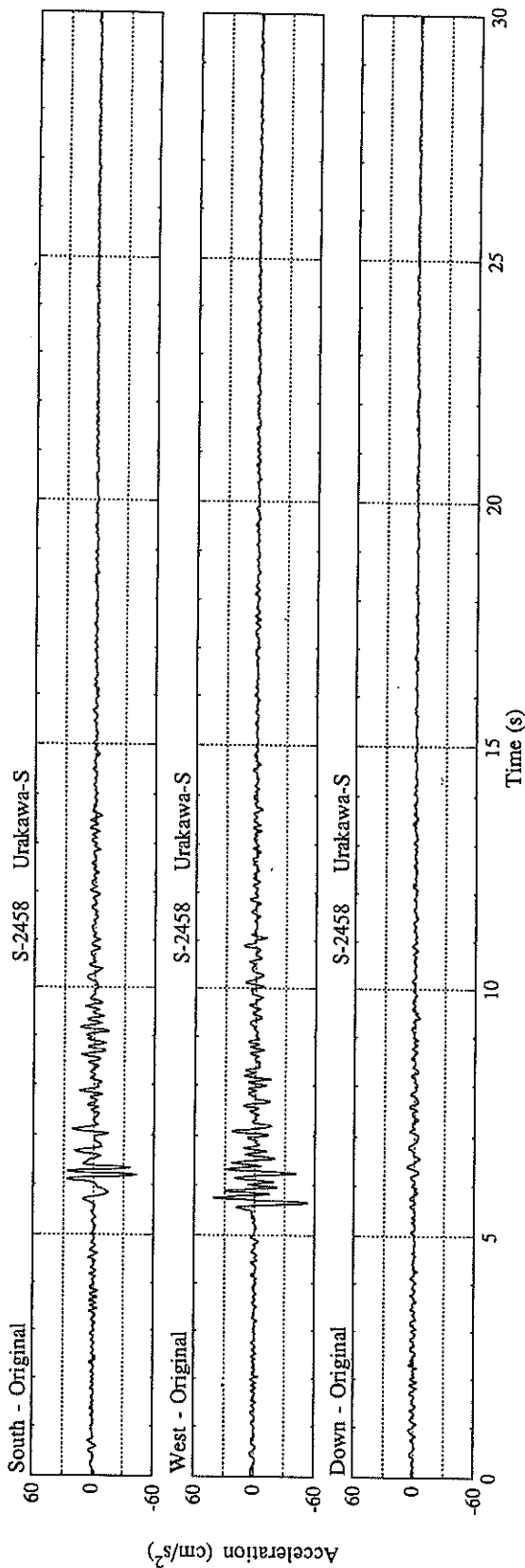
MAXIMUM VELOCITY (CM/SEC)

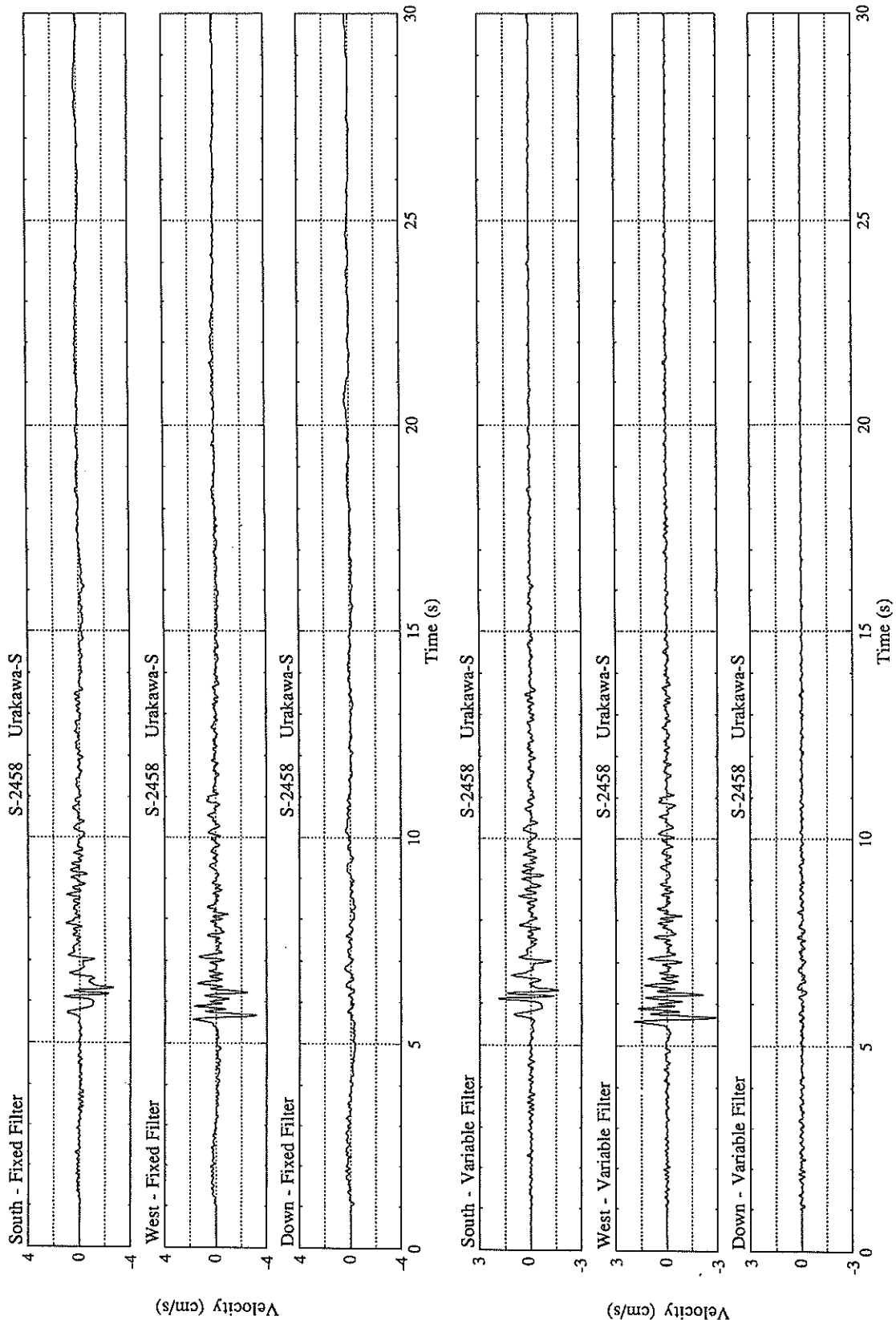
FIXED FILTER	2.62	3.19	0.48	3.22
VARIABLE FILTER	1.95	2.87	0.30	2.89

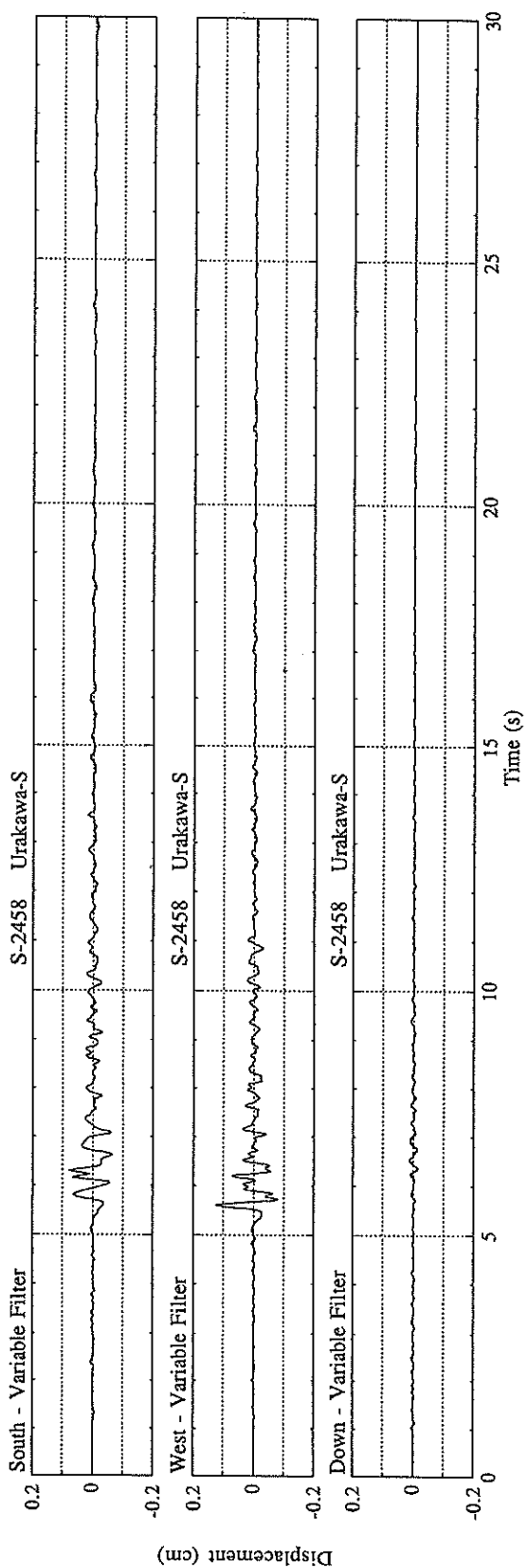
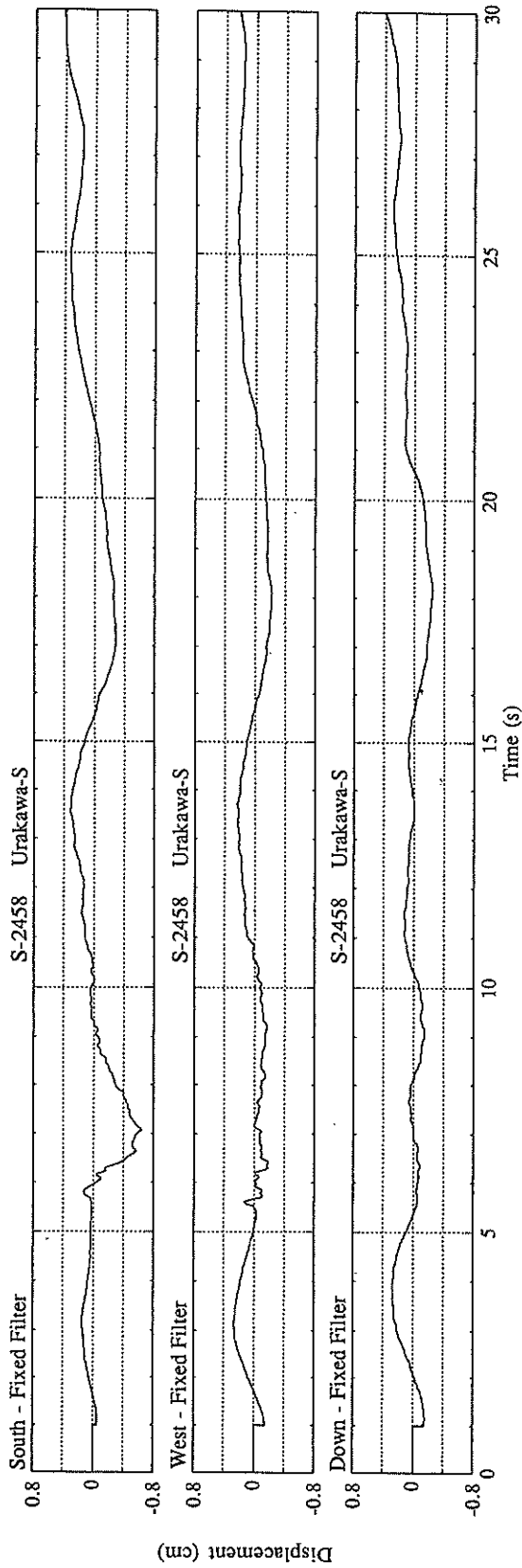
MAXIMUM DISPLACEMENT (CM)

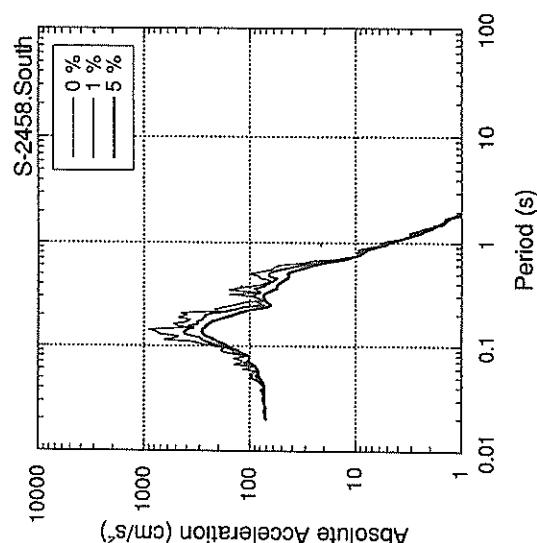
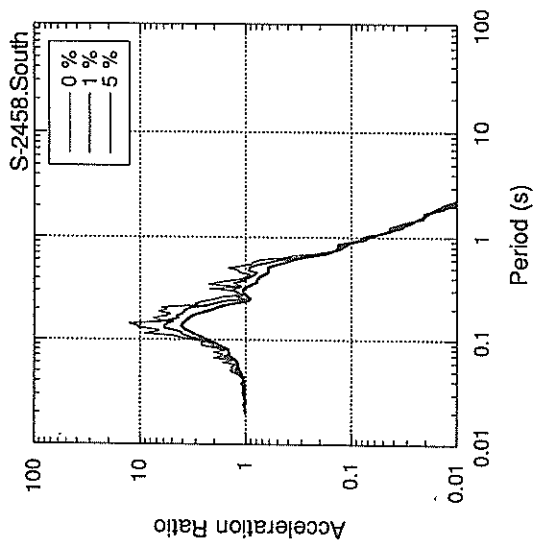
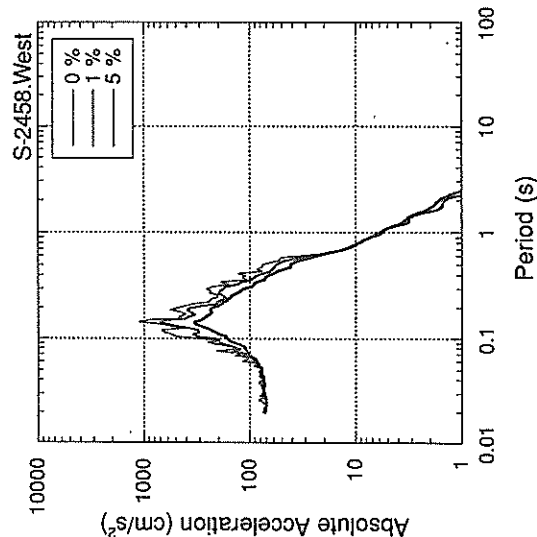
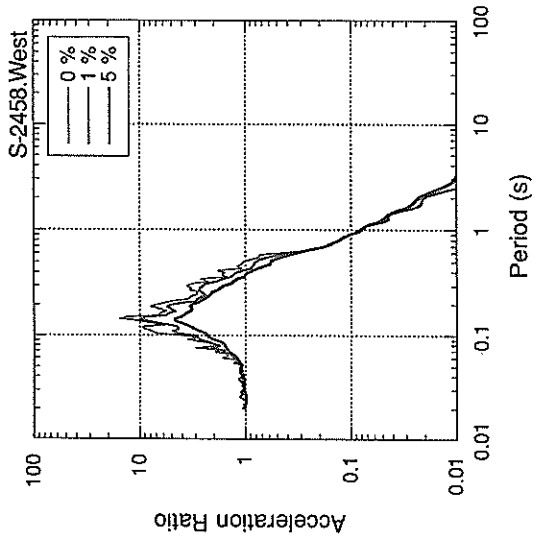
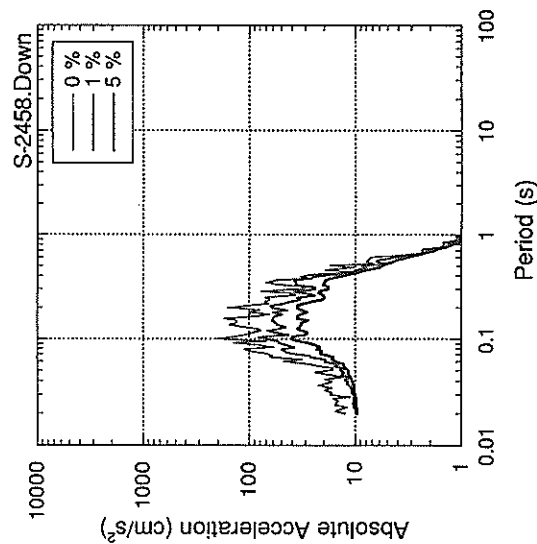
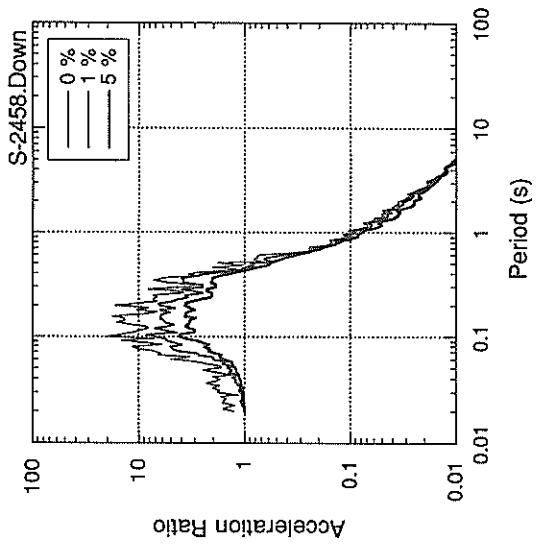
FIXED FILTER	0.64	0.27	0.41	0.64
VARIABLE FILTER	0.08	0.12	0.01	0.13

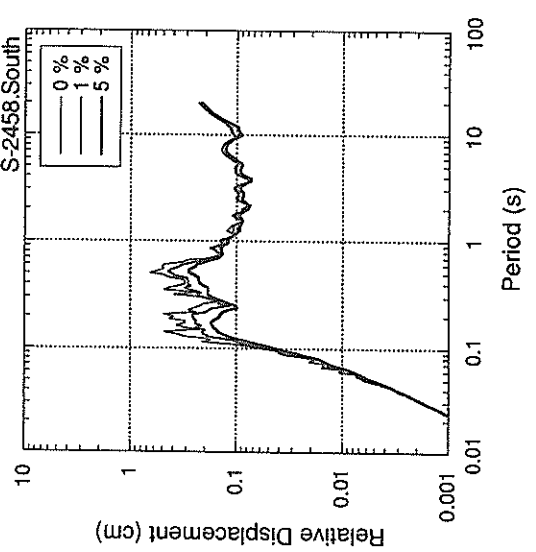
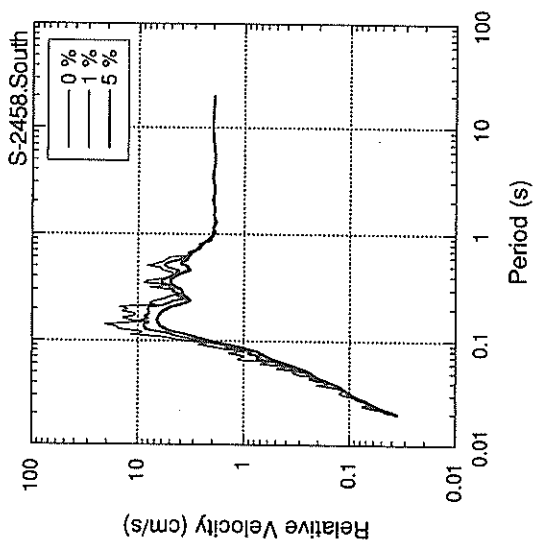
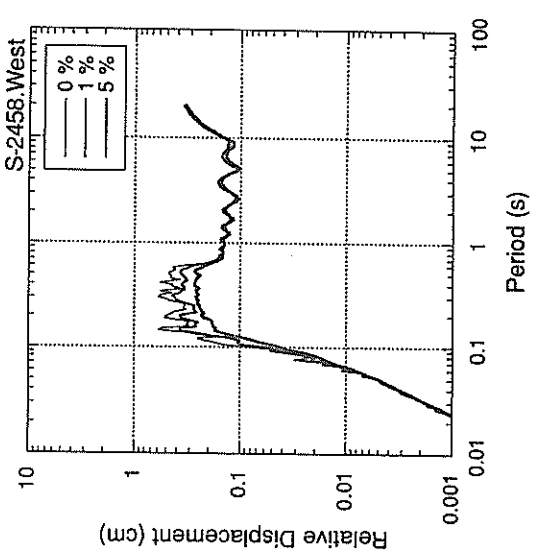
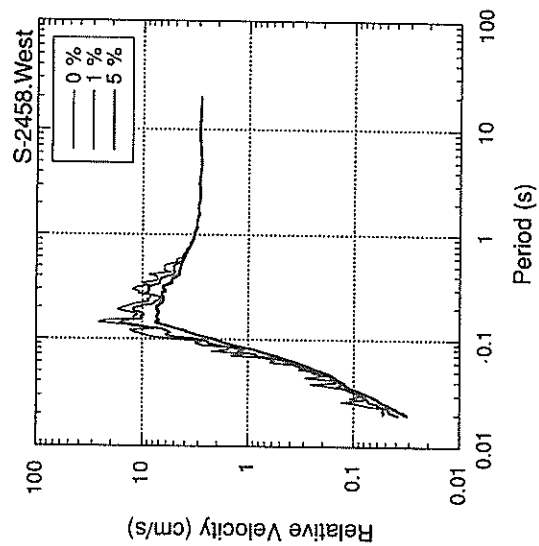
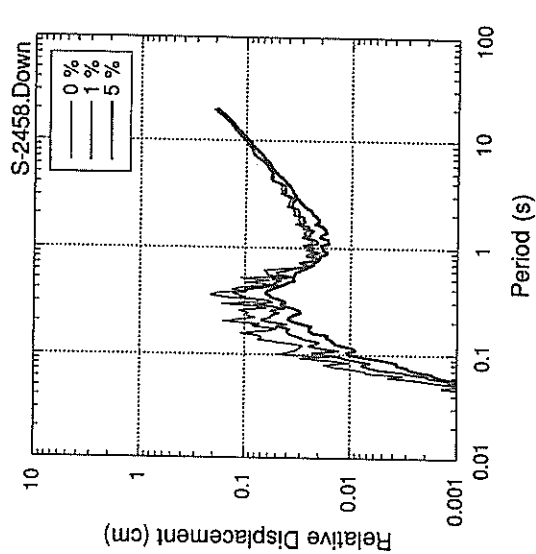
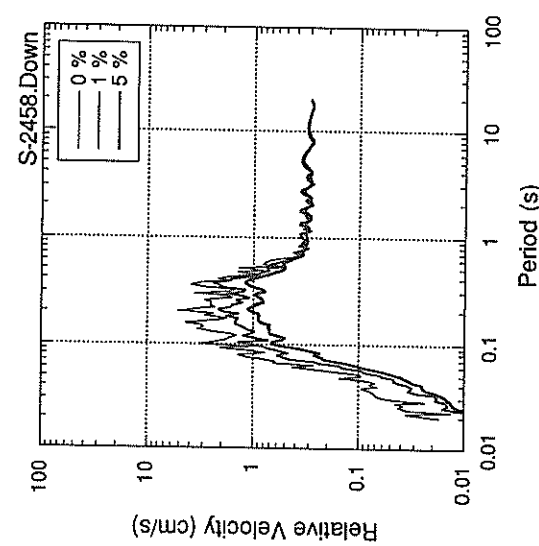
\* RESULTANT OF HORIZONTAL COMPONENTS



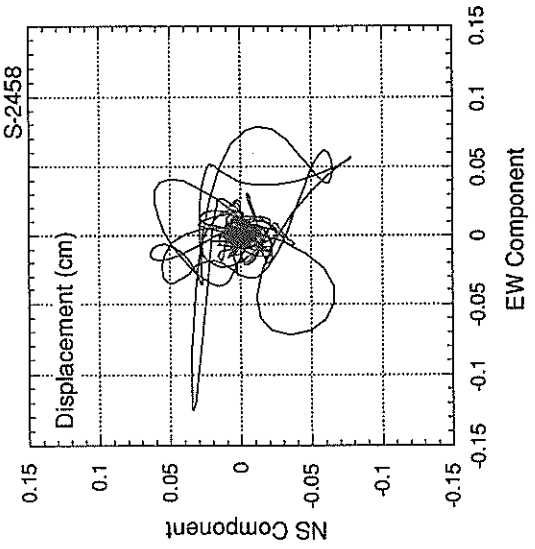
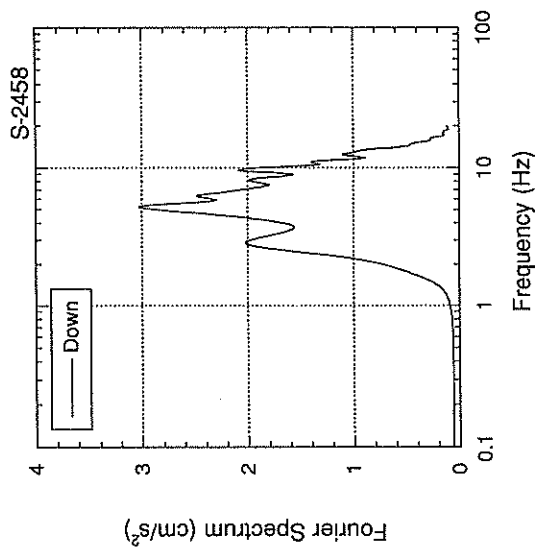
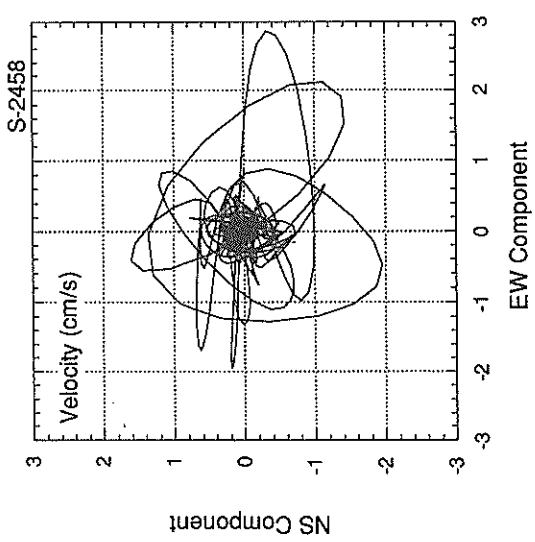
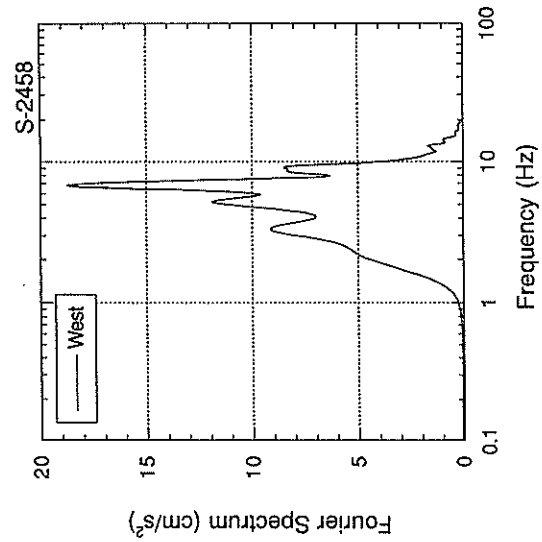
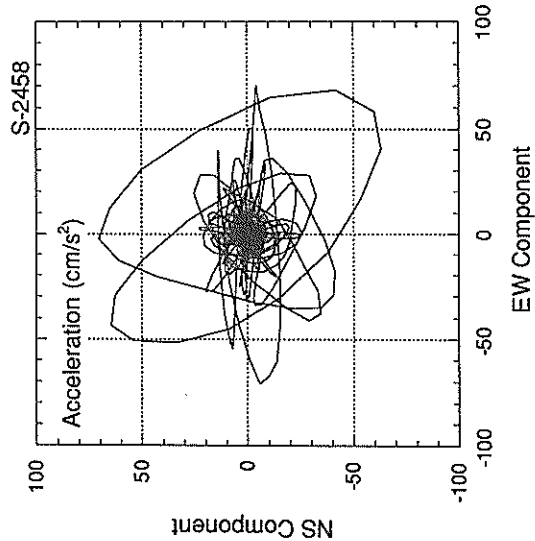
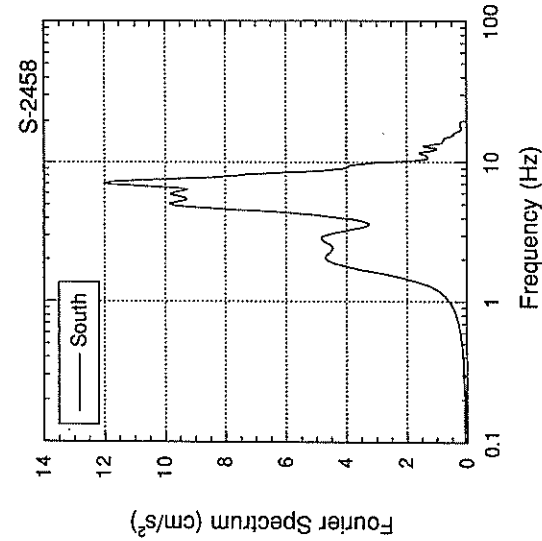












RECORD NUMBER : M-1416

STATION : TOKACHI-M

EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 23:52 AUG. 8, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION S OFF URAKAWA

LATITUDE 42° 0.6' N

LONGITUDE 142° 41.1' E

DEPTH 46.4KM

JMA MAGNITUDE 5.1

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PEAK VALUES OF COMPONENTS

-----  
N S            E W            U D            HORIZONTAL\*  
-----

PARAMETER OF THE VARIABLE FILTER

-----  
FC (HZ)                    1.269            0.561            0.781

MAXIMUM ACCELERATION (GAL)

-----  
SMAC-B2 EQUIVALENT            18.7            39.6            8.9            39.9  
ORIGINAL                    30.2            62.5            19.9            62.7  
CORRECTED                    30.0            60.9            18.9            60.9

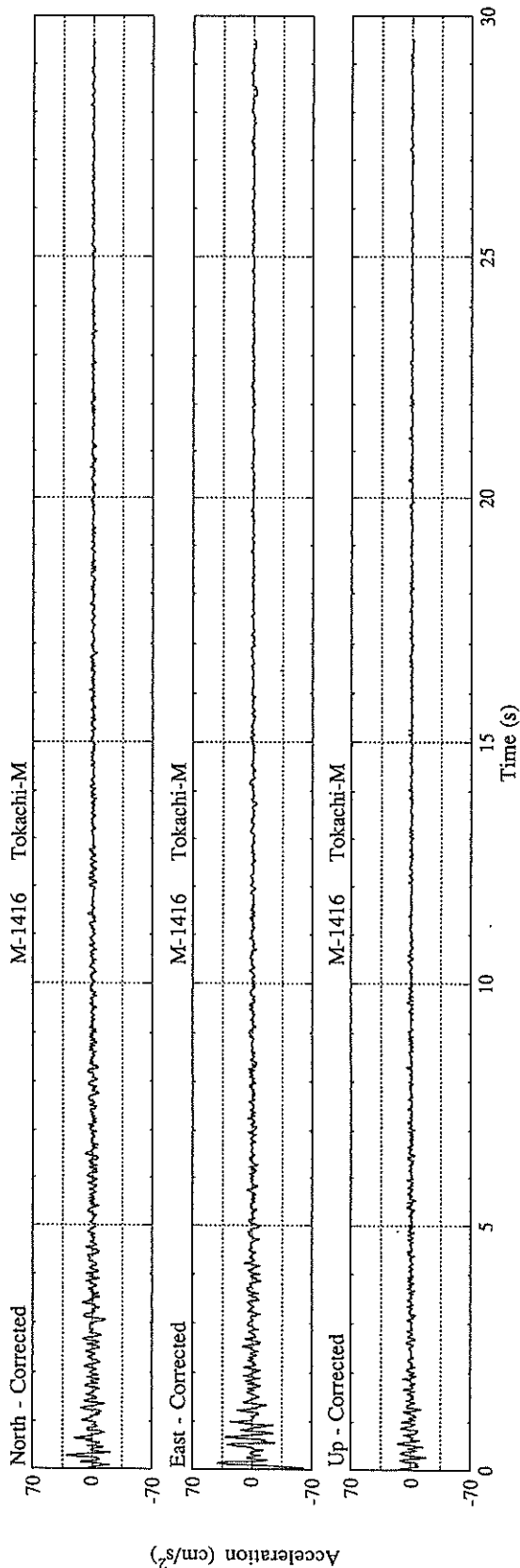
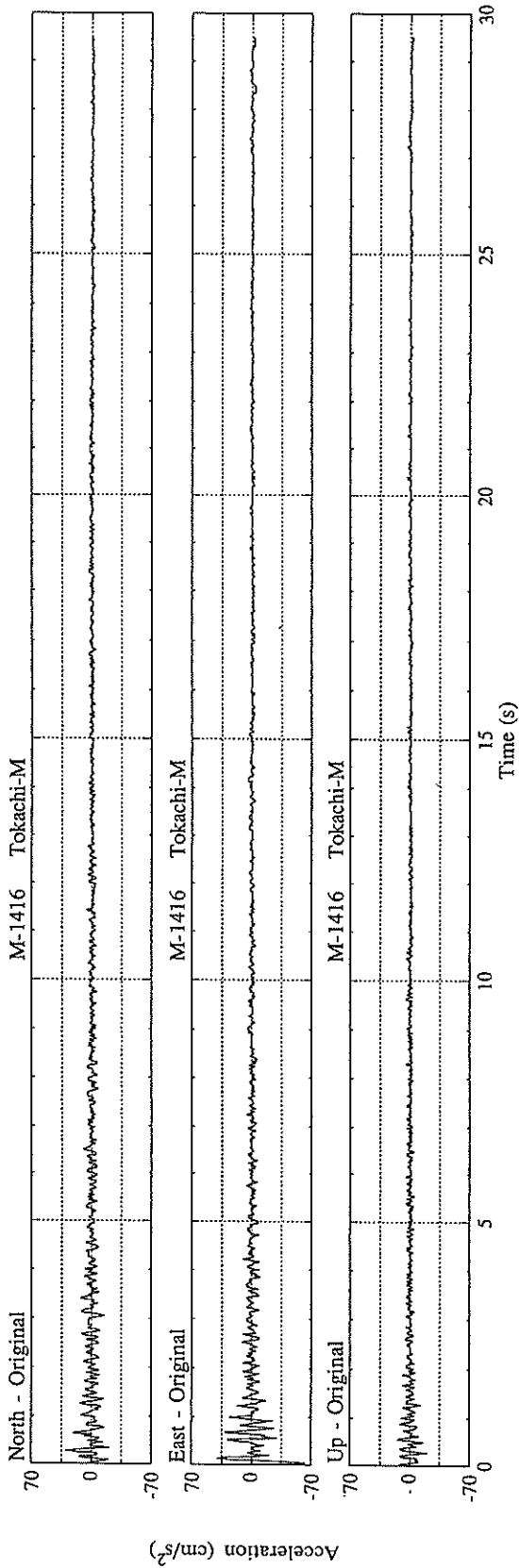
MAXIMUM VELOCITY (CM/SEC)

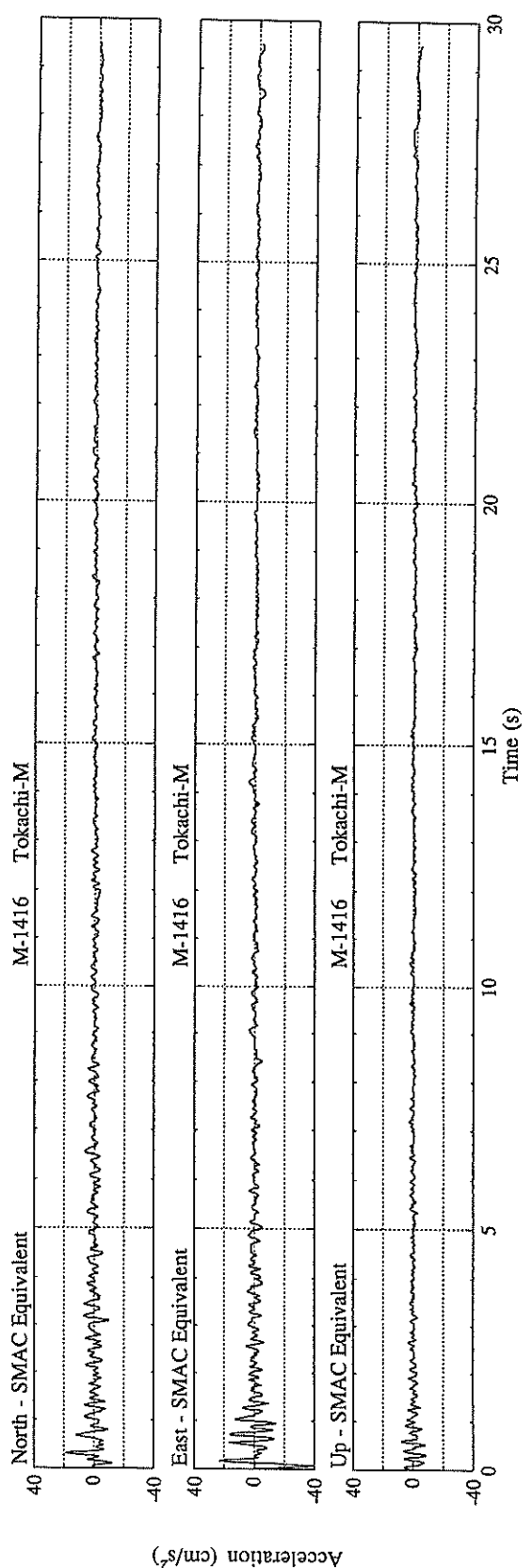
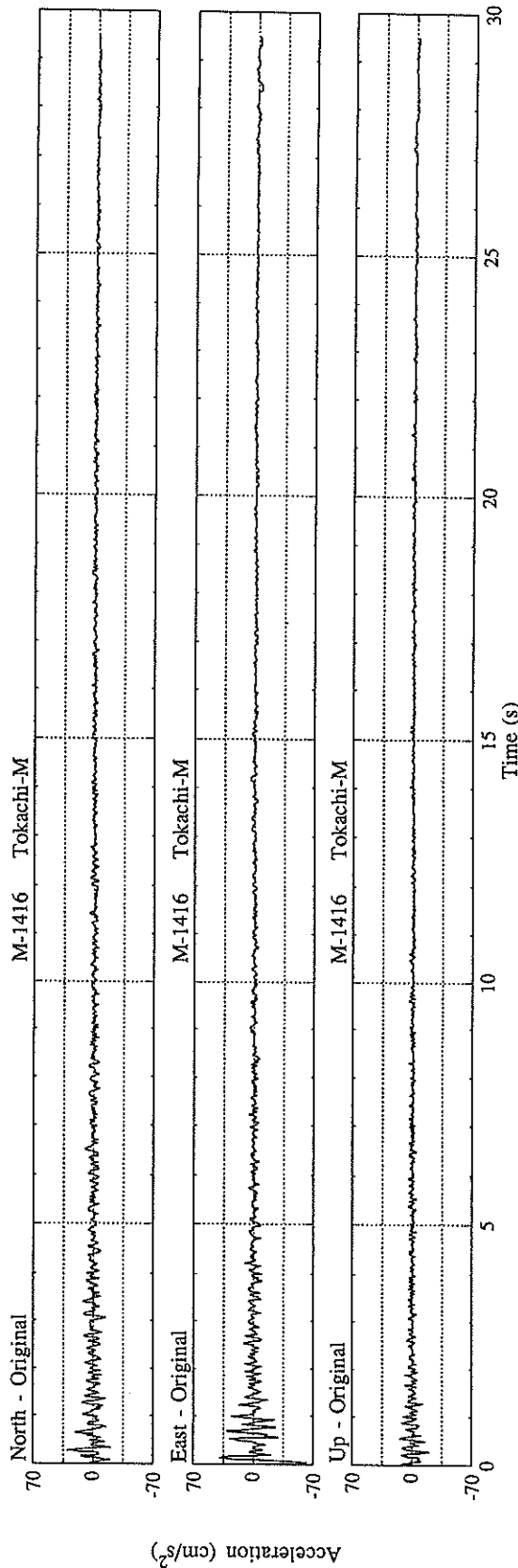
-----  
FIXED FILTER                    0.94            2.83            0.73            2.88  
VARIABLE FILTER                0.92            2.11            0.46            2.14

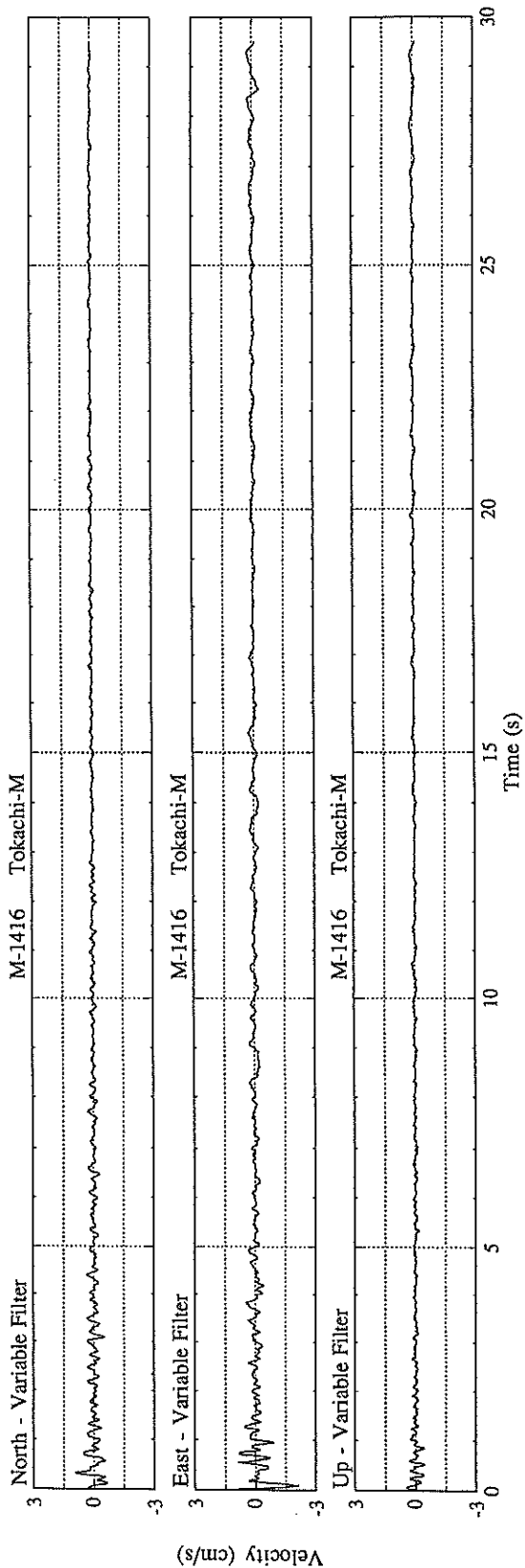
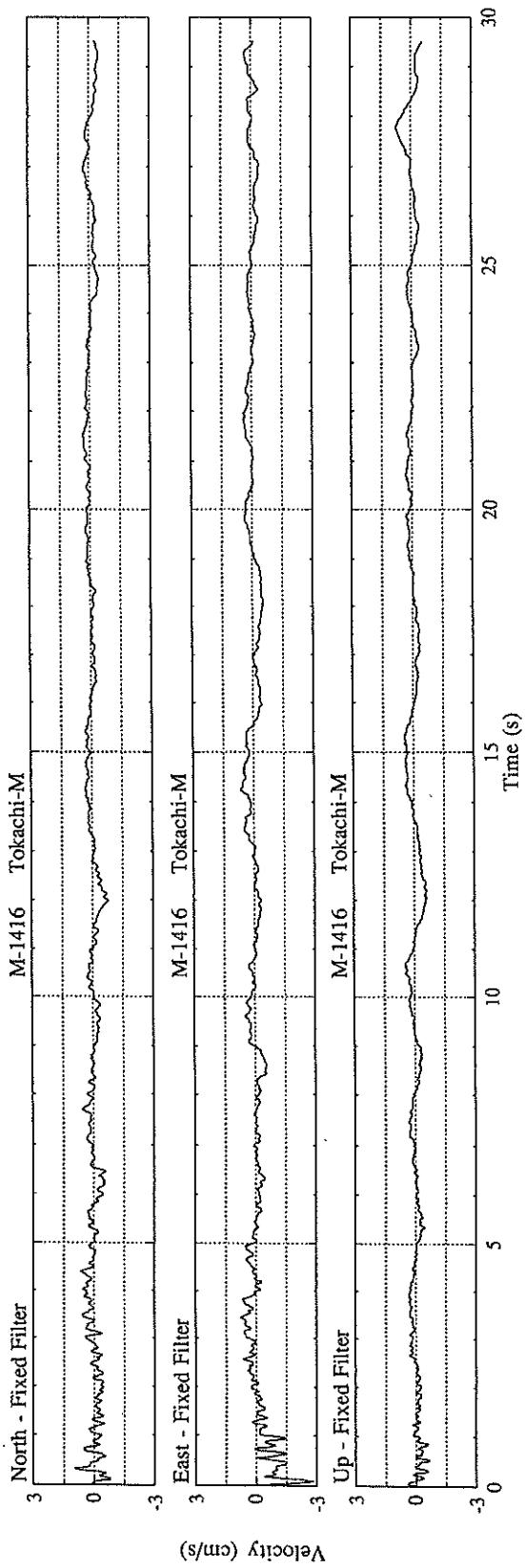
MAXIMUM DISPLACEMENT (CM)

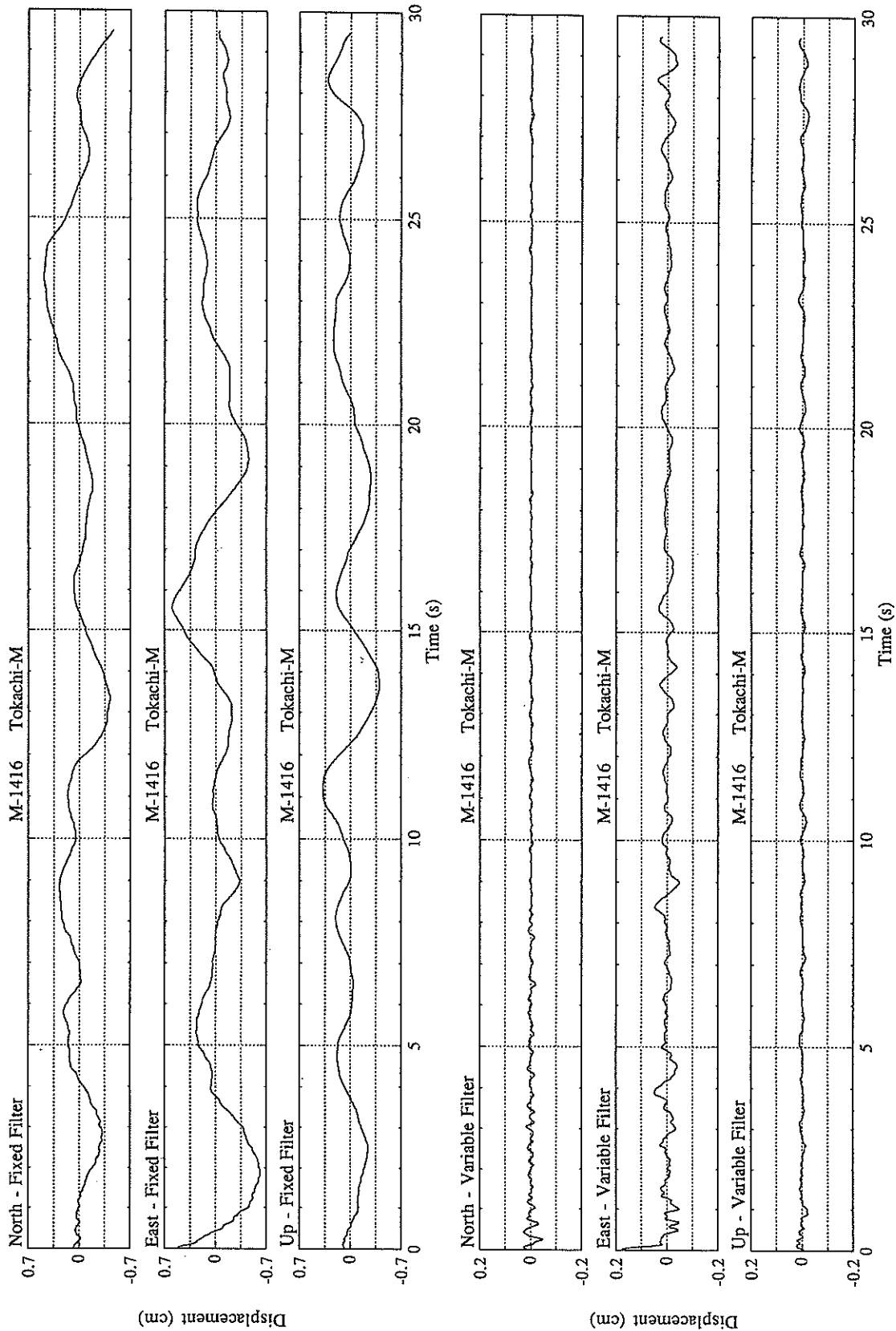
-----  
FIXED FILTER                    0.49            0.61            0.40            0.64  
VARIABLE FILTER                0.05            0.18            0.02            0.18

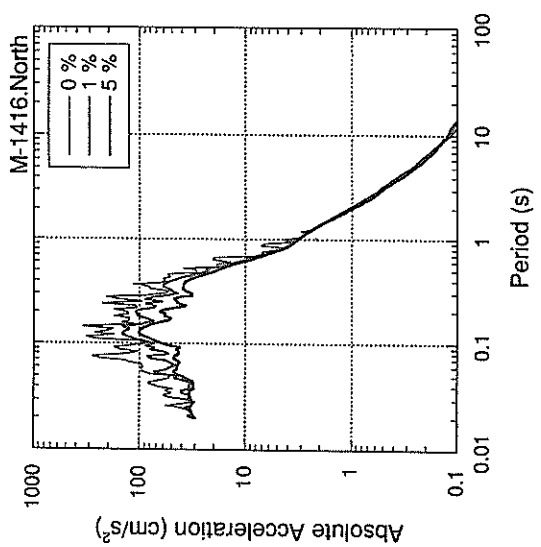
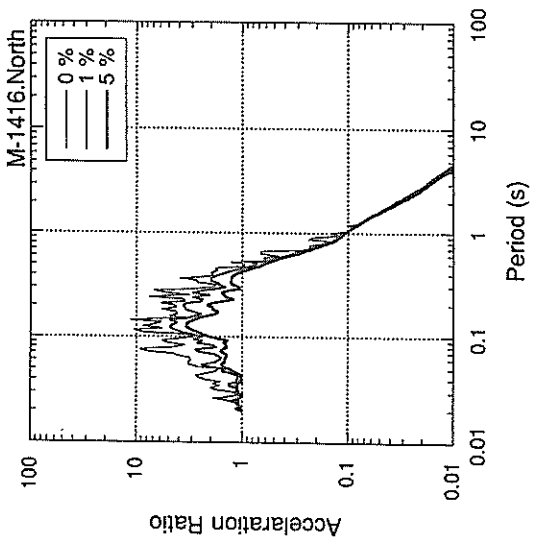
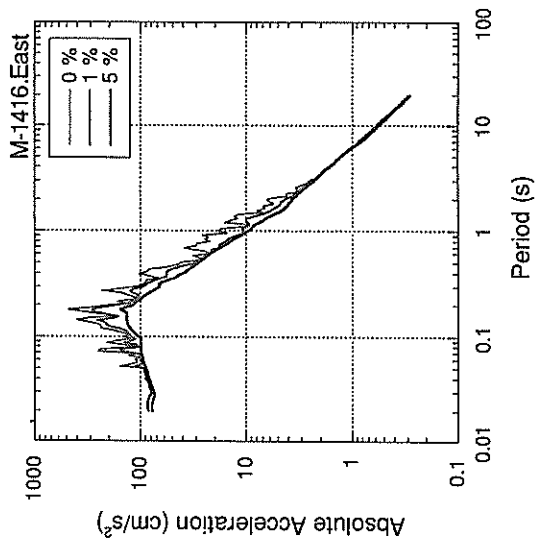
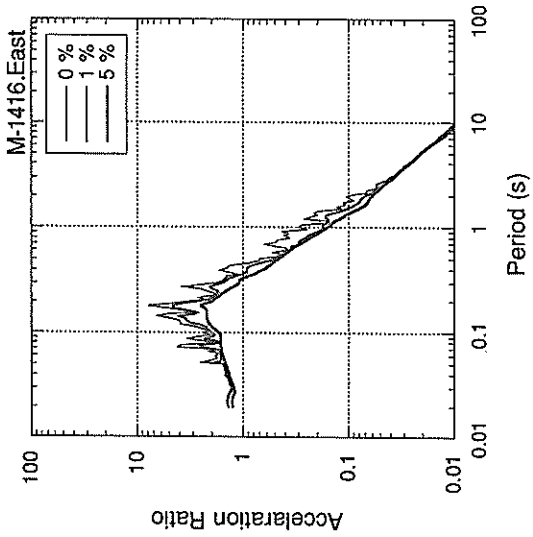
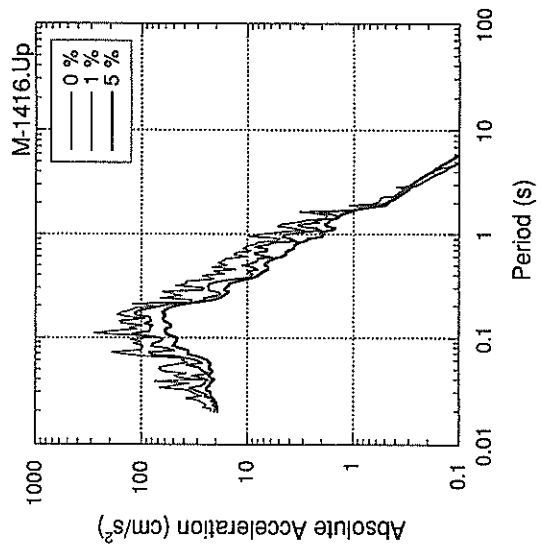
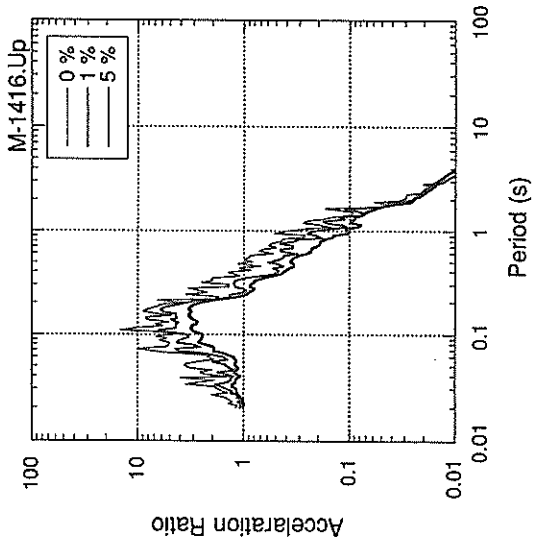
\* RESULTANT OF HORIZONTAL COMPONENTS

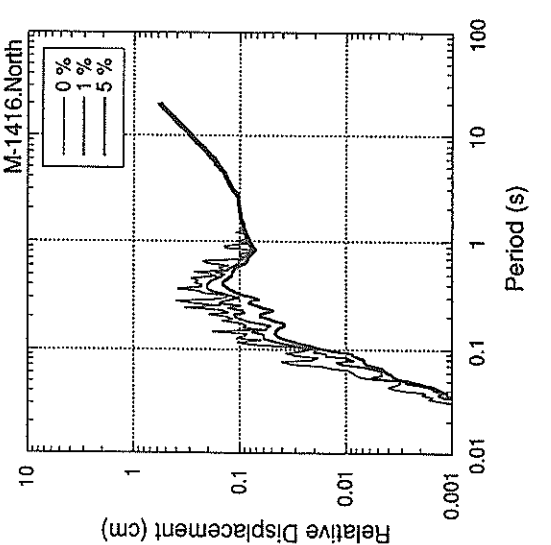
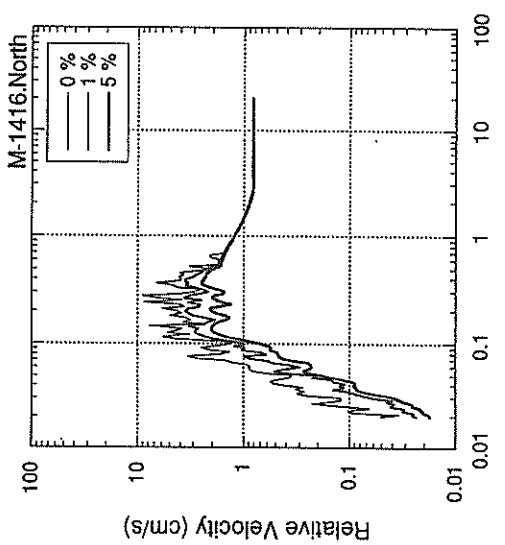
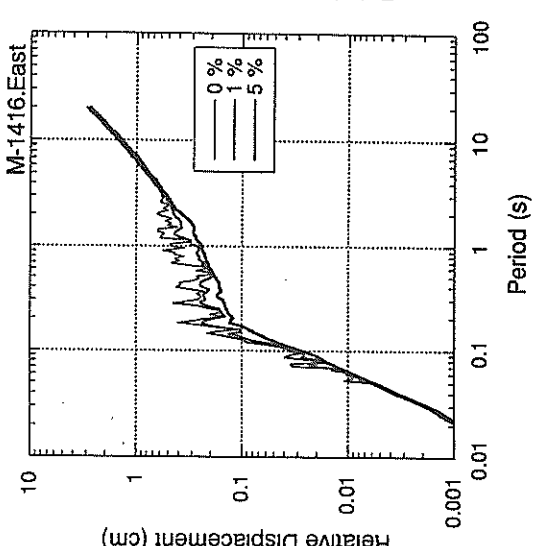
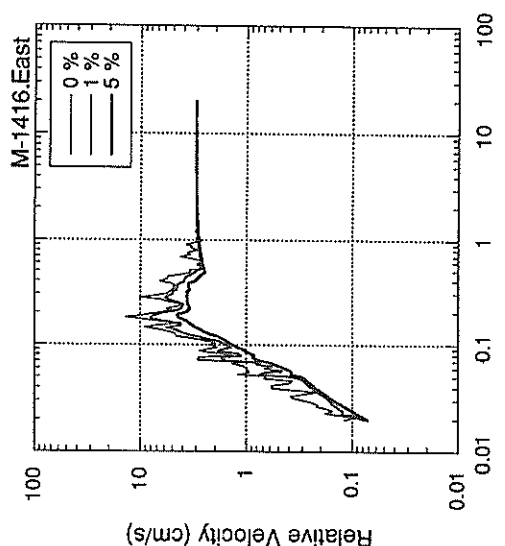
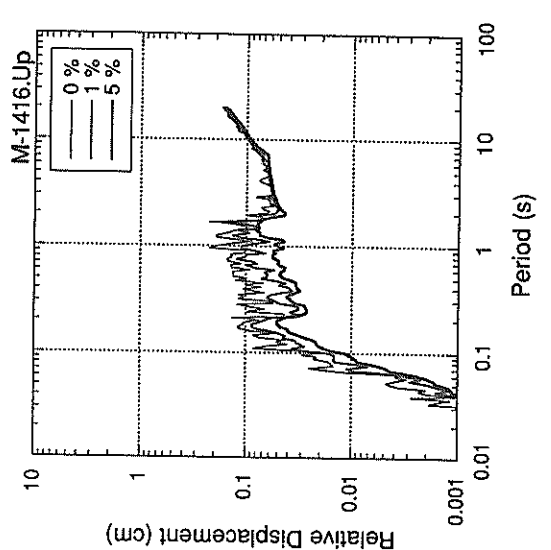
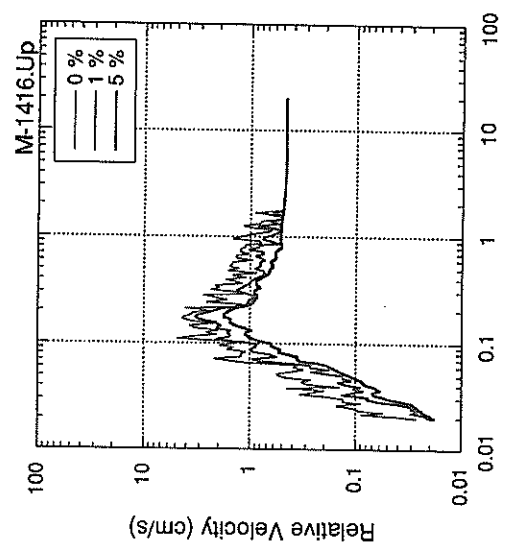




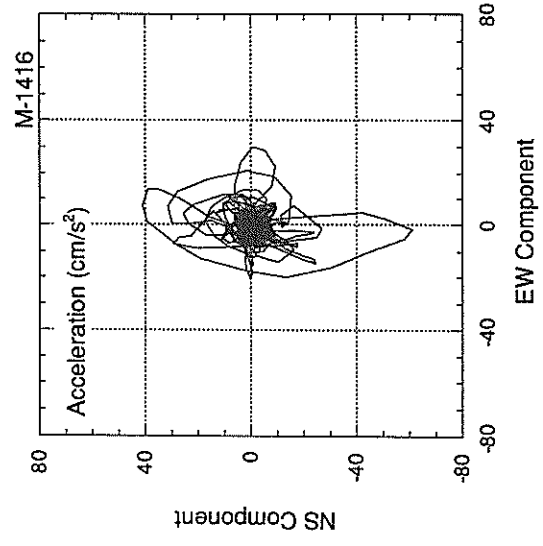
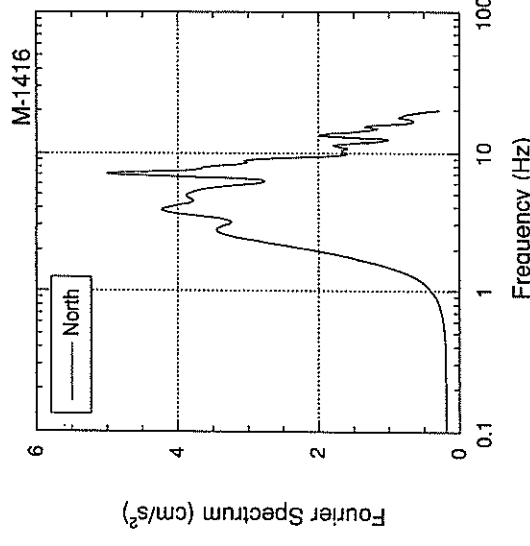
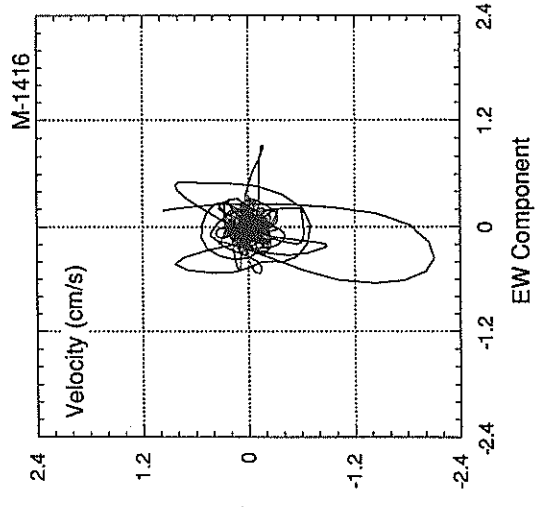
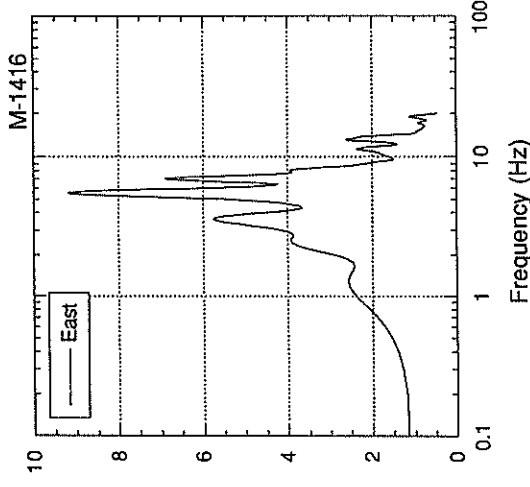
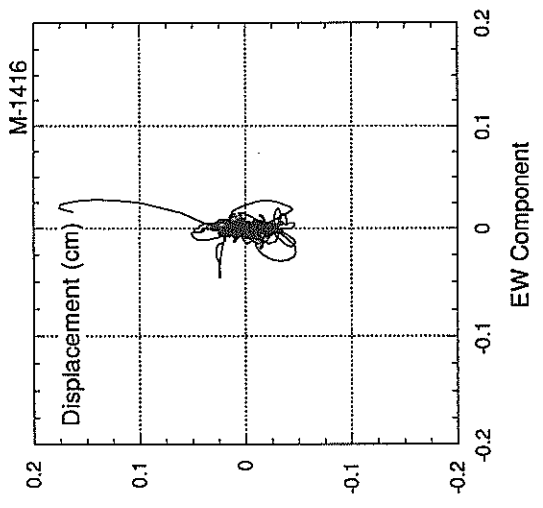
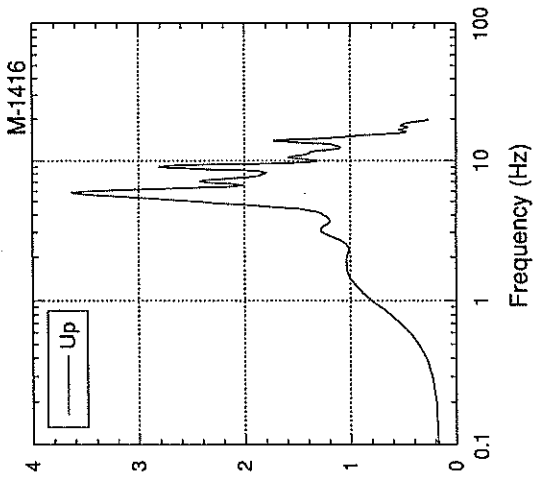












RECORD NUMBER : F-497

STATION : WAKAYAMA-G

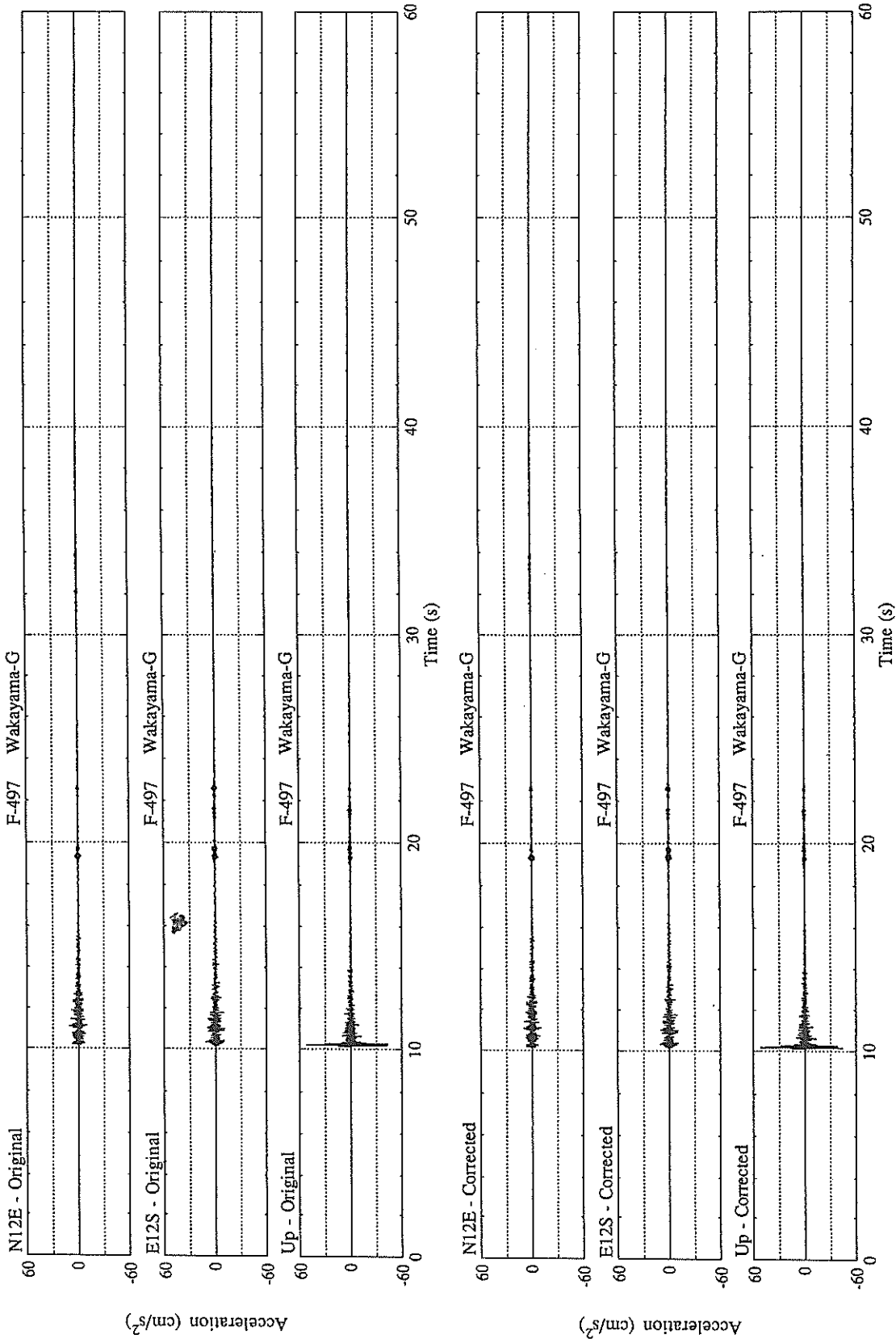
EARTHQUAKE DATA

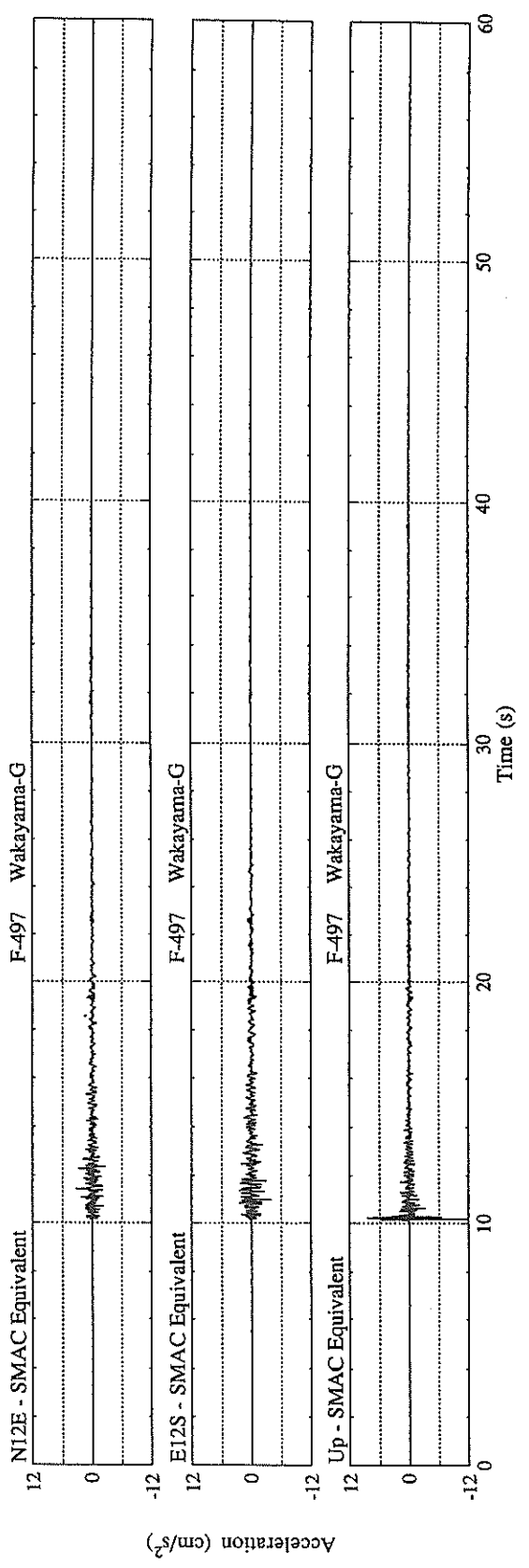
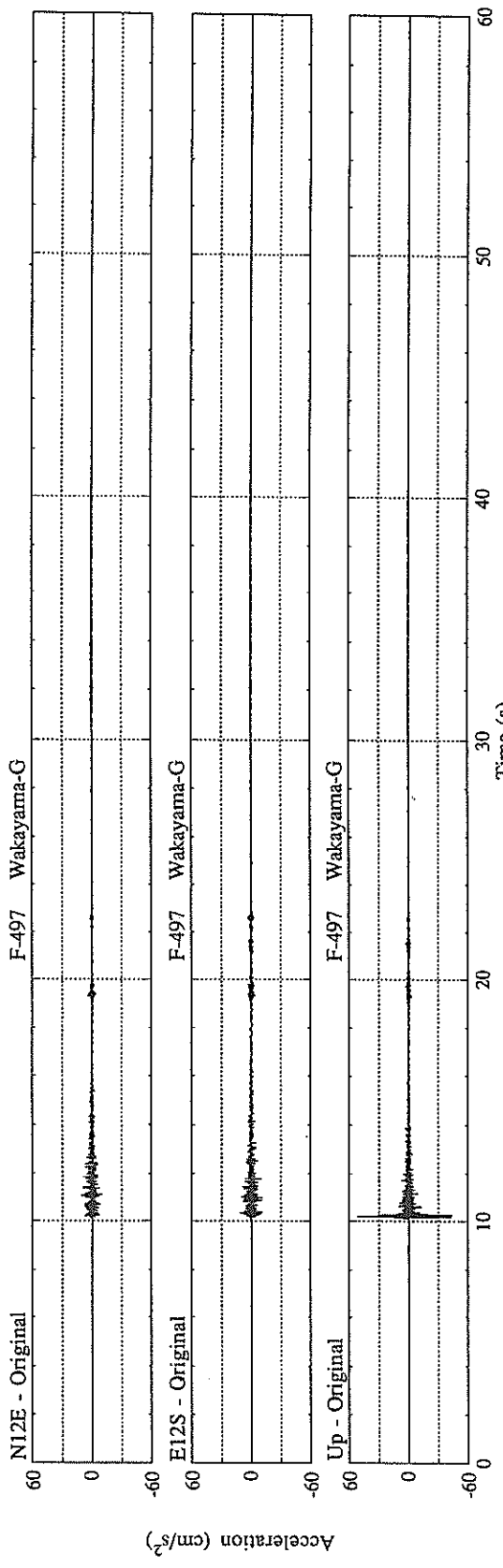
\*\*\*\*\*  
DATE AND TIME 19:11 AUG. 20, 1992  
LOCATION OF HYPOCENTER  
EPICENTRAL REGION NW WAKAYAMA PREF  
LATITUDE 34° 12.4' N  
LONGITUDE 135° 8.0' E  
DEPTH 7.3KM  
JMA MAGNITUDE 3.2  
\*\*\*\*\*

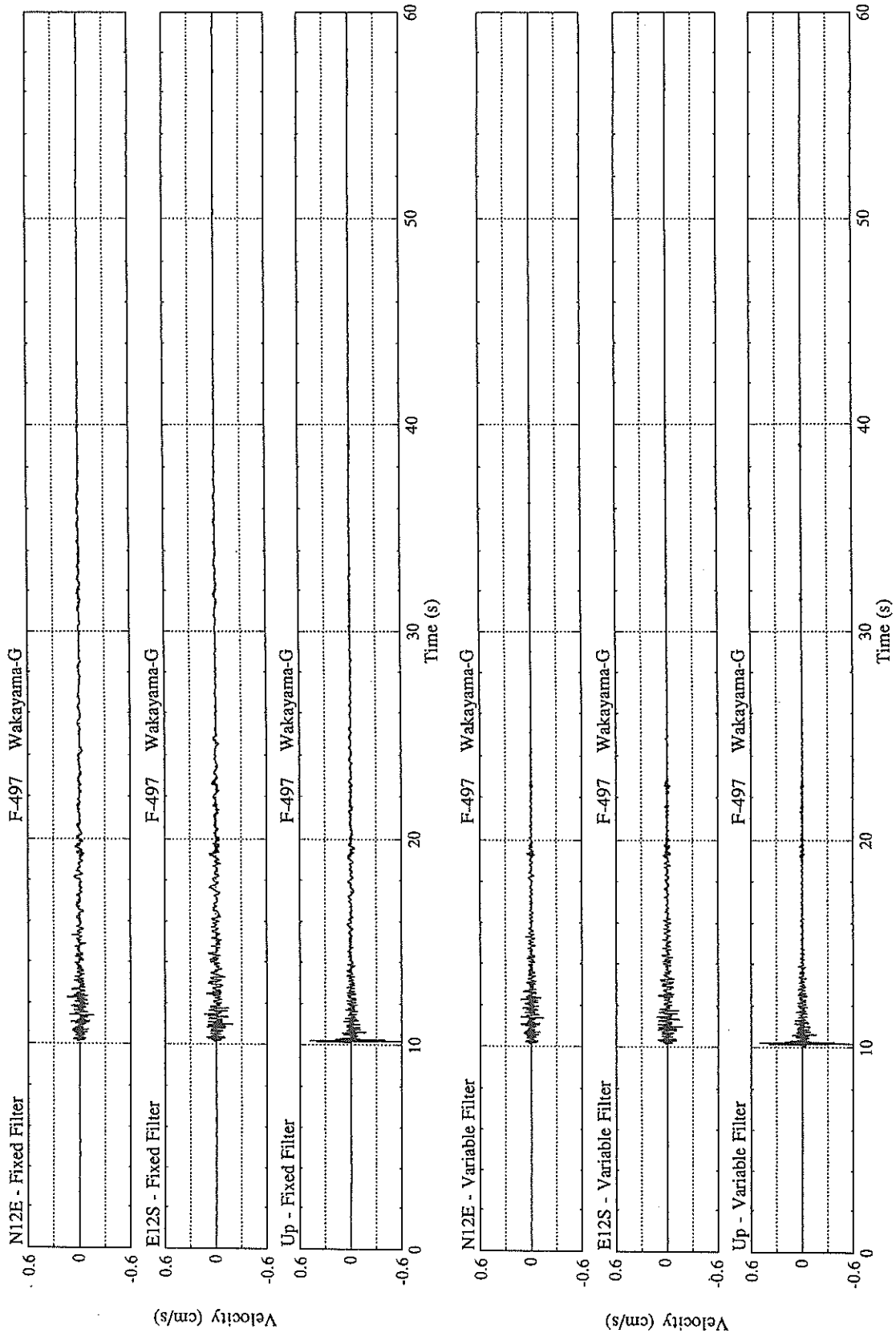
PEAK VALUES OF COMPONENTS

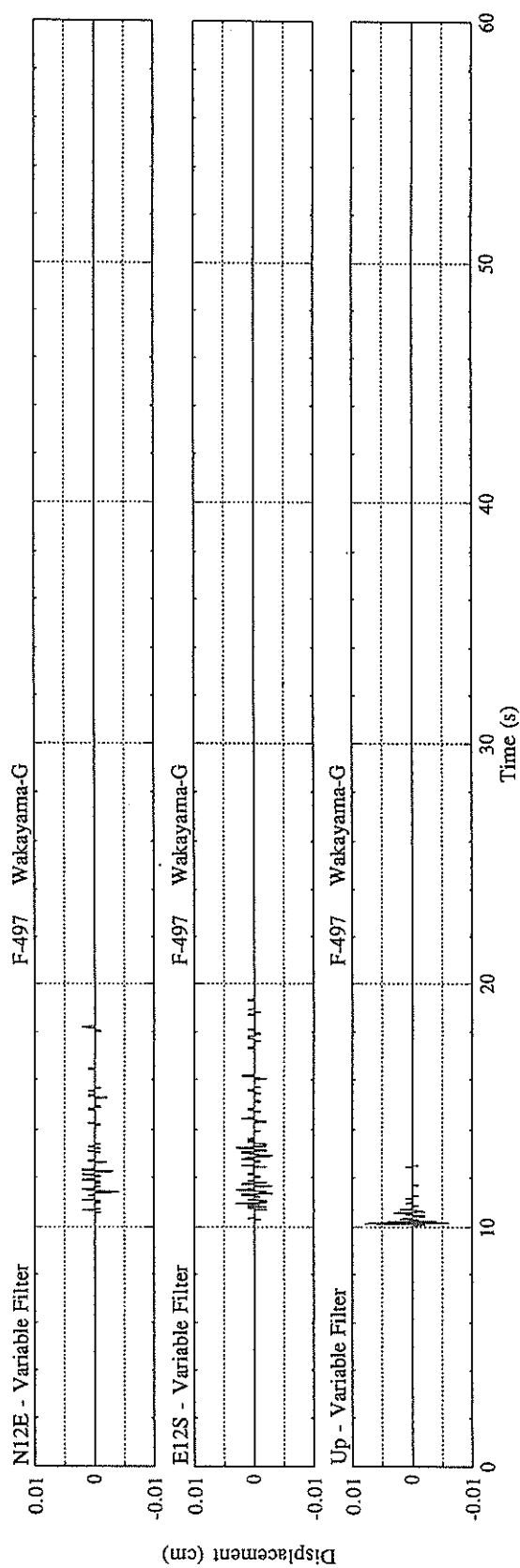
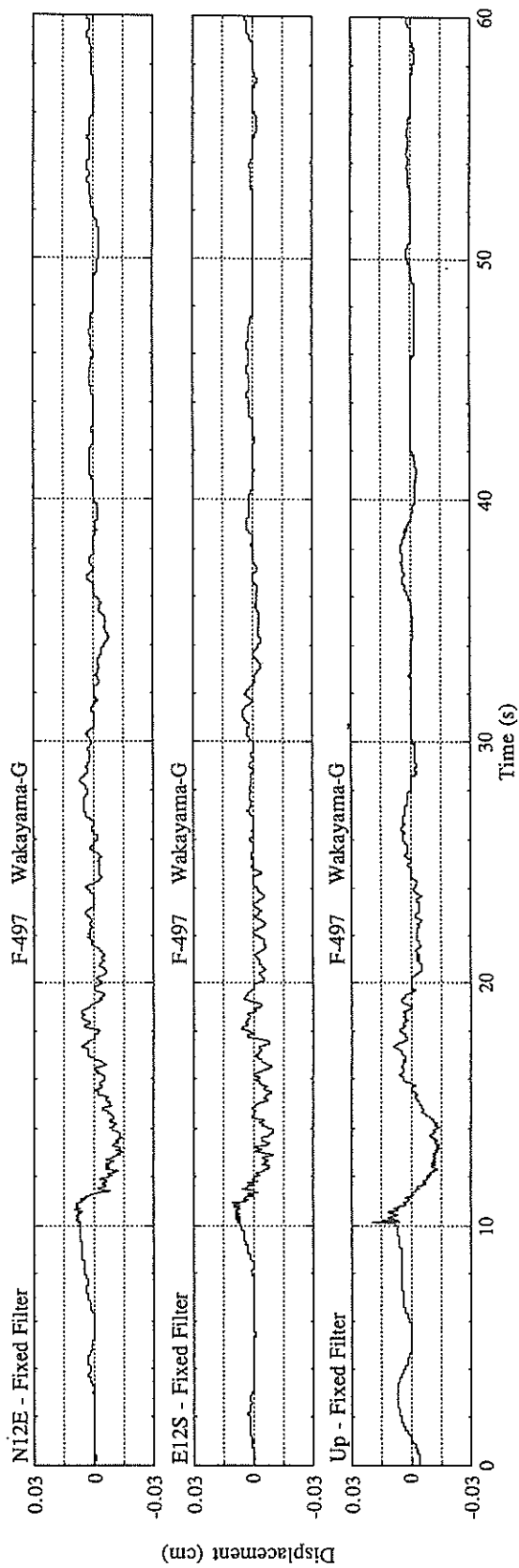
	N S	E W	U D	HORIZONTAL*
PARAMETER OF THE VARIABLE' FILTER				
FC (HZ)	2.532	2.313	3.295	
MAXIMUM ACCELERATION (GAL)				
SMAC-B2 EQUIVALENT	3.3	3.9	11.7	4.0
ORIGINAL	10.8	11.3	51.8	11.8
CORRECTED	10.2	10.7	51.7	10.9
MAXIMUM VELOCITY (CM/SEC)				
FIXED FILTER	0.17	0.20	0.60	0.21
VARIABLE FILTER	0.15	0.17	0.60	0.18
MAXIMUM DISPLACEMENT (CM)				
FIXED FILTER	0.01	0.01	0.02	0.02
VARIABLE FILTER	0.00	0.00	0.01	0.00

