



HAWAIIAN VOLCANO OBSERVATORY

Summary 93 Part I

Seismic Data, January to December 1993

by Jennifer S. Nakata, Paul G. Okubo, Alvin H. Tomori, & Wilfred R. Tanigawa

Chronological Summary
by T. Mattox, C. Heliker, & M. Mangan

Open-File Report 99-415

1999

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the North American Stratigraphic Code. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Hawaiian Volcano Observatory
Hawai'i Volcanoes National Park, Hawai'i 96718

TABLE OF CONTENTS

	Page
Hawaiian Volcano Observatory Staff	1
Introduction	2
Chronological Summary	3
Table C-1 1993 Eruption statistics	3
Figure C-1 Eruption flow map	5
Figure C-2a Plot of Kilauea data	6
Figure C-2b Plot of Mauna Loa data	7
Seismic Instrumentation	8
Figure 1 Map of Hawai'i Island showing geographic and geologic features	9
Figure 2 Seismic stations operated by the USGS on Hawai'i Island	10
Figure 3 Seismic telemetry scheme	11
Table 1 Seismic stations in Hawai'i operated by the USGS	12
Table 2 Seismic instrument types in use by HVO	13
Figure 4 HVO system response curve of the four basic seismograph types	14
Seismic Data Processing	15
Seismic Catalog	16
Table 3 Number of earthquakes and minutes of tremor recorded on seismographs around Kilauea and Mauna Loa	16
Table 4 Coordinates of named regions used for classifying earthquakes	24
Figure 5 Earthquake classification, shallow for Kilauea and Mauna Loa	26
Figure 6 Earthquake classification, intermediate for Kilauea and Mauna Loa	27
Figure 7 Earthquake classification, crustal, for Hawai'i Island	28
Figure 8 Earthquake classification, deep, for Hawai'i Island	29
Figure 9 Earthquake locations, Hawaiian Islands, all depths, $M \geq 3.5$	30
Figure 10 Earthquake locations, Hawai'i Island, all depths, $M \geq 3.0$	31
Figure 11 Earthquake locations, Hawai'i Island, shallow, $M \geq 2.0$	32
Figure 12 Earthquake locations, Hawai'i Island, intermediate, $M \geq 2.0$	33
Figure 13 Earthquake locations, Hawai'i Island, deep, $M \geq 2.0$	34
Figure 14 Earthquake locations, Kilauea summit, shallow, $M \geq 1.0$	35
Figure 15 Earthquake locations, Kilauea summit, intermediate, $M \geq 1.0$	36
Figure 16 Earthquake locations, Kilauea summit, deep, $M \geq 1.0$	37
Figure 17 Earthquake locations, Kilauea south flank, shallow, $M \geq 2.0$	38
Figure 18 Earthquake locations, Kilauea south flank, intermediate, $M \geq 2.0$	39
Figure 19 Earthquake locations, Kilauea south flank, deep, $M \geq 2.0$	40
Figure 20 Earthquake locations, Mauna Loa summit, shallow, $M \geq 2.0$	41
Figure 21 Earthquake locations, Mauna Loa summit, intermediate, $M \geq 2.0$	42
Figure 22 Earthquake locations, Mauna Loa summit, deep, $M \geq 2.0$	43
Table 5 List of all located earthquakes	44
Table 6 List of located earthquakes of magnitude 3.0 or greater	72

1993 HAWAIIAN VOLCANO OBSERVATORY STAFF

DAVID A. CLAGUE (SCIENTIST-IN-CHARGE)

ARNOLD T. OKAMURA (DEPUTY S-I-C)

GEOLOGY

C. CHRISTINA HELIKER
MARGARET T. MANGAN
TARI N. MATTOX

GEOPHYSICS

JAMES P. KAUAHIKAUA
GARY S. PUNIWAI

SEISMOLOGY

JENNIFER S. NAKATA
PAUL G. OKUBO
ALVIN H. TOMORI

DEFORMATION

ROGER P. DENLINGER
ASTA MIKLIUS
MAURICE K. SAKO

GEOCHEMISTRY

TAMAR ELIAS
A. JEFFERSON SUTTON+

ELECTRONICS

RENEE L. ELLORDA
KENNETH T. HONMA
ALLAN J. LARGO

COMPUTER/SEISMOLOGY

WILFRED R. TANIGAWA

CARTOGRAPHY

SANDRA C. MARGRITER

LIBRARY/PHOTO ARCHIVE

T. JANE TAKAHASHI

ADMINISTRATION

PAULINE N. FUKUNAGA
MARIAN M. KAGIMOTO
IRENE S. TENGAN

SCIENTIST EMERITUS

DALLAS B. JACKSON
ROBERT Y. KOYANAGI

AFFILIATED USGS PROJECTS

JOHN LOCKWOOD - Geologic History of Mauna
Loa Volcano
FRANK TRUSDELL (PST)

CONTRACTS

Seismic Record Changing
JAMES KAGIMOTO*

+ Arrived during 1993
* Left during 1993

INTRODUCTION

The Hawaiian Volcano Observatory (HVO) summary presents seismic data gathered during the year and a chronological narrative describing the volcanic events. The seismic summary is offered, without interpretation, as a source of preliminary data. It is complete in the sense that all data for events of $M \geq 1.5$ routinely gathered by the Observatory are included. The large quantity of deformation data, also gathered by HVO scientists, is published separately as summary data Part II.

The HVO summaries have been published in various forms since 1956. Summaries prior to 1974 were issued quarterly, but cost, convenience of preparation and distribution, and the large quantities of data dictated annual publication beginning with Summary 74 for the year 1974. Summary 86 (the introduction of CUSP at HVO) includes a description of the seismic instrumentation, calibration, and processing used in recent years. The present summary includes enough background information on the seismic network and processing to allow use of the data and to provide an understanding of how they were gathered.

A report tabulating instrumentation, calibration, and recording history of each seismic station in the network by Klein and Koyanagi is available as a USGS Open-File Report ¹. It is designed as a reference for users of seismograms and phase data, and it includes and augments the information in the station table in this summary.

¹ Klein, F.W., and Koyanagi, R.Y., 1980, Hawaiian Volcano Observatory seismic network history, 1950-1979: U.S. Geological Survey Open-File Report 80-302, 84 p.

CHRONOLOGICAL SUMMARY 1993

by

by Tari Mattox, Christina Heliker, and Margaret Mangan

The east rift zone eruption celebrated its tenth anniversary this year by shutting down for 26 hours on January 3. The eruption paused again on February 7, following the single upper east rift zone intrusion of 1993. On February 20, the eruption resumed, with low-level fountaining from a new vent on the south flank of Pu'u 'O'o, less than 10 m southwest of the main episode 52 vent (active in October 1992). This was the beginning of episode 53 and of a new era of continuous effusion. No more pauses in the eruption occurred for the rest of the year.

Initial fountain heights at the episode 53 vent were 1-4 m, but by the second day, the fountains reached 15 m and quickly built a spatter cone around the vent. Pahoehoe flows ponded at the base of the episode 51 shield. Meanwhile, the episode 51 vent quietly resumed erupting on February 16, and lava from this vent reoccupied the 51 tube. Flows from the episode 53 vent also found their way into the 51 tube via a skylight at the 2,350-ft elevation. From this elevation, lava from the two vents travelled through the tube to the 2,080-ft elevation, where flows broke to the surface and began the overland journey to the Kamoamoia area on the coast.

Episode 53 lava flows expanded the Kamoamoia flow field and covered Lae'apuki, the site of an ancient Hawaiian village. By fall 1993, lava tubes transported lava directly from the vents to the ocean, and surface breakouts were rare. Lava entered the ocean from several different points along a 2.5-km stretch of coastline in the Kamoamoia area. The steep submarine topography off the coast contributed to the frequency of collapse events at the ocean entries during 1993. Prograding lava deltas in the Kamoamoia and Lae'apuki areas sustained catastrophic collapses, culminating, on November 26, in the largest collapse event on record for this eruption, in which five acres of new land slid into the ocean. The first fatality associated with a bench collapse took place in April, when a portion of the Lae'apuki bench fell into the ocean, taking a visitor with it. Lava tubes and hot, incandescent flows exposed during these collapse events created an additional hazard as spatter and solid blocks were deposited onshore. Lithic blocks were found up to 200 m inland following bench collapses.

In the beginning of 1993, the floor of Pu'u 'O'o Crater was only 40 m below the crater rim; the surface of the lava pond was 75 m below the rim. During the intrusive event in February, withdrawal of magma from the conduit resulted in the collapse of the crater floor to a depth of 85 m below the rim. When the lava pond reappeared, it slowly rose, building up the crater floor anew. At the onset of episode 53, the lava pond dropped from 65 to 77 m below the crater rim. In the days that followed, the level of lava in the pond rose, and overflows from the pond built up the crater floor until it was within 61 m of the crater rim.

By the end of March, the lava pond had stopped overflowing, and the level of lava in the pond slowly dropped. The pond level fluctuated between 75 and 94 m below the spillway rim in May and June. As the year progressed, the pond level became increasingly more stable, and by December, the pond was 83-84 m below the crater rim.

Table C-1. ERUPTION STATISTICS

Total area covered by lava, January 1993 - December 1993 = 87 sq km (33.6 sq mi)

Exposed areas of:

Pu'u 'O'o flows (episodes 1-47 48A = 25 sq km* (9.7 sq mi)

* Pu'u 'O'o flows originally covered about 42 sq km, but much of this area was buried by flows of episodes 48-53.

Kupaianaha flows, July 20, 1986 - February 6, 1992 = 41 sq km (16 sq mi)

Episode 49 flows, November 8-26, 1991 = 3.9 sq km (1.5 sq mi)

Episodes 50 flows, ongoing as of 12/31/93 = 17 sq km (6.6 sq mi)

New land created December 1986 - December 1993 = 199 hectares (491 acres) This is a net figure, which does not include new land that was claimed by wave erosion or collapse of the active lava bench.

Table C-1. (continued)

Volumes

Total, 1/83 through 11/93	Approximately: 998 x 106 m ³ (dense rock equivalent)
Episodes 1-47 (1/83 - 6/86)	385 x 106 m ³
Episode 48 (7/86 - 2/92)	500 x 106 m ³
Episode 49 (11/92)	11 x 106 m ³
Episode 50 (2/92 - 3/92)	4.5 x 106 m ³
Episode 51 (3/92 - 2/93)	32 x 106 m ³
Episode 52 (10/92)	2 x 106 m ³
Episode 53 (2/93-12/93, ongoing)	63 x 106 m ³

Other fascinating facts

Height of episode 51 lava shield: ~60 m
Episode 51 lava pond active March 1992 - July 1992

Height of Kupaianaha lava shield: 56 m
Kupaianaha vent inactive since February 1992

Height of Pu'u 'O'o cone: 234 m (768 ft). Cone has lost 23 m due to collapse since 1986
Dimensions of Pu'u 'O'o Crater, December 1993: ~200 m x 300 m
Depth of Pu'u 'O'o floor, December 1993: 60 m
Pu'u 'O'o pond status: continuously active

Thickness of lava at coast:
~25 m (75 ft) over Hwy 130 at Queens Bath
~16-25 m (50-75 ft) over Kalapana Gardens
~5 m (15 ft) over Chain of Craters at Lae'apuki

Length of highway covered by lava flows from this eruption: 12 km (7.5 mi)

- Episode 50, 51, & 52 flows, 2/17/92 - 2/20/93
- Episode 53 flows, 2/20/93 - 2/28/94 (ongoing)
- ⊗ Episode 51 and 53 vents
- ☆ Ocean entry

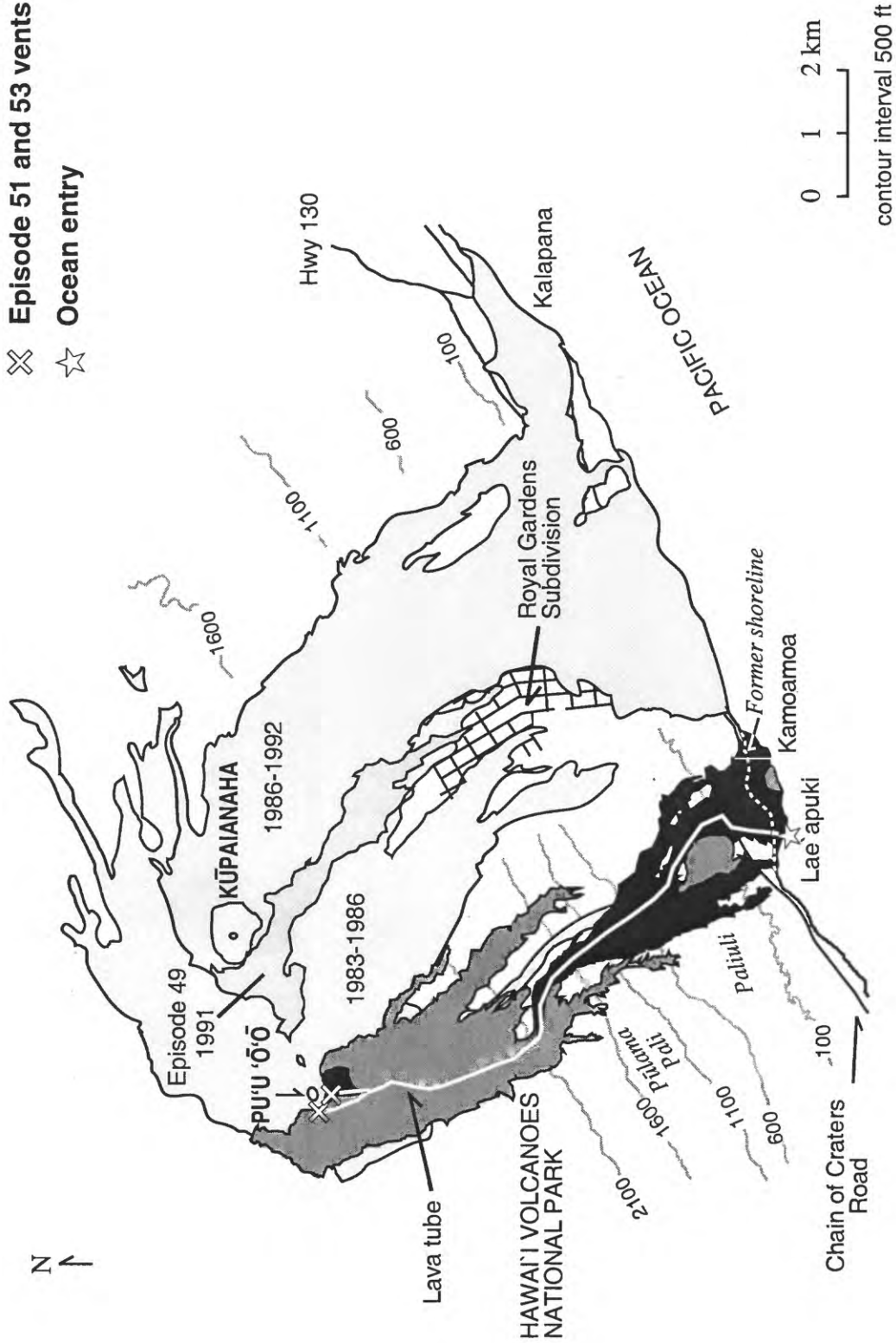


Figure C-1. Lava flows produced from 1983 through 1993. The star marks the location of the episode 51 vent.

KILAUEA

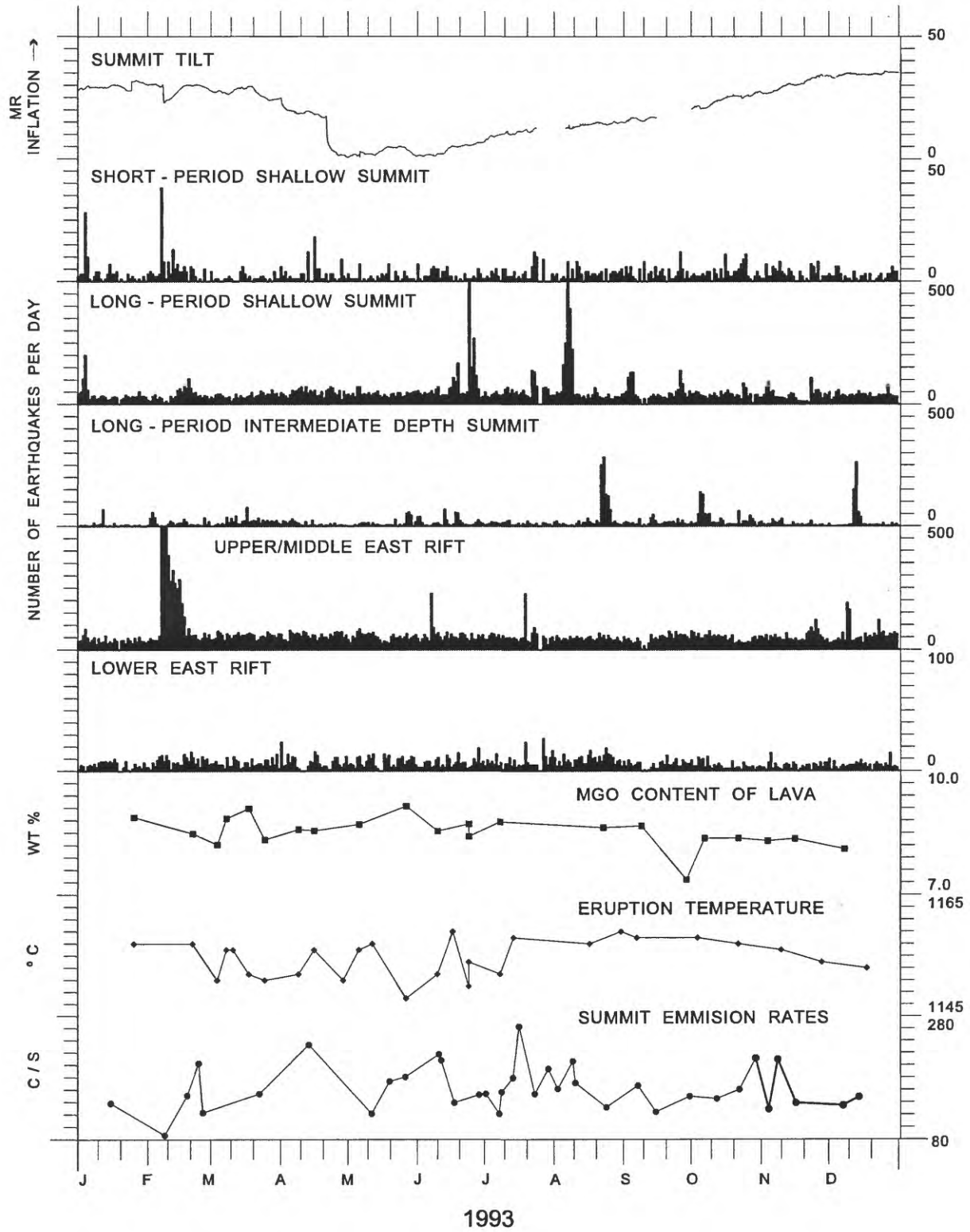


Figure C-2a. Selected seismic, geodetic, petrologic and geochemical data for Kilauea, 1993 (MR, microradian; C/S, Carbon dioxide ratio).

MAUNA LOA

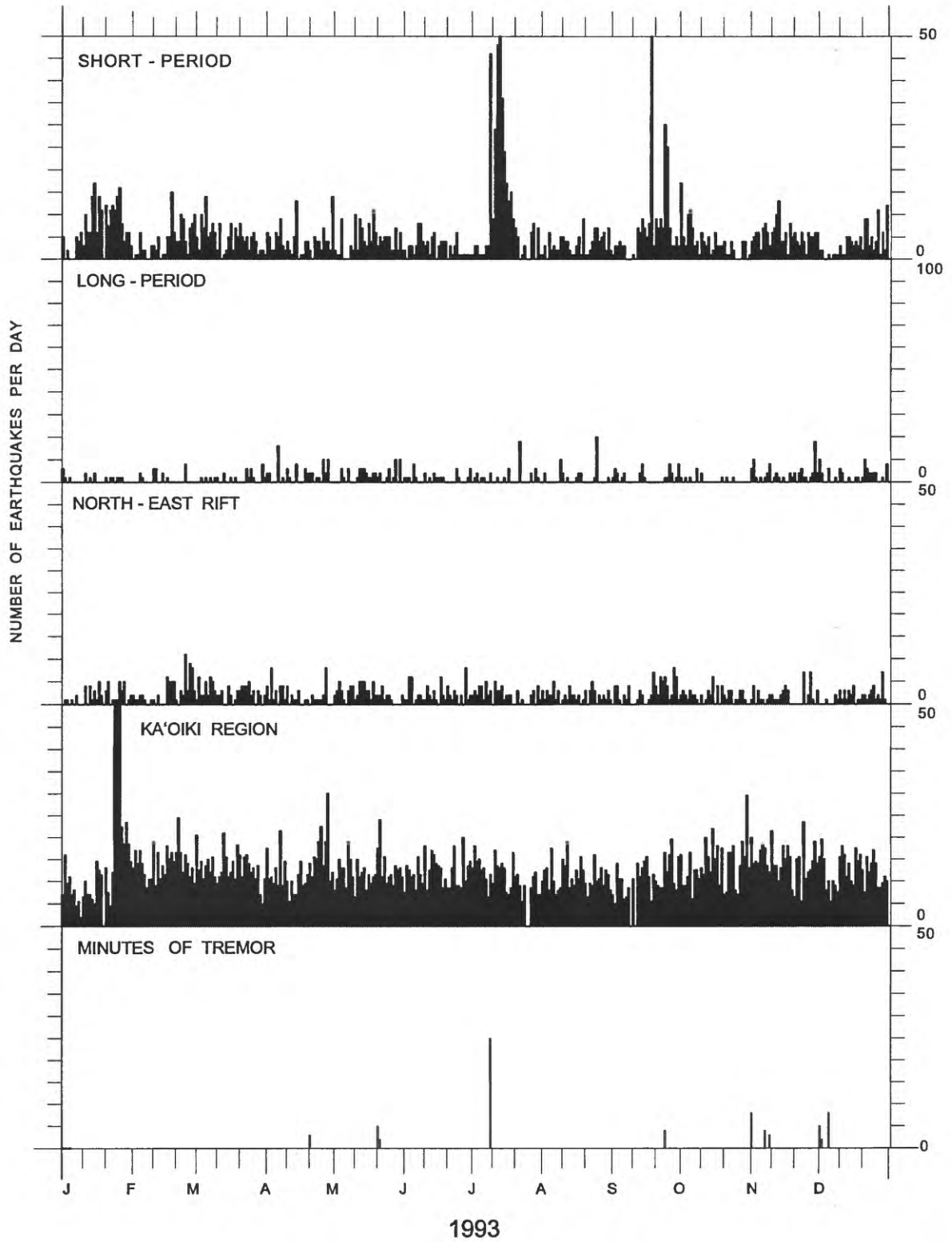


Figure C-2a. Selected seismic data for Mauna Loa, 1993.

SEISMIC INSTRUMENTATION

The network. Hawaiian Volcano Observatory maintains an extensive telemetered seismic network on the Island of Hawai'i. The 1993 network consisted of 52 stations—51 digital and 1 low-gain, three-component optical. The 51 digital stations include 13 three-component, 1 four-component (which includes a moderate-gain vertical with a 48db setting), and 37 vertical-component-only sites. The coverage is most dense on and around Kilauea Volcano. With the exception of self-contained photographic systems at the Hilo station, all seismic signals from the short-period network are telemetered to the Observatory for recording.

Figure 1 is a map of selected geographic and geologic features, figure 2 shows the seismic stations operated on the Island of Hawai'i during 1993, and figure 3 indicates the telemetry scheme for the respective seismic stations.

Table 1 lists seismic stations by names, four-letter station codes, coordinates in degrees and minutes, elevation in meters, and other data, as described below, pertaining to each station. The list includes all the stations operated by the Observatory during 1993. A few seismic stations operated by the Pacific Tsunami Warning Center (NOAA) on the Islands of O'ahu and Maui are also listed. Phase times from these stations are occasionally used to supplement data for events that occur within the Hawaiian Archipelago but distant from the Hawai'i Island network.

Instrumentation and recording. Each telemetered station has a voltage-controlled oscillator (VCO) for FM multiplex transmission to HVO via either hardwire or radio. These telemetering stations are all of Type 1, standard system used in USGS seismic networks (see table 2 for details). After discrimination at the receiver, the analog signals are converted to digital form as part of the routine computer location processing and archiving. Continuous signals from the telemetered network are saved on 4-mm digital-audio tape (DAT) recording units. Three DAT recorders run in automatic rotation, as each 30 hr tape is filled. Analog signals from 18 selected stations are recorded on one Develocorder ('A') using 16-mm microfilm. The type(s) of recording used for each station is coded in table 1 as follows: D - Develocorder film, P - photographic paper, H - Helicorder paper, and I - ink paper.

In addition to the standard stations, optical drum seismographs are maintained at Hilo. The less sensitive optical records are used primarily for amplitude measurements for magnitude calculations to supplement readings from the high-gain stations. The paper records, as well as the 16-mm Develocorder microfilms, are archived at HVO.

Seismograph response and calibration. Displacement response curves for the three short-period seismograph types in use are given in figure 4. Types 2 and 3 are electro-mechanical systems recorded on paper records. The Type 1 curve gives the displacement magnification of the standard OEVE system from ground motion at the seismometer to the seismic trace, as seen on a 20x Develocorder film viewer. The curves plot the unit response, which is multiplied by a constant but known factor (CAL-factors range from about 1 to 7, averaging about 4, table 1) to get the response for an individual station. Individual CAL factors for Type 1 seismographs are equal to the peak-to-peak amplitude measured in millimeters on the 20x Develocorder viewer of a 100-microvolt 5 to 8-Hz signal introduced to the preamp/VCO in place of the geophone at the field station. The calibration process is normally performed each time a station is visited when other maintenance is required.

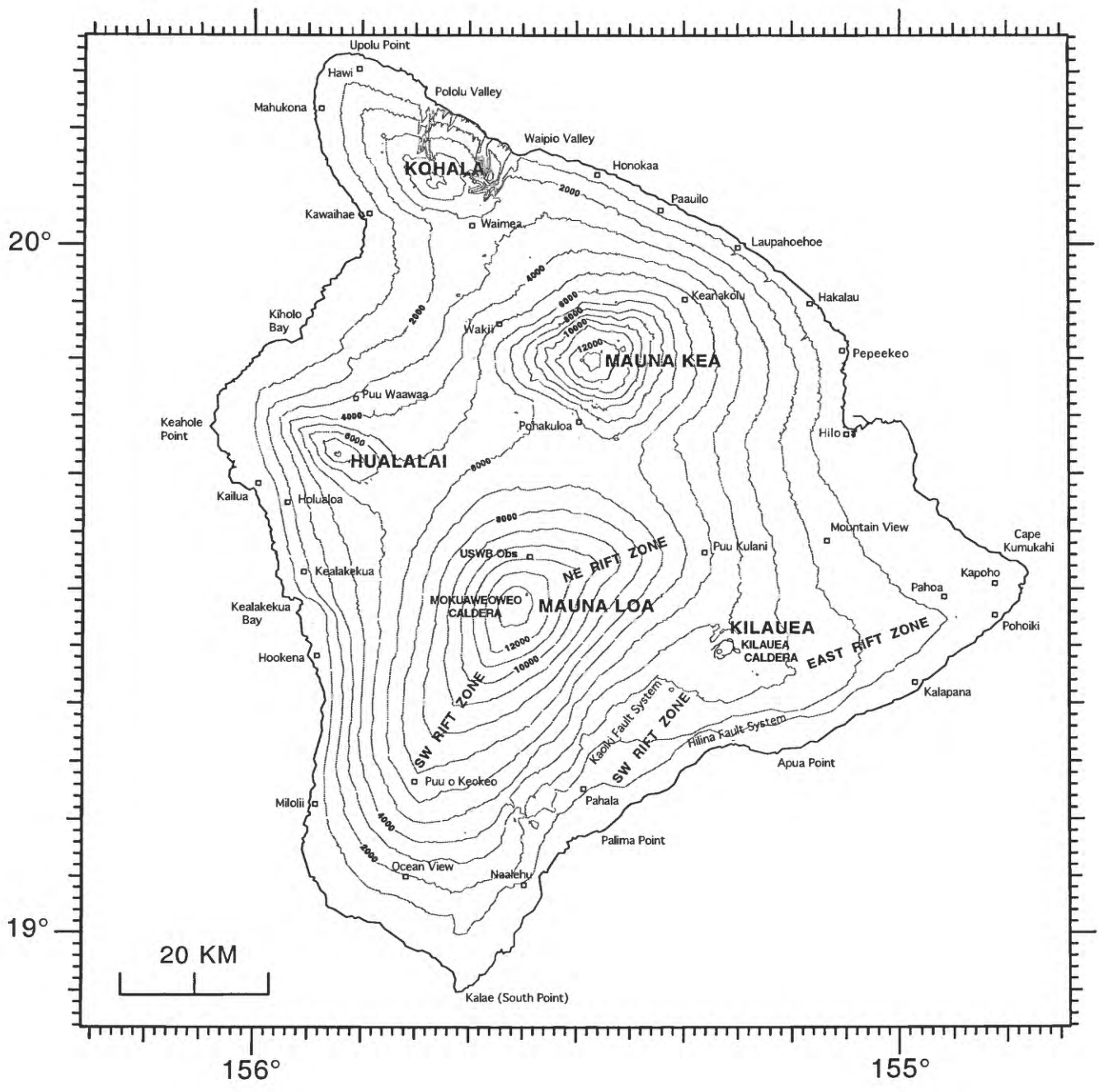


Figure 1. Map of the Island of Hawai'i, showing principal settlements and selected geographic and geologic features.

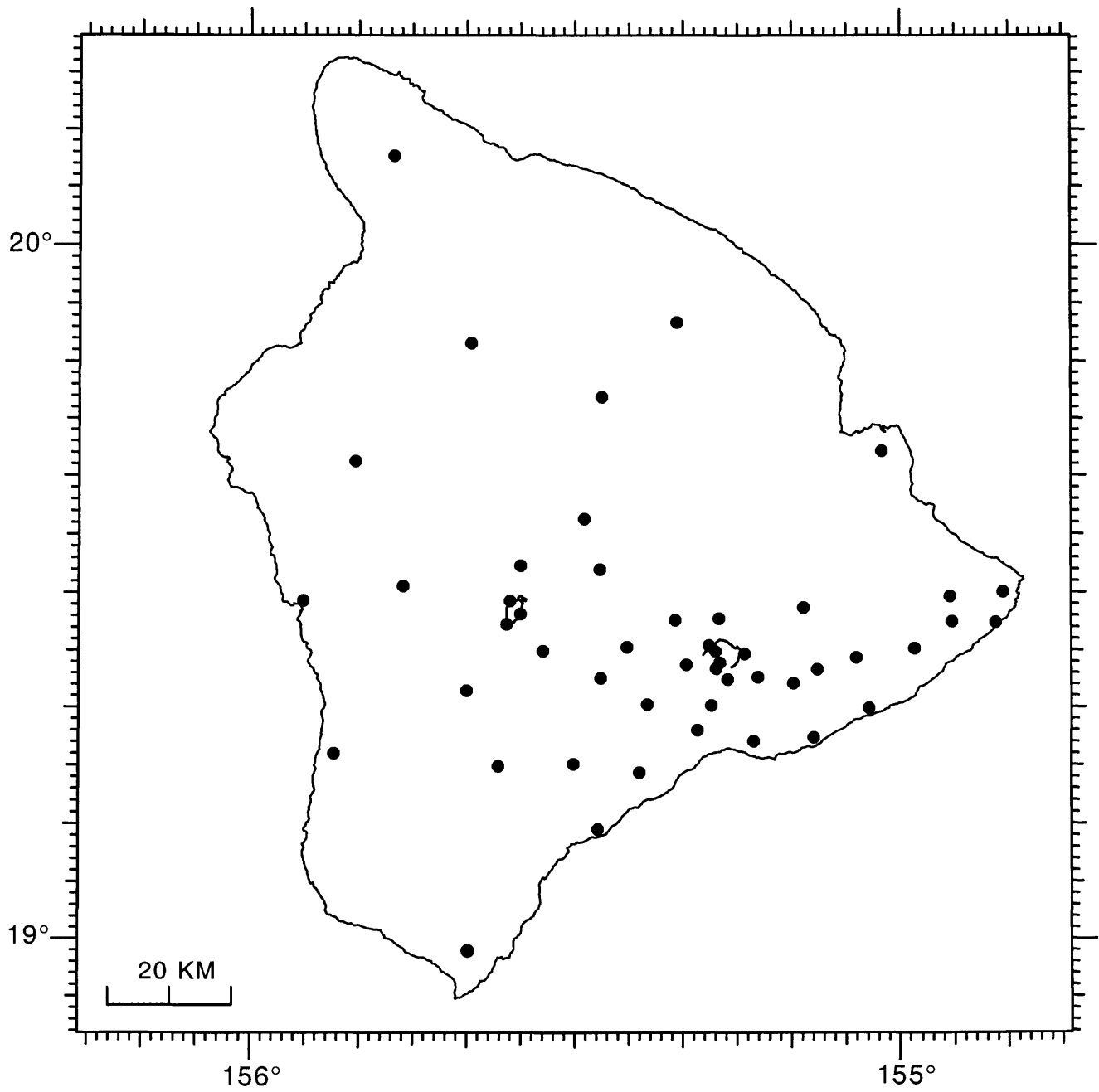


Figure 2. Seismic stations operational during 1993 on the Island of Hawai'i.

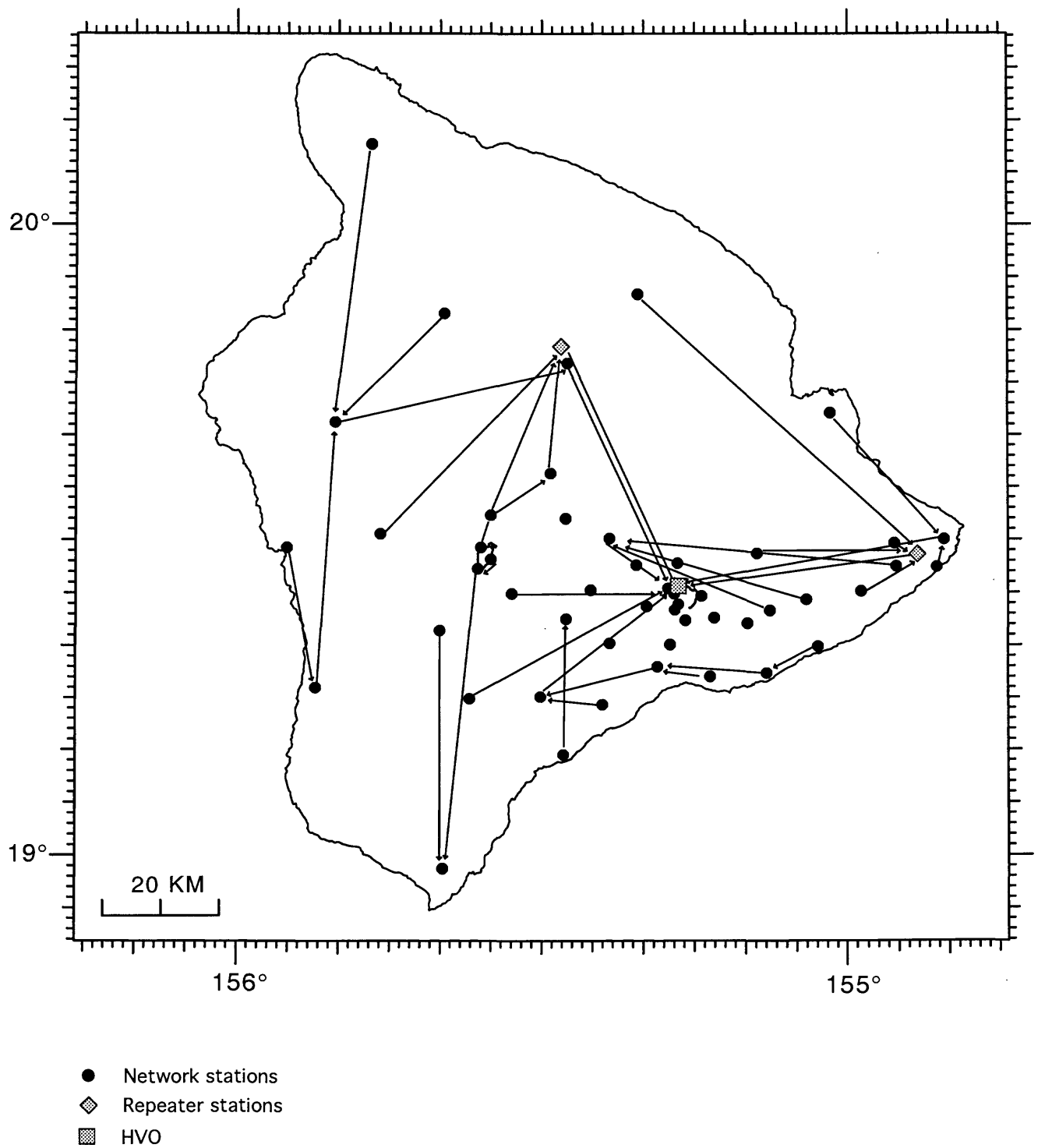


Figure 3. Telemetry scheme for the 1993 Hawaiian Volcano Observatory seismic network.

