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U.S. GEOLOGICAL SURVEY

HAWAIIAN VOLCANO OBSERVATORY
SUMMARY 91 PART I
SEISMIC DATA, JANUARY TO DECEMBER 1991

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INTRODUCTION

The Hawaiian Volcano Observatory (HVO) summary presents data gathered during the year, with a narrative highlighting seismic activity and a chronological narrative describing the volcanic events and significant Observatory-related activities. 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 emphasis in collection of tilt and deformation data has shifted from quarterly measurements at a few water-tube tilt stations ("wet" tilt) to a larger number of continuously recording borehole tiltmeters, repeated measurements at numerous spirit-level tilt stations ("dry" tilt), and surveying of level and trilateration networks. Because of the large quantity of deformation data now gathered and differing schedules of data reduction, the seismic and deformation summaries are published separately.

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 an annual publication beginning with Summary 74 for the year 1974. Summary 86 includes an extensive 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 Report¹. It is designed as a reference for users of seismograms and phase data and 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, 34 p.

CHRONOLOGICAL SUMMARY - 1991

by

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Kupaianaha

1991 was a year of transition for the Puu Oo/Kupaianaha eruption. At the beginning of the year, the woodchip tube, which fed flows to Kalapana, was still active, but flow activity soon reverted to the western side of the flow field, where lava entered the ocean at three main entry points until September. The new year also brought the era of eruptive pauses to a close. In 1990, the continuous effusion from Kupaianaha was interrupted by 12 pauses, the last occurring in November 1990. The pauses were soon followed by an era of intrusions. The first intrusion was at Kilauea's summit in December 1990, the second on the upper east rift zone in March, and the third at the summit in August. The only immediate, visible effect of the intrusions on the eruption was a brief increase in activity at the Puu Oo lava pond following the December intrusion.

The lava output from Kupaianaha gradually diminished after we began to make VLF measurements on a regular basis in April 1991. By year's end, the volume was about a quarter of that measured in April. The over-all eruption output briefly surged in November, when a fissure opened between Puu Oo and Kupaianaha. The fissure activity (episode 49) lasted about two weeks. Our estimate of the volume erupted from the episode 49 vent is $15 \times 10^6 \text{ m}^3$ (not corrected for void space).

Puu Oo

One of the most dramatic changes in 1991 occurred at Puu Oo, where, in August, the active lava pond rose to within 40 m of the crater rim. This was the culmination of more than a year of heightened activity in Puu Oo. Lava has been active intermittently at the bottom of the crater since 1987, but since August 1990 the activity has been continuous. In that month, the depth from the crater rim to the floor rose abruptly from about 180 m to 80 m. By January 1991, a lava pond had formed on the extreme northeastern (downrift) side of the crater, almost undercutting the crater wall. Through July 1991, this pond, which covered about 20% of the floor, was a constant feature of the crater. Activity was usually confined within the pond's levees, although, occasionally, short-lived overflows covered a broader area.

The floor maintained a constant level until August 1991, when it rose to 40 m below the rim during a period of greatly increased pond activity, marked by weeks of gas-pistoning (during which the pond level rapidly rose and fell by several meters), low-level fountaining, and frequent pond overflows that covered the entire floor. In November, the pond drained shortly after episode 49 began, and the floor dropped to roughly 80 m below the rim. As activity resumed in December, the floor rose to the 40 m level once again.

The crater continued to enlarge in 1991 through collapse of the inner walls and stoping of the rubble into the conduit below. The dimensions of the crater at the end of the year were 290 m by 200 m. The cone had lost 22 m in height since the last high fountaining episode in 1986.

Table C-1.

Eruption Statistics

Areas

Total area covered by lava, January 1983 through December 1991 = 76 km^2 (29 sq mi)

Surface area* covered by Puu Oo flows

(episodes 1-47) and by the "A vent" flow of episode 48 = 36 km^2 (14 sq mi)

Surface area covered by Kupaianaha flows through December 1991 = 40 km^2 (15 sq mi)

Surface area covered by episode 49 flows, November 8-26, 1991 = approximately 4 km^2 (1.5 sq mi)

*Puu Oo flows originally covered about 42 sq km, but some of this area has been reburied by Kupaianaha flows.

New land created December 1986 - December 1991 = approximately 300 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.)

Volumes

This eruption:

Total, January 1983 through December 1991 = approximately $950 \times 10^6 \text{ m}^3$ (dense rock equivalent)

Episodes 1-47 (1/83 - 6/86) = $550 \times 10^6 \text{ m}^3$ (not corrected for void space) or roughly $385 \times 10^6 \text{ m}^3$ dense rock equivalent

Episode 48 (7/86 - 12/91) = approximately $550 \times 10^6 \text{ m}^3$ (dense rock equivalent)

Episode 49 (11/91) = (preliminary) $15 \times 10^6 \text{ m}^3$ (not corrected for void space)

Other fascinating facts

Height of Kupaianaha lava shield = 56 m

Kupaianaha pond status: completely sealed off since June 1990

Height of Puu Oo cone, January 1992 = 235 m (772 ft). The cone has lost 22 m due to collapse since 1986.

Dimensions of Puu Oo Crater, October 1991 = 200 m x 295 m

Depth of Puu Oo Crater floor, January 1992 = 40 m

Puu Oo pond status: active almost all of 1991

Thickness of lava at the coast:

roughly 25 m (75 ft) over Highway 130 at Queen's Bath

roughly 50-75 ft over Kalapana Gardens

roughly 15 m (45 ft) near the sea cliff at mid-flow

Structures destroyed:

Residences destroyed through December 1991 = 181. Total losses = \$61 million.

Other structures include the Waha'ula Visitor Center and maintenance shop, Royal Gardens community center, Mauna Kea Congregational Church, Puna Canoe Club na'iau, and the Kalapana Drive-in.

Puu Oo, Episodes 1-47: 16

Kupaianaha:

November 1986-December 1989: 58

February 1990-January 1991: 105

October 1991: 2

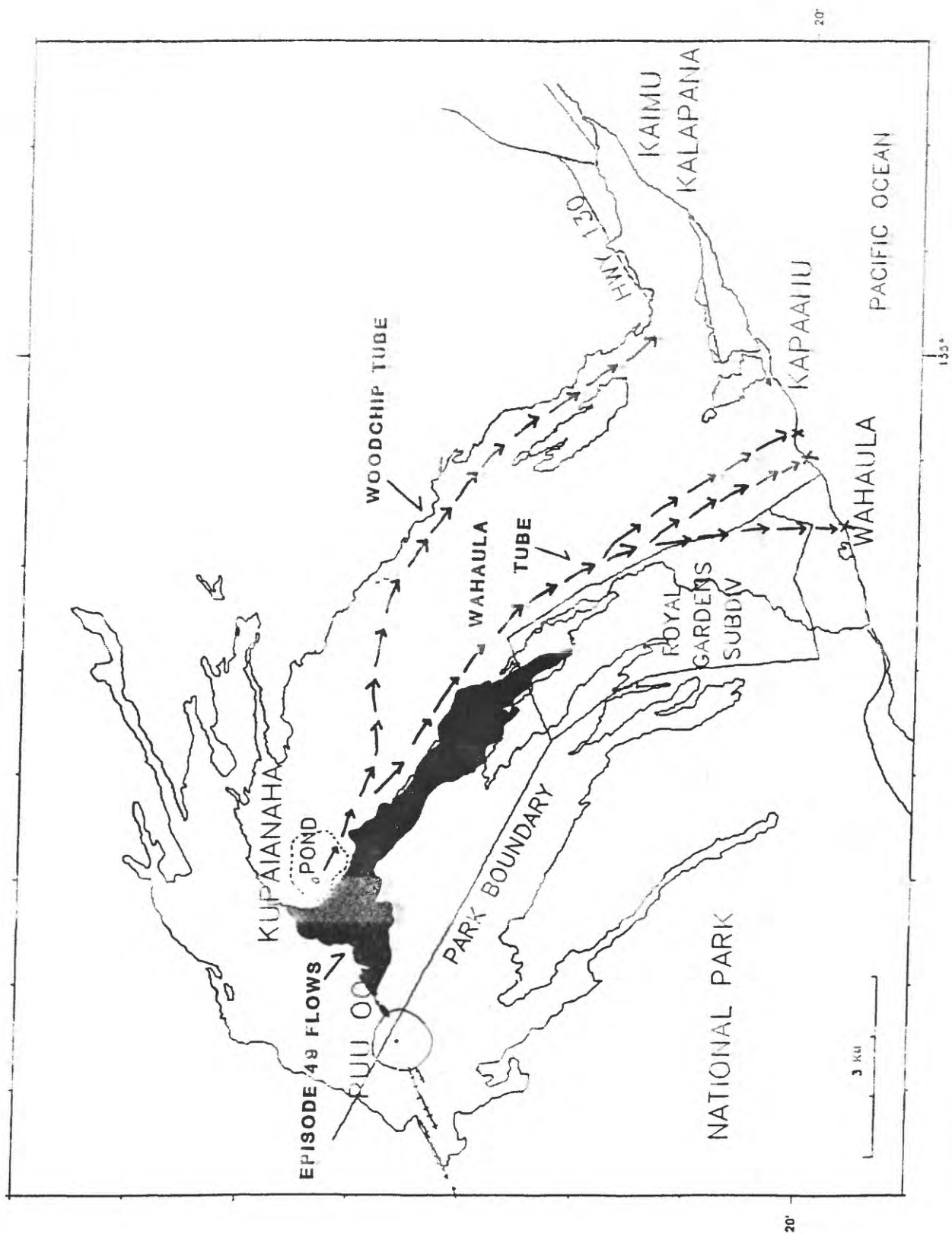


Figure C-1. Map showing area covered by lava flows produced by Kilauea's east rift eruption from 1983 through 1991.

KILAUEA

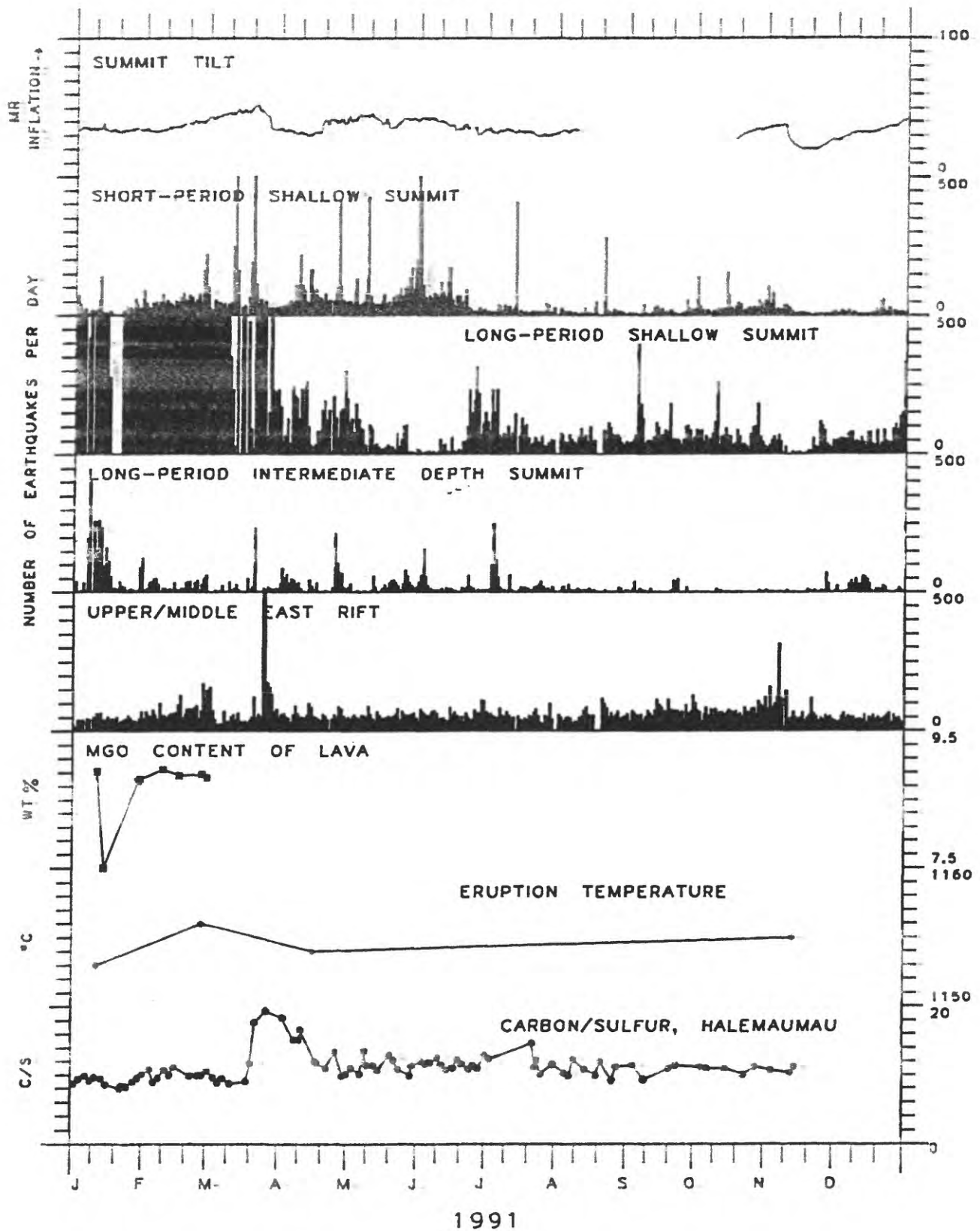


Figure C-2. Selected seismic, geodetic, petrologic and geochemical data for Kilauea, 1991.

SEISMIC INSTRUMENTATION

The network. The Hawaiian Volcano Observatory maintains an extensive telemetered seismic network on the Island of Hawaii. The 1991 network consisted of 52 stations--50 digital and 2 low-gain, three-component optical. The 50 digital stations include 12 three-component and 38 vertical-component-only sites. The coverage is most dense on and around Kilauea Volcano. With the exception of self-contained systems at the Uwekahuna and the Hilo stations, 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 Hawaii during 1991, and Figure 3 indicates the telemetry scheme for the respective seismic stations. Table 1 lists all seismic stations operated by the U.S. Geological Survey field office in Hawaii during 1991. Listed are names, four-letter station codes, coordinates in degrees and minutes, elevation in meters, and other data, as described below, pertaining to each station. In addition to the seismometers listed in Table 1, a long-period, three-component set of Press-Ewing seismometers was operated in the Uwekahuna vault and recorded on photographic paper.

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, the Office of Earthquakes, Volcanoes and Engineering (OEVE) 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. Analog signals from 36 selected stations are recorded on two Develocorders using 16-mm microfilm. FM signals from the telemetering network are also recorded directly on one-inch magnetic tape. Selected larger events are copied onto condensed FM library tapes, which are currently archived in Menlo Park. The type(s) of continuous recording used for each station (in addition to magnetic tape for the telemetered stations) 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 Uwekahuna (HVO) and Hilo and a helicorder drum seismograph is maintained on Oahu (Honolulu station operated by the Pacific Tsunami Warning Center). 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.

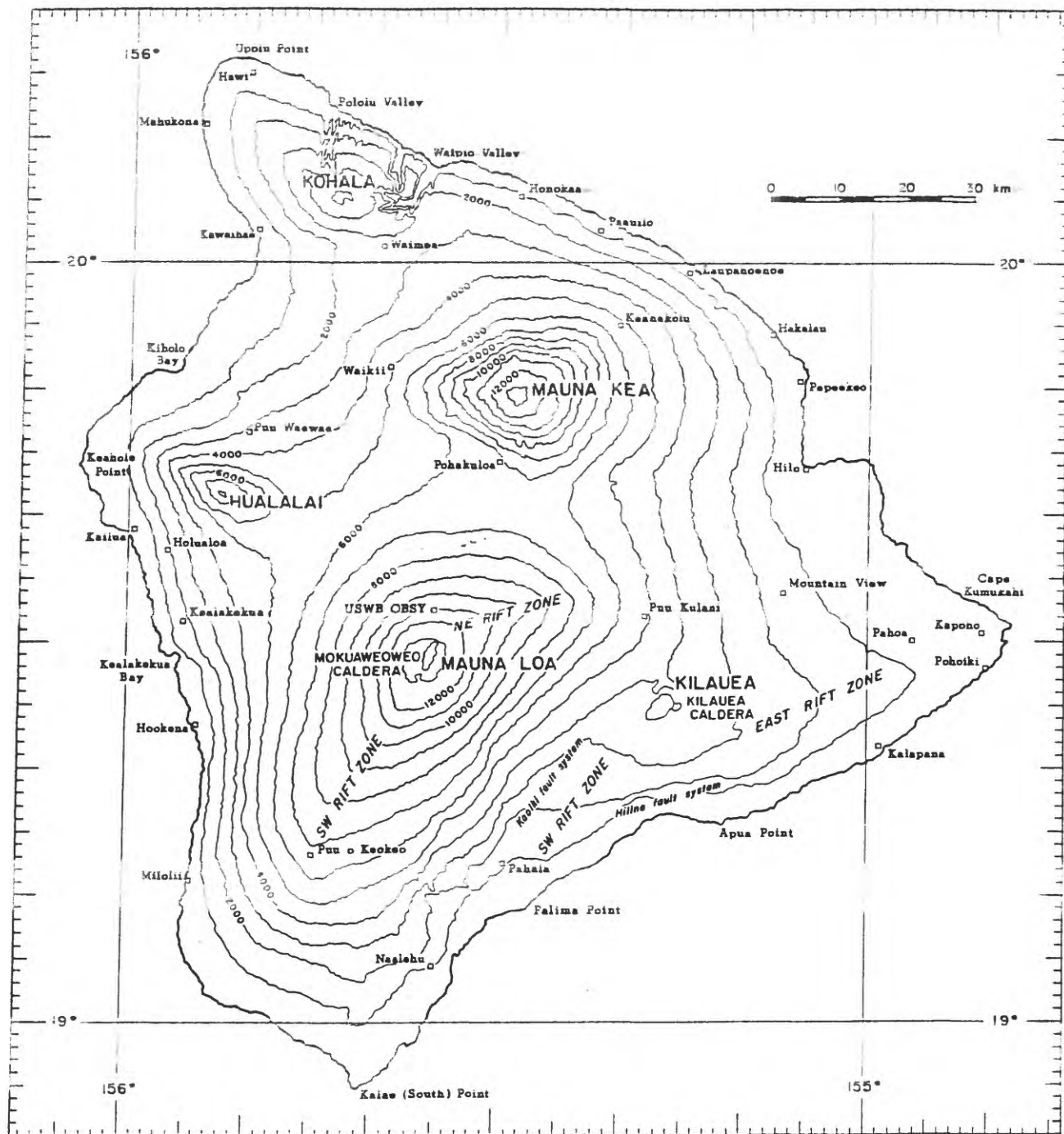


Figure 1. Map of the Island of Hawaii, showing principal settlements and selected geographic and geologic features.

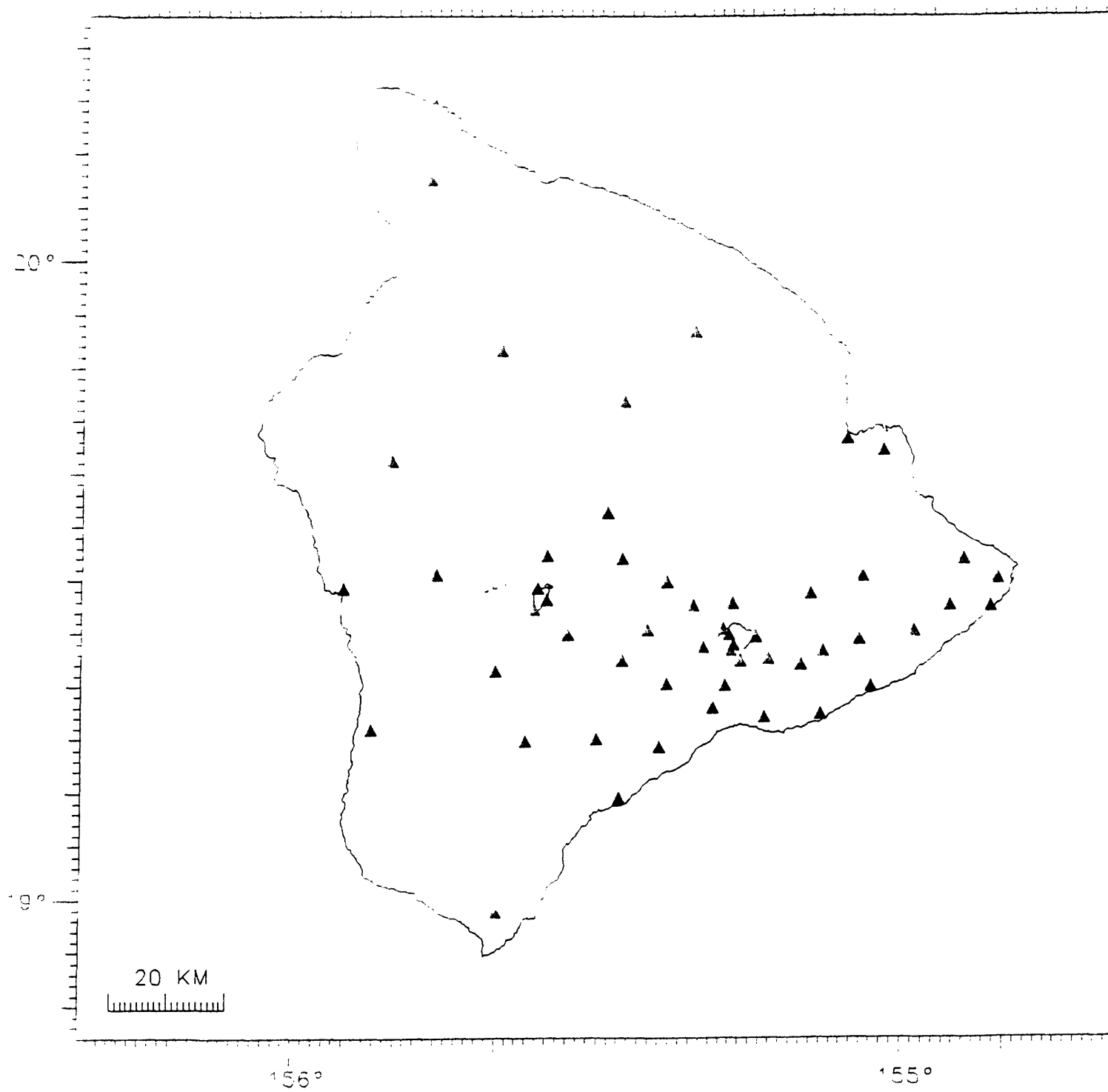


Figure 2. Seismic stations operational during 1991 on the Island of Hawaii.

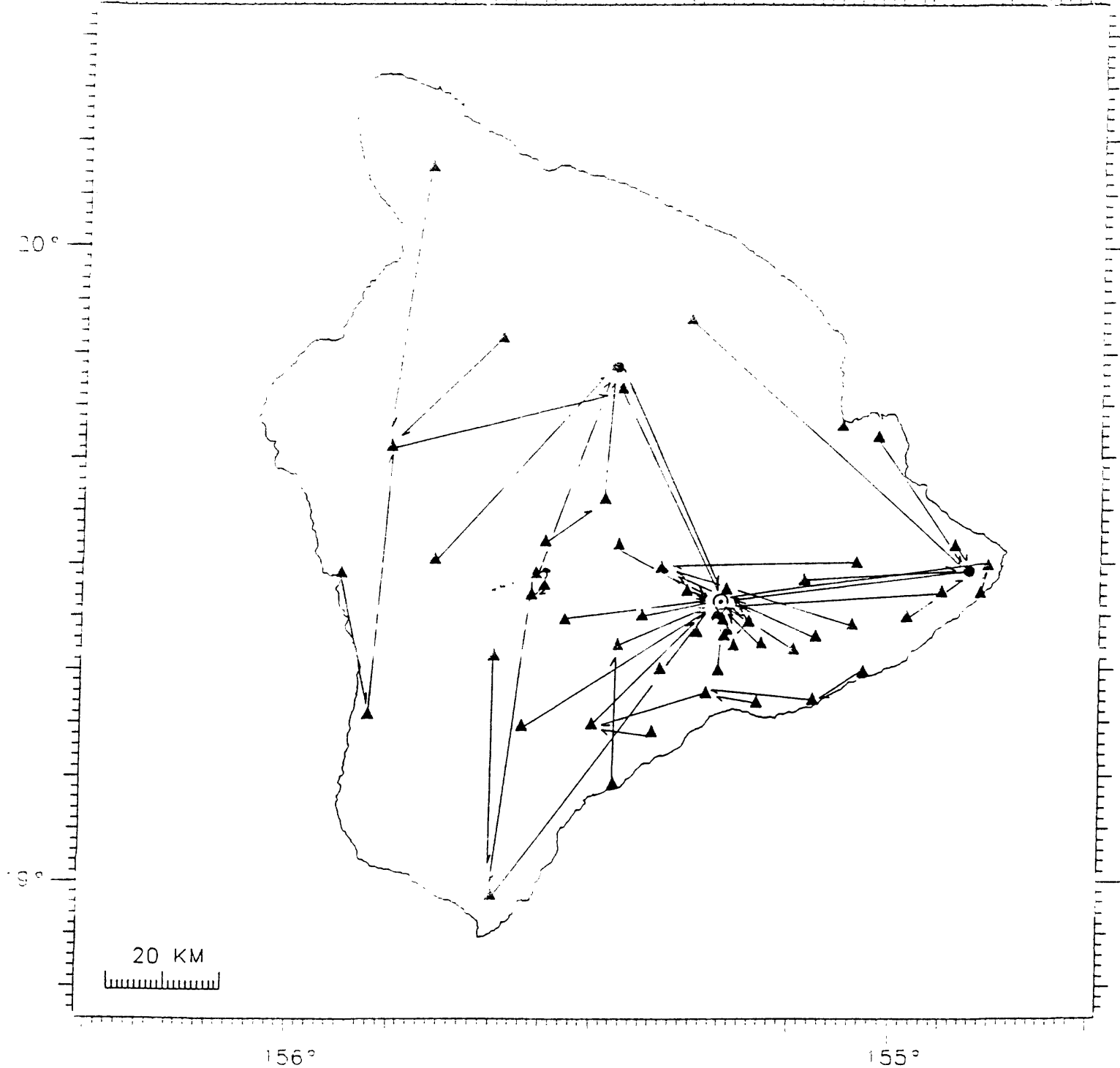


Figure 3. Telemetry scheme for the 1991 Hawaiian Volcano Observatory seismic network.

