



Hawaiian Volcano Observatory Summary 99; Part I, Seismic Data, January to December 1999

by Jennifer S. Nakata

Chronological Summary
by C. Heliker & D. Sherrod

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

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1999 HAWAIIAN VOLCANO OBSERVATORY STAFF

DONALD A. SWANSON (SCIENTIST-IN-CHARGE)

ARNOLD T. OKAMURA (DEPUTY SCIENTIST-IN-CHARGE)

GEOLOGY

C. CHRISTINA HELIKER
DAVID SHERROD
CARL THORNBUR*
FRANK A. TRUSDELL

GEOPHYSICS

JAMES P. KAUAHIKAUA

SEISMOLOGY

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

DEFORMATION

MICHAEL LISOWSKI
ASTA MIKLIUS
MAURICE K. SAKO

GEOCHEMISTRY

TAMAR ELIAS
A. JEFFERSON SUTTON

ELECTRONICS

STEVEN FUKU
BRUCE FURUKAWA
KENNETH T. HONMA

COMPUTER

WILFRED R. TANIGAWA

LIBRARY/PHOTO ARCHIVE

T. JANE TAKAHASHI

ADMINISTRATION

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

PROGRAM OUTREACH COORDINATOR

STEVE BRANTLEY

SCIENTIST EMERITUS

DALLAS B. JACKSON
ROBERT Y. KOYANAGI

CONTRACTS

Seismic Record Changing
L. GLADYS FORBES
ADOLPH R. TEVES

Program Outreach Coordinator
JENDA JOHNSON+

* Left during 1999

INTRODUCTION

The Hawaiian Volcano Observatory (HVO) summary presents seismic data gathered during the year and a chronological narrative describing the volcanic events. The seismic summary is offered without interpretation as a source of preliminary data. It is complete in the sense that all data for events of $M \geq 1.5$ routinely gathered by the Observatory are included. The 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 (the introduction of CUSP at HVO) includes a description of the seismic instrumentation, calibration, and processing used in recent years. The present summary includes enough background information on the seismic network and processing to allow use of the data and to provide an understanding of how they were gathered.

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

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

CHRONOLOGICAL SUMMARY 1999

by

C. Heliker and D. Sherrod

The century ended quietly, with little change in the eruption until the extended surface flow activity that followed the upper east rift zone intrusion and eruptive pause in mid-September. Much of the episode-55 flow field below the 2,300-ft elevation was resurfaced (fig. C-1), largely in the last three months of the year. Flows from this eruption now cover 101 km² (table C-1).

The aftermath of the September intrusion resulted in a lava pond in Pu'u 'O'o crater, about ten new spatter cones both inside the crater and on its flanks, and a sizable new collapse pit in the west gap of the cone. Puka Nui, the humongous collapse pit on the southwest flank of Pu'u 'O'o, showed little change in size this year, but during September and October it gained a new floor of pahoehoe and several spatter cones.

Following the intrusion, the eruption paused for 11.5 days. When the flank vent(s) resumed erupting, the pre-intrusion lava tube was only reoccupied to the 1750 ft elevation. For several weeks, persistent breakouts at 2050 ft elevation formed large perched ponds over the tube. These merged into a string of rootless shields 5-20 m high and up to 500 m in diameter. The Pu'u 'O'o lava pond persisted through mid October, when its presence became intermittent. After mid-November, it remained empty.

The lava supply to the Pu'u 'O'o flank vent(s) that feed the tube system paused eight times in 1999. These pauses ranged from 19 hrs to 11.5 days in length and added up to a total of 24 days. Prior to September, pause 22 on February 6-7 was the most eventful, even though it lasted less than 24 hrs. During this pause the summit tilt abruptly rose 6.5 microradians and then deflated steeply when the eruption resumed. The tube was quickly reoccupied along its entire length, but a string of breakouts occurred from the south base of Pu'u 'O'o to Paliuli, suggesting that a surge of magma briefly overwhelmed the tube.

A single ocean entry at Kamokuna was active from the beginning of the year through September 11. This entry had been active since August 30, 1998. No new land was added to Hawai'i in 1999, due to bench collapses that claimed both the active lava bench and slices of the older sea cliff behind it. The largest collapse of the year was in March and removed 8 hectares (20 acres) of bench.

Following the September pause, no lava entered the ocean for three months. In mid-December, lava reached the ocean again at Highcastle. This entry was active for less than a week, and was succeeded by an entry at Lae'apuki, which remained active through the end of the year.

Table C-1. Eruption Statistics

Areas

Total area covered by lava, 3/83 - 12/99: 101.5 km² (39.2 mi²)

Episode	Area originally covered	Area exposed, 1/99
1-47 & 48A (mostly Pu'u 'O'o)	42 km²	20.8 km²
48 (Kupaianaha)	41	38.8
49 (between Pu'u 'O'o & Kupaianaha)	3.9	3.9
50-53 (Pu'u 'O'o flank vents)	26.4	15.2
54 (in & NE of Napau Crater)	0.24	0.24
55 (Pu'u 'O'o flank vents)	20.8	20.8

New territory covered in 1999: 1.8 km²

Net total of new land created, Nov 86 - Dec 99: 205 hectares (505 acres)#

Net new land created during episode 55 (2/97-12/99): ~ 5.5 hectares (13.5 acres)

#These figures do not include new land that was claimed by wave erosion or collapse of the active lava bench. Due to these processes, new mapping in 1998 and 1999 revealed a decrease in total acreage.

Volumes

Total, 1/83 thru 12/99 Approximately: 1.894 km³ (dense rock equivalent)

Episodes 1-47 (1/83 - 6/86)	385 x 10⁶ m³
Episode 48 (7/86 - 2/92)	500 x 10⁶ m³
Episode 49 (11/91)	11 x 10⁶ m³
Episode 50 (2/92 - 3/92)	4.5 x 10⁶ m³
Episode 51 (3/92 - 2/93)	32 x 10⁶ m³
Episode 52 (10/92)	2 x 10⁶ m³
Episode 53 (2/93 - 1/97)	535 x 10⁶ m³
Episode 54 (1/97)	0.3 x 10⁶ m³
Episode 55 (2/97 - ongoing)	424 x 10⁶ m³

Other fascinating facts

Height of Pu'u 'O'o cone: ~187 m (613 ft) Cone has lost 68 m due to collapse since 1986

Dimensions of Pu'u 'O'o crater: ~250 m x 400 m

Depth of Pu'u 'O'o crater floor (terrace around the pond), Dec 99: ~55 m

Dimensions of Episode 50-55 lava shield: 1.8 x 0.8 km

Height of Episode 50-55 lava shield: ~80 m

Height of Kupaianaha lava shield: 56 m

Kupaianaha vent inactive since Feb 92

Thickness of lava at the coast:

~15-25 m (50-80 ft) over Kalapana Gardens

~25 m (80 ft) over Chain of Craters Rd at Kamoamoa

Highway covered by lava flows from this eruption: 13 km (8 mi)

Structures destroyed

Residences destroyed thru Oct 91 (none since then): 181 Total losses: \$61 million

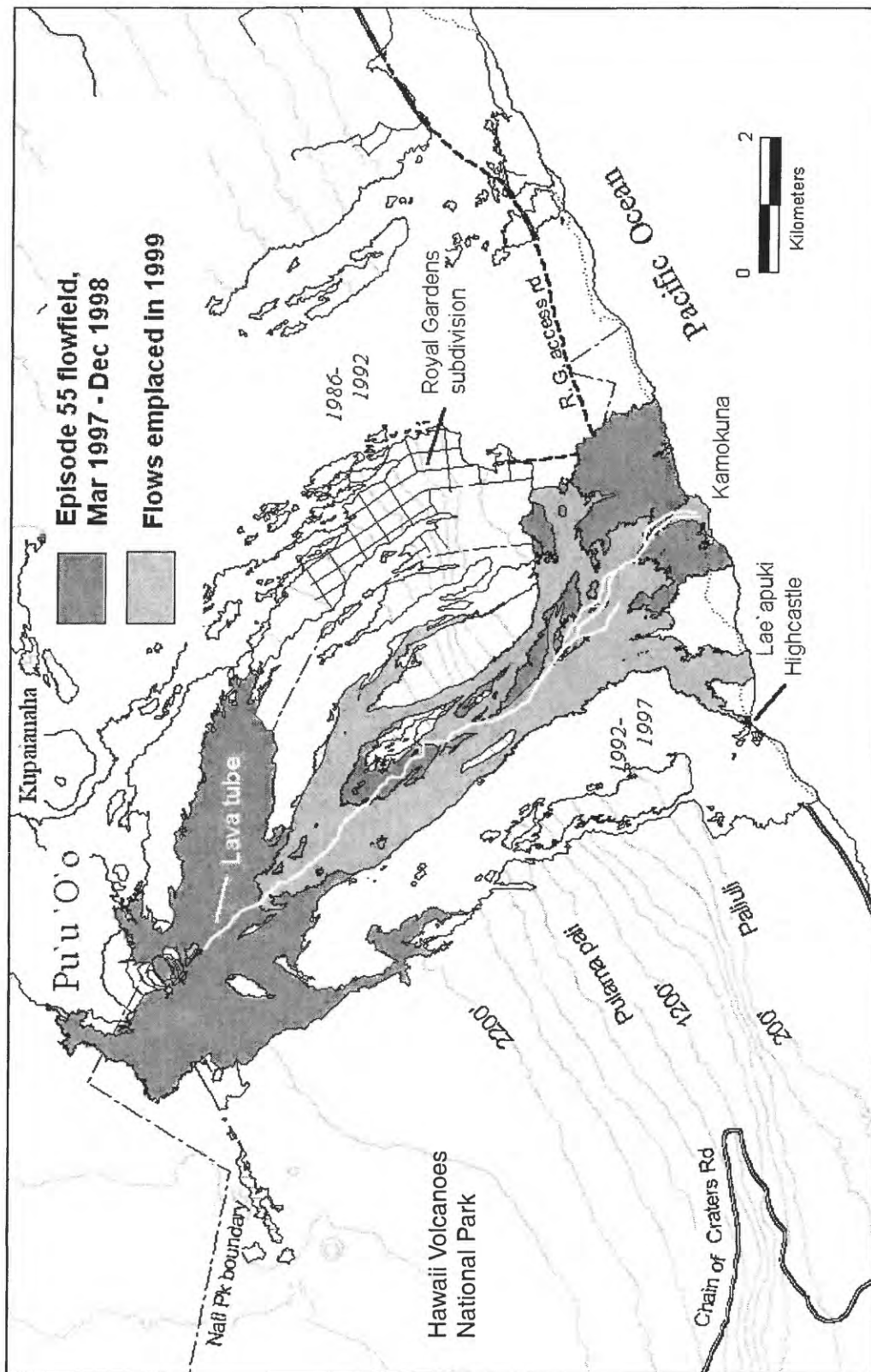


Figure C-1. The eruption site, showing flows emplaced in 1999 and the lava tubes that were active through September 11, 1999.

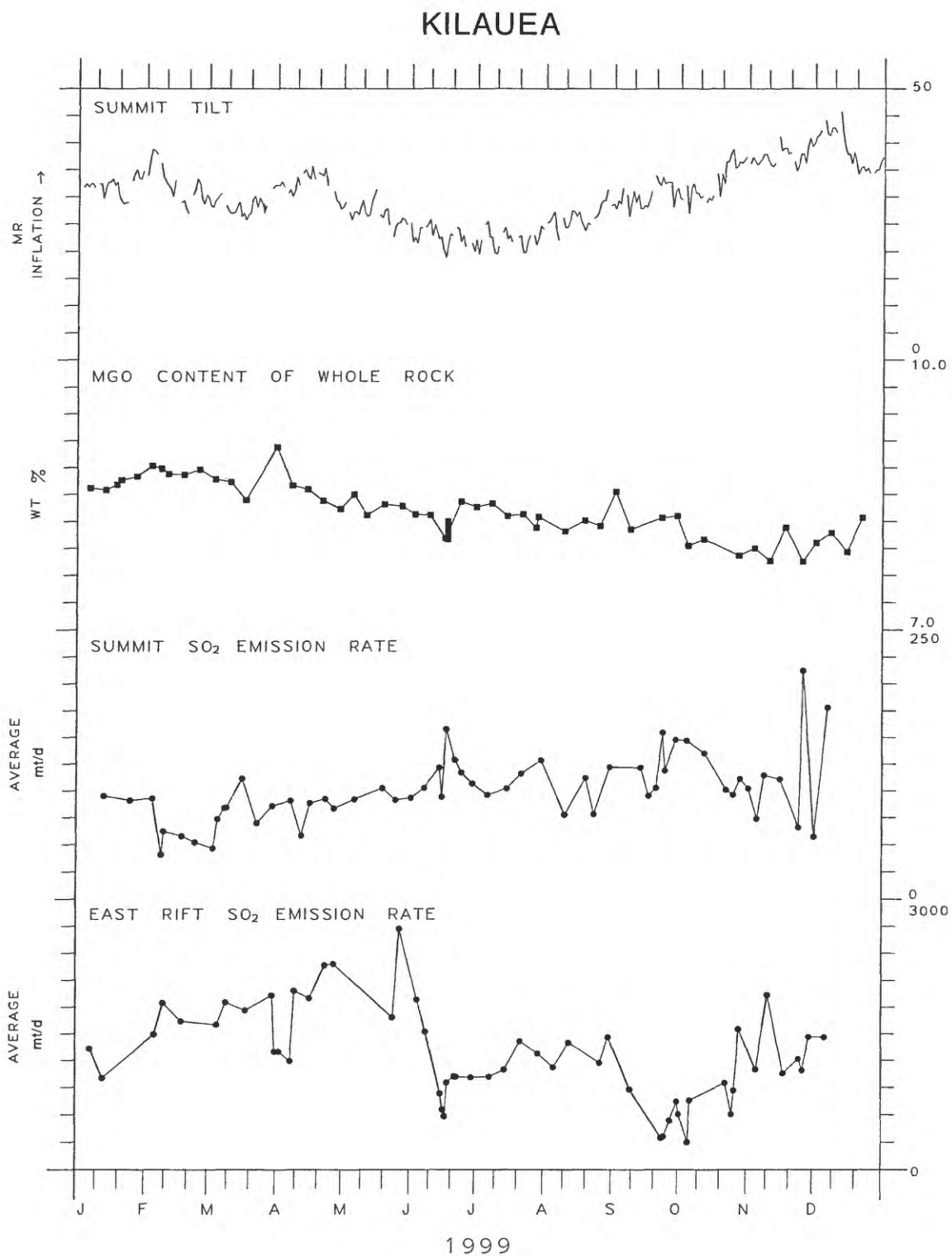


Figure C-2. Selected geodetic, petrologic and geochemical data for Kilauea, 1999.

SEISMIC INSTRUMENTATION

The network. The Hawaiian Volcano Observatory maintains an extensive telemetered seismic network on the Island of Hawai'i. The standard HVO field sensors, 1-Hz geophone, are deployed as single-component, vertical-only units or as three-component combinations of one vertical and two orthogonal horizontal units. The 1999 network consisted of 50 station sites: 12 three-component, one seven-component (which included a low-gain vertical with a unity gain setting, and a three-component Kinemetric Force-Balance accelerometer), one four-component and two two-component (each site included a moderate-gain vertical with a 48db setting), and 34 vertical-component-only sites. The coverage is most dense on and around Kilauea Volcano. During 1999 HVO added, to the network, 3 vertical-component-only sites on the Island of Maui. All seismic signals from the network are telemetered in real time to the Observatory for recording.

The Pacific Tsunami Warning Center (NOAA) operates and maintains a network of stations on the islands of Hawai'i, Maui, and O'ahu. In 1999, radio links were established to share data, in real-time, between PTWC and HVO. PTWC signals from one O'ahu three-component station, and 1 Maui and four Hawai'i vertical-component-only stations, were telemetered to the Observatory for recording.

Figure 1 is a map of selected geographic and geologic features. Figure 2 shows the seismic stations sites operated by HVO and PTWC on the Island of Hawai'i during 1999. Figure 3 indicates the telemetry scheme for the seismic stations on Hawai'i Island, and figures 4a and 4b are expanded views of the telemetry schemes at Kilauea summit: 4a, HVO seismic stations and 4b, broadband network installed by Menlo Park and maintained by HVO. Figure 5 indicates the telemetry scheme for the seismic stations on Maui Island.

Table 1 lists seismic stations by names, four-letter station codes, coordinates in degrees and minutes, elevation in meters, and other data, as described below, pertaining to each station. The list includes all the stations operated by HVO during 1999. Seismic stations operated by PTWC on the Islands of Hawai'i, O'ahu and Maui are also listed. Phase times from PTWC stations, not telemetered to HVO, are used to supplement local earthquakes and earthquakes that occur within the Hawaiian Archipelago, but distant from the Hawai'i Island network.

Instrumentation and recording. Each telemetered station's data channel has a voltage-controlled oscillator (VCO) for FM multiplex transmission to HVO via radio. These telemetering stations are all of Type 1, Earthquake Hazards Team (EHT) standard system used in USGS seismic networks (see table 2 for details). After discrimination at the receiver, the analog signals are converted to digital form as part of the routine computer location processing and archiving. Continuous signals from the telemetered network are saved on 4-mm digital-audio tape (DAT) recording units. Three DAT recorders run in automatic rotation, as each ~20-hr tape is filled. Optic recordings are coded in table 1 as follows: H - Helicorder paper, and I - ink paper. DAT and paper records are archived at HVO.

Seismograph response and calibration. Displacement response curve for the short-period seismograph type in use is given in figure 6. The Type 1 curve gives the displacement magnification of the standard EHT system from ground motion at the seismometer to the seismic trace, as seen on a 20x Develocorder film viewer. The curve plots the unit response, which is multiplied by a constant but known factor, CAL, to get the response for an individual station. Individual CAL factors for Type 1 seismographs are Develocorder equivalent peak-to-peak amplitudes, measured in millimeters, 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 for other required maintenance.

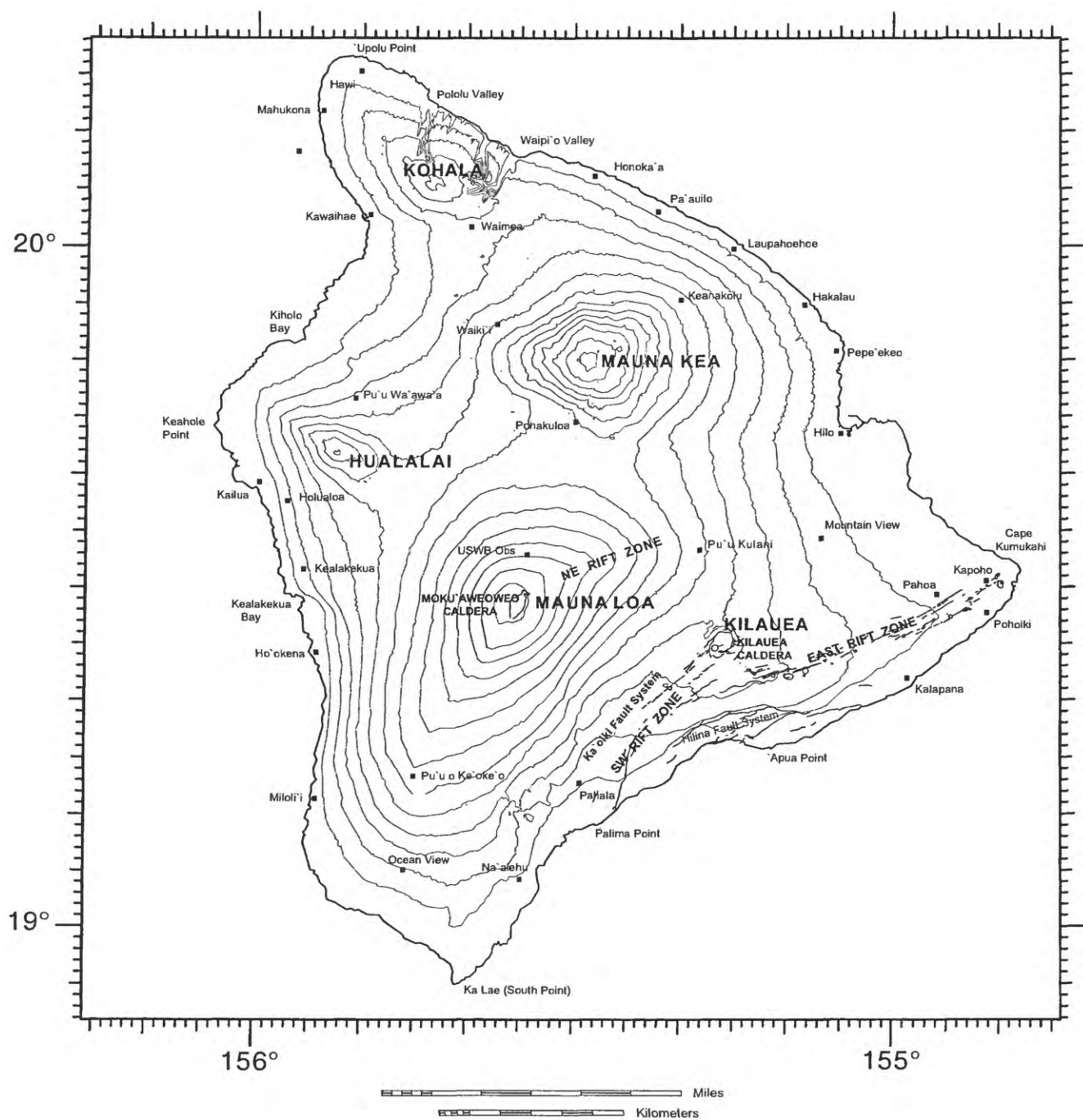


Figure 1. Map of the Island of Hawai'i, showing principal settlements and selected geographic and geologic features.

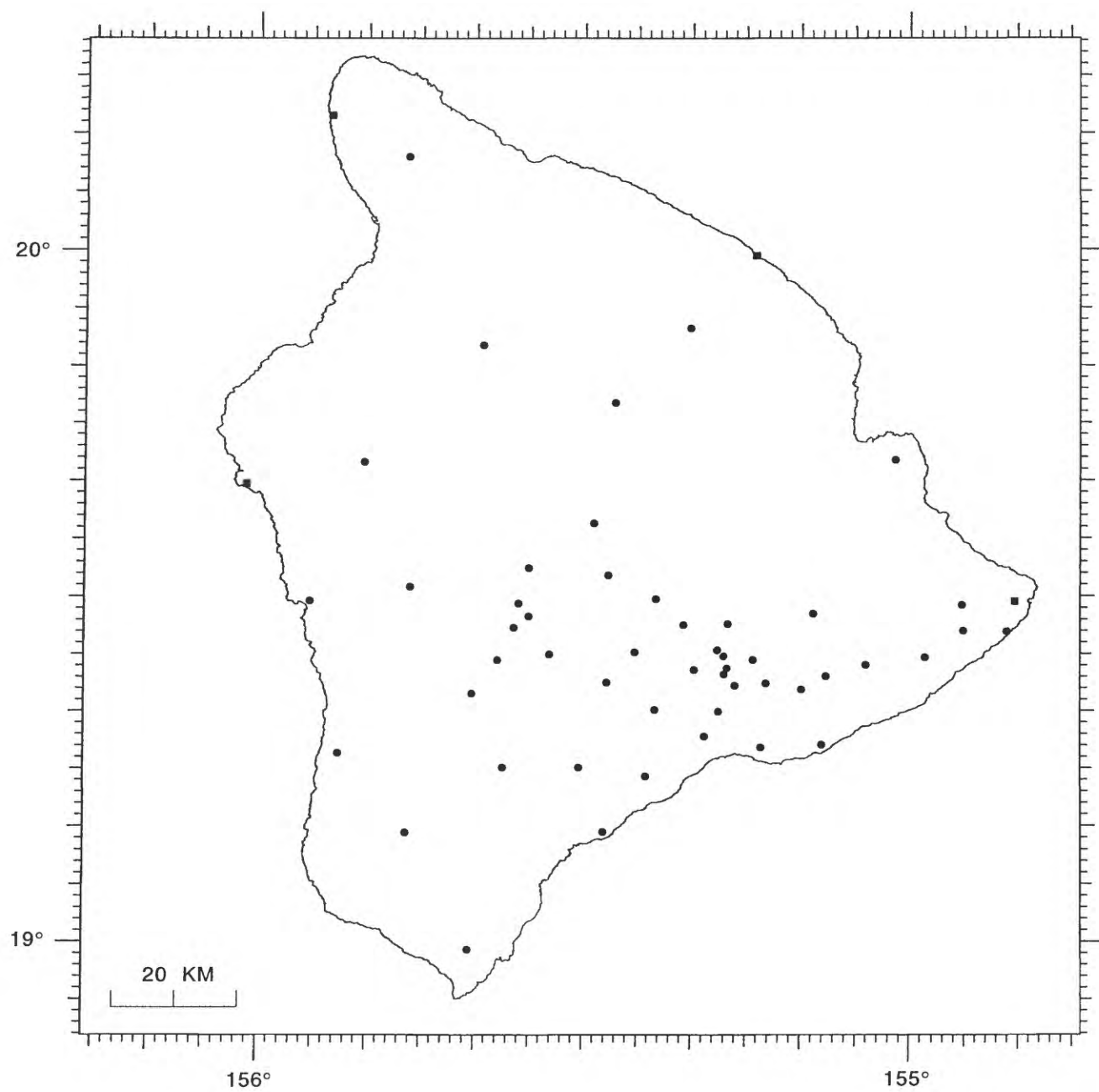


Figure 2. Seismic station sites operational during 1999 on the Island of Hawai'i.