Table 1. Seismic stations in Hawai'i operated by the USGS in 1993.

STATION NAME	CODE	-LAT-		-LON-		ELEV (M)	DELAY 1	DELAY 2	CAL	SEIS TYPE	OPTIC RECORD
		D	M	D	M						
AHUA	AHUV	19	22.40	155	15.90	1070	-0.10	-0.13	2.1	E5	DI
AHUA	AHUE	19	22.40	155	15.90	1070	-0.10	-0.13	3.0	E5	
AHUA	AHUN	19	22.40	155	15.90	1070	-0.10	-0.13	3.0	E5	
AINAPO	AINV	19	22.50	155	27.62	1524	0.13	0.17	6.8	L5	
AINAPO	AINE	19	22.50	155	27.62	1524	0.13	0.17	3.0	L5	
AINAPO	AINN	19	22.50	155	27.62	1524	0.13	0.17	3.0	L5	
AINAPO	AINZ	19	22.50	155	27.62	1524	0.13	0.17	0.0	L5	
CAPTAIN COOK	CACV	19	29.29	155	55.09	323	0.00	-0.16	1.1	L5	D
CONE PEAK	CPKV	19	23.70	155	19.70	1038	-0.26	-0.07	6.0	L5	
DANDELION	DANV	19	21.42	155	40.04	3003	-0.27	0.03	4.3	E5	
DESERT	DESV	19	20.20	155	23.30	815	-0.29	-0.13	4.5	L5	DI
DIAMOND HEAD, O'AHU	DHHV	21	16.12	157	48.25	137	0.00	0.00	0.0	H1	H
ESCAPE ROAD	ESRV	19	24.68	155	14.33	1177	-0.17	-0.19	2.2	L5	D
FERN FOREST	FEFV	19	28.70	155	8.91	691	0.01	0.05	0.0	L5	
HAWAIIAN BEACHES	HABV	19	31.89	154	53.89	92	-0.09	-0.24	1.0	L5	
HILO	HIEE	19	43.20	155	5.30	20	0.54	0.30	1.0	W	P
HILO	HILV	19	43.20	155	5.30	20	0.54	0.30	1.0	H1	P
HILO	HINN	19	43.20	155	5.30	20	0.54	0.30	1.0	W	P
HALEAKALA, MAUI	HKLV	20	42.63	156	15.55	3051	0.00	0.00	0.0	H1	H
HILINA PALI	HLPV	19	17.96	155	18.63	707	0.02	0.07	2.1	L5	D
HONOLULU, O'AHU	HONV	21	19.30	158	0.50	2	0.00	0.00	0.0	H1	H
HALE POHAKU	HPUV	19	46.85	155	27.50	3396	0.31	0.17	3.3	L5	
HUMUULA SHEEP STA	HSSV	19	36.31	155	29.13	2445	0.20	0.35	4.0	L5	
HUMUULA SHEEP STA	HSSE	19	36.31	155	29.13	2445	0.20	0.35	3.0	L5	
HUMUULA SHEEP STA	HSSN	19	36.31	155	29.13	2445	0.20	0.35	3.0	L5	
HOT CAVES	HTCV	19	14.33	155	24.02	381	-0.16	-0.07	2.3	E4	
HUALALAI	HUAV	19	41.25	155	50.32	2189	0.67	0.38	2.8	L5	I
HEIHEIAHULU	HULV	19	25.13	154	58.72	369	-0.17	-0.16	1.7	L5	DI
HEIHEIAHULU	HULE	19	25.13	154	58.72	369	-0.17	-0.16	3.0	E5	
HEIHEIAHULU	HULN	19	25.13	154	58.72	369	-0.17	-0.16	3.0	L5	
KAAPUNA	KAHV	19	15.98	155	52.28	524	-0.12	-0.01	3.3	E5	
KAENA POINT	KAEV	19	17.35	155	7.95	37	-0.01	0.06	1.4	L5	
KA'OIKI FAULTS	KFAV	19	25.25	155	25.18	1579	0.13	0.17	0.0	E5	
KAHUKU	KHUV	19	14.90	155	37.10	1939	0.03	-0.03	5.0	E5	
KANEKII	KIIV	19	30.56	155	45.90	1841	0.15	0.37	3.0	L5	
KANEKII	KIIE	19	30.56	155	45.90	1841	0.15	0.37	3.0	L4	
KANEKII	KIIN	19	30.56	155	45.90	1841	0.15	0.37	3.0	L4	
KEANAKOLU	KKUV	19	53.39	155	20.58	1863	0.68	0.24	3.3	L5	
KALALUA CONE	KLCV	19	24.35	155	4.08	659	-0.25	-0.30	3.4	L5	
PUU KALIU	KLUV	19	27.48	154	55.26	271	-0.17	-0.30	3.4	L5	
KOHALA	KOHV	20	7.69	155	46.77	1166	-0.03	-0.17	6.3	L5	
KOHALA	KOHE	20	7.69	155	46.77	1166	-0.03	-0.17	3.0	L5	
KOHALA	KOHN	20	7.69	155	46.77	1166	-0.03	-0.17	3.0	L5	
KIPUKA NENE	KPNV	19	20.10	155	17.40	924	-0.11	-0.08	3.5	L5	D
KAPOHO	KPOV	19	30.02	154	50.51	134	-0.09	-0.24	2.5	L5	D
MAUNA LOA	MLOV	19	29.80	155	23.30	2010	0.03	0.08	5.6	L5	DI
MAUNA LOA	MLOE	19	29.80	155	23.30	2010	0.03	0.08	3.0	L5	
MAUNA LOA	MLON	19	29.80	155	23.30	2010	0.03	0.08	3.0	L5	
MAUNA LOA X	MLXV	19	27.60	155	20.70	1475	0.06	0.15	3.0	L5	
MOKUAWEOWEO	MOKV	19	29.28	155	35.98	4104	0.15	0.16	4.2	L5	DI
MAKAOPUHI	MPRV	19	22.07	155	9.85	881	-0.17	-0.20	3.0	L5	DI
MOUNTAIN VIEW	MTVV	19	30.25	155	3.75	409	-0.02	0.01	5.6	E5	
NATIONAL GUARD	NAGV	19	42.12	155	1.72	18	0.54	0.30	4.0	E5	
NATIONAL GUARD	NAGE	19	42.12	155	1.72	18	0.54	0.30	3.0	R5	
NATIONAL GUARD	NAGN	19	42.12	155	1.72	18	0.54	0.30	3.0	R5	
NORTH PIT	NPTV	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L5	DI
NORTH PIT	NPTE	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L5	

NORTH PIT	NPTN	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L5	
OPANA, O'AHU	OPAV	21	41.45	158	0.70	134	0.00	0.00	0.0	H1	H
OUTLET	OTLV	19	23.38	155	16.94	1038	-0.19	-0.18	4.9	L5	
PAUAAHI	PAUV	19	22.62	155	13.10	994	-0.21	-0.24	2.2	L4	D
PAUAAHI	PAUE	19	22.62	155	13.10	994	-0.21	-0.24	3.0	L5	
PAUAAHI	PAUN	19	22.62	155	13.10	994	-0.21	-0.24	3.0	L5	
PUU ULAULA	PLAV	19	32.00	155	27.67	2992	-0.03	0.13	5.4	L5	DI
POHOIKI	POIV	19	27.42	154	51.22	16	-0.09	-0.24	0.0	L5	
POLIOKEAWE PALI	POLV	19	17.02	155	13.47	169	-0.02	0.03	3.4	E5	
PUU PILI	PPLV	19	9.50	155	27.87	35	-0.15	-0.15	1.3	E5	D
RIM	RIMV	19	23.90	155	16.60	1128	-0.21	-0.13	0.0	L5	
RAINSHED	RSDV	19	27.78	155	16.68	1270	0.06	0.15	0.0	L5	
SOUTHPOINT	SPTV	18	58.91	155	39.92	244	-0.17	-0.22	2.8	L5	
SOUTHPOINT	SPTV	18	58.91	155	39.92	244	-0.17	-0.22	3.0	L4	
SOUTHPOINT	SPTN	18	58.91	155	39.92	244	-0.17	-0.22	3.0	L4	
STEAM CRACKS	STCV	19	23.30	155	7.67	765	-0.25	-0.30	2.8	L5	DH
STEAM CRACKS	STCE	19	23.30	155	7.67	765	-0.25	-0.30	3.0	L5	
STEAM CRACKS	STCN	19	23.30	155	7.67	765	-0.25	-0.30	3.0	L5	
SOUTHWEST RIFT	SWRV	19	27.26	155	36.30	4048	0.01	0.04	5.6	E5	D
TRAIL	TRAV	19	24.91	155	32.96	3207	0.00	0.00	0.0	L5	
UWEKAHUNA	URAV	19	25.40	155	17.60	1240	-0.21	0.00	0.0	R5	
UWEKAHUNA	URAE	19	25.40	155	17.60	1240	-0.21	0.00	3.0	R5	
UWEKAHUNA	URAN	19	25.40	155	17.60	1240	-0.21	0.00	3.0	R5	
WAIKII	WAIV	19	51.58	155	39.60	1433	0.20	0.35	0.0	L5	
WAHAULA	WHAV	19	19.90	155	2.92	29	-0.10	-0.04	2.4	E5	
WILKES CAMP	WILV	19	28.15	155	35.02	4037	0.22	0.17	2.6	E5	D
WILKES CAMP	WILE	19	28.15	155	35.02	4037	0.22	0.17	3.0	L5	
WILKES CAMP	WILN	19	28.15	155	35.02	4037	0.22	0.17	3.0	L5	
WEATHER OBSERVATORY	WOBV	19	32.31	155	35.01	3396	0.00	0.00	0.0	E5	
WOOD VALLEY	WOOV	19	15.08	155	30.12	909	-0.15	-0.06	2.6	E5	

Table 2. Seismic instrument types

The codes in parentheses refer to the seismometer types listed in table 1.

Type 1 (Codes E, L, and 3, 4, 5) consists of:

- a) Geophone - Electrotech EV-17 (E), or Mark Products L4C (L) 1.0-sec. period moving-magnet vertical- or horizontal- (E-W and N-S) component seismometer adjusted for an output of 0.5 volts/cm/sec and 0.8, critically damped.
- b) Preamp/VCO - USGS/OEVE Model J402 (4), J502 (5) voltage-controlled oscillator. Three db points for bandpass filter at 0.1 Hz and 30 Hz. Signals are transmitted on audio FM carrier over cable or FM radio link to HVO.

Type 2 (Code E) consists of:

- a) Electrotech EV-17 1.0-sec. period moving-magnet vertical- or horizontal- (E-W and N-S) component seismometer.
- b) 3.5 Hz galvanometer with appropriate shunt resistances for critical damping. System is poorly calibrated. Peak magnification approximately 25,000 at 4 Hz.

Type 3 (Code H1) consists of:

Electrotech EV-17 or Observatory-built 0.8-sec. period moving-coil seismometer, with HVO-built solid-state seismic preamplifier, galvanometer driver, and 2 Hz galvanometer. Peak magnification approximately 40,000 at 4 Hz.

Code (W) is a Wood-Anderson torsion seismograph.

Code (MW) is a horizontal-component seismograph based on a Type 1 system and modified to a Wood-Anderson response.

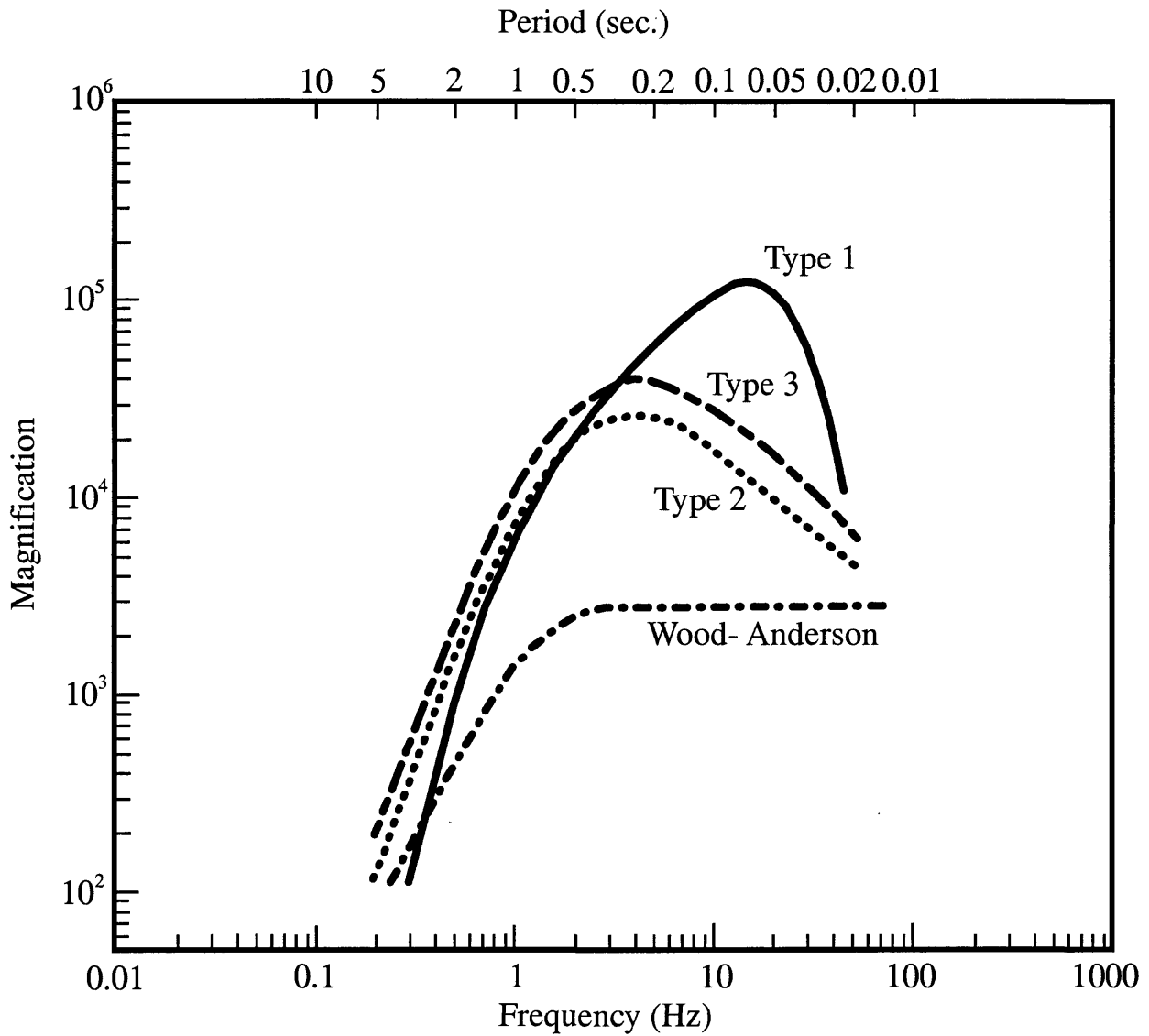


Figure 4. System response curves for the Wood-Anderson torsion seismograph and for the three different types of seismometers used by the Hawaiian Volcano Observatory. Types 2 and 3 are electromagnetic seismographs recorded optically on photographic paper. Type 1 is the standard OEVE seismometer system recorded on Develocorder film and magnetic tape. The curve for Type 1 includes response of the geophone, all electronics including telemetry, Develocorder galvanometer, and projection of film by a 20x viewer. The curves plot the unit response, which should be multiplied by a constant but known factor (CAL) to get the response for an individual station.

SEISMIC DATA PROCESSING

The Develocorder 'A' film is scanned on a daily basis for frequency of earthquakes, and coda duration in seconds is measured for coda magnitude M_D . In 1986, HVO acquired a VAX 11-750 computer and adopted the CUSP (California Institute of Technology USGS Seismic Processing) routine. Discriminated analog signals are converted to digital form, and detected events are saved in real time. Detected events are demultiplexed, and P-picks are made by the computer, producing a rough location. Events are examined by an analyst, on a VAX workstation, to refine computer P-picks and to time additional P- and S-phases for a preliminary location. Binary CUSP files are tape-archived and translated into ASCII phase files. Locations and amplitude magnitudes are then determined, using the program HYPOINVERSE (Klein, 1989)². Events are reworked and rerun, as needed, to produce a final solution. Magneto optical copies of arrival times and output summary data are kept at HVO.

In July 1992, HVO acquired VAX workstations for timing earthquakes using a "generic" version of CUSP. In addition to timing P and S arrival signals, the VAX workstations are capable of measuring peak-to-peak amplitudes, along with the associated period. This capability allowed the renewal of amplitude magnitude determinations from the network seismic stations. Amplitude data gathered from July 1992 to July 1997 became part of a test set to determine magnitude corrections for network stations. Results of newly determined magnitude corrections are detailed by Nakata and Okubo in a USGS Open-File Report.³

The crustal model used is specified by velocities at four depth points. Velocity at any depth is given by linear interpolation between points and uses a homogeneous half-space, as listed below:

VELOCITY (km/sec)	DEPTH (km)
1.9	0.0
6.5	4.6
6.9	15.0
8.3	16.5

Two empirical sets of station delays or corrections were used in the HYPOINVERSE locations and are given in table 1. The delay models are separated by a circle of radius 34 km, centered at 19°22' N and 155°10' W. Delay model 1 is used for epicenters occurring within a circle of radius 31 km from the center. This region includes Kilauea and its south flank. A combination of the two delay models is used for epicenters that fall in a transition zone that is 6 km wide. Delay model 2 is applied to the rest of the island and offshore earthquakes. (For a detailed description, refer to Klein, 1989.)²

Magnitudes for events are computed using recorded amplitudes on selected network vertical, Modified Wood-Anderson (MW) horizontal, moderate and low gain, and/or Wood-Anderson stations. Amplitudes read from other than Wood-Anderson instruments are corrected to an equivalent Wood-Anderson amplitude using the curves of figure 4 and CAL factors listed in table 1.

Duration magnitude is determined by the length of signal, in seconds, from Type 1 seismographs read from the develocorder viewer. This length of time, also called "F-P time," is measured from the P arrival to the point where the earthquake signal has decayed to nearly the background noise level. A bilinear relation used to compute duration magnitude is described in Klein, 1989².

² Klein, F.W., 1989, User's guide to HYPOINVERSE: U.S. Geological Survey Open-File Report 89-314, 58 p.

³ Nakata, J., and Okubo, P., 1997, Determination of station amplitude magnitude corrections for the Hawaiian Volcano Observatory telemetered seismograph network: data from 1992-1997: U.S. Geological Survey Open-File Report 97-863, 73 p.

SEISMIC CATALOG

The emphasis in both station coverage and detailed data analysis is on the highly active south half of the Island of Hawai'i. Hundreds of earthquakes too small to locate are classified as type⁴ and counted daily. The set of well-recorded earthquakes located in the Hawai'i Island region is nearly complete above magnitude 2.0. Many smaller events are located in the densely instrumented Kilauea area. Substantial effort is made to locate earthquakes elsewhere within the Hawaiian Archipelago. Such coverage cannot be as complete as in south Hawai'i, but nearly all events above magnitude 4.0 are located with limited precision. Data presented in the seismic catalog are in four parts: (1) Table 3 gives duration of harmonic tremor and numbers of earthquakes (most too small to locate) from several source regions around Kilauea and Mauna Loa. The source region is determined visually from signal character and pattern of arrival times at key stations. (2) Maps showing computer-located hypocenters are given in figures 9-22. The location maps are of different scales and provide hypocenters with magnitude thresholds set at 1.0, 2.0, 3.0, and 3.5, varying according to region. (3) Table 5 lists computer locations which constitutes the bulk of this summary. Each earthquake in the list is assigned a three-letter code based on its general location and depth. Figures 5-8 are maps of the regions used to assign the location codes. The latitude and longitude limits of rectangular regions are listed in table 4. When the listed coordinates overlap, precedence is given according to figures 5-8. (4) Table 6 re-lists the events in table 5 for which either, duration or amplitude magnitude is 3.0 or greater. This list includes many of the earthquakes felt in Hawai'i.

Table 3. Number of earthquakes and minutes of tremor recorded on seismographs around Kilauea and Mauna Loa.

Earthquake categories are as follows:

- 1) Kilauea summit, short-period caldera: shallow earthquakes beneath the caldera.
- 2) Kilauea summit, long-period caldera A: earthquakes characterized by low frequency signatures of 3 to 5 Hz, often originating 0-5 km beneath the summit.
- 3) Kilauea summit, long-period caldera B: earthquakes characterized by low frequency signatures of 1 to 3 Hz, often originating 0-5 km beneath the summit.
- 4) Kilauea summit, long-period caldera C: earthquakes characterized by low frequency signatures of 1 to 5 Hz, often originating 5-15 km beneath the summit.
- 5) Kilauea summit 30 km: earthquakes about 30 km deep beneath the summit region.
- 6) Ka'oiki and southwest rift zone: earthquakes beneath the southwest rift zone of Kilauea, western parts of the Koa'e fault system, and adjacent Ka'oiki fault system of Mauna Loa.
- 7) Upper east rift zone: earthquakes in the upper and middle east rift zone, the adjacent parts of the south flank, and eastern parts of the Koa'e fault system.
- 8) Lower east rift zone: earthquakes in the lower east rift zone and adjacent parts of the south flank.
- 9) Mauna Loa short-period: shallow earthquakes in the Mauna Loa summit region.
- 10) Mauna Loa long-period: earthquakes characterized by low-frequency signatures near the summit region.
- 11) Mauna Loa northeast rift zone: earthquakes beneath the northeast rift zone of Mauna Loa.
- 12-15) Tremor is separated into four categories: Kilauea—shallow, intermediate, and deep, and Mauna Loa. Depth is inferred on the basis of relative amplitudes on seismographs.

The criteria for Kilauea shallow tremor have been changed to accommodate the ongoing eruption, during which tremor in the middle east rift zone is continuous. Distinction is made between high amplitude tremor related to strong eruptive periods and low amplitude tremor during periods with no surface lava extrusion. Only minutes of tremor at saturated levels recorded locally at STC and/or KLC are included in table 3.

⁴ Koyanagi, R.Y., 1982, Procedure for routine analyses and classification of seismic events at the Hawaiian Volcano Observatory, Part I: U.S. Geological Survey Open-File Report 82-625, 32 p.; figs., 59 p.

Table 3. KILAUEA SUMMIT KILAUEA FLANK MAUNA LOA TREMOR (MINUTES)

DATE 1993	SHORT PER. CALD.	LONG PERIOD CALDERA			30 KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA			MAUNA LOA
		A	B	C								SHAL.	INT.	DEEP	
JAN 1	2	44		1		14	36	1	5	3		1440			
2	3	51		4		32	38	5		1	1	1440			
3	3	104		3		19	59	4	2		1	480			
4	28	199	1	4		22	85			1		1020			
5	10	59		2		14	50	4			1	1440			
6	1	20		1		16	32	5				1440			
7		33		2		9	40	4	5		2	1440			
8	2	35		14		11	50	6	4			1440			
9	4	21		4		4	23	3	6			1440	4		
10	4	25		7		13	46	7	3			1440			
11	1	34		10		20	30	8	10	2	4	1440			
12		34		69		14	34	8	6			1440		37	
13	1	28		3		14	57	8	6	1	4	1440			
14	3	17				12	26	7	14		1	1440			
15	7	20		3		10	34	8	17	2	3	1440		16	
16	3	29				29	28	7	6		1	1440		3	
17	3	31		12		25	45	10	14		5	1440			
18	4	28		2	1	23	36	7	11		2	1440		12	
19*															
20	1	19		4		26	38		12	1	3	1440			
21		25		3		15	39	3	7		5	1440			
22		30	8	6		9	26	8	11	1		1440			
23	3	31		6		24	47	1	12	1	1	1440			
24	1	27		2		788	38		11		1	1440		29	
25	2	32		1		327	27	2	14	1	1	1440			
26	1	30		4		194	48	6	16	1	5	1440			
27		31	1	2		45	33	3	8	1	3	1440			
28	1	48	4	5		37	52	4	4		5	1440		19	
29		32				47	36	2	6			1440			
30	2	33				37	34	7	6		1	1440			
FEB 31		29		1	1	29	30	3	3		2	1440			
1	3	17		4		26	36	3			2	1440			
2	4	13		33		34	46	1	1		1	1440			
3	3	32		57		28	40	7	1		1	1440		11	
4	2	39		37		34	39	4	6	2	2	1440			
5	2	20		9		28	39	9	2	1	2	1440		10	
6	3	29		1		23	56	12	2		1	1440		9	
7	38	24		3		17	2405	13				1440			
8	8	7				21	2628	8				1440			
9	1	11	2	2		21	499	13	3		1	1440			
10	8	5		9		38	382	9	3	3	1	1440			
11	3	30	3	21		18	279	1	2	3					
12	13	23		15		33	322	7	5		2			8	
13	5	31		4		21	271	6							
14	7	56		11		27	248	7	1	2					
15	4	64		14		23	285	5	1						
16	4	50		14		36	188	5	5	1	6				
17	6	79		29		30	135	14	5		5				
18	4	65		18		33	57	11	15		5			23	
19		104		3	1	29	87	8	6		5	120		3	
20	6	65		7		33	58	16	4		1	1440			
21	5	45		6		49	59	11	4			1440		3	
22	2	48		3		33	60	6	10		3	1440			
23		33		7		24	43	10	9		2	1440			
24	1	36		4	1	32	38	3	4	4	11	1440			

		KILAUEA SUMMIT			KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)			
DATE 1993	SHORT PER.	LONG CALDERA	PERIOD	30 KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA			MAUNA LOA
	CALD.	A	B								C	SHAL.	INT.	
FEB25		26		2		28	47	12			3	1440		
26	5	36		35		22	68	9			9	1440		
27		32		7		26	48	10			8	1440	4	
28		21		19		19	62	5			10	1440		
MAR 1	4	30		1		41	41	6			1	1440		36
2		23				25	43	6			6			
3	1	38		5	1	29	47	8	10	1	2	1440		
4	1	42		9		21	76	5			7	1440		
5		42		5		27	69	5	14	1	5	1440	3	
6		34		11		30	59	5	5		2	1440		
7	1	26		6		24	39	2	6	1	6	1440		
8	1	26		37		31	65	11	8		5	1440		
9	2	30		14		22	58	4	6	1	3	1440		
10	1	11		32	1	19	46	4	2	1	2	1440		
11		22	1	17		22	58	12	8		2	1440		
12		41		42		24	60	9			3	1440		
13		25		10	1	42	70	8	1	2		1440		
14	4	35		8		31	56	2	2			1440		
15	6	26		20		22	60	3	5		4	1440		
16	3	25		23		24	59	7	8	1	2	1440		
17	1	31		77		29	64	7	2			1440		
18	2	35		17	3	21	68	3	7	1	1	1440		22
19		48		21		37	63	10	5		3	1440		12
20	1	27		24		32	60	4	8		3	1440		
21	1	33	1	21		22	37	5	5		4	1440		
22	1	37		33		31	42	6	4		4	1440		
23	2	53		12		32	54	6	5	3	4	1440		
24	2	47		26		28	56	4	2	1	5	1440		
25	1	35		19		24	51	9	5	3	2	1440		
26		42		24	1	26	73	9	6	1	3	1440		
27	1	40		18		21	65	4	4			1440		13
28		58		22		27	59	11	1		3	1440		
29	4	42		18	1	14	57	5	2		2	1440		
30	1	44		23	1	10	49	14	2	4		1440		
31	1	30		13		21	65	2	1	1	2	1440		
APR 1	6	47		7		35	63	24	6	2	4	1440		
2	2	41		22		21	41	4	5	2	1	1440		6
3	4	34		19		22	41	5	2		8	1440		5
4	1	24	1	13		19	34	14	2		1	1440		
5	2	39		21		26	79	7	6		3	1440		6
6	1	56		30		18	69	12	5	8		1440		40
7	1	52		21		43	63	11	9		4	1440		37
8	1	56		15		18	68	3	3	1	4	1440		
9	1	64		12	1	29	65	2	2		1	1440		
10	3	70		5	2	20	55		4	3	4	1440		
11	3	50		2		11	75		2	1		1440		
12		77		19		20	70		1		2	1440		56
13	12	45		2		14	56	4	5		1	1440	4	
14		56		4		14	46	8	13	4	1	1440		50
15		49		24		23	61	7			3	1440		
16	18	53	3	5	1	29	58	16	1			1440		
17	5	34		2		18	37	13	1			1440		15
18	5	37		6		19	48	6	4	3	1	1440		
19	1	50	1	7		23	64	3	4	2	1	1440		23
20	1	26				28	52	4	2	2		1440		3

KILAUEA SUMMIT					KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)				
DATE 1993	SHORT PER. CALD.	LONG CALDERA A	PERIOD B	30 C	30 KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL. INT. DEEP			MAUNA LOA
APR 21	3	55		5		22	52	4		2	2	1440			
22		61		3		31	42	1	5		1	1440			9
23	3	73		10		30	63	1	4	1	1	1440			
24	3	66		3		38	55	8	4	1	1	1440			
25	1	45		12		45	71	11	2		1	1440			
26		37		2		27	74	11	7	5	2	1440			
27	1	55		4		38	70	5	4	2	8	1440			
28	9	16	2	6		60	73	3	4	5		180			
29	2	52		3		20	51	6	2			1440			
30	1	38		3	1	24	59	12	14			1440			
MAY 1	3	41		1		16	42	5	2		2	1440			
2	1	34				21	29	6	1		3	1440			
3	1	44		1		30	55	5	1		5	1440			
4	1	30		6		26	47	2	9	3	3	1440			
5	1	74		3		26	74	11		1	1	1440			
6	7	73		9		17	84	12				1440			
7		40		13		38	65	5		3	3	1440			
8	1	43		14		30	62	3	3		4	1440			9
9		39		11		22	62	8	2		4	1440			
10	1	47		15	2	13	67	13	10		1	1440			
11	2	35	1	2		30	64	10	2	1	2	1440			
12	1	43		14		22	71	14	9	3	5	1440			8
13		46		5		24	55	4	7	3	5	1440			15
14	2	53		7		26	51	2	4	3	5	1440			
15	1	35		4		16	40		3	2	3	1440			
16	3	29		2		23	27		8	1	3	1440	4		16
17	2	39		2		19	36	14	4	1	1	1440			
18	3	31		5	1	22	32	10	11	2	5	1440			
19	7	25		6	1	23	27	13	6	2	2	1440			27
20		41		5		35	53	3	3	1	2	1440			5
21		44		3	1	48	62	5	5	2	2	1440			2
22	4	32		28		22	48	3	4		4	1440			
23	2	47				31	49	10	5		1	1440			
24		46		7		19	55	10	5	1	2	1440			10
25	1	30		2	1	22	44	12	5	3	2	1440			21
26	4	34		9		23	53	5	2		1	1440			
27	2	48		52		18	65	8	2	1		1440			
28	1	44		58		27	42	9	7	5		1440			
29	1	45		46		25	48	12	2			1440			
30	1	50		1		26	55	11	6	5		1440			
JUN 31		51		18		22	61	5	2		2	1440			
1	7	50	4	39		15	46	3	2	1	1	1440			
2	1	44		40		27	31	3	1		1	1440			
3		37		14	1	25	44	3	3	1	6	1440			
4	2	47		3		22	61	7	3		6	1440			52
5	2	41		4		23	49	8	1	4		1440			
6	2	45				16	36	8	3	1	1	1440			
7	5	54		3		31	229	3	8		2	1440			38
8	6	41		11		23	90	4	8		2	1440			
9	5	61		12		19	61	9	4		1	1440			15
10	5	74		13		36	69	11	3	2	1	1440			
11	1	33		6		16	52	3	4		4	1440			
12	4	38		2		25	38	5	1	1	2	1440			
13	4	38		69		34	54	3	5		1	1440			
14	6	37		25		32	71	13	6	2	3	1440			

KILAUEA SUMMIT KILAUEA FLANK MAUNA LOA TREMOR (MINUTES)

DATE 1993	SHORT PER. CALD.	LONG PERIOD CALDERA			30 KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA			MAUNA LOA
		A	B	C								SHAL.	INT.	DEEP	
JUN15	2	64		7		28	44	10		1	1	1440			
16	2	69		2	1	27	63	3	3	1		1440			
17		108		8	1	26	51	5	4	1	6	1440			
18	2	92		56		17	50	7	4	1	2	1440			
19		167		53		21	44	15	4		1	1440			
20	1	40		23	1	17	65	6			4	1440			
21		44		13	1	17	67	7	3		2	1440			
22	3	39	1	6		26	60	7	1		1	1440			
23	1	49		6		36	45	2	3		3	1440			
24	1	719		3		18	36	3	6	3	2	1440			
25	1	148		4		18	65	4	1	1		1440			
26	2	268		6		17	43	10	1		2	1440			
27	1	117		15	1	40	41	7	1			1440			
28	5	62		26		20	58	19	1		8	1440			
29	3	26		16		27	51	6	1	1	1	1440			
JUL 30	1	32		12		29	60	8	1	3	2	1440		25	
1	1	49		5		26	42	4	1		2	1440			
2	2	31		6		36	40	9	3	1	3	1440		8	
3	1	27		10		29	56	6	3	2	2	1440		35	
4	4	38		17		30	66	8	1		4	1440	4		
5	3	43		14		25	63	5	1	1	4	1440	9		
6	5	51		15		26	49	14	1	1	1	1440	6		
7	2	38		11		21	60	4	3		5	1440			
8		35		9		13	43	7	3		2	1440		11	
9	5	38	2	15		23	57	1	46	2	3	1440		25	
10	5	60	1	16		19	47	6	9			1440		18	
11	2	66	3	22		34	48	6	29		5	1440			
12	2	44		25		27	49	11	48	1	3	1440		40	
13	2	60		5	1	26	45	4	69		3	1440		3	
14	4	43	1	5		28	49	9	36		4	1440			
15	1	51		6		26	43	3	24	1	1	1440			
16	2	38		12		15	33	5	17		2	1440			
17	1	46		3		14	46	4	13	3	2	1440			
18	3	57		11		17	48	5	15		2	1440			
19	4	38		7		33	227	24	9			1440		9	
20	1	34		21		22	36	7	7			1440			
21	1	27		11		23	30	5	5		3	1440			
22	6	137		7		18	68	5		9		1440			
23	12	130	1	5		11	90	5	1		1	1440			
24	10	73	1	12		18	65	5	3			1440			
25*															
26*															
27	9	67		14	1	17	55	27	6	2	2	1440			
28		74		13		22	46	12	8		3	1440			
29		61	1	8		24	21	5		3		1440			
30		36		8		14	46	11	7	1	4	1440			
31	3	37		1		14	52	17	1		1	1440			
AUG 1	2	37		17		20	35	11	1		3	1440			
2	3	50		21		25	57	4	3	2	1	1440		7	
3		43	1	10		26	48	8			3	1440		12	
4	1	51		6		16	37	4	6		2	1440	3		
5	2	161		11		35	46	14	2		2	1440			
6	1	249		6		20	45	7	3		5	140		3	
7	8	500		2		14	39	9	2		1	1440		11	
8	1	389		3		16	54	7	2		3	1440			