Legend

- △ Seismometer location
- Repeater station
- HVO

Table 1. Seismic stations in Hawaii operated by the USGS in 1991.

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	15.30	1070	-0.10	-0.13	3.0	E5	DI
AHUA	AHUE	19	22.40	155	15.30	1070	-0.10	-0.13	3.0	MW	
AHUA	AHUN	19	22.40	155	15.30	1070	-0.10	-0.13	3.0	MW	
AINAPO	AINV	19	22.30	155	27.32	1524	0.13	0.17	3.0	L5	D
AINAPO	AINB	19	22.30	155	27.32	1524	0.13	0.17	3.0	MW	
AINAPO	AINN	19	22.30	155	27.32	1524	0.13	0.17	3.0	MW	
CAPTAIN ROCK	CACV	19	29.29	155	55.09	123	0.00	-0.16	1.1	L5	D
CONE PEAK	CPKV	19	23.70	155	19.70	1038	-0.26	-0.07	6.0	E4	
DANDELION	DANV	19	21.42	155	40.04	2003	-0.27	0.03	7.0	E4	D
DESERT	DESV	19	20.20	155	23.20	315	-0.29	-0.13	3.0	L5	DI
ESCAPE ROAD	ESRV	19	24.68	155	14.33	1177	-0.17	-0.19	1.1	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	L4	
HALEAKALA, MAUI	HAZ	20	46.00	156	15.00	2090	0.00	0.00	1.0	W	P
HALEAKALA, MAUI	HAL	20	46.00	156	15.00	2090	0.00	0.00	1.0	H1	P
HALEAKALA, MAUI	HAN	20	46.00	156	15.00	2090	0.00	0.00	1.0	W	P
HILO	HIE	19	43.20	155	5.30	20	0.54	0.30	1.0	W	P
HILO	HIL	19	43.20	155	5.30	20	0.54	0.30	1.0	H1	P
HILO	HIN	19	43.20	155	5.30	20	0.54	0.30	1.0	W	P
HILINA PALI	HLPV	19	17.96	155	18.63	707	0.02	0.07	2.6	L5	D
HONOLULU, OAHU	HON	21	19.30	158	0.30	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	L4	D
HUMUULA SHEEP	STHSSV	19	36.31	155	29.13	2445	0.20	0.35	3.0	L5	D
HUMUULA SHEEP	STHSSE	19	36.31	155	29.13	2445	0.20	0.35	3.0	MW	
HUMUULA SHEEP	STHSSN	19	36.31	155	29.13	2445	0.20	0.35	3.0	MW	
HOT CAVES	HTCV	19	14.33	155	24.02	381	-0.16	-0.07	0.0	E4	
HUALALAI	HUAV	19	41.25	155	50.32	2189	0.67	0.38	3.0	L4	DI
HEIHEIAHULU	HULV	19	25.13	154	58.72	369	-0.17	-0.16	1.6	L5	DI
HEIHEIAHULU	HULE	19	25.13	154	58.72	369	-0.17	-0.16	3.0	MW	
HEIHEIAHULU	HULN	19	25.13	154	58.72	369	-0.17	-0.16	3.0	MW	
KAAPUNA	KAAP	19	15.98	155	52.28	524	-0.12	-0.01	3.5	E5	D
KAENA POINT	KAEP	19	17.35	155	7.95	37	-0.01	0.06	1.4	L5	D
KAOIKI 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	2.7	E4	D
KANEKII	KIIV	19	30.56	155	45.90	1841	0.15	0.37	3.0	L5	D
KANEKII	KIIE	19	30.56	155	45.90	1841	0.15	0.37	3.0	MW	
KANEKII	KIIN	19	30.56	155	45.90	1841	0.15	0.37	3.0	MW	
KEANAKOLU	KKUV	19	53.39	155	20.58	1863	0.68	0.24	3.3	L5	D
KALALUA CONE	KLCV	19	24.35	155	4.08	659	-0.25	-0.30	0.0	L5	DH
PUU KALI	KLUV	19	27.48	154	55.26	271	-0.17	-0.30	2.9	L5	D
KOHALA	KOHV	20	7.69	155	46.77	1166	-0.03	-0.17	1.5	L5	D
KOHALA	KOHE	20	7.69	155	46.77	1166	-0.03	-0.17	3.0	MW	
KOHALA	KOHN	20	7.69	155	46.77	1166	-0.03	-0.17	3.0	MW	
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	5.8	L5	DI
MAUNA LOA	MLOE	19	29.80	155	23.30	2010	0.03	0.08	3.0	MW	D
MAUNA LOA	MLON	19	29.80	155	23.30	2010	0.03	0.08	3.0	MW	
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	5.5	L4	DI
MAKAOPUHI	MPRV	19	22.07	155	9.85	881	-0.17	-0.20	4.2	L5	DI
MOUNTAIN VIEW	MTVV	19	30.25	155	7.75	409	-0.02	0.01	5.0	E5	D
NATIONAL GUARD	NAGV	19	42.12	155	1.72	18	0.54	0.30	3.2	E5	D
NORTH PIT	NPTV	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L4	DI
NORTH PIT	NPTE	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	MW	
NORTH PIT	NPTN	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	MW	
OUTLET	OTLV	19	23.28	155	16.94	1038	-0.19	-0.18	4.3	L4	
PAUHAHI	PAUV	19	22.52	155	13.10	994	-0.21	-0.24	2.4	L4	D
PAUHAHI	PAUE	19	22.52	155	13.10	994	-0.21	-0.24	3.0	MW	

PAUAAHI	PAUN	19	22.62	155	13.10	294	-0.21	-0.24	3.0	MW	
PUU ULAULA	PLAV	19	22.80	155	27.87	2992	-0.03	0.13	6.1	LS	DI
POHOIKI	POIV	19	27.42	154	51.22	16	-0.09	-0.24	0.0	LS	
POLIOKEAWE PALI	POLV	19	17.32	155	12.17	169	-0.02	0.03	2.8	E5	D
PUU PILI	PPLV	19	9.50	155	27.87	35	-0.15	-0.15	1.7	E4	D
RIM	RIMV	19	23.90	155	16.60	1128	-0.21	-0.13	0.0	LS	
RAINSLED	RSDV	19	27.78	155	16.68	1270	0.06	0.15	0.0	LS	
SOUTHPOINT	SPTV	18	58.91	155	39.92	244	-0.17	-0.22	2.8	LS	D
SOUTH POINT	SPTL	18	58.91	155	39.92	244	-0.17	-0.22	3.0	MW	
SOUTH POINT	SPTN	18	58.91	155	39.92	244	-0.17	-0.22	2.0	MW	
STEAM CRACKS	STCV	19	23.20	155	7.67	765	-0.25	-0.30	2.1	LS	DH
STEAM CRACKS	STCE	19	23.20	155	7.67	765	-0.25	-0.30	0.0	MW	
STEAM CRACKS	STCN	19	23.20	155	7.67	765	-0.25	-0.30	3.0	MW	
SOUTHWEST RIFT	SWRV	19	27.26	155	26.30	4048	0.01	0.04	5.6	E4	D
TRAIL	TRAV	19	24.01	155	32.96	1207	0.00	0.00	0.0	LS	
UWEKAHUNA	UEE	19	25.40	155	17.60	1240	-0.21	0.00	2.5	E	P
UWEKAHUNA	UEN	19	25.40	155	17.60	1240	-0.21	0.00	2.5	E	P
UWEKAHUNA	UEZ	19	25.40	155	17.60	1240	-0.21	0.00	2.5	E	P
UWEKAHUNA	URAV	19	25.40	155	17.60	1240	-0.21	0.00	0.0	RA	
UWEKAHUNA	URAE	19	25.40	155	17.60	1240	-0.21	0.00	0.0	RA	
UWEKAHUNA	URAN	19	25.40	155	17.60	1240	-0.21	0.00	0.0	RA	
WAIKII	WAIV	19	51.58	155	29.60	1433	0.20	0.35	0.0	LS	
WAHAULA	WHAV	19	19.90	155	2.92	29	-0.10	-0.04	1.5	E4	D
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	MW	
WILKES CAMP	WILN	19	28.15	155	35.02	4037	0.22	0.17	3.0	MW	
WEATHER OBSERVAT	WOBV	19	32.31	155	35.01	3396	0.00	0.00	0.0	E4	
WOOD VALLEY	WOOV	19	15.08	155	30.12	909	-0.15	-0.06	4.6	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:

- 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.
- Preamplifier/VCO - USGS/OEVE Model J302 (3), 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:

- Electrotech EV-17 1.0-sec. period moving-magnet vertical- or horizontal- (E-W and N-S) component seismometer.
- 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.

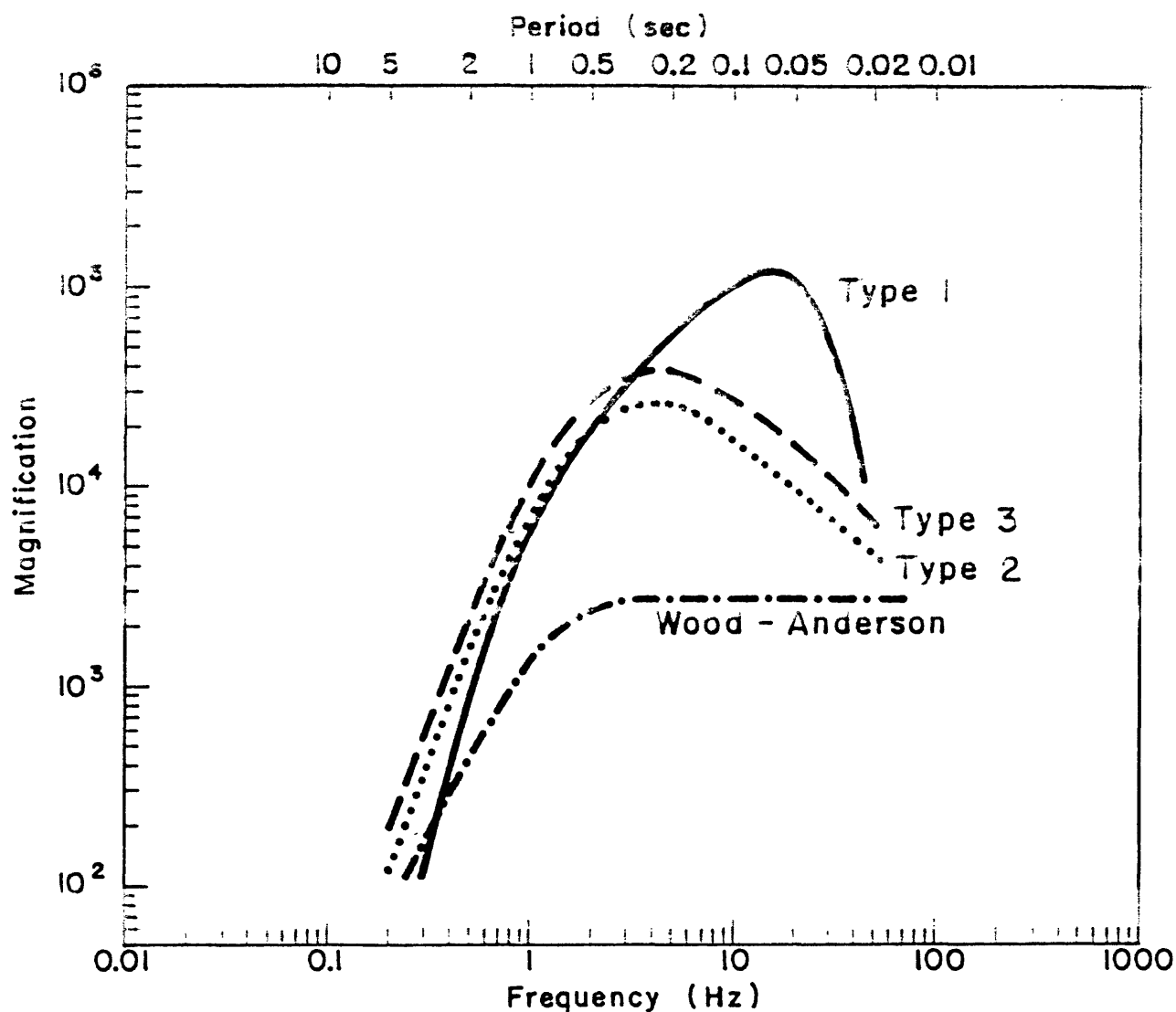


Figure 4. System response curves for the Wood-Anderson torsion seismograph and for the three different types of seismometers used by the Hawaiian Volcano Observatory. Types 2 and 3 are electro-magnetic seismographs recorded optically on photographic paper. Type 1 is the standard OEVE seismometer system 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

Develocorder films are scanned on a daily basis for frequency of earthquakes, and coda duration in seconds are measured only as a guide to magnitude. 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 and coda-amplitude (CD) magnitude. Events are examined by an analyst 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 are then determined, using the program HYPOINVERSE (Klein, 1989)². Events are reworked and rerun, as needed, to produce a final solution. Magnetic tape copies of all arrival times and output summary data are kept at Menlo Park and at HVO.

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 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 most events are computed using recorded amplitudes on low gain 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. Amplitude magnitudes larger than 2.5 are generally based on the Wood-Anderson instruments in Hilo or on Type 2 seismographs at Uwekanuna. A coda-amplitude (CD) magnitude determined by CUSP has also been included. The CD magnitudes were computed using maximum amplitudes and coda decay rates from digitized signals.

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

SEISMIC SUMMARY

The emphasis in both station coverage and detailed data analysis is on the highly active south half of the island of Hawaii. Hundreds of earthquakes too small to locate are classified as type³ and counted daily. The set of well-recorded earthquakes located in the Hawaii 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 Hawaii, but nearly all events above magnitude 4.0 are located with limited precision. Data presented in the seismic summary 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) The list of computer locations constitutes the bulk of this summary and is given in Table 5. 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 larger. This list includes many of the earthquakes felt in Hawaii.

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) Koaiki and southwest rift: earthquakes beneath the southwest rift of Kilauea, western parts of the Koaie faults, and adjacent Koaiki fault system of Mauna Loa.
- 7) Upper east rift: earthquakes in the upper and middle east rift zones, the adjacent parts of the south flank, and eastern parts of the Koaie faults.
- 8) Lower east rift: 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: 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 where 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 lava production. Only minutes of tremor at saturated levels recorded locally at STC and KLC are included in Table 3.

³ 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. [unpaginated].

Table 3. KILAUEA SUMMIT KILAUEA FLANK MAUNA LOA TREMOR (MINUTES)													
DATE	SHORT PER.	LONG PER.	PERIOD	30	KAO. SW	UP. EAST	LOW. EAST	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA INT.	LOA DEEP
1991	CALD.	A	B	C	RIFT	RIFT	RIFT						
JAN 1	15	748		2	29	26	4	1					
2	73	1156		39	26	14	4	6	3	3			
3	40	1067		3	18	41	13	6	1	5			
4	20	1005		9	29	41	5	1	3	1			
5	24	1043		26	12	41	6	4	2	1			
6*													
7	10	119		199	5	46	3	2	1	1			
8	17	643		402	27	43	12		1	1	33		
9*													
10	18	874		258	23	52	4	1	1		22	2	
11	53	816		151	21	64	4	2		9	25		
12	140	509		262	26	64	3	3				3	
13	3	858		236	25	66	2	2			5		
14	10	793		96	19	41	4	2		5	20		
15	5	903		161	47	41	5	6		4		22	
16	14	275		115	32	51	8		1	1			
17*				56	21	41	6	1	1				4
18*				13	44	45	15	6	2	2			
19*				15	22	42	4	2	1	1			
20*				11	33	50	11	4					
21*				37	27	27	10	1	2			72	
22*	19	1785		22	18	36	7	4					
23	34	2644		18	24	41	9	2	2			28	
24	26	2591		5	22	45	9	8	1	2			
25	29	2443		10	23	56	5	3	1				
26	22	1935		11	19	48	4	3	2	3			
27	59	1685		9	13	38	3						
28	40	3037		4	11	37	4						
29	23	5098		9	19	33	5	3	1	2			
30	31	4299		91	12	46	7	4	1	4		4	
31	90	2320		125	28	71	2	4		4			
FEB 1	45	1026			15	46	3	2		4			
2	26	3045		13	23	70	1		1	2		13	
3	25	2444		33	37	56	9			1			
4	46	1564		37	33	53	5	6	1	2			
5	47	1854		48	37	77	13	3	1	1			
6	33	3033		49	23	59	1	2		1			
7	50	2508		29	35	42	10	3				10	
8	16	2037		4	27	101	12	3	2				
9	19	2726		12	35	56	15	5	2	4			
10	55	3186		13	22	57	4	6					
11	43	3909		10	25	49	16	6	1	1		8	
12	38	3655		11	22	59	3	5		3		16	
13	27	1927		7	17	64	5	1	1	3			
14	52	2675		34	15	65	3	4		4			
15	44	1782		8	22	68	5	7	3	7			
16	65	2129		9	15	95	4	8		3			
17	80	1948		15	14	129	5	4	1	3			
18	56	2356		14	37	48	6	2		2			
19	51	1450		35	23	62	4		1				
20	73	1972		38	19	80	6	1				3	
21	66	1907		39	19	81	4	7		2			
22	45	2698		11	18	80	4	7		3			
23	57	1887		34	27	84	5	4	1	1			
24	79	1835		46	15	93	3					16	

KILAUEA SUMMIT				KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)		
DATE	SHORT PER.	LONG CALDERA	PERIOD	DS KM	HAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL. INT.	MAUNA LOA DEEP
1991	CALD.	A B C										
FEB25	44	1626	11	5	9	46	1					
26	162	1042		29	14	75	6	2	1			
27	219	775	1	52	31	173	7	1	1			
28	100	505		61	23	116	9	4		1		
MAR 1	24	1608		2	24	148	1	5	1			
2	20	1213			26	139	2					4
3	55	985		4	28	75	7	20	1	2		
4	46	3438		7	24	43	3	30				
5	46	3352		4	27	25	6	26		1		16
6	39	2209		5	26	26	3	15	2	1		
7	42	1185		25	18	27	1	40		3		
8	29	1250			23	73	7	12	4	2		
9	41	767			28	36	4	23	4	2		
10	48	252		38	24	35	3	2		1		
11	248	234		8	26	53	3	6	7			
12	594	28		12	13	60	1	2	2			
13	160	1035		27	20	41	3	4	1			
14*				7	28	65	4	7	1			
15	30	1614		2	18	36	6	7	3	3		
16	35	1112		4	23	34	1	2	1	2		
17*				1	33	25	4	3	3	1	5	13
18	65	477		50	21	31	1	3	1	2		39
19	190	91		6	34	39	2	5	1	6		
20	519	19		18	29	52	5	6	2	4		
21	113	1139		234	33	123	4	9	1	1		39
22	38	869		3	14	47	8	5	4	5		
23	56	854		2	31	62	6	8	2			
24	39	976		4	38	51	8	4	2			
25	48	1115		12	31	611	12	4	1	1		7
26	20	63		3	22	1089	10	5	3	4		
27	26	150		18	30	176	9	6	4	1		
28	27	603		14	29	158	11	12		1		
29	27	231		11	23	123	8	10		1		
30	30	222		15	23	71	3	4		1		
31	34	233		13	22	80	6	5	1	2		
APR 1	20	171		32	24	50	8	5		1	32	36
2	39	44		88	33	61	4	5	1	1		36
3	45	69		53	30	64	5	3		3		
4	51	129		65	22	52	11	2		1		
5	34	40		36	19	47	2			3		3
6	42	245		47	29	34	4			7		
7	109	211		45	24	60	10	10	1	5		5
8	113	204		21	27	92	9	1	1	8	6	11
9	217	128		35	29	64	7	3	1	2		4
10	120	235		15	26	52	2	11	3	1		
11	90	165		3	21	52	8	8	3	4		
12	47	261		3	29	49	5	6	4	1		
13	42	101		1	37	58	13	8	6	3		
14	164	26		46	27	100	23	18	2	4		
15	92	28		22	38	86	2	3	5			
16	33	27		7	16	53	11	9				
17	64	84		34	26	50	6	8	1			
18	61	35		4	20	44	9	2	4			
19	52	161		3	23	27	5	2		1		
20	77	194			35	61	8	3	2			

KILAUEA SUMMIT				KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)		
DATE	SHORT PER.	LONG CALDERA	PERIOD	SO KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA LOA INT. DEEP
1991	CALD.	A B C										
APR 21	47	123	5		10	55	9	4		3		
22	54	158	4		42	41	2	5	3	4		
23*												
24	53	207	16		26	44	11	3		2		
25	103	132	217		26	50	9	5		2		
26	412	59	105		22	47	9	2				
27	107	157	70		21	39	4	1	4	2		
28	57	163	59		22	32	4	1	1	2		
29	44	100	17		27	55	9	6	2	5		
30	49	201	10		16	44	11	5	2	1	2	
MAY 1	51	113	19		26	52	9	5	2	7		17
2	38	128	21		24	42	5	5	1	2	2	9
3	30	79			27	54	1	11	3	4		38
4	132	181	2		21	50	7	3	2	3		
5	39	127	5		35	50	4	1				9
6	42	95	2		12	42	5					16
7	49	90	2		23	59	7	2		2		
8	79	36	5		28	56	10	7	1	2		11
9	427	8	4		35	50	8	4	1	2		
10	69	105	4		25	90	4	7	1	2		
11	43	94	7		21	61	6	4	1	3		
12	36	32	58		24	45	6	4		1		
13	41	39	18		29	36	8	9	2	5		
14	40	27			32	71	13	11		3		
15	51	14	3		34	57	10	6	2	1		30
16	76	22	12		21	46	3	8	1	2		
17	43	26	26		35	46	3	9	2			5
18	48	35	13		31	50	6	1		3		6
19	33	29	36		26	55	9	6				
20	63	26	43		31	50	9	4	1	1		
21	69	16	45		22	54	7	4	3			
22	76	78	25		20	63	3	12	2	6		
23	97	28	22		33	32	3	7	1			38
24	70	55	7		23	40	5	11	4	1		46
25	95	103	31		18	73	12	12	2	1		
26	108	106	79		25	60	8	6	3			4
27	136	8	59		39	55	4	5		1		
28	169	9	35		19	58	8	9	1	2		
29	91	3	24		25	50	10	5				
30	103	6	14		21	65	17	10	4			
31	360	20	19	2	37	47	7	7	3	1		
JUN 1	416	14	37	5	37	33	20	11	1	4		
2	110	3	61		33	80	9	6	1	1		
3	65	7	159		41	69	11	7	2	1		
4	51	9	59		37	62	13	2	6	2		5
5	70	13	24		38	54	8	6	2	3		
6	59	4	13		26	58	18	7	4	4		
7	79	11	8		33	70	5	2	3	2		
8	75	4	3		33	75	15	4	1			
9	62	12	6		24	64	10	6		1		
10	121	55	3		21	43	13	3	2			5
11	85	7	13		28	46	16	3	3	2		
12	64	38			17	48	11	7	3	1		4
13	172	11	16		22	39	15	6	2	3		
14	169	10	13		15	35	16	5	3	1		

		KILAUEA SUMMIT			KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)	
DATE	SHORT PER.	LONG CALDERA	PERIOD	20 KM	HWO. 2 SW	UP. EAST	LOW. EAST	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA LOA
1991	CALD.	A	B		RIFT	RIFT	RIFT				INT.	DEEP
JUN 15	56	61	12	0	24	85	12	9	4			
16	56	12	10		18	59	16	2				
17	71		5		28	68	21	11	2			
18	58	18			23	55	9	4	1	4		
19	49	9		2	25	26	11	2	1	3		
20	22	46	17		22	53	13	4	6	2		26
21	34	47	5		22	31	14	3	1	1		
22	29	42	59	18	24	56	16	5		1		5
23	23	44	188	60	20	51	11	2	2			
24	12	59	58	18	21	41	7	10	2	1		
25	14	30	162	14	74	42	8	3	3	2		
26	14	43	269	4	25	76	7	5	1	1		
27	27	13	185	5	23	65	10	3	2	1		
28	16	31	18	5	43	55	4	6	1	1		
29	21	49	63	9	36	111	6	7		2		2
30	13	54	95	10	31	109	12	8	4	1		2
JUL 1	12	55	60	8	22	68	10	3	1	1		
2	12	49	32	11	27	62	12	9	2			32
3	12	32	201	103	25	64	14	13	5	2		
4	12	42	109	250	29	55	12	7	5	1		9
5	41	51	184	119	29	49	11	9	1	3		
6	36	36	33	55	28	50	10	9		1		
7	20	56	2	16	47	83	11	7	1	3		24
8	38	73	1	7	28	57	8	4	2	2		11
9	15	51	7	9	31	53	13	9	2	4	4	
10	34	71	30	6	13	68	8	8		1		
11	18	45	15	61	20	56	7	3	3	1	12	
12	24	44	34	7	27	37	10	11	2	1		
13	406	142	2	4	45	49	8	168	437	3		3 51
14*												
15	16	39	27	8	24	55	11	27	1	2		7
16	7	22	107	19	29	40	10	53	6	7		
17	13	22	69	18	26	29	16	42	2	2		4
18	3	22	13	16	12	46	13	18		3		
19	10	19	39	15	26	42	24	12		1		6
20	14	28	4	3	25	57	52	7	2	1		9
21	18	37	3	10	26	52	57	13	1	3		9
22	12	57	3	19	19	67	39	14	1	2		
23	12	43	1	21	20	79	22	11	6			
24	12	43		29	27	55		10				18
25	8	13	36	29	30	70	12	4	1		25	5
26	43	15	15	20	16	27	3	2	1	2		
27	37	19	6	9	31	54	3	7	3	2		41
28	5	40		13	33	50	6	6	3	1		
29	12	52			33	29	5	13		1		
30	29	47	3	19	39	42	7	9	3	6		
31*												
AUG 1*												
2	23	73	1	5	23	38	10	9	1	2		
3	13	71		20	40	50	4	5				
4	14	29	5	21	39	38	3	14		2		15
5	14	41	1	5	22	49	4	16	1			
6	13	53	18	29	18	51	2	3	1	2		
7	8	15	18	10	17	46	4	6		1		
8	10	41	1	10	26	31	9	15	4			