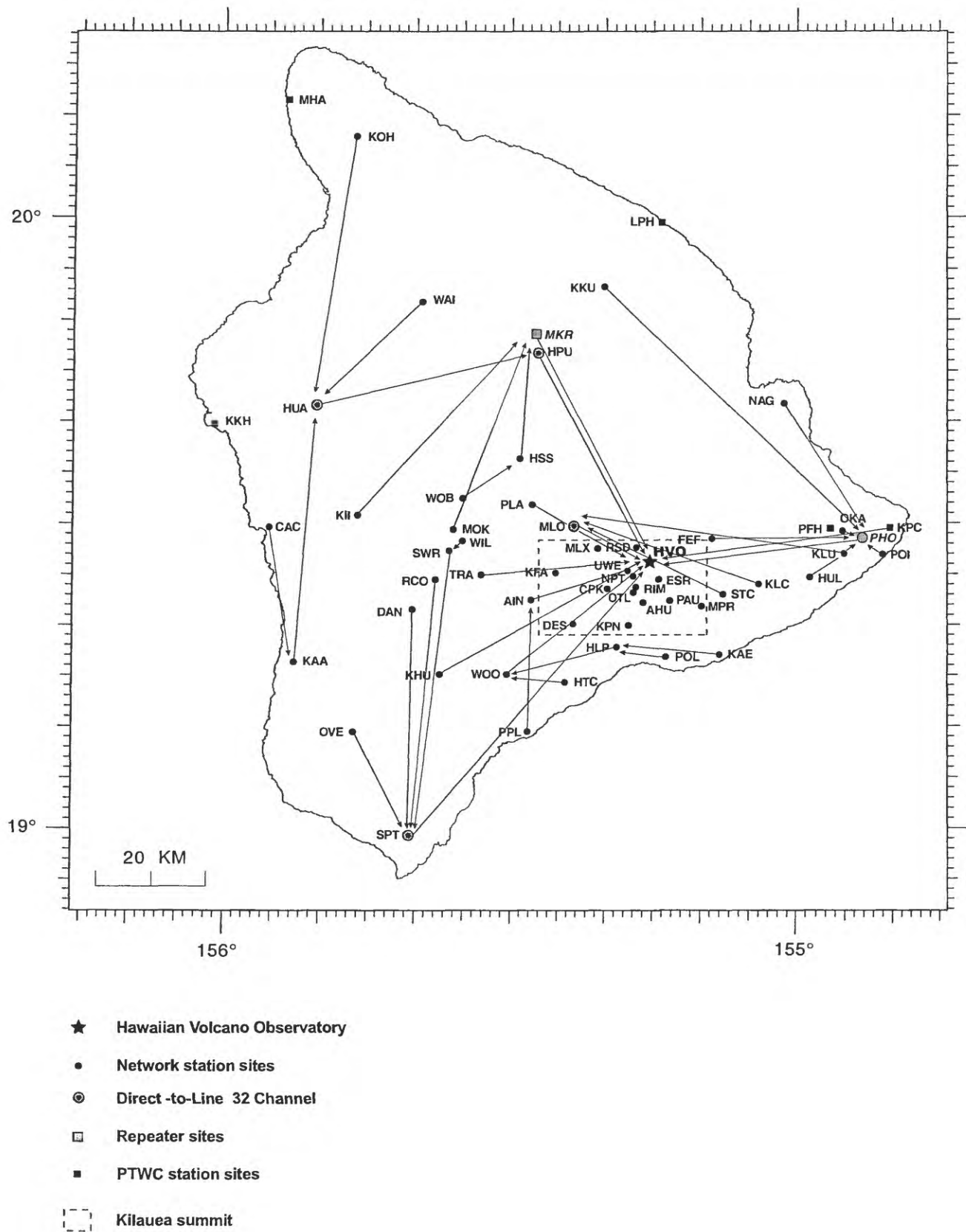
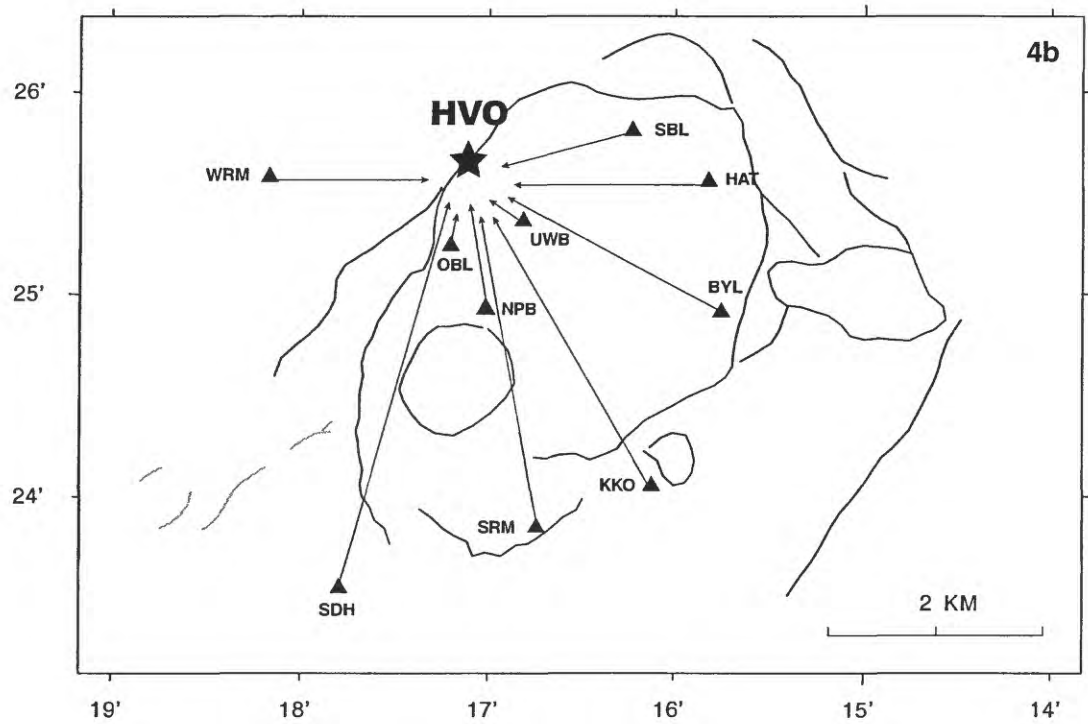
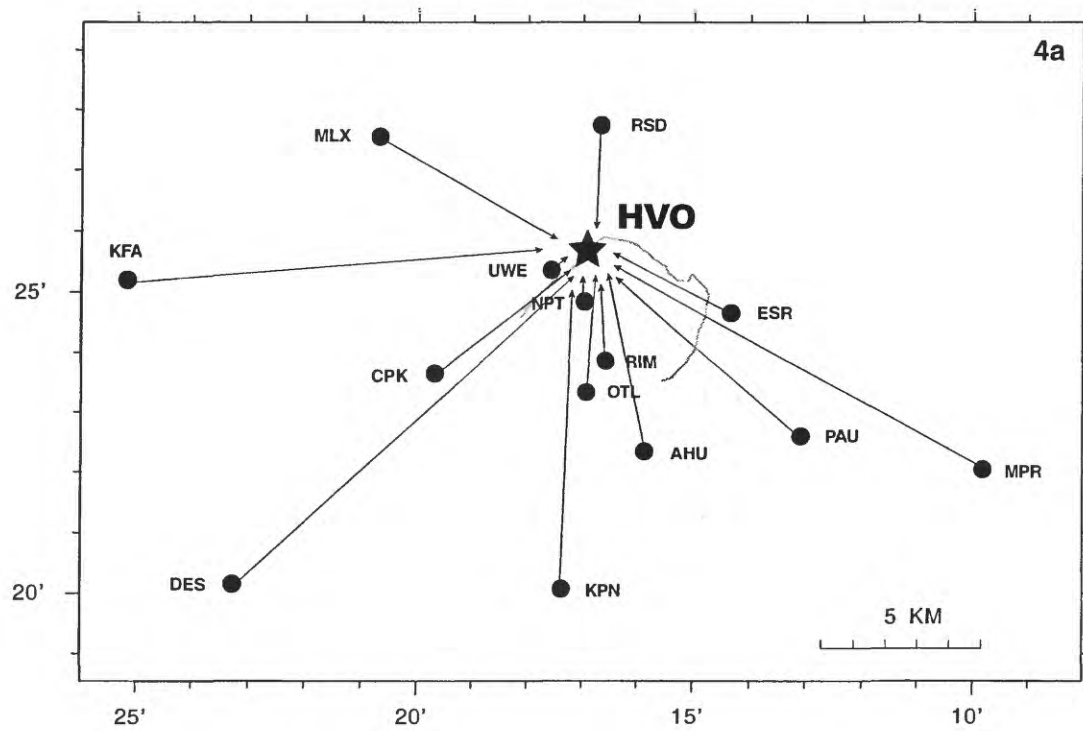


Figure 3. Telemetry scheme for seismic stations operational during 1999 on the Island of Hawai'i.



- ★ Hawaiian Volcano Observatory
- Network sites
- ▲ Broadband sites

Figure 4a. Expanded telemetry scheme for the 1999 Hawaiian Volcano Observatory seismic network at Kilauea summit.

Figure 4b. Expanded telemetry scheme for the 1999 Menlo Park broadband network at Kilauea summit.

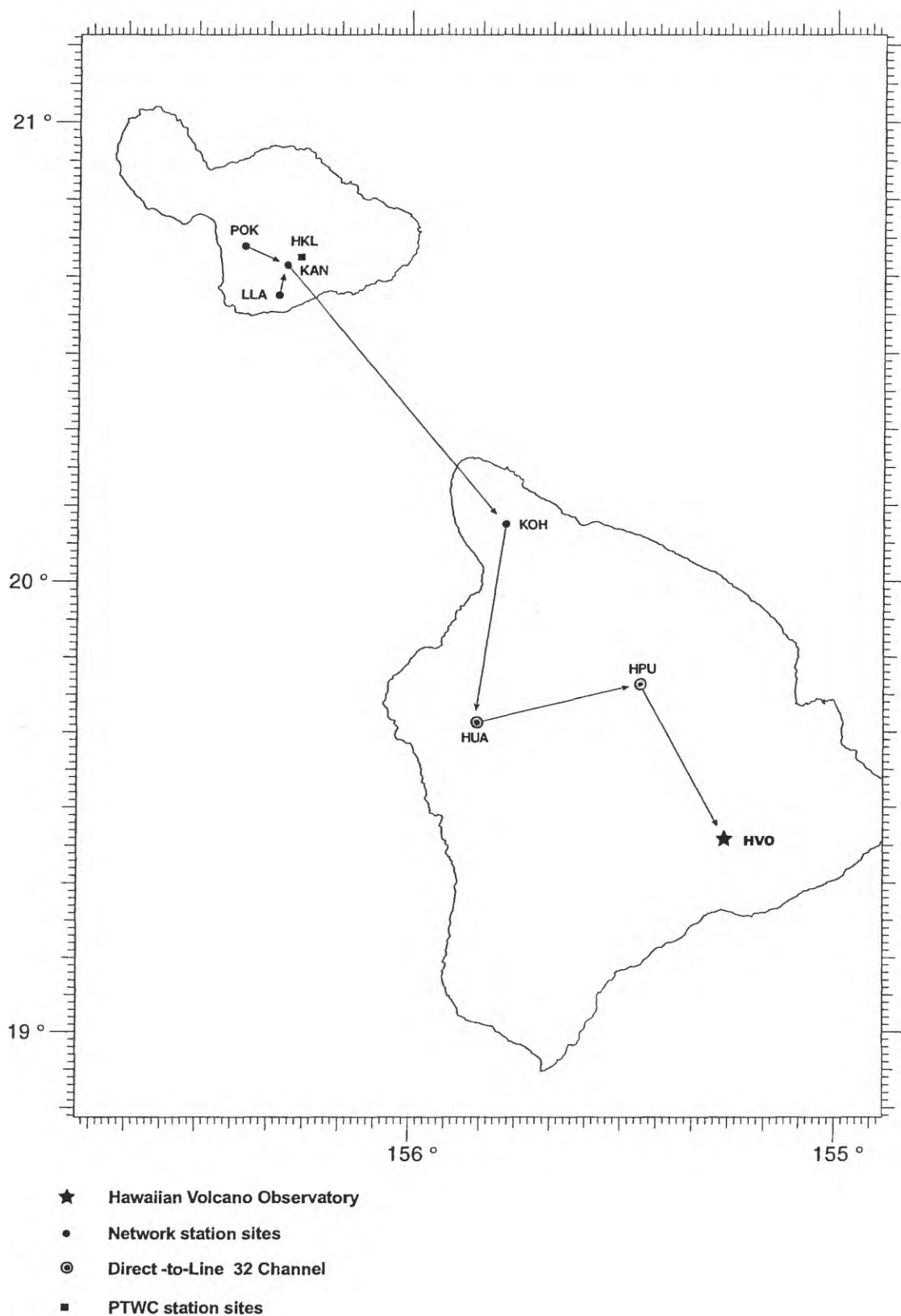


Figure 5. Telemetry scheme for seismic stations operational during 1999 on the Island of Maui.

Table 1. Seismic stations in Hawai'i operated by the USGS in 1999.

STATION NAME	CODE	-LAT-		-LON-		ELEV (M)	DELAY		CAL	SEIS TYPE	OPTIC RECORD
		D	M	D	M		1	2			
AHUA	AHUV	19	22.40	155	15.90	1070	-0.10	-0.13	3.1	E5	
AHUA	AHUE	19	22.40	155	15.90	1070	-0.10	-0.13	3.0	E5	MW
AHUA	AHUN	19	22.40	155	15.90	1070	-0.10	-0.13	3.0	E5	MW
AINAPO	AINV	19	22.50	155	27.62	1524	0.13	0.17	6.8	L5	
AINAPO	AINE	19	22.50	155	27.62	1524	0.13	0.17	3.0	L5	MW
AINAPO	AINN	19	22.50	155	27.62	1524	0.13	0.17	3.0	L5	MW
AINAPO	AINZ	19	22.50	155	27.62	1524	0.13	0.17	0.0	L5	
CAPTAIN COOK	CACV	19	29.29	155	55.09	323	0.00	-0.16	1.1	L5	D
CONE PEAK	CPKV	19	23.70	155	19.70	1038	-0.26	-0.07	6.0	L5	
DANDELION	DANV	19	21.42	155	40.04	3003	-0.27	0.03	4.3	E5	
DESERT	DESV	19	20.20	155	23.30	815	-0.29	-0.13	4.5	L5	DI
DIAMOND HEAD, OA	DHHZ	21	16.12	157	48.25	137	0.00	0.00	0.0	S13	
ESCAPE ROAD	ESRV	19	24.68	155	14.33	1177	-0.17	-0.19	1.2	L5	D
FERN FOREST	FEFV	19	28.70	155	8.91	691	0.01	0.05	0.0	L5	
HALEAKALA, MAUI	HKLZ	20	42.63	156	15.55	3051	0.00	0.00	0.0	S13	
HILINA PALI	HLPV	19	17.96	155	18.63	707	0.02	0.07	2.1	L5	D
HONOLULU, OAHU	HONZ	21	19.30	158	0.50	2	0.00	0.00	0.0	S13	
HONOLULU, OAHU	HONE	21	19.30	158	0.50	2	0.00	0.00	0.0	S13	
HONOLULU, OAHU	HONN	21	19.30	158	0.50	2	0.00	0.00	0.0	S13	
HONUPO	HPOZ	19	5.34	155	33.23	15	0.00	0.00	0.0	S13	
HALE POHAKU	HPUV	19	46.85	155	27.50	3396	0.31	0.17	3.3	L5	
HUMUULA SHEEP	HSSV	19	36.31	155	29.13	2445	0.20	0.35	4.0	L5	
HUMUULA SHEEP	HSSE	19	36.31	155	29.13	2445	0.20	0.35	3.0	L5	MW
HUMUULA SHEEP	HSSN	19	36.31	155	29.13	2445	0.20	0.35	3.0	L5	MW
HOT CAVES	HTCV	19	14.33	155	24.02	381	-0.16	-0.07	2.3	E4	
HUALALAI	HUAV	19	41.25	155	50.32	2189	0.67	0.38	2.8	L5	I
HEIHEIAHULU	HULV	19	25.13	154	58.72	369	-0.17	-0.16	1.6	L5	DI
HEIHEIAHULU	HULE	19	25.13	154	58.72	369	-0.17	-0.16	3.0	E5	MW
HEIHEIAHULU	HULN	19	25.13	154	58.72	369	-0.17	-0.16	3.0	L5	MW
KAAPUNA	KAHV	19	15.98	155	52.28	524	-0.12	-0.01	3.3	E5	
KAENA POINT	KAHV	19	17.35	155	7.95	37	-0.01	0.06	1.4	L5	
KANAHAU, MAUI	KANV	20	41.60	156	17.48	2745	0.00	0.00	0.0	L5	
KAOIKI FAULTS	KFAV	19	25.25	155	25.18	1579	0.13	0.17	0.0	L5	
KAHUKU	KHUV	19	14.90	155	37.10	1939	0.03	-0.03	5.0	E5	
KANEKII	KIIV	19	30.56	155	45.90	1841	0.15	0.37	3.0	L5	
KANEKII	KIIE	19	30.56	155	45.90	1841	0.15	0.37	3.0	L5	MW
KANEKII	KIIN	19	30.56	155	45.90	1841	0.15	0.37	3.0	L5	MW
KIPAPA, OAHU	KIPZ	21	25.40	158	0.90	2	0.00	0.00	0.0	S13	
KAILUA, KONA	KKHZ	19	39.40	156	1.12	1	0.00	0.00	0.0	S13	
KEANAKOLU	KKUV	19	53.39	155	20.58	1863	0.68	0.24	3.3	L5	
KALALUA CONE	KLCV	19	24.35	155	4.08	659	-0.25	-0.30	3.4	L5	
PUU KALIU	KLUV	19	27.48	154	55.26	271	-0.17	-0.30	3.4	L5	
KOHALA	KOHV	20	7.69	155	46.77	1166	-0.03	-0.17	6.3	L5	
KOHALA	KOHE	20	7.69	155	46.77	1166	-0.03	-0.17	3.0	L5	MW
KOHALA	KOHN	20	7.69	155	46.77	1166	-0.03	-0.17	3.0	L5	MW
KAPOHO CONE	KPCZ	19	30.02	154	50.51	134	0.00	0.00	0.0	S13	
KIPUKA NENE	KPNV	19	20.10	155	17.40	924	-0.11	-0.08	3.5	L5	D
LUALAILUA, MAUI	LLAV	20	37.62	156	18.62	683	0.00	0.00	0.0	L5	
LAUPAHOEHOE	LPHZ	19	59.82	155	14.58	1	0.00	0.00	0.0	S13	
MAHUKONA	MHAZ	20	11.27	155	54.18	1	0.00	0.00	0.0	S13	

MAUNA LOA	MLOV	19	29.80	155	23.30	2010	0.03	0.08	5.6	L5		DI
MAUNA LOA	MLOE	19	29.80	155	23.30	2010	0.03	0.08	3.0	L5	MW	
MAUNA LOA	MLON	19	29.80	155	23.30	2010	0.03	0.08	3.0	L5	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	4.2	L5		DI
MAKAOPUHI	MPRV	19	22.07	155	9.85	881	-0.17	-0.20	2.6	L5		DI
MAKAOPUHI	MPRZ	19	22.07	155	9.85	881	-0.17	-0.20	0.1	L5		
NATIONAL GUARD	NAGV	19	42.12	155	1.72	18	0.54	0.30	4.0	R5		
NATIONAL GUARD	NAGE	19	42.12	155	1.72	18	0.54	0.30	3.0	R5	MW	
NATIONAL GUARD	NAGN	19	42.12	155	1.72	18	0.54	0.30	3.0	R5	MW	
NORTH PIT	NPTV	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L5		DI
NORTH PIT	NPTE	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L5	MW	
NORTH PIT	NPTN	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L5	MW	
OOKA	OKAV	19	29.66	154	55.44	180	0.00	0.00	0.0	L5		
OPANA, OAHU	OPAZ	21	41.45	158	0.70	100	0.00	0.00	0.0	S13		
OUTLET	OTLV	19	23.38	155	16.94	1038	-0.19	-0.18	2.6	L5		
OUTLET	OTLZ	19	23.38	155	16.94	1038	-0.19	-0.18	0.0	L5		
OCEANVIEW EST	OVEV	19	9.21	155	45.92	1378	0.00	0.00	0.0	L5		
PAUAAHI	PAUV	19	22.62	155	13.10	994	-0.21	-0.24	2.9	L4		D
PAUAAHI	PAUE	19	22.62	155	13.10	994	-0.21	-0.24	3.0	L5	MW	
PAUAAHI	PAUN	19	22.62	155	13.10	994	-0.21	-0.24	3.0	L5	MW	
PUU ULAULA	PLAV	19	32.00	155	27.67	2992	-0.03	0.13	6.3	L5		DI
POHOIKI	POIV	19	27.42	154	51.22	16	-0.09	-0.24	0.0	L5		
PUUOKALI, MAUI	POKV	20	44.00	156	23.32	511	0.00	0.00	0.0	L5		
POLIOKEAWE PALI	POLV	19	17.02	155	13.47	169	-0.02	0.03	3.4	E5		
PUU PILI	PPLV	19	9.50	155	27.87	35	-0.15	-0.15	1.4	E5		D
RED CONE	RCOV	19	24.36	155	37.79	3601	0.00	0.00	0.0	L5		
RIM	RIMV	19	23.90	155	16.60	1128	-0.21	-0.13	0.0	L5		
RAINSLED	RSDV	19	27.78	155	16.68	1270	0.06	0.15	0.0	L5		
SOUTH POINT	SPTV	18	58.91	155	39.92	244	-0.17	-0.22	2.8	L5		
SOUTH POINT	SPTE	18	58.91	155	39.92	244	-0.17	-0.22	3.0	L5	MW	
SOUTH POINT	SPTN	18	58.91	155	39.92	244	-0.17	-0.22	3.0	L5	MW	
STEAM CRACKS	STCV	19	23.30	155	7.67	765	-0.25	-0.30	3.4	L5		DH
STEAM CRACKS	STCE	19	23.30	155	7.67	765	-0.25	-0.30	3.0	L5	MW	
STEAM CRACKS	STCN	19	23.30	155	7.67	765	-0.25	-0.30	3.0	L5	MW	
SOUTHWEST RIFT	SWRV	19	27.26	155	36.30	4048	0.01	0.04	5.6	E5		D
TRAIL	TRAV	19	24.91	155	32.96	3207	0.00	0.00	0.0	L5		
UWEKAHUNA	URAV	19	25.40	155	17.60	1240	-0.21	0.00	0.0	R5		
UWEKAHUNA	URAE	19	25.40	155	17.60	1240	-0.21	0.00	3.0	R5	MW	
UWEKAHUNA	URAN	19	25.40	155	17.60	1240	-0.21	0.00	3.0	R5	MW	
UWEKAHUNA	UUGZ	19	25.40	155	17.60	1240	0.00	0.00	0.0	L0		
UWEKAHUNA	UWAZ	19	25.40	155	17.60	1240	0.00	0.00	0.0	F0		
UWEKAHUNA	UWAE	19	25.40	155	17.60	1240	0.00	0.00	0.0	F0		
UWEKAHUNA	UWAN	19	25.40	155	17.60	1240	0.00	0.00	0.0	F0		
WAIKII	WAIV	19	51.58	155	39.60	1433	0.20	0.35	0.0	L5		
WILKES CAMP	WILV	19	28.15	155	35.02	4037	0.22	0.17	2.6	E5		D
WILKES CAMP	WILE	19	28.15	155	35.02	4037	0.22	0.17	3.0	L5	MW	
WILKES CAMP	WILN	19	28.15	155	35.02	4037	0.22	0.17	3.0	L5	MW	
WAIMANALO RG, OA	WMRZ	21	19.22	157	40.94	200	0.00	0.00	0.0	S13		
WEATHER OBSERV	WOBV	19	32.31	155	35.01	3396	0.00	0.00	0.0	E5		
WOOD VALLEY	WOOV	19	15.08	155	30.12	909	-0.15	-0.06	2.6	E5		

Table 2. Seismic instrument types

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

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

- a) Geophone - Electrotech EV-17 (E), Mark Products L4C (L) or Kinemetric Ranger SS1 (R).
(L) and (R) are 1.0-sec. period moving-magnet vertical- or horizontal- (E-W and N-S) component seismometers adjusted for an output of 0.5 volts/cm/sec and 0.8, critically damped.
- b) Preamplifier/VCO - USGS/OEVE Model J402 (4), J502 (5) voltage-controlled oscillator.
Three db points for bandpass filter at 0.1 Hz and 30 Hz. Signals are transmitted on audio FM carrier over cable or FM radio link to HVO.

Code (W) - Wood-Anderson torsion seismograph.

Code (MW) - Horizontal-component seismograph based on a Type 1 system and modified to 3x a Wood-Anderson response.

Code (F) - Kinemetric Force-Balance Accelerometer (FBA23).

Code (S13) - Geotech, 1Hz seismometer with A1 VCO operated by the Pacific Tsunami Warning Center.

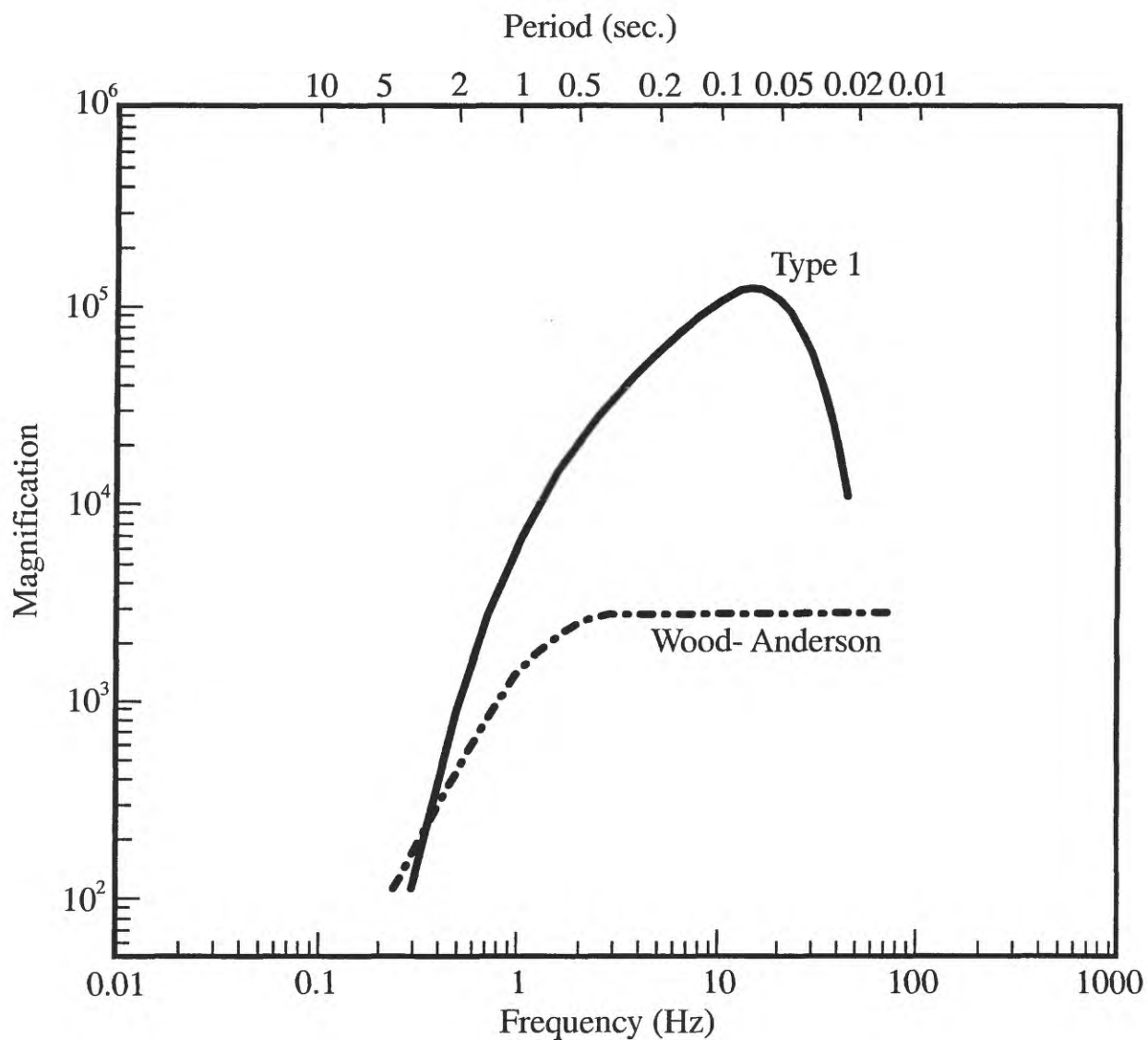


Figure 6. System-response curves for the Wood-Anderson torsion seismograph and for seismometers used by the Hawaiian Volcano Observatory. Type 1 is the standard OEVE seismometer system recorded on Develocorder film and DAT tape. The curve for Type 1 includes response of the geophone, all electronics including telemetry, Develocorder galvanometer, and projection of film by a 20x viewer. The curve plots 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

Due to age and high cost of maintenance, Develocorder 'A' was discontinued on August 1, 1997. Daily count of classified microearthquakes from source regions around Kilauea and Mauna Loa, and duration of tremor, were also discontinued. Coda duration, however, is measured in seconds from drum (ink or helicorder) records to determine a coda magnitude that is entered as an external magnitude in the final solution.

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

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

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

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

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

Magnitudes for events are computed using recorded amplitudes on selected network vertical, Modified Wood-Anderson (MW) horizontal, and/or moderate and low gain stations. Amplitude readings are corrected to an equivalent Wood-Anderson amplitude using the curves of figure 6 and CAL factors listed in table 1.

Duration magnitude is determined by the length of signal, in seconds, read from drum recordings of Type 1 seismographs. This length of time is measured from the P arrival to the point where the earthquake signal has decayed to nearly the background noise level. Drum-recorded duration magnitude is calculated with a relationship equivalent to the develocorder viewer output.

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

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

SEISMIC CATALOG

The emphasis in both station coverage and detailed data analysis is on the highly active south half of the Island of Hawai'i. The set of well-recorded earthquakes located in the Hawai'i Island region is nearly complete above magnitude 2.0. Many smaller events are located in the densely instrumented Kilauea area. Substantial effort is made to locate earthquakes elsewhere within the Hawaiian Archipelago. Such coverage cannot be as complete as in south Hawai'i, but nearly all events above magnitude 4.0 are located with limited precision.