KILAUEA SUMMIT KILAUEA FLANK MAUNA LOA TREMOR (MINUTES)

DATE 1993	SHORT PER. CALD.	LONG PERIOD CALDERA			30 KM	KAO. & SW RIPT	UP. EAST RIPT	LOW. EAST	SHORT PER.	LONG PER.	NE RIPT	KILAUEA			MAUNA LOA
		A	B	C								SHAL.	INT.	DEEP	
AUG 9	5	224		5		17	44	3	5	5		1440			
10	1	39		1	2	30	46	9	5	2	1	1440			
11	8	40	1	11		27	54	9	4		2	1440			
12	6	39		22		38	45	11	4	1	1	1440		2	
13	3	27		4		17	49	12	2		4	1440		23	
14		34		16	1	21	37	6	1		2	1440			
15	4	21		16		18	44	6	1		2	1440			
16	4	39		32		25	50	13	3	1	1	1440			
17	2	25		18		21	54	17	5	2	2	1440			
18	3	39		11		31	41	10	1	2		1440			
19	3	67		8		25	36	11	9		1	1440			
20	2	46		23	1	19	44	7	1		3	1440			
21	3	31		13	1	13	67	12	1			1440			
22	4	26		251		19	49	8	2		3	1440			
23		23		283		18	57	13	4		5	1440			
24	5	29		132		32	41	19	7	1	3	1440		4	
25		41		125		20	57	14	7	10		1440		4	
26	3	22		68		21	45	13	4		2	1440			
27	4	21		13	1	26	38	11	5		1	1440			
28	4	31		20		18	40	5	6		2	1440		26	
29	3	31		11		25	49	8	2		1	1440			
30	4	29		8		23	36	9	7	1	3	1440	10		
31	5	38	3	5		16	30	4	2		1	1440			
SEP 1	2	43		13		14	52	8	1	1		1440		36	
2	6	52		18		10	40	4	3	3	4	1440			
3	3	110		15		28	45	9	3	2	4	1440			
4	6	129		11		21	36	6	4		1	1440		10	
5	2	130		14		21	26	4	3	1		1440		12	
6	1	38		7		12	30	5	3	2	2	1440			
7		31		9	2	13	46	7			1	1440			
8	5	20		31		17	33	7			4	1440		11	
9*															
10	8	23		7		21	17	1	1			1440			
11*															
12	3	24		10	1	28	27	1	7		1	1440		6	
13	4	32		34		22	61	3	6	2	3	1440			
14	1	40		49		26	42	6	9	4	2	1440			
15	6	31		23		29	48	2	7	1		1440		5	
16	2	39		10		31	40	2	5			1440		7	
17	4	34		7		22	55	7	8		1	1440		5	
18	5	27		11		11	57	8	63		2	1440		16	
19	2	29		16	4	23	53	5	3		7	1440		10	
20		23		15		20	47	13	9		4	1440			
21	5	45		19		18	75	5	7		2	1440		5	
22	1	43		17		17	63	5	9		6	1440			
23	1	30		19		17	45	7	7		5	1440			
24	2	52		10		33	73	10	30	1	6	1440		4	
25	4	60		30		24	58	4	25	1	4	1440			
26	12	137		13		32	62	4	7	4	1	1440		3	
27	5	84		24		39	59	9	3	2	2	1440		20	
28	1	44		11		19	60	7	3		8	1440			
29	4	28		6		16	52	6	5	1	6	1440		58	
30	1	53		8		31	43	6	3	4	1	1440			
OCT 1	2	42		17		32	76	9	17	1	2	1440		61	
2	3	43		10		18	70	4	5		3	1440			

KILAUEA SUMMIT KILAUEA FLANK MAUNA LOA TREMOR (MINUTES)

DATE 1993	SHORT PER.	LONG CALDERA	PERIOD	30 KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA			MAUNA LOA
	CALD.	A	B					C	PER.	PER.	RIFT	SHAL.	INT.	
OCT 3	2	51	13		18	52	4	3	1	2	1440			
4	2	48	50		22	65	11	10		1	1440			
5	2	37	140		33	46	9	11	1	3	1440			
6	3	34	131		12	47	10	7		2	1440			
7	2	32	51		25	58	3	3		2	1440			
8	4	23	47		25	59	12	4	3	1	1440			
9	4	39	51		21	76	4	1			1440			
10		34	15		26	53	2	6	2	2	1440			
11	5	45	16	1	23	58	5	4			1440			
12	3	34	13		40	53	4	3		1	1440		96	
13	1	27	14		31	58	6	5		3	1440			
14	5	52	32		24	53	4	1		2	1440		32	
15	1	38	22		44	50	2	2		6	1440			
16	11	46	3		30	56	2	6			1440			
17	4	55	1	8	36	37	2	3		4	1440			
18	2	43	9		18	44	2	3			1440		57	
19	2	41	7		35	58	8	3	1	4	1440		17	
20	4	29	8	1	14	26	2	4		2	1440			
21	4	38	8		15	29	3	1	1	1	1440			
22	5	35	63		33	37	3	1		3	1440			
23	7	21	8	1	33	29	1	4		3	1440		11	
24	9	85	21	2	36	27	7	2	1		1440			
25	11	67	21		16	27	4			1	1440			
26	2	32	18		14	32	3			1	1440			
27	1	42	44		27	29	3			3	1440			
OCT28		5	31		38	47	4	4		3	1440			
29	2	38	18		31	53	1	4		1	1440			
30	4	39	1		59	40	3				1440		34	
31	2	28	15		26	54	4	1			1440			
NOV 1	1	28	19		40	53	3	4	3	1	1440		8	
2	1	39	9		28	46	3	5	5	4	1440		13	
3	7	69	5		29	60	1	6	1		1440		4	
4	2	92	10	1	28	36	7	6		3	1440		4	
5	2	48	9		34	55	15	2	1	1	1440		4	
6	6	55	28	2	37	48	2	7		1	1440		12	
7	5	29	18		35	60	6	8	1		1440		3	
8	4	29	13		27	47	3	6	2	1	1440		4	
9	8	28	21		24	49	2	3	4	2	1440	14	3	
10	4	27	31		43	40	1	6		2	1440		26	
11	3	25	5		27	39	5	7	1	1	1440		23	
12	2	20	2		27	67	6	10	2	1	1440			
13	5	37	3		20	43	5	13	1	1	1440			
14	4	44	1	3	26	43	2	4		2	1440			
15	2	42	16		36	37	7	4	1	3	1440			
16		25	5		30	45	5	6		4	1440			
17		14	8		36	35		1		3	1440		39	
18	4	14	5		31	37	2	8	2		1440			
19	2	12	8		16	41	4	5	1		1440	3		
20		11	3		13	36	3	6	2		1440			
21	1	13	5		30	64	5	4			1440			
22		7	8		31	73	5	3	2		1440	143		
23	7	107	23		11	90		6	3		1440			
24	6	41	4		47	72	6	4	1	7	1440			
25	3	56	5		21	121	5	1	1		1440			
26	8	57	1		24	82	3	6		2	1440			

		KILAUEA SUMMIT			KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)		
DATE 1993	SHORT PER. CALD.	LONG CALDERA A	PERIOD B	30 KM C	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA		MAUNA LOA
											SHAL.	INT.	DEEP
NOV27		45		5	1	25	57	7	5	1	7	1440	
28	2	24		6		29	48	3	5	2	1	1440	21
29	2	43		1		38	36	7	6	9		1440	
30	2	37				28	42	7	6	2	3	1440	
DEC 1	3	49		9		31	27	10	2	5		1440	5
2	2	18		1		39	28	1	2	2		1440	2
3	2	28			1	30	35	8				1440	
4	6	49				16	36	3			1	1440	
5	6	57		1		20	45	1	1	3		1440	8
6	3	33		2		11	39	3				1440	
7		39		2		20	69	5	1			1440	
8	2	35		3		18	36	3	1	1	2	1440	
9	1	28		2		15	190	4	1		1	1440	
10	1	37		6		31	162	5	3	3	3	1440	26
11		39		6		36	35	5	1	2	1	1440	
12	4	34		151		32	36	5	1		3	1440	
13	1	39		262		22	43	7	5		1	1440	
14		52		58		28	46	6	5	1	3	1440	
15	2	40		39		20	49	9	4		2	1440	
16	2	42		6		18	27	5	3		4	1440	
17	3	40		7		35	65	6	4	1		1440	
18		31		3		29	48	3	3	1	1	1440	
19	3	45		5	1	32	55	5	5		1	1440	
20		28		4		25	49		2	1	2	1440	
21		28		5		15	65	5	9	5	2	1440	
22	1	30		6	1	31	55	7	9	3	1	1440	
23	2	39		5		24	120	5	3	2	2	1440	
24	3	36		3		28	66	5	5	2	3	1440	
25		39		12		34	72	3	2	2	4	1440	
26	1	38		1		28	52	6	4	2	1	1440	
27	3	78		2		17	53	4	11		2	1440	
28	3	40		2		17	64	15	1		1	1440	
29	6	35		13		19	61	3	6	1	7	1440	
30	4	31		4		22	70	4	2		1	1440	
31	4	31		9		20	63	3	12	4		1440	

*Data incomplete - station(s) or recorder not in operation.

Table 4. Names and coordinates of regions used for classifying earthquakes.

All earthquakes locate in one of the following groups, identified by a numerical class or three-letter code:

—Shallow:

- 1 SNC - Shallow north caldera (0-5 km)
- 2 SSC - Shallow south caldera (0-5 km)
- 3 SEC - Shallow east caldera (0-5 km)
- 4 SER - Shallow east rift zone (0-5 km)
- 5 SME - Shallow middle east rift zone (0-5 km)
- 6 KOA - Koa'e fault system (0-5 km)
- 7 SSF - Shallow south flank (0-5 km)
- 8 SLE - Shallow lower east rift zone(0-5 km)

—Intermediate depth:

- 9 SF1 - Kilauea south flank (5-13 km) (west end)
- 10 SF2 - Kilauea south flank (5-13 km)
- 11 SF3 - Kilauea south flank (5-13 km)
- 12 SF4 - Kilauea south flank (5-13 km)
- 13 SF5 - Kilauea south flank (5-13 km) (east end)
- 14 LER - Lower east rift zone (5-99 km)
- 15 MLO - Mauna Loa (0-13 km)
- 16 LSW - Lower southwest rift zones of Kilauea and Mauna Loa (0-13 km)
- 17 GLN - Glenwood (0-13 km)
- 18 SWR - Southwest rift zone (0-13 km)
- 19 INT - Intermediate caldera (5-13 km)
- 20 KAO - Ka'oiki (0-13 km)

—Deep:

- 21 DEP - Deep Kilauea (>13 km) (below regions 1-13, 17-19)
- 22 DLS - Deep lower southwest rift zone (>13 km) (below region 16)
- 23 DML - Deep Mauna Loa (>13 km) (below regions 15, 20)

—Outer regions, all depths:

- 24 LOI - Lo'ihl
- 25 KON - South Kona
- 26 HUA - Hualalai
- 27 KOH - Kohala
- 28 KEA - Mauna Kea
- 29 HIL - Hilo
- 30 DIS - Distant, everywhere else

Table 4 (continued). The latitude and longitude limits of the regions are given below. When the coordinates overlap, precedence is given as in the maps.

No.	Code	N. Lat.	S. Lat.	W. Lon.	E. Lon.
1	SNC	19 28.0	19 24.5	155 19.0	155 14.0
2	SSC	19 24.5	19 22.0	155 19.0	155 16.5
3	SEC	19 24.5	19 22.0	155 16.5	155 14.0
4	SER	19 26.0	19 20.5	155 14.0	155 07.2
5	SME	19 26.0	————	155 07.2	155 00.0
6	KOA	19 22.0	19 20.5	155 17.0	155 14.0
7	SSF	————	19 10.0	155 17.0	155 00.0
8	SLE	19 32.0	19 16.0	155 00.0	154 40.0
9	SF1	19 22.0	19 10.0	155 17.0	155 14.5
10	SF2	19 26.0	19 10.0	155 14.5	155 12.3
11	SF3	19 26.0	19 10.0	155 12.3	155 09.1
12	SF4	19 26.0	19 10.0	155 09.1	155 05.3
13	SF5	19 26.0	19 10.0	155 05.3	155 00.0
14	LER	19 32.0	19 16.0	155 00.0	154 40.0
15	MLO	19 35.0	19 19.0	155 35.0	155 19.0
16	LSW	19 19.0	18 40.0	155 43.0	155 25.0
17	GLN	19 35.0	19 26.0	155 19.0	155 00.0
18	SWR	19 22.0	19 10.0	155 25.0	155 17.0
19	INT	19 28.0	19 22.0	155 19.0	155 14.0
20	KAO	19 30.0	19 19.0	155 32.0	155 19.0
21	DEP	19 35.0	19 10.0	155 25.0	155 00.0
22	DLS	19 19.0	18 40.0	155 43.0	155 25.0
23	DML	19 35.0	19 19.0	155 35.0	155 19.0
24	LOI	19 10.0	18 40.0	155 25.0	155 00.0
25	KON	19 39.0	19 00.0	156 20.0	155 43.0
26	HUA	19 55.0	19 39.0	156 20.0	155 43.0
27	KOH	20 25.0	19 55.0	156 20.0	155 34.0
28	KEA	20 25.0	19 35.0	155 34.0	154 40.0
29	HIL	19 47.0	19 32.0	155 09.0	154 40.0

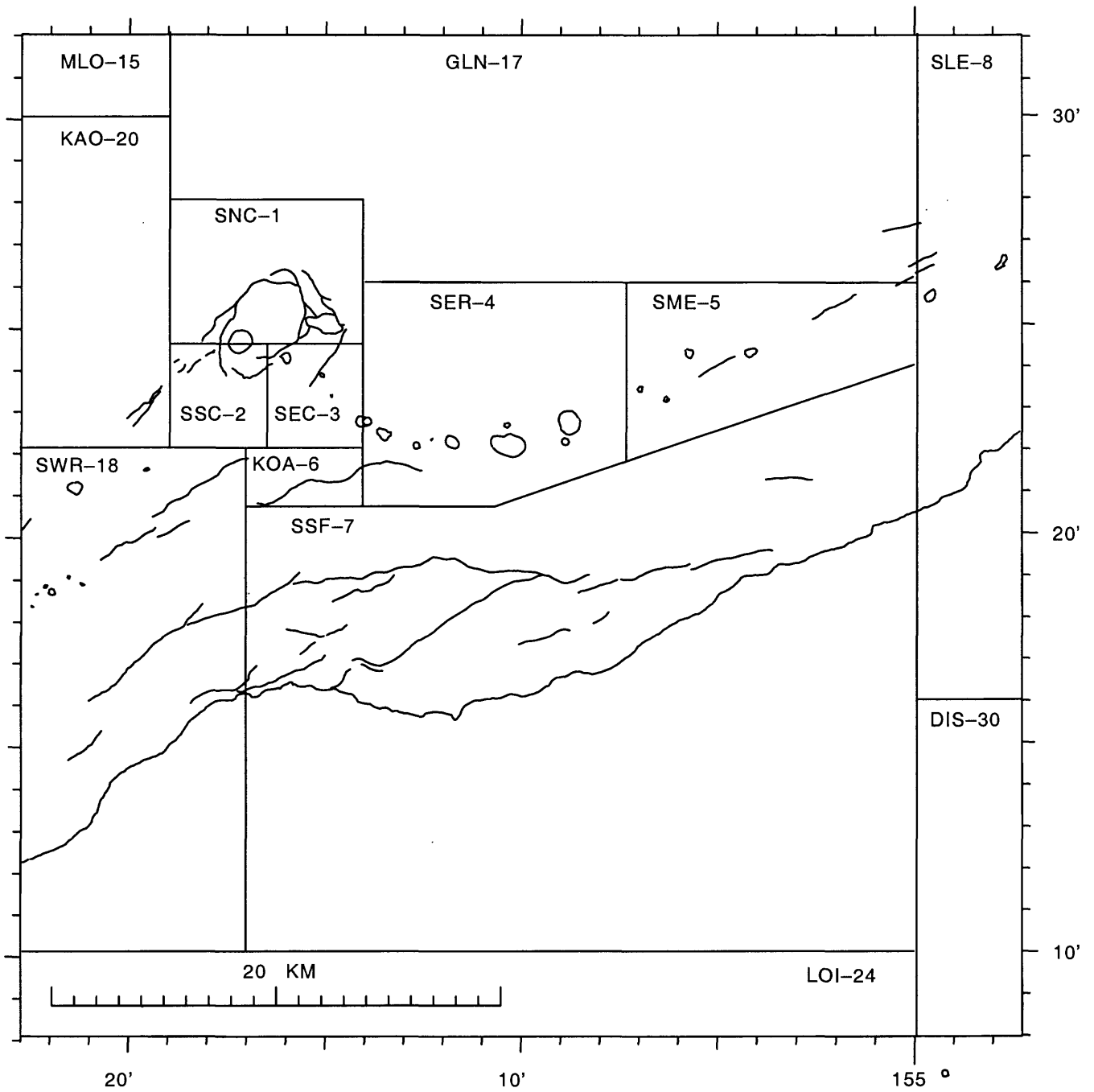


Figure 5. Earthquake classification, shallow (0-5 km deep), for Kilauea and the east flank of Mauna Loa.

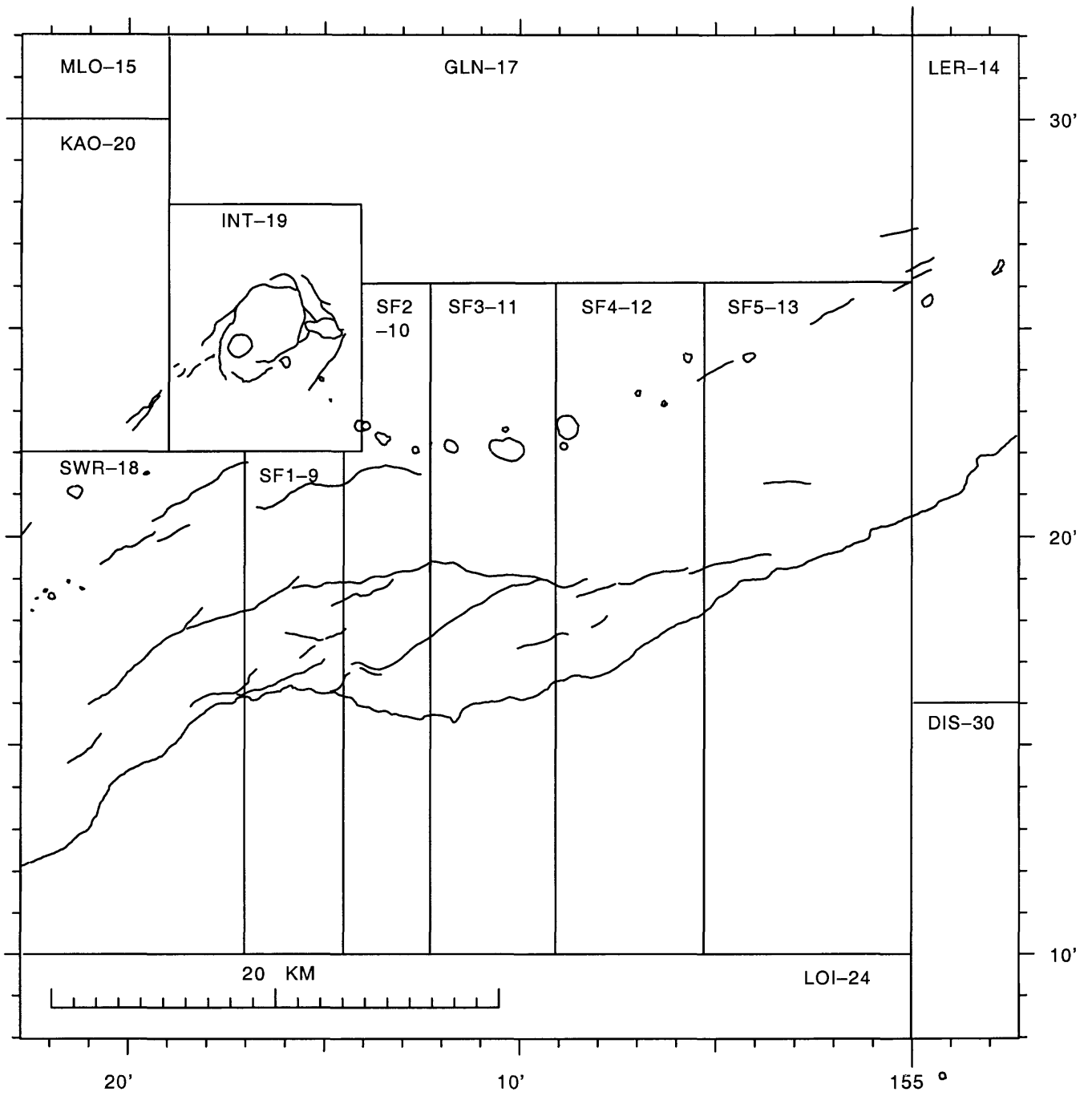


Figure 6. Earthquake classification, intermediate (5.1-13 km deep), for Kilauea and the east flank of Mauna Loa.

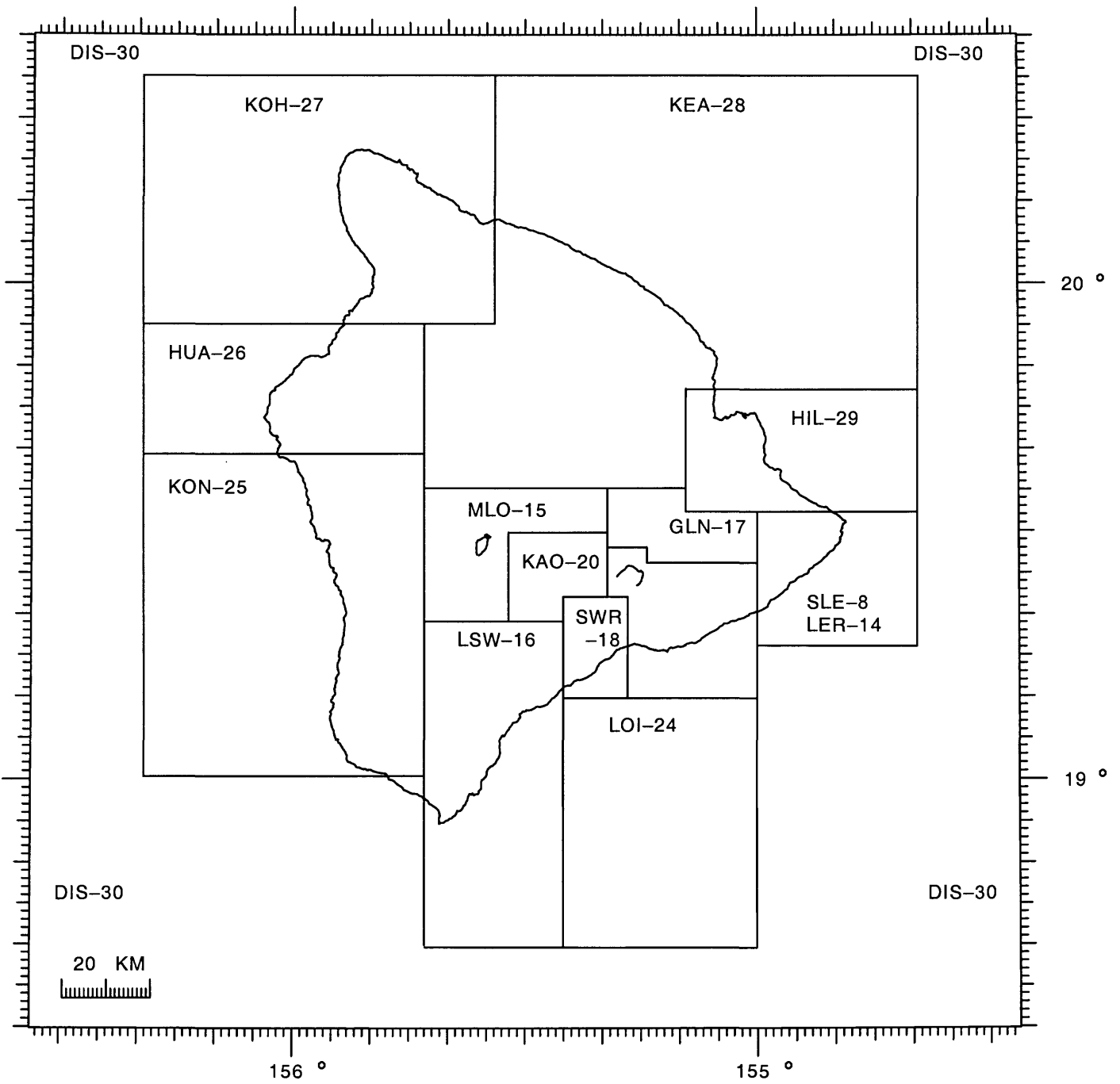


Figure 7. Earthquake classification, crustal (0-13 km deep), for the Island of Hawai'i.

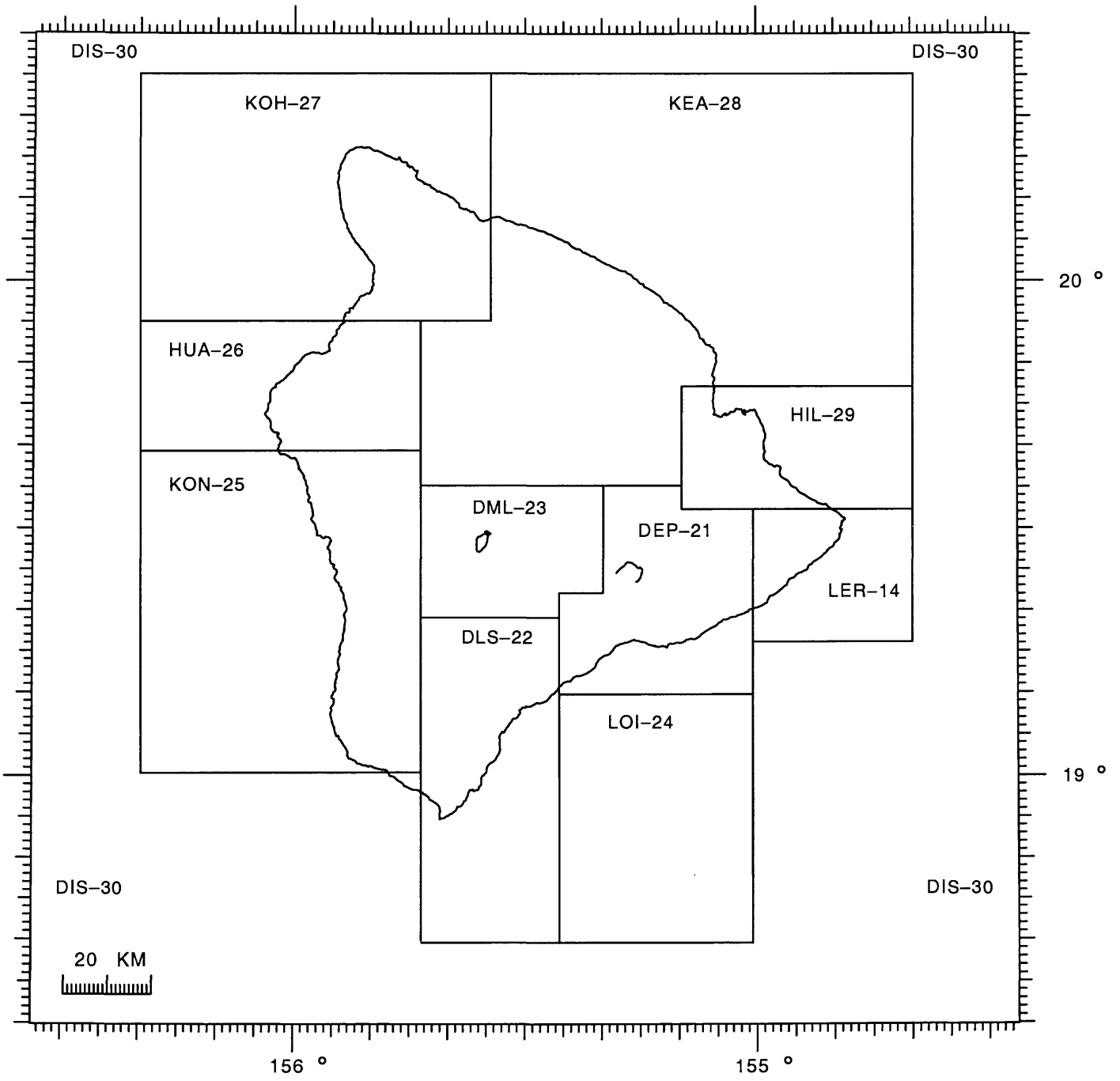


Figure 8. Earthquake classification, deep (greater than 13 km deep), for the Island of Hawai'i.

Figure 9. 1993 Earthquake locations, Hawaiian Islands, 0-60 km depth, $M \geq 3.5$.

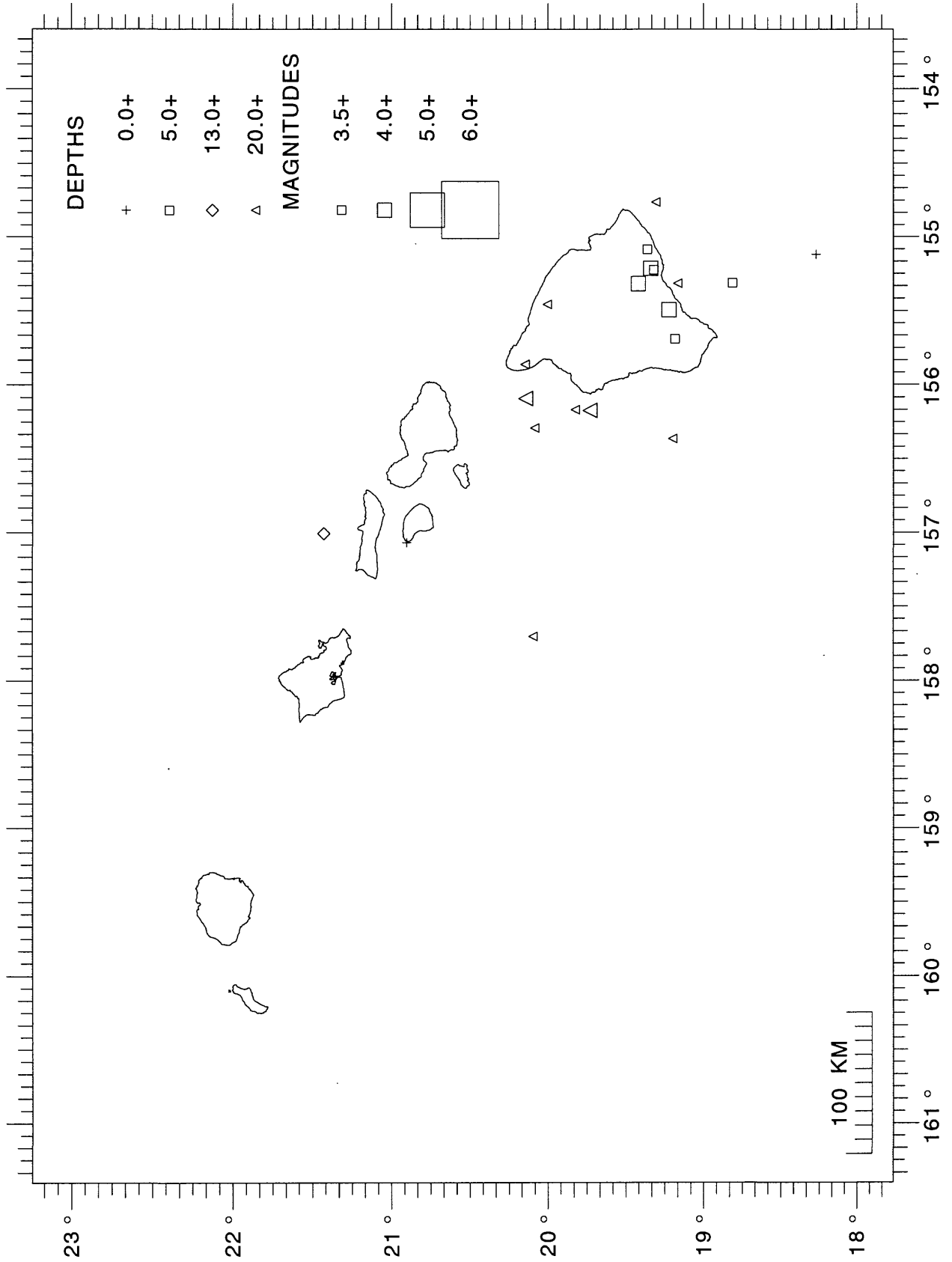


Figure 10. 1993 Earthquake locations, Hawai'i Island, 0-60 km depth, $M \geq 3.0$.