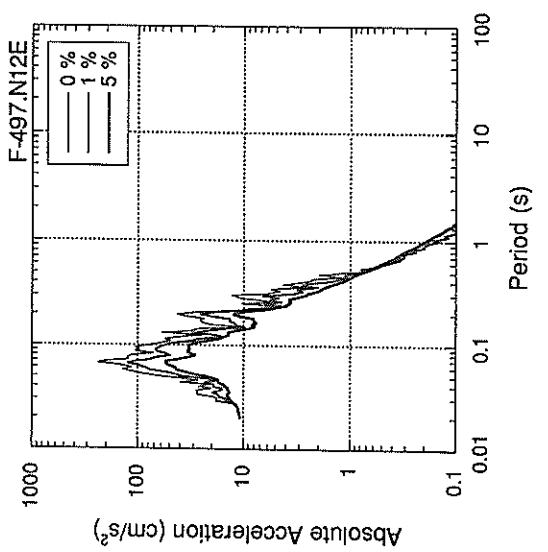
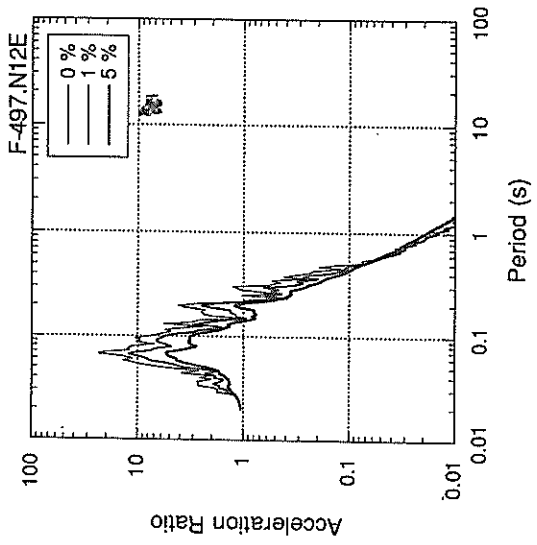
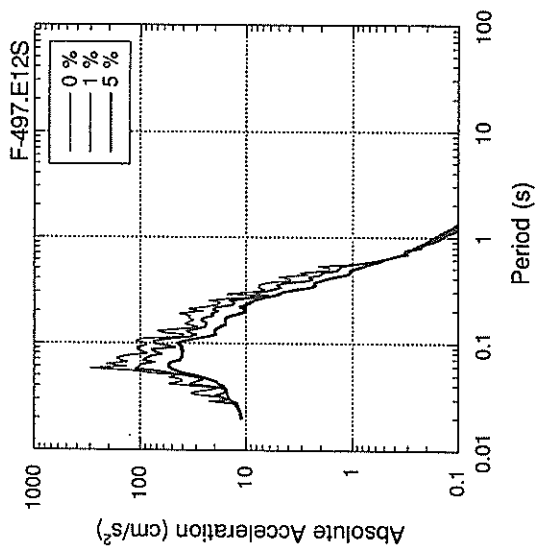
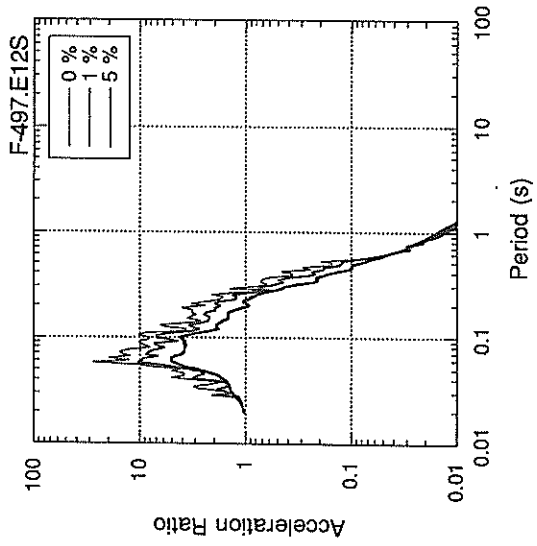
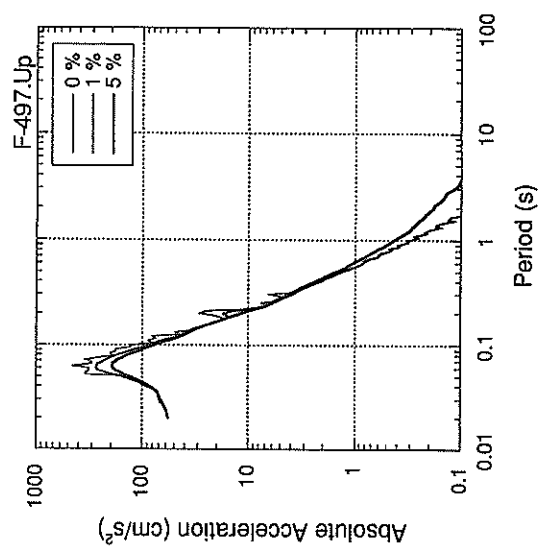
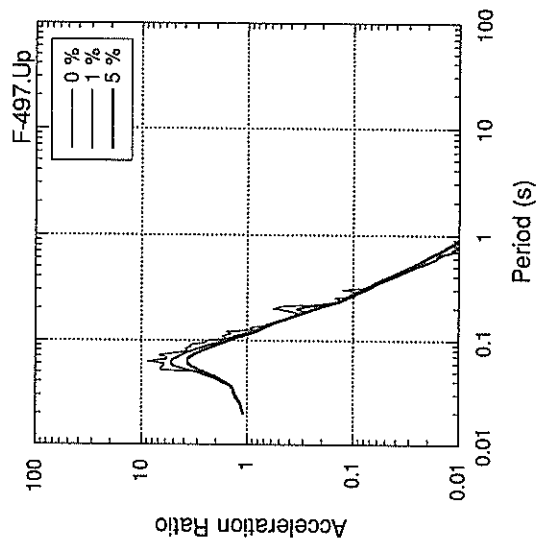
\* RESULTANT OF HORIZONTAL COMPONENTS

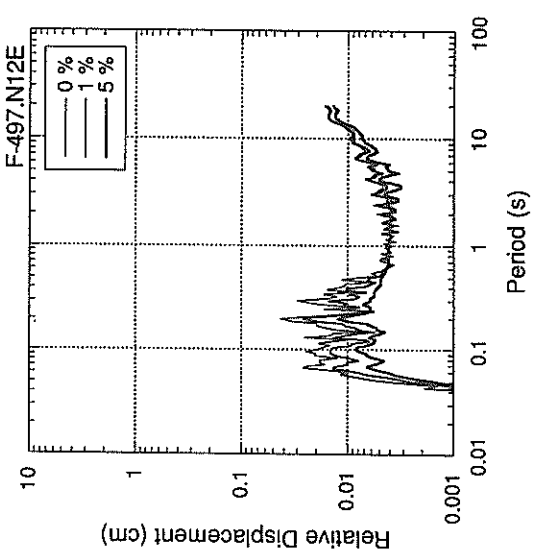
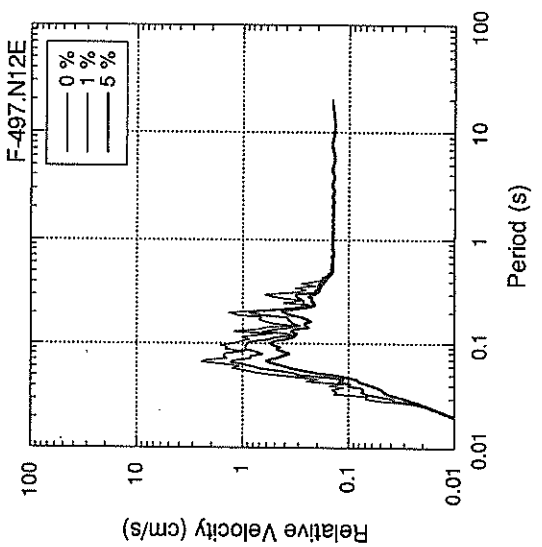
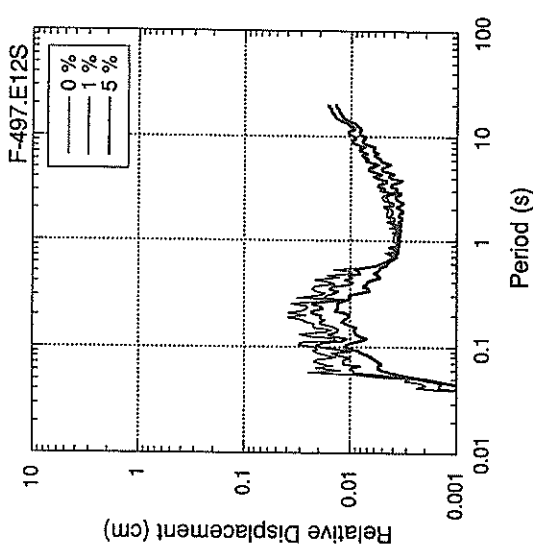
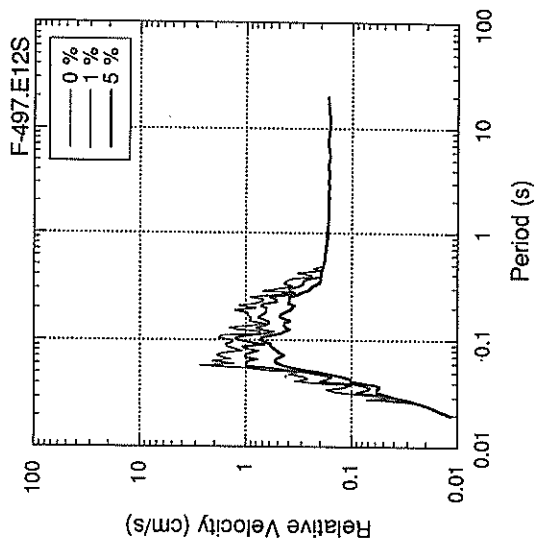
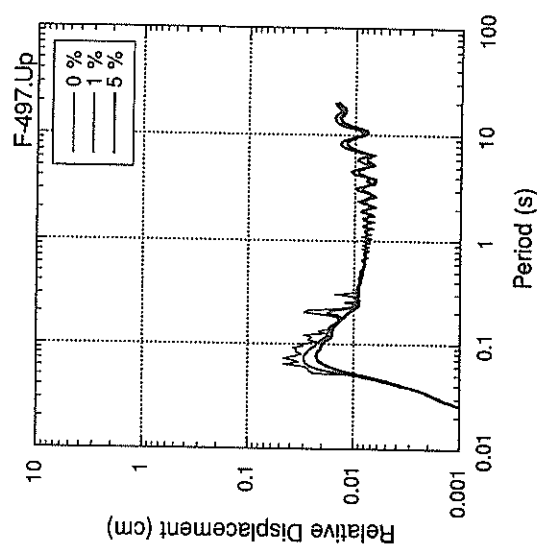
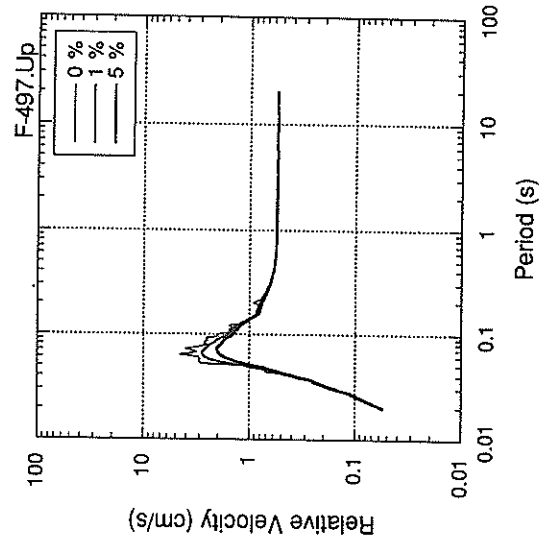




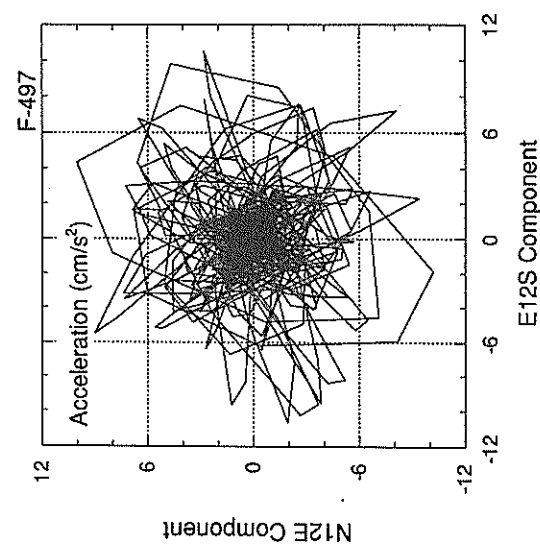
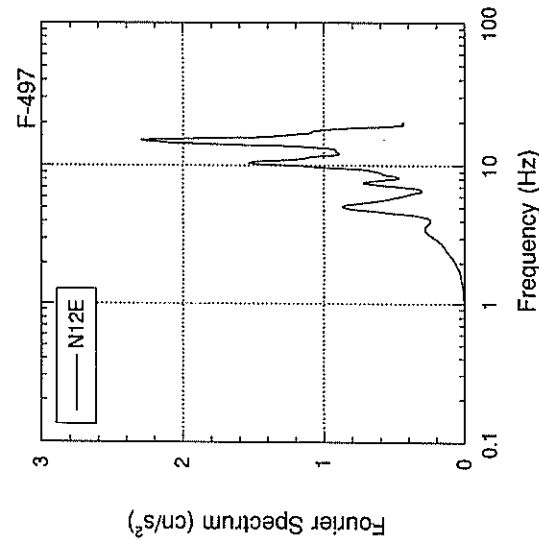
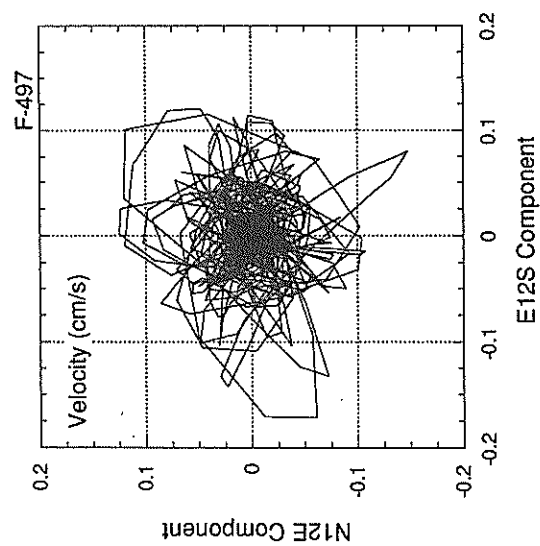
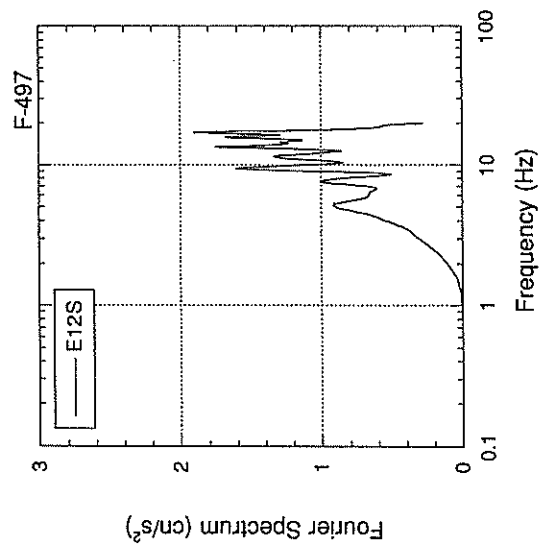
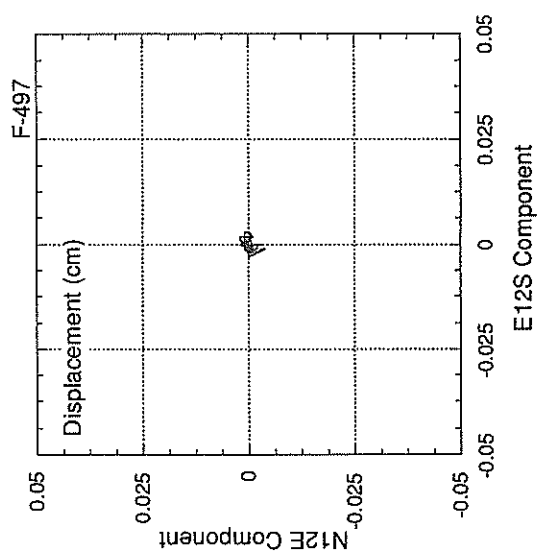
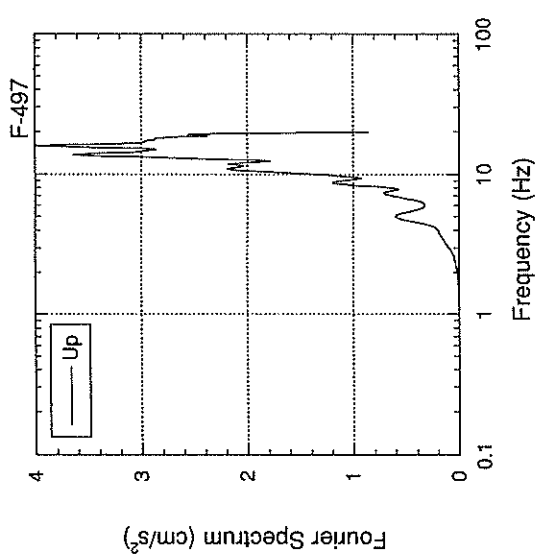












RECORD NUMBER : F-503  
 STATION : WAKAYAMA-G

EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME 23:18 SEP. 21, 1992  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION NW WAKAYAMA PREF  
 LATITUDE 34° 12.9' N  
 LONGITUDE 135° 10.3' E  
 DEPTH 4.1KM  
 JMA MAGNITUDE 2.9  
 \*\*\*\*\*

PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
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PARAMETER OF THE VARIABLE FILTER

FC (HZ)	3.539	3.552	4.797	
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MAXIMUM ACCELERATION (GAL)

SMAC-B2 EQUIVALENT	7.0	3.8	10.2	7.2
ORIGINAL	24.8	19.1	54.2	25.3
CORRECTED	23.2	15.3	54.1	23.3

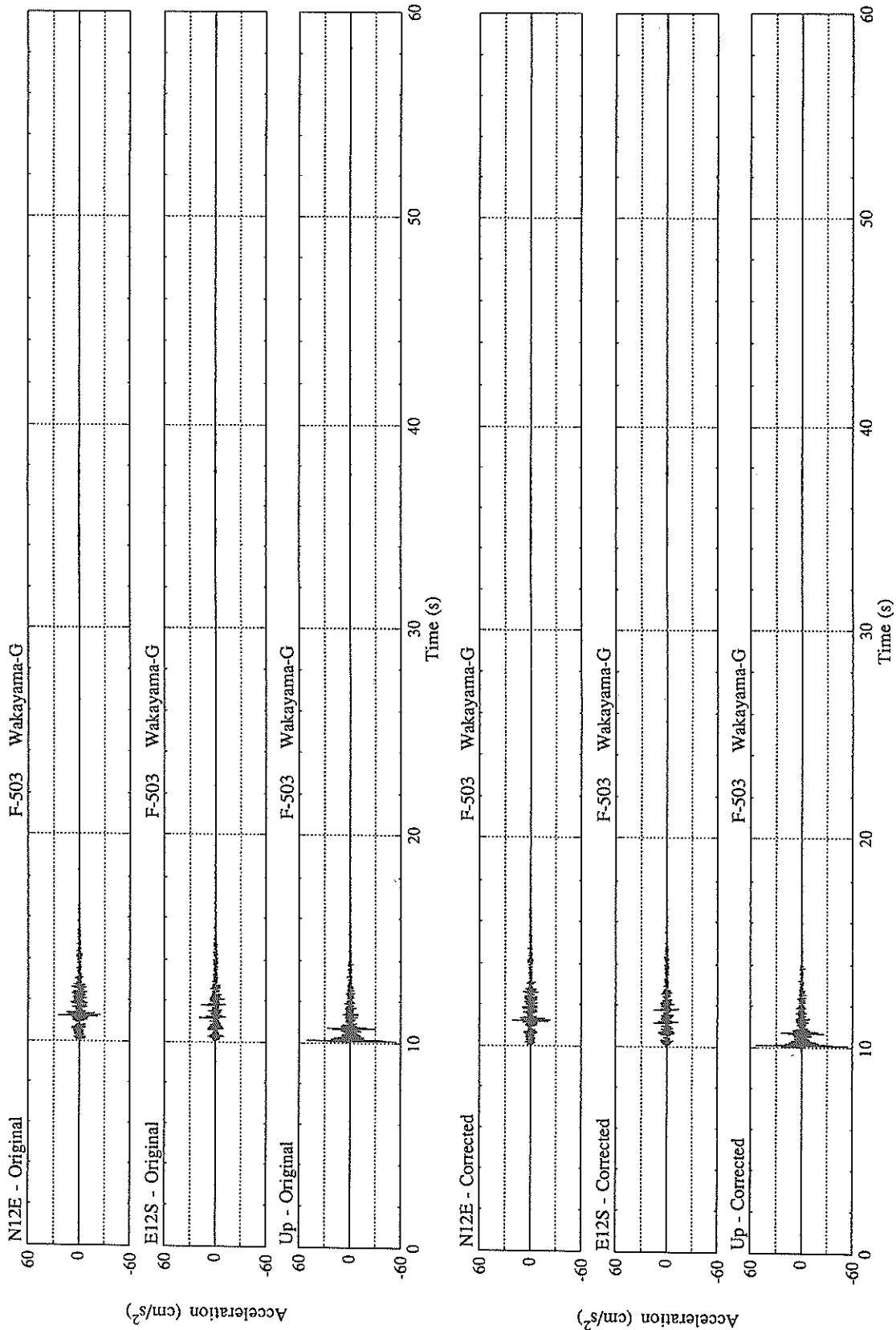
MAXIMUM VELOCITY (CM/SEC)

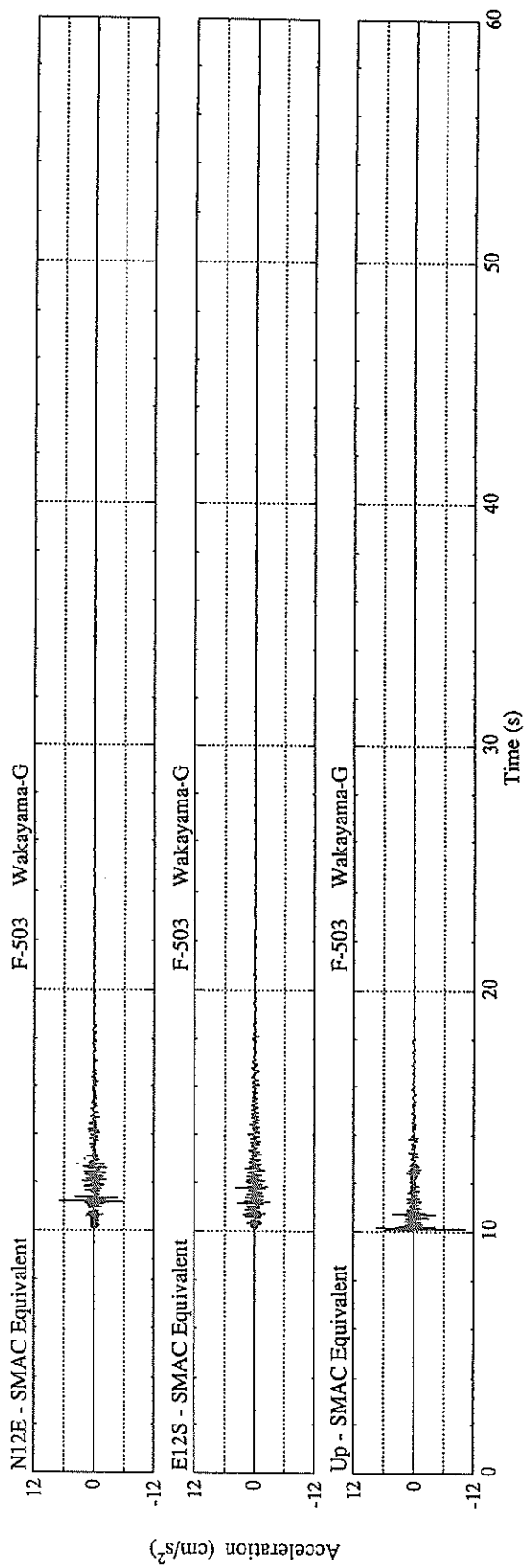
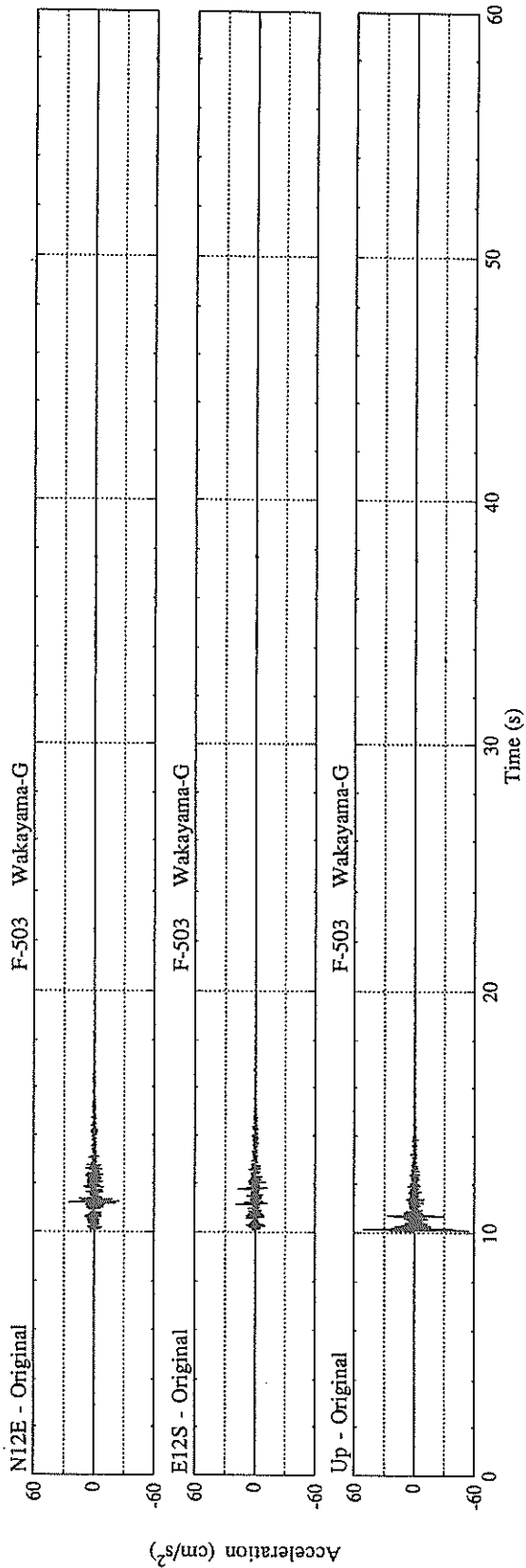
FIXED FILTER	0.37	0.18	0.54	0.39
VARIABLE FILTER	0.34	0.19	0.52	0.36

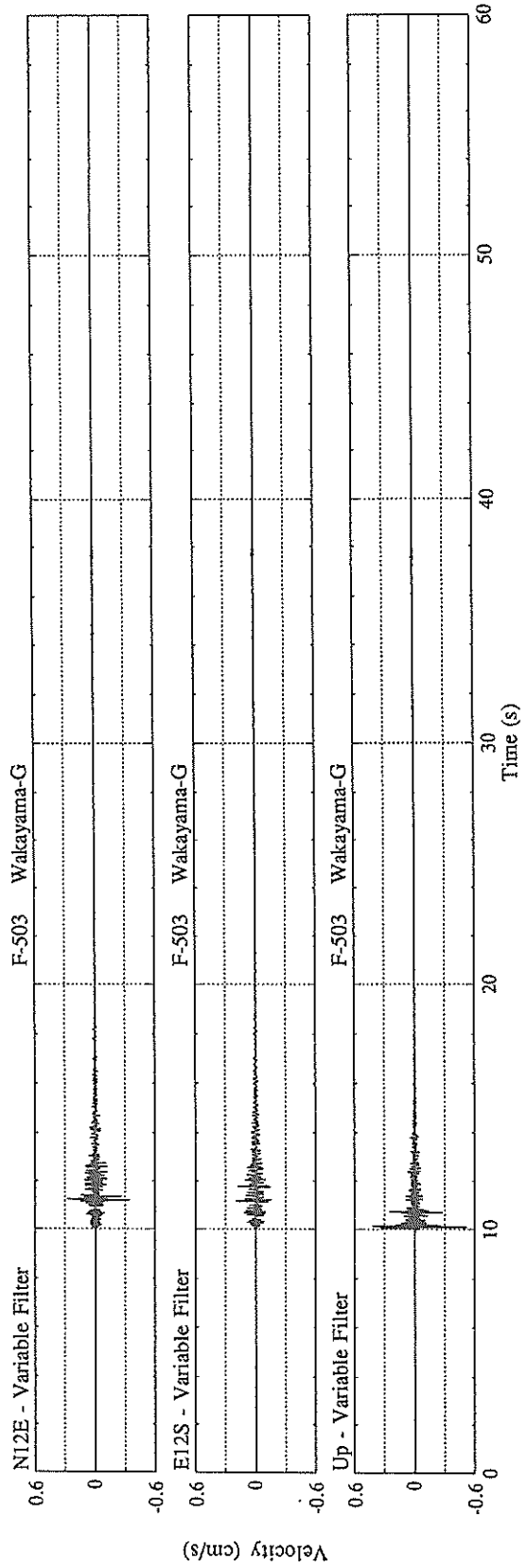
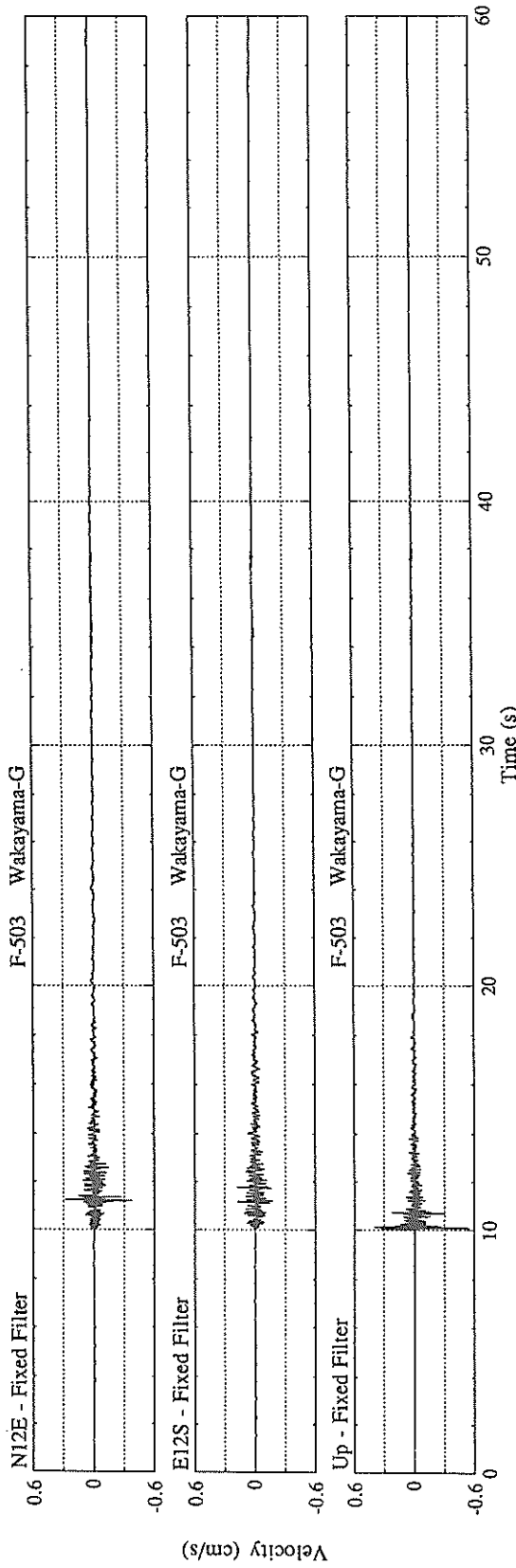
MAXIMUM DISPLACEMENT (CM)

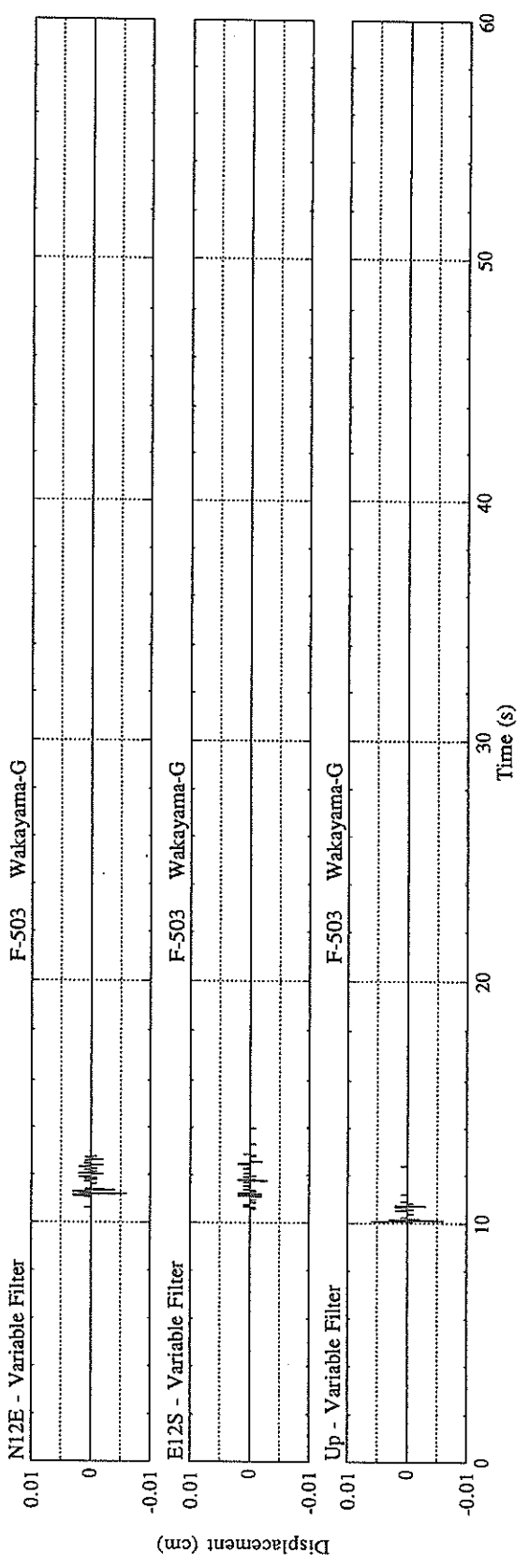
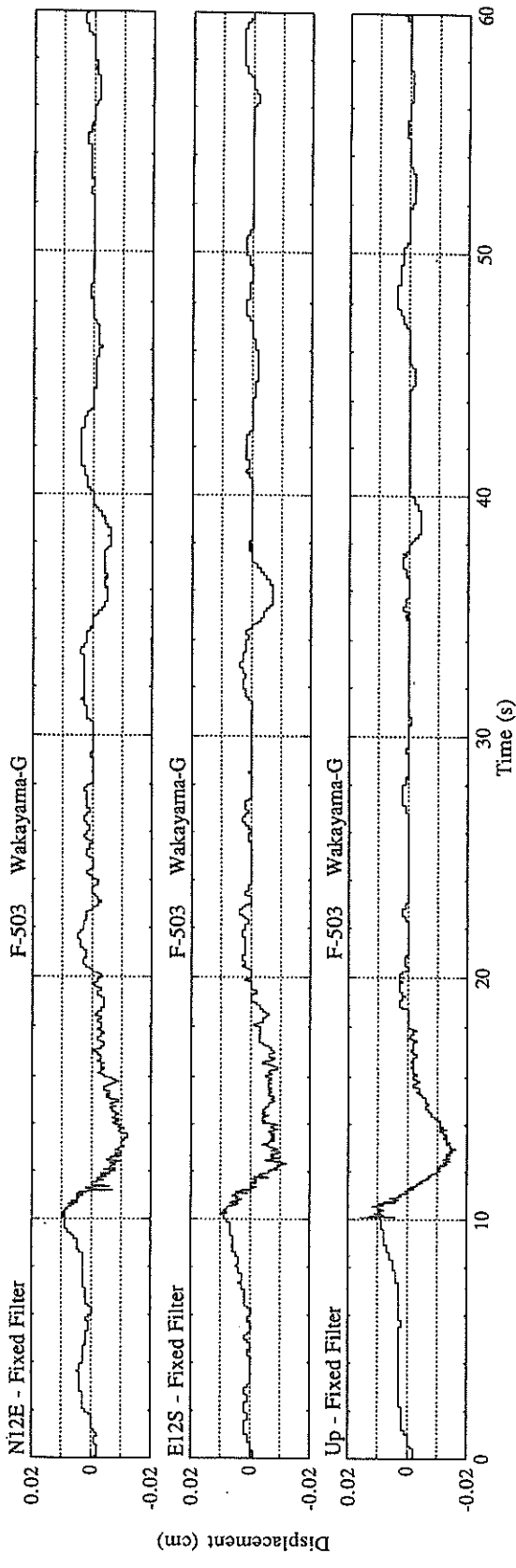
FIXED FILTER	0.01	0.01	0.02	0.01
VARIABLE FILTER	0.01	0.00	0.01	0.01

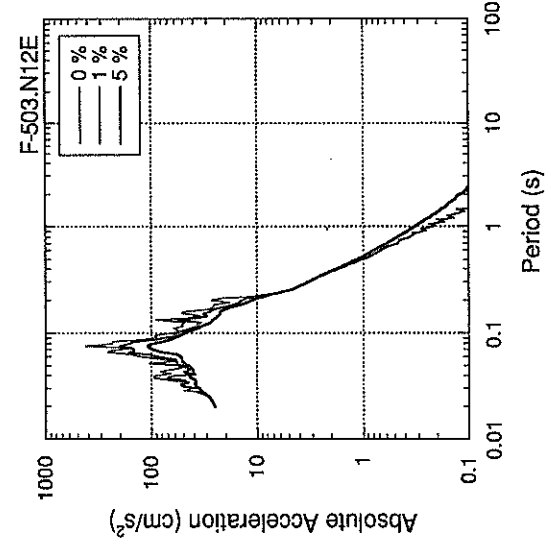
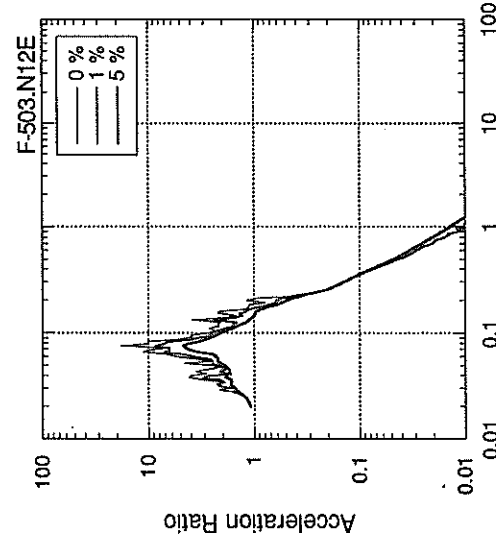
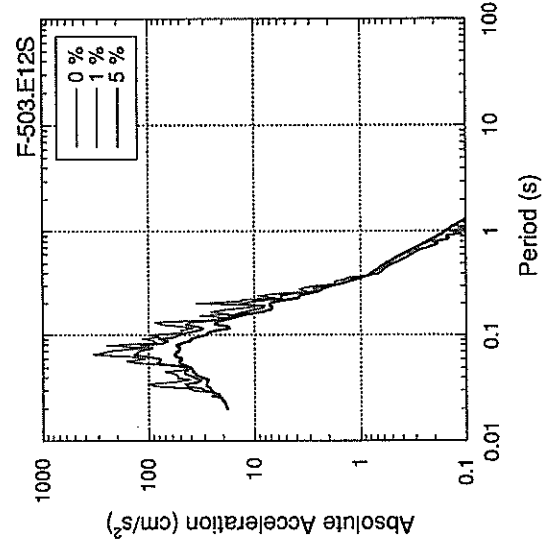
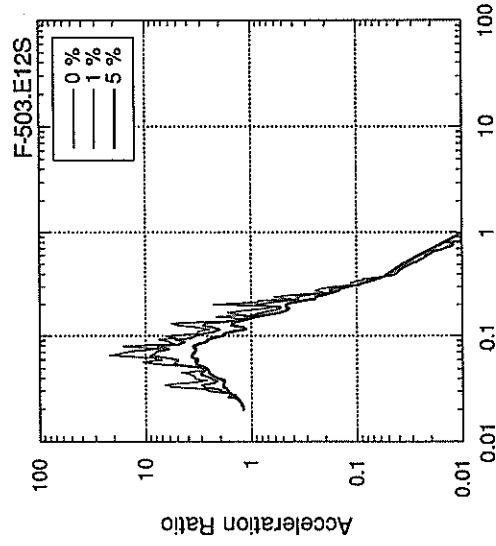
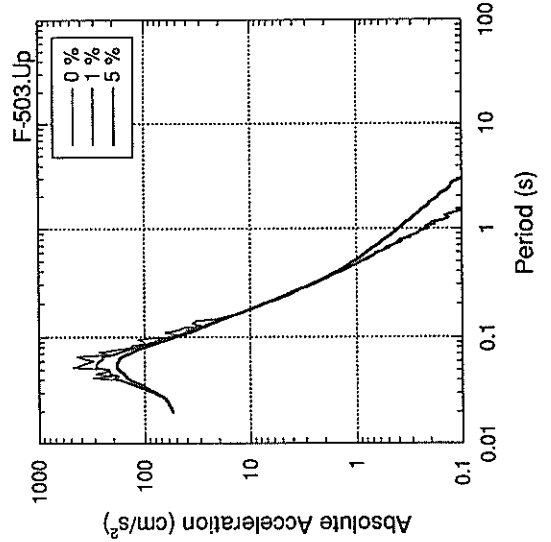
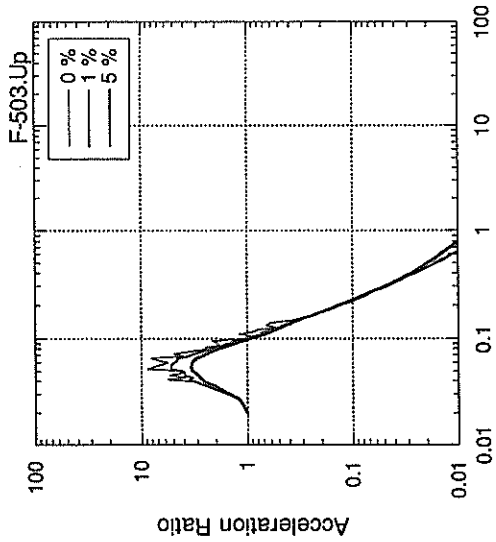
\* RESULTANT OF HORIZONTAL COMPONENTS

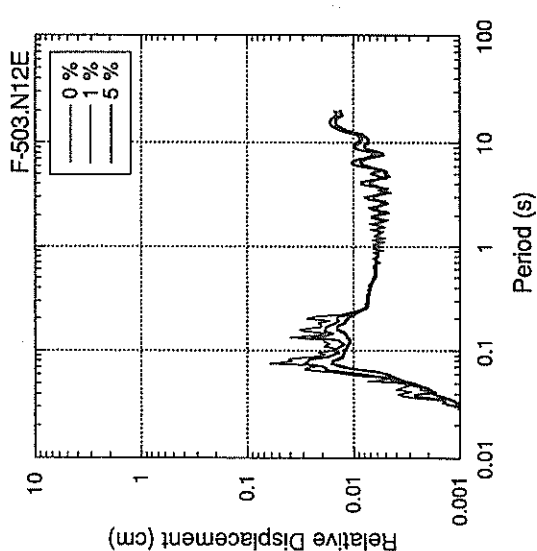
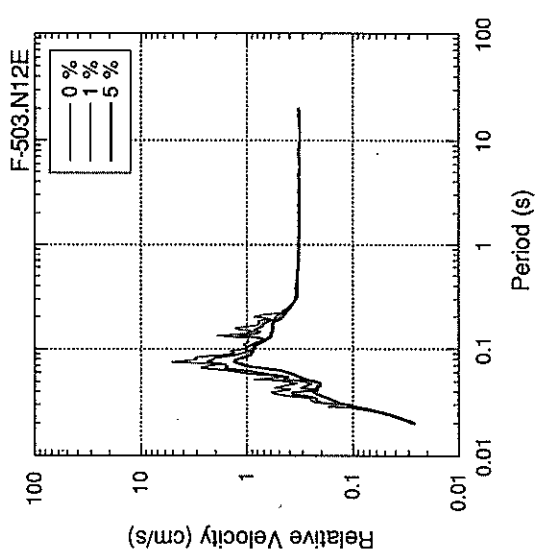
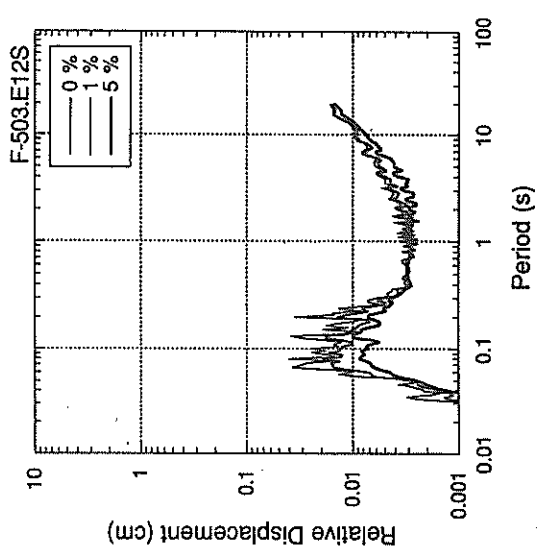
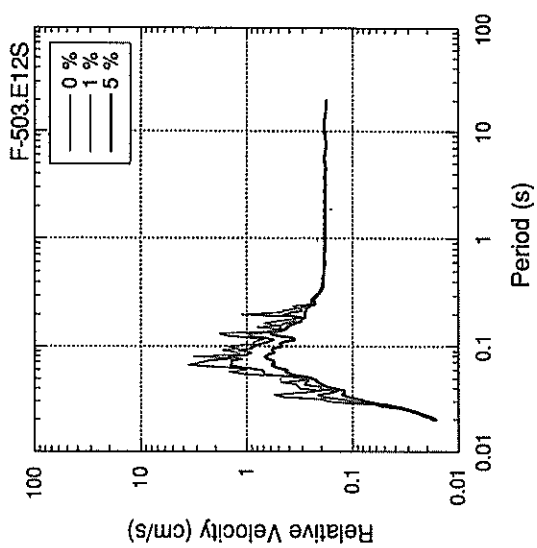
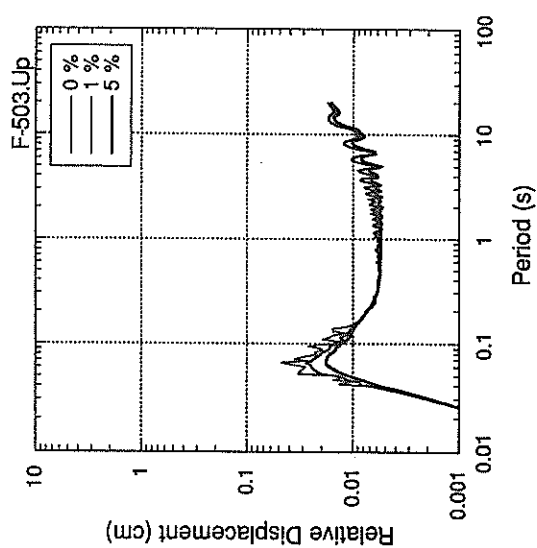
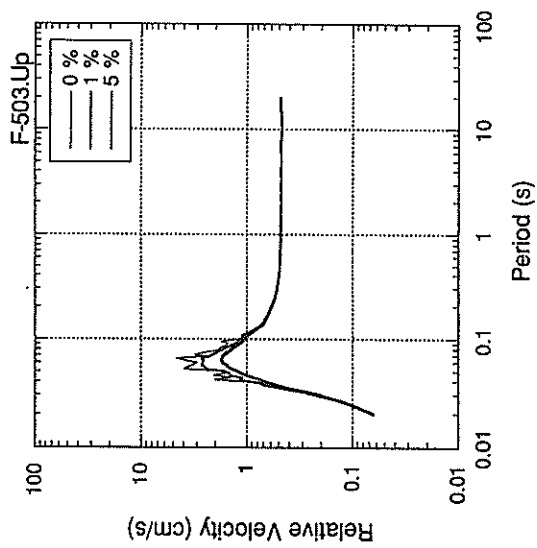




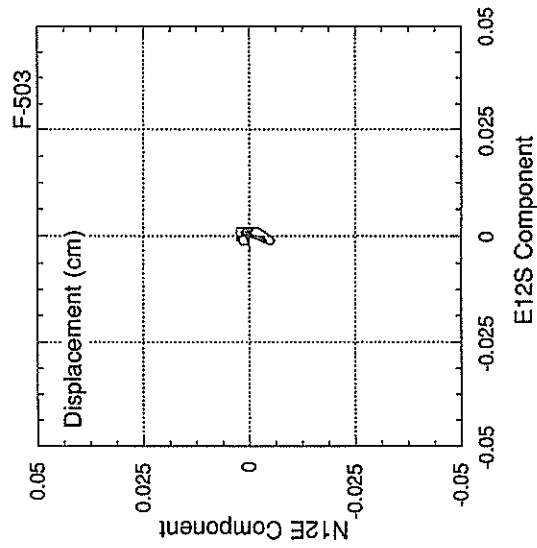
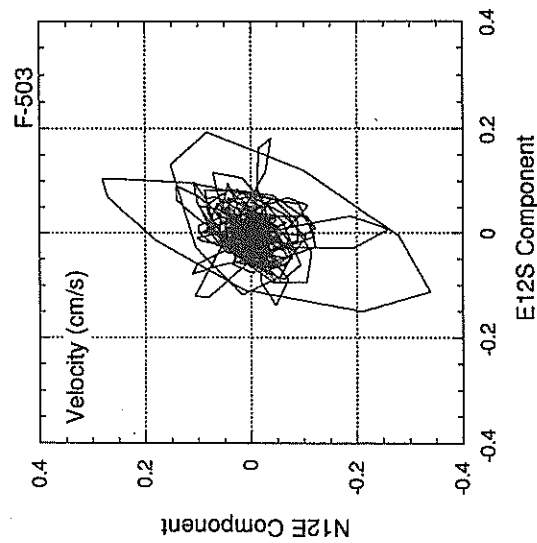
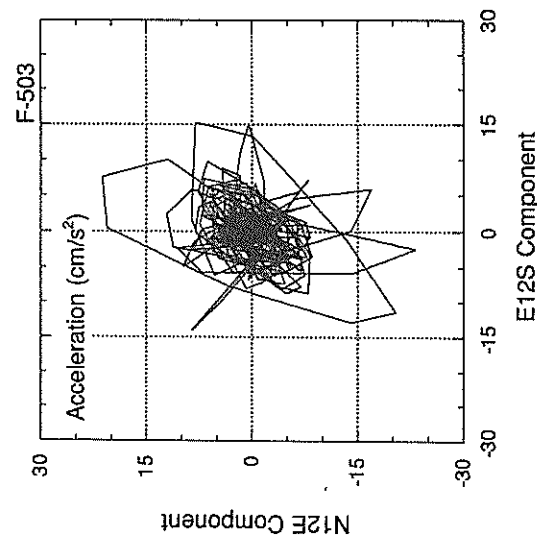
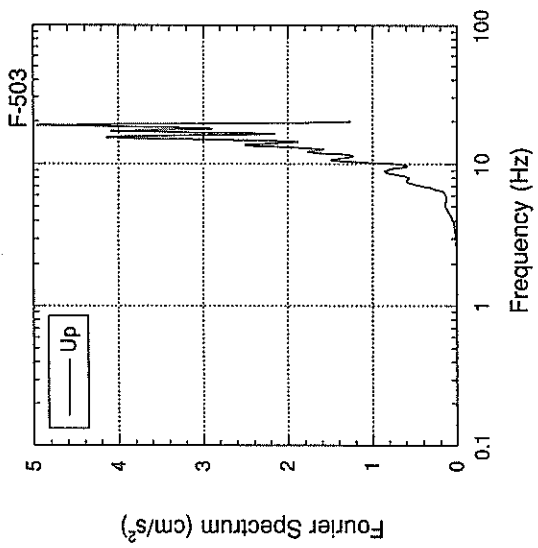
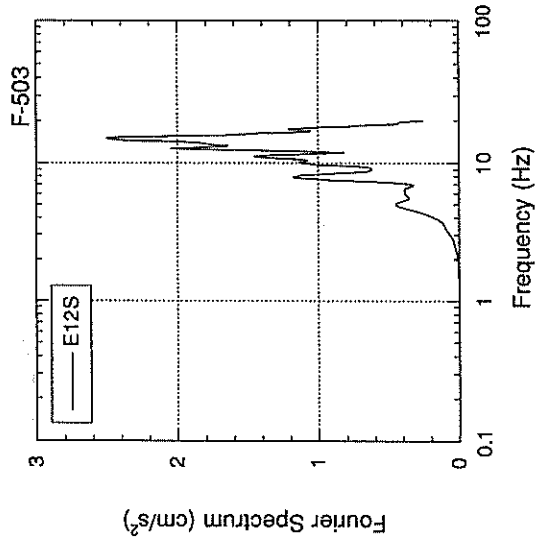
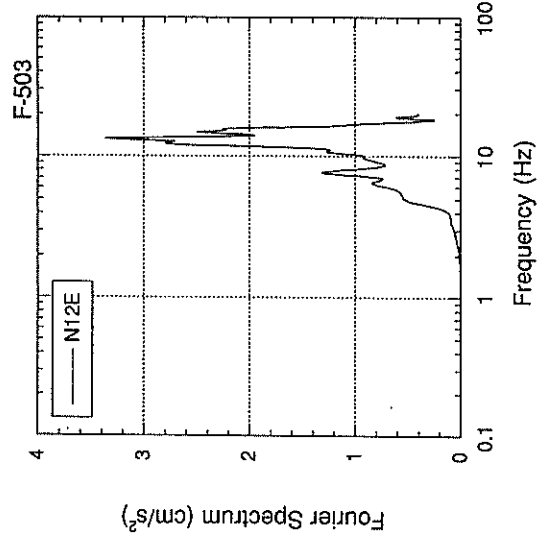












RECORD NUMBER : F-504  
 STATION : WAKAYAMA-G  
 EARTHQUAKE DATA

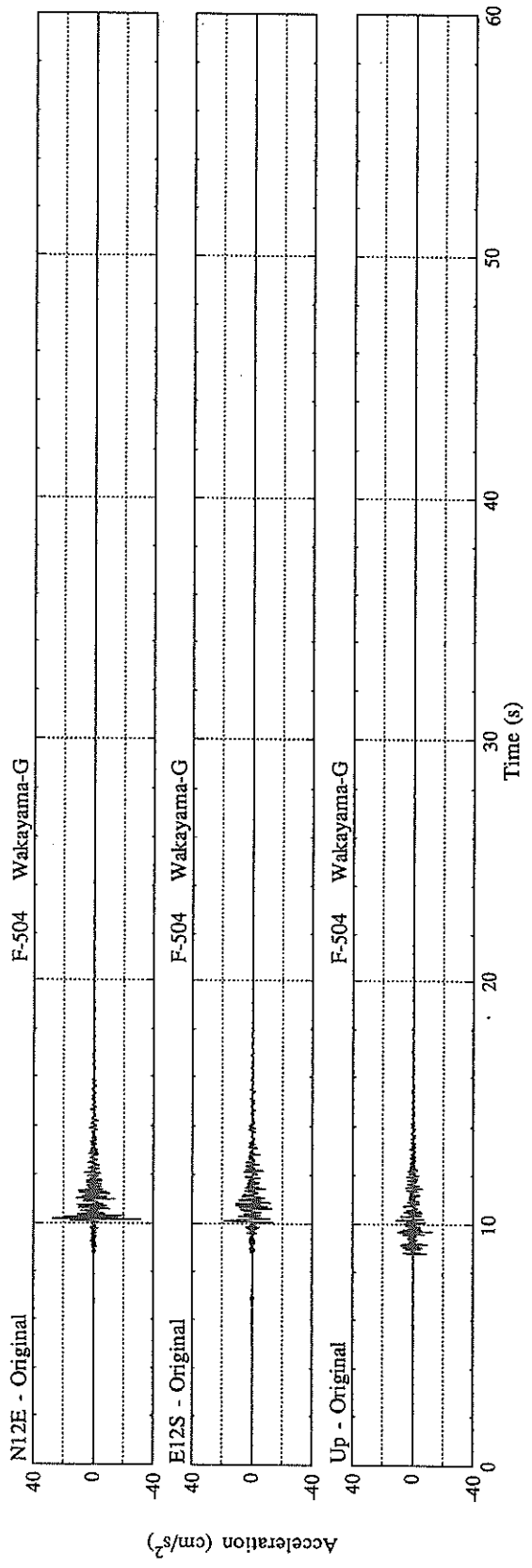
\*\*\*\*\*  
 DATE AND TIME : 0:57 OCT. 23, 1992  
 \*\*\*\*\*

LOCATION OF HYPOCENTER  
 EPICENTRAL REGION  
 LATITUDE 34° 13.3' N  
 LONGITUDE 135° 7.6' E  
 DEPTH 8.1KM  
 JMA MAGNITUDE 3.1

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

	N	S	E	W	U	D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)	31.5	18.9	13.0	31.8			

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-489  
 STATION : HITACHINAKA-F  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 23:41 OCT. 31, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION E OFF IBARAKI PREF

LATITUDE 36° 44.4' N

LONGITUDE 141° 12.4' E

DEPTH 44.6KM

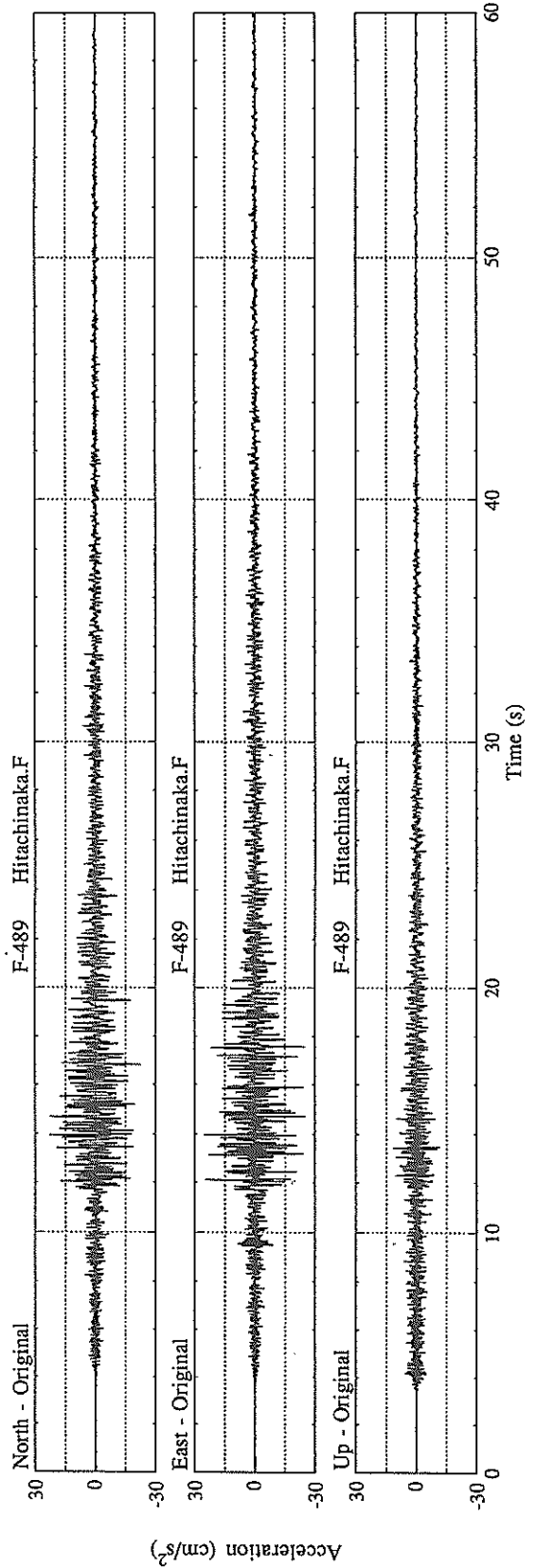
JMA MAGNITUDE 3.8

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 23.1 25.5 11.8 32.1  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-490  
 STATION : HITACHINAKA-F  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME

7:35 NOV. 6, 1992

LOCATION OF HYPOCENTER

NORTHERN IBARAKI PREF

EPICENTRAL REGION

36° 28.5' N

LONGITUDE

140° 36.5' E

DEPTH

52.2KM

JMA MAGNITUDE

4.1

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

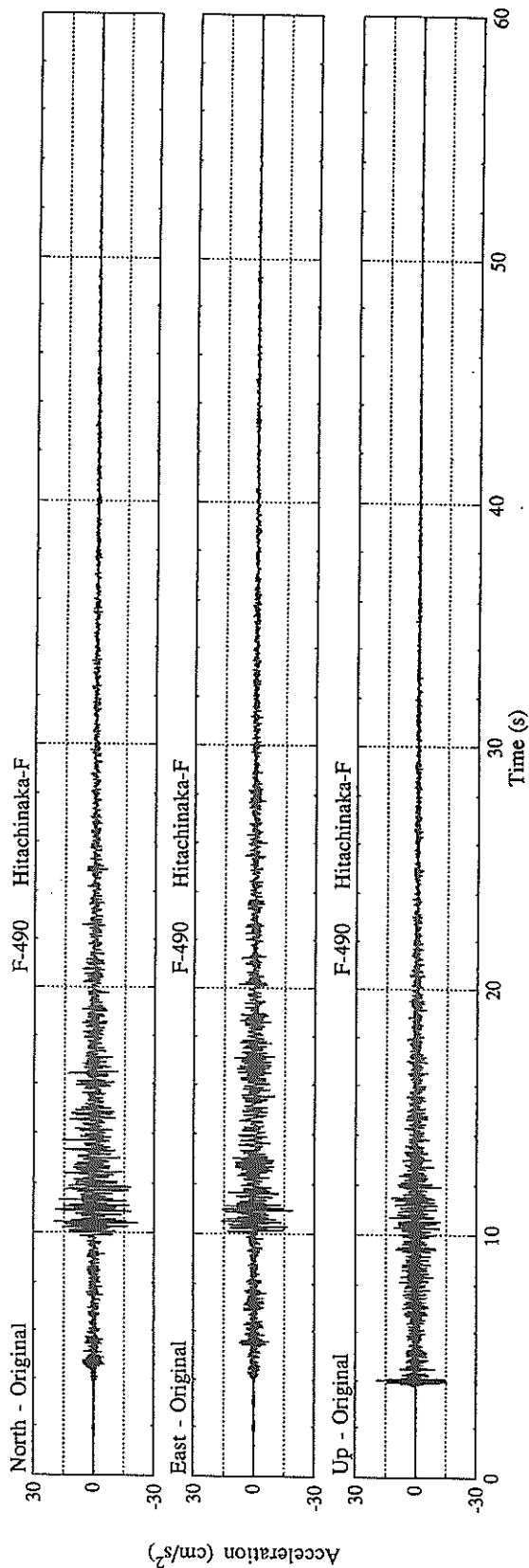
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N S E W U D HORIZONTAL\*

-----

ORIGINAL ACCELERATION (GAL) 21.8 19.2 19.5 22.9

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-500  
 STATION : KUSHIRO-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 9:20 NOV.30,1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION OFF NEMURO PENINSULA

LATITUDE 42°52.6' N

LONGITUDE 144°46.6' E

DEPTH 57.6KM

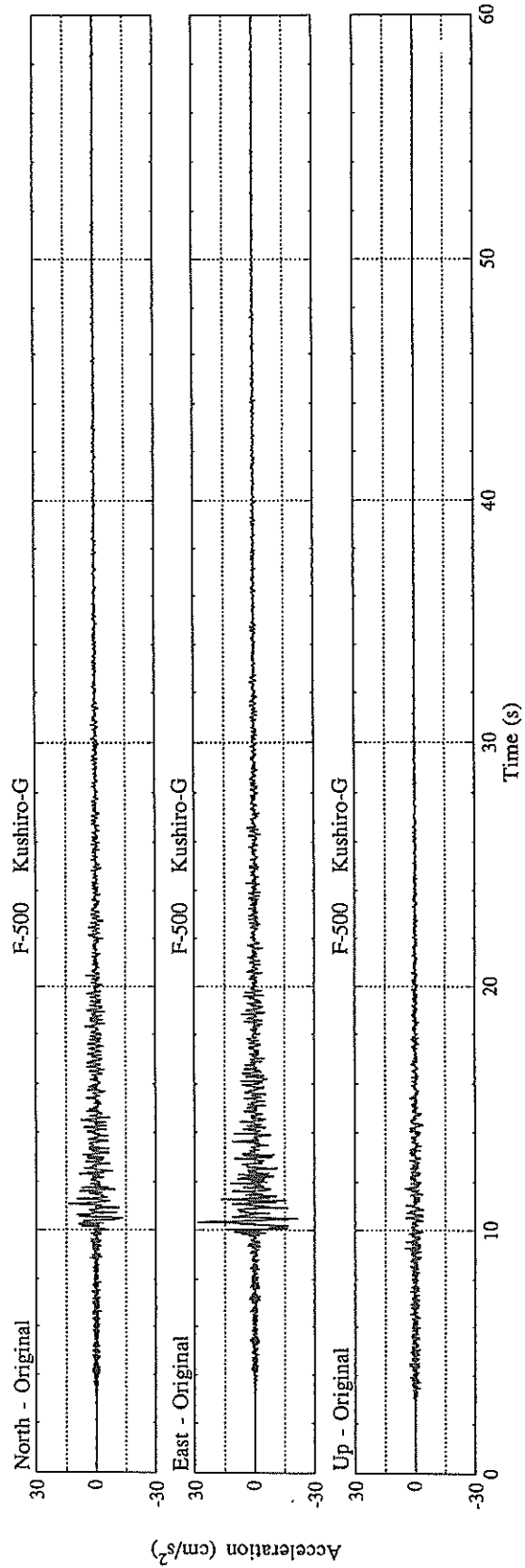
JMA MAGNITUDE 4.9

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----						
N	S	E	W	U	D	HORIZONTAL*
13.9	28.4	5.4	29.1			

ORIGINAL ACCELERATION (GAL)  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1424  
 STATION : OFUNATO-MOUND-M  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 1:21 DEC.28,1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION E OFF MIYAGI PREF

LATITUDE 38°55.5' N

LONGITUDE 142°33.0' E

DEPTH 33.5KM

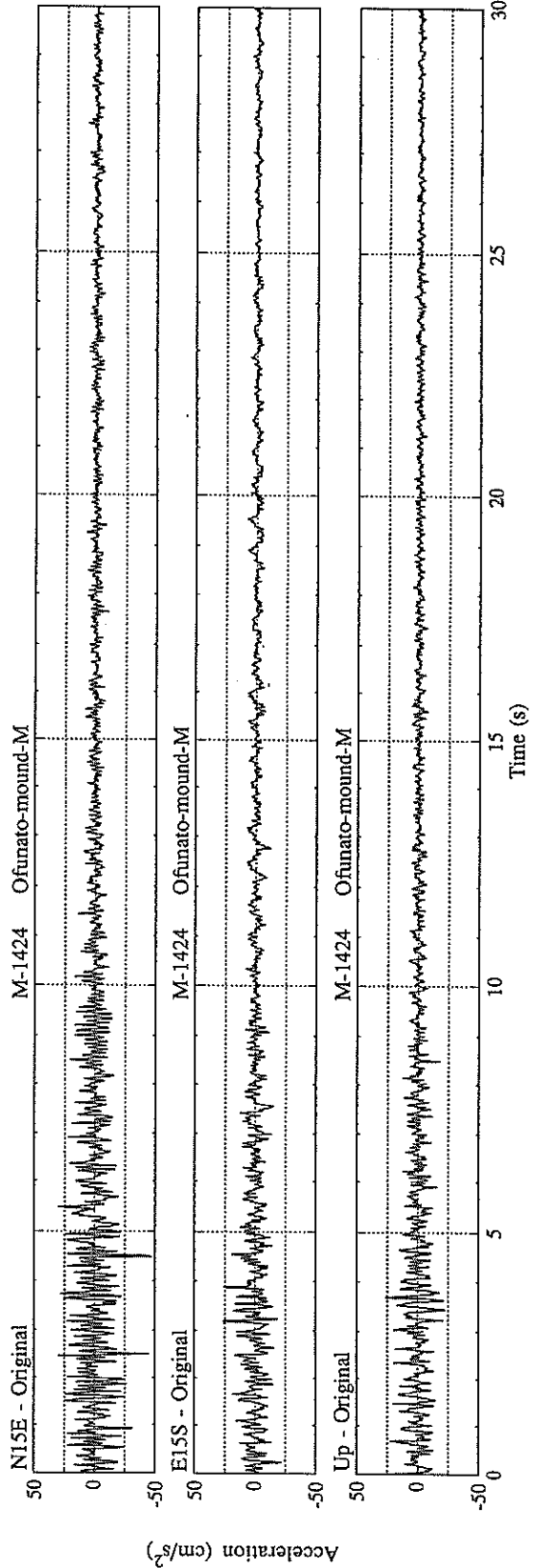
JMA MAGNITUDE 5.9

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 46.8 26.2 26.3 47.0  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1427  
 STATION : KAMAISHI-M  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 1:21 DEC. 28, 1992  
 \*\*\*\*\*

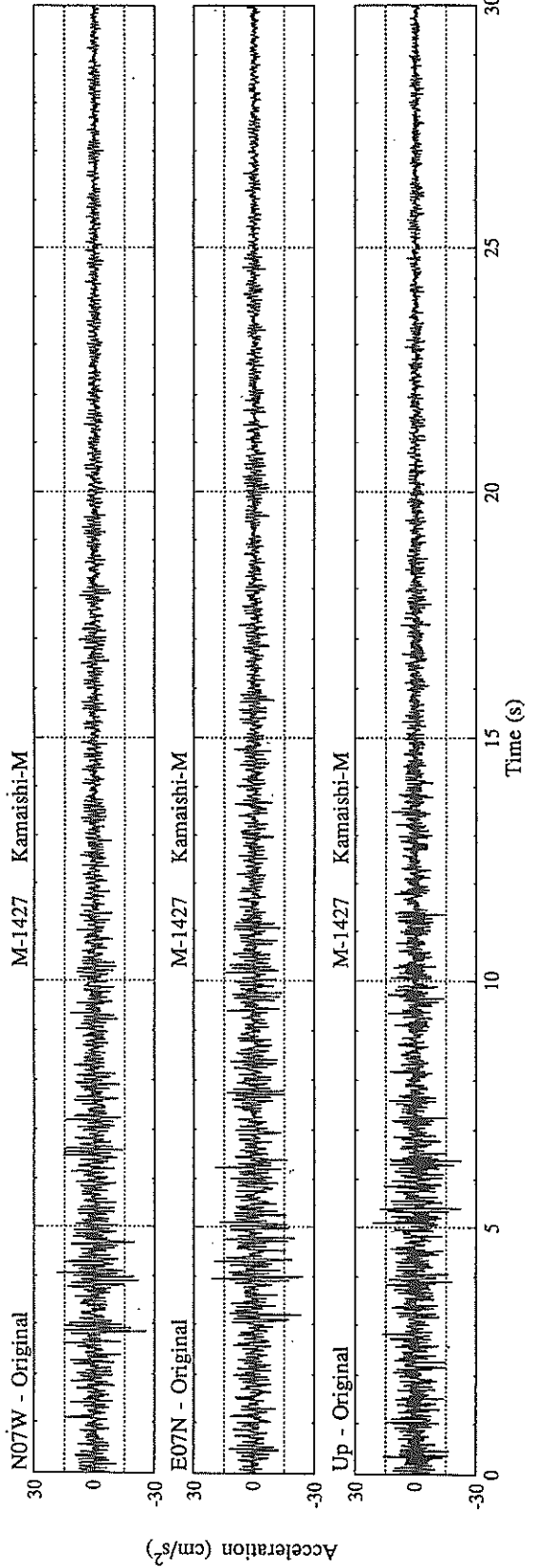
LOCATION OF HYPOCENTER

EPICENTRAL REGION : E OFF MIYAGI PREF  
 LATITUDE : 38° 55.5' N  
 LONGITUDE : 142° 33.0' E  
 DEPTH : 33.5KM  
 JMA MAGNITUDE : 5.9

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL)      25.3    24.0    22.1    28.8  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1437  
 STATION : SENDAI-M  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 1:21 DEC. 28, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION E OFF MIYAGI PREF

LATITUDE 38° 55.5' N

LONGITUDE 142° 33.0' E

DEPTH 33.5KM

JMA MAGNITUDE 5.9

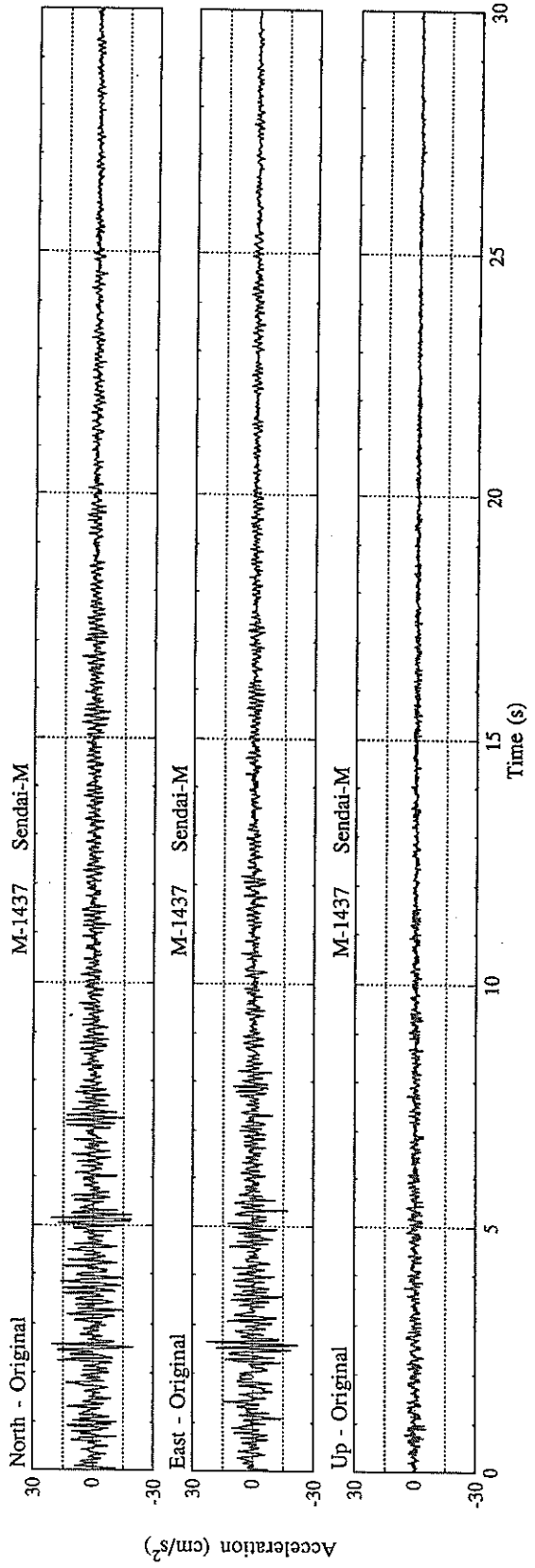
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 20.9 22.7 5.3 29.9

\* RESULTANT OF HORIZONTAL COMPONENTS





RECORD NUMBER : S-2479  
 STATION : OFUNATO-BO-S  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 16:26 DEC. 31, 1992

LOCATION OF HYPOCENTER

EPICENTRAL REGION E OFF MIYAGI PREF

LATITUDE 38° 55.9' N

LONGITUDE 142° 35.9' E

DEPTH 29.8KM

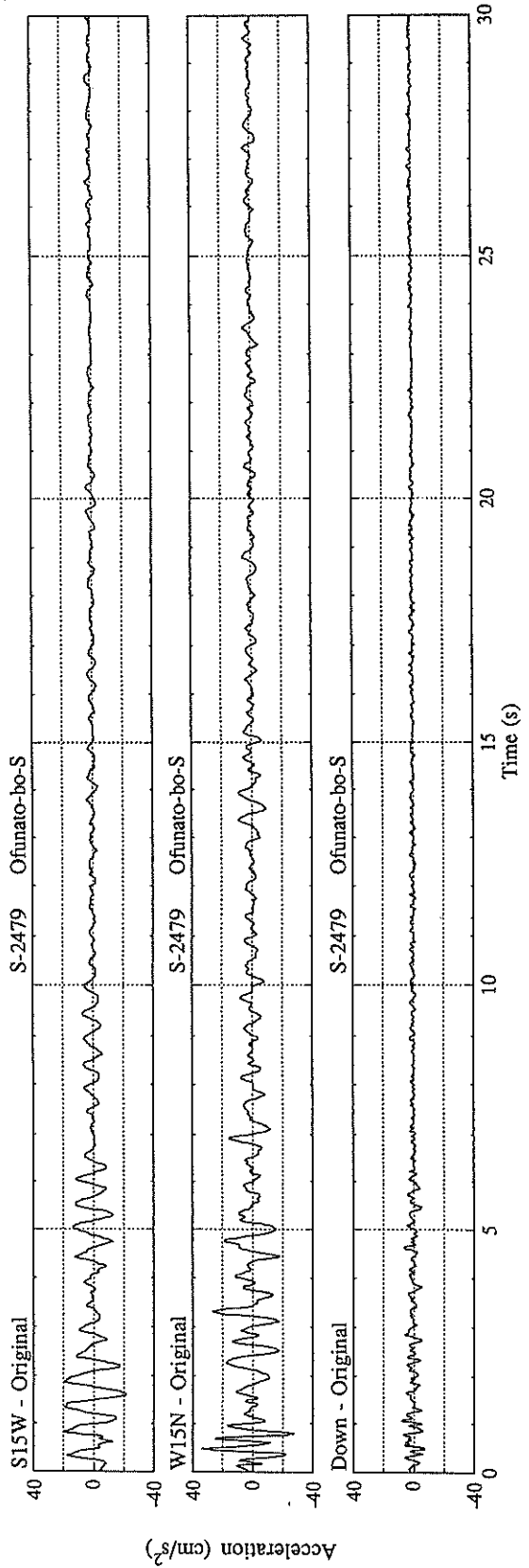
JMA MAGNITUDE 5.8

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

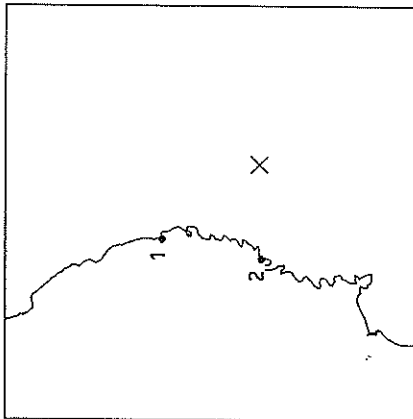
ORIGINAL ACCELERATION (GAL) 21.6 34.1 8.0 34.2  
 \* RESULTANT OF HORIZONTAL COMPONENTS



## Strong-Motion Earthquake Observation Results (1993)

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

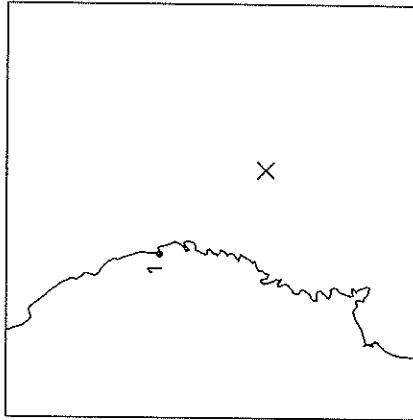
10:31 JAN. 5, 1993  
 E OFF MIYAGI PREF  
 EPICENTER : 38°57.9'N 142°31.7'E  
 DEPTH : 29.2KM MAGNITUDE : 4.7  
 JMA INTENSITIES  
 III : OFUNATO-MORIOKA  
 II : MIYAKO,ISHINOWAKI  
 I : HACHINOHE



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EH) (UD)	MAX. ACC. (GAL) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F-502	11 11 5	5 5	89
2 OFUNATO-MOUND-H	ON STRUC.	M-1449	5 3 5	5 5	68

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

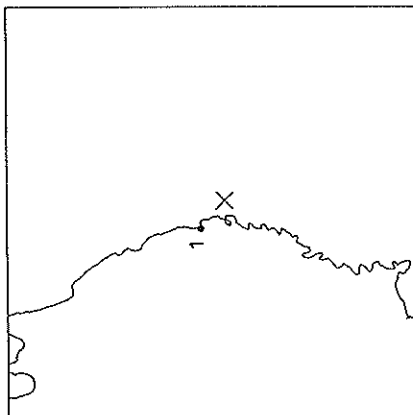
13:01 JAN. 9, 1993  
 E OFF MIYAGI PREF  
 EPICENTER : 38°53.9'N 142°36.0'E  
 DEPTH : 33.9KM MAGNITUDE : 5.0  
 JMA INTENSITIES  
 III : MORIOKA  
 II : OFUNATO,ISHINOWAKI,  
 HACHINOHE  
 I : MIYAKO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EH) (UD)	MAX. ACC. (GAL) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F-511	8 8 4	8 4	98

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

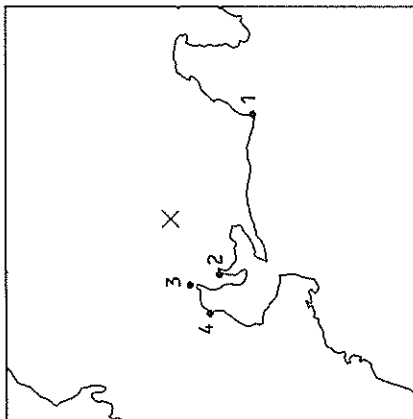
20:35 JAN. 12, 1993 JMA INTENSITIES  
 E OFF IWATE PREF II : MIYAKO  
 EPICENTER : 39°28.2'N 142°11.2'E I : OFUNATO  
 DEPTH : 21.2KM MAGNITUDE : 3.7



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F-512	25 11 8	26

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

09:58 JAN. 11, 1993 JMA INTENSITIES  
 NE AICHI PREF III : NAGOYA-YOKKAICHI  
 EPICENTER : 35°11.1'N 137°24.8'E II : GIFU/SHIZUOKA-FUKUI  
 DEPTH : 56.1KM MAGNITUDE : 4.8 I : OMAEZAKI



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	DIST. (KM)
1 OMAEZAKI-M	ON GROUND	M-1440	3 4 2	97
2 KINUURA-JI-S	ON GROUND	S-2484	12 13 8	54
3 INAE-SAMBASHI-M	ON STRUC.	M-1452	29	50
3 INAE-S	ON STRUC.	S-2495	4 6 3	51
3 INAE-YAITA-M	ON STRUC.	M-1453	15	51
3 NAGOYA-ZOKAN-S	ON GROUND	S-2496	4 7 4	51
4 YOKKA--DAI2-M	ON STRUC.	M-1442	9 2	74
4 YOKKA.--CHITOSE-S	ON GROUND	S-2485	9 12 6	75
4 YOKKA.--SEKITAN-M	ON STRUC.	M-1441	9 37	75

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

10:31 JAN. 13, 1993

E OFF MIYAGI PREF

EPICENTER : 38°53.7'N 142°34.3'E

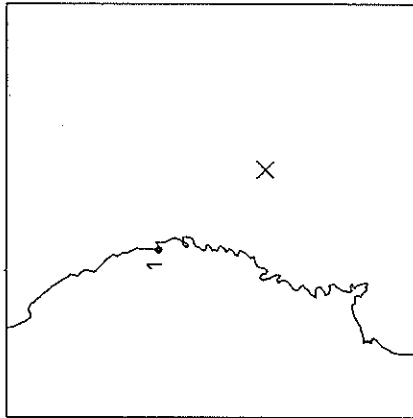
DEPTH : 33.5KM MAGNITUDE : 5.4

JMA INTENSITIES

III : OFUNATO, MIYAKO

II : ISHINOWAKI, MORIOKA

I : SENDAI, HACHINOHE, SAKATA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F- 513	14 9 5	97