Data presented in the seismic catalog are in three parts: (1) Maps showing computer-located hypocenters are given in figures 11-24. 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. (2) The list of computer locations constitutes the bulk of this summary and is given in table 4. Each earthquake in the list is assigned a three-letter code based on its general location and depth. Figures 7-10 are maps of the regions used to assign the location codes. The latitude and longitude limits of rectangular regions are listed in table 3. When the listed coordinates overlap, precedence is given according to figures 7-10. (3) Table 5 re-lists the events in table 4 for which the preferred magnitude is 3.0 or larger. This list includes many of the earthquakes felt in Hawai'i.

Table 3. 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 - Koa'e 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 rift zones of Kilauea and Mauna Loa (0-13 km)
- 17 GLN - Glenwood (0-13 km)
- 18 SWR - Southwest rift zone of Kilauea (0-13 km)
- 19 INT - Intermediate caldera (5-13 km)
- 20 KAO - Ka'oiki (0-13 km)

—Deep:

- 21 DEP - Deep Kilauea (>13 km) (below regions 1-13, 17-19)
- 22 DLS - Deep lower southwest rift zone of Kilauea and Mauna Loa (>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 3 (continued). The latitude and longitude limits of the regions are given below. If 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

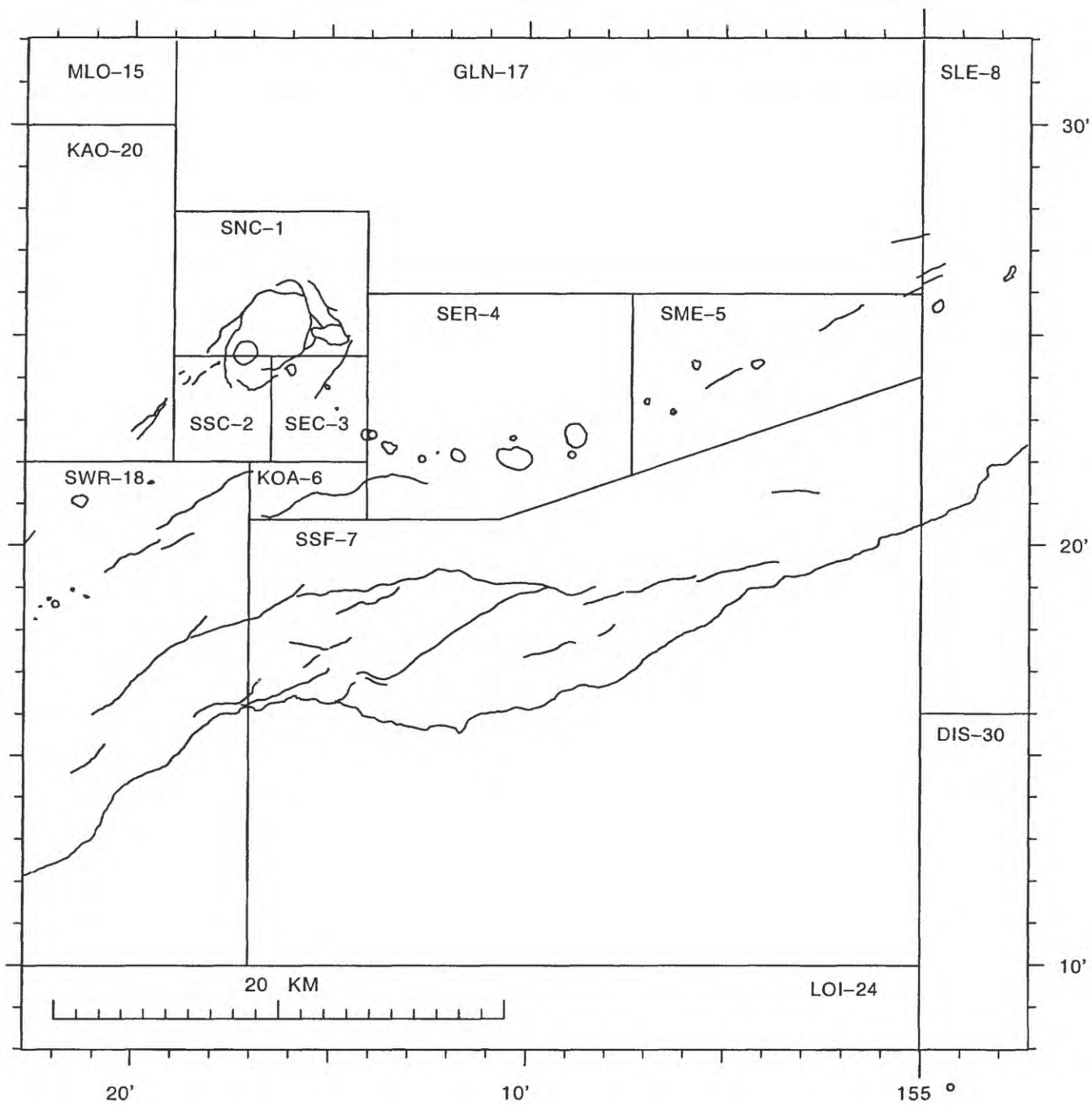


Figure 7. Earthquake classification, shallow (0-5 km deep), for Kilauea and the east flank of Mauna Loa.

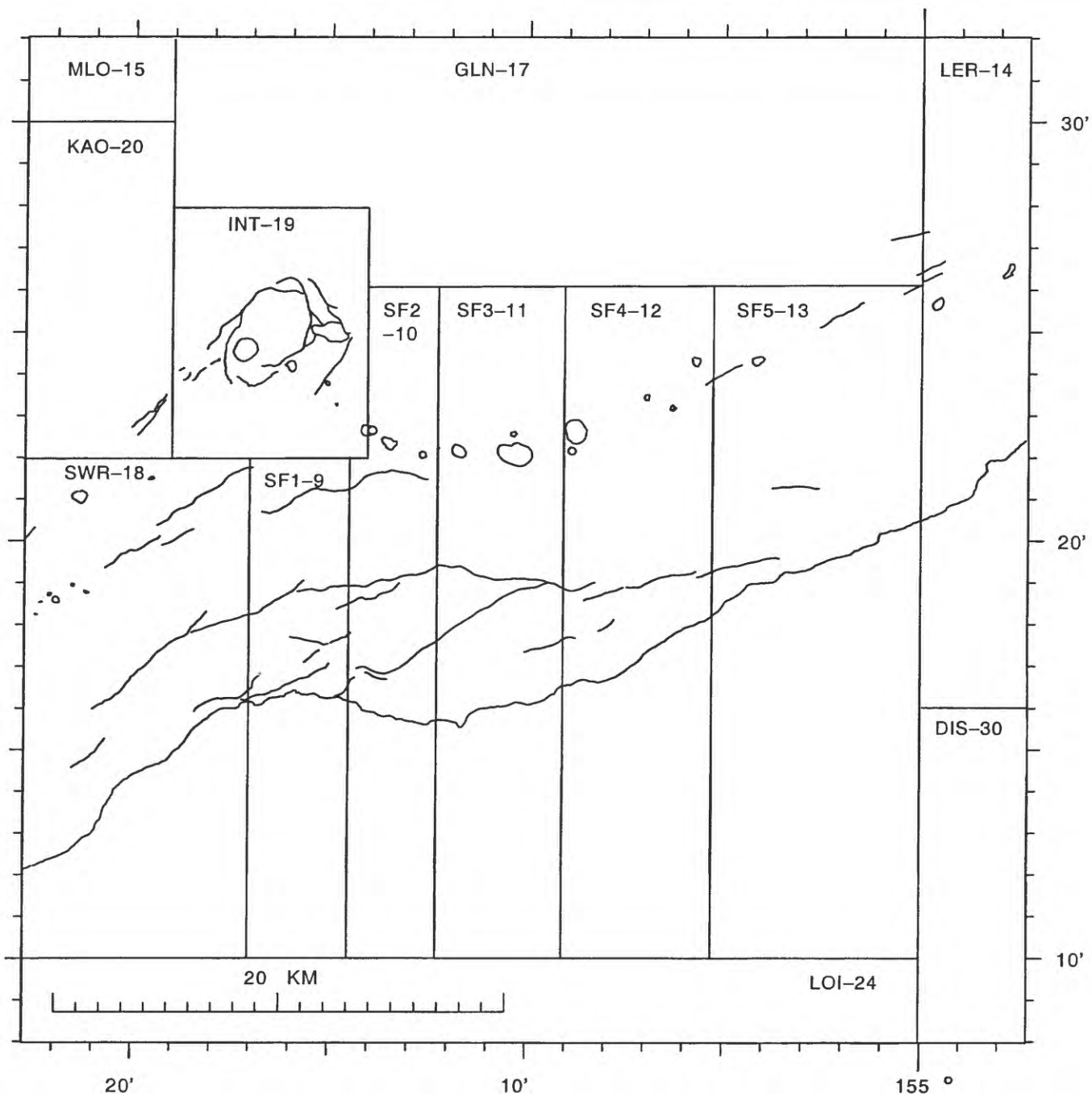


Figure 8. Earthquake classification, intermediate (5.1-13 km deep), for Kilauea and the east flank of Mauna Loa.

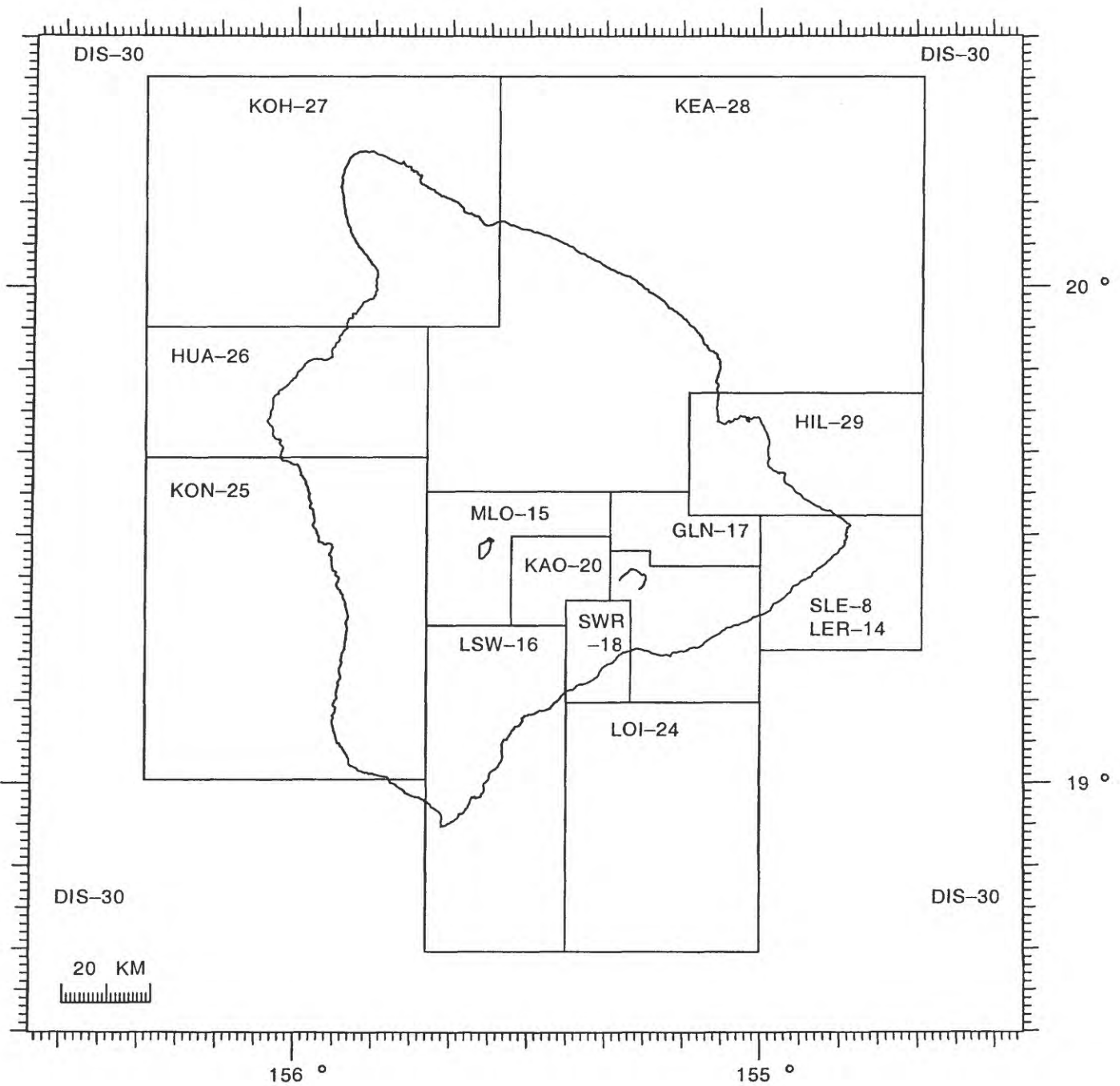


Figure 9. Earthquake classification, crustal (0-13 km deep), for the Island of Hawai'i.

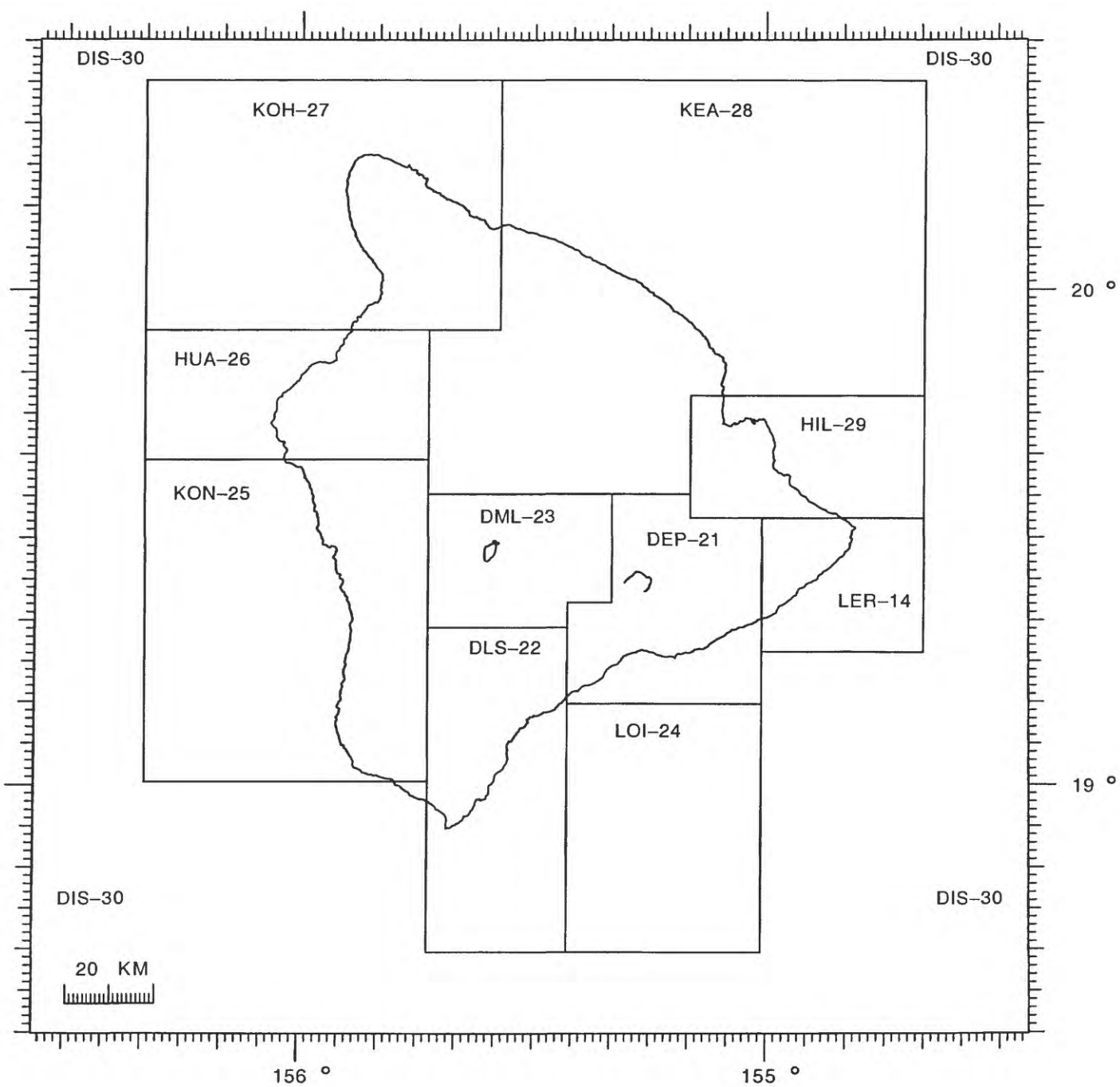


Figure 10. Earthquake classification, deep (greater than 13 km deep), for the Island of Hawai'i.

Figure 11. 1999 earthquake locations, Hawaiian Islands, 0–60 km depth, $M \geq 3.5$.

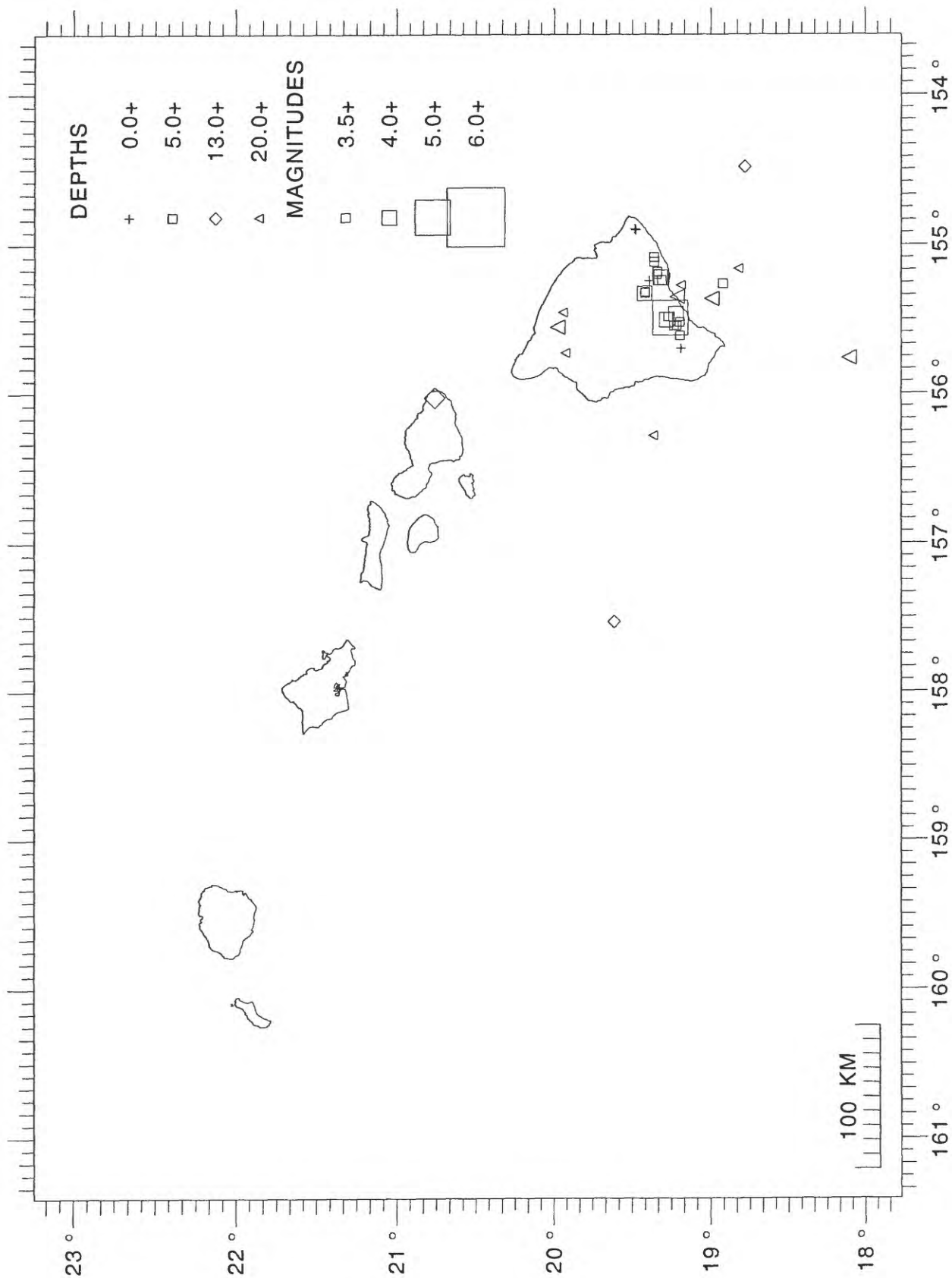


Figure 12. 1999 earthquake locations, Hawai'i Island,
0–60 km depth, $M \geq 3.0$.

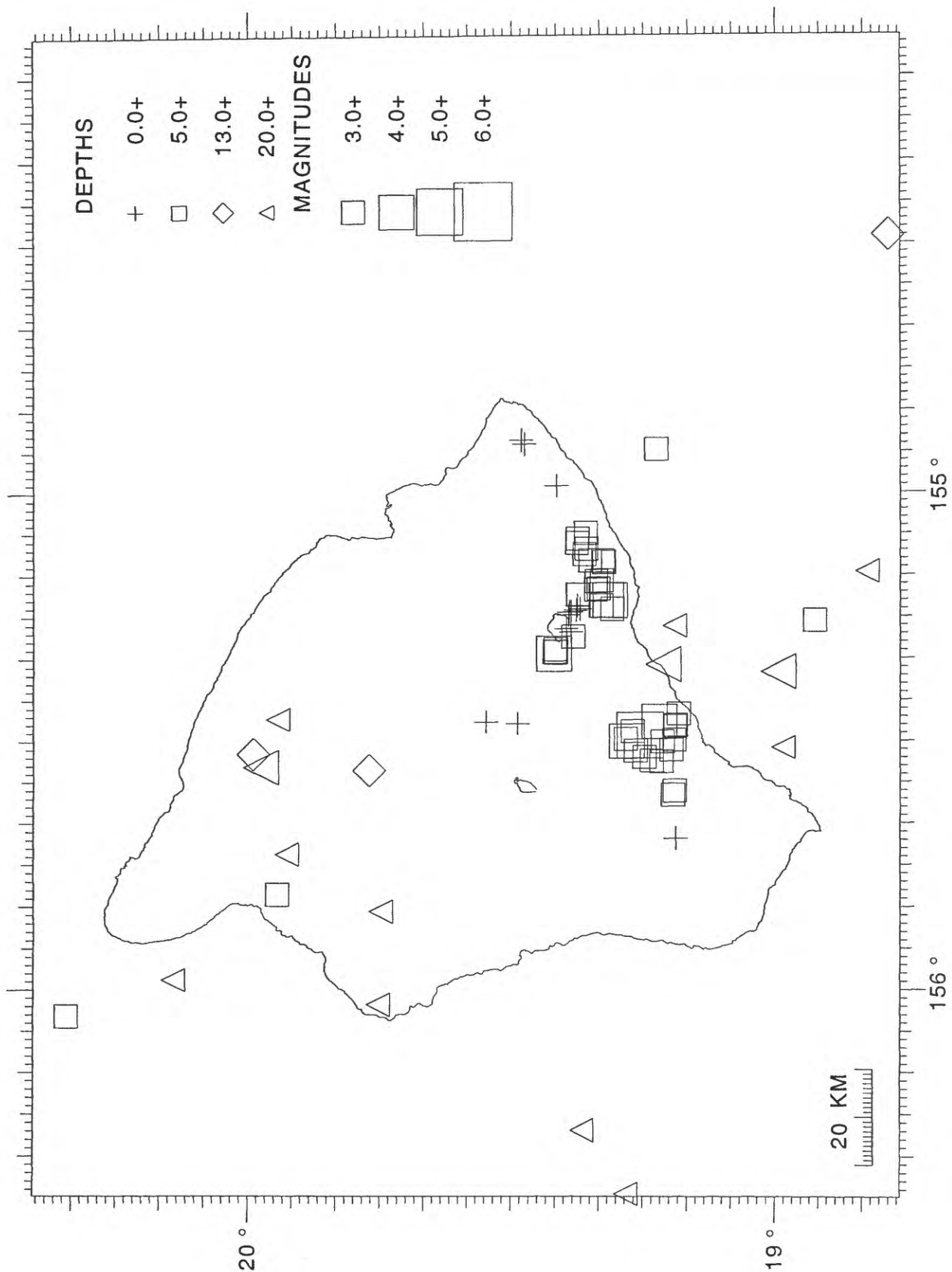


Figure 13. 1999 earthquake locations, Hawai'i Island, shallow (0–5.0 km depth), $M \geq 2.0$.

