EARTHQUAKE DATA FOR THE UTAH REGION

January 1, 1981 to December 31, 1983

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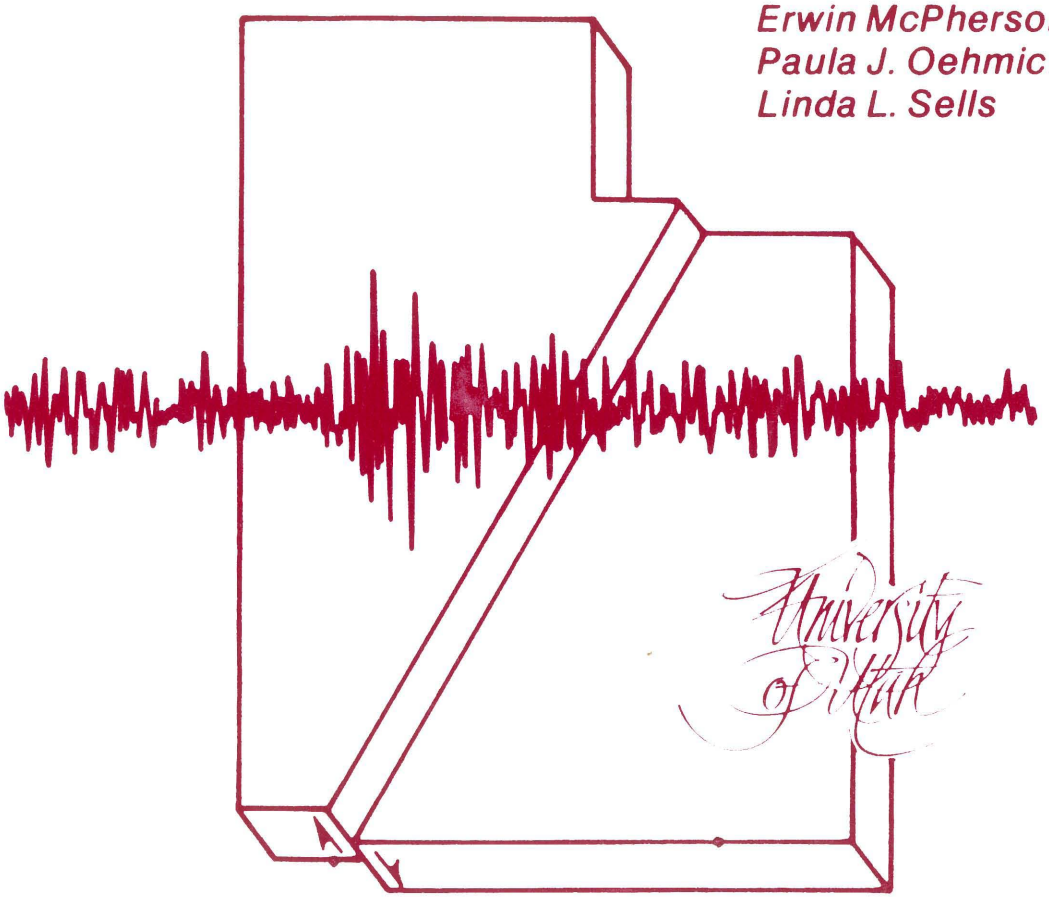

UUSS

UNIVERSITY OF UTAH SEISMOGRAPH STATIONS
DEPARTMENT OF GEOLOGY AND GEOPHYSICS
UNIVERSITY OF UTAH

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University of Utah Seismograph Stations
Department of Geology and Geophysics
University of Utah

R.B. Smith, Director

August 1984

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December 1983

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PREFACE

The University of Utah Seismograph Stations (UUSS) is a research, educational, and public service group that forms an integral part of a larger seismological research and teaching program within the Department of Geology and Geophysics of the University of Utah. The UUSS has operated a telemetered network of high-gain short-period seismic stations in the Intermountain region since 1974. This network currently consists of 76 stations, 28 operated and maintained by other agencies. The network includes stations throughout Utah focusing on the urban areas of the Wasatch Front, as well as stations in southeast Idaho, and western Wyoming (including 16 stations in Yellowstone Park).

This report is a catalog of instrumentally recorded earthquakes located by the UUSS network in the Utah region during the period January 1, 1981 to December 31, 1983. Pertinent University of Utah thesis abstracts and a bibliography of seismological publications resulting from research at the University of Utah for 1981-1983 are listed in the Appendices. Earthquake catalogs for previous years (beginning with non-instrumental data in 1850) as well as background information are published in Earthquake Studies in Utah, 1850 to 1978 (Arabasz et al., 1979) and Earthquake Data for the Utah Region July 1, 1978 to December 31, 1980 (Richins et al., 1981).

This volume of the UUSS earthquake catalog incorporates, for the first time, a complete set of earthquake information that was recorded, analyzed and processed using a new computer facility. The facility includes as its principal components: 1) a PDP 11/34 computer with two tape drives and an event-detection algorithm that forms the principal recording device for the UUSS 76-station telemetered network; 2) a PDP 11/70 computer with approximately 650 megabytes of disk storage and two tape drives that is designed for processing digital seismic data using interactive graphics terminals; and 3) a 32-station Real-Time-Picker (RTP), a digital computational device that provides automated earthquake locations in areas of intense activity. The PDP 11/70 is used for routine earthquake analyses, including epicenter determinations, magnitude determinations, fault plane solutions and the like. It also serves as the principal computer for computations related to the earthquake research efforts at the University of Utah. It currently supports 16-user terminals including high resolution Tektronix interactive graphics terminals, a Versatec printer/plotter and a Hewlett Packard multi-color pen plotter.

The acquisition and development of the computer-recording laboratory at the UUSS was motivated by recognition that the large amounts of earthquake data from the Utah region require a high-speed, high volume computational device for routine analysis. Modern earthquake research requires earthquake data in a digital-format, unavailable from previous analog recording forms. The PDP 11/34 and 11/70 systems were acquired in 1980 through support of the U.S. Geological Survey Earthquake Hazards Reduction Program with an initial purchase cost of approximately $225,000. Support for air conditioning and remodeling of the recording room was provided by the University of Utah.

Software to enable complete routine analysis of earthquake data was implemented by George Randall, William D. Richins, James C. Pechmann, George Zandt, and Darrel Cameron over the past four years. Programs available include routines for interactive display and analysis of seismograms and determination of hypocenters, magnitudes, and fault plane solutions. Hypocentral data are archived in a time-sequential earthquake catalog format that may be sorted to produce hypocenter data summaries for any time period and geographic area. In addition, high resolution maps of epicenters can be produced by simple user-oriented commands. This report and accompanying maps were produced on the PDP 11/70 computer system utilizing the UNIX word processor and the Hewlett-Packard digital plotter.

The UUSS computer recording laboratory is one of several modern facilities for earthquake research supported by the U.S. Geological Survey Earthquake Hazards Reduction Program. Others are located at: 1) California Institute of Technology, Pasadena, California, 2) the U.S. Geological Survey Earthquake Research Center, Menlo Park, California, 3) the University of Washington, Seattle, Washington; 4) St. Louis University, St. Louis, Missouri; 5) the Cooperative Institute for Research in Environmental Science (CIRES), University of Colorado, Boulder, Colorado; and 6) the Lamont-Doherty Geological Observatory of Columbia University, Palisades, New York. These institutions together with the University of Utah provide a modern earthquake recording and computational network that spans the active earthquake regions of the United States.

Salt Lake City, Utah
August 1984

Robert B. Smith
Director, UUSS

William D. Richins
Senior Staff Seismologist

ACKNOWLEDGMENTS

The earthquake information in this report would not be available without financial assistance from a number of organizations and agencies. During the 1981-1983 period, the most significant support for the operation of the University of Utah seismic network--and for associated earthquake research--was provided by the Earthquake Hazards Reduction Program of the U.S. Geological Survey, the State of Utah, and the U. S. Bureau of Reclamation. UUSS gratefully acknowledges support from the U.S. Geological Survey Contract Nos. 14-0001-19257, 14-088-0001-21184, 14-08-0001-21856, and 14-08-0001-21857; and from the U.S. Bureau of Reclamation Contract No. 2-07-40-S2051. Continuous operation of the University of Utah's Worldwide Standardized Seismograph Station at Dugway is supported in part by the U.S. Geological Survey, Branch of Global Seismology.

Another factor contributing to successful earthquake surveillance in the Utah region is the cooperation received from different groups in the recording and location of local and regional earthquakes. UUSS directly records continuous seismic data from stations operated by: 1) the U.S. Geological Survey, Branch of Global Seismology, Golden, Colorado; 2) the U.S. Geological Survey, Branch of Ground Motion and Faulting, Golden, Colorado; 3) the Idaho National Engineering Laboratory, Idaho Falls, Idaho; 4) Ricks College, Rexburg, Idaho; and 5) Snow College, Ephraim, Utah. Also, seismic arrival-time data are kindly provided upon request for stations operated in southeastern Utah by Woodward-Clyde Consultants of Walnut Creek, California.

We sincerely thank all the individuals and organizations whose efforts, encouragement, cooperation, and financial assistance make possible the on-going earthquake research and seismic network operations reflected in this report. We thank the entire UUSS staff for their continued support in maintaining and operating the seismic network and especially Donna M. Thomas for her efforts as UUSS Administrative Assistant in helping us complete this report.

INTRODUCTION

The purpose of this report is to summarize data compiled by the University of Utah Seismograph Stations (UUSS) for local earthquakes in the Utah region during the period January 1, 1981 through December 31, 1983. The term "Utah region", as used in this report, signifies the rectangular area extending from latitude 36°45'N to 42°30'N, and from longitude 108°45'W to 114°15'W. This report is basically a continuation of previous catalogs of earthquake hypocentral and magnitude data presented in UUSS publications Earthquake Studies in Utah, 1850 to 1978 (Arabasz et al., 1979), and Earthquake Data for the Utah Region July 1, 1978 to December 31, 1980 (Richins et al., 1981).

The UUSS has operated a telemetered seismic network in the Intermountain area since October 1974 (see Arabasz et al., 1979). During 1974-1980, data from this network was centrally recorded at the University of Utah in Salt Lake City, primarily on 16-mm analog film recorders (Develocorders), which provide continuous visual recording at relatively low dynamic range. On January 1, 1981 a computer system (described elsewhere in this report) provided by the U.S. Geological Survey for network recording became fully operational and the analog film recording was discontinued. This report presents an earthquake catalog based on data from the first three years of recording using the new computer facility.

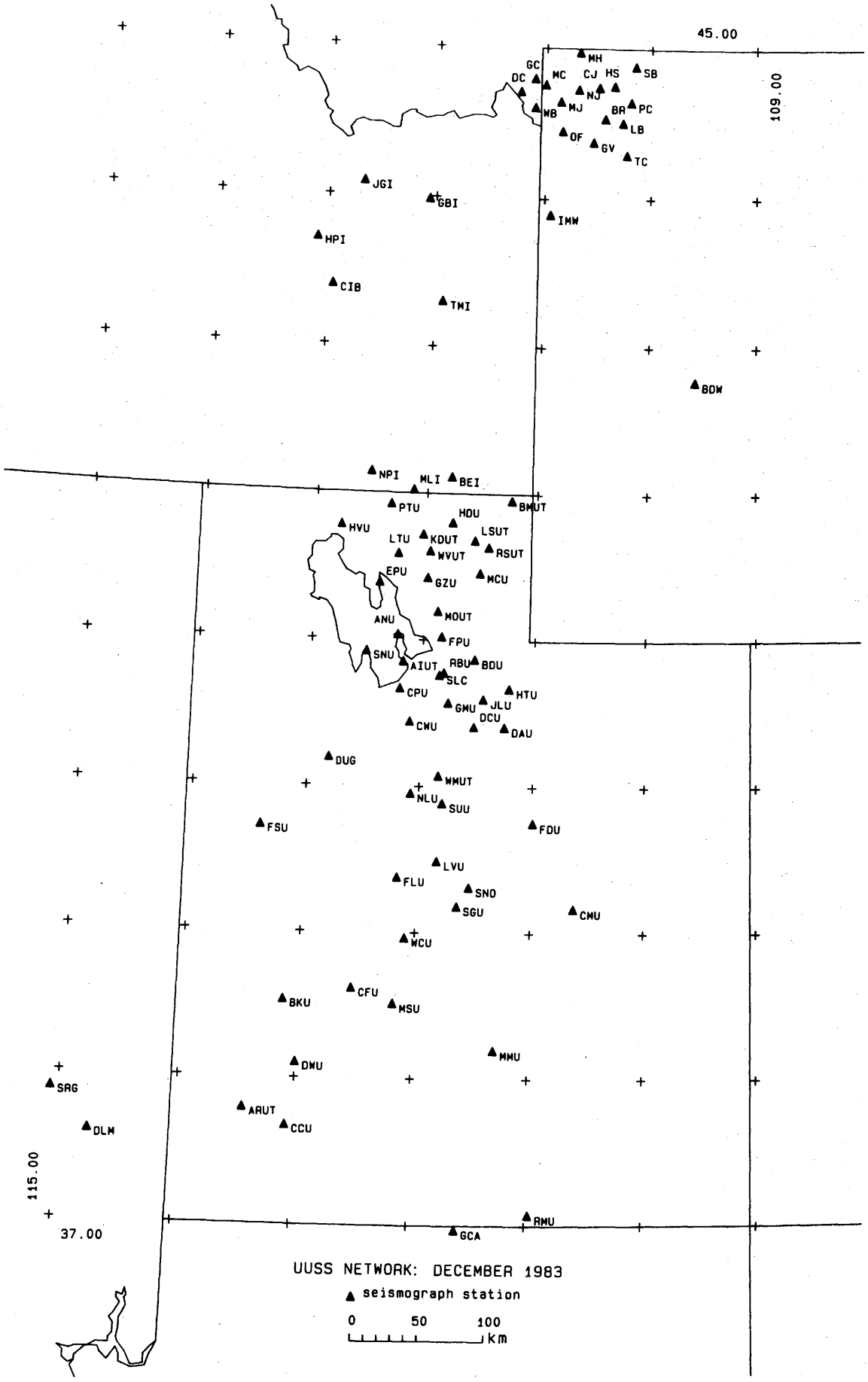
STATION DATA AND INSTRUMENTATION

The current seismic network recorded by the UUSS (see Figure 1) consists of 76 short period vertical stations, 28 which are operated and maintained by other agencies. Essential information for each station is summarized in Tables 1 and 2. DUG, GMU, and HVU have three short-period components. DUG continues to operate as part of the World Wide Standardized Seismograph Network (WWSSN) with a vertical short-period component telemetered to the University of Utah. All stations are centrally recorded at the University of Utah. The network has average station spacings of 15 to 35 km in north-central Utah and 30 to 100 km in central and south-western Utah.

The instrumentation in the current UUSS network is illustrated in the block diagram in Figure 2. Data from each seismometer are telemetered via telephone, microwave, and/or radio data transmission lines to a central recording facility located on the University of Utah campus in Salt Lake City. The standard instrumentation at each field site consists of a vertical seismometer with a natural frequency of 1.0 Hz, an amplifier/voltage controlled oscillator (VCO) package, a 100-milliwatt radio transmitter, a 9 db gain directional Yagi antenna, and interfacing electronics powered by air-cell batteries or solar electric panels. The central recording facility incorporates a bank of discriminators, a WWVB time code receiver, 14 drum recorders, and a PDP 11/34 computer.

At each field site, the seismometer acts as a transducer to convert ground motion to an electrical signal which is amplified and converted into a frequency-modulated (FM) audio tone within the amplifier/VCO unit. Eight FM center frequencies ranging from 680 to 3060 Hz are in use with a 340 Hz separation between center frequencies and an individual fixed bandwidth of 150 Hz. Typically, data from several field sites are transmitted via VHF radio link in the 160-174 MHz range to a receiver site where up to eight data channels are multiplexed and transmitted to the University of Utah campus via additional VHF radio links and/or voice-grade telephone lines. At the recording site, each FM seismic signal is demodulated by a discriminator and the resulting amplified seismometer signal is routed to a multiplexed A/D converter in the PDP 11/34. A program in the PDP 11/34 continuously monitors all the seismic signals. When the occurrence of an earthquake is detected, the digitized signals are recorded on magnetic tape for the duration of the earthquake. In addition, 14 seismic signals are recorded on the drum recorders to provide a continuous visual record.

Figure 3 illustrates the response characteristics of the entire telemetered system from seismometer (Mark Products L4C or Geotech S13) to the input of the analog to digital converter. The complete system gain ranges from 1.0×10^6 counts/cm/sec to 8.0×10^6


45.00
109.00
115.00
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MH
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DC
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HPI
CIB
TMI
BDW
NPI
MLI
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PTU
BMUT
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HVU
LTU
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CWU
DAU
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FSU
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FLU
SND
SGU
CMU
WCU
CFU
BKU
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MMU
DWU
SRG
ARUT
DLM
CCU
RMU
GCA
UUSS NETWORK: DECEMBER 1983
seismograph station
0
50
100
km

Figure 1

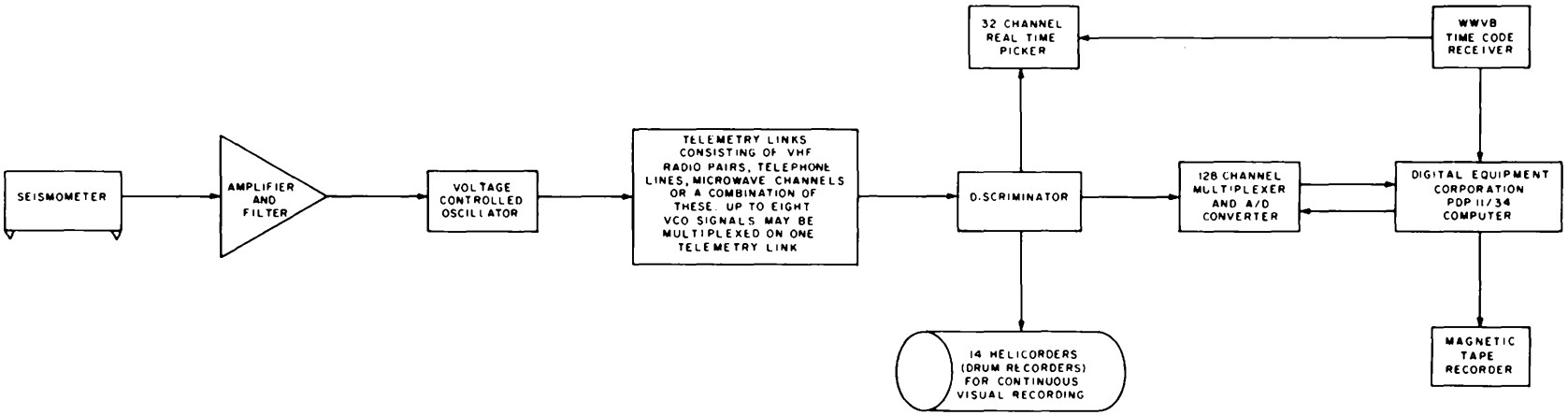


Figure 2. Schematic diagram of University of Utah telemetered seismic station and recording system.

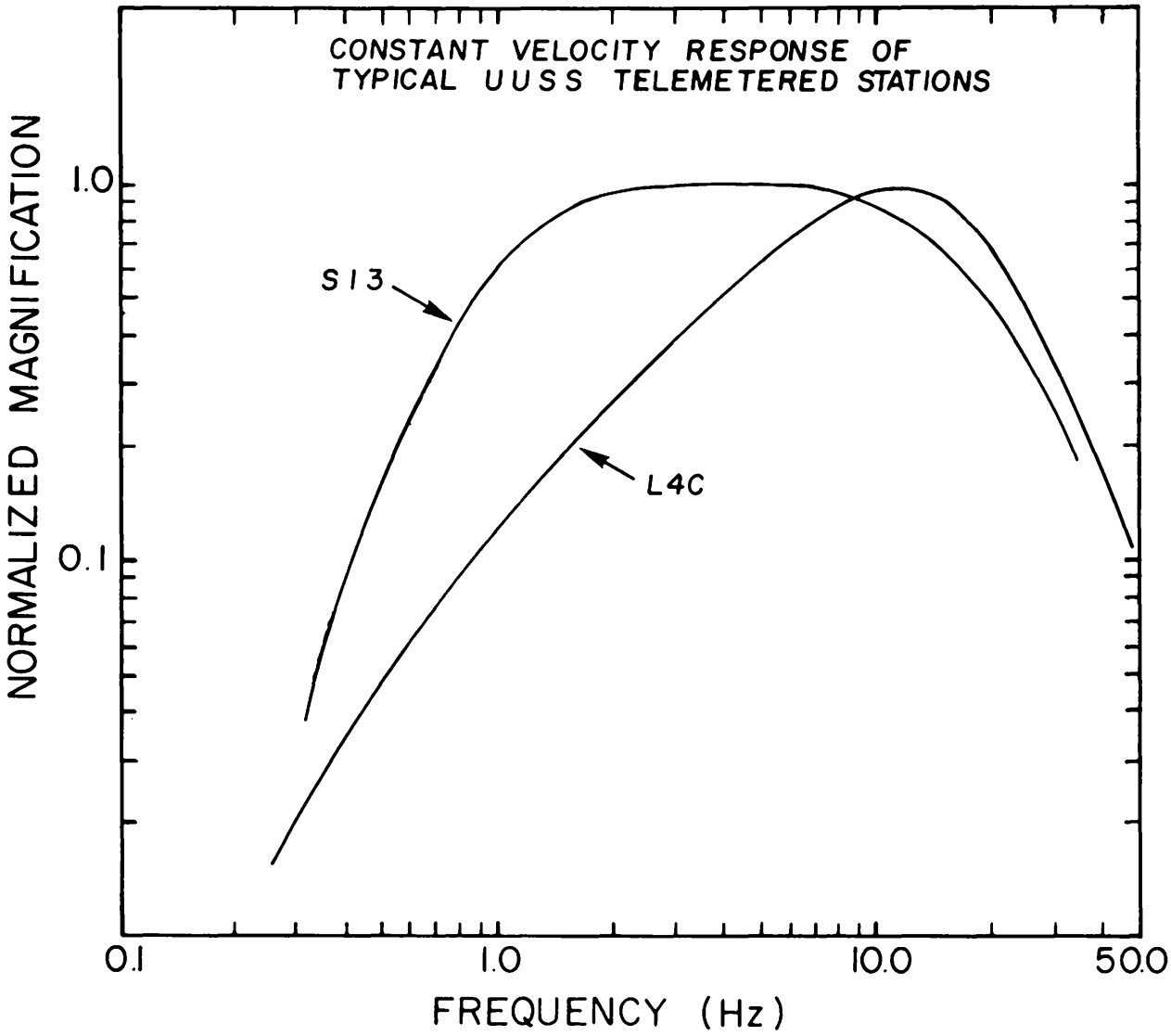

CONSTANT VELOCITY RESPONSE OF
TYPICAL UUSS TELEMETERED STATIONS
NORMALIZED MAGNIFICATION
1.0
0.1
S13
L4C
0.1
1.0
10.0
50.0
FREQUENCY (Hz)

Figure 3

counts/cm/sec. The gain for a particular station is determined according to the level of ground noise at the site.

Station siting is constrained by several factors including accessibility (especially difficult during winter months), requirements for unobstructed line-of-sight radio transmission, exposure of competent bed rock if available, difficulty in obtaining land permits, and the need to effectively cover seismically active areas of Utah. Economic factors also govern the variable station spacing within the network.