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

20:06 JAN. 15, 1993

SE OFF TOKACHI

EPICENTER : 42°53.5'N 144°22.4'E

DEPTH : 103.2KM MAGNITUDE : 7.8

JMA INTENSITIES

VI : KUSHIRO

V : HIROO, OBIHIRO, URAKAWA,

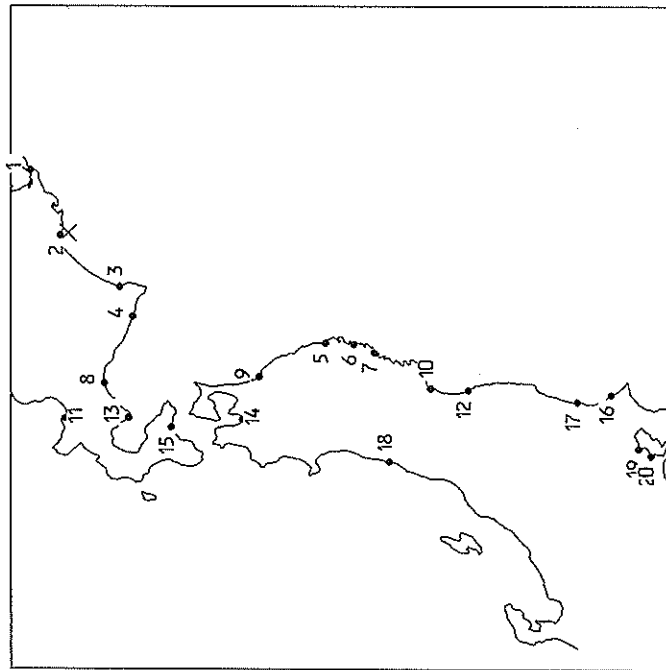
HACHINOHE

IV : NEMURO, TOMAKOMAI, OTARU,

MURORAN, HAKODATE

III : AKITA, SAKATA, SENDAI,

TOKYO, YOKOHAMA

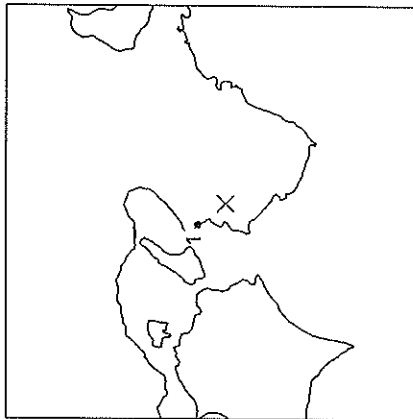


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	MAX. ACC. (GAL)	DIST. (KM)
1 HANASAKI-F	ON GROUND	F- 510	149 163 93		107
2 KUSHIRO-G	ON GROUND	F- 507	469 344 382		11
2 KUSHIRO-GB	IN GROUND	F- 506	204 262 122		11
3 TOKACHI-M	ON GROUND	M-1443	411 318 222		108
4 URAKAWA-S	ON GROUND	S-2490	174 133 48		153
5 MIYAKO-G	ON GROUND	F- 514	83 89 38		412
6 KAMAISHI-MB	IN GROUND	M-1448	17 14 16		452
6 KAMAISHI-M	ON GROUND	M-1447	27 31 19		452
7 OFUNATO-MOUND-M	ON STRUC.	M-1450	48 48 23		484
8 TOMAKOMAI-S	ON GROUND	S-2491	78 52 19		226
9 HACHINOHE-JI-S	ON GROUND	S-2486	93 70 27		353
10 SHIOGAMA-KOJOYO-S	ON GROUND	S-2493	23 18		581
11 OTARU-G	ON GROUND	F- 536	14 13 8		272
10 SENDAI-MB	IN GROUND	M-1446	7 6 4		585
10 SENDAI-M	ON GROUND	M-1445	24 20 8		585
12 SOMA-S	ON GROUND	S-2487	19 17 5		632
13 MURORAN-G	ON GROUND	F- 505	110 140 51		286
14 AOMORI-S	ON GROUND	S-2488	38 41 16		377
15 HAKODATE-FR	ON STRUC.	F- 509	47 37 22		323
15 HAKODATE-FB	IN GROUND	F- 508	33 19 14		323
15 HAKODATE-M	ON GROUND	M-1444	56 48 28		323
16 KASHIMA-ZOKAN-S	ON GROUND	S-2492	9 10 4		835
17 HITACHINAKA-F	ON GROUND	F- 525	22 20 9		791
18 SAKATA-S	ON GROUND	S-2489	8 4		582
19 SHINAGAWA-MB	IN GROUND	M-1451	2 3 2		900
19 SHINAGAWA-S	ON GROUND	S-2494	9 8 3		900
20 KEIHIH-JI-S	ON GROUND	S-2499	6 6 3		921

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

18:37 JAN. 18, 1993  
 NW WAKAYAMA PREF  
 EPICENTER : 34°1.8 'N 135°18.8'E  
 DEPTH : 10.4KM MAGNITUDE : 4.3

JMA INTENSITIES  
 II : WAKAYAMA

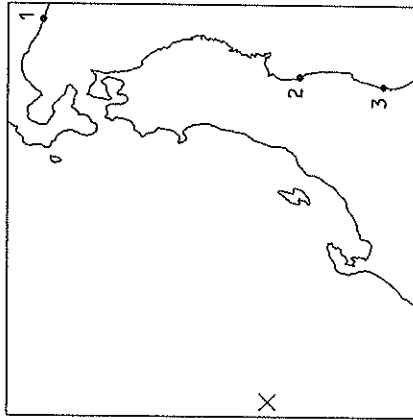


STATION	CONDITION	RECORD NUMBER	MAX.ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F- 626	16 17 10	25

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

23:39 JAN. 19, 1993  
 SEA OF JAPAN  
 EPICENTER : 38°37.3'N 133°52.1'E  
 DEPTH : 488.8KM MAGNITUDE : 6.9

JMA INTENSITIES  
 III : ONAHAMA  
 II : MITO  
 I : KANAZAWA, FUKUI

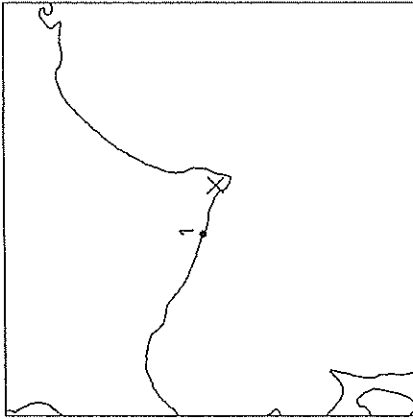
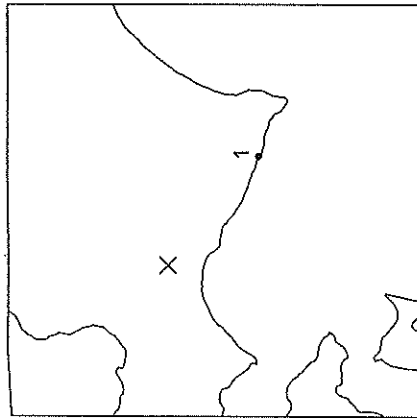


STATION	CONDITION	RECORD NUMBER	MAX.ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2497	1 1 1	850
2 SOMA-S	ON GROUND	S-2498	2 1 2	625
3 HITACHINAKA-F	ON GROUND	F- 526	5 5 2	644

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

00:25 JAN. 28, 1993  
 ISHIKARI DEPRESSION  
 EPICENTER : 42°50.3'N 141°53.6'E  
 DEPTH : 147.7KM MAGNITUDE : 4.6

18:45 FEB. 1, 1993  
 HIDAKA MOUNTAINS REGION  
 EPICENTER : 42°2.7'N 143°11.4'E  
 DEPTH : 60.8KM MAGNITUDE : 4.6



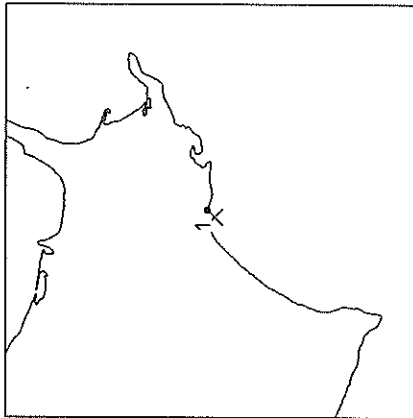
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2500	2 1 1	104

STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2501	7 4 3	36



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

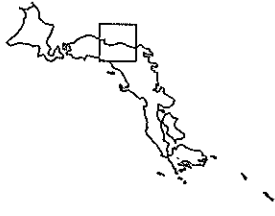
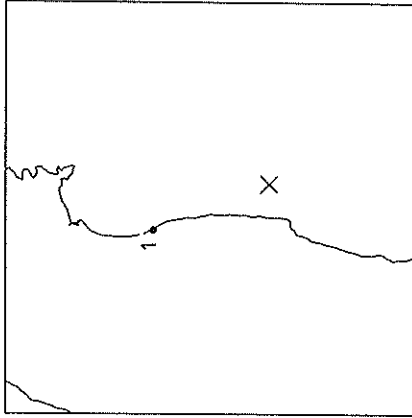
23:43 FEB. 4, 1993  
 KUSHIRO REGION  
 JMA INTENSITIES  
 III : KUSHIRO  
 II : OBIHIRO-HIROO  
 I : URAKAWA,HACHINOHE  
 EPICENTER : 42°57.2'N 144°16.9'E  
 DEPTH : 94.7KM MAGNITUDE : 4.9



STATION	CONDITION	RECORD NUMBER	MAX.-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 KUSHIRO-G	ON GROUND	F- 528	19 17 7	7
1 KUSHIRO-GB	IN GROUND	F- 527	8 9 2	7

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

02:54 FEB. 6, 1993  
 E OFF FUKUSHIMA PREF  
 JMA INTENSITIES  
 II : ONAHAMA,FUKUSHIMA  
 I : SENDAI  
 EPICENTER : 37°2.5 'N 141°15.4'E  
 DEPTH : 52.4KM MAGNITUDE : 4.6



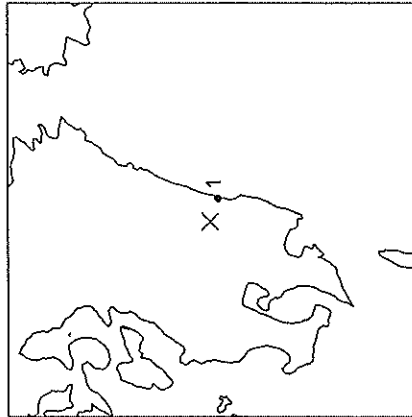
STATION	CONDITION	RECORD NUMBER	MAX.-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SOMA-S	ON GROUND	S-2503	6 5 2	91

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

03:32 FEB. 6 /1993  
 SOUTHERN MIYAZAKI PREF  
 EPICENTER : 31°57.0'N 131°17.1'E  
 DEPTH : 12.8KM MAGNITUDE : 4.1

JMA INTENSITIES

II : MIYAZAKI  
 I : OIITA



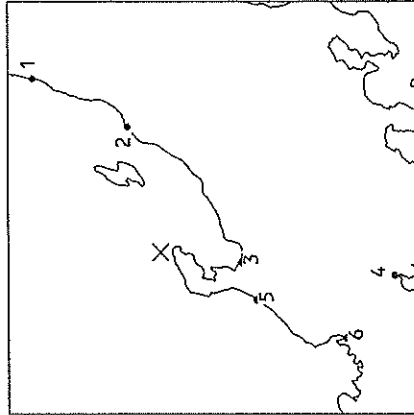
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	MAX. ACC. (GAL)	DIST. (KM)
1 MIYAZAKI-M	ON GROUND	M-1454	21 18 16	17	17

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

22:27 FEB. 7 /1993  
 OFF NOTO PENINSULA  
 EPICENTER : 37°39.2'N 137°18.0'E  
 DEPTH : 24.8KM MAGNITUDE : 6.6

JMA INTENSITIES

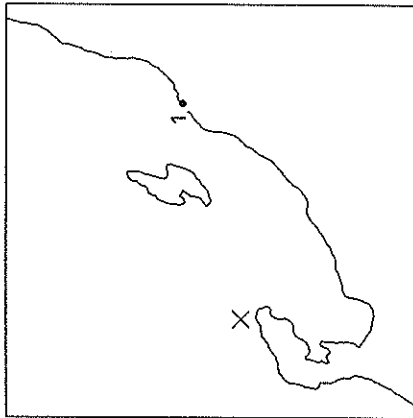
IV : TOYAMA-KANAZAWA  
 III : NIIGATA-FUKUI  
 II : SAKATA-MORIOKA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	MAX. ACC. (GAL)	DIST. (KM)
1 SAKATA-S	ON GROUND	S-2505	3 2 1	262	262
2 NIIGATA-G	ON GROUND	F-524	23 23 11	158	158
3 TOYAMA-S	ON GROUND	S-2502	78 66 12	99	99
4 INAE-SANBASHI-M	ON STRUC.	M-1455	6 25	289	289
4 INAE-S	ON STRUC.	S-2508	6 8 4	289	289
5 KANAZAWA-S	ON GROUND	S-2506	60 74 11	130	130
6 TSURUGA-S	ON GROUND	S-2504	6 6 2	248	248

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

01:51 FEB. 16, 1993  
 OFF NOTO PENINSULA  
 EPICENTER : 37°37.7'N 137°16.4'E  
 DEPTH : 24.1KM MAGNITUDE : 5.0

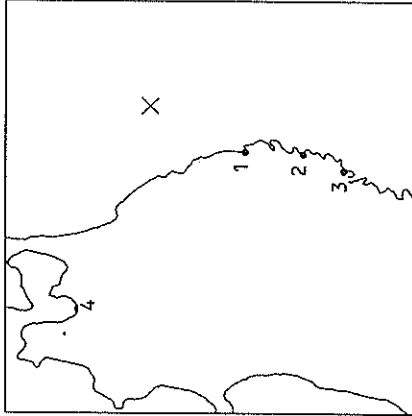


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 NIIGATA-G	ON GROUND	F- 578	4 4 1	161

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

18:27 FEB. 25, 1993  
 NE OFF IWATE PREF  
 EPICENTER : 40°14.1'N 142°26.8'E  
 DEPTH : 28.4KM MAGNITUDE : 5.9

JMA INTENSITIES  
 III : MIYAKO, MORIOKA, OFUNATO  
 II : HACHINOHE, ISHINOMAKI, SENDAI  
 I : AKITA, SAKATA, ONAHAMA

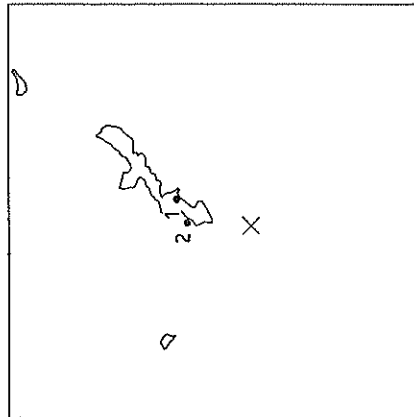


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F- 580	44 40 18	77
2 KAMAISHI-MB	IN GROUND	M-1457	6 7 5	116
3 KAMAISHI-M	ON GROUND	M-1456	7 10 7	116
3 OFUNATO-MOUND-M	ON STRUC.	M-1458	17 15 13	148
3 OFUNATO-BO-S	ON STRUC.	S-2510	8 8 5	148
4 AOMORI-S	ON GROUND	S-2507	5 6 2	157

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

01:52 MAR. 2, 1993  
 NEAR OKINAWAJIMA ISLAND  
 EPICENTER : 25°49.4'N 127°40.3'E  
 DEPTH : 52.0KM MAGNITUDE : 4.7

JMA INTENSITIES  
 II : NAHA

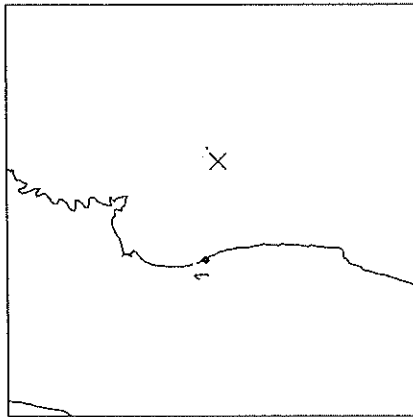


STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 NAKAGUSUKU-G	ON GROUND	F- 535	6 5 6	58
2 NAHA-G	ON GROUND	F- 614	7 5 4	47
2 NAHA-GB	IN GROUND	F- 613	4 4 3	47

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

09:36 MAR. 7, 1993  
 E OFF FUKUSHIMA PREF  
 EPICENTER : 37°41.4'N 141°45.3'E  
 DEPTH : 79.6KM MAGNITUDE : 5.1

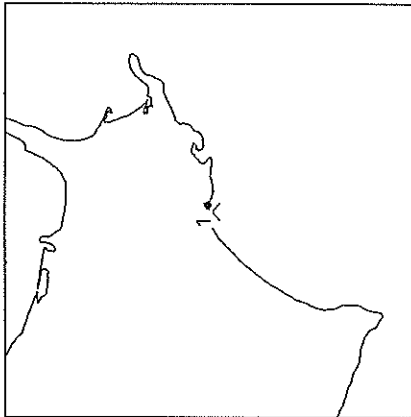
JMA INTENSITIES  
 II : ISHINOMAKI, SENDAI,  
 ONAHAMA, OFUNATO



STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SOMA-S	ON GROUND	S-2509	8 11 6	71

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

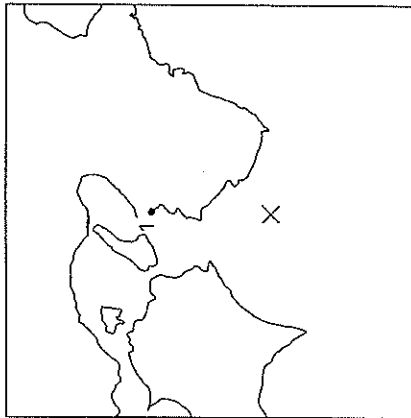
01:27 MAR. 12, 1993  
 KUSHIRO REGION  
 JMA INTENSITIES  
 III : KUSHIRO  
 I : NEMURO  
 EPICENTER : 42°58.7'N 144°17.8'E  
 DEPTH : 95.2KM MAGNITUDE : 4.3



STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 KUSHIRO-G	ON GROUND	F- 530	10 13 4	5
1 KUSHIRO-GB	IN GROUND	F- 529	7 7 1	5

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

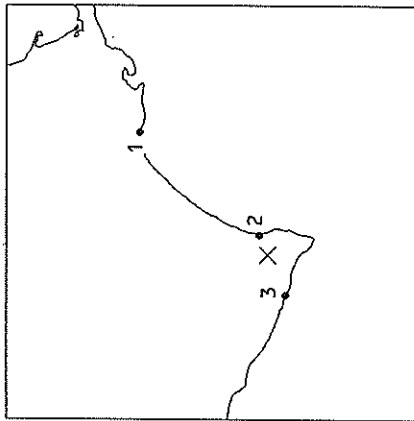
09:46 MAR. 14, 1993  
 S OFF KII PENINSULA  
 JMA INTENSITIES  
 II : TOKUSHIMA, NARA  
 I : WAKAYAMA, YOKKAICHI  
 EPICENTER : 33°25.3'N 135°6.3 'E  
 DEPTH : 47.0KM MAGNITUDE : 5.1



STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F- 627	13 11 6	88

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

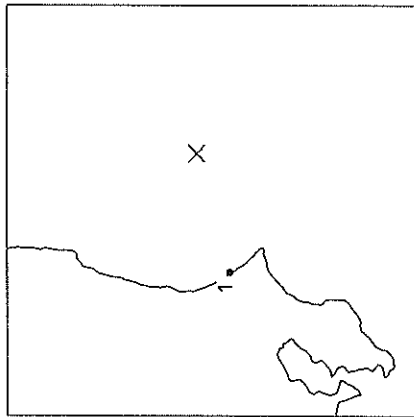
12:35 MAR. 15, 1993 JMA INTENSITIES  
 HIDAKA MOUNTAINS REGION  
 EPICENTER : 42°15.2'N 143°8.4 'E  
 DEPTH : 64.0KM MAGNITUDE : 5.1  
 III : HIROO,URAKAWA,KUSHIRO  
 II : OBIHIRO  
 I : TOMAKOMAI,OTARU,NEMURO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 KUSHIRO-G	ON GROUND	F- 532	5 6 2	129
1 KUSHIRO-GB	IN GROUND	F- 531	3 3 1	129
2 TOKACHI-M	ON GROUND	M-1459	53 72 26	15
3 URAKAWA-S	ON GROUND	S-2511	21 16 4	31

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

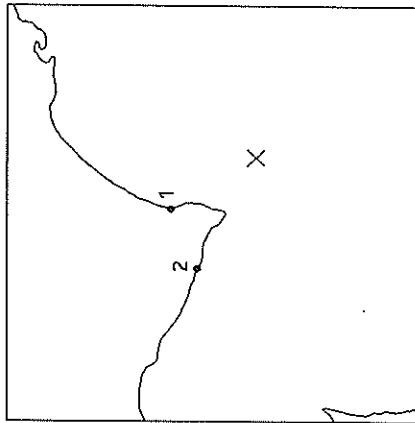
14:59 MAR. 19, 1993 JMA INTENSITIES  
 FAR E OFF IBARAKI PREF  
 EPICENTER : 36°4.9 'N 141°40.3'E  
 DEPTH : 38.0KM MAGNITUDE : 5.7  
 II : ONAHAMA,CHIBA  
 I : TOKYO,YOKOHAMA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 KASHIMA-ZOKAN-S	ON GROUND	S-2512	14 12 6	89

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

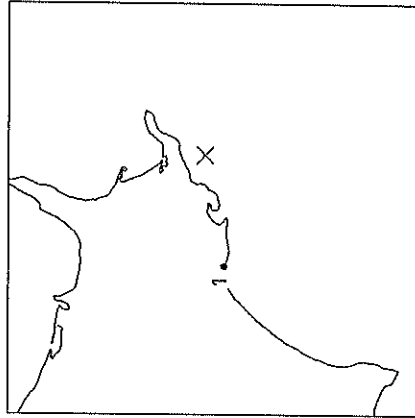
16:08 MAR. 25, 1993  
 SE OFF ERIMOMISAKI  
 JMA INTENSITIES  
 III : HIROO, URAKAWA  
 II : OBIHIRO, KUSHIRO  
 I : TOMAKOMAI, HAKODATE,  
 OTARU



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 TOKACHI-M	ON GROUND	M-1460	15 15 7	72
2 URAKAWA-S	ON GROUND	S-2513	6 5 3	91

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

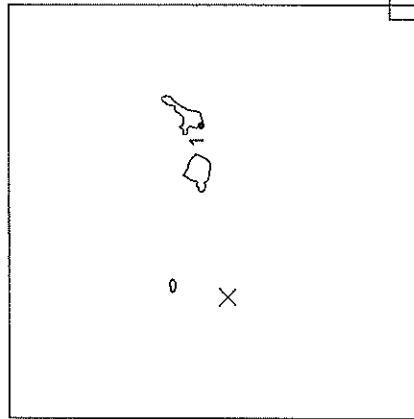
06:43 MAR. 31, 1993  
 OFF NEMURO PENINSULA  
 JMA INTENSITIES  
 III : NEMURO, KUSHIRO  
 I : OBIHIRO, HIROO, URAKAWA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 KUSHIRO-G	ON GROUND	F-534	12 11 4	81
1 KUSHIRO-GB	IN GROUND	F-533	5 5 2	81

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

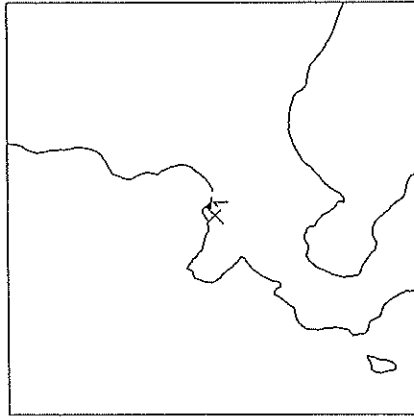
12:36 MAR. 31, 1993  
 NEAR ISHIGAKIJIMA ISLAND  
 EPICENTER : 23°31.3'N 123°42.8'E  
 DEPTH : 56.1KM MAGNITUDE : 4.9



STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 ISHIGAKI-G	ON GROUND	F- 641	7 8 3	100

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

06:31 APR. 1, 1993  
 SHIRIBESHI REGION  
 EPICENTER : 43°9.7 'N 140°56.5'E  
 DEPTH : 10.8KM MAGNITUDE : 2.8

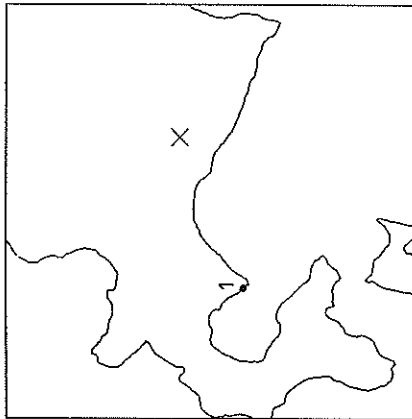


STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 OTARU-G	ON GROUND	F- 537	22 44 18	8



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

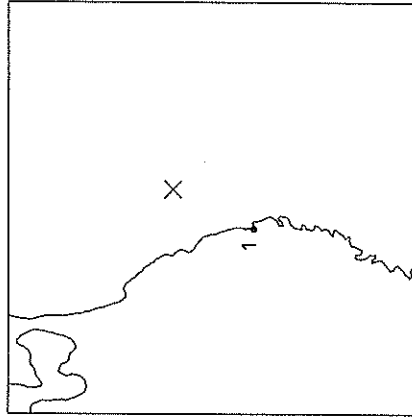
19:33 APR. 11, 1993  
 HIDAKA REGION  
 JMA INTENSITIES  
 II : TOMAKOMAI-KUSHIRO  
 I : URAKAWA  
 EPICENTER : 42°40.4'N 142°20.8'E  
 DEPTH : 136.9KM MAGNITUDE : 5.0



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 553	6 10 2	119

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

02:18 APR. 15, 1993  
 NE OFF IWATE PREF  
 JMA INTENSITIES  
 I : MIYAKO-HACHINOHE/  
 OFUNATO  
 EPICENTER : 40°8.7 'N 142°22.1'E  
 DEPTH : 36.0KM MAGNITUDE : 4.6

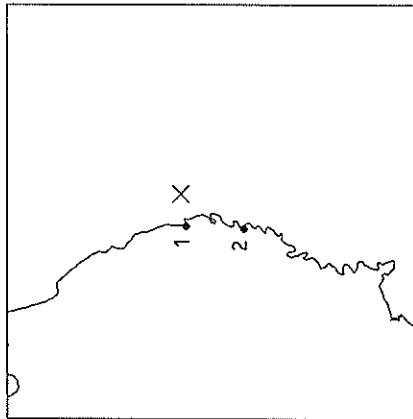


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F- 581	9 8 4	65

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

03:30 APR. 16, 1993  
 E OFF IWATE PREF  
 EPICENTER : 39°39.3'N 142°15.0'E  
 DEPTH : 33.0KM MAGNITUDE : 4.1

JMA INTENSITIES  
 III : MIYAKO  
 II : OFUNATO, MORIOKA  
 I : ISHINOWAKI



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F- 582	66 44 19	23
2 KAWAISHI-MB	IN GROUND	M-1466	4 4 3	52
2 KAWAISHI-M	ON GROUND	M-1465	9 11 11	52

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

00:09 APR. 20, 1993  
 NW WAKAYAMA PREF  
 EPICENTER : 34°11.5'N 135°7.2 'E  
 DEPTH : 6.8KM MAGNITUDE : 3.5

JMA INTENSITIES  
 I : WAKAYAMA

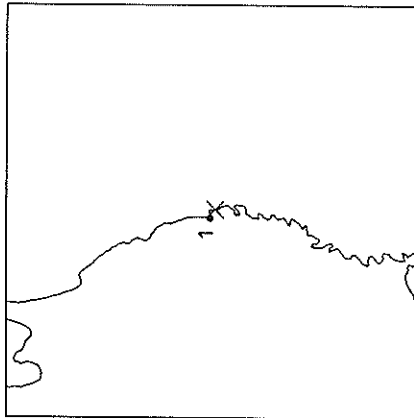


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F- 628	19 14 18	3

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

18:01 APR. 22, 1993  
 NORTHERN IWATE PREF  
 EPICENTER : 39°36.3'N 142°2.3 'E  
 DEPTH : 36.2KM MAGNITUDE : 3.7

JMA INTENSITIES  
 I : MIYAKO

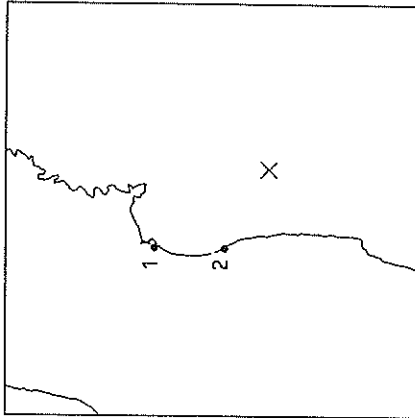


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F- 583	20 11 8	7

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

08:31 APR. 27, 1993  
 E OFF FUKUSHIMA PREF  
 EPICENTER : 37°29.8'N 141°34.5'E  
 DEPTH : 53.9KM MAGNITUDE : 4.7

JMA INTENSITIES  
 II : SENDAI-OFUNATO  
 I : ONAHAMA, ISHINOMAKI

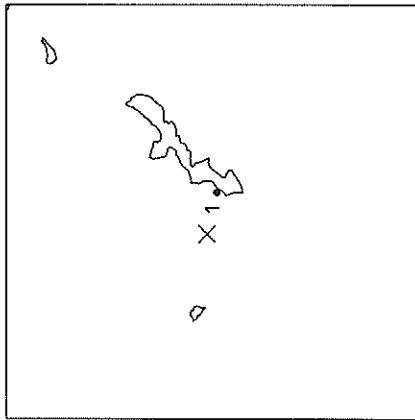


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SENDAI-MB	IN GROUND	M-1464	2 2 1	100
1 SENDAI-N	ON GROUND	M-1462	9 5 3	100
2 SOMA-S	ON GROUND	S-2514	25 34 6	65

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

11:48 MAY 1, 1993  
 NEAR OKINAWAJIMA ISLAND  
 EPICENTER : 26°18.1'N 127°22.4'E  
 DEPTH : 56.2KM MAGNITUDE : 5.3

JMA INTENSITIES  
 I : NAHA

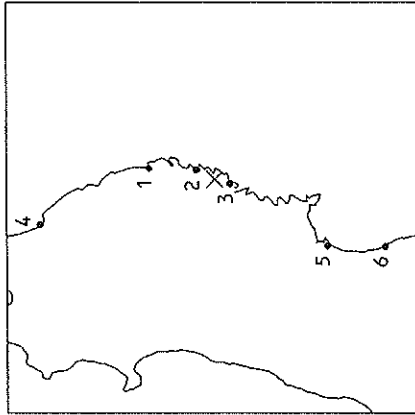


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 NAHA-G	ON GROUND	F- 630	10 14 7	30
1 NAHA-GB	IN GROUND	F- 629	5 6 5	30

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

03:21 MAY 6, 1993  
 SOUTHERN IWATE PREF  
 EPICENTER : 39°7.9 'N 141°47.5'E  
 DEPTH : 106.1KM MAGNITUDE : 5.6

JMA INTENSITIES  
 IV : MORIOKA  
 III : OFUNATO, MIYAKO,  
 ISHINOMAKI, HACHINOHE  
 II : SENDAI, SAKATA

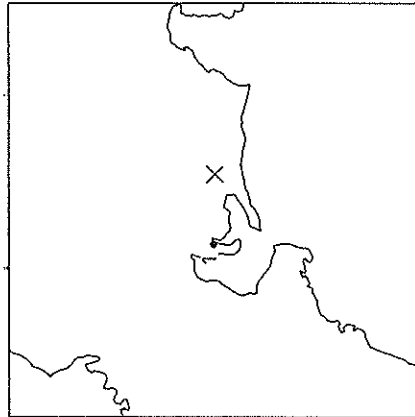


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F- 584	36 60 26	59
2 KAMAISHI-MB	IN GROUND	M-1468	19 16 9	18
2 KAMAISHI-M	ON GROUND	M-1467	36 38 21	18
3 OFUNATO-MOUND-M	ON STRUC.	M-1469	33 18 24	13
4 HACHINOHE-JI-S	ON GROUND	S-2515	13 19 6	160
5 SENDAI-MB	IN GROUND	M-1463	3 3 2	115
5 SENDAI-M	ON GROUND	M-1461	12 8 5	115
6 SOMA-S	ON GROUND	S-2516	8 6 3	161

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

04:37 MAY 19, 1993  
 HAMANAOKO LAKE REGION  
 EPICENTER : 34°51.1'N 137°30.3'E  
 DEPTH : 10.4KM MAGNITUDE : 3.9

JMA INTENSITIES  
 I : GIFU, YOKKAICHI

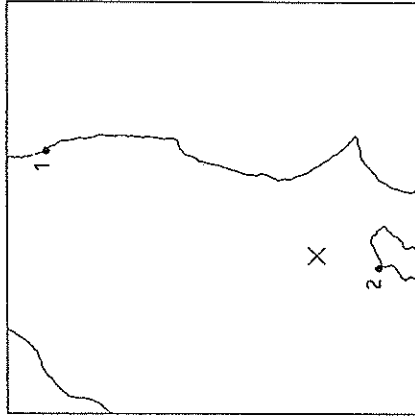


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIKAWA-G	ON GROUND	F- 606	17 8 13	50
1 MIKAWA-GB	IN GROUND	F- 605	4 6 4	50

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

11:36 MAY 21, 1993  
 SW IBARAKI PREF  
 EPICENTER : 36°2.5 'N 139°54.0'E  
 DEPTH : 60.8KM MAGNITUDE : 5.3

JMA INTENSITIES  
 IV : TOKYO, YOKOHAMA  
 III : CHIBA  
 II : ONAHAMA, SHIZUOKA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SOMA-S	ON GROUND	S-2517	1 1 1	219
2 SHINAGAWA-MB	IN GROUND	M-1470	6 5 4	48
2 SHINAGAWA-S	ON GROUND	S-2518	21 33 6	48

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

18:50 MAY 25, 1993

E OFF IBARAKI PREF

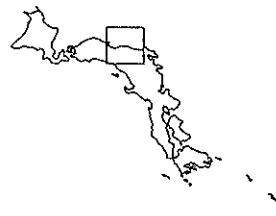
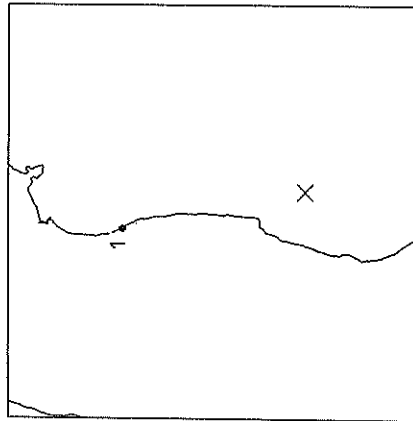
EPICENTER : 36°36.6'N 141°8.8'E

DEPTH : 44.6KM MAGNITUDE : 4.4

JMA INTENSITIES

II : SHIRAKAWA

I : ONAHAMA



STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SOMA-S	ON GROUND	S-2519	1 1 1	136

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

16:27 JUNE 1, 1993

NE OFF IWATE PREF

EPICENTER : 40°8.0'N 142°30.2'E

DEPTH : 31.5KM MAGNITUDE : 5.4

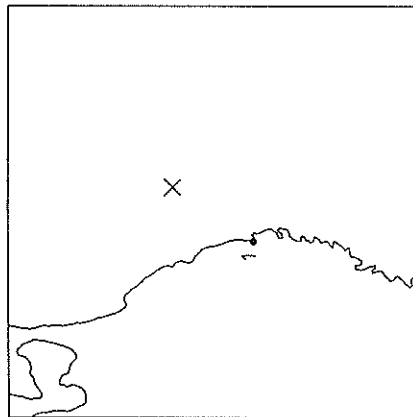
JMA INTENSITIES

III : MORIOKA

II : MIYAKO-HACHINOHE/

OFUNATO

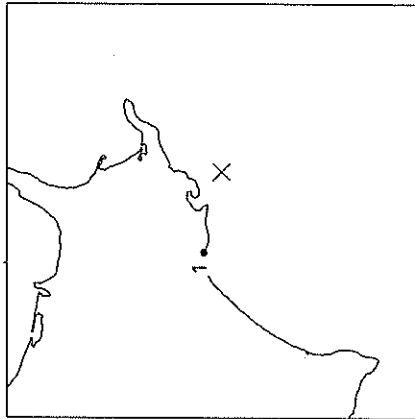
I : SENDAI, ISHINOMAKI



STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F-585	27 17 12	70

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

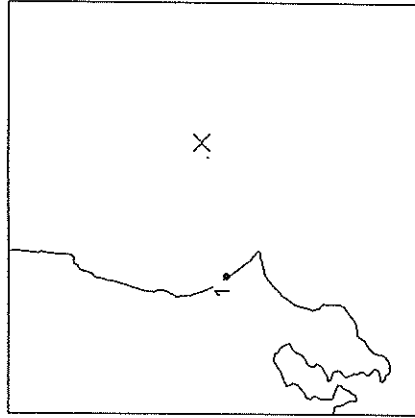
17:01 JUNE 3, 1993  
 OFF NEMURO PENINSULA  
 JMA INTENSITIES  
 II : KUSHIRO  
 I : NEMURO  
 EPICENTER : 42°48.7'N 145°3.7 'E  
 DEPTH : 81.6KM MAGNITUDE :



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 KUSHIRO-G	ON GROUND	F- 623	7 14 2	60
1 KUSHIRO-GB	IN GROUND	F- 622	2 4 1	60

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

16:49 JUNE 7, 1993  
 FAR E OFF IBARAKI PREF  
 JMA INTENSITIES  
 III : MITO  
 II : ONAHAMA, CHIBA, TOKYO  
 I : YOKOHAMA  
 EPICENTER : 36°1.4 'N 141°46.6'E  
 DEPTH : 26.0KM MAGNITUDE : 5.9



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 KASHIMA-ZOKAN-S	ON GROUND	S-2520	19 29 7	97

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

22:41 JUNE 9, 1993  
 OFF NOTO PENINSULA  
 EPICENTER : 37°41.4'N 137°23.3'E  
 DEPTH : 21.2KM MAGNITUDE : 5.1

JMA INTENSITIES

II : TOYAMA-KANAZAWA-NIIGATA

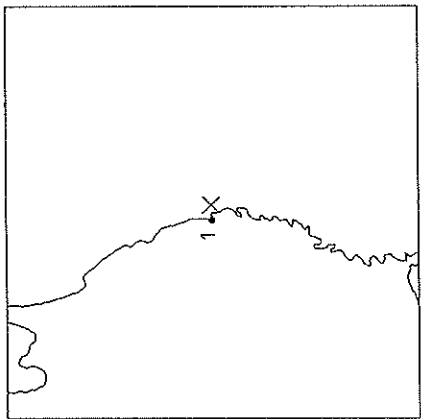
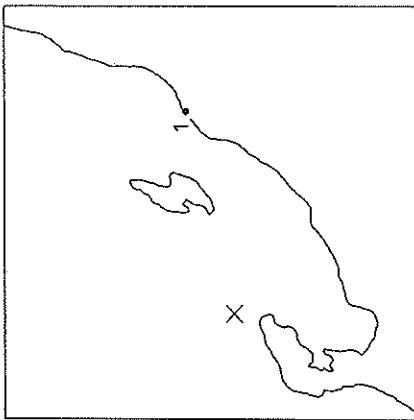
STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

02:03 JUNE 17, 1993  
 E OFF IWATE PREF  
 EPICENTER : 39°38.6'N 142°6.2 'E  
 DEPTH : 50.6KM MAGNITUDE : 3.7

JMA INTENSITIES

II : MIYAKO

I : MORIOKA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 NIIGATA-G	ON GROUND	F- 579	5 6 2	149

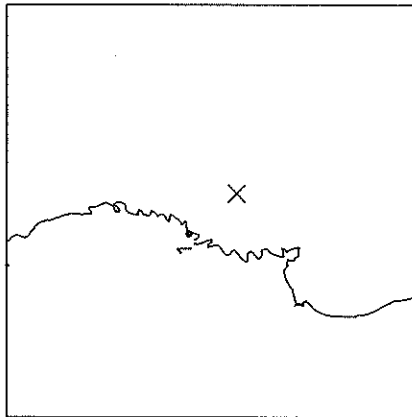
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAKO-G	ON GROUND	F- 586	9 9 5	11



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

12:01 JUNE 24, 1993  
 E OFF MIYAGI PREF  
 EPICENTER : 38°41.2'N 142°2.1'E  
 DEPTH : 56.5KM MAGNITUDE : 4.0

JMA INTENSITIES  
 II : ISHINOMAKI  
 I : OFUNATO/MORIOKA

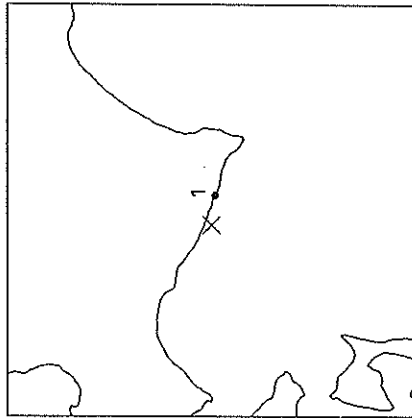


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 OFUNATO-MOUND-M	ON STRUC.	M-1474	3 2 2	44

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

21:49 JULY 4, 1993  
 S OFF URAKAWA  
 EPICENTER : 42°12.3'N 142°31.1'E  
 DEPTH : 68.3KM MAGNITUDE : 4.5

JMA INTENSITIES  
 II : URAKAWA-HIROO/OBIHIRO  
 I : TOMAKOMAI/HACHINOHE



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2521	3 3 1	21

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

13:33 JULY 7, 1993

JMA INTENSITIES

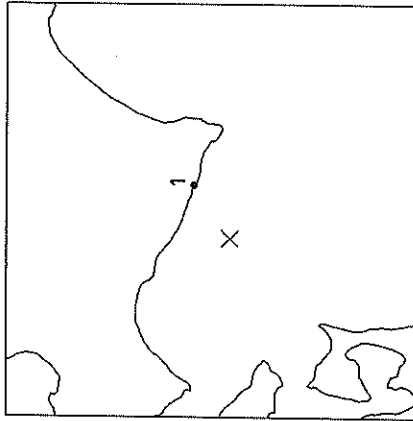
S OFF URAKAWA

EPICENTER : 41°57.9'N 142°16.9'E

II : URAKAWA

I : HIROO

DEPTH : 64.6KM MAGNITUDE : 4.5



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2522	3 3 1	46

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

17:44 JULY 7, 1993

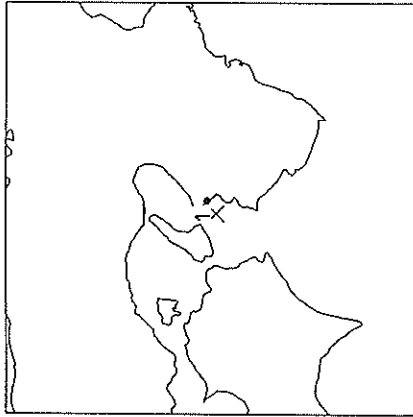
JMA INTENSITIES

NW WAKAYAMA PREF

EPICENTER : 34°9.5'N 135°2.6'E

II : WAKAYAMA

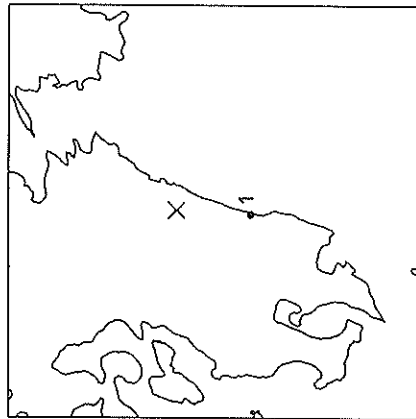
DEPTH : 11.3KM MAGNITUDE : 3.3



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F-637	16 17 15	11

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

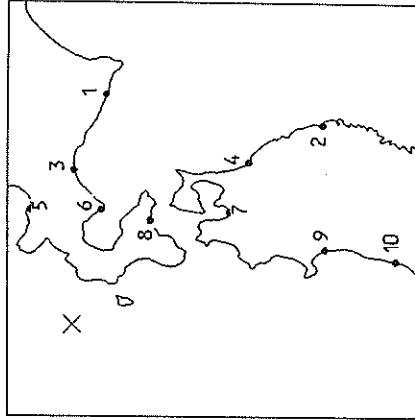
22:09 JULY 7, 1993  
 NORTHERN MIYAZAKI PREF  
 JMA INTENSITIES  
 II : MIYAZAKI  
 EPICENTER : 32°23.4'N 131°28.7'E  
 DEPTH : 82.6KM MAGNITUDE : 4.8



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAZAKI-M	ON GROUND	M-1471	7 6 5	54

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

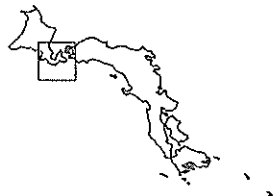
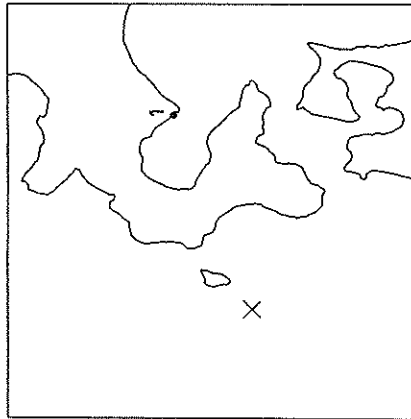
22:17 JULY 12, 1993  
 SW OFF HOKKAIDO  
 JMA INTENSITIES  
 V : OTARU-ESASHI-FUKAURA  
 EPICENTER : 42°46.8'N 139°11.0'E  
 DEPTH : 35.1KM MAGNITUDE : 7.8  
 W : MURORAN-HAKODATE-TOMAKOMAI  
 III : HIROO-HACHINOHE



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2526	3 3 1	302
2 MIYAKO-G	ON GROUND	F-587	6 4 2	419
3 TOMAKOMAI-S	ON GROUND	S-2528	18 17 9	199
4 HACHINOHE-JI-S	ON GROUND	S-2524	15 22	313
5 OTARU-G	ON GROUND	F-538	59 66 25	157
6 MURORAN-G	ON GROUND	F-554	217 215 100	152
7 AOMORI-S	ON GROUND	S-2523	68 63 26	253
8 HAKODATE-FR	ON STRUC.	F-549	162 127 67	168
8 HAKODATE-F	ON GROUND	F-545	119 116 64	168
8 HAKODATE-FB	IN GROUND	F-541	71 59 46	168
8 HAKODATE-M	ON GROUND	M-1472	144 149 92	168
9 AKITA-S	ON GROUND	S-2525	12 11 6	345
10 SAKATA-S	ON GROUND	S-2527	3 6 2	431

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

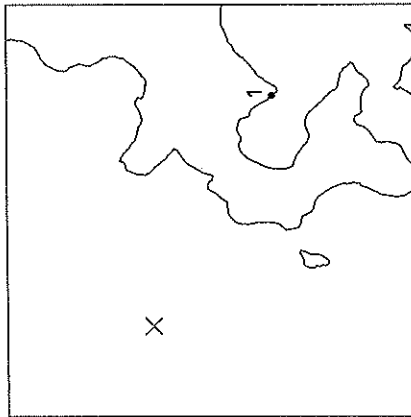
22:32 JULY 12,1993 JMA INTENSITIES  
 SW OFF HOKKAIDO I : OTARU  
 EPICENTER : 41°55.2'N 139°12.5'E  
 DEPTH : 39.0KM MAGNITUDE : 4.6



STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 556	7 15 5	151

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

22:35 JULY 12,1993 JMA INTENSITIES  
 NW OFF SHAKOTAN PEN I : ESASHI  
 EPICENTER : 43°13.7'N 139°0.1 'E  
 DEPTH : 10.0KM MAGNITUDE :

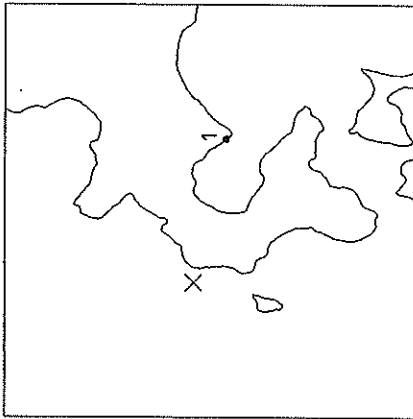


STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 557	5 5 2	187

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

22:43 JULY 12,1993  
 SW OFF HOKKAIDO  
 EPICENTER : 42°37.6'N 139°43.2'E  
 DEPTH : 0.0KM MAGNITUDE : 4.7

JMA INTENSITIES  
 I : OTARU/ESASHI

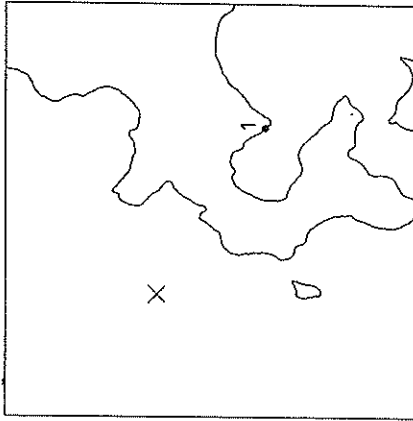


STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL)	DIST.(KM)
1 MURORAN-G	ON GROUND	F- 558	(NS) 6 (EW) 3	106

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

23:01 JULY 12,1993  
 NW OFF SHAKOTAN PEN  
 EPICENTER : 43°8.0 'N 139°32.2'E  
 DEPTH : 37.0KM MAGNITUDE : 4.3

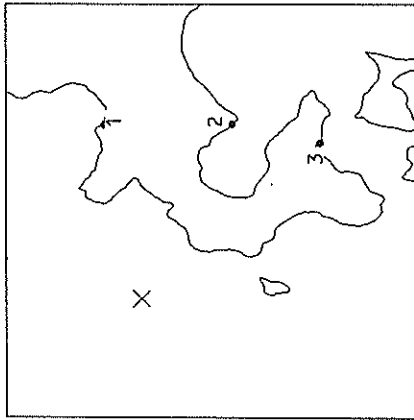
JMA INTENSITIES  
 II : OTARU



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL)	DIST.(KM)
1 MURORAN-G	ON GROUND	F- 559	(NS) 18 (EW) 10	145

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

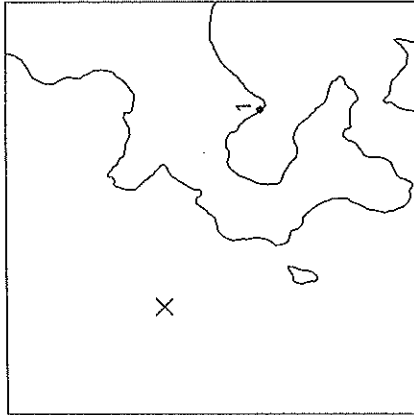
23:04 JULY 12, 1993 JMA INTENSITIES  
 NW OFF SHAKOTAN PEN III : OTARU, HAKODATE  
 EPICENTER : 43°1.2'N 139°27.6'E II : ESASHI  
 DEPTH : 34.5KM MAGNITUDE : 5.4 I : TOMAKOMAI, AOMORI,  
 MURORAN, FUKAURA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 OTARU-G	ON GROUND	F- 539	11 15 3	129
2 MURORAN-G	ON GROUND	F- 560	8 13 6	143
3 HAKODATE-FR	ON STRUC.	F- 550	17 11 4	172
3 HAKODATE-F	ON GROUND	F- 546	12 16 5	172
3 HAKODATE-FB	IN GROUND	F- 542	6 6 4	172
3 HAKODATE-W	ON GROUND	M-1473	17 15 6	172

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

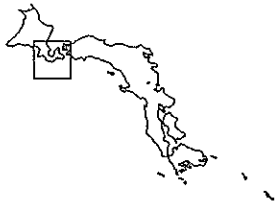
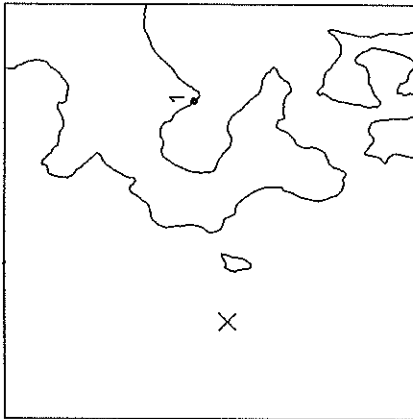
23:09 JULY 12, 1993 JMA INTENSITIES  
 NW OFF SHAKOTAN PEN III : OTARU  
 EPICENTER : 43°4.0'N 139°17.7'E I : ESASHI, MURORAN  
 DEPTH : 41.0KM MAGNITUDE : 5.3



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 561	11 11 5	157

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

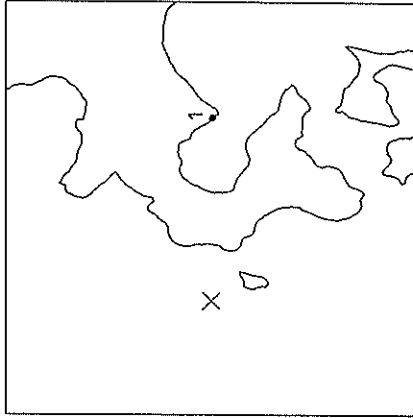
23:18 JULY 12,1993 JMA INTENSITIES  
 SW OFF HOKKAIDO I : ESASHI, HAKODATE  
 EPICENTER : 42°13.7'N 138°59.7'E  
 DEPTH : 36.0KM MAGNITUDE : 4.9



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EH) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 562	10 9 4	161

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

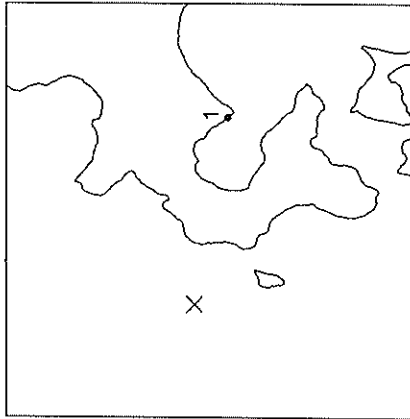
23:22 JULY 12,1993 JMA INTENSITIES  
 SW OFF HOKKAIDO II : ESASHI  
 EPICENTER : 42°26.1'N 139°20.3'E  
 DEPTH : 40.0KM MAGNITUDE : 5.2  
 I : OTARU, MURORAN, TOMAKONAI, HAKODATE



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EH) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 563	33 40 11	133

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

23:30 JULY 12,1993  
 SW OFF HOKKAIDO  
 EPICENTER : 42°39.0'N 139°18.7'E  
 DEPTH : 45.8KM MAGNITUDE : 4.4

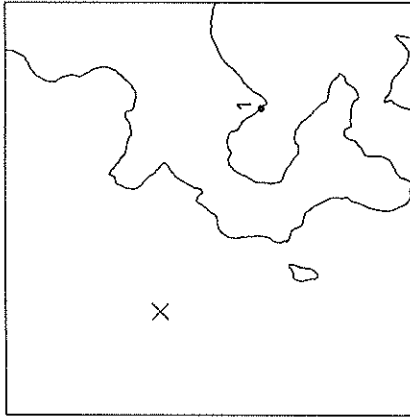


STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 564	4 7 3	138

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

23:45 JULY 12,1993  
 NW OFF SHAKOTAN PEN  
 EPICENTER : 43°6.2 'N 139°13.5'E  
 DEPTH : 7.5KM MAGNITUDE : 6.0

JMA INTENSITIES  
 III : OTARU  
 II : ESASHI  
 I : HAKODATE-MURORAN,  
 TOMAKOMAI

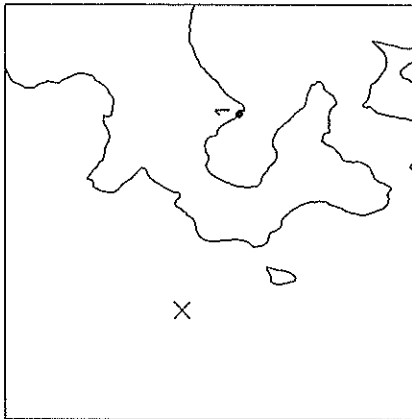


STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 565	7 13 5	164



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

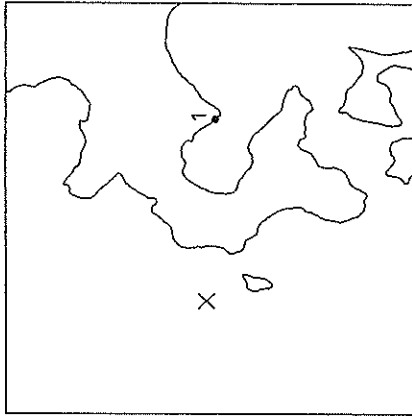
23:52 JULY 12, 1993 JMA INTENSITIES  
 SW OFF HOKKAIDO II : ESASHI  
 EPICENTER : 42°48.7'N 139°14.6'E I : HAKODATE-MURORAN-OTARU  
 DEPTH : 39.2KM MAGNITUDE : 4.3



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	(GAL)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 566	14 13 5		149

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

00:07 JULY 13, 1993 JMA INTENSITIES  
 SW OFF HOKKAIDO I : MURORAN-OTARU-ESASHI  
 EPICENTER : 42°29.5'N 139°21.4'E  
 DEPTH : 29.0KM MAGNITUDE : 4.7



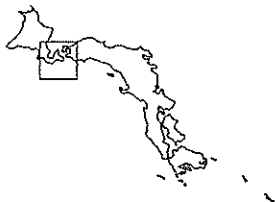
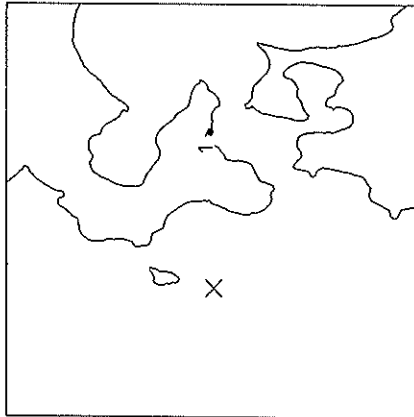
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	(GAL)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 567	12 14 5		132

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

00:25 JULY 13, 1993  
 SW OFF HOKKAIDO  
 EPICENTER : 41°49.7'N 139°22.4'E  
 DEPTH : 28.0KM MAGNITUDE : 4.7

JMA INTENSITIES

I : HAKODATE, ESASHI



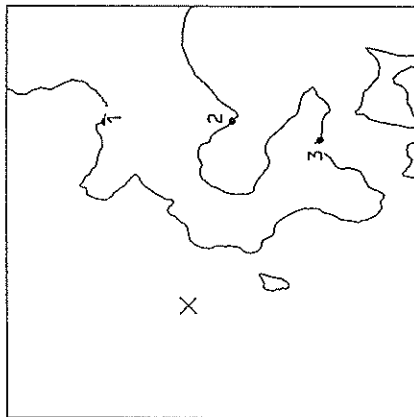
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HAKODATE-FR	ON STRUC.	F- 551	5 4 1	112
1 HAKODATE-F	ON GROUND	F- 547	3 4 2	112
1 HAKODATE-FB	IN GROUND	F- 543	1 1 1	112

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

01:01 JULY 13, 1993  
 SW OFF HOKKAIDO  
 EPICENTER : 42°43.3'N 139°19.9'E  
 DEPTH : 28.6KM MAGNITUDE : 6.0

JMA INTENSITIES

III : MURORAN, OTARU, ESASHI  
 II : HAKODATE, TONAKOWAI



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 OTARU-G	ON GROUND	F- 540	8 9 3	147
2 MURORAN-G	ON GROUND	F- 568	29 38 16	139
3 HAKODATE-FR	ON STRUC.	F- 552	9 6 3	155
3 HAKODATE-F	ON GROUND	F- 548	8 7 4	155
3 HAKODATE-FB	IN GROUND	F- 544	3 3 3	155

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

03:25 JULY 13,1993

SW OFF HOKKAIDO

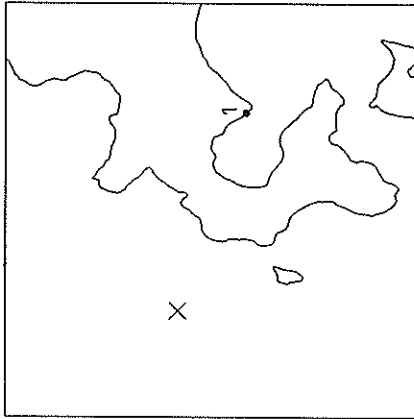
EPICENTER : 42°53.1'N 139°14.1'E

DEPTH : 20.0KM MAGNITUDE : 4.8

JMA INTENSITIES

II : OTARU,ESASHI

I : TOMAKOMAI,MURORAN



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 569	6 6 3	153

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

03:54 JULY 13,1993

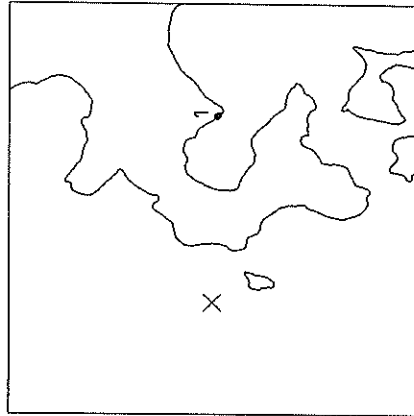
SW OFF HOKKAIDO

EPICENTER : 42°27.9'N 139°20.0'E

DEPTH : 28.0KM MAGNITUDE : 3.6

JMA INTENSITIES

I : OTARU



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 570	4 7 4	133

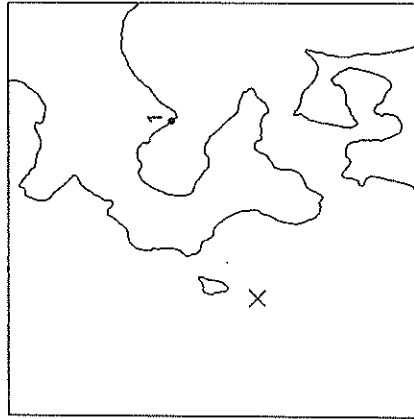
STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

06:07 JULY 13,1993

SW OFF HOKKAIDO

EPICENTER : 41°52.0'N 139°21.7'E

DEPTH : 8.0KM MAGNITUDE : 3.0



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 571	5 6 2	141

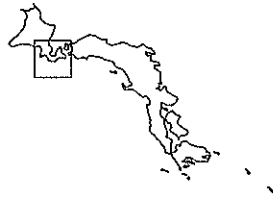
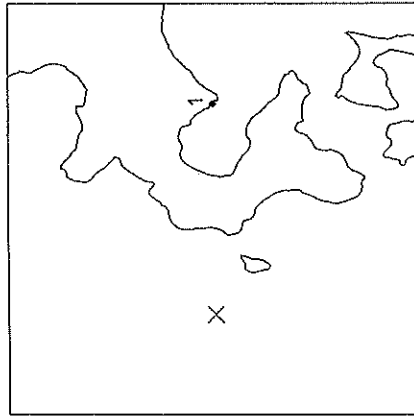
STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

06:11 JULY 13,1993

SW OFF HOKKAIDO

EPICENTER : 42°25.7'N 139°4.8 'E

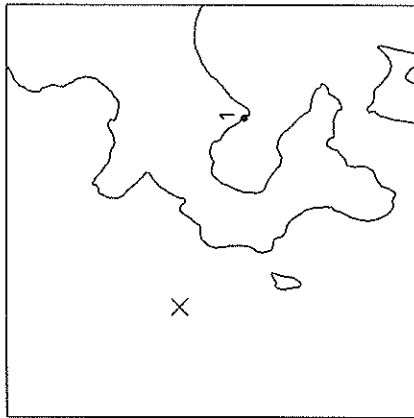
DEPTH : 32.0KM MAGNITUDE : 3.9



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 572	6 5 3	154

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

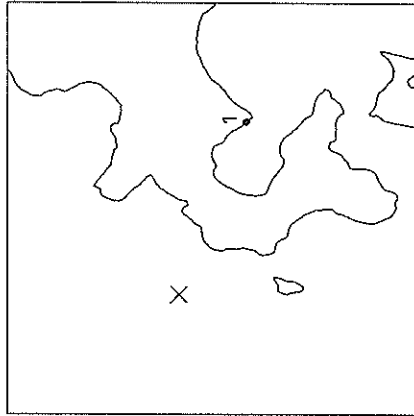
08:05 JULY 13, 1993  
 SW OFF HOKKAIDO  
 EPICENTER : 42°51.6'N 139°19.6'E  
 DEPTH : 9.0KM MAGNITUDE : 3.8



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 573	6 7 2	145

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

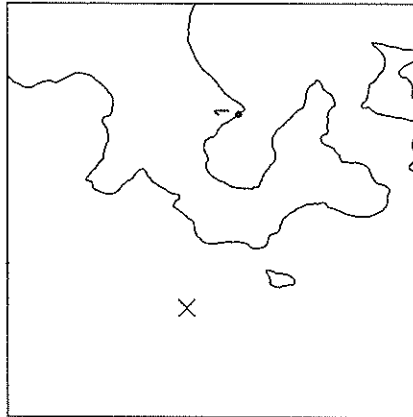
10:16 JULY 13, 1993  
 SW OFF HOKKAIDO  
 EPICENTER : 42°52.2'N 139°28.7'E  
 DEPTH : 0.7KM MAGNITUDE : 4.2



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 575	1 1 1	134

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

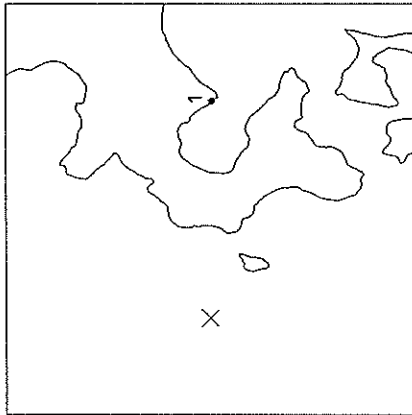
11:19 JULY 13,1993 JMA INTENSITIES  
 SW OFF HOKKAIDO I : MURORAN/ESASHI  
 EPICENTER : 42°46.5'N 139°17.3'E  
 DEPTH : 31.8KM MAGNITUDE : 3.9



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 576	7 7 3	144

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

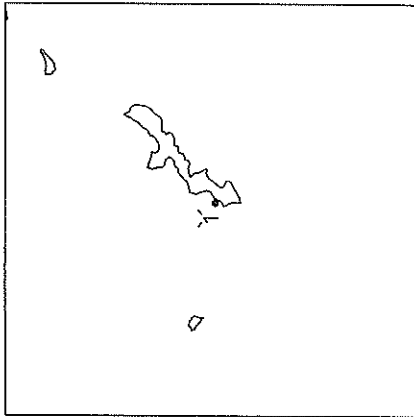
21:35 JULY 13,1993 JMA INTENSITIES  
 SW OFF HOKKAIDO I : MURORAN  
 EPICENTER : 42°27.4'N 139°2.3'E  
 DEPTH : 26.5KM MAGNITUDE : 4.9



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 577	14 17 7	157

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

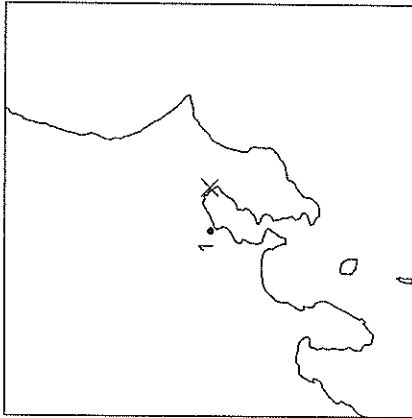
05:46 JULY 19, 1993  
 NEAR OKINAWAJIMA ISLAND  
 JMA INTENSITIES II : NAHA  
 EPICENTER : 26°18.3'N 127°33.6'E  
 DEPTH : 14.0KM MAGNITUDE : 3.3



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 NAHA-G	ON GROUND	F- 632	5 6 6	2 3 2	13
1 NAHA-GB	IN GROUND	F- 631	2 3 2	2 3 2	13

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

16:33 JULY 23, 1993  
 CENTRAL CHIBA PREF  
 JMA INTENSITIES II : TOKYO  
 EPICENTER : 35°36.9'N 140°6.6'E  
 DEPTH : 83.4KM MAGNITUDE : 4.1



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EW) (UD)	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SHINAGAWA-MB	IN GROUND	M-1478	1 1 1	1 1 1	31
1 SHINAGAWA-S	ON GROUND	S-2533	2 3 2	2 3 2	31

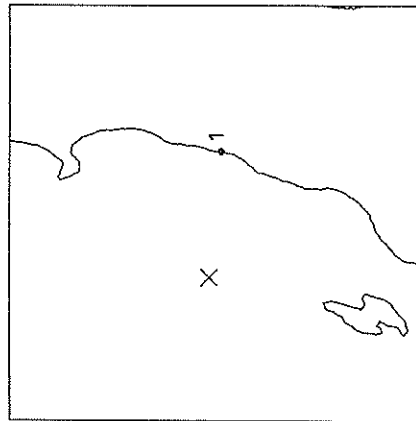
STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

21:56 JULY 24, 1993  
 W OFF YAMAGATA PREF  
 EPICENTER : 39°3.7 'N 138°46.9 'E  
 DEPTH : 43.2KM MAGNITUDE : 5.1

13:50 JULY 28, 1993  
 WESTERN FUKUSHIMA PREF  
 EPICENTER : 37°11.4 'N 139°58.0 'E  
 DEPTH : 122.9KM MAGNITUDE : 4.0

JMA INTENSITIES

I : MITO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SAKATA-S	ON GROUND	S-2529	3 2 1	91

STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 ONAHAMA-JI-S	ON GROUND	S-2532	25 30 10	88



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

18:57 JULY 29, 1993

SE GIFU PREF

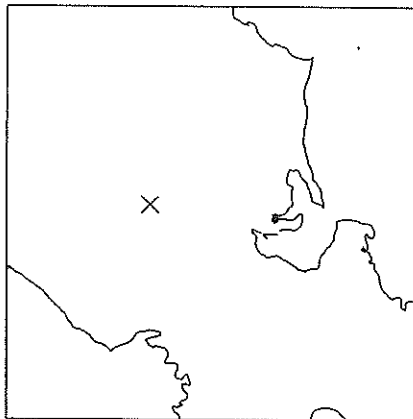
EPICENTER : 35°42.4'N 137°5.8 'E

DEPTH : 8.0KM MAGNITUDE : 4.6

JMA INTENSITIES

II : NAGOYA

I : TOYAMA, YOKKAICHI



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL)	DIST. (KM)
1 MIKAWA-G	ON GROUND	F- 608	(NS) 5 (EW) 6 (UD) 1	93
1 MIKAWA-GB	IN GROUND	F- 607	2 3 1	93

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

23:53 JULY 29, 1993

HIDAKA MOUNTAINS REGION

EPICENTER : 42°25.0'N 143°0.9 'E

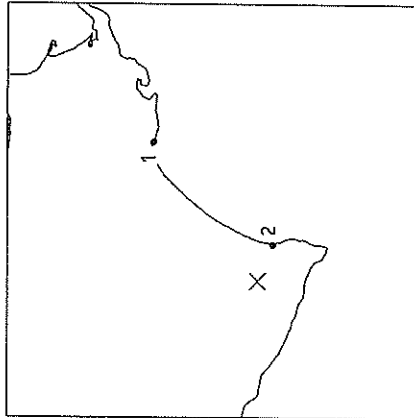
DEPTH : 77.1KM MAGNITUDE : 5.0

JMA INTENSITIES

III : OBIHIRO, KUSHIRO

II : HIROO, URAKAWA, TOMAKOMAI

I : OTARU, HACHINOHE



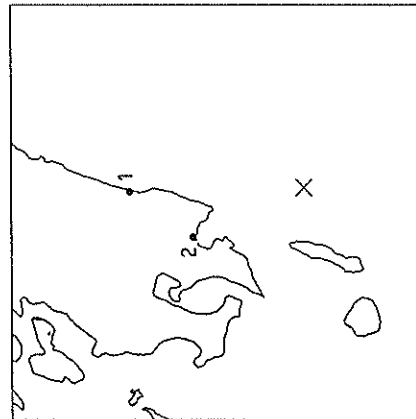
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL)	DIST. (KM)
1 KUSHIRO-G	ON GROUND	F- 625	(NS) 6 (EW) 9 (UD) 2	127
1 KUSHIRO-GB	IN GROUND	F- 624	2 3 1	127
2 TOKACHI-M	ON GROUND	M-1475	18 21 12	29

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

12:13 AUG. 2, 1993  
 SE OFF OSUMI PEN  
 EPICENTER : 30°44.6'N 131°30.2'E  
 DEPTH : 42.0KM MAGNITUDE : 5.6

JMA INTENSITIES

Ⅲ : KAGOSHIMA-MIYAZAKI



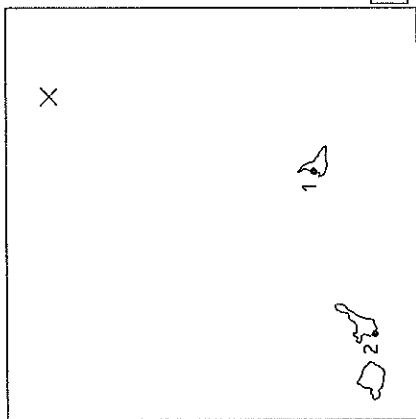
STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAZAKI-M	ON GROUND	M-1477	5 5 1	128
2 SIBUSI-G	ON GROUND	F-593	7 11 4	89

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

09:00 AUG. 7, 1993  
 NW OFF OKINAWAJIMA IS  
 EPICENTER : 26°34.7'N 125°41.8'E  
 DEPTH : 158.1KM MAGNITUDE : 6.5

JMA INTENSITIES

Ⅱ : NAHA



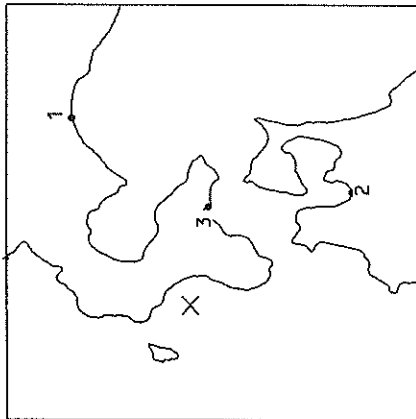
STATION	CONDITION	RECORD NUMBER	MAX-ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 HIRARA-G	ON GROUND	F-588	8 11 4	201
2 ISHIGAKI-G	ON GROUND	F-642	9 7 4	293

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

04:42 AUG. 8, 1993  
 SW OFF HOKKAIDO  
 EPICENTER : 41°57.3'N 139°53.3'E  
 DEPTH : 23.2KM MAGNITUDE : 6.3

JMA INTENSITIES

IV : ESASHI, HAKODATE  
 III : MURORAN, TOMAKOMAI, OTARU  
 II : HACHINOHE



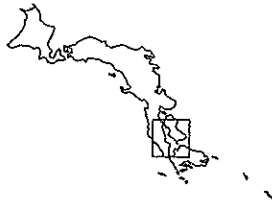
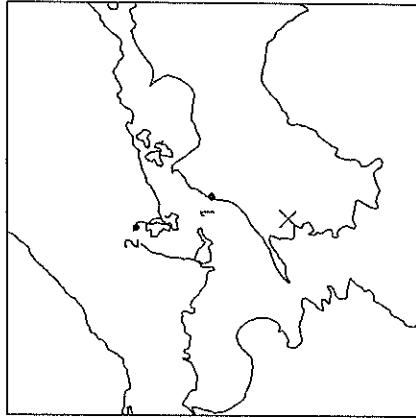
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 TOMAKOMAI-S	ON GROUND	S-2531	7 13 5	160
2 AOMORI-S	ON GROUND	S-2530	21 16 9	144
3 HAKODATE-FR	ON STRUC.	F-604	49 46 16	72
3 HAKODATE-F	ON GROUND	F-603	47 50 21	72
3 HAKODATE-M	ON GROUND	M-1476	52 56 31	72

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

10:29 AUG. 14, 1993  
 SW EHIME PREF  
 EPICENTER : 33°20.9'N 132°32.8'E  
 DEPTH : 47.2KM MAGNITUDE : 5.0

JMA INTENSITIES

III : KURE  
 II : OITA, HIROSHIMA, YAMAGUCHI  
 I : KOCHI, FUKUOKA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MATUYAMA-G	ON GROUND	F-610	31 25 8	58
2 HIROSHIMA-G	ON GROUND	F-602	8 12 4	111

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

06:44 AUG. 16, 1993

NW WAKAYAMA PREF

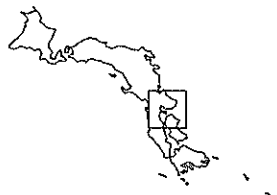
EPICENTER : 34°5.6 'N 135°6.7 'E

DEPTH : 8.7KM MAGNITUDE : 4.2

JMA INTENSITIES

II : WAKAYAMA

I : TOKUSHIMA, OKAYAMA



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F- 638	25 13 10	13

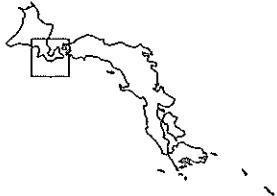
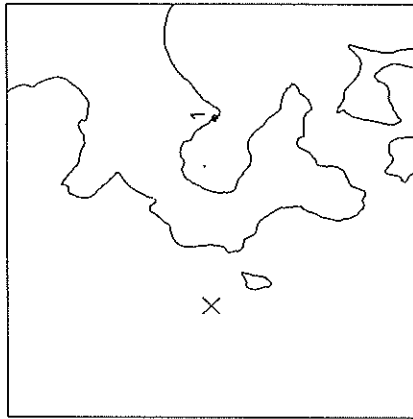
STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

00:20 AUG. 28, 1993

SW OFF HOKKAIDO

EPICENTER : 42°27.5'N 139°18.1'E

DEPTH : 32.6KM MAGNITUDE : 3.6



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 615	5 9 4	136

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

00:08 AUG. 31, 1993

SW EHIME PREF

EPICENTER : 33°36.0'N 132°28.2'E

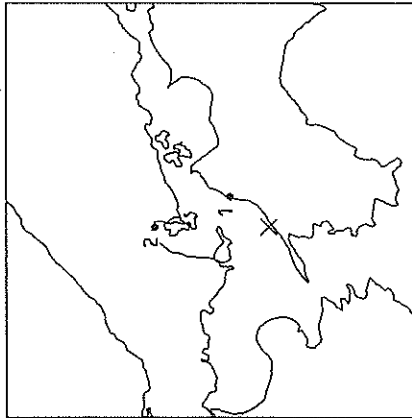
DEPTH : 61.8KM MAGNITUDE : 5.1

JMA INTENSITIES

III : HIROSHIMA

II : YAMAGUCHI

I : OITA, KOCHI



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MATUYAMA-G	ON GROUND	F- 611	18 24 15	36
2 HIROSHIMA-G	ON GROUND	F- 612	17 18 10	83

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

13:55 SEP. 11, 1993

S OFF URAKAWA

EPICENTER : 41°58.4'N 142°39.6'E

DEPTH : 61.4KM MAGNITUDE : 5.6

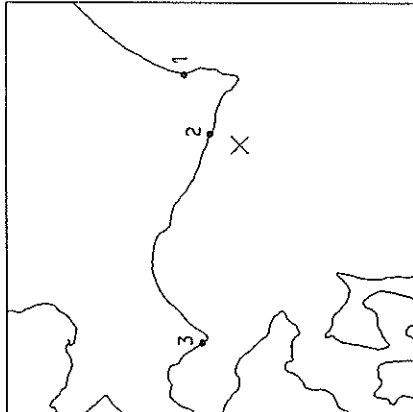
JMA INTENSITIES

IV : URAKAWA

III : HIROO

II : OBIHIRO, TOMAKOMAI,  
MURORAN, KUSHIRO, OTARU

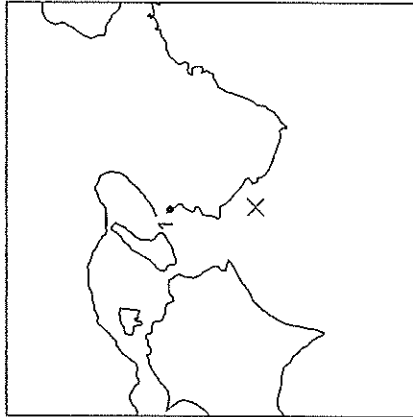
I : HAKODATE



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 TOKACHI-M	ON GROUND	M-1479	19 32 16	65
2 URAKAWA-S	ON GROUND	S-2534	39 44 12	23
3 MURORAN-G	ON GROUND	F- 616	11 9 4	146

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

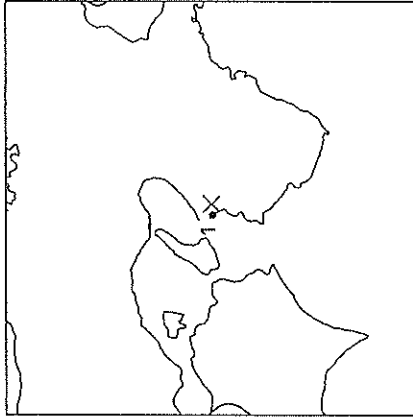
04:04 SEP. 17, 1993 JMA INTENSITIES  
 S PART OF KII CHANNEL I : WAKAYAMA  
 EPICENTER : 33°38.9'N 135°9.0 'E  
 DEPTH : 49.7KM MAGNITUDE : 4.1



STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F- 639	7 9 4	62

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

07:47 SEP. 18, 1993 JMA INTENSITIES  
 NW WAKAYAMA PREF II : WAKAYAMA  
 EPICENTER : 34°13.4'N 135°13.9'E  
 DEPTH : 5.3KM MAGNITUDE : 3.6



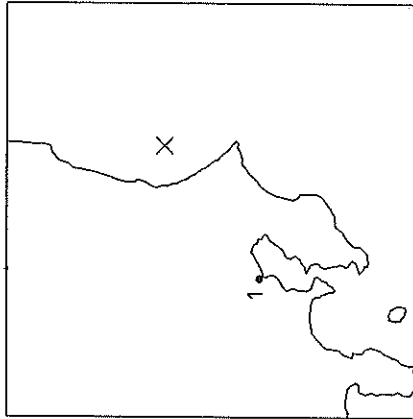
STATION	CONDITION	RECORD NUMBER	MAX.ACC.(GAL) (NS) (EW) (UD)	DIST. (KM)
1 WAKAYAMA-G	ON GROUND	F- 640	17 20 15	7

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

11:18 SEP. 18, 1993  
 E OFF IBARAKI PREF  
 EPICENTER : 36°10.8'N 140°53.1'E  
 DEPTH : 35.4KM MAGNITUDE : 5.0

JMA INTENSITIES

IV : MITO  
 II : CHIBA, TOKYO, YOKOHAMA



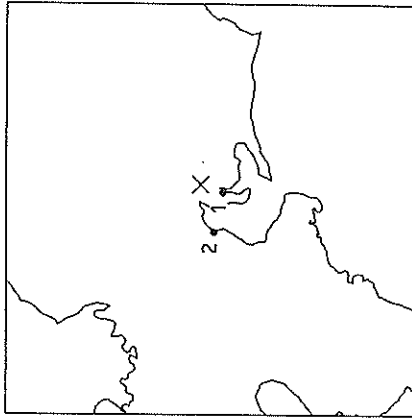
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SHINAGAWA-MB	IN GROUND	M-1482	1 1 1	118
1 SHINAGAWA-S	ON GROUND	S-2536	6 5 2	118

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

15:52 SEP. 23, 1993  
 CENTRAL AICHI PREF  
 EPICENTER : 35°1.6'N 137°0.9'E  
 DEPTH : 48.4KM MAGNITUDE : 4.3

JMA INTENSITIES

III : NAGOYA, GIFU  
 II : YOKKAICHI



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIKAWA-G	ON GROUND	F-621	13 19 6	17
1 MIKAWA-GB	IN GROUND	F-620	7 4 5	17
1 KINUURA-JI-S	ON GROUND	S-2535	7 8 9	17
2 YOKKA.-SEKITAN-M	ON STRUC.	M-1480	14	35