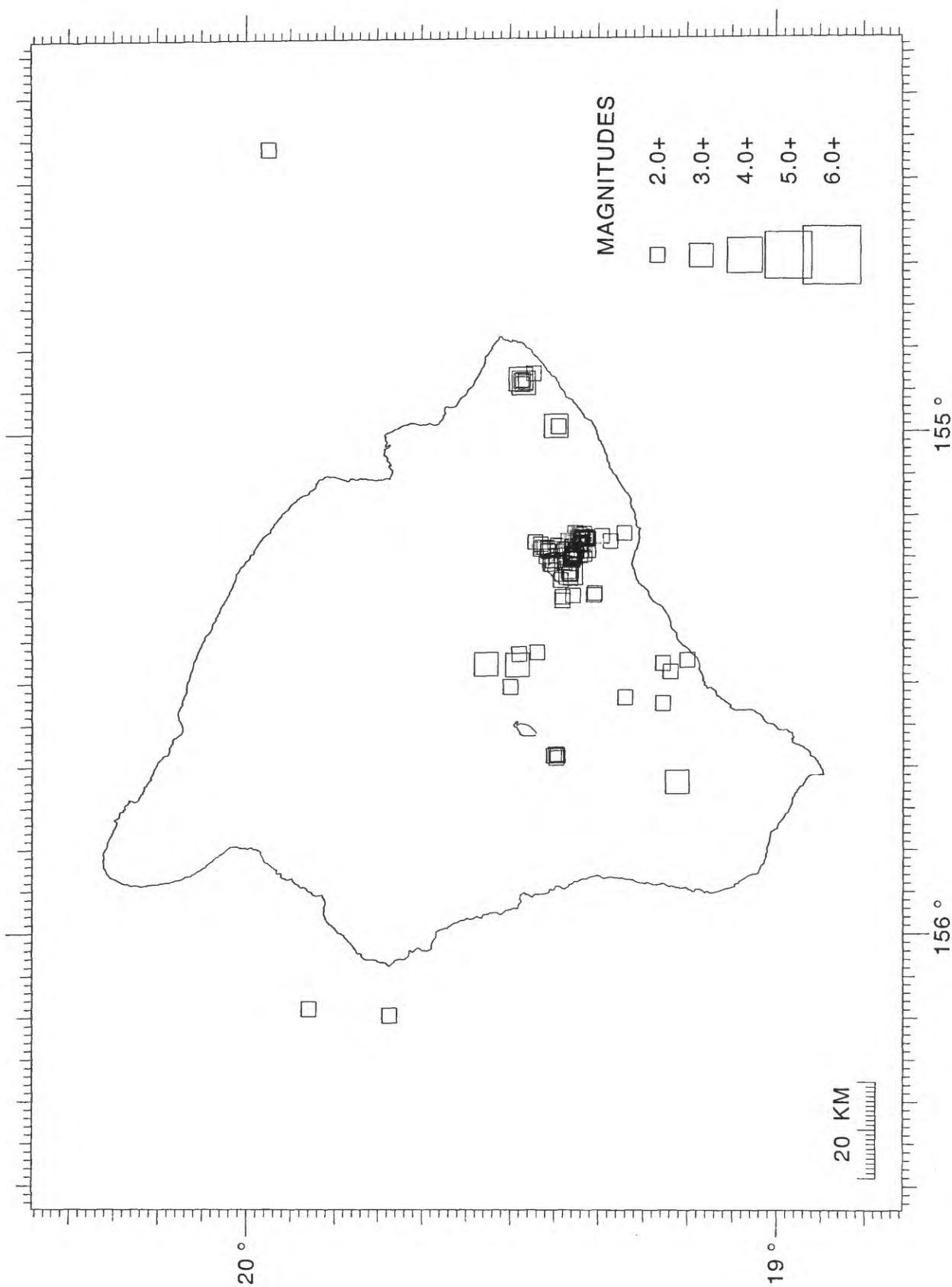


Figure 14. 1999 earthquake locations, Hawai'i Island, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

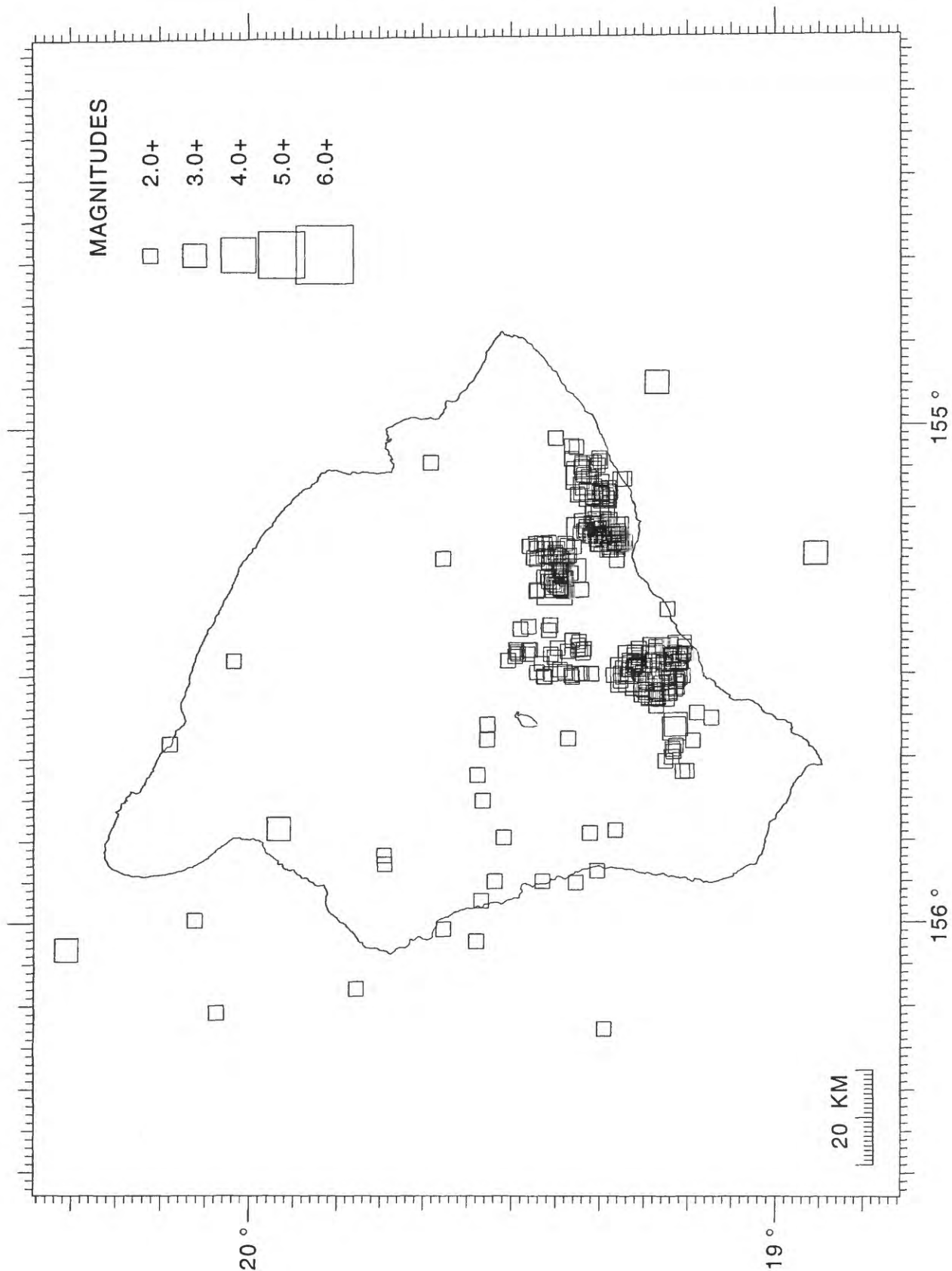


Figure 15. 1999 earthquake locations, Hawai'i Island, deep (13.1–60.0 km depth), $M \geq 2.0$.

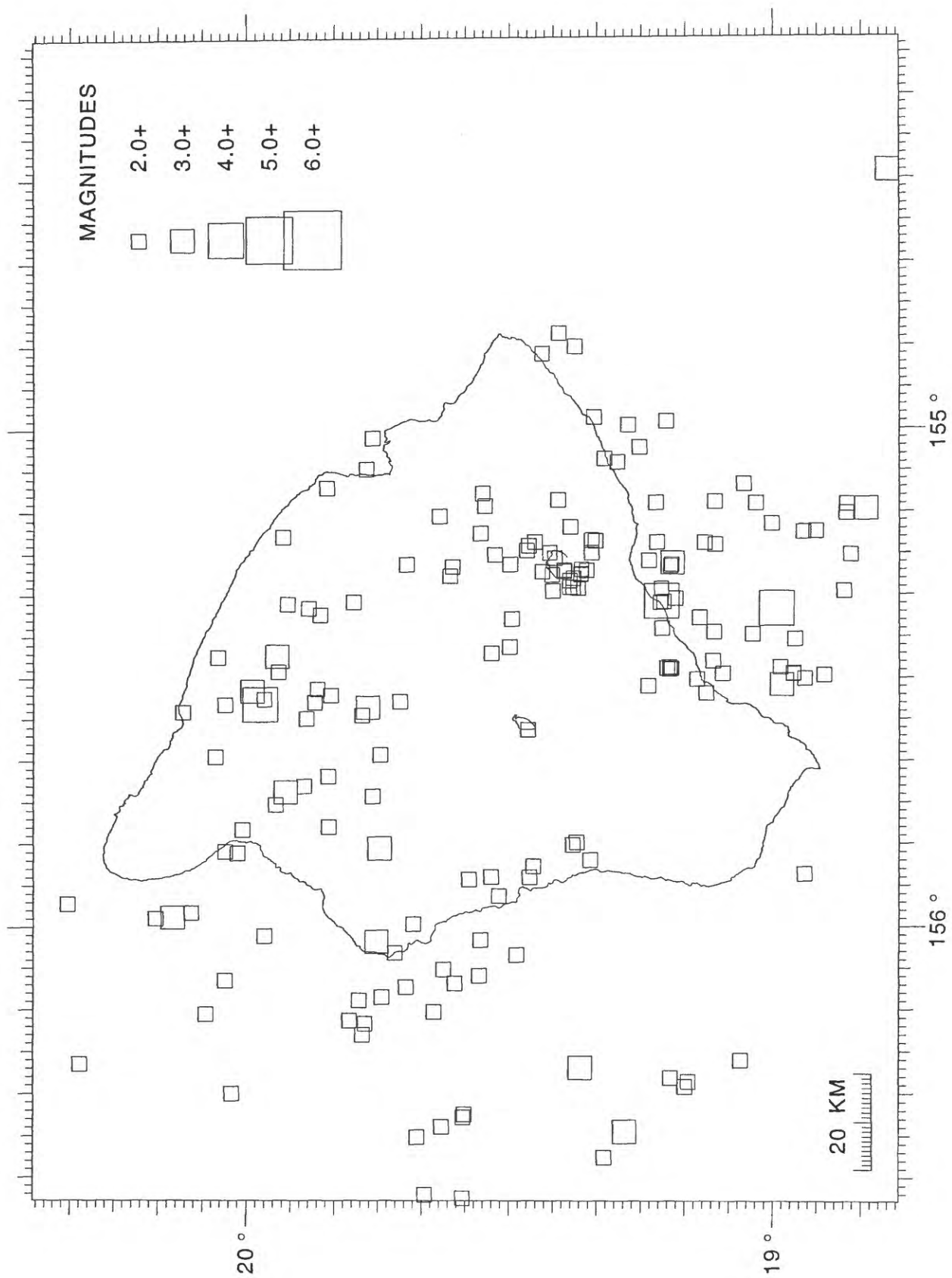


Figure 16. 1999 earthquake locations, Kilauea summit, shallow (0–5.0 km depth), $M \geq 1.0$.

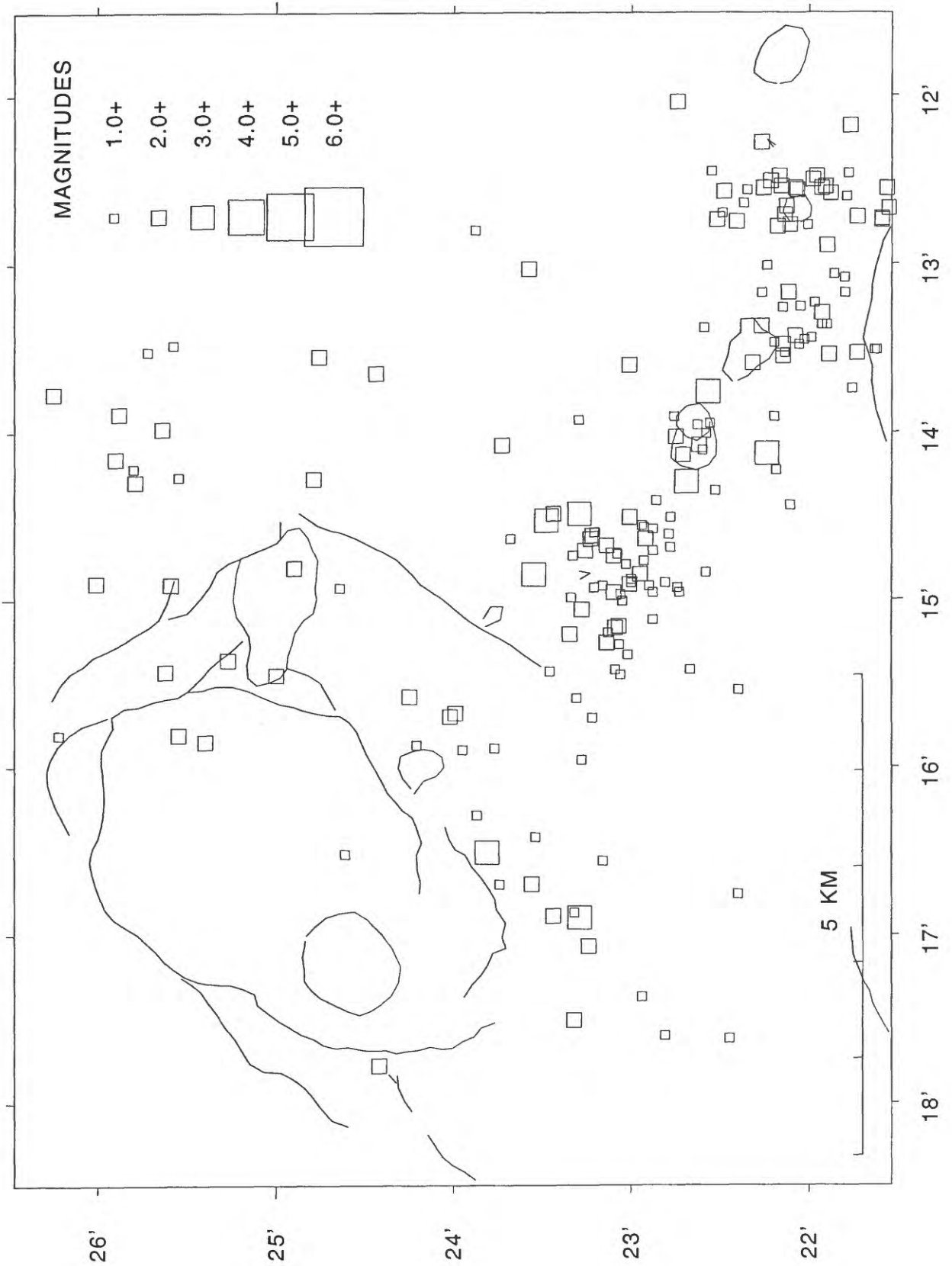


Figure 17. 1999 earthquake locations, Kilauea summit, intermediate (5.1–13.0 km depth), $M \geq 1.0$.

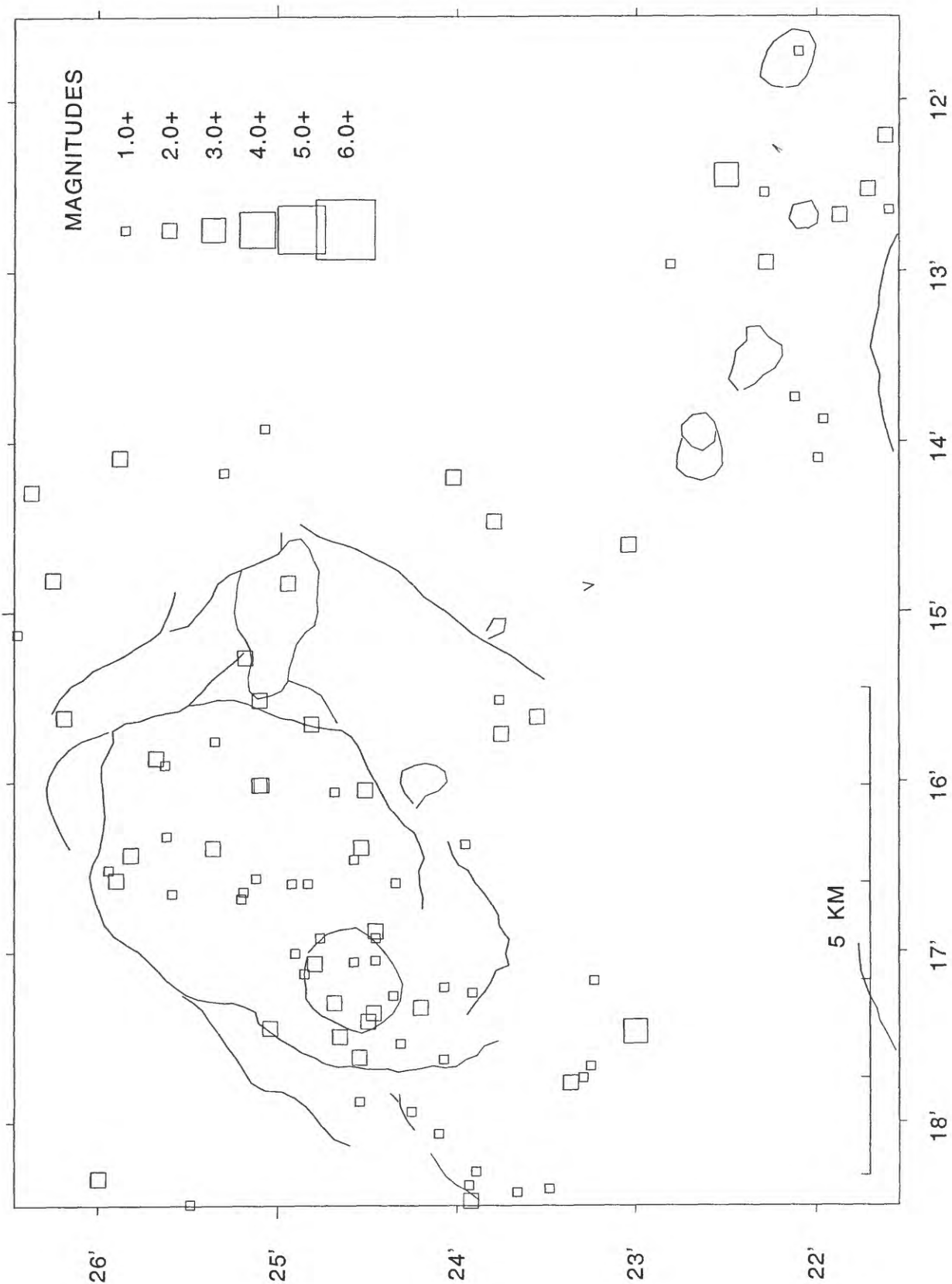


Figure 18. 1999 earthquake locations, Kilauea summit, deep (13.1–60.0 km depth), $M \geq 1.0$.

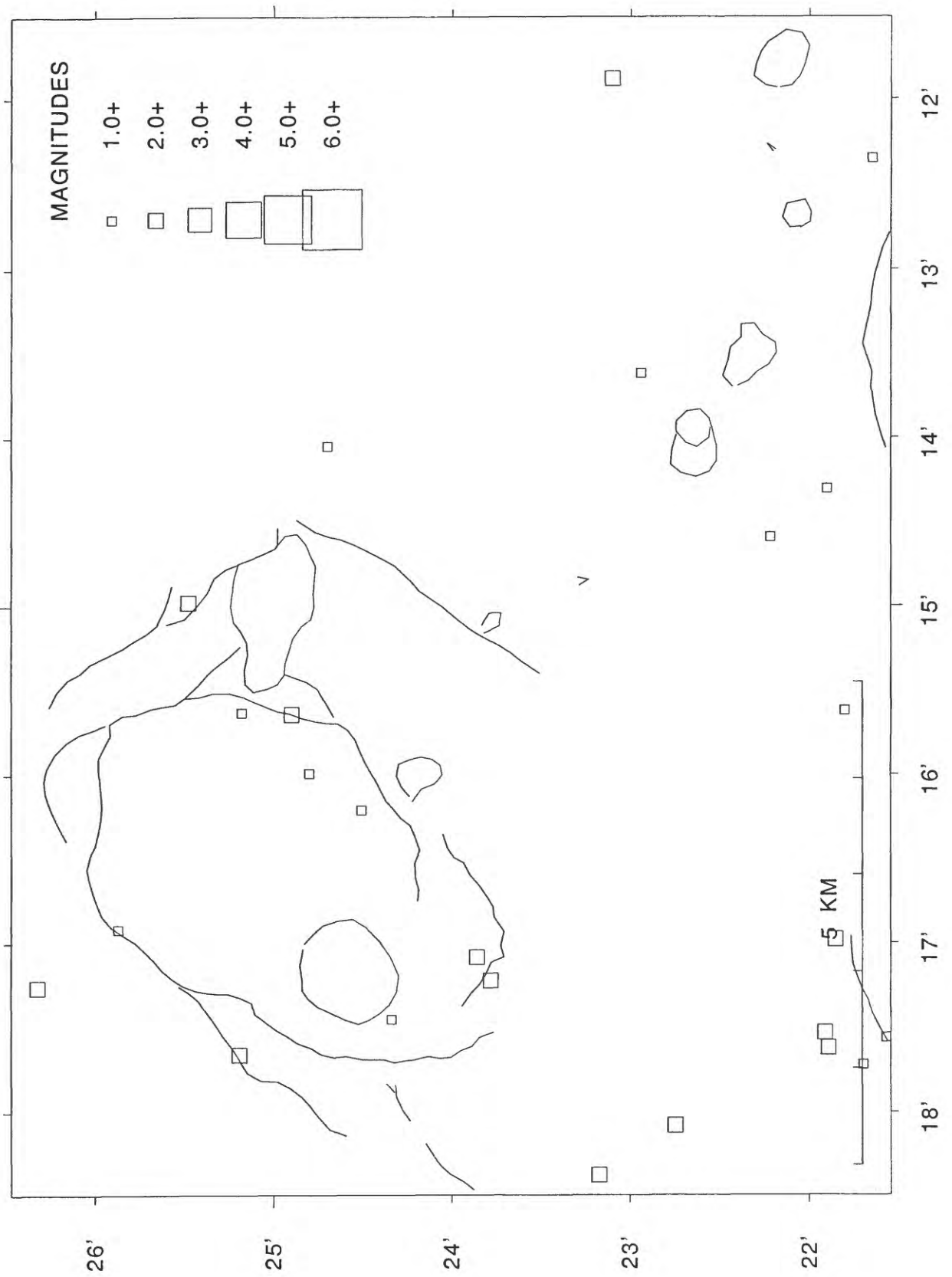


Figure 19. 1999 earthquake locations, Kilauea south flank, shallow (0–5.0 km depth), $M \geq 2.0$.

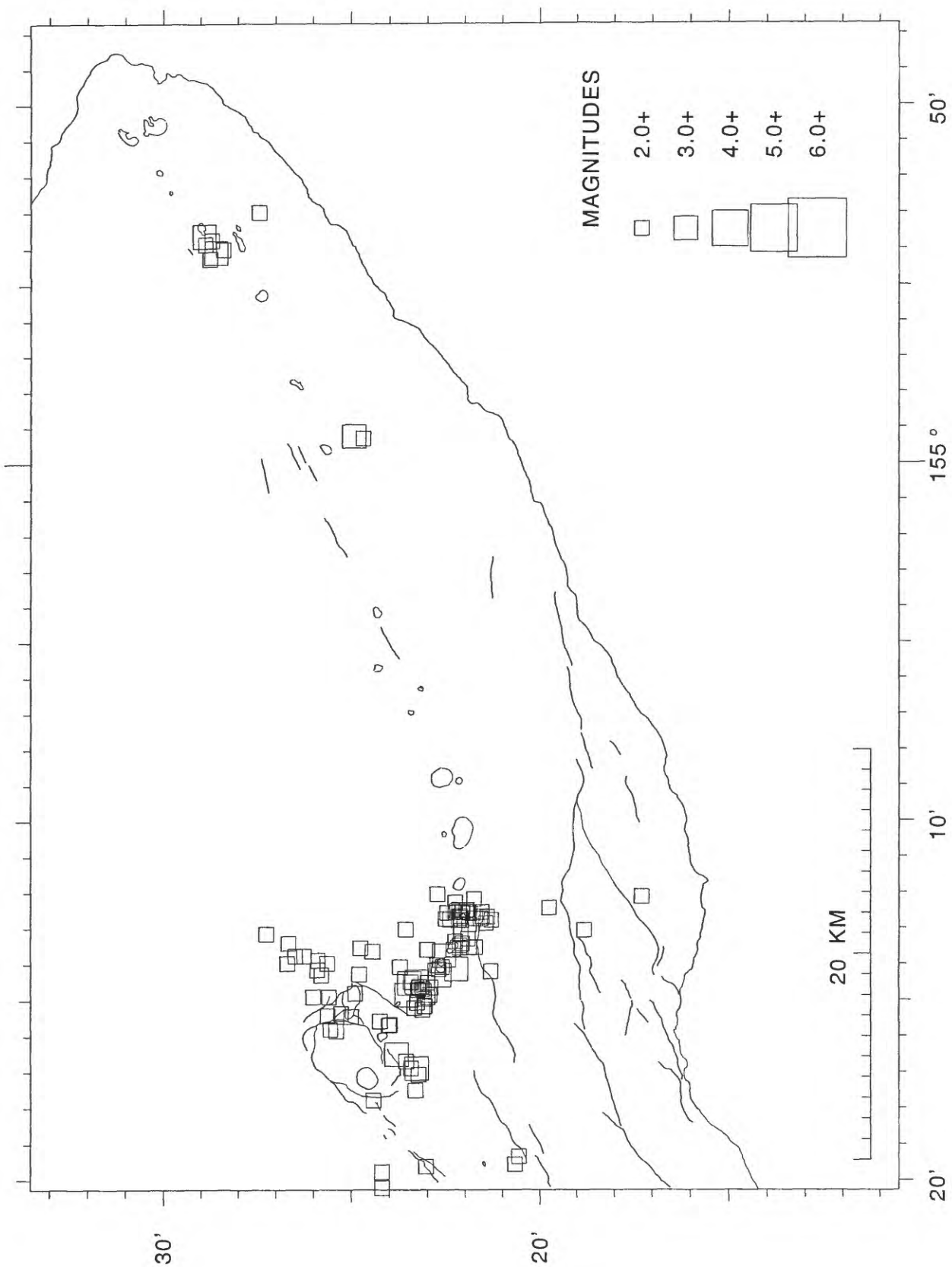


Figure 20. 1999 earthquake locations, Kilauea south flank, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

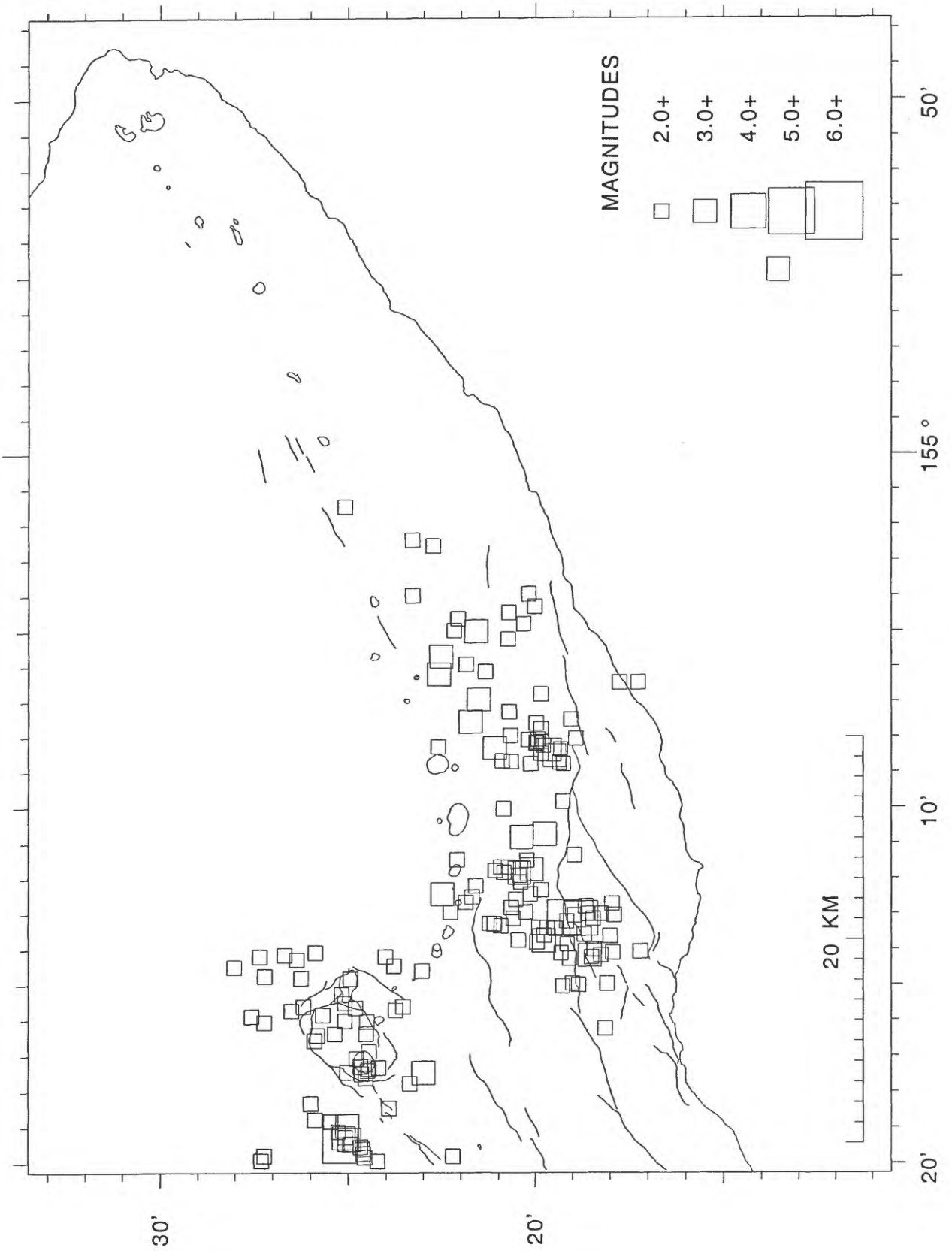


Figure 21. 1999 earthquake locations, Kilauea south flank, deep (13.1–60.0 km depth), $M \geq 2.0$.