Table 1

OPERATING STATIONS, DECEMBER 1983

Code	Station Name	N-Lat	W-Long	Elev (m)	Date Open**
ANU	Antelope Island, UT	41°02.38'	112°13.90'	1353	11/75
AIUT	So.Antelope Island, UT	40°51.35'	112°10.53'	1334	04/83
ARUT	Antelope Range, UT	37°47.28'	113°26.42'	1646	12/80
BDU	Big Dutch Hollow, UT	40°52.45'	111°32.04'	2198	09/74
BDW	Boulder, WY*	42°46.57'	109°34.10'	2190	06/77
BEI	Bear River Range, ID	42°07.00'	111°46.94'	1859	10/74
BKU	Beaver Lake Mts., UT	38°32.11'	113°07.61'	1859	12/80
BMUT	Black Mt., UT	41°57.49'	111°14.05'	2243	10/79
CCU	Cedar City, UT	37°40.52'	113°04.11'	1775	12/68
CFU	Cove Fort, UT	38°37.13'	112°32.32'	2012	03/77
CIB	Cedar Butte, ID*	43°24.07'	112°56.51'	1611	03/81
CMI	Centennial Mt., ID*#	44°31.52'	111°37.31'	2377	11/83
CMU	Cedar Mt., UT	39°10.28'	110°37.16'	2332	06/78
CPU	Coon Peak, UT	40°40.34'	112°11.78'	2377	11/74
CWU	Camp Williams, UT	40°26.75'	112°06.13'	1945	10/74
DAU	Daniels Canyon, UT	40°24.75'	111°15.35'	2771	11/74
DCU	Deer Creek Res., UT	40°24.82'	111°31.61'	1829	11/74
DLM	Delmar Mts., NV*	37°36.35'	114°44.33'	1730	03/80
DGEU	Dugway, UT	40°11.70'	112°48.80'	1477	05/82
DGNU	Dugway, UT	40°11.70'	112°48.80'	1477	05/82
DGZU	Dugway, UT	40°11.70'	112°48.80'	1477	05/82
DUG	Dugway, UT	40°11.70'	112°48.80'	1477	05/62
DWU	Dry Willow, UT	38°06.32'	112°59.85'	2270	09/82
EPU	E. Promontory, UT	41°23.49'	112°24.53'	1436	09/75
FDU	Ford Ridge, UT	39°45.41'	110°59.40'	2975	03/78
FLU	Fools Peak, UT	39°22.69'	112°10.23'	1950	09/81
FPU	Francis Peak, UT	41°01.58'	111°50.21'	2816	09/74
FSU	Fish Springs, UT	39°43.35'	113°23.48'	1487	06/79
GBI	Big Grassy Butte, ID*	43°59.25'	112°03.80'	1561	12/81
GCA	Glen Canyon. AZ*	36°58.42'	111°35.58'	1339	12/76
GMU	Granite Mt., UT	40°34.53'	111°45.79'	1829	08/70
GRCI	Grant Creek, ID*#	43°58.00'	113°59.35'	2341	11/83
GZU	Grizzly Peak, UT	41°25.53'	111°58.50'	2646	11/81
HDU	Hyde Park, UT	41°48.27'	111°45.89'	1853	03/75
HPI	Howe Peak, ID*	43°42.68'	113°05.90'	2597	03/81
HTU	Hoyt Peak, UT	40°40.52'	111°13.21'	2576	11/74
HVEU	Hansel Valley, UT	41°46.78'	112°46.50'	1609	03/81
HVNU	Hansel Valley, UT	41°46.78'	112°46.50'	1609	02/81
HVU	Hansel Valley, UT	41°46.78'	112°46.50'	1609	11/76
IMW	Indian Meadow, WY*	43°53.82'	110°56.35'	2646	08/80

OPERATING STATIONS, DECEMBER 1983 (Continued)

Code	Station Name	N-Lat	W.Long	Elev (m)	Date Open**
JECI	Jemson Cabin, ID*#	44°22.33'	114°11.05'	2135	11/83
JGI	Juniper Gulch, ID*	44°05.56'	112°40.61'	1657	02/80
JLU	Jordanelle, UT	40°36.11'	111°26.95'	2304	09/81
KCI	Kelly Creek, ID*#	43°40.13'	111°39.87'	1902	11/83
KDUT	Kidman Hollow, UT	41°43.28'	112°01.75'	1829	10/78
LGUI	Leaton Gulch, ID*#	44°31.78'	114°04.55'	2538	11/83
LSUT	Lucky Star, UT	41°41.09'	111°33.45'	2225	11/79
LTU	Little Mt., UT	41°35.51'	112°14.83'	1585	09/74
LVU	Levan Peak, UT	39°29.50'	111°49.60'	2530	01/78
MCPI	Mackay Peak, ID*#	43°54.02'	113°42.27'	2902	11/83
MCU	Monte Cristo Peak, UT	41°27.70'	111°30.45'	2664	12/74
MLI	Malad Range, ID	42°01.61'	112°07.53'	1896	10/74
MMU	Miners Mt., UT	38°11.91'	111°17.66'	2387	10/80
MOUT	Mount Ogden, UT	41°11.94'	111°52.73'	2743	09/80
MSU	Marysvale, UT	38°30.80'	112°10.45'	2141	11/75
NLU	North Lily, UT	39°57.29'	112°04.50'	2036	08/81
NPI	N. Pocatello Valley, ID	42°08.84'	112°31.10'	1640	04/75
PTU	Portage, UT	41°55.76'	112°19.48'	2192	12/76
RBU	Red Butte Canyon, UT	40°46.85'	111°48.50'	1676	06/74
RMU	Rainbow Bridge, UT*	37°04.56'	110°58.20'	1536	11/81
RSUT	Red Spur, UT	41°38.31'	111°25.90'	2682	10/79
SGU	Sterling, UT	39°10.97'	111°38.60'	2365	10/78
SLC	Salt Lake City, UT	40°45.83'	111°50.87'	1423	04/62
SNO	Snow College, UT*	39°18.86'	111°32.28'	2446	10/81
SNU	Stansbury North, UT	40°55.43'	112°30.60'	1378	05/78
SRG	Seaman Range, NV*	37°52.93'	115°04.08'	1645	03/80
SURI	Summit Reservoir, ID*#	44°18.35'	113°28.95'	2324	11/83
SUU	Santaquin Canyon, UT	39°53.32'	111°47.50'	1987	08/74
TMI	Taylor Mt., ID*	43°18.33'	111°55.09'	2179	12/76
WCU	Willow Creek, UT	38°57.88'	112°05.40'	2714	01/78
WICI	Willow Creek, ID*#	44°10.46'	113°53.13'	2088	11/83
WMUT	West Mountain, UT	40°04.60'	111°50.00	1981	08/81
WVUT	Wellsville, UT	41°36.61'	111°57.55'	1828	08/79
YPBR	Bridge Bay, YNP*	44°32.20'	110°26.37'	2383	12/83
YPCJ	Canyon Village, YNP*	44°44.63'	110°29.85'	2426	12/83
YPDC	Denny Creek, YNP*	44°42.57'	111°14.38'	2025	12/83
YPGC	Grayling Creek, YNP*	44°47.77'	111°06.39'	2075	12/83
YPGV	Grant Village, YNP*	44°22.85'	110°32.72'	2430	12/83
YPHS	Hot Springs Basin, YNP*	44°45.33'	110°21.24'	2621	12/83
YPLB	Lake Butte, YNP*	44°30.68'	110°16.32'	2565	12/83

OPERATING STATIONS, DECEMBER 1983 (Continued)

Code	Station Name	N-Lat	W-Long	Elev (m)	Date Open**
YPMC	Maple Creek, YNP*	44°45.56'	111°00.37'	2073	12/83
YPMH	Mammoth Hot Springs, YNP*	44°58.62'	110°41.12'	1781	12/83
YPMJ	Madison Junction, YNP*	44°38.90'	110°51.52'	2111	12/83
YPNJ	Norris Junction, YNP*	44°43.82'	110°41.58'	2290	12/83
YPOF	Old Faithful, YNP*	44°27.15'	110°50.48'	2260	12/83
YPPC	Pelican Cone, YNP*	44°38.84'	110°11.58'	2939	12/83
YPSB	Soda Butte, YNP*	44°53.04'	110°09.06'	2072	12/83
YPTC	Trail Creek, YNP*	44°17.79'	110°13.92'	2360	12/83
YPWB	West Yellowstone, YNP*	44°36.35'	111°06.05'	2310	12/83

* Station operated by other agency and recorded by UUSS.

**Date open indicates beginning of data recording at University of Utah

Station recorded only intermittently during November and December 1983 on an experimental Real-Time-Picker (RTP) and not shown on Figure 1.

Note: Each station has a vertical-component short-period seismometer. Stations DUG and HVU are three-component stations. Station DUG is a World-wide Standardized Seismograph Station.

Table 2

DISCONTINUED STATIONS, DECEMBER 1983

Code	Station Name	N-Lat	W-Long	Elev(m)	Open	Closed
ETU	E. Traverse Mts., UT	40°28.64'	111°50.67'	1884	07/74	11/83
HID	Hamer Butte, ID*	43°57.78'	112°09.83'	1527	12/76	10/81
LBUT	Lower Brown's Hole, UT	41°18.58'	111°43.90'	1768	08/78	05/81
LWA	Lower Mag Wash, UT*	38°29.32'	112°51.71'	1817	02/81	02/82
PBU	Perry Basin, UT	41°28.09'	112°00.58'	1625	09/75	11/81
PCY	Pole Canyon, UT*	38°20.07'	112°54.15'	2033	02/81	01/82
RVUT	Riverside, UT	41°50.30'	112°15.55'	1951	09/79	10/81
SAU	Saltair, UT	40°49.18'	112°04.38'	1283	03/74	04/82
SHUT	Spring Hollow, UT	41°43.80'	111°41.13'	2716	11/81	08/83
WHU	Wild Horse, UT	39°22.83'	112°10.19'	1993	10/74	09/81
WMU	West Mountain, UT	40°05.30'	111°49.36'	2054	12/73	08/81
YNJ[1]	Norris Junction, YNP*	44°43.82'	110°41.58'	2290	09/81	11/81
YPMC[1]	Maple Creek, YNP*	44°45.56'	111°00.37'	2073	11/80	11/81

*Station operated by other agency and recorded by UUSS

Note: "Open" and "Closed" in this table indicate the period for which seismic data are on file at the University of Utah.

[1]YPMC was used alternately with YNJ from September 1981 until November 1981.

DATA PROCESSING AND ANALYSIS

General Procedure

During the period of this report, seismic network data were chiefly recorded on digital tape using the PDP 11/34 computer system operating in an event detection mode. The on-line recording system is closely modeled after the CEDAR system designed by C. Johnson (1979). The current code was written at the University of Washington by A. Bittenbinder. The system is currently (August, 1984) capable of recording 128 channels of digital data, including time code, in a multiplexed format on tape.

Tapes written by the on-line PDP 11/34 system are read onto a PDP 11/70 computer for analysis and eventual archival of the seismic data. Software developed primarily by S. Malone, A. Bittenbinder and D. Leaver at the University of Washington was adapted to the UUSS PDP 11/70 system for routine earthquake analysis. The following steps summarize the analysis process:

1) Demultiplexing and scanning. Data tapes from the PDP 11/34 system are demultiplexed (a software process that separates the multiplexed 64 or 128 channel data into individual data files) and scanned to identify seismic events of interest. Scanning is accomplished by visually examining trace data from individual stations displayed on either a Versatec printer/plotter or a Tektronix graphics terminal.

2) Timing. Events provisionally identified as local earthquakes within the UUSS network are timed as accurately as possible (with reading errors less than about $\pm$0.1 sec for the best data) using the computer program "PING". This routine uses the Tektronix interactive graphics terminals to display seismic trace data from individual stations. Each channel may be scaled in either time or amplitude, band-pass filtered to reduce site or transmission noise, and saved or deleted from the archive file at the option of the analyst. Arrival times and total signal duration can be read using the terminal cursor controls. These data are automatically stored on disk. A time code trace is used to establish absolute timing.

3) Location procedure. The computer program HYPOINVERSE (Klein, 1978) is used for earthquake location as described in the next section. The hypocentral solution for each event is analyzed by a geophysicist and checked for errors. Arrival times having large residuals are re-timed. Additional data are sought for events having a poor spatial distribution of stations. Poor hypocentral solutions are reprocessed and checked for remaining errors. Small earthquakes (magnitude <1.5) that cannot be reliably located are deleted.

4) Data archival. Seismic trace data as well as arrival times, signal durations, first motions, location, origin time, and magnitude information are archived on digital tape for each local earthquake processed.

5) Elimination of blasts and check for completeness. Located seismic events identifiable as blasts are deleted. To ensure that all data are accounted for, final data files are correlated with preliminary scanning lists, felt earthquake lists, press releases, and the U.S. Geological Survey publication Preliminary Determination of Epicenters.

6) Magnitude check. Available Wood-Anderson seismograms are examined and read for all earthquakes with local magnitude greater than 2.7.

7) Final processing. A final batch run on the computer is made of all data to create a catalog summary of hypocentral information.

Earthquake Location Techniques

The computer program HYPOINVERSE (Klein, 1978) was used to locate earthquakes in the Utah region for the January 1981 through December 1983 time period. This program determines hypocenters by minimizing differences between observed and computed travel-times using a generalized inverse (singular value decomposition) technique. Computed travel-times are calculated by assuming a trial hypocenter and then finding the appropriate ray path through a horizontally layered velocity model back to each station.

Two velocity models were used in order to approximate the transition in crustal structure across Utah from the Basin and Range province on the west to the Middle Rocky Mountains-Colorado Plateau on the east. A third velocity model was used to model crustal structure for stations in the southeast/central Idaho-western Wyoming area.

The first model, informally designated the "Wasatch Front model," was applied to all stations west of 111°W longitude and south of 42.5°N latitude, with the exception of GCA and MMU. The model was determined by seismic refraction profiling (Keller et al., 1975) south of Salt Lake City along the Basin and Range-Colorado Plateau transition zone using local quarry blasts. A 7.9 km/sec halfspace at 42 km depth has been added in order to fit observed travel time data from earthquakes at distances greater than about 250 km (James C. Pechmann, unpublished data, 1984). The model is specified by:

Layer	Depth (km)	P-Velocity (km/sec)
1	0 to 1.4	3.4
2	1.4 to 15.5	5.9
3	15.5 to 25.4	6.4
4	25.4 to 42.0	7.5
5	42.0 to ∞	7.9

The second model, informally designated the "Colorado Plateau model," was applied to all stations east of 111°W longitude and south of 40°N latitude plus GCA and MMU. This model is modified from Roller (1965) and is specified by:

Layer	Depth (km)	P-Velocity (km/sec)
1	0 to 1.5	3.4
2	1.5 to 27.5	6.2
3	27.5 to 40.0	6.8
4	40.0 to 80.0	7.8
5	80.0 to ∞	7.9

The third model, informally designated the "southeast Idaho model," was applied to all stations north of 42.5°N latitude. This model was determined for analysis of the 1983 Borah Peak, Idaho sequence using data from several seismic refraction profiles near Mackay, Idaho (Richins et al., 1984).

Layer	Depth (km)	P-Velocity (km/sec)
1	0 to 1.1	4.8
2	1.1 to 6.5	5.6
3	6.5 to 18.0	6.2
4	18.0 to 40.0	6.8
5	40.0 to ∞	8.0

Reliable S-wave arrival times were used in addition to P-wave arrival times whenever possible, with an empirically determined ratio of 1.74 for V_p/V_s corresponding to a Poisson's ratio of 0.25. S-wave arrivals prove particularly helpful in controlling locations near or slightly outside the boundaries of the network. Corrections for elevation were made to a datum level of 1500 m (above mean sea level) using the angle of incidence and the near-surface velocity of 3.4 km/sec for P-waves and 1.95 km/sec for S-waves. Some corrections are as large as 0.3 sec for P-waves. Empirical station delays were not applied to the data set due to the large geographical area involved.

Magnitude Estimation

Local magnitudes (M_L) for all earthquakes located in the Utah region since July 1, 1962 are systematically estimated by either direct or indirect relation to Wood-Anderson-type torsion seismographs at three (currently two) widely spaced sites within Utah. The estimates are based on statistical studies of determinations of M_L from the Utah Wood-Anderson network, their relation to published body-wave magnitudes (M_b), and the derivation of coda-duration magnitude scales--both for standard Benioff short-period vertical seismographs and for telemetered short-period, high-gain stations of the University of Utah seismic network. We refer the reader to Griscom and Arabasz (1979) for a critical evaluation of local magnitude in the Utah region, and for the technical basis of the following discussion.

Local magnitudes for the majority of earthquakes for which Wood-Anderson magnitudes cannot be determined were estimated from signal duration from the the telemetry stations as recorded digitally. The network equation for these stations is:

$$M_L = -3.13 + 2.74\ \overline{\log\tau} + 0.0012\overline{\Delta}$$

where $\overline{\log\tau}$ is the average logarithm of total signal duration in seconds (measured from P-wave onset) and $\overline{\Delta}$ is the average epicentral distance in kilometers. The standard error of estimation is $\pm$0.27. This equation was originally determined using local earthquake data recorded on 16 mm film records from Develocorders. Preliminary evaluations indicate that this equation yields reasonable estimates of local magnitude when applied to signal durations from the digital data. Signal durations for some earthquakes were problematical due to the length of the computer trigger where recording stopped before the end of the seismic signal. Research on refined methods of magnitude determination using the digital data is currently underway at UUSS.

Magnitudes for some earthquakes in this report, particularly those in southern Utah, were estimated from signal durations on paper records from Benioff short-period vertical seismographs using the relation:

$$M_L = -4.26 + 2.79\ \log\overline{\tau} + 0.0026\overline{\Delta}$$

where $\overline{\tau}$ is the average total signal duration in seconds (measured from P-wave onset), and $\overline{\Delta}$ is the average epicentral distance in kilometers. The standard error of estimation is $\pm$0.28.

It is important to note compelling evidence that coda-magnitude scales cannot justifiably be extrapolated below about M_L = 1.5

without special calibration (Bakun and Lindh, 1977; Suteau and Whitcomb, 1979). Thus, symbols in various figures of this paper that indicate smaller magnitudes should be interpreted only as indicating relatively small size.

Quality and Completeness of Data

The quality of hypocenter locations is governed by many factors and should be considered when assessing earthquake hazards, comparing relative seismicity of various parts of Utah, associating earthquakes with mapped faults, and in other applications of these data. The accuracy (difference between actual and calculated locations) is limited by systematic errors such as inadequate velocity models, possible consistent mis-identification of phases, and systematic station delays (dependent on the local geology beneath the site). Accuracy can be evaluated using data from explosions where the origin time and location is known. Precision (a measure of the ability to recalculate the same location, which determines the reliability of seismicity patterns) is affected by random timing errors and the use of a variety of station subsets. Precision can be estimated for each earthquake using standard statistical methods in the location routine, HYPOINVERSE (Klein, 1978).

For each earthquake located, four parameters that relate to the precision of the solution (NO, GAP, DMN, and RMS; see Data Explanation, Page 33) are listed. HYPOINVERSE (Klein, 1978) also calculates lengths in kilometers and orientations of the three mutually perpendicular principal axes of a confidence ellipsoid. The earthquake hypocenter has a statistical probability of 32 to 95% (depending on user specified program options) of lying within the region described by the confidence ellipsoid. Hence, the smaller the ellipsoid, the better the estimate of the location. The ellipsoid is a function of the random reading error, the array geometry used to locate each earthquake, and the velocity model. The calculation assumes that the only source of error is random reading error, thus it is a measure of the precision of each earthquake hypocenter. The RMS residual listed for each solution is primarily a measure of systematic errors including the incompatibility of velocity models, misinterpretation of phases, and consistent but uncorrected station delays. Generally, if the hypocenter is well-surrounded by stations (as determined by a small value for GAP), the number of arrival times used (NO) is greater than 5, and the velocity model is well known, then RMS is a measure of the correctness of phase identification and timing.

Explosions from many quarries, particularly in north-central Utah along the Wasatch Front, are routinely recorded. Accurate locations of several blasts from the Keigley quarry, the Bingham Canyon Copper mine, and the Devil's Slide quarry (see detailed information on individual quarries, below) were compared with our instrumental locations. The comparisons suggest an accuracy of approximately ± 1 km for well recorded earthquakes. Using well recorded earthquakes,

Kastrinsky (1977) estimated epicentral errors for earthquakes located on the Wasatch Front during 1975-1976 (using 30 stations) at ±2.0 km. Depth determinations are judged to be reliable to within ±2.0 km, if DMN (the distance to the closest recording station) is approximately equal to or less than the depth. An asterisk next to the depth is used in the earthquake catalog to indicate events with poor depth control, i.e. earthquakes that do not have a recording station within 10 km of the epicenter or within a distance to the epicenter of twice the depth.

The catalog is estimated to be systematically complete above magnitude (M_L) 1.5 in north-central Utah, above magnitude 2.5 in central and southwestern Utah, and above magnitude 3.0 in southeastern Utah and eastern Uinta Basin. Magnitudes are judged to be accurate to within ±0.3 magnitude units. Some earthquakes listed are multiple events where seismographs record two or more events in rapid succession, which often precludes locating both events.

Blasting in the Utah Region

Blasting for mining, road and dam construction, seismic exploration, and military ammunition disposal is common in the Utah region. Most of these blasts are too small for an epicenter calculation and are automatically excluded from the catalog. Nevertheless, locatable blasts are recorded regularly from two major mines in the region: the Bingham Canyon Copper mine, located about 25 km southwest of Salt Lake City, and the Elkol coal mine in southwestern Wyoming (see Table 3). The Bingham blasts are readily identifiable during the scanning process and are regularly discarded from further routine analysis, but are analyzed in special studies (see Smith *et al.*, 1980). Elkol blasts are also sorted out and eliminated from the catalog. Known mines with active blasting operations are listed in Table 3. Events identified as blasts by contacting individual blasting operations and/or correlation with known blasting areas and the time of day of frequent blasting have been removed from the earthquake catalog. However, some blasts may still be included in the catalog.

Table 3

BLAST SITES IN THE UTAH REGION
(December 1983)

NAME & ORGANIZATION	LOCATION	SCHEDULE & FREQUENCY	SIZE
Bingham Canyon Copper Mine; Kennecott Copper Corp.	40°31'N, 112°08'W. East side of Oquirrh Mountains. Salt Lake Co., Utah.	Large blasts are twice a day 11:45-12:00 Noon and 2:45-3:00 PM. Smaller blasts throughout the day. Mine operates 7 day/week; 24 hrs/day.	Larger blasts: 40,000-100,000 lbs. Small blasts 10,000 lbs.
Black Mesa, Peabody Coal Co.	36°30'N, 110°20'W. T36N and T35N, R18E Navajo Co., Arizona	Usually 6:30 AM-5:30 PM Mon.-Sat. Sometimes at odd hours.	Large.
Carr Fork Mine, Anaconda Co.	40°33'N, 112°12'W. West side of Oquirrh Mountains, Tooele Co., Utah	No specific schedule in 1982. No blasting the first 6 months of 1983.	Only small blasts.
Devil's Slide Quarry, Ideal Basin Industries Inc. (Ideal Cement)	41°03.'N, 111°33'W. East of Morgan, Near I80 N. Morgan Co., Utah	Blasts usually three times per month. Larger blasts about every three weeks. Usually 2:00-3:30 PM.	5,000-11,000 lbs.
Diamond Mountain, Chevron Resources Co.,	40°37.5'N, 109°30'W. Area about 300 acres. About 15 miles north of Vernal. Uinta Co., Utah.	Blasting at end of day shift, Mon.-Fri. Between 3:00-5:30 PM, 6 times a month.	Overburden blasts, 10,000-70,000 lbs. smaller blasts under 10,000 lbs.
Dolomite Mine, U.S. Lime Co.	40°42'N, 112°35'W, Northeast side of Stansbury Mountains about 9 miles northwest of Grantsville. Tooele Co., Utah.	Blasts every two to four weeks; on Mon.-Fri. usually between 12:00 noon and 4:00 PM.	1,000-20,000 lbs.

Table 3 (continued)

NAME & ORGANIZATION	LOCATION	SCHEDULE & FREQUENCY	SIZE
Dugway Proving Grounds, U.S. Army	40°7.5'-15'N, 112°52.5'-60'W. South of Cedar Mountains, about 12 miles WSW of Dugway. Tooele Co., Utah.	Variable	Variable
Elkol and Sorensen Mines. Kemmerer Coal Co.	41°44'N, 110°37'W. About 6 miles southwest of Kemmerer, Wyoming. Lincoln Co., Wyoming.	Usually two blasts a day, Mon.-Fri. (Sometimes on Sat.), usually between 8:30-9:00 AM, 12:00 noon-3:00 PM, and 4:00 PM-5:00 PM.	Average blasts are between 10,000 and 15,000 lbs., upper limits are usually 25,000 lbs., and maximum blasts are 30,000 lbs.
Georgia Pacific Corp., Gypsum Division	38°55'N, 111°53'W. Near Sigurd. Sevier Co., Utah.	Blasting usually two times per month near 1:00 PM	Up to 10,000 lbs.
Iron Mountain-Comstock Mine, Utah International (closed Jan. 1981)	37°39'N, 113°22'W. Southwest of Cedar City. Iron Co., Utah.	Usually 3:45-3:55 PM Mon.-Fri. Occasionally 11:45 AM.	Up to 4,000 lbs. with small delays.
Keigley Quarry, U.S. Steel Co.	40°01'N, 111°49'W. Southern tip of West Mountain. Utah Co., Utah.	Large blasts occur about once or twice a month. Smaller blasts are more frequent. All blasts are on Mon.-Fri., between 8:00 AM-5:00 PM.	Up to 140,000 lbs.

Table 3 (continued)

NAME & ORGANIZATION	LOCATION	SCHEDULE & FREQUENCY	SIZE
Lakeside Mountain Quarry, Utah Marblehead Lime Co.	40°54'N, 112°50'W. West side of Lakeside Mountain, about 9 miles NW of Delle. Tooele Co., Utah.	Blasts about once every two months. Schedule is Mon.-Fri. usually between 12:00 noon and 4:30 PM.	Blast sizes range from 14,000-16,000 lbs.
Lakeside Quarry, Southern Pacific RR.	41°13'N, 112°52'W. Northern tip of Lakeside Mountain. Box Elder Co., Utah.	Variable	500 lbs-20,000 lbs.
Mercur Mine, Getty Oil.	40°17'N, 112°11'W. Southeast of Tooele. Tooele Co., Utah.	Blast schedule 12:00-12:30 PM; 5:15 PM-5:30 PM 7 days a week.	Variable
Parleys Canyon Quarry, Portland Cement Co. of Utah.	40°43'N, 111°46'W. Near mouth of Parleys Canyon. Salt Lake Co., Utah.	Locatable blasts every one or two months. Usually 1:00-2:30 PM.	Up to 20,000 lbs.
Pelican Point, Interstate Brick Co.	40°15.55'N 111°52.31'W. West side of Utah Lake. Utah Co., Utah.	Variable	About 2,000 lbs.
Providence Canyon Quarry, Legrand-Johnson Construction.	41°41'N, 111°44'W. Providence Canyon about 5 miles southeast of Logan, Utah. Cache Co., Utah.	Six to eight blasts from May to November. 7:00 AM-4:00 PM.	800 to 9,750 lbs.