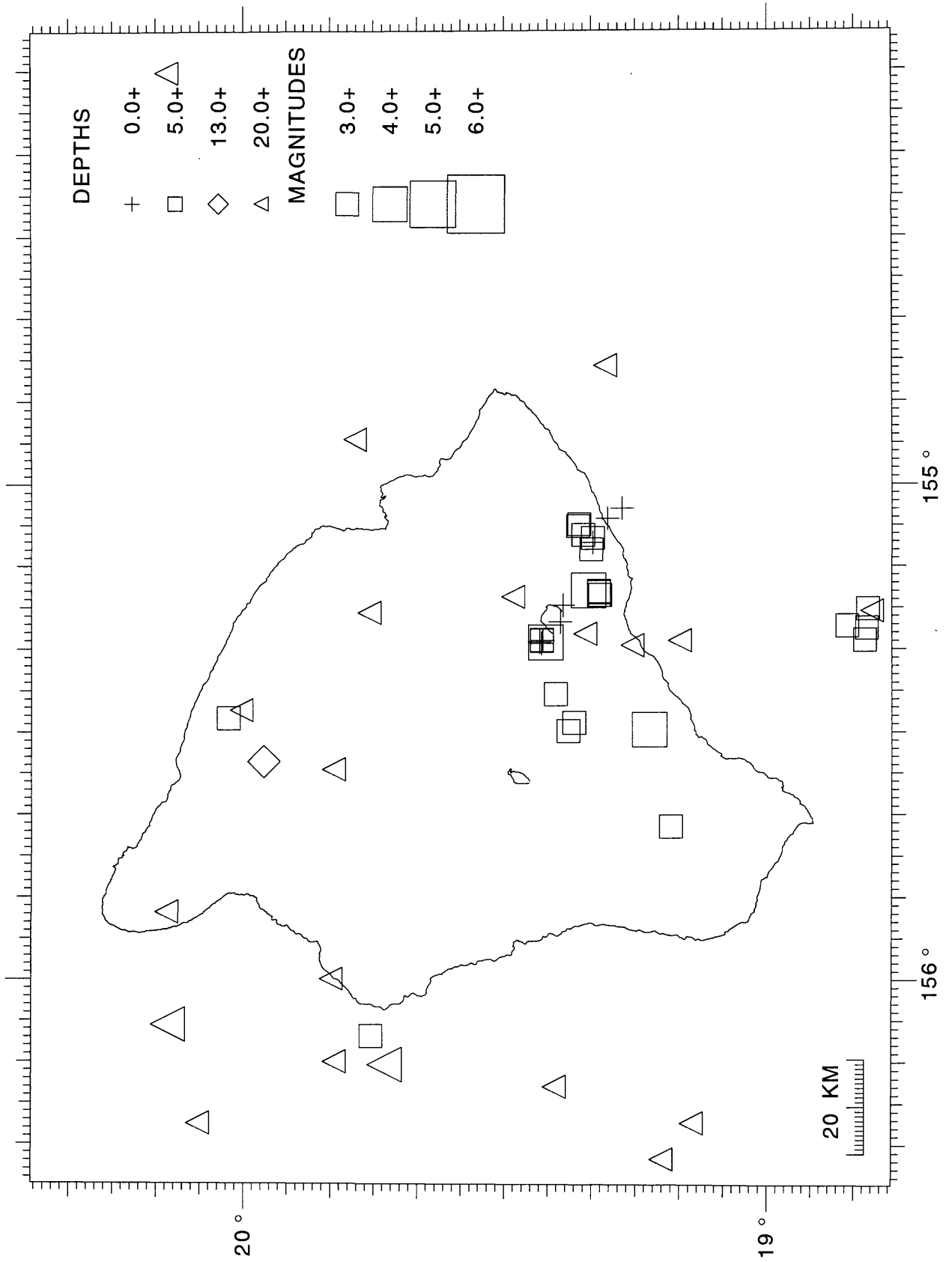


Figure 11. 1993 Earthquake locations, Hawai'i Island, shallow (0-5.0 km depth), $M \geq 2.0$.

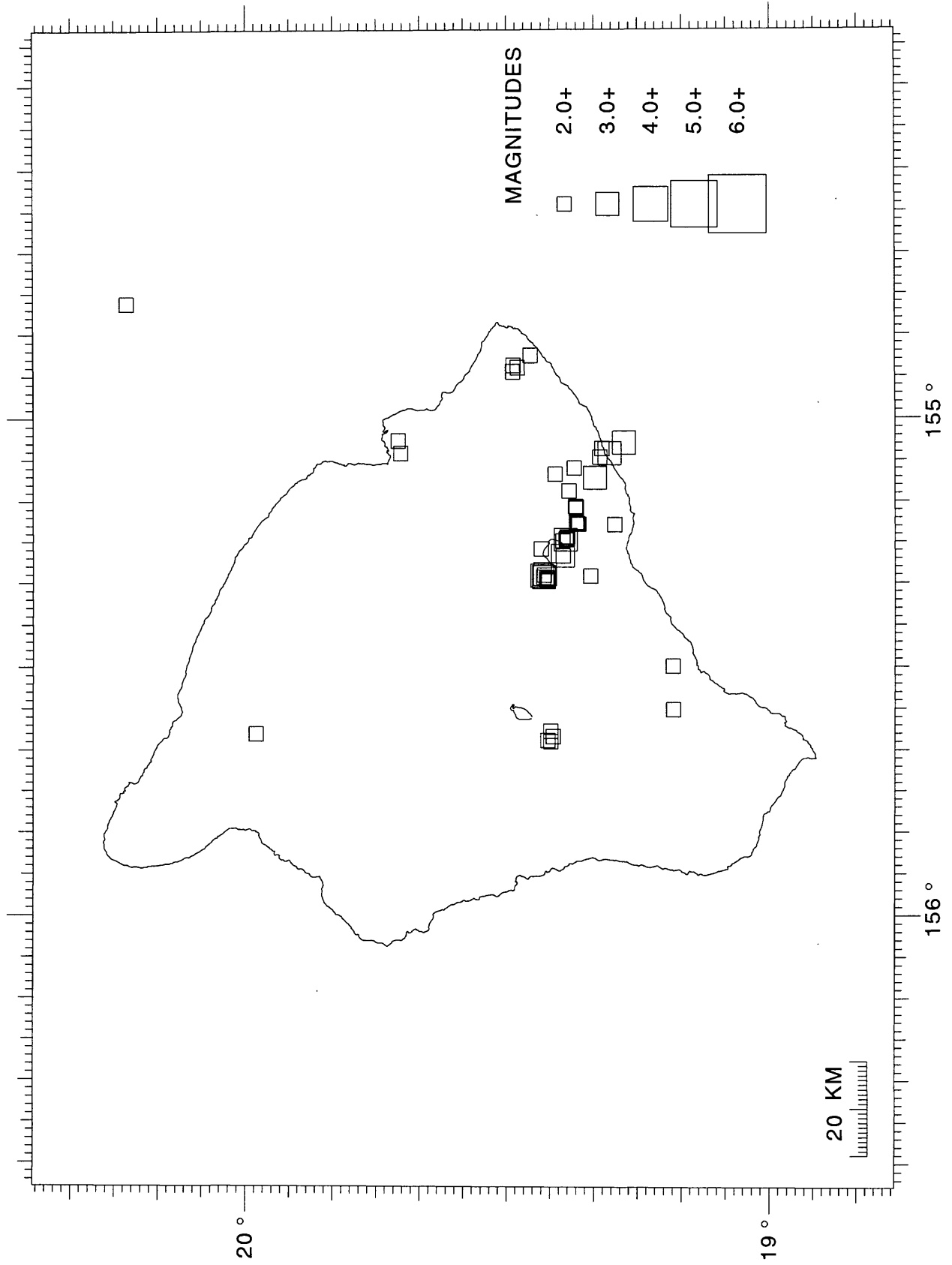


Figure 12. 1993 Earthquake locations, Hawai'i Island, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

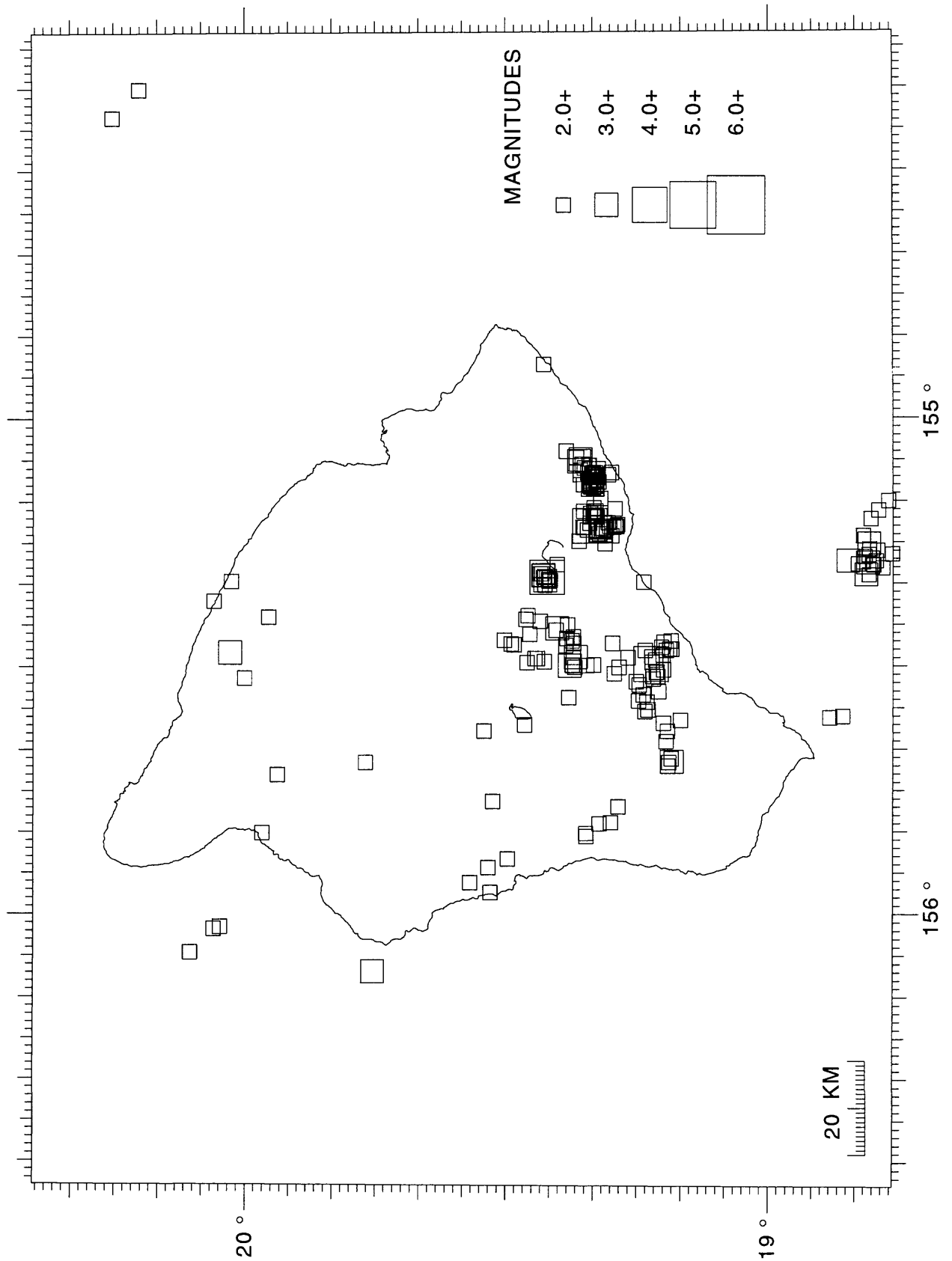


Figure 13. 1993 Earthquake locations, Hawai'i Island, deep (13.1–60.0 km depth), $M \geq 2.0$.

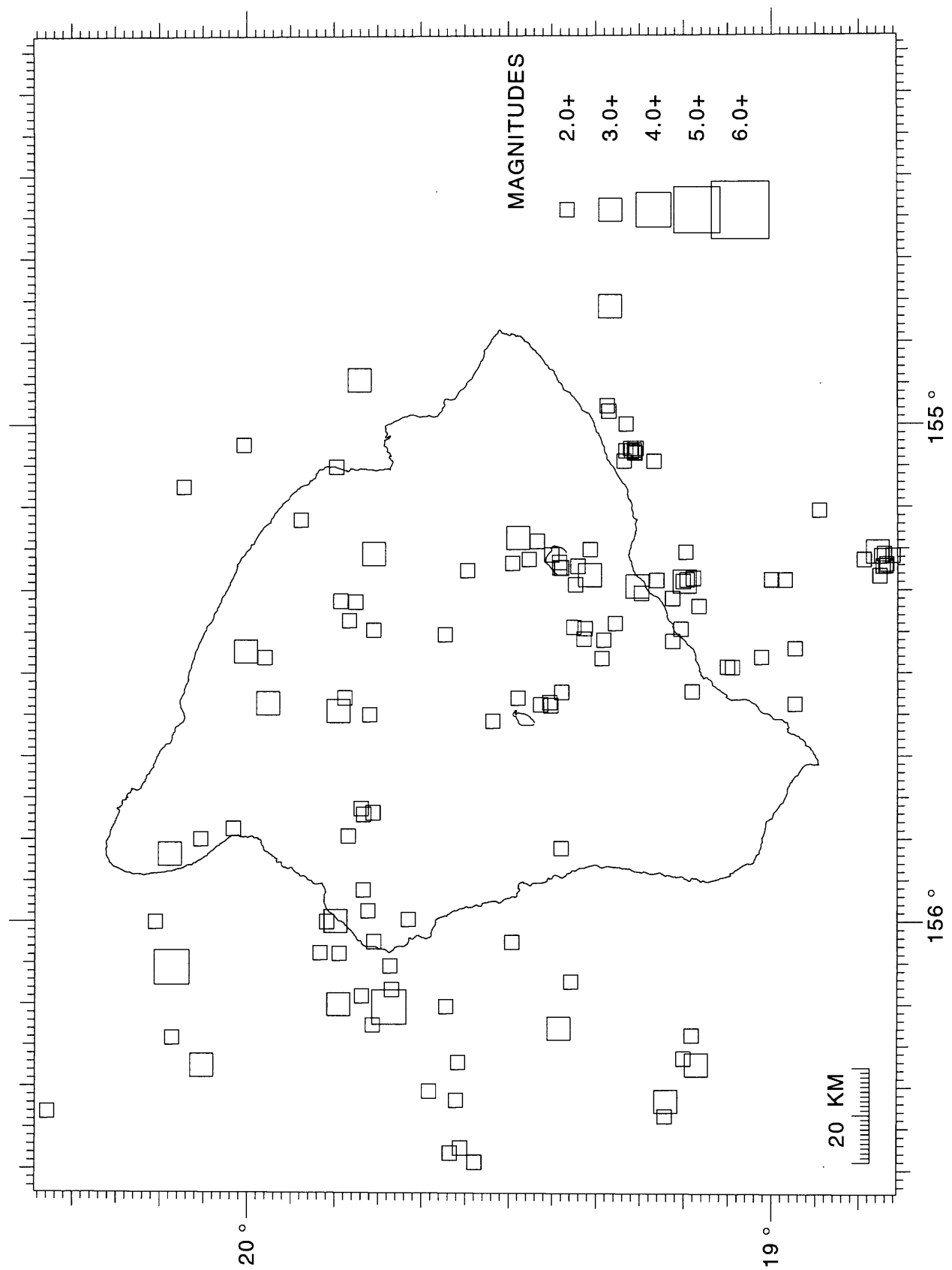


Figure 14. 1993 Earthquake locations, Kilauea summit, shallow (0-5.0 km depth), $M \geq 1.0$.

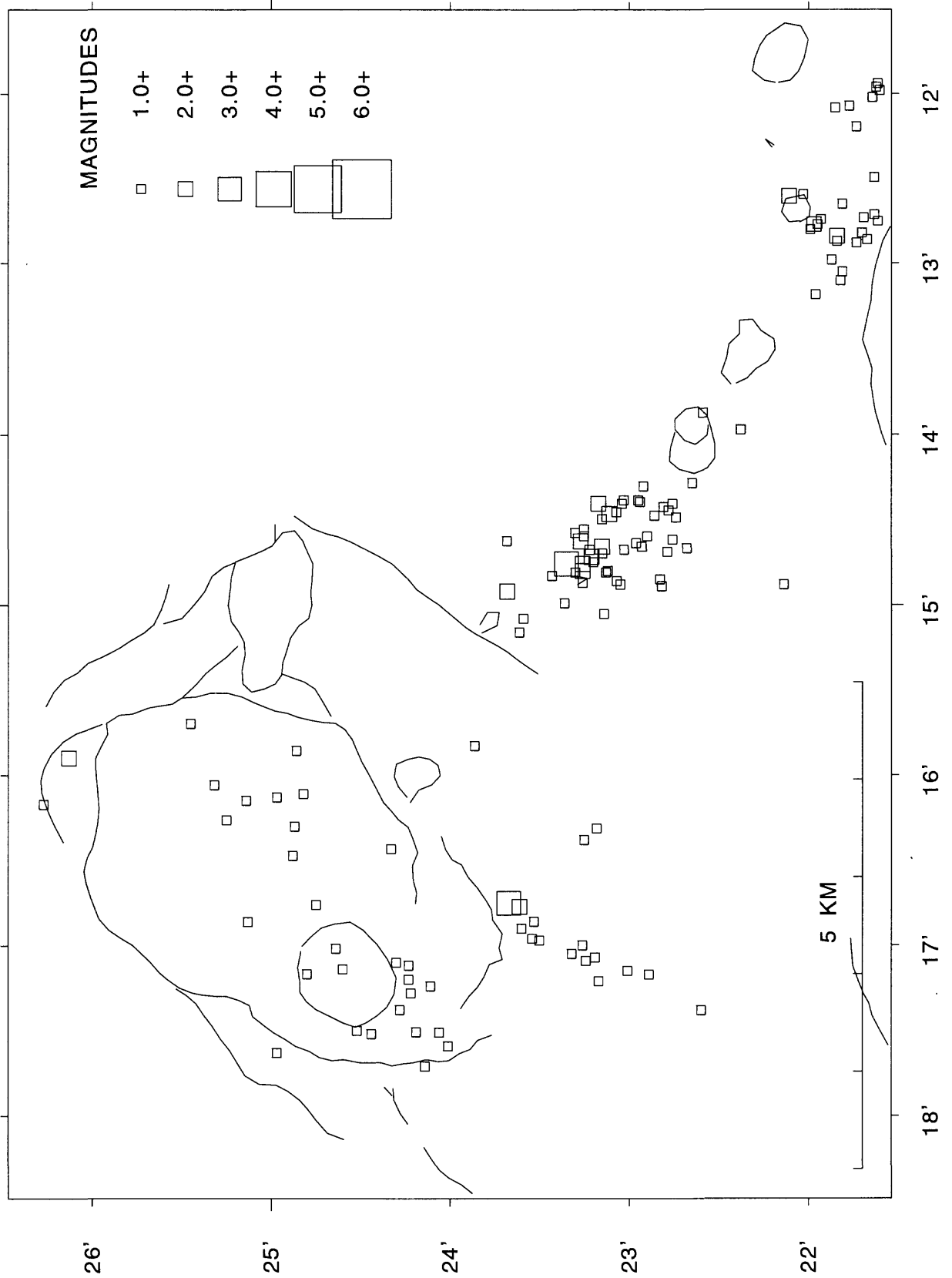


Figure 15. 1993 Earthquake locations, Kilauea summit, intermediate (5.1–13.0 km depth), $M \geq 1.0$.

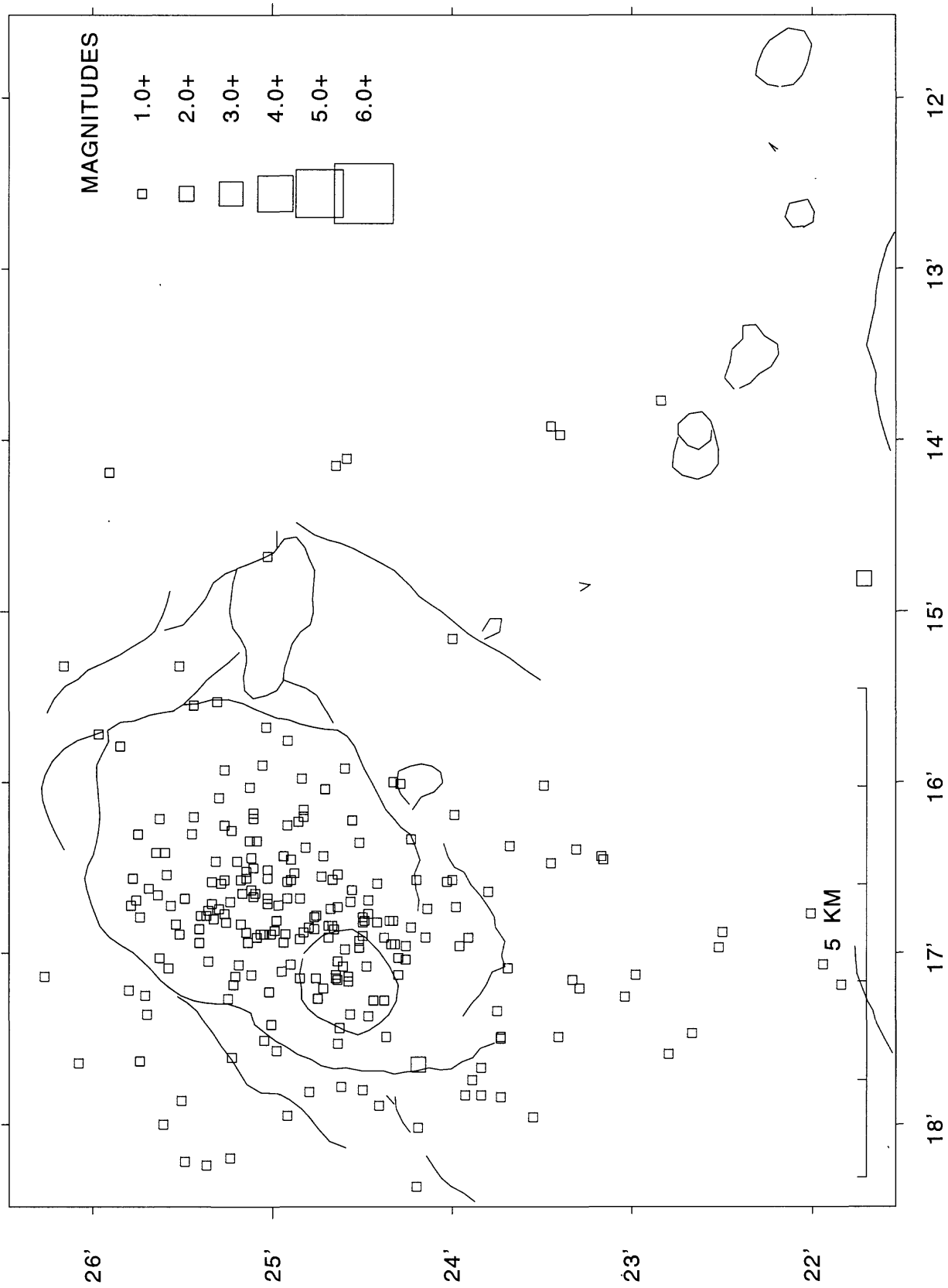


Figure 16. 1993 Earthquake locations, Kilauea summit, deep (13.1–60.0 km depth), $M \geq 1.0$.

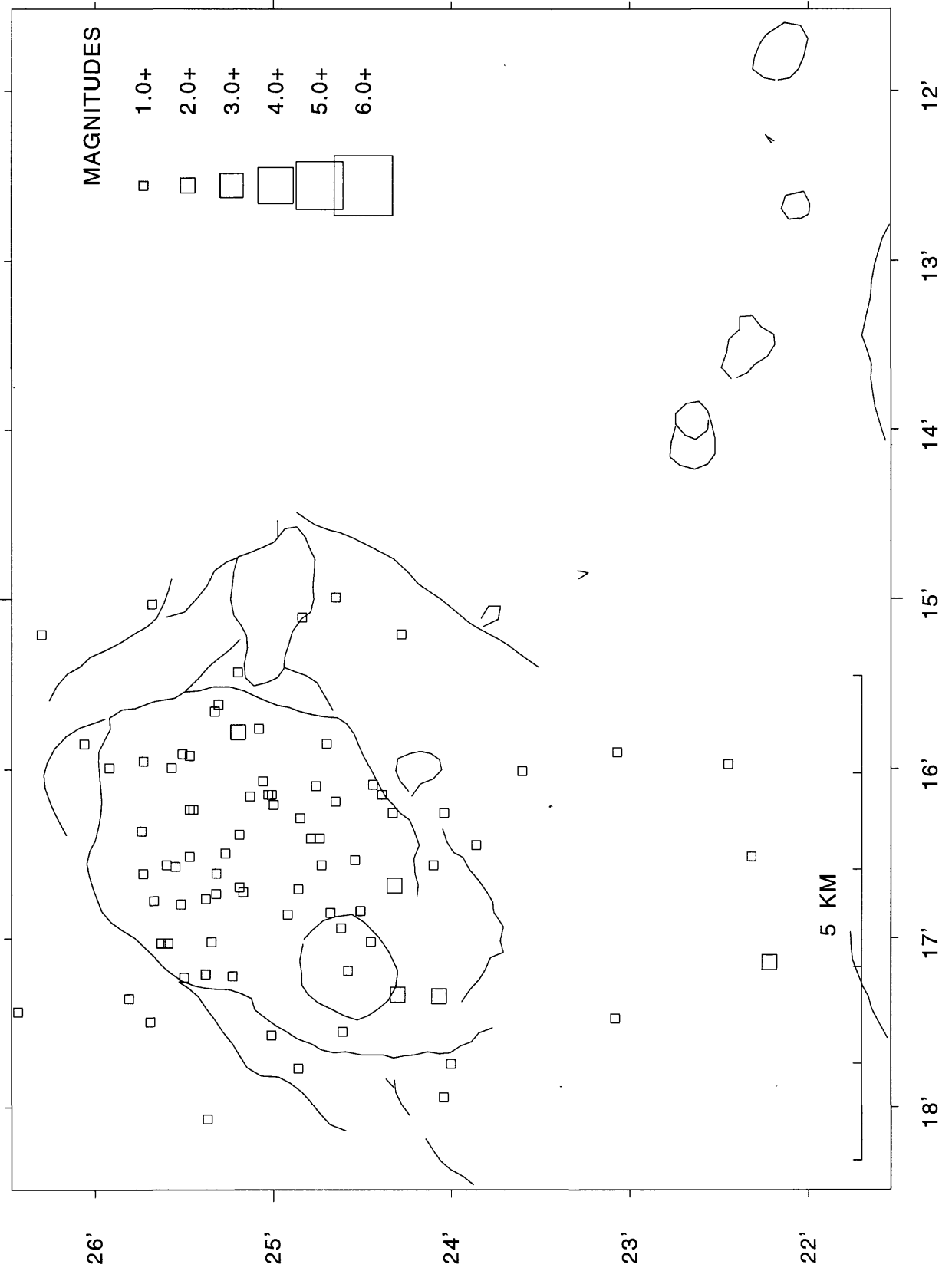


Figure 17. 1993 Earthquake locations, Kilauea south flank, shallow (0-5.0 km depth), $M \geq 2.0$.

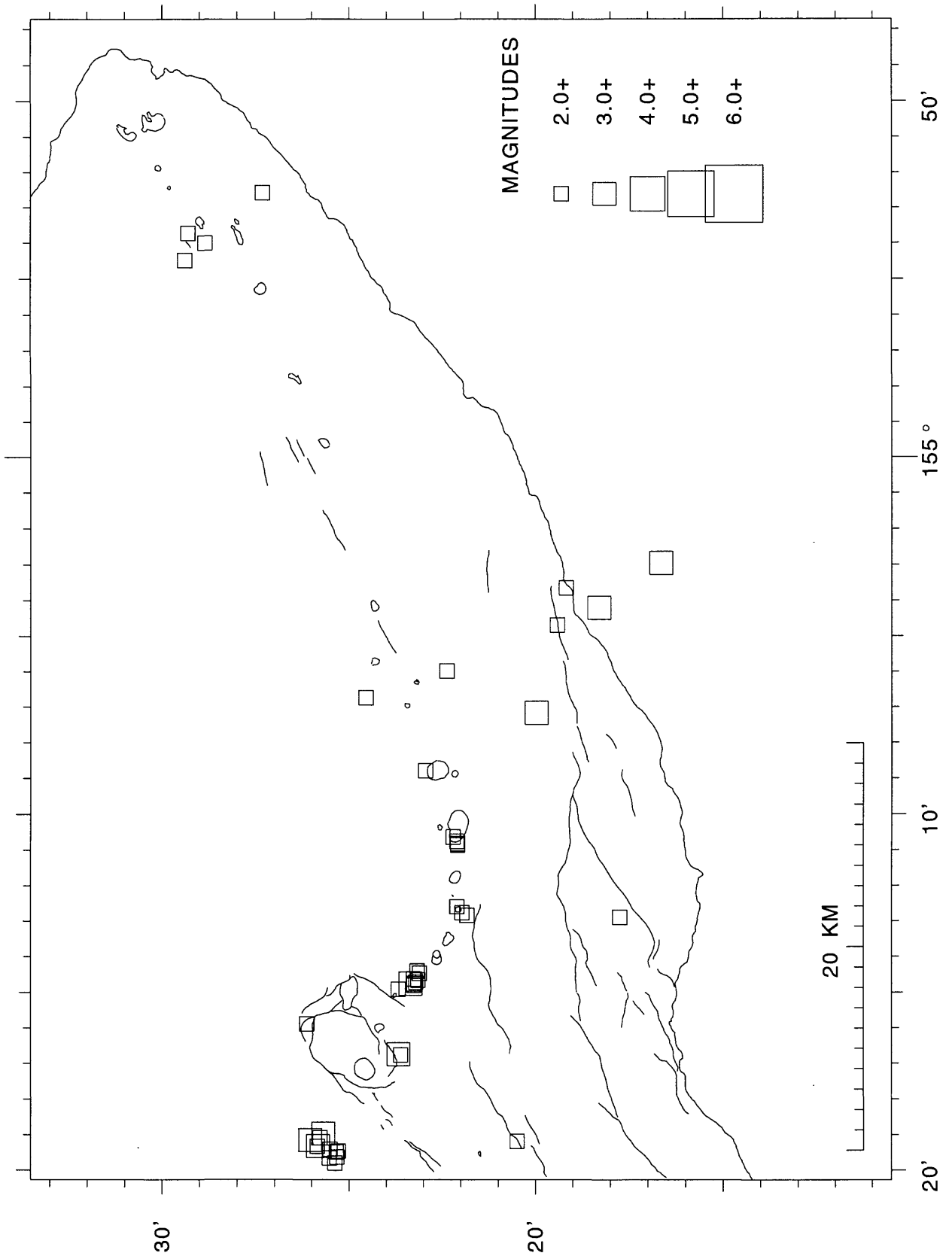


Figure 18. 1993 Earthquake locations, Kilauea south flank, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

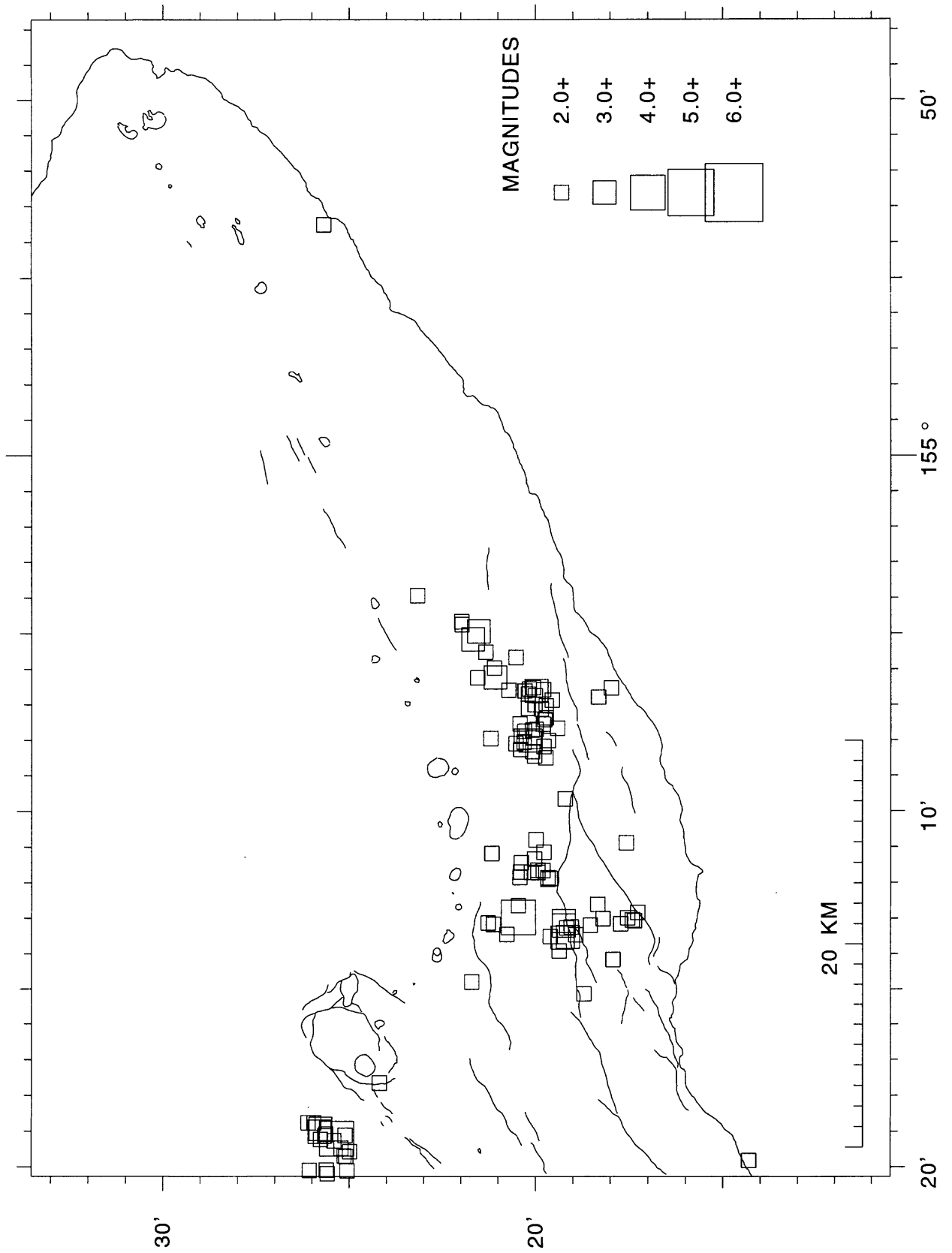


Figure 19. 1993 Earthquake locations, Kilauea south flank, deep (13.1–60.0 km depth), $M \geq 2.0$.

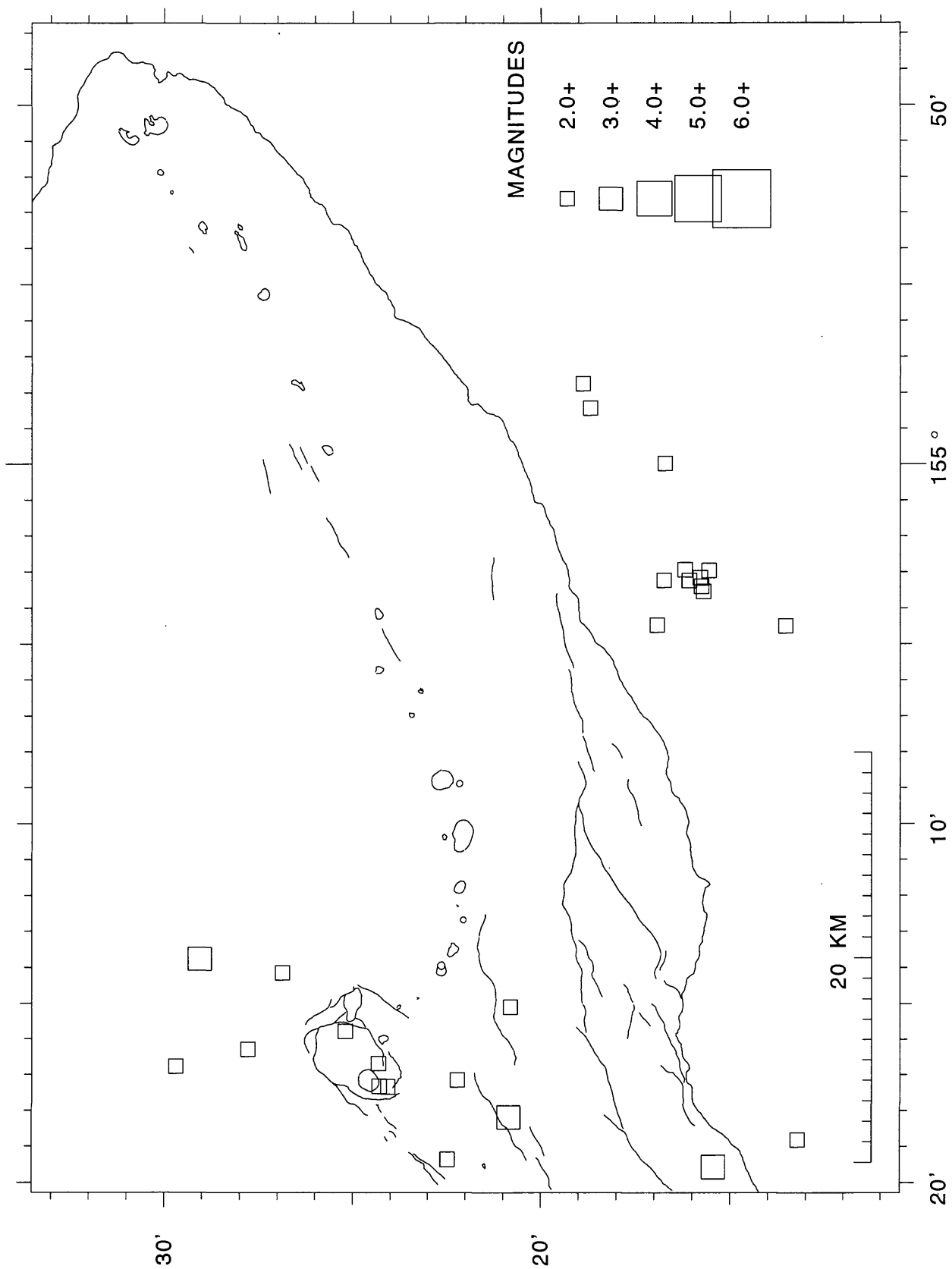


Figure 20. 1993 Earthquake locations, Mauna Loa summit, shallow (0-5.0 km depth), $M \geq 2.0$.