KILAUEA SUMMIT					KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)		
DATE	SHORT PER.	LONG CALDERA	PERIOD	DO KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA LOA	DEEP
1991	CALD.	A B C			RIFT	RIFT	RIFT						
AUG 9*	4	31	9		15	35	6		1				
10*	4	32	30	14	42	53	6					31	
11	3	48	44	7	28	50	13	4		2			
12	26	47	3	10	25	54	4	7	1	1			
13	11	58	11	7	31	75	7	4	2	2			
14	7	45	9		36	36	13	11				15	
15	5	38		13	24	59	4	5	2	3			
16*													
17	30	45	4	9	19	57	7	4	2	2		8	
18*													
19*													
20*													
21	380	36		1	30	118	7	3	1	1		16	
22	20	48	1	3	21	101	5	3		5		2	
23	12	111			30	83	9	4	5	1		36	2
24	8	95		1	21	50	4	5		1			
25	21	70		1	28	56	3	5					
26	19	66		4	16	51	5	5		1			
27*	14	71		2	24	58	4	9	5	2			
28	12	59		17	34	70	5	12	3	3			
29	3	41		14	17	44	8	7		3		3	
30	3	34		1	32	49	7	4		1		39	
31	3	45		5	23	53	8	7	2				
SEP 1	9	30		5	34	62	7	3	3	1			
2	6	43		4	23	34	10	7	1	2			
3	4	53		11	35	72	13	4	3	2			
4	6	68		38	46	66	9	5	1	6			
5	4	78	317	4	34	58	7	7	4	3			
6	24	88	92	15	14	57	5	2	2	1			
7	40	94	32	5	14	60	8	4	4				
8	7	38	1	5	26	37	7	1	3	2			
9	1	48	2	3	36	52	5	1		1		2	
10	5	49		3	37	75	7	3				41	
11	12	51		15	24	64	11	5		1			
12	31	63		1	21	55	4	3	3				
13	35	112		4	27	76	14	2	2	1			
14	22	95		1	39	115	12	4	1				
15	25	69		2	35	96	3	9	1	1			
16	3	69			22	36	3	10		2		29	
17	15	37		1	17	58	11	14	4	4			
18	3	30			15	72	7	3	1	4			
19	19	181		1	34	115	8	25	1	2			
20	7	53		9	36	77	11	11	1	2			
21	6	54		42	29	76	8	17	10	1			
22	4	54		16	37	70	10	23	2	3			
23	2	49		48	35	74	6	13	1	2		2	
24	7	35		1	36	66	3	6	4	5			
25	15	55		1	28	70	12	17	1	4			
26	57	100		1	31	41	15	10	1	4			
27	27	103		18	23	93	14	5	1				
28	22	36		1	26	63	7	6	1	2			
29	19	43		1	35	72	31	18	1	1		49	
30	25	51			38	128	22	7		2			
OCT 1	137	89		3	29	100	3	3	3	4			
2	16	80			29	75	11	2	2				

		KILAUEA SUMMIT			KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)	
DATE	SHORT PER.	LONG PER.	PERIOD CALDERA	DO FM	SW & RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA LOA DEEP
OCT 3	19	34	2		29	68	15	2	1	1		
4	1	45	1		74	26		5	2	1	4	
5	19	56			29	60	31	5	1			
6	12	45	1		43	85	12	3		2		
7	3	54	2		18	56	14	5	2	1		
8	20	77	1	1	10	80	9	4	1			10
9	17	116	1	1	21	65	10	4	1			
10	27	157	2	14	21	61	18	2	3			7
11	10	35		6	16	56	14	5	2	3		3
12	27	63		1	27	69	9		1	3		
13	30	68		2	35	69	13	5	3			5 17
14	157	94		3	32	62	18	9	4	1		
15	74	57		2	20	57	7	12	1	2		
16	23	65		3	45	77	12	11	3	3		5
17	18	34			29	73	6	11	1	3		30
18	33	41			27	67	8	3	4	1		8
19	46	35	1	2	26	73	11	2	2	2		28
20	40	65		2	22	59	11	11		1		107
21	9	36	2	3	27	63	11	10	1			6
22	20	54	1	1	26	63	8	5	1	1		
23	24	79		1	33	84	2	5	2			5
24	31	17		1	51	68	12	6	2			
25	25	74	1		34	63	10	5	3	2		
26	33	97	2		32	81	6	3		3	2	2
27	19	95	6		30	83	5	5	4	13	9	32
28	56	174	8	1	32	58	7	6	2			
29	44	63		7	30	107	14	7	2	2		5
30	18	44			57	93	2	3	1	5		
31	53	31		3	24	84	7	1	1	2		3
NOV 1	105	24		10	25	121	4	3	3			
2	41	33		2	26	80	8	5	1	1		
3	79	52		3	20	139	13	5	2	2		
4	22	36	7	3	26	84	8	2	5	3	12	
5	15	45	1		29	78	5		4	2		53
6	18	66	3	3	27	121	10	2	1	2		
7	22	43	1	2	23	311	4	4	1	1	60	
8	39	2		1	24	117	8	2	3		1440	
9	37	26		3	38	11		1		1	1440	
10	31			7	24	144	10	1	2	1	1440	
11	16			1	29	139	8	5		1	1440	
12	5	9		1	31	48	20	3	3	1	1440	
13	7	1		1	15	68	13			5	1440	
14	10	7		1	23	49	11	11	2	2	1440	
15	11	7		1	25	36	2	3	1	1	1440	
16	11	1			16	47	7	3			1440	
17	10	4		1	22	67	9	8		2	1440	
18	5	5		4	15	38	5	12	3		1440	27
19	3	14		11	18	47	15	12	1	1		
20	1	13		5	17	57	6	42		1		
21	3	55	3		36	118	7	4		1		
22	5	20	8	3	25	64	2		1			
23	7	14	11	2	25	53	10	2	2	5		
24	5	31	86	2	16	28	12	1	3	1		
25	1	17	86	7	12	48	10	2	1	1		
26	5	19	55	5	15	41	5	5	2	1		

KILAUEA SUMMIT					KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)		
DATE	SHORT PER.	LONG CALDERA	PERIOD	DO KM	KAG. & SW RIFT	JP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA LOA INT.	DEEP
1991	CALD.	A	B	C									
NOV27	5	15	22	70		11	56	81	10	3	5		
28	7	18	10	32		21	44	121	3	1	2		
29	18	20		1		19	53	31	2				
30	18	48	2	1		13	40	101	2	1	1		
DEC 1	10	50		6		15	37	51	3	1	4		
2	5	53		23		19	32	91	3	2	3		5
3	19	58		1		16	36	11	3		3		
4	12	56		4		44	54	21	3	1	2		5
5	9	46		3		32	55	51	15		2		
6	21	69	3	5		22	45	61	2		1		
7		72	7	31	1	11	55	71	5	1	3		
8	13	79	1	43	1	17	40	81	4		1		
9	7	42		29		13	51	91	3		2		
10	3	47		49		33	59	141	5	1	4		
11	8	29		22	1	17	43	71	4	5	2		35
12	6	62		31		20	45	91	9		3		5
13	7	43		50		12	41	111	7	2	1		13
14	9	31		56		22	60	71	3		1		
15	8	75	4	47		16	30	111			2		
16	12	79		32		22	52	31		1	3		
17	12	37		5	1	23	48	81	2	1	2		
18	26	34		2		22	58			1			
19	19	84	3	13		16	42	61		1	1		4
20	54	23	3	14	1	9	52		2	1	3		
21	60	41		4		18	37	41	2	5	3		74
22	16	87		25		42	45	141	3	9	6		
23	11	47		19		44	51	91	5	9	5		2
24	30	43		4		10	58	11	1	3	2		2
25	7	44		3		30	65	51	9	6			28
26	19	92		1		23	31	51	5	2			6
27	16	107	1			16	59	31	6	1	3		
28	12	87	1	5		23	44	71	9				
29	15	132	2	16		16	48	71	2		1		
30	13	147	3	3		19	35	111	9	2			
31	10	329	1			11	28	181		14	4		

*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 (0-5 km)
- 5 SME - Shallow middle east rift (0-5 km)
- 6 KOA - Koaie fault zone (0-5 km)
- 7 SSF - Shallow south flank (0-5 km)
- 8 SLE - Shallow lower east rift (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 (5-99 km)
- 15 MLO - Mauna Loa (0-13 km)
- 16 LSW - Lower southwest rifts of Kilauea and Mauna Loa (0-13 km)
- 17 GLN - Glenwood (0-13 km)
- 18 SWR - Southwest rift (0-13 km)
- 19 INT - Intermediate caldera (5-13 km)
- 20 KAO - Kaoiki (0-13 km)

--Deep:

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

--Outer regions, all depths:

- 24 LOI - Loihi
- 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

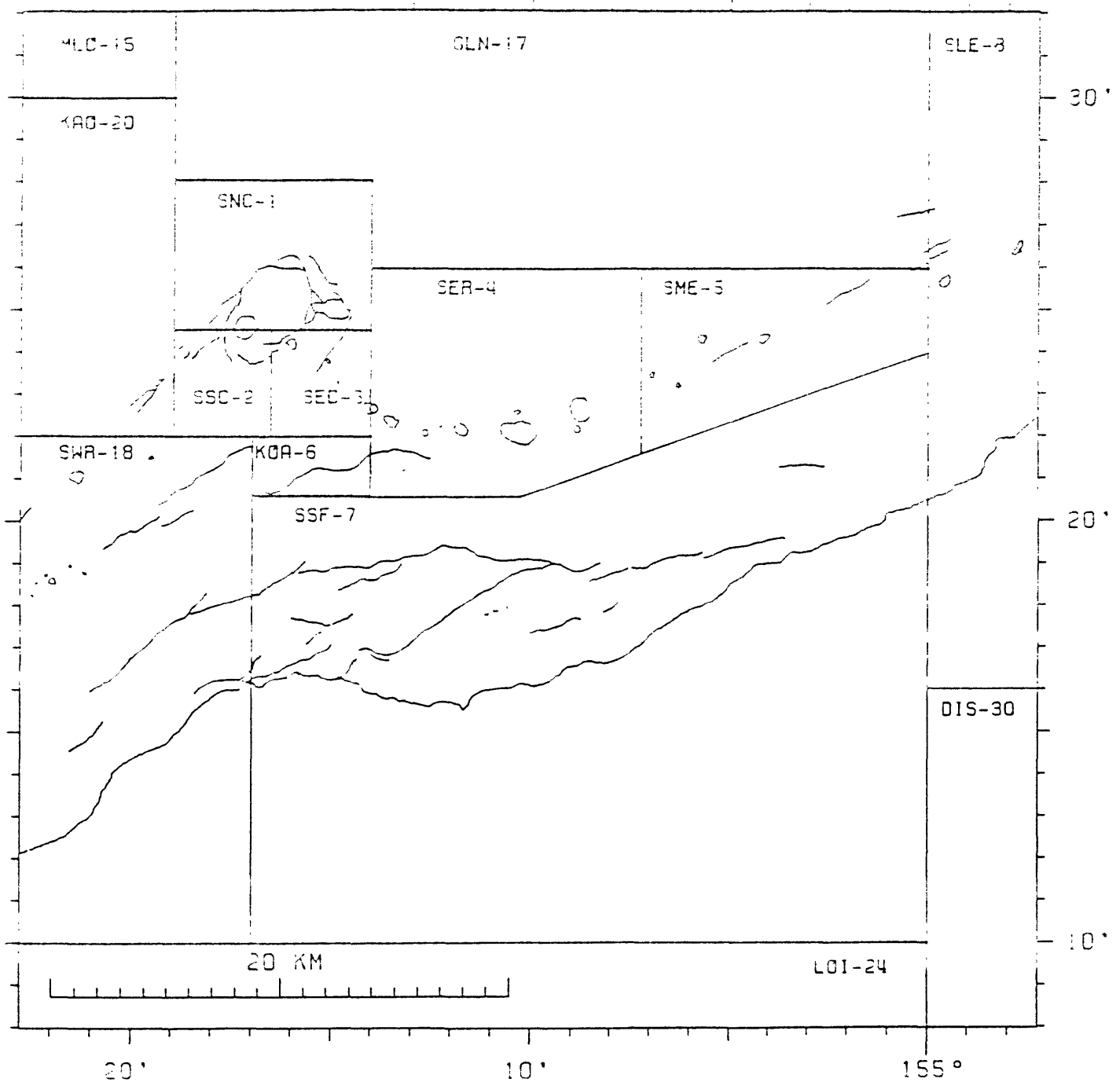


Figure 5. Earthquake classification, shallow (0-5 km deep), for Kilauea and the east flank of Mauna Loa.

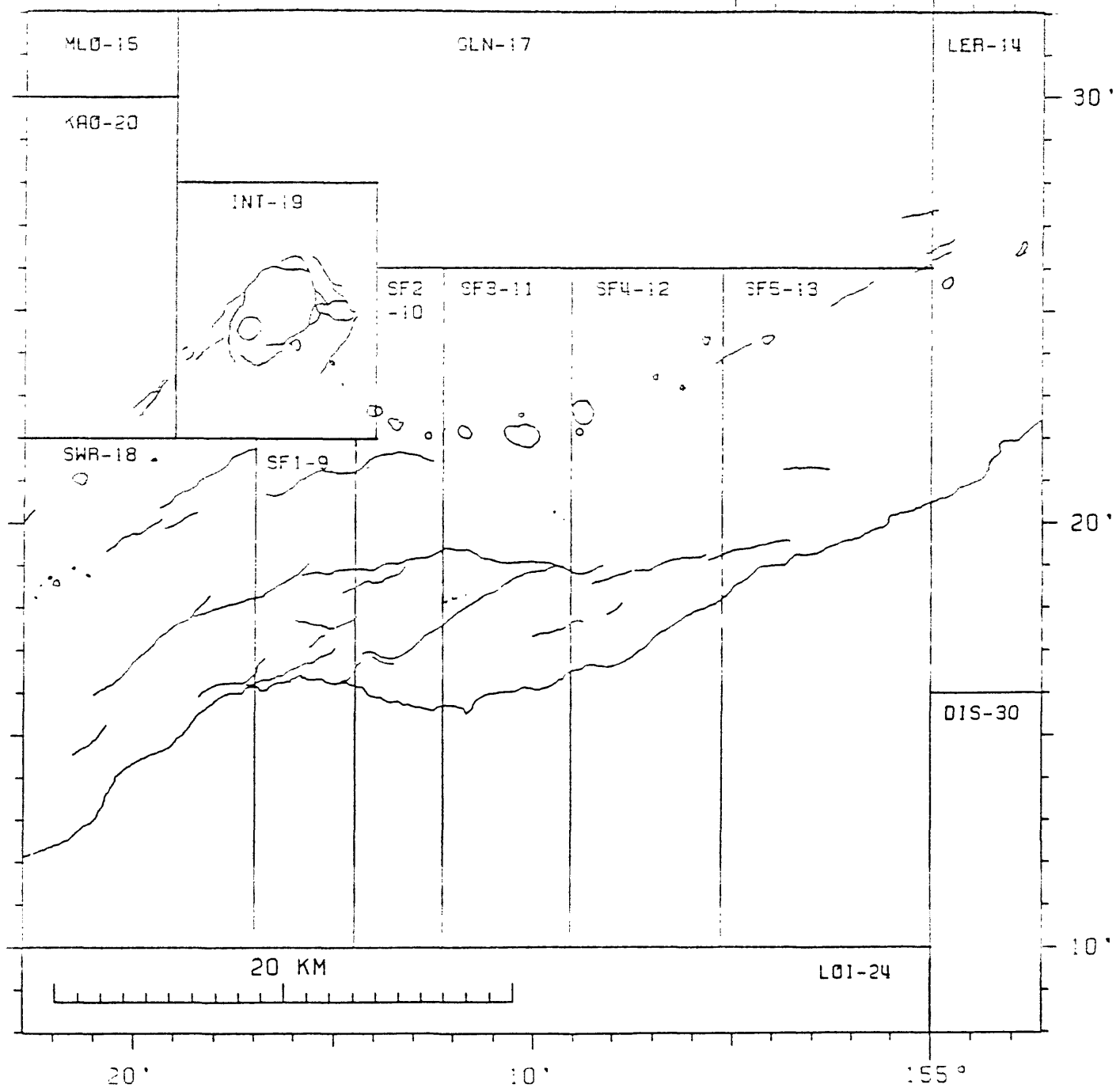


Figure 6. Earthquake classification, intermediate (5.1-13 km deep), for Kilauea and the east flank of Mauna Loa.

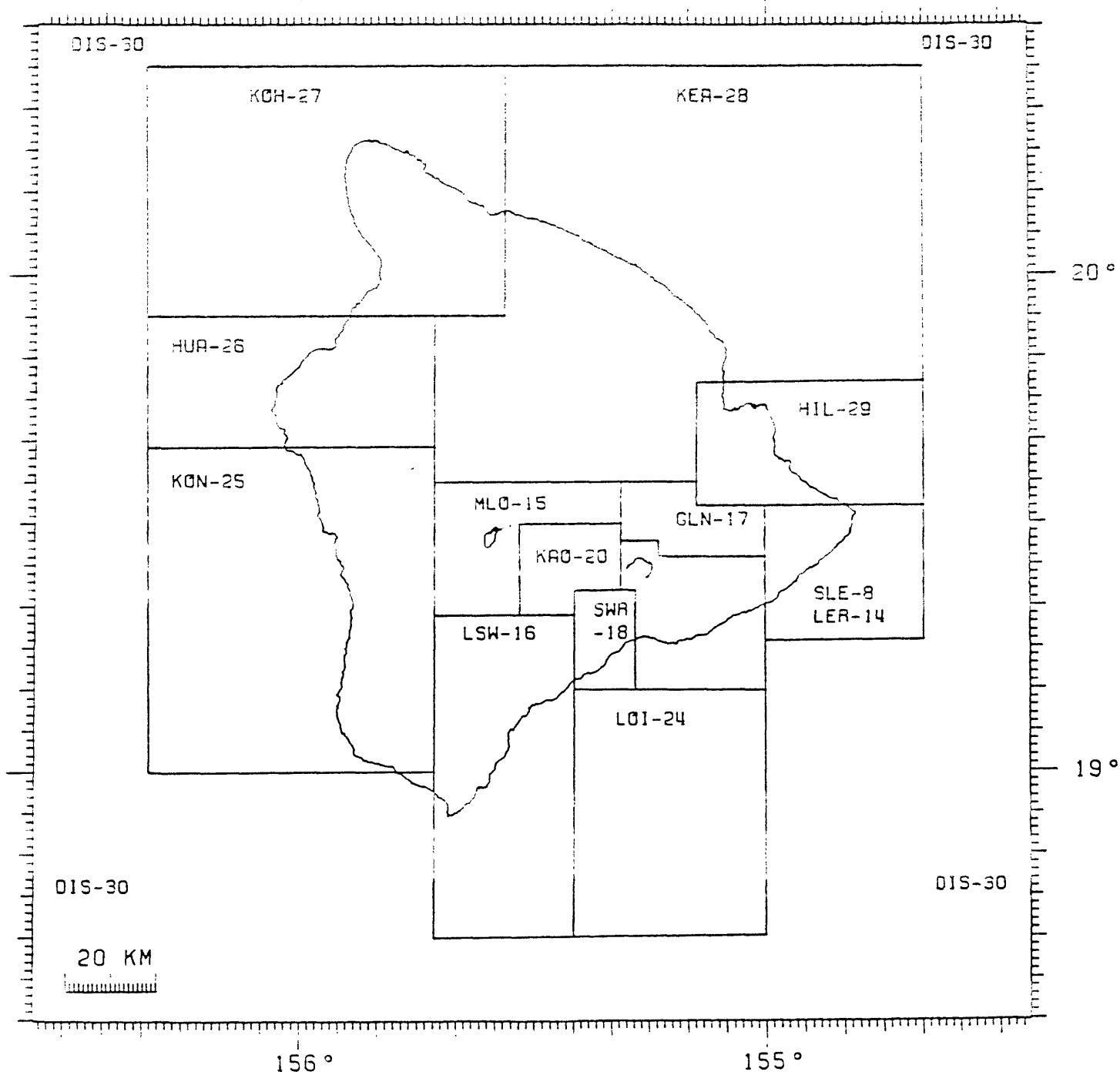


Figure 7. Earthquake classification, crustal (0-13 km deep), for the Island of Hawaii.

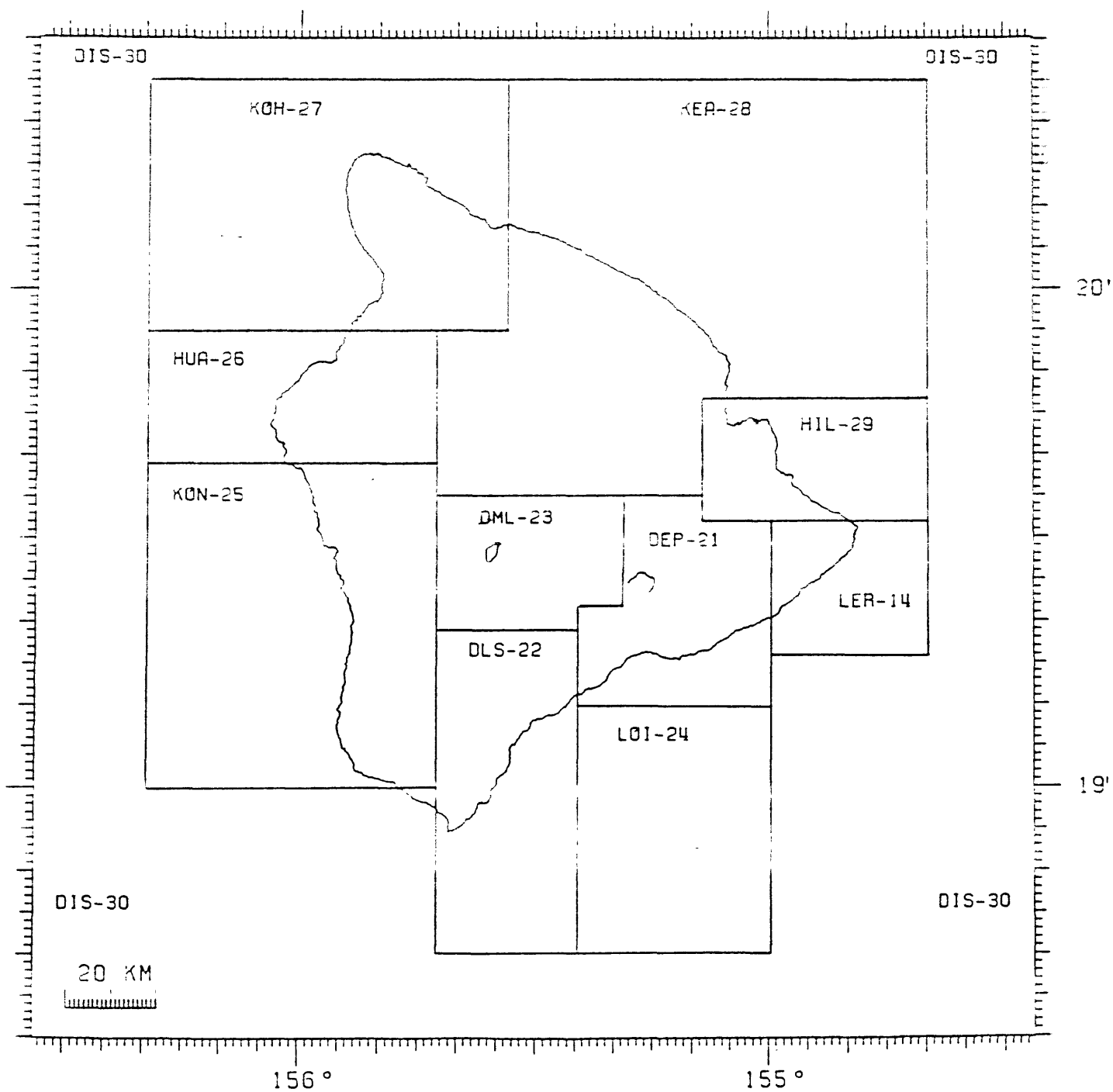


Figure 8. Earthquake classification, deep (greater than 13 km deep), for the Island of Hawaii.

Figure 9. 1991 Earthquake locations, Hawaiian Islands,
0-60 km depth, $M \geq 3.5$.

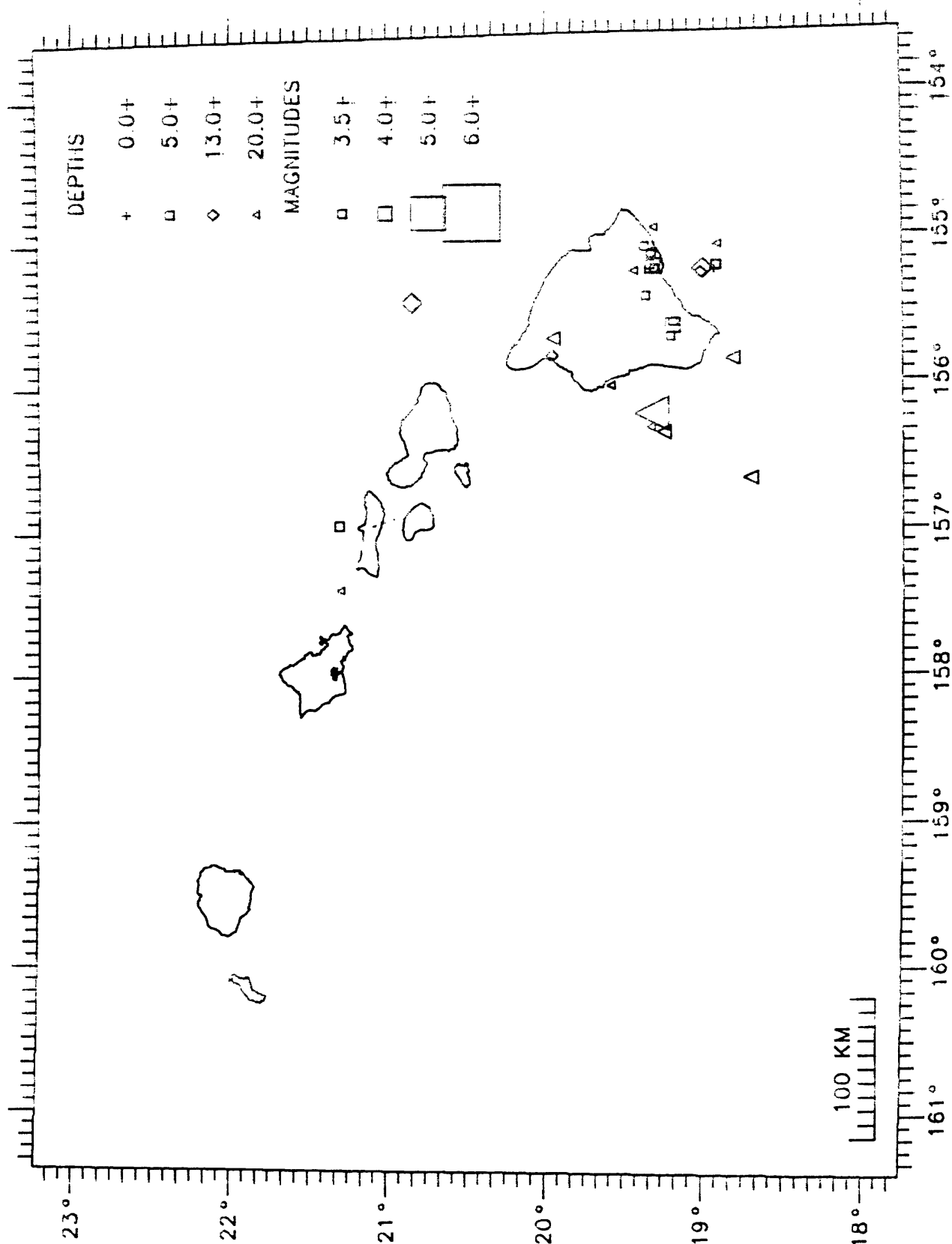


Figure 10. 1991 Earthquake locations, Hawaii Island,
0-60 km depth, $M \geq 3.0$.