Table 3 (continued)

NAME & ORGANIZATION	LOCATION	SCHEDULE & FREQUENCY	SIZE
Skull Point Mine, FMC Corporation.	41°40'N, 110°32'W. About 4-5 miles south of Elkol, Wyo. Lincoln Co., Wyo.	Mon.-Fri. between 7:30 AM-6:00 PM. Large blasts around 4:00 PM.	Variable.
Thiokol Chemical Corp.	41°35'N, 112°25'W. Rocket Propellant Testing Grounds, Blue Springs Hill. Box Elder Co., Utah.	Variable. Sometimes several per month or none for six months.	Variable.
Tooele Ordinance Depot, U.S. Army.	40°30'N, 112°28'W. Southwest side of Tooele Valley. Tooele Co., Utah.	Mon.-Fri-., 7:30 AM-4:00 PM. Some times at 7:00 PM. Frequency is very irregular.	Variable.
Topaz Mining Property, Legrand-Johnson Construction Co.	39°42'N, 113°13'W. West side of Thomas Range, east of Fish Springs. Juab Co., Utah.	No blasting since December 1, 1982.	400-9,400 lbs.
United States Gypsum	38°53'N, 111°55'W. Near Sigurd. Sevier Co., Utah.	Blasting usually three times per month.	2500-4000 lbs.

OVERVIEW OF SEISMICITY

Recent publications by the UUSS have examined detailed characteristics of seismicity in Utah. Earthquake data for the time period 1850 through June 1978 is presented in Earthquake Studies in Utah: 1850 to 1978 (Arabasz et al., 1979). Earthquake data for July 1978 through December 1980 is presented in Earthquake Data for the Utah Region July 1, 1978 to December 31, 1980 (Richins et al., 1981). Selected bibliographies of UUSS Publications are available in both of the above volumes for the respective time periods. Publications after 1980 are listed in Appendices of this volume.

Annual maps of seismicity in the Utah region for 1981, 1982, and 1983 are shown in Figures 4, 5, and 6, respectively. A total of 1843 earthquakes were located during these three years in the Utah region including 29 felt shocks (see Page 83) and 29 earthquakes of magnitude (M_L) 3.0 or greater (see Table 4). The largest shock was one of magnitude 4.6 that occurred April 5, 1981 near Kanarraville 20 km southwest of Cedar City, Utah. Other significant aspects of earthquake activity shown in Figures 4, 5, and 6 include (from north to south):

1) an earthquake swarm near Soda Springs, Idaho which began in December 1981 and included a magnitude 4.7 earthquake on October 14, 1982. The majority of this swarm occurs just north of 42.5°N latitude and does not appear on the seismicity maps. Preliminary results of a detailed study of this swarm have been reported by Richins et al. (1983);

2) on-going, densely-clustered activity along the Idaho-Utah border (approximately 42.0°N, 112.5°W), including late aftershocks of the magnitude 6.0 Pocatello Valley earthquake of March 1975, (see Arabasz et al., 1981), as well as several nearby swarms within Hansel Valley. The largest earthquake in this area during 1981-1983 occurred on November 19, 1983 with a magnitude of 3.8.

3) clustered earthquakes 5 to 25 km east and south of Logan, Utah beneath the Bear River Range with magnitudes less than 2.0, and approximately 25 km east of Ogden, Utah including several felt events with magnitudes less than 3.0. This seismicity is part of an on-going north-south zone of activity in northern Utah.

4) a magnitude 4.3 earthquake on October 8, 1983 6 km southeast of the Salt Lake City International Airport. This earthquake was widely felt throughout Salt Lake Valley as well as to the south in northern Utah county and to the north in the Ogden area. Several small aftershocks were instrumentally recorded. A magnitude 5.2 earthquake occurred in this same area in 1962 causing moderate damage. Preliminary results of a study of the 1983

event have been reported by Pechmann and Thorbjarnardottir (1984).

5) a magnitude 3.9 earthquake on February 20, 1981 near Provo that was widely felt throughout Utah Valley. No aftershocks were recorded during several days of monitoring in the area with portable instrumentation.

6) a magnitude 3.9 earthquake in a remote area near Dinosaur National Monument (approximately 40.5°N, 109.0°W) on September 24, 1983 that was apparently not felt;

7) earthquakes southwest, north and east of Price in central Utah predominantly related to extensive underground coal mining. The largest event in this area occurred on May 14, 1981 with a magnitude of 3.5. Special studies by Smith et al. (1974) in the Sunnyside area east of Price and by McKee and Arabasz (1982; see also McKee, 1982) in the eastern Wasatch Plateau southwest of Price document abundant microseismicity at shallow depths (<4 km) but below the levels of coal mining. There appears to be a general correlation of such shallow seismicity with mining areas where annual extraction exceeds 500,000 tons.

8) on-going small magnitude activity 30 to 100 km north of Richfield near the southern portion of the Wasatch fault (see Mckee, 1982);

9) a magnitude 4.0 earthquake on May 24, 1982 approximately three miles southeast of Richfield near Annabella. Slight damage was reported in the immediate vicinity. Results of detailed aftershock monitoring are reported by Julander (1983).

10) a magnitude 3.6 earthquake near Cove Fort southwest of Richfield on December 9, 1983;

11) scattered small earthquakes throughout south-central and southwestern Utah in a broad NE-SW trending belt encompassing the Elsinore, Tushar, Sevier, and Hurricane fault zones between Richfield and Cedar City;

12) a rare felt earthquake near Hanksville (approximately 38.3°N, 110.6°W) on May 3, 1983 with magnitude 3.0; and

13) a notable earthquake swarm sequence 20-30 km south and southwest of Cedar City near Kanarraville which began on December 21, 1980 and continued into 1981 with several earthquakes in the magnitude 3.0-4.6 range. Preliminary results of a study of this sequence are reported by Richins et al. (1981b).

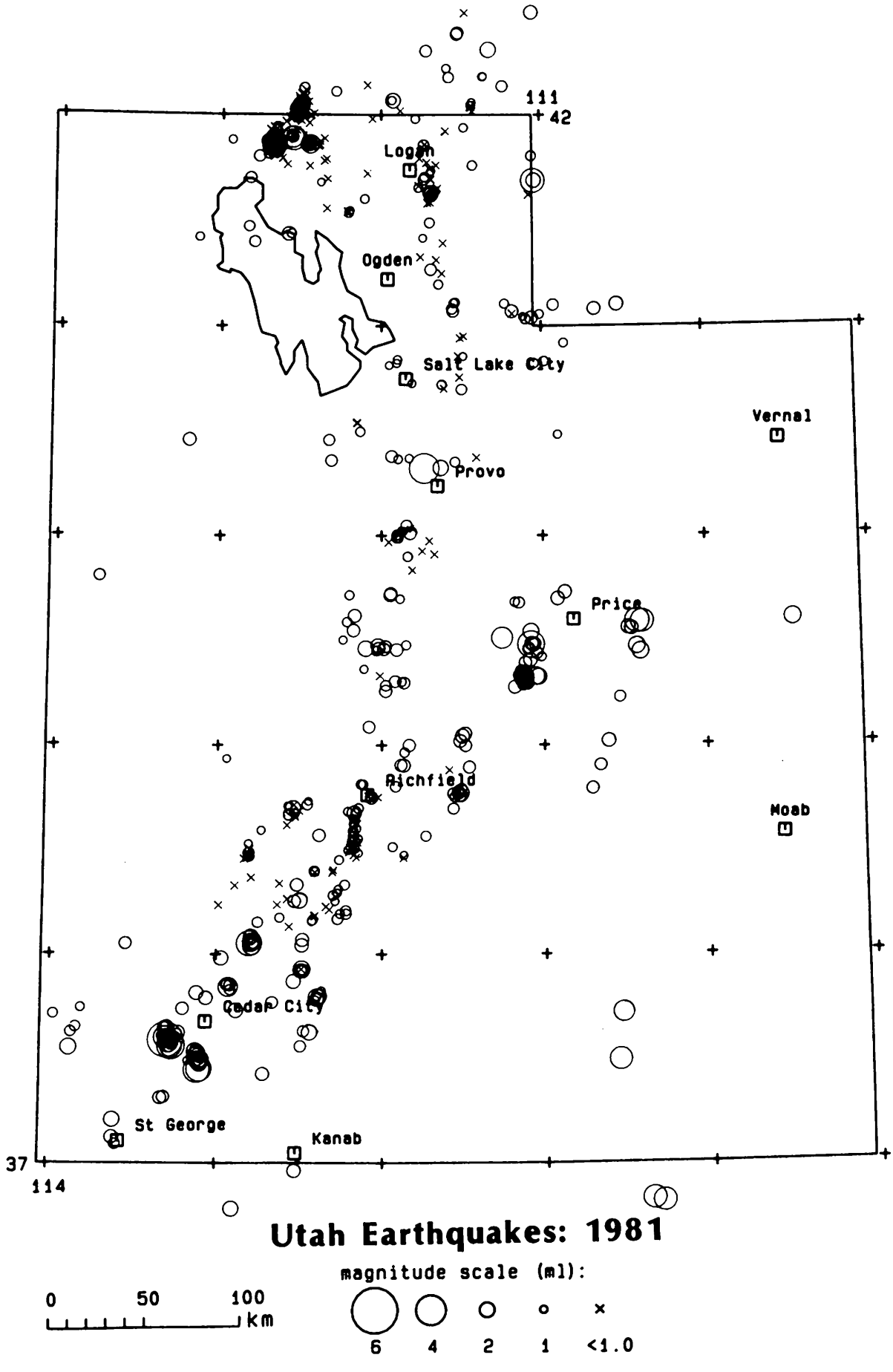
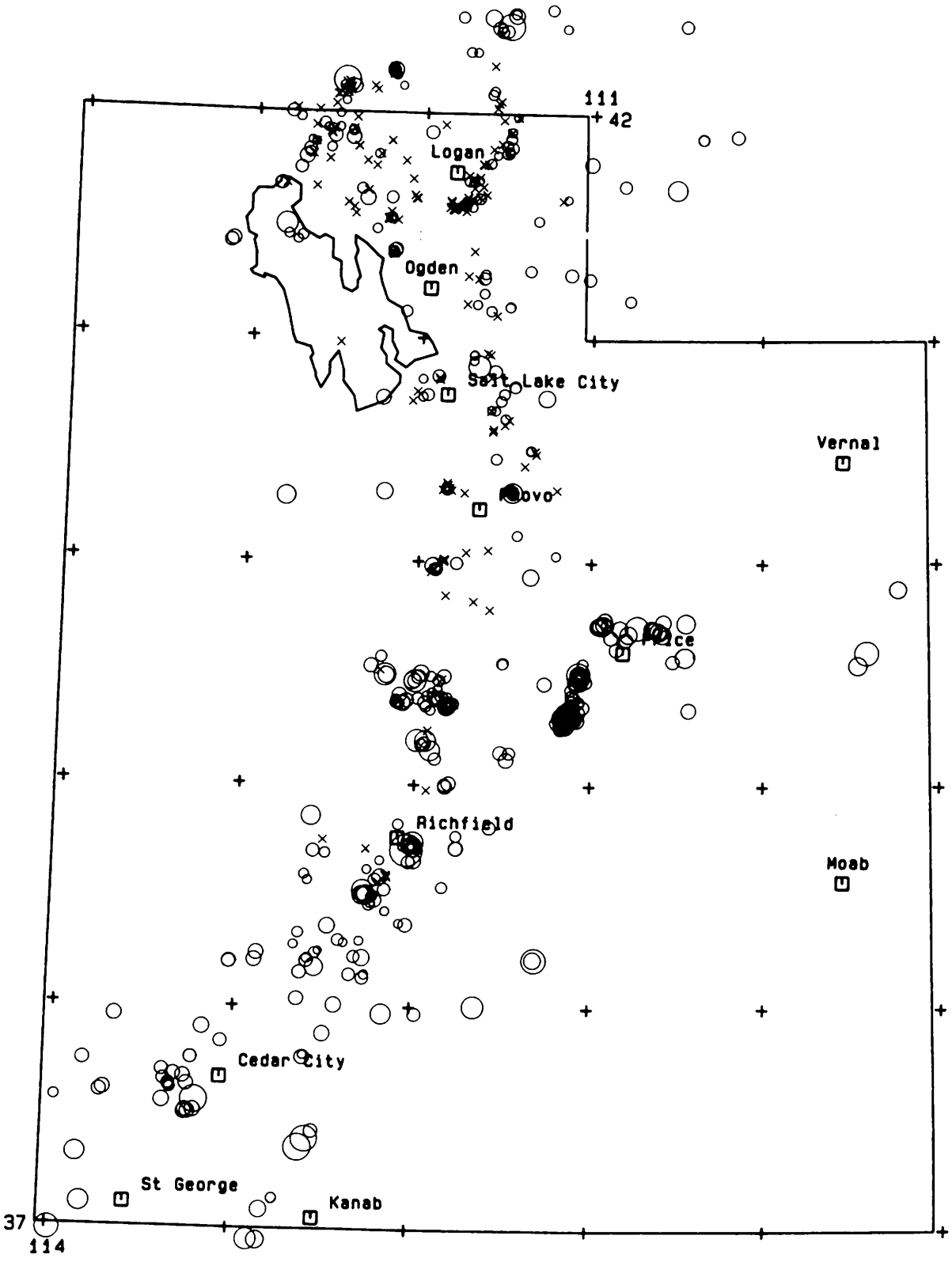

111
42
Logan
Ogden
Salt Lake City
Vernal
Provo
Price
Richfield
Moab
Cedar City
St George
Kanab
37
114
Utah Earthquakes: 1981
magnitude scale (ml):
0
50
100
km
6
4
2
1
<1.0

Figure 4



Utah Earthquakes: 1982

magnitude scale (ml):

0 50 100 km

6 4 2 1 <1.0

Figure 5

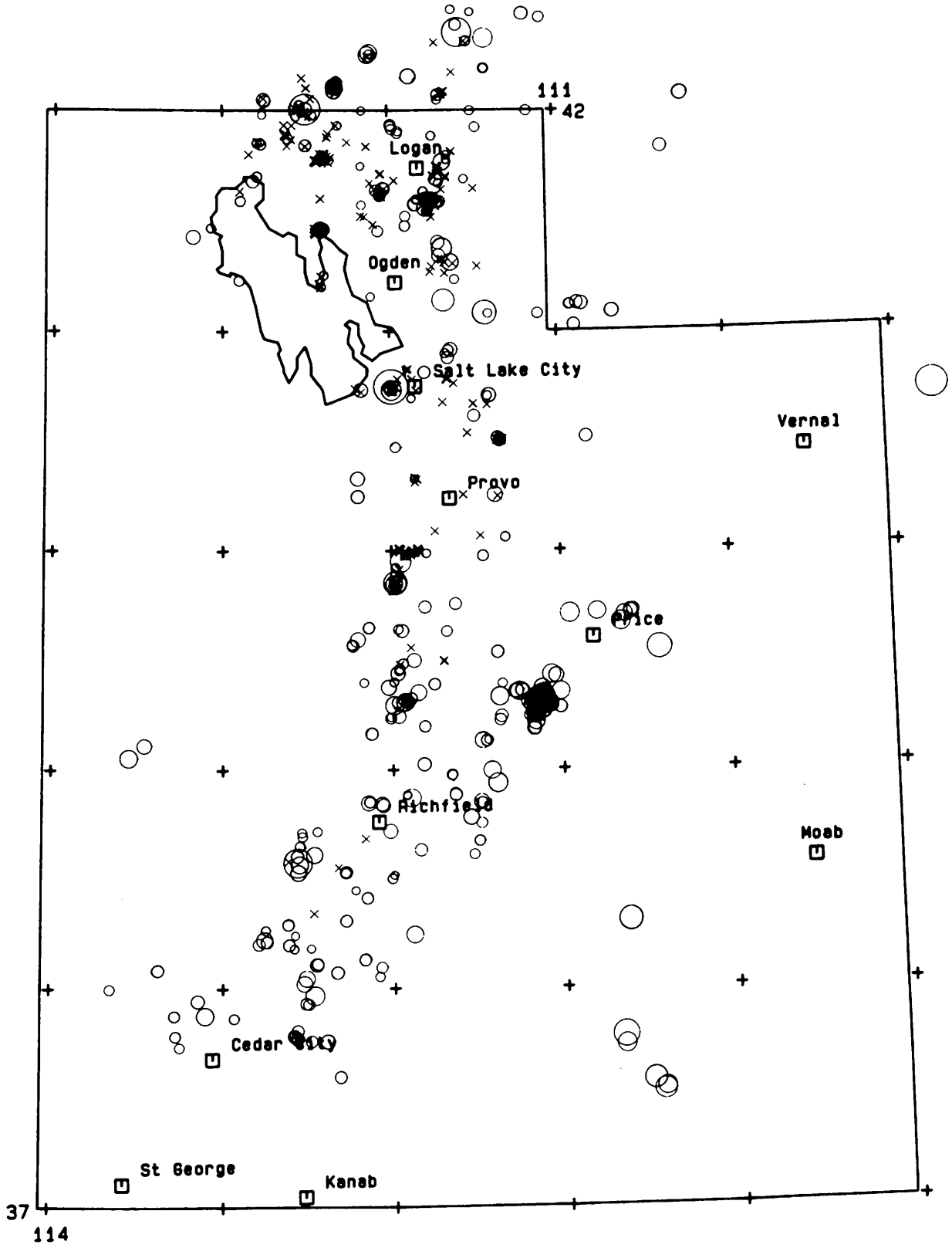

111
42
Logan
Ogden
Salt Lake City
Vernal
Provo
Price
Richfield
Moab
Cedar City
St George
Kanab
37
114
Utah Earthquakes: 1983
magnitude scale (ml):
0
50
100
km
6
4
2
1
<1.0

Figure 6

Table 4

UTAH REGION EARTHQUAKES: 1981-1983, MAGNITUDE 3.0 AND LARGER#

yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	116	1026 29.77	37-26.87	113- 6.61	1.4*	3.4W	21	115	25	.36
81	116	1450 45.92	37-27.10	113- 5.77	1.8*	3.3W	21	111	25	.48
81	201	221 47.67	37-33.82	113-15.83	1.4*	3.6W	26	114	21	.34
81	220	913 1.19	40-19.33	111-44.11	.7*	3.9W	32	110	19	.29
81	331	2040 45.51	41-41.42	111- 2.60	.1*	3.1W	37	143	32	.29
81	405	540 39.69	37-35.49	113-17.87	.8*	4.6W	24	149	22	.27
81	411	519 48.65	41-51.43	112-40.81	3.3*	3.0W	26	137	11	.19
81	411	808 2.32	41-51.53	112-40.58	.4*	3.1W	32	137	12	.24
81	514	511 4.34	39-28.86	111- 4.72	.7*	3.5W	27	133	58	.51
81	808	620 16.93	38- 3.23	112-48.12	1.4*	3.3	19	105	32	.24
81	921	801 33.51	39-35.48	110-25.47	1.6*	3.2W	15	229	49	.38
81	922	503 59.43	39-35.35	110-23.61	7.5*	3.0W	14	233	50	.42
81	1229	1139 21.22	41-53.42	112-33.46	2.1*	3.1W	33	130	19	.27
82	128	800 40.38	42-23.32	111-30.70	.1*	3.2W	22	89	37	.23
82	212	1044 12.69	37-24.38	112-34.40	1.6*	3.2W	29	86	52	.24
82	305	550 22.92	37-22.03	112-36.67	1.5*	3.3W	28	46	43	.44
82	417	600 12.46	38-13.09	111-18.16	8.7	3.0	18	132	2	.41
82	524	1213 26.56	38-42.50	112- 2.19	4.7*	4.0W	26	56	24	.41
82	823	458 22.97	37-34.32	113-12.09	2.8*	3.3W	15	179	135	.58
82	1224	1511 21.09	42- 8.57	112-29.43	.7*	3.3W	11	157	32	.36
83	127	2337 11.83	37-46.67	110-40.44	7.0*	3.3	22	194	65	.19
83	322	1112 35.06	39-32.78	110-25.32	1.6*	3.1	21	239	45	.43
83	503	1243 37.66	38-18.29	110-37.97	2.0*	3.0	36	115	59	.25
83	829	1253 11.45	41- 4.99	111-25.60	9.8*	3.0W	12	165	50	.24
83	924	1657 46.33	40-42.57	108-45.83	7.6*	3.9W	20	190	213	.63
83	1008	1157 53.83	40-44.88	111-59.56	5.5*	4.3W	30	66	15	.33
83	1119	350 46.93	42- .33	112-29.96	4.8*	3.8W	18	229	16	.24
83	1209	858 40.72	38-34.62	112-33.93	.2*	3.6W	26	94	34	.27
83	1211	740 45.69	42-21.10	111-34.16	5.6*	3.6W	20	98	58	.33

number of earthquakes = 29

* indicates poor depth control
W indicates Wood-Anderson data used for magnitude calculation
see Page 33 for data explanation

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EARTHQUAKE DATA FOR THE UTAH REGION

January 1981 - December 1983

(Explanation)

The following data are listed for each event:

1. Year (YR), date and origin time in Universal Coordinated Time (UTC). Subtract seven hours to convert to Mountain Standard Time (MST).

2. Earthquake location coordinates in degrees and minutes of north latitude (LAT-N) and west longitude (LONG-W), and depth in kilometers. "#" indicates poor depth resolution: no recording station within 10 km or twice the depth.

3. MAG, computed local magnitude for each earthquake. "W" indicates Wood-Anderson records were used.

4. NO, number of P and S readings used in solution.

5. GAP, largest azimuthal separation in degrees between recording stations used in the solution.

6. DMN, epicentral distance in kilometers to the closest station.

7. RMS, root-mean-square error in seconds of the travel-time residuals:

$$RMS = [\Sigma_i (W_i R_i)^2) / \Sigma_i (W_i)^2]^{1/2}$$

where:

R_i is the observed minus the computed arrival time for the i-th P or S reading,

W_i is the relative weight given to the i-th P or S arrival time (0.0 for no weight through 1.0 for full weight).