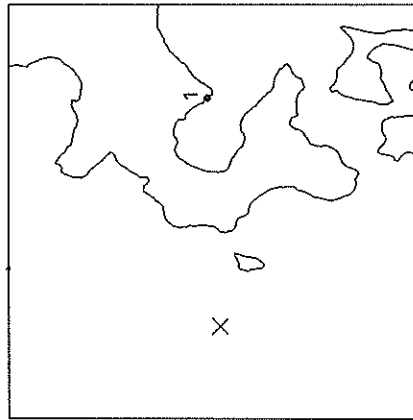
STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

09:06 SEP. 25, 1993

SW OFF HOKKAIDO

EPICENTER : 42°21.8'N 138°57.2'E

DEPTH : 29.4KM MAGNITUDE : 5.0



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 617	11 12 5	164

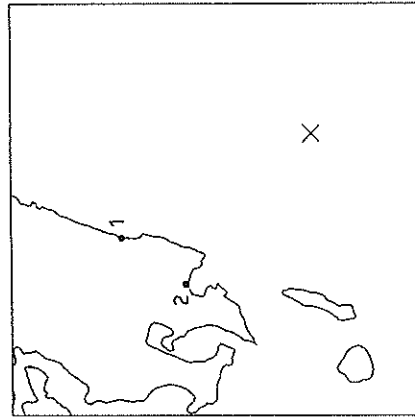
STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

13:43 SEP. 27, 1993

E OFF TANEGASHIMA ISLAND

EPICENTER : 30°38.8'N 132°16.0'E

DEPTH : 64.0KM MAGNITUDE : 5.5



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MIYAZAKI-M	ON GROUND	M-1481	5 5 2	159
2 SIBUSI-G	ON GROUND	F- 609	5 4 2	143



STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

00:54 OCT. 3, 1993  
 MID FUKUSHIMA PREF  
 EPICENTER : 37°28.7'N 140°37.3'E  
 DEPTH : 92.3KM MAGNITUDE : 5.1

JMA INTENSITIES

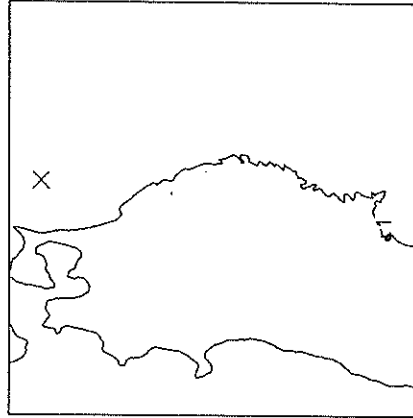
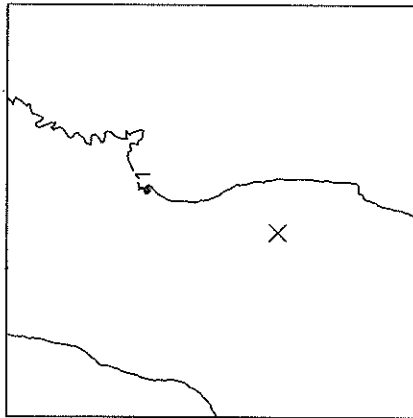
II : FUKUSHIMA, ONAHAMA, MITO  
 I : SENDAI, ISHINOMAKI

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

14:37 OCT. 5, 1993  
 E OFF AOMORI PREF  
 EPICENTER : 41°9.8'N 141°58.5'E  
 DEPTH : 72.0KM MAGNITUDE : 4.9

JMA INTENSITIES

III : HACHINOHE  
 I : URAKAWA, TOMAKOMAI,  
 OFUNATO

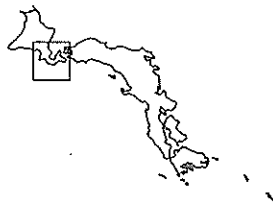
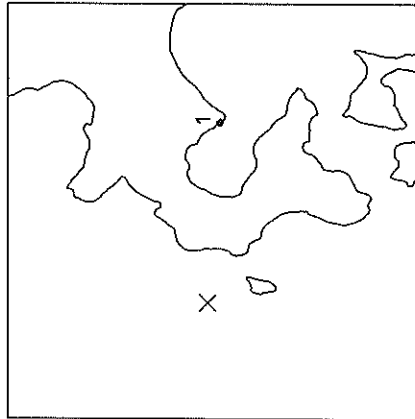


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SHIOGAMA-KOJYO-S ON GROUND		S-2537	5 6	100

STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SHIOGAMA-KOJYO-S ON GROUND		S-2538	8 2	326

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

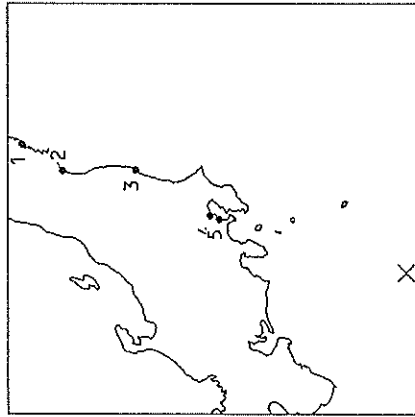
22:57 OCT. 8, 1993 JMA INTENSITIES  
 SW OFF HOKKAIDO  
 II : ESASHI, MURORAN  
 I : OTARU  
 EPICENTER : 42°30.6'N 139°22.1'E  
 DEPTH : 35.6KM MAGNITUDE : 4.8



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 MURORAN-G	ON GROUND	F- 618	19 19 5	131

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

00:54 OCT. 12, 1993 JMA INTENSITIES  
 FAR S OFF TOKAI DISTRICT  
 IV : TOKYO, YOKOHAMA  
 III : CHIBA, ONAHAMA, MITO  
 II : SENDAI, ISHINOMAKI,  
 OFUNATO

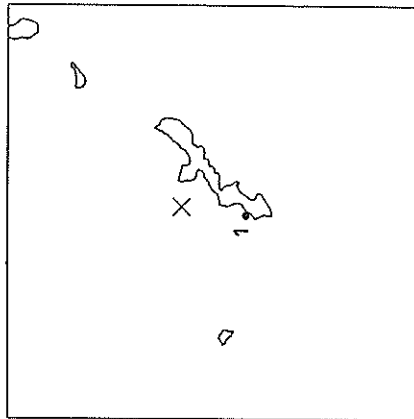


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 OFUNATO-MOUND-M	ON STRUC.	M-1486	7 7 6	839
1 OFUNATO-BO-S	ON STRUC.	S-2542	16 14 4	839
2 SHIOGAMA-KOJYO-S	ON GROUND	S-2539	18 6 744	744
2 SENDAI-MB	IN GROUND	M-1484	1 1 1	740
2 SENDAI-M	ON GROUND	M-1483	5 4 2	740
3 ONAHAMA-JI-S	ON GROUND	S-2540	13 10 7	599
4 SHINAGAWA-MB	IN GROUND	M-1485	6 4 5	424
4 SHINAGAWA-S	ON GROUND	S-2541	24 18 8	424
5 YAMASHITA-FR	ON STRUC.	F- 646	29 68 7	402
5 YAMASHITA-F	ON GROUND	F- 645	25 22 8	402
5 YAMASHITA-FB	GROUND	F- 644	5 5 3	402

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

09:38 OCT. 25, 1993  
 NEAR OKINAWAJIMA ISLAND  
 EPICENTER : 26°40.4'N 127°42.8'E  
 DEPTH : 45.6KM MAGNITUDE : 3.9

JMA INTENSITIES  
 II : NAHA

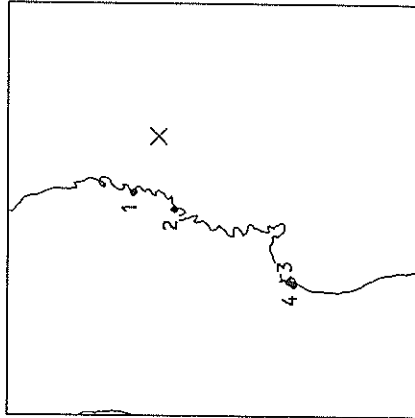


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 NAHA-G	ON GROUND	F- 634	7 8 3	47
1 NAHA-GB	IN GROUND	F- 633	5 6 2	47

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

09:06 NOV. 11, 1993  
 E OFF IWATE PREF  
 EPICENTER : 39°4.2 'N 142°22.0'E  
 DEPTH : 36.3KM MAGNITUDE : 5.5

JMA INTENSITIES  
 IV : OFUNATO  
 III : MIYAKO, ISHINOMAKI,  
 SENDAI  
 II : HACHINOHE, SAKATA



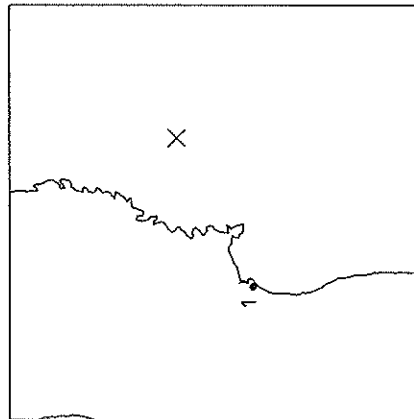
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 KAMAISHI-MB	IN GROUND	M-1491	10 10 8	45
1 KAMAISHI-M	ON GROUND	M-1490	23 22 20	45
2 OFUNATO-BO-S	ON STRUC.	S-2545	17 19 6	54
2 OFUNATO-MOUND-M	ON STRUC.	M-1489	34 17 18	54
2 OFUNATO-BOCHI-S	ON GROUND	S-2544	8 13 6	54
3 SHIOGAMA-KOJYO-S	ON GROUND	S-2543	11 6	142
4 SENDAI-MB	IN GROUND	M-1488	3 4 2	146
4 SENDAI-M	ON GROUND	M-1487	9 6 3	146

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

09:49 NOV. 22, 1993  
 E OFF MIYAGI PREF  
 EPICENTER : 38°41.6'N 142°18.9'E  
 DEPTH : 40.1KM MAGNITUDE : 4.8

JMA INTENSITIES

II : IISHINOMAKI  
 I : OFUNATO, MIYAKO, SENDAI



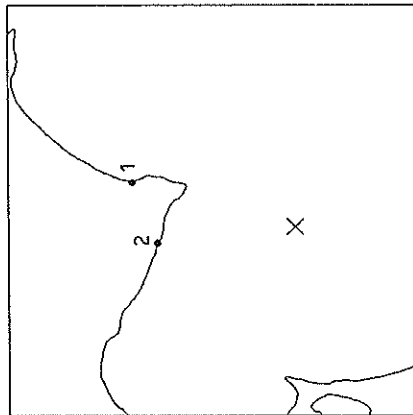
STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 SENDAI-MB	IN GROUND	M-1497	1 1 1	121
1 SENDAI-M	ON GROUND	M-1496	6 4 2	121

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

05:07 NOV. 24, 1993  
 E OFF AOMORI PREF  
 EPICENTER : 41°15.0'N 142°47.5'E  
 DEPTH : 48.0KM MAGNITUDE : 5.6

JMA INTENSITIES

III : URAKAWA  
 II : HACHINOHE  
 I : HAKODATE, TOMAKOMAI

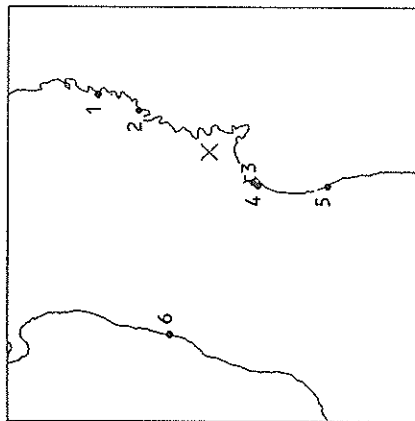


STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 TOKACHI-M	ON GROUND	M-1492	11 17 3	123
2 URAKAWA-S	ON GROUND	S-2546	6 3 1	101

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

15:11 NOV. 27, 1993  
 NORTHERN MIYAGI PREF  
 EPICENTER : 38°34.9'N 141°20.3'E  
 DEPTH : 111.7KM MAGNITUDE : 5.9

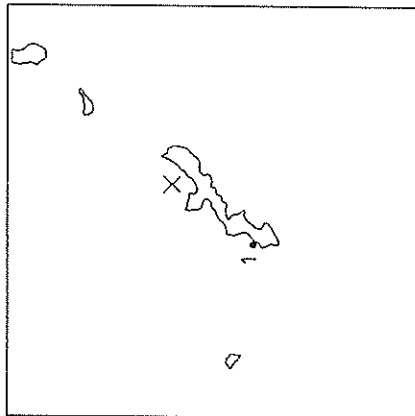
JMA INTENSITIES  
 IV : SENDAI, OFUNATO  
 III : ISHINOMAKI, MIYAKO,  
 SAKATA, HACHINOHE  
 II : KUSHIRO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EH) (UD)	MAX. ACC. (GAL)	DIST. (KM)
1 KAMAISHI-MB	IN GROUND	M-1495	14 20 13	13	90
1 KAMAISHI-M	ON GROUND	M-1494	26 50 26	26	90
2 OFUNATO-MOUND-M	ON STRUC.	M-1493	51 60 73	73	59
2 OFUNATO-BO-S	ON STRUC.	S-2547	37 66 15	15	59
2 OFUNATO-BOCHI-S	ON GROUND	S-2548	21 34 7	7	58
3 SHIOGAMA-KOJYO-S	ON GROUND	S-2551	75 56	56	39
4 SENDAI-MB	IN GROUND	M-1499	39 47 26	26	43
4 SENDAI-M	ON GROUND	M-1498	164 111 38	38	43
5 SOMA-S	ON GROUND	S-2549	26 32 7	7	90
6 SAKATA-S	ON GROUND	S-2550	5 6 1	1	136

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

22:55 DEC. 3, 1993  
 NEAR OKINAWAJIMA ISLAND  
 EPICENTER : 26°48.0'N 128°4.7 'E  
 DEPTH : 12.9KM MAGNITUDE : 4.2



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (NS) (EH) (UD)	MAX. ACC. (GAL)	DIST. (KM)
1 NAHA-G	ON GROUND	F- 636	2 4 3	3	73
1 NAHA-GB	IN GROUND	F- 635	2 2 1	1	73

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

18:30 DEC. 4, 1993

E OFF AOMORI PREF

EPICENTER : 41°43.4'N 141°59.3'E

DEPTH : 79.7KM MAGNITUDE : 5.4

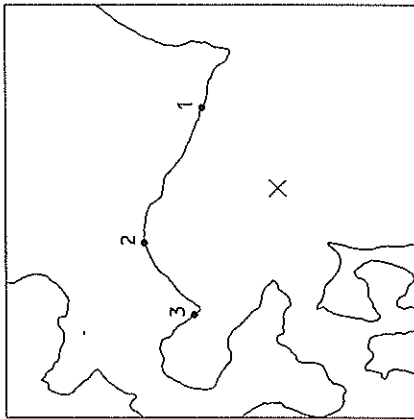
JMA INTENSITIES

IV : TOMAKOMAI

III : URAKAWA-MURORAN

II : HAKODATE, HACHINOHE,

OTARU



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2552	8 6 4	81
2 TOMAKOMAI-S	ON GROUND	S-2553	6 5 2	105
3 MURORAN-G	ON GROUND	F- 619	17 28 9	109

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

00:37 DEC. 7, 1993

E OFF AOMORI PREF

EPICENTER : 41°28.8'N 141°57.6'E

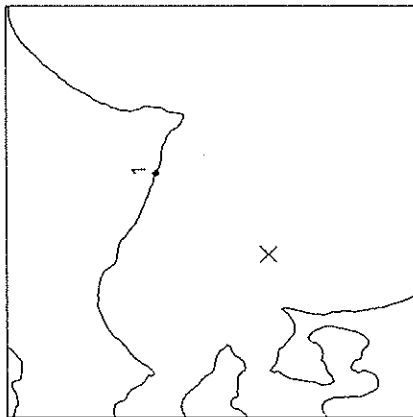
DEPTH : 71.7KM MAGNITUDE : 5.3

JMA INTENSITIES

II : URAKAWA, HACHINOHE, HIROO,

TOMAKOMAI

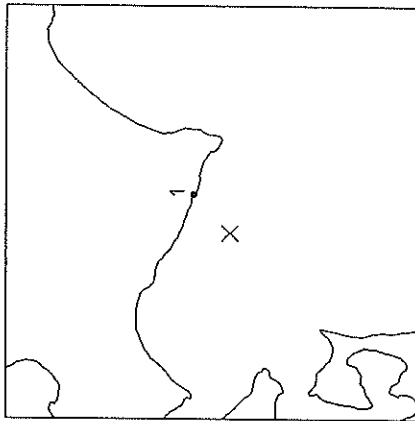
I : HAKODATE, KUSHIRO



STATION	CONDITION	RECORD NUMBER	MAX. ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2554	5 4 1	101

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

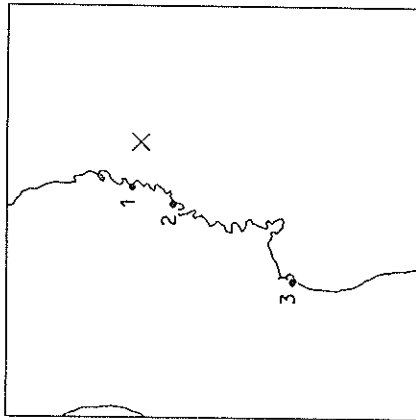
09:01 DEC. 11, 1993 JMA INTENSITIES  
 S OFF URAKAWA  
 III : URAKAWA  
 II : HIROO-TONAKOHAI  
 I : MURORAN, OTARU, KUSHIRO  
 EPICENTER : 41°57.3'N 142°23.8'E  
 DEPTH : 66.1KM MAGNITUDE : 4.9



STATION	CONDITION	RECORD NUMBER	MAX.ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 URAKAWA-S	ON GROUND	S-2555	15 8 3	38

STRONG-MOTION EARTHQUAKE OBSERVATION RESULTS

12:19 DEC. 17, 1993 JMA INTENSITIES  
 E OFF IWATE PREF  
 IV : OFUNATO  
 III : MIYAKO, ISHINOMAKI  
 II : MORIOKA, HACHINOHE  
 I : SENDAI, SAKATA  
 EPICENTER : 39°11.2'N 142°16.0'E  
 DEPTH : 62.1KM MAGNITUDE : 5.3



STATION	CONDITION	RECORD NUMBER	MAX.ACC. (GAL) (NS) (EW) (UD)	DIST. (KM)
1 KAMAISHI-MB	IN GROUND	M-1503	11 9 7	32
1 KAMAISHI-M	ON GROUND	M-1502	39 44 29	32
2 OFUNATO-MOUND-M	ON STRUC.	M-1504	40 22 19	49
3 SENDAI-MB	IN GROUND	M-1501	2 3 1	147
3 SENDAI-M	ON GROUND	M-1500	8 7 4	147

## Results of Preliminary Analyses (1993)



RECORD NUMBER : F-512  
 STATION : MIYAKO-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME : 20:35 JAN. 12, 1993

LOCATION OF HYPOCENTER

E OFF IWATE PREF

39° 28.2' N

142° 11.2' E

21.2KM

3.7

JMA MAGNITUDE

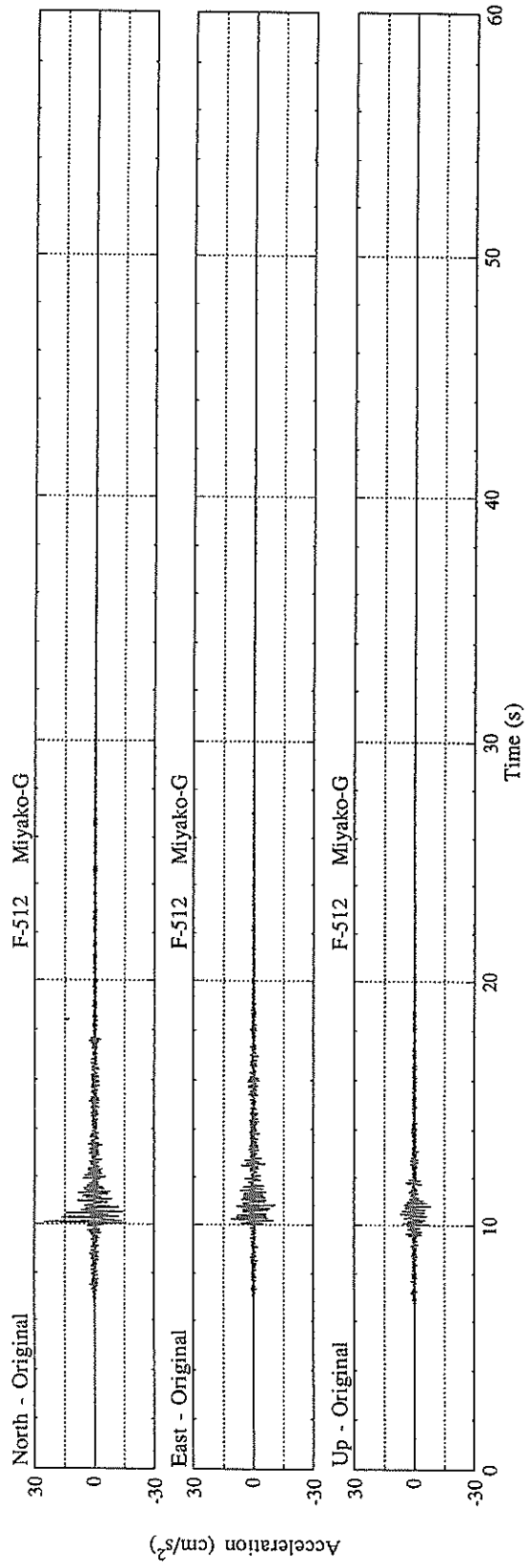
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 25.0 11.1 8.0 25.2

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1454  
 STATION : MIYAZAKI-M  
 EARTHQUAKE DATA

DATE AND TIME  
 3:32 FEB. 6, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION  
 SOUTHERN MIYAZAKI PREF

LATITUDE  
 31° 57. 0' N

LONGITUDE  
 131° 17. 1' E

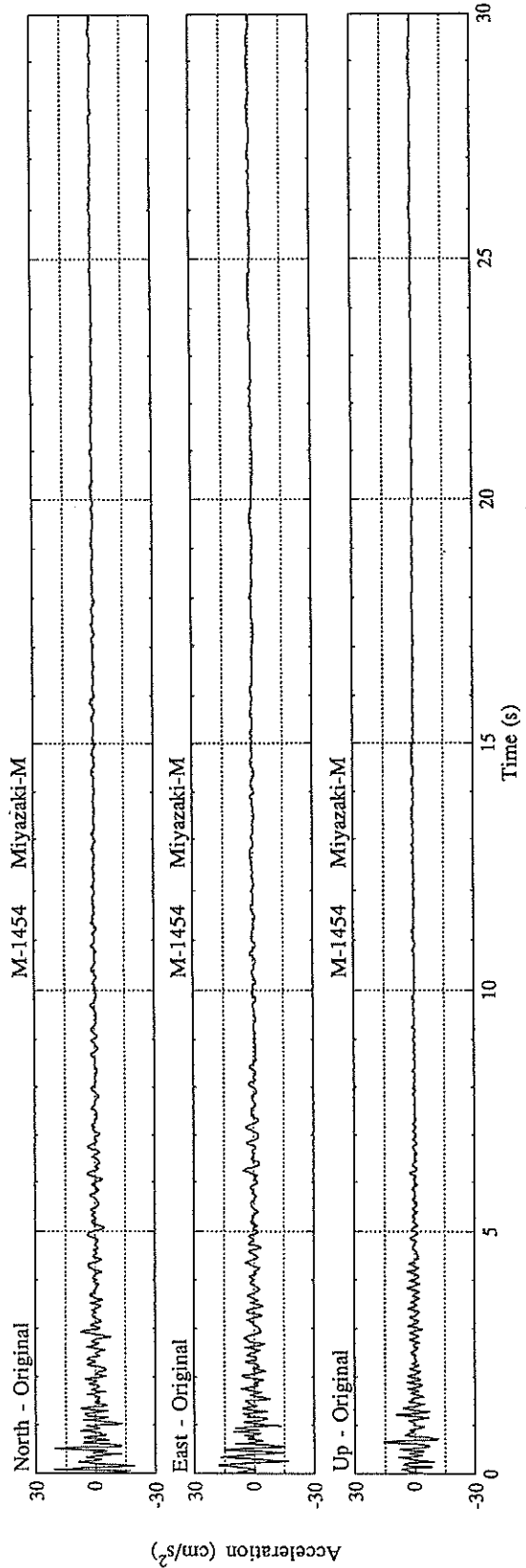
DEPTH  
 12.8KM

JMA MAGNITUDE  
 4.1

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

	N	S	E	W	U	D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)	20.8	18.2	15.7	24.2			

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2502  
 STATION : TOYAMA-S

EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME 22:27 FEB. 7, 1993  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION OFF NOTO PENINSULA  
 LATITUDE 37° 39.2' N  
 LONGITUDE 137° 18.0' E  
 DEPTH 24.8KM  
 JMA MAGNITUDE 6.6  
 \*\*\*\*\*

PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
--	-----	-----	-----	-------------

PARAMETER OF THE VARIABLE FILTER

FC (HZ)	0.243	0.182	0.341	
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MAXIMUM ACCELERATION (GAL)

ORIGINAL	78.4	66.1	12.3	82.1
CORRECTED	86.9	74.7	15.4	90.7

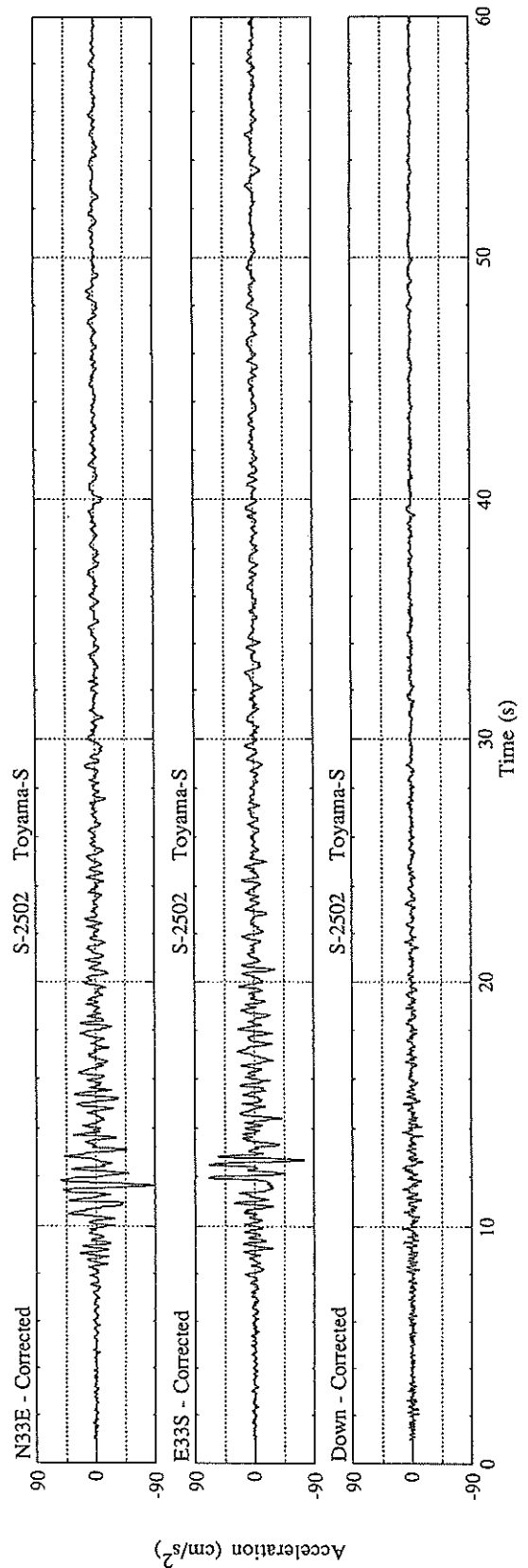
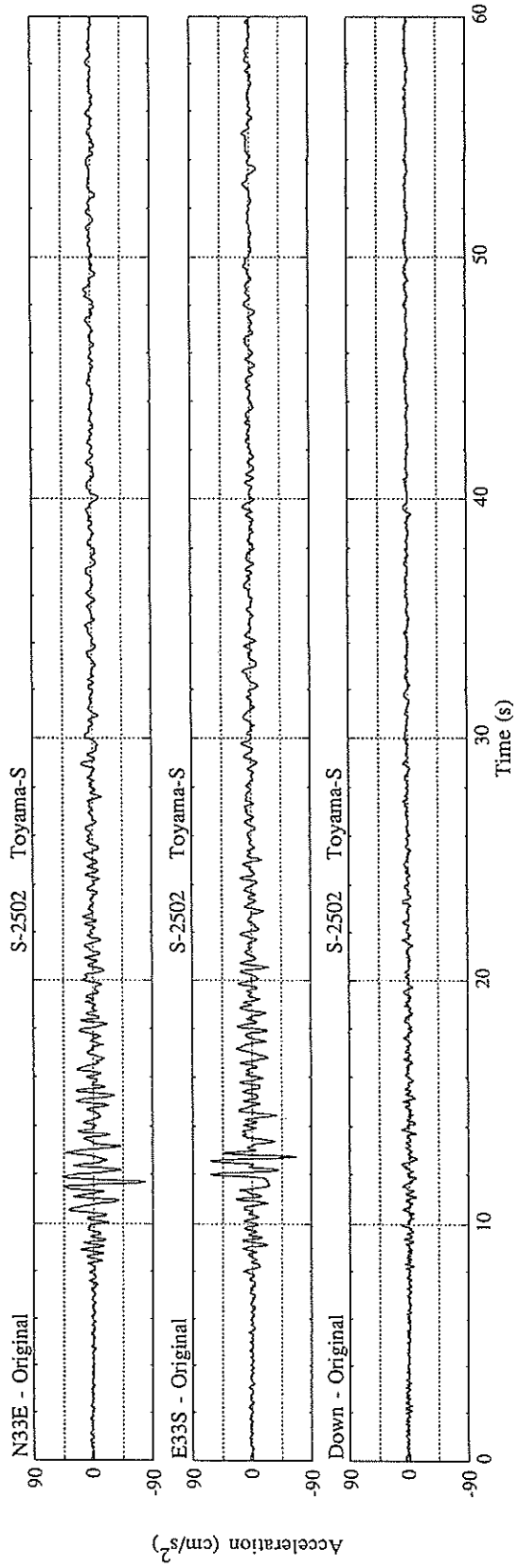
MAXIMUM VELOCITY (CM/SEC)

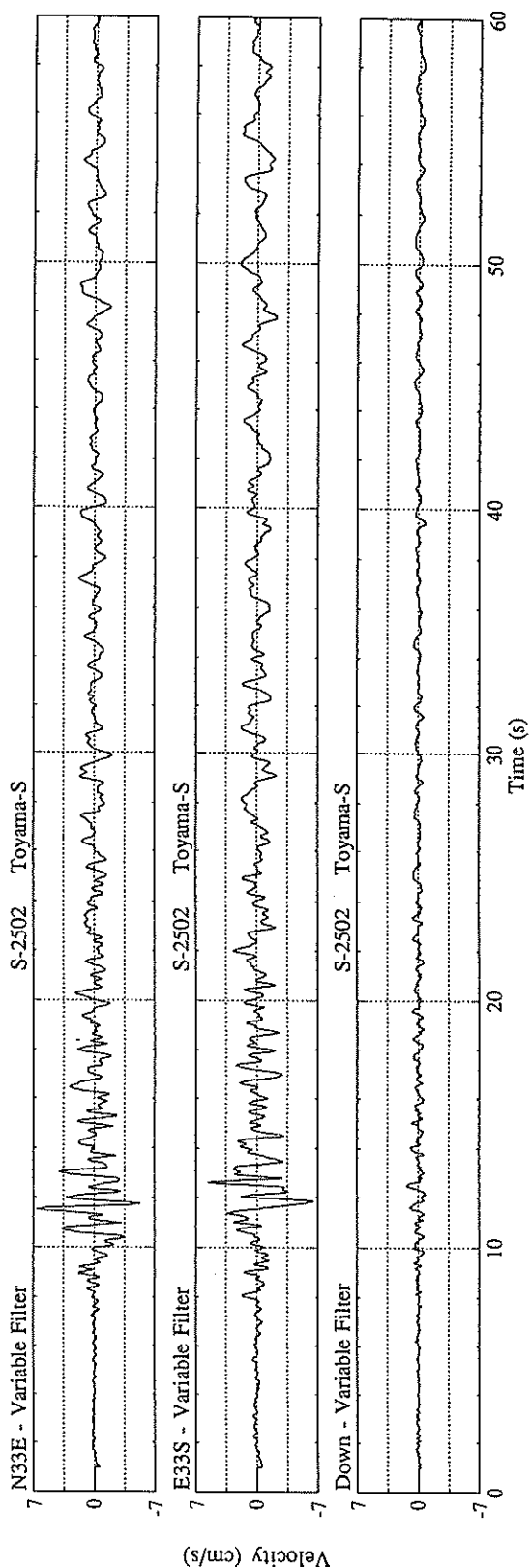
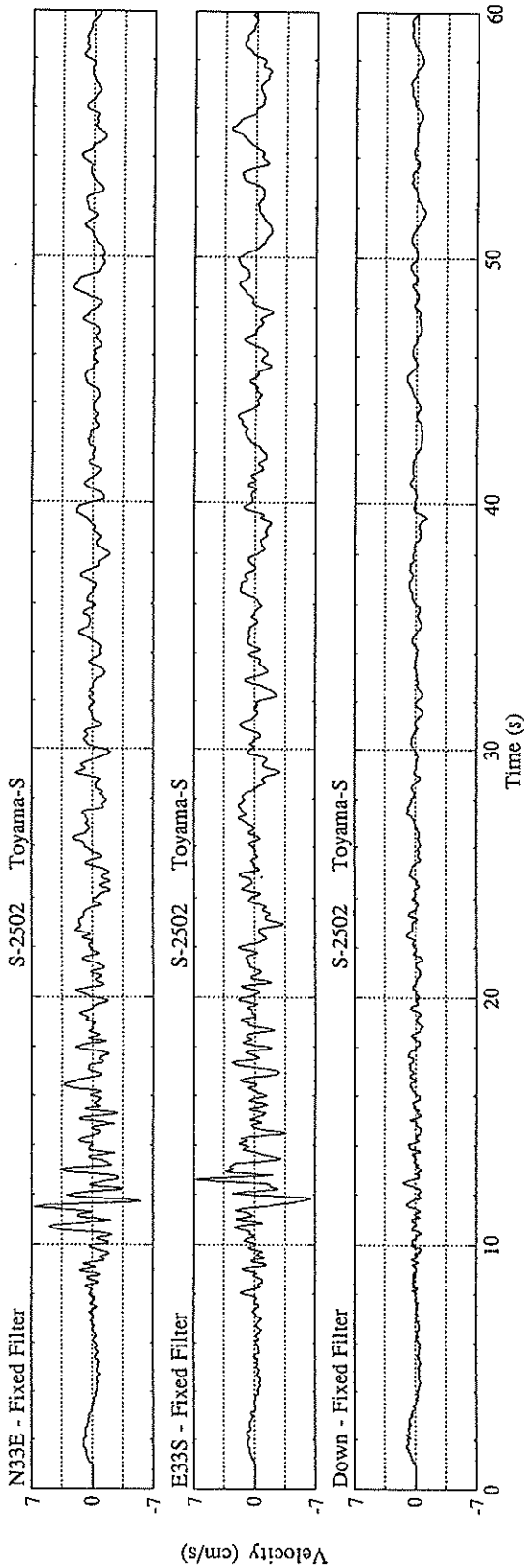
FIXED FILTER	6.74	6.80	1.42	7.76
VARIABLE FILTER	6.61	6.45	1.38	7.17

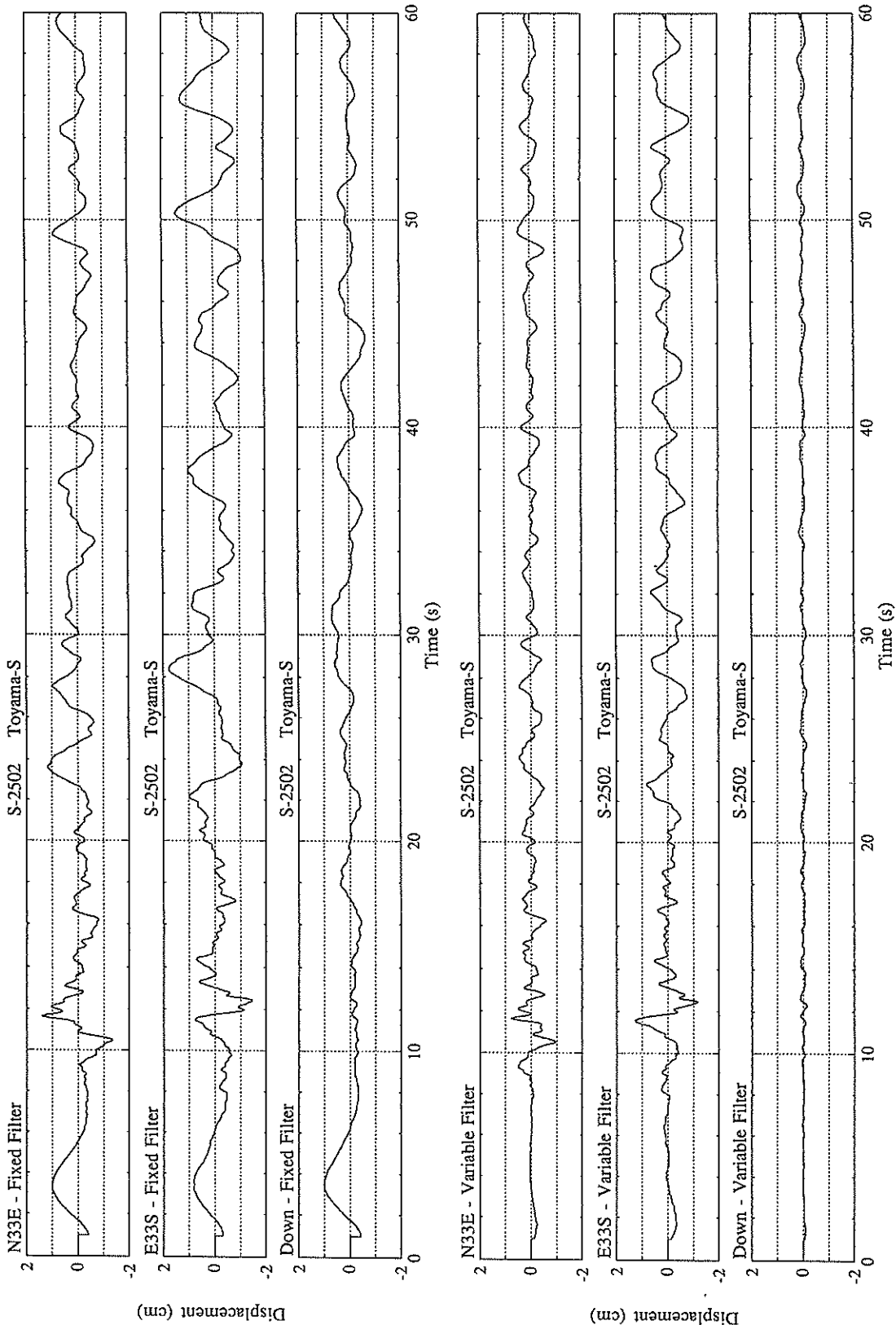
MAXIMUM DISPLACEMENT (CM)

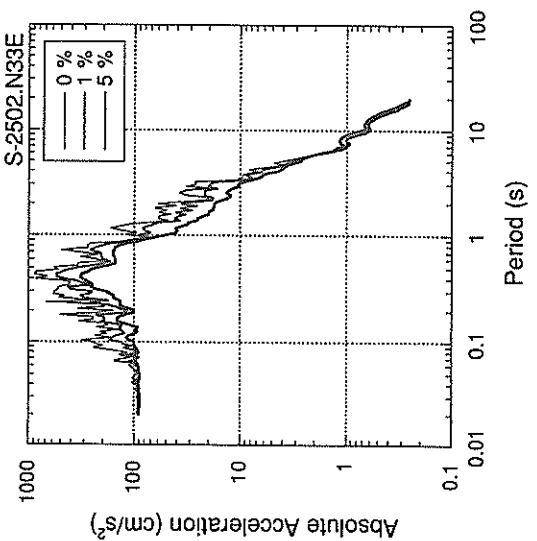
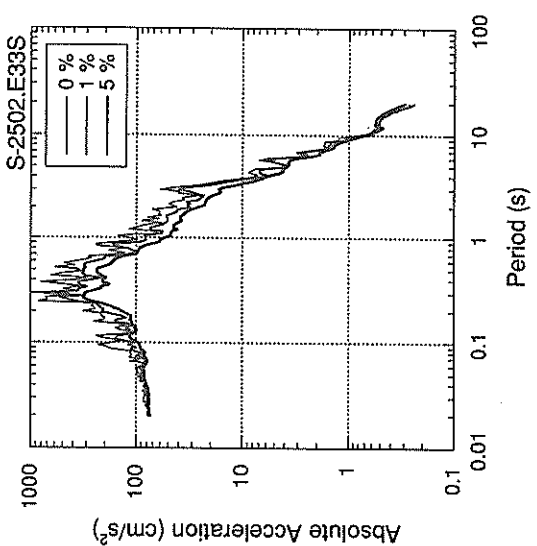
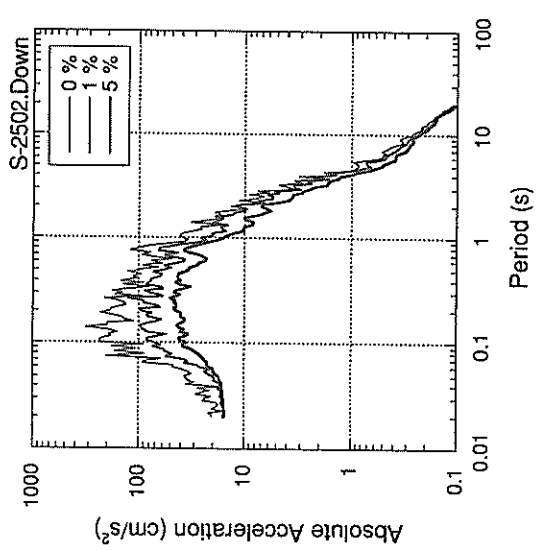
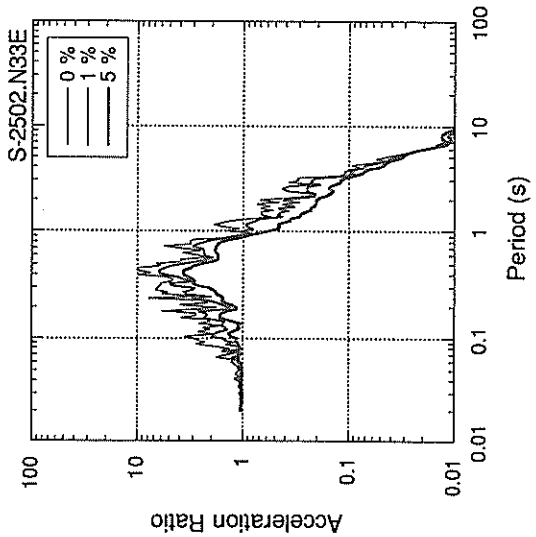
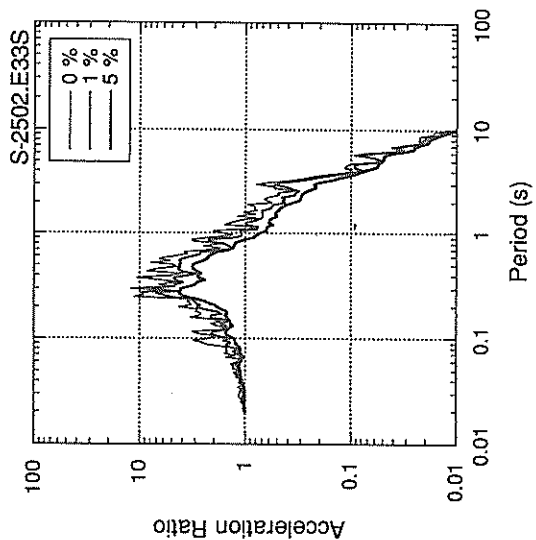
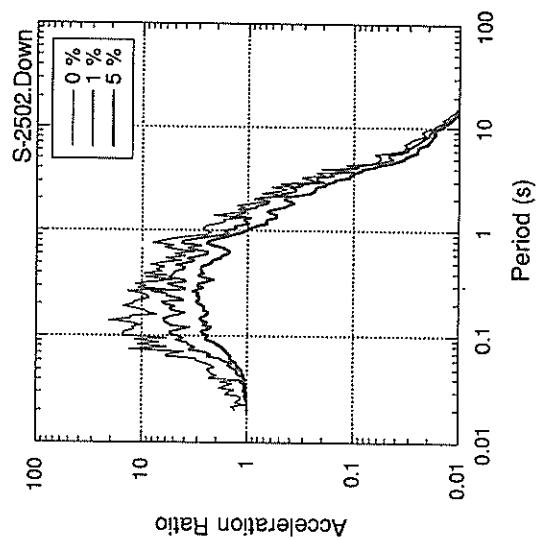
FIXED FILTER	1.42	1.79	1.02	1.79
VARIABLE FILTER	0.95	1.28	0.17	1.43

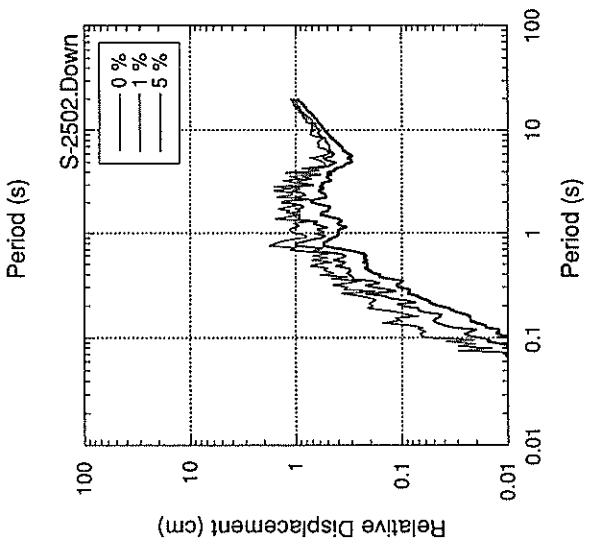
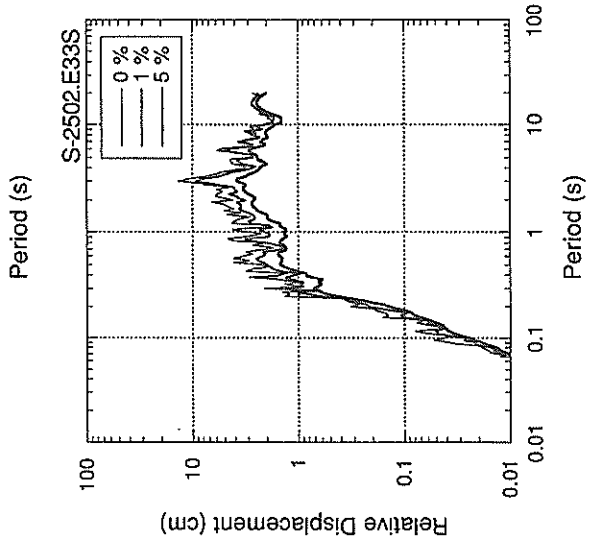
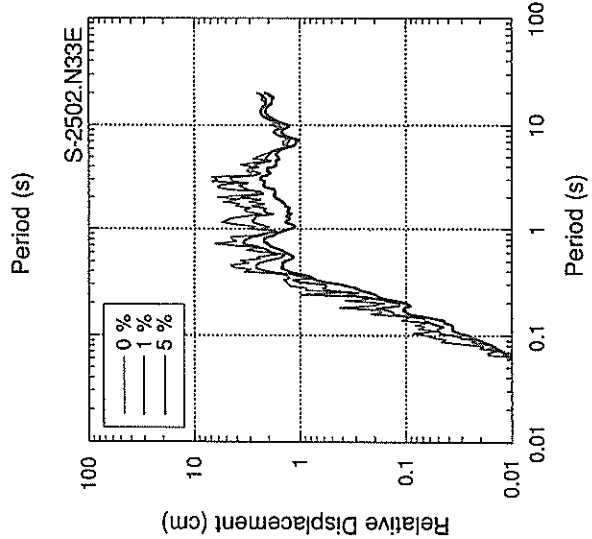
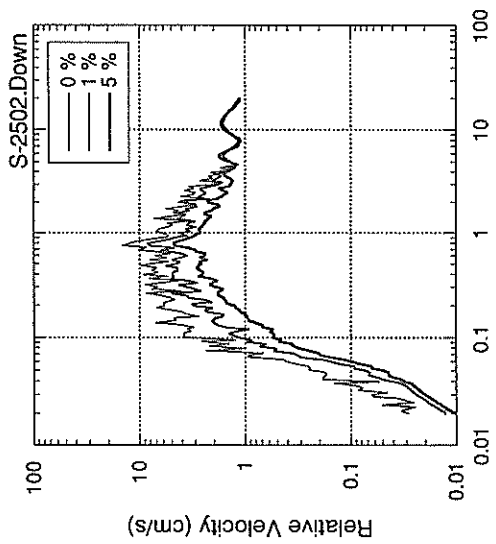
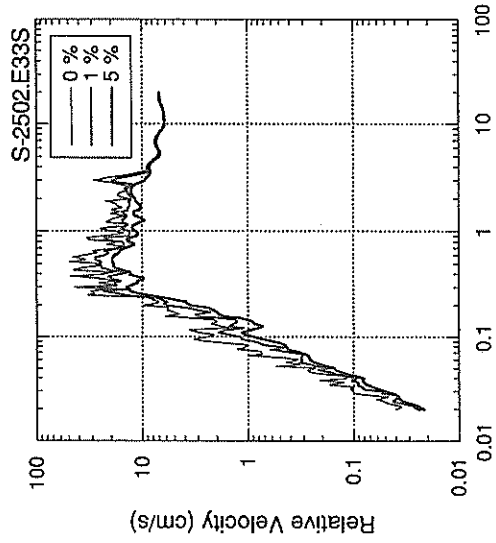
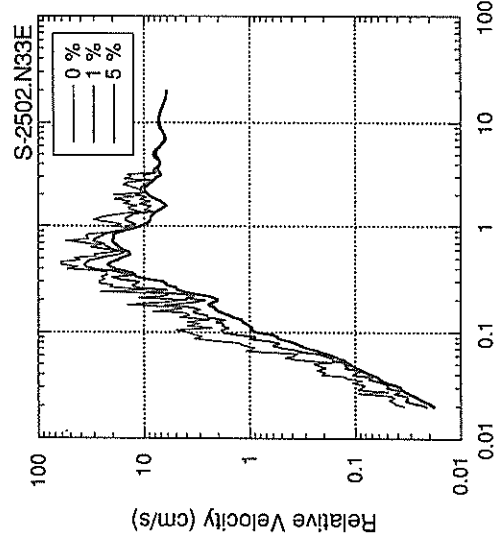
\* RESULTANT OF HORIZONTAL COMPONENTS



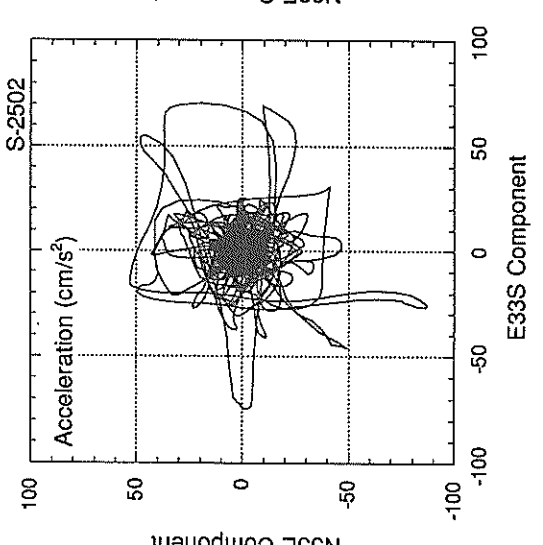
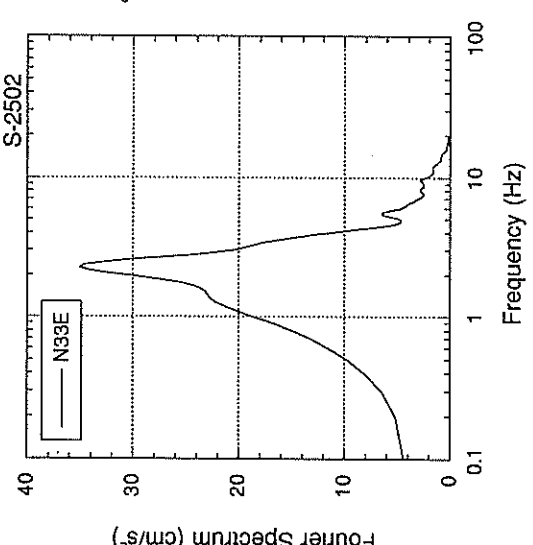
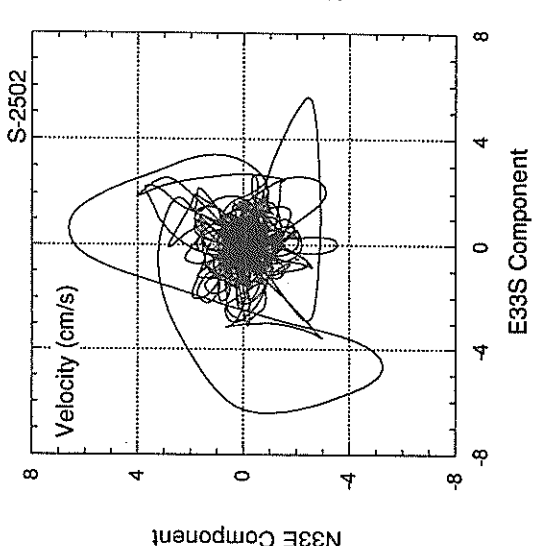
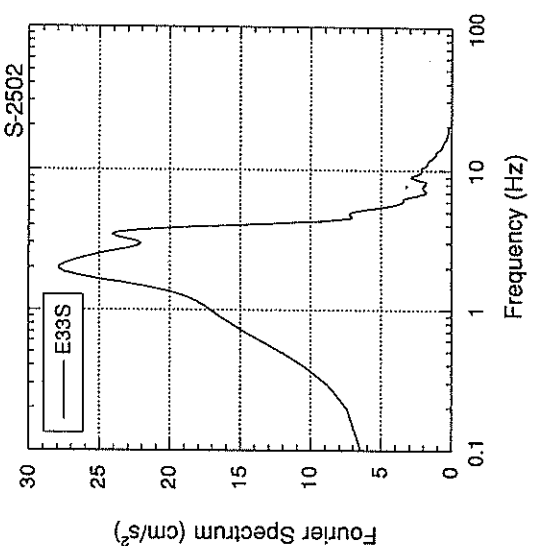
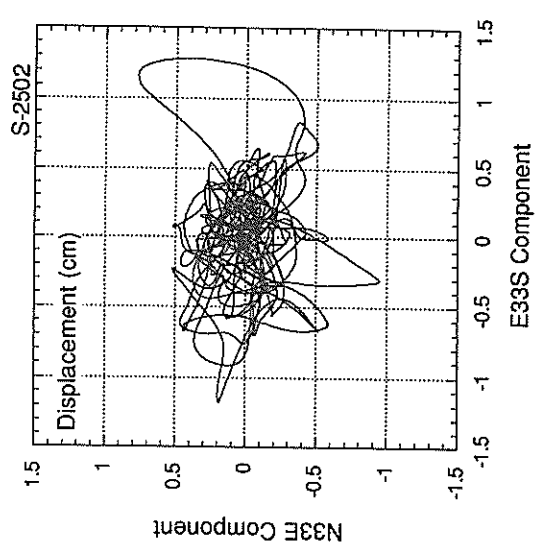
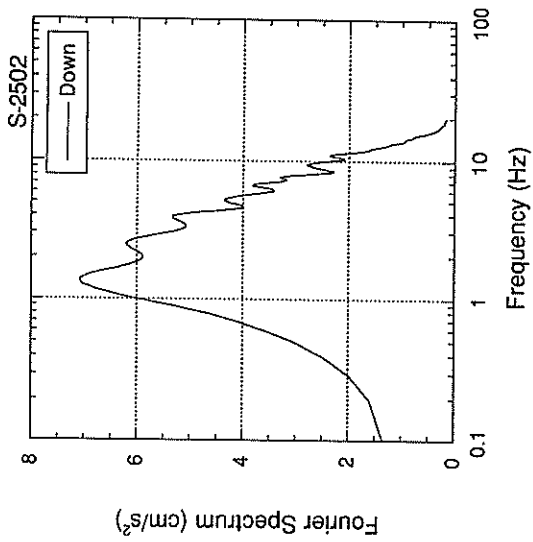












RECORD NUMBER : S-2506  
 STATION : KANAZAWA-S

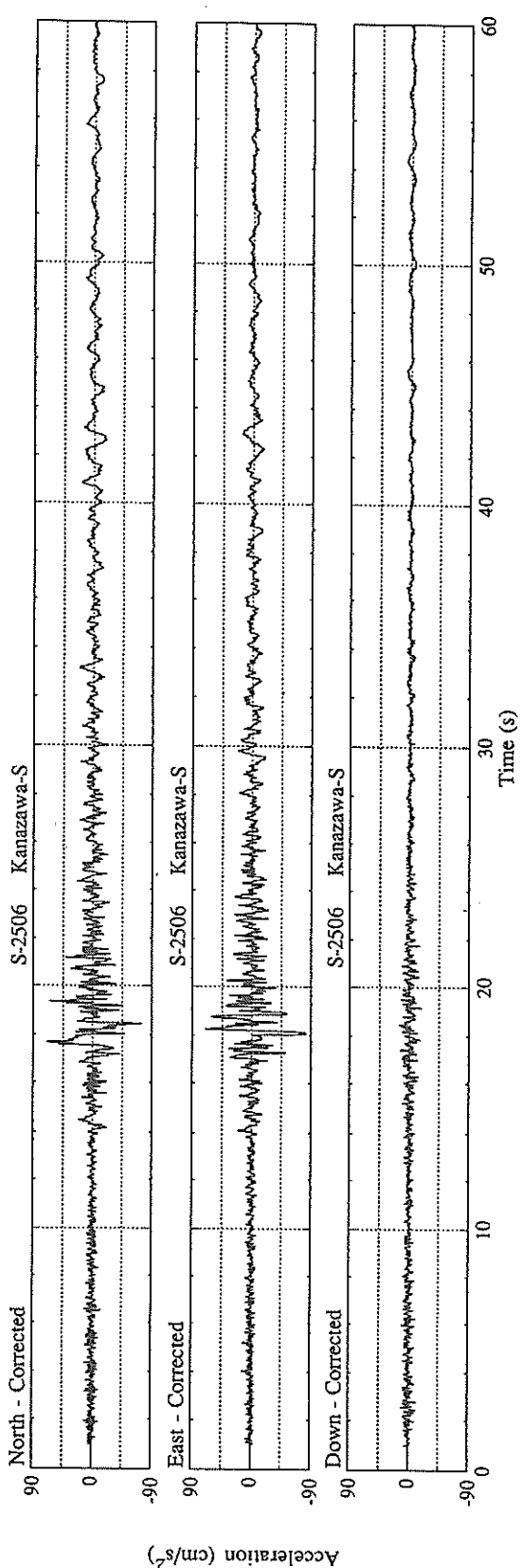
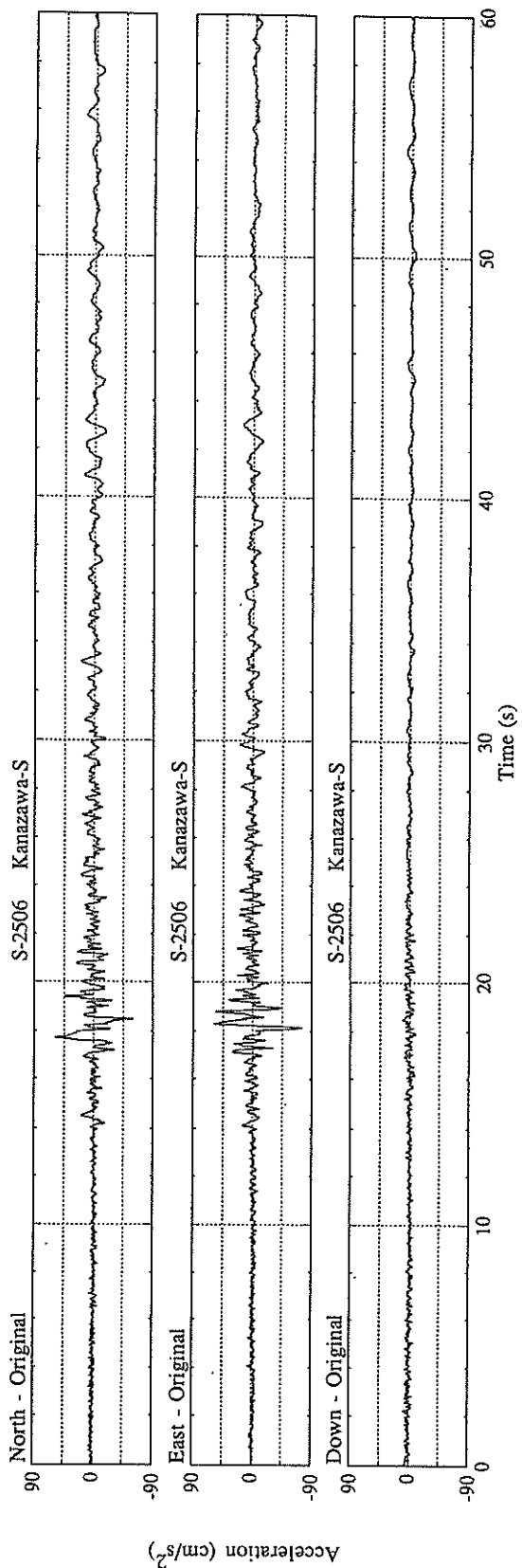
EARTHQUAKE DATA

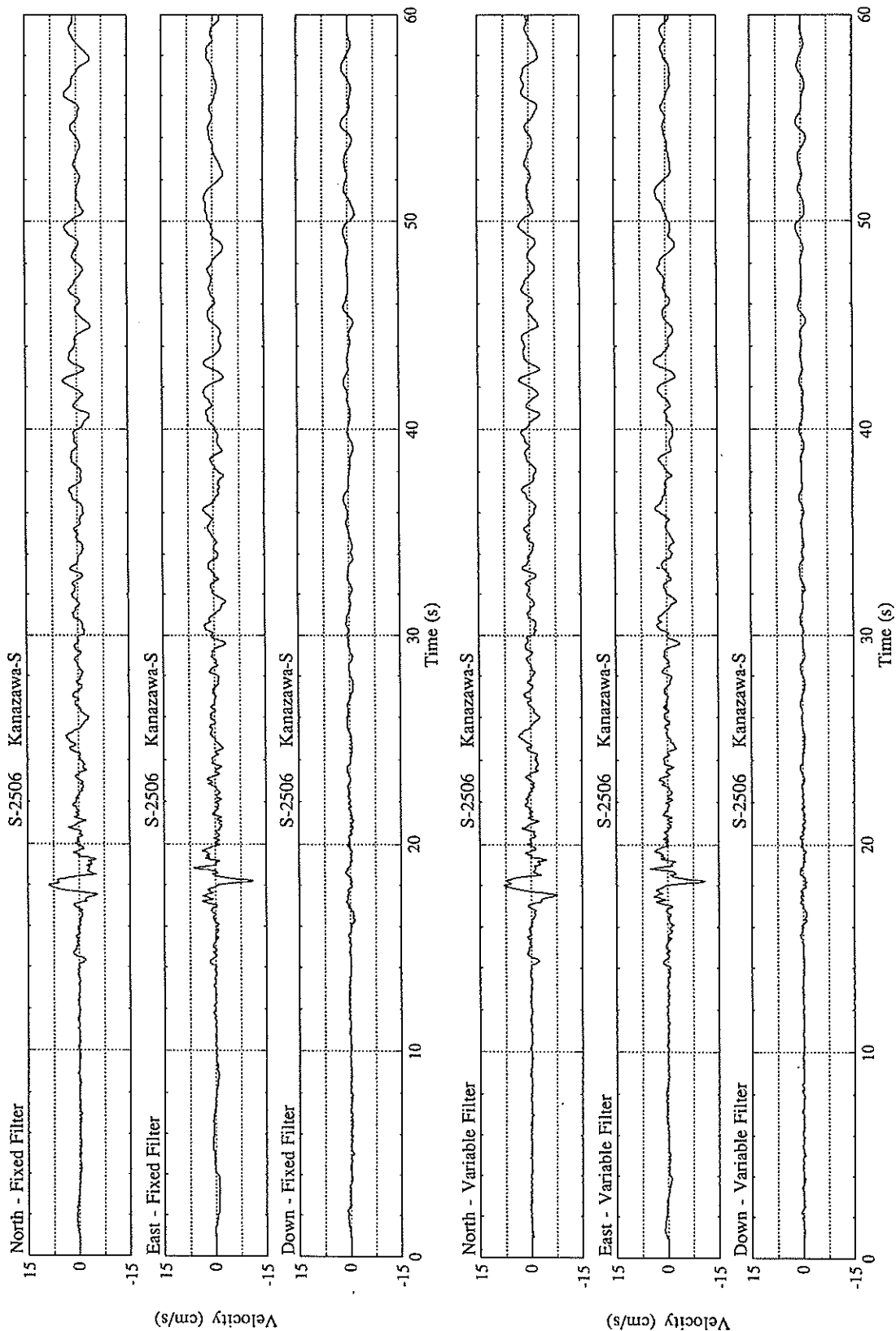
\*\*\*\*\*  
 DATE AND TIME 22:27 FEB. 7, 1993  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION OFF NOTO PENINSULA  
 LATITUDE 37° 39.2' N  
 LONGITUDE 137° 18.0' E  
 DEPTH 24.8KM  
 JMA MAGNITUDE 6.6  
 \*\*\*\*\*

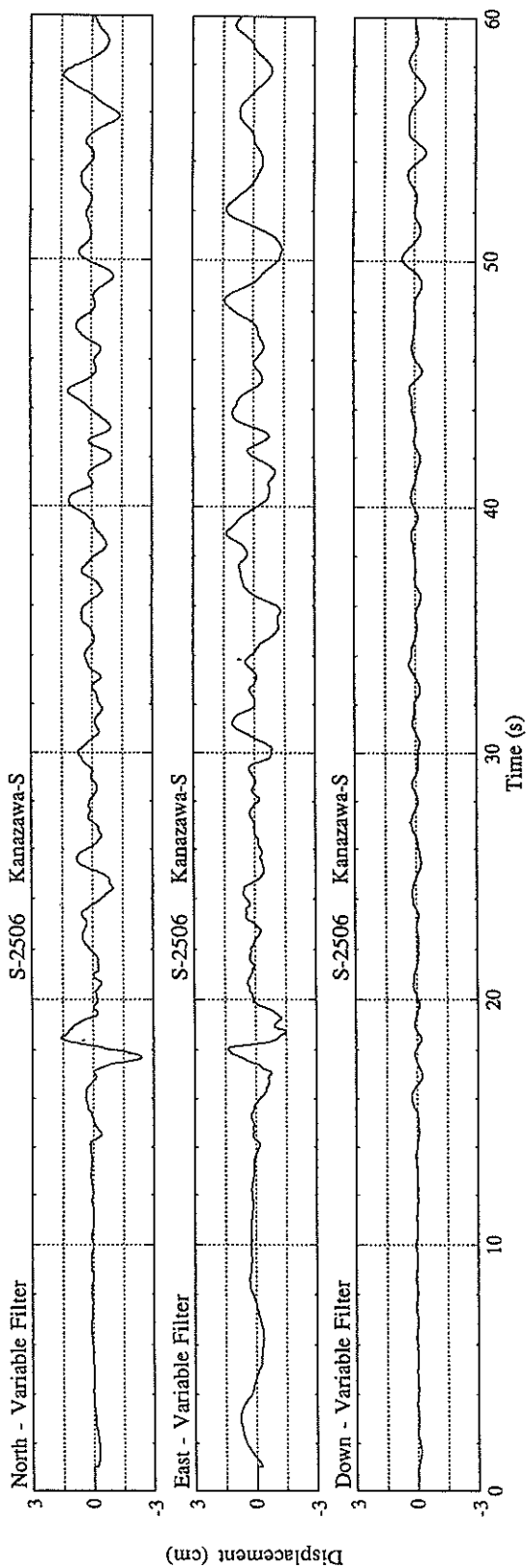
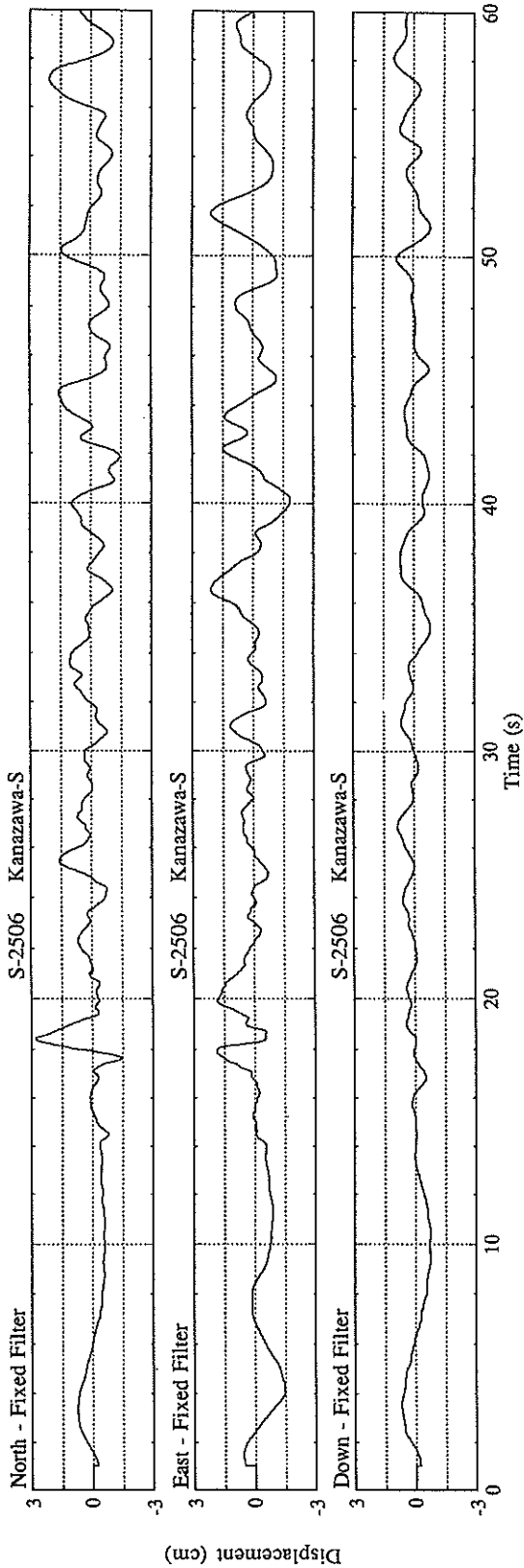
PEAK VALUES OF COMPONENTS

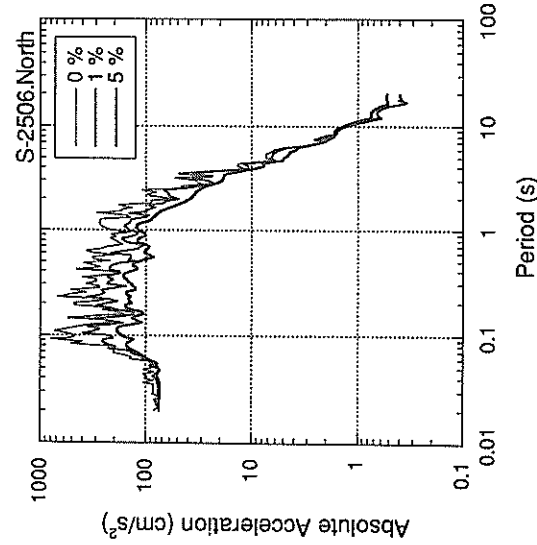
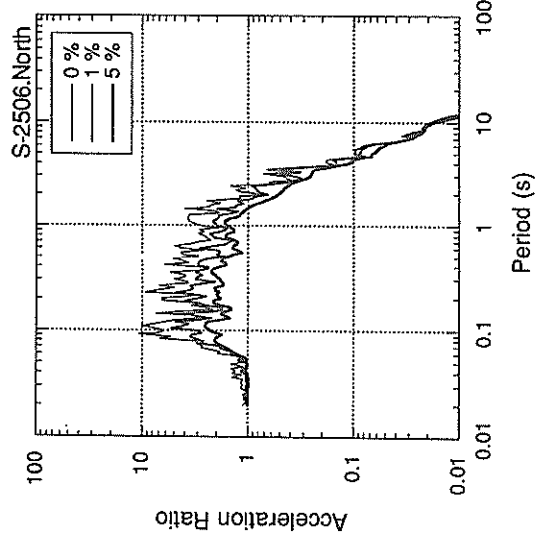
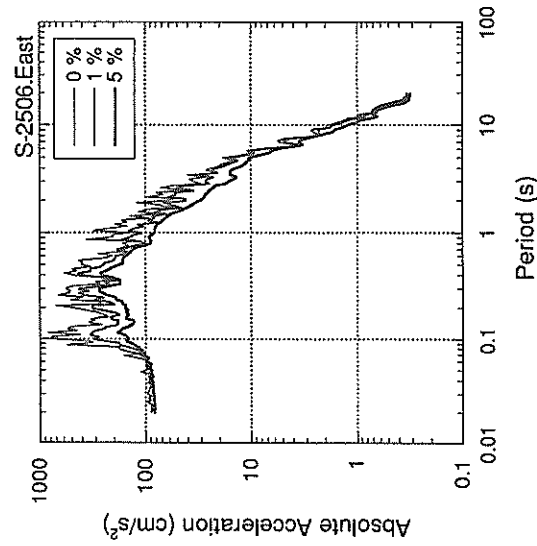
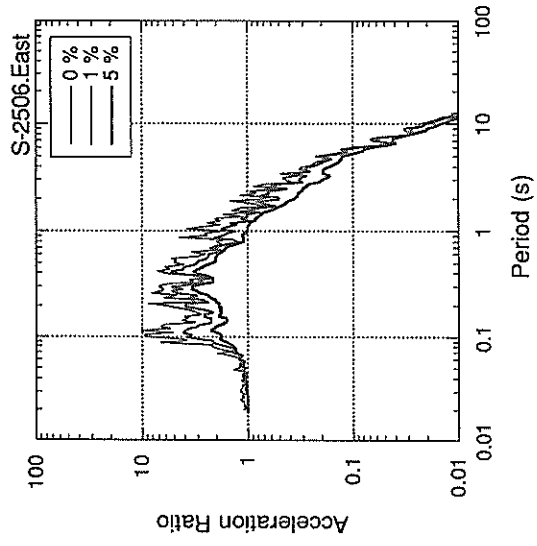
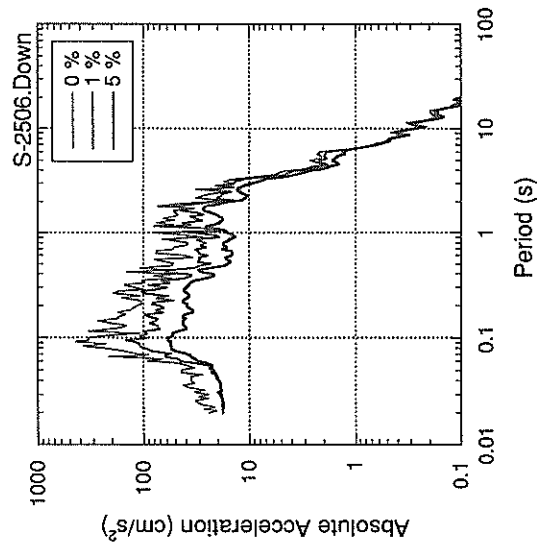
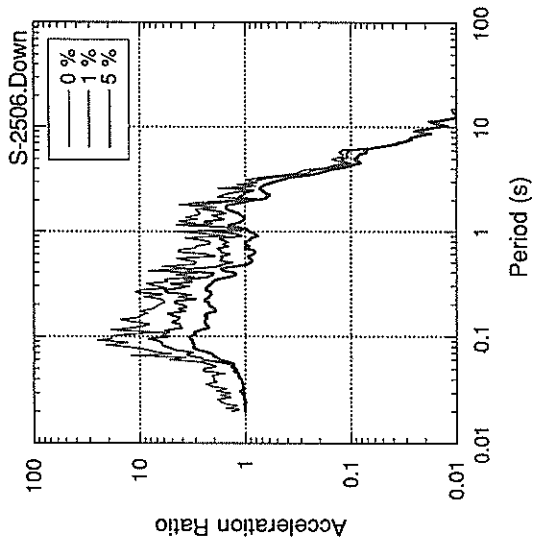
	N S	E W	U D	HORIZONTAL*
PARAMETER OF THE VARIABLE FILTER				
FC (HZ)	0.182	0.146	0.256	
MAXIMUM ACCELERATION (GAL)				
ORIGINAL	59.7	73.9	11.1	74.3
CORRECTED	74.3	82.0	17.6	91.9
MAXIMUM VELOCITY (CM/SEC)				
FIXED FILTER	8.94	11.14	2.17	12.77
VARIABLE FILTER	8.02	10.94	1.57	13.15
MAXIMUM DISPLACEMENT (CM)				
FIXED-FILTER	2.82	2.09	0.97	2.87
VARIABLE FILTER	2.40	1.50	0.60	2.51

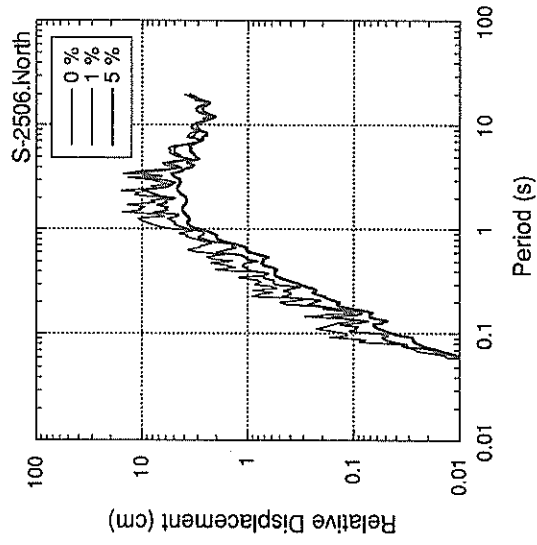
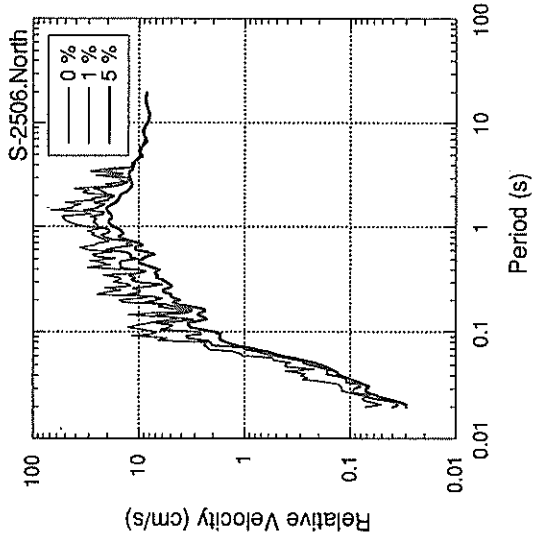
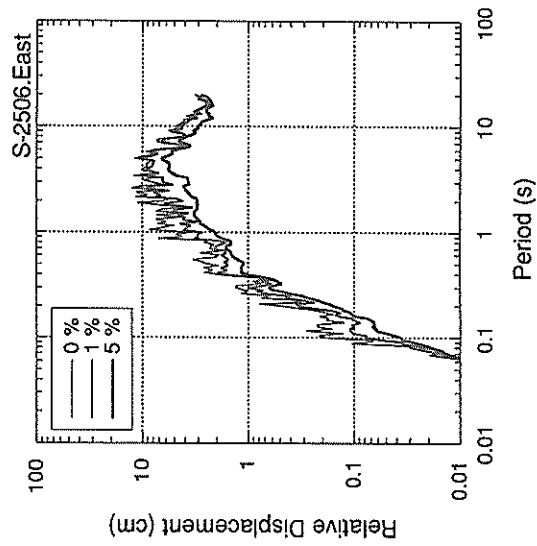
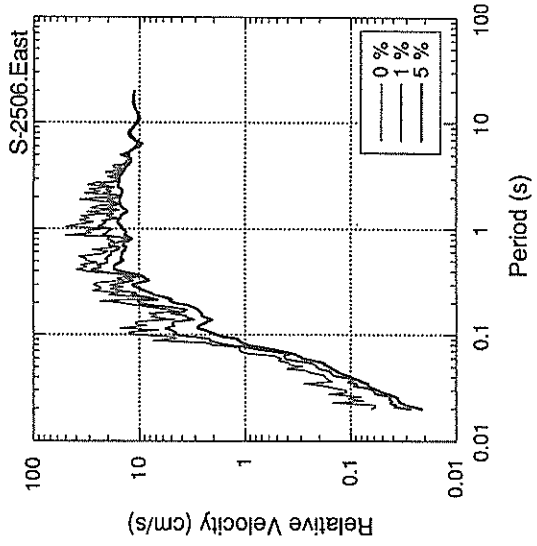
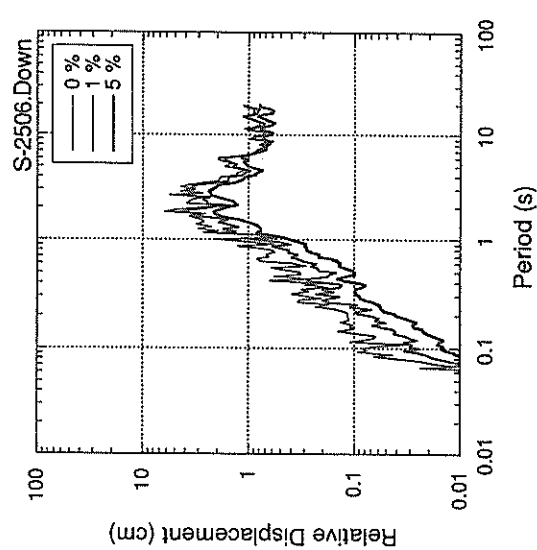
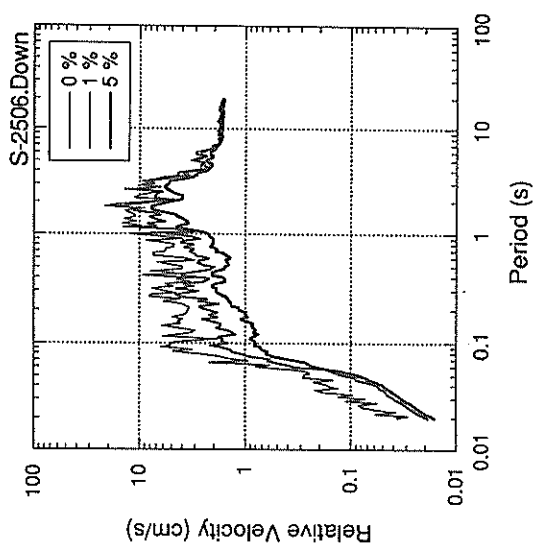
\* RESULTANT OF HORIZONTAL COMPONENTS