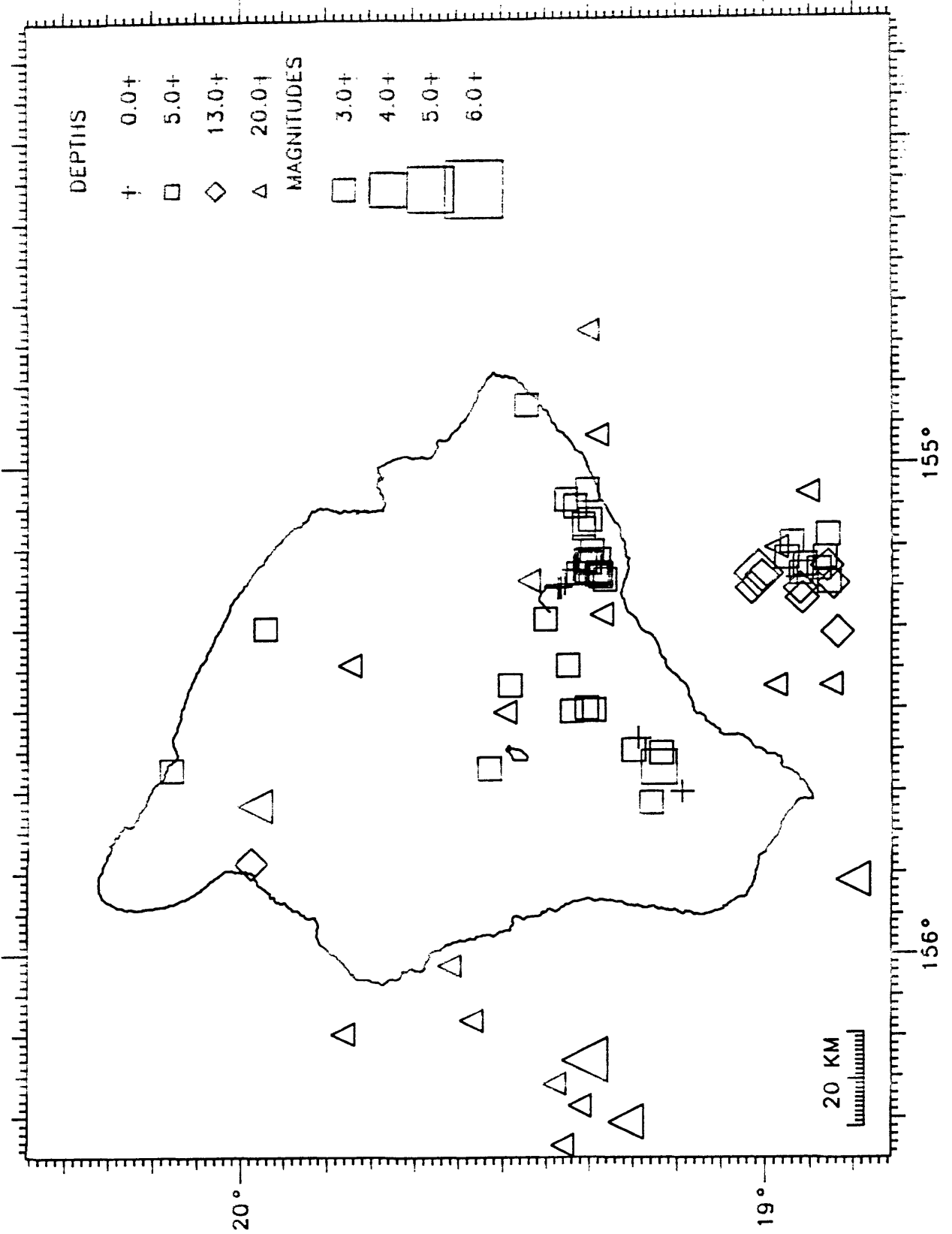


Figure 11. 1991 Earthquake locations, Howii Island, shallow (0–5.0 km depth), $M \geq 2.0$.

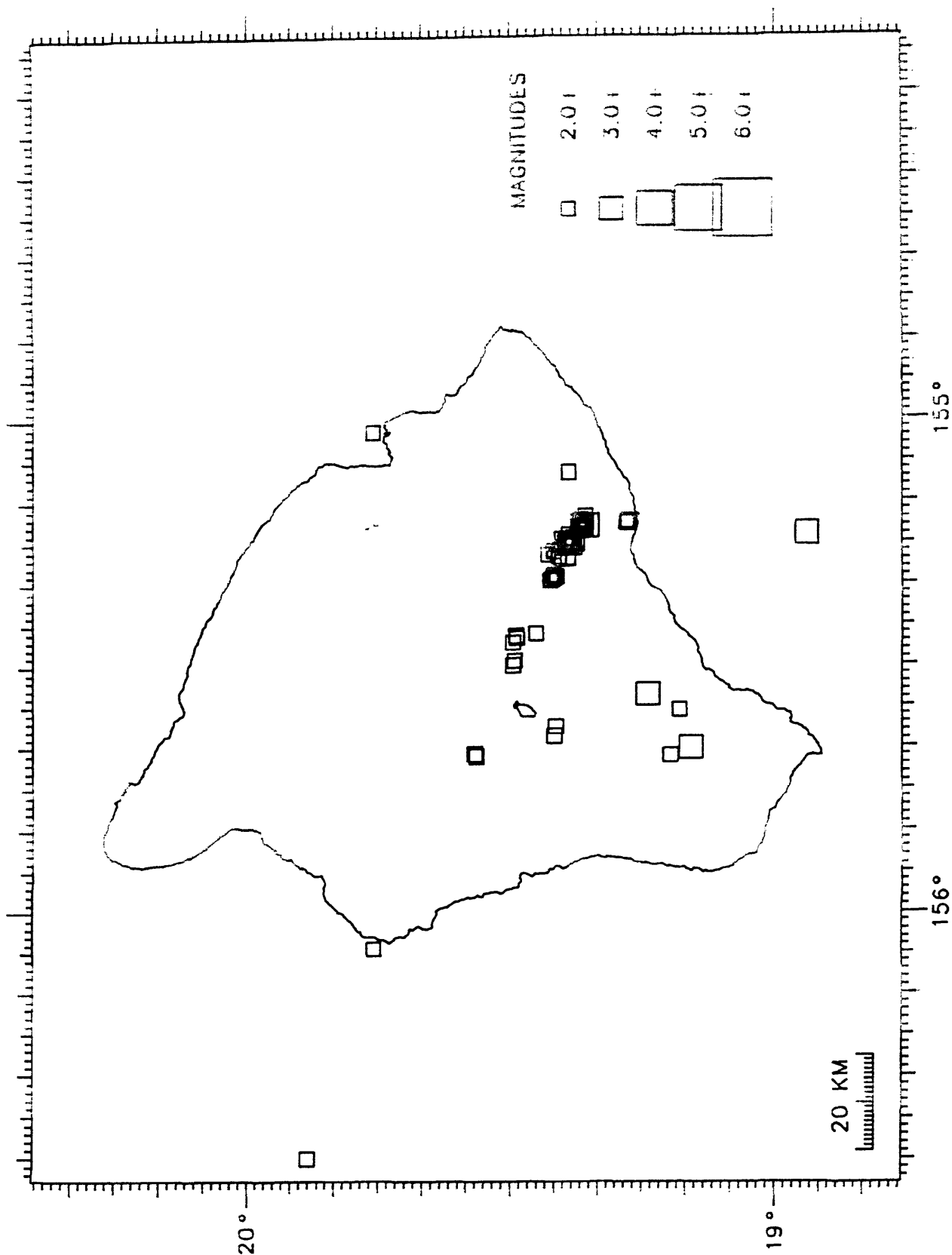


Figure 12. 1991 Earthquake locations, Howii Island, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

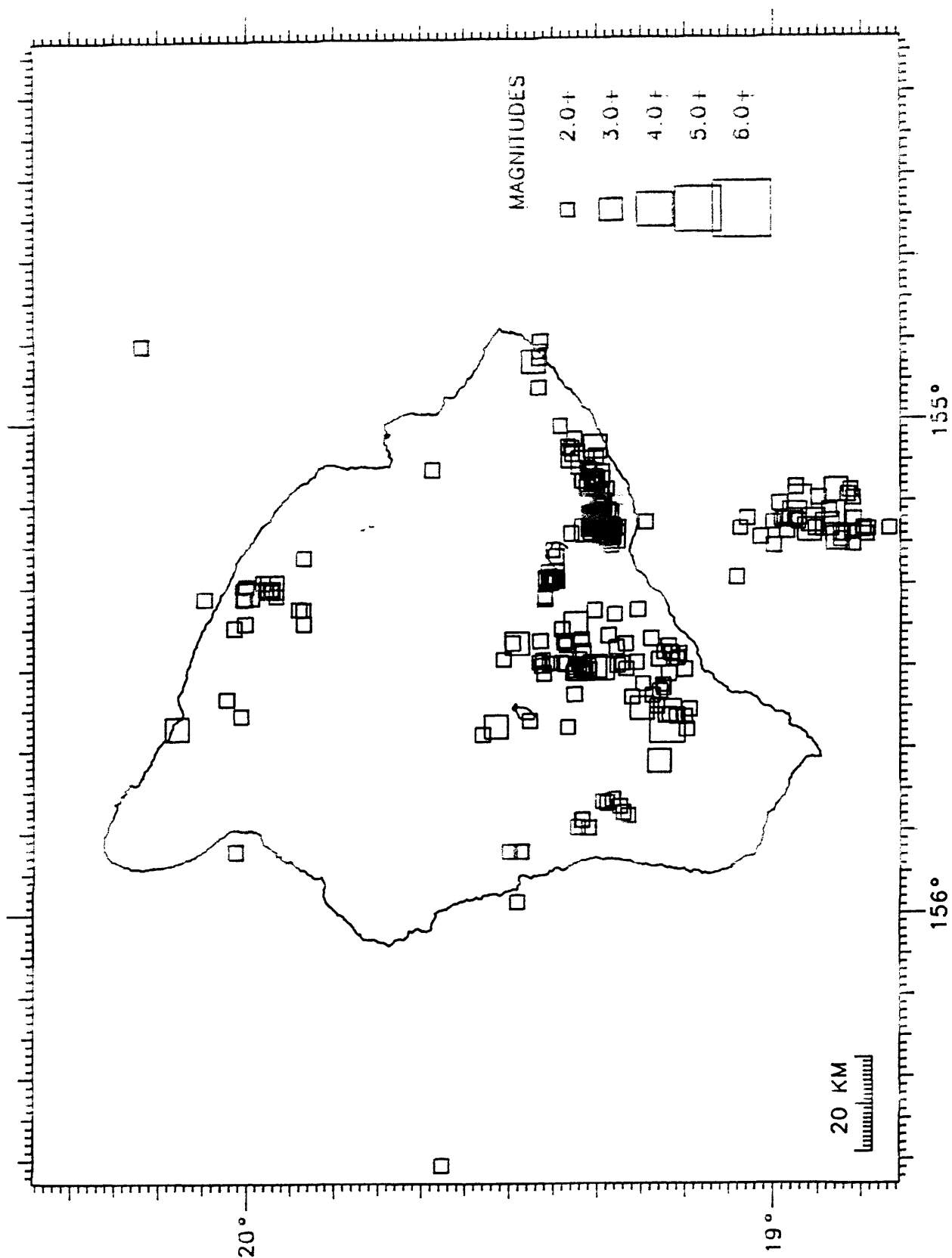


Figure 13. 1991 Earthquake locations, Hawaii Island, deep (13.1–60.0 km depth), $M \geq 2.0$.

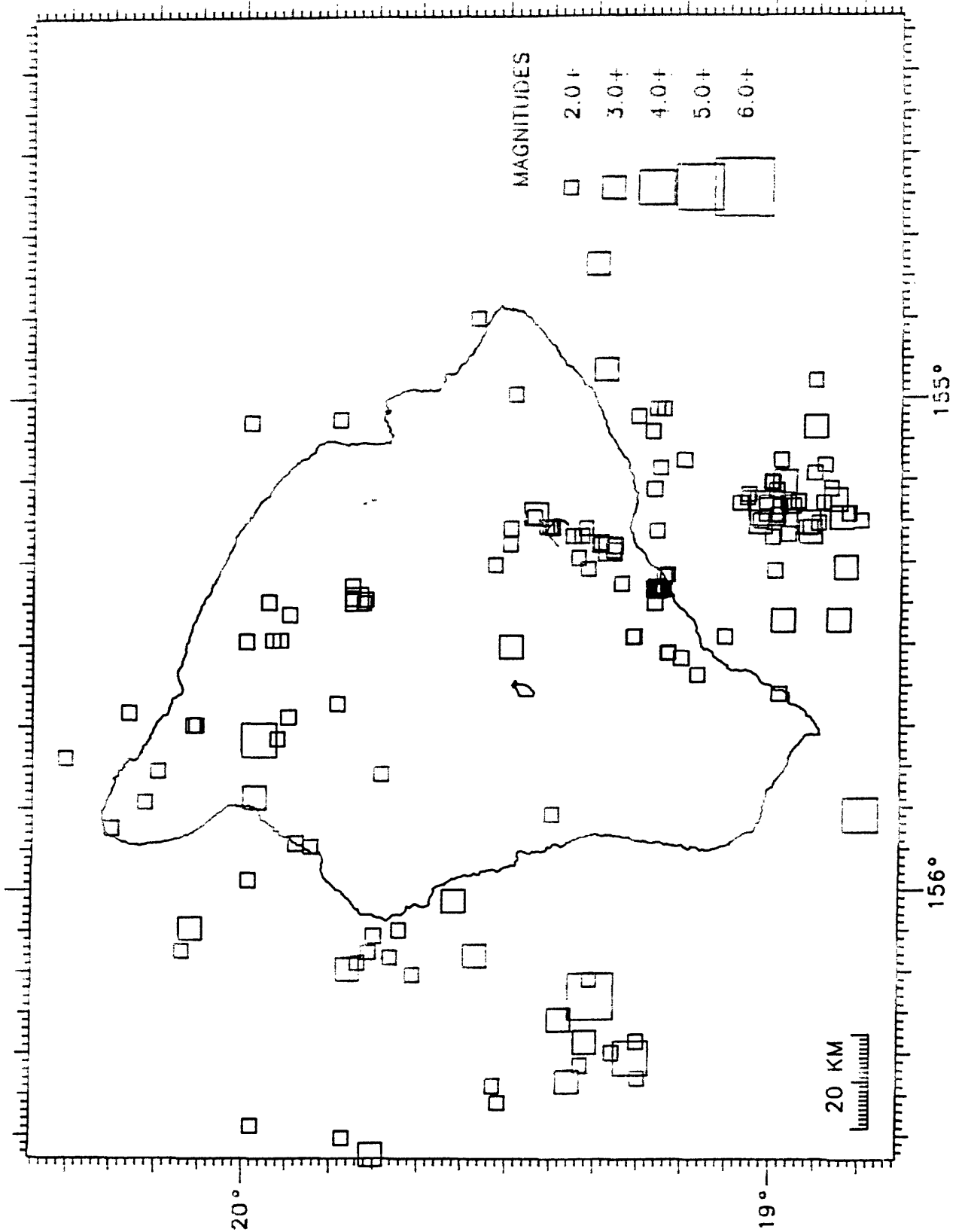


Figure 14. 1991 Earthquake locations, Kilauea summit, shallow (0–5.0 km depth), $M \geq 1.0$.

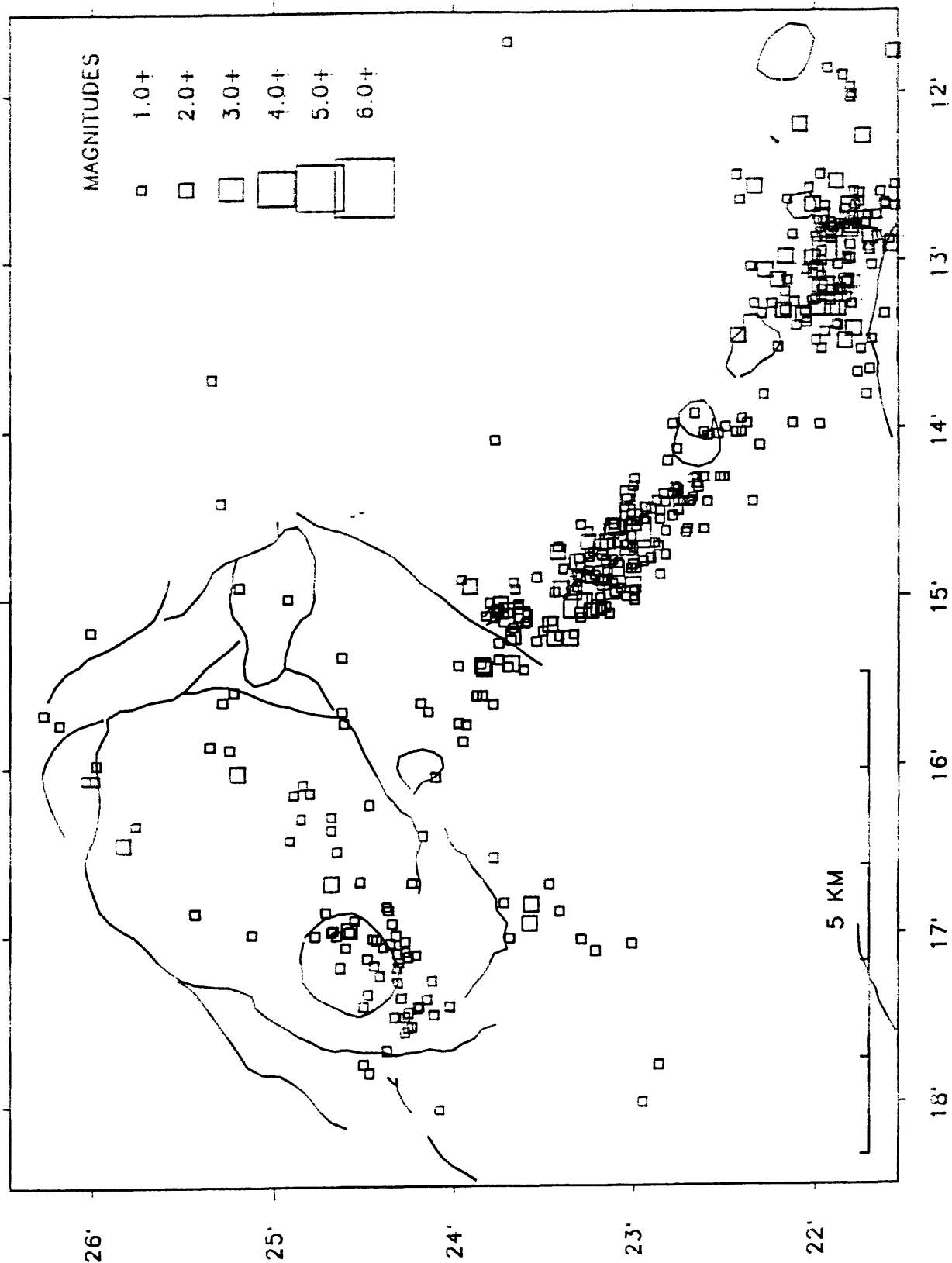


Figure 15. 1991 Earthquake locations, Kilauea summit, intermediate (5.1–13.0 km depth), $M \geq 1.0$.

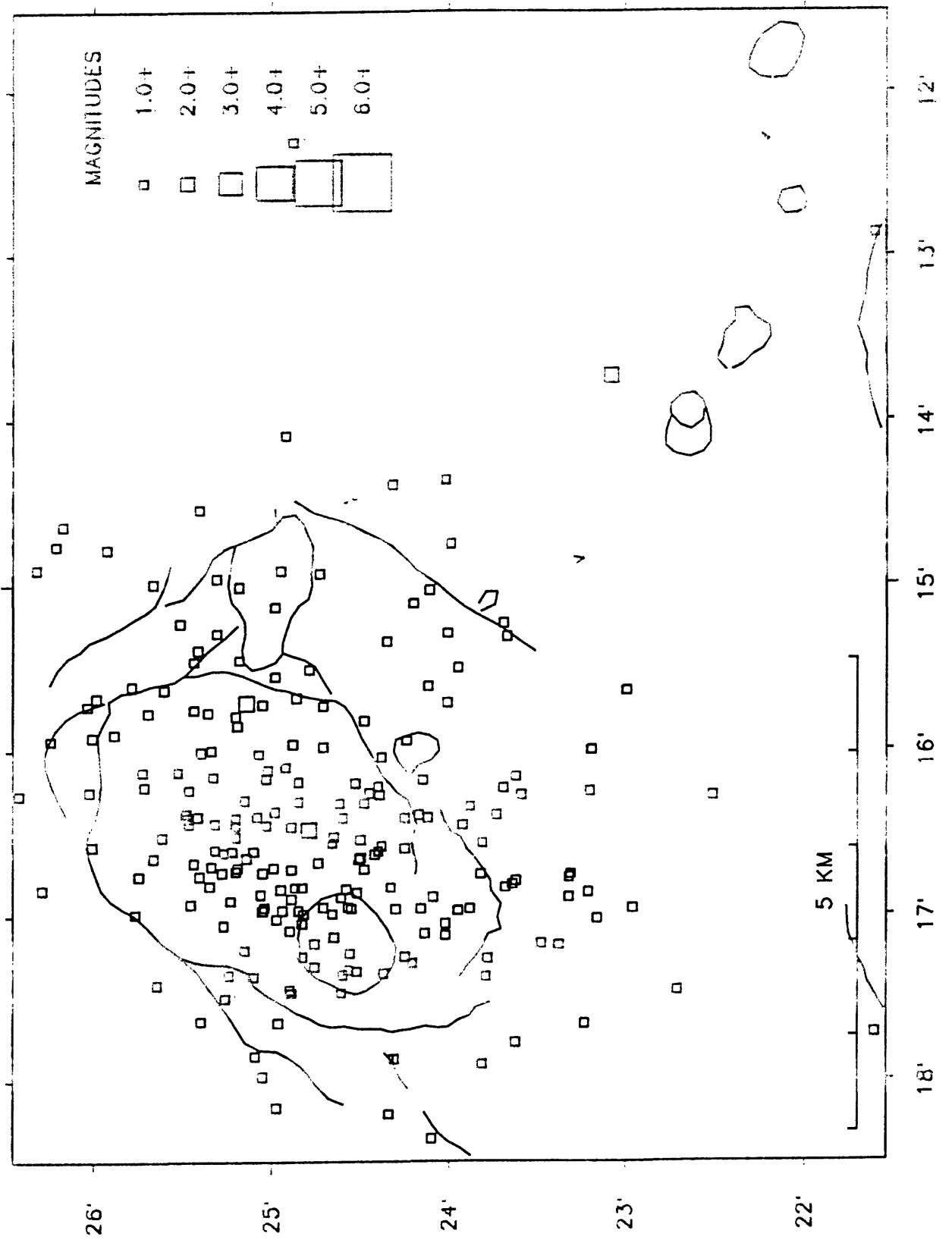


Figure 16. 1991 Earthquake locations, Kilauea summit,
deep (13.1–60.0 km depth), $M \geq 1.0$.

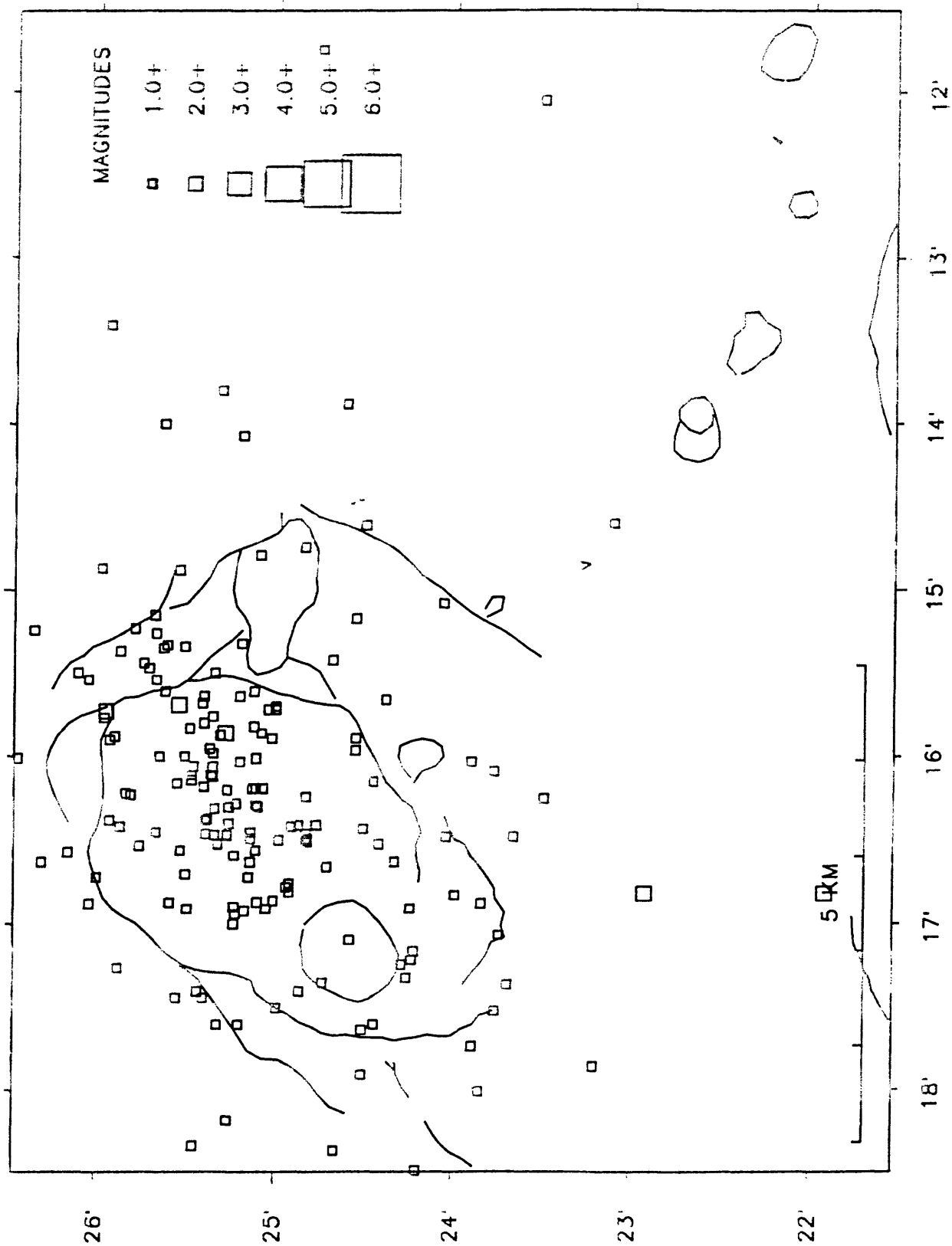


Figure 17. 1991 Earthquake locations, Kilauea south flank, shallow (0-5.0 km depth), $M \geq 2.0$.