Utah Region Earthquakes: 1981-1983

yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	101	440 50.87	41-38.16	111-40.32	14.5	.7	14	82	10	.18
81	102	1720 23.22	37-37.45	113-13.59	1.3*	2.0	11	248	15	.23
81	102	2354 10.41	40-50.44	111-54.10	7.7*	1.1	13	121	21	.22
81	103	7 55.78	41-52.95	112-40.54	2.9*	.8	14	167	14	.24
81	104	125 55.23	41-45.66	111-25.56	5.0*	1.3	20	147	13	.32
81	105	1631 17.62	41-52.31	112-40.49	6.0*	.3	6	163	13	.17
81	105	1738 9.78	41-53.62	112-41.29	8.2	.5	8	176	14	.20
81	106	1925 9.38	41-54.38	112-40.20	2.4*	.8	20	173	16	.22
81	106	1931 34.67	41-53.78	112-39.44	2.9*	.6	9	165	16	.23
81	106	1947 .09	41-53.98	112-40.38	3.0*	.5	9	171	15	.25
81	106	2007 25.73	41-54.08	112-39.61	1.3*	1.5	31	167	16	.25
81	106	2051 1.92	41-51.68	112-39.32	11.0	.5	6	151	13	.20
81	107	1927 21.95	40-22.14	111-49.75	2.6*	1.1	27	100	23	.29
81	108	2350 53.53	41-49.96	112-40.73	10.9	.6	19	146	9	.30
81	110	1108 55.45	41-59.92	112-33.86	5.3*	1.1	23	156	16	.25
81	110	1513 2.24	42- 5.42	112-28.51	2.5	.2	6	184	7	.07
81	110	1742 14.35	39-24.41	111- 5.01	1.0*	1.8	10	228	54	.35
81	111	1052 24.91	41-53.17	112-39.36	5.2*	.2	6	161	15	.17
81	111	1141 30.66	41-54.65	112-40.07	3.0*	1.0	10	173	17	.42
81	112	1344 26.79	42-18.52	111-19.15	5.5*	2.0	19	269	39	.30
81	113	2328 25.30	41-33.54	112-20.68	4.7	.3	11	166	8	.22
81	115	1500 56.60	41-52.54	112-23.26	6.2	.9	25	89	7	.22
81	116	455 34.23	41-51.86	112-37.75	6.9*	.1	4	143	15	.05
81	116	1026 29.77	37-26.87	113- 6.61	1.4*	3.4W	21	115	25	.36
81	116	1138 29.27	37-30.70	113- 6.65	1.5*	2.5	19	154	18	.31
81	116	1207 41.66	37-31.62	113- 6.43	3.4*	2.1	14	202	16	.32
81	116	1413 56.45	37-29.78	113- 5.63	1.4*	2.1	18	154	20	.33
81	116	1450 45.92	37-27.10	113- 5.77	1.8*	3.3W	21	111	25	.48
81	116	1700 51.70	37-29.67	113- 6.11	1.4*	2.3	28	154	20	.33
81	116	2230 5.79	40-21.14	111-32.54	1.5*	1.3	30	129	25	.36
81	116	2341 11.60	37-29.84	113- 5.06	1.3*	2.0	23	154	19	.43
81	117	1607 2.55	41- 6.03	110-55.34	1.4*	1.5	15	293	63	.25
81	117	2233 22.05	37-31.74	113- 6.65	3.5*	1.9	29	202	16	.35
81	118	48 25.01	37-32.61	113- 6.96	3.4*	1.4	27	150	15	.44
81	118	556 21.68	37-32.20	113- 7.14	3.5*	2.1	25	201	16	.25
81	118	2113 17.32	41- 6.38	111-13.68	5.5*	1.2	22	179	36	.30
81	118	2345 50.10	40-56.62	111-30.42	6.2	.2	13	193	8	.20
81	119	1110 19.47	37-28.60	113- 5.61	1.7*	2.0	20	156	22	.32
81	119	1445 46.17	37-29.18	113- 6.04	1.4*	2.2	18	155	21	.31
81	120	24 33.53	40-57.08	111-29.17	5.8	.0	12	203	9	.15

Utah Region Earthquakes: 1981-1983

yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	120	123 51.84	37-29.46	113- 5.82	1.3*	2.3	19	154	20	.32
81	120	501 12.51	41-54.13	112-40.49	2.9*	.8	12	173	15	.22
81	120	1153 26.67	37-31.23	113- 6.45	1.5*	1.6	18	202	17	.43
81	120	1302 36.71	37-30.43	113- 5.60	.9*	1.4	16	203	18	.53
81	121	27 31.39	40-49.44	111-54.36	.3	1.1	27	55	9	.33
81	121	158 2.82	41-37.59	111-40.29	10.5	.3	8	123	11	.20
81	121	218 11.22	37-29.43	113- 9.99	3.0*	1.0	11	297	22	.22
81	121	653 25.21	37-29.07	113- 5.51	.8*	1.8	15	205	21	.27
81	122	837 16.92	37-58.96	112-58.23	5.2*	1.9	9	115	35	.25
81	122	2113 44.71	41-55.70	112-32.08	3.0*	.5	8	132	17	.16
81	123	433 41.84	39-59.30	111-53.74	4.4*	1.1	21	105	12	.35
81	123	844 18.07	39-59.46	111-54.53	2.8*	1.3	20	101	13	.35
81	123	1749 35.38	41- 2.68	111- 6.76	.2*	1.0	12	198	40	.41
81	124	1210 30.71	41-47.60	111-45.60	12.0	.4	10	143	1	.26
81	124	1515 .31	41-37.36	111- 4.32	21.4	.5	12	255	29	.13
81	126	1801 22.89	39-17.16	111-58.56	.1*	1.4	11	89	30	.37
81	129	2001 36.09	42- 5.24	112-31.09	2.6	.4	7	148	6	.12
81	201	221 47.67	37-33.82	113-15.83	1.4*	3.6W	26	114	21	.34
81	202	351 31.39	37-35.07	113-15.39	1.2*	1.5	12	195	19	.53
81	204	342 14.22	37-34.68	113-16.82	1.5*	2.6W	14	150	21	.34
81	204	601 22.33	42- 6.69	112-17.08	2.4*	1.3	25	167	16	.20
81	205	1432 44.95	37-33.52	113-15.81	1.6*	2.8W	15	117	21	.51
81	205	1435 42.71	37-34.48	113-15.81	1.3*	1.6	10	196	20	.41
81	206	102 47.89	40-48.81	111-57.18	.3*	1.0	19	137	12	.45
81	206	807 28.57	41-43.34	112- 5.13	2.0*	.6	13	111	16	.13
81	206	1257 4.86	38-46.34	111-31.91	3.6*	1.5	12	102	46	.37
81	207	11 .23	42- 3.83	112-27.50	4.7*	.6	17	179	10	.16
81	207	1018 30.76	41-41.97	111-41.67	1.9*	.8	10	139	11	.25
81	207	1525 43.88	41-41.66	111-41.28	1.6*	.1	11	142	10	.24
81	207	1552 42.53	38-46.27	111-32.54	1.6*	1.1	8	170	46	.23
81	209	1733 33.76	41-51.28	112-39.26	1.5*	1.6	27	148	13	.34
81	210	1247 49.07	39-16.64	111-10.82	6.5*	1.7	12	186	41	.38
81	211	1810 37.78	41-55.87	112-42.08	2.7*	1.0	15	192	17	.31
81	211	1950 16.28	41-46.46	111-42.88	13.9	.2	12	113	5	.23
81	212	416 26.01	41-25.32	113- 8.56	6.8*	1.1	18	242	86	.22
81	214	950 39.74	41-49.04	112-42.87	6.1	1.3	26	152	6	.23
81	217	1325 21.27	37-33.68	112-29.56	6.2*	1.5	9	216	52	.33
81	218	452 46.67	37-42.78	113-58.32	10.7*	1.3	5	182	47	.17
81	220	913 1.19	40-19.33	111-44.11	.7*	3.9W	32	110	19	.29
81	220	1549 10.66	42-28.94	111-28.16	7.6*	.9	12	298	48	.24

Utah Region Earthquakes: 1981-1983

yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	222	1559 48.59	42- 1.62	112-32.01	2.3*	.6	13	148	13	.21
81	223	449 13.81	39-13.63	110-32.14	9.8*	1.5	8	229	95	.40
81	223	922 59.44	41-44.72	111-41.72	7.5	.4	13	67	8	.29
81	224	1223 29.45	42- .39	112-32.34	6.5*	1.2	13	148	15	.31
81	224	1223 34.32	41-25.05	111-44.42	10.2	1.0	10	101	12	.38
81	226	1304 .62	41-18.82	111-39.37	18.2	.3	11	199	6	.14
81	227	819 14.15	38-31.16	112-10.95	4.8	.9	7	202	1	.34
81	227	1212 23.42	38-12.59	112-13.17	5.0*	1.4	10	126	34	.21
81	227	1453 19.04	39-58.53	111-42.20	1.6*	.9	11	106	12	.26
81	227	1557 54.21	37-36.16	113-14.47	1.3*	1.4	11	213	17	.29
81	301	1347 58.99	41-23.58	111-36.79	15.1	.2	9	177	11	.35
81	302	29 12.05	37-52.32	112-32.07	1.6*	1.9	12	106	51	.42
81	307	702 59.69	41-39.19	111-38.82	14.6	.8	14	75	8	.21
81	307	1335 54.99	41-38.76	111-39.22	9.6	.6	14	98	9	.17
81	307	1804 37.08	41-59.78	112-26.90	1.4*	.7	24	113	12	.20
81	307	2056 36.70	41- 4.90	110-39.82	.3*	1.7	21	260	65	.45
81	309	511 17.54	41-59.88	112-26.92	1.9*	.6	16	112	12	.09
81	309	907 29.53	38-33.92	111-43.83	1.0*	1.3	17	83	39	.39
81	309	1510 14.05	42- .08	112-26.72	3.7*	.6	9	148	12	.05
81	309	1530 43.08	41-46.05	112-35.57	6.0*	.3	16	117	15	.20
81	311	1358 .84	37-39.08	113-50.28	.1*	1.4	12	193	38	.45
81	311	1622 25.51	37-47.23	112-23.59	7.0*	1.8	8	130	75	.16
81	312	2057 48.94	38-54.27	111-53.00	8.9*	1.6	8	113	19	.13
81	314	341 37.43	37-55.77	112-29.31	7.0*	.9	16	177	57	.18
81	314	858 13.67	37-46.90	112-24.19	7.0*	1.1	25	118	59	.24
81	314	901 19.60	37-47.21	112-22.97	3.3*	1.7	25	117	61	.37
81	314	1824 36.48	37-47.66	112-23.64	1.4*	2.3	23	123	74	.34
81	314	1837 40.54	37-49.52	112-22.00	1.4*	1.1	18	193	73	.27
81	314	2314 48.49	37-48.01	112-22.83	1.5*	2.0	19	118	74	.25
81	315	316 26.76	37-47.96	112-23.62	7.0*	1.1	16	257	74	.21
81	316	34 7.38	37-55.76	112-29.13	1.5*	2.3	29	99	57	.45
81	316	52 33.11	39-21.13	111- 8.36	4.3*	1.6	10	129	47	.30
81	316	544 46.78	37-55.38	112-29.70	1.4*	1.7	29	169	57	.44
81	316	609 39.55	37-55.18	112-28.71	7.0*	1.7	20	170	58	.24
81	316	1939 18.37	38-14.13	112-59.23	.0*	.9	6	180	13	.12
81	318	636 43.07	37-55.65	112-28.93	5.3*	1.4	17	169	58	.22
81	318	638 10.44	37-55.43	112-28.83	5.3*	1.7	22	169	58	.24
81	318	1411 52.84	37-55.48	112-29.29	3.1*	1.4	18	117	58	.22
81	322	548 29.36	41-34.97	111-42.56	3.1*	.6	11	109	16	.18
81	322	637 52.48	41-35.12	111-41.56	11.5	.6	13	113	15	.16

Utah Region Earthquakes: 1981-1983

yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	323	148 18.55	38-19.76	112-53.49	9.4	.4	5	260	1	.01
81	323	949 42.80	41-53.35	112-21.60	7.0	.4	17	118	5	.11
81	324	657 14.81	41-53.08	112-35.48	2.4*	.6	15	138	19	.16
81	325	1616 48.92	38-14.27	112-38.11	10.3*	.9	7	243	25	.10
81	325	2335 51.37	40-55.16	110-51.44	1.4*	1.2	27	241	40	.45
81	326	2103 57.87	41-49.96	112-39.85	2.9*	.3	9	140	10	.23
81	326	2142 19.98	41-50.73	112-39.95	2.2*	.8	19	148	11	.39
81	327	215 46.13	41-52.29	112-40.84	2.2*	.9	21	165	12	.30
81	327	259 37.61	41-52.67	112-41.78	2.2*	.6	16	175	12	.48
81	327	1045 22.08	41-51.98	112-40.87	2.2*	1.1	16	164	12	.22
81	327	1110 50.57	41-52.33	112-41.18	1.7*	1.1	24	168	12	.24
81	328	1936 44.30	41-51.93	112-40.94	3.8*	1.0	22	164	12	.19
81	329	439 2.37	38-20.38	112-37.33	7.2*	.4	6	206	24	.02
81	329	706 57.26	37-55.12	112-29.04	1.9*	1.6	11	170	58	.16
81	331	2040 45.51	41-41.42	111- 2.60	.1*	3.1W	37	143	32	.29
81	331	2202 35.98	41-41.48	111- 2.30	.1*	1.9	27	143	33	.30
81	401	2117 23.05	41-53.01	112-41.21	1.8*	.6	13	172	13	.22
81	402	430 17.20	41-52.50	112-41.20	3.8*	1.4	21	169	12	.30
81	402	1932 48.94	39-28.70	111-51.01	.1*	1.2	9	145	29	.23
81	402	2013 46.71	41-52.65	112-27.87	6.6	.4	16	104	12	.09
81	402	2016 26.60	41-52.57	112-27.89	6.8	.3	16	104	13	.11
81	402	2017 32.18	41-52.51	112-28.20	2.3*	.1	10	105	13	.09
81	402	2048 55.77	42- 1.09	111-25.50	9.2	.6	11	182	17	.17
81	402	2121 50.76	41-52.84	112-28.03	4.3*	.3	13	105	12	.08
81	402	2253 48.80	41-52.38	112-27.76	7.5	1.0	27	103	13	.20
81	402	2258 38.31	41-52.31	112-28.01	6.0*	.7	19	104	13	.12
81	402	2312 34.28	41-52.86	112-27.67	7.7	.4	12	104	12	.12
81	402	2339 8.89	41-51.84	112-27.29	3.3*	1.4	28	100	12	.21
81	402	2344 28.20	41-52.73	112-26.86	.5*	1.3	29	101	11	.38
81	403	5 44.28	41-51.74	112-27.07	3.5*	2.4	27	99	12	.24
81	403	46 50.08	41-52.16	112-27.27	4.2*	.9	27	101	12	.25
81	403	118 10.22	41-52.41	112-27.88	5.2*	.4	15	104	13	.12
81	403	310 46.78	41-52.93	112-27.49	4.6*	.3	10	121	12	.08
81	403	1221 29.01	41-51.66	112-27.32	2.5*	1.7	24	99	13	.18
81	403	1513 25.94	41-52.19	112-27.80	4.7*	.6	23	103	13	.15
81	403	1616 57.49	41-52.59	112-28.08	6.6*	1.3	19	105	13	.13
81	403	1639 12.99	41-52.04	112-27.35	3.2*	1.5	28	101	12	.18
81	403	1814 29.22	41-52.18	112-27.76	7.2	1.1	18	103	13	.12
81	404	18 40.14	41-52.25	112-28.59	2.4*	.5	9	174	14	.13
81	404	1028 6.93	38-16.95	112-17.82	2.3*	1.3	11	181	27	.31

Utah Region Earthquakes: 1981-1983

yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	404	2158 28.27	41-54.08	112-41.74	2.2*	1.3	15	182	15	.17
81	404	2235 18.92	41-52.16	112-27.61	9.6	1.3	26	102	13	.12
81	404	2237 11.21	41-52.38	112-27.66	10.4	.1	10	124	12	.33
81	404	2344 45.85	41-52.16	112-27.59	7.0	1.8	30	102	13	.17
81	405	220 1.35	41-51.87	112-40.76	2.3*	1.8	26	161	12	.13
81	405	224 15.40	41-51.20	112-40.52	2.3*	.6	10	155	11	.22
81	405	230 3.20	41-52.58	112-41.59	2.5*	.9	12	172	12	.21
81	405	540 39.69	37-35.49	113-17.87	.8*	4.6W	24	149	22	.27
81	405	545 37.14	37-36.35	113-15.99	2.2*	1.9	24	194	19	.28
81	405	640 2.59	37-35.68	113-17.47	1.5*	2.0	12	157	21	.33
81	405	1052 35.01	37-35.67	113-16.55	1.5*	1.8	13	157	20	.43
81	406	520 46.07	41-52.46	112-28.23	6.2*	1.0	22	105	13	.13
81	406	523 21.93	41-52.25	112-28.50	2.5*	1.1	12	106	14	.19
81	406	534 37.27	41-52.36	112-27.67	6.5	.8	24	103	12	.17
81	406	1048 2.71	41-52.13	112-41.43	1.4*	1.8	29	144	12	.17
81	406	1206 29.28	41-51.92	112-41.85	5.6*	1.2	11	170	11	.22
81	406	1735 9.00	41-52.66	112-43.04	9.3	1.7	13	184	11	.22
81	406	1743 41.13	41-50.25	112-42.92	2.2	1.0	9	167	8	.31
81	406	2038 28.43	37-36.15	113-17.55	.3*	2.2	11	157	21	.41
81	407	850 38.51	41-16.14	111-41.45	12.6	1.5	32	114	5	.26
81	407	1337 31.94	41-52.21	112-42.01	6.0	.7	11	173	11	.29
81	407	1418 12.18	41-51.82	112-40.63	.3*	1.9	33	139	12	.21
81	407	1430 46.95	41-52.36	112-41.36	5.6*	1.4	25	169	12	.21
81	407	1436 2.18	41-52.25	112-42.07	8.4	.8	7	174	11	.06
81	407	1526 33.08	41-52.72	112-42.29	2.9*	.8	7	179	12	.29
81	407	1553 .55	38-11.14	112-24.34	7.0*	.8	6	262	41	.36
81	407	1603 51.29	41-52.58	112-41.52	4.4*	1.1	26	172	12	.35
81	407	1622 5.36	41-51.85	112-41.45	2.2*	2.1	28	143	11	.19
81	407	2111 45.70	37-35.71	113-18.18	2.1*	1.4	11	202	89	.34
81	408	1011 13.75	41-51.84	112-40.93	.3*	2.4	29	161	12	.25
81	408	1015 8.16	41-52.26	112-41.34	2.4*	.9	14	168	12	.15
81	408	1017 34.47	41-55.38	111-35.68	10.9	.8	13	117	19	.13
81	408	1854 47.10	39-28.64	112- 1.42	.3*	1.8	18	108	16	.39
81	408	2252 30.91	41-50.53	112-39.59	3.4*	.6	7	145	11	.12
81	408	2325 12.45	37-36.65	113-19.10	2.5*	1.3	9	201	88	.15
81	409	528 55.87	41-51.81	112-40.78	2.1*	1.4	24	161	12	.18
81	409	753 8.29	41-50.79	112-39.73	3.1*	.4	7	147	11	.16
81	409	754 56.93	41-49.03	112-40.92	13.7	.9	6	156	8	.09
81	409	1136 6.05	41-51.52	112-40.61	2.1*	1.1	21	159	11	.28
81	409	1152 53.43	41-52.39	112-27.49	6.8	1.6	20	102	12	.16

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	409	1154 47.89	41-52.13	112-27.81	1.4*	.9	22	103	13	.14
81	409	1437 35.05	41-47.85	112-37.44	7.3	.7	5	180	12	.10
81	409	1547 46.95	39-28.26	110-25.68	.1*	2.2	12	229	109	.32
81	409	1935 55.35	41-52.32	112-27.63	5.1*	.7	23	103	12	.18
81	409	2308 23.90	41-52.43	112-28.11	6.3*	.5	9	105	13	.09
81	409	2341 29.90	37-43.27	110-32.37	1.5*	2.7	17	112	49	.34
81	410	120 50.42	41-51.12	112-40.69	2.3*	.5	13	156	11	.25
81	410	1147 3.01	41-50.78	112-40.94	2.5*	.8	12	155	10	.28
81	410	1330 33.11	41-52.15	112-41.42	5.7*	1.4	21	168	12	.20
81	410	1343 27.19	37-35.08	113-15.83	2.9*	1.3	10	204	19	.40
81	410	1345 20.62	37-35.93	113-16.42	3.3*	1.4	14	203	20	.36
81	410	1352 2.57	37-36.17	113-16.20	3.7*	.9	13	202	19	.38
81	410	1655 24.49	41-52.41	112-41.90	3.5*	1.3	23	174	12	.20
81	410	1929 53.69	41-50.62	112-40.86	10.3	.6	5	153	10	.12
81	410	2210 36.27	41-51.91	112-40.63	1.5*	1.3	27	161	12	.33
81	410	2219 24.35	41-49.88	112-40.48	8.1	.7	8	144	10	.14
81	410	2258 18.32	41-49.51	112-40.61	12.4	.8	7	152	9	.09
81	411	509 57.31	41-51.94	112-40.69	.8*	1.5	25	162	12	.21
81	411	519 48.65	41-51.43	112-40.81	3.3*	3.0W	26	137	11	.19
81	411	531 26.65	41-52.20	112-41.71	2.9*	1.1	9	171	12	.14
81	411	532 52.15	41-51.61	112-41.29	5.6*	1.4	22	164	11	.18
81	411	539 36.03	41-51.99	112-41.62	1.6*	1.1	15	169	11	.23
81	411	541 11.82	41-51.13	112-41.02	2.4*	.9	13	158	11	.32
81	411	543 56.34	41-51.54	112-40.72	2.2*	1.1	17	159	11	.22
81	411	552 37.46	41-50.29	112-40.55	2.2*	.8	13	148	10	.29
81	411	626 11.24	38- 9.67	112-25.50	7.0*	1.2	8	208	45	.21
81	411	635 53.31	41-50.97	112-40.94	2.4*	.7	9	157	10	.24
81	411	737 57.81	37-34.76	113-15.99	1.6*	1.7	17	158	20	.31
81	411	803 20.73	41-51.97	112-40.86	4.0*	1.6	25	163	12	.14
81	411	808 2.32	41-51.53	112-40.58	.4*	3.1W	32	137	12	.24
81	411	811 51.28	41-51.58	112-40.83	1.9*	1.2	19	160	11	.20
81	411	824 44.76	41-52.04	112-41.26	2.2*	1.0	15	167	12	.14
81	411	831 36.03	41-51.80	112-41.12	3.4*	1.2	20	164	11	.13
81	411	905 28.16	41-52.08	112-41.52	3.8*	1.0	14	169	12	.14
81	411	911 23.48	41-51.62	112-40.78	1.8*	.5	17	160	11	.26
81	411	916 12.64	41-52.32	112-41.53	1.9*	.7	11	171	12	.10
81	411	1812 8.61	41-51.89	112-42.16	7.8	.9	12	172	11	.15
81	411	1918 40.25	41-50.55	112-40.48	2.9*	.6	8	150	10	.18
81	411	1925 44.75	41-48.69	112-40.84	12.9	.7	7	161	8	.13
81	411	2115 15.22	41-52.12	112-41.44	3.8*	1.4	19	168	12	.19

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81	411	2143 13.34	41-52.03	112-41.46	8.1	.5	6	168	11	.02
81	412	10 5.43	41-52.34	112-41.01	1.3*	1.3	18	164	12	.17
81	412	12 29.65	41-50.40	112-41.21	10.3	.4	7	154	9	.10
81	412	135 10.17	41-51.86	112-41.74	4.2*	.9	14	169	11	.24
81	412	136 47.32	41-52.39	112-41.60	4.0*	.9	11	171	12	.09
81	412	212 39.08	41-51.51	112-40.93	2.3*	.9	12	160	11	.16
81	412	532 35.68	41-50.58	112-40.97	1.3*	1.3	13	153	10	.29
81	412	1205 26.27	41-52.30	112-41.52	5.1*	1.1	16	171	12	.14
81	412	2223 25.45	38-39.49	112-31.59	7.4	.9	8	124	4	.43
81	413	104 29.48	39-27.40	111-54.53	2.2*	1.6	13	120	23	.38
81	413	259 58.79	37-35.03	113-15.71	4.2*	1.6	9	158	19	.62
81	413	416 54.55	37-36.22	113-14.83	3.8*	1.5	14	203	17	.50
81	413	524 41.94	37-34.98	113-15.93	3.7*	1.0	12	204	20	.45
81	414	0 59.61	39-32.97	112-10.50	3.8*	1.7	5	215	18	.27
81	414	1330 45.19	37-35.01	113-15.21	1.7*	1.4	13	204	19	.48
81	414	2042 14.72	41-51.94	112-27.42	5.1*	1.4	27	100	13	.20
81	415	646 8.12	37-39.35	113-18.16	6.2*	1.2	10	185	19	.34
81	415	2202 26.81	38-16.51	112-16.91	6.9*	.8	4	258	28	.08
81	417	1851 28.98	38-52.89	111-35.05	6.2*	.6	6	214	33	.29
81	417	2012 9.16	41-52.18	112-28.19	5.6*	.5	10	104	13	.10
81	418	240 57.83	41-52.81	112-28.16	4.0*	.6	10	122	13	.12
81	418	1119 37.09	37-35.36	113-15.82	2.1*	.9	14	211	19	.44
81	419	2359 54.67	42- 4.52	112-30.75	4.3	.7	8	216	8	.15
81	420	211 .69	41-51.78	112-41.29	4.4*	1.1	16	165	11	.17
81	420	1454 40.24	41-51.79	112-42.11	8.6	.9	9	171	11	.10
81	420	1629 35.53	42- 2.31	112-32.48	8.3	.2	6	154	12	.07
81	420	1647 25.34	41-50.32	112-43.02	2.1	1.0	13	168	8	.24
81	421	132 21.07	42- 1.87	112-32.64	2.4*	1.5	23	154	13	.32
81	422	1742 47.50	38-40.19	112-34.01	1.0	1.5	11	100	6	.35
81	422	1943 23.09	40- .72	111-49.46	.8*	1.6	23	120	13	.37
81	423	254 54.30	37-35.40	113-17.35	.4*	1.7	9	203	21	.41
81	423	346 32.12	42- 4.81	112-29.57	1.6	1.1	17	130	7	.14
81	423	626 44.74	37-35.57	113-17.28	.3*	1.6	6	203	89	.45
81	423	629 14.19	37-36.24	113-17.98	1.3*	2.9W	14	157	23	.64
81	423	632 18.72	37-35.63	113-16.22	2.5*	1.9	10	203	19	.33
81	423	756 46.81	37-36.20	113-15.40	2.5*	1.6	11	203	18	.45
81	424	106 59.81	39-19.02	111- 7.14	.8*	1.5	10	190	47	.49
81	425	1008 35.91	42-29.10	111- 2.60	3.2*	1.8	13	234	60	.24
81	427	1456 48.23	41-41.86	112-20.38	4.8*	.5	11	172	14	.25
81	430	1753 18.91	38-23.60	112-24.50	5.2*	.6	7	206	24	.11