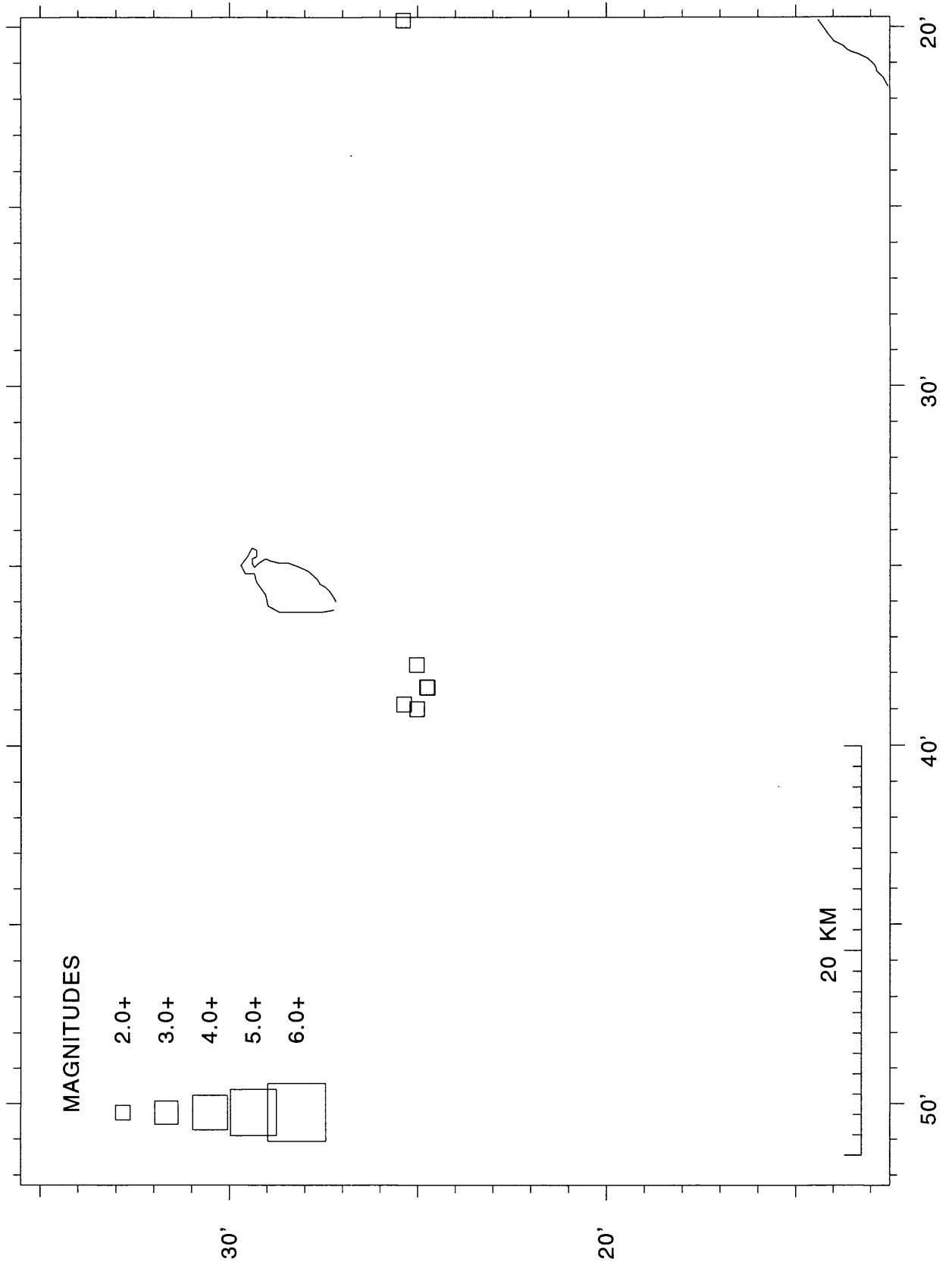


Figure 21. 1993 Earthquake locations, Mauna Loa summit, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

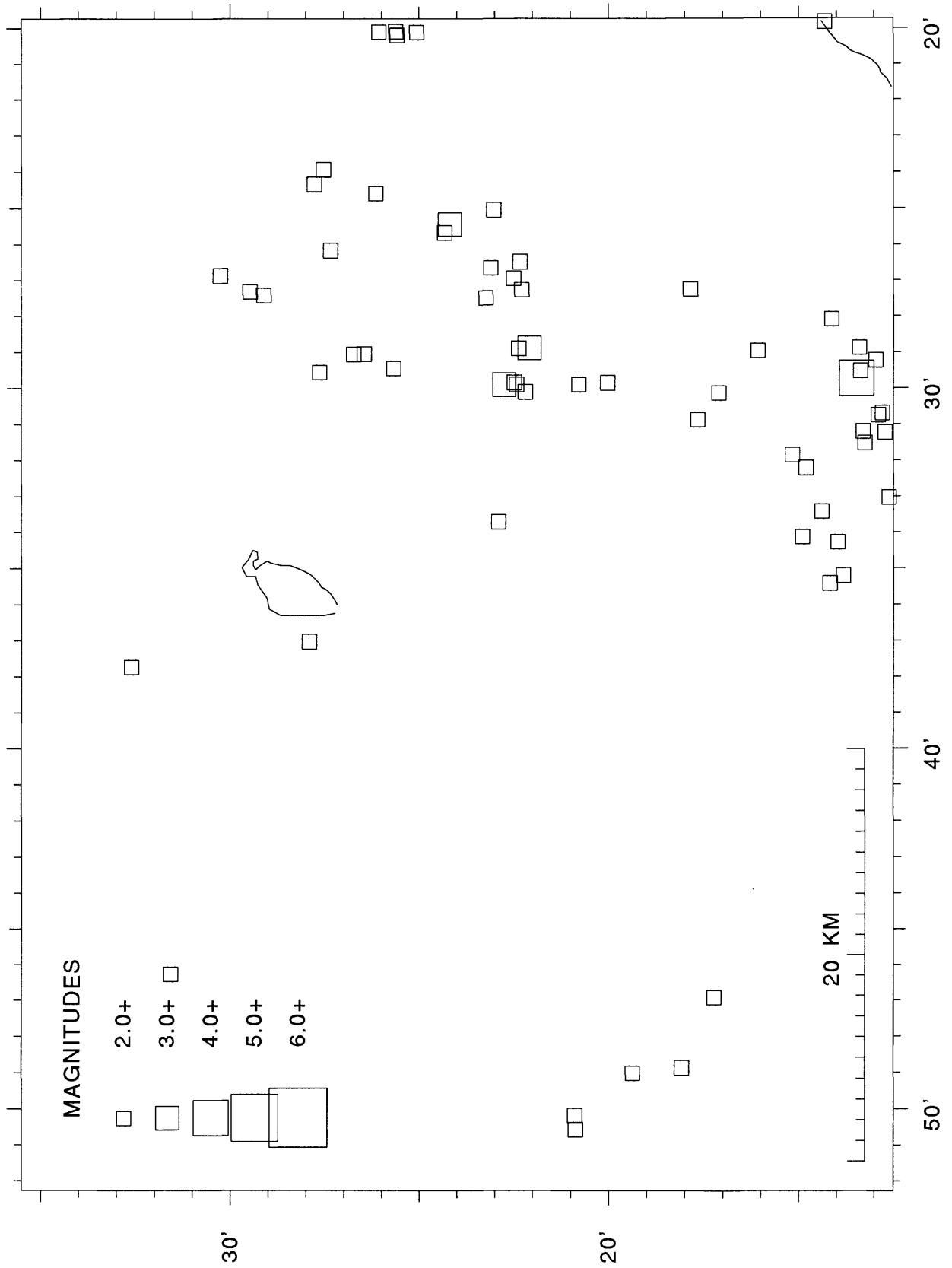


Figure 22. 1993 Earthquake locations, Mauna Loa summit, deep (13.1–60.0 km depth), $M \geq 2.0$.

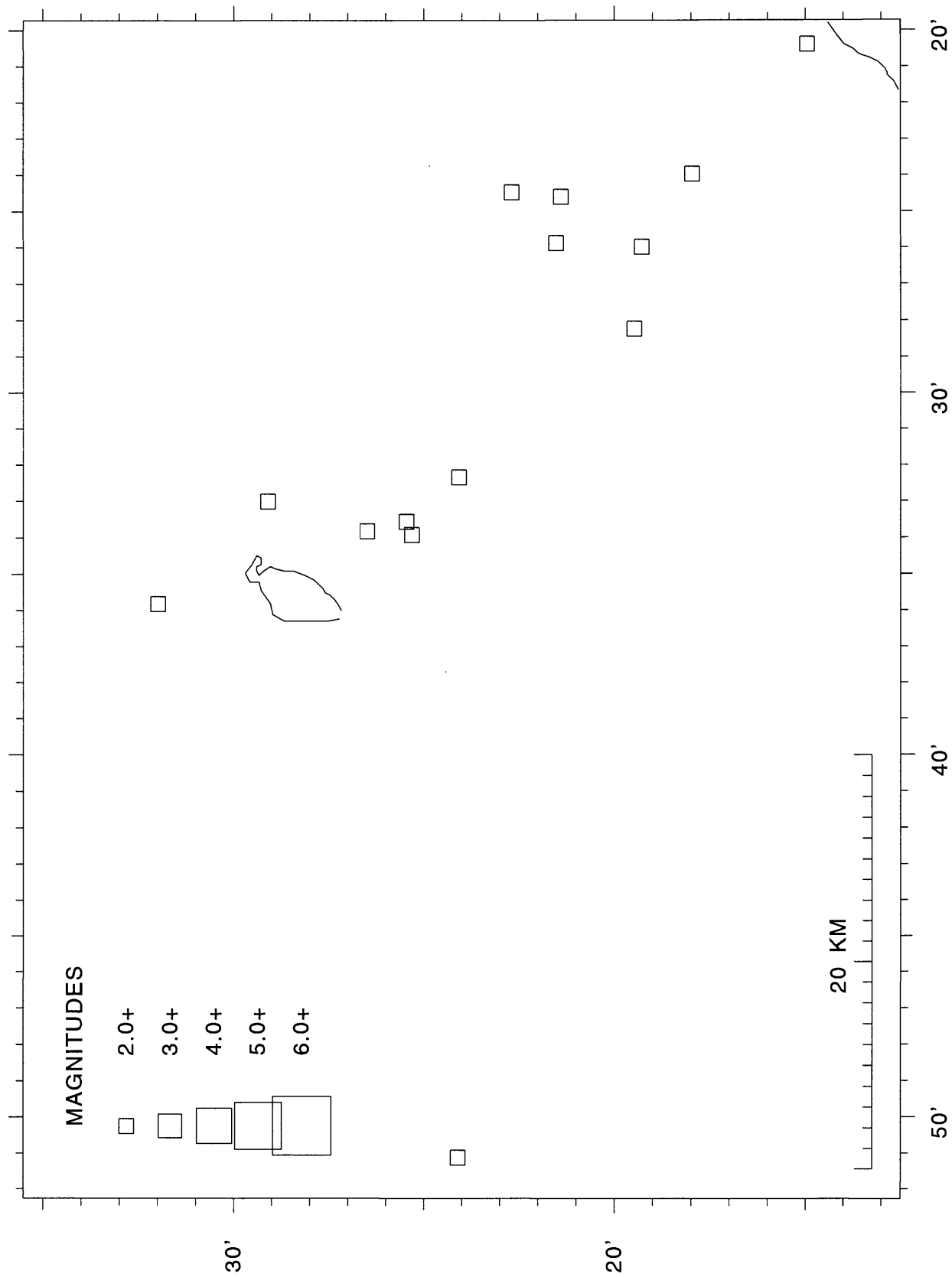


Table 5 is a chronological list of selected events of $M \geq 1.4$, successfully located during 1993. For each event, the following data are presented:

ORIGIN TIME - in Hawaiian Standard Time: date, hour (HR), minute(MN), and second (SEC).

EPICENTER - in degrees and minutes of north latitude (LAT N) and west longitude (LON W).

DEPTH - Depth of focus in kilometers.

AMP MAG - Amplitude magnitude, if determined.

DUR MAG - Duration magnitude, if determined.

NR - Number of arrivals (P and S) used in the solution.

NS - Number of S arrivals used in the solution.

GAP DEG - Largest azimuthal separation in degrees between stations.

RMS SEC - Root mean square error of time residuals, in seconds.

$$RMS = (\sum R_i^2 / NR)^{1/2}$$

MIN DIS - Epicentral distance, in kilometers, to the third nearest station.

ERH km - Standard error of the epicenter, in kilometers.

ERZ km - Standard error of depth of focus, in kilometers.

REMK - Remarks, three-letter code for geographic location of events. See figures 5-8 for location of mnemonic code. Additional one-letter codes have the following meanings:

- F felt
- L long-period character
- T associated with harmonic tremor
- B quarry or other blast
- * the location program had a convergence problem, which usually means that the depth may be unreliable.
- the depth was held fixed.

Table 6 is a list of events of magnitude 3.0 or greater, selected from table 5.

1993 HVO EARTHQUAKE SUMMARY LIST

1993 HVO EARTHQUAKE SUMMARY LIST

YEAR	MON	DA	HRMN	SEC	LAT N	DEG	MIN	LON W	DEG	MIN	DEPTH	AMP	DUR	GAP	RMS	MIN	ERH	ERZ	NO	KM	FM	REMK	
1993	JAN	1	13	9	54.80	19	17.94	155	21.00	6.59	1.2	0.9	14	0	122	.07	4	0.5	1.8	12	SWR		
		1	17	05	155	29.57	8.78	1.9	1.3	37	5	46	14	8	0.4	1.0	29	KAO					
		1	19	59	38.04	19	32.61	155	37.73	10.45	2.0	4.2	5	141	12	7	0.5	0.4	31	MLO			
		1	21	54	37.08	19	19.98	155	7.17	4.72	2.9	3.5	55	12	105	.18	5	0.4	1.0	32	SSF	F	
		1	21	58	48.53	19	19.80	155	7.01	7.69	1.9	1.6	30	3	113	.10	5	0.5	0.9	18	SF4		
		1	21	59	40.01	19	19.64	155	7.06	7.12	1.9	1.4	29	3	115	.11	5	0.5	1.0	20	SF4		
		2	4	37	41.27	19	8.40	155	21.94	41.74	2.3	1.7	26	3	186	.06	11	1.4	0.4	22	LOI		
		2	9	5	23.98	19	18.33	155	15.05	6.40	1.8	1.7	34	0	4	0.9	24	SF1					
		2	15	29	4.59	19	19.85	155	7.12	7.74	2.9	2.9	46	5	109	.11	5	0.4	0.5	33	SF4		
		2	16	24	55.99	19	24.01	155	17.59	0.84	1.8	1.8	3	72	.07	2	0.2	0.3	16	SSC	L		
		3	6	56	32.90	19	26.27	155	16.17	2.37	1.5	1.0	15	1	149	.08	3	0.3	0.4	10	SNC		
		3	7	48	23.99	19	12.01	155	27.11	5.52	2.2	1.9	36	1	124	.14	5	0.5	1.0	18	LSW		
		4	1	25	19.20	19	20.15	155	22.80	10.24	2.0	0.9	26	3	74	.11	1	0.5	1.1	22	SNR		
		4	3	21	10.11	19	24.87	155	16.30	0.03	1.9	1.4	12	2	102	.15	1	0.2	0.3	1	SNC	L#	
		4	3	22	43.22	19	24.80	155	17.17	1.92	1.7	1.8	19	5	53	.10	0	0.3	0.2	14	SNC	L	
		5	0	5	28	7.80	19	11.59	155	37.79	5.91	2.6	2.5	39	0	98	.18	6	0.8	0.0	27	LSW	
		5	2	40	39.67	19	19.66	155	7.37	8.90	1.6	3.0	3	108	.09	4	0.5	0.9	19	SF4			
		5	13	41	28.46	19	19.21	155	11.64	7.81	1.6	1.2	24	3	102	.08	5	0.5	1.0	21	SF3		
		6	21	7	32.14	19	18.28	155	13.01	3.69	1.8	1.3	20	0	100	.08	2	0.4	0.9	12	SSF		
		8	9	0	46.61	19	18.77	155	15.05	7.78	1.2	2.4	0	104	.09	4	0.5	1.1	18	SF1			
		8	15	40	49.72	19	52.05	155	34.48	31.02	1.5	1.7	32	4	209	.13	16	1.1	1.4	28	KEA		
		8	17	30	47.17	19	19.80	155	11.27	8.24	1.6	1.5	45	9	90	.09	5	0.4	0.6	36	SF3		
		8	18	14	37.67	18	57.45	155	27.08	35.90	2.2	2.0	48	8	231	.09	22	1.1	1.1	40	DLS		
		8	19	4	29.82	19	8.62	156	17.34	31.64	2.9	3.5	52	9	293	.09	46	1.2	1.9	43	KON		
		8	19	11	7.73	19	10.11	156	16.57	33.47	2.3	2.4	39	9	303	.12	44	1.1	2.2	29	KON		
		8	19	29	35.19	9	15	156	13.76	29.34	2.5	2.8	43	8	287	.11	40	1.1	2.1	36	KON		
		9	0	5	21.13	19	24.11	155	51.13	13.70	2.1	2.2	38	4	209	.12	15	1.0	0.4	34	KON		
		9	1	7	52	26.75	19	19.27	155	10.92	8.71	1.6	1.4	28	7	104	.10	5	0.5	0.8	21	SF3	
		9	1	9	3	54.23	19	19.78	155	12.19	7.47	1.7	1.8	43	7	83	.12	5	0.4	0.7	37	SF3	
		10	0	48	28.13	19	49.48	155	41.44	39.23	1.8	1.7	46	7	212	.09	22	0.9	1.2	38	KEA		
		10	22	49	37.54	19	20.04	155	8.19	9.16	1.9	2.0	44	9	84	.10	5	0.4	0.5	38	SF4		
		11	0	12	13.18	19	16.31	155	29.70	9.78	1.5	1.6	28	7	61	.12	2	0.4	0.8	18	LSW		
		11	0	39	58.28	19	22.84	155	2.89	8.24	1.9	1.7	41	4	122	.12	3	0.4	0.4	32	SF5		
		11	0	43	4.54	19	19.90	155	7.22	8.64	1.8	1.3	26	4	107	.09	5	0.5	0.8	18	SF4		
		11	6	31	58.96	19	25.31	155	30.53	10.24	1.5	1.2	35	4	43	.08	7	0.3	0.9	31	KAO		
		11	10	59	6.63	19	24.12	155	3.13	3.82	1.8	1.4	24	3	115	.10	2	0.4	0.4	20	SME		
		11	12	54	20.20	19	22.89	155	30.65	10.46	2.0	1.9	35	2	43	.06	5	0.3	0.8	34	KAO		
		11	21	8	2.36	19	20.79	155	12.82	8.82	1.5	1.4	38	5	64	.10	3	0.4	0.6	31	SF2		
		12	6	19	31.61	19	12.37	155	30.06	9.23	1.8	1.6	37	5	76	.12	5	0.4	0.8	32	LSW		
		12	16	6	3.74	19	26.07	155	20.10	8.42	2.3	2.5	47	12	82	.10	3	0.3	0.5	34	KAO		
		12	19	22	46.78	19	12.97	155	37.21	10.75	1.7	1.7	29	5	144	.11	4	0.4	0.5	31	LSW		
		12	21	4	13.23	19	42.88	155	12.91	21.50	2.2	1.5	50	14	166	.09	24	0.5	1.7	25	KEA		
		13	5	24	14.45	19	24.19	155	17.65	8.00	1.6	2.8	18	3	58	.13	2	0.6	0.8	16	INT	L	
		13	6	37	29.29	19	19.20	155	11.70	9.02	1.8	1.2	28	6	101	.07	5	0.4	0.8	17	SF3		
		13	14	7	23.03	19	18.52	154	45.79	50.75	3.3	3.7	51	10	279	.10	23	1.2	0.8	43	LSR		

YEAR	MON	DA	HRMN	SEC	DEG	MIN	LON W	DEPTH	AMP	DUR	GAP	RMS	MIN	ERH	ERZ	NO	ORIGIN	TIME	LAT N	LON W	DEPTH	AMP	DUR	GAP	RMS	MIN	ERH	ERZ	NO	YEAR	MON	DA	HRMN	SEC	DEG	MIN	LAT N	LON W	DEPTH	AMP	DUR	GAP	RMS	MIN	ERH	ERZ	NO
YEAR	MON	DA	HRMN	SEC	DEG	MIN	LON W	KM	MAG	MAG	NR	NS	DEG	SEC	DIS	KM	KM	FM	REMK	DEG	MIN	DEG	MIN	KM	MAG	MAG	NR	NS	DEG	SEC	DIS	KM	KM	FM	REMK	DEG	MIN	LON W	DEPTH	AMP	DUR	GAP	RMS	MIN	ERH	ERZ	NO
1993	JAN	24	1941	44.49	19	25.36	155 19.86	3.56	1.0	13	1	70	.07	3	0.5	0.8	7	KAO	24	2246	48.59	19	25.63	155 19.08	5.63	2.3	51	11	66	.12	3	0.3	0.6	39	KAO												
24	1947	27	32	19	25.66	155 19.94	3.46	1.0	8	0	93	.07	4	0.5	1.1	3	KAO	24	2246	50.00	19	25.69	155 18.98	4.87	2.9	3	8	54	14	66	.11	2	0.3	0.6	41	SNC											
24	1948	26	48	19	23.75	155 19.48	7.98	0.8	14	4	115	.09	0	0.7	0.7	11	KAO	24	2251	42.27	19	25.38	155 19.22	5.26	2.1	1.8	33	5	85	.09	3	0.4	0.6	22	KAO												
24	1948	33	87	19	25.68	155 19.78	4.73	1.2	22	5	78	.12	4	0.4	0.8	17	KAO	24	2253	8.41	19	25.37	155 19.76	3.89	1.3	0.6	15	1	87	.09	3	0.5	0.8	10	KAO												
24	1952	40	62	19	25.55	155 20.35	3.09	0.9	11	2	66	.08	4	0.4	0.8	5	KAO	24	2253	37.06	19	25.24	155 18.71	5.44	1.1	12	1	80	.10	2	0.6	1.4	10	INT													
24	20	6	39	54	19	25.76	155 19.89	3.43	0.7	8	0	78	.12	4	0.7	1.5	4	KAO	24	2254	20.51	19	25.77	155 18.93	5.65	2.9	3	4	54	11	57	.13	2	0.3	0.6	42	INT										
24	2014	24	22	19	25.88	155 20.63	2.74	0.6	8	0	66	.06	3	0.5	1.0	4	KAO	24	2255	3.97	19	26.26	155 19.79	1.99	1.6	17	4	105	.13	4	0.4	1.2	13	KAO													
24	2018	41	40	19	25.34	155 19.50	4.20	2.1	2.5	36	2	55	.13	3	0.3	0.8	29	KAO	24	2258	56.80	19	25.77	155 19.23	6.75	2.1	2.2	39	8	70	.12	3	0.4	0.7	30	KAO											
24	2038	49	52	19	25.53	155 20.02	5.79	1.0	12	5	97	.11	3	0.6	1.2	6	KAO	24	23	2	56.25	19	25.49	155 19.63	3.84	1.5	0.8	14	3	130	.09	3	0.5	0.9	7	KAO											
24	2057	47	49	19	25.43	155 20.08	4.95	0.9	15	4	80	.12	3	0.5	1.0	9	KAO	24	23	4	26.31	19	25.95	155 18.95	5.12	1.8	1.2	24	4	91	.13	3	0.5	0.9	17	INT											
24	2131	27	16	19	25.56	155 20.08	3.37	1.0	15	2	70	.10	3	0.4	0.7	10	KAO	24	23	5	29.46	19	25.63	155 19.07	5.07	2.3	2.3	33	3	66	.11	3	0.4	0.7	19	KAO											
24	2137	37	41	19	25.68	155 19.66	4.06	1.1	14	0	80	.10	4	0.5	1.0	5	KAO	24	23	7	19.47	19	25.94	155 18.52	6.01	1.6	1.4	21	4	87	.10	2	0.5	0.6	12	INT											
24	2141	51	35	19	25.48	155 20.36	2.77	0.7	11	4	108	.10	3	0.4	0.8	5	KAO	24	2311	20.17	19	25.53	155 19.11	4.89	1.7	1.6	31	4	86	.11	3	0.4	0.7	26	KAO												
24	2152	47	21	19	25.37	155 19.92	3.83	1.0	14	2	107	.08	3	0.5	0.9	6	KAO	24	2313	38.26	19	25.75	155 18.97	7.01	1.6	0.4	18	5	91	.14	2	0.6	1.2	8	INT												
24	2213	22	08	19	25.55	155 19.60	4.13	1.3	23	5	78	.11	3	0.4	0.7	18	KAO	24	2314	37.83	19	26.06	155 19.01	6.92	1.7	0.7	17	4	99	.11	3	0.6	0.5	10	INT												
24	2213	32	67	19	25.22	155 19.47	5.30	2.5	44	10	74	.12	3	0.3	0.6	34	KAO	24	2316	33.84	19	25.66	155 19.13	5.24	2.3	2.1	34	5	67	.11	3	0.4	0.6	23	KAO												
24	2214	53	82	19	25.34	155 19.21	6.01	1.6	4.3	48	6	64	.11	3	0.3	0.5	42	KAO	24	2320	58.40	19	26.11	155 18.76	6.50	2.1	2.7	39	7	70	.11	2	0.4	0.6	25	INT											
24	2221	30	46	19	25.23	155 19.89	4.88	1.4	23	5	120	.09	3	0.4	0.8	19	KAO	24	2325	47.90	19	25.83	155 18.73	6.56	1.5	0.4	14	4	89	.11	2	0.7	0.9	7	INT												
24	2221	54	59	19	24.44	155 19.56	6.48	1.1	13	4	95	.09	1	0.7	0.9	10	KAO	24	2326	31.63	19	25.80	155 19.01	6.01	2.6	3.4	50	8	56	.11	3	0.3	0.6	33	INT												
24	2221	56	12	19	25.55	155 19.38	6.20	1.7	18	4	89	.08	3	0.5	0.9	14	KAO	24	2331	37.98	19	24.69	155 19.34	4.63	1.4	0.7	16	4	102	.07	2	0.5	0.6	10	KAO												
24	2225	3	57	19	24.81	155 19.92	3.83	1.4	13	5	182	.06	2	0.9	0.4	5	KAO	24	2332	56.85	19	25.79	155 19.90	1.52	0.7	12	1	138	.11	4	0.4	1.0	8	KAO													
24	2225	21	44	19	25.37	155 19.64	6.70	1.6	12	6	227	.12	3	1.0	1.1	3	KAO	24	2333	42.76	19	24.80	155 20.09	5.48	0.8	14	3	106	.08	2	0.6	1.2	12	KAO													
24	2226	16	23	19	25.15	155 19.97	4.94	1.5	17	3	83	.09	3	0.5	0.9	14	KAO	24	2334	16.97	19	25.93	155 20.50	0.71	0.4	14	4	96	.06	4	0.3	0.7	10	KAO													
24	2226	36	63	19	25.35	155 19.34	6.17	1.6	25	4	86	.10	3	0.4	0.7	21	KAO	24	2334	24.17	19	25.45	155 19.51	5.05	0.8	16	4	87	.06	3	0.5	0.9	12	KAO													
24	2226	39	45	19	25.62	155 20.09	5.57	2.2	2.1	40	10	56	.09	4	0.3	0.6	28	KAO	24	2336	5.78	19	24.50	155 17.80	8.50	1.0	10	3	185	.10	2	1.6	1.0	5	INT												
24	2228	50	37	19	24.57	155 21.07	10.30	1.2	15	4	129	.15	3	1.1	1.3	11	KAO	24	2340	7.21	19	25.30	155 19.41	5.91	1.3	14	3	85	.11	3	0.6	1.4	6	KAO													
24	2229	2	62	19	26.53	155 21.99	4.92	1.6	16	4	96	.09	6	0.6	2.8	12	KAO	24	2341	18.20	19	26.77	155 20.45	2.36	0.9	7	1	267	.04	6	0.9	2.4	3	KAO													
24	2229	28	60	19	25.70	155 20.25	3.83	1.0	13	3	131	.10	4	0.5	1.1	11	KAO	24	2343	48.41	19	25.68	155 19.52	4.35	1.1	10	1	93	.10	3	0.8	1.9	6	KAO													
24	2229	32	57	19	24.90	155 20.46	4.49	1.7	17	4	79	.15	3	0.7	0.9	13	KAO	24	2344	48.08	19	25.48	155 19.03	5.86	1.0	0.4	15	3	87	.12	3	0.7	1.0	7	KAO												
24	2230	50	16	19	25.54	155 19.36	4.77	1.5	0.9	23	4	88	.09	3	0.4	0.8	19	KAO	24	2346	35.06	19	25.95	155 19.29	5.87	1.1	15	4	97	.06	3	0.6	1.1	11	KAO												
24	2233	10	75	19	25.70	155 19.05	5.08	1.6	1.1	28	7	88	.11	3	0.4	0.8	21	KAO	24	2346	58.89	19	25.63	155 19.58	4.60	1.5	24	5	91	.13	3	0.4	0.9	19	KAO												
24	2233	17	41	19	23.98	155 19.04	7.83	1.5	22	6	69	.09	1	0.4	0.7	16	KAO	24	2347	4.19	19	25.20	155 19.09	4.69	2.0	1.7	37	7	61	.11	3	0.3	0.6	29	KAO												
24	2233	34	92	19	25.78	155 19.09	3.98	2.0	34	4	90	.11	3	0.3	0.5	27	KAO	24	2351	22.60	19	25.72	155 19.24	6.87	1.4	1.6	22	3	90	.09	3	0.5	0.9	18	KAO												
24	2237	28	32	19	26.19	155 20.14	3.96	1.1	11	5	254	.08	5	0.6	1.2	3	KAO	24	2357	32.39	19	24.51	155 17.18	10.10		6	1	244	.07	2	3.7	2.2	3	INT													
24	2238	2	38	19	25.63	155 19.14	5.43	2.0	1.8	30	7	88	.11	3	0.4	0.6	22	KAO	24	2359	39.31	19	26.12	155 18.16	6.44	1.2	0.7	19	4	86	.10	2	0.4	0.7	15	INT											
24	2239	27	36	19	25.39	155 19.08	5.65	1.7	1.2	24	4	84	.11	3	0.4	0.7	17	KAO	25	0	3	18.78	19	25.30	155 19.43	5.52	1.4	0.5	13	3	85	.09	3	0.6	1.1	6	KAO										
24	2239	51	51	19	25.07	155 19.19	6.64	1.4	14	4	80	.10	3	0.7	1.0	8	KAO	25	0	7	52.16	19	25.49	155 18.22	7.65	1.3	16	3	80	.09	1	0.7	0.8	6	INT												
24	2240	47	23	19	24.93	155 20.40	0.60	1.1	15	3	108	.12	3	0.2	0.6	10	KAO	25	0	9	17.22	19	25.37	155 19.55	3.16	0.9	0.2	11	0	127	.06	3	0.5	0.7	8	KAO											
24	2240	57	36	19	25.24	155 19.77	3.80	1.3	12	3	85	.09	3	0.7	1.0	6	KAO	25	010	32.84	19	25.72	155 19.31	4.78	0.9	12	2	92	.13	3	0.7	1.5	7	KAO													
24	2241	50	07	19	25.61	155 19.02	6.23	1.8	29	6	86	.10	3	0.4	0.5	23	KAO	25	011	58.34	19	25.28	155 19.33	5.83	2.0	1.8	33	6	84	.13	3	0.4	0.9	20													