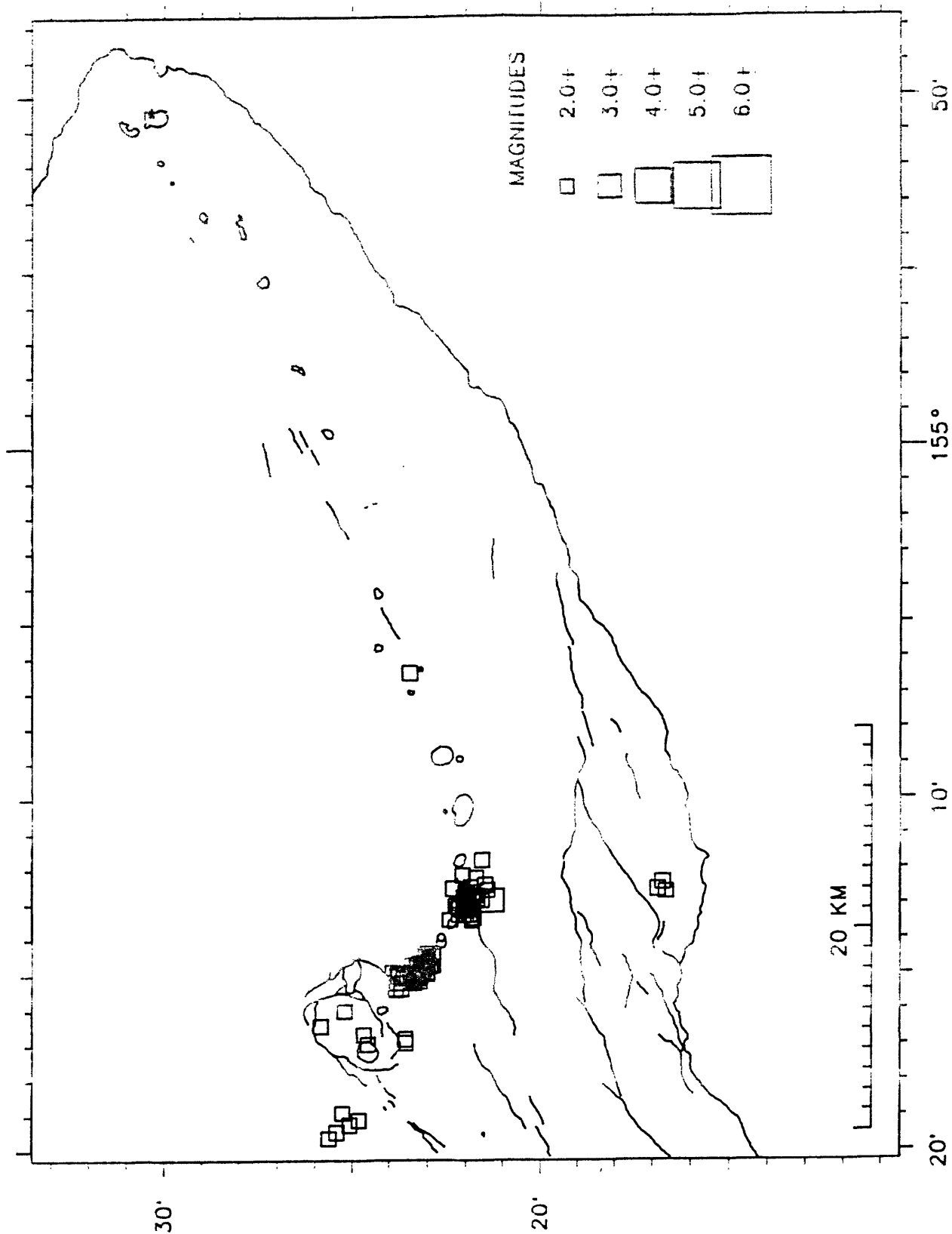


Figure 18. 1991 Earthquake locations, Kilauea south flank, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

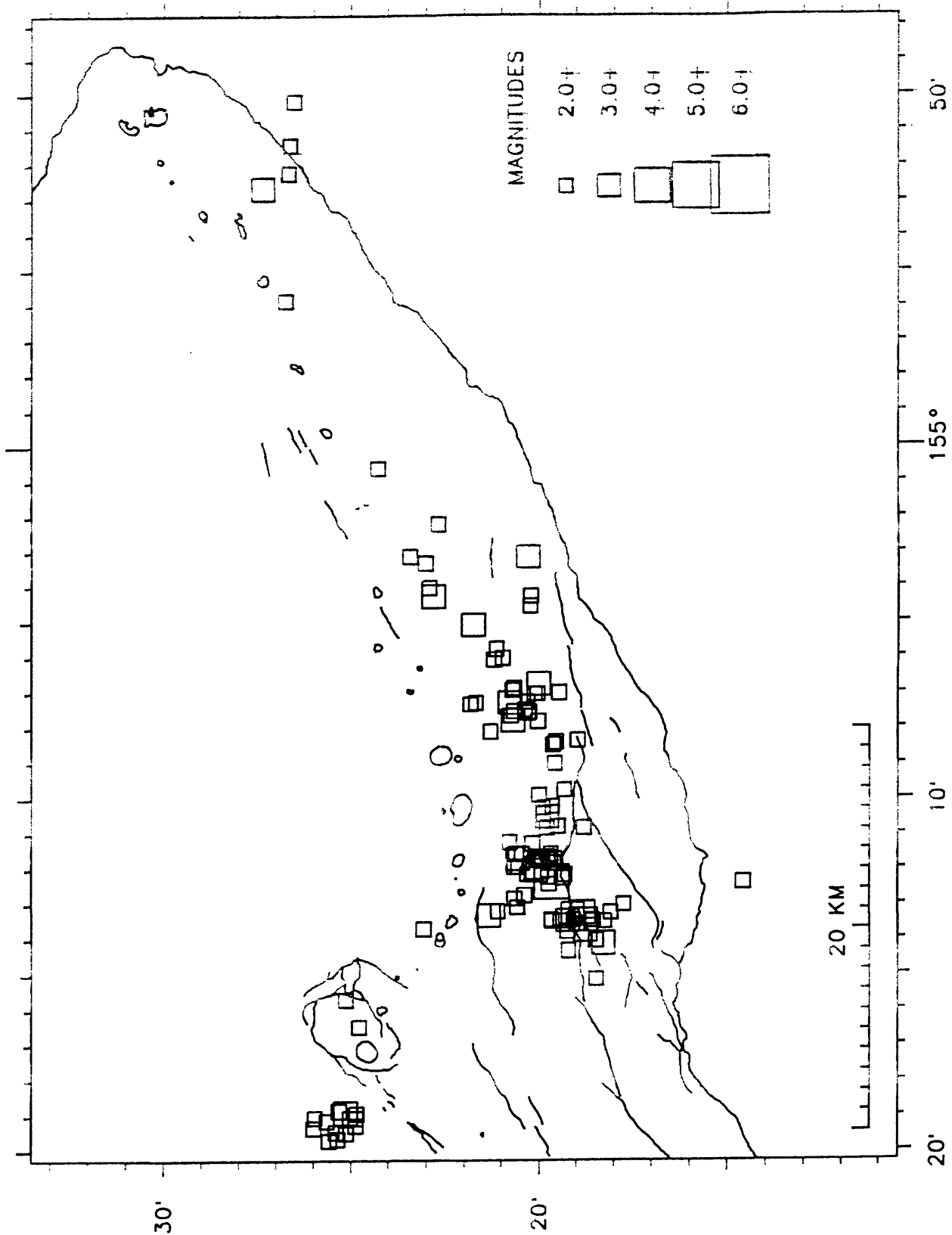


Figure 19. 1991 Earthquake locations, Kilauea south flank, deep (13.1–60.0 km depth), $M \geq 2.0$.

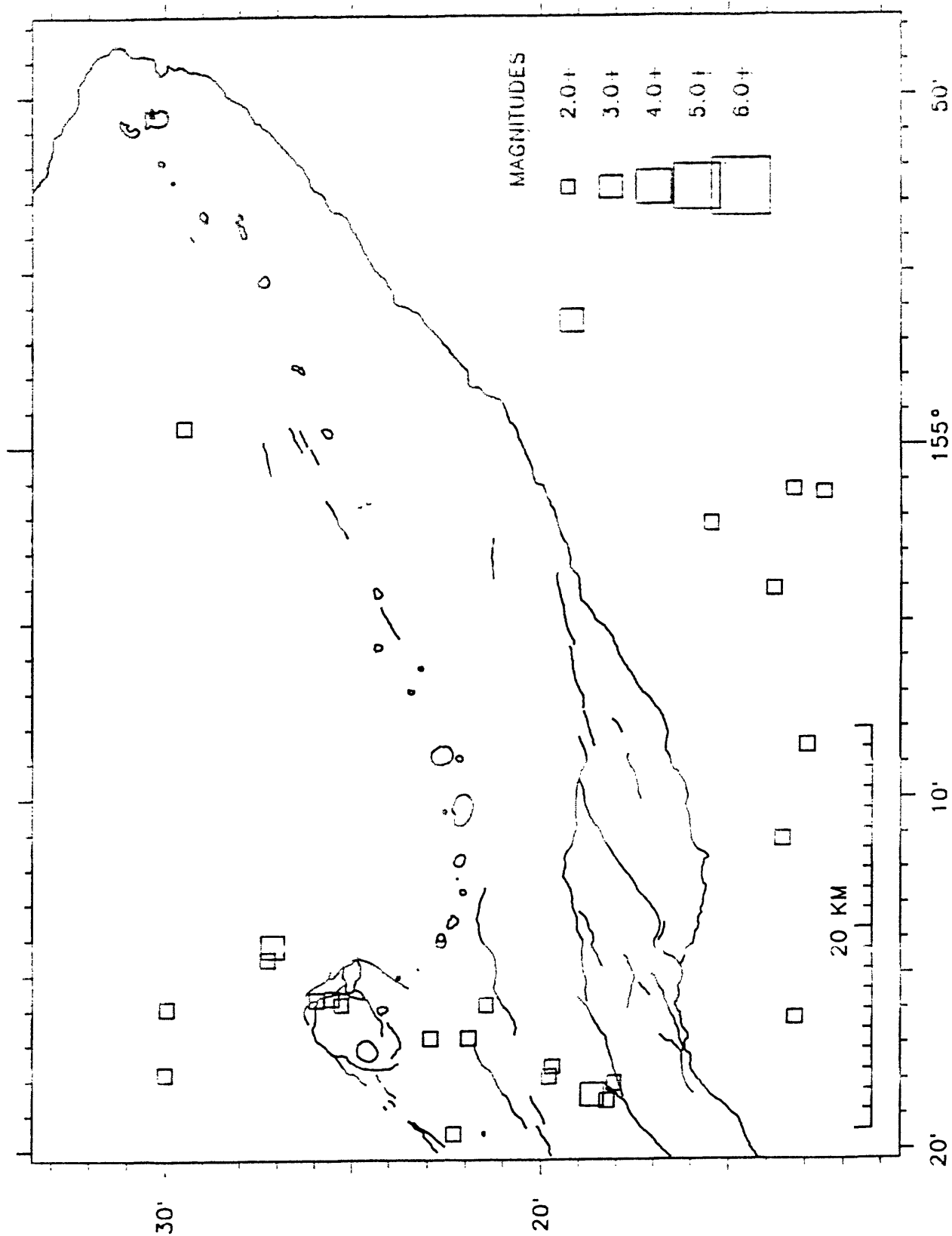


Figure 20. 1991 Earthquake locations, Mauna Loa summit, shallow (0–5.0 km depth), $M \geq 2.0$.

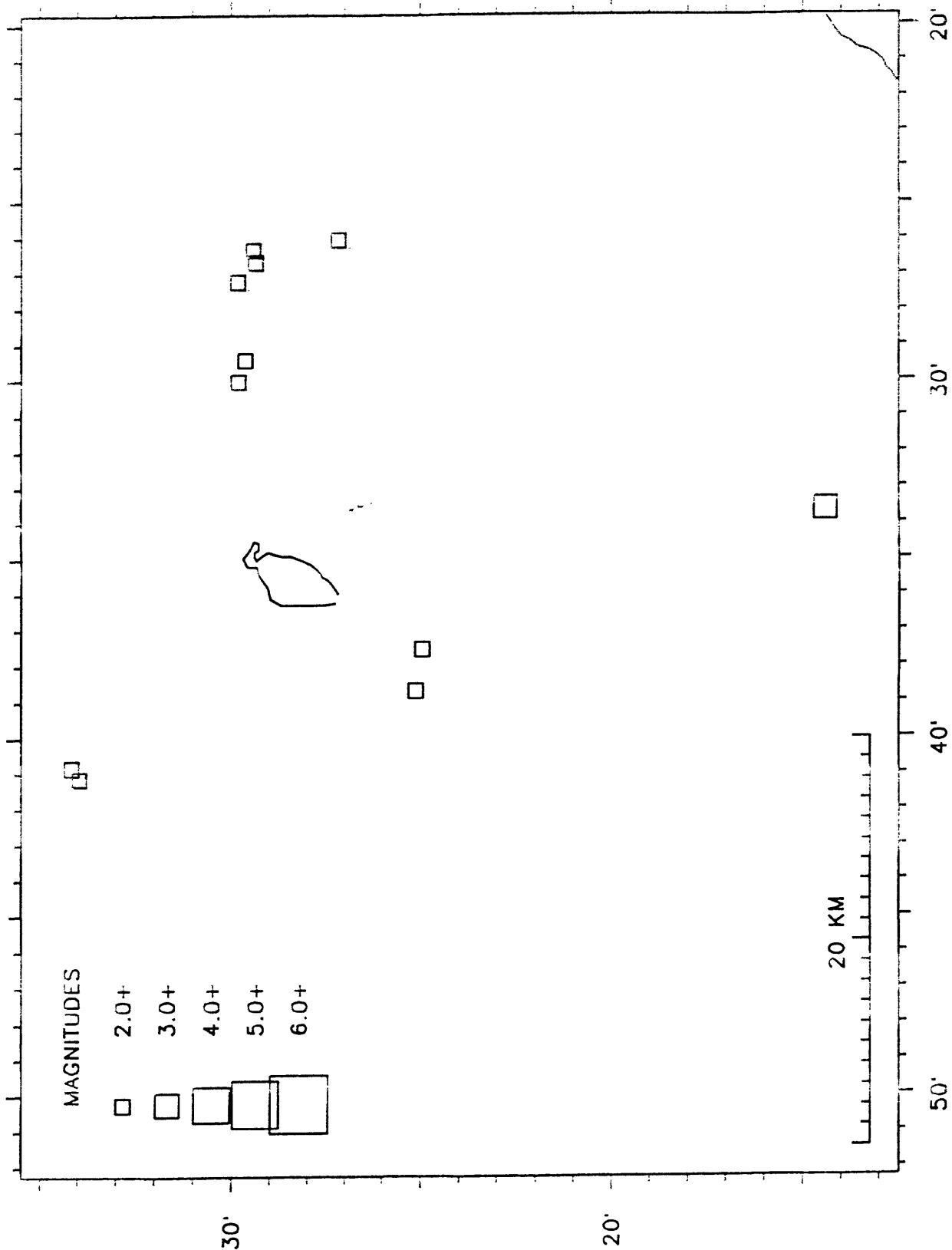


Figure 21. 1991 Earthquake locations, Mouno Ioo summit, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

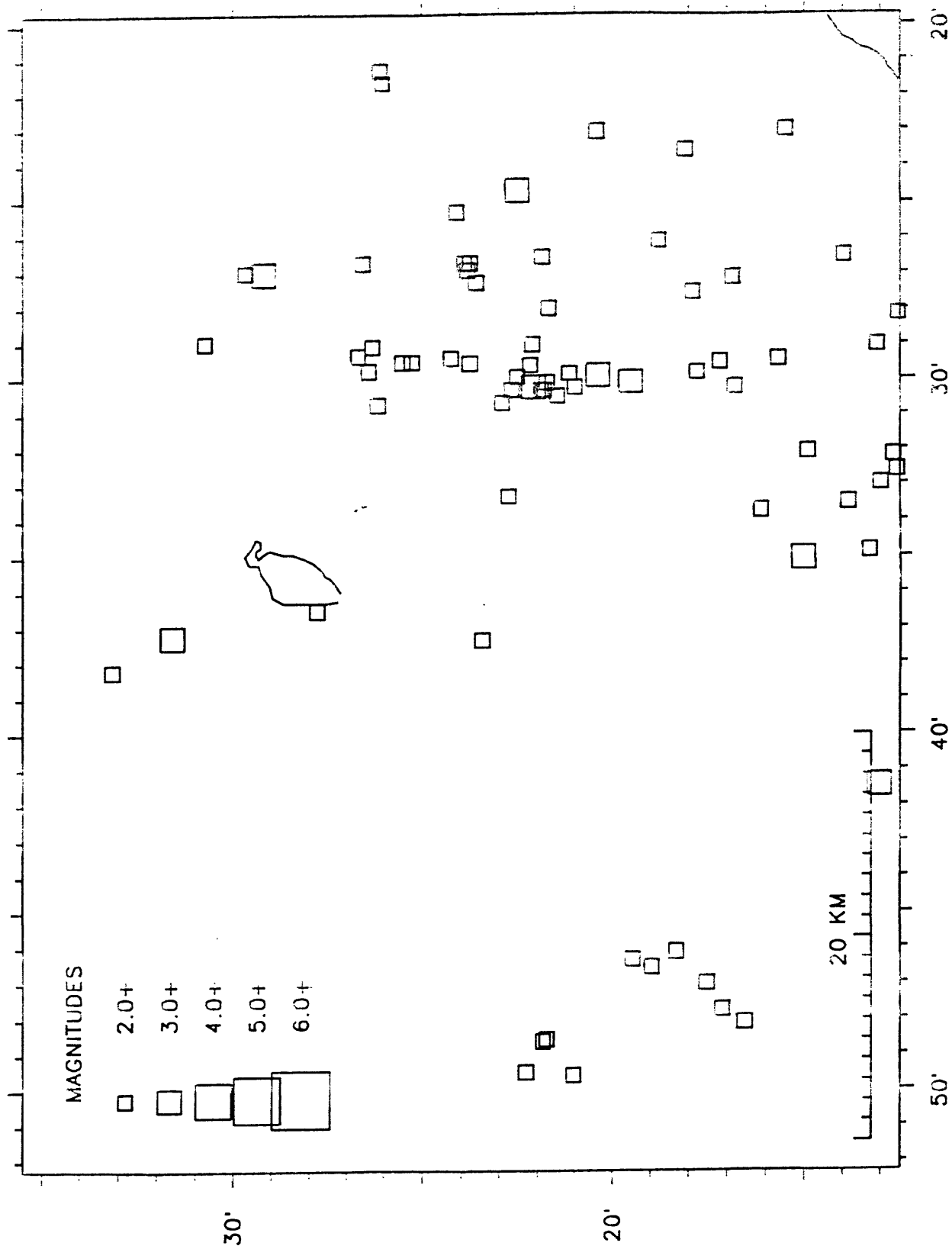


Figure 22. 1991 Earthquake locations, Mauna Loa summit,
deep (13.1–60.0 km depth), $M \geq 2.0$.

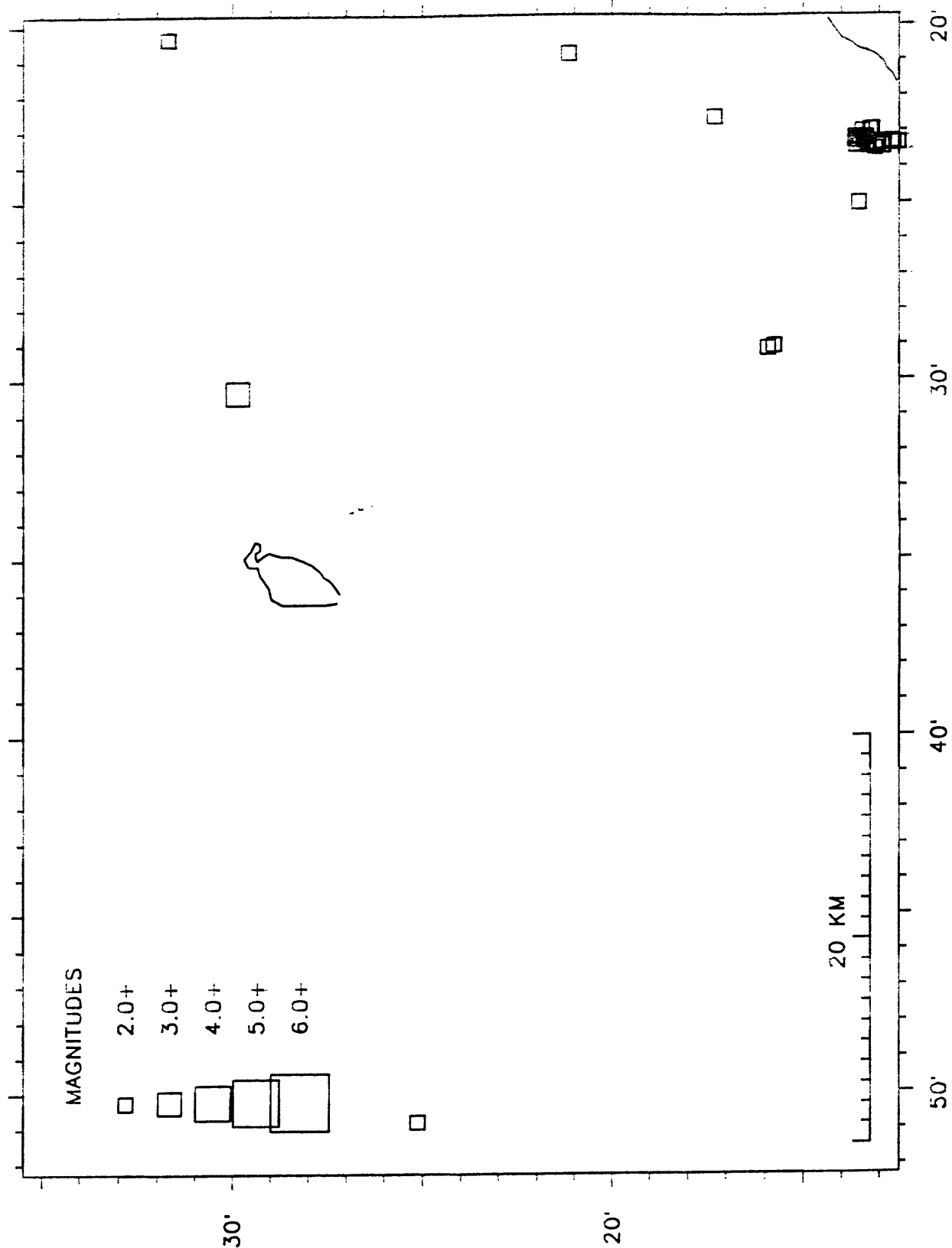


Table 5 is a chronological list of selected events $M \geq 1.4$, successfully located during 1991. For each event, the following data are presented:

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.

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

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.