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	430	2208 15.76	39-32.51	111- 4.71	2.3*	2.1	12	193	62	.30
81	502	1124 10.47	41- 4.23	111-10.87	5.4*	1.7	31	187	44	.30
81	502	2309 14.29	41-52.18	112-41.41	2.2*	1.0	17	168	12	.24
81	504	357 16.08	37-39.02	113-17.50	5.4*	1.8	13	152	19	.41
81	504	549 32.74	37-38.83	113-17.98	2.0*	1.8	13	187	19	.39
81	506	435 46.22	42-10.90	111-21.43	13.1*	1.1	10	258	26	.27
81	511	2237 57.46	38-23.97	112-24.68	2.4*	1.3	12	159	24	.23
81	513	1259 37.50	38-32.45	112-10.92	5.3*	1.2	6	134	32	.25
81	513	2226 42.26	41- 3.36	111- .56	.1*	1.1	8	213	45	.41
81	514	511 4.34	39-28.86	111- 4.72	.7*	3.5W	27	133	58	.51
81	514	1455 23.65	37-37.64	113-51.97	1.5*	1.4	11	205	41	.52
81	515	1611 9.90	38-30.80	111-56.09	10.7	1.2	8	135	20	.21
81	515	2157 33.14	41- 1.97	111- 5.76	1.3*	1.3	13	201	41	.42
81	517	505 52.30	38-28.45	111-51.93	2.9*	1.1	8	195	27	.29
81	517	1239 15.75	42- 8.45	112- 5.01	10.6	.7	18	93	13	.21
81	518	1655 10.50	38-45.19	111-33.05	2.9*	1.4	11	169	48	.28
81	521	453 44.79	39-41.96	111-53.22	1.3*	1.1	8	139	22	.32
81	521	547 40.76	41-19.69	111-45.34	10.0	.6	10	162	17	.22
81	525	2053 24.16	42- 2.58	112-30.53	3.2*	.4	6	220	11	.14
81	526	311 17.85	41-37.53	111-41.28	9.0	1.9	25	54	12	.19
81	526	315 53.98	41-37.68	111-40.90	10.4	1.1	17	59	12	.17
81	526	320 54.70	41-37.58	111-41.20	10.1	1.0	15	67	12	.17
81	526	324 .30	41-38.63	111-39.98	8.6	.5	12	87	10	.32
81	526	343 40.13	41-37.39	111-40.51	10.3	1.1	16	58	11	.19
81	526	423 57.19	41-37.59	111-40.58	10.2	1.4	22	58	11	.19
81	526	440 35.98	41-38.09	111-41.69	1.0*	1.8	30	53	12	.36
81	526	609 6.80	41-37.61	111-41.04	10.7	1.0	16	125	12	.19
81	526	721 49.61	41-37.48	111-41.21	7.8	1.3	18	59	12	.26
81	528	1833 5.06	41-58.15	112-36.17	2.9*	.7	10	164	21	.18
81	528	2243 38.99	41-32.20	112-12.40	6.1	1.1	23	73	6	.25
81	528	2311 38.35	41-32.58	112-12.77	6.3	.5	12	109	6	.21
81	528	2313 40.03	41-32.54	112-12.57	7.9	.6	12	106	6	.19
81	528	2320 37.82	41-32.50	112-12.38	8.6	.6	17	74	6	.17
81	529	309 2.23	36-49.72	110-22.48	1.2*	3.0	9	276	86	.33
81	530	151 39.05	38-23.90	112-24.54	5.8*	1.1	6	159	24	.01
81	530	1547 14.22	40-22.42	111-24.44	6.9	.8	11	223	11	.24
81	530	2330 34.14	40-41.94	111-29.98	.2*	1.4	17	89	23	.26
81	603	544 58.76	37-37.24	113-13.75	6.9*	1.3	5	247	26	.04
81	603	2220 55.86	38-15.32	112-31.89	1.4*	1.6	12	144	33	.24
81	608	144 27.59	38-27.70	111-52.04	5.7*	.9	16	143	25	.49

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81	609	120 5.44	42- 3.02	112-31.79	2.5*	.5	9	151	10	.14
81	609	1600 35.88	38-46.31	111-30.95	2.3*	2.2	26	103	47	.32
81	609	1643 16.45	41-28.43	112-49.98	7.4*	1.3	17	248	34	.15
81	609	1912 19.35	39-30.76	111-15.37	1.1*	2.8W	18	123	49	.24
81	610	1402 39.04	38-47.53	111-30.61	1.5*	1.4	19	178	38	.28
81	611	615 19.01	38-27.84	112- 9.31	8.3	.9	21	147	12	.22
81	611	629 16.58	37-44.40	113-11.88	9.8*	1.6	9	191	21	.21
81	612	1156 52.86	38-37.13	112-34.62	.6	.8	18	147	3	.26
81	616	1857 50.21	38-54.19	111-51.94	.2*	1.7	9	116	20	.27
81	617	1608 48.45	38-40.62	112-10.11	6.1	1.9	23	94	10	.22
81	618	944 15.74	41-45.71	111-39.34	12.2	.8	11	78	10	.10
81	622	1001 35.11	39-30.26	112-14.39	6.8*	1.1	8	156	15	.27
81	624	430 53.95	41-56.40	111-28.81	8.0*	1.1	19	135	20	.13
81	626	1729 20.54	41-51.06	112-23.80	8.0	.9	23	88	10	.25
81	626	1920 42.24	38-38.64	112- 9.94	1.5	.9	15	82	3	.25
81	626	2014 27.29	39-17.37	111- 7.67	.0*	1.5	10	111	45	.44
81	627	745 9.87	37-48.93	113- 6.96	.2*	1.9	10	97	16	.39
81	627	2248 38.65	41- 2.39	111- 3.60	1.3*	1.7	13	207	42	.39
81	630	327 14.25	41-56.76	112-38.85	6.3*	.7	15	175	21	.17
81	630	351 3.20	41-56.82	112-39.51	9.4*	1.1	20	179	20	.12
81	630	2309 45.52	38-38.97	112-10.33	.1	1.1	18	56	3	.13
81	701	1423 14.15	39- 5.27	112- 4.64	1.5*	1.6	14	87	13	.27
81	702	239 25.17	38-41.20	112-30.17	1.9	.6	8	156	8	.31
81	702	1420 21.50	38-45.54	111-30.76	3.6*	1.6	12	104	48	.40
81	702	1422 25.49	38-46.62	111-31.60	7.0*	1.1	7	102	46	.10
81	703	605 1.95	38-45.67	111-31.34	2.0*	1.7	10	174	48	.29
81	703	823 5.81	38-12.85	112-19.24	4.0*	.9	23	273	31	.18
81	705	817 5.77	39-23.60	111- 6.90	.6*	1.6	10	123	49	.39
81	705	928 43.34	37-18.82	113-19.61	1.8*	1.7	19	182	46	.48
81	706	401 52.85	39-41.99	110-54.62	.3*	1.8	14	203	84	.39
81	706	622 31.00	38-23.56	112-18.04	1.6*	.9	24	244	11	.19
81	706	646 11.46	38-24.17	112-17.67	2.1*	.7	21	242	10	.21
81	707	2240 27.40	38-35.63	112-44.08	1.6*	1.1	10	124	16	.24
81	708	1703 23.43	38-39.00	112- 9.44	.9	.6	17	93	3	.25
81	708	1853 28.94	38-48.13	111-54.95	5.2*	1.4	5	186	23	.21
81	711	503 12.96	38-11.69	112-15.31	4.9	1.2	21	213	5	.22
81	711	1120 16.81	40-27.44	113-11.71	6.1*	1.7	21	181	43	.19
81	711	1931 2.04	42- 8.18	111-13.92	6.3*	1.5	24	151	19	.31
81	711	1946 46.21	38-38.73	112- 9.71	.7	1.0	19	87	3	.32
81	712	1444 39.12	39-19.93	112- .60	3.9*	.8	6	185	14	.42

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	712	1447 52.69	38-42.94	112-32.16	4.8*	.8	24	185	10	.25
81	713	1940 38.08	38-40.83	112- 9.76	3.3	1.1	23	112	2	.28
81	714	1929 50.98	36-49.01	110-18.90	.1*	3.0	17	256	80	.42
81	716	113 16.89	42- 7.10	112-28.71	4.0	.6	11	154	4	.09
81	716	1826 43.44	38-45.33	112- 4.75	12.9	.9	21	149	12	.29
81	716	1851 58.59	38-45.47	112- 3.16	12.1	.6	18	203	9	.33
81	716	2050 4.17	38-45.02	112- 1.30	11.6	.5	14	204	11	.24
81	716	2135 45.25	38-44.94	112- 3.67	9.3	1.6	21	158	8	.25
81	717	1250 39.79	38-15.26	112-17.09	4.3	1.0	14	95	3	.12
81	717	1710 44.19	38-41.91	112- 8.54	2.8	1.3	23	80	1	.29
81	717	2027 24.63	42- 1.79	112-31.92	2.6*	.3	6	148	13	.06
81	719	437 24.48	42-23.27	111-30.90	2.5*	1.6	13	171	37	.12
81	719	621 57.59	42-22.92	111-31.13	3.1*	1.5	12	170	36	.11
81	720	2216 3.76	41-42.26	112-49.48	6.7	1.5	19	223	9	.24
81	723	316 56.93	38-28.19	112-48.38	6.1	1.1	9	126	5	.17
81	723	1215 27.47	38-28.25	112-48.63	6.8	.6	8	123	4	.12
81	723	1220 44.68	38-28.15	112-48.37	6.5	1.3	31	79	3	.11
81	727	526 5.70	38-29.20	112-48.52	.8	1.4	14	103	4	.43
81	727	658 6.71	38-28.81	112-48.34	6.8	.7	8	133	4	.15
81	727	1317 47.92	38-28.20	112-48.98	7.1	.4	7	152	4	.14
81	727	1338 52.15	38-28.11	112-48.89	7.1	.5	7	145	4	.13
81	729	658 5.37	37-46.24	112-39.79	6.9*	1.5	8	186	37	.25
81	729	1652 52.18	37- 7.53	113-36.67	1.4*	1.8	12	204	75	.36
81	730	205 7.87	39-48.37	113-44.37	2.8*	1.5	8	262	90	.36
81	730	1311 13.66	41-59.40	112-34.56	2.2*	.9	13	159	18	.12
81	730	1747 44.31	42-18.15	111-42.95	2.5*	1.5	11	262	21	.13
81	730	1825 37.54	38-46.41	111-31.75	4.9*	1.7	10	102	46	.21
81	731	1600 35.30	41-41.72	111-43.95	1.9*	1.4	9	100	12	.26
81	731	2050 2.62	41- 4.25	111-33.02	2.3*	1.5	15	133	21	.25
81	731	2119 56.38	38-41.79	111-33.61	7.0*	1.5	7	164	54	.27
81	802	2139 9.86	38-27.82	112-49.01	6.4	.8	7	154	4	.07
81	802	2141 34.81	38-27.47	112-50.12	5.2	.1	6	237	4	.03
81	804	926 9.77	38-30.56	112-11.58	5.0*	.9	10	180	32	.24
81	805	502 44.34	39-19.17	111- 6.47	.4*	1.9	15	100	45	.42
81	805	627 4.77	38-33.06	112-10.76	8.9	1.1	10	192	4	.12
81	806	1109 18.96	42- 2.43	111-25.81	7.7*	.9	11	192	18	.13
81	806	1111 55.47	42- 2.26	111-25.86	7.7*	1.0	10	191	18	.10
81	806	1133 35.46	42- 2.36	111-26.26	3.1*	.9	11	191	19	.23
81	806	2125 13.62	38- 4.77	112-47.68	1.3*	1.1	10	157	29	.28
81	807	17 28.15	39-21.86	112- 6.52	1.7	1.1	7	129	5	.43

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	807	332 55.24	38-36.00	112- 9.41	13.5	1.2	12	120	9	.22
81	807	1305 26.63	42- 3.61	111-25.64	5.0*	1.0	9	202	19	.32
81	807	1314 17.95	42- 2.71	111-26.02	3.8*	1.1	9	194	19	.20
81	807	1947 18.92	39-35.85	109-27.87	.0*	2.3	12	262	110	.24
81	807	2305 47.08	39-27.84	112- 1.11	.0*	1.6	14	79	44	.45
81	808	201 35.58	42- 1.36	112-32.21	2.2*	.8	9	149	13	.29
81	808	354 27.85	41-11.94	111-38.50	11.4	1.2	23	145	19	.31
81	808	612 48.19	38- 3.03	112-47.50	.0*	2.0	15	105	33	.25
81	808	620 16.93	38- 3.23	112-48.12	1.4*	3.3	19	105	32	.24
81	808	732 35.74	38- 3.39	112-46.57	1.4*	1.5	15	160	32	.16
81	808	1250 44.34	39-19.79	111- 3.02	4.6*	2.3	10	109	41	.38
81	808	1602 34.50	38-30.60	112-11.31	1.5	.8	11	141	1	.26
81	809	442 34.40	38-32.02	112- 8.70	1.6	.9	9	190	3	.38
81	809	613 11.44	38- 4.22	112-28.97	2.5*	1.7	13	168	56	.24
81	809	1153 34.40	39-20.39	111- 7.29	1.4*	1.8	12	100	47	.41
81	809	1601 18.80	38- 8.01	112-33.77	7.1*	.9	7	222	37	.53
81	809	1704 11.25	41-48.42	112-46.25	5.1	1.5	27	201	3	.28
81	811	233 42.02	38- 5.84	112-47.84	3.2*	1.3	11	168	27	.33
81	811	300 4.08	38- 9.28	112-45.16	13.6	1.4	12	121	23	.30
81	811	1416 35.14	38- 2.31	112-47.25	1.3*	2.2	11	130	34	.38
81	811	2032 44.72	38- 2.79	112-46.92	7.2*	1.6	9	199	33	.10
81	811	2041 40.72	38-56.16	112-56.74	1.8*	1.0	9	137	47	.21
81	812	706 56.79	41-52.95	112-56.47	6.2*	1.1	10	279	17	.23
81	812	1520 29.76	39-15.54	111-58.58	1.5*	1.6	8	99	29	.15
81	812	1812 47.91	38-19.99	112-13.60	11.6	1.3	8	171	20	.16
81	812	1921 37.36	38- 5.12	112-47.47	.9*	1.9	12	125	29	.49
81	812	2035 41.47	38- 3.85	112-47.44	16.4	2.1	15	77	31	.25
81	813	433 1.01	38-37.47	112-10.25	2.0*	1.2	10	127	12	.12
81	813	642 22.18	38-35.42	112-10.52	4.0*	1.3	8	127	31	.18
81	813	1300 16.61	38-37.51	112- 8.82	6.1*	.8	7	213	12	.10
81	813	1840 54.09	37-38.01	112-28.45	7.1*	1.5	12	224	86	.28
81	813	2059 24.87	38-17.61	112-16.30	5.8*	1.1	8	256	25	.09
81	813	2126 59.55	41- 6.16	110-31.40	1.1*	1.8	15	226	75	.32
81	814	448 59.22	41-59.19	112-32.17	1.9*	.8	12	143	17	.10
81	814	1819 8.19	39-20.16	111- 7.75	3.0*	1.9	14	98	47	.38
81	814	2352 33.03	38- 4.27	112-47.73	1.6*	1.5	11	158	30	.22
81	815	133 43.84	40-28.91	110-54.08	1.4*	1.1	18	195	31	.36
81	815	1754 30.87	38-10.61	112-37.26	9.4*	1.2	8	260	30	.15
81	816	2111 42.53	41-45.53	112-27.15	2.2*	.7	14	101	21	.36
81	819	255 1.59	42- .47	112-25.59	1.8*	.2	8	191	12	.16

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	819	759 16.44	41-51.44	112-23.30	6.5	.6	16	128	9	.07
81	819	838 44.98	39-33.35	110-27.56	6.9*	1.8	10	225	44	.23
81	819	1810 27.90	39-27.80	112- 1.22	2.0*	1.6	18	102	44	.46
81	820	2235 19.88	40-22.75	111-56.30	2.3*	1.6	27	82	26	.38
81	820	2239 41.30	40-49.91	110-59.00	.4*	1.3	13	229	26	.32
81	821	1827 11.79	41-58.94	112-34.28	3.7*	.4	9	156	18	.12
81	822	330 57.75	41-40.92	112-22.94	5.5*	1.0	17	105	15	.17
81	823	1516 .78	39-33.66	110-28.75	.9*	1.8	16	215	44	.52
81	823	1856 34.93	42- 1.18	111-52.83	2.5*	.9	15	123	13	.16
81	824	51 24.61	39-43.09	112-12.02	4.0*	1.2	8	210	28	.50
81	824	926 3.58	42- .35	112-29.42	2.3*	.3	10	128	15	.15
81	824	1922 55.73	41-59.73	112-32.05	5.2*	1.3	19	144	16	.22
81	824	2252 57.28	40-51.44	111-31.20	14.0	.4	7	160	2	.15
81	825	1412 16.46	39-17.83	111- 7.37	.4*	1.5	12	110	45	.47
81	825	1949 28.46	39-40.82	111- 9.04	1.9*	1.5	13	83	16	.45
81	827	822 56.80	41-50.93	112-43.46	.2	.7	15	178	8	.26
81	827	909 7.30	41-50.39	112-42.68	2.2	.9	12	166	8	.20
81	827	1744 26.01	40-32.45	112- 9.14	2.2*	1.0	19	95	15	.41
81	827	1901 52.26	37-37.70	112-26.26	2.1*	2.0	12	136	88	.25
81	827	2014 11.44	38-47.55	110-42.41	6.6*	1.6	8	208	42	.40
81	828	237 42.33	37-51.33	112-55.81	1.3*	1.5	12	186	45	.40
81	828	243 30.87	37-51.29	112-56.28	1.3*	1.4	12	186	44	.25
81	828	2119 8.40	37-50.62	112-55.56	1.6*	2.5	10	132	45	.21
81	828	2125 30.21	37-51.14	112-54.99	1.8*	1.5	12	132	46	.33
81	829	443 50.44	38-22.09	112-47.55	7.7	.5	7	211	10	.11
81	829	1902 8.79	40-49.35	111- 2.72	.2*	1.3	14	230	22	.40
81	829	1920 3.59	39-28.36	111-58.62	.5*	1.5	8	120	43	.38
81	829	1936 7.12	41-59.47	112-31.96	2.2*	.4	11	142	17	.24
81	831	2316 5.03	36-46.99	112-53.78	1.4*	2.0	11	221	117	.62
81	901	655 53.33	38- 2.68	112-29.10	6.5*	1.8	14	106	58	.24
81	902	1538 49.60	39- 3.30	111-29.26	3.5*	1.7	12	94	76	.28
81	902	2035 21.65	40-27.45	112-19.72	.3*	1.5	8	209	49	.43
81	902	2044 14.96	39- .03	111-49.86	2.5*	1.6	8	114	25	.17
81	902	2342 44.44	39-26.40	111- 2.55	1.3*	1.5	14	122	35	.31
81	903	1956 39.48	38-29.06	112- 8.51	9.9	1.0	8	158	4	.23
81	904	1717 42.99	39-27.55	111-59.21	8.6*	1.6	9	116	42	.17
81	904	2324 52.46	39-17.46	111- 6.01	8.8*	1.4	8	123	43	.41
81	906	26 24.28	41-56.59	112-40.67	2.9*	.6	10	186	19	.43
81	906	1507 20.09	42- 4.17	111-55.99	2.3*	1.1	16	181	16	.19
81	906	2333 24.19	42- 4.11	111-55.56	2.3*	1.9	23	102	17	.16

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	907	1555 8.77	38-46.13	111-33.71	2.3*	1.5	13	98	46	.36
81	908	258 26.14	38-59.87	111-29.06	5.7*	1.6	10	94	24	.31
81	909	1921 8.34	38-54.17	110-39.40	2.3*	1.5	11	109	30	.25
81	909	2309 22.79	41-50.32	111-43.96	11.6	1.0	24	129	4	.17
81	910	755 9.67	37-29.71	110-33.68	1.5*	2.9	26	142	50	.35
81	910	1702 20.69	42- 6.05	112-30.19	2.3	.8	16	134	5	.24
81	912	840 45.28	38-57.95	111-51.63	8.0*	1.3	11	113	19	.31
81	912	1758 7.44	41-47.50	112-20.80	7.4	.6	22	81	8	.24
81	913	1916 57.60	41-51.59	111-43.67	11.0	.6	11	156	6	.15
81	914	249 13.18	39- 2.66	111-30.24	.8*	1.8	17	90	19	.35
81	914	540 31.69	39-50.16	111-48.60	8.2	.7	5	287	6	.03
81	914	655 19.30	39-58.20	111-57.42	2.7*	.3	4	140	10	.03
81	915	1234 17.08	42- .90	112-32.70	2.8*	.4	11	151	14	.13
81	915	1641 11.23	41-42.42	111-43.75	2.2*	1.2	8	96	11	.19
81	915	2035 .39	42-10.69	111-34.38	8.8*	1.4	18	223	18	.28
81	917	902 38.38	42- .92	112-33.17	2.3*	.7	17	155	14	.23
81	918	918 45.67	39-19.99	111- 6.42	7.9*	1.6	9	101	45	.16
81	919	559 54.99	39-19.15	111- 6.32	.3*	1.5	7	147	44	.29
81	919	1029 49.13	39-20.44	111- 7.29	3.8*	1.6	10	100	47	.31
81	921	801 33.51	39-35.48	110-25.47	1.6*	3.2W	15	229	49	.38
81	921	1200 47.62	41-47.03	112-21.63	7.4	.3	13	157	10	.15
81	921	1203 59.29	38-43.04	112-27.32	3.5*	1.4	18	82	13	.35
81	922	503 59.43	39-35.35	110-23.61	7.5*	3.0W	14	233	50	.42
81	925	1005 51.07	39-20.70	111- 8.21	4.3*	1.7	9	98	47	.30
81	926	141 3.46	41-32.82	112-12.01	1.6	1.1	20	96	6	.27
81	926	1853 33.36	39-17.92	111- 6.96	3.7*	1.5	10	143	45	.38
81	927	1244 57.41	39-19.76	111- 6.57	3.7*	1.9	13	100	45	.34
81	927	1434 13.42	39-18.42	111- 7.32	4.3*	1.6	10	124	45	.22
81	929	11 43.99	41-39.35	111-46.06	4.6*	1.1	17	90	16	.18
81	929	2100 33.47	37-33.60	113-16.42	1.0*	1.6	12	206	29	.41
81	930	234 46.25	38-41.06	112-12.48	2.9*	1.1	7	122	19	.14
81	930	253 45.46	39-18.02	111- 6.31	5.7*	1.7	8	98	44	.28
81	930	433 15.29	39-19.63	111- 2.00	13.1*	2.1	6	111	39	.28
81	930	851 55.25	37-25.72	112-43.03	6.9*	1.7	9	222	75	.32
81	1002	1059 47.34	40- .30	111-54.33	.8*	1.3	17	77	10	.39
81	1002	1103 46.31	40- .25	111-53.82	2.1	.8	5	142	9	.08
81	1002	1533 19.66	40- .37	111-53.67	8.3	.3	5	143	9	.07
81	1002	1956 27.34	37-43.93	112-52.71	6.7*	1.9	7	124	17	.80
81	1003	1213 37.75	41-49.31	112-38.94	4.9*	1.0	14	130	11	.19
81	1004	2257 38.96	37-47.44	113- 3.51	1.2*	1.8	14	82	12	.44

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	1005	2226 22.79	41-48.38	111- 3.22	4.1*	1.3	6	267	22	.16
81	1006	1604 41.74	41-53.92	112-33.16	3.9*	.3	9	130	19	.07
81	1006	1640 46.51	41-54.13	112-33.26	1.5*	.6	20	132	19	.16
81	1007	1719 20.02	38-32.08	112-10.49	1.6	.8	8	188	2	.18
81	1007	2243 14.54	39-41.06	111-10.56	7.1*	1.2	7	196	57	.24
81	1009	544 17.56	41-36.17	112- 6.24	11.0	1.1	25	44	11	.22
81	1012	106 54.81	42- 2.70	112-31.00	3.7*	1.9	35	144	11	.22
81	1012	215 11.67	40-21.92	111-53.87	1.3*	1.1	23	122	25	.28
81	1012	1041 2.22	41-44.04	111-41.33	9.5	1.1	15	94	10	.20
81	1012	2223 18.35	39-43.09	111-56.84	2.8*	1.7	10	135	28	.19
81	1012	2346 .37	39-43.47	111-56.69	.4*	1.6	11	134	22	.41
81	1013	115 49.05	39-19.70	111- 6.63	6.0*	1.5	9	199	48	.20
81	1013	142 28.85	40-43.39	111-37.41	5.8*	1.2	18	77	16	.40
81	1013	1925 11.65	39-35.38	112-12.87	2.2*	1.3	6	127	42	.29
81	1014	2312 44.94	38-20.04	112-31.04	7.3*	1.7	8	195	31	.12
81	1015	1415 56.61	39- 1.24	111-31.04	3.1*	1.7	14	167	80	.51
81	1016	1937 45.43	37-33.17	113-52.56	1.7*	2.1	14	168	46	.23
81	1019	1919 25.11	38-13.73	112-20.40	6.9*	.7	8	205	34	.14
81	1022	1528 15.33	40-29.77	112- 7.98	5.8*	1.3	9	195	53	.25
81	1024	18 1.54	40-21.54	112-18.81	7.0*	1.5	8	267	49	.11
81	1024	1154 15.86	38-30.24	112-48.19	1.4	1.0	11	148	5	.27
81	1024	1806 53.79	38-31.79	112-48.63	2.6	1.0	5	179	6	.13
81	1026	408 55.50	38-32.38	112-11.00	1.7	1.1	5	190	3	.10
81	1027	1700 59.28	38-18.71	112-15.90	7.0*	1.1	8	191	41	.14
81	1029	100 25.89	39-27.76	112- 5.92	1.4*	2.0	10	125	54	.34
81	1030	1157 .40	39-18.18	111-52.64	7.7*	1.1	13	155	41	.25
81	1030	1231 3.33	39-18.34	111-55.11	1.7*	1.5	16	82	40	.21
81	1030	1238 53.99	39-17.93	111-51.80	6.4*	1.5	17	96	41	.25
81	1031	1815 32.48	37-49.85	112-54.96	.6*	1.3	12	145	21	.42
81	1101	37 9.73	37-44.65	113-48.52	5.0*	1.2	6	179	32	.17
81	1101	1239 49.24	38-44.01	112-26.94	1.5*	1.0	9	123	14	.47
81	1102	333 17.11	41-58.94	112-31.49	2.9*	1.1	10	138	17	.41
81	1102	627 30.13	39-28.66	111- 3.86	2.9*	1.8	9	120	31	.15
81	1102	2148 22.84	41- 6.76	111-32.21	4.8*	1.2	12	148	26	.25
81	1102	2253 34.63	40-45.41	111-30.71	8.8	.7	6	171	13	.26
81	1103	926 58.30	41-15.00	111-37.23	13.6	.6	10	147	25	.18
81	1103	1041 51.19	39-55.64	111-44.90	5.9	.7	6	203	5	.17
81	1104	1605 58.42	38-33.89	112-10.41	4.1*	1.3	6	145	32	.05
81	1105	747 13.64	38-30.01	112-12.33	1.6	1.1	8	157	3	.23
81	1105	1941 21.05	39-27.14	112- 1.74	1.0*	1.3	9	134	56	.27