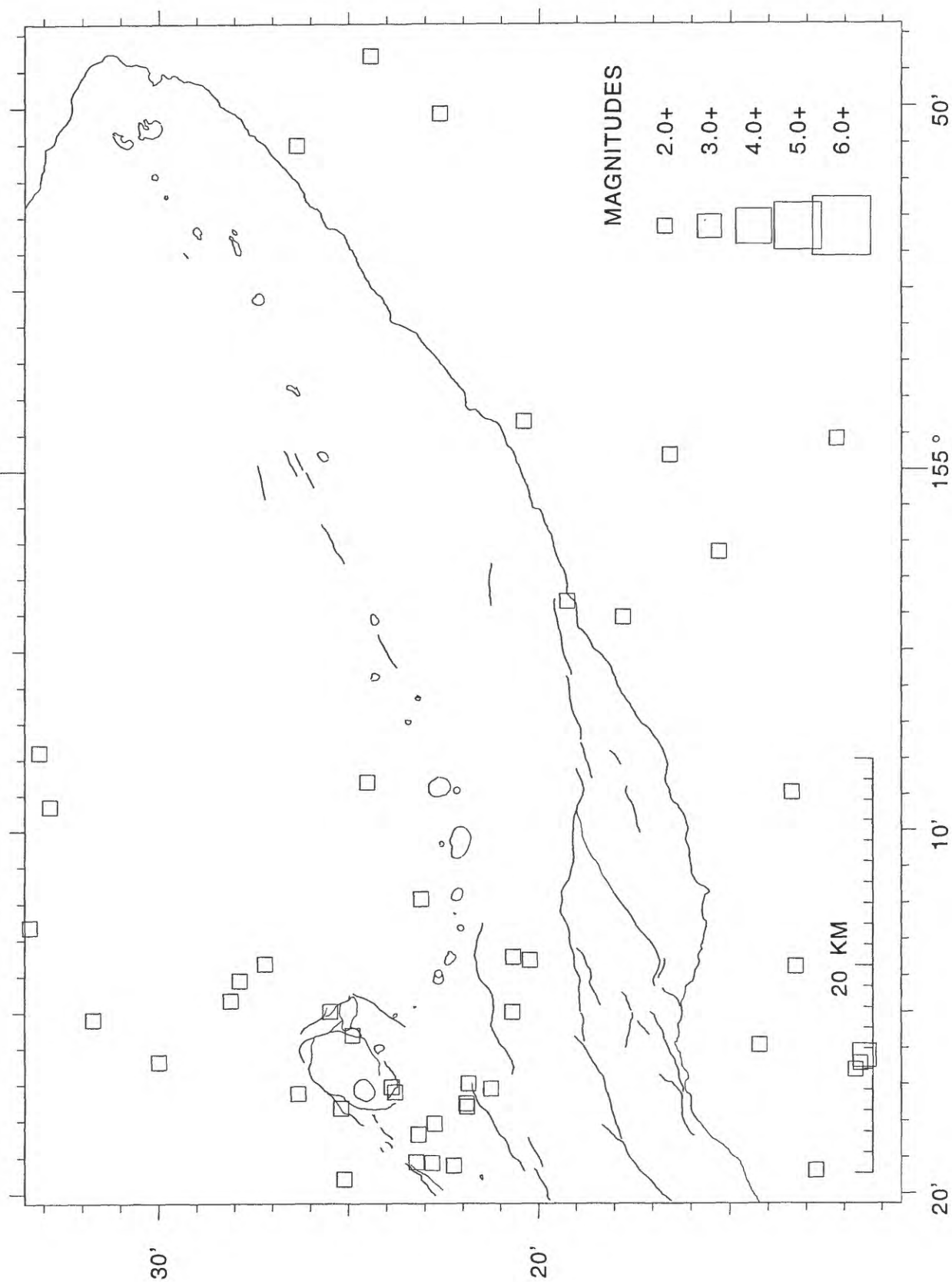


Figure 22. 1999 earthquake locations, Mauna Loa summit, shallow (0–5.0 km depth), $M \geq 2.0$.

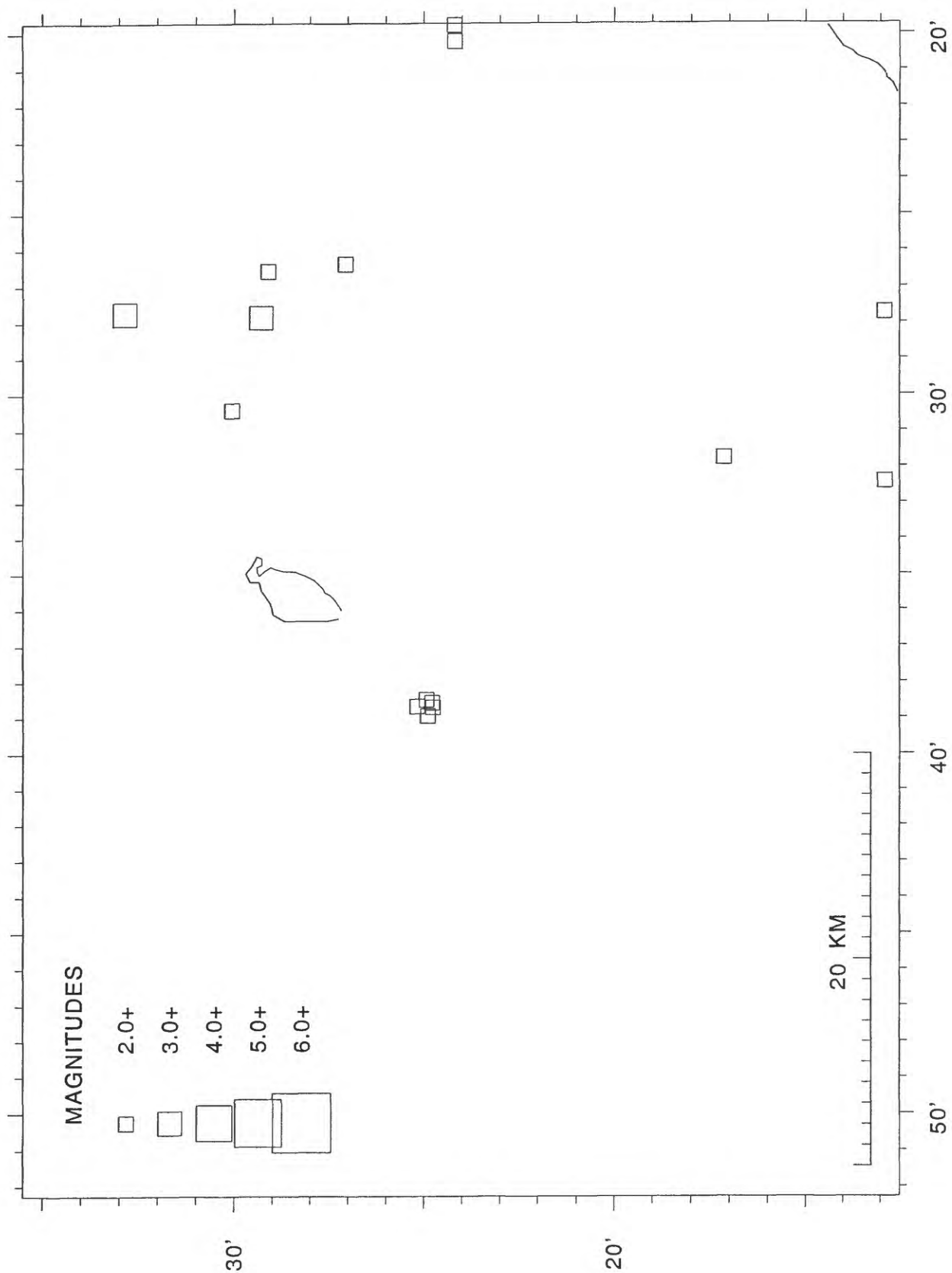


Figure 23. 1999 earthquake locations, Mauna Loa summit, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

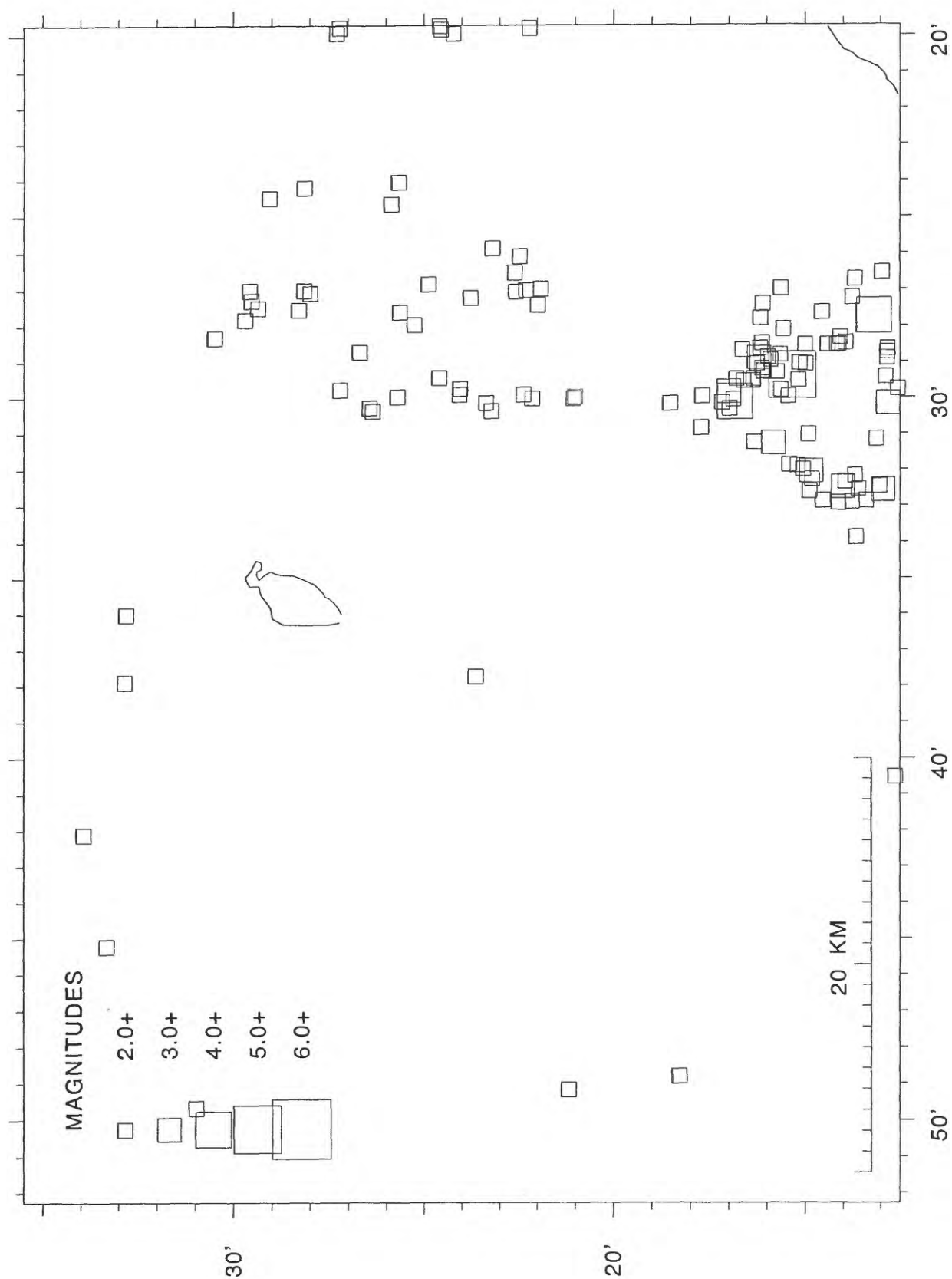


Figure 24. 1999 earthquake locations, Mauna Loa summit,
deep (13.1–60.0 km depth), $M \geq 2.0$.

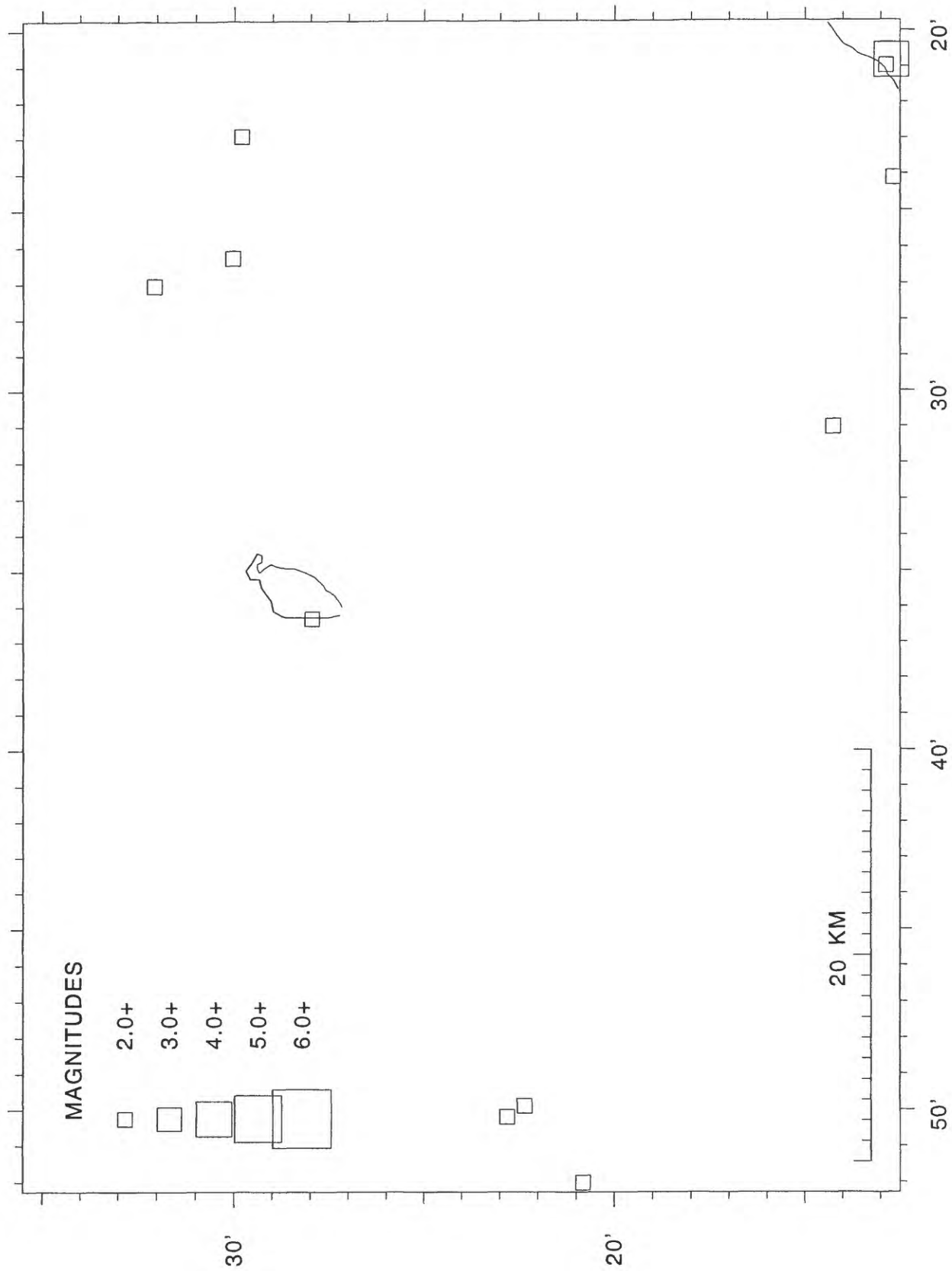


Table 4 is a chronological list of selected events successfully located during 1999. For each event, the following data are presented:

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) in Old Hawaiian Datum.

DEPTH - Depth of focus in kilometers.

NRD - Number of P & S readings with final weights > 0.1.

NS - Number of S. readings with final weights > 0.1

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

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

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

LOC REMKS - Remarks, three-letter code for geographic location of events. See Figures 7-10 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.

PREF MAG – The preferred magnitude chosen from the available magnitudes.
 Preference set as: X-amplitude magnitude, if none
 D-Develocorder duration magnitude, if none
 U-external magnitude, usually calculated from drum records.

NRD – The total weight of amplitude magnitude readings from contributing stations.

AZ GAP - Largest azimuthal gap in degrees between azimuthally adjacent stations.

MIN DS – Distance to the nearest station, in kilometers.

Table 5 is a list of events of magnitude 3.0 or greater, selected from Table 4.

Table 4.

ORIGIN TIME		LAT N		LON W		DEPTH N		N RMS		ERH ERZ		LOC		PREF N		AZ MIN		
YR	MON	DA	HRMN	SEC	DEG	MIN	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	S	
YR	MON	DA	HRMN	SEC	DEG	MIN	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	S	
99	JAN	1	140	5:38	19	28.30	155	27.55	9.99	3710	.11	.3	.6	KAO	2.0U	102	8	
99	JAN	1	610	35:77	19	29.02	155	26.97	5.28	28	6	.11	.3	2.0	KAO	1.6U	78	7
99	JAN	1	738	0:17	19	18.53	155	30.16	10.31	31	5	.11	.3	.6	LSW	2.3U	60	6
99	JAN	1	1019	7:16	17	29.52	155	1.18	6.46	31	4	.13	9.913.0	DIS	-	3.2U	334178	
99	JAN	1	1201	43:89	19	19.83	155	22.27	34.84	36	5	.12	.7	.9	DEP	1.8U	79	2
99	JAN	1	1320	53:21	19	20.32	155	10.00	6.54	27	7	.10	.4	.9	SF3	1.5U	110	3
99	JAN	1	1541	32:54	19	19.90	155	12.38	8.18	24	5	.11	.5	.9	SF2	1.5U	91	6
99	JAN	1	1943	8:19	19	10.92	155	36.12	8.62	27	6	.14	.6	.9	LSW	1.4U	97	8
99	JAN	1	2206	24:01	19	20.56	155	8.15	7.00	23	3	.12	.4	.6	SF4	1.3U	114	4
99	JAN	2	37	54:14	19	20.56	155	19.34	1.60	25	7	.12	.3	.9	SWR	2.4U	51	5
99	JAN	2	326	37:02	19	17.78	155	15.09	6.17	30	4	.12	.4	.9	SF1	1.8U	120	3
99	JAN	3	516	17:98	19	21.85	155	16.98	26.47	37	4	.12	.6	.8	DEP	2.5U	57	2
99	JAN	3	841	29:89	19	24.84	155	18.93	7.62	25	6	.11	.6	1.0	INT	1.8U	67	3
99	JAN	3	1807	15:11	19	23.68	155	14.64	4.02	13	5	.10	1.5	.7	SEC	1.8U	267	3
99	JAN	3	1924	1:48	19	23.48	155	2.15	8.46	27	2	.10	.8	.6	SF5	1.1U	171	7
99	JAN	3	2126	33:41	19	20.67	155	13.58	6.89	31	2	.10	.4	.8	SF2	1.6U	57	5
99	JAN	3	2347	50:58	18	59.40	155	7.28	32.07	29	1	.11	2.1	1.8	LOI	1.8U	258	33
99	JAN	4	29	31:89	19	20.72	155	4.47	7.23	36	7	.11	.5	.7	SF5	2.0U	164	7
99	JAN	4	335	36:58	19	18.04	155	13.31	6.76	33	5	.11	.4	.7	SF2	1.6U	92	2
99	JAN	4	728	9:47	19	23.49	155	2.71	6.85	24	1	.10	.7	1.1	SF5	1.5U	168	8
99	JAN	4	745	18:92	19	27.97	155	25.88	9.81	4211	.10	.3	.8	KAO	1.9U	42	6	
99	JAN	5	613	5:87	19	21.19	155	14.33	27.58	23	5	.07	1.0	1.1	DEP	1.6U	109	4
99	JAN	5	642	44:52	19	20.24	155	13.57	35.71	37	7	.10	.8	.9	DEP	2.8U	67	6
99	JAN	5	728	12:93	19	23.29	155	3.99	8.54	35	6	.11	.6	.4	SF5	2.7U	142	6
99	JAN	6	337	48:17	19	28.99	155	26.65	10.63	27	6	.11	.4	.8	KAO	1.6U	77	6
99	JAN	6	1745	2:72	19	11.62	155	36.63	11.66	41	8	.16	.5	.6	LSWF	3.7U	116	6
99	JAN	7	9	38:10	19	28.74	155	26.57	7.16	21	4	.12	.3	1.2	KAO	1.5U	73	6
99	JAN	7	2138	50:06	19	10.66	155	41.79	8.41	21	4	.15	.5	1.5	LSW	2.6U	79	8
99	JAN	7	2346	17:50	19	22.51	155	30.18	11.65	28	4	.11	.4	.8	KAO	1.8U	42	4
99	JAN	8	328	0:45	19	20.53	155	12.59	8.83	26	3	.12	.5	.7	SF2	2.0U	87	6
99	JAN	8	614	17:97	19	51.68	155	22.40	32.48	40	4	.10	.6	1.2	KEA	2.7U	100	4
99	JAN	8	1240	55:10	19	43.11	156	3.20	45.32	29	5	.09	1.3	2.0	HUA	2.3U	233	38
99	JAN	8	1337	11:10	18	54.74	155	35.27	42.27	21	6	.09	2.1	1.2	DLS		289	33
99	JAN	9	356	40:36	19	20.68	155	13.49	35.74	37	6	.11	.7	.7	DEP	2.2U	109	5P
99	JAN	9	515	22:80	19	23.98	156	2.22	6.85	27	6	.25	1.5	1.3	KON	2.5U	265	25
99	JAN	9	728	14:95	19	29.30	155	27.85	2.86	4613	.12	.3	.9	KAO	3.4U	61	8	
99	JAN	9	748	52:34	19	29.53	155	27.30	5.19	27	7	.12	.3	2.7	KAO	2.0U	85	7
99	JAN	9	2253	27:02	19	28.88	154	53.87	1.87	15	1	.11	.5	.5	SLEF	2.2U	149	3
99	JAN	9	2302	17:77	19	28.70	154	53.76	0.90	19	1	.10	.4	.4	SLEF	2.4U	176	3
99	JAN	10	204	33:42	19	21.51	155	1.42	9.22	23	1	.13	1.2	.6	SF5	1.2U	202	8
99	JAN	10	2053	29:39	19	19.26	155	9.83	7.33	34	3	.11	.5	.7	SF3	2.4U	102	5
99	JAN	11	352	39:09	19	19.26	155	15.04	5.54	31	2	.14	.4	1.3	SF1	2.0U	86	5
99	JAN	11	1036	18:53	19	23.91	155	17.24	12.35	30	5	.11	.8	.9	INT	1.7U	77	1
99	JAN	12	2003	56:24	19	16.84	154	58.16	45.28	28	5	.13	1.8	1.1	LER	1.7U	251	15
99	JAN	12	2133	31:00	19	24.93	154	59.24	4.55	25	1	.18	1.0	.6	SLE	3.1U	181	1

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ORIGIN TIME		LAT N		LON W		DEPTH N		N RMS		ERH		ERZ		LOC		PREF N		AZ MIN	
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMK	MAG	RD	GAP	DS
99	MAR	18	1513	46.83	19	17.32	155	12.65	9.79	28	5	.11	.7	.9	SF2	1.7U	217	10	
99	MAR	18	1536	16.21	19	17.32	155	12.99	7.56	22	4	.12	.7	1.4	SF2	1.4U	202	9	
99	MAR	18	1558	5.64	19	19.00	155	13.52	9.18	21	3	.10	.9	.8	SF2	1.8U	193	7	
99	MAR	18	1836	51.12	19	16.70	155	12.90	6.84	26	7	.10	.6	1.5	SF2	1.4U	209	10	
99	MAR	19	431	24.35	19	19.05	155	7.50	7.43	30	4	.11	.8	.6	SF4	2.0U	203	7	
99	MAR	19	2016	11.24	20	20.59	156	3.23	12.45	28	3	.12	1.9	.8	KOH	3.4U	312	37	
99	MAR	20	836	55.95	19	20.86	155	11.56	7.43	26	5	.15	1.0	.7	SF3	1.8U	192	4	
99	MAR	20	1607	46.11	19	22.53	155	5.71	7.89	38	6	.13	.8	.5	SF4	3.2U	169	4	
99	MAR	21	253	44.51	19	19.88	155	5.61	9.36	27	5	.12	1.2	.5	SF4	1.9U	198	7	
99	MAR	21	1858	20.88	18	5.04	155	52.14	14.98	23	4	.11	7.913	2	DIS -	2.3U	337119		
99	MAR	21	1907	8.37	19	27.86	154	54.86	2.90	11	3	.11	.4	.3	SLE	1.9U	128	1	
99	MAR	22	49	15.00	20	2.71	155	49.00	25.60	24	4	.09	1.0	1.5	KOH	1.8U	192	10	
99	MAR	22	243	10.19	19	28.40	154	54.01	1.40	16	3	.10	.3	.4	SLE	2.1U	138	3	
99	MAR	22	520	51.37	19	18.68	155	13.12	10.46	27	3	.19	.7	1.0	SF2	1.8U	175	8	
99	MAR	23	701	57.22	19	25.40	155	15.85	0.27	10	3	.15	.4	.8	SNC	2.1U	239	2	
99	MAR	24	1142	26.06	19	19.96	155	13.80	8.94	35	4	.13	.6	.5	SF2	2.7U	170	6	
99	MAR	25	1354	38.34	19	20.85	155	11.82	8.67	30	3	.12	.6	.8	SF3	2.8U	164	4	
99	MAR	25	2148	36.53	19	36.83	157	32.10	16.51	33	5	.13	2.116	4	DIS -	3.6U	327170		
99	MAR	27	935	30.73	19	31.91	155	13.39	8.31	32	3	.12	.5	.4	SF2	2.6U	164	6	
99	MAR	27	1021	26.24	19	23.28	155	15.96	2.98	13	4	.07	.5	.3	SEC	1.8U	120	2	
99	MAR	28	213	1.28	19	22.61	155	8.28	7.97	34	3	.12	.7	.4	SF4	2.5U	161	2	
99	MAR	28	421	17.45	19	22.08	155	4.64	5.21	23		.14	1.0	1.2	SF5	2.2U	191	6	
99	MAR	28	524	52.58	19	6.70	155	8.89	39.59	35	7	.12	1.6	1.1	LOI	2.4U	252	28	
99	MAR	28	722	4.04	19	24.89	155	38.95	3.13	17	3	.10	.8	.5	MLO	2.8U	151	2	
99	MAR	29	951	37.73	19	22.59	155	6.22	9.59	30	4	.11	.9	.5	SF4	3.0U	167	3	
99	MAR	29	1203	44.81	19	10.14	155	41.73	10.05	27	7	.16	.7	1.0	LSW	2.7U	182	8	
99	MAR	29	1656	32.54	19	45.19	156	1.84	41.23	38	3	.10	1.3	1.0	HUA	3.1U	230	21	
99	MAR	30	630	38.44	19	22.57	155	27.06	11.14	29	6	.16	.4	.8	KAO	2.1U	37	1	
99	MAR	30	1349	41.90	19	23.44	155	16.89	3.07	16	4	.06	.3	.3	SSC	2.5U	68	1	
99	MAR	30	2044	30.69	19	50.46	155	32.11	21.02	31	7	.12	.8	1.9	KEA	2.5U	192	10	
99	APR	1	503	57.72	19	55.16	155	30.96	33.99	21	3	.09	1.4	1.6	KEA	1.6U	213	16	
99	APR	1	1254	41.60	19	11.83	155	39.11	10.95	21	5	.11	.6	1.0	LSW	2.2U	169	7	
99	APR	1	2026	34.58	19	21.97	155	2.52	8.56	19		.14	1.5	.7	SF5	1.8U	214	9	
99	APR	2	543	35.70	19	28.80	155	52.34	13.79	23	4	.11	.7	.5	KON	1.8U	102	5	
99	APR	2	1220	50.64	19	25.09	155	1.49	9.23	17	2	.09	1.4	1.2	SF5	2.0U	155	5	
99	APR	2	1538	46.92	19	19.26	155	12.97	8.54	25	4	.12	.7	.8	SF2	1.5U	179	8	
99	APR	2	1800	1.84	19	20.06	155	13.15	9.36	26	3	.13	.6	.9	SF2	1.8U	164	6	
99	APR	2	2222	34.58	19	18.24	155	13.00	10.52	37	6	.14	.6	.4	SF2	2.7U	174	9	
99	APR	3	24	32.23	19	18.45	155	13.14	10.45	34	3	.15	.7	.5	SF2	2.5U	172	9	
99	APR	3	344	11.69	19	17.95	155	12.71	8.75	23	2	.12	.8	1.2	SF2	2.0U	192	9	
99	APR	3	414	25.75	19	21.37	155	13.35	8.83	29	5	.11	.6	.5	SF2	1.8U	152	5	
99	APR	3	2345	29.88	19	23.30	155	2.43	8.19	30	3	.12	.9	.5	SF5	2.7U	173	7	
99	APR	3	2355	48.98	19	24.29	155	1.71	9.92	17	3	.14	1.2	.8	SF5	1.1U	172	5	
99	APR	4	619	7.34	19	22.46	155	26.10	11.69	32	4	.13	.4	.5	KAO	2.0U	39	3	
99	APR	4	1723	51.93	19	17.70	155	29.97	9.62	31	6	.14	.4	.8	LSW	2.4U	64	5	
99	APR	5	1059	15.02	18	57.61	155	27.99	35.47	24	4	.09	2.1	1.5	DLS	1.7U	281	32	
99	APR	5	1554	16.03	19	33.68	156	29.15	9.19	23	8	.10	6.6	9.1	DIS -	1.2U	318	60	
99	APR	5	1653	58.98	19	21.91	155	26.98	10.95	31	5	.12	.4	.6	KAO	2.1U	45	2	
99	APR	6	117	18.62	18	58.64	155	28.10	34.73	29	4	.09	1.1	1.1	DLS	1.7U	256	20	
99	APR	6	214	11.82	19	18.81	155	13.06	0.00	37	8	.19	.5	.3	SSF #	2.7U	172	8	
99	APR	6	2015	44.10	20	6.46	155	47.41	22.82	24	5	.10	1.5	1.3	KOH	1.7U	194	3	
99	APR	6	2028	7.57	19	25.87	155	16.92	20.95	17	3	.14	2.4	1.4	DEP	1.3U	258	1	
99	APR	7	438	43.40	19	19.69	155	13.39	9.82	31	5	.11	.4	.6	SF2	2.1U	165	7	
99	APR	7	715	41.47	19	23.15	155	30.40	13.87	20	3	.12	.6	1.1	DML	1.4U	42	5	
99	APR	7	837	6.36	19	23.29	155	16.90	3.19	22	3	.10	.4	.3	SSC	3.2U	64	1	
99	APR	7	2155	53.18	19	32.06	155	27.06	24.60	38	7	.10	.4	.7	DML	2.2U	51	1	
99	APR	7	2332	45.29	19	21.29	155	18.94	33.97	23	3	.13	1.6	1.7	DEP	1.8U	146	6	
99	APR	8	142	7.54	19	47.78	156	7.94	11.09	21	1	.12	2.2	1.2	HUA	2.6U	251	33	
99	APR	8	159	24.98	19	43.05	155	2.74	29.15	19	3	.11	1.6	1.9	HIL	1.4U	191	2	
99	APR	8	1604	0.32	19	56.67	156	4.39	6.73	22	3	.10	1.7	1.1	KOH	2.98	38		
99	APR	8	1604	28.66	19	57.36	155	55.38	11.03	27	4	.12	1.4	.6	KOH	1.9U	277	30	
99	APR	9	407	37.50	19	33.31	155	45.22	9.71	27	3	.12	.4	.8	KON	2.1U	82	5	
99	APR	9	1519	59.22	19	15.57	155	28.10	11.65	27	4	.14	.4	.8	LSW	2.4U	73	4	
99	APR	9	1843	13.09	19	27.34	155	28.49	12.84	25	3	.12	.4	.7	KAO	1.8U	47	9	
99	APR	10	657	26.07	19	28.14	155	24.21	10.82	26	8	.11	.4	.9	KAO	2.3U	72	3	
99	APR	10	1623	21.74	19	24.07	155	29.92	12.79	23	4	.10	.5	1.1	KAO	2.1U	38	5	
99	APR	10	1848	50.64	19	14.93	155	15.31	48.15	23	2	.11	1.3	1.7	DEP	1.3U	224	10	
99	APR	10	2001	19.32	19	12.38	155	22.20	5.72	27	2	.19	.8	1.1	SWR	2.4U	162	5	
99	APR	10	2020	19.96	19	11.79	155	21.48	0.62	23	4	.11	.4	.4	SMR	1.7U	202	6	
99	APR	11	611	10.42	19	37.50	156	5.21	38.88	33	4	.09	1.5	1.0	KON	2.9U	269	23	
99	APR	12	123	2.68	19	11.93	156	16.24	30.20	22	5	.11	2.0	3.0	KON	1.7U	306	43	
99	APR	12	631	42.30	19	31.31	155	16.68	23.20	30	5	.12	.8	.9	DEP	1.9U	103	7	
99	APR	12	1839	7.57	19	20.19	155	12.52	9.76	22	3	.11	.9	.8	SF2	1.7U	199	6	
99	APR	12	2040	0.37	19	17.95	155	15.07	9.34	23	2	.13	.8	1.3	SF1	1.9U	182	8	
99	APR	13	750	59.30	19	14.83	155	32.28	8.43	33	5	.18	.5	1.1	LSW	2.8U	106	4	
99	APR	13	1443	10.04	19	18.83	155	15.00	10.44	35	3	.12	.6	.5	SF1	2.8U	166	5	
99	APR	13	1903	13.93	18	59.04	155	30.86	49.95	30	4	.12	1.9	1.2	DLS	3.2U	254	20	
99	APR	14	150	28.2															