YEAR	MON	DA	HRMN	SEC	LAT N	DEG	MIN	LON W	DEG	MIN	DEPTH	AMP	DUR	MAG	NR	NS	DEG	SEC	RMS	MIN	ERH	ERZ	NO	KM	PK	REMK	
1993	JAN	26	549	21.49	19	18.45	155	29.70	12	2	112	1.0	6	0.6	2.4	1.0	LSW										
26	550	45.37	19	12.97	155	27.77	10.49	1.2	19	3	113	1.2	6	0.5	1.0	16	LSW										
26	551	0.53	19	12.19	155	29.31	11.53	1.5	12	4	138	0.5	6	0.5	0.9	9	LSW										
26	551	1.81	19	25.55	155	20.23	5.73	0.9	11	4	103	0.9	4	0.7	1.7	7	KAO										
26	551	25.73	19	25.62	155	19.74	3.52	1.0	14	4	91	0.9	4	0.4	0.9	10	KAO										
26	551	28.24	19	13.43	155	31.08	13.09	1.9	13	3	74	0.9	3	0.7	1.1	9	DLS										
26	553	46.57	19	13.73	155	28.77	7.05	1.4	27	4	86	1.2	3	0.4	0.9	20	LSW										
26	554	9.80	19	13.16	155	27.71	9.90	1.1	10	3	127	0.6	6	0.7	1.2	7	LSW										
26	554	14.37	19	12.44	155	28.37	8.74	1.4	18	4	105	0.9	6	0.4	0.7	15	LSW										
26	558	27.08	19	13.54	155	28.65	9.26		7	0	111	0.4	4	0.6	1.7	5	LSW										
26	558	47.72	19	13.72	155	29.06	6.02	2.0	11	26	1	82	1.6	3	0.5	1.3	22	LSW									
26	612	51.14	19	25.91	155	19.00	7.43	1.7	19	3	91	1.0	3	0.5	1.0	15	INT										
26	618	20.93	19	13.31	155	29.49	8.23	1.2	1	0	38	7	125	1.4	3	0.3	0.6	28	LSW								
26	622	39.06	19	12.81	155	32.19	8.62	1.3	21	3	80	1.3	6	0.5	0.9	16	LSW										
26	624	12.34	19	12.13	155	30.29	7.07		9	0	156	1.2	5	0.8	2.1	6	LSW										
26	626	55.60	19	13.27	155	28.96	9.41	1.2	18	4	119	1.4	4	0.5	0.9	11	LSW										
26	632	46.36	19	12.35	155	28.67	6.49	1.0	20	4	99	1.2	5	0.4	0.9	15	LSW										
26	633	1.41	19	13.96	155	29.05	7.43	1.7	1	2	32	4	80	1.3	3	0.3	0.8	26	LSW								
26	634	36.79	19	13.84	155	28.34	9.83	1.5	13	4	133	0.8	4	0.6	0.9	10	LSW										
26	639	22.25	19	13.82	155	28.62	6.15	1.8	1	2	3	2	87	1.4	4	0.4	1.1	18	LSW								
26	642	19	12.61	155	30.84	8.03			15	1	85	1.4	5	0.7	1.1	12	LSW										
26	652	54.78	19	12.21	155	28.91	8.78		12	4	131	0.8	5	0.5	0.9	6	LSW										
26	658	46.64	19	13.63	155	29.18	8.22	1.5	24	4	82	1.4	3	0.4	1.1	18	LSW										
26	71	37.95	19	13.38	155	28.62	9.92	1.1	13	3	112	0.8	4	0.5	1.0	10	LSW										
26	715	56.37	19	13.37	155	31.45	9.97	1.2	6	0	148	0.6	4	1.1	2.3	4	LSW										
26	723	57.30	19	13.14	155	28.68	8.81		8	1	115	0.6	4	0.7	1.9	7	LSW										
26	726	40.73	19	13.59	155	31.54	9.53	1.4	1	8	23	1	70	1.6	4	0.6	1.3	16	LSW								
26	728	37.09	19	14.15	155	28.82	8.96		12	4	138	0.8	3	0.6	0.9	9	LSW										
26	734	50.01	19	25.65	155	19.11	9.21	0.8	16	3	142	0.8	3	0.7	0.9	13	KAO										
26	738	42.55	19	13.39	155	28.87	6.63	2.0	40	8	111	1.3	4	0.3	0.8	31	LSW										
26	751	13.30	19	26.06	155	19.94	5.66	0.7	11	4	146	0.7	4	0.6	1.5	10	KAO										
26	753	58.58	19	14.21	155	32.81	11.47	1.2	22	5	145	1.0	5	0.5	0.9	16	LSW										
26	8	34.72	19	14.20	155	28.96	9.21	1.0	16	2	109	1.3	3	0.6	1.1	14	LSW										
26	814	58.24	19	13.14	155	32.33	8.60	1.3	14	2	162	1.5	5	0.6	1.1	12	LSW										
26	821	1.24	19	12.28	155	28.80	6.78	1.5	1	0	28	5	97	1.3	5	0.3	1.0	23	LSW								
26	828	15.19	19	12.01	155	29.98	8.31	1.4	32	5	128	1.3	5	0.5	0.8	27	LSW										
26	842	22.71	19	11.21	155	29.98	10.11	1.5	18	3	169	1.1	5	0.7	1.0	15	LSW										
26	9	25.56	19	14.02	155	28.86	8.73	1.4	24	4	82	1.3	3	0.4	0.9	18	LSW										
26	9	48.58	19	12.49	155	31.21	10.92		15	5	161	1.0	5	0.6	1.0	8	LSW										
26	914	13.01	19	14.48	155	29.20	10.11	1.9	42	7	74	1.4	2	0.3	0.6	32	LSW										
26	914	32.60	19	14.46	155	29.23	9.67	1.9	1	9	36	5	74	1.2	2	0.4	0.7	31	LSW								
26	922	25.95	19	13.18	155	31.33	9.93	1.8	24	3	72	1.3	4	0.5	0.9	23	LSW										
26	930	26.10	19	14.19	155	28.85	9.93	1.0	10	2	108	0.9	3	0.7	1.3	8	LSW										
26	958	52.36	19	12.91	155	28.59	7.03	1.9	2	0	42	6	97	1.5	5	0.4	0.8	36	LSW								
26	1020	47.87	19	14.39	155	29.06	9.40	1.2	19	4	108	0.9	2	0.4	0.8	15	LSW										

YEAR	MON	DA	HRMN	SEC	LAT N	DEG	MIN	LONG W	DEG	MIN	DEPTH	AMP	DUR	MAG	NR	NS	DEG	SEC	DIS	ERH	ERZ	NO	RM	FM	REMK
1993	JAN	28	2	2	30.56	19	19.75	155	11.52	7.41	1.6	1.5	43	9	174	11	5	0.5	0.6	34	SF3				
28	322	59.73	20	15.16	154	23.56				7.05	2.7	31	8	317	09	94	7.1	8.6	19	DIS	-				
28	452	8.33	19	26.35	155	19.23				6.51	1.6	1.4	35	7	102	11	3	0.4	0.6	27	KAO				
28	747	37.60	19	25.03	155	37.76				2.05	2.1	2.8	38	6	69	11	5	0.3	0.7	33	MLO				
28	8	21.04	19	20.46	155	12.64				9.21	2.6	3.0	56	15	161	12	4	0.4	0.3	41	SF2				
28	1156	29.75	19	12.23	155	31.47				9.69	1.9	1.5	29	5	84	13	6	0.4	0.8	12	LSW				
28	1311	32.82	19	20.03	155	8.44				8.17	2.2	2.7	50	11	79	08	5	0.3	0.5	29	SF4				
28	1855	29.20	19	24.95	154	56.19				0.89	2.0	1.2	19	3	186	12	5	0.7	0.5	13	SLE				
29	1017	4.53	19	13.36	155	29.52				6.38	2.5	2.2	33	2	78	18	3	0.4	1.1	21	LSW				
29	1244	49.27	19	16.71	154	59.98				38.53	2.6	2.5	48	5	211	10	8	1.0	1.3	39	LER				
29	14	24.43	19	18.45	155	13.15				5.65	1.4	1.1	19	1	90	07	3	0.4	1.3	12	SF2				
29	1828	7.56	19	18.62	155	13.17				4.65	1.6	1.3	28	0	87	10	3	0.4	1.3	24	SSF				
29	2232	43.80	19	15.87	155	28.20				6.98	1.6	1.2	26	2	66	21	4	0.5	1.5	16	LSW				
30	337	3.85	19	18.64	155	48.83				9.92	1.5	3.1	142	1	142	13	8	0.6	0.5	20	KON				
30	427	7.81	19	45.21	155	29.37				14.06	2.0	1.3	11	0	202	08	4	1.9	0.8	7	KEA				
30	527	52.80	19	12.19	155	30.59				7.46	1.7	2.7	0	158	13	5	0.6	1.4	21	LSW					
30	641	9.59	19	25.20	155	19.19				4.80	1.5	1.1	25	5	72	11	3	0.4	0.8	18	KAO				
30	1829	41.23	19	23.24	155	27.49				10.99	2.3	2.3	43	7	34	11	1	0.3	0.6	28	KAO				
31	215	9.33	19	17.11	155	12.11				9.09	2.0	1.2	24	5	232	09	2	0.6	0.9	12	SF3				
31	254	51.40	20	6.35	156	4.63				7.82	2.8	2.6	34	5	292	12	31	0.9	1.1	14	KOH				
FEB	1	056	25.63	19	39.19	156	20.56			15.49	2.5	2.5	39	0	278	14	53	3.5	17.3	31	DIS				
1	446	28.28	19	19.78	155	11.46				6.58	1.8	1.7	32	4	159	10	5	0.5	0.9	25	SF3				
1	1448	12.42	19	12.28	155	28.60				1.2	1.8	0	115	12	5	0.5	1.8	12	LSW						
1	1728	23.86	19	20.71	155	6.95				8.81	1.4	2.6	1	180	07	5	0.7	0.8	23	SF4					
1	1935	37.44	19	10.67	155	41.95				0.82	1.8	2.1	25	2	129	16	12	0.6	0.9	17	LSW				
1	23	3	2.70	20	0.36	155	25.73			10.58	1.5	1.2	25	3	214	13	16	1.0	0.6	21	KEA				
2	454	31.84	19	23.17	155	3.94				9.06	2.4	2.1	32	3	168	08	2	0.5	0.4	22	SF5				
2	1324	2.75	19	19.25	155	13.20				10.16	3.4	3.4	46	5	166	11	6	0.5	0.4	33	SF2	F			
2	1336	17.90	19	17.64	155	13.16				7.61	1.5	1.2	25	5	164	08	1	0.5	0.8	21	SF2				
2	2357	44.21	19	26.38	155	29.30				10.32	1.8	1.2	29	4	43	09	7	0.4	0.8	18	KAO				
3	128	14.27	19	24.75	155	19.37				6.42	1.7	1.8	29	6	58	11	2	0.4	0.8	23	KAO				
3	2049	42.94	19	25.40	155	19.79				5.26	1.7	1.3	24	2	72	13	3	0.4	1.0	20	KAO				
4	0	9.51	19	15.44	155	19.57				31.55	3.0	3.3	57	12	150	10	5	0.6	0.8	44	DEP				
4	037	29.79	19	27.43	154	53.22				7.03	1.8	1.2	27	3	187	10	4	1.3	0.6	23	LER				
4	241	21.18	19	20.53	155	6.67				6.50	1.6	1.3	27	1	102	11	5	0.5	1.2	21	SF4				
4	1010	11.27	19	18.84	155	15.14				7.72	1.8	1.4	30	1	103	09	4	0.5	0.9	25	SF1				
4	1111	8.55	19	20.24	155	8.35				7.50	1.6	1.4	30	2	79	07	4	0.5	0.8	20	SF4				
5	023	5.53	19	23.03	155	25.04				10.75	2.5	3.1	58	13	29	12	4	0.3	0.4	35	KAO				
5	2242	12.46	19	45.67	155	24.79				26.74	2.6	2.5	58	14	70	10	5	0.5	1.0	40	KEA				
5	2335	52.70	19	22.73	155	2.30				6.06	1.7	1.4	26	2	138	13	4	0.6	1.1	15	SF5				
6	0	27.24	19	22.33	155	29.11				9.90	1.6	4.2	2	35	10	3	0.3	0.6	30	KAO					
6	722	58.94	19	25.20	155	15.78				14.76	2.7	55	12	37	10	2	0.4	0.2	40	DEP					
6	724	16.58	19	25.31	155	15.62				14.74	1.8	1.6	50	13	83	09	3	0.4	0.3	34	DEP				
6	1153	17.50	19	20.33	155	8.34				8.42	1.2	1.5	1	78	04	4	0.6	1.2	10	SF4					
7	535	38.16	19	23.12	155	27.81				10.15	1.1	2.1	3	63	11	1	0.5	0.7	12	KAO					

YEAR	MON	DA	HRNN	SEC	LAT N	DEG	MIN	LONG W	DEG	MIN	DEPTH	AMP	DUR	MAG	NR	NS	DEG	SEC	DIS	ERH	KM	PKM	REMK	ERZ	NO		
1993	FEB	8	132	16.34	19	21.97	155	11.09	1.77	10	4	115	.07	2	0.6	0.4	5	SER									
8	133	52.03	19	21.94	155	10.82	2.43	13	4	116	.08	2	0.4	0.6	5	SER											
8	135	24.74	19	21.78	155	11.78	3.36	20	3	105	.08	3	0.3	0.4	17	SER											
8	135	38.08	19	22.64	155	11.10	3.81	15	4	134	.09	2	0.8	0.4	11	SER											
8	135	41.97	19	22.93	155	10.54	1.79	14	4	140	.08	2	0.7	0.6	10	SER											
8	135	46.84	19	21.45	155	11.21	6.21	17	3	105	.11	3	0.7	0.8	14	SF3											
8	136	6.03	19	23.33	155	10.73	1.57	9	2	158	.10	3	0.7	1.3	7	SER											
8	136	9.05	19	20.54	155	10.44	2.68	14	4	147	.07	3	0.4	0.5	10	SSF											
8	138	32.50	19	25.95	155	16.34	2.07	13	1	116	.10	2	0.4	0.4	13	SNC											
8	139	1.05	19	21.61	155	11.94	2.54	9	1	103	.05	3	0.6	0.6	8	SER											
8	139	52.86	19	21.69	155	11.88	2.72	14	3	105	.05	3	0.3	0.4	7	SER											
8	140	5.13	19	21.43	155	10.28	3.17	10	4	196	.07	1	1.4	0.5	4	SER											
8	142	28.72	19	21.60	155	11.98	2.66	14	3	102	.07	3	0.4	0.5	11	SER											
8	142	37.74	19	21.87	155	10.78	3.90	17	22	5	107	.09	2	0.6	0.4	18	SER										
8	143	18.87	19	21.62	155	11.96	3.31	14	15	4	103	.08	3	0.4	0.5	11	SER										
8	2	4	11.39	19	21.50	155	11.98	2.07	12	2	101	.07	3	0.3	0.5	7	SER										
8	210	15.38	19	21.85	155	12.08	3.31	14	12	3	106	.10	2	0.4	0.5	4	SER										
8	215	37.62	19	22.34	155	11.44	2.61	15	8	2	123	.08	3	0.8	0.5	6	SER										
8	217	24.21	19	21.16	155	10.52	3.01	7	2	210	.05	2	1.7	0.6	4	SER											
8	246	46.02	19	21.90	155	10.46	3.29	9	2	138	.07	1	0.6	0.5	7	SER											
8	246	16.67	19	21.73	155	12.88	2.63	13	2	85	.04	2	0.3	0.5	8	SER											
8	247	11.31	19	21.84	155	12.84	2.95	22	8	21	2	54	.06	1	0.3	0.4	14	SER									
8	248	17.67	19	25.45	155	15.70	2.63	19	11	2	141	.09	3	0.5	0.6	4	SNC										
8	3	6	49.10	19	24.97	155	16.13	1.88	15	24	5	103	.12	2	0.2	0.3	19	SNC									
8	3	6	58.47	19	25.14	155	16.15	2.59	19	25	6	112	.08	2	0.2	0.3	19	SNC									
8	3	7	17.36	19	21.30	155	10.63	3.71	12	5	220	.08	2	1.3	0.5	8	SER										
8	326	25.84	19	21.85	155	10.93	3.02	17	26	5	60	.11	2	0.3	0.3	21	SER										
8	327	2.81	19	22.47	155	10.89	2.42	16	4	129	.11	2	0.6	0.3	12	SER											
8	342	37.30	19	22.36	155	10.53	2.79	17	16	3	70	.05	1	0.4	0.4	11	SER										
8	355	30.34	19	23.16	155	11.61	5.58	15	5	126	.14	3	0.6	0.8	12	SF3											
8	355	44.82	19	22.31	155	10.49	2.83	17	29	5	60	.11	1	0.4	0.3	23	SER										
8	4	3	35.93	19	20.70	155	8.67	0.12	7	3	275	.07	3	0.4	0.5	4	SSF										
8	4	9	58.99	19	22.18	155	10.75	2.99	6	2	185	.05	2	5.2	2.6	4	SER										
8	420	51.35	19	25.25	155	16.26	2.29	17	14	2	115	.08	1	0.6	0.3	2	SNC										
8	430	4.42	19	21.80	155	11.38	3.18	15	26	5	60	.09	3	0.3	0.4	21	SER										
8	442	26.69	19	22.41	155	12.69	1.56	17	11	1	85	.06	2	0.4	0.8	9	SER										
8	442	54.54	19	22.06	155	10.95	2.93	13	36	4	56	.11	1	0.4	0.4	28	SER										
8	449	7.28	19	24.33	155	16.26	16.38	1.6	15	4	118	.10	2	0.6	0.4	11	SER										
8	457	34.81	19	22.34	155	10.63	2.93	17	18	17	2	70	.06	1	0.3	0.3	12	SER									
8	5	2	50.73	19	22.31	155	10.89	2.25	1.1	11	3	144	.09	2	0.8	0.4	7	SER									
8	5	22.74	19	22.04	155	11.33	3.18	1.6	12	3	116	.06	3	0.4	0.5	9	SER										
8	531	18.19	19	24.04	155	16.26	18.08	1.8	1.3	44	7	76	.12	1	0.5	0.6	26	DEP									
8	536	32.48	19	22.07	155	10.92	2.76	1.1	0.9	11	4	119	.07	2	0.7	0.4	4	SER									
8	542	25.31	19	22.14	155	14.88	2.93	1.8	20	5	90	.11	2	0.3	0.3	15	SEC										

YEAR	MON	DA	HRMN	SEC	ORIGIN TIME	LAT N	DEG	MIN	DEG	MIN	LON W	DEG	MIN	DEPT	AMP	DUR	GAP	RMS	MIN	ERH	ERZ	NO		
														KM	MAG	NR	NS	DEG	SEC	DIS	KM	KM	FM	REMK
1993 FEB 8 1034	10	36	19	21	90	155	11	04	2	51	1.6	14	2	64	.09	2	64	.09	2	0.3	0.4	6	SER	
8 1034	37	99	19	22	18	155	10	83	2	75	2.1	1.8	23	3	59	.09	2	0.3	0.3	0.3	12	SER		
8 1036	20	27	19	21	70	155	12	82	2	74	1.5	15	5	87	.06	2	0.4	0.4	0.4	10	SER			
8 1036	50	25	19	20	88	155	10	69	4	10	0.5	9	4	239	.04	3	1.4	0.7	5	SER				
8 11	6	8	05	19	1	31	155	28	14	40	5.9	2.6	1.6	31	5	208	.07	15	1.3	0.8	22	DLS		
8 1159	46	18	19	21	95	155	11	14	2	86	1.5	0.9	15	5	114	.08	2	0.6	0.4	10	SER			
8 12	1	47	79	19	21	10	155	10	89	3	45	1.6	8	3	232	.02	3	1.9	0.6	5	SER			
8 1210	19	99	19	22	08	155	10	64	3	01	1	19	12	4	119	.09	1	0.6	0.4	4	SER			
8 1210	49	19	19	22	23	155	10	60	3	18	1.5	1.1	19	4	68	.09	1	0.4	0.4	8	SER			
8 1212	16	22	19	22	25	155	10	62	3	68	1.5	1.1	18	5	124	.06	1	0.4	0.3	13	SER			
8 1252	47	79	19	21	73	155	12	19	3	26	1.4	11	2	103	.08	2	0.5	0.6	7	SER				
8 1254	20	56	19	23	27	155	11	48	1	16	1.5	6	1	151	.02	3	0.8	1.6	6	SER				
8 13	2	24	33	19	17	58	155	10	89	8	00	2.3	2.5	41	3	150	.11	5	0.4	0.6	29	SF3		
8 1323	46	50	19	21	64	155	12	02	3	31	2.1	1.3	35	7	60	.12	3	0.3	0.4	27	SER			
8 1350	5	24	19	23	19	155	17	07	2	90	1.9	1.3	21	2	61	.09	0	0.3	0.3	19	SSC			
8 1527	5	33	19	23	01	155	17	15	2	61	1.7	1.1	12	2	77	.04	1	0.3	0.4	9	SSC			
8 1542	42	18	19	22	09	155	10	82	3	12	2	0	22	1	59	.08	2	0.3	0.4	15	SER			
8 1620	6	11	19	22	09	155	10	81	2	80	0	0	0	11	4	119	.11	2	0.6	0.4	4	SER		
8 1646	29	03	19	24	19	155	0	42	7	60	2	0	1.4	20	5	150	.10	3	0.5	0.7	10	SF5		
8 1726	17	08	19	22	15	155	10	50	3	46	1.6	17	3	121	.07	1	0.4	0.3	13	SER				
8 1745	27	34	19	22	02	155	11	21	3	19	1.4	1.1	12	4	117	.07	2	0.6	0.5	8	SER			
8 1749	40	36	19	21	99	155	10	89	3	14	1.7	1.5	16	4	116	.05	2	0.3	0.4	9	SER			
8 18	0	52	81	19	22	09	155	11	26	2	99	1.3	1.1	12	3	118	.07	2	0.7	0.5	6	SER		
8 18	1	0	43	19	22	03	155	10	64	3	20	1.4	13	4	120	.06	1	0.5	0.4	7	SER			
8 2035	54	80	19	22	56	155	14	64	3	09	1.6	16	4	73	.11	2	0.3	0.4	10	SEC				
8 2154	56	01	19	22	23	155	10	57	3	50	0	0	0	9	3	123	.04	1	0.4	0.4	5	SER		
8 2324	59	05	19	21	45	155	12	88	1	87	1.3	18	3	78	.08	2	0.4	0.6	15	SER				
8 2329	2	18	19	21	85	155	11	27	2	95	1.6	19	4	112	.09	3	0.4	0.3	16	SER				
8 2334	30	48	19	21	40	155	12	97	1	44	1.5	14	2	74	.08	2	0.3	0.6	11	SER				
8 2355	58	83	19	22	03	155	12	59	3	40	1.2	10	4	188	.05	1	1.0	0.4	6	SER				
9 155	32	79	19	17	98	155	6	53	9	43	2.1	2.4	37	3	188	.09	7	0.5	0.5	35	SF4			
9 2	9	37	40	19	22	21	155	10	98	2	87	0.9	10	3	122	.07	2	0.9	0.5	6	SER			
9 223	37	78	19	21	98	155	11	18	3	42	0	13	4	115	.09	2	0.5	0.4	9	SER				
9 342	47	75	19	23	03	155	14	39	3	43	1.8	1.3	11	3	117	.06	2	0.4	0.5	8	SEC			
9 4	10	40	19	22	81	155	14	43	4	08	1.6	12	4	128	.08	2	0.6	0.8	7	SEC				
9 616	44	20	19	19	26	155	11	83	4	79	1.5	19	5	98	.06	5	0.3	1.5	11	SSF				
9 1323	56	30	19	21	69	155	12	73	3	01	1.6	1.6	33	9	56	.10	2	0.3	0.3	24	SER			
9 1614	56	04	19	20	85	155	6	71	9	53	1.3	0.8	32	4	95	.09	5	0.5	0.6	27	SF4			
9 1658	2	16	19	28	85	155	14	81	7	65	1.5	0.9	35	3	102	.09	4	0.4	0.7	34	SF1			
9 1845	48	17	19	23	14	155	15	14	3	17	0	0	0	19	5	71	.08	2	0.3	0.4	14	SEC		
9 1946	28	17	19	18	25	155	31	19	9	73	1.2	42	3	42	.11	6	0.3	0.7	40	LSW				
9 2321	51	78	19	18	32	155	6	79	10	25	2.8	3.0	59	18	181	.11	7	0.4	0.3	41	SF4			
10 222	8	55	19	22	38	155	13	97	3	16	1.7	15	3	81	.07	2	0.4	0.4	12	SER				
10 454	1	99	19	21	63	155	12	71	2	91	1.4	0.9	16	4	109	.05	2	0.3	0.4	7	SER			
10 658	0	26	19	25	13	155	16	86	0	02	1.6	1.4	11	2	155	.14	0	0.2	0.3	0	SNC	L#		

YEAR	MON	DA	HRMN	SEC	LAT N	DEG	MIN	DEG	LON W	DEG	MIN	DEG	AMP	DUR	RMS	MIN	ERH	ERZ	NO		
					KM	MAG	NR	NS	DEG	SEC	DIS	KM	PK	REMK							
					CM				CM												
1993	MAR	1	1320	32.40	19	27.20	154	52.87	5.89	2.0	1.4	3.9	4	1.95	.12	4	0.7	0.6	35	LER	
		1	1627	51.86	19	19.69	155	30.55	8.68	1.9	1.9	4.4	7	4.8	13	7	0.3	0.8	40	KAO	
		1	1712	16.34	19	44.65	156	3.55	9.10	1.7	1.5	2.4	2	2.35	.09	24	1.7	0.7	22	HUA	
		1	1758	37.18	19	19.37	155	29.90	10.90	1.7	1.6	3.9	5	3.6	.09	7	0.3	0.7	34	KAO	
		1	1945	4.10	19	19.75	155	7.88	7.55	1.6	1.2	3.5	4	9.4	1.0	4	0.4	0.8	33	SF4	
2	536	34.94	19	24.91	155	50.92	14.35	1.9	1.6	3.7	6	12.9	16	11	0.6	0.4	0.4	31	KON		
2	1133	3.55	19	19.98	155	7.78	8.78	1.9	1.9	4.5	10	9.3	10	5	0.4	0.6	34	SF4			
2	1235	6.00	19	17.58	155	26.38	9.00	1.5	1.6	4.2	5	70	14	7	0.4	0.7	39	LSW			
2	17	3	45.56	19	25.19	155	29.39	10.47	1.5	1.2	3.7	5	38	.08	6	0.3	0.6	32	KAO		
4	316	21.65	19	26.99	155	28.00	13.72	1.8	1.3	4.2	9	54	.09	6	0.4	0.5	34	DML			
4	1122	12.35	19	10.71	155	34.36	32.77	1.8	1.5	4.4	7	10.4	.09	9	0.6	1.0	37	DLS			
4	1345	11.98	19	20.09	155	11.72	7.63	1.4	1.1	3.8	9	82	.08	5	0.3	0.6	27	SF3			
4	2127	28.41	20	0.22	155	48.85	26.79	1.9	1.7	4.1	0	189	.08	14	1.5	2.5	40	KOH			
4	2343	44.41	19	37.29	155	10.32	29.87	2.3	2.3	4.7	3	25.4	.12	30	1.3	1.5	45	KON			
5	2	1	40.65	19	18.53	155	15.97	7.16	1.3	1.2	3.8	6	110	.10	4	0.4	0.7	32	SF1		
5	536	21.66	19	14.90	155	34.13	8.53	2.3	2.7	5.4	12	71	.15	5	0.4	0.6	44	LSW			
5	1641	18.45	19	25.68	155	29.44	9.63	2.1	2.0	5.2	11	40	.11	7	0.3	0.6	43	KAO			
6	6	0	24.18	19	20.17	155	6.56	9.77	2.4	2.4	5.1	10	112	.10	6	0.3	0.3	38	SF4		
6	1518	19.82	20	5.95	155	36.52	25.66	2.2	1.7	2.7	5	206	.10	18	0.9	1.1	16	KOH			
6	0222	54.02	19	20.20	155	12.89	8.76	1.6	1.4	4.2	9	69	.09	4	0.4	0.6	33	SF2			
6	3	1	25.92	19	13.24	155	31.52	8.02	2.2	2.3	4.9	7	73	.15	4	0.5	0.9	42	LSW		
6	446	3.62	19	55.73	156	36.49	0.04	2.9	2.5	5.3	9	299	.15	85	5.4	1.3	44	DIS			
6	6	0	24.18	19	20.17	155	6.56	9.77	2.4	2.4	5.1	10	112	.10	6	0.3	0.3	38	SF4		
7	1343	53.39	19	27.55	155	52.90	12.01	1.8	1.4	2.8	3	13.4	.17	5	1.1	0.5	25	KON			
7	1711	3.21	19	29.12	155	27.42	6.59	2.7	2.9	5.9	15	56	.12	5	0.3	0.8	45	KAO			
7	2155	56.41	19	22.86	155	50.29	10.87	2.0	1.4	3.3	3	192	.17	13	0.9	0.5	16	KON			
8	029	47.90	19	19.49	155	28.23	22.06	2.7	3.1	5.7	15	53	.10	6	0.4	0.8	42	DML			
8	9	0	6.31	19	10.90	155	14.83	4.58	1.5	1.4	3.4	7	213	.11	12	0.6	6.4	17	SSF		
8	950	25.00	19	21.21	155	13.08	8.81	1.9	1.8	5.0	10	58	.12	3	0.4	0.5	40	SF2			
8	17	0	8.78	19	12.98	155	31.26	9.64	1.6	1.3	2.4	3	142	.11	4	0.4	0.8	11	LSW		
8	2318	40.78	19	14.31	155	19.82	9.17	2.2	2.8	4.5	6	162	.12	7	0.5	0.6	42	SWR			
9	13	7	46.75	19	24.79	155	38.46	0.67	1.1	1.5	2	179	.12	6	0.6	1.0	13	MLO			
9	14	6	7.12	20	7.38	155	7.56	35.46	2.5	2.0	5.2	10	232	.11	34	1.0	1.6	43	KEA		
10	1357	21.88	19	47.70	155	21.40	22.95	2.3	2.3	4.2	12	105	.10	11	0.5	1.0	19	KEA			
10	2031	4.43	19	26.87	155	14.14	33.63	2.3	2.2	5.3	6	81	.10	4	0.6	0.7	40	DEP			
10	2045	32.15	19	13.34	156	20.00	32.26	2.0	1.9	3.8	1	279	.13	49	2.1	2.4	36	DIS			
10	2050	9.39	19	12.08	156	21.73	35.55	3.3	3.9	5.3	10	282	.10	52	1.0	1.8	36	DIS			
10	2159	22.70	19	10.54	156	16.72	40.16	1.7	1.5	4.7	5	131	.05	44	3.7	2.4	12	KON			
12	0	7	7.05	19	17.30	155	21.15	4.37	1.1	1.3	3.0	3	128	.11	5	0.4	1.4	23	SWR		
12	757	18.37	19	27.26	154	42.32	26.03	2.2	1.4	3.1	0	318	.10	15	10.0	4.3	28	LER			
12	15	2	38.71	19	25.05	155	29.32	11.43	1.8	1.8	5.4	12	34	.11	6	0.3	0.6	42	KAO		
13	13	5	9.01	19	12.22	156	23.55	38.32	2.5	2.8	4.7	10	299	.12	55	1.0	1.9	29	DIS		
13	1336	48.17	19	23.60	155	16.01	26.87	1.9	1.5	5.2	11	60	.10	1	0.6	0.6	42	DEP			
13	1436	36.10	19	20.11	155	11.71	9.31	2.3	2.5	5.1	9	82	.10	5	0.4	0.4	45	SF3			
13	2114	49.26	19	11.56	155	42.00	8.33	2.1	2.6	4.2	12	124	.18	11	0.4	1.3	14	LSW			
1993	MAR	14	0	9	22.39	19	20.53	155	8.10	9.09	2.1	2.0	3.5	7	80	.08	4	0.3	0.7	21	SF4
		14	244	55.35	19	21.95	155	5.12	7.09	1.8	1.4	3.9	9	77	.12	5	0.4	0.7	30	SF5	
		14	717	56.62	19	17.94	8.43	1.3	1.3	3.6	6	114	.12	5	0.4	0.8	30	SWR			
		14	1016	18.58	19	11.04	155	35.13	2.09	2.5	2.3	4.0	0	99	.14	12	0.5	7.1	41	LSW	
		14	2129	6.95	19	20.87	155	13.28	9.31	1.6	1.3	4.1	6	60	.10	3	0.4	0.6	33	SF2	
15	3	8	33.16	19	20.18	155	7.18	8.68	1.4	1.2	3.6	5	102	.08	5	0.4	0.6	32	SF4		
15	954	53.97	19	18.66	155	13.60	9.15	1.8	1.6	4.0	8	72	.09	3	0.4	0.6	34	SF2			
15	1438	37.66	19	26.60	155	49.80	9.62	1.7	1.7	3.7	5	106	.18	10	0.6	0.6	33	KON			
15	16	8	19.84	19	8.20	155	10.02	37.93	2.0	1.7	5.0	7	217	.12	17	1.2	1.1	43	LOI		
16	439	37.35	19	18.98	155	16.02	7.91	1.5	1.2	2.9	3	111	.08	3	0.4	0.8	19	SF1			
16	1151	15.32	19	27.75	154	52.80	1.15	2.0	1.9	1.5	3	188	.20	4	1.0	0.8	7	SLE			
16	1247	10.42	19	58.13	155	28.11	39.13	2.3	2.0	4.3	1	244	.08	16	1.8	2.0	36	KEA			
16	1347	30.47	19	29.73	155	51.74	8.06	1.1	1.25	5	127	.11	6	0.5	0.3	17	KON				
16	1832	53.65	19	19.46	155	8.84	7.85	1.7	1.6	3.6	3	84	.07	4	0.4	0.6	23	SF4			
16	23	5	20.71	19	19.93	155	8.70	7.27	1.6	1.4	2.9	5	74	.08	4	0.4	0.7	13	SF4		
17	0	3	55.07	19	14.32	155	34.59	8.14	2.0	1.8	4.6	7	77	.16	5	0.5	0.8	40	LSW		
17	437	47.71	19	18.63	155	12.94	5.95	1.2	1.1	3.3	4	93	.09	3	0.4	0.9	20	SF2			
17	446	27.49	19	20.79	155	12.84	9.89	2.0	1.9	3.7	6	83	.10	3	0.4	0.6	26	SF2			
17	1424	31.08	19	13.82	155	26.21	8.54	1.8	1.7	3.0	4	125	.11	4	0.4	0.9	17	LSW			
17	1637	15.32	19	43.53	156	8.25															

YEAR	MON	DA	HHR	MIN	SEC	LAT N	DEG	MIN	DEG	AMP	DUR	DEPTH	RMS	MIN	NS	DEG	SEC	DIS	ERZ	NO	REMARK	
YEAR	MON	DA	HHR	MIN	SEC	LON W	DEG	MIN	DEG	AMP	DUR	DEPTH	RMS	MIN	NS	DEG	SEC	DIS	ERZ	NO	REMARK	
1993	MAY	14	11:20	0:07	19	53.39	155	23.71	27.61	1.8	1.6	47	7	214	10	14	0.9	1.6	39	KEA		
15	539	45.30	19	30.82	24.57	2.1	1.8	51	9	63	11	4	0.5	0.7	37	DML						
16	1943	2.80	19	19.66	155	8.01	9.10	2.1	51	16	91	10	4	0.3	0.5	29	SF4					
16	1947	22.36	19	20.22	155	12.35	7.98	1.9	1.8	50	13	75	13	5	0.3	0.5	39	SF2				
17	524	32.31	19	21.27	155	13.13	8.63	2.4	2.7	55	16	57	12	2	0.3	0.4	39	SF2				
17	535	45.90	19	21.11	155	12.96	9.27	1.6	1.2	38	8	70	13	3	0.4	0.6	34	SF2				
17	924	27.96	19	25.38	155	30.59	10.51	1.7	1.4	44	7	35	09	4	0.3	0.6	39	KEA				
17	1341	41.86	19	22.05	155	3.02	7.73	1.7	1.3	42	10	174	10	4	0.3	0.6	32	SF5				
17	1447	17.06	19	18.50	155	15.79	6.66	1.4	1.2	37	8	119	09	4	0.3	0.6	30	SF1				
19	633	31.74	19	22.22	155	17.14	31.76	2.6	2.6	64	18	41	12	2	0.5	0.6	45	DEP	F			
19	1152	22.62	19	29.30	154	53.73	0.12	2.2	2.2	34	4	143	15	4	0.4	0.2	15	SLE	F			
19	23	3	27.38	19	46.37	156	8.02	17.24	1.8	1.6	31	9	285	10	32	0.9	11.9	15	HUA			
20	152	17.52	19	19.85	155	8.72	8.73	1.6	1.2	31	4	75	08	5	0.4	0.6	24	SF4				
20	456	19.33	19	22.20	155	30.10	11.73	2.6	2.9	60	15	34	10	4	0.3	0.4	46	KEA				
20	530	11.22	19	21.98	155	4.75	7.95	2.3	2.4	52	17	153	11	5	0.3	0.5	27	SF5				
20	1246	23.34	19	16.95	155	22.39	6.71	1.4	1.3	38	4	122	13	6	0.4	0.9	30	SWR				
20	1345	2.17	19	47.24	154	54.60	40.73	3.2	3.5	62	19	234	11	20	0.6	1.0	44	KEA	F			
20	1736	26.11	20	1.12	155	17.01	25.74	1.8	1.6	39	4	218	10	16	1.0	1.1	36	KEA				
21	4	0.28	15	19.48	155	34.59	13.47	1.7	1.7	50	12	99	10	10	0.3	0.3	28	KEA				
21	8	4	4.92	19	20.03	155	11.34	9.10	2.1	1.9	17	2	188	08	5	0.7	0.8	10	SF3			
21	14	0	50.51	19	11.12	155	27.94	7.13	2.5	2.8	49	5	106	14	3	0.4	0.6	44	LSW	F		
21	1431	48.80	19	11.36	155	27.93	6.31	2.4	2.7	46	5	106	18	3	0.5	0.8	38	LSW	F			
22	1	9	1.52	19	21.17	155	11.18	8.82	2.1	2.2	53	13	67	10	3	0.3	0.4	38	SF3			
22	242	4.18	19	14.42	155	31.70	8.01	1.4	1.3	35	6	132	12	3	0.3	0.6	21	LSW				
22	1037	28.98	19	16.72	155	46.98	0.60	1.7	1.2	41	9	103	18	9	0.5	0.3	25	KON				
22	1355	8.30	19	21.28	155	49.21	12.08	1.7	1.4	37	6	148	13	11	0.4	0.3	27	KON				
22	2216	30.27	19	43.80	156	10.38	36.94	3.8	4.6	65	16	254	11	35	0.8	1.2	49	HUA	F			
23	745	41.85	19	13.39	155	32.34	6.46	1.5	1.2	44	12	75	17	5	0.3	1.0	25	LSW				
23	1335	39.25	19	12.02	155	28.45	6.91	1.6	1.6	46	6	93	15	5	0.3	0.6	32	LSW				
24	248	17.22	19	30.11	154	53.29	0.06	1.7	1.2	38	3	125	18	5	0.3	0.4	32	SLE	#			
24	18	1	24.56	19	23.57	154	53.91	45.76	2.0	1.5	58	17	220	10	8	0.9	0.4	36	LER			
24	1832	49.14	19	47.76	156	7.83	6.76	1.6	1.2	26	5	287	11	50	1.2	0.9	16	HUA				
25	119	43.56	19	14.52	156	18.14	15.25	1.9	1.8	24	4	309	13	45	5.7	10.1	19	KON				
25	1146	35.57	19	48.54	156	37.34	0.13	2.2	1.4	22	5	308	18	83	10.5	2.6	48	DIS	#			
26	615	35.38	19	18.52	155	13.44	7.17	1.2	1.2	38	6	79	10	3	0.4	0.6	31	SF2				
26	1144	35.47	19	19.48	155	10.41	8.95	1.7	1.4	50	11	98	10	5	0.3	0.4	37	SF3				
26	1728	41.65	19	17.64	155	13.14	5.75	1.4	1.4	46	9	114	09	1	0.3	0.7	29	SF2				
27	1	9	38.08	19	17.35	155	28.34	10.28	1.4	1.4	45	8	50	12	5	0.3	0.5	35	LSW			
27	745	6.62	19	22.76	155	14.62	3.71	1.5	1.1	27	9	72	09	2	0.3	0.3	18	SEC				
27	1314	37.78	19	25.16	155	19.63	5.45	1.6	1.3	35	8	68	12	3	0.3	0.8	26	KEA				
28	828	10.66	19	26.27	155	20.13	8.92	1.6	1.2	39	9	87	10	3	0.3	0.6	30	KEA				
28	1012	56.63	19	16.08	155	29.09	9.93	1.4	1.2	41	7	60	12	3	0.3	0.5	31	LSW				
28	2015	0.67	19	18.13	155	13.11	3.86	1.2	1.1	31	3	99	10	2	0.3	0.8	22	SSF				
30	1538	4.83	20	0.79	155	36.03	7.99	1.8	1.4	29	7	171	13	18	0.4	0.6	24	KOH				
30	1918	16.30	19	19.28	155	13.54	9.91	3.6	3.6	59	10	69	12	4	0.4	0.4	49	SF2	F			