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	1105	2317 34.07	39-43.86	110-51.93	1.5*	1.8	12	187	11	.55
81	1106	255 30.77	41- 6.62	111-32.78	9.7*	1.1	17	156	26	.22
81	1108	1056 40.04	39-37.18	112-10.02	2.5*	1.7	21	76	32	.26
81	1108	1453 30.36	41-57.74	112-27.41	4.3*	.6	18	114	11	.26
81	1108	2052 30.40	38-29.48	112-11.85	2.1	.6	8	158	3	.28
81	1109	1800 28.18	41- 3.50	111-10.72	5.8*	1.0	12	187	36	.28
81	1109	1928 25.12	39-25.31	111- .80	18.1*	1.2	7	144	43	.12
81	1110	314 20.88	39-19.07	111- 7.53	2.9*	2.3	8	120	46	.49
81	1110	2139 24.69	41- 4.97	111-33.39	6.1*	1.4	21	133	23	.22
81	1112	1902 46.48	38-34.26	112-22.96	8.0	1.6	5	149	14	.22
81	1114	38 7.79	39-29.06	111- 3.27	.0*	1.5	14	138	45	.37
81	1114	805 5.13	39-26.72	110-24.40	1.7*	2.2	10	244	98	.29
81	1115	126 36.86	37- 5.57	113-35.45	1.3*	1.4	10	210	78	.51
81	1115	2037 46.48	42- 2.83	112-30.76	1.4*	1.2	28	141	11	.24
81	1115	2041 11.46	42- 3.03	112-30.70	2.8*	.6	14	142	10	.19
81	1116	157 52.90	42- 2.36	112-31.19	2.4*	1.3	23	143	12	.23
81	1116	432 49.01	36-57.87	112-31.48	.9*	1.8	10	207	122	.38
81	1116	534 25.20	42- 2.82	112-30.52	6.5	2.2	26	139	11	.25
81	1116	720 1.89	38-11.62	112-13.08	7.0*	1.4	7	158	35	.45
81	1116	757 54.75	42- 3.17	112-31.24	8.1	1.0	12	146	10	.13
81	1116	1215 32.77	38-10.19	112-16.20	1.3*	1.4	8	163	39	.32
81	1117	308 13.68	39-19.24	111- 6.58	1.4*	1.8	12	114	36	.41
81	1117	1257 56.41	39-19.95	111- 8.98	.4*	1.6	14	188	33	.36
81	1119	1718 30.00	39-27.73	111- 5.52	4.0*	1.5	13	192	41	.26
81	1120	712 25.65	41-58.36	112-30.35	2.4*	.5	8	130	15	.21
81	1120	856 1.98	41-58.87	111-47.10	2.2*	1.1	13	93	15	.24
81	1121	728 39.49	39-18.45	111- 7.07	1.6*	1.7	10	120	36	.53
81	1121	1658 6.01	42- 3.03	112-30.05	3.0*	1.5	23	136	10	.28
81	1122	1725 7.78	38-15.96	112-34.49	7.0*	.9	9	209	35	.25
81	1123	24 27.06	39- 1.13	110-36.35	6.1*	1.8	11	165	94	.32
81	1123	241 26.82	38- 3.12	113-32.67	1.5*	1.6	10	102	30	.32
81	1123	1603 1.91	39-54.73	111-40.31	4.1*	.9	5	289	10	.19
81	1124	550 54.10	42- .23	112-32.36	6.7*	1.3	18	147	16	.15
81	1130	1724 15.20	38-42.68	112-34.41	3.9*	1.0	6	168	10	.29
81	1130	1727 1.23	38-42.02	112-32.45	.3	2.0	11	77	9	.30
81	1201	551 5.58	38-30.28	112- 9.60	3.4	1.0	8	155	1	.31
81	1201	1339 11.27	37-19.07	113-18.45	1.2*	1.6	12	224	45	.62
81	1202	540 22.10	40-51.39	111-29.38	10.8	1.0	6	235	4	.18
81	1202	836 18.19	42-13.22	111-35.21	9.9	1.1	12	250	19	.19
81	1202	1343 12.92	40-42.15	111-36.51	2.9*	.4	7	111	17	.10

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
81	1202	2121 16.12	37-12.56	113-36.55	.4*	2.0	10	233	70	.51
81	1203	2108 28.17	38-37.43	112-10.10	11.9	1.0	12	73	12	.28
81	1205	315 8.36	38-27.17	112-15.62	2.1*	1.2	11	167	10	.18
81	1205	2243 19.84	38-35.04	112-10.41	10.9	1.0	9	110	7	.12
81	1207	911 23.13	41-58.90	112- 3.22	2.3	1.0	13	105	7	.32
81	1209	1836 34.92	40-43.66	111-48.63	7.1	1.0	14	114	5	.42
81	1209	1901 28.01	38-31.07	112- 9.95	4.8	.8	7	185	0	.16
81	1209	1915 47.67	42- 7.76	112-29.24	6.2	1.3	28	96	3	.30
81	1210	531 54.62	38-48.80	112- 6.79	3.2*	1.2	7	127	17	.10
81	1210	539 8.31	38-48.89	112- 7.62	4.1*	1.2	6	131	17	.12
81	1210	946 18.60	38-32.26	112- 9.23	1.5	1.0	10	136	3	.31
81	1210	1552 48.58	38-33.13	112- 8.66	1.8	1.1	7	194	5	.12
81	1211	559 19.59	39-29.15	111- 4.49	2.2*	1.8	14	118	31	.30
81	1211	2131 6.11	38-28.61	112-10.25	1.7	.2	7	163	4	.35
81	1213	1946 9.77	38-53.72	111-27.74	1.4*	1.6	12	102	47	.32
81	1214	721 51.55	41-36.48	111-41.38	5.5*	1.0	17	63	13	.40
81	1215	509 52.62	41-24.05	112-47.88	6.2*	1.4	24	181	32	.18
81	1215	1657 23.01	41-51.46	111-44.03	6.2	1.4	21	81	6	.41
81	1217	1047 43.36	40-19.48	111-37.89	.5*	2.0	37	101	24	.43
81	1218	2109 15.23	39-27.57	111- 5.74	4.7*	1.5	11	134	41	.36
81	1220	1707 4.66	42- .98	112-32.69	2.2*	.9	20	152	14	.27
81	1221	2344 41.97	41-39.85	111-45.92	7.0	.5	8	155	9	.07
81	1222	720 15.18	42- 1.14	112-31.98	2.0*	.9	23	147	14	.25
81	1223	1008 19.03	39-54.08	111-50.34	1.4	1.3	10	96	4	.31
81	1225	951 12.92	38-40.57	112-31.91	1.9	1.2	12	121	6	.43
81	1226	201 6.17	41-26.33	112-35.14	3.1*	1.8	30	150	15	.27
81	1226	206 52.15	41-26.42	112-34.08	5.9*	1.2	17	191	14	.20
81	1226	954 34.16	41-54.16	112-34.28	2.5*	1.0	16	138	20	.22
81	1226	1450 16.34	41-29.43	111-41.86	2.5*	1.3	18	153	24	.29
81	1227	735 16.96	40- 1.24	111-52.51	3.8	1.1	4	142	7	.19
81	1227	740 21.20	40- 1.37	111-52.08	2.6	.7	5	138	6	.07
81	1227	743 37.64	40- 2.94	111-50.71	7.4	1.5	15	125	3	.23
81	1229	403 4.33	41-53.85	112-33.62	6.4*	2.8W	29	133	19	.20
81	1229	1139 21.22	41-53.42	112-33.46	2.1*	3.1W	33	130	19	.27
81	1230	657 15.95	41-54.44	112-34.03	6.5*	1.4	25	137	20	.21
81	1230	946 53.40	41-53.82	112-33.63	7.6*	1.4	28	133	19	.17
81	1230	1539 57.40	38-15.57	112-30.04	6.9*	2.0	15	84	40	.54
82	102	1926 54.51	38-14.55	112-32.73	4.6*	1.4	11	170	38	.19
82	107	1621 45.41	36-56.99	112-53.10	9.7	2.6	26	107	9	.57
82	107	1631 21.25	37- 5.03	112-49.09	.2	2.0	15	90	7	.63

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	110	1911 33.36	38-39.64	112-11.25	3.2*	1.1	7	112	16	.10
82	110	2142 24.03	41-53.71	112-33.05	1.1*	1.7	28	178	19	.27
82	111	236 .31	38- 7.88	112-16.26	7.0*	1.5	8	167	43	.37
82	113	1707 32.60	42-27.86	111-15.85	7.6*	1.4	13	206	56	.37
82	114	846 30.16	38- 8.80	112-15.75	7.1*	1.1	9	205	57	.19
82	118	1054 29.53	38-10.66	112-32.83	3.2*	2.3	19	105	44	.23
82	118	2152 43.36	41-31.61	111-19.93	19.8	1.2	12	177	14	.22
82	121	526 14.89	41-55.25	111-29.91	2.2*	1.1	16	126	22	.26
82	121	1130 36.39	38-33.78	112-11.65	6.5	.5	6	195	5	.13
82	121	1142 35.35	39-17.76	111-10.15	1.0*	1.7	15	187	31	.59
82	121	2346 19.38	38-17.36	112-23.02	7.2*	1.1	6	197	30	.18
82	122	1137 38.59	37-50.37	113- 3.75	9.6*	1.6	8	278	74	.06
82	122	1614 3.66	40- 1.88	111-12.56	1.5*	1.1	18	152	42	.32
82	124	644 23.95	42- 3.09	112-29.41	6.1	1.0	18	167	10	.26
82	125	122 9.34	41-54.23	112-34.17	3.0*	.9	16	191	20	.16
82	128	800 40.38	42-23.32	111-30.70	.1*	3.2W	22	89	37	.23
82	129	130 44.27	39-19.50	111- 7.31	1.7*	2.5	8	122	35	.35
82	129	1209 49.19	39-29.69	112-10.88	5.9*	2.7W	32	66	30	.30
82	129	1229 14.02	39-29.58	112-10.42	5.7*	2.0	17	66	29	.18
82	201	1033 5.80	40-19.54	111-12.35	1.5*	.4	9	291	10	.19
82	204	110 39.02	39-27.92	111- 5.26	2.2*	1.6	11	133	42	.29
82	206	541 40.41	39-28.74	111- 3.96	1.5*	1.9	14	136	44	.39
82	206	549 43.88	42- 6.19	112-18.15	3.8*	.6	23	162	16	.18
82	210	1437 26.21	41-55.20	111-29.81	2.7*	1.0	12	125	22	.15
82	210	1542 47.51	41-54.98	111-30.18	3.2*	1.0	10	124	22	.13
82	211	250 39.72	36-58.72	113-59.03	1.4*	2.9	17	153	96	.41
82	211	529 40.55	41-40.21	111-42.94	8.7	.9	12	76	7	.28
82	211	1321 21.82	39-27.95	110-25.48	0.1*	1.9	11	234	37	.24
82	212	1044 12.69	37-24.38	112-34.40	1.6*	3.2W	29	86	52	.24
82	212	2056 25.94	37-26.49	112-32.30	5.8*	1.7	8	170	132	.24
82	213	756 39.71	42-22.07	111-31.99	1.3*	1.5	15	167	34	.25
82	213	2108 53.98	38-13.34	112-16.60	1.4*	2.0	12	140	81	.27
82	215	1952 30.52	39-12.02	111-59.30	1.3*	2.8	19	62	27	.50
82	215	2152 38.58	41-43.55	111-44.88	9.5	.5	11	124	5	.15
82	217	2253 13.32	39-30.29	111- 4.61	4.9*	1.8	9	147	44	.12
82	220	2306 8.90	37-33.98	113-22.83	1.1*	1.9	7	169	110	.31
82	221	1407 1.33	42-23.88	110-27.28	.8*	1.5	14	167	80	.31
82	225	2020 4.15	39-36.13	109-23.94	.2*	2.9	32	233	120	.36
82	227	254 37.76	42- 8.00	112-29.37	5.4	.7	19	129	2	.26
82	228	1412 36.50	40- 7.32	111-25.97	5.0*	1.2	27	113	33	.37

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	302	1552 31.72	37-54.16	113-10.20	15.6*	1.9	8	179	70	.16
82	303	257 12.33	41-50.54	112-34.35	3.7*	1.2	29	234	22	.25
82	305	137 32.93	41-25.08	113- 8.98	4.4*	1.6	14	275	61	.21
82	305	325 26.91	41-50.65	111-36.20	8.0	.8	10	131	14	.15
82	305	550 22.92	37-22.03	112-36.67	1.5*	3.3W	28	46	43	.44
82	305	1844 49.84	42- 7.28	112- 8.93	8.1	1.0	15	175	10	.14
82	305	1847 3.46	39-43.49	110-56.85	.9	2.0	22	165	5	.44
82	308	615 41.80	41-25.60	113- 8.18	4.8*	1.8	31	205	60	.34
82	308	1023 4.84	40-45.74	112- 1.59	2.5*	.8	17	94	18	.29
82	308	1631 26.17	37-58.28	112- 9.57	1.8*	2.5	13	105	60	.64
82	308	1712 36.27	39-20.12	111- 6.44	1.9*	2.0	7	101	37	.22
82	308	2152 30.44	41-46.90	111- 1.35	23.0	1.8	25	237	26	.26
82	309	448 56.44	39-33.79	110-31.37	.3*	1.6	12	209	44	.53
82	309	1519 9.14	40- 2.64	111-43.57	6.1	.4	6	266	9	.13
82	311	1750 41.39	41-37.29	112-20.93	1.4	1.9	30	153	9	.27
82	313	2028 37.98	39-28.14	112- 1.30	.4*	2.1	19	96	16	.32
82	314	1859 34.04	41-53.52	111-30.13	2.2*	1.3	15	113	23	.30
82	316	1443 39.14	39-51.00	111-50.47	13.5	.4	5	257	6	.15
82	316	1923 40.48	39-41.54	110-35.77	1.4*	1.9	11	217	34	.39
82	319	704 4.18	42- 1.04	112-46.68	10.7*	.9	13	260	25	.29
82	319	1104 6.35	41-59.98	112-48.20	7.7*	1.6	20	234	28	.24
82	320	30 44.21	39- .53	111-48.25	6.6*	1.8	6	120	25	.22
82	321	656 10.26	40-35.13	111-34.87	1.7*	.5	11	86	11	.21
82	321	705 14.04	40-35.79	111-34.64	1.9*	.3	9	116	10	.29
82	321	812 8.70	41-55.51	112-33.38	2.3*	.7	17	199	19	.13
82	322	1707 27.07	41-37.18	111-42.07	4.9*	1.0	23	106	12	.28
82	323	733 8.29	37-57.03	113-39.55	.9*	1.9	5	167	79	.02
82	323	1044 40.16	41-49.02	112-17.12	1.8*	1.2	21	140	12	.24
82	323	1350 35.14	38-45.11	112-30.98	6.6*	.7	7	115	39	.16
82	323	2249 2.63	39-28.03	112- .40	.2*	2.7	11	96	43	.32
82	324	1333 23.69	41-48.97	112-16.38	4.1*	.3	16	138	13	.29
82	325	1529 36.15	42-11.39	112-11.93	1.5*	1.9	29	110	19	.25
82	325	1531 32.43	42-10.51	112-11.54	3.3*	.6	18	196	17	.36
82	325	1550 35.91	42-12.25	112-12.24	1.7*	.5	12	208	20	.26
82	325	1707 30.13	42-11.57	112-11.89	2.1*	1.0	11	203	19	.18
82	325	1720 26.83	42-11.67	112-12.24	2.1*	1.1	13	205	19	.23
82	325	1723 .88	42-11.88	112-12.29	3.0*	.7	8	206	20	.19
82	325	1743 56.47	42-11.49	112-12.55	5.8*	1.2	16	203	19	.21
82	325	2019 12.14	42-11.18	112-11.89	6.6*	.8	9	201	18	.12
82	325	2342 34.75	42-10.03	112-11.35	9.2	1.1	21	166	16	.21

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	327	659 34.74	39-29.89	111- 4.22	1.9*	1.8	11	120	29	.41
82	329	233 26.57	39-47.27	111-35.00	5.0*	.8	10	126	21	.32
82	329	1721 56.97	38-28.87	112-12.60	3.0*	1.6	10	164	54	.50
82	330	1627 21.63	40-51.42	111-34.31	9.0	1.6	25	65	3	.27
82	330	2014 31.40	41-45.94	112-17.90	3.9*	.6	7	161	18	.18
82	331	252 49.19	39-29.00	111- 4.64	.1*	1.9	8	118	31	.33
82	331	1854 30.47	39-29.19	111-59.19	8.3*	1.7	9	96	43	.34
82	404	1028 17.72	39-30.20	111- 4.07	6.9*	1.6	11	120	29	.33
82	405	1351 57.65	41-49.21	112-41.93	5.6*	1.3	21	198	33	.23
82	407	751 51.48	39-21.19	111-56.59	8.7*	1.4	10	92	35	.32
82	407	1607 36.54	39-27.55	111-15.93	3.6*	1.7	14	118	28	.44
82	407	1709 54.93	39-17.88	111-10.40	.3*	1.7	13	107	31	.34
82	407	1713 50.56	39-19.10	111- 9.77	.2*	1.9	17	93	32	.42
82	407	2316 56.20	39-17.76	111- 8.11	.7*	1.8	13	94	34	.59
82	408	919 16.25	38-32.54	111-49.91	1.0*	1.4	9	135	29	.28
82	408	1903 25.14	39-41.07	110-46.86	.5*	2.2	23	174	19	.50
82	408	2155 18.50	39-39.62	110-47.77	5.6*	1.7	9	181	19	.25
82	409	121 41.06	41-10.52	110-47.09	5.9*	1.4	14	245	68	.38
82	409	404 37.20	41-18.24	111-22.58	1.5*	1.4	17	223	20	.24
82	409	542 3.43	37-19.38	113-50.93	4.5*	2.4	12	192	63	.41
82	409	2132 55.69	39-56.23	111-21.08	.8*	2.0	23	114	36	.26
82	411	444 37.05	39-30.15	111-58.37	3.7*	2.0	27	59	12	.35
82	413	4 54.92	40-49.96	111-54.29	1.5	1.6	16	57	9	.45
82	414	1921 12.52	38-19.97	112-38.61	2.9*	1.3	7	166	45	.22
82	414	2127 13.24	38-34.48	112-12.76	1.3	1.5	7	106	7	.05
82	415	1906 14.31	39-28.10	112- .53	1.6*	1.7	11	97	43	.28
82	415	2247 34.48	38-51.43	112-35.20	.0*	2.4	13	97	44	.27
82	416	705 48.58	38-29.77	112-13.87	1.6	1.3	9	130	5	.32
82	416	1221 46.01	38-27.84	112-14.58	1.3	1.5	12	132	8	.38
82	416	1544 15.07	38-28.10	112-14.16	1.3	1.1	9	166	7	.41
82	416	2235 59.88	37-42.33	113-23.18	5.0*	1.6	9	157	10	.35
82	417	541 16.74	38-13.23	111-18.53	9.4	2.0	12	124	2	.34
82	417	600 12.46	38-13.09	111-18.16	8.7	3.0	18	132	2	.41
82	417	1045 9.73	39-24.09	111-56.10	2.8*	1.3	20	59	13	.33
82	418	1215 26.42	40-44.91	111-57.96	1.4*	1.5	23	64	11	.45
82	418	2154 26.97	42- 7.09	112-30.20	9.1	1.1	14	171	3	.35
82	421	2245 28.60	37-39.85	113-22.65	1.6*	1.5	7	196	14	.22
82	421	2335 58.99	41-37.52	112-12.13	1.1	1.5	34	111	5	.29
82	422	1424 28.25	41-16.17	111-38.78	3.6*	1.5	30	139	20	.33
82	422	1642 49.84	42- 6.09	111-36.30	5.1*	1.2	12	200	14	.28

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	422	2333 34.66	41-42.53	112- 4.71	3.7	.7	12	157	4	.12
82	423	8 25.56	40-49.03	111-53.78	1.7	.7	8	190	8	.16
82	427	2132 46.90	37-38.56	113-20.88	.3*	1.5	7	188	18	.51
82	428	837 42.18	41-45.15	112-44.94	4.2	1.5	33	143	3	.29
82	428	959 16.46	40- .13	111-53.09	1.8	.9	6	134	9	.19
82	430	37 11.57	41-52.03	112-39.75	9.2	.8	16	156	13	.17
82	430	756 58.07	36-56.82	112-49.81	1.5*	2.2	8	243	107	.27
82	502	408 8.83	42-21.82	111-33.73	7.1*	1.4	22	164	32	.32
82	502	434 11.05	42-22.98	111-33.90	4.1*	1.1	15	258	34	.28
82	502	447 43.94	42-22.82	111-34.86	2.2*	1.6	29	94	33	.36
82	502	649 48.24	40-43.43	111-32.14	10.0	1.3	25	91	15	.33
82	504	1717 35.36	39-23.62	111-53.80	10.1	1.6	15	90	12	.35
82	505	4 2.73	40-49.56	111-53.98	2.2	.9	9	80	9	.32
82	505	2136 20.36	40-38.67	111-30.58	1.6	1.2	11	86	6	.32
82	506	310 5.35	39- 8.96	111-30.73	.8*	1.7	9	168	53	.35
82	508	1437 14.07	41-55.63	112-34.24	2.5*	1.1	24	144	20	.22
82	511	2341 59.85	39-22.04	112- 4.47	7.6*	1.9	12	75	44	.46
82	512	1934 5.60	41- 7.52	111-36.19	4.1*	1.3	32	135	22	.35
82	512	2059 38.89	37-34.54	113-58.71	.3*	1.3	6	210	52	.26
82	512	2348 8.79	41-49.09	111-34.79	8.4	1.0	13	197	13	.36
82	513	2139 16.42	37-37.49	113-20.39	.1*	1.3	10	125	20	.38
82	514	2130 7.25	37-37.90	113-20.81	1.3*	1.3	9	124	19	.40
82	515	907 4.58	41-52.50	112-41.36	5.2*	1.0	15	171	12	.31
82	515	1512 28.25	41-42.25	111-41.27	5.2	1.1	18	147	2	.34
82	516	1408 5.98	41-50.09	112-41.99	2.7	1.5	23	155	8	.22
82	516	2229 40.95	40-44.31	111-16.29	.4	2.0	30	161	8	.33
82	517	11 15.46	39-58.21	111-54.67	9.1	1.0	8	133	13	.12
82	517	410 6.56	37-44.78	113-49.67	14.0*	1.7	8	127	34	.10
82	518	726 53.07	38-42.13	112-34.26	7.4*	1.6	8	163	40	.20
82	518	952 48.52	39-58.18	111-54.14	1.7*	1.2	10	108	13	.54
82	518	955 28.78	39-57.33	111-55.48	3.0*	.1	6	147	12	.22
82	518	1033 12.95	38-46.37	111-45.39	1.5*	1.3	10	82	35	.34
82	518	1051 21.90	39-42.82	110-43.81	.2*	2.9	20	192	22	.32
82	518	1206 4.38	39-58.12	111-54.11	3.7*	1.6	20	92	12	.23
82	518	1219 7.57	39-59.08	111-55.05	.7*	2.0	22	92	12	.25
82	519	144 14.85	39-57.89	111-54.79	5.8*	.6	6	137	13	.05
82	519	1510 5.90	39-22.30	112- 4.52	.1*	1.8	13	104	46	.52
82	521	2001 31.34	40-49.15	111-59.86	1.8*	1.1	19	73	16	.31
82	521	2129 53.18	39-18.76	111- 8.54	1.7*	1.7	12	95	34	.54
82	524	1213 26.56	38-42.50	112- 2.19	4.7*	4.0W	26	56	24	.41