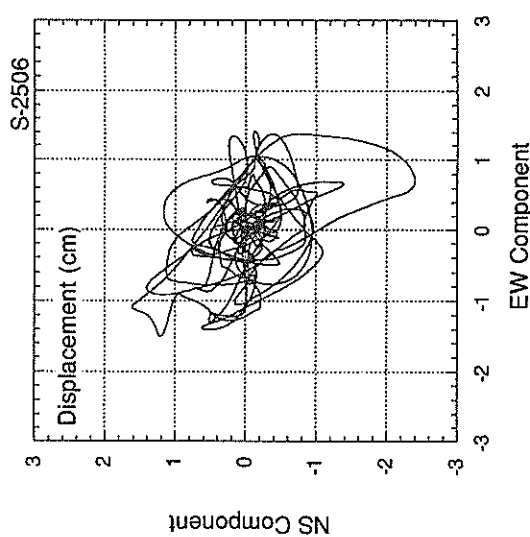
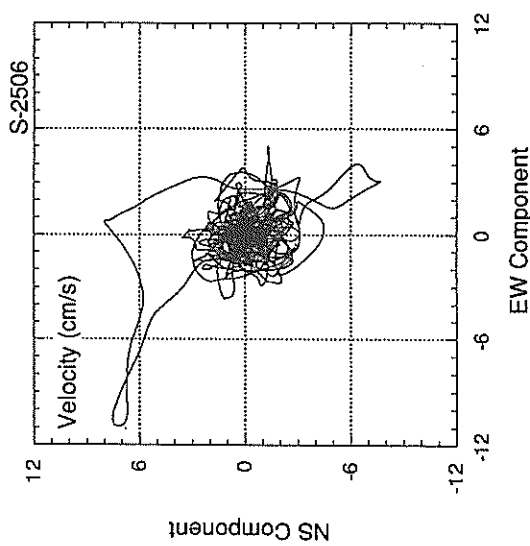
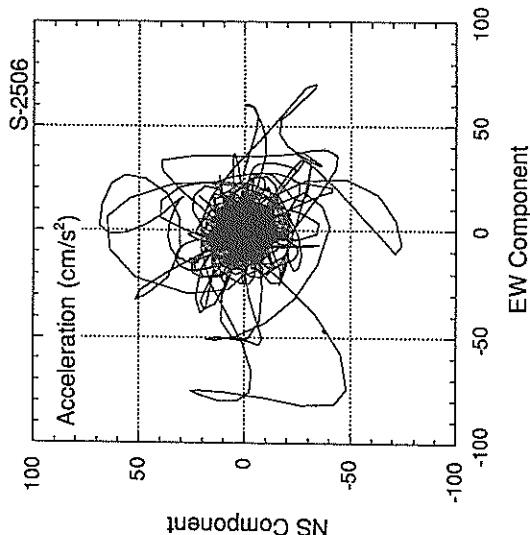
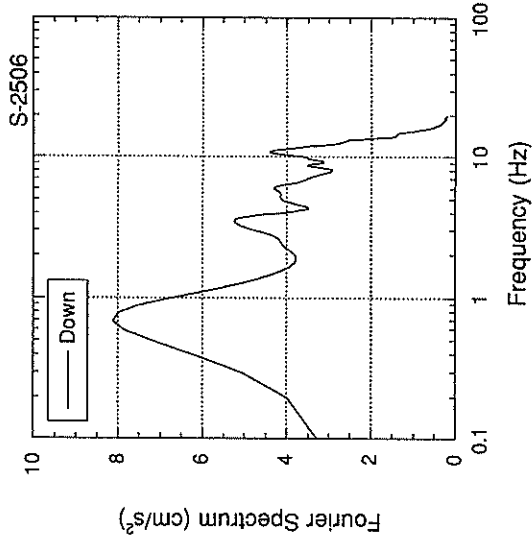
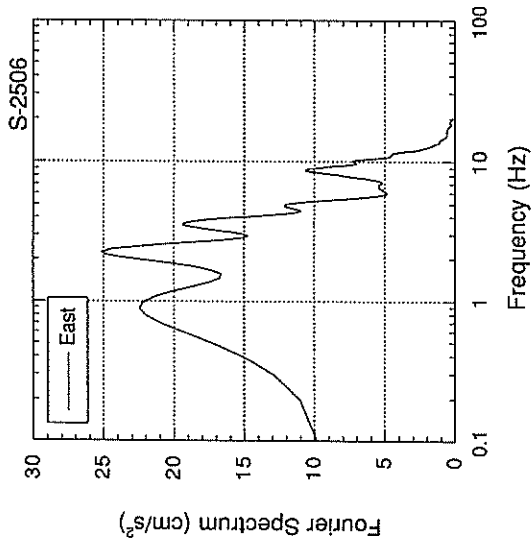
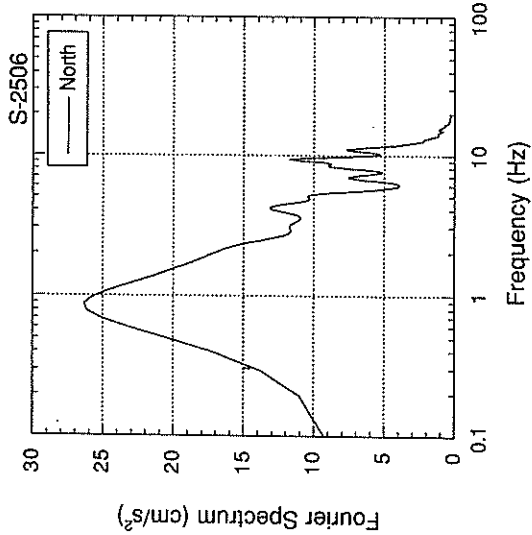














RECORD NUMBER : F-524  
 STATION : NIIGATA-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 22:27 FEB. 7, 1993

LOCATION OF HYPOCENTER

OFF NOTO PENINSULA

LATITUDE 37° 39.2' N

LONGITUDE 137° 18.0' E

DEPTH 24.8KM

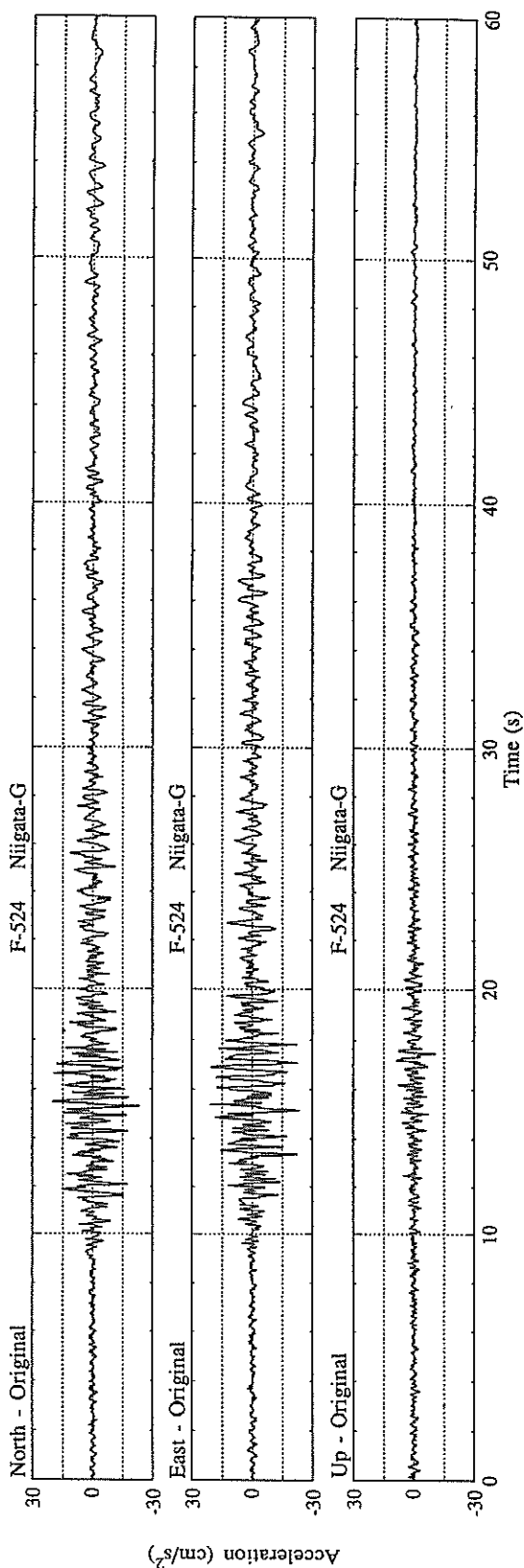
JMA MAGNITUDE 6.6

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 23.3 23.4 10.5 26.0  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-580  
 STATION : MIYAKO-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 18:27 FEB. 25, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION NE OFF IWATE PREF

LATITUDE 40° 14.1' N

LONGITUDE 142° 26.8' E

DEPTH 28.4KM

JMA MAGNITUDE 5.9

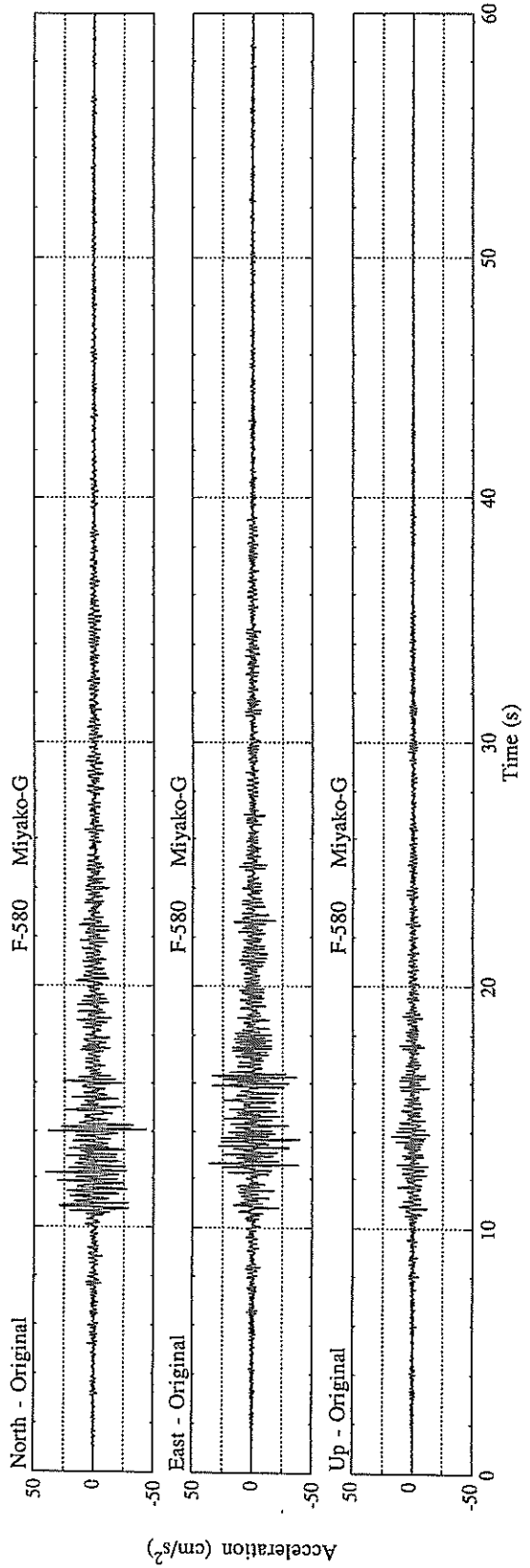
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PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 43.7 39.5 17.8 48.9

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1459

STATION : TOKACHI-M

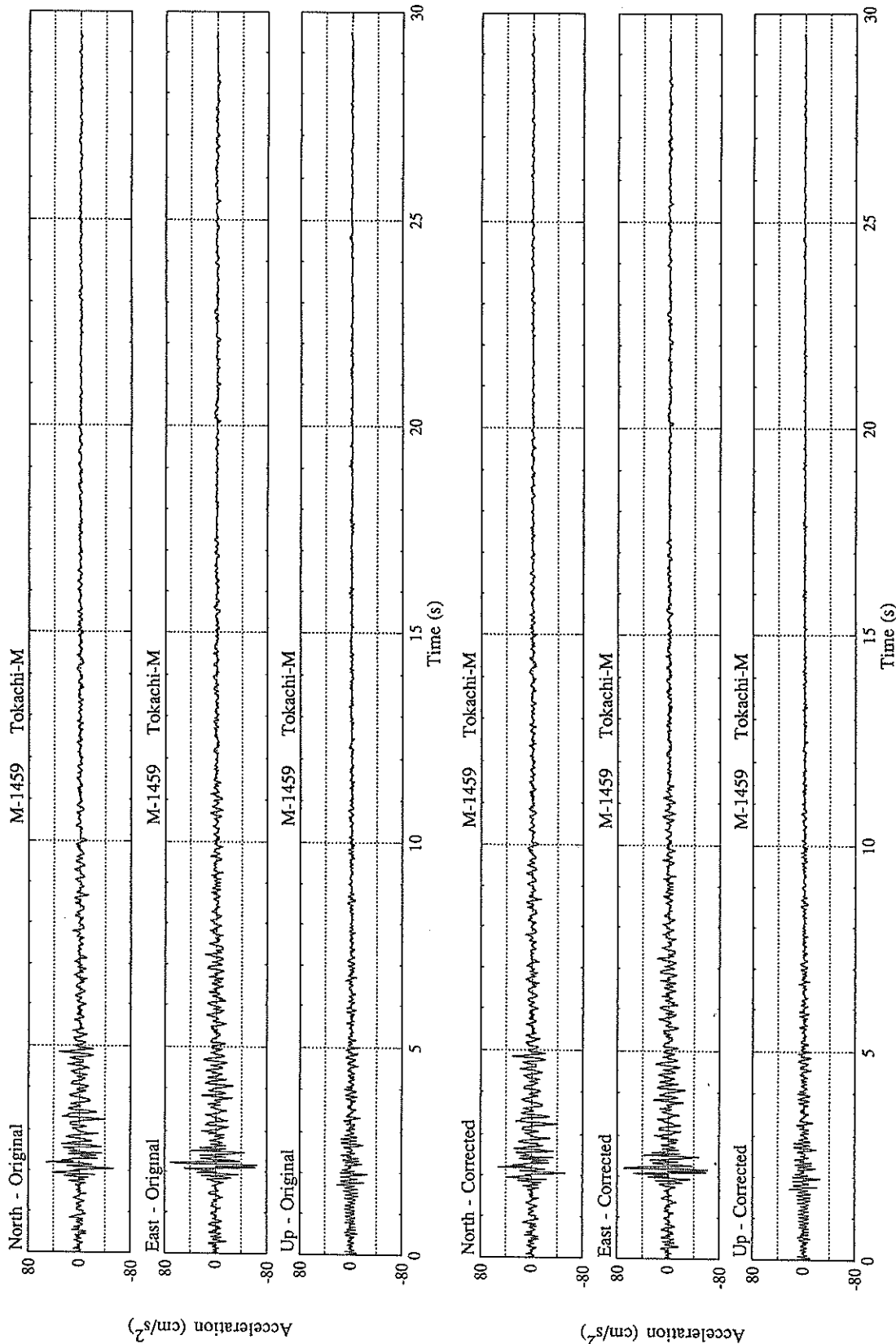
EARTHQUAKE DATA

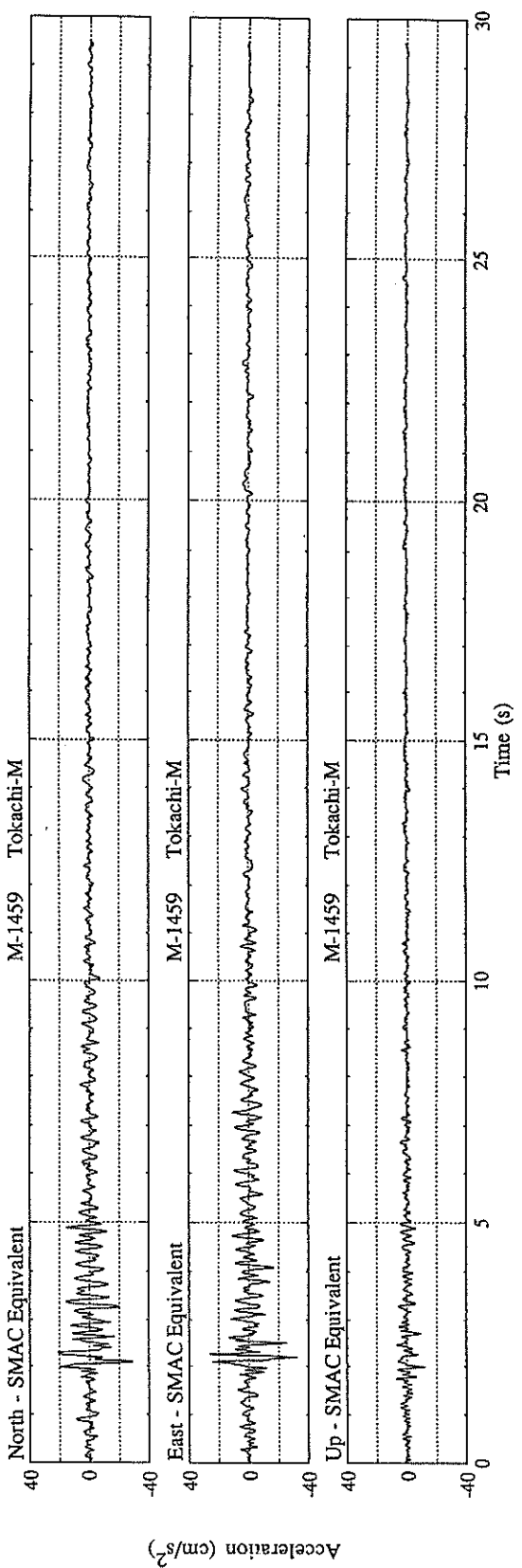
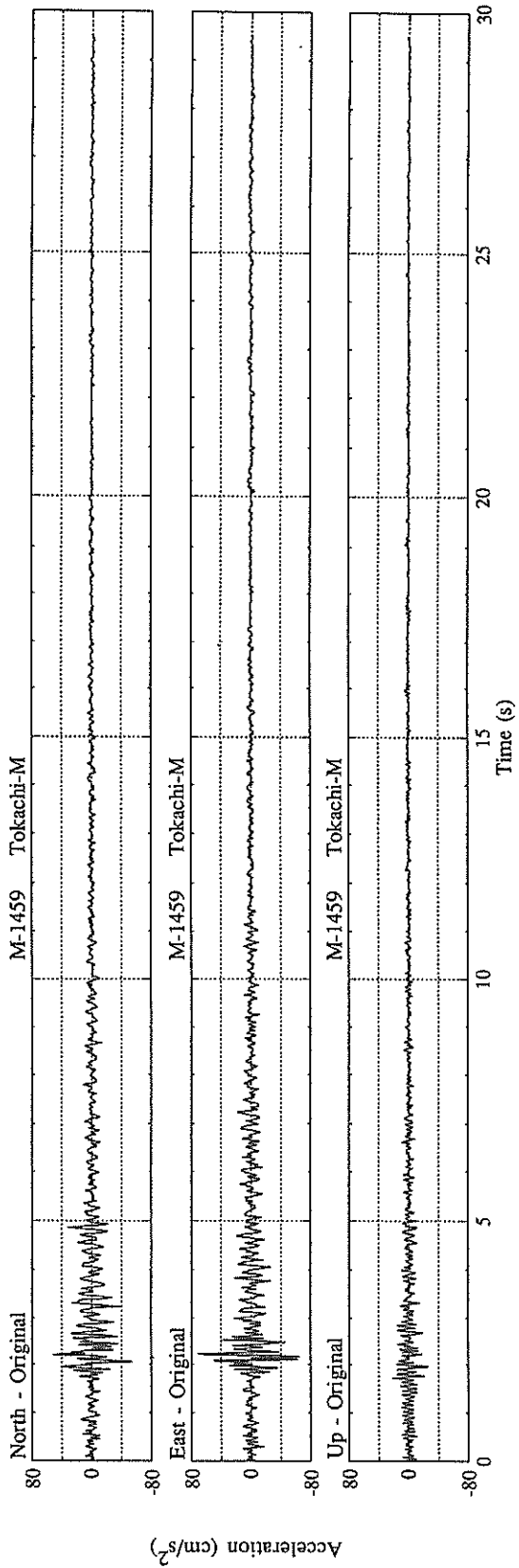
\*\*\*\*\*  
DATE AND TIME 12:35 MAR. 15, 1993  
LOCATION OF HYPOCENTER  
EPICENTRAL REGION HIDAKA MOUNTAINS REGION  
LATITUDE 42° 15.2' N  
LONGITUDE 143° 8.4' E  
DEPTH 64.0KM  
JMA MAGNITUDE 5.1  
\*\*\*\*\*

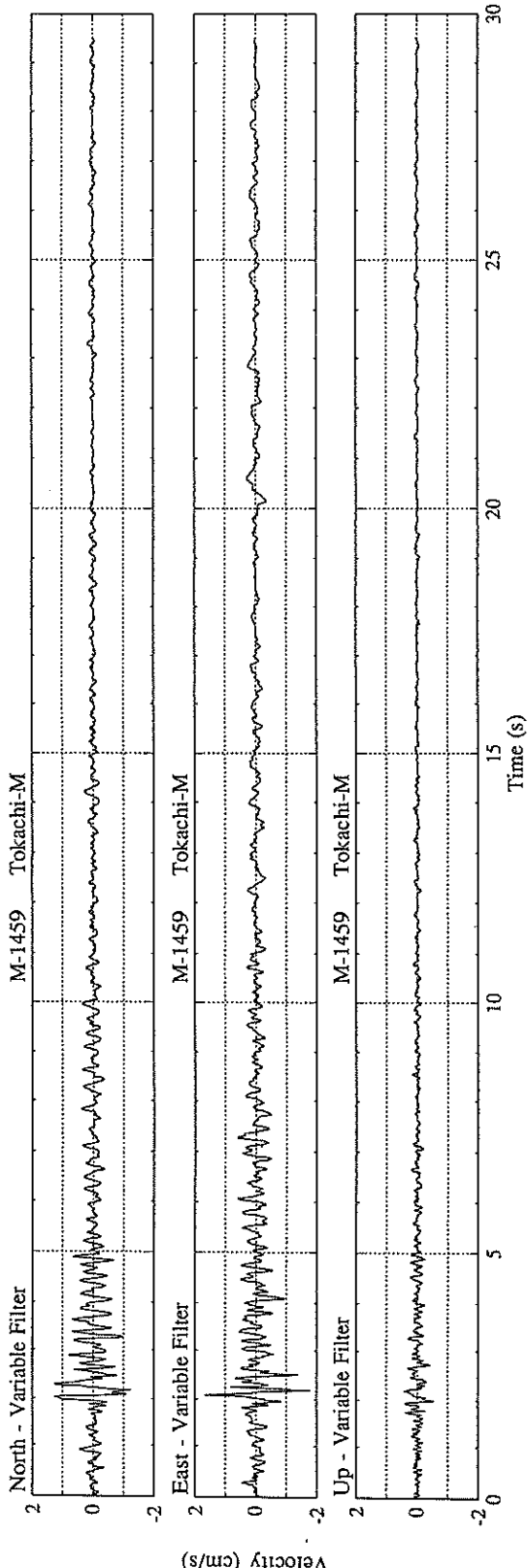
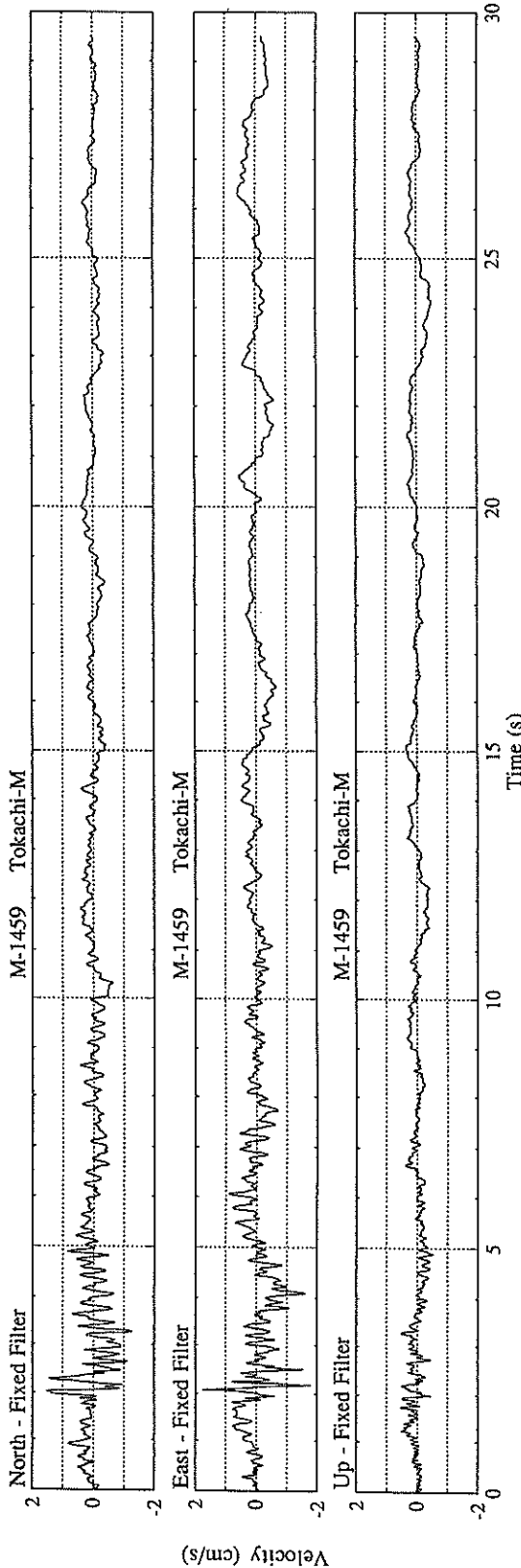
PEAK VALUES OF COMPONENTS

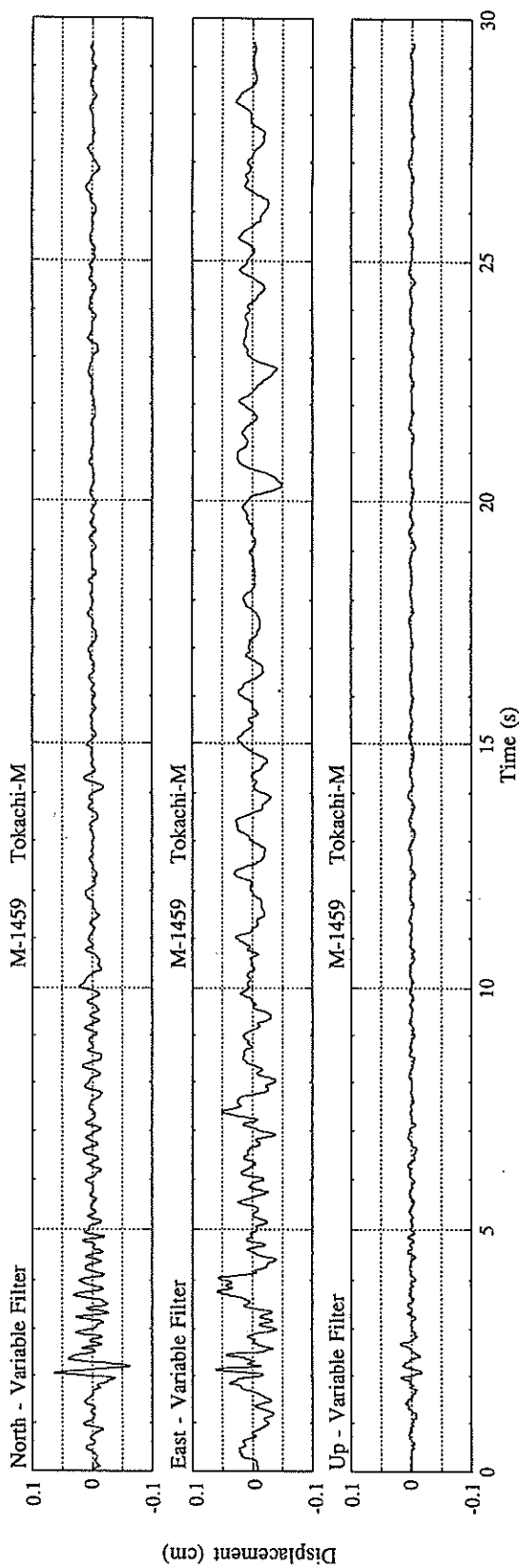
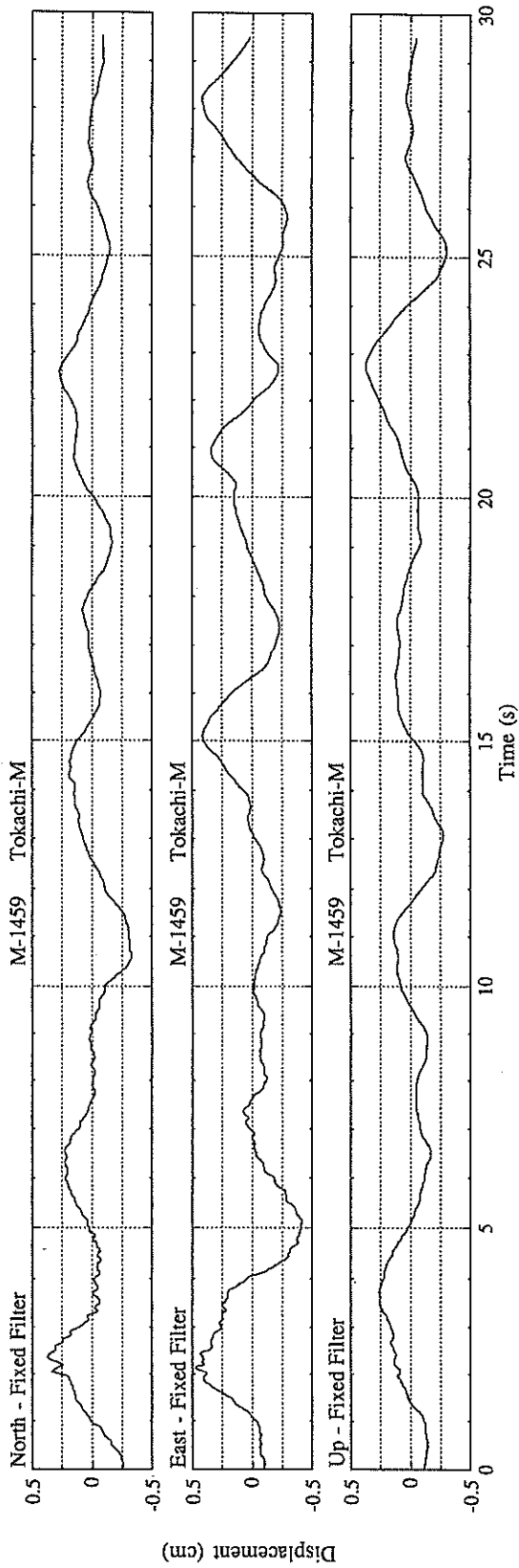
	N S	E W	U D	HORIZONTAL*
PARAMETER OF THE VARIABLE FILTER				
FC (HZ)	1.074	0.610	1.440	
MAXIMUM ACCELERATION (GAL)				
SMAC-B2 EQUIVALENT	29.1	32.5	11.5	38.0
ORIGINAL	53.4	71.6	26.0	81.4
CORRECTED	52.9	70.1	25.8	87.5
MAXIMUM VELOCITY (CM/SEC)				
FIXED FILTER	1.54	1.77	0.55	1.93
VARIABLE FILTER	1.28	1.76	0.53	2.07
MAXIMUM DISPLACEMENT (CM)				
FIXED FILTER	0.37	0.48	0.37	0.57
VARIABLE FILTER	0.07	0.06	0.02	0.07

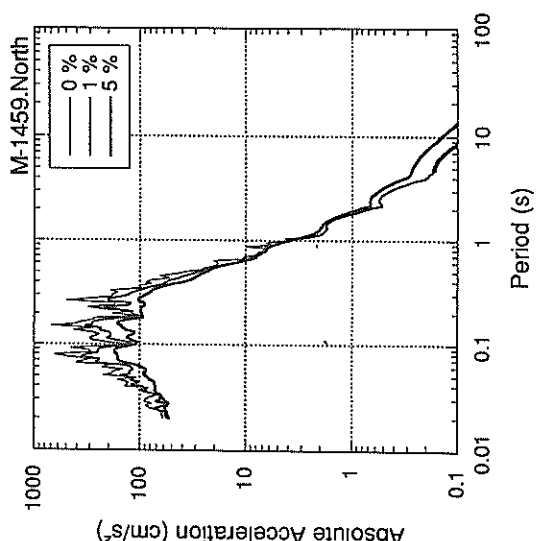
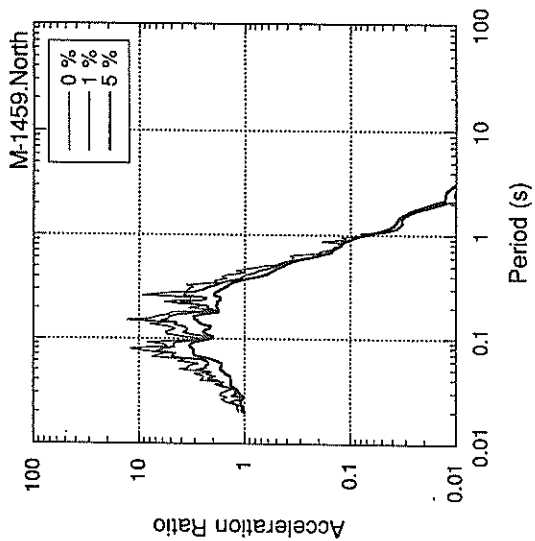
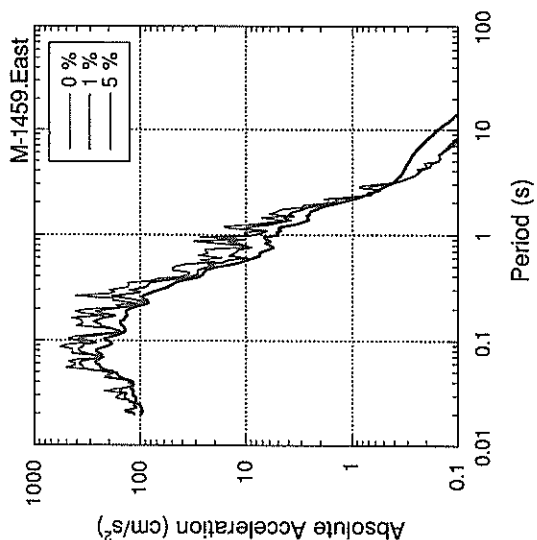
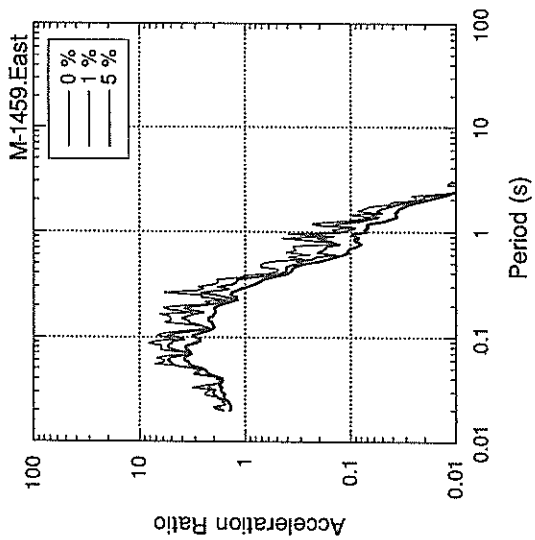
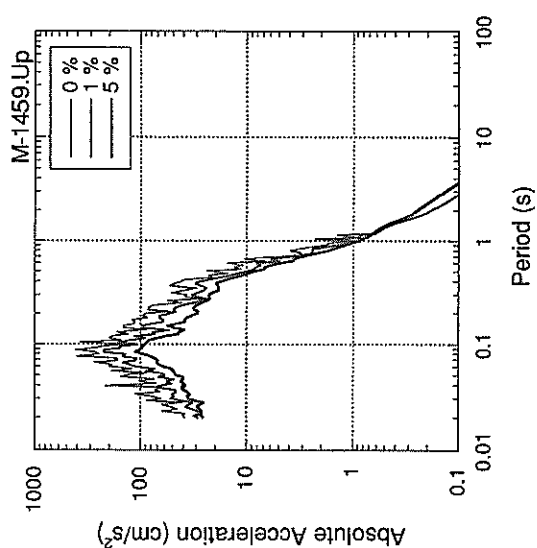
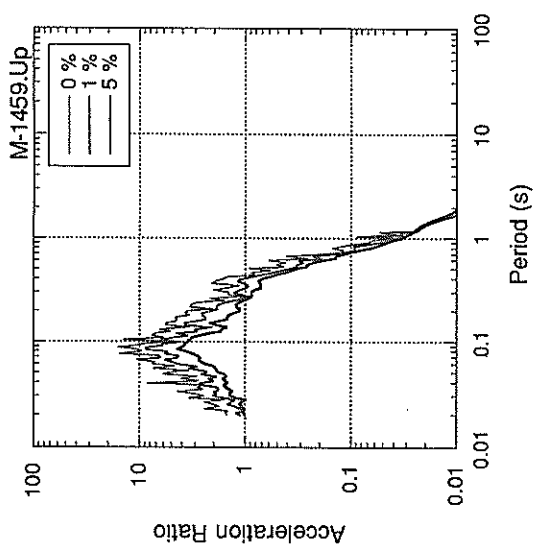
\* RESULTANT OF HORIZONTAL COMPONENTS



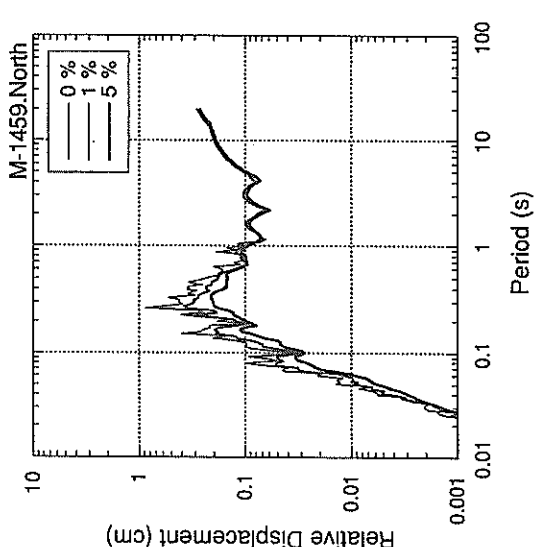
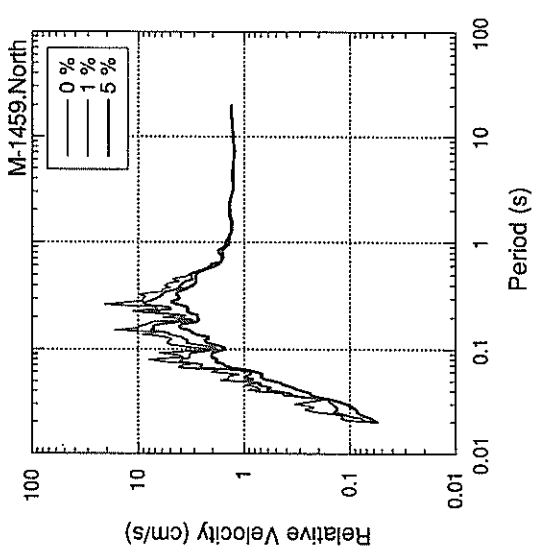
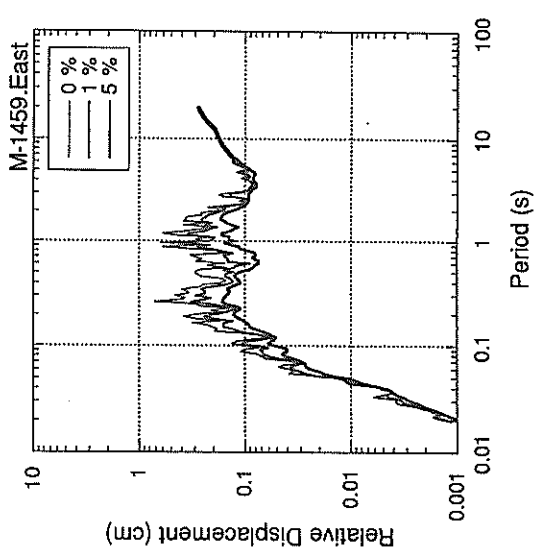
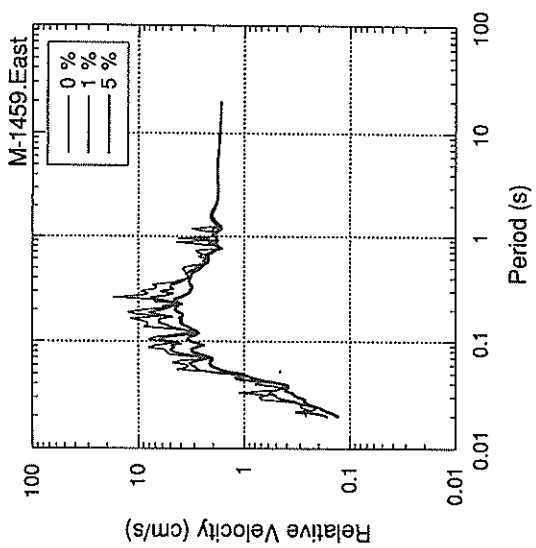
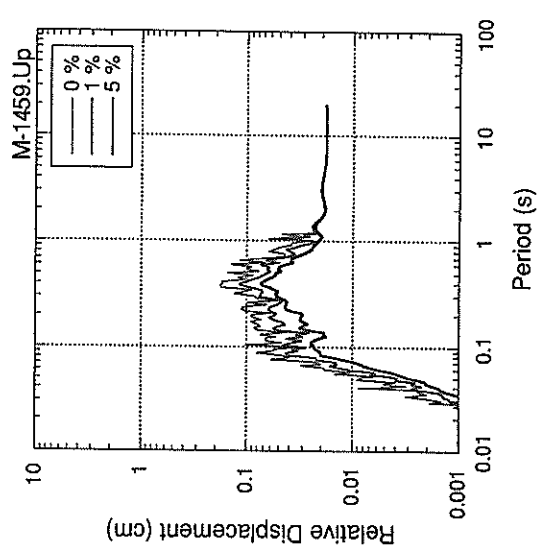
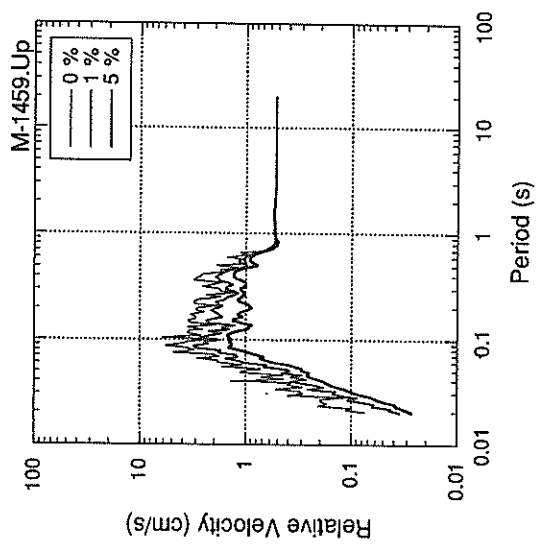


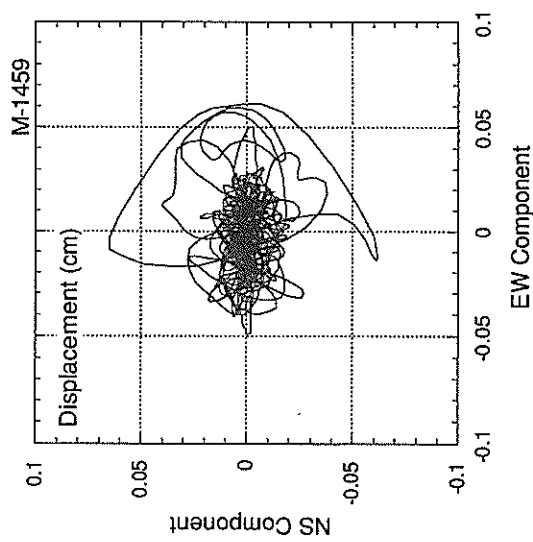
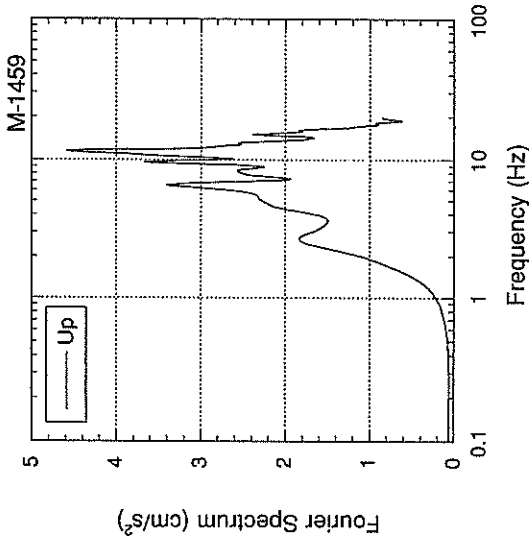
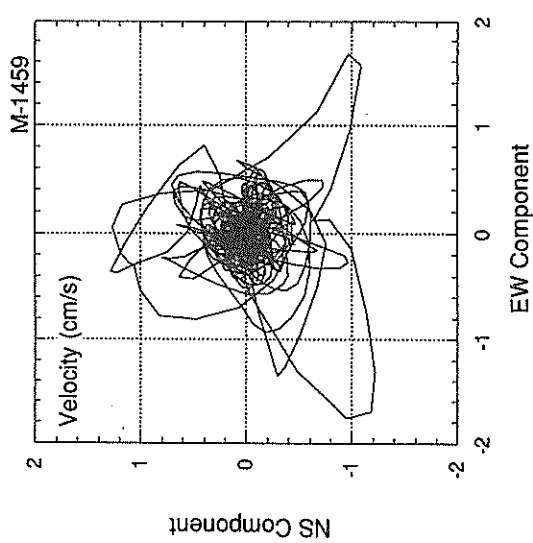
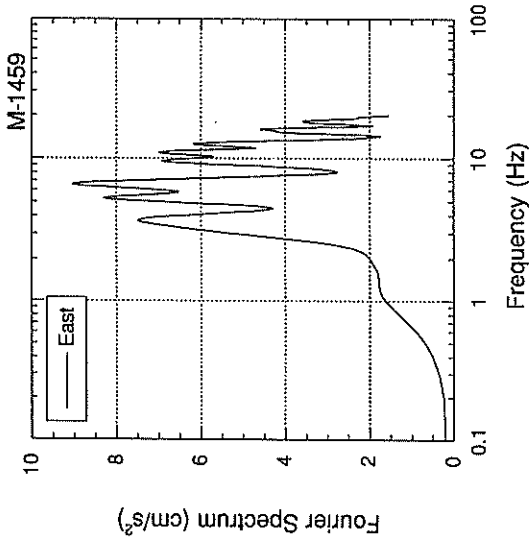
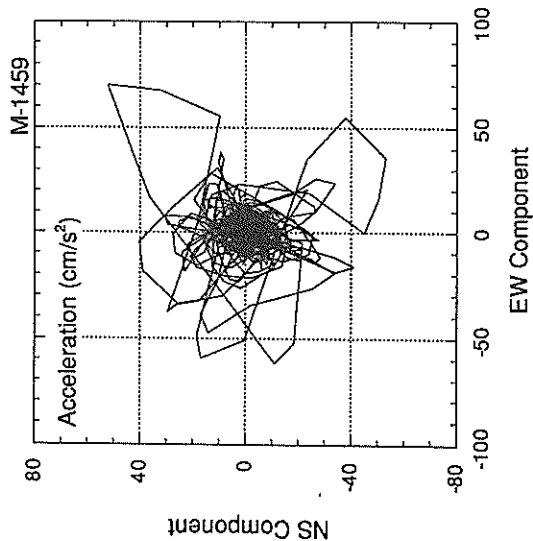
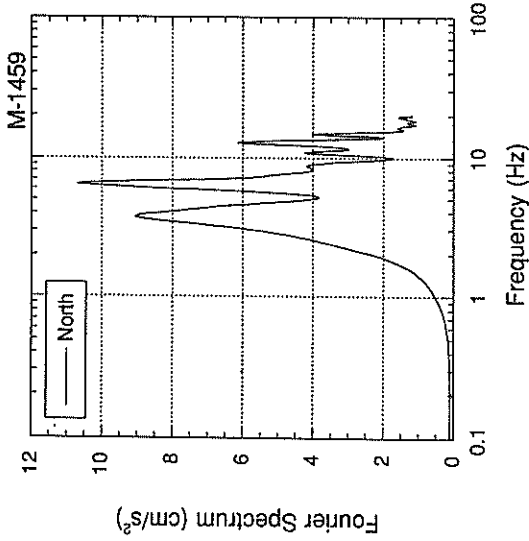












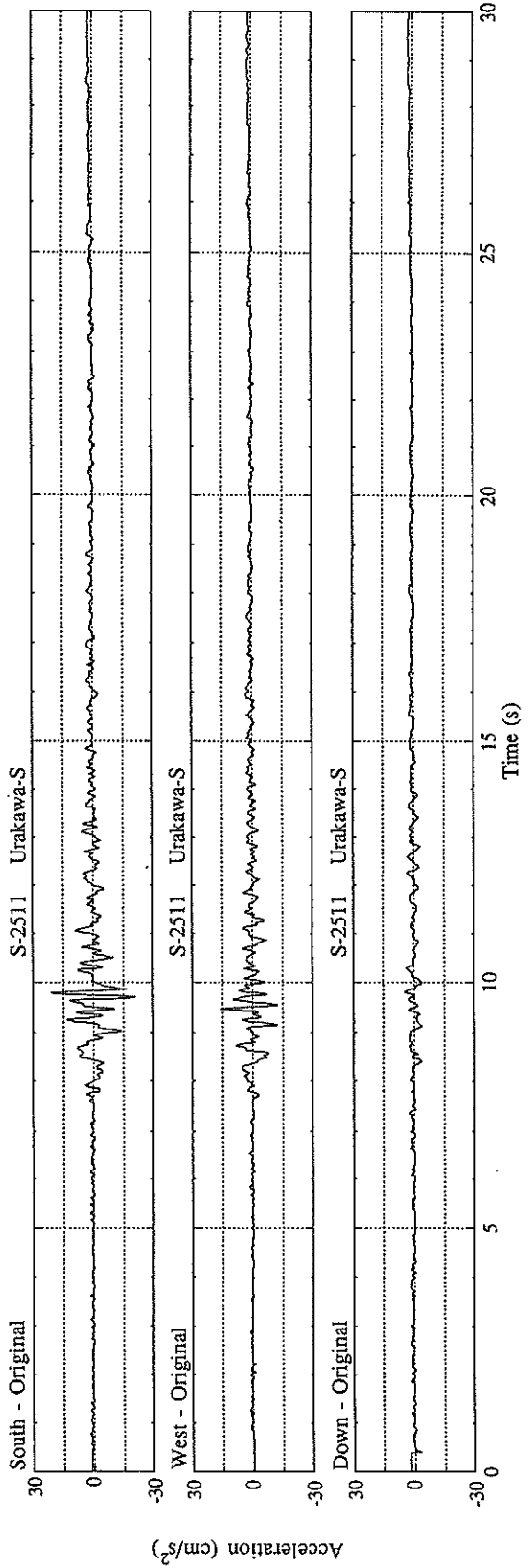
RECORD NUMBER : S-2511  
 STATION : URAKAWA-S  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 12:35 MAR. 15, 1993  
 LOCATION OF HYPOCENTER

EPICENTRAL REGION : HIDAKA MOUNTAINS REGION  
 LATITUDE : 42° 15.2' N  
 LONGITUDE : 143° 8.4' E  
 DEPTH : 64.0KM  
 JMA MAGNITUDE : 5.1

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)	21.2	15.9	4.1	21.5
* RESULTANT OF HORIZONTAL COMPONENTS				



RECORD NUMBER : F-537  
 STATION : OTARU-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 6:31 APR 1, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION

SHIRIBESHI REGION

LATITUDE

43° 9.7' N

LONGITUDE

140° 56.5' E

DEPTH

10.8KM

JMA MAGNITUDE

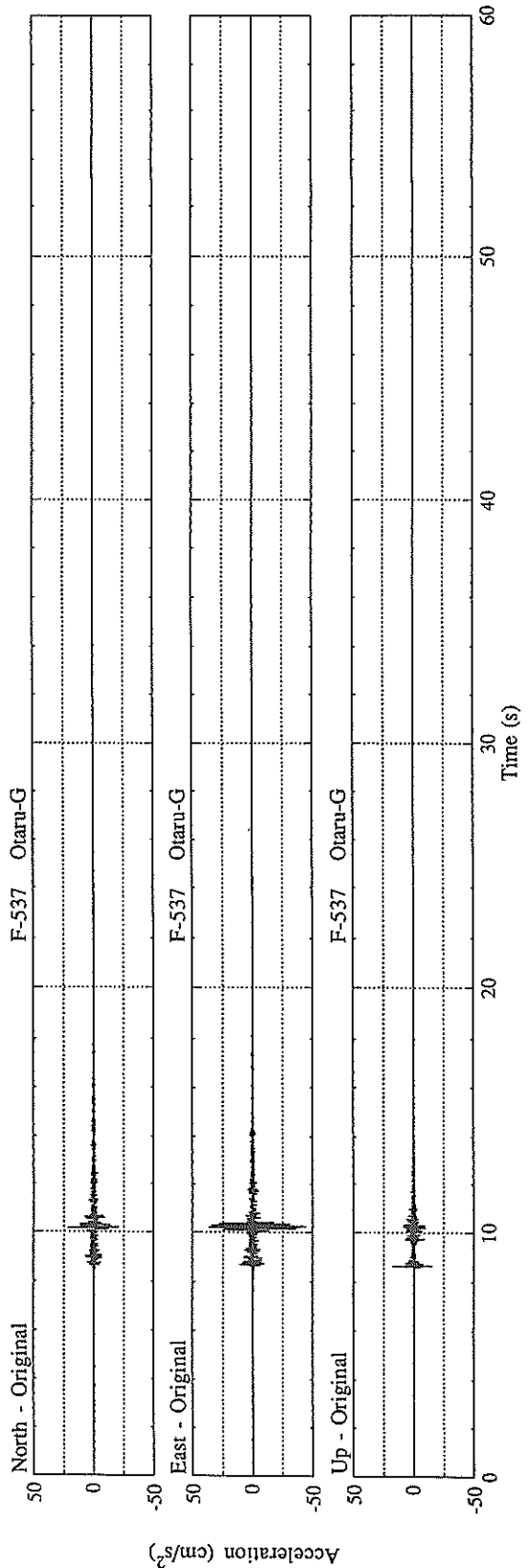
2.8

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PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 21.7 44.0 17.5 45.5  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-582  
 STATION : MIYAKO-G

EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME 3:30 APR 16, 1993  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION E OFF IWATE PREF  
 LATITUDE 39° 39.3' N  
 LONGITUDE 142° 15.0' E  
 DEPTH 33.0KM  
 JMA MAGNITUDE 4.1  
 \*\*\*\*\*

PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
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PARAMETER OF THE VARIABLE FILTER

FC (HZ)	1.598	1.635	2.660	
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MAXIMUM ACCELERATION (GAL)

SMAC-B2 EQUIVALENT	38.3	23.4	9.1	42.5
ORIGINAL	65.6	43.9	18.9	77.2
CORRECTED	63.9	46.0	17.7	75.5

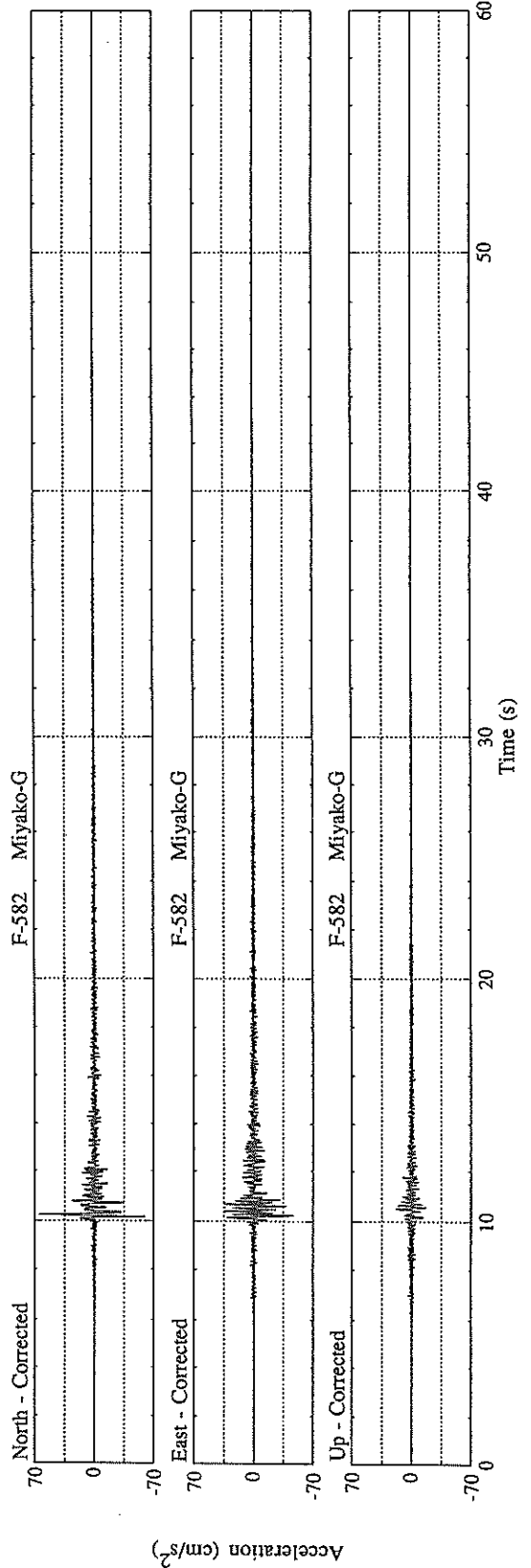
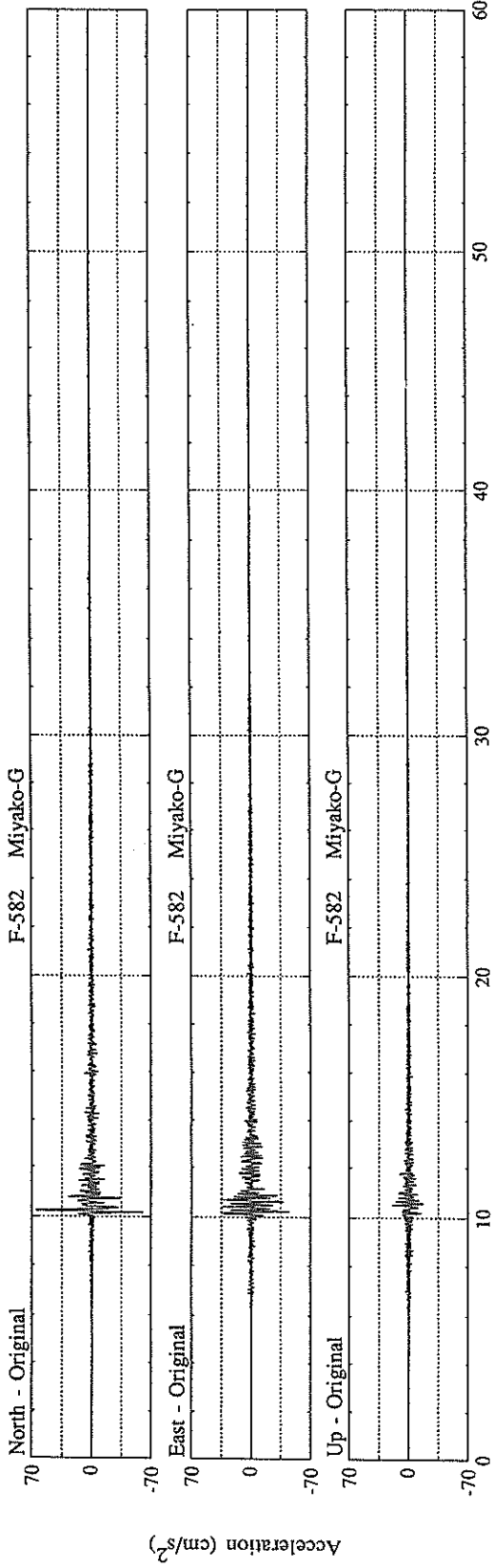
MAXIMUM VELOCITY (CM/SEC)

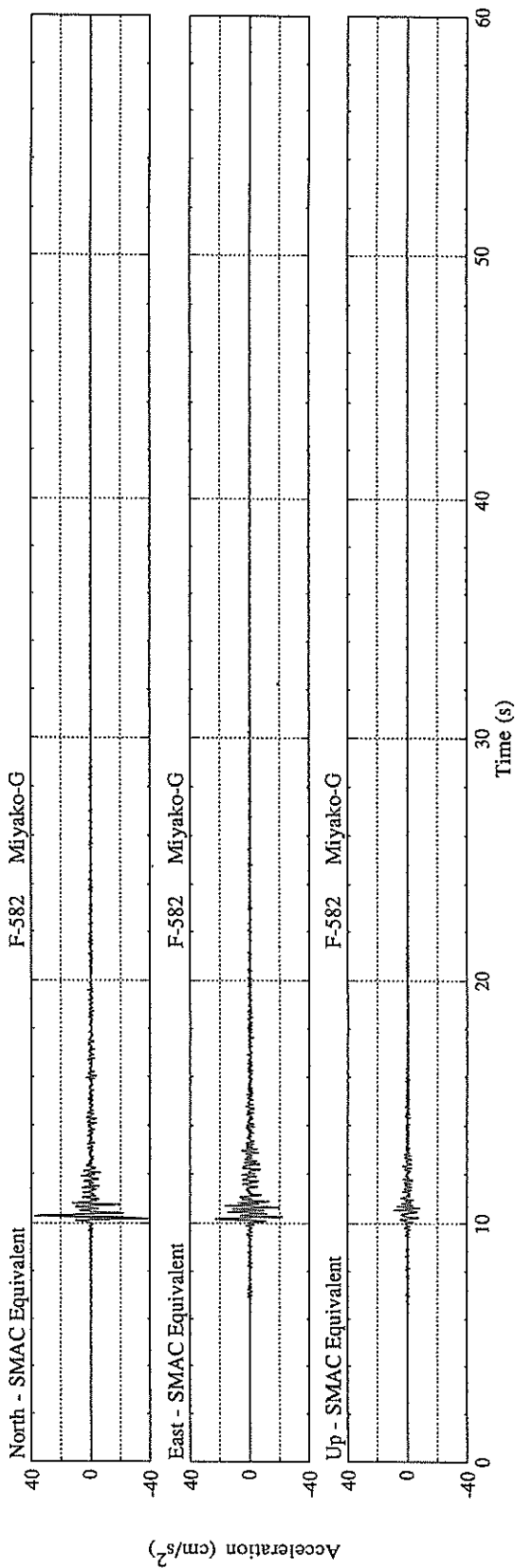
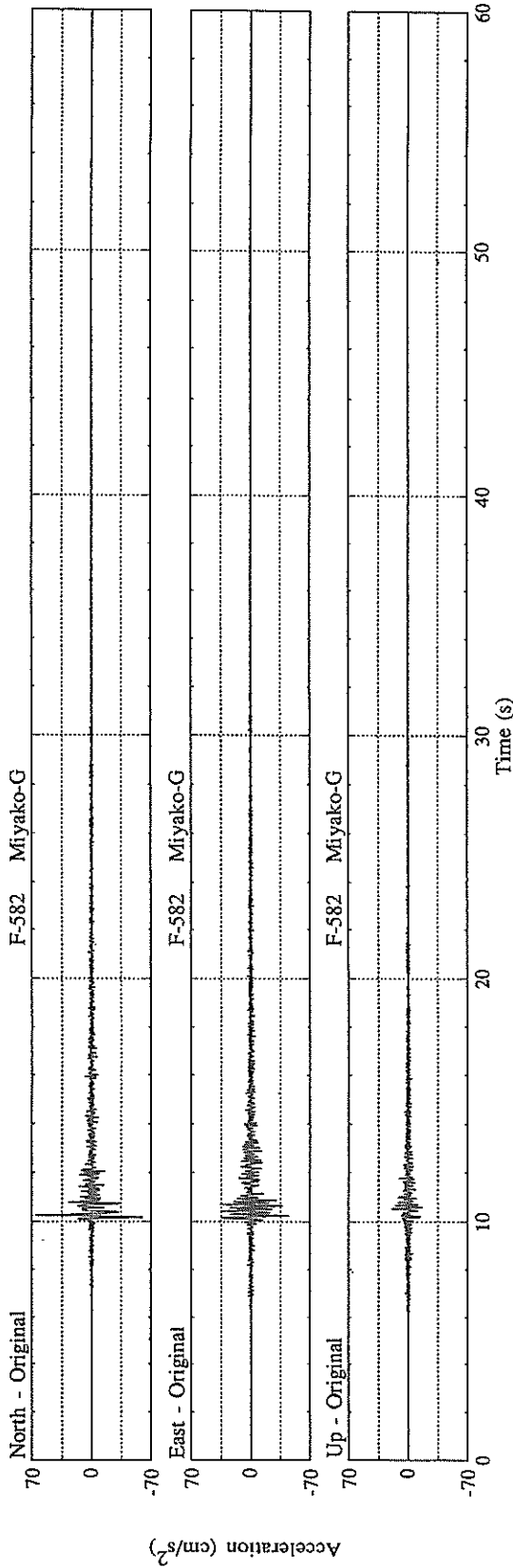
FIXED FILTER	2.27	1.27	0.40	2.51
VARIABLE FILTER	2.20	1.19	0.41	2.39

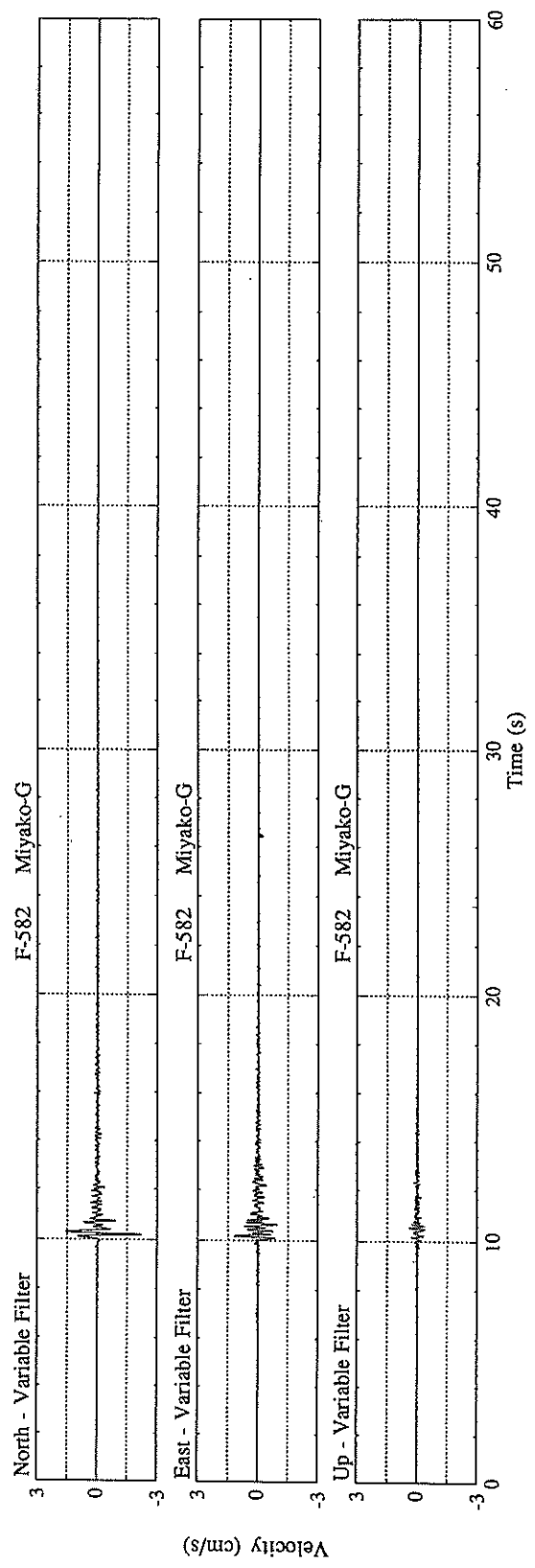
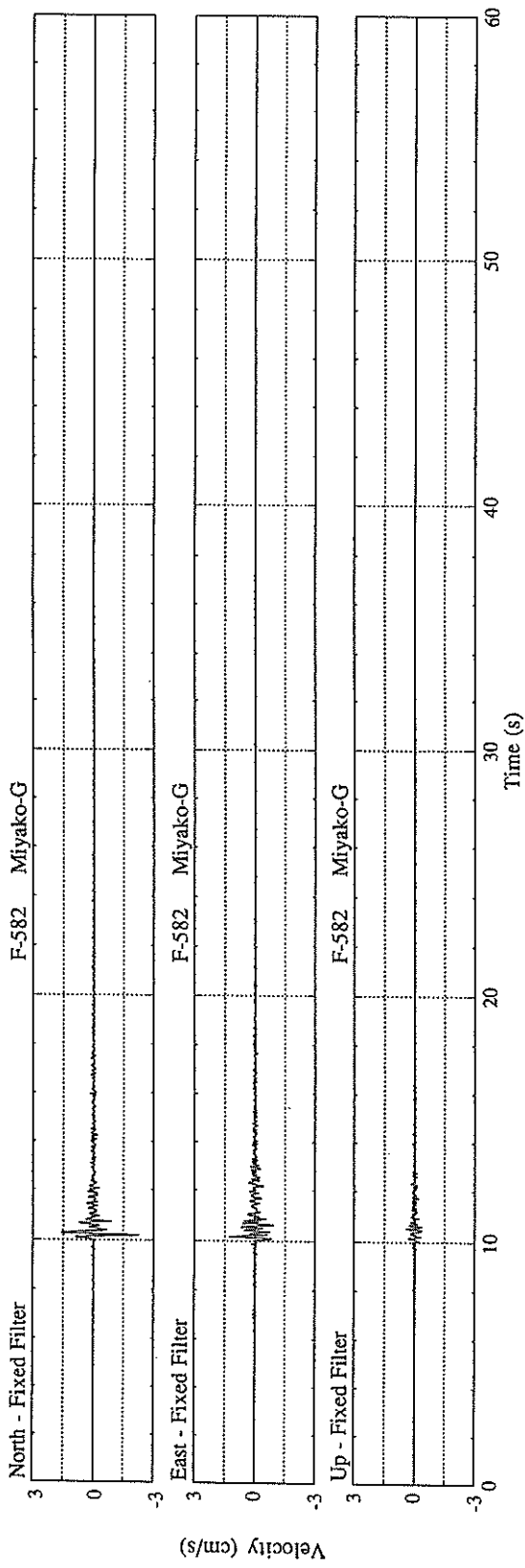
MAXIMUM DISPLACEMENT (CM)

FIXED FILTER	0.08	0.05	0.02	0.08
VARIABLE FILTER	0.07	0.04	0.01	0.08

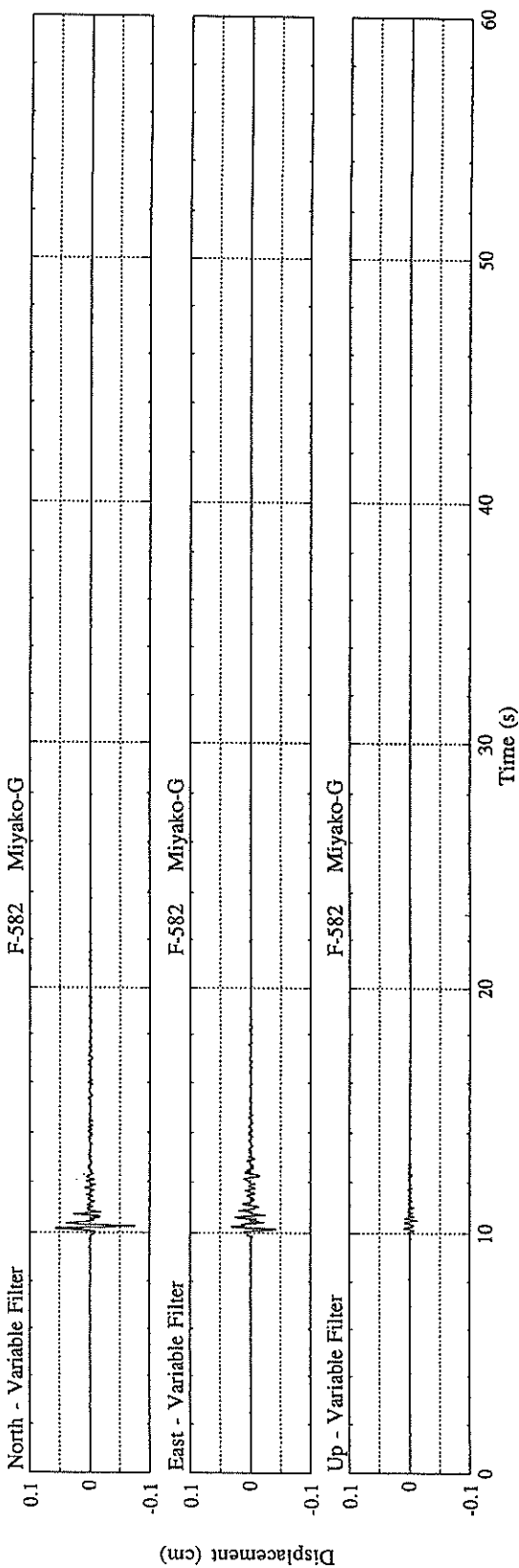
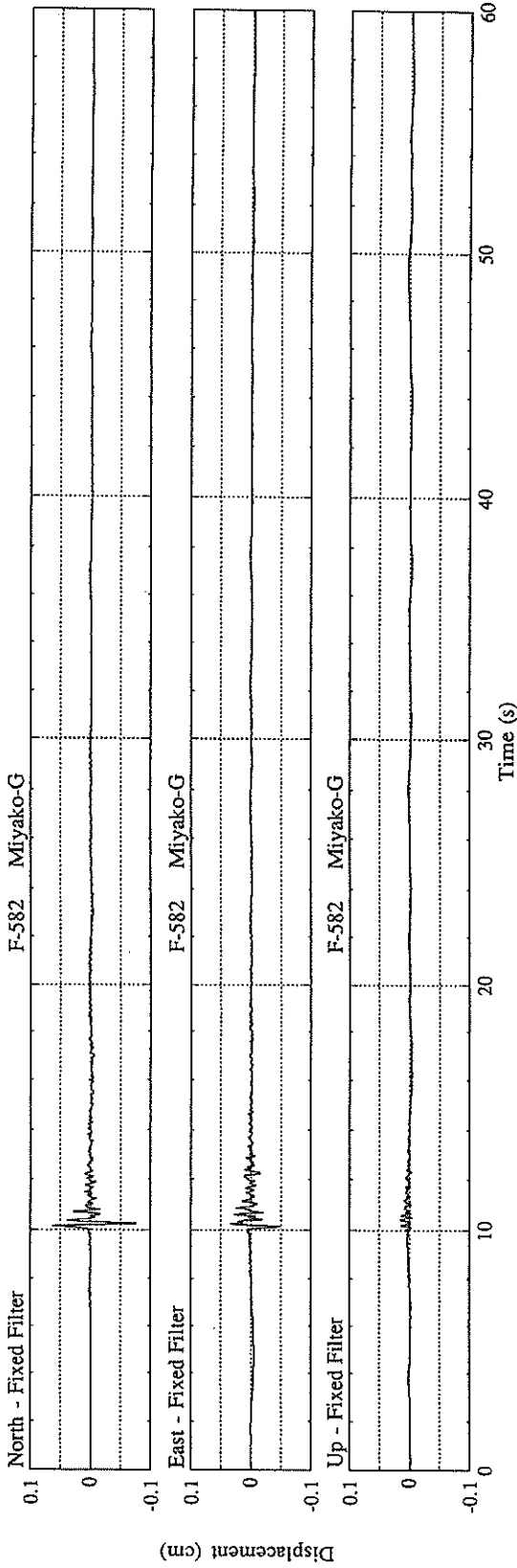
\* RESULTANT OF HORIZONTAL COMPONENTS

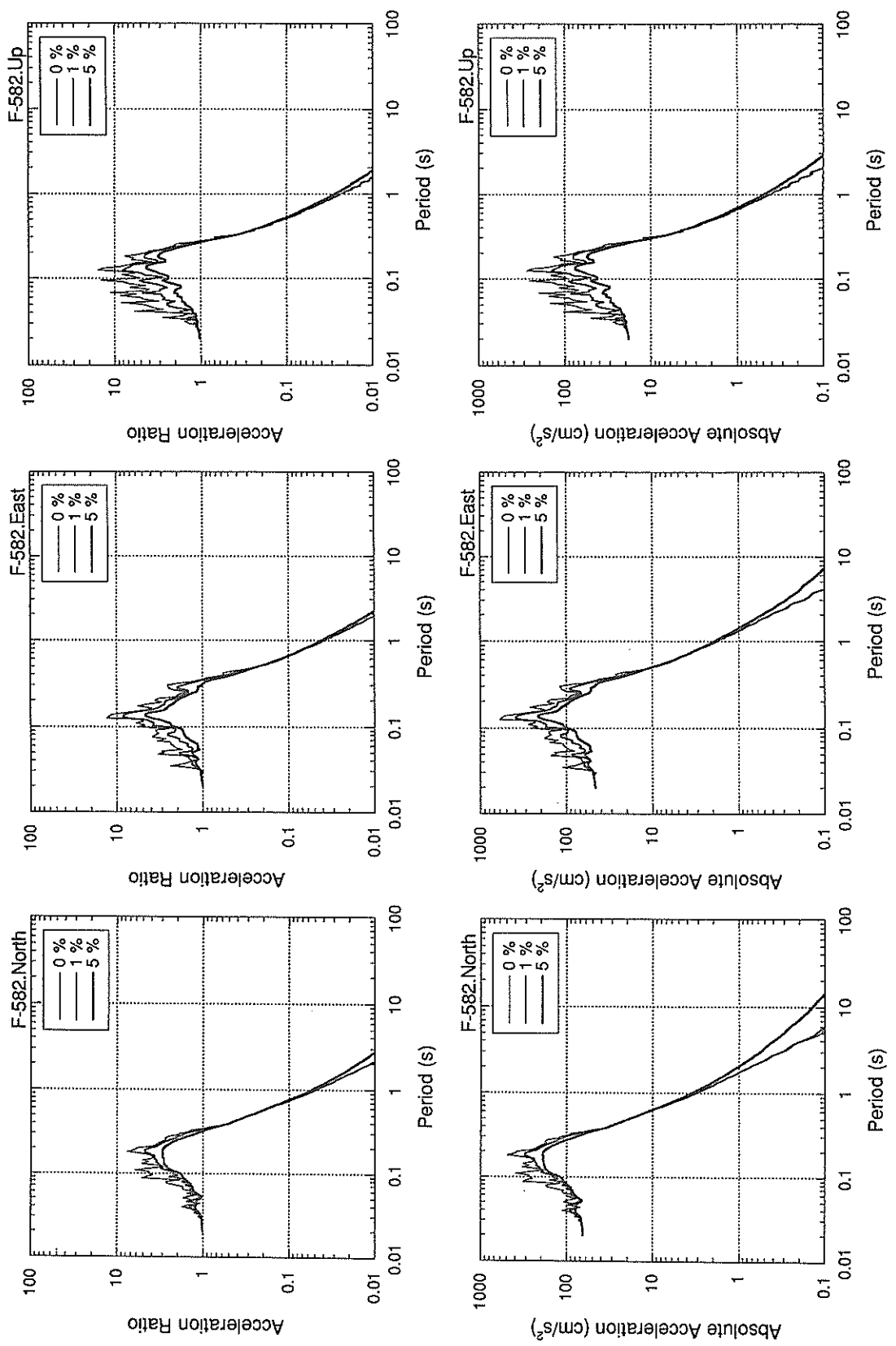


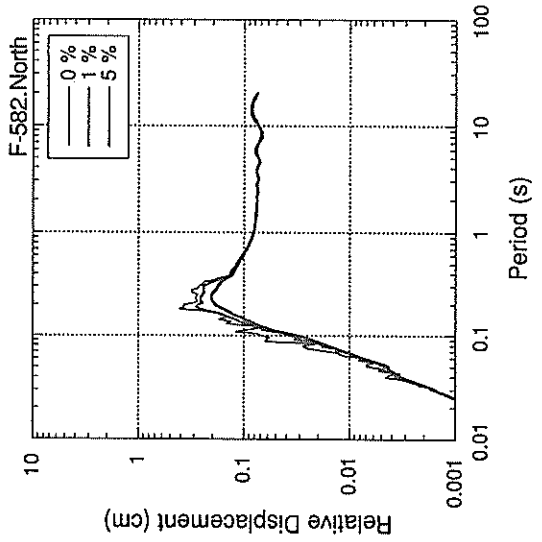
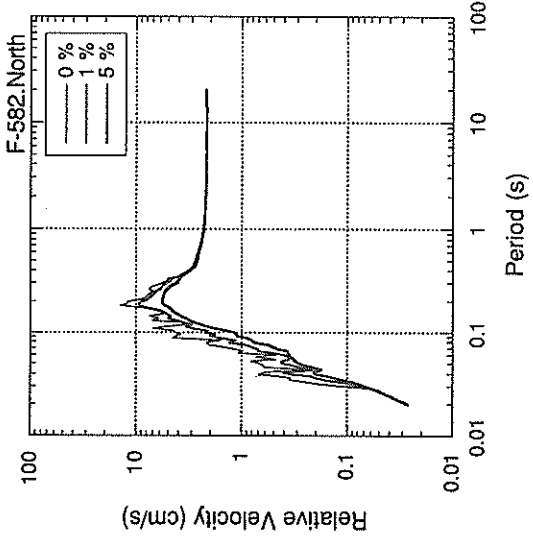
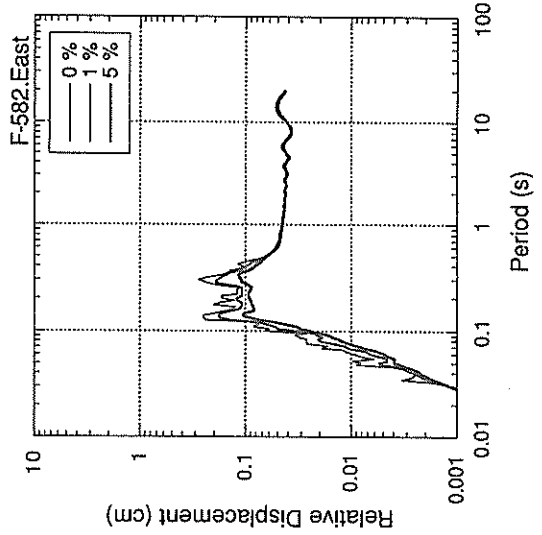
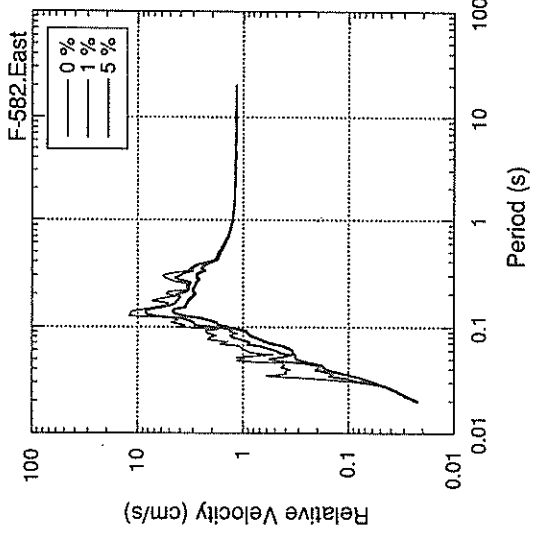
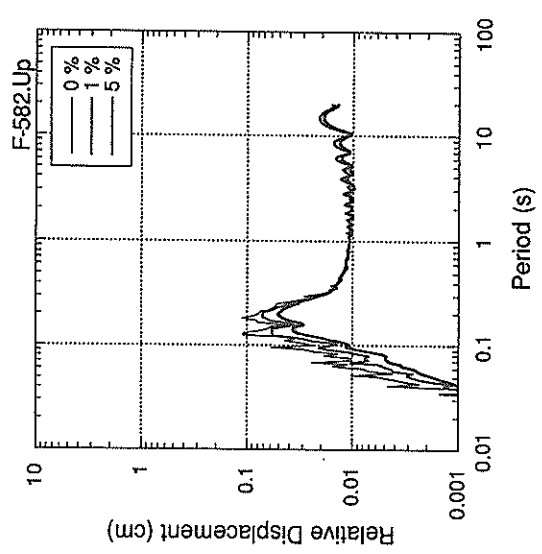
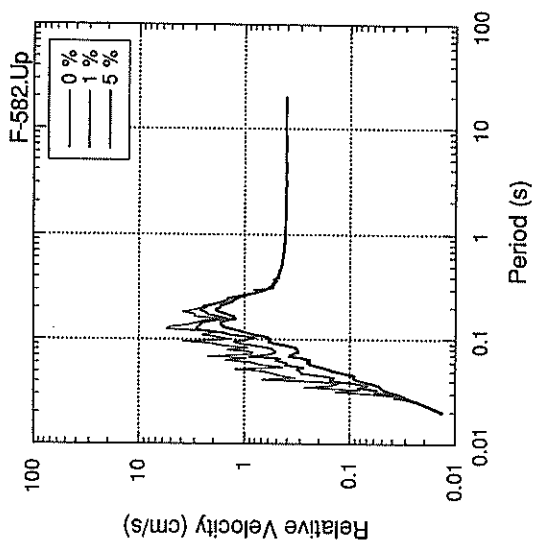