YEAR	MON	DA	HHR	MIN	SEC	LAT N	DEG	MIN	DEG	AMP	DUR	DEPTH	RMS	MIN	NS	DEG	SEC	DIS	ERZ	NO	REMARK	
YEAR	MON	DA	HHR	MIN	SEC	LON W	DEG	MIN	DEG	AMP	DUR	DEPTH	RMS	MIN	NS	DEG	SEC	DIS	ERZ	NO	REMARK	
1993	MAY	30	19:20	43.94	19	18.91	155	13.41	10.22	1.8	1.5	38	10	76	0.9	3	0.4	0.7	29	SF2		
31	2	9.58	19	21.81	155	29.99	10.22	1.5	1.4	52	7	33	09	4	0.3	0.5	44	KEA				
31	211	44.82	19	50.57	155	34.19	22.03	1.8	1.5	42	4	111	08	10	0.5	1.3	38	KEA				
31	319	46.70	19	19.78	155	13.51	8.83	1.7	2.0	54	11	120	12	5	0.4	0.5	41	SF2				
31	6	7	3.98	19	31.99	155	35.82	14.30	2.1	2.4	57	13	45	10	2	0.3	0.2	42	DML			
31	17	56.29	19	22.16	155	2.63	8.54	1.7	1.2	44	8	136	10	4	0.3	0.4	36	SF5				
31	2356	55.77	19	14.13	155	28.09	8.25	2.0	2.5	57	13	91	16	4	0.3	0.6	44	LSW	F			
JUN	1	0	44.59	19	10.75	155	19.34	48.11	1.5	1.6	45	7	180	09	11	0.9	1.1	35	DEP	L		
2	452	32.35	19	19.30	155	13.20	8.77	1.9	1.3	41	4	76	12	4	0.4	0.6	33	SF2				
2	1922	13.24	19	19.74	155	6.75	8.63	1.8	1.3	52	14	119	10	5	0.3	0.4	36	SF4				
3	0	34.42	19	19.80	155	11.66	8.03	2.4	2.4	53	9	88	10	5	0.3	0.5	46	SF3				
3	2252	43.54	19	46.50	155	34.26	14.76	1.7	1.5	27	5	105	10	12	0.5	0.5	21	KEA				
4	2048	27.58	19	22.76	155	30.57	8.58	1.3	1.2	44	6	43	11	5	0.3	0.6	38	KEA				
5	1	6	0.79	19	23.27	155	14.63	3.69	2.8	3.0	48	9	46	10	3	0.3	0.3	39	SEC			
5	2229	59.77	19	19.56	155	6.87	8.33	2.4	2.1	58	16	122	11	4	0.4	0.4	32	SF4				
6	1345	10.82	19	20.21	155	3.01	9.10	1.6	1.6	47	11	114	11	3	0.4	0.3	33	SF5				
6	14	23.56	19	20.34	155	6.45	7.26	1.8	1.9	46	11	109	10	6	0.3	0.5	34	SF4				
7	132	57.32	19	58.64	155	25.64	18.94	1.5	1.3	21	6	207	07	9	0.8	1.2	13	KEA				
7	521	28.43	19	14.37	155	27.86	8.62	1.5	1.6	31	5	93	14	4	0.4	0.8	27	LSW				
7	639	39.27	19	50.09	155	34.08	29.97	1.7	1.4	30	0	109	07	10	0.8	1.8	28	KEA				
7	941	5.80	19	11.46	155	33.87	39.74	1.8	1.8	53	11	97	12	9	0.5	0.7	41	DIS				
7	1931	50.86	19	23.68	155	14.63	4.14	1.8	1.3	24	6	71	12	2	0.4	0.4	15	SEC				
8	237	49.41	19	20.46	155	12.97	9.68	4.8	4.8	1	65	12	4	0.3	0.4	48	SF2	F				
8	3	58.42	19	19.49	155	11.70	8.37	1.9	2.0	49	5	95</										

1993 HVO EARTHQUAKE SUMMARY LIST

1993 HVO EARTHQUAKE SUMMARY LIST

ORIGIN TIME	LAT N	LONG W	DEPTH AMP DUR	GAP RMS MIN ERH	ERZ NO	YEAR MON DA HRMN	SEC	DEG MIN	DEG MIN	KM	MAG	MAG NR	NS	DEG SEC DIS	KM	KM	FM	REMK	
1993 JUN 15	738	12.08	19 19.44	155 13.75	7.75 1.7 1.5 41	6 63	.09	4 0.3	0.5	26	SF2								
15	953	10.02	19 20.18	155 6.83	8.23 1.6 1.3 34	8 107	.08	6 0.4	0.6	23	SF4								
15	20	1 38.63	19 19.09	155 11.63	6.75 1.5 1.2 48	9 105	.10	5 0.3	0.5	37	SF2								
16	6	33.30	19 19.74	155 12.36	8.60 1.6 1.4 49	12 83	.10	5 0.4	0.5	36	SF3								
16	1111	13.47	19 19.72	155 7.37	8.13 2.1 1.9 43	11 106	.08	4 0.4	0.6	28	SF4								
16	1157	41.62	19 28.25	155 27.60	7.83 1.9 1.2 37	6 69	.11	7 0.3	0.9	28	KAO								
16	1636	34.01	19 19.59	155 13.38	9.26 1.9 1.7 37	4 69	.08	5 0.4	0.6	28	SF2								
17	355	39.32	19 52.33	155 31.13	23.03 1.9 1.3 24	6 126	.07	12 0.6	0.9	13	KEA								
17	11	4	3.14	19 21.71	155 14.81	9.33 2.7 3.0 49	6 60	.11	2 0.3	0.3	41	SF1							
18	2114	14.49	19 22.80	155 17.59	7.87 1.5 1.3 24	4 77	.13	2 0.5	0.7	21	INT								
19	12	4	9.5	18 42.05	154 54.90	16.63 2.3 1.3 46	12 292	.16	69 1.6	17.3	28	DIS							
19	1734	37.69	19 23.04	155 17.26	12.24 1.5 1.2 29	3 67	.11	1 0.6	0.6	26	INT L								
19	1911	22.70	19 27.80	155 25.17	10.19 1.7 1.4 50	11 47	.13	5 0.3	0.5	37	KAO								
20	244	35.65	19 30.14	155 29.48	4.19 1.3 1.2 36	8 51	.12	5 0.3	1.4	26	MLO								
20	1025	5.37	19 18.98	155 12.94	6.69 1.3 1.1 29	4 87	.07	4 0.3	0.8	23	SF2								
20	1259	15.92	19 10.13	155 36.47	6.87 2.1 1.9 51	16 198	.13	9 0.4	0.7	34	LSW								
20	1452	32.80	19 46.81	156 10.73	31.04 1.9 1.6 39	10 257	.15	37 1.1	2.0	26	HDA								
20	18	5	55.59	19 20.84	155 7.10	8.72 1.7 1.4 49	12 91	.09	5 0.4	0.4	32	SF4							
20	19	8	37.44	19 19.08	155 13.37	8.50 1.8 1.9 56	12 75	.11	4 0.4	0.5	42	SF2							
21	231	2.67	19 24.92	155 16.86	13.53 1.4 1.2 28	5 60	.09	0 0.5	0.5	22	DEP L								
21	1138	21.76	19 28.85	154 54.00	2.19 2.2 2.3 41	3 104	.12	3 0.3	0.4	35	SLE								
21	1547	4.82	19 24.45	155 38.65	1.91 1.3 1.4 22	6 108	.09	6 0.3	0.6	12	MLO								
21	18	1	36.58	19 25.67	155 19.40	6.01 2.0 1.8 38	9 52	.11	3 0.3	0.7	29	KAO							
22	314	50.78	19 6.67	155 27.53	31.69 1.7 1.3 43	9 182	.10	5 0.8	0.8	33	DLS								
22	627	50.52	19 19.67	155 11.90	8.81 2.1 1.9 40	5 89	.10	6 0.4	0.6	31	SF3								
22	1933	47.07	19 12.12	155 25.58	7.48 1.3 1.2 32	2 148	.12	5 0.5	0.9	31	LSW								
23	18	3	5.16	19 13.61	155 26.59	6.54 1.3 1.2 26	3 119	.15	5 0.4	1.0	17	LSW							
23	2312	0.17	19 18.02	155 13.18	8.59 1.7 1.4 35	4 99	.09	2 0.4	0.6	29	SF2								
24	0	9.91	19 18.20	155 13.21	6.94 1.6 1.2 37	4 93	.12	2 0.4	0.7	34	SF2								
24	529	13.46	19 15.31	155 25.96	9.66 1.7 1.9 38	4 69	.11	4 0.3	0.6	35	LSW								
24	6	9.70	19 49.43	155 21.31	21.88 2.4 2.2 50	9 102	.11	7 0.4	1.1	41	KEA								
24	1516	32.95	19 26.62	155 29.57	10.54 2.0 1.5 48	6 41	.10	8 0.3	0.5	43	KAO								
24	20	7	5.13	18 54.70	155 10.44	51.97 2.5 2.1 51	5 256	.10	41 1.7	1.6	45	LOI							
26	2031	36.54	19 24.26	155 17.04	11.40 1.6 2.1 19	3 77	.09	1 1.0	0.6	17	INT L								
27	1611	53.31	19 45.83	155 55.98	13.54 2.0 1.5 29	5 204	.10	13 1.0	0.5	25	HVA								
27	2034	24.15	19 14.46	155 21.62	7.34 1.5 1.4 27	6 154	.11	4 0.5	0.8	17	SWR								
28	321	50.35	19 11.04	155 41.37	11.04 1.1 1.0 26	3 119	.15	5 0.4	1.0	17	LSW								
28	322	10.00	19 11.17	155 41.10	12.55 2.1 2.3 24	8 121	.09	10 0.5	0.8	13	LSW								
28	446	53.91	19 24.97	155 17.63	2.97 1.3 1.1 14	2 78	.08	1 0.5	0.2	7	ENC L								
28	1220	20.96	19 25.27	155 16.57	12.60 1.6 1.2 12	2 187	.07	1 2.0	0.7	7	INT L								
28	1416	32.52	19 20.29	155 10.50	8.70 1.8 1.2 41	6 81	.09	3 0.4	0.6	33	SF3								
28	16	5	58.10	19 23.91	155 16.91	12.62 1.6 1.2 19	3 62	.10	1 1.0	0.8	14	INT L							
28	1629	38.82	19 26.55	155 53.80	7.90 2.0 1.4 39	6 164	.21	6 0.5	0.6	26	RON								
28	1947	54.67	19 17.80	155 13.13	8.78 1.7 1.3 47	11 108	.10	2 0.4	0.5	37	SF2								
29	630	2.30	19 24.04	155 17.94	13.67 1.6 1.2 14	3 87	.11	2 2.1	0.8	7	DEP L								

YEAR	MON	DA	HRMN	SEC	ORIGIN TIME	LAT N	DEG	MIN	LON W	DEG	MIN	DEPTH	AMP	DUR	KM	MAG	NR	NS	DEG	SEC	DIS	ERH	ERZ	NO	KM	FM	REMK		
1993	JUL	12	527	51.30	19 24.23	155	17.20	155	11.94	1.80	1.6	1.0	2.29	6	65	08	5	0.2	0.2	16	SSC	L							
12	1158	47.03	19	19.24	155	11.94	8.23	1.8	1.2	2.29	2	98	08	5	0.5	0.8	16	SF3											
12	12	3	11.43	18	41.68	155	5.99	7.03	2.1	2.2	2.27	6	321	15	64	7	6	9.5	12	LOI									
12	1254	12.28	19	19.19	155	11.99	8.19	1.6	1.2	2.28	3	98	08	5	0.4	0.8	14	SF3											
12	1940	24.57	19	21.48	155	30.01	9.96	1.3	1.2	3.5	4	45	08	5	0.3	0.7	27	KAO											
13	021	16.20	19	19.38	155	11.62	8.37	1.9	1.9	4.0	6	97	11	5	0.4	0.6	30	SF3											
13	027	15.09	18	54.68	155	16.66	12.32	2.0	1.4	2.4	7	310	13	34	0.9	0.5	12	LOI											
13	092	50.06	19	41.61	155	59.75	36.21	2.2	1.8	4.9	8	258	10	16	1.1	0.9	36	HUA											
13	095	15.83	19	12.61	155	22.41	36.77	1.6	1.6	4.0	7	169	10	4	0.8	0.9	31	DEP											
13	1357	35.30	19	18.57	155	13.85	7.83	1.5	1.2	4.8	13	95	10	3	0.3	0.5	32	SF2											
13	1841	4.94	19	31.69	155	45.17	9.08	1.9	1.5	5.0	13	118	15	2	0.5	0.4	37	KON											
14	2216	4.98	19	11.81	155	41.96	7.64	1.5	1.4	3.0	4	123	16	10	0.6	1.4	24	LSW											
15	352	58.03	19	21.81	155	13.05	3.11	1.4	1.1	3.2	7	76	09	2	0.3	0.3	19	SER											
15	741	56.41	18	44.20	155	1.13	44.90	2.6	3.3	4.2	12	303	13	62	1.6	2.7	28	LOI											
15	1041	55.47	19	43.73	156	5.37	46.42	2.9	2.8	5.2	8	241	11	32	0.9	1.3	46	HUA											
15	1432	36.15	19	18.29	155	15.05	7.11	1.2	1.2	3.3	6	116	10	4	0.4	0.4	34	SF1											
18	944	21.83	19	20.10	155	7.89	8.65	1.6	1.2	4.2	7	90	08	5	0.4	0.5	28	SF4											
19	22	0	57.04	19	25.18	155	16.57	10.69	1.5	1.2	2.3	3	139	08	1	0.8	0.6	20	INT	L									
20	026	27.44	19	25.03	155	14.68	11.89	1.5	1.2	2.3	5	170	11	1	0.9	0.7	19	INT	L										
20	131	37.85	19	19.37	155	49.01	11.56	2.5	2.9	5.2	10	107	10	8	0.4	0.3	40	KON											
20	917	45.98	19	23.75	155	17.34	10.21	1.5	1.6	2.29	6	53	10	1	0.5	0.4	23	INT	L										
20	1146	40.78	19	23.07	155	15.90	15.63	1.8	1.4	2.9	5	80	11	1	1.1	0.6	11	DEP	L										
20	14	6	32.18	18	47.31	155	11.12	7.17	2.1	2.1	3.7	7	302	12	50	0.9	0.8	23	LOI										
22	543	18.42	19	49.69	155	34.60	25.89	3.0	3.2	5.7	11	106	09	9	0.5	1.0	47	REA	F										
22	11	4	46.41	19	46.91	155	35.64	14.31	2.0	1.3	2.4	5	103	09	11	0.5	0.5	16	NEA										
22	14	7	40.99	19	23.15	155	14.66	3.37	2.4	2.6	4.2	9	48	10	3	0.3	0.3	30	SEC										
22	1412	48.62	19	23.12	155	14.80	3.79	1.8	1.1	2.3	8	73	10	2	0.3	0.4	13	SEC											
22	1558	18.90	19	23.26	155	14.87	3.37	1.9	1.1	0	104	07	2	0.4	0.5	6	SEC												
22	1955	7.02	19	23.10	155	26.65	10.50	2.0	1.6	0	99	12	8	0.7	1.8	7	KAO												
24	456	59.73	19	18.21	155	16.12	7.17	1.6	1.2	3.6	5	118	11	4	0.5	0.8	21	SF1											
24	715	56.07	19	21.84	155	12.87	2.77	1.6	1.3	2.5	5	54	09	1	0.3	0.3	20	SER											
24	1338	45.52	19	18.43	155	15.63	6.62	1.3	1.2	3.0	2	109	09	4	0.4	0.8	29	SF1											
24	2052	50.52	19	25.01	155	17.42	11.00	1.6	1.2	2.5	3	51	10	1	0.6	0.6	22	INT	L										
25	446	1.04	19	20.60	155	11.54	8.95	1.9	1.4	3.9	8	75	08	4	0.3	0.5	30	SF3											
27	1745	7.56	18	52.45	155	36.62	9.42	1.8	1.4	3.2	5	287	12	13	0.9	0.5	31	LSW											
27	20	1	27.22	19	15.60	155	28.12	11.01	1.8	1.8	4.9	5	78	10	4	0.3	0.5	36	LSW										
28	0	1	1.94	19	21.95	155	12.77	2.63	1.7	1.3	3.2	4	53	08	1	0.3	0.3	27	SER										
28	047	53.65	19	58.63	155	43.35	5.63	1.7	1.2	2.8	5	140	10	15	0.5	0.7	16	KOH											
28	546	19.01	19	19.99	155	10.39	7.36	1.8	1.2	4.1	8	87	11	4	0.4	0.6	28	SF3											
28	637	51.24	19	25.02	155	38.99	0.57	2.4	2.9	3.5	3	191	10	6	0.6	0.4	28	MLO											
28	1449	24.21	19	20.10	155	8.11	7.18	1.8	1.5	4.0	6	84	10	5	0.4	0.6	35	SF4											
28	2026	49.84	20	0.08	155	55.19	8.40	1.7	1.3	2.0	5	240	08	20	1.3	1.1	11	KOH											
29	340	53.98	19	24.83	155	18.71	1.86	1.7	1.1	1.8	5	99	14	2	0.3	0.4	12	SNC	L										
29	538	24.79	19	11.46	155	27.96	7.61	1.8	1.2	4.6	6	105	15	4	0.4	0.6	40	LSW											
29	711	56.11	19	28.23	155	49.18	8.79	1.9	1.3	3.4	4	132	17	7	0.6	0.5	31	KON											

YEAR	MON	DA	HRMN	SEC	ORIGIN TIME	LAT N	DEG	MIN	DEG	MIN	LON W	DEG	MIN	DEPT	AMP	DUR	GAP	RMS	MIN	ERH	ERZ	NO	REMK	
YEAR	MON	DA	HRMN	SEC	ORIGIN TIME	LAT N	DEG	MIN	DEG	MIN	LON W	DEG	MIN	DEPT	AMP	DUR	GAP	RMS	MIN	ERH	ERZ	NO	REMK	
1993	AUG	9	1948	40.17	19 23.14	155 15.05	3.09	1.5	1.0	22	8 70	11	2	0.3	0.4	14	SEC	0.4	14	SEC	0.4	14	SEC	
10	643	30.13	19 20.05	155 10.36	9.05	1.9	0.7	28	5 101	07	4	0.5	0.8	23	SF3									
10	1826	5.66	19 22.01	155 30.11	9.52	1.6	1.3	46	9 43	11	4	0.3	0.6	39	KAO									
10	1844	26.18	19 8.75	155 37.36	10.07	1.8	1.3	30	6 109	14	11	0.4	1.0	24	LSW									
11	5	4	5.18	19 19.98	155 17.75	31.00	1.7	1.0	43	7 77	09	1	0.7	0.9	36	DEP								
11	1056	21.75	19 36.12	156 21.68	34.95	2.2	1.9	53	13 295	12 48	0.8	1.6	41	DIS										
11	1149	53.94	19 31.85	155 52.16	8.96	1.4	1.1	29	1 142	19 7	1.3	0.6	28	KON										
11	19	0	33.64	19 44.57	156 3.92	14.51	1.6	1.1	26	4 237	10 25	1.1	0.7	23	HUA									
11	20	1	41.72	19 29.36	155 26.99	5.03	1.9	1.9	54	15 83	12	5	0.3	1.4	39	KAO								
12	028	48.49	20 8.69	156 5.58	44.09	4.3	4.5	60	12 303	12 55	1.0	1.5	48	KOH F										
12	342	36.16	19 21.76	155 4.97	8.47	1.8	1.6	46	9 80	10	5	0.4	0.5	40	SF5									
12	540	31.96	19 15.17	155 31.85	9.35	2.3	2.5	53	9 61	14	3	0.3	0.6	44	LSW									
12	948	54.24	19 25.14	155 16.94	9.80	1.6	1.6	14	3 95	08	0	0.8	1.0	11	INT L									
12	1024	52.48	19 5.19	155 29.31	30.57	2.4	2.6	57	11 180	08	8	0.6	0.9	48	DLS									
12	1156	30.39	19 19.99	155 7.70	7.86	2.5	2.8	55	12 95	10	5	0.3	0.5	43	SF4									
12	1212	53.43	19 13.52	155 23.18	35.45	1.9	1.4	41	6 153	10	2	0.9	1.0	35	DEP									
12	1325	11.48	19 18.84	155 7.78	8.55	1.7	1.4	35	8 95	08	5	0.4	0.6	27	SF4									
12	15	1	34.85	19 11.11	155 41.48	7.34	3.7	4.1	62	14 123	17	10	0.4	0.7	48	LSW F								
12	1926	27.40	19 20.14	155 7.31	8.64	1.4	1.0	32	4 100	09	5	0.5	0.7	29	SF4									
12	20	0	51.50	19 24.28	155 17.38	1.51	1.4	0.6	13	3 94	07	1	0.3	0.3	10	SSC L								
13	1932	56.73	19 23.50	155 16.97	3.22	1.6	0.9	26	6 41	10	0	0.3	0.3	20	SSC									
14	1921	53.36	19 21.21	155 7.97	8.92	1.3	0.7	33	4 74	08	4	0.4	0.6	32	SF4									
14	2028	15.76	19 17.39	155 12.91	6.64	1.3	0.7	37	6 146	10	1	0.4	0.6	31	SF2									
15	839	40.27	19 22.65	155 14.29	3.82	1.6	1.1	23	7 85	08	2	0.4	0.4	16	SEC									
16	158	3.51	19 21.25	155 30.34	9.71	1.4	0.7	36	4 48	07	5	0.3	0.7	33	KAO									
16	2	2	54.08	19 21.36	155 30.24	10.09	1.6	1.4	41	5 48	07	5	0.3	0.6	37	KAO								
16	327	43.13	19 21.28	155 5.94	9.60	1.8	1.4	42	7 91	09	5	0.5	0.5	35	SF4									
16	9	2	13.10	19 5.73	155 26.14	36.12	2.0	1.3	38	6 195	09	8	0.8	0.9	32	DLS								
16	1313	6.53	19 19.14	155 13.52	9.46	3.1	3.5	62	16 124	13	6	0.3	0.3	46	SF2 F									
16	1349	15.05	19 19.13	155 13.61	8.25	1.9	1.5	47	9 127	11	7	0.4	0.6	39	SF2									
16	1652	56.19	19 12.60	155 33.03	8.86	2.6	3.1	53	9 128	15	7	0.5	0.7	45	LSW F									
16	1814	14.06	19 18.02	155 13.12	7.65	1.4	0.8	26	6 102	09	2	0.4	0.8	21	SF2									
16	1819	24.94	19 18.10	155 13.49	7.45	1.5	0.3	33	7 82	10	2	0.4	0.7	27	SF2									
16	1819	43.04	19 20.57	155 10.54	8.90	1.8	1.2	28	8 84	09	3	0.4	0.6	20	SF3									
16	1832	58.33	19 26.43	155 28.99	9.60	1.6	0.8	37	6 45	09	7	0.4	0.8	31	KAO									
16	2218	8.00	19 47.35	155 28.50	19.32	2.1	1.5	29	4 119	09	2	0.5	1.1	25	KEA									
16	2255	16.50	19 25.40	155 16.78	9.83	1.5	1.0	17	2 105	08	1	0.7	0.9	15	INT L									
16	2348	44.95	19 23.53	155 16.86	3.22	1.6	1.0	21	6 48	06	0	0.3	0.2	15	SSC									
17	022	24.92	20 0.49	155 2.51	41.43	2.5	2.3	55	12 244	11 32	0.9	1.4	42	KEA										
17	4	0	28.27	19 25.36	155 19.69	5.42	1.6	1.0	28	8 72	11	3	0.4	0.8	20	KAO								
17	434	44.35	19 19.25	155 13.07	10.22	2.9	3.2	55	11 125	12	6	0.4	0.5	46	SF2									
17	713	1.86	19 18.02	155 13.89	8.79	2.0	1.9	46	9 142	11	7	0.4	0.7	38	SF2									
17	1440	10.91	19 19.60	155 6.67	5.56	1.4	1.2	34	5 156	09	5	0.4	0.9	30	SF4									
17	1555	19.65	19 23.36	155 14.99	2.85	1.5	0.6	18	6 101	08	2	0.3	0.4	12	SEC									
18	6	5	53.70	19 20.71	155 29.72	11.13	1.2	0.7	21	4 49	11	5	0.5	0.9	17	KAO								

YEAR	MON	DA	HRMN	SEC	ORIGIN TIME	LAT N	DEG	MIN	DEG	LON W	DEG	MIN	DEG	AMP	DUR	DEPTH	AMP	DUR	MAG	NR	NS	DEG	SEC	DIS	ERZ	NO	RM	FM	REMK
1993	AUG	28	4	8	7:78	19	24	67	155	16	57	11	10	1.3	1.0	25	3	61	07	1	0.6	0.5	24	INT	L				
28	1048	48.04	19	25	23	14	58	1.5	1.0	24	3	57	11	1	0.8	0.9	21	DEP	L										
28	1820	50.97	19	22	61	10	52	3.0	1.1	40	3	46	08	4	0.3	0.6	38	KAO											
28	2359	14.93	19	10	48	15	24	7.1	4.1	5	216	11	7	1.1	1.3	36	DEP	T											
29	029	57.82	19	18	96	15	11	35	7	12	1.5	0.8	47	8	111	11	4	0.4	0.6	38	KAO								
29	116	13.39	19	24	60	155	0	36	8	51	1	7	1.4	4	6	9	137	11	3	0.4	0.4	37	SF5						
29	548	46.54	19	19	61	155	11	88	7	58	2	0	1.1	56	14	90	12	6	0.3	0.5	42	SF3							
29	613	39.50	19	19	57	155	10	76	8	86	1	6	1.4	4	3	7	97	09	5	0.4	0.5	36	SF3						
29	633	58.03	19	23	52	155	17	10	3	18	1	1	0.6	20	8	63	08	0	0.3	0.3	12	SSC							
29	1113	59.97	19	10	48	155	26	00	9	35	1	6	0.9	21	3	197	11	4	0.4	0.7	18	LSW							
29	1721	56.05	20	22	94	156	23	09	28	46	2	8	2.7	30	3	317	13	69	1.6	3.0	29	DIS							
29	2134	31.73	19	24	14	155	17	71	0	46	1	3	1.0	12	4	121	06	2	0.2	0.4	8	SSC	L						
30	1212	39.25	19	19	20	155	11	46	7	74	1	2	0.7	25	4	104	08	5	0.4	0.9	21	SF3							
30	1219	58.62	19	19	61	155	13	51	8	50	2	4	8	54	9	118	12	6	0.4	0.4	46	SF2							
30	1510	26.03	19	29	19	155	28	13	7	11	1	6	0.7	22	6	74	09	5	0.4	1.1	16	KAO							
30	1824	58.45	19	12	57	155	28	58	8	47	1	9	1.7	44	3	91	13	5	0.4	0.6	41	LSW							
30	1936	6.48	19	17	21	155	18	05	29	79	1	8	1.1	34	4	152	06	2	0.7	0.9	32	DEP							
30	2345	55.82	19	19	84	155	10	88	9	32	1	0	1.7	25	5	91	07	4	0.5	0.8	20	SF3							
31	144	57.81	19	25	08	155	15	26	15	45	2	0	1.9	51	8	37	10	2	0.4	0.2	43	DEP							
31	1644	58.47	19	25	46	155	20	70	3	51	1	1	0.6	15	3	67	08	3	0.4	0.8	12	KAO							
31	1936	27.52	20	9	69	156	44	07	14	86	2	5	2.1	28	2	324	12	107	7.7	12.0	26	DIS							
SEP	1	122	29.31	19	24	19	155	17	2	69	1	8	1.1	17	4	46	12	2	0.3	0.3	13	SSC	L						
1	439	24.46	19	25	55	155	19	02	5	70	1	1	0.7	17	3	81	08	2	0.5	0.9	14	INT							
1	5	9	48	06	19	23	155	16	3	01	1	3	1.0	12	4	136	06	1	0.4	0.3	8	SEC	L						
1	712	20.08	19	23	18	155	17	05	3	43	1	7	1.0	24	6	47	11	0	0.3	0.3	18	SSC							
1	1337	2.53	19	24	39	155	27	03	6	95	1	5	1.4	36	4	34	11	4	0.4	0.8	32	KAO							
2	450	10.19	19	19	94	155	11	65	8	40	2	6	3.0	57	12	85	12	5	0.4	0.5	47	SF3							
2	11	4	3.36	19	20	38	155	11	44	7	52	2	1	2.5	49	7	78	14	4	0.4	0.6	41	SF3						
2	1818	52.85	19	20	39	155	17	89	8	06	2	4	2.5	60	14	87	12	5	0.4	0.5	46	SF4							
3	520	3.10	19	24	39	155	16	15	15	71	1	6	1.3	20	4	88	12	1	1.4	1.0	16	DEP	L						
3	821	7.17	19	21	82	155	13	10	3	18	1	6	1.5	32	7	53	10	1	0.3	0.3	26	SER							
3	13	1	40.21	19	23	08	155	17	47	13	11	1	1.7	4	22	3	64	10	1	0.6	0.8	19	DEP	L					
3	1452	43.78	19	4	63	155	29	36	32	20	2	0	2.3	55	14	184	10	9	0.7	0.9	42	DLS							
3	2152	48.18	19	25	44	155	16	20	11	14	1	5	1.6	19	2	123	07	2	0.8	0.9	17	INT	L						
4	152	41.79	19	26	59	155	29	17	9	74	1	7	1.3	47	7	44	09	7	0.3	0.6	41	KAO							
4	514	38.59	19	19	54	155	4	44	0	11	1	6	1.5	29	4	161	10	3	0.3	0.4	25	SSF							
4	15	5	13.58	19	19	61	155	11	28	8	12	1	4	0.8	34	6	94	07	5	0.4	0.7	27	SF3						
4	1645	43.03	19	15	59	155	28	52	11	53	1	3	1.0	32	6	78	11	3	0.3	0.7	28	LSW							
5	242	13.54	19	21	39	155	18	80	3	53	1	4	1.1	1.29	6	45	10	3	0.3	0.6	23	SMR							
5	327	41.60	19	26	06	155	15	85	16	54	1	6	1.6	1.7	20	3	149	11	3	1.3	0.9	17	DEP	L					
5	1515	50.59	19	16	11	155	29	49	7	51	1	6	1.0	42	6	58	14	2	0.3	0.6	37	LSW							
5	1758	30.20	19	18	23	155	15	29	7	02	1	2	0.7	39	6	110	09	4	0.4	0.6	34	SF1							
5	1825	25.19	19	21	21	155	7	96	9	09	1	3	0.9	35	5	74	08	4	0.5	0.6	30	SF4							
5	2343	7.55	19	18	02	155	12	94	4	64	1	2	0.7	29	5	109	10	2	0.3	0.9	24	SSF							
6	351	25.41	19	17	53	155	30	21	9	09	1	1	0.9	32	4	72	14	5	0.4	0.9	28	LSW							