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	524	1534 54.39	38-22.65	112- 4.22	6.1*	1.1	5	175	17	.33
82	524	2225 34.76	38-44.57	112- .12	1.4*	2.7W	16	66	29	.47
82	524	2300 34.64	39-23.33	111-59.29	11.2*	1.5	10	107	39	.21
82	525	620 37.16	38-42.87	111-59.82	2.3	2.0	18	82	3	.28
82	525	1432 6.34	38-43.53	111-59.81	2.2	1.7	19	81	2	.23
82	525	1624 2.93	38-44.20	112- .72	2.4	1.7	19	73	1	.35
82	525	2214 6.72	39-17.81	111- 4.73	16.8*	1.9	10	121	41	.53
82	526	0 15.86	38-35.67	112- 9.23	3.7	.6	10	107	4	.14
82	526	24 55.40	38-35.67	112- 8.80	2.1	.9	8	107	5	.18
82	526	133 49.51	38-37.24	112-15.61	3.2	1.1	11	250	5	.33
82	526	639 28.92	41- 7.24	112- 6.12	6.5*	1.4	28	82	14	.23
82	526	1255 39.67	39- 8.81	111-27.64	1.1*	1.5	13	87	19	.48
82	526	1727 22.57	38-35.06	112- 8.74	1.7	.8	11	107	5	.19
82	528	2044 56.63	37-38.28	113-21.09	.3*	1.4	11	124	18	.39
82	529	1915 45.71	38-43.91	111-59.89	.4	1.5	13	97	2	.20
82	530	1622 2.60	38-43.18	112- 1.16	.7	1.3	12	81	1	.24
82	530	2157 47.82	37-52.82	112-29.44	12.5*	1.9	7	108	91	.25
82	531	331 56.57	41- 6.28	111-34.10	2.3*	.8	13	159	24	.16
82	531	924 42.43	39-29.28	111-54.85	2.5*	1.3	13	124	37	.34
82	601	1210 45.91	38-25.97	112- 9.07	2.1	1.1	9	239	9	.26
82	601	1218 57.12	38-25.97	112- 9.03	2.2	1.1	9	239	9	.23
82	602	21 20.96	41-29.17	112-17.33	4.1*	1.2	19	85	12	.17
82	602	402 44.10	41-59.28	111-27.94	7.8*	1.0	14	160	19	.24
82	602	1136 59.73	41-59.12	111-27.45	12.2	.9	11	160	18	.17
82	602	1217 38.19	40-55.86	111-36.06	5.0*	.9	19	150	22	.35
82	603	546 34.34	40-25.93	111-23.57	1.4*	.7	17	124	11	.39
82	604	435 36.92	38-12.49	112-53.27	3.3*	1.8	9	158	41	.40
82	604	728 40.01	38-14.43	112-52.62	12.4*	1.8	9	156	39	.14
82	608	601 38.26	39- 7.13	111-53.13	2.1*	1.5	14	88	37	.50
82	608	1612 38.83	40-18.09	111-26.82	4.7*	.8	11	181	14	.28
82	608	2126 4.43	38- 8.78	112-20.86	7.0*	1.5	7	114	43	.22
82	608	2231 52.95	39-28.15	111-52.21	.0*	1.4	14	138	47	.33
82	609	1036 53.03	38-43.76	111-59.46	.5*	1.8	8	103	28	.32
82	609	1318 26.79	38-39.56	111-59.67	10.0*	1.9	9	102	22	.37
82	609	2055 6.16	41-49.67	111-31.18	.3*	1.5	21	102	16	.28
82	610	809 26.78	39-43.42	110-57.17	.5	1.6	14	165	4	.49
82	610	1853 56.41	40-36.95	111-30.72	1.7	.7	7	97	5	.26
82	611	13 7.73	41-17.30	111-38.49	9.1*	1.2	12	180	22	.14
82	611	1104 55.78	41-55.71	112-26.21	7.9	.8	18	105	9	.32
82	611	1959 46.18	38-43.39	112- 1.60	3.0*	1.6	6	150	26	.11

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	611	2029 8.40	38-16.74	112-39.99	10.1*	1.1	7	154	49	.05
82	611	2049 59.81	39-22.87	112- 3.24	11.9*	1.8	10	133	63	.33
82	612	1853 5.80	41-35.21	111-49.08	2.4*	.9	9	126	12	.10
82	612	1901 30.85	41-35.48	111-49.02	2.9*	.9	10	90	12	.18
82	612	1909 51.86	41-36.38	111-51.13	13.8	.9	9	117	8	.26
82	612	1912 23.73	41-35.13	111-49.36	4.0*	.8	7	139	11	.11
82	612	1922 7.16	41-35.73	111-49.21	2.9*	.8	8	106	11	.23
82	612	1925 35.76	41-35.46	111-49.16	2.9*	.8	8	143	11	.20
82	612	1928 2.91	41-36.80	111-51.21	15.2	.9	7	164	8	.11
82	612	1930 33.19	41-35.48	111-49.34	3.9*	.9	7	143	11	.25
82	612	1933 53.95	41-35.00	111-49.61	6.9	.9	6	137	11	.10
82	612	1945 6.04	41-35.20	111-49.25	5.2*	.7	6	140	11	.16
82	612	1947 57.42	41-35.04	111-49.32	5.3*	.7	6	137	11	.07
82	612	2136 37.55	41-34.99	111-51.43	16.7	.7	7	96	9	.19
82	612	2139 10.21	41-34.83	111-49.52	6.9	.7	5	135	11	.03
82	612	2142 19.39	41-34.71	111-49.72	2.9*	.8	8	83	11	.16
82	612	2144 48.99	41-34.90	111-50.02	10.5	.7	8	85	10	.13
82	612	2149 43.12	41-34.90	111-49.46	3.7*	.9	8	136	11	.06
82	612	2151 54.51	41-35.12	111-51.39	14.6	.9	9	111	9	.19
82	612	2327 39.14	41-34.40	111-49.86	2.6*	.9	9	74	11	.14
82	612	2330 3.23	41-34.51	111-50.41	2.2*	.6	9	78	10	.15
82	613	231 23.52	37-31.03	113-15.32	1.1*	1.9	8	130	67	.21
82	613	318 7.82	40-54.20	111-41.97	7.1*	1.1	25	85	14	.36
82	613	354 27.42	37-31.07	113-14.11	1.4*	1.8	9	129	66	.45
82	613	411 56.84	37-38.61	113-14.83	2.3*	1.8	7	210	99	.13
82	613	1029 39.40	37-41.21	113-19.28	9.1*	1.8	7	219	95	.53
82	613	1035 4.34	37-31.55	113-15.01	1.3*	1.8	8	128	68	.42
82	613	1256 10.71	38-48.75	111-33.93	1.9*	1.6	10	97	62	.19
82	613	2033 53.24	40-29.12	111-19.62	14.4	.6	7	120	10	.12
82	615	1457 35.59	39-18.82	111- 7.47	4.4*	2.3	10	119	46	.31
82	615	1838 28.23	40-38.34	111-29.29	1.6	.7	15	77	5	.37
82	616	1830 59.80	42- 6.63	112-28.36	.1	1.0	20	103	5	.44
82	616	1904 .76	41-52.02	111-33.26	3.5*	.3	7	180	18	.14
82	617	1810 35.87	39-15.96	111- 9.83	.7*	2.0	8	111	42	.42
82	617	2058 15.02	40-18.36	111-27.56	4.6*	1.3	24	177	13	.25
82	618	1937 31.92	39-29.31	111-50.43	.1*	1.7	16	138	37	.48
82	618	2151 5.47	39-24.26	112- 5.70	.0*	1.8	7	104	46	.06
82	619	134 29.77	38-45.29	112- 2.85	20.8	1.5	8	135	29	.42
82	619	907 11.18	39-18.39	111- 7.71	8.3*	1.6	8	113	46	.25
82	619	1605 7.94	42-26.60	111-29.06	1.4*	1.2	24	179	43	.45

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	619	1831 36.53	38-44.17	112- .97	6.9*	1.5	6	183	28	.34
82	619	1838 35.83	42- 6.95	112-26.36	2.3	1.7	26	83	7	.30
82	619	2117 37.37	38-22.33	112- 1.94	1.5*	1.7	10	134	19	.38
82	619	2210 36.48	40-41.04	111-35.54	9.5	1.0	13	84	15	.23
82	620	333 2.85	42-26.22	111-28.95	.4*	1.9	23	179	43	.32
82	620	545 45.87	39-42.58	110-49.89	1.3*	2.0	9	189	62	.58
82	620	1119 20.12	42- 5.97	112-28.04	4.2	.9	23	106	6	.39
82	620	1432 51.98	41-29.98	112-49.42	8.6*	2.6	33	173	31	.21
82	621	1315 37.21	41-35.10	111-43.49	3.6*	1.1	18	74	17	.20
82	622	1638 53.74	37-40.72	113-16.02	1.2*	1.8	5	250	96	.20
82	623	1310 49.90	39-43.45	110-54.28	1.4*	1.5	15	169	66	.36
82	623	1537 39.43	39- 6.99	111-28.64	.7*	1.8	24	86	16	.43
82	624	426 11.46	41-40.87	112-49.60	7.3	.9	20	219	11	.23
82	624	503 22.59	40-19.35	111-27.93	1.1*	1.2	18	116	11	.27
82	625	2258 4.88	40-30.15	111-21.60	7.5	1.2	16	107	13	.29
82	626	1929 12.67	39-21.83	111-46.72	1.5*	.9	8	117	14	.50
82	626	2021 23.51	39-21.98	111-47.29	1.8*	1.4	8	117	22	.35
82	627	235 54.14	39-21.08	111-49.21	3.5*	1.9	12	89	24	.25
82	627	334 24.23	39-21.32	111-49.03	2.4*	2.0	12	88	15	.39
82	627	755 34.31	40-19.23	111-28.22	.1*	1.5	28	86	11	.33
82	627	909 45.17	38-18.08	112-24.90	2.4*	1.5	6	197	31	.18
82	628	1613 37.54	41-42.09	111-44.73	2.5*	1.3	12	99	11	.19
82	628	1748 10.30	41-33.14	112-24.99	3.0*	.6	11	124	14	.40
82	630	810 4.42	37-36.97	113-42.61	1.8*	1.9	6	197	90	.24
82	630	1323 6.18	37-36.31	113-43.77	8.5*	1.7	7	199	88	.10
82	701	1002 28.57	38-13.61	112-19.39	1.6*	1.5	7	205	34	.32
82	703	339 6.12	38-42.59	111-59.83	2.8*	1.7	9	102	26	.38
82	703	1104 29.84	40-29.88	111-20.07	12.1	.3	9	119	11	.15
82	705	1612 25.08	38-39.27	112- 1.44	13.1	1.6	9	92	20	.34
82	708	1031 41.87	38-43.34	112- 3.60	3.9*	1.0	9	151	25	.33
82	710	1845 8.74	37-58.27	111-58.31	1.2*	1.6	9	124	62	.17
82	711	1342 40.95	42- 2.22	112-32.92	2.5*	.2	7	157	12	.11
82	712	2032 52.53	38-49.48	112- 5.19	2.1*	1.3	8	135	15	.26
82	714	312 6.12	37- 6.18	113-48.97	.5*	2.5	9	244	98	.17
82	714	454 33.37	40-40.73	111-35.59	1.9*	.5	11	148	14	.23
82	715	1822 26.90	39-44.39	110-34.56	4.4*	1.9	15	211	63	.36
82	715	1954 8.31	38-17.90	112-17.66	5.1*	1.1	6	193	26	.14
82	718	1233 50.50	38- 9.26	112-37.69	1.5*	1.6	10	165	56	.40
82	718	1329 7.38	38- 2.16	112-38.44	1.5*	1.7	7	175	66	.35
82	718	1539 1.61	37-46.36	112-35.95	1.3*	1.8	8	265	90	.35

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	718	1632 19.14	41-58.38	111-32.75	.5*	.7	11	143	25	.26
82	718	2049 10.12	39-21.25	111-49.01	.8	1.7	24	88	3	.26
82	718	2120 46.76	39-21.03	111-49.52	2.3	2.0	20	87	3	.26
82	719	1042 17.74	40-40.80	111-34.04	8.4	1.1	25	84	13	.36
82	720	35 10.28	39-22.22	112- 6.61	1.1	1.4	20	59	5	.37
82	720	506 39.50	39-18.50	111- 7.63	.1*	1.7	11	96	46	.30
82	720	1218 30.11	41-52.09	112-39.90	3.7*	1.0	8	205	13	.30
82	720	1432 38.59	39-21.31	111-48.99	2.1	1.7	27	43	3	.33
82	720	1708 49.04	39-21.94	111-48.75	2.5*	1.8	20	92	10	.27
82	720	1828 29.73	39-21.42	111-49.43	3.6	1.7	26	42	3	.30
82	720	2146 51.07	39-21.62	111-48.78	1.3	1.3	26	84	4	.29
82	720	2155 5.75	41-54.53	110- 9.03	22.3*	1.6	15	302	134	.55
82	721	534 22.47	39-21.84	111-48.13	.8	1.3	24	91	5	.44
82	721	555 42.80	40- 3.29	111-35.89	3.0*	.8	8	211	20	.20
82	722	335 8.05	38- .60	112-25.82	1.3*	1.9	8	237	60	.47
82	727	233 8.86	39-21.92	112- 5.92	.2	1.4	10	102	6	.39
82	727	1815 41.09	39-43.16	110-57.51	2.9	2.0	15	165	5	.38
82	728	1830 41.88	41-40.18	112-39.20	3.2*	.4	8	175	15	.30
82	729	2312 42.54	39-22.30	112- 6.92	2.2	1.4	8	99	4	.33
82	801	2002 14.01	42- 5.17	111-36.85	10.6	1.3	11	278	14	.11
82	802	821 14.62	39-26.01	111-52.49	6.9*	1.0	5	217	26	.28
82	803	2110 29.67	39-30.92	112-12.49	2.2*	.9	7	148	15	.27
82	803	2251 23.70	39-23.11	112- 6.93	.1	1.2	8	81	4	.28
82	805	2359 33.90	39-42.29	110-37.73	.0*	2.0	15	203	31	.25
82	806	255 40.52	39-18.77	111- 8.41	2.3*	2.4	15	117	34	.26
82	807	17 28.15	39-21.86	112- 6.52	1.7	1.1	7	129	5	.43
82	808	354 27.85	41-12.17	111-38.76	12.4	1.2	21	144	19	.28
82	810	42 23.52	42-16.32	111-42.49	6.0*	1.1	12	257	18	.33
82	812	2329 23.69	40-30.15	111-21.46	4.9*	1.1	19	108	13	.29
82	813	351 38.12	41-47.19	112-21.30	2.0*	.9	16	99	16	.22
82	813	600 14.20	41-16.01	111-40.76	6.9*	.6	12	166	18	.22
82	813	1356 21.54	39-43.29	110-56.26	1.2	2.3	10	167	5	.32
82	813	1417 50.44	40-19.22	111-27.55	3.2*	.6	11	226	11	.28
82	817	113 19.76	41-16.75	111-44.45	9.6	.7	11	178	14	.30
82	817	1802 40.06	39-28.58	111-51.08	1.5	1.0	17	73	2	.28
82	817	1923 52.63	39-49.46	111-40.75	.1*	.7	6	192	12	.38
82	818	340 5.75	42-22.90	111-10.60	3.2*	1.1	15	319	57	.14
82	818	2054 12.46	39-32.74	109-27.01	3.3*	2.3	25	219	108	.36
82	820	1609 48.04	39-59.78	111-46.93	1.7*	1.5	13	142	11	.37
82	821	613 30.83	39-42.65	110-38.66	.5*	1.9	18	171	30	.25

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	821	1602 41.70	41-37.52	111- 9.74	3.5*	1.0	8	260	33	.17
82	821	1613 33.76	41-37.07	111-11.54	4.9*	1.0	10	257	31	.34
82	822	1119 19.79	41-34.88	112-25.68	11.5	.6	10	208	15	.30
82	822	1127 14.16	41-39.36	112-20.67	2.6*	.6	9	172	10	.24
82	822	2009 27.61	40-17.19	112-46.82	3.5*	2.3	23	175	10	.36
82	823	458 22.97	37-34.32	113-12.09	2.8*	3.3W	15	179	135	.58
82	824	2205 35.94	38-21.89	112-28.69	.2*	2.0	10	292	74	.54
82	825	527 41.92	39-44.18	110-26.71	5.2*	2.3	10	226	64	.39
82	825	1329 9.38	38- .45	111-38.50	6.7*	2.7W	23	226	148	.26
82	827	943 58.05	42-12.75	111-36.27	12.9	.6	10	315	18	.21
82	827	2116 56.21	39-32.08	112-15.79	1.3*	1.8	6	174	18	.56
82	828	706 7.63	40-19.39	111-27.45	4.7*	1.0	17	152	11	.33
82	828	908 14.41	40-18.84	111-27.79	.6*	2.4	26	88	12	.34
82	829	1207 54.32	40-52.73	111-40.04	5.2*	2.7W	33	81	11	.31
82	831	340 4.28	41-56.03	112-31.33	2.8*	1.1	20	129	16	.33
82	831	1904 48.47	41-59.67	112-31.38	1.5*	1.1	20	139	17	.41
82	901	1541 53.45	39-19.49	111- 6.10	7.0*	1.5	4	157	37	.21
82	903	1629 51.90	39-30.80	111- 3.99	.2*	1.6	14	121	27	.60
82	905	526 31.89	41-55.38	112-26.83	6.8	1.1	14	186	10	.28
82	906	455 42.28	40-56.17	111-37.10	11.1	.9	16	150	9	.23
82	910	0 40.63	39-41.10	110-34.95	6.0*	2.1	17	210	35	.52
82	911	536 57.00	42-25.56	111-37.15	1.8*	2.1	25	157	36	.34
82	913	540 5.62	41-32.09	112-12.68	4.8	.8	11	109	7	.16
82	913	1031 57.44	41-31.83	112-12.96	3.0	.5	12	113	7	.11
82	913	1142 50.03	41-31.80	112-13.07	1.8	.2	10	115	7	.16
82	913	1647 39.22	41-32.03	112-12.77	4.6	.9	14	111	7	.19
82	916	1903 13.21	40-21.29	111-50.58	5.9*	.6	15	182	13	.35
82	917	2258 24.74	39-20.22	111-54.95	2.6*	1.2	7	127	22	.28
82	918	727 35.07	38-58.65	111-55.81	5.3*	.6	5	142	13	.20
82	918	800 13.98	41-31.93	112-13.40	4.0	.7	9	119	6	.13
82	918	1921 3.92	39- 9.34	111-54.87	9.6*	2.5	15	103	23	.34
82	919	1334 16.22	39-11.69	111-56.84	.2*	1.3	13	112	26	.14
82	919	1712 58.01	39-11.96	111-56.51	1.2*	2.5	15	109	25	.25
82	919	1723 52.46	39-14.73	111-55.72	7.0*	.8	5	131	25	.14
82	920	1227 52.96	39-18.38	111- 7.34	4.2*	2.1	8	97	35	.42
82	920	1300 35.66	41-36.03	112-27.78	3.9*	.5	8	209	23	.25
82	920	1723 13.90	39-10.88	111-57.87	1.0*	1.5	16	117	26	.33
82	921	544 2.58	40-19.56	111-50.29	3.1*	1.3	26	99	26	.30
82	921	617 15.96	40-20.69	111-50.31	.2*	.9	16	102	25	.38
82	921	653 41.47	40-19.74	111-50.93	.9*	1.3	22	98	25	.33

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	921	657 35.42	40-19.80	111-49.72	3.6*	.9	15	106	26	.31
82	921	658 45.04	40-19.42	111-52.05	3.9*	.6	8	104	24	.43
82	921	711 37.42	39-19.13	111- 7.55	2.1*	2.3	10	97	35	.40
82	922	711 6.75	41-47.29	112- 7.37	1.7*	.7	9	152	10	.26
82	922	949 5.88	40-19.26	111-49.02	4.9*	.6	14	116	26	.45
82	923	525 56.19	39-18.65	111- 6.81	2.1*	2.3	14	98	36	.50
82	923	641 13.94	40-19.96	111-50.07	4.4*	1.1	17	105	25	.34
82	923	1212 30.14	40-19.99	111-50.69	1.3*	1.1	22	95	25	.31
82	923	1214 5.43	40-20.16	111-50.75	.7*	1.3	22	94	24	.37
82	923	1216 54.01	40-18.64	111-44.51	2.6*	.9	13	140	21	.25
82	923	1401 22.03	42-10.35	112-12.51	4.9*	.9	17	122	17	.17
82	924	23 14.22	40-19.27	111-50.58	5.7*	1.1	18	106	17	.29
82	925	124 39.85	39-11.21	111-56.96	2.0*	1.6	20	112	26	.27
82	927	1420 39.36	39-28.15	111- 1.66	8.5*	1.5	12	128	32	.50
82	927	2333 40.73	40-18.80	112-12.47	3.3*	2.0	14	96	41	.27
82	928	347 57.33	39-16.60	111- 9.02	7.1*	2.5	15	191	33	.38
82	928	1710 .72	39-29.48	111- 3.35	5.6*	2.3	12	123	30	.55
82	930	1721 6.35	41-41.13	110-49.15	.1*	1.5	8	289	51	.36
82	1001	1649 8.94	41-32.09	112-12.39	2.5	1.2	16	73	7	.21
82	1001	1654 2.58	41-31.82	112-13.06	3.6	.5	6	115	7	.27
82	1002	348 59.03	41-32.14	112-12.22	1.4	1.3	16	73	7	.23
82	1002	1709 47.87	41-31.91	112-12.73	3.0	.9	8	115	7	.13
82	1003	634 34.41	39-28.64	111- 4.37	1.3*	1.5	13	119	31	.30
82	1007	2229 .57	39-34.55	112-12.33	.3*	1.4	11	146	43	.27
82	1009	541 58.28	39-22.10	111-48.73	6.3*	1.1	9	109	13	.12
82	1009	1143 13.03	39-23.69	111-49.19	3.9*	1.1	8	113	10	.44
82	1009	1213 20.83	39-21.56	111-49.86	2.4*	1.3	9	100	14	.21
82	1009	1525 33.79	39-17.15	111-11.65	1.6*	1.6	8	193	29	.28
82	1010	2142 32.69	39-25.05	111-54.45	3.8*	1.1	9	139	10	.40
82	1013	25 6.12	39-29.10	111- 3.95	5.0*	1.7	6	127	30	.10
82	1013	2024 27.64	41-40.35	110-30.57	2.9*	2.4	15	223	67	.33
82	1014	844 7.98	39-29.03	111- 3.89	4.4*	1.5	11	121	31	.23
82	1015	614 56.38	39-16.66	111- 9.79	.7*	1.7	8	142	32	.38
82	1015	1323 59.64	39-20.29	111- 7.73	13.2*	1.6	6	206	35	.38
82	1015	1928 25.16	41-42.21	111-43.75	1.7	1.0	10	69	4	.24
82	1016	559 45.08	39-28.60	111- 3.86	.6*	1.9	12	120	31	.36
82	1016	756 48.19	39-19.79	111- 7.26	2.8*	2.0	9	123	35	.28
82	1017	430 32.80	41-55.83	112-35.71	2.6*	1.0	8	212	22	.06
82	1017	1926 38.76	41-56.99	112-36.97	11.9	1.4	13	165	23	.54
82	1020	326 26.33	42- 7.09	112-19.18	4.7*	.9	9	109	16	.18

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	1020	959 21.57	39-20.31	111- 9.20	10.8*	1.7	6	206	33	.02
82	1020	1032 43.29	39-20.05	111- 9.21	9.9*	1.8	6	204	33	.04
82	1021	339 20.47	39-18.12	111- 9.65	.1*	1.4	7	116	32	.22
82	1021	818 47.61	39-19.85	111- 9.31	10.1*	1.4	6	204	33	.10
82	1021	1902 31.73	39-24.34	111- 6.51	6.9*	1.5	6	226	38	.27
82	1022	806 34.36	39-33.03	111- 2.72	3.5*	1.3	6	260	49	.14
82	1022	906 44.87	39-16.20	111- 8.91	.0*	1.6	8	112	33	.38
82	1022	2038 11.21	42-16.40	111-44.91	3.0*	1.2	8	288	55	.44
82	1023	1403 10.80	39-43.78	110-55.63	1.6	1.9	17	180	6	.47
82	1023	1943 23.69	40-18.44	111-27.57	7.4	.5	9	231	13	.23
82	1024	503 46.41	41- 9.22	111-41.18	3.2*	1.1	16	134	16	.31
82	1024	517 15.94	39-20.20	111- 7.29	2.9*	2.0	11	100	35	.44
82	1024	523 27.73	41- 9.33	111-44.72	10.6	.8	7	241	12	.16
82	1024	1210 20.51	38-31.61	112-16.94	.2	2.6	16	119	9	.40
82	1024	1217 58.23	38-30.70	112-15.84	.4	2.1	11	123	7	.45
82	1024	1221 31.01	38-30.80	112-16.81	.1	1.9	13	123	9	.41
82	1024	1247 31.78	38-30.27	112-15.78	.6	2.3	13	125	7	.49
82	1024	1827 8.09	39-17.36	111- 6.65	.3*	1.6	9	118	36	.34
82	1024	1921 48.96	38-30.31	112-13.44	10.5	1.2	6	135	4	.14
82	1025	15 35.14	41-16.19	111- 1.67	7.1*	1.5	9	245	45	.15
82	1025	2255 49.77	38-30.33	112-17.15	1.5	2.3	10	124	9	.54
82	1025	2356 25.04	38-30.56	112-17.07	1.4	1.9	12	124	9	.50
82	1027	5 3.34	41-17.32	111- 8.28	4.2*	1.6	8	293	36	.37
82	1027	2323 37.94	38-15.15	112-31.69	13.0*	1.0	6	156	42	.01
82	1028	331 1.45	37-31.61	113-12.34	1.5*	1.9	9	209	35	.30
82	1028	1135 49.79	41-23.34	111-42.45	8.8*	.3	9	151	18	.16
82	1029	343 6.93	41-48.12	112-43.06	4.2	1.9	22	138	5	.20
82	1029	1042 25.85	39-19.44	111- 9.18	6.7*	1.5	6	201	33	.06
82	1029	1646 25.99	39-30.00	111- 3.51	4.1*	1.8	7	250	46	.20
82	1029	2217 .58	39-19.54	111- 7.43	6.7*	1.5	5	202	35	.50
82	1030	444 1.82	39-30.01	111- 4.26	7.1*	1.7	7	147	45	.06
82	1030	505 .57	39-19.02	111- 7.28	5.5*	1.5	9	121	35	.33
82	1030	744 57.93	38-42.82	112-16.05	2.8*	.8	8	229	23	.47
82	1030	1628 24.08	41-40.80	112-51.52	7.7	1.6	18	228	13	.21
82	1030	1823 30.21	40-45.32	111-31.07	9.4	1.3	15	114	13	.27
82	1031	1325 28.15	39-16.85	111- 9.81	6.1*	1.5	7	113	32	.28
82	1031	1810 30.68	41-50.96	112-24.43	2.0*	.6	9	141	11	.34
82	1101	456 35.86	41-52.60	112-12.52	7.2	.8	9	117	11	.20
82	1101	1754 57.82	39-44.94	110-55.11	3.7*	1.8	10	174	69	.36
82	1101	1943 13.11	41- 8.65	111-29.56	11.1*	1.2	21	151	30	.34