ORIGIN TIME	LAT N	LONG W	DEPTH N	N RMS	ERH	ERZ	LOC	PREF N	AZ	MIN
YR MON DA HRMN SEC	DEG MIN	DEG MIN	KM	RD S	SEC	KM	KM	MAG	RD	GAP DS
99 APR 16 1502	56.13	19 12.44	155 27.34	5.53	15 3	12	5.1.4 LSW	132	5	
99 APR 16 1503	25.91	19 12.22	155 30.99	7.30	28 4	19	6.1.5 LSWF	2.7U		
99 APR 16 1505	52.15	19 12.09	155 29.49	4.16	15 2	14	5.2.0 LSW	111	6	
99 APR 16 1507	31.67	19 15.00	155 28.53	10.26	20 4	14	4.8 LSW	2.0U		
99 APR 16 1508	8.92	19 11.48	155 28.83	11.21	20 5	18	7.9 LSW	1.8U		
99 APR 16 1510	39.29	19 12.03	155 27.76	12.16	22 5	12	6.6 LSW	2.2U		
99 APR 16 1510	51.50	19 12.72	155 29.21	9.50	18 4	11	5.8 LSW	1.8U		
99 APR 16 1515	5.43	19 11.76	155 29.37	9.22	22 5	12	5.9 LSW	1.1U		
99 APR 16 1517	32.32	19 11.78	155 29.64	9.79	14 3	11	6.1.1 LSW	118	5	
99 APR 16 1518	28.42	19 12.42	155 28.07	8.50	12 4	13	5.1.1 LSW	113	5	
99 APR 16 1518	41.43	19 12.84	155 28.91	5.66	26 6	16	4.1.2 LSW	2.3U		
99 APR 16 1521	26.22	19 12.47	155 30.24	7.52	35 4	19	6.7 LSW	2.4U		
99 APR 16 1524	26.31	19 16.39	155 29.82	10.82	21 4	11	4.1.1 LSW	1.9U		
99 APR 16 1527	2.44	19 15.30	155 28.70	9.63	21 4	20	6.1.4 LSW	1.5U		
99 APR 16 1528	18.45	19 14.08	155 31.14	10.66	17 4	12	6.1.0 LSW	1.3U		
99 APR 16 1528	55.63	19 13.74	155 31.16	9.99	19 4	14	5.1.0 LSW	1.7U		
99 APR 16 1530	14.51	19 15.94	155 30.09	8.54	21 1	14	5.1.1 LSW	1.3U		
99 APR 16 1530	29.76	19 14.12	155 27.97	6.82	39 9	13	4.6 LSW	92	4	
99 APR 16 1530	37.68	19 12.58	155 28.98	4.86	38 6	13	4.1.1 LSW	98	5	
99 APR 16 1531	41.14	19 14.32	155 27.89	9.52	19 4	13	5.1.0 LSW	1.9U		
99 APR 16 1532	17.80	19 16.06	155 29.83	10.28	15 5	12	5.1.3 LSW	1.8U		
99 APR 16 1535	46.71	19 14.67	155 26.98	9.96	9 4	07	8.1.4 LSW	1.3U		
99 APR 16 1536	58.45	19 11.83	155 28.75	10.41	20 4	13	5.9 LSW	1.8U		
99 APR 16 1537	41.24	19 15.65	155 28.81	12.04	26 5	12	4.9 LSW	2.3U		
99 APR 16 1541	18.16	19 12.74	155 25.25	14.04	13 3	15	1.3 DLS	1.5U		
99 APR 16 1542	26.90	19 13.86	155 28.33	9.01	26 4	14	4.8 LSW	1.8U		
99 APR 16 1546	18.47	19 16.26	155 29.07	10.80	31 5	11	3.6 LSWF	2.5U		
99 APR 16 1549	59.02	19 15.60	155 29.09	10.19	21 4	13	4.1.1 LSW	1.8U		
99 APR 16 1550	47.19	19 15.55	155 29.07	10.11	9 2	10	8.1.3 LSW	1.3U		
99 APR 16 1552	18.22	19 15.15	155 29.00	10.27	20 4	13	5.1.0 LSW	1.8U		
99 APR 16 1553	55.56	19 14.93	155 28.34	10.71	20 4	10	4.9 LSW	1.6U		
99 APR 16 1555	55.40	19 11.49	155 29.97	7.53	35 6	16	4.6 LSWF	3.0U		
99 APR 16 1600	19.45	19 14.85	155 32.05	9.52	38 8	17	5.7 LSWF	3.2U		
99 APR 16 1606	28.92	19 16.19	155 28.78	8.58	20 4	11	4.1.1 LSW	.9U		
99 APR 16 1609	36.60	19 13.62	155 30.90	10.43	13 4	18	9.1.3 LSW	1.0U		
99 APR 16 1610	34.65	19 12.07	155 28.70	10.91	20 5	12	5.9 LSW	1.3U		
99 APR 16 1612	14.53	19 17.14	155 31.76	2.09	32 6	12	3.7 LSW	2.6U		
99 APR 16 1621	20.90	19 15.06	155 28.50	9.25	12 4	10	5.1.5 LSW	.7U		
99 APR 16 1624	37.18	19 15.69	155 28.65	9.09	17 3	14	6.1.2 LSW	1.4U		
99 APR 16 1625	24.61	19 14.15	155 26.97	10.23	13 3	09	5.1.0 LSW	1.2U		
99 APR 16 1627	43.31	19 14.73	155 31.18	11.09	12 3	10	6.1.2 LSW	.8U		
99 APR 16 1629	6.57	19 14.46	155 27.01	14.69	13 1	11	9.4 DLS	.9U		
99 APR 16 1632	36.29	19 16.10	155 29.26	9.23	29 4	15	4.8 LSW	2.6U		
99 APR 16 1634	41.54	19 11.75	155 28.57	8.83	15 4	07	5.8 LSW	.8U		

ORIGIN TIME										DEPTH N N RMS ERH ERZ LOC PREF N AZ MIN															
YR	MON	DA	HRMN	SEC	LAT N	DEG	MIN	DEG	MIN	LON W	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	RMKS	MAG	RD	GAP	DS	
99	APR	16	1931	56.77	19	10.33	155	27.60	7.30	32	3	13	.6	.4	LSW	2.5U								138	2
99	APR	16	1946	17.45	19	22.41	155	30.54	8.67	13	3	03	.5	1.2	KAO	.8U								111	5
99	APR	16	1948	23.35	19	11.13	155	30.24	6.17	16	5	12	.5	1.3	LSW									138	5
99	APR	16	1952	2.61	19	13.59	155	28.83	10.43	16	3	10	.5	.8	LSW	1.5U								88	4
99	APR	16	2012	57.02	19	12.81	155	30.16	10.36	44	8	14	.4	.5	LSWF	3.2U								111	4
99	APR	16	2018	43.83	19	12.13	155	29.47	11.47	12	3	07	.6	1.0	LSW	.8U								110	6
99	APR	16	2027	26.82	19	15.75	155	28.67	12.01	16	5	12	.5	1.2	LSW	1.6U								72	3
99	APR	16	2036	19.52	19	10.46	155	26.74	10.72	18	4	18	1.1	1.0	LSW	1.1U								196	3
99	APR	16	2037	33.47	19	12.23	155	31.56	13.22	15	4	12	.8	.9	DLS									131	6
99	APR	16	2039	44.70	19	10.47	155	26.76	7.26	32	3	11	.5	.8	LSW	2.5U								168	3
99	APR	16	2040	6.35	19	11.08	155	28.56	6.29	26	1	12	.5	.9	LSW	2.2U								107	3
99	APR	16	2043	9.29	19	16.53	155	29.49	10.79	15	4	12	.6	1.3	LSW									55	3
99	APR	16	2045	17.92	19	11.42	155	28.27	7.19	37	3	13	.4	.6	LSWF	3.3U								103	4
99	APR	16	2054	15.57	19	10.53	155	26.44	6.27	14	5	13	.8	1.1	LSW									202	3
99	APR	16	2056	52.83	19	10.41	155	28.30	9.39	14	5	12	.6	.9	LSW	1.3U								111	2
99	APR	16	2104	34.05	19	15.76	155	28.80	10.68	16	4	10	.5	1.1	LSW									71	3
99	APR	16	2105	28.46	19	12.69	155	30.65	11.83	14	4	09	.6	.9	LSW									117	5
99	APR	16	2115	5.55	19	10.46	155	27.07	6.72	17	4	12	.8	.9	LSW	.8U								183	2
99	APR	16	2125	47.18	19	10.96	155	31.04	12.02	12	4	10	.8	1.1	LSW									148	6
99	APR	16	2132	21.49	19	14.25	155	29.26	11.43	18	5	12	.5	1.0	LSW	1.3U								89	2
99	APR	16	2137	32.20	19	15.19	155	28.59	9.45	13	4	07	.5	.9	LSW									93	3
99	APR	16	2204	47.62	19	12.98	155	31.60	11.56	13	4	08	.7	.9	LSW									121	5
99	APR	16	2206	41.83	19	11.03	155	27.05	12.82	14	4	11	.9	.7	LSW									166	3
99	APR	16	2207	29.05	19	9.42	155	25.75	10.84	13	3	09	1.1	.7	LSW									252	4
99	APR	16	2215	57.12	19	13.58	155	31.44	10.40	20	4	14	.6	1.1	LSW	1.2U								113	4
99	APR	16	2218	58.48	19	11.36	155	30.97	7.87	28	3	14	.6	.5	LSW	2.2U								140	6
99	APR	16	2226	49.27	19	14.72	155	31.86	10.99	16	3	11	.5	1.1	LSW	1.1U								104	3
99	APR	16	2230	5.54	19	12.57	155	31.76	8.20	16	3	11	.6	1.0	LSW									128	5
99	APR	16	2233	28.11	19	12.33	155	27.56	8.12	24	5	13	.4	.9	LSW	1.4U								127	5
99	APR	16	2235	43.55	19	10.24	155	26.17	12.08	18	4	11	1.0	.4	LSW	.8U								220	3
99	APR	16	2240	15.21	19	15.23	155	28.59	13.59	13	4	09	.6	1.2	DLS									92	3
99	APR	16	2243	28.20	19	10.07	155	25.08	12.25	17	4	12	1.1	.6	LSW	1.1U								245	5
99	APR	16	2249	33.56	19	9.57	155	26.60	8.82	14	4	15	1.2	.8	LSW	1.0U								229	2
99	APR	16	2251	55.36	19	10.63	155	28.42	14.13	9	2	05	.7	.8	DLS									112	2
99	APR	16	2253	19.83	19	15.63	155	27.06	5.96	12	2	09	.9	3.3	LSW	1.3U								77	6
99	APR	16	2300	36.09	19	11.53	155	30.19	9.34	8	3	04	.6	1.1	LSW									130	6
99	APR	16	2307	0.15	19	11.91	155	27.63	7.62	16	4	11	.5	.9	LSW									132	4
99	APR	16	2315	43.61	19	12.13	155	27.75	10.96	9	2	09	.8	1.0	LSW									125	5
99	APR	16	2321	31.34	19	12.26	155	30.48	7.47	34	5	17	.4	.6	LSW	2.6U								121	5
99	APR	16	2338	19.20	19	15.22	155	27.05	11.70	16	4	09	.7	1.3	LSW	.8U								81	6
99	APR	16	2339	39.08	19	12.26	155	26.93	4.40	20	2	14	.7	2.5	LSW	.9U								145	5
99	APR	17	11	52.48	19	12.68	155	30.51	12.90	19	5	13	.6	.9	LSW									116	4
99	APR	17	17	36.21	19	13.26	155	29.23	8.46	23	5	18	.5	.8	LSW	1.6U								96	4
99	APR	17	44	18.28	19	11.06	155	26.43	11.94	21	5	13	.8	.6	LSW	1.1U								158	4
99	APR	17	55	25.95	19	11.00	155	26.41	11.33	14	4	07	.9	.8	LSW									189	4

ORIGIN TIME			LAT N			LON W			DEPTH N			N RMS			ERH ER2			LOC			PREF N			AZ MIN		
YR	MON	DA	HR	MM	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMK	MAG	RD	GAP	DS						
99	APR	21	437	31.56	19	16.18	155	28.63	9.64	25	2	13	.4	.8	LSW	2.1U	61	3								
99	APR	21	439	43.66	19	18.42	155	14.00	9.75	30	3	13	.6	.5	SF2	2.9U	171	8								
99	APR	21	447	34.34	19	15.58	155	28.17	12.58	17	5	.07	.5	1.2	LSW	.9U	73	8								
99	APR	21	544	41.99	19	10.78	155	27.01	10.13	15	4	10	1.0	.0	.9	LSW	175	3								
99	APR	21	716	18.86	20	2.52	155	33.22	43.22	31	4	.10	.8	1.2	KEA	2.7U	191	23								
99	APR	21	1330	59.47	19	15.20	155	31.90	8.88	32	7	.19	.5	1.0	LSW	2.6U	100	3								
99	APR	21	1637	44.62	19	23.32	155	17.51	2.17	12	5	.06	.9	1.0	SSC	2.3U	135	2								
99	APR	21	1707	12.61	19	11.62	155	29.65	8.42	22	5	.12	.4	.9	LSW	121	5									
99	APR	21	2137	3.50	19	15.97	155	28.76	8.75	14	3	.11	.5	1.8	LSW	91	9									
99	APR	22	1	44.97	19	14.91	155	28.14	9.80	9	2	.08	1.0	2.4	LSW	154	7									
99	APR	22	29	47.67	19	28.97	155	26.60	8.93	24	5	.13	.4	1.0	KAO	1.9U	77	6								
99	APR	22	214	17.74	19	12.98	155	29.41	5.92	14	3	.14	.8	2.2	LSW	182	4									
99	APR	22	307	43.31	19	22.10	155	11.46	7.42	27	3	.13	.6	.4	SF3	2.5U	146	3								
99	APR	22	325	25.86	19	13.69	155	28.26	5.35	13	3	.11	.7	4.3	LSW	175	8									
99	APR	22	633	41.36	19	15.70	155	28.70	13.40	16	4	.11	.6	.8	DLS	1.3U	142	9								
99	APR	22	722	57.43	19	15.41	155	28.33	14.28	14	4	.09	.6	.9	DLS	1.1U	146	3								
99	APR	22	1150	8.91	19	17.37	155	29.31	6.06	10	3	.07	.6	3.4	LSW	1.1U	84	10								
99	APR	22	1239	25.17	19	14.69	155	27.84	3.63	13	4	.11	.4	1.6	LSW	1.4U	91	7								
99	APR	22	1245	5.52	19	13.08	155	32.59	12.28	13	3	.12	.7	1.3	LSW	1.5U	151	6								
99	APR	22	1432	23.65	19	14.52	155	25.14	10.85	13	3	.09	.9	1.0	LSW	1.3U	157	2								
99	APR	22	1809	25.37	19	14.31	155	31.57	9.13	23	4	.20	.6	1.1	LSW	1.7U	107	3								
99	APR	22	1843	17.55	19	11.10	155	37.89	13.09	12	2	.10	.6	.7	DLS	1.5U	158	7								
99	APR	22	1949	54.25	19	14.08	155	28.32	7.96	38	8	.17	.4	.7	LSW	2.4U	88	4								
99	APR	22	1956	4.59	19	14.41	155	28.53	7.72	37	7	.17	.4	.7	LSW	2.2U	81	3								
99	APR	23	250	22.44	19	13.12	155	31.16	7.80	36	7	.16	.6	.7	LSWF	2.7U	176	4								
99	APR	23	401	16.44	19	12.89	155	30.38	10.85	20	3	.11	.6	.8	LSW	1.5U	181	4								
99	APR	23	520	27.20	19	14.04	155	31.70	10.54	14	3	.12	.6	1.1	LSW	1.6U	164	3								
99	APR	23	712	26.50	19	16.89	155	30.06	10.95	25	4	.11	.4	.7	LSW	2.2U	68	3								
99	APR	23	1244	8.46	19	28.91	154	53.65	1.66	31	5	.14	.4	.3	SLEF	3.5U	152	3								
99	APR	23	1417	41.13	19	11.71	155	28.26	6.50	35	6	.13	.4	.8	LSWF	2.7U	111	4								
99	APR	23	1805	47.16	19	15.61	155	28.97	14.73	12	4	.10	.6	1.3	DLS		95	9								
99	APR	24	1011	30.86	19	11.01	155	27.74	7.64	33	4	.12	.6	.5	LSW	2.6U	123	3								
99	APR	25	546	39.67	19	20.85	155	10.03	9.57	30	5	.12	.8	.6	SF3	2.7U	175	2								
99	APR	25	750	38.41	19	12.55	155	29.76	10.92	20	5	.11	.4	.8	LSW	2.0U	109	5								
99	APR	25	823	0.52	19	10.05	155	28.90	30.02	19	5	.10	1.2	1.2	DLS		149	2								
99	APR	25	904	24.77	19	12.28	155	30.40	7.47	27	5	.10	.4	.7	LSW	1.7U	120	5								
99	APR	25	1537	45.20	19	18.07	155	14.97	9.76	28	4	.13	.7	.8	SF1	2.1U	171	6								
99	APR	25	1650	52.01	19	59.43	155	31.59	14.48	36	4	.09	.8	.6	KEAF	3.4U	180	22								
99	APR	25	1745	23.22	19	13.89	155	27.38	8.85	22	4	.11	.5	.7	LSW	1.9U	105	5								
99	APR	25	1835	2.96	19	16.14	155	29.20	9.52	25	3	.13	.4	.7	LSW	2.0U	59	3								
99	APR	26	159	7.87	19	15.96	155	31.18	9.53	19	5	.13	.4	1.0	LSW	1.6U	91	2								
99	APR	26	826	24.75	19	10.90	155	27.92	7.90	26	4	.11	.6	.6	LSW	2.4U	116	3								
99	APR	26	1039	44.46	19	11.86	155	30.20	7.05	16	3	.12	1.0	1.2	LSW	1.9U	215	6								
99	APR	26	1218	2.79	19	10.65	155	27.75	6.46	23	5	.12	.6	.9	LSW	2.0U	130	2								
99	APR	26	1225	37.39	19	11.32	155	28.14	6.38	40	7	.14	.4	.8	LSW	3.2U	108	3								
99	MAY	1	222	31.69	19	37.79	155	15.96	12.97	33	4	.14	.4	.6	KEA	2.1U	87	19								
99	MAY	2	26	28.61	19	19.62	155	8.37	8.92	33	3	.11	1.0	.6	SF4F	3.4U	190	5								
99	MAY	2	1052	14.24	19	25.39	155	15.85	15.53	10	2	.06	1.0	1.3	DEPL	180	2									
99	MAY	2	1814	27.30	19	28.10	155	14.69	33.24	37	5	.12	.6	.9	DEP	2.6U	53	4								
99	MAY	3	654	46.33	19	46.22	155	33.60	14.96	35	8	.13	.5	.6	KEA	3.4U	89	11								
99	MAY	3	1104	25.26	19	10.99	155	26.76	7.58	32	4	.12	.6	.8	LSW	3.0U	161	3								
99	MAY	3	1551	0.45	19	21.11	155	13.29	8.47	34	3	.11	.6	.7	SF2	2.1U	182	5								
99	MAY	3	1810	28.11	20	40.85	154	49.02	15.76	20	3	.13	6.2	14.3	DTS	3.0U	317	103								
99	MAY	3	2041	59.35	19	12.14	155	32.23	6.95	25	4	.19	.6	1.1	LSW	2.0U	87	8								
99	MAY	5	42	58.66	19	18.13	155	16.24	9.70	29	4	.11	.6	.5	SF1	2.0U	169	7								
99	MAY	5	502	13.95	19	21.87	155	12.67	10.74	27	3	.12	.7	.5	SF2	2.4U	151	5								
99	MAY	5	659	26.23	18	57.72	155	29.48	41.94	27	5	.10	1.7	1.0	DLS	2.1U	230	18								
99	MAY	6	1628	4.81	19	15.15	155	29.05	11.40	36	4	.14	.4	.9	LSW	2.2U	82	2								
99	MAY	7	1454	48.29	19	27.35	155	29.64	11.33	23	3	.10	.4	.7	KAO	1.9U	152	7								
99	MAY	8	302	7.70	19	9.01	155	34.75	7.43	28	6	.16	.7	1.0	LSW	2.2U	187	12								