YEAR	MON	DA	URVN	SBL	DEG	MIN	DEG	MIN	LONG	DEPTH	ANAL	COLL	WAT	DEP	HTN	EDN	WZD	HT													
ORIGIN	TIME	LAT	N	DEG	MIN	DEG	MIN	DEG	MIN	W	W	W	W	W	W	W	W	W													
1991	JUN	9	1339	7	40	19	24	55	155	15	90	13.34	1.9	1.0	13	5	163	09	2	1	1	0	7	0	16	1					
		9	1342	47	10	19	23	52	155	17	77	7.00	1.8	1.1	18	2	50	09	2	0.5	1	3	0	0	10	1					
		9	14	21	27	19	23	69	155	23	13	12.80	2	0	0.8	15	4	71	14	2	1.3	1	3	0	10	1					
		9	1426	59	08	19	24	55	155	15	17	15.41	2.0	1.1	15	4	253	07	4	1	6	0	8	0	16	1					
		9	1429	36	19	24	38		155	15	66	14.32	1.9	1.1	15	4	202	12	4	1.4	0	8	0	0	16	1					
		9	1441	38	48	19	25	05	155	15	72	12.51	1.8	0	8	16	4	202	09	3	1	2	0	9	0	10	1				
		9	1457	29	61	19	25	12	155	15	82	13.43	2	0	1	123	3	123	17	3	1.2	0	6	0	0	16	1				
		9	1528	47	70	19	24	24	155	16	91	14.72	1	9	1	115	2	93	21	1	0	1	0	1	0	0	16	1			
		9	1541	8	13	19	25	68	155	15	15	13.77	1.8	1.1	13	1	227	09	4	1.5	0	8	0	0	16	1					
		9	1558	18	49	19	24	29	155	17	38	0.98	1.1	0	7	10	0	133	12	4	0.5	1	1	0	0	0	16	1			
		9	1617	6	57	19	24	84	155	14	74	16	23	2.1	1	3	11	4	176	12	4	1	5	0	9	0	0	16	1		
		9	17	2	15	63	19	25	155	15	89	14.99	2	1	0.9	16	4	117	10	2	1	2	0	6	0	0	16	1			
		9	17	2	31	51	19	25	155	15	80	19	02	2	1	1	2	150	05	3	2	1	1	0	1	0	0	16	1		
		9	1728	58	70	19	24	68	155	15	42	16.13	1	9	1	111	1	109	08	2	1	3	1	1	0	0	0	16	1		
		9	1736	56	42	19	25	12	155	15	61	15	29	2	1	1	19	4	130	07	2	0	9	0	5	0	0	16	1		
		9	1817	21	83	19	25	44	155	16	08	10	55	1	1	1	2	17	0	169	09	1	0	6	1	3	0	0	16	1	
		9	1838	29	54	19	1	55	155	41	67	2.80	1	6	22	1	1	122	22	10	1	1	6	1	0	1	0	1	13	9	
		9	1922	3	29	19	25	26	155	16	45	16	03	2	1	1	14	2	163	09	3	1	5	0	9	0	0	16	1		
		9	2032	6	36	19	25	32	155	16	44	12	15	2	0	1	1	23	2	112	09	1	0	7	0	9	0	0	16	1	
		9	21	0	10	37	19	25	14	155	16	49	14	25	1	8	9	15	3	105	11	2	1	0	9	0	0	16	1		
		9	21	0	19	34	19	25	67	155	16	65	12	43	1	8	1	0	16	3	114	08	2	0	8	0	8	0	0	16	1
		9	2141	8	40	19	25	48	155	16	38	12	93	1	9	1	0	20	2	119	08	2	0	7	1	0	0	0	16	1	
		9	2231	58	37	19	25	63	155	14	00	16	44	1	0	9	0	10	2	258	11	6	2	0	8	0	0	16	1		
		9	2240	22	71	19	26	05	155	15	54	14	56	2	0	1	1	17	2	171	09	3	1	1	3	0	0	0	16	1	
		9	2248	7	71	19	25	98	155	14	87	14	51	1	9	1	0	13	1	239	06	5	1	4	1	4	0	0	16	1	
		9	2311	34	51	19	25	48	155	16	41	12	63	2	0	1	1	21	3	416	08	1	0	7	0	8	0	0	16	1	
		9	2324	29	00	19	24	94	155	16	78	13	16	2	1	1	2	20	5	95	11	0	1	0	7	0	0	16	1		
		9	2358	24	30	19	24	66	155	18	36	14	81	1	8	0	19	3	65	08	2	1	2	1	0	0	0	16	1		
		10	010	39	38	19	24	83	155	16	50	15	07	1	9	1	0	18	3	97	11	2	1	1	0	1	0	0	16	1	
		10	055	31	57	19	23	99	155	16	83	13	66	1	5	1	0	22	5	71	13	0	0	8	1	2	0	0	16	1	
		10	056	7	42	19	25	40	155	16	18	13	21	2	0	1	2	21	4	123	09	2	0	7	0	8	0	0	16	1	
		10	118	15	64	19	24	12	155	16	41	12	40	2	0	1	0	18	5	90	08	3	0	8	0	9	0	0	16	1	
		10	121	16	98	19	25	27	155	16	20	13	81	1	8	0	19	2	116	08	2	0	7	1	2	0	1	0	0	16	1
		10	137	53	16	19	25	40	155	15	80	14	93	2	0	1	0	26	3	136	07	2	0	8	1	0	0	0	16	1	
		10	213	23	42	19	25	20	155	16	73	11	16	1	9	1	1	28	7	66	11	1	0	5	0	6	0	0	16	1	
		10	229	10	59	19	24	09	155	16	89	11	96	1	5	0	9	19	1	169	11	1	0	7	1	0	0	0	16	1	
		10	243	4	93	19	24	42	155	16	63	11	19	1	8	0	19	17	4	118	10	2	0	8	0	8	0	0	16	1	
		10	244	67	19	23	59	155	16	27	155	10	10	82	1	8	1	1	20	3	103	09	1	0	6	0	8	0	0	16	1
		10	3	6	47	03	19	24	155	17	11	12	86	1	9	0	18	15	3	58	12	2	0	7	1	0	0	0	16	1	
		10	3	7	50	19	25	44	155	15	46	12	80	1	8	0	19	018	3	167	09	3	0	8	0	9	0	0	16	1	
		10	328	52	94	19	25	42	155	16	40	11	44	1	9	1	1	23	4	11	09	1	0	6	0	8	0	0	0	16	1
		10	457	28	45	19	24	34	155	18	20	12	91	1	8	1	0	20	2	37	10	2	0	8	1	2	0	0	0	16	1
		10	457	36	21	19	23	73	155	16	39	11	75	2	1	1	4	21	2	64	09	0	0	6	0	9	0	0	0	16	1
		10	5	10	29	19	25	24	155	15	30	14	95	1	9	0	15														
		10	510	18	89	19	24	71	155	15	98	12	80	1	8	0	19	018	4	139	13	2	0	9	0	9	0	0	0	16	1

YEAR	DAY	TIME	ORIGIN		LAT N	LON W	DEPT				WPG				WPG				EXP NO	
			TIME	SEC			DEG MIN	DEG MIN	NS	WGS	WGS	WGS	NS	WGS	WGS	WGS				
1941	01	08	13	05	45.49	19 25.35	155	15.98	13.72	2.0	1.3	2.1	5	1.8	.07	2	0.9	0.6	0	1447
	02	13	45	19	27.93	155 24.40	25.08	2.3	2.0	4.9	6	151	09	3	6	0.6	1.1	0	1454	
	03	14	05	13	24.92	155 16.10	12.94	2.0	1.1	1.7	4	139	13	3	1.1	1.0	0	1461		
	04	14	06	37.81	19 19.17	155 14.81	32.47	1.6	46	4	83	10	5	0.8	0.9	0	1468			
	05	14	59	67	19 23.77	155 16.09	13.66	1.8	1.0	1.3	5	75	09	3	1.5	0.8	0	1475		
	06	15	10	03	19 24.55	155 15.89	13.34	2.1	1.4	2.3	5	97	12	2	0.7	0.9	0	1482		
	07	15	31	13	19 24.77	155 3.63	3.25	1.7	1.4	2.3	3	87	09	1	0.4	0.4	0	1489		
	08	15	54	43	19 28.09	155 16.38	0.04	2.2	1.2	1.1	3	94	18	5	1.1	1.2	0	1496		
	09	16	7	8	24 19 24.89	155 17.47	11.72	1.8	1.0	1.7	3	80	14	1	0.7	0.6	0	1503		
	10	16	20	25	93 19 25.20	155 15.64	16.21	1.9	1.1	1.7	2	469	12	2	1.2	1.0	0	1510		
	11	16	35	31	19 24.83	155 16.46	13.05	2.1	1.3	2.2	5	146	07	1	0.7	0.6	0	1517		
	12	16	50	67	19 25.23	155 17.00	13.82	2.2	1.3	2.0	6	96	08	1	1.2	0.8	0	1524		
	13	17	05	47	19 25.11	155 16.39	14.28	2.1	1.3	2.0	3	110	12	1	1.0	1.1	0	1531		
	14	17	14	31	19 25.05	155 17.27	12.29	1.8	1.0	1.4	3	87	12	1	1.0	1.3	0	1538		
	15	17	28	18	19 26.36	155 15.24	14.07	1.9	1.1	1.20	4	194	15	3	1.4	0.8	0	1545		
1942	01	07	39	19	25.47	155 16.44	12.33	2.1	1.4	3.4	8	116	20	1	0.8	0.5	0	1552		
	02	08	52	67	19 25.00	155 15.72	13.21	2.1	1.2	2.7	6	121	13	2	0.7	0.5	0	1559		
	03	12	42	48	19 25.08	155 16.40	12.91	1.8	1.1	2.1	5	106	07	1	0.8	0.7	0	1566		
	04	22	58	39	19 25.74	155 15.44	14.49	2.0	1.2	2.1	5	164	10	3	1.0	0.6	0	1573		
	05	23	12	05	19 25.41	155 15.68	14.92	2.0	1.1	2.0	4	140	10	2	0.9	0.9	0	1580		
	06	24	29	19	24.87	155 16.83	11.92	2.0	1.2	2.1	5	64	12	0	0.7	0.8	0	1587		
	07	24	47	19	24.76	155 17.17	10.16	1.7	1.1	1.18	0	49	09	0	0.7	1.0	0	1594		
	08	24	56	09	19 24.25	155 15.64	14.40	2.0	1.1	2.2	5	132	09	2	0.9	0.6	0	1601		
	09	24	66	09	19 24.26	155 17.33	15.92	2.3	1.5	2.5	6	43	10	1	0.9	0.7	0	1608		
	10	25	58	36	19 26.04	155 16.88	13.54	1.9	1.1	1.22	5	115	11	2	1.0	0.7	0	1615		
	11	25	57	19	25.48	155 15.83	15.21	2.1	1.4	2.1	5	138	12	2	1.0	0.6	0	1622		
	12	26	08	19	24.58	155 16.84	12.10	1.9	1.2	2.2	5	89	08	1	0.5	0.5	0	1629		
	13	26	17	72	19 26.04	155 15.73	11.75	2.2	1.1	2.1	1	552	09	3	0.6	0.7	0	1636		
	14	26	46	09	19 24.52	155 17.46	6.56	2.4	1.4	2.4	5	117	09	2	0.7	1.3	0	1643		
	15	26	55	19	24.31	155 17.87	10.15	2.0	1.2	2.2	4	79	11	1	0.6	0.7	0	1650		
1943	01	08	41	44	19 24.71	155 16.95	10.26	2.0	1.1	2.0	4	86	09	0	0.6	0.8	0	1657		
	02	08	52	95	19 24.85	155 16.19	7.94	1.9	1.2	2.1	3	103	09	1	0.5	0.8	0	1664		
	03	08	52	38	19 25.04	155 15.72	15.12	2.1	1.1	2.1	7	152	09	3	0.9	0.6	0	1671		
	04	09	40	82	19 24.52	155 17.34	9.92	1.9	1.1	2.8	5	47	13	1	0.5	0.8	0	1678		
	05	09	35	71	19 24.31	155 17.87	10.15	2.0	1.2	2.2	4	52	10	2	0.5	0.8	0	1685		
	06	10	56	12	19 24.83	155 16.83	11.82	1.9	1.1	2.0	3	91	11	0	0.7	1.0	0	1692		
	07	10	56	19	19.10	155 10.07	6.80	1.4	3.4	7	107	08	5	0.4	0.8	0	1699			
	08	10	57	19	25.07	155 16.19	14.58	1.9	1.0	1.7	3	111	04	1	0.9	0.9	0	1706		
	09	11	22	77	19 24.06	155 15.08	13.26	1.9	1.1	1.12	2	158	12	2	1.7	1.1	0	1713		
	10	11	22	77	19 24.61	155 13.88	17.45	2.0	0.9	1.2	2	260	08	5	1.8	0.9	0	1720		
	11	12	30	38	19 24.83	155 16.24	15.01	2.1	1.3	2.1	5	102	10	1	1.0	0.6	0	1727		
	12	12	36	19	25.94	155 13.41	17.36	2.0	0.9	1.3	3	773	09	7	1.9	0.9	0	1734		
	13	12	49	51	34 19 24.56	155 17.23	16.93	1.7	0.8	2.2	5	55	10	1	0.6	0.8	0	1741		
	14	12	50	15	19 24.31	155 16.28	11.97	1.9	1.2	2.1	5	97	17	1	1.0	1.1	0	1748		
	15	12	51	18	19 22.53	155 16.83	12.85	1.8	0.9	2.5	4	89	09	2	1.4	1.1	0	1755		

YEAR	ORIGIN TIME			LAT N	LON W	DEPTH AMP CODE			CAP RMS MON ERR			RM RM CORR							
	DATE	SBC	LEG MIN			NM	MAG	NR	RS	TBS	SBC		DIES	RH					
1991	JAN	10	521	35.21	19 24 83	155 17.05	11.20	1.7	1.0	19	2	48	09	0	0.7	1.1	0 INT L		
		10	530	47.18	19 19 70	155 10.21	8	20	0	1.5	34	4	92	10	4	0.5	0.8 0 SF3		
		10	649	22.90	19 24 21	155 17.29	10.59	2.0	1.3	19	2	59	10	1	0.7	1.2	0 INT L		
		10	712	46.48	19 25 51	155 15.34	14	90	2.1	1.3	22	3	95	07	2	0.6	0.7 0 DEPT L		
		10	821	40.95	19 24 65	155 17.13	11.29	2.0	1.1	20	2	63	08	1	0.6	0.8	0 INT L		
		10	841	59.59	19 24 51	155 16.43	13	79	1.8	0.9	15	3	170	08	3	1.2	1.2	0 LAEP L	
		10	849	33.00	19 25 22	155 16.28	13.25	2	0.1	2.21	4	114	10	1	0.8	0.9	0 DEPT L		
		10	931	5.42	19 25 00	155 15.70	14	85	1.9	1.1	19	4	121	13	2	0.5	0.9	0 DEPT L	
		10	931	21.54	19 23 67	155 15.31	8.28	2.0	1.2	22	5	146	07	2	0.6	0.7	0 INT L		
		10	949	9.67	19 23 95	155 16.97	11	32	1.9	1.2	17	3	69	14	1	0.9	1.1	0 INT L	
		10	1020	23.11	19 24 62	155 16.32	12.43	2.1	1.3	19	3	94	07	1	0.8	1.0	0 INT L		
		10	1055	13.91	19 23 51	155 12.05	15	63	2.1	1.2	10	2	298	15	7	2.8	1.1	0 DEPT L	
		10	1121	49.76	19 23 66	155 16.48	14	67	2.1	1.2	19	4	84	15	0	1.1	1.1	0 DEPT L	
		10	1151	50.17	19 24 85	155 16.31	12	45	1.1	1.2	17	3	75	08	1	0.9	1.0	0 INT L	
		10	1220	39.67	19 25 62	155 15.61	14	81	2.2	1.2	16	4	166	07	3	1.4	0.9	0 DEPT L	
		10	1256	51.23	19 13 44	156 23.17	46	49	1.7	20	3	331	13	54	2	7	2.2	0 LOSS	
		10	1329	25.77	19 19 70	155 11.60	7	17	2	1.9	42	5	90	10	5	0.4	0.7	0 SF3	
		10	1356	20.59	19 26 52	155 16.49	11	84	1.8	0.8	12	5	234	07	3	1.6	0.7	0 INT L	
		10	1412	28.94	19 24 38	155 16.04	12	64	2.0	1.4	23	5	89	10	1	0.7	0.8	0 INT L	
		10	1453	54.17	19 25 54	155 14.88	14	31	1.9	1.0	16	4	234	08	5	1.3	0.7	0 DEPT L	
		10	1527	5.73	19 25 55	155 16.16	13	69	1.8	0.8	15	3	147	07	3	1.3	0.7	0 DEPT L	
		10	1618	29.60	19 25 49	155 16.91	14	12	2.0	1.3	17	4	182	11	1	1.4	0.8	0 DEPT L	
		10	1729	2.36	19 25 34	155 16.45	10	95	1.8	1.1	17	3	106	12	1	0.8	0.9	0 INT L	
		10	19	2	8.06	19 26 30	155 16.84	9	82	1.9	1.4	12	1	117	15	3	1.0	1.5	0 INT L
		10	1952	58.67	19 25 87	155 15.37	13	42	1.8	1.1	20	3	172	12	3	0.9	0.6	0 DEPT L	
		10	2041	44.82	19 25 14	155 16.65	12	16	1.8	1.1	17	2	67	10	1	0.7	0.9	0 INT L	
		10	2124	40.50	19 25 10	155 16.61	11	95	1.8	1.0	22	4	101	08	1	0.6	0.7	0 INT L	
		10	2238	47.19	25 67	155 16.45	13	41	1.8	1.1	20	4	121	08	2	0.9	0.7	0 DEPT L	
		10	2358	1.82	19 25 20	155 16.41	11	96	1.8	1.0	20	5	109	07	1	0.8	0.7	0 INT L	
		11	037	58.28	19 24 89	155 16.90	11	27	2.1	1.4	22	4	62	09	0	0.6	0.8	0 INT L	
		11	2	4	17	19 25 63	155 15.35	14	57	1.6	1.1	20	4	154	08	3	1.1	0.9	0 LAEP L
		11	3	3	33.73	19 25 05	155 16.74	12	49	2	0.1	2.21	4	65	08	1	0.7	0.8	0 INT L
		11	341	34.15	24 86	155 16.94	13	04	1.7	1.1	18	3	90	10	5	1.0	0 DEPT L		
		11	355	3.95	19 27 24	155 13.49	8	19	2.5	1.3	18	4	254	14	0	0.5	1.1	0 CORR L	
		11	359	45.92	19 24 14	155 15.67	1	19	2.1	1.2	15	3	80	13	2	0.3	0.5	0 CORR L	
		11	421	47.70	19 25 39	155 16.46	13	48	1.8	1.0	18	2	113	08	1	0.7	1.1	0 DEPT L	
		11	443	29.08	19 25 49	155 16.38	12	95	1.8	1.1	18	2	119	08	2	0.9	0.8	0 INT L	
		11	526	12.98	19 23 88	155 16.34	9	84	2	0.1	2.22	3	65	10	0	0.6	0.8	0 INT L	
		11	628	37.38	19 12 27	155 22.82	49	55	2	1	6	20	3	206	13	4	0.6	1.8	0 DEPT L
		11	728	31.28	19 25 32	155 17.61	15	87	2	1.3	19	1	53	10	0	0.8	1.1	0 DEPT L	
		11	849	3	21	19 25 53	155 16.13	12	58	2	0.1	0.1	3	147	12	3	1.0	1.0	0 INT L
		11	9	5	59.59	19 24 66	155 16.56	12	83	2.1	1.4	18	2	91	11	1	0.9	1.4	0 INT L
		11	914	2.88	19 24 82	155 16.51	13	23	1.8	1.0	16	2	97	09	1	1.0	1.4	0 DEPT L	
		11	1014	49.56	19 25 47	155 16.11	13	98	2	0.1	2.21	3	123	07	2	0.9	0.9	0 DEPT L	
		11	1129	14.82	19 26 31	155 16.63	15	30	2	2	1	6	11	1	127	11	2	1.5	1.1

1991 IWO EARTHQUAKE SUMMARY LIST

[illegible]

1991 F.M. EARTHQUAKE: SECONDARY LISI

[illegible]

1991 IMO EARTHQUAKE SUMMARY LIST

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[illegible]

YEAR	MIN	DA	HR	SEC	ORIGIN TIME	LAT N	LONG	DEPTH	AMP	CSA	GAP	NIS	MIN	ENR	DIS	RM	RM	RM	RM
YEAR	MIN	DA	HR	SEC	ORIGIN TIME	LAT N	LONG	DEPTH	AMP	CSA	GAP	NIS	MIN	ENR	DIS	RM	RM	RM	RM
1991	APR	11	1041	42.10	19 21 31	155 25.38	12 01	1.6	1.2	17	4	57	10	4	0.5	0.8	0	0	0
12	130	20.74	19 35 50	155 6.97	1.13	1.9	1.7	32	4	95	12	11	0.3	0.6	0	0	0	0	0
12	338	19.92	19 20 70	155 12.66	7.82	1.8	1.6	34	5	65	13	4	0.5	0.7	0	0	0	0	0
12	444	41.57	19 23 68	155 15.25	3.24	1.7	1.2	19	5	67	08	2	0.3	0.3	0	0	0	0	0
12	737	47.04	19 17 24	155 13.02	7.40	0.9	1.8	38	8	156	11	1	0.5	0.7	0	0	0	0	0
12	850	51.78	19 18 77	155 14.13	6.73	1.5	1.4	25	2	100	08	3	0.5	1.0	0	0	0	0	0
12	1227	36.20	19 20 76	155 7.94	6.72	1.6	1.7	50	13	81	11	4	0.4	0.6	0	0	0	0	0
12	2317	51.95	19 23 97	155 15.40	3.11	1.9	1.5	30	6	71	12	2	0.3	0.3	0	0	0	0	0
13	819	3.20	19 21 89	155 26.56	10.20	2.6	2.8	66	15	44	13	2	0.3	0.4	0	0	0	0	0
13	944	26.16	19 20 03	155 9.83	6.53	1.6	1.5	43	6	83	10	4	0.4	0.7	0	0	0	0	0
13	1151	4.99	19 23 00	155 14.81	3.15	2.2	1.6	28	8	80	08	2	0.2	0.3	0	0	0	0	0
13	1312	7.67	19 10 64	155 35.33	7.17	1.9	1.9	28	5	102	21	8	0.6	1.3	0	0	0	0	0
15	854	10.31	19 18 10	155 13.00	9.58	1.2	2.0	51	7	105	12	2	0.4	0.4	0	0	0	0	0
15	1155	59.15	19 18 97	155 46.56	10.94	2.6	1.4	21	3	157	12	11	0.7	1.2	0	0	0	0	0
15	1553	29.08	19 18 33	155 46.13	10.75	2.6	2.4	37	3	131	11	12	0.4	0.4	0	0	0	0	0
15	1631	11.47	19 22 78	155 8.93	3.22	1.5	1.2	4	115	07	2	0.7	0.3	0	0	0	0	0	0
16	012	51.62	19 25 10	155 20.16	6.38	1.9	1.0	23	6	61	09	3	0.4	0.9	0	0	0	0	0
16	026	49.56	19 24 26	155 29.42	8.92	2.3	2.1	45	8	34	11	5	0.3	0.7	0	0	0	0	0
16	154	43.79	19 22 97	155 2.75	8.39	1.7	1.6	34	3	117	10	3	0.4	0.4	0	0	0	0	0
16	823	28.19	19 45 25	156 42.34	34.77	3.2	2.8	53	7	305	12	71	1.2	2.3	0	0	0	0	0
16	941	5.09	19 20 61	155 11.92	8.25	2.0	1.9	42	5	73	10	4	0.4	0.5	0	0	0	0	0
16	1154	31.09	19 21 65	155 6.96	6.80	2.0	1.6	30	4	79	10	3	0.5	0.7	0	0	0	0	0
16	2112	25.04	19 20 48	155 13.07	6.38	1.5	1.4	34	5	65	11	4	0.4	0.7	0	0	0	0	0
17	255	3.08	19 22 61	155 14.02	3.56	1.9	1.4	24	6	77	08	2	0.3	0.3	0	0	0	0	0
17	417	27.56	19 19 88	155 9.55	7.64	0.9	1.4	24	7	84	07	4	0.4	0.7	0	0	0	0	0
17	814	29.38	19 19 20	154 56.42	42.77	3.8	3.4	69	18	214	10	11	0.8	0.6	0	0	0	0	0
17	22	11.13	19 16 88	155 27.14	10.10	2.3	2.1	45	6	56	13	6	0.3	0.6	0	0	0	0	0
18	1412	51.61	19 44 18	155 3.02	31.68	1.5	22	5	247	09	34	1.3	3.0	0	0	0	0	0	0
18	1429	9.42	19 19 60	155 10.12	1.76	1.5	40	11	94	12	5	0.3	0.6	0	0	0	0	0	0
19	23	3	12	19 19 21	51	155 5.14	6.51	1.7	1.8	46	4	86	11	5	0.4	0.7	0	0	0
19	23	5	31	15 19 17	14	155 47.75	10.01	3.0	2.8	47	3	96	11	8	0.4	0.4	0	0	0
20	330	0.39	19 23 10	155 14.97	2.89	2.4	1.5	31	6	61	10	2	0.3	0.3	0	0	0	0	0
20	332	17.49	19 21 83	155 6.53	8.20	1.1	1.4	39	6	78	09	3	0.3	0.5	0	0	0	0	0
20	723	20.09	19 12 06	155 30.93	38.17	1.6	38	0	82	08	6	0.7	2.0	0	0	0	0	0	0
20	1529	41.26	19 23 64	155 27.31	10.15	1.2	29	3	34	10	2	0.4	0.8	0	0	0	0	0	0
20	1545	29.14	19 23 50	155 27.49	10.36	1.3	28	3	34	10	2	0.4	0.8	0	0	0	0	0	0
20	1647	6.74	19 23 18	155 15.07	3.03	1.8	1.6	26	7	70	09	2	0.3	0.3	0	0	0	0	0
20	2113	6.61	19 12 43	155 23.32	36.29	1.5	35	0	167	11	4	1.0	2.1	0	0	0	0	0	0
21	048	9.13	19 23 21	155 17.10	3.05	1.4	1.1	27	7	61	08	0	0.3	0.2	0	0	0	0	0
21	048	53.88	19 5 49	155 28.62	29.96	2.0	1.9	46	4	101	09	8	0.7	1.1	0	0	0	0	0
21	130	14.15	19 13 12	155 23.50	45.03	3	0	2.8	62	13	155	11	2	0.6	0.7	0	0	0	0
21	4	28.63	19 15 92	155 11.13	7.49	1.9	1.7	49	7	88	10	5	0.4	0.5	0	0	0	0	0
21	918	41.92	19 19 13	155 10.04	6.66	1.4	30	4	105	10	5	0.4	0.9	0	0	0	0	0	0
21	926	9.37	19 18 07	155 13.03	4.81	1.1	20	4	104	06	2	0.5	1.0	0	0	0	0	0	0
21	20	3	25	37 20 16	71	156 40.18	25.02	3	3	2.6	38	5	316	12	94	1.7	3.9	0	0

YEAR		MON		DA		HR		MIN		SEC		ORIGIN TIME		LAT N		LONG		DEPTH		AMP		CSA		GAP		NIS		DIS		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM		RM	
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YEAR	MO	DAY	TIME	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN