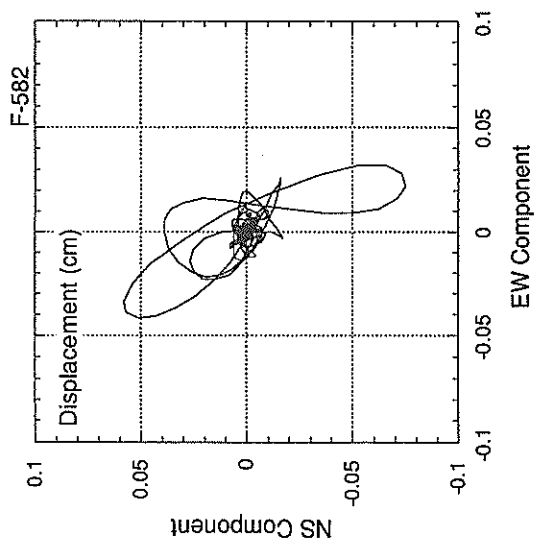
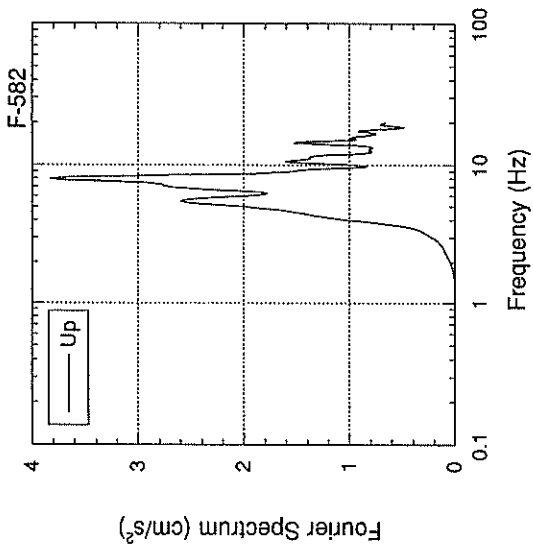
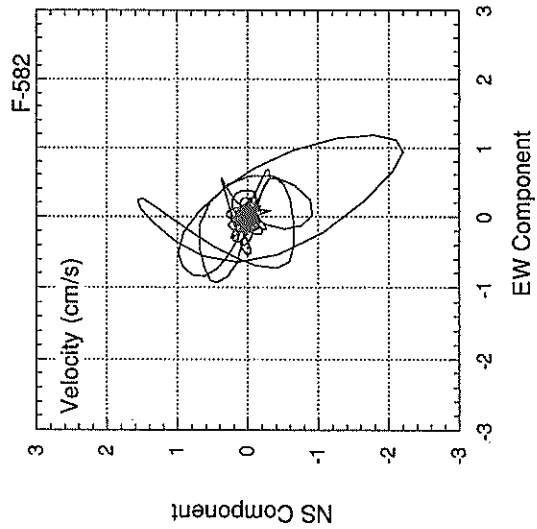
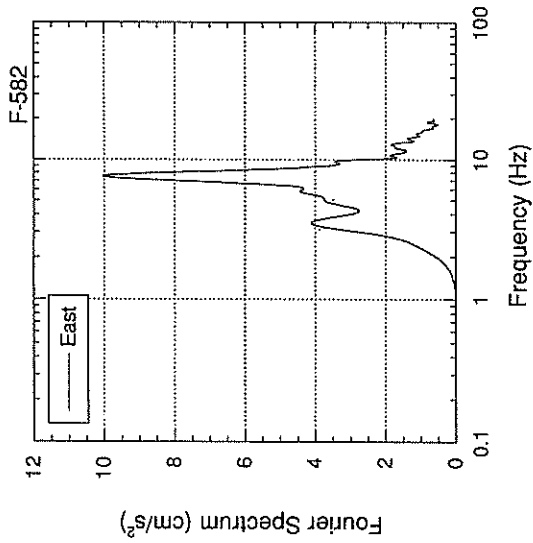
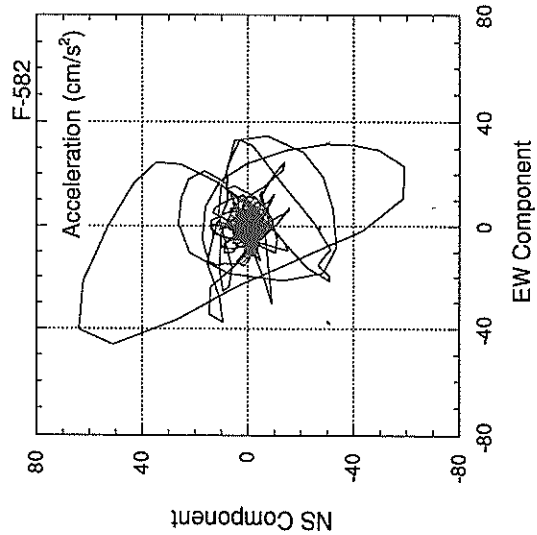
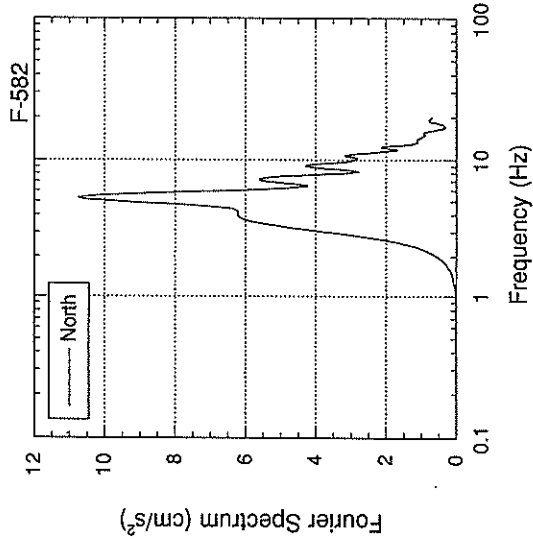












RECORD NUMBER : F-583  
 STATION : MIYAKO-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 18: 1 APR 22, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION NORTHERN IWATE PREF

LATITUDE 39° 36.3' N

LONGITUDE 142° 2.3' E

DEPTH 36.2KM

JMA MAGNITUDE 3.7

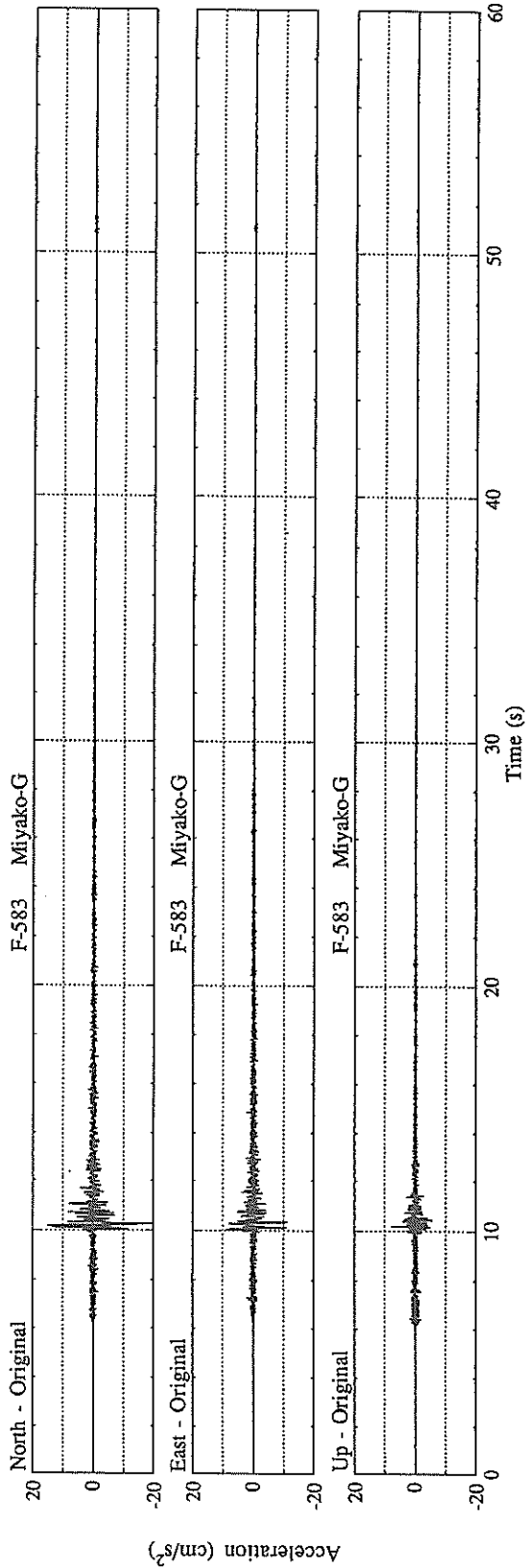
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 20.0 11.1 7.7 20.6

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2514  
 STATION : SOMA-S  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 8:31 APR 27, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION E OFF FUKUSHIMA PREF

LATITUDE 37° 29.8' N

LONGITUDE 141° 34.5' E

DEPTH 53.9KM

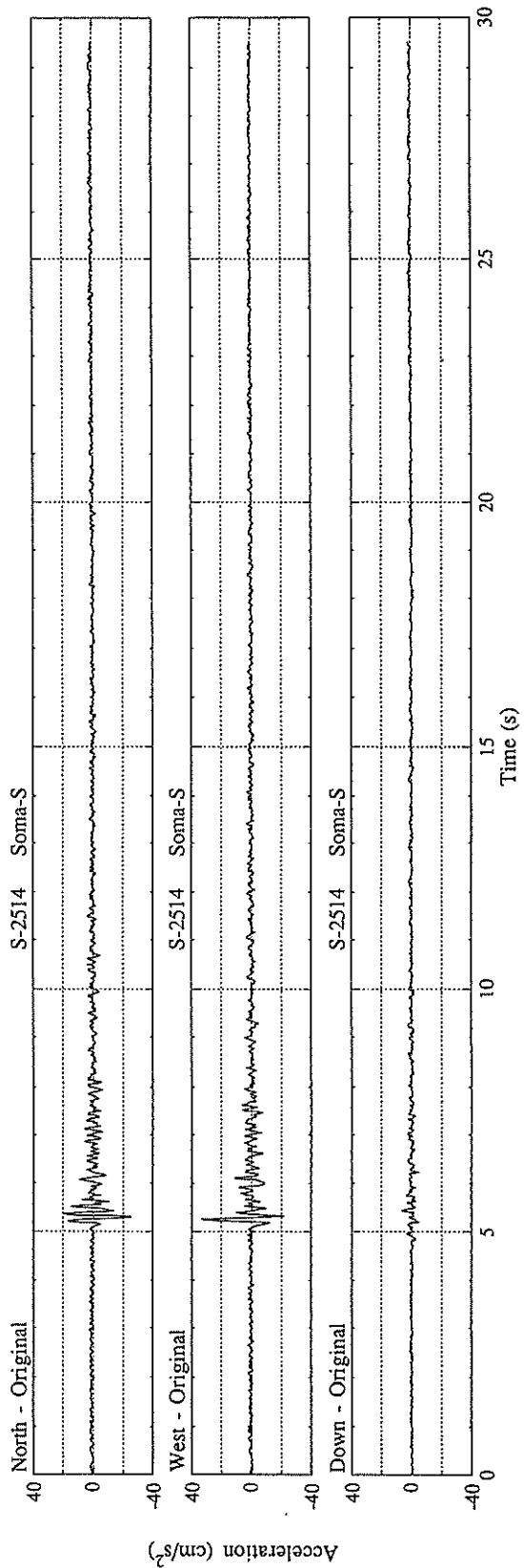
JMA MAGNITUDE 4.7

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 25.1 33.8 6.3 34.0  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1467  
 STATION : KAMAISHI-M  
 EARTHQUAKE DATA

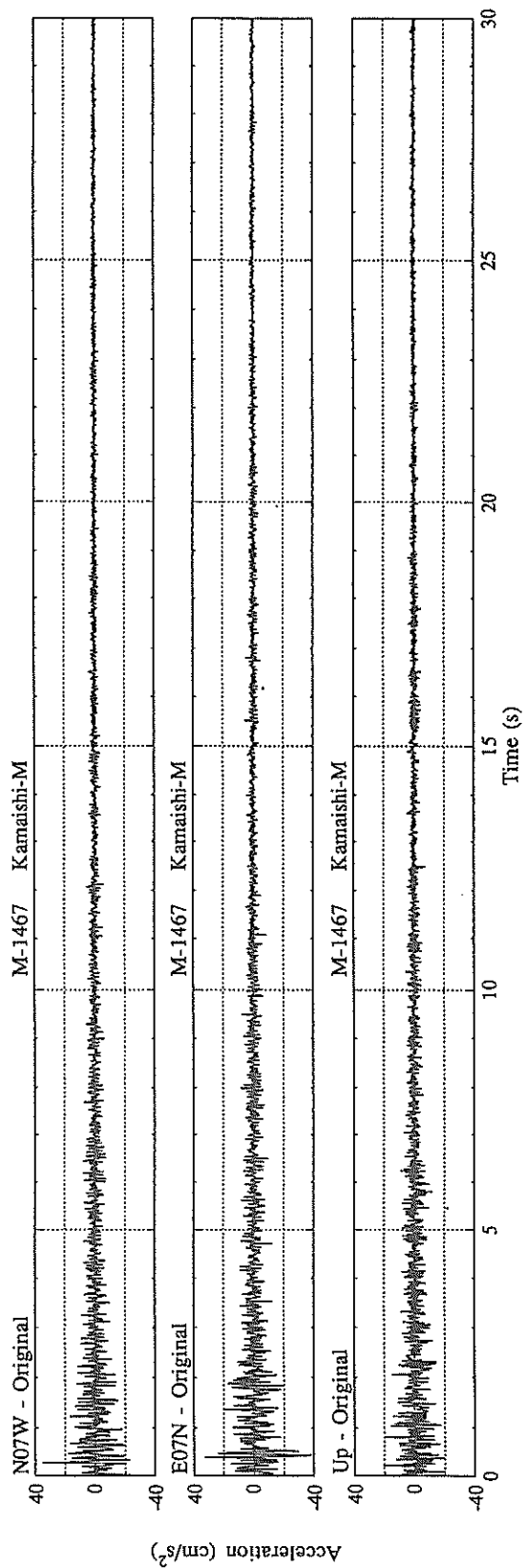
\*\*\*\*\*  
 DATE AND TIME : 3:21 MAY 6, 1993  
 LOCATION OF HYPOCENTER

EPICENTRAL REGION : SOUTHERN IWATE PREF  
 LATITUDE : 39° 7.9' N  
 LONGITUDE : 141° 47.5' E  
 DEPTH : 106.1KM  
 JMA MAGNITUDE : 5.6

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS

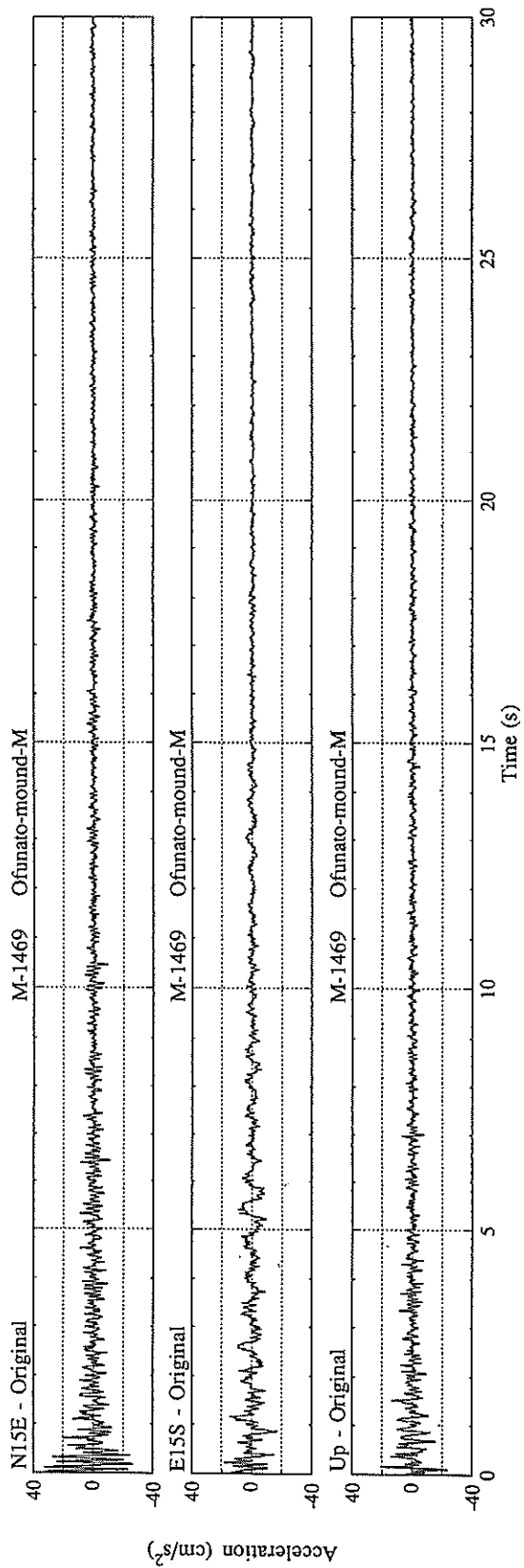
	N	S	E	W	U	D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)	35.5	37.8	21.0	41.8			

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1469  
 STATION : OFUNATO-MOUND-M  
 EARTHQUAKE DATA  
 \*\*\*\*\*  
 DATE AND TIME : 3:21 MAY 6, 1993  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION SOUTHERN IWATE PREF  
 LATITUDE 39° 7.9' N  
 LONGITUDE 141° 47.5' E  
 DEPTH 106.1KM  
 JMA MAGNITUDE 5.6  
 \*\*\*\*\*

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 -----  
 N S E W U D HORIZONTAL\*  
 -----  
 ORIGINAL ACCELERATION (GAL) 32.8 18.4 23.5 34.3  
 \* RESULTANT OF HORIZONTAL COMPONENTS





RECORD NUMBER : F-584

STATION : MIYAKO-G

EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 3:21 MAY 6, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION SOUTHERN IWATE PREF

LATITUDE 39° 7.9' N

LONGITUDE 141° 47.5' E

DEPTH 106.1KM

JMA MAGNITUDE 5.6

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
N S E W U D HORIZONTAL\*  
-----

PARAMETER OF THE VARIABLE FILTER

-----  
FC (HZ) 1.116 0.762 1.666

MAXIMUM ACCELERATION (GAL)

-----  
SMAC-B2 EQUIVALENT 21.5 28.3 9.9 28.4  
ORIGINAL 35.8 59.9 25.9 60.0  
CORRECTED 36.1 60.4 24.0 60.4

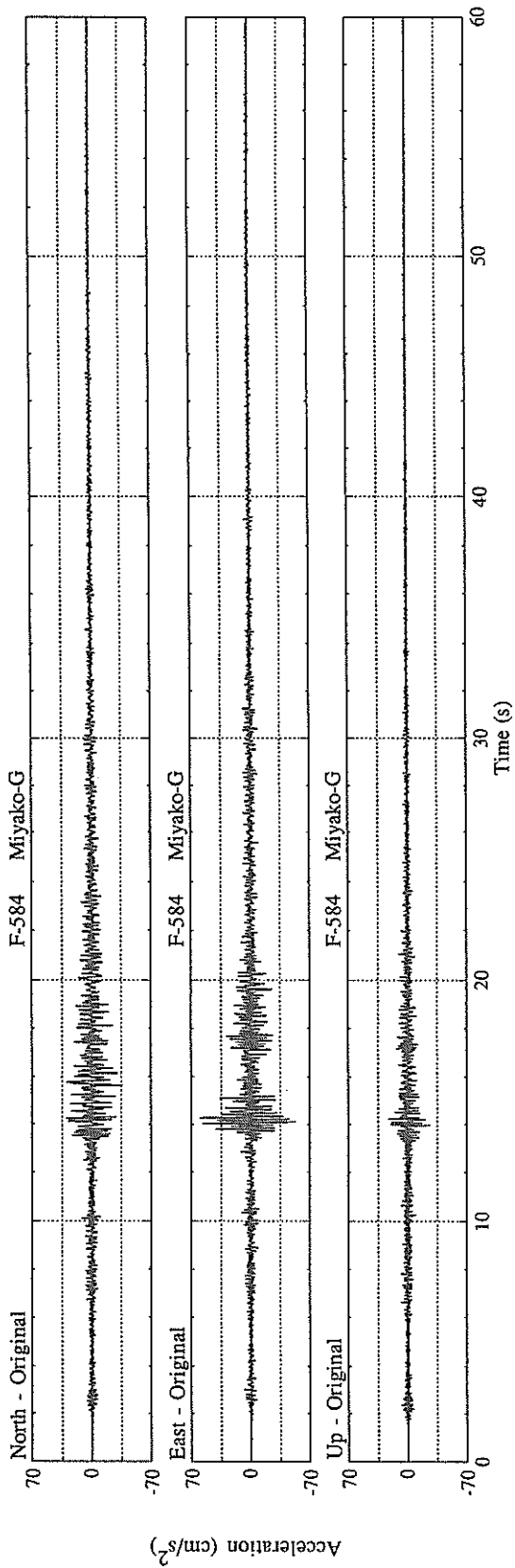
MAXIMUM VELOCITY (CM/SEC)

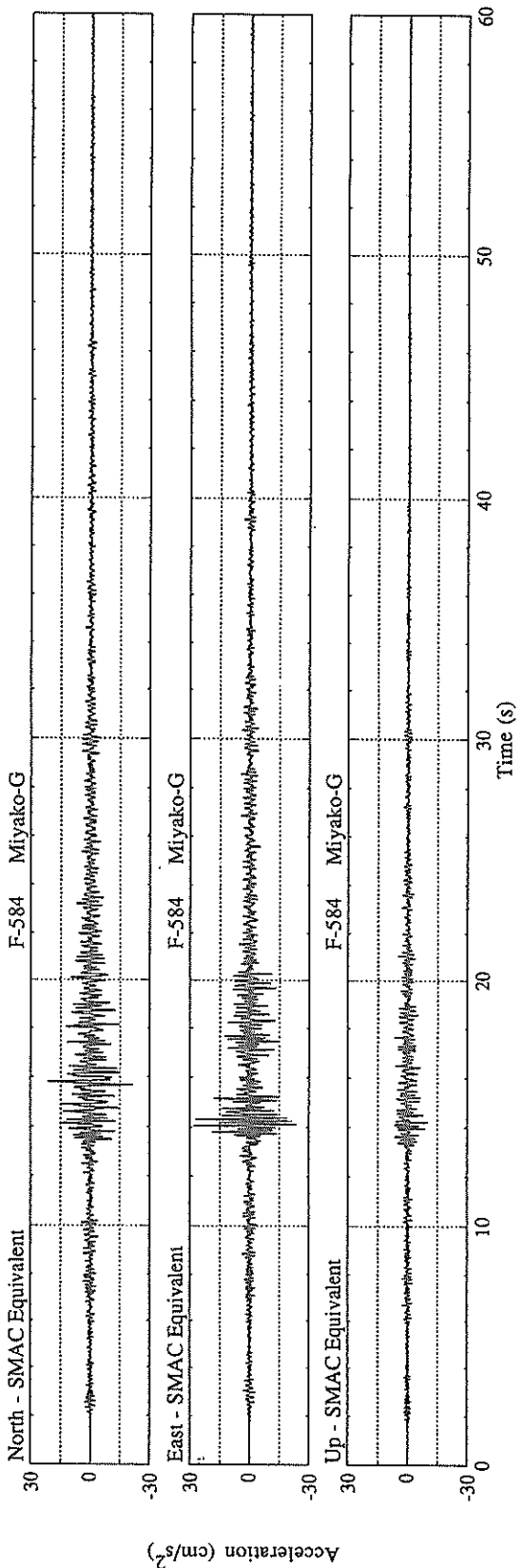
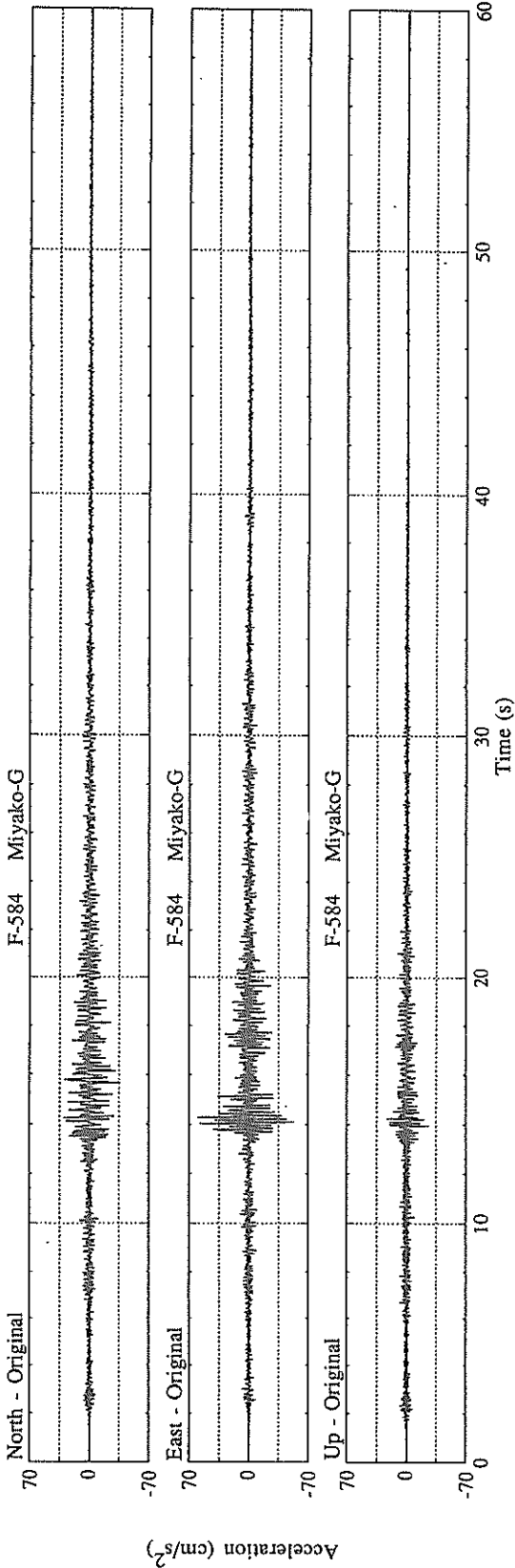
-----  
FIXED FILTER 1.08 1.32 0.54 1.36  
VARIABLE FILTER 1.05 1.41 0.51 1.44

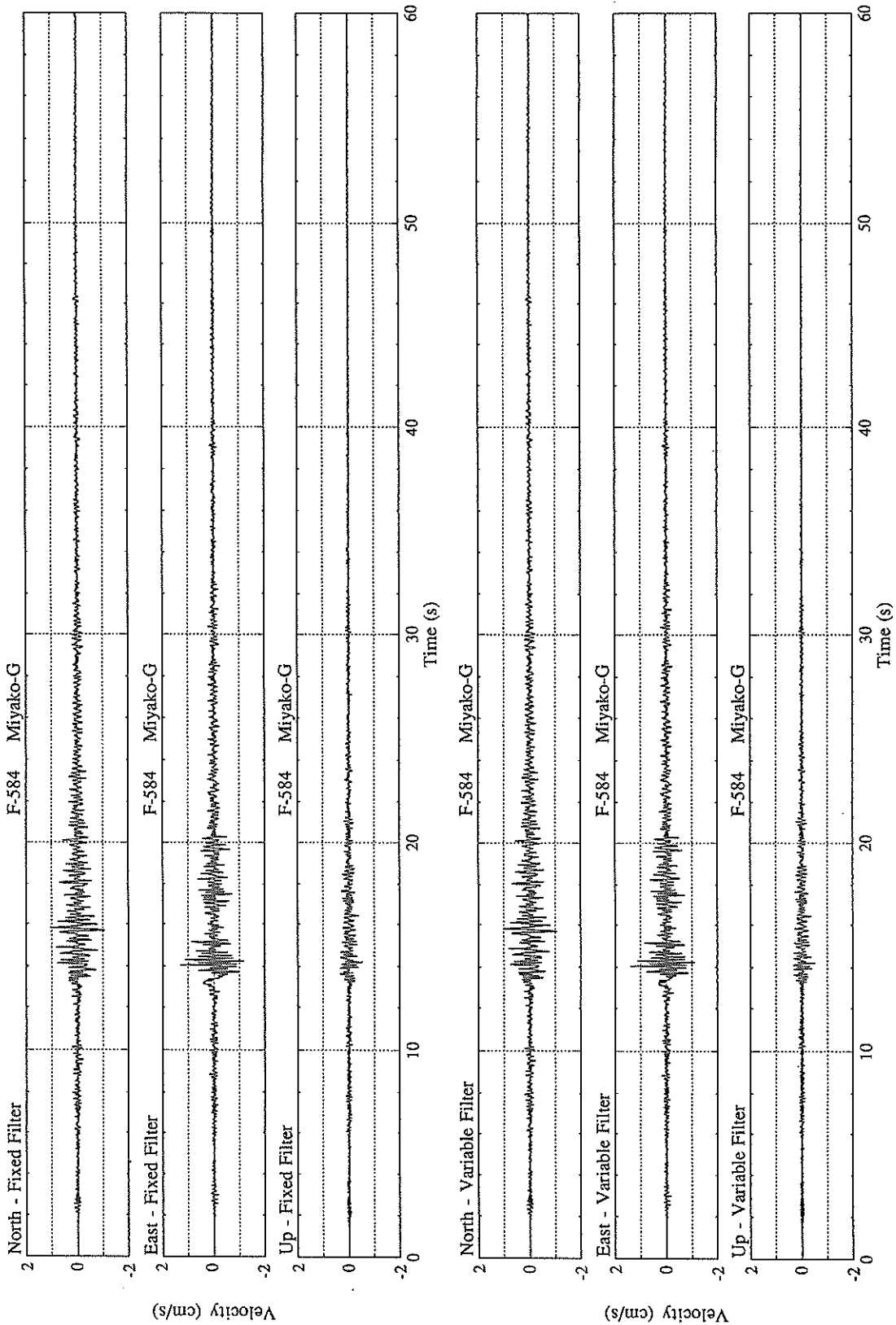
MAXIMUM DISPLACEMENT (CM)

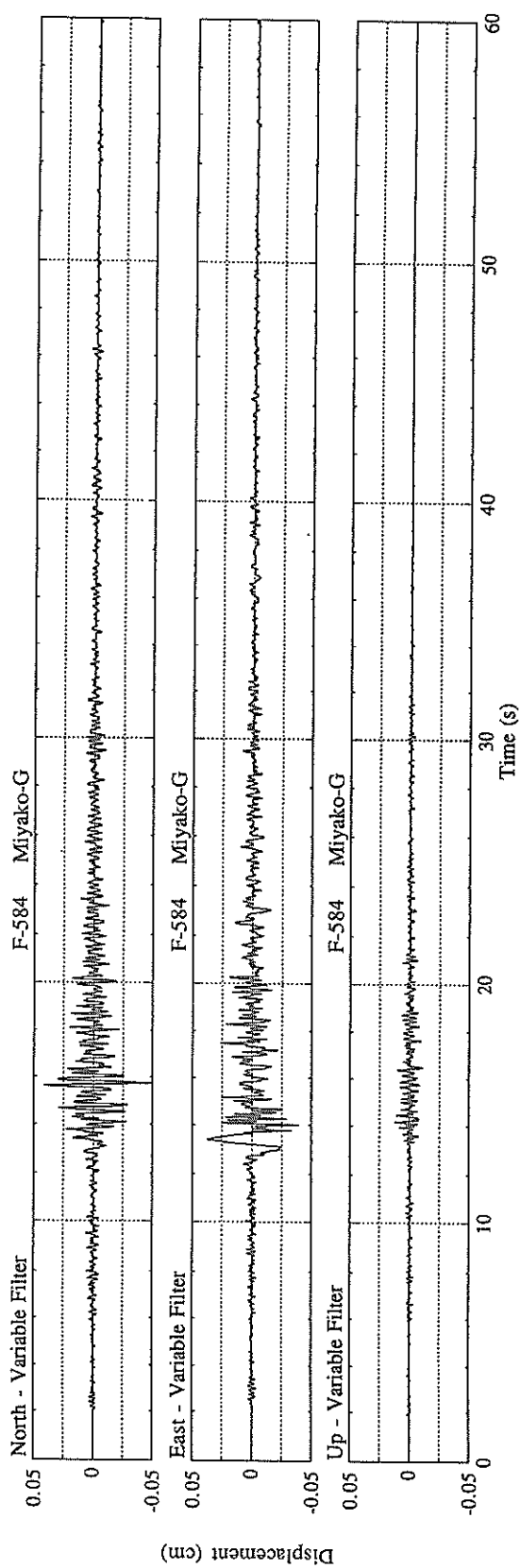
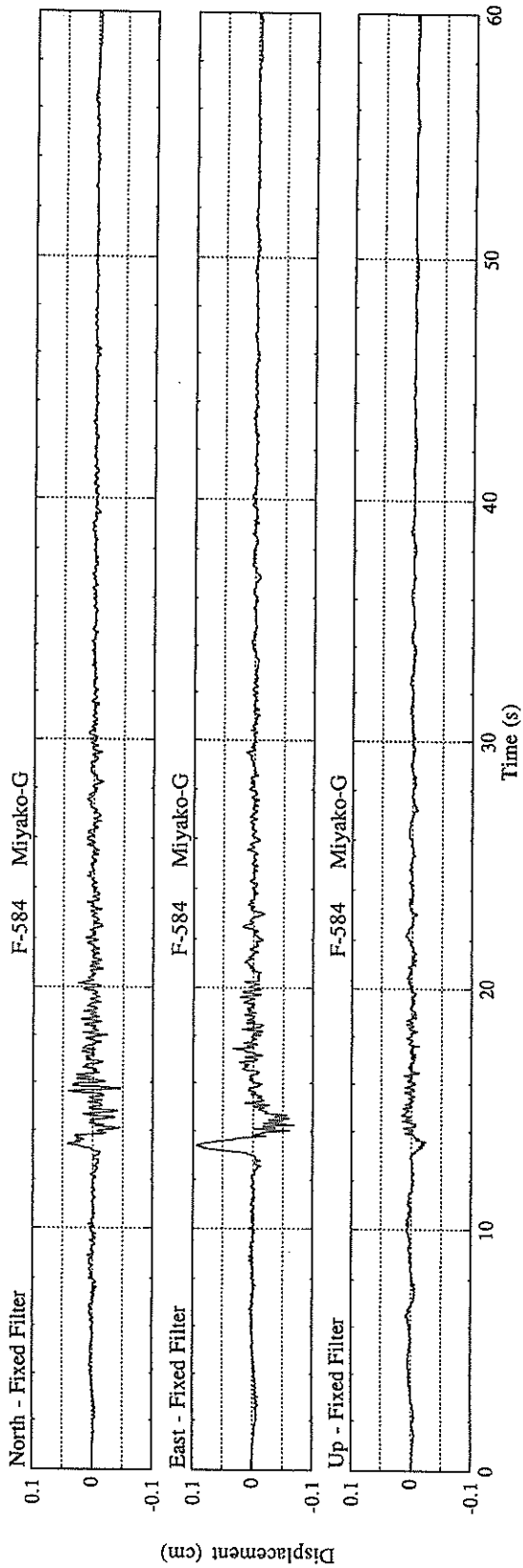
-----  
FIXED FILTER 0.05 0.10 0.02 0.10  
VARIABLE FILTER 0.05 0.04 0.01 0.05

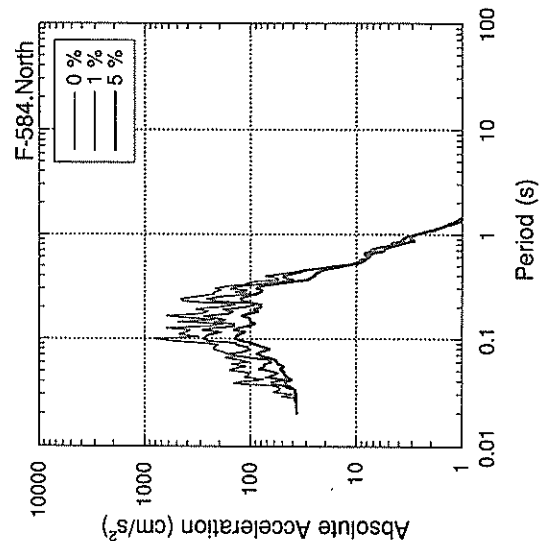
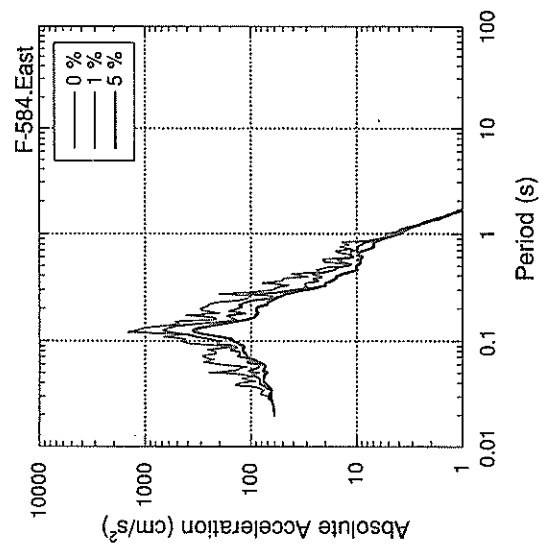
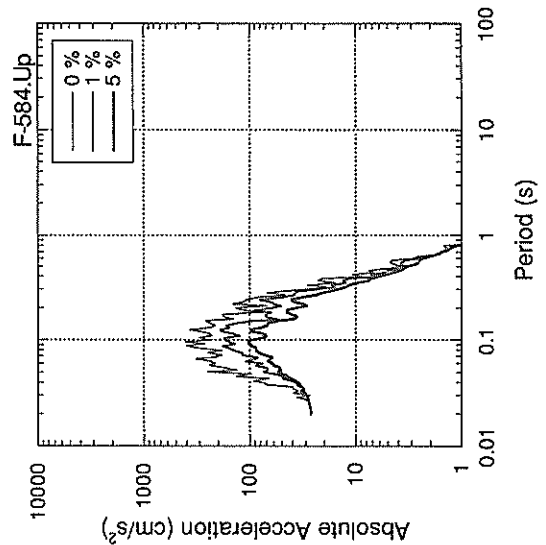
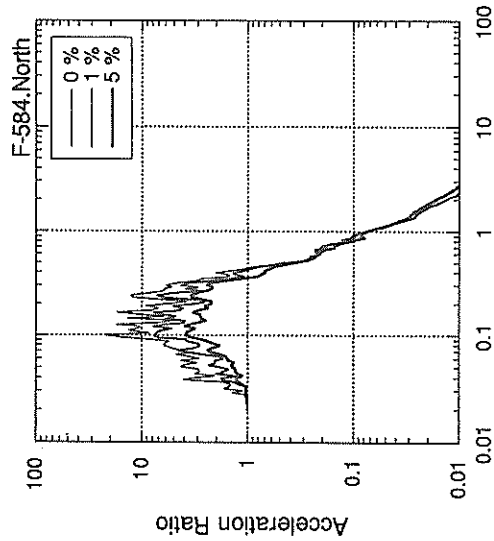
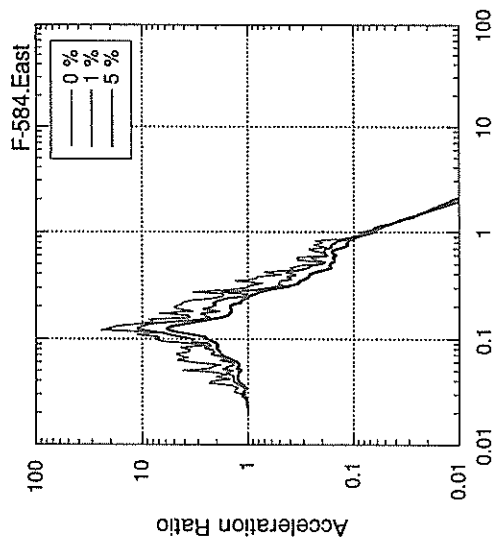
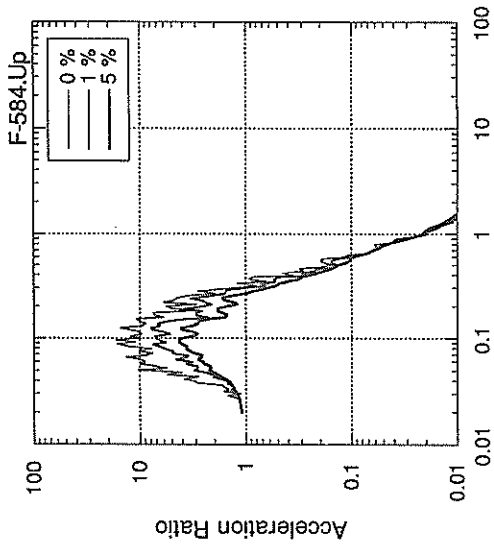
\* RESULTANT OF HORIZONTAL COMPONENTS

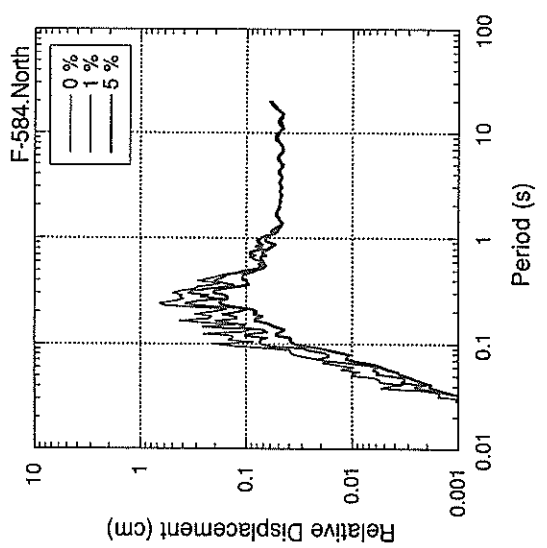
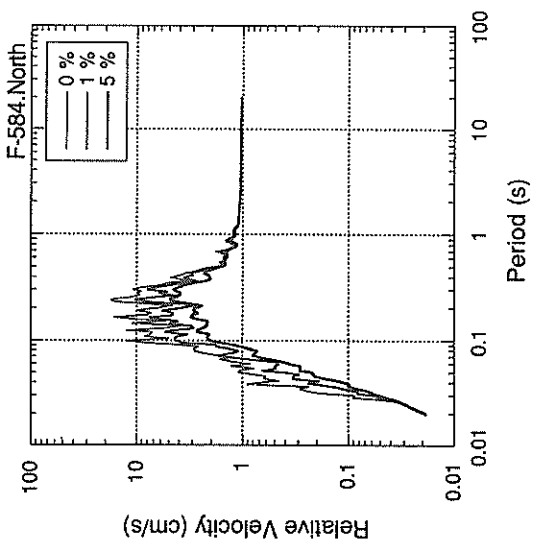
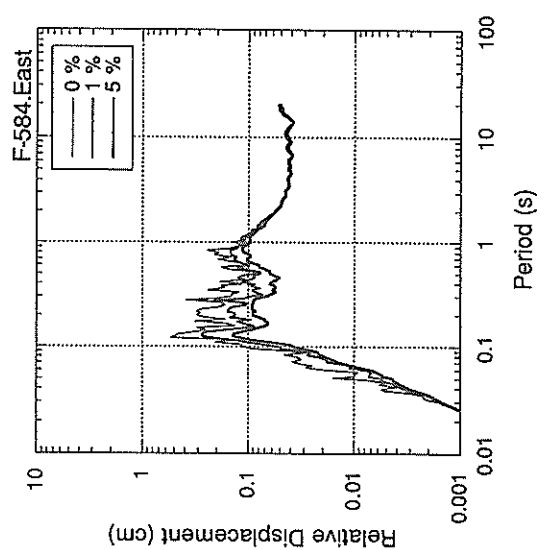
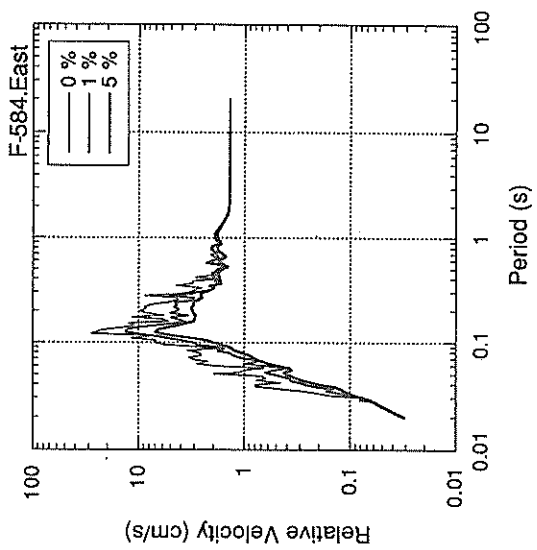
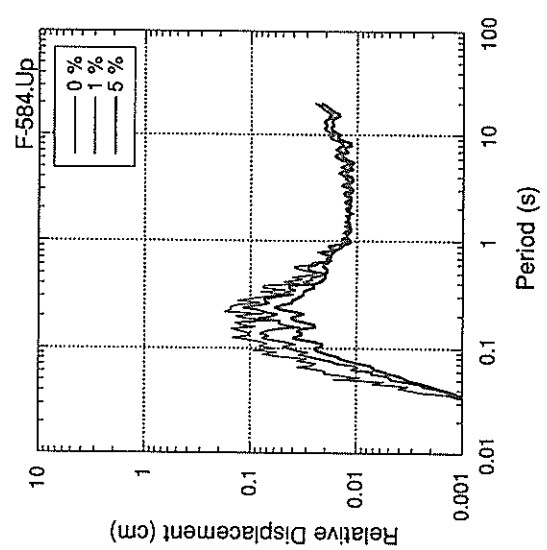
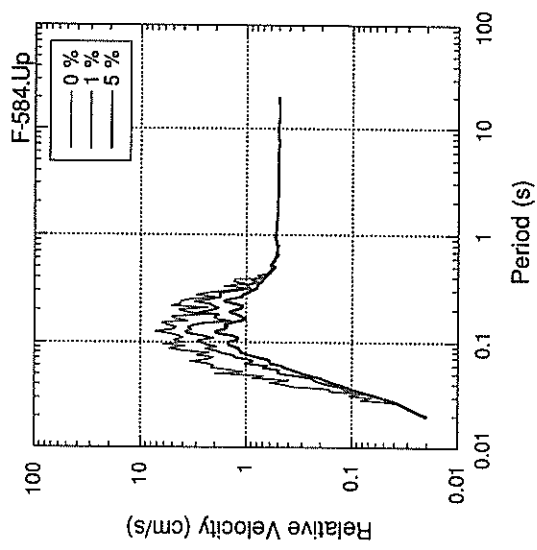


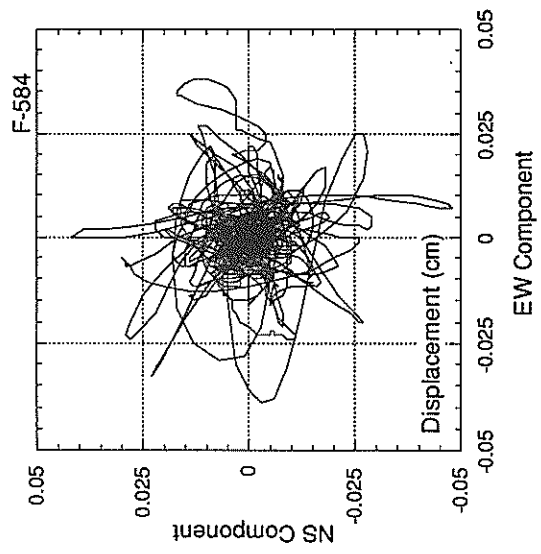
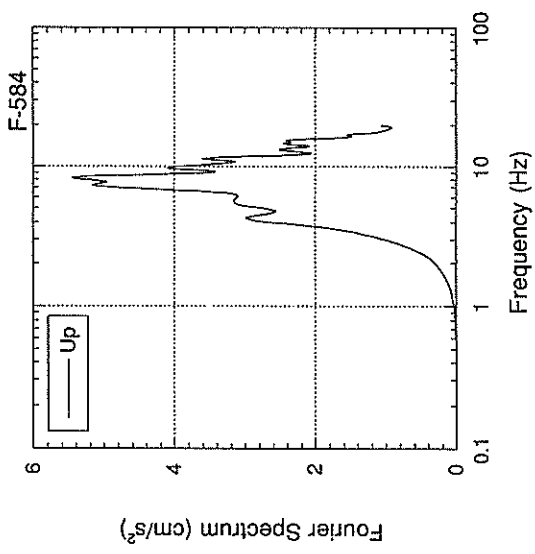
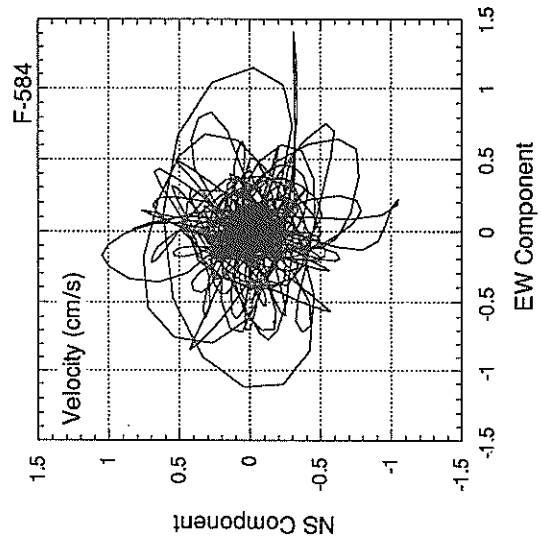
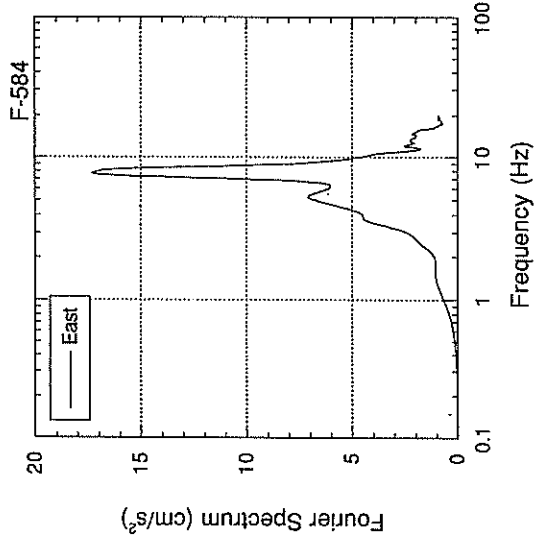
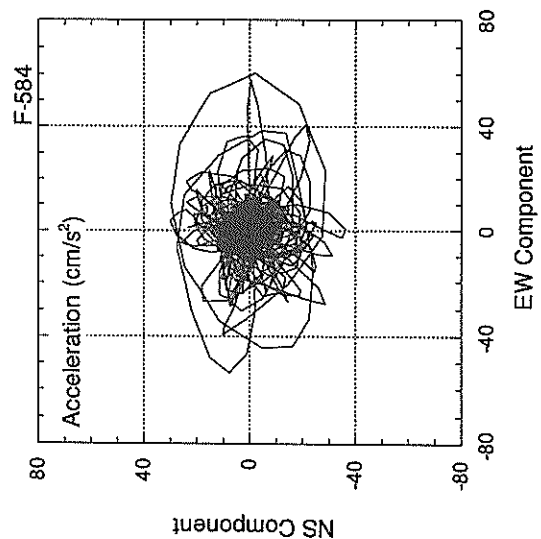
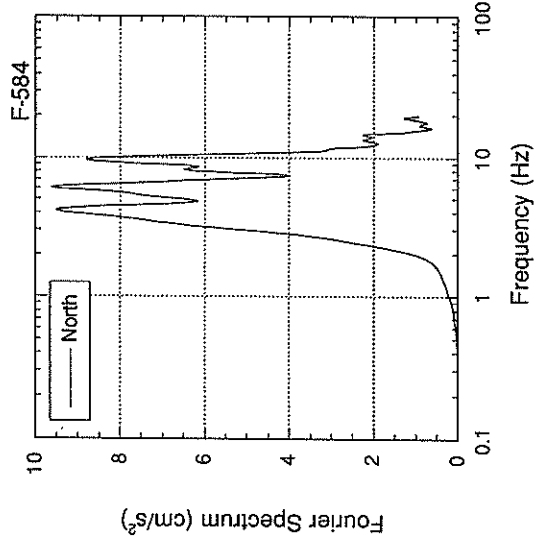














RECORD NUMBER : S-2518  
 STATION : SHINAGAWA-S  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 11:36 MAY 21, 1993  
 LOCATION OF HYPOCENTER

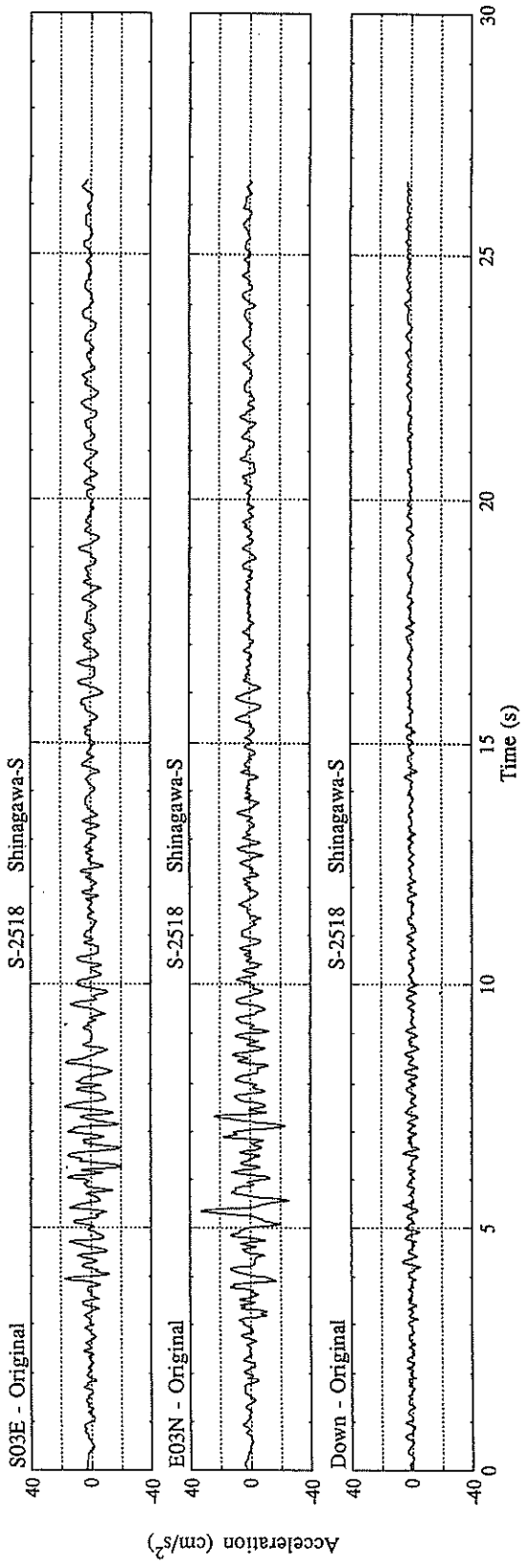
EPICENTRAL REGION : SW IBARAKI PREF  
 LATITUDE : 36° 2.5' N  
 LONGITUDE : 139° 54.0' E  
 DEPTH : 60.8KM

JMA MAGNITUDE : 5.3  
 \*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----		N	S	E	W	U	D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)		20.5	33.2	6.3	34.2			

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-585  
 STATION : MIYAKO-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME : 16:27 JUNE 1, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION : NE OFF IWATE PREF

LATITUDE : 40° 8.0' N

LONGITUDE : 142° 30.2' E

DEPTH : 31.5KM

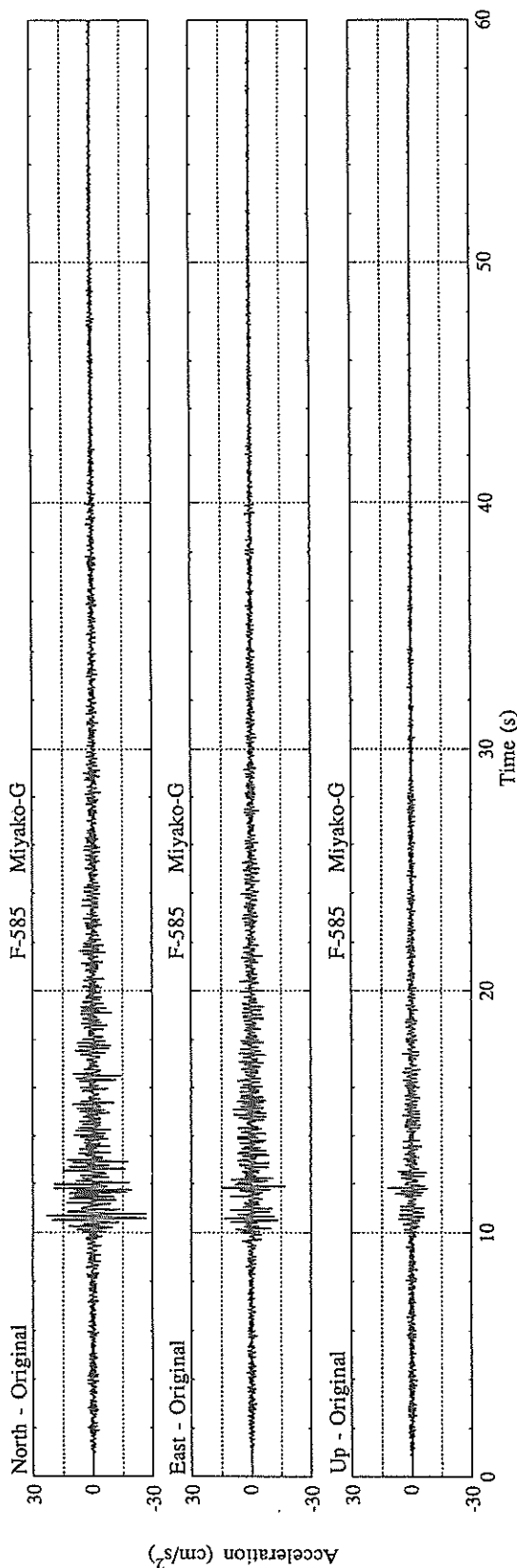
JMA MAGNITUDE : 5.4

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) : 27.0 17.1 11.7 28.4  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2520  
 STATION : KASHIMA-ZOKAN-S

EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME  
 16:49 JUNE 7, 1993

LOCATION OF HYPOCENTER

FAR E OFF IBARAKI PREF

36° 1.4' N

141° 46.6' E

DEPTH  
 26.0KM

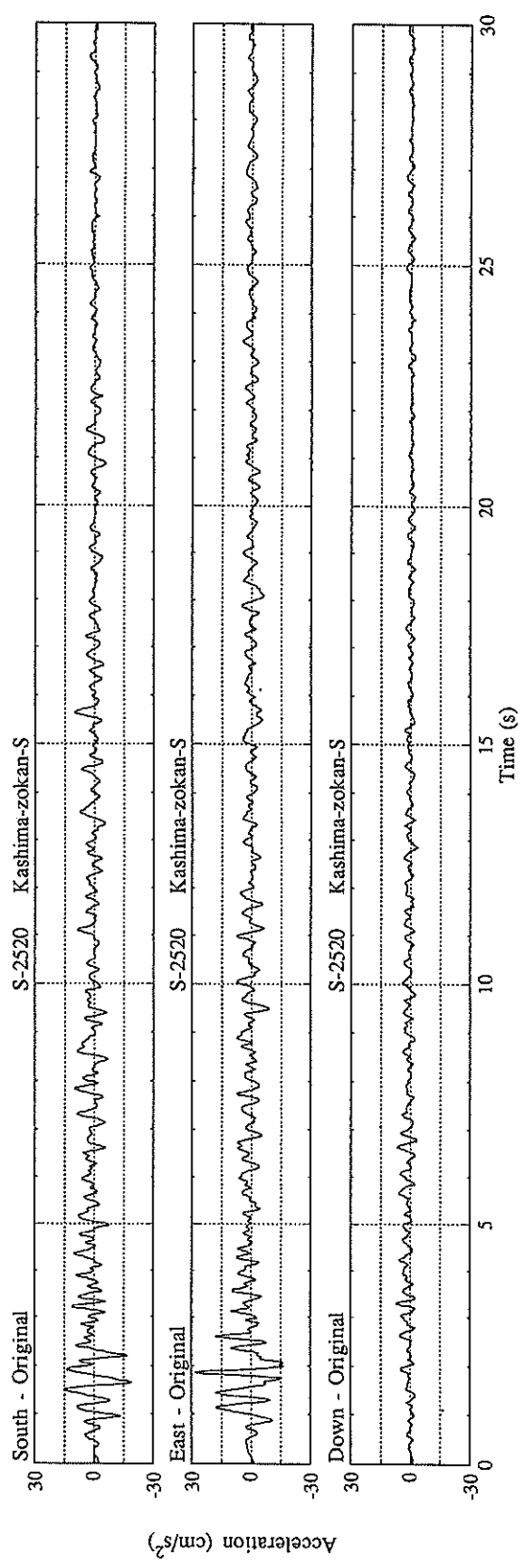
JMA MAGNITUDE  
 5.9

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

N S	E W	U D	HORIZONTAL*
19.1	28.5	7.1	30.0

ORIGINAL ACCELERATION (GAL)  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-563  
 STATION : MURORAN-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 23:22 JULY12, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION SW OFF HOKKAIDO

LATITUDE 42° 26.1' N

LONGITUDE 139° 20.3' E

DEPTH 40.0KM

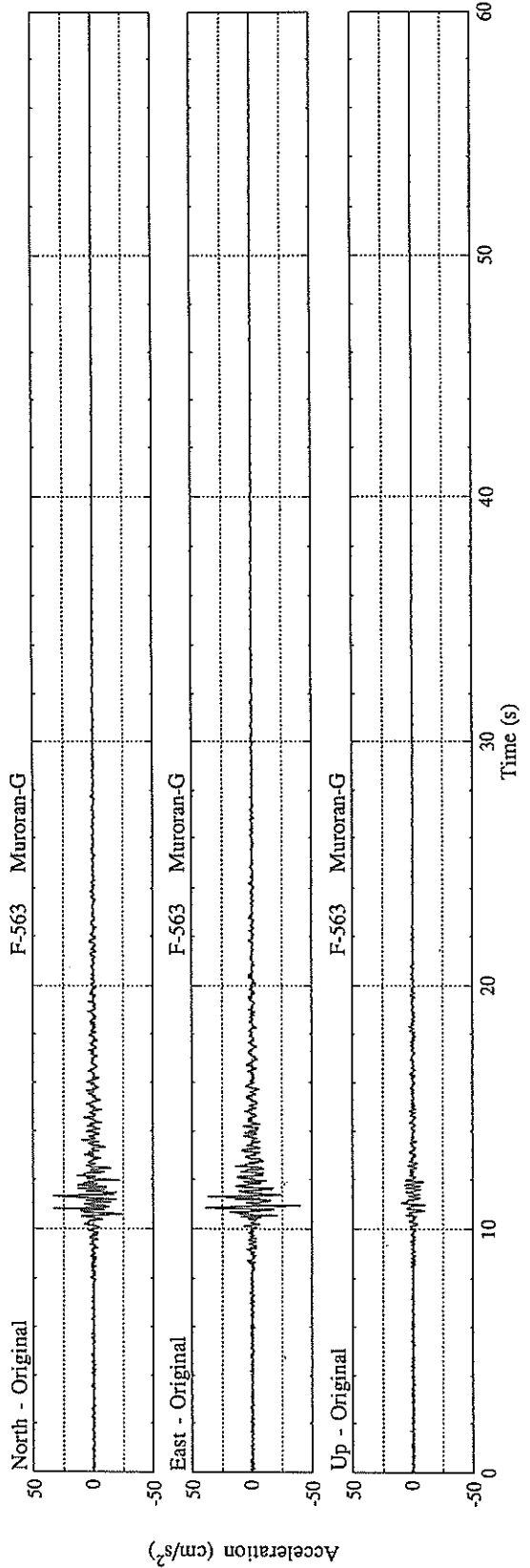
JMA MAGNITUDE 5.2

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 33.4 40.1 10.5 47.2  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2532  
 STATION : ONAHAMA-JI-S  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 13:50 JULY28, 1993  
 \*\*\*\*\*

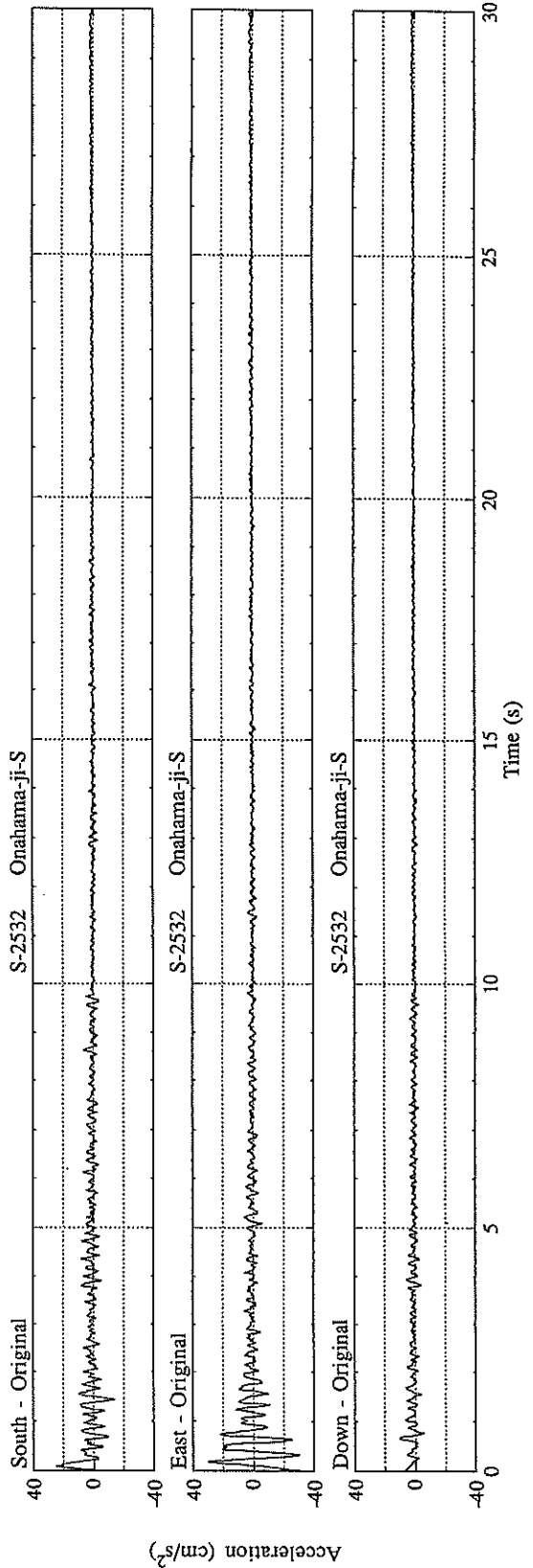
LOCATION OF HYPOCENTER  
 EPICENTRAL REGION : WESTERN FUKUSHIMA PREF  
 LATITUDE : 37° 11.4' N  
 LONGITUDE : 139° 58.0' E  
 DEPTH : 122.9KM  
 JMA MAGNITUDE : 4.0

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

N	S	E	W	U	D	HORIZONTAL*
25.2	30.3	10.3	31.3			

\* RESULTANT OF HORIZONTAL COMPONENTS

ORIGINAL ACCELERATION (GAL)



RECORD NUMBER : M-1475  
 STATION : TOKACHI-M  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 23:53 JULY29,1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION HIDAKA MOUNTAINS REGION

LATITUDE 42° 25.0' N

LONGITUDE 143° 0.9' E

DEPTH 77.1KM

JMA MAGNITUDE 5.0

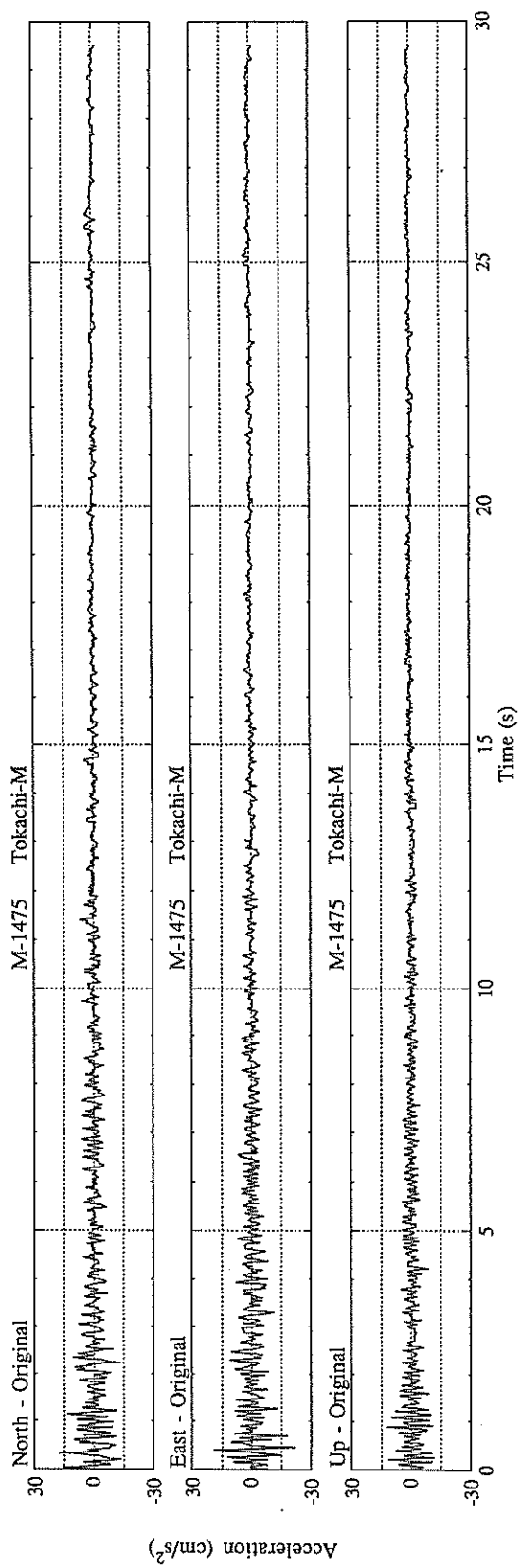
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 17.7 21.4 12.0 22.7

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-610  
 STATION : MATSUYAMA-G  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 10:29 AUG. 14, 1993  
 \*\*\*\*\*

LOCATION OF HYPOCENTER

EPICENTRAL REGION : SW EHIME PREF

LATITUDE : 33° 20.9' N

LONGITUDE : 132° 32.8' E

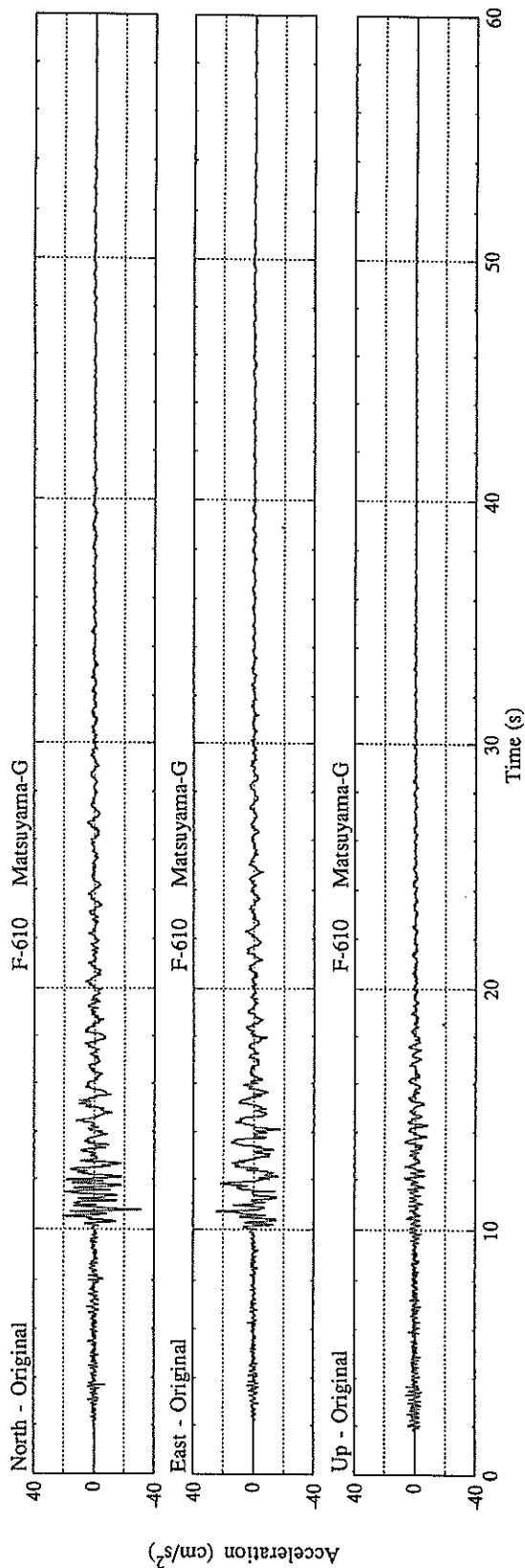
DEPTH : 47.2KM

JMA MAGNITUDE : 5.0

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL)    31.1    25.0    7.9    31.2  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-638  
 STATION : WAKAYAMA-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 6:44 AUG. 16, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION NW WAKAYAMA PREF

LATITUDE 34° 5.6' N

LONGITUDE 135° 6.7' E

DEPTH 8.7KM

JMA MAGNITUDE 4.2

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

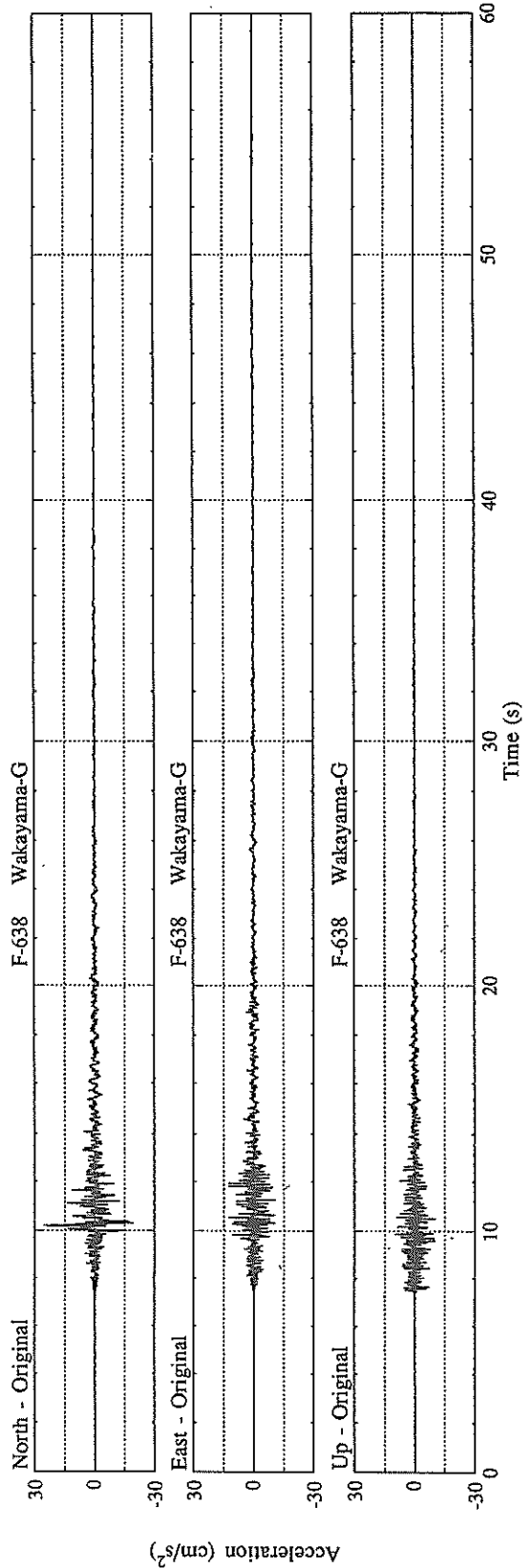
-----

N S E W U D HORIZONTAL\*

-----

ORIGINAL ACCELERATION (GAL) 25.4 12.7 10.2 26.1

\* RESULTANT OF HORIZONTAL COMPONENTS





RECORD NUMBER : F-611  
 STATION : MATSUYAMA-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 0: 8 AUG. 31, 1993

LOCATION OF HYPOCENTER  
 EPICENTRAL REGION

SW EHIME PREF

LATITUDE 33° 36.0' N

LONGITUDE 132° 28.2' E

DEPTH 61.8KM

JMA MAGNITUDE

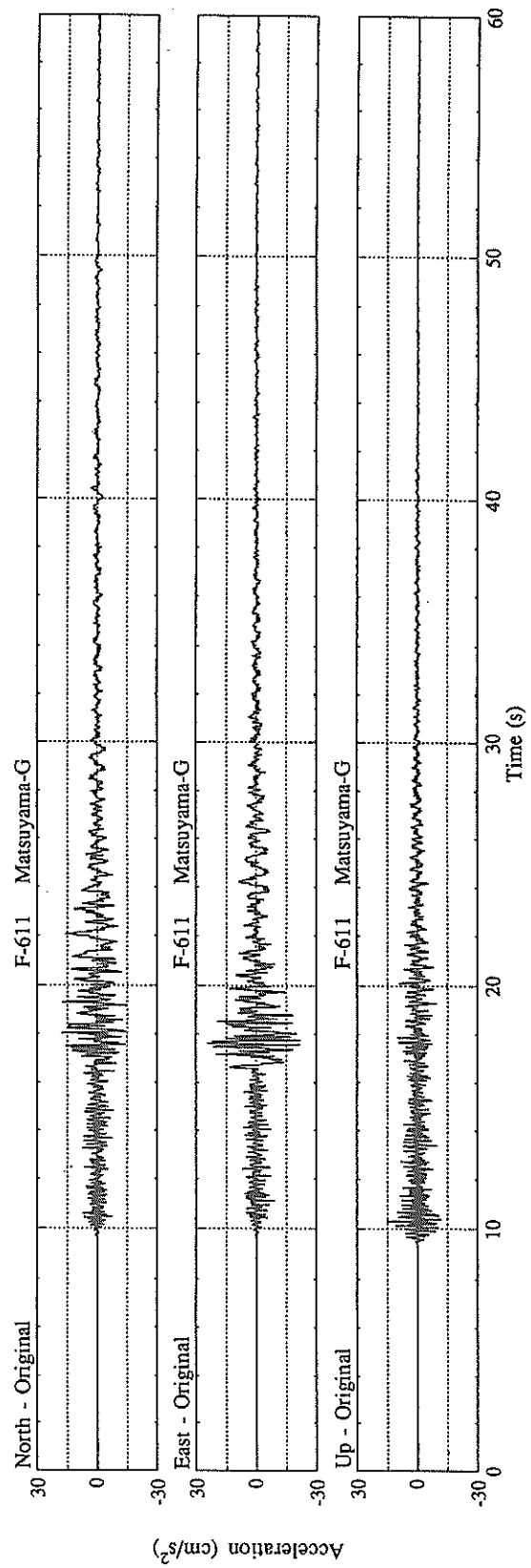
5.1

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PEAK VALUES OF COMPONENTS

-----		-----		-----		-----	
N	S	E	W	U	D	HORIZONTAL*	
17.7	24.0	24.0	15.1	26.3			

ORIGINAL ACCELERATION (GAL) \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2534  
 STATION : URAKAWA-S  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 13:55 SEP. 11, 1993

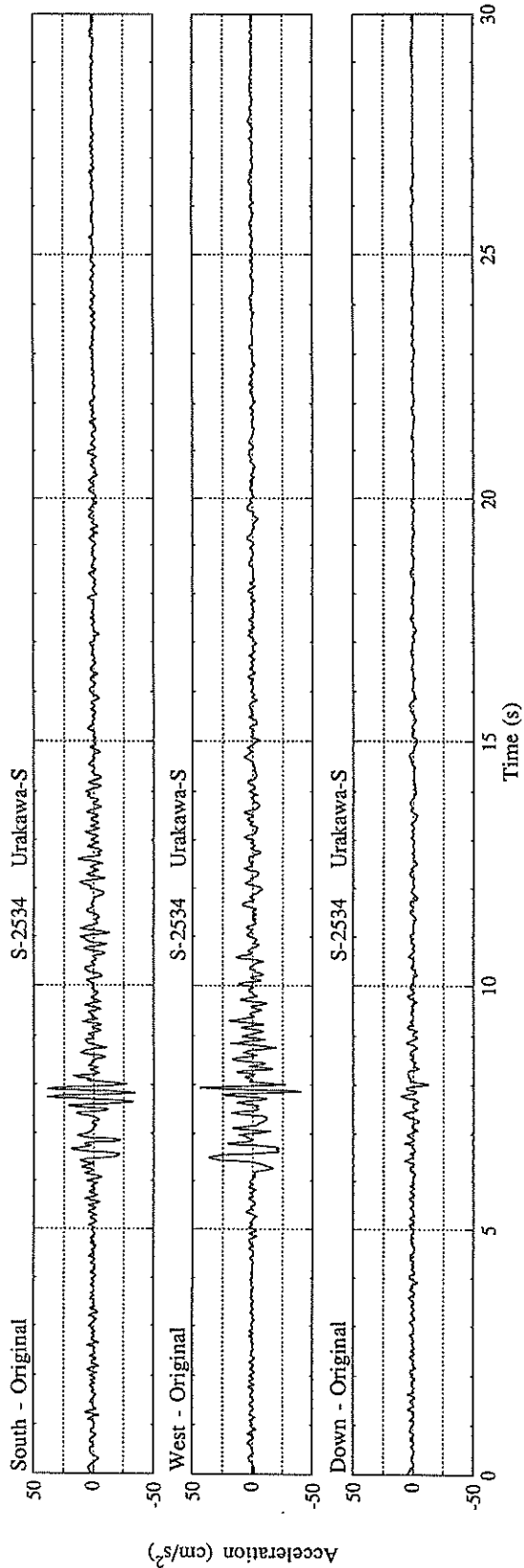
LOCATION OF HYPOCENTER

EPICENTRAL REGION : S OFF URAKAWA  
 LATITUDE : 41° 58.4' N  
 LONGITUDE : 142° 39.6' E  
 DEPTH : 61.4KM  
 JMA MAGNITUDE : 5.6

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*

ORIGINAL ACCELERATION (GAL)      38.8    44.2    12.0    53.7  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1479  
 STATION : TOKACHI-M  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 13:55 SEP. 11. 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION S OFF URAKAWA

LATITUDE 41° 58.4' N

LONGITUDE 142° 39.6' E

DEPTH 61.4KM

JMA MAGNITUDE 5.6

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

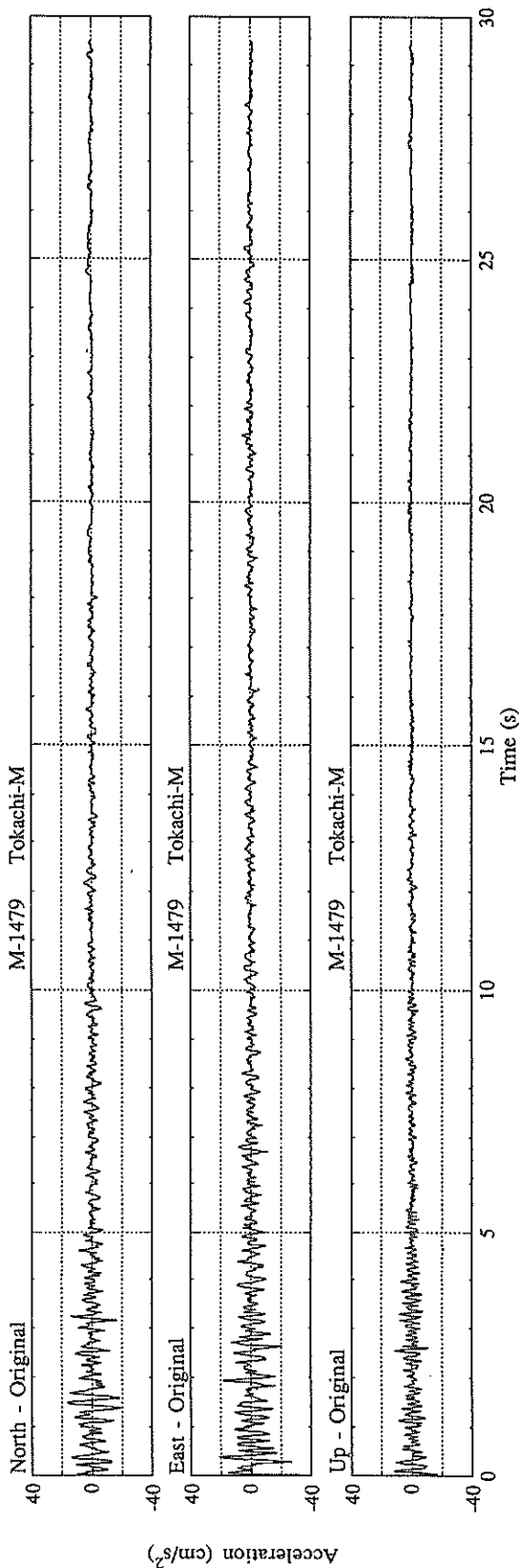
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N S E W U D HORIZONTAL\*