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ORIGIN TIME				LAT N				LOW W				DEPTH N				N RMS				ERH ERZ				LOC				PREF N				AZ MIN			
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN			
99	JUL	4	2042	56.92	19	12.88	155	32.43	4.59	28	3	16	5	2.9	LSW	2.2X	2	81	6																
99	JUL	5	2350	21.07	20.26	45	155	40.86	9.59	28	4	15	1.8	1.1	DLS	2.4X	2	302	36																
99	JUL	6	2422	2.86	19	16.41	155	29.98	7.68	29	4	19	5	1.8	LSW	1.8X	2	81	2																
99	JUL	6	517	16.09	19	38.04	155	10.58	21.12	29	5	10	7	2.0	KEA	2.2X	4	159	17																
99	JUL	6	946	22.43	19	19.85	155	6.78	8.44	30	5	10	5	4	SP4	2.1X	3	149	5																
99	JUL	7	350	33.19	19	15.42	155	31.87	7.39	31	5	18	4	8	LSW	2.0X	2	99	3																
99	JUL	7	2050	43.86	19	17.57	155	28.00	9.67	23	3	11	4	8	LSW	1.5X	2	65	9																
99	JUL	8	255	54.36	19	20.12	155	7.04	7.53	26	2	11	5	9	SP4	1.8X	2	141	5																
99	JUL	8	1114	32.69	19	14.69	156	20.51	7.00	18	4	11	7.5	9.6	DLS	1.6X	1	316	61																
99	JUL	8	1638	47.60	19	44.50	155	52.83	11.92	19	2	10	1.4	5	HUA	2.3X	1	1231	7																
99	JUL	8	1953	40.36	19	44.55	155	51.78	11.02	19	2	10	1.4	5	HUA	2.1X	2	241	7																
99	JUL	9	2007	19.57	19	26.68	155	29.10	10.70	24	6	08	3	7	RAO	1.7X	3	52	8																
99	JUL	10	228	14.28	19	19.70	155	11.89	5.06	26	4	11	4	1.6	SP4	1.6X	2	88	6																
99	JUL	10	2309	45.11	19	44.96	155	49.38	31.80	23	3	10	8.1	2	HUA	1.9X	1	166	7																
99	JUL	10	2309	7.05	19	21.92	155	4.46	6.64	24	2	11	6	1.2	SP5	1.8X	2	157	6																
99	JUL	11	744	44.19	19	19.68	155	8.33	6.37	22	2	09	6	9	SP4	1.3X	2	156	4																
99	JUL	11	822	23.57	19	19.02	155	26.49	10.19	24	2	13	5	1.1	RAO	1.5X	1	90	6																
99	JUL	11	2025	38.48	19	23.34	155	14.99	2.87	13	3	07	6	3	SEC	1.7X	2	140	2																
99	JUL	12	100	8.24	19	21.91	155	17.53	27.88	37	6	11	6	8	SEC	2.8X	3	54	3																
99	JUL	12	2003	43.68	19	18.87	155	13.35	3.88	23	5	13	4	1.0	SSF	1.3X	1	78	3																
99	JUL	12	2108	43.23	19	12.44	155	32.43	7.13	32	4	19	6	9	LSWF	2.5X	84	6																	
99	JUL	13	615	16.81	19	19.99	155	8.47	6.88	27	3	12	5	8	SP4	1.6X	2	109	5																
99	JUL	13	846	39.22	19	8.41	155	26.20	39.86	21	09	27	4	6	DLS	241	4																		
99	JUL	13	1953	7.14	18	56.84	156	39.59	1.20	29	3	10	7.7	3.0	DLS	2.8X	3	308	97																
99	JUL	14	1546	33.77	19	28.15	155	27.02	6.90	31	6	14	4	1.5	RAO	2.1X	3	68	7																
99	JUL	14	1922	53.80	19	20.12	155	10.83	7.22	24	4	14	5	8	SP3	1.7X	1	84	4																
99	JUL	14	2144	30.22	19	22.55	155	25.05	12.71	24	3	09	5	7	RAO	1.4X	2	64	5																
99	JUL	15	505	18.39	19	20.19	155	8.08	8.45	32	4	11	5	4	SP4	2.5X	1	137	5																
99	JUL	15	1931	33.32	19	28.32	155	26.71	8.87	24	4	12	4	1.2	RAO	1.5X	3	7	5																
99	JUL	16	229	43.83	19	19.42	155	11.70	8.98	27	2	12	5	9	SP3	1.7X	3	95	5																
99	JUL	16	800	35.99	19	4.28	155	21.84	33.23	28	6	09	1.2	9	LOI	1.7X	2	222	14																
99	JUL	16	808	45.11	18	58.86	155	24.17	34.43	20	3	09	1.4	1.7	LOI	1.5X	1	242	21																
99	JUL	17	1457	30.19	19	23.09	155	15.42	3.37	12	3	06	6	4	SEC	1.8X	2	127	2																
99	JUL	17	351	15.61	19	6.20	155	32.46	32.57	14	12	3	1.9	3.9	DLS	220	10																		
99	JUL	17	507	40.69	19	19.64	155	6.52	7.56	26	2	09	8	6	SP4	1.8X	2	200	5																
99	JUL	17	1406	47.92	19	14.23	155	15.91	31.71	34	2	11	8	1.2	DEP	2.3X	3	170	7																
99	JUL	19	1127	18.99	19	22.95	155	14.85	3.38	17	3	10	4	5	SEC	2.0X	2	133	2																
99	JUL	19	2223	20.71	20	2.48	156	6.49	39.32	19	3	12	1.8	1.4	KOH	2.0X	1	273	36																
99	JUL	20	1138	31.33	19	21.55	155	33.29	35.54	19	3	11	9	1.7	DEP	1.5X	1	361	48																
99	JUL	21	1645	0.45	20	10.31	155	58.95	32.36	18	3	07	2.5	3.0	KOH	2.2X	1	306	2																
99	JUL	22	712	11.99	19	13.02	155	27.81	0.04	26	3	13	3	6	LSW	1.9X	2	104	7																
99	JUL	22	1548	34.44	19	19.87	155	6.95	8.08	33	5	08	4	4	SP4	2.0X	3	145	5																
99	JUL	23	1128	49.66	19	21.24	155	13.27	8.60	33	3	12	4	6	SP2	2.4X	3	56	5																
99	JUL	23	2138	45.86	19	13.39	155	32.87	7.62	26	4	15	5	1.0	LSW	2.1X	1	133	8																
99	JUL	24	446	32.16	19	18.06	155	27.70	9.92	12	3	12	4	1.0	LSW	1.9X	2	84	6																

ORIGIN TIME				LAT N		LON W		DEPTH N		N RMS		ERH ERZ		LOC		PREF N		AZ MIN	
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMK	MAG	RD	GAP	DS
99	AUG	8	219	48.45	19	19.85	155	29.81	13.06	24	3	.09	.4	1.0	DML	1.9X	1	66	6
99	AUG	8	1347	11.71	19	18.05	155	13.36	31.40	25	4	.12	.9	1.1	DEP	1.8X	2	125	2
99	AUG	8	2015	49.64	19	16.96	155	2.84	49.43	25	3	.12	1.6	1.5	DEP	2.0X	2	235	14
99	AUG	9	43	32.74	19	11.41	155	36.14	8.40	35	6	.37	.5	.9	LSMF	3.3U		94	7
99	AUG	9	649	17.56	18	23.86	153	55.24	32.25	29	3	.13	2.6	4.1	DIS	2.9X	1	332158	
99	AUG	9	902	55.51	19	28.59	155	27.77	7.86	25	4	.11	.4	1.3	KAO	1.5X	2	73	6
99	AUG	9	1702	30.34	18	48.66	156	41.50	28.31	30	3	.09	1.7	3.8	DIS	2.5X	2	314100	
99	AUG	9	1749	36.81	19	11.30	155	30.03	0.70	29	4	.18	.4	.7	LSW	1.9X	2	87	5
99	AUG	9	2248	39.53	19	13.57	155	22.60	34.66	26	3	.13	1.9	1.5	DEP	1.9X	2	82	2
99	AUG	10	230	32.38	19	36.54	155	16.66	28.84	24	2	.11	.9	1.4	KEA	2.1X	3	123	16
99	AUG	11	315	0.75	19	24.89	155	26.85	11.91	30	3	.09	.4	.6	KAO	2.2X	3	60	11
99	AUG	11	320	18.13	19	24.75	155	27.03	7.21	23	3	.12	.4	1.0	KAO	1.8X	2	42	4
99	AUG	11	1133	53.26	19	23.40	155	30.63	11.88	26	4	.08	1.0	KAO	1.8X	2	47	5	
99	AUG	12	627	17.69	19	20.48	155	7.53	9.00	30	4	.11	.7	.5	SF4	1.8X	3	174	5
99	AUG	12	1051	51.54	19	28.91	154	53.65	0.74	24	3	.16	1.8	.7	SLEF	1.6X	2	257	4
99	AUG	12	1052	6.89	19	27.95	154	54.35	2.59	19	3	.12	1.7	.3	SLEF	1.8X	1	262	2
99	AUG	12	1849	34.95	19	22.21	155	19.81	5.70	8	3	.09	4.11	8	KAO	2.4X	2	265	6
99	AUG	12	1914	14.66	19	23.02	155	18.82	4.90	12	6	.08	3.3	6.7	SSCL	1.7X	3	226	4
99	AUG	12	1959	42.12	19	25.68	155	15.86	9.86	10	3	.08	1.6	1.1	INTL	2.2X	2	201	3
99	AUG	12	2017	29.67	19	21.72	155	25.24	10.42	29	3	.11	.4	.6	KAO	1.4X	4	46	4
99	AUG	13	508	1.17	19	20.47	155	13.73	8.29	38	7	.14	.4	.5	SF2	2.3X	6	160	5
99	AUG	13	533	46.83	19	25.26	155	30.24	7.96	28	4	.11	3	1.0	KAO	1.1X	3	44	7
99	AUG	13	637	29.79	19	21.89	155	7.01	7.92	49	4	.09	.5	.7	SF4	1.6X	6	146	5
99	AUG	13	1937	54.43	19	21.89	155	17.62	27.92	21	7	.12	.6	.8	DEP	2.4X	5	54	3
99	AUG	14	231	42.10	19	19.20	155	5.36	7.73	27	5	.12	.6	.5	SF4	1.6X	2	185	6
99	AUG	14	557	54.18	19	19.87	155	3.86	7.08	29	5	.13	.7	.7	SF5	1.6X	2	196	9
99	AUG	15	127	4.60	19	22.74	155	14.93	3.86	12	3	.06	.5	.6	SEC	1.6X	2	127	2
99	AUG	15	1729	2.81	19	50.68	155	15.16	26	5	.09	.7	.5	HUA	2.0X	2	165	15	
99	AUG	16	131	51.47	19	11.43	155	38.69	8.34	26	4	.15	.5	.9	LSW	2.1X	1	86	7
99	AUG	16	1223	45.26	19	23.36	155	30.15	9.59	27	4	.10	.4	.6	KAO	2.2X	2	71	5
99	AUG	16	1329	24.91	19	19.81	155	10.39	8.04	26	4	.08	.5	.7	SF3	2.0X	2	91	4
99	AUG	16	1405	26.59	19	16.85	155	30.12	8.97	4912	.16	.3	.5	LSMF	4.4U		50	3	
99	AUG	16	1419	1.48	19	16.99	155	30.31	10.36	31	3	.10	.3	.8	LSW	2.1X	2	69	4
99	AUG	17	93	49.40	19	22.88	155	14.71	3.61	13	3	.07	.5	.5	SEC	1.8X	1	133	2
99	AUG	17	943	47.19	19	23.21	155	14.60	3.62	10	2	.04	.5	.6	SEC	1.6X	1	157	3
99	AUG	17	1448	16.85	19	20.93	155	13.34	9.56	34	5	.11	.5	.5	SF2	2.7X	4	58	5
99	AUG	17	1543	43.49	19	27.81	155	24.88	24.13	26	3	.12	.7	1.2	DML	1.8X	1	56	5
99	AUG	18	1114	43.63	19	12.22	154	59.14	43.71	42	5	.11	1.2	.9	DIS	2.8X	4	239	18
99	AUG	18	1655	20.48	20	3.66	156	1.42	11.91	16	2	.06	1.4	1.3	KOH	1.6X	1	269	27
99	AUG	19	32	22.79	19	23.17	155	18.37	29.28	38	3	.12	.5	.9	DEP	2.1X	4	41	3
99	AUG	19	2050	46.54	19	11.66	156	18.16	33.50	22	5	.09	1.7	2.6	KON	2.1X	1	292	46
99	AUG	19	2151	23.91	19	16.36	155	29.49	11.45	24	3	.13	.4	1.4	LSW	2.1X	2	79	10
99	AUG	20	652	44.24	19	20.44	155	11.46	10.29	23	2	.09	.6	.7	SF3	1.7X	2	81	4
99	AUG	20	1056	16.22	19	26.11	155	14.43	30.72	21	5	.10	1.6	1.0	DEPT	.9X	1	226	5
99	AUG	20	1057	46.57	19	16.92	155	18.26	29.75	14	2	.09	1.3	1.4	DEPT		157	2	

ORIGIN TIME				LAT N		LON W		DEPTH N		N RMS		ERR		ERZ		LOC		PREF N		AZ		MIN	
YR	MON	DA	HRMM	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	S
99	SEP	9	459	20.04	19	45.75	155	27.00	9.07	22	3	12	.5	.5	LSW	1.3X	2	142	6				
99	SEP	9	844	53.19	19	46.82	156	13.02	38.89	13	3	09	1.8	2.2	HUA	2.2U		274	41				
99	SEP	9	949	58.43	19	20.19	155	13.12	6.89	23	1	12	.5	1.0	SP2	1.9X	1	66	6				
99	SEP	9	1840	7.72	19	36.26	155	51.68	13.08	23	2	14	.9	.5	KON	2.2X	2	169	10				
99	SEP	9	2322	14.77	18	57.94	155	11.26	45.95	25			11	4.3	3.0	LOI	1.9X	2	280	35			
99	SEP	10	1652	52.66	19	36.26	155	52.08	14.09	14	2	.08	1.0	.5	KON	1.7X	1	175	10				
99	SEP	10	2020	31.25	19	25.59	155	14.91	0.66	22	6	10	.3	.4	SNCL	2.0X	3	142	4				
99	SEP	10	2029	4.95	19	24.57	155	17.06	10.63	15	1	13	1.8	.9	INTL	1.9X	4	138	1				
99	SEP	11	353	2.62	19	22.81	155	19.16	28.65	33	9	10	.7	.8	DML	2.1X	7	38	5				
99	SEP	11	414	36.22	19	22.20	155	19.56	30.18	28	5	12	.7	1.0	DML	1.6X	3	56	6				
99	SEP	11	946	43.27	19	11.79	155	31.32	6.31	36	7	12	.5	.9	LSW	1.9X	2	136	6				
99	SEP	11	1118	57.38	20	14.15	156	42.36	34.62	37	8	11	1.3	2.4	DIS	3.1X	7	316	98				
99	SEP	11	2058	26.16	20	20.36	155	57.32	26.94	25	2	13	3.5	1.3	KOH	2.3X	1	310	30				
99	SEP	11	2113	17.36	19	21.42	155	18.34	2.60	14	5	.09	.5	1.1	SWRL	1.7X	4	200	5				
99	SEP	11	2114	11.36	19	22.40	155	16.76	0.29	18	5	11	.3	.4	SSC	1.4X	3	110	2				
99	SEP	11	2134	31.20	19	21.98	155	1.55	8.75	3610	13	.6	.4	SP5	1.9X	7	186	8					
99	SEP	12	116	12.46	19	18.15	155	30.47	7.99	30	3	13	.4	1.0	LSW	1.5X	4	66	6				
99	SEP	12	131	22.29	19	22.81	155	12.96	6.42	16	1	.08	.6	1.1	SP2	1.8X	4	139	5				
99	SEP	12	132	50.54	19	22.13	155	12.66	2.53	28	1	13	.4	.8	SER	2.2X	5	74	5				
99	SEP	12	134	25.19	19	22.11	155	12.77	3.55	28	6	12	.4	.9	SERF	2.7X	5	56	5				
99	SEP	12	139	5.73	19	22.52	155	12.74	3.08	21	6	.09	.5	.8	SER	2.1X	4	84	5				
99	SEP	12	139	44.28	19	22.74	155	12.04	3.60	16	2	12	.6	1.1	SER	2.5X	4	89	4				
99	SEP	12	140	6.08	19	21.30	155	12.77	0.80	20	7	13	.4	.6	SERF	2.5X	3	74	5				
99	SEP	12	140	54.15	19	21.96	155	12.48	0.20	25	7	13	.5	.7	SER	2.4X	3	120	5				
99	SEP	12	141	10.56	19	21.93	155	12.55	4.26	28	5	13	.5	1.4	SER	2.7X	3	73	5				
99	SEP	12	144	44.67	19	22.27	155	12.28	0.44	24	6	13	.4	.5	SER	2.6X	3	74	4				
99	SEP	12	145	49.17	19	22.18	155	12.78	1.28	35	6	12	.3	.6	SERF	2.7X	1	52	5				
99	SEP	12	146	58.56	19	21.55	155	12.67	1.92	20	6	11	.4	.7	SERF	2.3X	3	117	5				
99	SEP	12	152	12.93	19	21.79	155	12.60	2.21	14	4	.08	.5	.9	SER	1.7X	3	124	5				
99	SEP	12	152	48.39	19	22.16	155	12.54	3.50	21	5	.08	.4	.8	SER	2.2X	3	118	5				
99	SEP	12	152	55.49	19	19.75	155	12.43	3.94	20	7	14	.4	1.9	SSP	2.2X	4	86	5				
99	SEP	12	154	28.95	19	22.26	155	12.55	4.60	14	4	10	.6	1.6	SER	2.2X	3	132	5				
99	SEP	12	155	48.64	19	22.08	155	12.55	2.18	28	6	11	.4	.7	SER	2.6X	4	74	5				
99	SEP	12	156	31.58	19	21.56	155	12.55	2.54	16	4	.09	.5	1.0	SER	2.2X	2	120	5				
99	SEP	12	159	43.52	19	22.17	155	12.48	4.48	31	4	12	.4	1.3	SER	2.4X	4	53	5				
99	SEP	12	204	40.76	19	22.01	155	12.77	2.25	32	6	10	.3	.7	SER	1.9X	4	53	5				
99	SEP	12	204	47.09	19	22.14	155	12.71	3.86	33	9	10	.3	.8	SER	2.5X	4	74	5				
99	SEP	12	207	14.08	19	21.45	155	12.86	2.75	19	6	.08	.4	.8	SER	2.3X	4	115	5				
99	SEP	12	210	56.63	19	22.07	155	13.23	3.69	17	3	.07	.5	1.0	SER	1.6X	3	122	5				
99	SEP	12	212	15.48	19	22.08	155	13.43	2.80	24	5	11	.4	.8	SER	2.2X	2	123	4				
99	SEP	12	213	33.90	19	21.88	155	12.58	2.49	24	4	10	.4	.8	SER	2.3X	2	123	5				
99	SEP	12	214	24.83	19	21.93	155	13.29	2.85	27	6	12	.4	.7	SER	2.2X	4	87	5				
99	SEP	12	218	43.82	19	22.76	155	13.91	2.00	15	5	.07	.4	.6	SER	1.7X	4	137	4				
99	SEP	12	220	46.94	19	21.59	155	12.73	2.78	28	3	.09	.4	.9	SER	2.1X	4	83	5				
99	SEP	12	221	6.36	19	21.41	155	12.68	0.89	28	7	10	.3	.5	SER	2.1X	3	114	5				

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ORIGIN TIME	LAT N	LONG	DEPTH N	N RMS	ERH	ERZ	LOC	PREF N	AZ	MIN
YR MON DA HRMN SEC	DEG MIN	DEG MIN	KM	RD S	SEC	KM	KM	REMARKS	MAG	RD GAP DS
99 SEP 16 1125	44.09	19 23.22	155 19.13	13.60	25 7 .12	.7	.8	DMLL	2.3X	4 51 5
99 SEP 16 1139	32.23	19 19.13	155 13.21	8.29	34 7 .11	.4	.8	SF2	1.6X	7 127 8
99 SEP 16 1459	32.00	19 49.02	155 24.75	24.54	33 4 .10	.6	1.2	KEA	1.7X	3 90 6
99 SEP 16 1544	46.01	19 22.19	155 14.23	2.07	13 2 .12	.4	.7	SER	1.3X	2 123 3
99 SEP 16 1613	59.18	19 22.32	155 13.59	4.13	28 2 .13	.5	1.3	SER	2.7X	2 50 4
99 SEP 17 327	58.04	19 46.39	155 4.87	35.59	33 6 .11	.8	1.3	HILF	2.8X	3 206 10
99 SEP 17 833	13.48	19 24.45	155 16.88	11.46	10 3 .07	2.7	1.1	INTL	2.4X	1 168 1
99 SEP 17 1030	55.65	19 24.42	155 17.78	4.63	7 1 .07	1.4	.9	SSCL	2.2X	1 144 2
99 SEP 17 1459	6.87	19 19.42	155 11.58	4.93	20 4 .08	.4	1.8	SSF	1.4X	1 96 6
99 SEP 18 307	54.86	19 22.61	154 50.18	44.01	33 5 .12	1.5	.9	LER	2.8X	3 279 13
99 SEP 18 958	57.81	19 23.29	155 14.49	4.06	35 4 .13	.4	.6	SECF	3.5U	46 3
99 SEP 18 1011	4.53	19 22.94	155 14.56	3.06	13 3 .07	.4	.6	SEC	1.8X	2 135 3
99 SEP 18 1017	32.14	19 22.86	155 14.41	3.66	9 2 .07	.8	.8	SEC	1.5X	1 120 3
99 SEP 18 1057	53.48	19 22.88	155 14.58	3.01	13 2 .09	.4	.6	SEC	1.8X	1 79 2
99 SEP 18 1249	13.49	19 15.74	155 29.30	11.04	21 3 .12	.6	1.1	LSW	2.3X	2 70 2
99 SEP 18 1635	6.03	19 19.81	155 11.74	6.13	20 3 .11	.5	1.4	SF3	1.7X	1 133 2
99 SEP 18 2025	37.05	19 14.89	155 32.61	6.36	32 2 .16	.5	1.0	LSW	2.3X	2 106 4
99 SEP 19 215	51.10	19 20.32	155 4.79	7.14	24 3 .11	.6	.7	SF5	2.1X	1 175 7
99 SEP 19 556	47.25	19 21.37	155 14.50	1.87	12 3 .07	.4	.7	KOA	1.6X	2 106 3
99 SEP 19 757	7.63	19 23.00	155 14.88	2.92	12 2 .08	.4	.5	SEC	1.4X	1 133 2
99 SEP 19 758	49.63	19 16.87	155 12.19	2.15	21 4 .12	.7	.4	SSF	1.7X	1 175 2
99 SEP 19 936	19.03	19 17.06	155 12.20	2.32	20 3 .12	.7	.4	SER	1.8X	1 159 2
99 SEP 19 1011	57.54	19 13.83	155 20.88	43.54	18 2 .12	1.9	2.0	DEP	1.1X	1 172 6
99 SEP 19 1637	59.11	19 17.54	155 12.03	0.83	21 4 .12	.4	.6	SSF	1.6X	2 150 3
99 SEP 19 1646	4.08	19 24.42	155 18.58	7.75	11 3 .06	1.9	2.0	INTL	1.8X	2 140 2
99 SEP 19 1647	6.58	19 17.25	155 12.19	1.55	24 3 .14	.5	.5	SSF	1.7X	2 155 2
99 SEP 19 1657	37.98	19 17.28	155 12.12	1.76	29 4 .13	.5	.5	SSF	2.3X	2 154 2
99 SEP 20 230	13.44	19 20.93	155 16.86	1.62	13 4 .06	.4	.6	KOAL	1.3X	3 88 3
99 SEP 20 434	5.27	19 17.64	155 12.45	1.82	30 7 .13	.5	.6	SSF	1.5X	6 145 2
99 SEP 20 1316	36.35	19 23.26	155 14.71	2.92	33 7 .11	.3	.4	SEC	2.3X	6 49 3
99 SEP 20 2222	12.69	20 0.49	155 48.33	25.64	28 4 .09	1.1	1.9	KOH	2.0X	1 179 14
99 SEP 20 2241	28.98	19 15.99	155 12.48	2.42	26 5 .08	.5	.3	SSF	1.0X	4 187 3
99 SEP 20 2254	52.10	19 22.12	155 13.74	8.29	22 5 .14	.6	.9	SF2	1.3X	3 123 4
99 SEP 20 2311	38.28	19 21.99	155 14.10	12.19	29 6 .09	.4	.5	SF2	1.4X	5 104 3
99 SEP 21 52	8.42	19 20.10	155 10.50	8.56	22 2 .08	.5	.8	SF3	1.4X	4 85 4
99 SEP 21 59	36.62	19 21.96	155 13.87	12.47	37 8 .11	.3	.3	SF2	1.7X	7 88 4
99 SEP 21 544	43.49	19 23.30	155 13.93	2.73	19 7 .09	.4	.7	SER	1.6X	4 140 4
99 SEP 21 753	53.11	19 20.94	155 7.13	6.45	29 5 .12	.5	.8	SF4	1.6X	4 131 4
99 SEP 21 1028	15.22	19 23.86	155 17.08	19.17	26 5 .13	.6	.6	DEPL	2.8X	5 69 1
99 SEP 21 1121	55.00	19 21.71	155 9.83	3.47	29 7 .11	.4	.3	SER	1.9X	5 85 1
99 SEP 21 1609	25.86	19 25.23	155 28.28	10.05	26 5 .14	.4	1.0	KAO	1.2X	2 38 5
99 SEP 22 754	4.28	19 22.93	155 14.77	4.18	2110 .10	.4	.6	SEC	1.4X	4 132 2
99 SEP 22 935	31.53	19 12.46	155 29.83	5.15	20 1 .15	.6	1.6	LSW	1.3X	3 112 5
99 SEP 22 954	7.66	19 30.04	155 26.29	48.24	4310 .12	.7	1.0	DNL	2.0X	8 49 5
99 SEP 22 1641	47.42	19 23.06	155 14.97	3.25	21 8 .10	.3	.4	SEC	1.6X	4 133 2

ORIGIN TIME		LAT N		LON W		DEPTH N		N RMS		ERH		ERZ		LOC		PREF N		AZ	
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMS	MAG	RD	GAP	DS
99	SEP	22	1758	36.44	19	16.34	155	12.43	2.23	29	8	.12	.5	.3	SSF	1.5X	5	184	2
99	SEP	23	34	57.18	19	14.66	155	26.66	6.67	28	5	.13	.4	.7	LSW	1.2X	4	157	5
99	SEP	23	136	39.94	19	20.49	155	10.59	8.93	29	7	.09	.4	.5	SF3	1.8X	6	78	3
99	SEP	23	319	52.35	19	11.15	155	31.44	11.89	3510	.12	.5	.5	.5	LSW	1.4X	5	140	8
99	SEP	23	434	5.71	19	31.55	155	18.98	10.44	3210	.14	.5	.8	.5	GLN	1.5X	6	60	8
99	SEP	24	115	41.62	19	15.96	155	30.60	7.07	29	6	.12	.4	.8	LSW	1.2X	4	66	2
99	SEP	24	134	21.98	19	32.85	155	9.32	22.76	4918	.13	.4	1.0	.10	DEP	2.5X	7	90	16
99	SEP	24	211	7.13	19	24.96	155	18.76	6.49	25	7	.11	.6	.7	INT	1.5X	5	37	2
99	SEP	24	331	17.67	19	19.99	155	11.91	6.72	24	5	.10	.4	.9	SF3	1.4X	4	82	5
99	SEP	24	534	44.01	19	57.57	154	26.17	4.43	4013	.10	5.2	5.8	.5	DIS	2.4X	6	306	68
99	SEP	24	617	1.91	19	29.56	155	26.73	6.07	21	7	.08	.4	1.4	KAO	1.3X	4	72	6
99	SEP	24	754	55.92	19	22.56	155	13.95	4.08	17	7	.10	.5	.8	SER	1.3X	4	132	3
99	SEP	24	929	7.59	19	22.53	155	14.35	3.30	15	6	.09	.4	.6	SEC	1.4X	4	129	3
99	SEP	24	1937	3.63	19	26.66	155	30.03	13.56	20	3	.12	.6	1.5	DML	1.2X	3	83	6
99	SEP	24	2257	9.15	19	28.44	155	28.00	12.15	20	5	.14	.5	1.2	KAO	1.4X	3	72	9
99	SEP	24	2330	19.57	20	6.86	153	54.53	7.09	36	7	.15	9.211	6	DIS	- 2.6X	5	333119	
99	SEP	25	46	0.93	19	36.63	155	25.49	26.93	28	8	.11	.6	.9	KEA	1.5X	5	99	6
99	SEP	25	331	56.17	19	17.52	155	12.68	6.00	24	5	.12	.4	.8	SF2	1.3X	4	145	2
99	SEP	25	339	53.94	19	33.92	155	42.13	9.59	37	8	.14	.4	.7	MLO	2.3X	7	64	13
99	SEP	25	1845	16.89	19	32.00	155	37.83	8.93	31	7	.15	.4	1.3	MLO	1.8X	6	61	6
99	SEP	26	440	28.07	19	16.10	155	12.34	2.02	36	9	.13	.5	.3	SSF	1.7X	6	185	3
99	SEP	26	1229	21.73	19	23.54	155	16.42	3.27	29	6	.12	.4	.3	SEC	2.0X	4	55	1
99	SEP	26	1438	50.09	19	30.52	155	44.65	9.75	15	5	.12	.9	1.2	KON	1.5X	2	156	2
99	SEP	26	1603	6.91	19	26.01	155	14.90	0.55	25	6	.09	.3	.4	SNCL	2.2X	4	89	4
99	SEP	26	1609	27.48	19	24.44	155	13.65	1.56	24	6	.11	.3	.6	SERL	2.1X	4	91	5
99	SEP	26	1609	59.53	19	27.35	155	14.21	11.33	22	6	.11	1.0	.5	INTL	2.3X	3	180	7
99	SEP	26	1615	19.18	19	25.63	155	15.90	9.20	20	5	.09	.9	.5	INTL	1.6X	4	155	2
99	SEP	26	1619	10.12	19	25.12	155	16.57	5.97	20	6	.07	1.2	.4	INTL	1.9X	4	212	1
99	SEP	26	1623	29.66	19	25.72	155	13.52	0.04	22	6	.09	.3	.3	SERL	1.8X	3	146	6
99	SEP	26	1630	29.67	19	25.36	155	16.39	11.18	23	6	.11	.8	.5	INTL	2.2X	4	137	1
99	SEP	26	1640	7.42	19	24.02	155	14.21	7.23	23	6	.13	.6	.6	INTL	2.2X	3	133	4
99	SEP	26	1649	53.98	19	25.82	155	16.43	9.59	22	6	.10	.8	.4	INTL	2.3X	4	128	2
99	SEP	26	1734	20.44	19	23.04	155	19.62	1.83	17	5	.11	.4	.9	KOAL	2.2X	4	110	6
99	SEP	26	1821	5.17	19	24.07	155	17.21	9.49	15	6	.08	1.2	.7	INTL	1.9X	4	124	1
99	SEP	26	1830	13.91	19	25.90	155	16.58	9.79	16	5	.08	1.2	.6	INTL	2.0X	4	168	2
99	SEP	26	1848	59.56	19	25.35	155	15.76	10.18	16	6	.05	1.1	.6	INTL	1.9X	4	153	2
99	SEP	26	1940	43.20	19	24.76	155	13.55	0.84	24	6	.12	.3	.5	SERL	2.4X	4	139	6
99	SEP	26	2021	15.08	19	24.31	155	17.54	9.59	14	6	.08	1.7	.7	INTL	1.9X	3	126	1
99	SEP	26	2041	9.54	19	25.04	155	17.45	9.79	17	5	.06	1.1	.6	INTL	2.1X	4	121	1
99	SEP	26	2113	32.59	19	24.54	155	17.88	9.57	13	5	.05	1.9	1.0	INTL	1.7X	4	99	2
99	SEP	26	2134	29.66	19	24.46	155	17.36	9.63	18	6	.08	1.3	.5	INTL	2.2X	4	81	1
99	SEP	26	2229	56.29	19	25.59	155	16.66	10.46	14	5	.05	1.7	.8	INTL	1.9X	4	174	1
99	SEP	26	2395	35.75	19	25.19	155	17.66	13.77	16	6	.07	1.8	.5	DEPL	2.3X	4	122	0
99	SEP	27	17	56.96	19	19.48	155	9.32	7.00	23	3	.08	.4	.8	SF3	1.3X	3	91	5
99	SEP	27	216	55.56	19	24.90	155	17.01	10.21	17	5	.08	1.2	.6	INTL	1.9X	4	117	0