OBSERV. TIME		LAT N		LONG W		DEPTH		MAP		COA		CP		US		MIN		ERR		EQZ		NO								
YEAR	MO	DAY	HR	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	MIN	SEC							
1991	MAY	11	6:56	10	31	19	18	99	155	13	12	9	62	1	9	1	8	49	7	75	11	4	0	4	0	5	0	05.2		
		11	16:32	31	69	19	19	31	155	13	76	6	88	1	2	30	2	81	11	4	0	4	0	4	0	9	0	05.2		
		11	17	8	15	36	19	21	05	155	6	93	8	51	1	3	28	5	80	09	4	0	4	0	6	0	0	05.4		
		11	18:19	15	24	20	5	65	155	19	85	23	23	3	0	2	6	59	8	195	10	3	0	6	1	2	0	00.0		
		12	16:16	40	56	19	21	48	155	30	49	8	38	2	3	2	2	40	4	32	11	5	0	3	0	9	0	05.0		
		12	20:29	10	31	19	22	54	155	8	47	3	14	1	6	1	2	14	2	98	09	2	0	6	0	3	0	0	05.0	
		13	9:15	47	38	19	10	38	155	17	15	9	81	1	4	17	3	59	14	8	0	8	1	3	0	1	3	0	01.1	
		13	10:46	3	54	19	25	27	155	16	47	14	81	2	2	1	3	17	3	110	06	1	0	9	0	9	0	0	05.1	
		13	11:34	21	32	19	24	53	155	16	20	12	29	1	8	1	0	9	1	139	09	1	1	8	1	3	0	0	05.1	
		13	13 1	15	39	19	21	64	156	21	39	35	71	2	6	2	3	29	6	294	10	48	1	4	2	2	0	0	05.0	
		13	20:56	54	26	19	19	04	155	13	88	5	33	1	5	1	4	26	1	88	14	4	0	4	1	1	0	0	05.2	
		14	5:53	50	00	19	17	70	155	13	11	4	87	1	3	16	4	113	05	1	0	6	0	8	0	0	0	0	05.0	
		14	9 2	51	17	19	19	80	155	11	67	7	15	2	3	2	4	42	5	88	12	5	0	4	0	6	0	0	05.0	
		14	9:10	7	63	19	22	69	155	2 21	7	38	2	4	2	1	35	5	141	12	4	0	5	0	5	0	0	0	05.5	
		14	12:14	26	98	19	24	38	155	3 12		3	60	1	7	1	4	12	2	98	06	2	0	5	0	4	0	0	05.0	
		14	12:47	52	33	19	26	62	155	29 61		9	52	2	2	1	6	33	7	16	11	7	0	4	0	8	0	0	05.0	
		14	15:56	13	65	19	58	14	155	38 77		10	63	1	8	1	8	14	5	143	08	23	0	8	1	0	0	0	00.0	
		14	16:29	42	58	20	11	39	155	49 23		31	02	2	9	2	3	31	9	303	10	8	0	9	0	5	0	0	0	05.0
		14	18:15	2	47	19	40	82	156	10 42		25	99	2	0	2	0	24	4	303	11	34	1	4	2	5	0	0	0	05.0
		15	0:40	9	40	19	22	59	155	14 34		3	13	1	9	1	6	19	4	81	06	2	0	3	0	0	0	0	0	05.0
		15	2:28	20	33	19	18	00	156	19 67		32	89	2	1	2	2	5	316	10	48	1	5	2	5	0	0	0	0	00.0
		15	9:40	51	16	19	20	80	155	11 27		8	64	2	6	2	2	38	7	72	16	3	0	4	0	5	0	0	0	05.0
		15	9:45	49	94	19	20	30	155	11 27		7	77	1	9	1	6	23	7	80	08	4	0	5	0	8	0	0	0	05.0
		15	12:51	38	38	19	19	62	155	11 85		4	10	1	5	1	5	23	5	90	13	6	0	4	1	6	0	0	0	05.0
		15	16:46	40	31	15	24	31	155	17 11		1	50	2	0	1	3	12	5	102	07	1	0	4	0	3	0	0	0	05.0
		15	22:22	33	46	19	9	08	155	38 58		7	94	1	5	1	8	21	4	111	11	11	0	6	1	6	0	0	0	05.0
		15	22:36	42	10	19	22	20	155	26 90		10	12	1	9	1	5	26	4	61	13	1	0	4	0	7	0	0	0	05.0
		16	2:12	58	42	19	21	27	155	2 86		3	47	1	7	1	4	13	3	104	06	2	0	4	0	6	0	0	0	05.0
		16	7:40	54	75	19	18	65	155	15 30		6	82	1	4	1	9	3	125	07	4	0	4	1	0	0	0	0	0	05.1
		16	8 8	52	63	19	20	55	155	28 56		9	57	1	4	2	4		4	62	09	7	0	4	1	0	0	0	0	05.0
		16	10:49	27	19	19	18	10	155	16 13		6	35	1	6	1	7	36	3	115	10	4	0	4	0	7	0	0	0	05.1
		17	2:54	4	91	15	18	17	155	46 03		8	98	1	7	27	3	134	13	12	04	1	0	4	1	0	0	0	0	00.0
		17	4:58	0	71	19	24	31	155	17 28		2	24	1	9	1	2	12	4	96	09	1	0	4	0	4	0	0	0	05.0
		17	7 1	1	57	19	18	24	155	16 03		6	92	1	5	1	5	35	4	116	11	4	0	4	0	8	0	0	0	05.1
		17	12:26	38	74	19	20	51	155	30 21		5	43	1	7	1	3	14	4	51	06	6	0	4	1	6	0	0	0	05.0
		18	7 9	13	08	19	20	62	155	30 23		12	17	1	7	1	4	27	3	36	11	4	0	5	0	9	0	0	0	05.0
		18	8:51	37	92	20	46	80	156	3 95		6	61	1	8	24	4	129	09	8	2	10	6	0	0	0	0	0	0	05.0
		18	10:30	26	29	19	21	15	155	7 22		7	25	1	7	25	2	84	08	4	0	4	0	8	0	0	0	0	0	05.4
		18	13:13	24	22	19	20	12	155	7 33		7	45	1	2	1	4	18	5	101	07	5	0	4	0	9	0	0	0	05.0
		19	0:50	7	91	19	21	41	155	17 11		23	36	1	6	3	4		4	51	05	2	0	8	0	9	0	0	0	05.0
		19	12:0	9	13	19	47	41	155	35 69		15	15	1	9	1	9	22	5	128	08	10	0	4	0	6	0	0	0	05.0
		19	6:49	14	19	21	23		155	17 54		1	70	1	2	10	3	110	06	2	0	3	0	6	0	0	0	0	0	05.0
		19	9:12	49	37	19	22	99	155	11 30		3	60	1	9	1	5	15	3	103	06	2	0	1	0	4	0	0	0	05.0
		20	11:3	52	61	19	19	76	155	11 83		8	78	1	9	1	9	34	3	87	09	6	0	4	0	7	0	0	0	05.0
		20	13:6	35	66	19	19	67	155	10 83		5	81	1	9	1	6	29	5	94	09	5	0	4	1	0	0	0	0	05.0

YEAR	GRGAIN TIME		LAT N	LONG W	DEPTH AM. (CM)	GRGAIN DATA			GRGAIN DATA			GRGAIN DATA			GRGAIN DATA											
	MON	DY				HR	MIN	SEC	DIS	DIS	DIS	DIS	DIS	DIS	DIS	DIS	DIS	DIS								
1991	AUG	12	2313	43	50	19	23	29	155	15	12	2	94	1.8	1.4	18	3	75	112	2	0.4	0.4	0.5EL			
		13	10	36	99	19	23	04	155	3	33	3	79	99	2.3	2.2	38	6	109	10	0.4	0.5	0.9FS			
		14	333	14	51	19	59	72	155	24	35	12	33	2.1	1.8	37	5	202	10	0.4	0.7	0.9NEA				
		14	925	55	63	19	50	34	155	50	34	13	16	1	5	20	2	269	13	2.0	2.8	0.9	0.8HA			
		14	1538	45	13	19	22	28	155	10	81	3	16	2.1	1.5	28	5	84	08	2	0.4	0.4	0.5SR			
		15	1	8	18	13	19	23	26	155	4	20	2	75	2.1	1.7	24	3	154	11	2	0.8	0.8	0.3HE		
		15	619	14	30	19	25	42	155	38	65	3	75	2.1	1.4	15	3	251	09	5	1.0	1.7	0.6LO			
		15	11	0	25	46	19	07	155	12	94	8	10	1.6	1.5	31	4	84	10	0.5	0.8	0.5FZ				
		15	1115	32	18	19	26	32	155	26	53	9	73	2.1	1.5	36	6	50	08	7	0.3	0.8	0.6FZ			
		15	1232	1	72	19	56	94	155	29	49	34	01	2.4	1.9	41	9	177	12	19	0.8	1.2	0.6EA			
1991	AUG	15	1512	19	28	19	26	70	155	21	76	10	81	2.1	1.3	32	8	72	09	3	0.4	0.7	0.6LO			
		15	2136	43	88	19	47	08	156	8	94	76	93	2	1	48	7	252	12	11	1.3	1.0	0.8HA			
		17	1524	34	04	19	19	73	155	12	51	6	13	1	32	8	81	11	5	0.4	1.0	0.5FZ				
		18	0	55	95	45	19	25	28	155	40	77	4	12	1.3	1.1	30	12	101	14	3	0.3	0.7	0.6LO		
		18	845	42	45	19	20	30	155	7	59	8	08	2.2	2.1	35	7	92	08	5	0.4	0.7	0.5FZ			
		18	2312	4	20	19	26	58	154	50	30	5	24	1.5	1.9	41	4	143	13	5	0.5	0.6	0.6HA			
		18	2325	42	00	18	43	40	156	39	55	9	76	4.7	4	0	57	8	324	10	0.3	1.3	2.4	0.5DIS		
		19	415	57	35	19	21	04	155	49	59	9	63	2.4	1.9	38	4	121	18	10	0.5	0.6	0.6HA			
		19	850	48	25	19	50	87	155	46	77	13	57	1	4	27	1	160	11	13	0.8	0.9	0.8HA			
		19	1124	8	19	13	25	48	155	19	17	7	66	2.2	1.2	28	8	79	15	3	0.5	0.8	0.6LO			
1991	AUG	20	151	35	08	19	19	34	155	12	19	8	43	2.3	2.2	43	5	92	10	5	0.4	0.5	0.5FS			
		20	822	24	59	19	20	59	155	13	25	7	78	1	5	1	3	23	3	62	06	4	0.4	0.8	0.5FZ	
		20	1569	6	14	19	21	83	155	11	28	3	27	1.5	1.3	18	3	111	04	3	0.5	0.4	0.5SR			
		20	1647	16	62	19	22	61	155	14	30	3	14	1.8	1.4	19	5	82	07	2	0.3	0.4	0.5SR			
		21	10	7	22	88	18	41	151	10	43	10	35	2	7	2	2	41	5	91	15	0.0	3	5	5.3	1.0TOT
		21	11	5	8	08	19	23	79	155	15	11	2	76	0	7	12	4	97	07	2	0.4	0.5	0.5EL		
		21	11	5	20	30	19	23	62	155	15	16	2	35	0	6	8	2	100	05	2	0.4	1.3	0.5SPT		
		21	11	5	42	85	19	23	75	155	24	25	2	50	0	7	11	2	95	07	2	0.3	0.7	0.5SPT		
		21	11	5	57	10	19	23	82	155	15	24	2	80	0	7	12	4	00	04	2	0.3	0.7	0.5SPT		
		21	11	6	17	38	19	23	72	155	15	10	2	81	1	5	1	11	2	91	06	2	0.4	0.5	0.5SPT	
1991	AUG	21	11	0	40	30	19	23	75	155	15	17	3	08	2	1	1	15	4	97	11	2	0.4	0.4	0.5EL	
		21	11	7	58	57	19	23	67	155	15	18	2	39	2	1	1	6	12	4	91	05	2	0.3	0.5	0.5SPT
		21	11	9	49	43	19	23	68	155	15	10	3	26	3	0	3	3	44	6	44	12	2	0.3	0.4	0.5SPT
		21	11	12	36	28	19	23	84	155	15	10	3	01	2	2	2	2	42	6	67	11	2	0.3	0.3	0.5SPT
		21	11	14	17	33	19	23	83	155	15	12	3	04	2	5	2	0	33	7	66	11	2	0.3	0.3	0.5SPT
		21	11	19	28	09	19	23	91	155	14	91	3	22	2	4	1	9	38	7	59	11	2	0.3	0.4	0.5SPT
		21	11	20	5	36	19	23	22	155	14	73	2	73	1	2	11	3	108	07	3	0.4	0.5	0.5SPT		
		21	11	24	2	89	19	23	74	155	15	04	3	39	2	1	7	20	5	90	09	2	0.3	0.4	0.5SPT	
		21	11	24	22	55	19	23	64	155	15	12	2	65	1	2	8	3	95	06	2	0.7	1.1	0.1SPT		
		21	11	24	56	75	19	23	77	155	15	12	2	69	1	5	1	6	4	94	09	2	0.4	0.4	0.5SPT	
1991	AUG	21	11	25	8	73	19	23	75	155	15	00	2	77	1	5	1	15	4	80	08	2	0.3	0.5	0.5SPT	
		21	11	25	28	34	19	23	70	155	15	09	2	45	1	0	1	6	17	4	92	09	2	0.3	0.4	0.5SPT
		21	11	25	41	63	15	23	62	155	15	11	2	26	1	6	1	15	4	96	07	2	0.3	0.5	0.5SPT	
		21	11	25	4	30	19	23	96	155	14	89	2	76	1	5	1	3	96	07	2	0.3	0.6	0.5SPT		
		21	11	26	22	27	19	23	54	155	11	88	2	73	2	4	1	4	28	5	75	11	2	0.3	0.3	0.5SPT
		21	11	26	22	27	19	23	54	155	11	88	2	73	2	4	1	4	28	5	75	11	2	0.3	0.3	0.5SPT
		21	11	26	22	27	19	23	54	155	11	88	2	73	2	4	1	4	28	5	75	11	2	0.3	0.3	0.5SPT
		21	11	26	22	27	19	23	54	155	11	88	2	73	2	4	1	4	28	5	75	11	2	0.3	0.3	0.5SPT
		21	11	26	22	27	19	23	54	155	11	88	2	73	2	4	1	4	28	5	75	11	2	0.3	0.3	0.5SPT
		21	11	26	22	27	19	23	54	155	11	88	2	73	2	4	1	4	28	5	75	11	2	0.3	0.3	0.5SPT

YEAR	DAY	TIME	LAT N	LON W		DEPTH AIR CALS		GEOPHYSICS				ENVIRONMENTAL								
				DEG MIN	SEC	RM	NOG	NOG	IR	IR	IR	IR	SEC	DIS	RM	RM				
1999	MAR	3	459	59.09	19 23	50	155	15.20	2.71	2.3	1.4	3.8	9	52	10	2	0.2	0.3	0.587	
		3	1641	14.61	19 22	29	155	20.80	10.79	1.8	1.4	35	3	75	08	3	0.4	0.6	0.600	
		3	1938	43.13	19 16	07	155	30.13	8.87	1.4	38	4	61	14	2	0.4	0.9	0.130		
		3	1939	5	99	19	155	28.42	8.21	1.4	28	4	90	13	4	0.4	1.0	0.150		
2002	MAR	3	2024	49.11	19 25	11	155	19.04	4.74	2.1	1.4	28	7	71	13	3	0.4	0.7	0.600	
		3	2055	16.67	19 25	13	155	18.92	5.75	3.3	1.4	44	4	41	12	2	0.3	0.6	0.100	
		3	2155	46.75	19 25	76	155	16.34	1.66	2.0	1.7	43	8	75	10	2	0.2	0.2	0.500	
		3	2249	49.38	19 25	83	155	16.45	1.60	2.5	1.5	26	5	113	11	2	0.3	0.3	0.500	
2005	MAR	4	2215	13.12	19 23	41	155	16.86	2.92	1.9	1.3	29	9	45	08	0	0.3	0.2	0.500	
		4	3267	27.77	19 22	78	155	13.97	3.84	1.8	1.5	28	5	90	10	2	0.4	0.5	0.500	
		4	927	0.90	19 25	18	155	15.01	10.90	2.1	1.2	13	1	139	11	2	1.3	1.3	0.100	
		5	1040	11.72	19 19	57	155	8.42	7.19	2.3	2.5	49	4	62	12	4	0.4	0.6	0.500	
2006	MAR	5	1210	25.73	19 20	19	155	7.37	8.09	1.6	30	0	99	10	5	0.6	0.8	0.500		
		5	1917	9.14	19 25	34	155	19.66	5.84	2.7	1.5	39	9	49	13	3	0.3	0.7	0.700	
		5	1945	42.17	19 18	74	155	13.48	10.10	3.8	3.9	57	7	75	11	3	0.4	0.3	0.500	
		6	125	33.88	19 19	46	155	13.79	8.68	2.3	2.6	51	6	63	13	4	0.4	0.5	0.300	
2007	MAR	6	248	54.30	19 19	33	155	13.49	7.41	1.5	1.5	42	5	69	12	4	0.4	0.7	0.500	
		6	6142	43.34	19 24	73	155	14.93	10.06	2.0	1.2	15	2	122	10	1	0.9	1.0	0.100	
		6	1127	28.04	19 19	03	155	13.31	4.43	1.5	1.4	38	5	77	13	4	0.3	1.3	0.500	
		6	1243	37.68	19 43	13	155	37.57	14.42	1.4	19	3	315	12	19	2	0.6	0.600		
2008	MAR	6	1315	4.95	19 19	26	155	13.45	4.93	1.4	29	3	71	11	4	0.4	1.5	0.500		
		6	1859	45.18	19 29	87	155	30.37	22.76	3.3	0.7	21	36	10	6	0.3	0.5	0.100		
		6	2324	25.11	19 46	48	155	34.42	14.95	1.0	1.6	24	5	105	09	12	0.5	0.6	0.600	
		7	1231	19.68	19 23	90	155	26.98	10.42	1	3	30	2	36	10	3	0.4	0.7	0.600	
2009	MAR	7	1637	13.90	19 21	11	155	13.23	8.69	2.9	2.9	51	9	57	10	3	0.3	0.4	0.500	
		8	2314	34.04	19 24	25	155	17.13	1.44	1	19	4	90	08	1	0.3	0.4	0.500		
		9	410	16.31	19 9	95	155	37.68	8.80	2.0	26	4	116	13	9	0.5	1.3	0.150		
		9	939	4.64	19 19	97	155	11.81	6.96	1.9	35	4	83	11	5	0.4	0.8	0.500		
2010	MAR	9	2023	9.71	19 26	54	155	19.52	14.65	1.9	1.2	28	4	107	08	3	0.6	0.6	0.600	
		9	2111	58.68	19 24	41	155	17.24	2.22	1.8	1.1	16	5	86	10	1	0.5	0.3	0.500	
		9	2314	58.84	19 10	32	156	17.38	10.96	1	8	22	10	45	2	3	2	7	0.100	
		10	19	8	16.45	19 24	86	155	18.96	6.10	2	1	4	26	6	66	10	3	0.4	0.6
2011	MAR	10	1913	24.87	19 24	73	155	19.32	5.04	2.5	1.6	31	8	73	12	2	0.3	0.6	0.600	
		10	1917	39.93	19 24	85	155	18.95	5.88	2.8	1.8	30	6	66	12	3	0.4	0.8	0.100	
		10	1921	54.27	19 24	91	155	19.10	5.14	2.2	1.4	27	6	67	11	2	0.3	0.8	0.600	
		10	1936	9.48	19 24	61	155	19.23	5.41	2.3	1.3	29	8	61	09	2	0.3	0.6	0.600	
2012	MAR	10	1956	53.91	19 24	81	155	19.13	4.85	2.1	1.9	36	7	65	12	2	0.3	0.6	0.600	
		10	20	5	54.04	19 24	84	155	19.03	5.61	2.3	1.5	26	5	65	11	2	0.4	0.8	0.600
		11	1	20	23.26	19 24	81	155	19.02	5.54	2.1	1.3	27	7	65	11	2	0.4	0.8	0.100
		11	329	59.69	19 22	82	155	4.29	8.76	3	5	37	51	7	87	09	3	0.3	0.3	0.500
2013	MAR	11	2334	34.32	19 18	72	155	8.31	7.90	1.7	1.5	27	4	80	08	3	0.5	0.9	0.300	
		11	2253	44	48	19 24	80	155	16.15	1.88	2.0	1.1	11	4	83	08	1	0.6	0.5	0.500
		12	138	19	50	19 23	47	155	6.43	0.03	2.4	1.7	17	0	60	11	2	0.5	0.8	0.500
		12	645	53.96	19 20	34	155	10.97	8.13	1.7	1.7	13	5	80	10	4	0.5	0.7	0.500	
2014	MAR	12	1253	58.53	19 23	19	155	15.06	2.58	2	1	39	22	8	78	10	2	0.3	0.3	0.500

YEAR	MIN	1E	100A	INT.	100T	100L	100H	100I	100J	100K	100L	100M	100N	100O	100P	100Q	100R	100S	100T	100U	100V	100W	100X	100Y	100Z	100AA	100AB	100AC	100AD	100AE	100AF	100AG	100AH	100AI	100AJ	100AK	100AL	100AM	100AN	100AO	100AP	100AQ	100AR	100AS	100AT	100AU	100AV	100AW	100AX	100AY	100AZ	100BA	100BB	100BC	100BD	100BE	100BF	100BG	100BH	100BI	100BJ	100BK	100BL	100BM	100BN	100BO	100BP	100BQ	100BR	100BS	100BT	100BU	100BV	100BW	100BX	100BY	100BZ	100CA	100CB	100CC	100CD	100CE	100CF	100CG	100CH	100CI	100CJ	100CK	100CL	100CM	100CN	100CO	100CP	100CQ	100CR	100CS	100CT	100CU	100CV	100CW	100CX	100CY	100CZ	100DA	100DB	100DC	100DD	100DE	100DF	100DG	100DH	100DI	100DJ	100DK	100DL	100DM	100DN	100DO	100DP	100DQ	100DR	100DS	100DT	100DU	100DV	100DW	100DX	100DY	100DZ	100EA	100EB	100EC	100ED	100EE	100EF	100EG	100EH	100EI	100EJ	100EK	100EL	100EM	100EN	100EO	100EP	100EQ	100ER	100ES	100ET	100EU	100EV	100EW	100EX	100EY	100EZ	100FA	100FB	100FC	100FD	100FE	100FF	100FG	100FH	100FI	100FJ	100FK	100FL	100FM	100FN	100FO	100FP	100FQ	100FR	100FS	100FT	100FU	100FV	100FW	100FX	100FY	100FZ	100GA	100GB	100GC	100GD	100GE	100GF	100GG	100GH	100GI	100GJ	100GK	100GL	100GM	100GN	100GO	100GP	100GQ	100GR	100GS	100GT	100GU	100GV	100GW	100GX	100GY	100GZ	100HA	100HB	100HC	100HD	100HE	100HF	100HG	100HH	100HI	100HJ	100HK	100HL	100HM	100HN	100HO	100HP	100HQ	100HR	100HS	100HT	100HU	100HV	100HW	100HX	100HY	100HZ	100IA	100IB	100IC	100ID	100IE	100IF	100IG	100IH	100II	100IJ	100IK	100IL	100IM	100IN	100IO	100IP	100IQ	100IR	100IS	100IT	100IU	100IV	100IW	100IX	100IY	100IZ	100JA	100JB	100JC	100JD	100JE	100JF	100JG	100JH	100JI	100JJ	100JK	100JL	100JM	100JN	100JO	100JP	100JQ	100JR	100JS	100JT	100JU	100JV	100JW	100JX	100JY	100JZ	100KA	100KB	100KC	100KD	100KE	100KF	100KG	100KH	100KI	100KJ	100KK	100KL	100KM	100KN	100KO	100KP	100KQ	100KR	100KS	100KT	100KU	100KV	100KW	100KX	100KY	100KZ	100LA	100LB	100LC	100LD	100LE	100LF	100LG	100LH	100LI	100LJ	100LK	100LL	100LM	100LN	100LO	100LP	100LQ	100LR	100LS	100LT	100LU	100LV	100LW	100LX	100LY	100LZ	100MA	100MB	100MC	100MD	100ME	100MF	100MG	100MH	100MI	100MJ	100MK	100ML	100MN	100MO	100MP	100MQ	100MR	100MS	100MT	100MU	100MV	100MW	100MX	100MY	100MZ	100NA	100NB	100NC	100ND	100NE	100NF	100NG	100NH	100NI	100NJ	100NK	100NL	100NM	100NO	100NP	100NQ	100NR	100NS	100NT	100NU	100NV	100NW	100NX	100NY	100NZ	100OA	100OB	100OC	100OD	100OE	100OF	100OG	100OH	100OI	100OJ	100OK	100OL	100OM	100ON	100OO	100OP	100OQ	100OR	100OS	100OT	100OU	100OV	100OW	100OX	100OY	100OZ	100PA	100PB	100PC	100PD	100PE	100PF	100PG	100PH	100PI	100PJ	100PK	100PL	100PM	100PN	100PO	100PP	100PQ	100PR	100PS	100PT	100PU	100PV	100PW	100PX	100PY	100PZ	100QA	100QB	100QC	100QD	100QE	100QF	100QG	100QH	100QI	100QJ	100QK	100QL	100QM	100QN	100QO	100QP	100QQ	100QR	100QS	100QT	100QU	100QV	100QW	100QX	100QY	100QZ	100RA	100RB	100RC	100RD	100RE	100RF	100RG	100RH	100RI	100RJ	100RK	100RL	100RM	100RN	100RO	100RP	100RQ	100RR	100RS	100RT	100RU	100RV	100RW	100RX	100RY	100RZ	100SA	100SB	100SC	100SD	100SE	100SF	100SG	100SH	100SI	100SJ	100SK	100SL	100SM	100SN	100SO	100SP	100SQ	100SR	100SS	100ST	100SU	100SV	100SW	100SX	100SY	100SZ	100TA	100TB	100TC	100TD	100TE	100TF	100TG	100TH	100TI	100TJ	100TK	100TL	100TM	100TN	100TO	100TP	100TQ	100TR	100TS	100TT	100TU	100TV	100TW	100TX	100TY	100TZ	100UA	100UB	100UC	100UD	100UE	100UF	100UG	100UH	100UI	100UJ	100UK	100UL	100UM	100UN	100UO	100UP	100UQ	100UR	100US	100UT	100UU	100UV	100UW	100UX	100UY	100UZ	100VA	100VB	100VC	100VD	100VE	100VF	100VG	100VH	100VI	100VJ	100VK	100VL	100VM	100VN	100VO	100VP	100VQ	100VR	100VS	100VT	100VU	100VV	100VW	100VX	100VY	100VZ	100WA	100WB	100WC	100WD	100WE	100WF	100WG	100WH	100WI	100WJ	100WK	100WL	100WM	100WN	100WO	100WP	100WQ	100WR	100WS	100WT	100WU	100WV	100WW	100WX	100WY	100WZ	100XA	100XB	100XC	100XD	100XE	100XF	100XG	100XH	100XI	100XJ	100XK	100XL	100XM	100XN	100XO	100XP	100XQ	100XR	100XS	100XT	100XU	100XV	100XW	100XX	100XY	100XZ	100YA	100YB	100YC	100YD	100YE	100YF	100YG	100YH	100YI	100YJ	100YK	100YL	100YM	100YN	100YO	100YP	100YQ	100YR	100YS	100YT	100YU	100YV	100YW	100YX	100YY	100YZ	100ZA	100ZB	100ZC	100ZD	100ZE	100ZF	100ZG	100ZH	100ZI	100ZJ	100ZK	100ZL	100ZM	100ZN	100ZO	100ZP	100ZQ	100ZR	100ZS	100ZT	100ZU	100ZV	100ZW	100ZX	100ZY	100ZZ
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[illegible]