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ORIGINAL ACCELERATION (GAL) 18.9 32.1 16.3 32.9

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2541  
 STATION : SHINAGAWA-S  
 EARTHQUAKE DATA

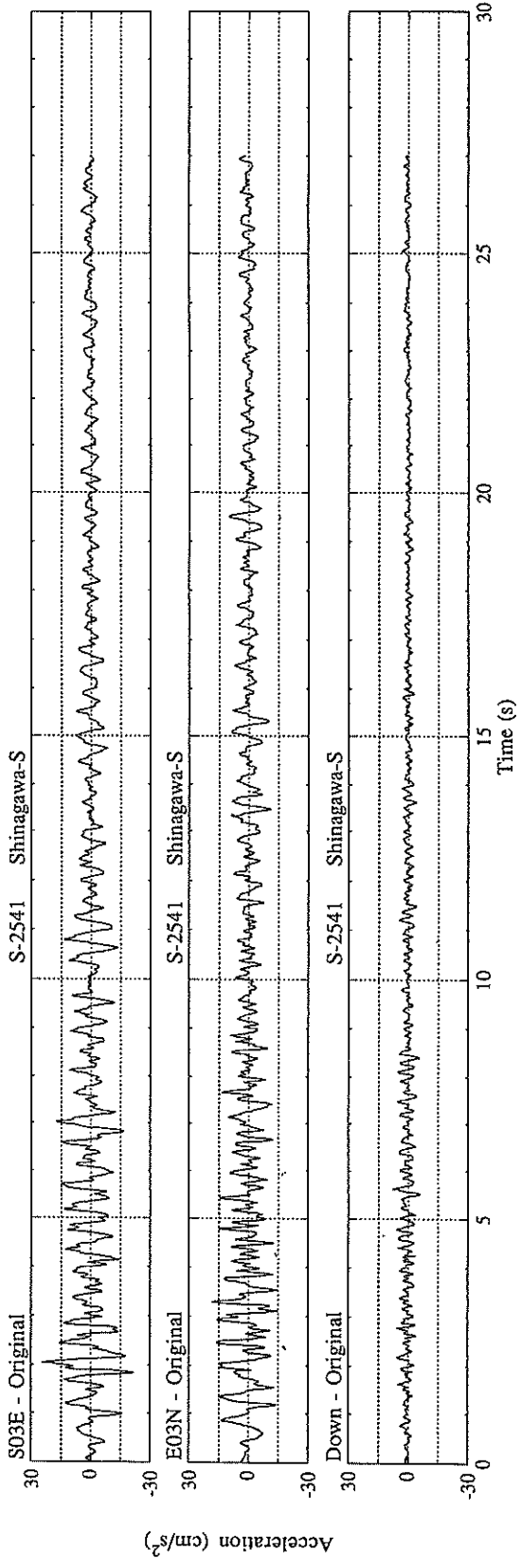
\*\*\*\*\*  
 DATE AND TIME : 0:54 OCT. 12, 1993  
 \*\*\*\*\*

LOCATION OF HYPOCENTER  
 EPICENTRAL REGION : FAR S OFF TOKAI DISTRICT  
 LATITUDE : 32° 1.3' N  
 LONGITUDE : 138° 14.4' E  
 DEPTH : 390.1KM  
 JMA MAGNITUDE : 7.1

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

	N S	E W	U D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)	24.4	18.3	7.7	27.7

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-645  
 STATION : YAMASHITA-F  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME : 0:54 OCT. 12, 1993

LOCATION OF HYPOCENTER

FAR S OFF TOKAI DISTRICT

32° 1.3' N

138° 14.4' E

390.1KM

7.1

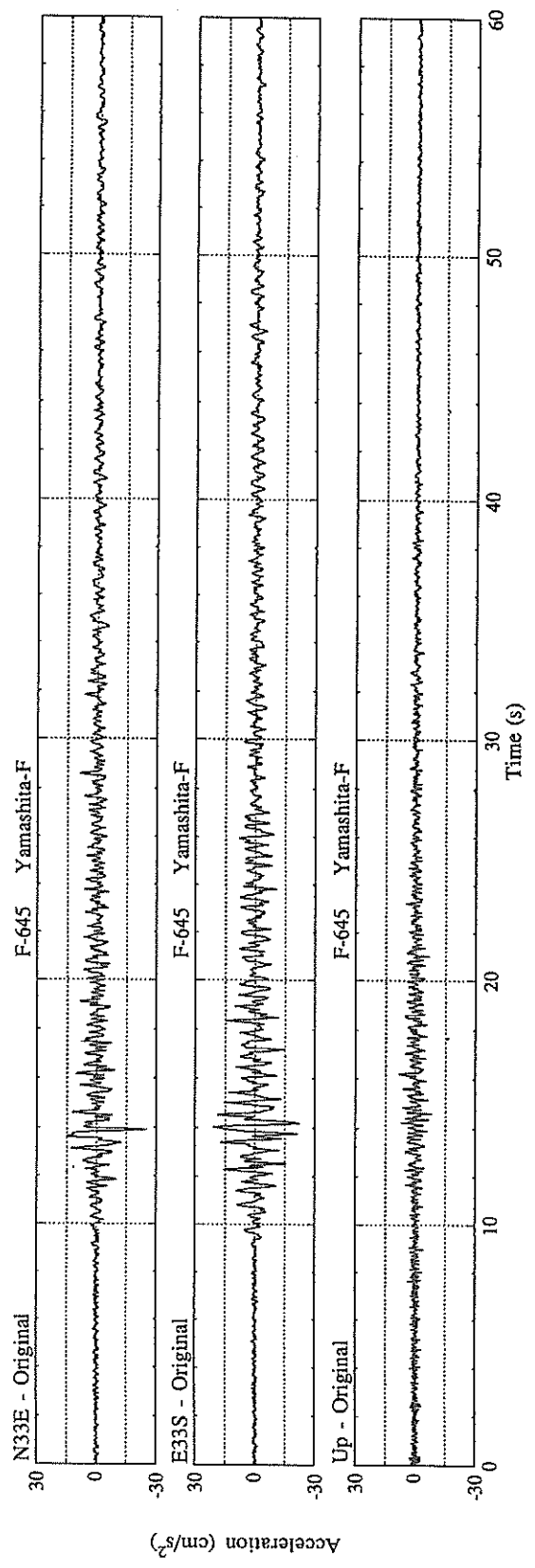
\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 25.0 22.3 8.1 27.2

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-646  
 STATION : YAMASHITA-FR  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 0:54 OCT. 12, 1993

LOCATION OF HYPOCENTER

FAR S OFF TOKAI DISTRICT

32° 1.3' N

138° 14.4' E

390.1KM

7.1

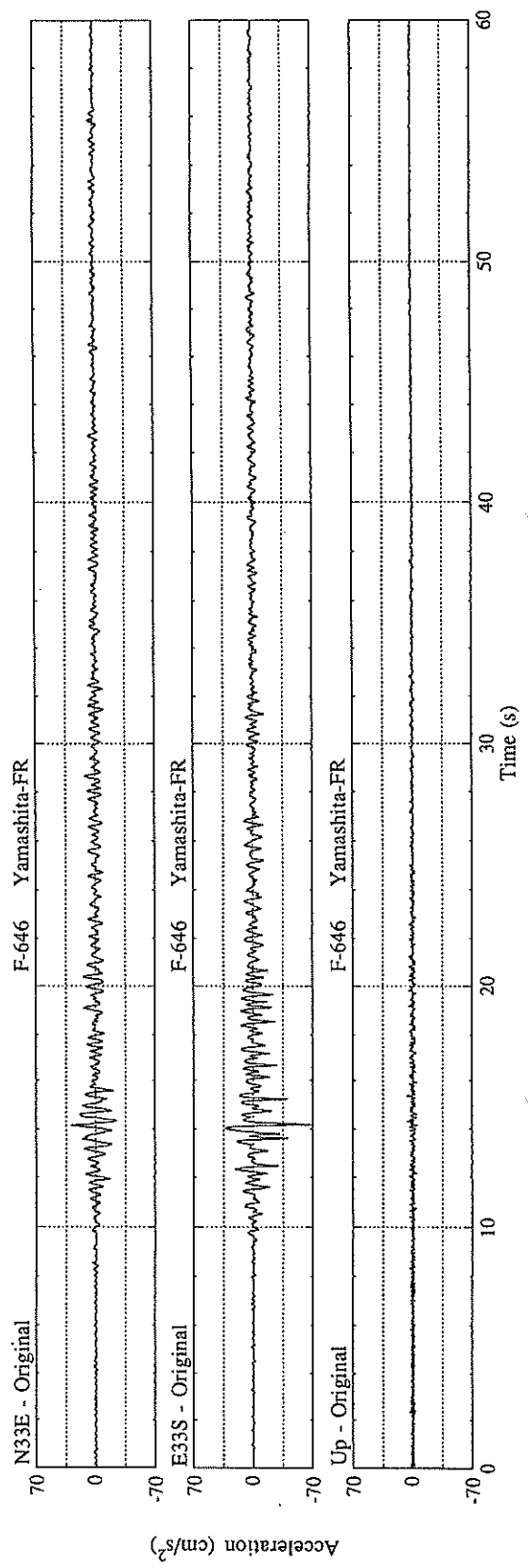
JMA MAGNITUDE

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

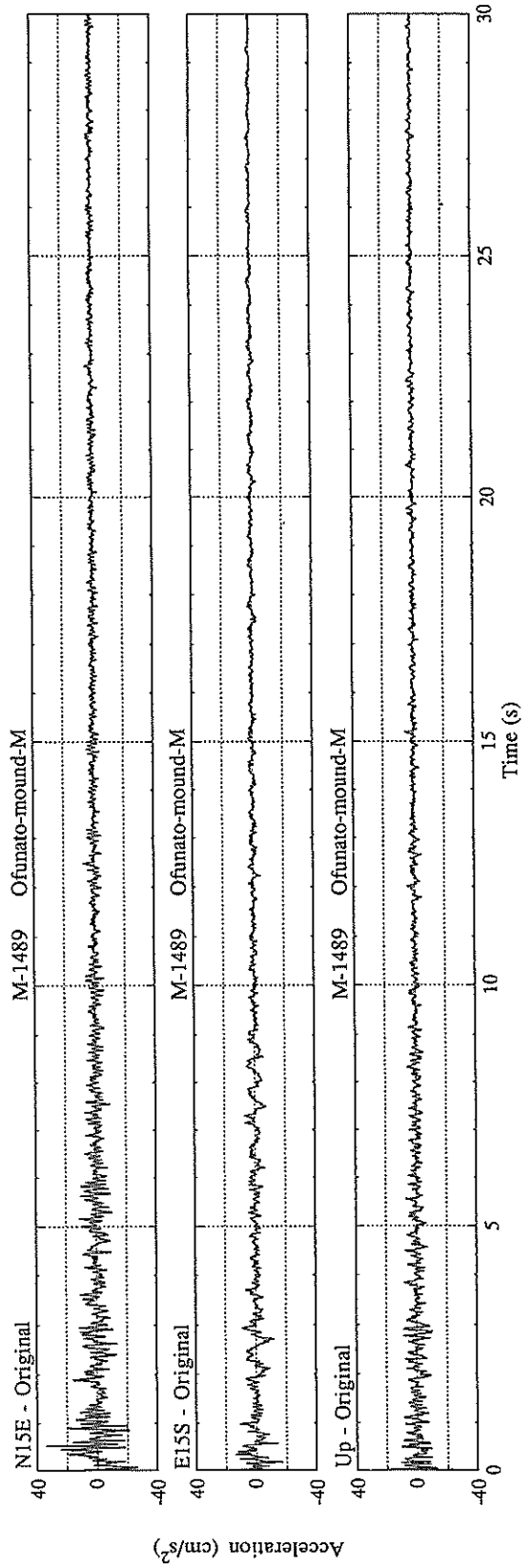
-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 29.0 67.9 6.7 69.8  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1489  
 STATION : OFUNATO-MOUND-M  
 EARTHQUAKE DATA  
 \*\*\*\*\*  
 DATE AND TIME : 9: 6 NOV. 11, 1993  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION : E OFF IWATE PREF  
 LATITUDE : 39° 4.2' N  
 LONGITUDE : 142° 22.0' E  
 DEPTH : 36.3KM  
 JMA MAGNITUDE : 5.5  
 \*\*\*\*\*

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 -----  
 N S E W U D HORIZONTAL\*  
 -----  
 ORIGINAL ACCELERATION (GAL)    34.1    16.8    17.6    35.2  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1490  
 STATION : KAMAISHI-M  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 9: 6 NOV. 11, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION E OFF IWATE PREF

LATITUDE 39° 4.2' N

LONGITUDE 142° 22.0' E

DEPTH 36.3KM

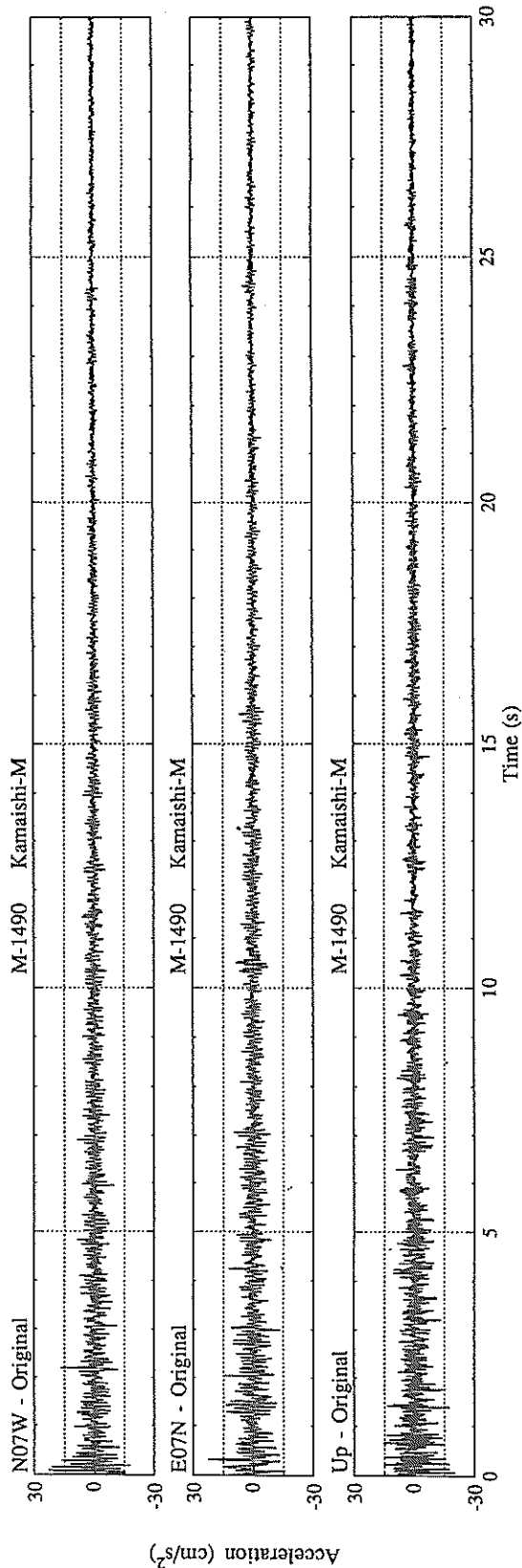
JMA MAGNITUDE 5.5

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 22.9 22.4 20.1 27.9  
 \* RESULTANT OF HORIZONTAL COMPONENTS





RECORD NUMBER : S-2547  
 STATION : OFUNATO-BO-S

EARTHQUAKE DATA

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*****
DATE AND TIME                15:11 NOV.27, 1993
LOCATION OF HYPOCENTER
  EPICENTRAL REGION          NORTHERN MIYAGI PREF
  LATITUDE                   38° 34.9' N
  LONGITUDE                   141° 20.3' E
  DEPTH                      111.7KM
  JMA MAGNITUDE              5.9
*****
  
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PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
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PARAMETER OF THE VARIABLE FILTER

FC (HZ)	0.853	0.414	1.622	
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MAXIMUM ACCELERATION (GAL)

ORIGINAL	37.1	65.5	15.2	70.2
CORRECTED	42.2	89.7	23.5	94.7

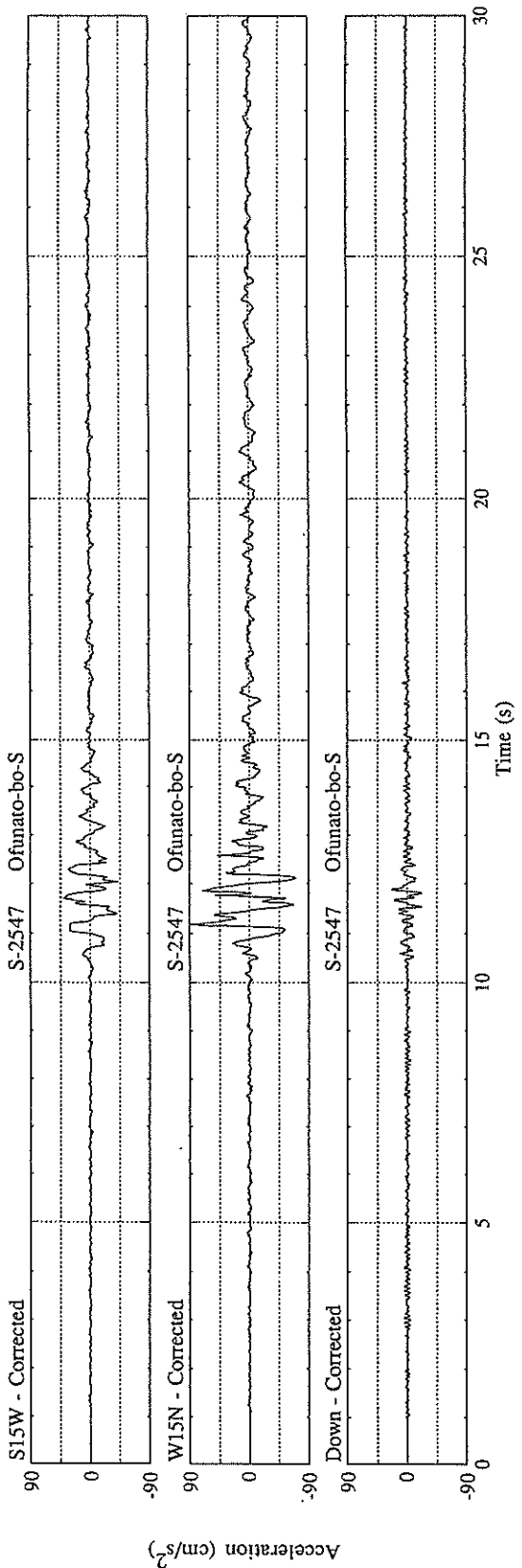
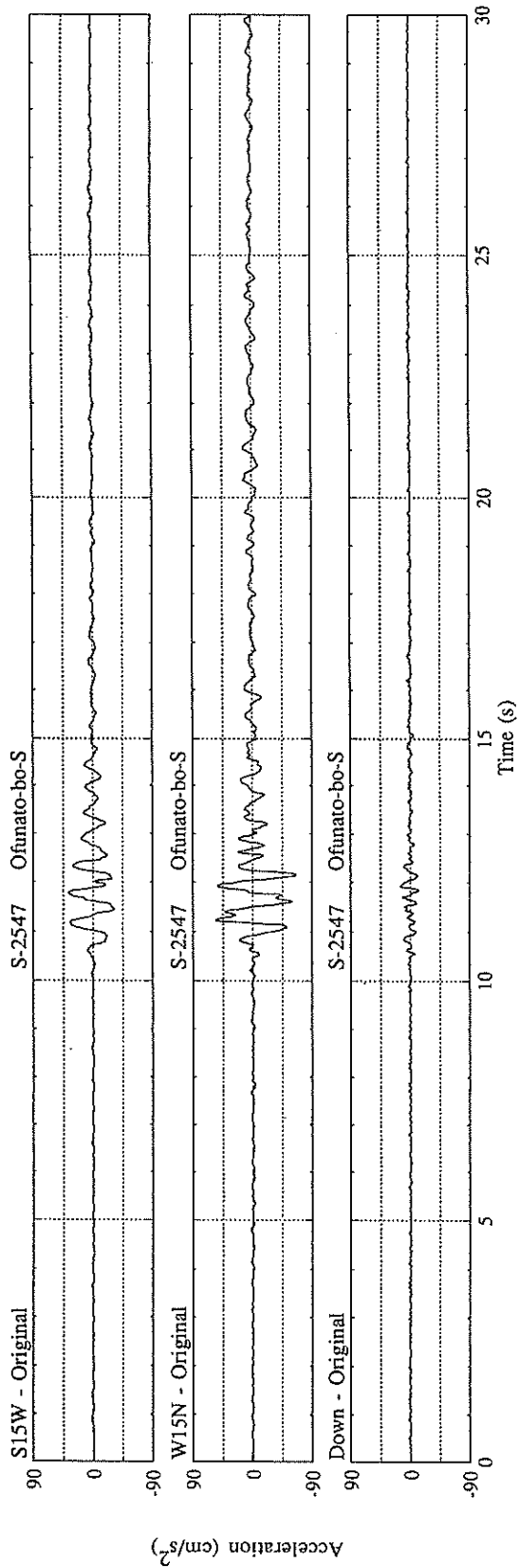
MAXIMUM VELOCITY (CM/SEC)

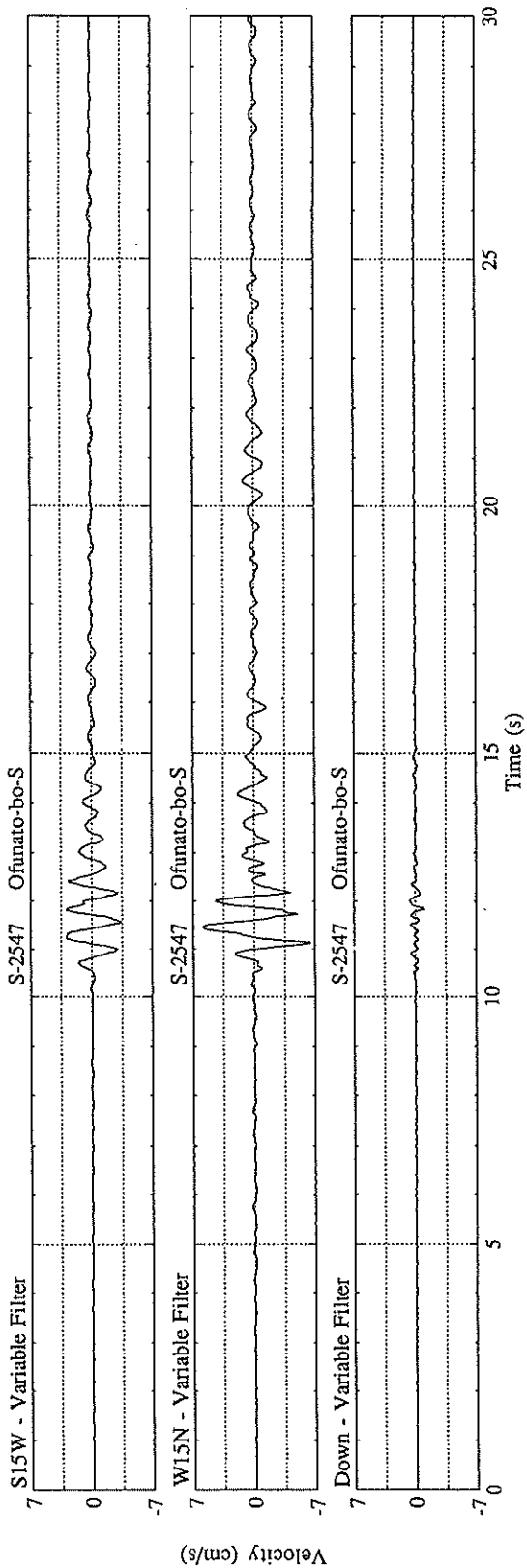
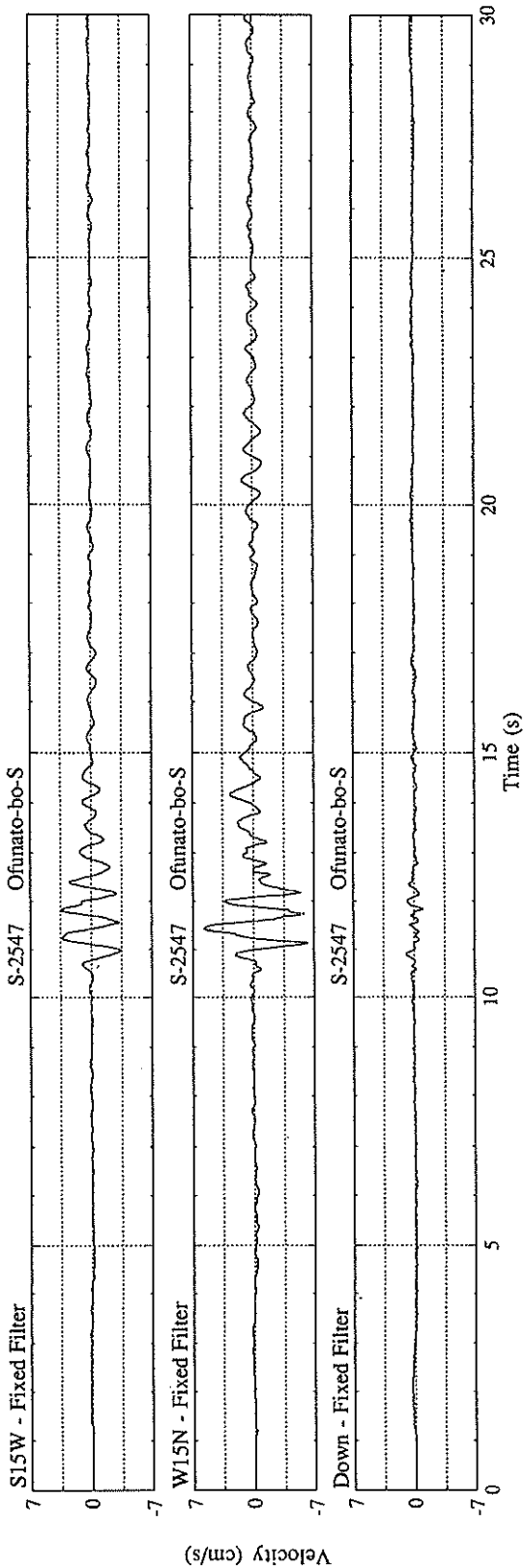
FIXED FILTER	3.49	6.20	1.00	6.26
VARIABLE FILTER	3.38	6.50	0.95	6.51

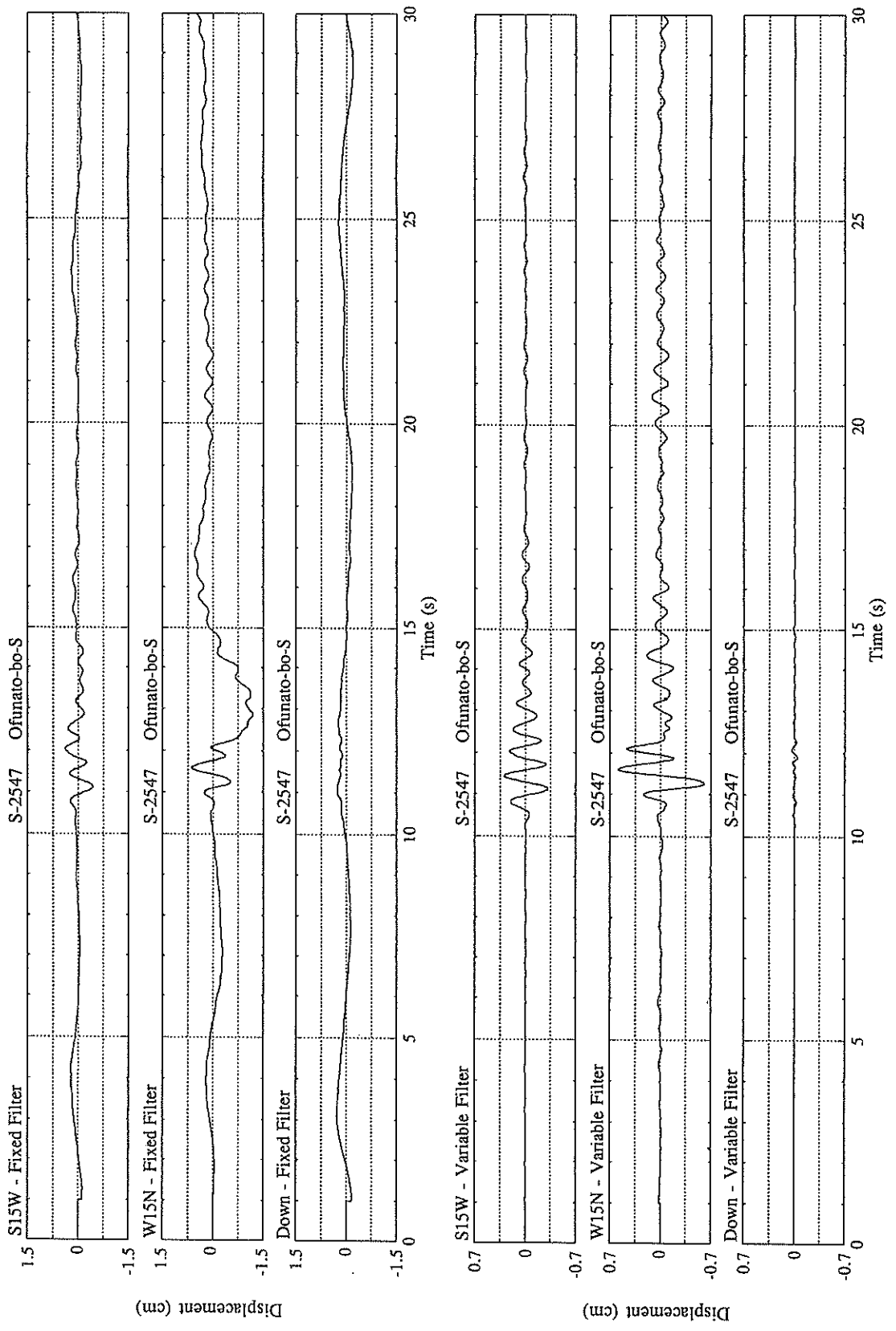
MAXIMUM DISPLACEMENT (CM)

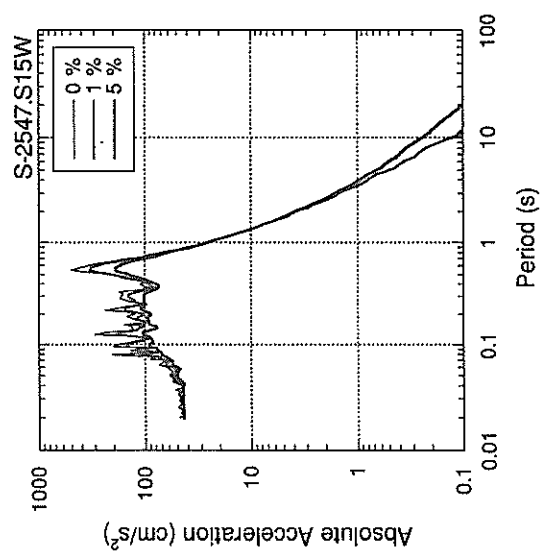
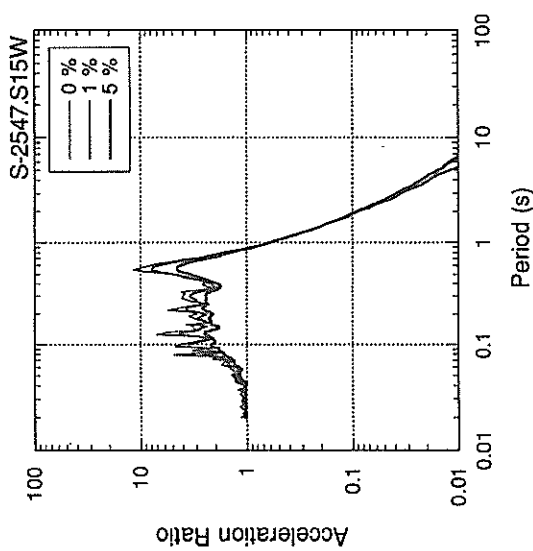
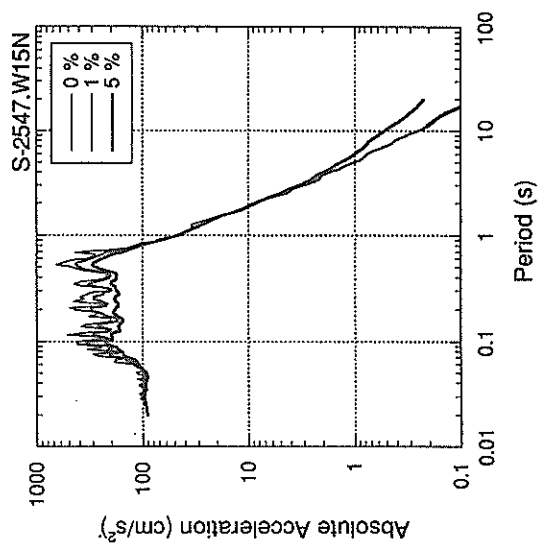
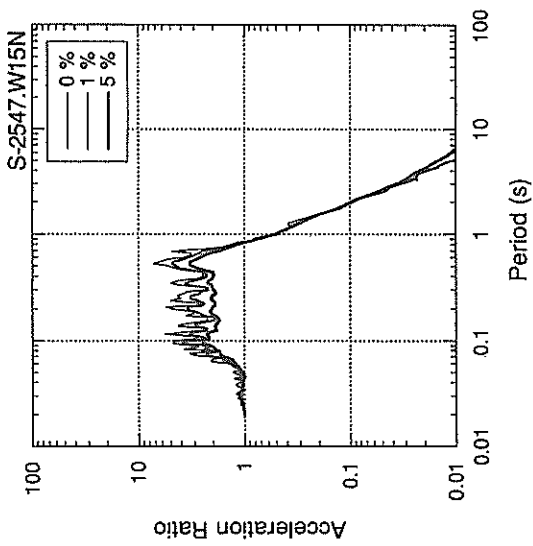
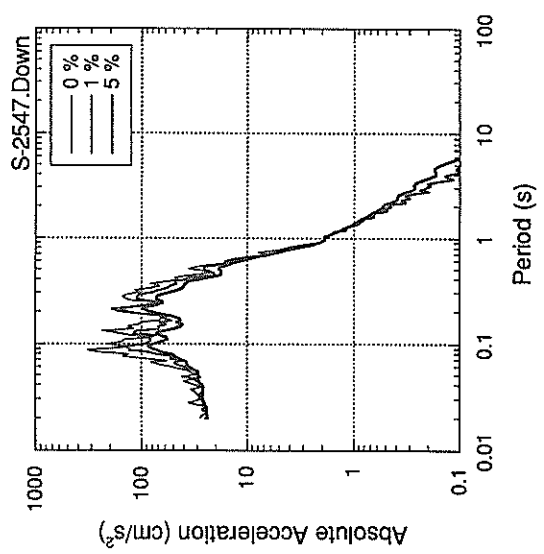
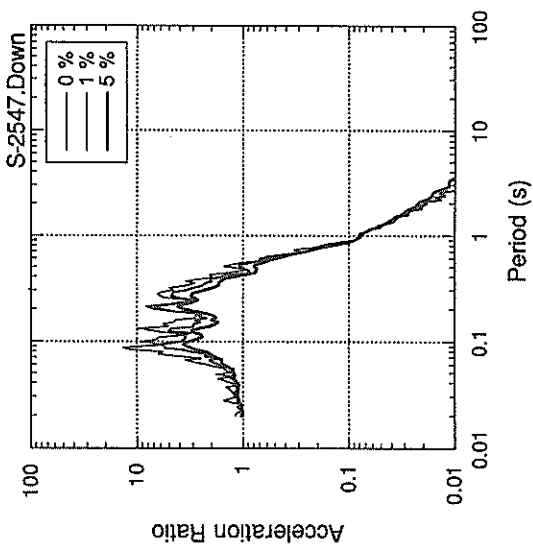
FIXED FILTER	0.43	1.19	0.28	1.20
VARIABLE FILTER	0.31	0.60	0.04	0.61

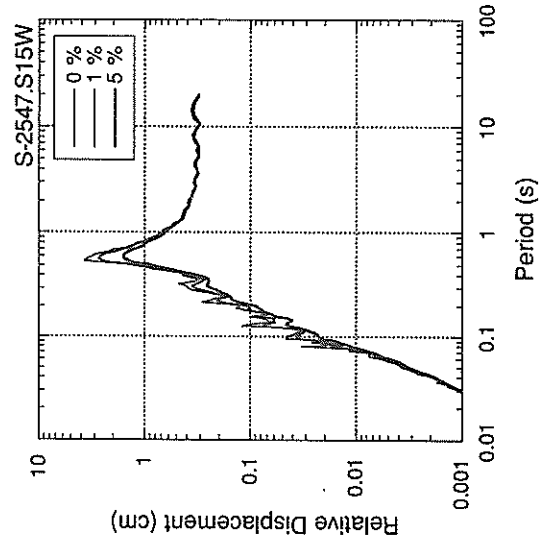
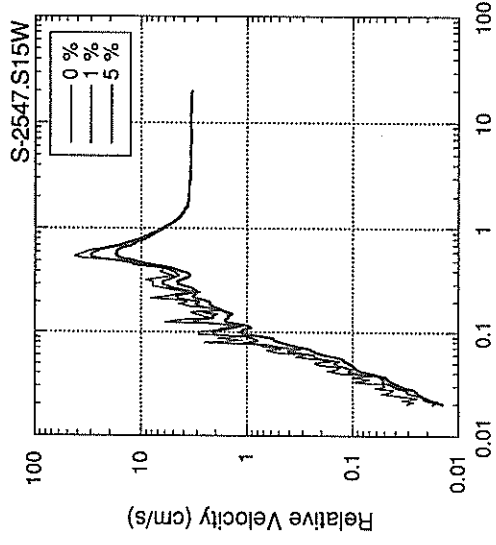
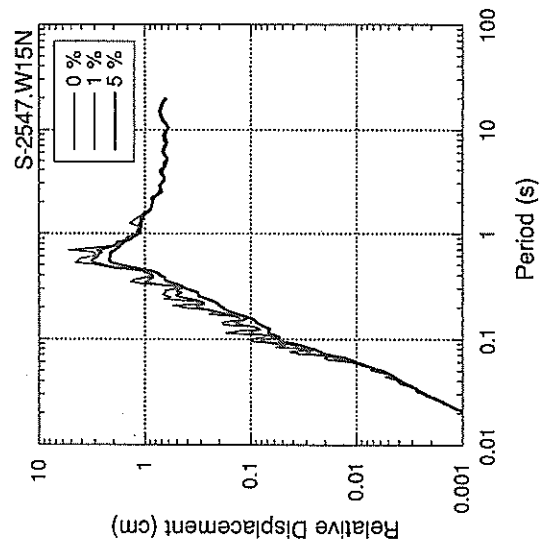
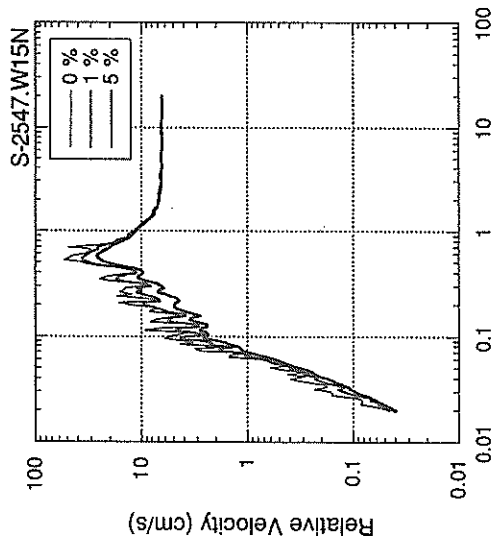
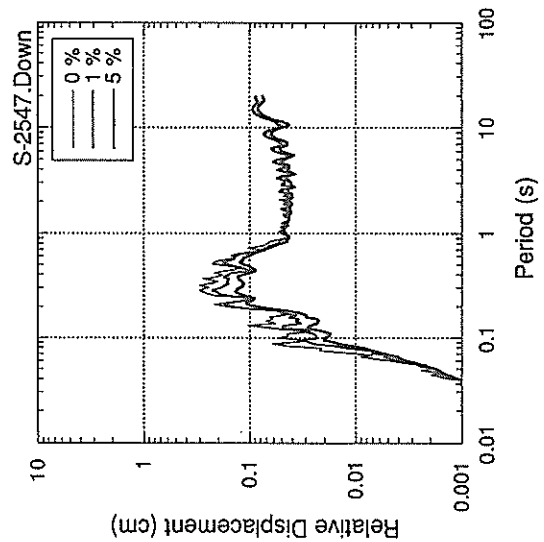
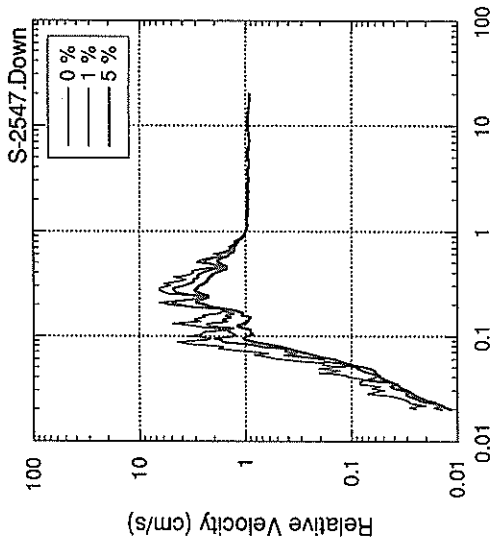
\* RESULTANT OF HORIZONTAL COMPONENTS

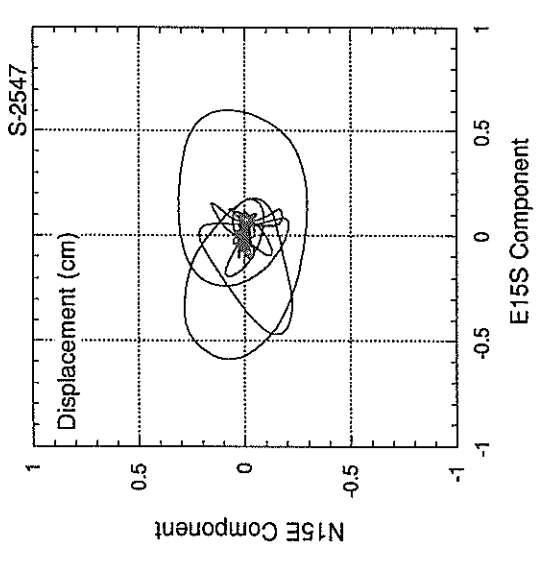
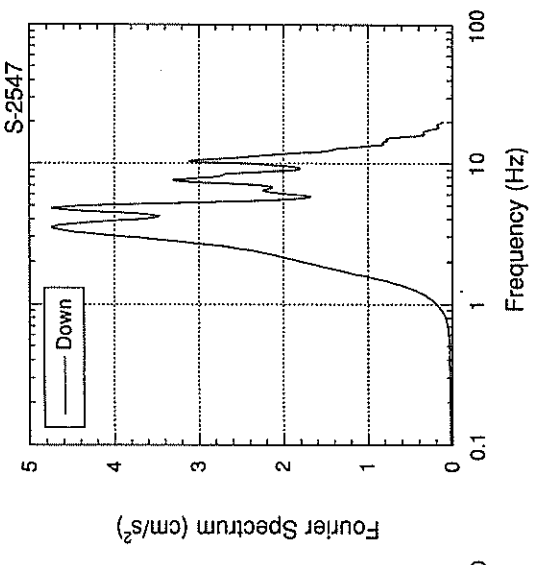
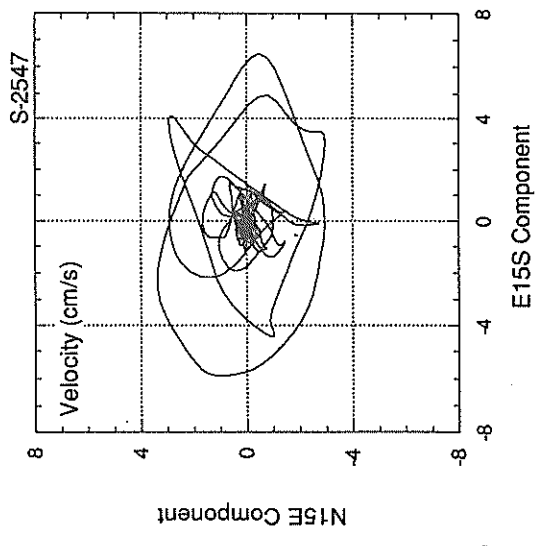
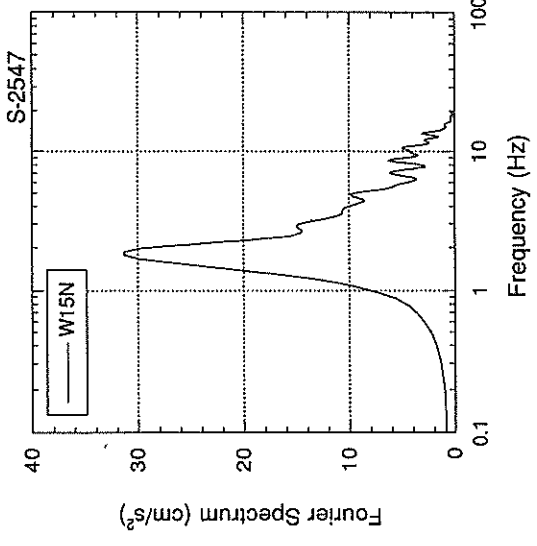
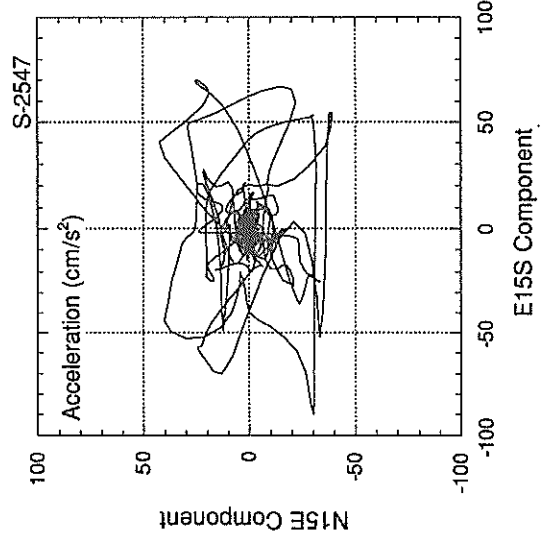
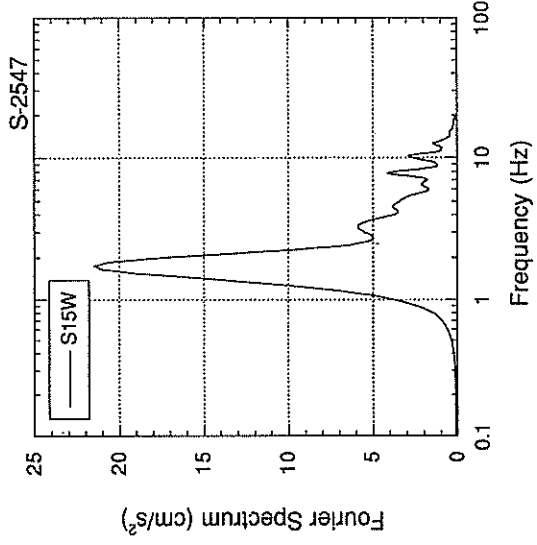












RECORD NUMBER : S-2548  
 STATION : OFUNATO-BOCHI-S  
 EARTHQUAKE DATA  
 \*\*\*\*\*

DATE AND TIME 15:11 NOV. 27, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION NORTHERN MIYAGI PREF

LATITUDE 38° 34.9' N

LONGITUDE 141° 20.3' E

DEPTH 111.7KM

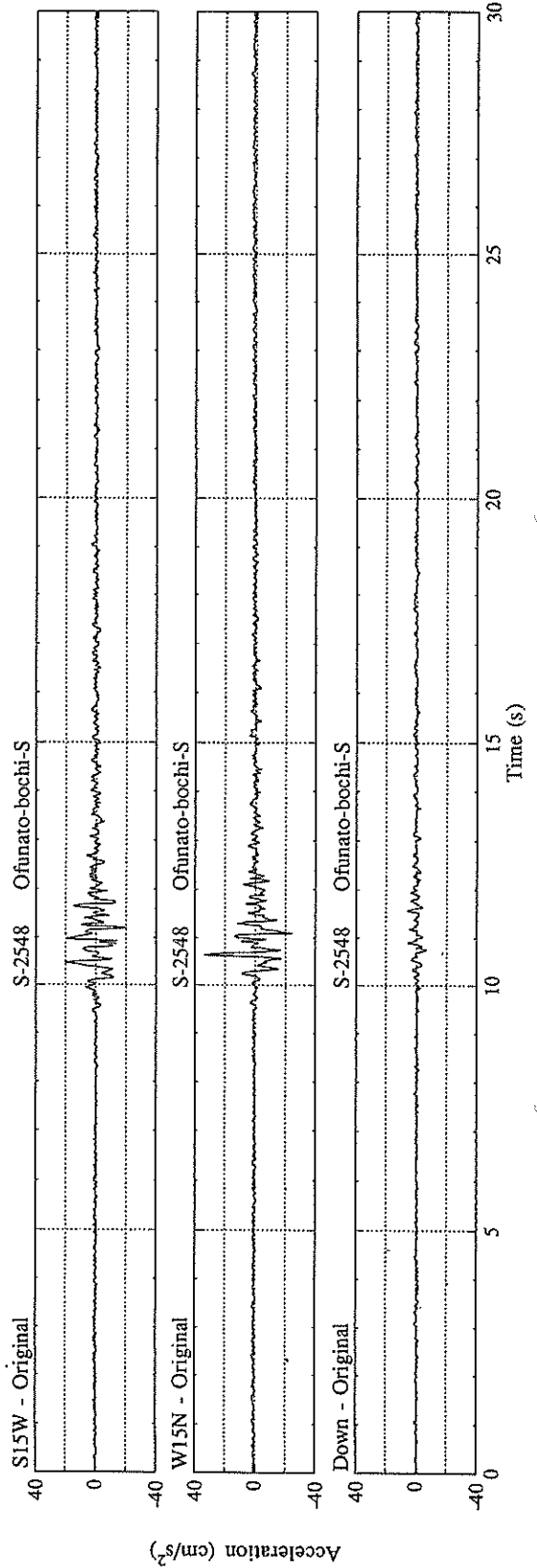
JMA MAGNITUDE 5.9

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
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 N S E W U D HORIZONTAL\*  
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ORIGINAL ACCELERATION (GAL) 20.5 33.8 6.5 33.8

\* RESULTANT OF HORIZONTAL COMPONENTS





RECORD NUMBER : S-2549  
 STATION : SOMA-S  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 15:11 NOV.27,1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION NORTHERN MIYAGI PREF

LATITUDE 38° 34.9' N

LONGITUDE 141° 20.3' E

DEPTH 111.7KM

JMA MAGNITUDE 5.9

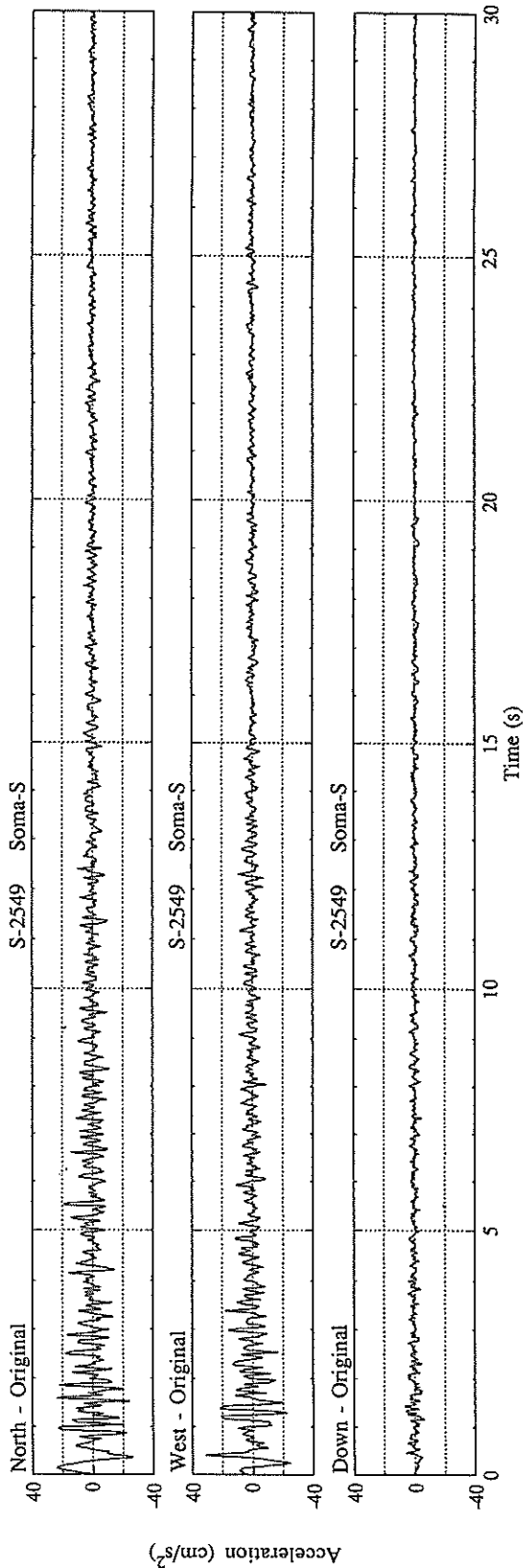
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PEAK VALUES OF COMPONENTS

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 N S E W U D HORIZONTAL\*

ORIGINAL ACCELERATION (GAL) 25.9 31.5 6.9 35.4

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : S-2551  
 STATION : SHIOGAMA-KOJYO-S

EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME 15:11 NOV. 27, 1993  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION NORTHERN MIYAGI PREF  
 LATITUDE 38° 34.9' N  
 LONGITUDE 141° 20.3' E  
 DEPTH 111.7KM  
 JMA MAGNITUDE 5.9  
 \*\*\*\*\*

PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
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PARAMETER OF THE VARIABLE FILTER

FC (HZ)		0.584	0.376	
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MAXIMUM ACCELERATION (GAL)

ORIGINAL		77.8	57.1	
CORRECTED		100.6	108.7	

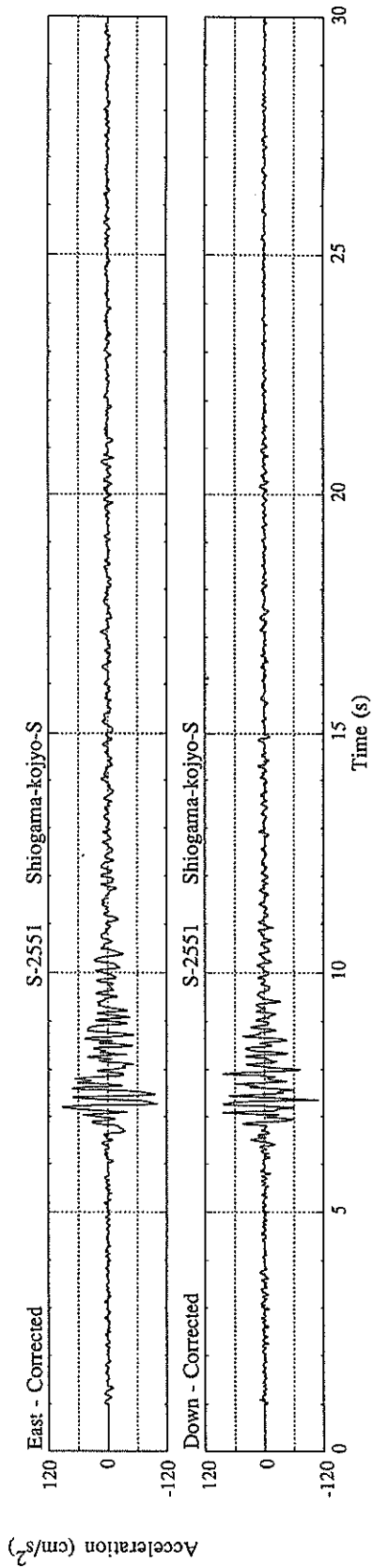
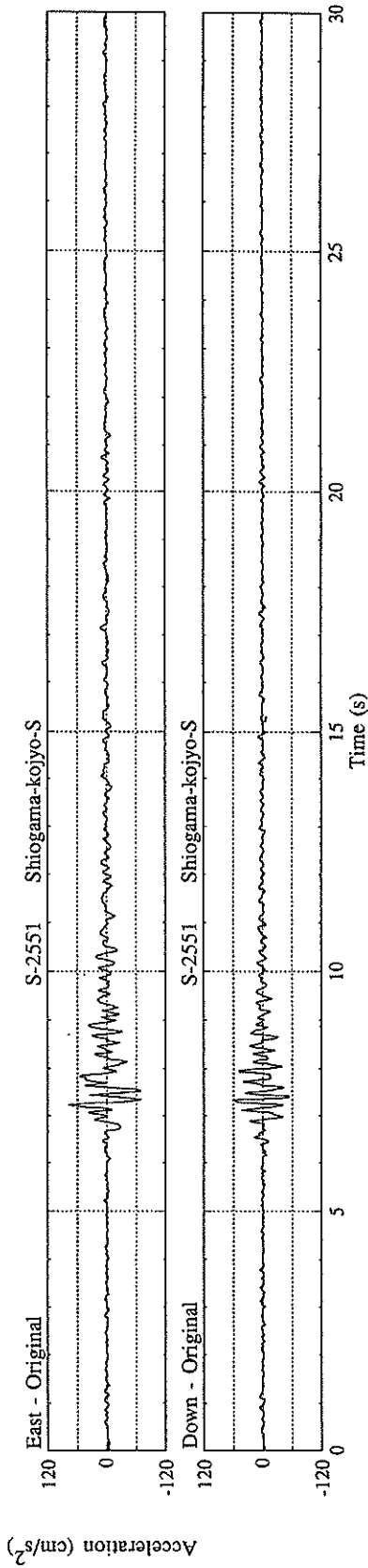
MAXIMUM VELOCITY (CM/SEC)

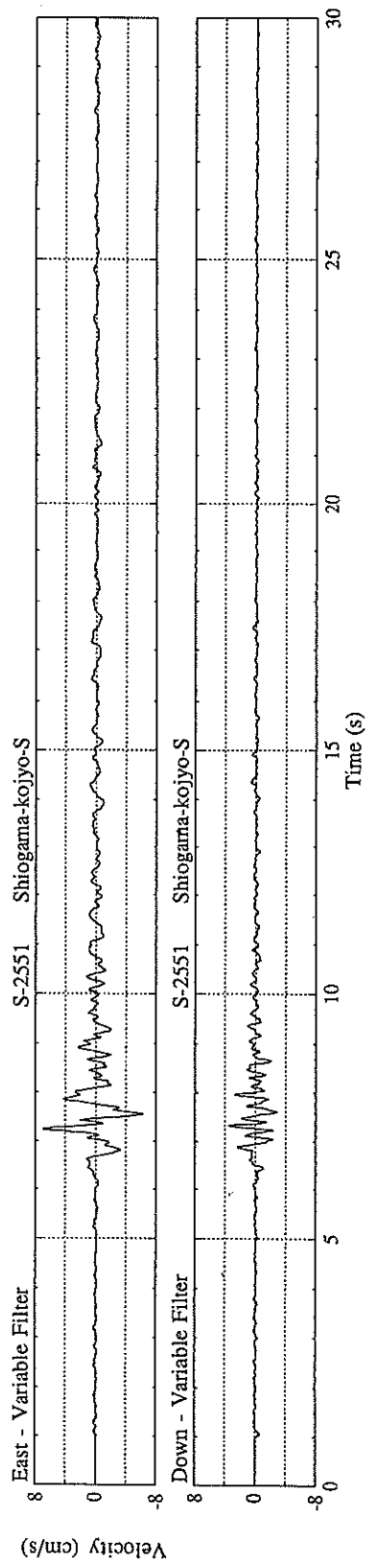
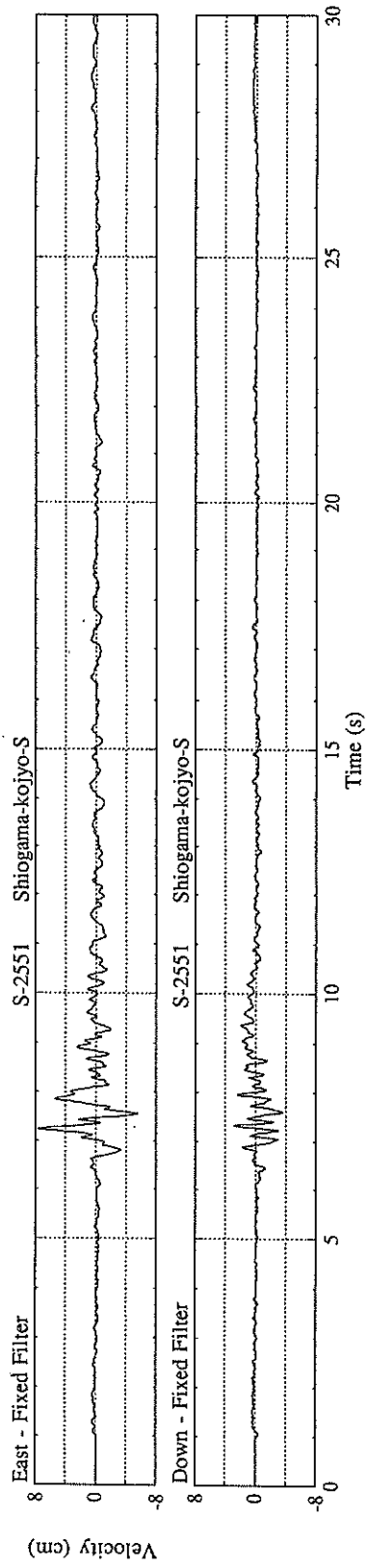
FIXED FILTER		7.72	3.56	
VARIABLE FILTER		7.07	3.57	

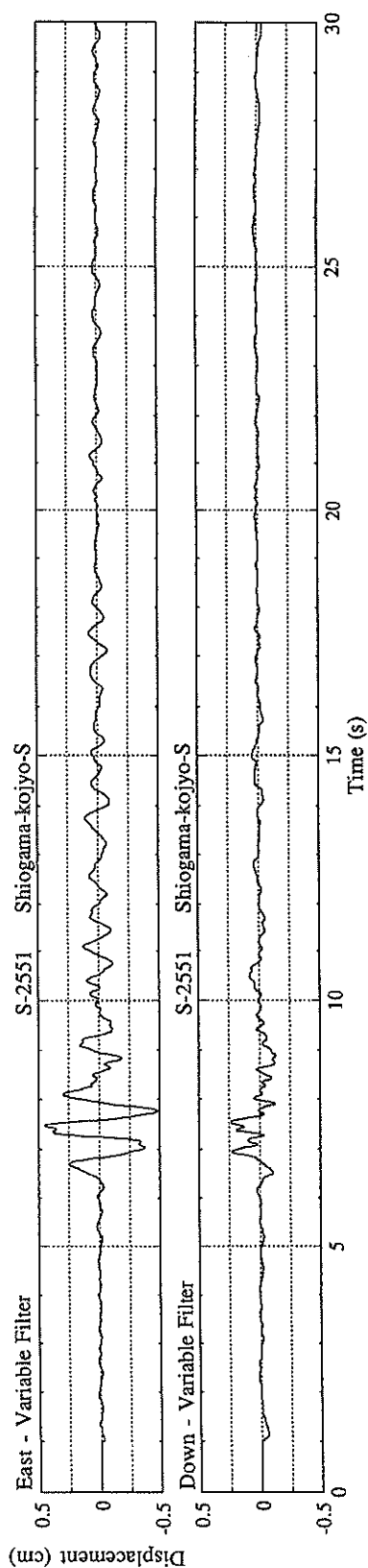
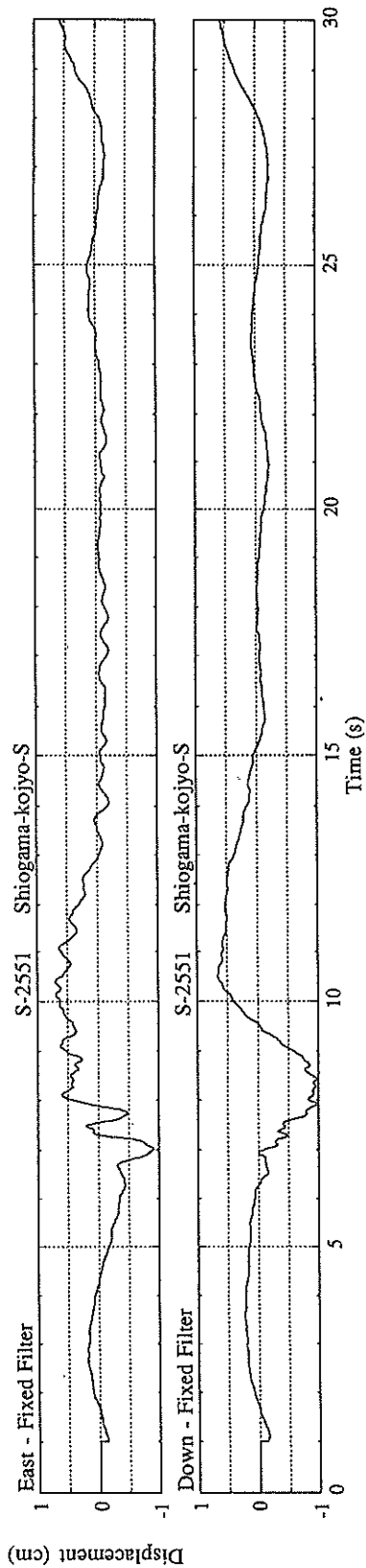
MAXIMUM DISPLACEMENT (CM)

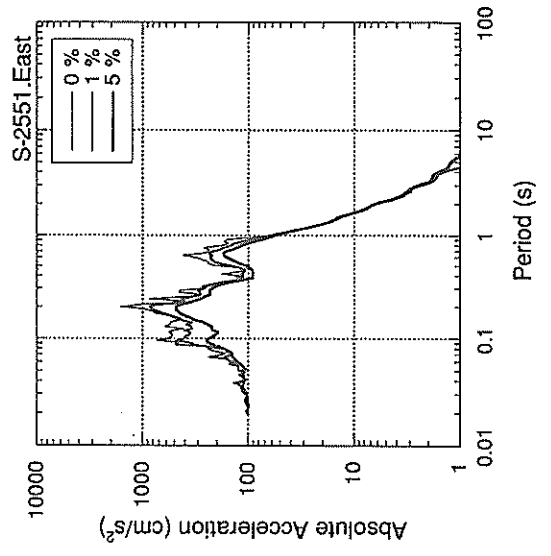
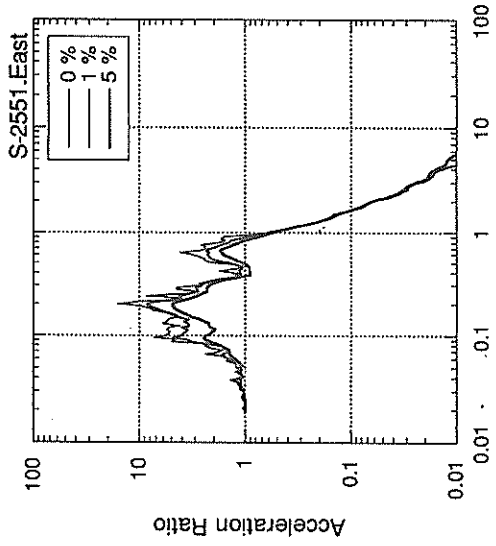
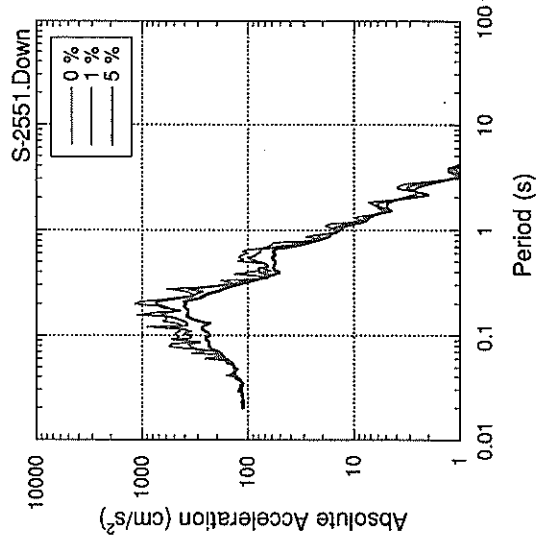
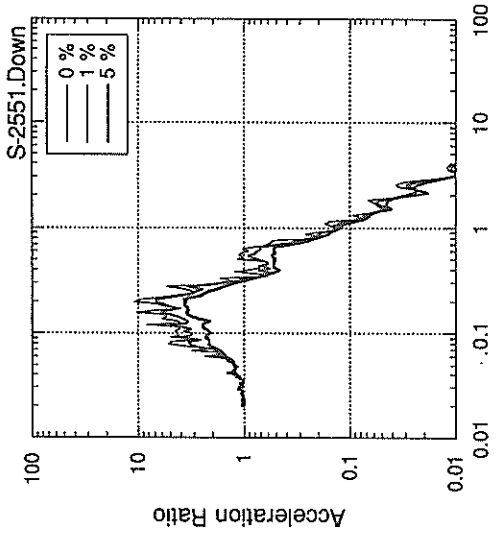
FIXED FILTER		0.904	0.973	
VARIABLE FILTER		0.479	0.237	

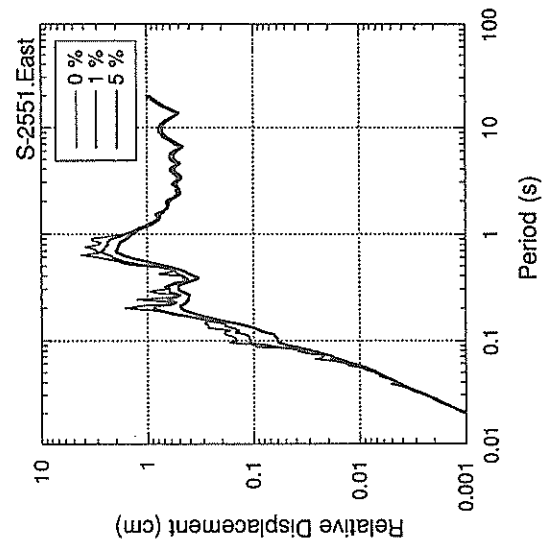
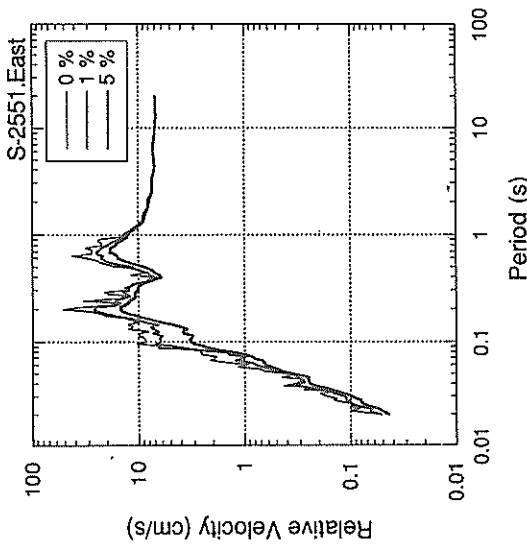
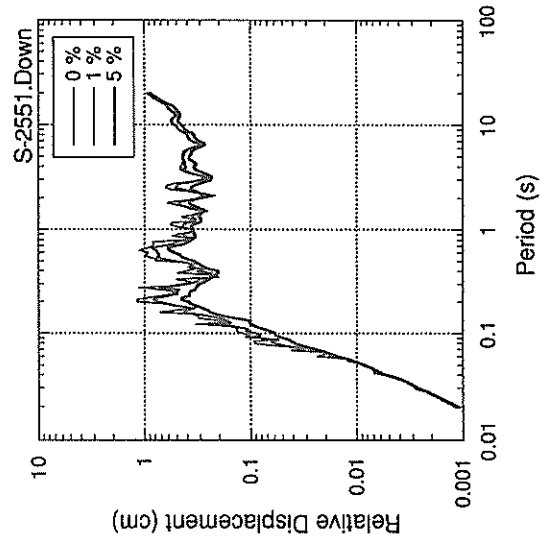
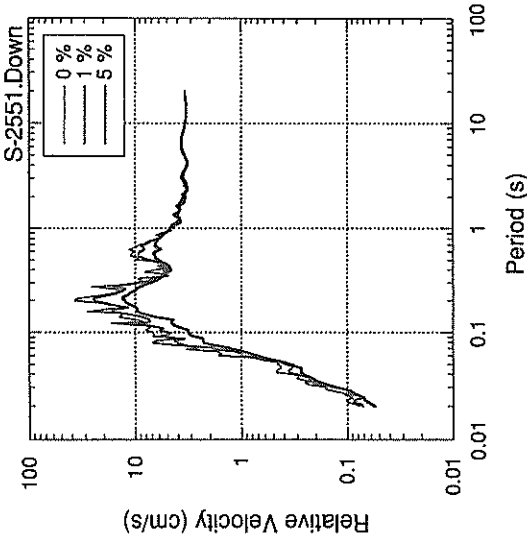
\* RESULTANT OF HORIZONTAL COMPONENTS

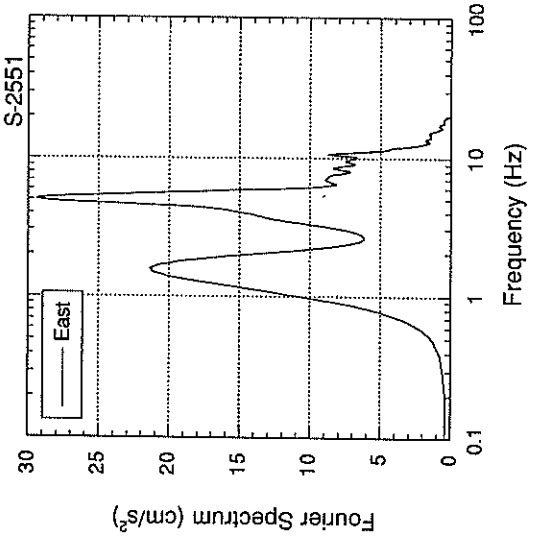
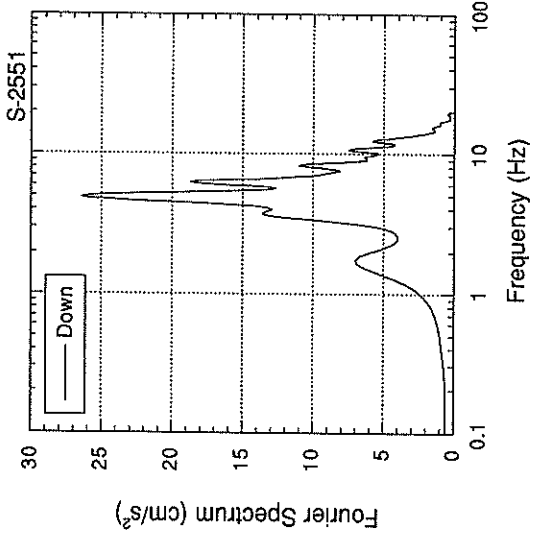














RECORD NUMBER : M-1493  
 STATION : OFUNATO-MOUND-M

EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME 15:11 NOV. 27, 1993  
 LOCATION OF HYPOCENTER  
 EPICENTRAL REGION NORTHERN MIYAGI PREF  
 LATITUDE 38° 34.9' N  
 LONGITUDE 141° 20.3' E  
 DEPTH 111.7KM  
 JMA MAGNITUDE 5.9  
 \*\*\*\*\*

PEAK VALUES OF COMPONENTS

	N S	E W	U D	HORIZONTAL*
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PARAMETER OF THE VARIABLE FILTER

FC (HZ)	0.242	0.144	0.217	
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MAXIMUM ACCELERATION (GAL)

SMAC-B2 EQUIVALENT	27.7	39.8	31.8	43.9
ORIGINAL	50.6	60.1	72.7	72.1
CORRECTED	50.8	53.0	73.2	67.3

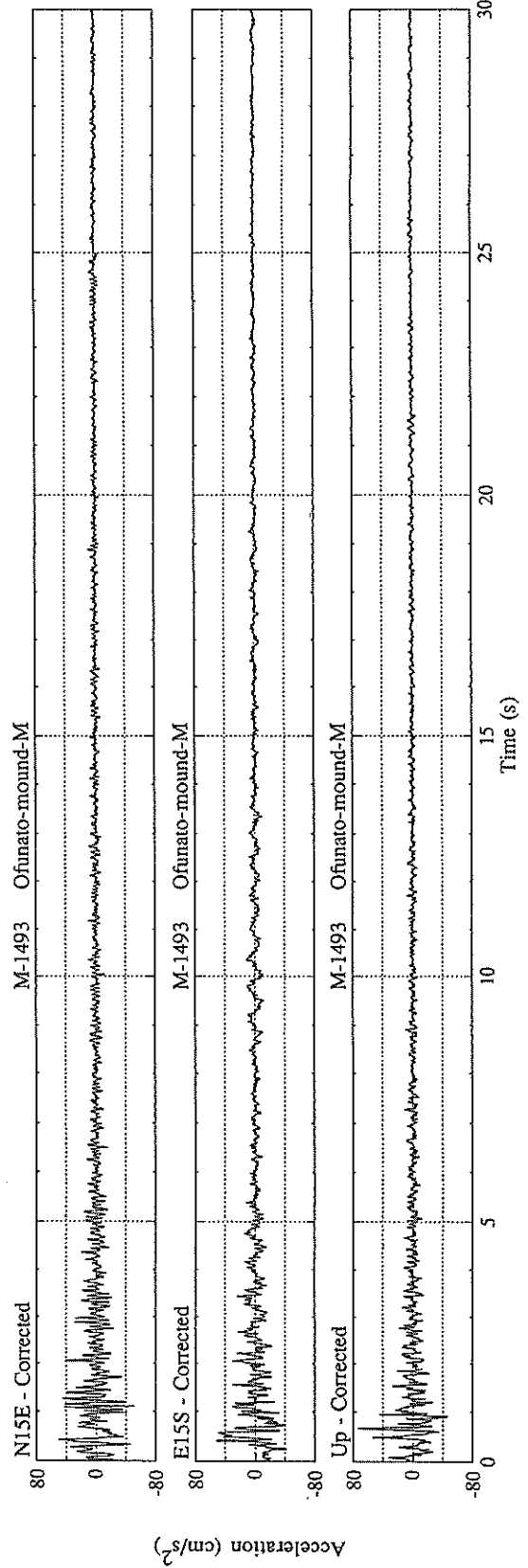
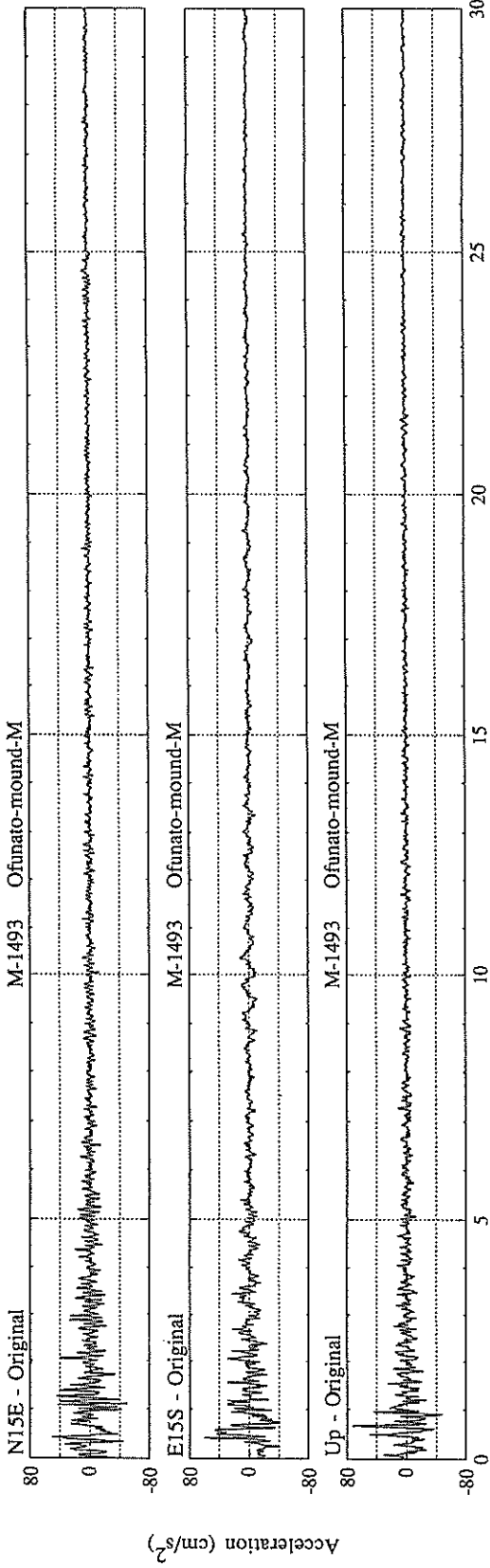
MAXIMUM VELOCITY (CM/SEC)

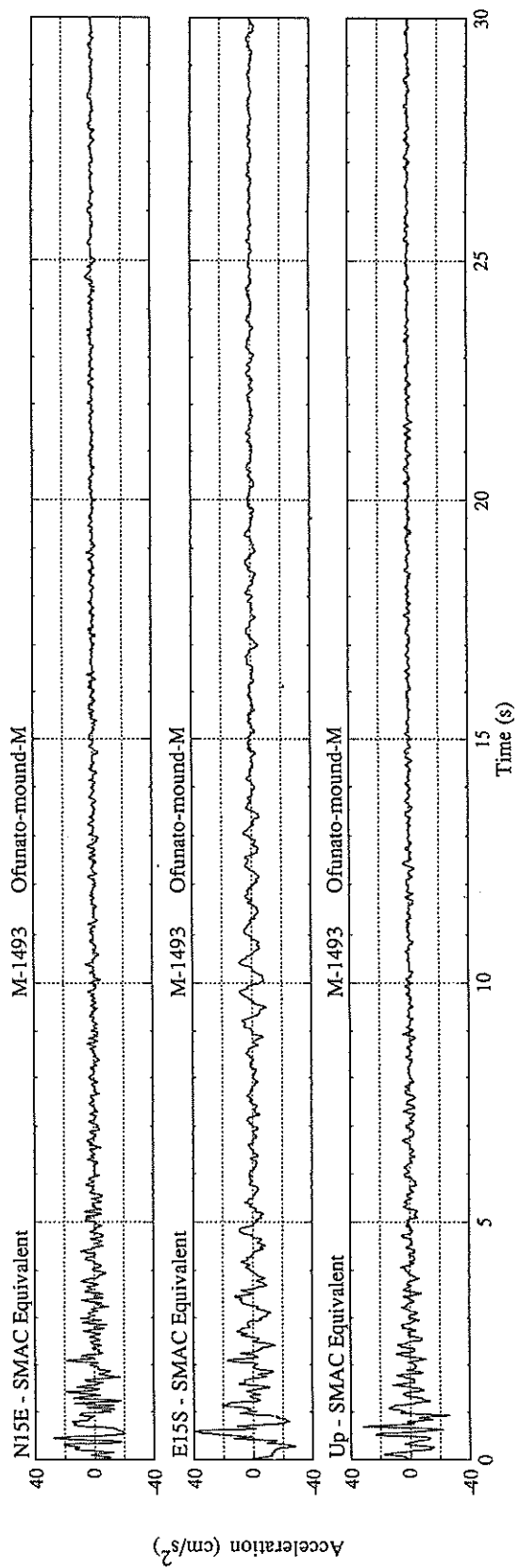
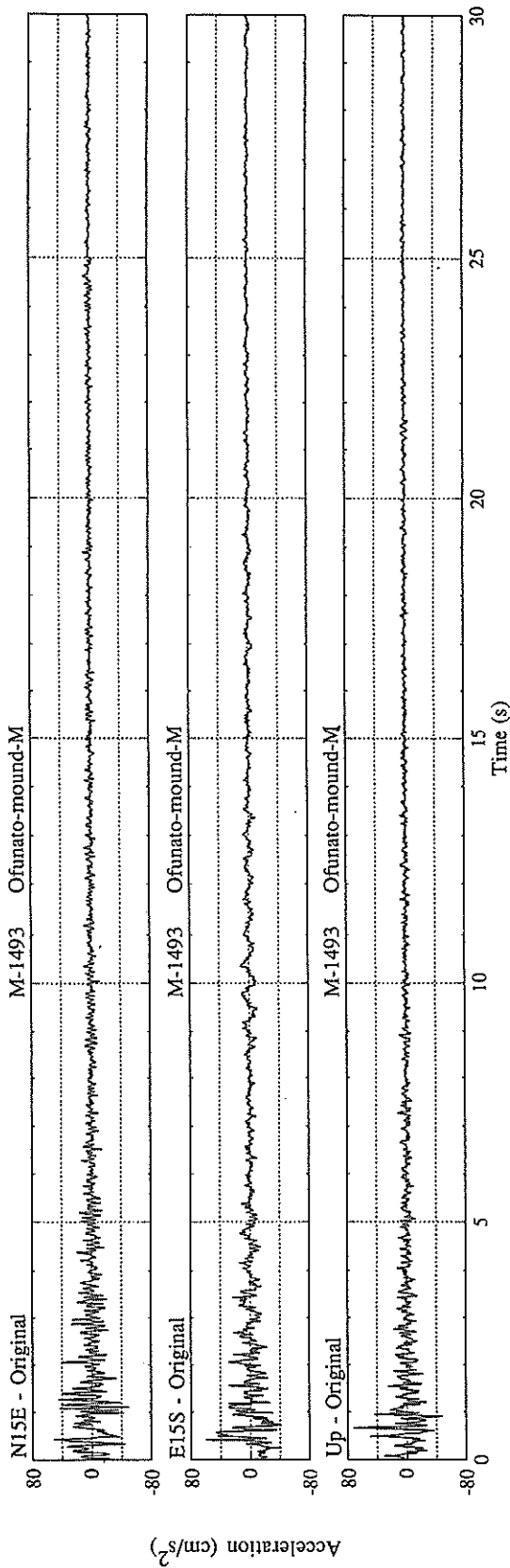
FIXED FILTER	2.11	4.77	2.13	4.77
VARIABLE FILTER	1.90	3.85	1.69	3.86