ORIGIN TIME		LAT N		LON W		DEPTH N		N RMS		ERH ERZ		LOC		PREF N		AZ MIN			
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	RMKS	MAG	RD	GAP	DS	
99	OCT	2	1902	58.52	19	18.46	155	13.56	8.03	29	6	.10	.4	.5	SF2	1.5X	5	78	3
99	OCT	2	1936	26.44	19	18.61	155	13.41	8.65	21	4	.11	.5	.9	LSW	1.3X	3	81	3
99	OCT	2	2039	37.16	19	15.68	155	12.65	9.44	23	3	.09	.4	.8	LSW	1.3X	2	100	5
99	OCT	2	2253	50.07	19	19.86	155	11.71	6.49	24	3	.08	.4	.8	SF3	1.1X	3	86	5
99	OCT	3	59	6.00	19	15.80	155	32.01	6.14	30	6	.16	.5	1.0	LSW	1.4X	3	97	4
99	OCT	3	203	40.40	19	14.86	155	27.99	6.63	26	4	.14	.4	1.1	LSW	1.4X	4	80	4
99	OCT	3	627	19.93	19	13.67	155	34.45	7.41	24	3	.13	.5	1.5	LSW	1.3X	2	125	8
99	OCT	3	833	28.46	19	17.60	155	26.29	0.25	25	3	.10	.2	.3	LSW	1.1X	3	54	7
99	OCT	3	1116	0.69	19	31.72	155	15.20	28.87	5012	.12	.4	.7	DEFP	3.0X	5	63	8	
99	OCT	3	1120	58.86	19	19.54	155	13.59	7.38	32	3	.13	.4	.8	SF2	1.9X	3	65	5
99	OCT	4	707	18.14	19	12.34	155	17.00	42.52	16	.11	3.4	6.1	DEPT				228	11
99	OCT	4	950	3.70	19	20.04	155	12.85	6.26	27	3	.12	.5	1.0	SF2	1.5X	2	73	6
99	OCT	4	1049	6.14	19	37.13	155	55.89	15.22	25	3	.11	.8	.5	KON	1.9X	2	121	10
99	OCT	4	1123	44.10	19	51.41	155	45.58	14.55	23	3	.12	1.0	1.2	HUA	1.6X	3	153	20
99	OCT	4	1330	28.86	19	22.81	155	50.20	13.40	26	3	.12	.6	.4	KON	2.0X	2	128	13
99	OCT	5	238	51.14	19	24.20	155	17.33	9.47	27	5	.11	.4	.4	INTL	2.5X	5	47	1
99	OCT	5	439	11.22	19	24.57	155	16.46	10.88	20	5	.10	.7	.5	INTL	1.9X	4	105	1
99	OCT	5	652	28.38	19	42.82	155	29.10	6.68	31	6	.14	.4	.9	LSW	1.4X	3	98	5
99	OCT	5	656	30.45	19	21.72	155	29.89	10.27	26	4	.07	.3	.7	KAO	1.6X	1	49	4
99	OCT	5	1051	55.18	19	30.49	155	28.33	6.14	4916	.12	.3	1.3	MLO	2.6X	2	48	9	
99	OCT	5	1051	56.24	19	32.86	155	27.75	1.10	5315	.14	.3	.3	MLO	3.2X	1	51	7	
99	OCT	5	1238	2.28	19	22.22	155	14.59	29.13	41	9	.12	.6	.8	DEP	1.8X	7	89	2
99	OCT	5	1716	44.73	19	49.43	155	8.99	5.86	35	9	.10	.4	.6	SF4	1.8X	6	94	4
99	OCT	5	1747	18.21	19	19.29	155	8.61	7.21	30	6	.10	.5	.8	SF4	1.5X	4	105	4
99	OCT	6	116	51.44	19	27.97	155	23.76	9.04	30	7	.09	.3	.7	KAO	1.5X	5	84	3
99	OCT	6	218	58.77	19	23.14	155	15.26	3.36	26	6	.12	.3	.3	SEC	2.3X	3	77	2
99	OCT	6	316	5.84	19	39.24	155	4.29	12.15	3913	.12	.4	.5	HIL	2.0X	7	93	7	
99	OCT	6	416	50.46	19	39.16	155	4.34	11.42	29	7	.13	.5	.8	HIL	1.4X	4	119	7
99	OCT	6	906	56.23	19	21.85	155	4.36	6.83	31	5	.14	.6	.9	SF5	1.7X	3	160	6
99	OCT	6	918	35.22	19	49.99	155	7.90	6.57	30	3	.08	.4	.7	SF4	1.4X	3	153	5
99	OCT	6	1500	6.87	19	30.35	155	46.90	9.05	22	3	.12	.6	.4	KON	1.6X	3	144	2
99	OCT	6	1715	5.91	19	49.44	155	11.85	6.13	21	2	.08	.5	1.3	SF3	1.3X	2	94	5
99	OCT	6	1829	2.99	19	48.90	155	31.98	25.40	30	6	.06	.5	1.0	DLS	1.9X	3	77	8
99	OCT	6	2309	37.22	19	9.38	155	37.60	9.02	22	3	.13	.5	1.8	LSW	1.5X	1	103	15
99	OCT	7	112	59.81	19	11.82	155	29.95	6.92	27	3	.18	.6	.9	LSW	1.9X	1	132	6
99	OCT	7	433	34.34	19	13.66	155	28.00	11.31	23	4	.09	.4	.7	LSW	1.3X	2	98	5
99	OCT	7	618	26.87	20	1.08	155	51.13	13.26	46	9	.13	.6	.4	KOH	2.4X	3	121	14
99	OCT	7	1632	13.20	20	3.77	156	10.80	9.58	35	5	.12	.7	1.4	KOH	2.0X	2	185	42
99	OCT	8	446	0.68	19	13.77	155	32.90	6.35	4010	.14	.4	.8	LSW	2.1X	5	119	5	
99	OCT	8	552	28.25	19	12.32	155	33.22	6.22	24	3	.12	.5	1.5	LSW	1.6X	1	138	7
99	OCT	8	1033	15.28	19	13.58	155	34.03	6.62	32	3	.14	.5	1.0	LSW	1.5X	4	77	7
99	OCT	8	1144	1.70	19	11.45	155	24.79	5.96	28	3	.11	.6	.9	SNR	1.5X	2	168	5
99	OCT	8	1804	25.96	19	24.53	155	16.39	11.96	24	5	.12	.8	.4	INTL	2.5X	4	94	1
99	OCT	8	1823	57.67	19	22.97	155	18.59	0.03	21	5	.12	.2	.4	ESCI#	1.8X	4	54	4
99	OCT	8	1841	4.09	19	21.54	155	28.76	6.42	25	2	.12	.4	.7	KAO	1.6X	1	41	3

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ORIGIN TIME				LAT N				LON W				DEPTH N				N RMS ERH ERZ				LOC				PREF N				AZ MIN					
YR	MON	DA	HRMN	SEC	DEG	MIN	SEC	DEG	MIN	SEC	DEG	KM	RD	S	SEC	KM	KM	REMK	MAG	RD	GAP	DS	PREF	N	AZ	MIN	RD	GAP	DS	PREF	N	AZ	MIN
99	NOV	19	1450	49.79	19	24.68	155	17.30	12.78	20	5.10	1.0	.6	INTVL	2.5X	4	73	1															
99	NOV	19	1708	37.32	19	23.25	155	17.67	10.99	24	5.11	.7	.8	INT	1.4X	2	59	2															
99	NOV	19	2158	56.07	19	23.05	155	15.01	3.75	18	5.08	.4	.3	SEC	1.7X	3	132	2															
99	NOV	20	137	14.25	19	22.88	155	14.96	3.29	16	5.06	.4	.3	SEC	1.7X	2	141	2															
99	NOV	20	1647	0.48	19	26.58	155	28.97	12.81	23	5.11	.4	.8	KAO	1.4X	2	61	8															
99	NOV	20	1943	2.93	19	16.89	155	30.77	7.68	27	1.15	.6	1.1	LSW	1.5X	1	83	12															
99	NOV	20	1944	43.58	19	7.58	155	29.36	60.51	32	5.15	1.8	1.3	DIST	2.6X	3	228	4															
99	NOV	20	1945	54.80	19	8.68	155	30.23	49.82	29	3.13	1.1	1.8	DIST	2.5X	2	203	4															
99	NOV	20	2217	20.29	19	23.56	155	30.35	9.99	28	3.07	.4	.7	KAO	1.6X	2	56	5															
99	NOV	21	221	31.85	19	27.48	155	11.16	42.16	34	8.12	.8	1.0	DEP	1.7X	3	119	10															
99	NOV	21	249	18.49	19	22.86	155	6.08	41.76	27	4.13	1.2	1.5	DEP	1.5X	1	127	3															
99	NOV	21	902	1.53	19	36.99	155	4.41	46.48	4010	.09	.8	.9	HIL	2.0X	5	197	24															
99	NOV	21	918	9.15	19	11.67	155	38.73	3.71	29	6.16	.5	2.0	LSW	1.5X	2	150	13															
99	NOV	21	927	36.16	19	11.80	155	38.82	0.01	36	7.15	.5	.3	LSW	2.0X	1	83	13															
99	NOV	21	1954	37.59	20	1.03	155	28.66	8.77	21	2.18	1.1	.9	KEA	1.9X	1	200	20															
99	NOV	21	2327	58.13	20	11.65	155	51.42	20.64	19	3.11	1.4	.8	KOH	1.9U		219	5															
99	NOV	22	254	8.79	19	23.88	155	26.62	10.57	30	5.12	.4	.7	KAO	1.5X	1	50	3															
99	NOV	22	608	44.41	19	20.98	155	28.60	10.09	37	7.13	.4	.7	KAO	1.7X	1	41	3															
99	NOV	22	624	32.46	19	19.37	155	8.87	6.10	19	3.10	.7	1.3	SP4	1.2X	1	140	4															
99	NOV	22	749	49.78	19	15.32	155	1.94	6.06	25	6.13	1.4	.8	SP5	1.3X	2	313	11															
99	NOV	22	854	13.92	19	15.99	155	27.95	9.45	38	6.16	.4	.6	LSW	1.9X	4	68	4															
99	NOV	22	924	35.23	19	24.93	155	38.50	3.23	32	6.13	.4	.6	MLO	2.3X	3	81	2															
99	NOV	22	1436	2.70	19	12.75	155	29.51	6.73	20	2.12	.5	.9	LSW	1.7X	1	104	4															
99	NOV	22	2202	43.83	20	1.25	155	28.10	9.07	22	3.15	1.3	.9	KEA	1.8X	2	206	20															
99	NOV	22	2258	4.15	19	21.80	155	15.62	24.67	25	4.09	.8	.9	DEP	1.3X	2	101	1															
99	NOV	23	1632	56.67	19	13.55	154	54.81	10.19	4311	.16	.9	.5	DIS	3.1X	3	264	22															
99	NOV	23	2345	23.72	19	35.88	155	55.19	16.80	23	4.10	.9	1.6	KON	1.8X	1	224	12															
99	NOV	24	1	20.38	19	21.54	155	0.74	0.06	20	4.11	1.1	.4	SSF	1.3X	1	211	8															
99	NOV	24	502	57.48	19	20.48	155	6.81	6.87	24	4.13	.5	.8	SP4	1.3X	2	142	5															
99	NOV	24	1306	37.33	19	19.75	155	12.22	8.26	23	3.10	.5	.9	SP3	2.0X	2	85	5															
99	NOV	24	1311	1.60	19	19.85	155	12.33	7.84	33	8.12	.4	.8	SP2	2.0X	2	81	6															
99	NOV	24	1355	47.99	19	15.98	155	27.87	7.93	32	3.12	.4	.7	LSW	1.5X	1	67	4															
99	NOV	24	1509	9.94	19	24.86	155	19.49	3.69	17	5.10	.7	1.2	KAO	1.4X	2	95	3															
99	NOV	24	1514	11.55	19	19.13	155	25.97	9.28	39	8.13	.4	.7	KAO	1.9X	4	58	5															
99	NOV	24	1913	22.73	19	53.26	155	34.94	27.94	25	4.08	.8	1.4	KEA	2.0X	3	218	18															
99	NOV	25	626	49.59	19	17.42	155	13.01	7.24	21	4.08	.5	.9	SP2	1.4X	3	138	1															
99	NOV	25	722	0.00	19	19.17	155	26.53	50.63	32	8.12	.9	1.2	DML	1.7X	3	54	6															
99	NOV	25	1123	32.21	18	53.09	155	15.32	16.69	19	.11	8.015	.3	LOIT-			308	37															
99	NOV	25	1651	54.90	19	19.84	155	8.14	8.51	36	8.09	.4	.5	SP4	2.1X	6	116	5															
99	NOV	25	1805	8.09	19	58.06	156	1.14	39.14	27	2.10	1.5	1.8	KOH	2.1X	2	277	34															
99	NOV	25	1857	44.83	19	43.78	156	9.71	3.31	19	3.11	1.3	1.0	HUA	2.3X	1	285	17															
99	NOV	25	2258	7.58	19	18.48	155	30.93	11.81	24	2.10	.4	1.0	LSW	1.5X	2	70	6															
99	NOV	26	1517	32.39	19	30.19	155	29.66	6.83	27	7.10	.3	1.6	MLO	1.8X	2	75	11															
99	NOV	27	251	38.45	19	21.91	155	30.38	12.27	24	2.10	.5	.9	KAO	1.5X	2	61	5															
99	NOV	27	312	12.04	19	18.20	155	16.49	7.73	38	9.11	.3	.6	SF1	1.8X	4	120	4															

Table 5.

ORIGIN TIME					LAT N		LON W		DEPTH N			N RMS	ERH	ERZ	LOC	PREF N	AZ	MIN
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMKs	MAG	RD	GAP DS
99	JAN	1	1019	7.16	17	29.52	155	1.18	6.46	31	4	.13	9.91	3.0	DIS -	3.2U	334	178
99	JAN	6	1745	2.72	19	11.62	155	36.63	11.66	41	8	.16	.5	.6	LSWF	3.7U	116	6
99	JAN	9	728	14.95	19	29.30	155	27.85	2.86	46	13	.12	.3	.9	KAO	3.4U	61	8
99	JAN	12	2133	31.00	19	24.93	154	59.24	4.55	25	1	.18	1.0	.6	SLE	3.1U	181	1
99	JAN	15	610	26.01	19	22.50	155	12.44	5.90	37	5	.12	.5	.6	SF2F	3.3U	130	5
99	JAN	15	1256	45.53	19	55.62	155	43.78	29.73	55	17	.09	.5	1.3	KOHF	3.5U	143	23
99	JAN	28	1421	9.87	18	43.54	155	14.03	8.39	39	5	.10	1.0	1.6	LOI	3.3U	285	54
99	JAN	30	2053	37.52	18	55.46	155	15.52	11.94	28	3	.12	1.6	.8	LOI	3.8U	266	34
99	FEB	1	146	44.22	19	11.47	155	16.21	45.12	29	6	.12	1.4	1.1	DEP	3.6U	207	11
99	FEB	5	2207	26.51	19	23.00	155	17.47	9.63	11	3	.15	1.5	1.1	INTL	3.0U	83	2
99	FEB	7	751	23.15	18	49.46	155	9.67	54.85	39	5	.10	1.9	1.2	LOI	3.6U	265	49
99	FEB	23	1437	5.06	19	44.87	155	50.59	32.13	41	4	.09	.7	1.2	HUA	3.0U	172	23
99	FEB	27	545	59.64	19	19.49	155	8.53	9.44	45	6	.13	.6	.4	SF4	3.4U	101	4
99	MAR	10	541	44.37	18	47.04	154	29.08	14.76	41	6	.17	7.61	1.8	DIS -	3.6U	308	84
99	MAR	11	809	48.59	19	20.10	155	11.74	9.59	36	5	.10	.5	.5	SF3	3.1U	82	5
99	MAR	18	1142	18.56	19	19.77	155	13.76	9.17	40	6	.13	.5	.5	SF2F	3.3U	163	6
99	MAR	18	1201	33.14	19	18.79	155	13.13	9.63	44	10	.13	.6	.4	SF2F	4.0U	180	8
99	MAR	18	1252	27.77	19	19.22	155	13.10	11.03	39	6	.14	.6	.5	SF2F	4.0U	168	8
99	MAR	19	2016	11.24	20	20.59	156	3.23	12.45	28	3	.12	1.9	.8	KOH	3.4U	312	37
99	MAR	20	1607	46.11	19	22.53	155	5.71	7.89	38	6	.13	.8	.5	SF4	3.2U	169	4
99	MAR	25	2148	36.53	19	36.83	157	32.10	16.51	33	5	.13	2.11	6.4	DIS -	3.6U	327	170
99	MAR	29	951	37.73	19	22.59	155	6.22	9.59	30	4	.11	.9	.5	SF4	3.0U	167	3
99	MAR	29	1656	32.54	19	45.19	156	1.84	41.23	38	3	.10	1.3	1.0	HUA	3.1U	230	21
99	APR	7	837	6.36	19	23.29	155	16.90	3.19	22	3	.10	.4	.3	SSC	3.2U	64	1
99	APR	13	1903	13.93	18	59.04	155	30.86	49.95	30	4	.12	1.9	1.2	DLS	3.2U	254	20
99	APR	14	150	28.26	19	56.70	155	48.54	8.39	34	5	.13	.7	.8	KOHF	3.4U	181	18
99	APR	16	1456	25.12	19	15.34	155	29.38	9.37	36	2	.13	.4	.4	LSWF	5.6U	83	1
99	APR	16	1555	55.40	19	11.49	155	29.97	7.53	35	6	.16	.4	.6	LSWF	3.0U	128	5
99	APR	16	1600	19.45	19	14.85	155	32.05	9.52	38	8	.17	.5	.7	LSWF	3.2U	104	3
99	APR	16	1641	28.64	19	17.00	155	29.84	8.32	38	6	.14	.4	.8	LSWF	3.0U	90	4
99	APR	16	1812	36.99	19	11.81	155	31.16	7.80	35	6	.14	.4	.5	LSWF	3.5U	134	6
99	APR	16	2012	57.02	19	12.81	155	30.16	10.36	44	8	.14	.4	.5	LSWF	3.2U	111	4
99	APR	16	2045	17.92	19	11.42	155	28.27	7.19	37	3	.13	.4	.6	LSWF	3.3U	103	4
99	APR	17	2211	37.48	19	28.59	154	54.10	2.03	31	3	.19	.5	.4	SLEF	3.7U	141	3
99	APR	18	106	50.52	20	45.56	156	1.88	13.76	44	10	.11	7.01	0.2	DISF-	4.0U	322	75
99	APR	19	1450	39.23	19	21.92	156	16.94	35.04	44	9	.10	1.0	1.5	KON	3.5U	278	41
99	APR	19	2258	16.30	19	15.83	155	31.27	9.80	36	5	.17	.4	.6	LSWF	3.1U	93	2
99	APR	21	411	58.58	19	18.54	155	14.17	10.27	33	5	.13	.5	.6	SF2	3.6U	171	8
99	APR	23	1244	8.46	19	28.91	154	53.65	1.66	31	5	.14	.4	.3	SLEF	3.5U	152	3
99	APR	25	1650	52.01	19	59.43	155	31.59	14.48	36	4	.09	.8	.6	KEAF	3.4U	180	22
99	APR	26	1225	37.39	19	11.32	155	28.14	6.38	40	7	.14	.4	.8	LSW	3.2U	108	3
99	APR	29	859	58.71	19	16.85	156	24.53	36.22	35	4	.10	1.2	2.0	DIS	3.3U	294	57
99	MAY	2	26	28.61	19	19.62	155	8.37	8.92	33	3	.11	1.0	.6	SF4F	3.4U	190	5
99	MAY	3	654	46.33	19	46.22	155	33.60	14.96	35	8	.13	.5	.6	KEA	3.4U	89	11
99	MAY	3	1104	25.26	19	10.99	155	26.76	7.58	32	4	.12	.6	.8	LSW	3.0U	161	3

ORIGIN TIME				LAT N		LON W		DEPTH N		N RMS	ERH	ERZ	LOC	PREF N	AZ MIN				
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMKS	MAG	RD	GAP	DS
99	MAY	3	1810	28.11	20	40.85	154	49.02	15.76	20	3	.13	6.2	14.3	DIS -	3.0U		317	103
99	MAY	8	459	57.42	19	21.10	155	8.32	9.11	37	4	.12	.7	.5	SF4F	3.4U		171	3
99	MAY	10	1115	22.49	19	16.21	155	28.90	10.07	48	11	.12	.3	.5	LSWF	3.8U		59	3
99	MAY	15	2340	52.83	20	8.40	155	58.82	36.46	41	4	.11	1.1	1.2	KOH	3.2U		279	21
99	MAY	26	601	29.26	19	25.21	155	19.50	7.64	43	9	.13	.3	.5	KAOF	4.3U		46	3
99	MAY	26	604	4.06	19	25.12	155	19.29	6.74	39	7	.12	.4	.6	KAOF	3.3U		44	3
99	MAY	26	816	27.37	19	25.03	155	18.95	7.19	45	10	.12	.3	.5	INTF	3.5U		41	2
99	MAY	26	1121	52.68	19	24.97	155	19.34	7.01	37	7	.12	.3	.6	KAOF	3.7U		43	3
99	JUN	3	141	28.03	19	58.56	155	33.19	27.67	36	1	.10	.9	2.0	KEAF	4.4U		167	17
99	JUN	6	2315	49.63	18	27.37	153	47.81	16.83	27	2	.13	2.5	16.4	DIS -	3.0X	1	334	162
99	JUN	7	720	16.10	19	14.02	155	32.49	6.87	42	4	.16	.4	.8	LSWF	3.7U		71	5
99	JUN	10	322	21.72	18	59.63	155	21.70	52.36	48	13	.09	.8	1.0	LOIF	4.4U		227	27
99	JUN	16	932	30.37	19	21.60	155	5.00	9.25	34	4	.11	.6	.4	SF5F	3.8U		155	6
99	JUN	29	1829	44.64	19	56.60	155	27.36	36.55	37	4	.11	.7	1.4	KEAF	3.5U		174	13
99	JUL	2	342	49.42	19	20.37	155	10.83	9.46	45	12	.13	.4	.3	SF3F	3.7U		80	4
99	JUL	4	1706	49.90	19	12.94	155	32.57	6.87	42	7	.16	.5	.7	LSWF	3.5U		127	6
99	JUL	27	1337	48.66	19	20.43	155	11.83	9.27	35	4	.12	.4	.4	SF3F	3.5U		76	5
99	JUL	27	1512	53.23	19	21.53	155	6.94	9.34	42	11	.09	.4	.3	SF4F	3.7U		128	4
99	JUL	28	2104	24.86	19	19.75	155	10.75	9.06	29	5	.12	.6	.7	SF3F	3.4U		92	5
99	AUG	9	43	32.74	19	11.41	155	36.14	8.40	35	6	.17	.5	.9	LSWF	3.3U		94	7
99	AUG	16	1405	26.59	19	16.85	155	30.12	8.97	49	12	.16	.3	.5	LSWF	4.4U		50	3
99	AUG	24	1600	26.01	19	13.18	155	27.73	8.61	41	6	.15	.6	.7	LSWF	4.0U		143	5
99	AUG	30	2242	51.93	18	6.26	155	45.81	26.80	42	7	.10	1.3	4.4	DIS	4.2X	1	322	111
99	SEP	2	2008	9.89	19	35.31	156	32.54	13.78	26	2	.16	7.4	11.3	DIS -	3.0X	2	311	66
99	SEP	7	209	5.87	19	11.29	155	41.91	0.41	38	11	.13	.6	.3	LSWF	3.7U		163	8
99	SEP	11	1118	57.38	20	14.15	156	42.36	34.62	37	8	.11	1.3	2.4	DIS	3.1X	7	316	98
99	SEP	12	332	21.07	19	23.55	155	14.85	3.74	24	1	.10	.4	.5	SECF	3.0U		100	3
99	SEP	12	559	36.77	19	21.75	155	7.57	8.19	38	7	.12	.4	.4	SF4F	3.2X	2	117	3
99	SEP	12	854	21.63	19	23.48	155	14.53	3.07	24	2	.11	.4	.6	SEC	3.1U		124	3
99	SEP	12	1140	36.72	19	22.57	155	13.76	0.47	16	3	.12	.3	.7	SERF	3.4U		93	4
99	SEP	12	1221	35.63	19	22.24	155	14.13	0.66	25	4	.11	.3	.5	SECF	3.4U		123	3
99	SEP	14	814	33.87	19	22.69	155	14.30	0.69	26	7	.09	.2	.4	SEC	3.3U		94	3
99	SEP	18	958	57.81	19	23.29	155	14.49	4.06	35	4	.13	.4	.6	SECF	3.5U		46	3
99	OCT	3	1116	0.69	19	31.72	155	15.20	28.87	50	12	.12	.4	.7	DEPF	3.0X	5	63	8
99	OCT	5	1051	56.24	19	32.86	155	27.75	1.10	53	15	.14	.3	.3	MLO	3.2X	1	51	7
99	OCT	22	1038	43.95	19	12.72	155	20.83	47.11	58	17	.11	.6	.7	DEP	4.1U		164	6
99	OCT	24	2208	51.63	19	23.81	155	16.51	3.46	39	10	.11	.3	.2	SSCF	3.3U		48	0
99	OCT	26	329	49.08	21	1.67	156	1.37	7.11	17	5	.16	2.2	2.7	DIS	3.2X	1	286	43
99	NOV	23	1632	56.67	19	13.55	154	54.81	10.19	43	11	.16	.9	.5	DIS	3.1X	3	264	22
99	DEC	20	1719	18.30	20	33.32	157	32.70	34.15	38	27	.11	1.4	1.7	DIS	3.0X	2	314	135