1993 HVO EARTHQUAKE SUMMARY LIST

1993 HVO EARTHQUAKE SUMMARY LIST

YEAR	MON	DA	HRMN	SEC	LAT N	DEG	MIN	LONG W	DEG	MIN	DEPTH	AMP	DUR	MAG	MAG	NR	NS	DEG	RMS	MIN	ERH	ERZ	NO	KM	FM	REMK				
1993	OCT	1	532	10.25	20	2.33	155	6.53	39.93	1.8	1.4	26	7	276	.09	30	1.2	1.5	19	KEA										
1	711	39.76	19	28.47	155	51.88	10.32	1.3	0.9	18	4	152	.15	6	0.8	1.0	1.1	KON												
1	10	1	43.84	19	24.84	155	15.02	37.94	1.5	1.3	34	3	82	.09	1	1.1	1.6	31	DEP L											
1	1611	0.23	19	11.37	155	29.23	12.02	1.9	1.3	31	5	75	.12	4	0.5	0.7	26	LSW												
1	1611	36.81	19	11.50	155	29.33	12.26	1.8	1.3	32	5	137	.11	4	0.5	0.4	27	LSW												
1	1653	31.86	19	11.57	155	29.23	12.21	1.8	1.5	48	9	74	.10	5	0.4	0.3	38	LSW T												
1	1734	18.25	19	20.29	155	7.45	7.22	1.7	1.4	38	7	95	.08	5	0.4	0.6	28	SF4												
1	1818	34.85	19	11.98	155	29.02	11.86	1.8	1.9	47	8	82	.12	5	0.4	0.6	35	SF3												
1	1951	11.26	19	20.45	155	11.24	9.23	1.3	1.0	40	8	78	.09	4	0.4	0.5	30	SF3												
1	2027	17.49	19	23.05	155	14.88	3.20	1.4	1.0	25	6	63	.08	2	0.3	0.3	18	SEC												
1	2115	54.81	19	30.52	155	7.89	15.55	2.0	1.7	10	2	327	.15	16	2.6	1.0	0	DEP L												
1	2219	20.89	19	22.24	155	3.76	7.66	1.1	0.8	35	7	103	.08	4	0.4	0.6	26	SF5												
2	340	49.63	19	19.89	155	7.55	8.32	1.8	2.0	42	5	100	.10	5	0.4	0.6	35	SF4												
2	7	20.95	19	25.16	155	19.34	6.65	1.6	0.7	33	8	70	.10	3	0.4	0.7	25	KAO												
2	748	52.93	19	25.28	155	19.24	6.45	1.2	0.9	25	4	74	.11	3	0.4	0.9	21	KAO												
2	1046	2.97	19	23.35	155	14.76	3.48	2.9	3.1	49	9	46	.10	3	0.3	0.3	39	SEC												
2	1847	13.00	19	29.09	154	53.12	6.01	1.7	1.9	16	3	153	.11	5	1.2	1.2	13	LER												
2	1947	25.54	19	23.20	155	14.75	3.24	1.4	0.6	20	6	110	.07	2	0.3	0.4	14	SEC												
3	1	4	59.72	19	20.41	155	29.96	9.00	1.4	0.8	30	4	51	.12	6	0.4	0.8	26	KAO											
3	559	47.22	19	19.54	155	13.12	6.68	1.3	0.7	29	1	75	.11	5	0.4	1.1	28	SF2												
3	844	18.20	19	28.77	154	54.33	5.59	1.9	1.9	29	2	256	.13	10	2.0	1.1	27	LER												
4	232	21.85	19	20.19	155	7.47	7.04	1.5	0.8	36	3	131	.07	5	0.4	0.7	33	SF4												
4	334	36.55	19	19.26	155	13.62	8.54	0.9	3.3	3	68	.10	4	0.5	0.7	32	SF2													
4	930	54.72	19	21.09	155	5.55	7.52	1.4	0.7	30	3	97	.08	5	0.5	0.8	28	SF4												
4	1017	9.80	19	24.56	155	16.63	9.16	1.9	1.7	22	3	60	.10	1	0.6	0.7	19	INT L												
4	1251	46.41	19	22.15	155	5.21	7.19	1.5	1.0	31	3	73	.11	5	0.5	0.7	29	SF5												
4	14	6	14.86	19	25.37	155	38.86	1.91	2.0	2.2	36	3	74	.10	6	0.4	0.8	33	WLO											
4	1943	49.60	20	8.93	155	51.82	30.46	3.3	3.7	57	10	279	.11	9	1.0	0.8	48	KHO F												
4	20	4	29.70	19	22.98	155	2.98	10.31	1.8	1.2	35	5	117	.10	3	0.4	0.4	32	SF5											
4	20	9	16.02	19	25.04	155	15.68	9.66	1.6	1.4	17	3	124	.07	2	1.2	0.9	14	INT L											
4	2120	0.45	19	26.08	155	29.42	11.63	0.9	0.9	24	7	69	.13	7	0.5	0.9	18	KAO												
5	137	54.39	19	21.19	155	6.95	8.36	1.9	1.9	45	9	86	.09	4	0.3	0.3	36	SF4												
5	453	30.35	19	29.60	155	26.06	4.95	1.3	1.2	22	3	108	.17	5	0.5	2.0	19	KAO												
5	948	16.26	19	24.41	155	29.46	9.43	1.8	1.6	54	15	32	.11	5	0.3	0.6	40	KAO												
5	14	7	50.15	19	26.99	154	54.28	5.60	1.8	0.7	25	4	149	.14	2	0.7	1.1	19	LER											
5	1453	1.20	19	24.60	155	15.92	12.32	1.5	0.8	14	2	138	.12	2	1.9	1.2	12	INT L												
5	1649	54.53	19	25.12	155	16.63	11.53	1.4	1.7	3	102	.11	1	0.8	1.0	14	INT L													
5	1657	33.50	19	25.59	155	20.47	7.55	1.8	1.6	32	6	143	.13	4	0.4	0.8	25	KAO												
5	17	4	49.21	19	25.18	155	16.06	13.08	1.5	1.0	17	3	119	.14	2	1.3	1.1	12	DEP L											
5	1723	6.15	19	25.03	155	16.51	11.22	1.3	1.9	1	66	.10	1	0.8	1.0	13	INT L													
5	1742	3.55	19	24.65	155	17.13	12.82	1.4	2.2	4	54	.06	1	0.8	0.7	16	INT L													
5	1742	44.56	19	20.46	155	11.90	9.09	1.6	0.8	32	6	77	.11	5	0.5	0.7	23	SF3 L												
5	1814	34.80	19	25.27	155	15.93	12.47	1.2	2.0	1	194	.09	3	1.2	1.5	9	INT L													
5	1823	52.20	19	23.45	155	16.47	10.66	1.2	1.1	22	3	60	.13	1	0.7	1.0	17	INT L												
5	1851	22.86	19	24.52	155	16.35	11.99	1.3	2.2	4	90	.10	1	0.9	0.7	18	INT L													

YEAR	MON	DA	HRMN	SEC	LAT N	DEG	MIN	LONG W	DEG	MIN	DEPTH	AMP	DUR	KM	MAG	NR	NS	DEG	SEC	DIS	ERZ	NO	KM	FM	REMK		
1993	OCT	22	356	6:22	19	59.63	155	32.96	7.44	1.7	1.2	37	8	176	.17	17	0	6	0.7	29	KEA						
22	8	0	32	16	19	20.48	155	10.79	8.84	1.6	1.4	44	8	78	.10	3	0.4	0.5	37	SF3							
22	1111	31	58	19	24.84	155	15.98	9.92	1.6	0.9	22	4	114	.07	2	0.6	0.3	0.5	18	INT L							
22	1130	44	20	19	26.60	155	29.83	6.43	1.7	1.6	50	10	42	.10	6	0.3	1.1	41	KAO								
22	1312	44	83	19	28.55	155	25.25	6.09	1.6	0.7	40	7	45	.11	4	0.3	0.7	33	KAO								
22	2041	19	61	19	19.29	155	25.99	32.29	2.3	2.0	56	11	59	.10	5	0.5	0.8	46	DML								
23	126	30	45	19	24.86	155	17.77	13.94	1.8	1.2	19	3	68	.09	1	1.1	0.8	16	DEP L								
23	527	47	19	23.84	155	17.67	11.93	1.3	0.8	17	2	56	.08	2	0.7	1.1	16	INT L									
23	13	6	43	43	18	48.76	155	18.91	12.75	3.4	4.0	54	11	264	.11	41	1.4	1.8	45	LOI							
23	1451	21	92	19	38.79	156	4.82	36.01	2.1	1.6	44	5	238	.10	24	1.3	1.0	39	KON								
23	1742	6	52	19	23.17	155	17.21	2.81	1.4	1.3	21	5	63	.10	1	0.3	0.3	16	SSC								
23	2216	9	89	19	24.78	155	38.07	1.72	1.8	2.0	36	5	76	.14	6	0.3	0.8	31	MLO								
24	040	37	85	19	20.11	155	11.08	9.74	1.4	0.7	30	6	85	.08	4	0.5	0.7	23	SF3								
24	322	30	37	18	44.18	155	18.78	36.10	2.0	2.0	37	8	283	.12	46	1.3	2.4	30	LOI								
24	350	2	72	20	1.78	155	28.36	12.42	2.9	3.4	55	10	202	.11	21	0.8	0.5	46	KEA								
24	5	0	34	56	20	0.35	155	29.25	12.91	1.6	1.5	40	6	196	.10	20	0.9	0.5	34	KEA							
24	7	23	94	19	20.03	155	8.72	7.90	1.6	1.4	41	7	73	.13	4	0.4	0.7	36	SF4								
24	1139	6	69	19	24.51	155	16.84	15.29	1.9	1.4	27	3	58	.12	1	0.8	0.7	24	DEP L								
24	1255	45	50	19	25.27	155	16.77	11.69	1.6	1.4	31	4	64	.14	1	0.7	0.7	27	INT L								
24	1337	34	69	19	17.66	155	30.88	9.02	2.1	2.4	52	9	81	.12	5	0.3	0.6	40	LSW								
24	1428	1	94	19	25.54	155	16.83	11.88	1.7	1.2	22	3	114	.10	1	0.8	0.7	18	INT L								
24	1546	52	25	19	27.35	155	26.16	8.36	2.4	2.6	47	8	48	.13	7	0.3	0.8	40	KAO								
24	1557	24	78	19	24.74	155	1.35	6.31	1.7	1.0	31	5	117	.11	5	0.4	0.8	26	SF5								
24	1640	37	45	19	27.32	154	52.58	0.06	1.9	2.3	37	3	197	.17	5	0.6	0.5	34	SLE #								
24	2058	4	83	19	25.33	155	15.66	16.65	1.9	1.7	21	4	125	.09	2	1.1	0.7	17	DEP L								
24	2334	16	85	19	25.57	155	16.72	11.20	1.6	1.0	18	3	95	.09	1	0.9	0.9	15	INT L								
25	034	5	28	19	16.78	155	29.49	8.45	1.5	1.4	36	3	56	.11	3	0.3	0.7	33	LSW								
25	4	0	12	41	19	13.24	155	14.85	30.81	2.1	1.3	42	7	183	.10	7	0.7	0.8	36	DEP							
25	515	41	72	19	20.23	155	10.36	10.62	0.8	24	5	102	.08	4	0.5	0.9	14	SF3									
25	526	2	61	19	24.67	155	16.84	11.21	1.8	1.2	19	3	59	.09	1	0.6	0.7	16	INT L								
25	850	43	06	19	20.92	155	6.54	11.37	1.2	0.7	20	6	95	.11	5	0.6	0.8	15	SF4								
25	945	28	92	19	10.05	155	18.98	38.65	3.3	3.9	69	19	184	.10	12	0.6	0.8	50	DEP F								
25	949	4	51	19	9.78	155	18.79	37.56	2.7	3.2	58	11	186	.10	12	0.6	0.7	46	LOI F								
25	1140	1	65	19	25.69	155	17.49	14.32	1.6	1.2	18	3	96	.09	1	0.9	0.8	17	DEP L								
25	2051	27	05	19	9.06	155	18.60	39.10	2.3	2.0	44	6	194	.10	14	0.7	0.9	38	LOI								
26	446	44	53	19	24.44	155	16.09	15.59	1.7	1.3	13	4	225	.06	1	2.2	0.8	8	DEP L								
26	1028	52	09	19	21.20	155	30.07	10.20	1.5	0.9	24	5	52	.09	5	0.4	0.8	18	KAO								
26	2330	48	24	19	19.57	155	47.56	9.15	1.7	0.8	28	3	136	.13	11	0.5	0.8	26	KON								
27	052	52	70	19	17.84	155	46.45	9.45	1.8	1.0	30	2	110	.13	11	0.5	0.8	28	KON								
27	236	59	79	19	25.53	154	59.73	3.39	1.4	0.9	28	5	97	.09	2	0.4	0.4	23	SLE								
27	747	49	74	19	24.33	155	16.81	8.66	1.4	0.9	20	3	79	.10	1	0.7	0.6	18	INT L								
27	933	46	95	19	21.08	155	30.06	8.85	1.9	1.9	45	8	33	.09	5	0.3	0.6	38	KAO								
27	1249	41	67	19	42.55	155	2.70	0.00	2.6	1.0	2	244	.10	2	9.4	3.0	8	HLL B#									
27	13	8	26	16	19	25.01	155	19.83	7.10	1.4	0.7	32	6	64	.08	2	0.3	0.6	26	KAO							
27	1322	24	43	19	25.60	155	16.41	10.18	1.9	1.4	20	3	102	.08	2	0.7	0.7	17	INT L								
1993	OCT	27	1458	6:70	19	22.09	155	5.01	7.42	1.7	1.7	45	7	74	.11	4	0.3	0.5	38	SF5							
27	1846	45	29	19	26.43	155	17.43	13.64	1.7	1.0	17	4	96	.07	2	1.2	0.7	13	DEP L								
27	2238	13	07	19	25.22	155	17.19	9.97	1.7	1.2	16	1	104	.09	1	0.7	1.1	15	INT L								
27	2357	53	91	19	46.97	156	9.03	44.35	2.4	2.0	33	10	288	.09	34	1.0	1.4	22	HUA								
28	441	36	63	19	25.59	155	17.03	13.56	1.8	1.2	14	3	120	.11	1	1.7	0.9	11	DEP L								
28	546	17	41	19	22.83	155	14.85	3.34	1.3	0.9	24	8	118	.09	2	0.3	0.3	16	SEC								
28	6	8	4	92	19	25.47	155	16.52	16.32	1.5	1.5	14	4	134	.09	1	2.0	1.1	10	DEP							
28	6	30	86	19	25.36	155	16.75	11.64	1.5	0.12	3	6	127	.08	1	1.4	0.8	8	INT L								
28	830	48	93	19	22.07	155	30.29	9.03	1.8	39	4	47	.10	5	0.3	0.8	34	KAO									
28	10	7	26	50	19	11.77	155	39.03	6.74	2.6	3.0	70	26	105	.14	17	0.3	0.7	45	LSW F							
29	129	14	69	19	20.73	155	12.06	8.63	2.0	1.8	45	7	70	.13	4	0.4	0.6	36	SF3								
29	251	1	85	19	25.21	155	17.14	11.77	1.6	1.4	15	2	60	.10	1	0.9	1.0	11	INT L								
29	548	13	96	19	11.40	155	26.19	56.05	2.0	2.1	23	6	156	.12	5	1.8	0.9	17	DLS L								
29	614	47	60	19	11.80	155	17.07	42.68	1.9	2.0	28	4	201	.21	12	2.4	1.5	20	DEP								
29	8	6	58	94	19	19.94	155	11.72	8.06	2.1	2.3	42	7	85	.10	5	0.4	0.6	35	SF3							
29	818	24	66	19	15.56	155	2.96	42.12	2.6	2.6	57	13	206	.12	8	0.9	0.6	43	DEP								
29	1040	50	98	19	12.07	155	36.83	10.95	2.1	2.3	43	9	92	.16	5	0.4	0.7	34	LSW								
29	1348	47	63	19	25.12	155	16.44	10.89	1.9	1.2	14	2	185	.12	1	1.6	1.0	11	INT L								
29	1847	59	46	19	24.48	155	17.08	9.26	1.6	1.2	14	3	132	.10	1	1.3	1.0	11	INT L								
29	2043	2	88	19	14																						

YEAR	MON	DA	HR	MIN	SEC	ORIGIN TIME	LAT N	DEG	MIN	SEC	LONG W	DEG	MIN	SEC	DEPTH	AMP	DUR	MAG	NR	NS	DEG	SEC	DIS	ERH	ERZ	NO	KM	FM	REMK			
1993	NOV	20	024	19	07	19	25.47	155	15.92	14.50	1.9	1.3	46	12	72	10	3	0.4	0.3	33	DEP											
20	5	1	34	97	19	25.75	155	16.30	12.43	1.5	1.2	14	3	130	114	2	1.4	1.3	11	INT L												
20	1439	28	68	19	20	48	155	11.85	7.37	1.9	0.8	28	6	76	09	5	0.4	0.6	24	SF3												
21	343	57	73	19	24	22	154	59.17	5.75	1.5	1.2	31	1	166	12	2	0.8	0.5	29	LER												
21	854	37	83	19	13	92	155	35.32	8.57	1.9	1.2	35	6	81	15	4	0.5	0.9	29	LSW												
21	950	53	83	19	17	00	155	28.26	9.89	1.7	1.3	26	4	54	11	5	0.4	0.7	13	LSW												
21	11	4	56	02	19	14	39	155	33.42	6.88	2.1	2.3	37	3	112	13	6	1.1	31	LSW												
21	12	8	47	02	19	25	70	155	29.95	11.29	1.9	1.4	38	5	60	09	5	0.4	0.6	29	RAO											
21	1432	5	24	19	18	77	155	15.32	7.90	1.7	1.2	30	3	99	10	4	0.5	0.8	22	SF1												
21	1826	9	36	19	19	22	155	9.94	6.43	1.6	0.8	28	5	103	12	5	0.4	0.9	22	SF3												
21	2258	14	20	19	19	35	155	9.84	7.68	1.4	0.7	24	4	98	07	5	0.4	0.8	19	SF3												
22	446	16	32	19	19	73	155	11.91	8.49	1.9	2.0	47	11	87	09	6	0.4	0.5	34	SF3												
22	1439	10	00	19	16	75	155	3.23	42.75	2.5	2.6	49	8	202	10	6	1.0	0.8	41	DEP												
23	256	58	93	19	12	95	155	26.36	8.59	1.9	1.9	33	4	128	10	5	0.4	0.6	31	LSW												
23	356	14	04	19	20	03	155	29.85	10.83	2.3	2.9	45	5	35	09	6	0.3	0.6	38	RAO												
23	7	9	4	05	18	43	97	155	9.09	6.36	2.1	1.4	27	6	289	17	57	1.3	1.6	18	LOI											
23	8	6	52	22	19	19	78	155	8.18	7.80	2.4	2.6	44	7	86	11	5	0.4	0.6	35	SF4											
23	1056	38	36	19	15	71	155	3.54	40.66	2.4	2.2	47	8	205	11	8	1.2	0.9	38	DEP												
24	126	27	31	19	24	23	155	17.12	1.66	1.9	1.1	14	3	103	11	1	0.4	0.3	10	SSC												
24	910	46	56	19	16	09	155	25.10	6.74	1.3	0.9	21	1	64	10	4	0.4	1.1	17	LSW												
24	1052	1	42	19	25	86	155	18.98	5.81	2.0	0.9	25	7	90	09	3	0.4	0.7	18	INT												
24	1317	36	27	19	17	85	155	27.25	8.41	2.0	2.4	46	4	47	11	7	0.3	0.7	41	LSW												
24	1347	21	16	19	17	30	155	27.37	10.38	1.4	1.0	17	3	92	07	7	0.5	1.1	14	LSW												
24	14	3	45	27	19	27	48	155	23.85	3.26	2.1	1.1	22	4	75	11	4	0.3	0.7	18	RAO											
24	2321	34	92	19	20	84	155	6.23	7.26	1.7	1.4	37	3	100	09	5	0.5	0.7	32	SF4												
25	314	27	68	19	19	01	155	15.31	7.50	1.6	1.2	31	2	94	09	4	0.5	0.9	29	SF1												
25	2015	42	99	19	27	22	155	53.21	12.52	1.8	1.2	23	3	145	18	5	1.1	0.6	18	KON												
25	21	5	33	18	19	19	33	155	11.55	7.62	1.5	0.9	31	3	85	09	5	0.4	0.9	27	SF3											
25	2322	28	65	19	9	63	155	27.31	6.47	2.0	1.9	40	2	189	11	1	0.5	0.7	39	LSW												
25	2356	11	49	19	9	82	155	27.35	5.72	1.7	1.0	30	1	161	12	1	0.6	1.1	31	LSW												
26	0	15	66	19	9	88	155	27.35	5.53	1.8	1.0	26	0	161	12	1	0.6	1.0	27	LSW												
26	940	18	57	19	18	33	155	25.53	9.09	1.7	1.6	28	1	74	09	5	0.4	1.0	27	LSW												
26	1915	31	99	19	9	88	155	15.46	48.70	2.3	2.1	41	8	202	09	14	1.1	1.0	29	LOI												
26	2049	21	19	19	9	59	155	32.82	7.30	1.6	0.7	25	1	122	14	9	0.5	1.0	21	LSW												
26	23	4	6	50	19	19	85	155	8.03	8.73	1.4	0.7	28	4	89	07	5	0.5	0.7	21	SF4											
27	259	14	63	19	18	32	155	12.78	3.76	1.4	0.6	23	3	106	11	3	0.4	1.1	20	SSF												
27	743	15	93	19	20	29	155	6.72	7.62	1.9	2.0	32	8	106	10	6	0.4	0.7	24	SF4												
27	1630	27	33	19	8	69	155	27.97	7.54	1.7	0.7	30	3	248	14	2	1.1	0.6	27	LSW												
28	0	32	70	19	0	48	155	41.15	13.00	1.8	1.4	26	6	183	11	4	0.8	0.5	21	DLS												
28	756	44	27	19	19	68	155	9.13	6.09	1.7	1.3	36	7	84	11	5	0.4	0.7	26	SF3												
28	23	5	48	97	19	22	40	155	2.75	6.39	1.9	1.0	34	6	127	13	3	0.4	0.7	29	SF5											
29	738	19	80	19	20	60	155	10.12	8.21	1.9	1.4	34	8	75	09	4	0.4	0.6	25	SF3												
29	838	52	21	19	19	51	155	9.15	8.65	1.6	1.0	26	5	87	06	5	0.4	0.7	17	SF3												
29	944	21	66	19	21	56	155	6.24	6.54	2.1	2.1	41	5	85	11	4	0.4	0.8	38	SF4												
29	1146	15	04	19	25	20	155	19.21	6.37	1.4	2.4	3	72	10	3	0.4	0.8	21	RAO													

HVO EARTHQUAKE SUMMARY LIST

PAGE 1

YEAR	MON	DA	HRMN	SEC	LAT N DEG MIN	LON W DEG MIN	DEPTH KM	AMP MAG	DUR MAG	NR	NS	GAP DEG	RMS SEC	MIN DIS	ERH KM	ERZ KM	NO FM	REMK
1993	JAN	1	2154	37.08	19 19.98	155 7.17	4.72	2.9	3.5	55	12	105	.18	5	0.4	1.0	32	SSF F
		8	19 4	29.82	19 8.62	156 17.34	31.64	2.9	3.5	52	9	293	.09	46	1.2	1.9	43	KON
		13	14 7	23.03	19 18.52	154 45.79	50.75	3.3	3.7	51	10	279	.10	23	1.2	0.8	43	LER
		17	6 1	4.65	19 22.69	155 24.48	14.03	2.8	3.1	55	11	28	.09	5	0.3	0.3	44	DML
		19	517	22.87	19 29.06	155 13.75	26.20	2.9	3.2	63	18	101	.11	6	0.4	0.6	45	DEP F
		24	2214	53.82	19 25.34	155 19.21	6.01	4.3	48	6	64	.11	3	0.3	0.5	42	KAO F	
		24	2246	50.00	19 25.69	155 18.98	4.87	2.9	3.8	54	14	66	.11	2	0.3	0.6	41	SNC
		24	2254	20.51	19 25.77	155 18.93	5.65	2.9	3.4	54	11	57	.13	2	0.3	0.6	42	INT
		24	2326	31.63	19 25.80	155 19.01	6.01	2.6	3.4	50	8	56	.11	3	0.3	0.6	33	INT
		25	556	23.09	19 25.83	155 19.33	4.31	2.8	3.7	59	17	72	.13	3	0.3	0.6	42	KAO
		25	6 6	14.28	19 26.04	155 19.16	4.06	2.8	3.4	44	3	57	.11	3	0.3	0.8	39	KAO
		25	1636	3.70	20 0.29	155 27.39	34.34	3.4	4.2	54	7	196	.10	17	0.8	1.3	47	KEA F
		26	524	8.81	19 13.47	155 29.73	9.43	4.8	46	8	122	.16	3	0.4	0.5	39	LSW F	
		28	8 8	21.04	19 20.46	155 12.64	9.21	2.6	3.0	56	15	161	.12	4	0.4	0.3	41	SF2
	FEB	2	1324	2.75	19 19.25	155 13.20	10.16	3.4	3.4	46	5	166	.11	6	0.5	0.4	33	SF2 F
		4	0 2	9.51	19 15.44	155 19.57	31.55	3.0	3.3	57	12	150	.10	5	0.6	0.8	44	DEP
		5	023	5.53	19 23.03	155 25.04	10.75	2.5	3.1	58	13	29	.12	4	0.3	0.4	35	KAO
		8	624	49.44	19 21.97	155 12.77	3.22	2.8	3.1	50	11	53	.10	1	0.2	0.3	40	SER
		9	2321	51.78	19 18.32	155 6.79	10.25	2.8	3.0	59	18	181	.11	7	0.4	0.3	41	SF4
		12	1831	39.51	19 9.20	155 32.26	33.56	2.4	3.1	55	15	131	.08	8	0.6	0.9	38	DLS
		18	2127	25.83	19 49.61	156 10.04	33.16	3.4	4.1	53	10	257	.12	46	1.2	1.6	43	HUA
		21	1052	46.97	19 22.76	155 29.90	11.80	3.1	3.8	59	13	32	.10	4	0.3	0.4	47	KAO F
	MAR	8	029	47.90	19 19.49	155 28.23	22.06	2.7	3.1	57	15	53	.10	6	0.4	0.8	42	DML
		10	2050	9.39	19 12.08	156 21.73	35.55	3.3	3.9	53	10	282	.10	52	1.0	1.8	36	DIS
		21	2121	34.18	18 49.12	156 42.07	10.01	3.1	2.4	51	11	313	.12	100	7.0	9.4	26	DIS -
		25	746	31.22	19 19.76	155 7.42	9.40	2.7	3.0	49	10	104	.08	5	0.4	0.5	30	SF4
		29	159	1.28	19 24.33	156 12.96	31.25	3.1	45	6	261	.10	33	1.2	0.9	28	KON	
	APR	2	1655	6.75	19 26.15	155 24.58	6.74	2.7	3.0	55	12	41	.12	2	0.3	0.8	44	KAO
		3	156	30.80	21 19.85	157 31.92	16.00	2.9	3.4	25	2	342	.13	254	4.8	15.5	16	DIS -
		9	510	17.61	20 54.38	157 4.10	1.82	3.6	4.1	43	2	336	.17	160	15.5	7.5	41	DIS F-
		11	1949	7.10	19 17.93	155 14.17	10.66	2.8	3.1	52	11	143	.10	7	0.3	0.3	38	SF2
		22	1232	54.96	19 35.18	157 35.55	17.70	3.4	3.5	51	13	325	.26	184	2.4	24.6	31	DIS -
		24	2114	4.71	19 23.67	155 16.75	3.17	2.7	3.3	56	11	36	.11	1	0.2	0.2	45	SSC F
		27	13 6	34.00	19 18.30	155 4.21	0.01	3.0	15	1	219	.19	4	2.2	0.9	14	SSF #	
		30	837	6.56	21 25.82	157 0.51	14.61	3.5	4.0	56	11	339	.17	193	10.2	15.5	45	DIS F-
		30	1353	17.64	18 52.96	155 36.17	10.07	2.6	3.0	36	7	286	.14	13	0.9	0.5	26	LSW
	MAY	8	10 8	41.56	19 21.53	155 4.94	8.85	3.0	3.2	56	14	85	.08	5	0.3	0.4	37	SF5
		20	1345	2.17	19 47.24	154 54.60	40.73	3.2	3.5	62	19	234	.11	20	0.6	1.0	44	KEA F
		22	2216	30.27	19 43.80	156 10.38	36.94	3.8	4.6	65	16	254	.11	35	0.8	1.2	49	HUA F
		30	1918	16.30	19 19.28	155 13.54	9.91	3.6	3.6	59	10	69	.12	4	0.4	0.4	49	SF2 F

HVO EARTHQUAKE SUMMARY LIST

YEAR	MON	ORIGIN TIME		LAT N		LON W		DEPTH KM	AMP MAG	DUR MAG	NR	NS	GAP DEG	RMS SEC	MIN DIS	ERH KM	ERZ NO					
		DA	HRMN	SEC	DEG	MIN	DEG										MIN	KM	FM	REMK		
1993	JUN	5	1	6	0.79	19	23.27	155	14.63	3.69	2.8	3.0	48	9	46	.10	3	0.3	0.3	39	SEC	
		8	257	49.41	19	20.46	155	12.97	9.68		4.8	48	1	65	.12	4	0.3	0.4	48	SF2	F	
		9	920	12.47	19	24.08	155	32.35	24.94	2.8	3.1	62	15	46	.10	2	0.4	0.6	45	DML		
		11	7	3	41.54	19	24.19	155	25.44	9.90	2.8	3.3	64	17	26	.12	2	0.3	0.5	42	KAO	F
		17	11	4	3.14	19	21.71	155	14.81	9.33	2.7	3.0	49	6	60	.11	2	0.3	0.3	41	SF1	
	JUL	10	11	9	57.85	19	49.98	155	59.97	46.70	3.1	3.7	56	8	228	.10	23	0.9	0.8	47	HUA	
		11	1853	41.09	18	46.18	155	9.99	9.43	2.7	3.0	52	13	296	.12	53	1.4	2.1	33	LOI		
		15	741	56.41	18	44.20	155	1.13	44.90	2.6	3.3	42	12	303	.13	62	1.6	2.7	28	LOI		
		22	543	18.42	19	49.69	155	34.60	25.89	3.0	3.2	57	11	106	.09	9	0.5	1.0	47	KEA	F	
	AUG	12	028	48.49	20	8.69	156	5.58	44.09	4.3	4.5	60	12	303	.12	55	1.0	1.5	48	KOH	F	
		12	15	1	34.85	19	11.11	155	41.48	7.34	3.7	4.1	62	14	123	.17	10	0.4	0.7	48	LSW	F
		16	1313	6.53	19	19.14	155	13.52	9.46	3.1	3.5	62	16	124	.13	6	0.3	0.3	46	SF2	F	
		16	1652	56.19	19	12.60	155	33.03	8.86	2.6	3.1	53	9	128	.15	7	0.5	0.7	45	LSW	F	
		17	434	44.35	19	19.25	155	13.07	10.22	2.9	3.2	55	11	125	.12	6	0.4	0.5	46	SF2		
		21	817	49.60	19	16.65	155	2.96	0.02	2.5	3.7	19	0	232	.14	6	1.4	2.7	20	SSF	B#	
	SEP	2	450	10.19	19	19.94	155	11.65	8.40	2.6	3.0	57	12	85	.12	5	0.4	0.5	47	SF3		
		6	2152	43.60	20	8.76	154	10.25	28.91	3.1	3.1	38	3	331	.12	100	2.7	4.2	35	DIS		
		16	439	19.13	17	17.76	158	6.86	1.94	4.1	4.1	51	5	343	.14	319	14.8	7.6	46	DIS	-	
		18	7	3	47.20	20	5.26	156	17.51	35.53	3.6	3.8	56	10	308	.12	65	1.0	2.0	47	KOH	
		23	358	46.89	21	52.03	156	21.80	12.86	3.2	3.2	44	6	340	.14	202	9.7	14.0	41	DIS	-	
		27	819	49.02	19	45.63	155	15.66	32.07	3.1	3.1	67	22	133	.12	17	0.5	0.9	46	KEA	F	
		27	2015	10.37	19	21.68	155	5.16	8.98	3.4	4.0	61	12	83	.10	5	0.3	0.3	49	SF5	F	
		29	216	36.68	19	47.12	157	25.26	14.10	3.3	3.2	40	7	328	.18	161	10.1	14.7	33	DIS	-	
		29	855	12.72	19	37.47	155	25.33	26.33	2.7	3.0	66	18	58	.11	7	0.4	0.7	49	KEA		
	OCT	2	1046	2.97	19	23.35	155	14.76	3.48	2.9	3.1	49	9	46	.10	3	0.3	0.3	39	SEC		
		4	1943	49.60	20	8.93	155	51.82	30.46	3.3	3.7	57	10	279	.11	9	1.0	0.8	48	KOH	F	
		8	1448	37.42	19	20.14	155	8.01	7.81	2.9	3.1	63	18	86	.12	5	0.3	0.5	47	SF4		
		12	1130	57.82	18	49.50	155	16.37	36.14	2.6	3.0	34	5	277	.13	45	1.7	2.5	30	LOI		
		12	1156	8.68	18	45.44	155	15.41	32.19	2.9	3.3	44	3	280	.12	49	1.7	3.0	42	LOI		
		12	12	6	46.25	18	48.41	155	15.16	11.07	3.2	3.6	51	7	272	.10	45	1.0	1.2	45	LOI	
		12	1343	49.27	18	50.82	155	17.21	12.75	3.1	3.7	49	6	264	.12	39	0.9	1.1	42	LOI		
		12	1625	23.11	18	47.94	155	15.43	22.41	3.0	3.7	51	12	273	.12	45	0.9	4.3	35	LOI		
		12	22	1	43.21	18	48.45	155	16.51	11.89	2.4	3.0	40	6	272	.13	44	2.4	3.1	31	LOI	
		13	259	23.18	18	16.21	155	7.19	4.01		3.5	34	1	318	.16	98	10.8	9.5	34	DIS	-	
		16	1330	1.15	18	48.55	155	17.46	12.02	2.9	3.2	43	5	271	.09	43	1.4	1.6	36	LOI		
		23	13	6	43.43	18	48.76	155	18.91	12.75	3.4	4.0	54	11	264	.11	41	1.4	1.8	45	LOI	
		24	350	2.72	20	1.78	155	28.36	12.42	2.9	3.4	55	10	202	.11	21	0.8	0.5	46	KEA		
		25	945	28.92	19	10.05	155	18.98	38.65	3.3	3.9	69	19	184	.10	12	0.6	0.8	50	DEP	F	
		25	949	4.51	19	9.78	155	18.79	37.56	2.7	3.2	58	11	186	.10	12	0.6	0.7	46	LOI	F	
		28	10	7	26.50	19	11.77	155	39.03	6.74	2.6	3.0	70	26	105	.14	17	0.3	0.7	45	LSW	F

HVO EARTHQUAKE SUMMARY LIST

PAGE 3

YEAR	MON	ORIGIN TIME		LAT N		LON W		DEPTH KM	AMP DUR			NR	NS	GAP RMS		MIN DIS	ERH KM	ERZ NO		REMK
		DA	HRMN	SEC	DEG	MIN	DEG		MIN	MAG	MAG			NR	DEG			SEC	FM	
1993	OCT	31	1123	9.61	19	19.98	155	6.61	9.06	2.9	3.6	49	8	115	.10	5	0.4	0.3	36	SF4 F
	NOV	6	4 4	48.81	19	17.23	155	46.93	10.53	2.5	3.0	46	4	98	.11	10	0.4	0.4	33	KON
		7	152	9.68	19	27.78	155	16.29	25.07	2.8	3.0	63	17	52	.12	1	0.4	0.6	43	DEP
		7	5 7	39.98	19	20.85	155	18.19	33.39	3.0	3.1	67	20	54	.12	2	0.5	0.6	45	DEP
		7	1952	33.50	19	22.09	155	28.89	10.60	3.0	3.9	65	18	37	.12	2	0.3	0.4	45	KAO F
		18	4 7	16.09	19	25.59	155	20.19	7.88	2.7	3.0	55	13	46	.12	4	0.3	0.5	42	KAO
1993	DEC	6	7 4	54.41	19	57.73	155	33.67	16.53	3.2	3.6	53	8	160	.11	15	0.6	2.2	45	KEA F
		8	6 3	29.18	19	21.08	155	6.23	7.79	2.8	3.2	53	12	94	.11	5	0.3	0.4	36	SF4 F
		10	1426	40.75	19	25.06	155	20.11	7.96	2.7	3.2	56	11	50	.12	3	0.3	0.4	44	KAO F
		12	110	17.03	19	25.09	155	19.71	7.37	2.5	3.0	54	13	62	.11	3	0.3	0.4	43	KAO
		12	235	13.19	19	19.73	155	8.50	8.80	2.6	3.1	54	14	79	.11	4	0.4	0.5	40	SF4
		20	638	47.01	19	45.39	156	6.91	9.19	3.0	3.2	49	9	246	.13	36	1.0	0.6	32	HUA
		24	23 5	56.45	19	11.43	155	21.01	55.29	1.9	3.1	34	2	172	.11	8	1.3	1.7	33	DEP L
		26	1131	48.28	20	5.82	157	42.10	24.88		3.5	46	9	329	.13199		1.7	3.6	19	DIS