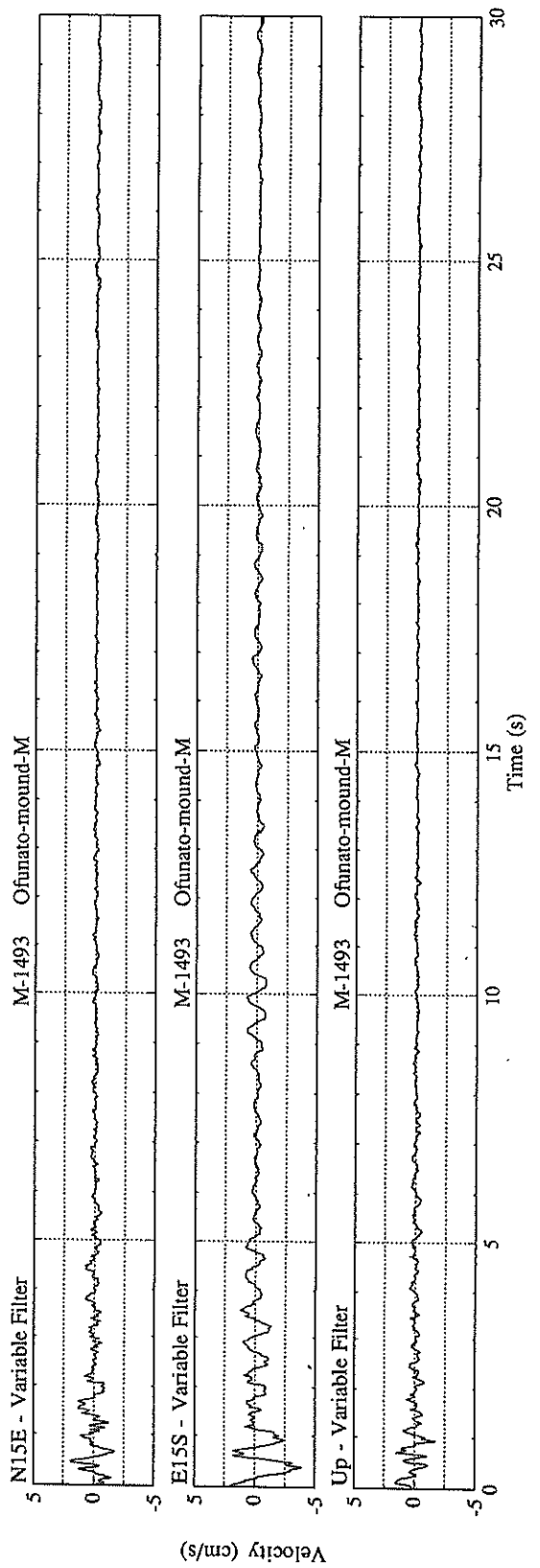
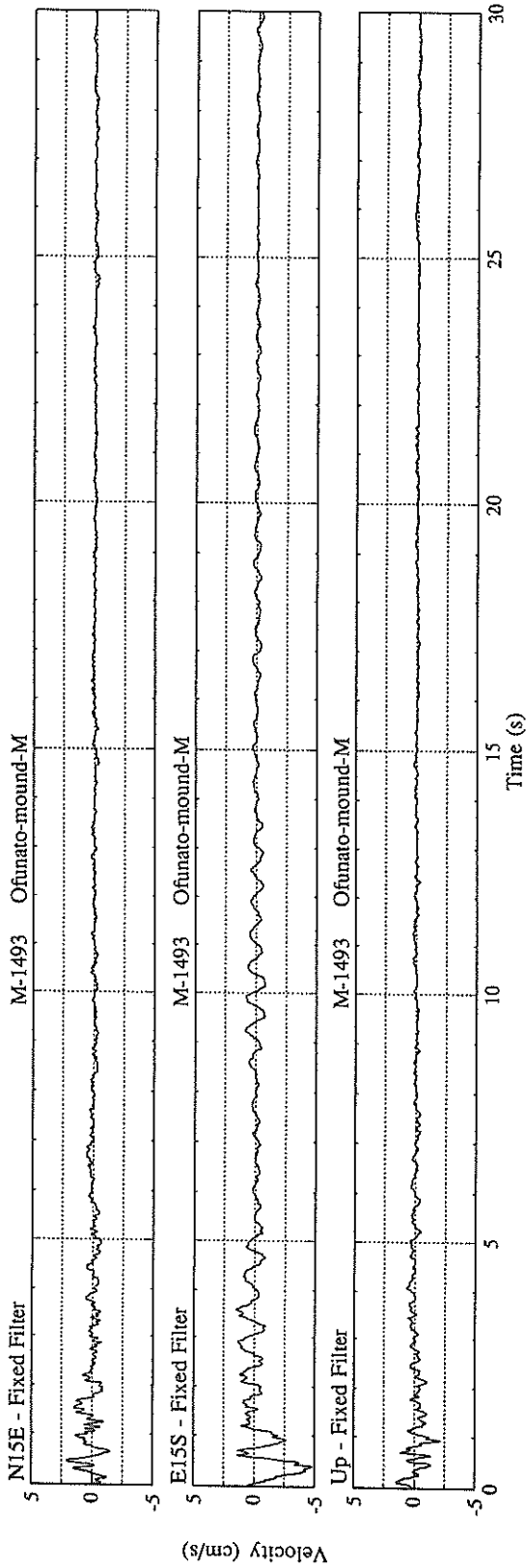
MAXIMUM DISPLACEMENT (CM)

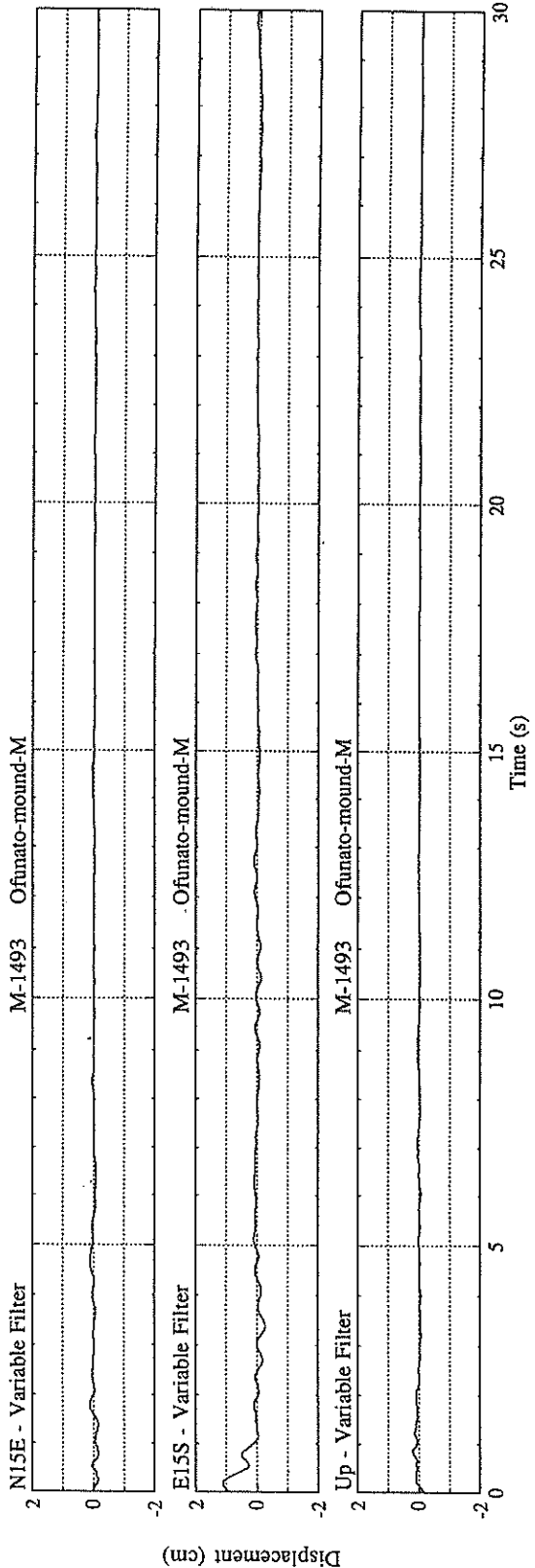
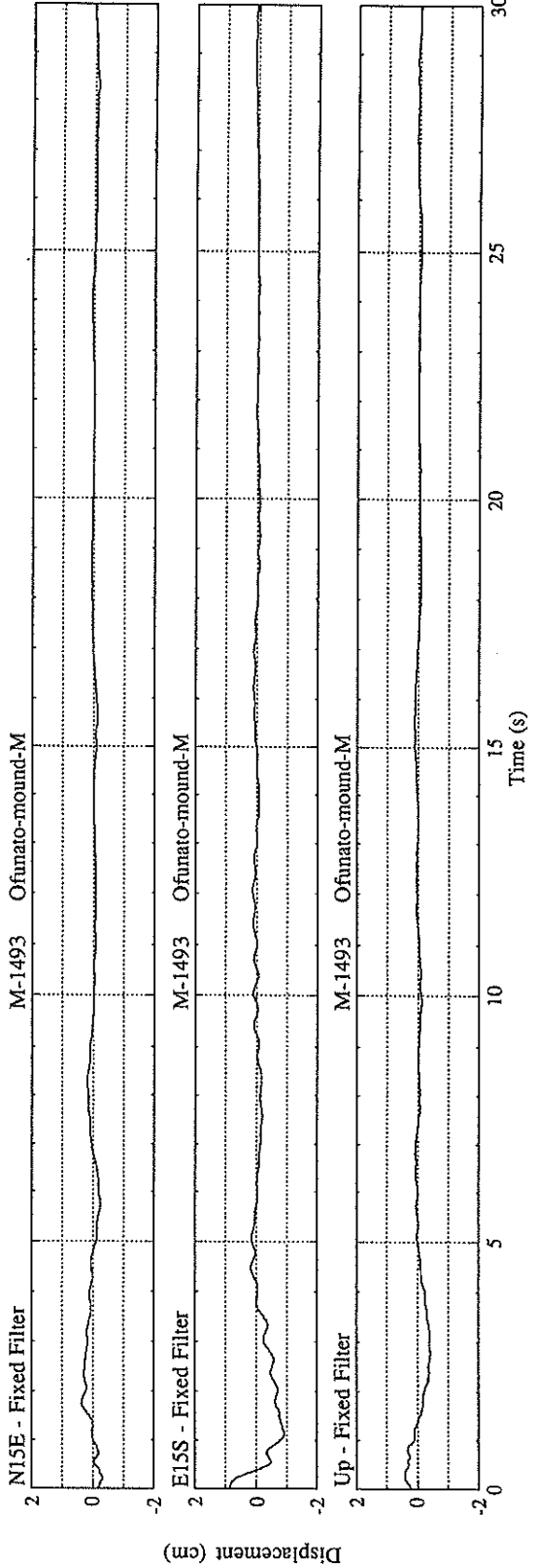
FIXED FILTER	0.38	0.93	0.42	0.93
VARIABLE FILTER	0.16	1.11	0.20	1.12

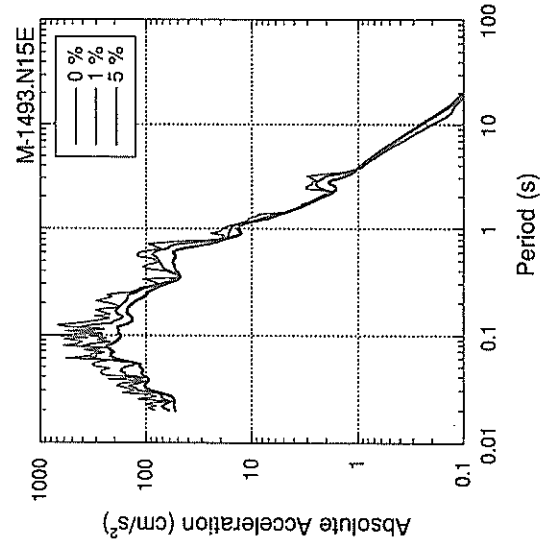
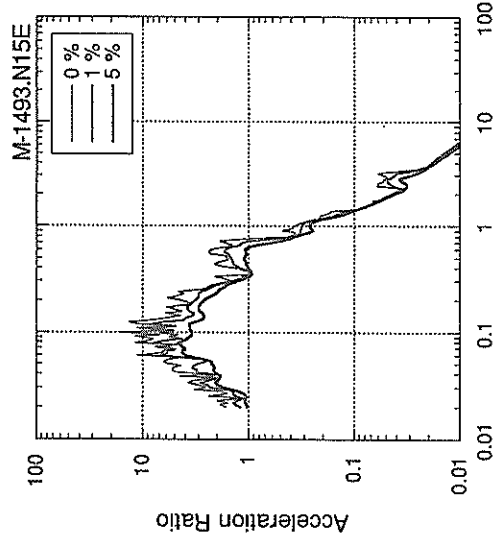
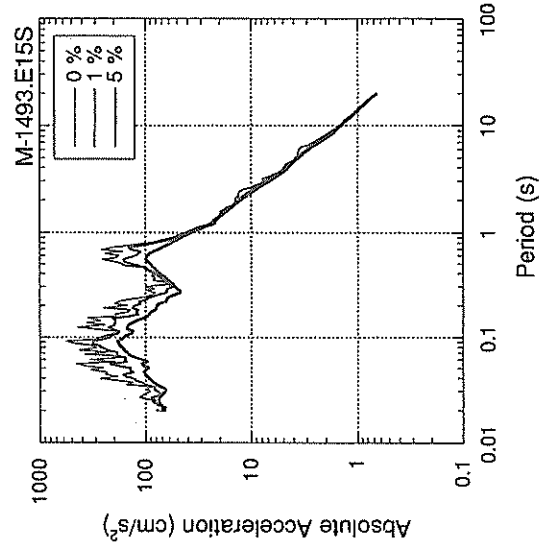
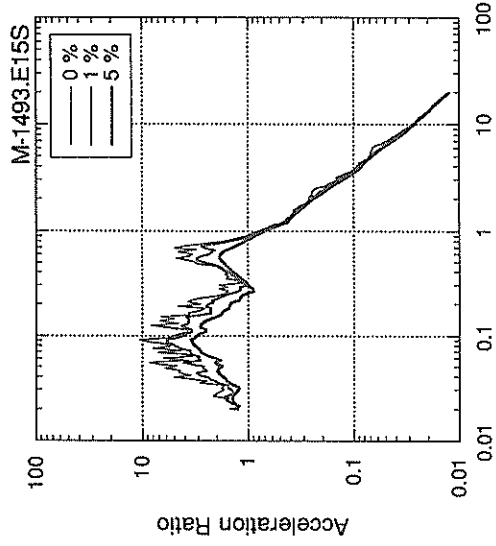
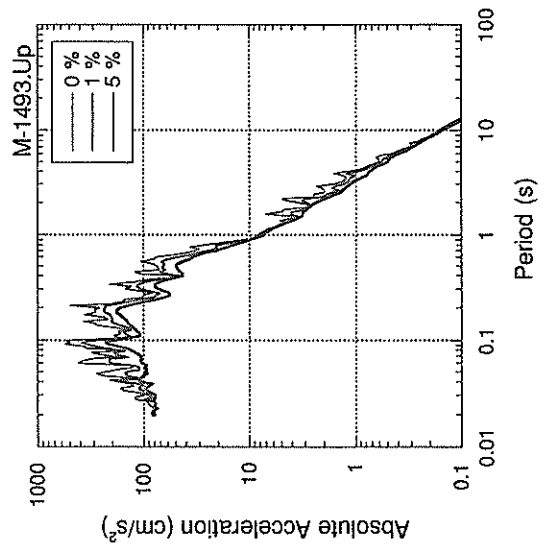
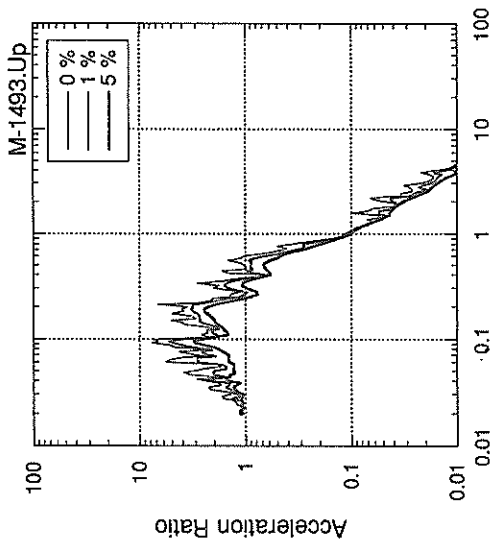
\* RESULTANT OF HORIZONTAL COMPONENTS

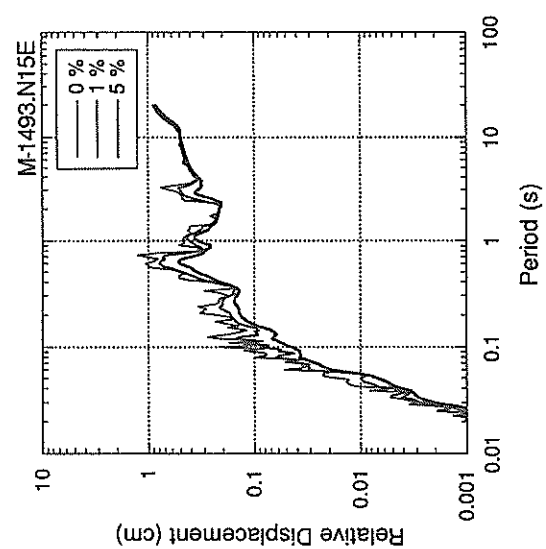
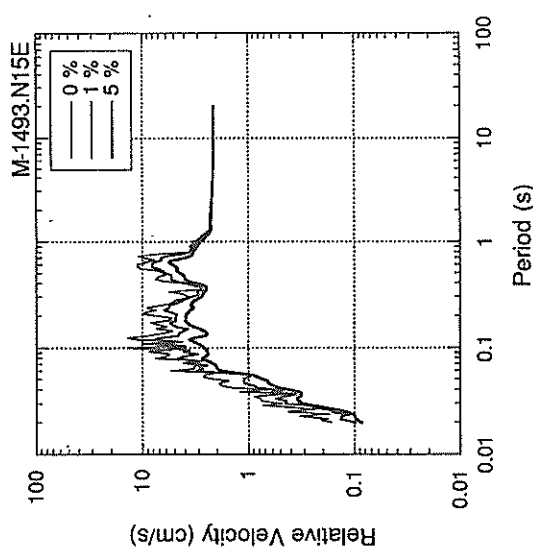
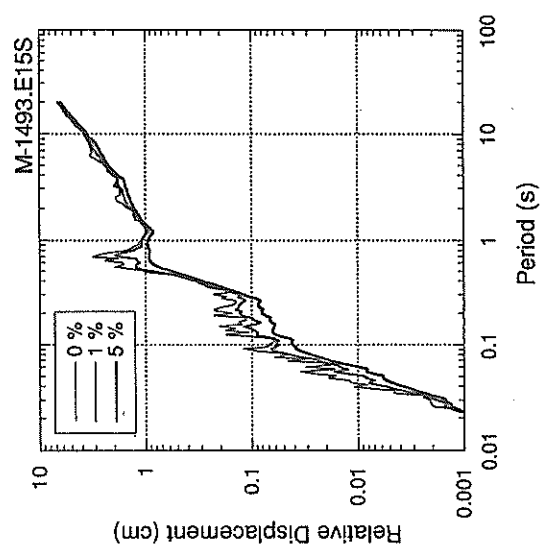
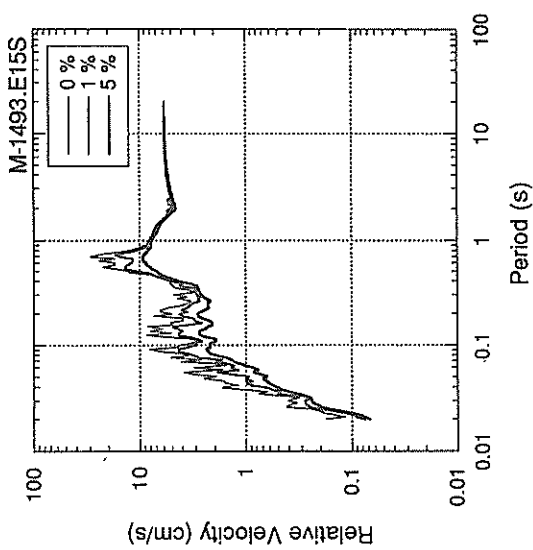
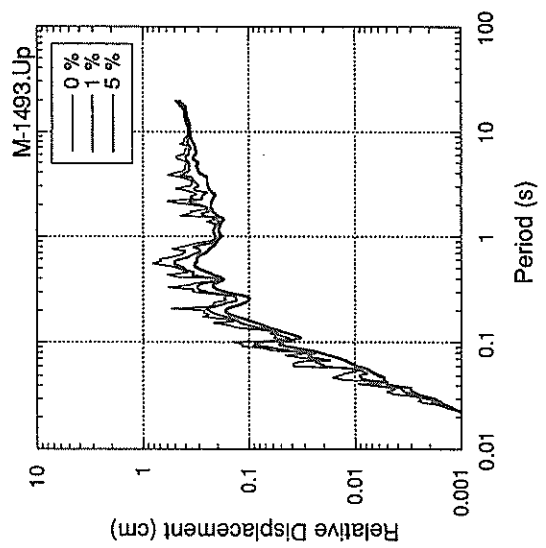
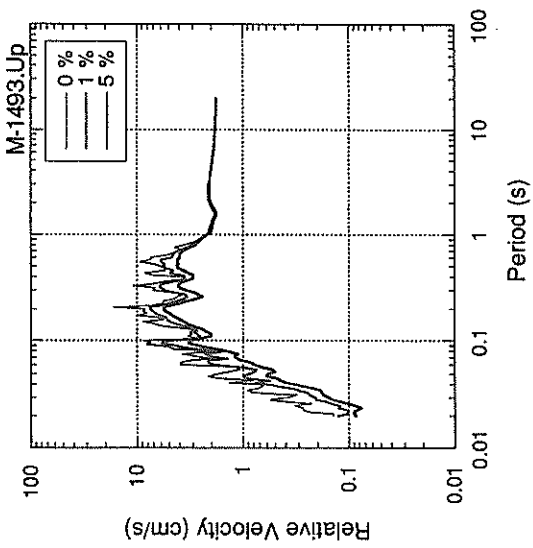


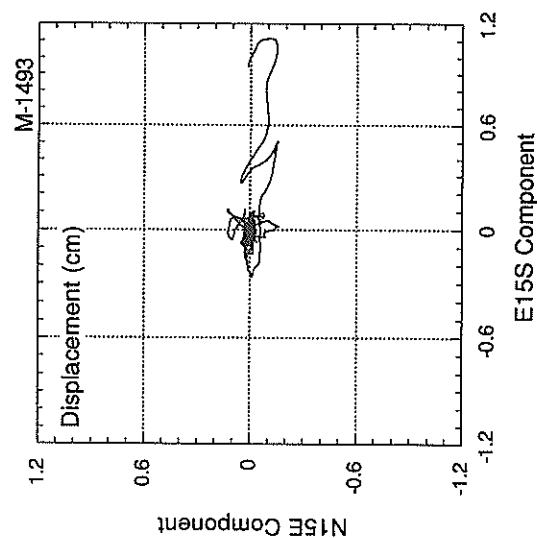
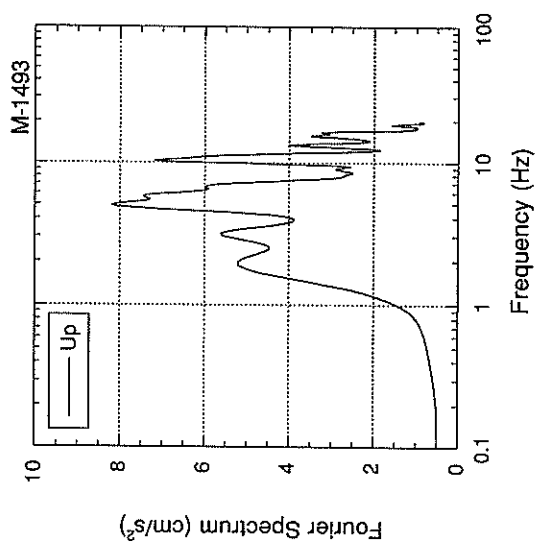
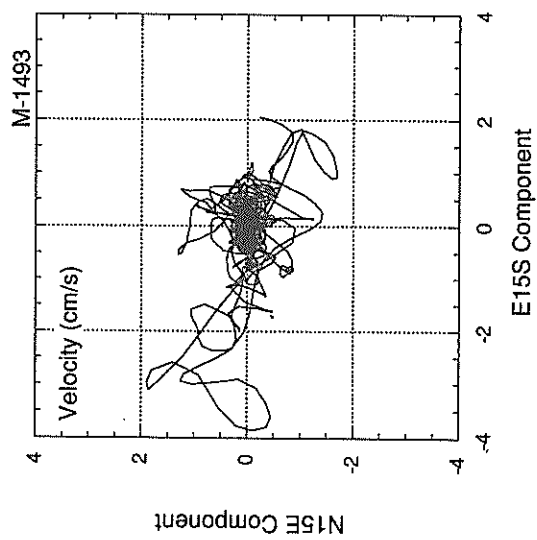
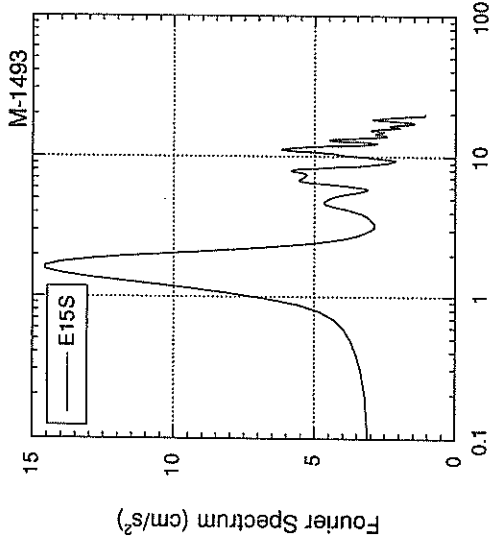
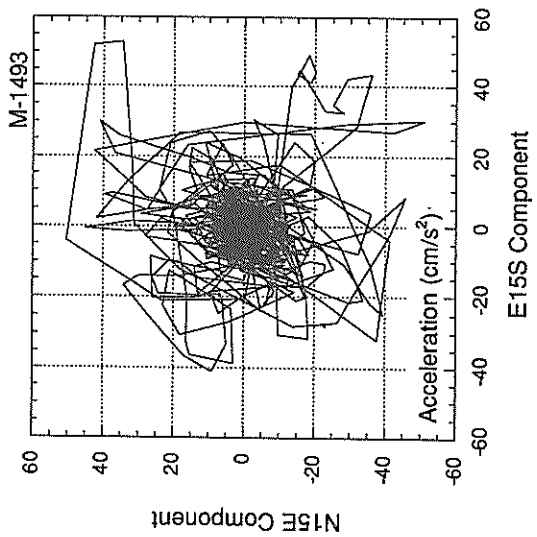
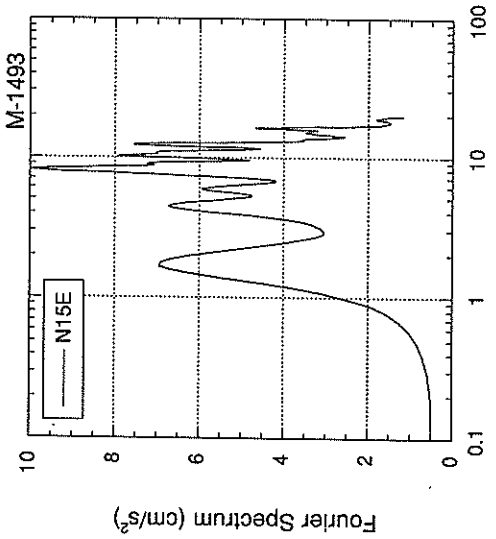














RECORD NUMBER : M-1494  
 STATION : KAMAISHI-M  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 15:11 NOV. 27, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION NORTHERN MIYAGI PREF

LATITUDE 38° 34.9' N

LONGITUDE 141° 20.3' E

DEPTH 111.7KM

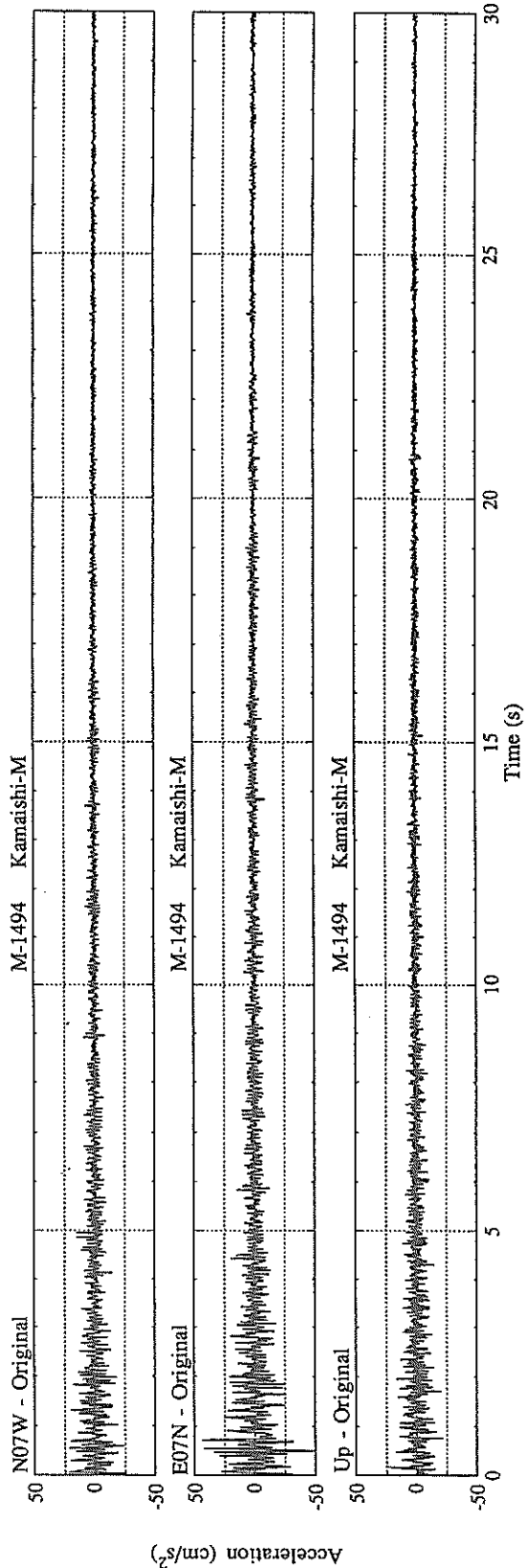
JMA MAGNITUDE 5.9

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

N S	E W	U D	HORIZONTAL*
25.5	49.7	25.6	49.8

ORIGINAL ACCELERATION (GAL)  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1495  
 STATION : KAMAISHI-MB  
 EARTHQUAKE DATA  
 \*\*\*\*\*

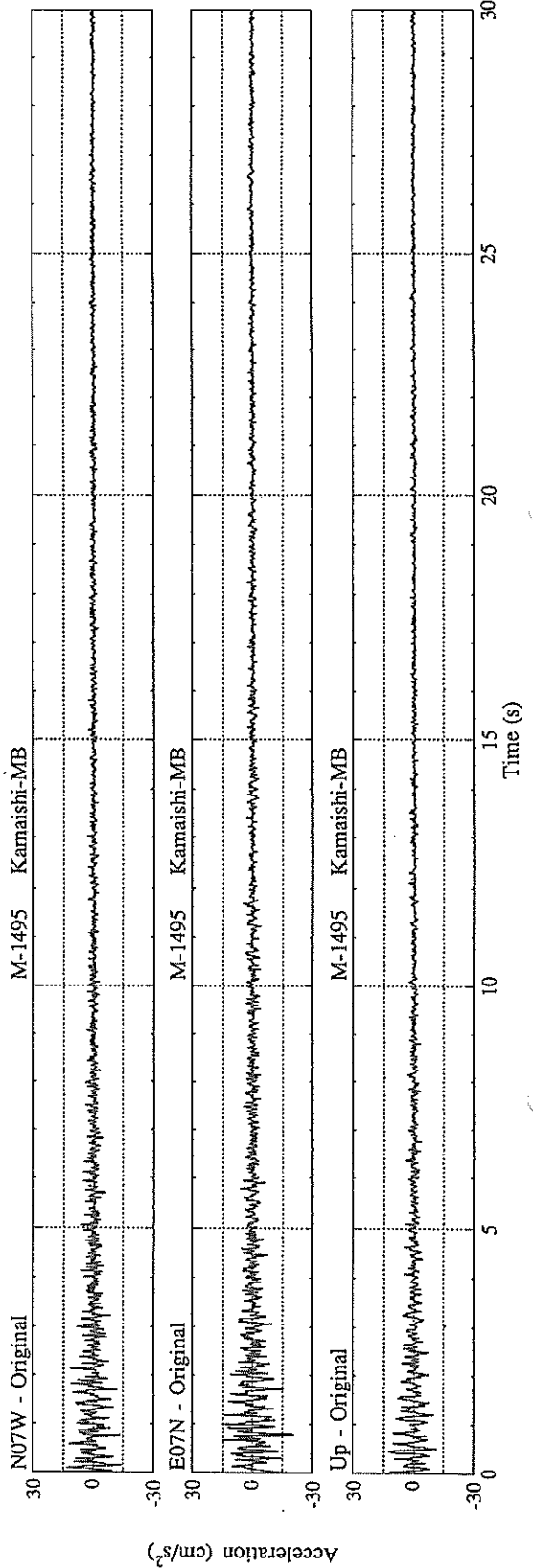
DATE AND TIME : 15:11 NOV. 27, 1993

LOCATION OF HYPOCENTER  
 EPICENTRAL REGION : NORTHERN MIYAGI PREF  
 LATITUDE : 38° 34.9' N  
 LONGITUDE : 141° 20.3' E  
 DEPTH : 111.7KM  
 JMA MAGNITUDE : 5.9

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

	N	S	E	W	U	D	HORIZONTAL*
ORIGINAL ACCELERATION (GAL)	14.2	20.4	20.4	12.7	21.0		

\* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1498

STATION : SENDAI-M

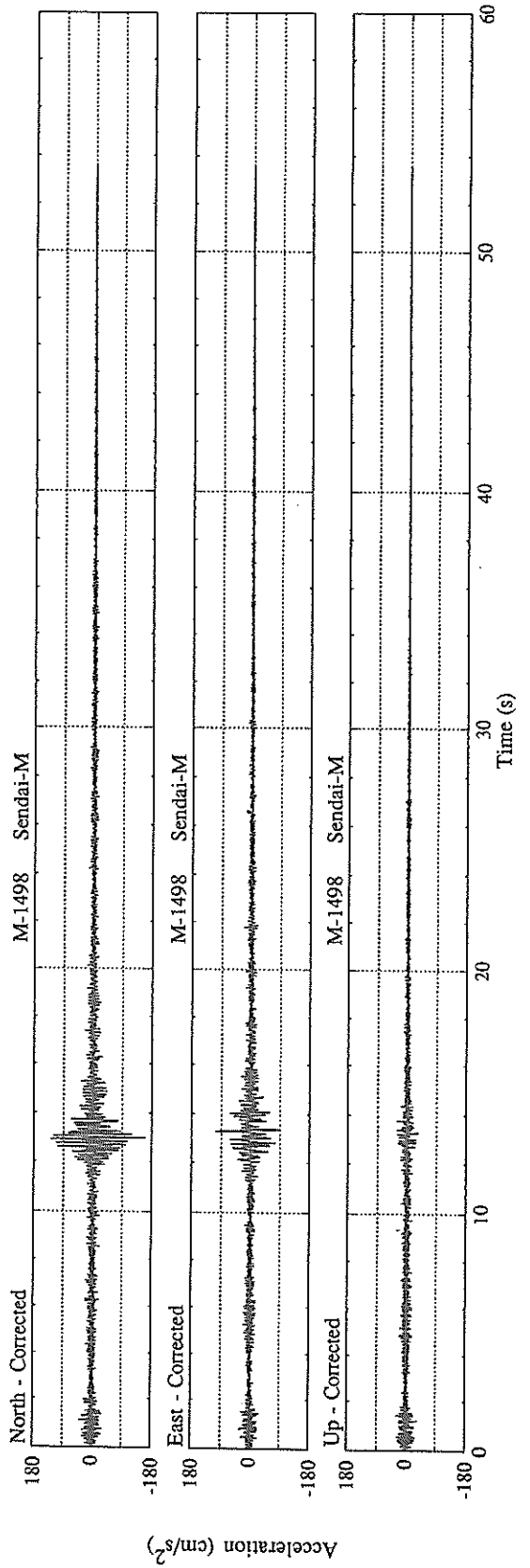
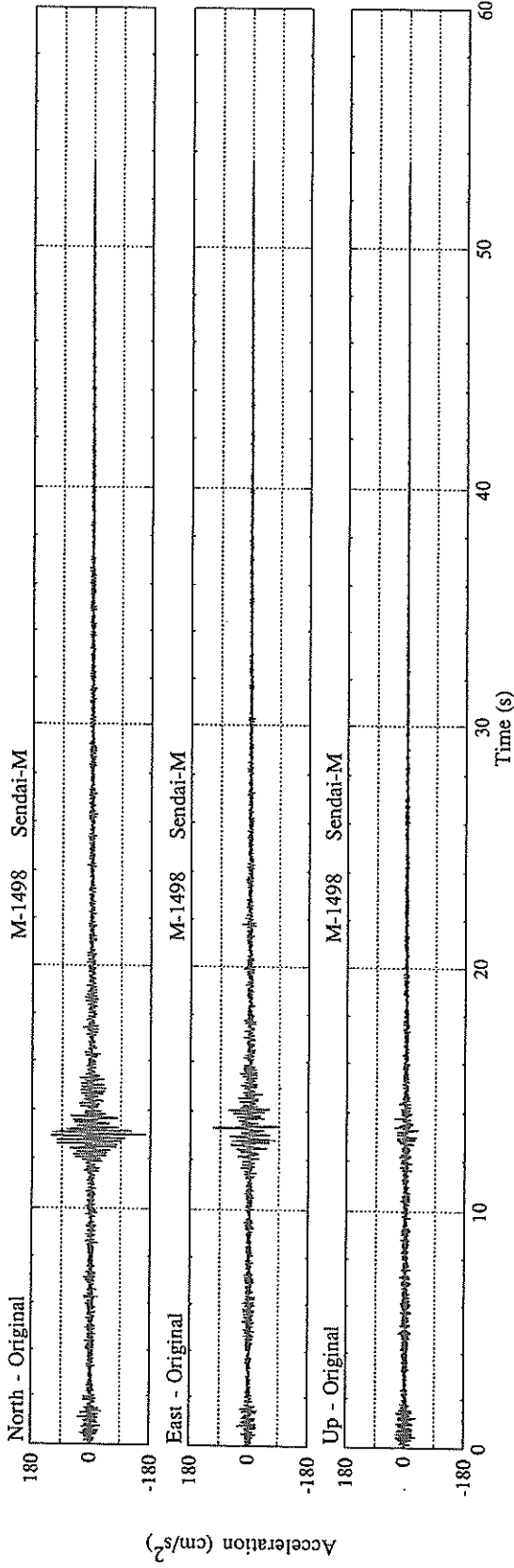
EARTHQUAKE DATA

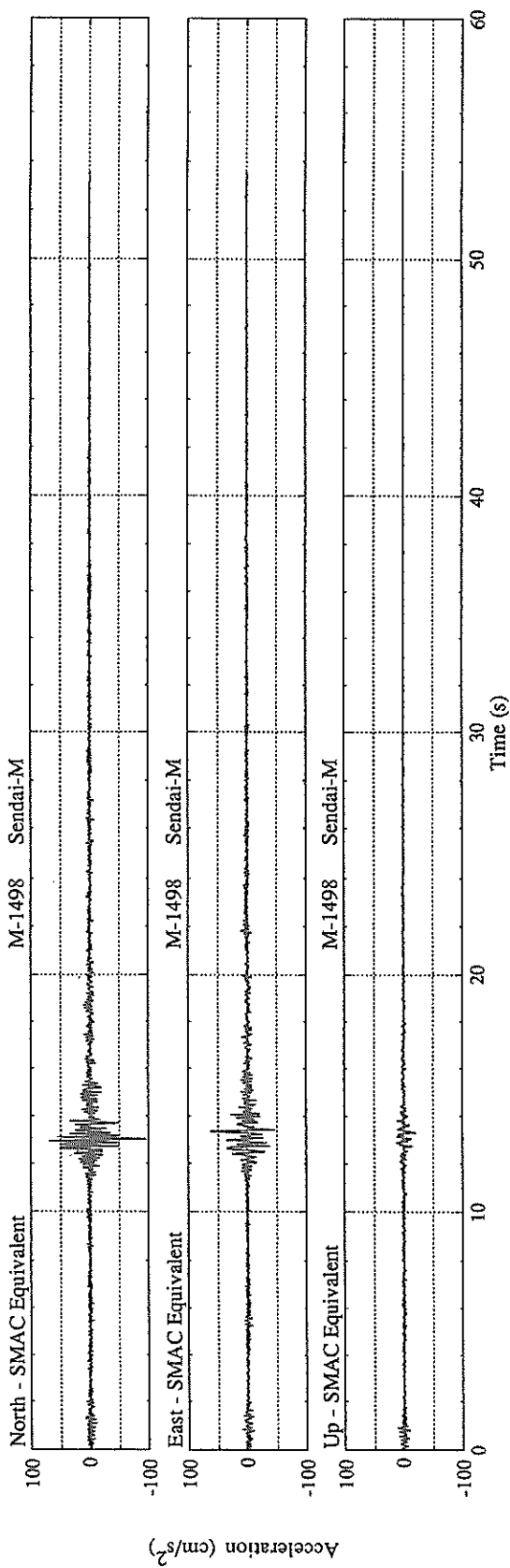
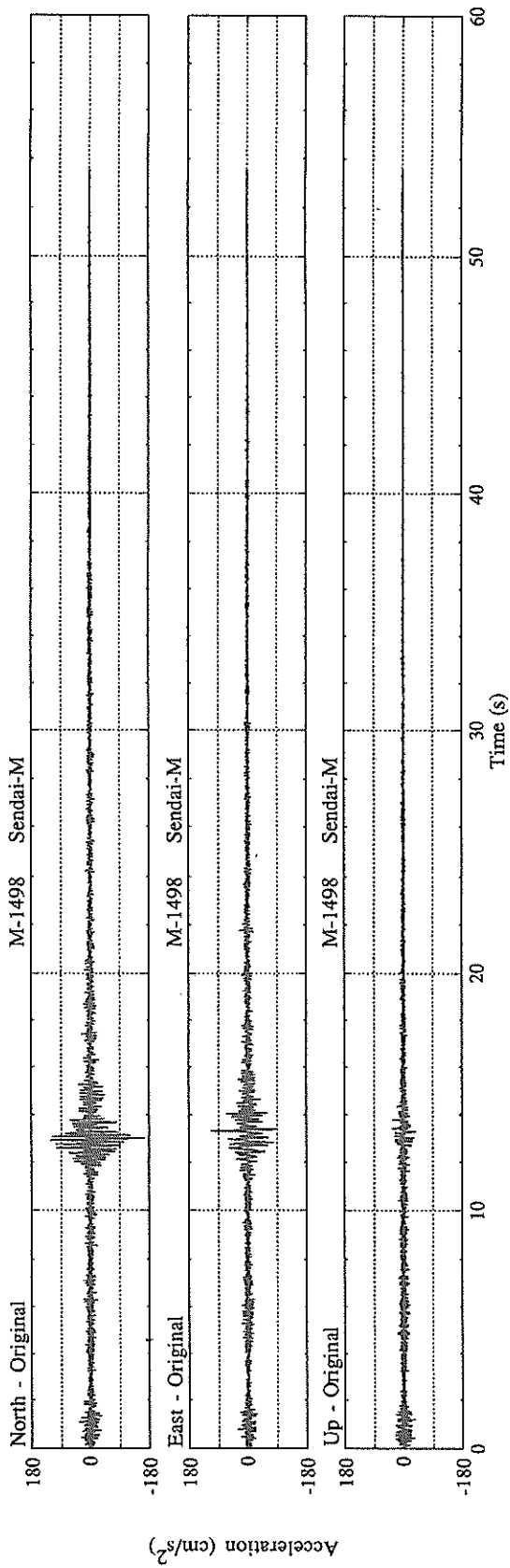
\*\*\*\*\*  
DATE AND TIME 15:11 NOV. 27, 1993  
LOCATION OF HYPOCENTER  
EPICENTRAL REGION NORTHERN MIYA I PREF  
LATITUDE 38° 34.9' N  
LONGITUDE 141° 20.3' E  
DEPTH 111.7KM  
JMA MAGNITUDE 5.9  
\*\*\*\*\*

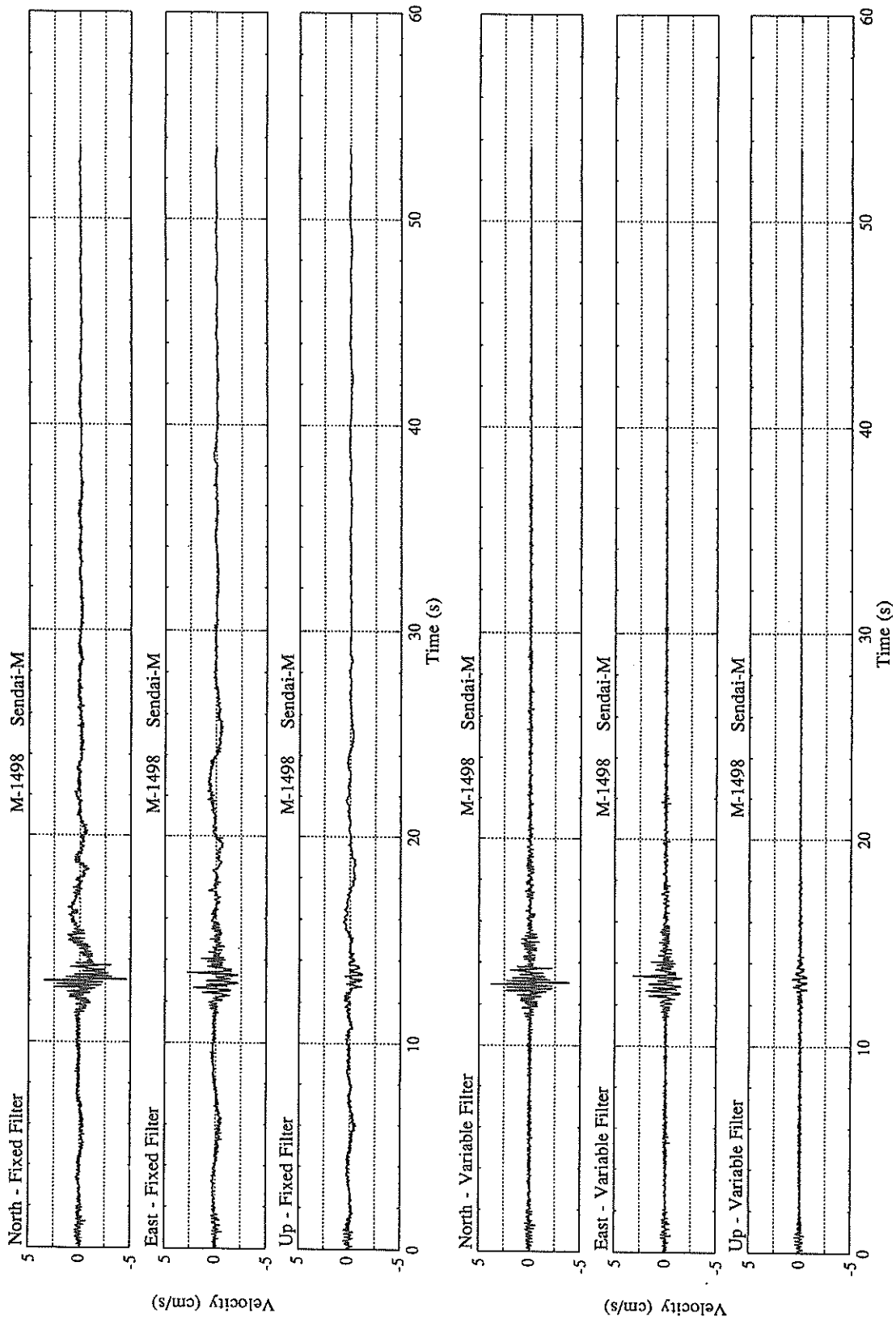
PEAK VALUES OF COMPONENTS

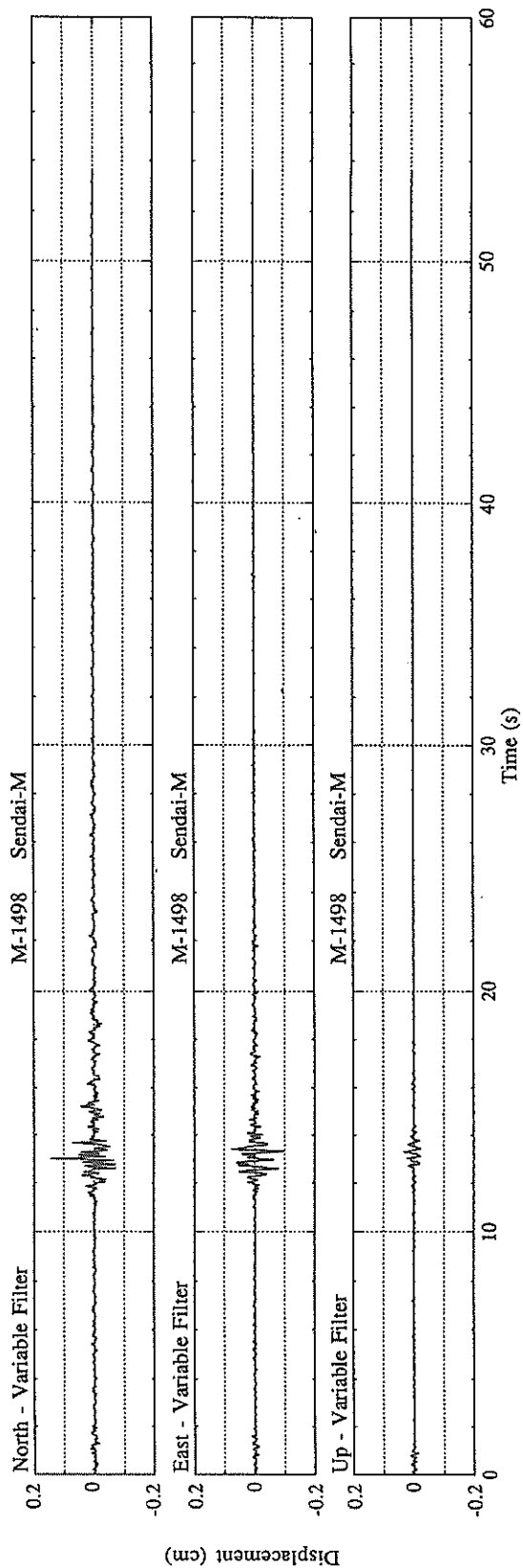
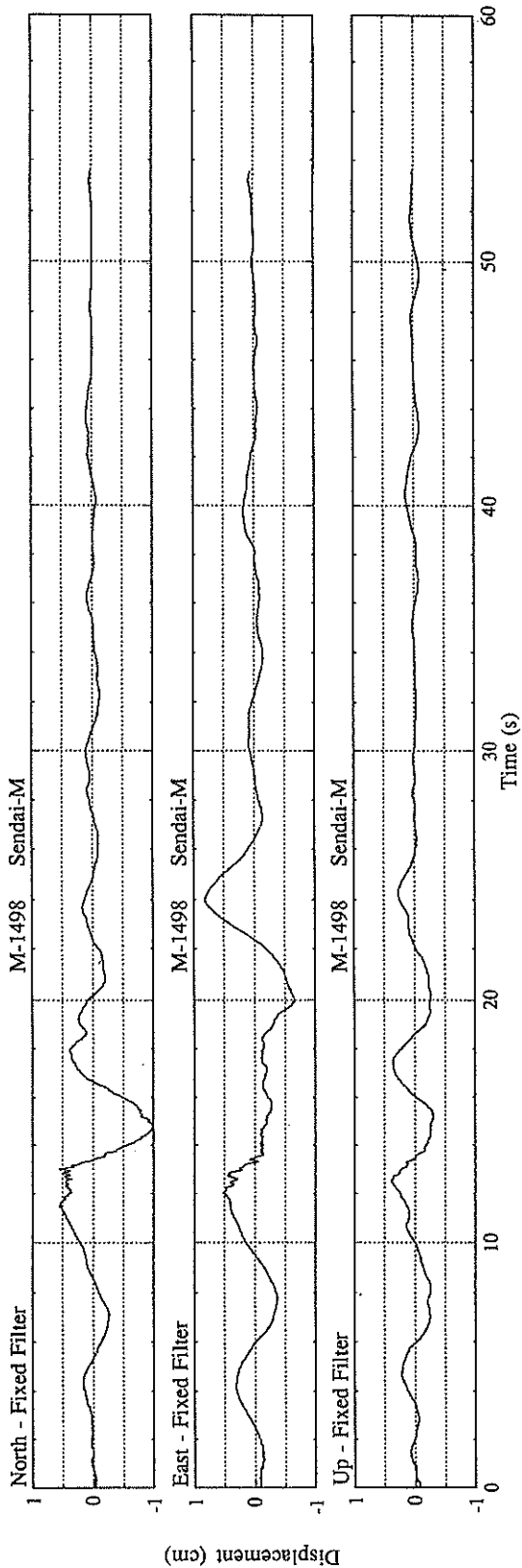
	N S	E W	U D	HORIZONTAL*
PARAMETER OF THE VARIABLE FILTER				
FC (HZ)	1.179	1.741	2.266	
MAXIMUM ACCELERATION (GAL)				
SMAC-B2 EQUIVALENT	95.3	63.0	20.3	95.5
ORIGINAL	164.0	111.4	37.9	164.9
CORRECTED	161.0	107.3	34.3	162.4
MAXIMUM VELOCITY (CM/SEC)				
FIXED FILTER	4.55	2.82	1.20	4.59
VARIABLE FILTER	3.87	3.23	0.74	3.92
MAXIMUM DISPLACEMENT (CM)				
FIXED FILTER	1.01	0.82	0.38	1.02
VARIABLE FILTER	0.14	0.10	0.03	0.15

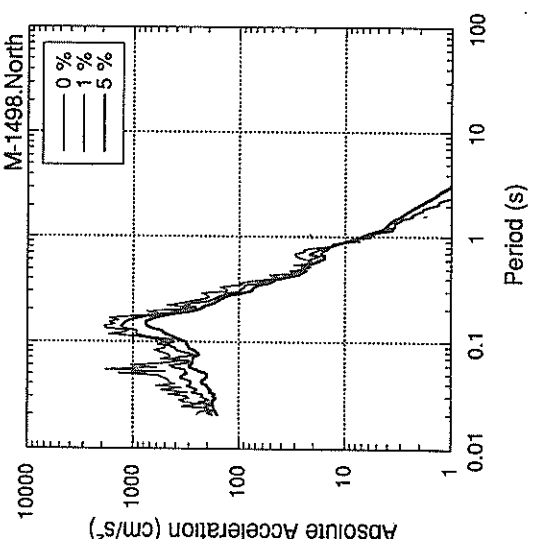
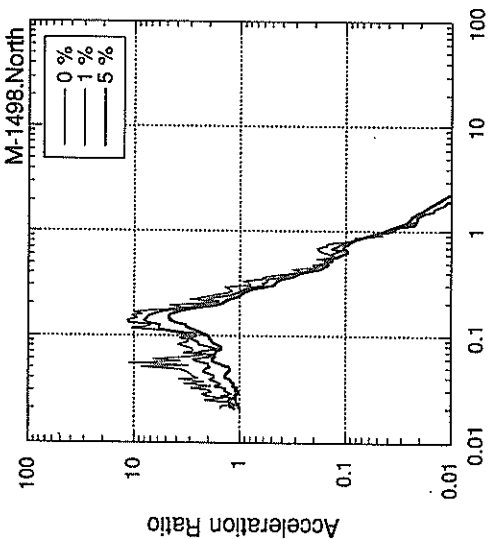
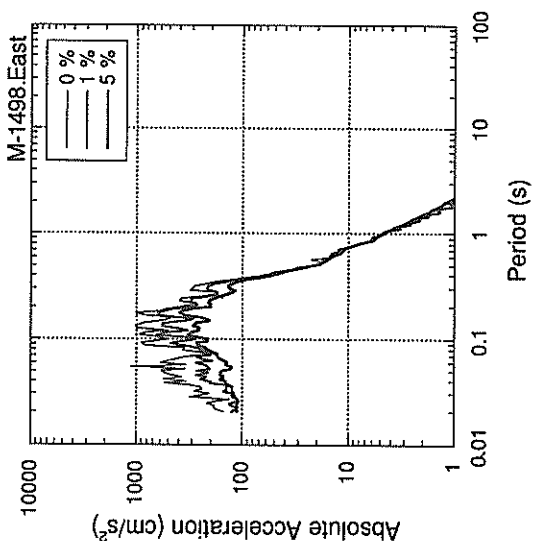
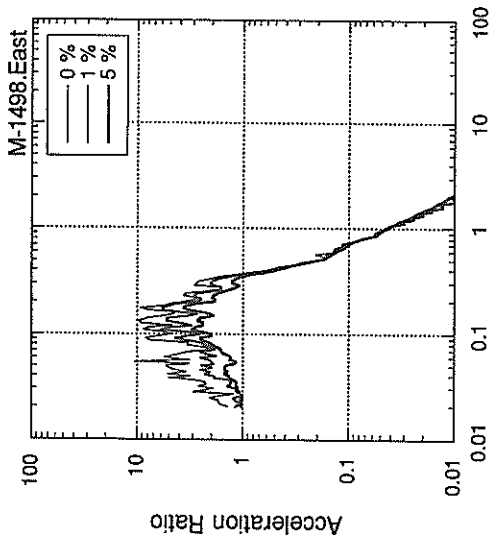
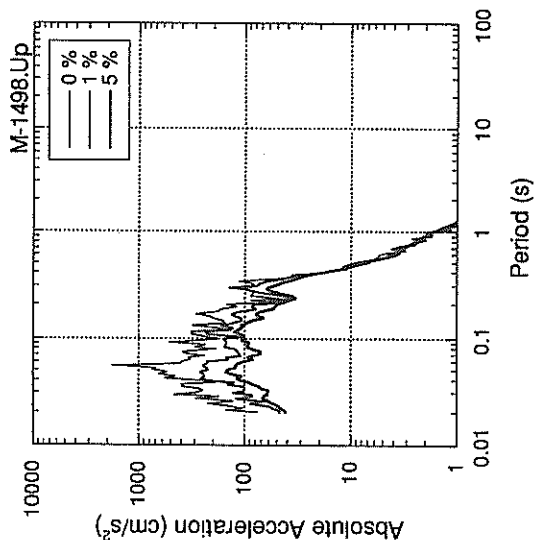
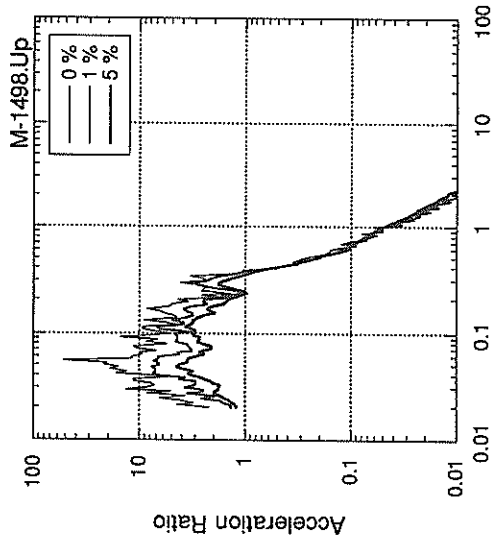
\* RESULTANT OF HORIZONTAL COMPONENTS



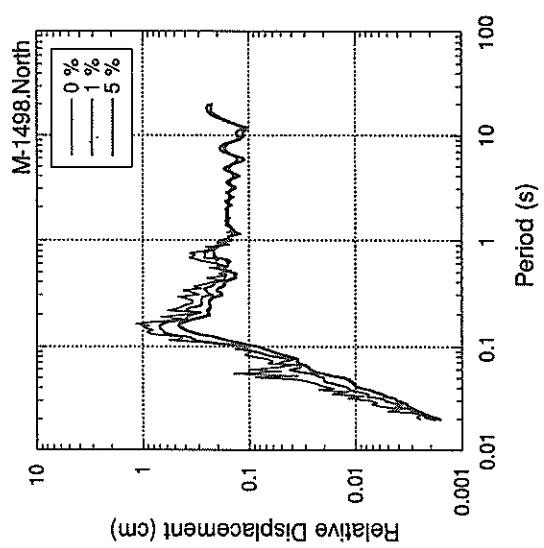
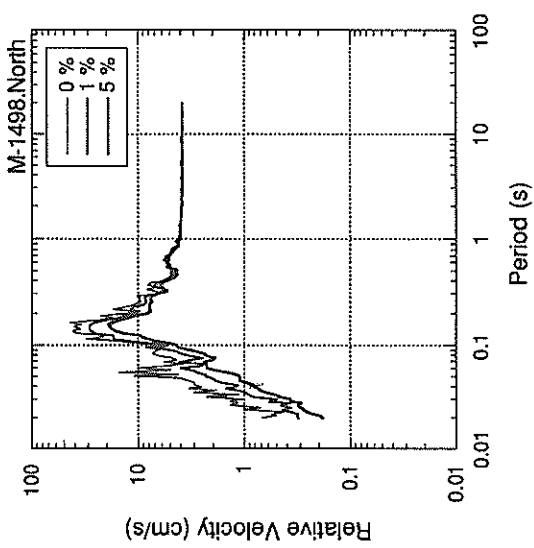
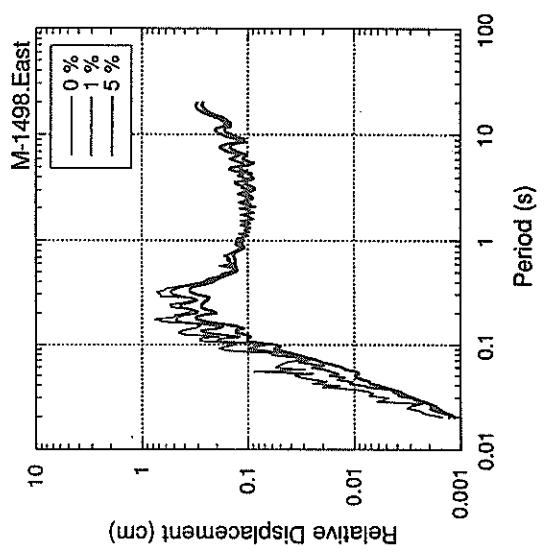
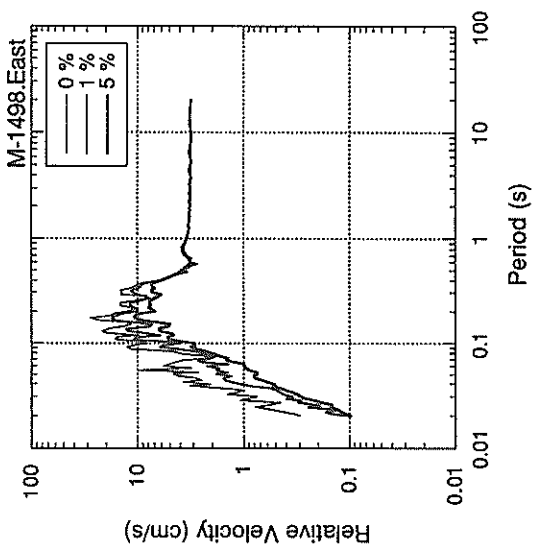
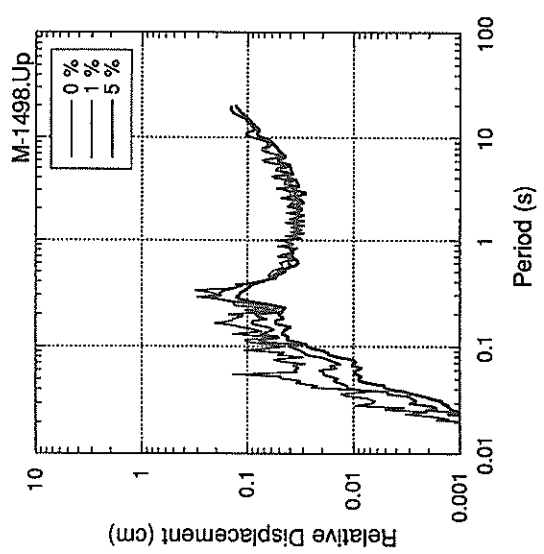
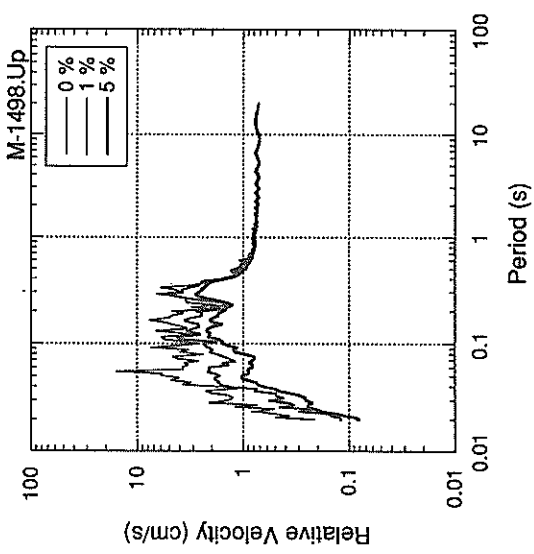


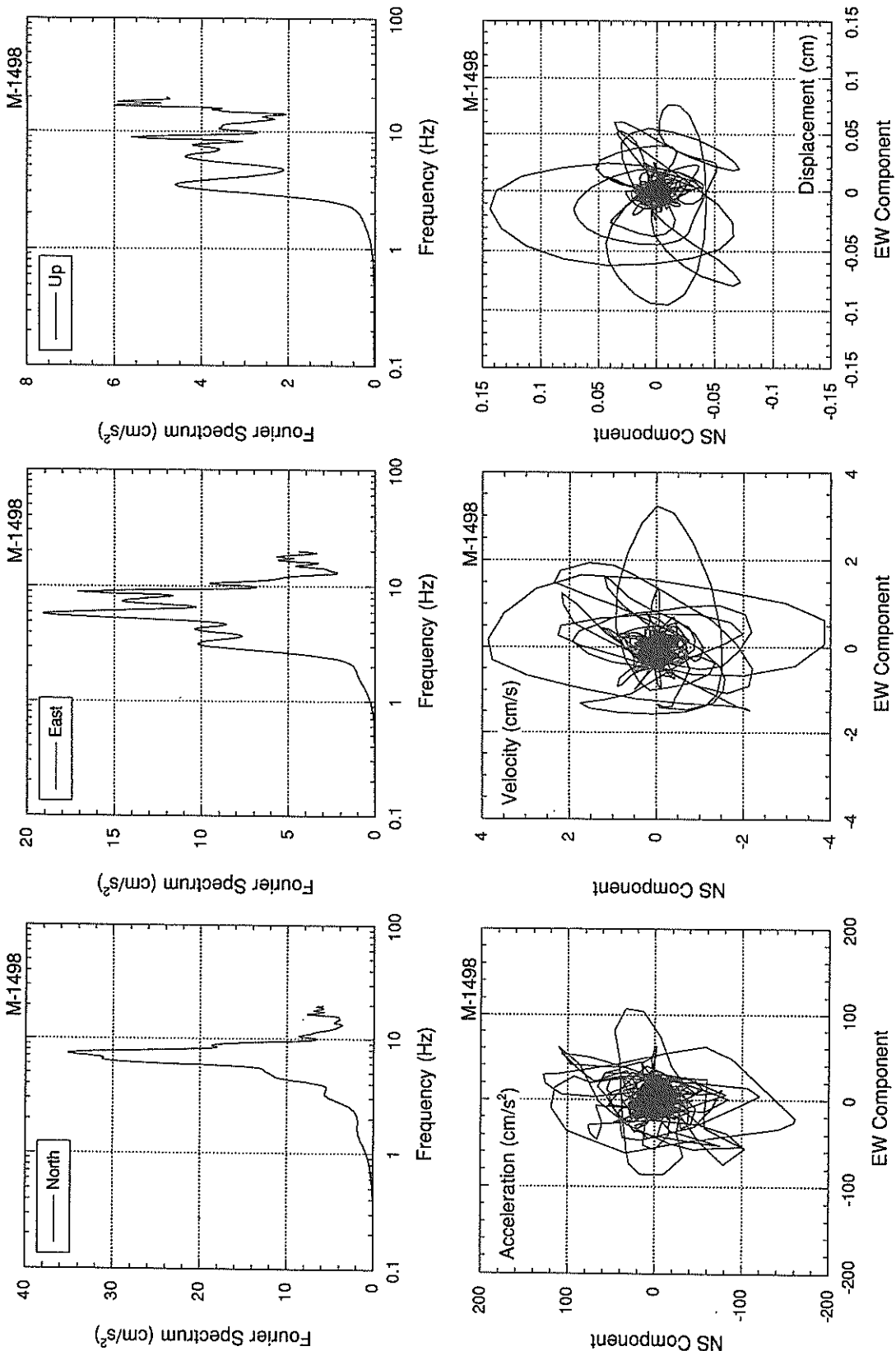












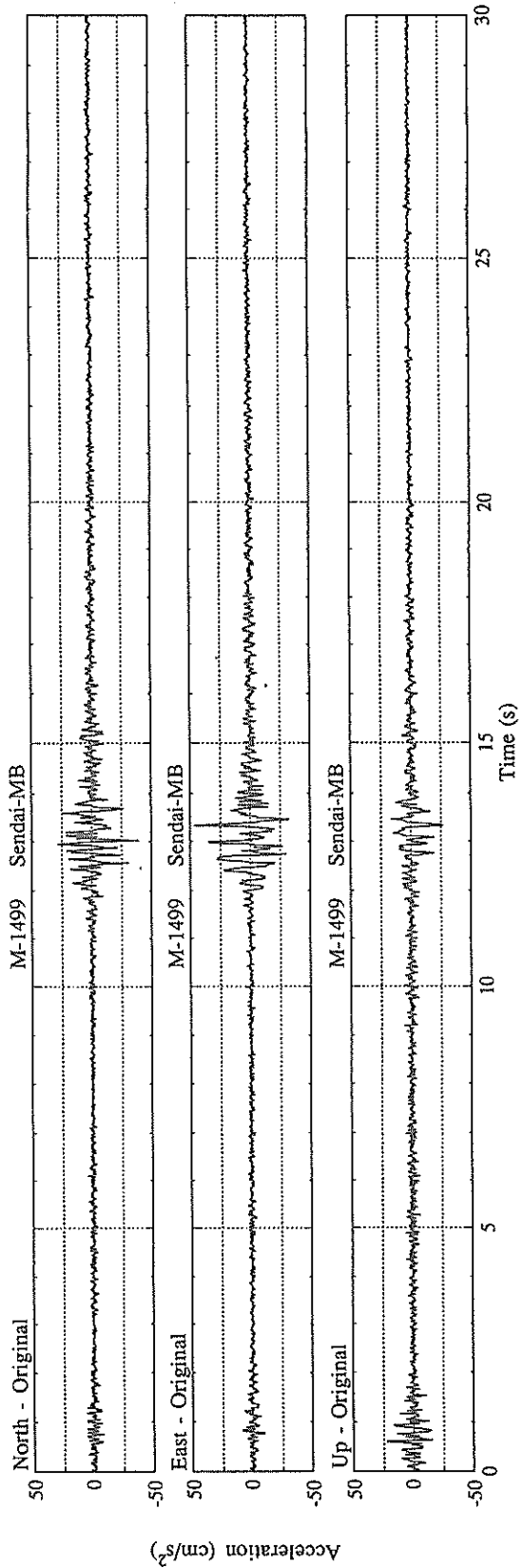
RECORD NUMBER : M-1499  
 STATION : SENDAI-MB  
 EARTHQUAKE DATA

\*\*\*\*\*  
 DATE AND TIME : 15:11 NOV. 27, 1993  
 \*\*\*\*\*

LOCATION OF HYPOCENTER  
 EPICENTRAL REGION  
 LATITUDE : 38° 34.9' N  
 LONGITUDE : 141° 20.3' E  
 DEPTH : 111.7KM  
 JMA MAGNITUDE : 5.9

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

-----  
 N S E W U D HORIZONTAL\*  
 -----  
 ORIGINAL ACCELERATION (GAL)    39.1    47.1    26.2    48.8  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : F-619  
 STATION : MURORAN-G  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME 18:30 DEC. 4, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION E OFF AMORI PREF

LATITUDE 41° 43. 4' N

LONGITUDE 141° 59. 3' E

DEPTH 79. 7KM

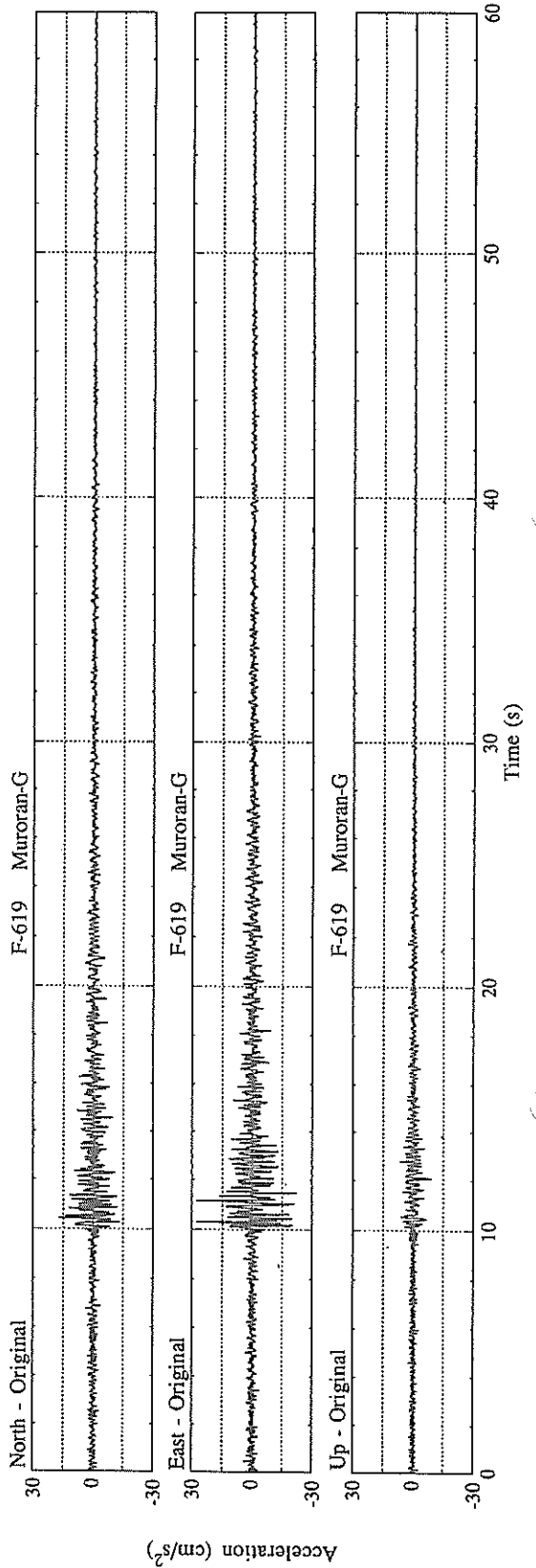
JMA MAGNITUDE 5. 4

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL) 17.1 27.6 8.9 29.2  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1502  
 STATION : KAMAISHI-M  
 EARTHQUAKE DATA

\*\*\*\*\*

DATE AND TIME : 12:19 DEC. 17, 1993

LOCATION OF HYPOCENTER

EPICENTRAL REGION : E OFF IWATE PREF

LATITUDE : 39° 11.2' N

LONGITUDE : 142° 16.0' E

DEPTH : 62.1KM

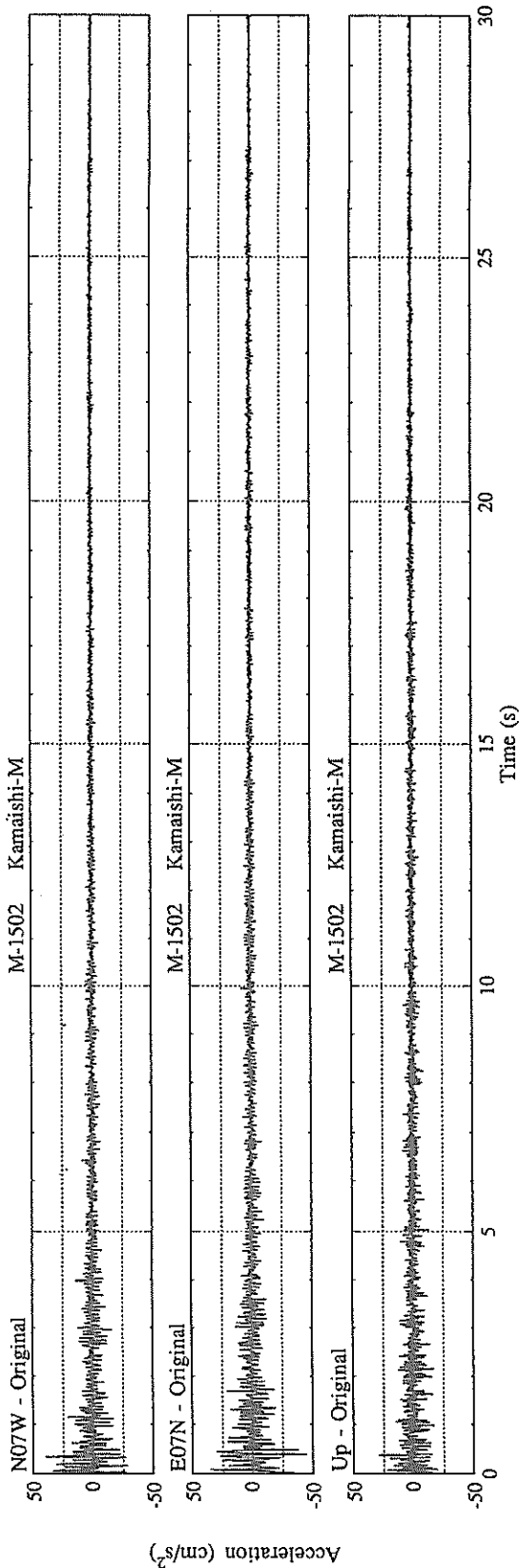
JMA MAGNITUDE : 5.3

\*\*\*\*\*

PEAK VALUES OF COMPONENTS

-----  
 N S E W U D HORIZONTAL\*  
 -----

ORIGINAL ACCELERATION (GAL)      39.4    44.2    29.3    47.7  
 \* RESULTANT OF HORIZONTAL COMPONENTS



RECORD NUMBER : M-1504  
 STATION : OFUNATO-MOUND-M  
 EARTHQUAKE DATA  
 \*\*\*\*\*

DATE AND TIME : 12:19 DEC. 17, 1993  
 \*\*\*\*\*

LOCATION OF HYPOCENTER

EPICENTRAL REGION : E OFF IWATE PREF

LATITUDE : 39° 11.2' N

LONGITUDE : 142° 16.0' E

DEPTH : 62.1KM

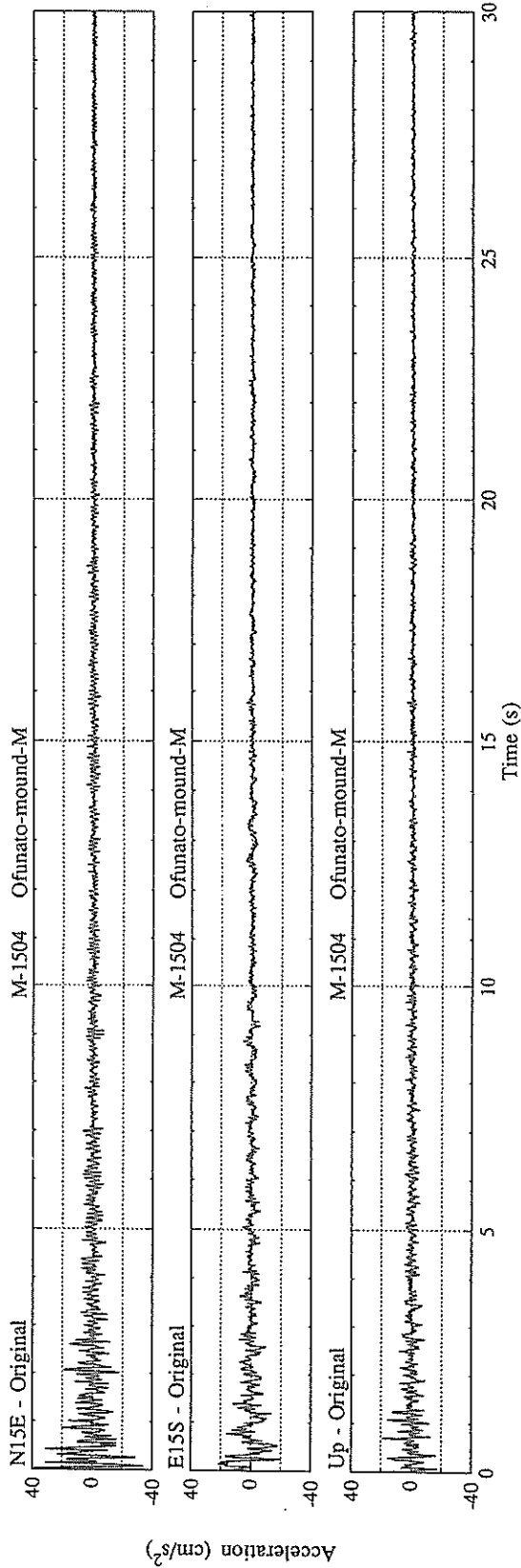
JMA MAGNITUDE : 5.3  
 \*\*\*\*\*

\*\*\*\*\*  
 PEAK VALUES OF COMPONENTS  
 \*\*\*\*\*

-----			
N S	E W	U D	HORIZONTAL*
-----			
39.6	21.7	19.1	41.9

ORIGINAL ACCELERATION (GAL)

\* RESULTANT OF HORIZONTAL COMPONENTS



港湾技研資料 No.776

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