CRUQIN TIME LAT N LON W LENGTH RUP OPA CAP RES MIN LSH EAZ MO YEAR MIN DE URAN SEC DEG MIN DEG MIN DEG SEC DIS RM RM PA HRIK

1991 DEC 18	1036	15	02	19	22	50	3	21	1	2	4	4	123	0	1	2	0	4	0	5	0	SRC					
18	1325	4	41	19	23	31	155	14	94	2	97	1	5	1	7	19	7	105	07	2	0	3	4	0	SRC		
18	2245	10	36	19	22	76	155	14	39	3	31	1	4	1	3	13	3	178	03	2	0	4	0	5	SRC		
19	0	7	21	17	19	23	155	15	05	3	63	3	1	3	7	29	8	105	06	2	0	3	0	3	0	SRC	
19	0	8	4	16	19	23	155	15	08	2	60	2	6	2	5	18	5	107	07	2	0	3	0	3	0	SRC	
19	254	12	78	18	56	48	155	15	67	16	20	1	4	1	3	1	4	29	4	0	31	2	8	13	1	0	LOI
19	3	25	00	18	48	87	155	13	33	10	98	1	8	15	4	320	08	46	1	9	1	2	0	1	LOI		
19	3	28	45	18	51	45	155	14	60	8	22	1	8	15	5	307	10	41	1	1	1	1	1	3	0	LOI	
19	3	56	52	18	49	94	155	13	50	11	71	4	2	1	9	14	2	313	09	44	2	8	1	7	0	LOI	
19	310	45	06	18	49	36	155	12	93	11	11	1	1	9	17	2	291	09	46	2	2	1	5	0	LOI		
19	312	51	98	18	47	50	155	13	35	9	72	1	8	14	2	341	09	48	2	6	1	2	0	1	LOI		
19	313	16	80	18	49	52	155	14	02	11	44	4	2	2	0	9	2	324	09	44	2	7	1	4	0	LOI	
19	334	6	73	18	49	86	155	13	20	11	52	2	2	0	16	1	310	10	45	2	4	1	3	0	LOI		
19	315	58	07	18	52	49	155	14	68	12	48	2	2	2	1	18	3	305	10	39	1	6	1	3	0	LOI	
19	318	0	12	18	49	38	155	13	35	11	24	2	5	2	2	18	2	310	07	45	1	8	1	1	0	LOI	
19	327	14	19	18	51	05	155	15	21	12	59	4	2	2	3	15	4	311	11	41	2	6	1	6	0	LOI	
19	328	48	09	19	4	24	155	19	09	12	38	2	4	2	0	14	0	255	25	18	3	9	1	9	0	LOI	
19	335	18	82	18	52	50	155	13	20	11	52	2	2	0	16	1	310	10	45	2	4	1	0	1	LOI		
19	339	48	88	18	55	94	155	16	46	14	00	3	0	3	2	22	0	278	09	32	4	5	1	6	0	LOI	
19	345	59	20	18	52	41	155	14	70	13	88	3	0	3	1	32	12	285	11	39	3	4	5	1	0	LOI	
19	348	41	68	19	23	24	155	14	89	2	53	1	6	1	6	17	1	307	06	2	0	3	0	4	0	SRC	
19	4	0	6	96	18	52	21	155	13	98	12	86	2	7	2	4	2	1	3	307	07	40	2	1	8	0	LOI
19	4	2	17	39	19	0	13	155	12	45	6	96	2	5	2	1	15	1	292	13	32	3	9	12	2	0	LOI
19	411	3	30	19	0	26	155	17	05	33	47	2	6	2	0	15	2	287	13	26	4	6	3	0	0	LOI	
19	415	15	72	18	56	17	155	15	28	14	42	3	1	3	4	28	7	277	10	33	1	1	1	5	0	LOI	
19	424	2	75	18	58	48	155	16	70	14	75	2	1	2	0	13	3	237	13	28	1	9	1	3	0	LOI	
19	441	14	95	18	48	98	155	22	92	39	12	3	1	6	12	0	311	14	39	10	8	7	0	LOI			
19	447	24	12	19	4	03	155	15	19	14	81	1	9	1	6	14	2	280	10	24	2	3	1	3	0	LOI	
19	451	24	58	19	0	51	155	14	97	7	04	1	6	14	1	291	11	28	3	5	11	3	0	LOI			
19	458	37	45	18	59	66	155	14	39	16	41	2	6	2	2	16	1	291	06	30	3	3	12	9	0	LOI	
19	5	6	2	59	18	53	09	155	12	52	13	15	3	0	3	1	3	4	283	12	41	2	9	3	8	0	LOI
19	515	42	70	18	59	03	155	14	16	6	97	1	7	14	3	295	10	31	1	7	11	1	0	LOI			
19	517	42	60	18	58	58	155	13	60	6	95	2	1	1	9	16	3	297	11	32	1	8	11	6	0	LOI	
19	526	36	68	18	59	49	155	12	85	22	20	2	6	2	0	16	2	295	09	33	3	2	3	7	0	LOI	
19	524	25	79	18	54	07	155	12	85	12	65	3	3	3	4	30	10	282	11	39	1	2	1	3	0	LOI	
19	526	39	49	19	1	63	155	15	21	14	61	3	1	4	1	27	4	262	10	26	1	4	1	2	0	LOI	
19	538	1	27	18	53	35	155	11	43	12	47	3	1	3	2	30	11	300	10	42	1	3	1	5	0	LOI	
19	541	27	34	19	3	66	155	13	95	22	86	2	7	2	4	8	0	283	05	28	4	0	7	8	0	LOI	
19	542	31	60	19	0	48	155	13	73	14	12	3	0	3	5	24	3	266	09	30	1	4	1	0	LOI		
19	6	3	55	68	18	55	34	155	13	27	6	55	2	9	2	7	7	8	280	14	46	0	8	1	6	0	LOI
19	6	9	2	81	18	59	19	155	12	11	6	84	2	0	3	13	1	266	15	34	2	9	15	4	0	LOI	
19	612	15	71	18	53	58	155	11	34	18	97	2	7	2	7	17	3	305	10	42	2	1	1	7	0	LOI	
19	617	55	33	18	56	02	155	15	87	20	18	2	6	2	1	16	2	299	10	33	2	3	7	3	0	LOI	
19	620	54	32	18	56	46	155	15	95	1	69	3	7	4	0	27	7	277	13	34	1	3	1	0	LOI		
19	643	26	72	18	58	87	155	10	21	48	99	3	4	3	3	28	7	231	12	37	2	0	2	4	0	LOI	

CRUQIN TIME LAT N LON W LENGTH RUP OPA CAP RES MIN LSH EAZ MO YEAR MIN DE URAN SEC DEG MIN DEG MIN DEG SEC DIS RM RM PA HRIK

1991 DEC 19	658	13	46	18	58	93	155	14	21	6	97	4	5	2	1	16	2	296	13	34	2	4	13	9	0	LOI	
19	7	6	0	03	19	1	52	155	14	28	6	93	2	3	1	7	13	2	291	12	28	2	3	13	5	0	LOI
19	7	8	3	62	18	59	155	11	38	49	54	2	9	2	4	15	1	294	15	34	3	6	6	4	0	LOI	
19	7	11	44	18	52	86	155	14	52	17	49	3	0	3	2	31	1	284	11	39	1	0	1	0	LOI		
19	7	15	57	31	19	0	85	155	13	52	14	63	4	0	4	3	30	8	265	11	30	1	4	1	6	0	LOI
19	727	35	64	18	56	89	155	12	50	16	59	2	1	1	8	12	1	299	11	36	3	1	11	6	0	LOI	
19	731	50	24	19	0	06	155	15	32	17	68	2	3	1	8	12	0	289	22	28	6	6	1	5	0	LOI	
19	736	41	16	19	43	33	155	15	22	4	51	1	4	6	9	2	106	06	2	0	6	0	9	0	SRC		
19	739	19	39	19	1	56	155	15	09	16	67	2	3	1	8	13	1	286	09	27	3	2	13	8	0	LOI	
19	741	48	26	18	54	33	155	8	23	27	19	2	6	2	3	15	3	310	19	41	2	4	11	0	LOI		
19	754	0	59	18	42	60	155	10	20	12	01	2	6	2	1	17	2	140	13	64	8	2	12	1	0	LOI	
19	756	43	18	59	34	155	13	21	17	59	2	4	1	5	16	1	282	11	32	3	0	11	9	0	LOI		
19	8	0	12	12	18	51	155	12	21	11	68	2	5	0	25	6	308	17	44	1	8	1	5	0	LOI		
19	8	5	8	23	18	57	65	155	12	18	6	00	2	6	1	8	20	3	286	13	35	1	4	3	9	0	LOI
19	8	6	55	50	18	57	85	155	13	28	16	89	2	4	1	8	20	0	285	07	33	4	6	13	5	0	LOI
19	811	49	11	13	0	97	155	12	62	13	81	3	0	2	2	27	5	275	20	30	2	4	3	0	LOI		
19	813	25	80	18	56	08	155	13	43	8	58	3	6	3	0	38	4	274	13	39	1	4	0	7	0	LOI	
19	846	9	47	19	3	82	155	13	16	9	27	2	5	2	0	19	0	262	08	24	2	1	5	9	0	LOI	
19	9	3	46	92	18	57	36	155	12	70	6	79	2	4	1	9	20	0	286	10	35	5	0	14	6	0	LOI
19	9	7	11	57	16	46	94	155	13	31	8	20	2	1	2	26	2	306	12	49	2	3	1	2	0	LOI	
19	927	33	51	18	55	03	155	9	59	14	22	2	4	2		14	274	12	41	0	8	0	6	0	LOI		
19	1017	30	17	18	57	58	155	10	72	7	02	1	9	2	1	2	289	13	36	2	7	1	8	0	LOI		
19	1044	54	07	19	0	35	155	18	58	4	83	1	2	11	3	274	13	23	7	0	9	0	LOI				
19	1119	48	28	19	1	38	155	12	58	7	91	1	6	17	1	294	11	29	2	3	9	0	LOI				
19	1151	25	19	19	17	56	155	18	18	0	02	2	0	1	5	13	1	131	10	1	2	2	4	7	0	DEF	
19	12	3	39	64	19	20	18	155	7	80	0	38	1	7	1	7	52	17	90	16	5	0	5	0	7	0	SNA
19	1211	26	43	18	56	82	155	15	31	1	98	1	6	11	0	113	10	32	9	4	1	9	0	LOI			
19	1257	40	20	18	51	09	155	9	64	8	20	2	0	2	13	3	289	15	47	11	9	4	1	0	LOI		
19	1320	42	08	18	54	79	155	10	62	1	64	1	8	22	1	293	11	41	1	8	0	9	0	LOI			
19	1349	47	13	19	1	16	155	14	16	14	03	1	4	9	1	300	14	28	3	8	1	1	0	LOI			
19	1612	35	34	18	50	78	155	12	79	0	43	1	2	14	2	308	11	33	2	9	14	8	0	LOI			
19	1615	46	90	18	56	52	155	13	45	13	15	1	4	17	0	287	12	35	5	2	1	2	0	LOI			
19	1621	7	46	18	55	04	155	15	33	16	01	2	6	2	0	37	2	289	11	35	3	1	1	3	0	LOI	
19	1637	6	24	18	51	17	155	7	19	9	52	1	3	17	0	320	08	49	11	3	3	0	LOI				
19	1644	46	43	18	59	95	155	21	08	0	18	4	1	7	15	2	302	08	21	3	4	2	1	0	LOI		
19	17	5	57	35	18	53	61	155	11	16	12	22	2	8	4	3	3	304	12	41	2	4	1	4	0	LOI	
19	1765	6	14	19	0	03	155	13	20	16	90	1	2	9	1	316	09	31	3	4	14	1	0	LOI			
19	1747	57	10	18	55	61	155	12	31	12	28	3	1	5	35	0	286	12	38	1	0	5	0	LOI			
19	1843	35	21	18	55	37	155	9	91	11	81	1	5	15	1	316	08	41	2	2	0	9	0	LOI			
19	21	2	41	18	39	35	155	7	62	7	04	2	4	2	1	3	316	14	66	9	7	12	6	0	DTS		
19	2126	31	39	18	50	63	155	11	17	10	50	1	7	15	5	315	09	46	1	8	0	7	0	LOI			
19	2225	34	75	18	59	52	155	14	79	6	81	2	0	1	21	5	290	11	29	0	8	2	4	0	LOI		
19	2248	52	72	18	48	13	155	10	76	12	63	1	6	12	3	329	09	50	8	0	11	5	0	LOI			
20	228	6	09	18	45	42	155	17	37	30	00	2	5	2	20	0	319	11	54	10	9	5	8	0	LOI		
20	238	43	40	16	24	33	155	10	77	46	1	53	2	1	5	17	6	83	10	1	0	2	0	2	0	SRC	

1991 HA. FARKAURAE SHEPARD LIFT														53
YEAR	DAY	HR	MIN	SEC	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT
YEAR	DAY	HR	MIN	SEC	UT	UT	UT	UT	UT	UT	UT	UT	UT	UT
1991	185	11	24	37	41	19	23	45	155	3	36	11	50	2
31	536	39	26	19	5	49	155	23	75	33	84	1	6	41
31	838	41	18	19	24	10	155	16	06	1	38	2	4	1
31	1239	23	04	19	29	50	155	33	72	42	00	2	1	1
31	1521	26	66	19	22	31	155	19	53	29	94	2	6	2
31	1745	52	57	19	59	46	155	2	91	45	45	3	3	2
31	1814	16	79	19	28	08	155	33	92	23	78	1	9	1
31	2231	39	11	19	19	49	155	11	58	5	29	1	4	1
31	2244	10	33	19	27	29	155	34	68	42	01	1	9	1

Table 6.

1991 HVO EARTHQUAKE SUMMARY LIST M>=3.0

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YEAR	MON	DA	ORIGIN TIME		LAT N		LON W		DEPTH AMP CODA				GAP RMS		MIN	ERH	ERZ NO			
			HRMN	SEC	DEG	MIN	DEG	MIN	KM	MAG	MAG	NR	NS	DEG	SEC	DIS	KM	KM	FM	REMK
1991	JAN	1	535	20.78	19	20.78	155	7.31	8.99	3.3	3.6	50	6	89	.10	5	0.3	0.3	0	SF4
		7	1219	34.43	19	31.60	155	37.26	11.25	3.3	3.3	47	5	109	.11	4	0.4	0.3	0	MLO
	FEB	8	10 5	45.02	19	48.23	156	9.72	37.49	3.6	3.2	52	7	254	.12	43	1.0	1.3	0	HUA
11		1123	58.91	19	13.04	155	41.46	5.83	3.5	3.8	51	7	113	.20	8	0.6	1.2	0	LSW F	
		23	754	54.04	19	20.71	155	7.81	3.01	3.4	3.7	54	3	34	.10	4	0.3	0.3	0	SF4 F
		23	1047	39.71	19	20.05	155	11.98	9.27	3.0	3.4	50	9	30	.11	5	0.4	0.4	0	SF3
		24	23 4	0.63	19	36.15	156	1.35	45.20	3.9	3.8	59	11	226	.10	17	0.7	1.0	0	KON
	MAR	7	413	21.88	19	58.45	155	41.71	30.14	4.2	4.2	61	10	131	.10	13	0.5	1.1	0	KOH F
11		1421	1.69	19	39.21	155	27.04	6.68	3.3	3.0	53	14	67	.13	5	0.3	0.8	0	KAO	
		23	1841	59.19	19	58.92	155	48.77	16.79	3.6	3.8	55	7	180	.12	17	0.9	3.4	0	KOH
		25	22 3	24.68	19	19.53	155	30.09	9.52	3.1	3.1	54	3	36	.11	7	0.3	0.6	0	KAO
		26	557	22.22	19	31.24	155	12.94	2.99	3.3	3.4	49	3	52	.11	1	0.3	0.4	0	SER F
		26	7 4	30.61	19	21.28	155	12.91	1.22	3.0	3.0	42	7	58	.16	2	0.3	0.5	0	SER F
		28	13 5	55.16	19	18.82	155	13.27	9.04	3.7	3.9	54	5	126	.12	7	0.4	0.3	0	SF2 F
		28	14 3	32.78	19	19.11	155	13.31	10.33	3.8	4.1	53	5	123	.12	7	0.3	0.3	0	SF2 F
		28	1418	35.63	19	19.26	155	13.49	9.53	3.5	4.0	54	6	121	.13	6	0.4	0.4	0	SF2 F
		29	2231	6.89	18	51.92	155	20.69	16.61	3.2	3.0	60	12	254	.12	35	0.9	12.5	0	LOI
	APR	3	1639	1.70	20	30.13	156	2.65	11.37	3.3	3.2	56	9	317	.11	82	5.6	7.4	0	DIS
17		814	29.38	19	19.20	154	56.42	42.77	3.8	3.4	69	18	214	.10	11	0.8	0.6	0	LER F	
		26	542	36.20	20	51.93	155	25.72	15.59	4.0	4.0	49	5	314	.13	90	5.8	12.4	0	DIS
	MAY	8	821	11.98	19	20.56	156	12.98	31.38	5.5	5.3	50	3	263	.11	35	1.3	1.6	0	KON F
8		830	12.54	19	24.09	156	15.86	32.53	3.6	3.3	55	9	266	.10	38	0.7	1.1	0	KON	
		8	1031	56.77	19	23.08	156	23.36	36.20	3.5	3.0	53	13	277	.10	51	0.9	1.5	0	DIS
		8	1447	32.86	19	21.10	156	18.54	35.08	3.8	4.0	50	4	271	.11	44	1.1	1.5	0	KON F
		9	1415	36.78	18	58.95	155	27.16	36.44	3.4	3.2	57	3	220	.09	20	0.8	0.8	0	DLS
	JUN	30	1756	43.40	19	57.21	155	19.95	11.23	3.2	3.0	51	9	198	.12	7	0.7	0.5	0	KEA
1		642	41.30	19	18.65	155	18.42	33.08	3.1	3.4	60	9	37	.11	1	0.5	0.6	0	DEP F	
		5	1513	0.45	19	22.97	155	14.60	3.81	3.3	3.2	50	5	49	.12	3	0.3	0.4	0	SEC F
		13	2217	23.54	21	20.23	156	57.53	6.52	4.0	3.1	49	6	339	.14	182	10.2	13.1	0	DIS
		18	031	16.10	19	19.80	155	10.54	8.66	2.9	3.3	50	5	90	.11	4	0.4	0.4	0	SF3
		18	18 8	25.82	19	27.37	154	52.67	9.77	3.0	3.1	51	8	145	.11	3	0.6	0.2	0	LER F
		25	6 9	42.31	19	20.09	155	12.07	3.26	2.9	3.1	52	7	79	.13	5	0.4	0.5	0	SF3 F
		27	1330	16.24	18	53.02	155	3.66	12.44	3.4	3.1	59	11	257	.14	45	1.7	2.9	0	LOI
		28	940	23.69	19	20.31	155	3.15	8.29	2.8	3.2	52	7	94	.12	1	0.6	0.4	0	SF5
		29	1617	15.14	19	20.03	155	6.76	9.02	3.5	3.8	48	6	111	.10	5	0.3	0.4	0	SF4
	JUL	1	534	27.51	19	20.40	155	29.90	9.65	2.9	3.2	53	7	68	.10	6	0.3	0.5	0	KAO
21		1240	45.11	19	20.03	155	11.74	9.58	2.8	3.1	46	5	33	.10	5	0.4	0.5	0	SF3	
	AUG	3	2055	16.67	19	25.13	155	18.92	5.75	3.0	3.1	44	4	41	.12	2	0.3	0.6	0	INT F
5		1945	42.17	19	13.74	155	13.48	10.10	3.8	3.9	57	7	75	.11	3	0.4	0.3	0	SF2 F	
		6	1359	25.18	19	29.87	155	30.37	22.76	3.0	3.0	72	21	36	.10	6	0.3	0.5	0	DML
		11	329	59.69	19	22.82	155	4.29	9.76	3.5	3.7	51	7	37	.09	3	0.3	0.3	0	SF5
		18	2325	42.00	18	43.40	156	19.55	29.76	4.7	4.0	57	8	324	.10	103	1.3	2.4	0	DIS
		21	11 9	49.48	19	23.68	155	15.10	3.26	3.0	3.3	44	6	44	.12	2	0.3	0.4	0	SEC
		23	2132	11.18	19	19.72	155	11.77	7.98	2.8	3.0	53	7	88	.13	6	0.4	0.5	0	SF3
	SEP	4	7 5	16.46	19	12.15	155	37.15	9.67	4.1	4.5	54	8	94	.17	5	0.4	0.6	0	LSW F

1991 HVO EARTHQUAKE SUMMARY LIST M>=3.0

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YEAR	MON	DA	ORIGIN TIME		LAT N		LON W		DEPTH AMP CODA				GAP RMS		MIN	ERH	ERZ NO			
			HRMN	SEC	DEG	MIN	DEG	MIN	KM	MAG	MAG	NR	NS	DEG	SEC	DIS	KM	KM	FM	REMK
1991	SEP	5	2356	34.24	18	55.37	155	3.55	35.41	3.9	3.4	61	14	257	.11	41	0.8	2.0	0	LOI F
		12	3 2	45.66	19	18.29	155	14.14	9.70	3.1	3.2	49	7	83	.11	3	0.4	0.5	0	SF2
		15	14 5	46.82	19	21.84	155	7.35	9.64	2.8	3.0	50	6	165	.10	3	0.6	0.4	0	SF4
		25	739	31.47	19	11.89	155	35.44	7.82	3.8	3.8	49	6	91	.21	6	0.5	1.0	0	LSW F
	OCT	2	1629	35.95	19	15.77	156	20.56	44.17	4.4	4.2	54	11	278	.10	49	1.1	1.3	0	DIS F
		4	17 9	16.83	19	22.53	155	24.68	11.51	3.6	3.8	54	5	26	.12	5	0.3	0.4	0	KAO F
		19	1217	39.52	19	15.03	155	35.06	6.15	3.3	3.5	54	14	71	.12	4	0.3	0.8	0	LSW
		23	250	28.60	21	20.02	157	24.42	23.35	4.1	3.1	45	7	341	.13265	3.4	5.9	0	DIS F	
		26	1612	27.17	19	21.76	155	5.11	9.02	3.1	3.3	56	7	81	.10	5	0.4	0.3	0	SF5
	NOV	1	1020	21.97	19	19.67	155	12.39	9.43	4.0	4.3	52	4	84	.10	5	0.4	0.3	0	SF2 F
		5	1215	48.00	19	20.58	155	11.74	7.94	3.4	3.7	56	7	73	.13	4	0.4	0.5	0	SF3
		10	2147	57.43	19	47.46	155	24.50	25.00	3.4	3.3	56	18	149	.11	5	0.5	1.0	0	KEA
		13	1052	2.07	19	21.34	155	13.34	9.75	2.3	3.3	57	14	54	.11	2	0.3	0.4	0	SF2 F
		15	1238	35.27	19	20.23	154	43.52	48.41	3.1	3.0	53	9	282	.10	19	1.1	0.8	0	LER
		21	2243	59.00	19	22.10	155	30.24	9.72	3.0	3.0	51	7	34	.09	5	0.3	0.5	0	KAO
		23	750	34.17	19	9.53	155	40.17	0.93	2.9	3.3	47	7	122	.21	11	0.6	0.6	0	LSW
	DEC	9	658	14.38	18	52.67	155	27.13	33.38	3.3	3.0	58	12	254	.10	25	0.8	1.4	0	DLS
		9	1314	20.48	18	50.11	155	50.94	46.42	5.2	4.6	50	3	299	.10	25	1.3	0.6	0	DIS F
		10	134	16.21	20	7.93	155	37.28	7.76	3.3	3.0	44	3	220	.09	17	1.0	0.7	0	KOH F
		12	037	4.62	19	27.12	155	14.20	33.77	3.8	3.8	58	11	59	.11	4	0.5	0.6	0	DEP F
		19	0 7	21.17	19	23.32	155	15.05	3.63	3.1	3.7	29	8	105	.08	2	0.3	0.3	0	SEC
		19	339	48.88	18	55.94	155	16.46	14.00	3.0	3.2	22	0	278	.09	32	4.5	1.6	0	LOI
		19	345	59.20	18	52.41	155	14.70	13.88	3.0	3.1	32	12	285	.11	39	3.4	5.1	0	LOI
		19	415	35.72	18	56.17	155	15.28	14.42	3.1	3.4	28	7	277	.10	33	1.1	1.5	0	LOI
		19	5 6	2.59	18	53.09	155	12.52	13.15	3.0	3.1	23	4	285	.12	41	3.9	3.8	0	LOI
		19	524	25.79	18	54.07	155	12.85	12.65	3.3	3.4	30	10	282	.11	39	1.2	1.3	0	LOI
		19	528	39.24	19	1.63	155	15.27	14.61	3.7	4.1	27	4	262	.10	26	1.4	1.2	0	LOI
		19	538	1.27	18	53.35	155	11.43	12.47	3.1	3.2	30	11	300	.10	42	1.3	1.5	0	LOI
		19	542	31.60	19	0.48	155	13.73	14.12	3.0	3.5	24	3	266	.09	30	1.4	1.0	0	LOI
		19	620	54.92	18	56.46	155	13.95	1.69	3.7	4.0	27	7	277	.13	34	1.3	1.0	0	LOI
		19	643	26.72	18	58.87	155	10.21	48.99	3.4	3.3	28	7	271	.12	37	2.0	2.4	0	LOI
		19	711	44.44	18	52.86	155	14.52	12.49	3.0	3.2	31	11	384	.11	39	1.0	1.0	0	LOI
		19	715	57.31	19	0.85	155	13.52	14.63	4.0	4.3	30	8	265	.11	30	1.4	1.6	0	LOI
		19	813	25.80	18	56.08	155	13.43	3.58	3.6	3.0	38	4	274	.13	39	1.4	0.7	0	LOI
		19	1747	57.10	18	55.61	155	12.31	12.28	3.7	3.5	45	10	286	.12	38	1.1	0.5	0	LOI
		20	426	58.08	18	57.71	155	11.49	8.84	3.1	3.0	46	8	274	.13	36	0.7	0.7	0	LOI
		20	730	45.97	18	57.13	155	9.60	11.75	2.9	3.2	48	9	276	.14	37	1.2	0.6	0	LOI
		23	224	12.66	19	33.65	156	8.05	33.93	3.1	3.1	46	5	251	.11	24	1.1	1.3	0	KON
		26	457	0.01	19	18.77	155	13.77	9.65	3.4	3.6	53	9	87	.11	3	0.4	0.4	0	SF2
		30	3 5	2.12	19	14.42	155	33.62	3.69	3.1	3.0	49	6	144	.15	6	0.7	1.5	0	LSW F