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	1101	2100 21.28	39-22.25	111- 6.43	6.6*	1.4	6	216	37	.49
82	1103	529 40.58	41-40.75	112-51.99	8.8	1.5	20	228	13	.19
82	1103	601 53.10	38-31.81	112- 9.51	1.6	1.5	9	100	2	.16
82	1103	1704 48.30	42- 5.31	112-29.30	5.7	.8	11	171	7	.19
82	1103	1721 37.19	42- 5.19	112-28.72	2.2	.6	6	192	7	.09
82	1103	1929 37.58	39-20.99	111- 6.95	.1*	2.0	7	125	36	.16
82	1104	51 53.70	41-46.87	111-37.10	12.8	1.2	17	191	8	.21
82	1104	713 24.66	40-27.82	111-33.52	3.1	1.3	12	114	6	.19
82	1104	802 48.11	39-19.71	111- 9.04	6.7*	1.7	6	202	33	.02
82	1104	2350 52.53	39-40.16	110-53.05	.4*	1.8	6	282	59	.26
82	1105	149 15.09	39-20.07	111- 7.19	5.6*	1.7	10	99	36	.28
82	1105	217 31.85	39-26.05	111- 6.88	7.0*	1.4	6	126	37	.43
82	1105	800 26.33	39-18.85	111- 6.95	1.8*	1.6	11	98	36	.40
82	1105	1607 36.83	39-32.95	111-30.37	21.2	1.4	9	143	26	.39
82	1105	1731 7.05	41-42.10	111-43.12	1.8	1.1	10	69	4	.25
82	1105	1920 45.33	39-53.25	109-13.20	1.8*	2.0	13	267	144	.40
82	1105	2308 .11	38-41.60	112-30.15	10.1	1.3	14	83	8	.35
82	1106	45 3.94	39-15.33	111-10.27	1.1*	1.5	7	110	32	.51
82	1106	1851 22.57	39-18.40	111- 9.07	1.0*	1.4	6	118	33	.21
82	1107	513 40.74	38-43.03	111-45.30	3.3*	1.7	14	93	40	.36
82	1107	537 29.59	38-43.12	111-45.41	4.8*	1.7	12	93	39	.39
82	1107	1643 54.88	41-37.45	111-40.78	10.5	1.3	16	75	11	.25
82	1107	2112 58.56	41-37.79	111-40.99	10.8	.6	12	85	11	.17
82	1108	103 6.68	41-38.54	111-38.46	10.4	.7	7	171	10	.13
82	1109	1325 27.40	39-19.55	111- 9.21	6.9*	1.5	6	202	33	.05
82	1109	1758 6.71	38-12.00	113- 1.81	.7*	1.7	7	101	10	.35
82	1110	1858 53.56	37-45.82	113-13.71	7.2*	1.6	9	189	18	.19
82	1111	257 45.21	39-16.32	111-10.26	.3*	1.5	8	112	31	.43
82	1111	2017 25.29	41-23.35	112-11.16	11.4	1.1	11	85	18	.12
82	1111	2050 28.50	41-22.93	112-11.21	2.4*	1.3	11	74	18	.26
82	1112	56 58.85	39-19.17	111- 7.91	6.4*	1.9	9	120	34	.20
82	1112	1957 41.80	41-23.59	112-10.58	1.5*	1.7	23	63	17	.29
82	1113	444 42.70	41-22.51	112-10.97	9.1	.9	11	132	18	.11
82	1113	1420 58.79	41-57.00	111-53.51	9.9	.8	7	147	19	.14
82	1113	1533 37.76	39-18.78	111- 7.04	6.4*	1.5	7	121	36	.19
82	1115	341 53.79	41-46.69	111-39.77	10.7	.1	9	183	5	.17
82	1115	503 51.08	41-36.50	111-45.84	8.3	1.1	15	85	14	.16
82	1115	613 39.25	41-36.47	111-45.56	6.5*	1.3	17	85	14	.21
82	1115	1000 39.19	41-34.04	111-45.69	3.9*	.2	6	110	17	.50
82	1115	1624 34.32	41-36.67	111-45.21	10.4	.6	9	106	14	.14

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	1115	1659 59.23	39-30.26	111- 4.24	.4*	2.8	16	120	28	.36
82	1115	1757 57.84	39-18.81	111- 7.07	.1*	1.7	8	121	36	.42
82	1115	2124 3.97	41-53.87	110-21.35	6.9*	1.4	10	297	117	.30
82	1116	123 32.99	39-23.27	111-51.73	1.4*	2.0	16	88	11	.24
82	1116	232 44.59	41-35.93	111-46.09	5.6*	1.0	16	87	15	.22
82	1116	424 43.88	41-35.73	111-45.55	2.0*	.9	13	99	16	.35
82	1116	429 45.06	41-35.92	111-45.56	6.3*	.7	10	97	15	.20
82	1116	433 16.56	41-36.13	111-45.71	6.8*	.4	8	97	15	.14
82	1116	658 4.97	39-23.10	111-53.30	1.1*	1.2	11	129	12	.22
82	1116	1450 25.25	41-40.61	111-39.75	7.8	.3	9	120	6	.18
82	1116	2108 49.49	41-46.57	111-38.08	5.2	.6	6	205	6	.06
82	1116	2109 57.08	41-43.15	111-40.95	9.8	.8	16	122	1	.17
82	1117	528 12.00	39-23.23	111-52.99	1.4*	1.4	9	217	12	.32
82	1117	1606 29.77	39-17.86	111- 7.17	4.4*	1.5	7	118	36	.23
82	1118	1949 7.75	39-22.88	111- 6.49	6.9*	1.5	6	220	37	.10
82	1118	2116 9.74	40-44.40	111-59.72	15.0	1.1	6	299	26	.14
82	1119	328 37.05	39-19.23	111- 6.99	6.9*	1.4	6	202	36	.21
82	1119	353 8.38	39-22.61	111- 4.22	5.2*	1.5	7	219	40	.50
82	1119	2222 35.26	41-48.73	112-40.66	1.7	.5	16	133	8	.40
82	1120	452 58.91	41-54.81	112-34.52	5.8*	.7	18	141	20	.22
82	1120	2141 16.83	41-31.48	112- 9.88	2.7*	.4	7	153	19	.09
82	1122	1252 11.40	42- .66	112-38.84	13.9	.4	9	192	18	.26
82	1124	134 21.83	39-17.39	111- 7.90	3.7*	1.8	9	116	35	.45
82	1124	1757 17.17	40-44.02	112-13.68	5.1	1.9	33	90	7	.23
82	1124	2145 10.67	39-23.78	111-51.83	.1*	1.1	14	122	11	.36
82	1124	2227 54.23	41-42.64	111-43.48	3.3	.8	8	127	3	.30
82	1124	2327 4.29	40-49.68	111-35.60	5.8	.9	8	110	7	.21
82	1125	127 59.82	39-20.09	111- 7.42	.0*	2.6	25	99	35	.45
82	1125	848 3.06	39-34.99	110-27.06	.6*	2.4	18	217	48	.32
82	1125	1054 48.61	39-16.88	111- 9.35	4.8*	1.7	8	113	33	.23
82	1125	1435 2.04	38-12.41	112-35.57	.9*	1.6	12	163	37	.27
82	1125	1854 41.96	38-34.19	112-35.96	1.3	1.1	12	105	7	.36
82	1127	517 8.56	41-51.58	111-31.53	10.0	1.4	22	198	19	.23
82	1128	411 24.22	40-58.62	112-29.21	6.3	.8	9	168	6	.27
82	1128	2216 14.77	41-38.21	112- 3.96	8.3	.8	14	119	9	.24
82	1129	55 54.75	41-27.27	112-48.52	8.0*	1.2	22	183	34	.15
82	1129	153 41.59	41-26.98	112-43.71	7.2*	1.3	8	255	27	.17
82	1129	811 5.43	41-37.43	112- 3.52	8.7	1.0	10	114	8	.18
82	1130	1113 9.76	39-21.34	111- 2.63	1.1*	1.6	6	133	41	.35
82	1130	1130 12.92	41-25.87	112-45.36	8.0*	1.1	9	239	61	.23

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	1130	1719 13.68	41-33.70	112-12.36	11.4	.8	14	94	4	.22
82	1201	208 46.22	41-36.28	111-45.98	8.8	1.2	18	96	15	.20
82	1201	2117 1.03	41-27.38	112- .64	4.6	.6	14	76	4	.24
82	1202	649 3.78	41-46.46	111-39.53	17.6	.4	7	197	5	.31
82	1202	840 2.56	41-36.39	111-46.08	3.3*	1.0	13	130	15	.22
82	1202	1501 18.24	38-13.12	112-35.39	8.6*	1.2	8	160	37	.22
82	1203	414 19.50	41-58.62	112-25.21	5.1	.2	7	206	9	.15
82	1203	816 46.81	41-37.36	112- 3.06	6.1	.0	11	94	7	.25
82	1204	340 38.97	41-37.68	111-45.26	9.9	.7	17	125	12	.28
82	1204	710 33.15	42- 1.58	111-35.10	2.5*	.8	13	221	19	.25
82	1204	1719 6.31	38-35.76	112-37.12	5.6	1.2	9	167	7	.15
82	1204	2135 47.35	41-58.54	112-45.35	7.0*	1.1	19	220	21	.30
82	1205	1551 57.19	41-39.73	112-22.91	4.1*	1.4	23	104	13	.17
82	1205	1820 31.06	39-18.37	111- 6.96	9.3*	2.0	16	114	36	.39
82	1207	108 48.94	40-47.29	111-27.42	5.6*	1.4	21	121	11	.29
82	1209	1027 14.45	39-17.31	111- 8.87	1.4*	1.6	8	114	33	.31
82	1209	1441 35.90	39-18.30	111- 8.98	5.8*	1.9	10	93	33	.31
82	1209	1444 20.43	39-18.47	111- 9.22	4.5*	2.8	22	93	33	.45
82	1209	1733 22.25	40-55.72	111-41.88	12.4	1.1	16	98	15	.19
82	1210	316 30.27	41-47.56	112-34.75	21.2	.5	8	153	16	.48
82	1210	1135 32.57	39-18.43	111- 7.82	1.4*	1.9	10	118	35	.37
82	1212	1128 46.84	41-53.36	112-26.53	.9*	1.8	25	101	10	.34
82	1212	1204 30.32	39-23.85	111- 5.82	17.5*	1.5	6	224	39	.23
82	1215	1443 45.30	41-55.10	112-26.59	7.7	1.2	16	106	9	.18
82	1215	2326 18.79	39-19.90	111- 4.59	3.8*	1.9	9	106	39	.42
82	1216	1144 45.54	37- 8.17	112-44.87	5.7*	1.3	9	273	66	.33
82	1216	1208 39.64	39-18.90	111- 9.14	.7*	1.6	8	119	33	.09
82	1216	1229 17.27	42- 6.76	112-27.52	1.9	.4	9	160	6	.39
82	1216	1501 17.73	42- 7.21	112-28.33	5.3	.7	15	160	4	.40
82	1216	1920 17.72	39-36.97	110-51.21	7.2*	1.7	14	259	19	.55
82	1217	356 14.97	41-56.44	112-39.80	3.0*	.4	7	179	20	.30
82	1217	1613 16.90	39-28.04	111- 4.79	8.1*	2.2	9	186	42	.19
82	1218	433 45.56	39-42.03	110-36.39	.2*	2.0	21	207	33	.27
82	1219	1152 5.67	41-35.07	111-47.74	11.8	.7	13	102	13	.16
82	1219	1734 19.68	39-16.85	111- 9.63	.3*	2.1	12	113	32	.57
82	1219	2344 4.16	41-22.66	112-11.33	3.2*	.9	9	106	18	.15
82	1220	1321 25.16	40- .39	111-51.16	2.2	.5	6	147	8	.04
82	1220	1329 2.41	40- .21	111-51.49	3.0	.8	10	128	8	.46
82	1220	1354 50.49	41-54.99	111-58.31	1.8*	1.6	24	89	17	.27
82	1220	2308 23.90	38-59.66	111-49.48	7.8*	1.7	7	110	23	.10

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
82	1220	2358 48.88	39- .12	111-49.69	1.4*	1.6	8	114	22	.47
82	1221	1134 17.43	38-35.28	112-11.08	1.4	1.9	14	60	8	.32
82	1223	2146 16.68	39-42.51	110-38.44	1.4*	2.0	13	202	59	.26
82	1224	1511 21.09	42- 8.57	112-29.43	.7*	3.3W	11	157	32	.36
82	1225	246 48.37	37-46.97	112-35.83	5.3*	1.0	11	187	43	.50
82	1225	727 43.50	42- 3.42	111-33.83	9.2*	.5	13	235	19	.19
82	1226	59 24.89	42- 2.83	111-34.60	6.2*	.9	14	230	18	.18
82	1226	755 6.44	39-27.63	111- 3.41	1.4*	1.6	10	121	33	.34
82	1226	947 10.31	40-43.20	112- 3.27	6.6	.8	14	58	13	.14
82	1226	1322 .45	42- 8.25	112-28.42	2.7	.6	13	111	3	.20
82	1226	2204 39.85	41-23.26	112-11.74	3.1*	.9	9	108	17	.23
82	1227	1452 40.30	42- 6.44	112-30.45	1.8	.4	5	207	4	.15
82	1227	1732 50.64	42-25.55	111-47.75	10.6*	1.4	16	194	34	.29
82	1227	1808 28.47	41-49.70	111-30.72	9.0	1.1	14	196	16	.23
82	1227	1820 12.53	41-51.04	111-29.77	3.0*	1.5	11	236	19	.15
82	1227	2038 59.78	41-50.19	111-30.69	7.2*	1.1	17	198	17	.19
82	1228	1403 50.51	39-22.28	111-57.01	3.7*	1.6	19	62	17	.29
82	1228	1703 19.79	39-19.32	111- 9.29	1.6*	1.6	12	119	33	.33
82	1230	1904 32.25	40- .79	111-51.25	1.7	.7	7	145	7	.29
82	1230	1912 6.52	42- 4.74	112-32.20	1.9	.6	7	238	7	.24
82	1231	2123 34.40	39-18.27	111- 5.76	.1*	2.0	12	99	38	.25
83	102	303 25.57	39-19.46	111- 9.04	2.3*	1.8	7	158	33	.09
83	102	2027 6.53	39-45.35	111-37.48	2.4*	1.5	16	87	20	.38
83	104	516 35.33	39-19.77	111- 6.69	.8*	1.9	10	123	36	.37
83	104	534 44.61	39-19.51	111- 8.90	5.3*	1.8	5	158	33	.10
83	104	2327 2.76	40- .62	111-50.49	4.8	.8	5	136	7	.04
83	106	645 36.38	39-18.12	111- 8.56	1.6*	1.7	8	117	34	.24
83	106	916 33.47	39-14.43	112- .61	11.2*	1.1	9	164	31	.21
83	107	625 31.32	39-14.09	112- .69	1.9*	1.4	10	102	30	.12
83	108	649 2.34	39-20.24	111- 6.58	.3*	1.8	8	124	36	.19
83	109	1331 5.33	40-43.36	112-10.29	1.3	.6	21	86	6	.33
83	110	403 18.26	39-40.06	110-38.89	7.9*	2.4	12	210	55	.43
83	110	854 11.54	40-30.42	111-20.02	5.7*	.4	8	120	12	.11
83	112	1746 22.94	39-19.65	111- 6.12	1.3*	2.0	7	177	37	.40
83	113	412 50.74	41- 4.70	111-24.37	3.9*	1.1	14	185	25	.39
83	113	2349 16.94	39-16.55	111- 9.25	5.0*	2.2	10	113	33	.48
83	114	59 23.01	41- 9.51	112- 6.59	10.4	1.1	20	84	16	.23
83	114	1350 39.46	38-43.18	112- 1.23	1.0*	1.8	12	103	26	.39
83	114	1456 39.61	39-17.16	111- 5.54	.2*	1.6	9	128	38	.25

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	114	2317 4.20	40-54.88	111-38.10	4.6	1.8	28	107	9	.33
83	115	649 9.07	39-18.67	111- 7.59	4.3*	1.5	6	157	35	.37
83	116	1531 35.82	38-20.70	112-28.19	5.2*	.9	7	141	31	.11
83	118	1242 59.47	39-19.01	111- 6.29	.5*	1.8	12	100	37	.41
83	119	1040 35.51	39-18.97	111- 7.48	9.2*	2.1	9	97	35	.28
83	119	1135 25.96	39-18.20	111- 7.11	10.9*	1.5	8	149	36	.42
83	119	1200 1.99	39-18.00	111- 8.67	8.1*	1.8	7	154	33	.23
83	120	1313 29.39	38-50.92	112- 8.81	6.4*	1.9	12	65	13	.27
83	121	4 30.07	40-49.68	111-53.29	.7	.8	15	120	8	.19
83	121	134 58.80	39-18.45	111-11.65	9.4*	2.3	5	231	29	.01
83	121	328 1.87	39-18.87	111- 7.33	4.8*	1.6	8	121	35	.32
83	121	1000 23.62	39-20.28	111- 7.85	1.8*	2.3	10	98	35	.39
83	121	1525 30.74	39-18.75	111- 6.84	7.4*	1.9	8	159	36	.22
83	121	1615 4.58	39-19.14	111- 8.80	8.5*	2.0	7	157	33	.16
83	122	419 31.71	38-11.08	112-29.28	3.7*	1.0	8	170	45	.16
83	122	1144 48.66	39-56.92	111-56.73	1.6*	2.6W	35	56	11	.27
83	122	2103 35.26	39-37.88	111-40.59	5.2*	1.4	6	151	30	.26
83	124	2218 3.88	39-19.57	111- 6.70	11.6*	2.0	8	161	36	.28
83	125	1852 3.80	40- 5.29	111-44.36	17.1	.6	7	124	8	.38
83	125	2104 19.73	39-17.35	111- 7.93	1.1*	1.4	8	116	35	.42
83	127	305 28.97	39-18.10	111- 8.92	5.3*	1.8	6	154	33	.27
83	127	1910 35.13	39-17.28	111- 5.33	6.3*	1.6	9	142	38	.45
83	127	2337 11.83	37-46.67	110-40.44	7.0*	3.3	22	194	65	.19
83	128	317 1.49	39-17.98	111- 8.76	5.3*	2.0	7	154	33	.19
83	129	137 42.48	39-14.47	111-21.71	14.5	1.6	7	133	17	.41
83	130	1258 50.63	39-16.04	111-10.38	1.1*	1.6	9	111	31	.54
83	130	1330 32.00	37-44.12	110-40.32	.1*	2.4	14	196	63	.32
83	201	901 9.13	41-54.82	111-58.56	1.4*	1.3	22	89	17	.43
83	201	2059 46.96	39-35.69	112-12.17	4.1*	1.9	13	100	41	.46
83	204	118 56.28	39-42.06	110-37.74	.3*	2.1	13	211	31	.34
83	204	355 36.94	39-21.48	111- 6.61	6.7*	1.7	5	213	37	.02
83	204	918 13.91	39-15.89	111- 9.81	1.6*	2.2	8	111	32	.53
83	204	1226 12.87	39- 7.98	111-26.42	2.2*	1.1	10	105	18	.30
83	204	1817 39.87	38-45.19	111-29.24	3.6*	1.4	11	106	49	.16
83	205	623 1.12	39-13.47	111-22.16	10.9	1.5	6	131	17	.48
83	205	834 25.22	39-18.99	111- 7.95	6.9*	2.5	13	96	34	.38
83	205	2258 53.10	39-17.75	111- 4.94	9.0*	1.8	10	101	39	.22
83	205	2301 11.80	39-20.03	111- 7.03	2.0*	2.3	11	99	36	.29
83	206	141 23.45	38-59.68	111-25.33	.1*	2.2	13	98	28	.38
83	206	515 12.88	39-16.78	111- 6.24	5.4*	1.7	7	117	37	.55

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	206	1938 19.14	39-18.85	111- 5.50	6.0*	2.2	10	101	38	.30
83	207	146 2.85	39-17.94	111- 7.62	8.4*	1.8	8	147	35	.39
83	207	741 15.52	39-18.47	111- 6.64	5.2*	1.6	6	157	36	.21
83	208	2120 14.92	41-38.30	112- 4.54	6.2	1.4	16	63	9	.25
83	209	359 26.90	39-20.36	111- 7.22	8.2*	2.0	9	100	36	.16
83	209	627 45.65	39-19.15	111- 6.78	6.0*	1.8	9	153	36	.22
83	209	1939 24.99	40-54.71	111-38.85	3.7*	1.4	10	185	19	.26
83	209	2104 39.53	39-17.42	111- 9.27	.5*	2.6	15	91	33	.45
83	209	2308 39.22	40-53.89	111-40.00	8.6	1.2	17	90	11	.34
83	210	951 21.70	39-17.59	111-10.62	.9*	2.3	16	114	31	.59
83	210	1757 43.69	39-19.02	111- 7.88	4.3*	1.5	7	158	35	.30
83	211	1936 39.47	39-18.24	111- 5.42	7.3*	2.4	10	100	38	.07
83	212	1108 48.85	41-52.41	112-36.13	1.3*	1.3	14	138	17	.29
83	212	1214 57.50	39-19.23	111- 8.25	10.5*	2.1	7	158	34	.31
83	212	1257 40.48	39-18.68	111- 9.75	.5*	2.7	10	92	32	.38
83	212	1613 50.19	41-38.62	112- 4.91	5.3*	.6	8	113	31	.23
83	213	2137 14.02	39-18.62	111- 5.92	5.3*	2.0	9	100	37	.35
83	214	1802 25.24	38-41.13	112- 9.92	3.8*	.9	8	188	19	.47
83	214	2329 38.56	40- 4.00	111-28.24	5.3*	.6	9	183	30	.31
83	215	1308 46.60	41-16.20	111-45.02	9.9*	.9	13	114	29	.31
83	217	944 46.53	39-20.28	111- 6.47	5.7*	2.3	11	124	37	.42
83	217	1639 24.31	39-17.34	111- 9.87	.4*	2.0	12	114	32	.50
83	218	606 39.57	39-19.85	111- 6.92	5.2*	1.9	7	155	36	.48
83	220	120 1.22	39-42.49	110-57.02	.4*	2.5	8	216	66	.30
83	221	130 7.41	39-18.63	111- 6.80	8.0*	1.9	8	97	36	.24
83	222	1235 47.03	41-53.10	112-36.49	2.0*	.3	14	144	18	.18
83	223	103 19.82	39- 1.41	111-49.09	7.2*	1.7	8	94	23	.40
83	224	154 58.02	39-18.49	111- 7.85	8.9*	2.0	8	157	35	.37
83	224	1353 41.20	39-42.76	110-35.36	.7*	1.9	10	219	34	.28
83	224	2021 49.43	41-55.85	112-18.15	8.6	1.1	15	89	1	.18
83	225	402 18.37	40-30.17	111-21.09	9.6	1.0	8	111	12	.24
83	225	413 12.02	40-30.14	111-21.46	5.5*	.9	13	108	13	.35
83	225	921 26.30	40-30.24	111-20.60	5.1*	1.0	7	115	12	.26
83	225	938 32.45	41-34.35	112- 9.67	4.8	1.1	15	61	7	.14
83	226	854 57.90	41-24.25	111-42.08	1.0*	1.7	26	85	17	.19
83	226	1054 14.54	41-14.10	111-36.27	9.9*	1.1	10	203	23	.16
83	226	1513 35.07	41-53.16	112-37.15	2.9*	.6	11	147	17	.18
83	226	2035 39.31	41-17.69	111-28.05	14.8	.9	18	183	18	.19
83	226	2110 34.57	41-53.26	112-37.36	3.9*	.6	12	149	17	.25
83	227	1303 10.60	42- 2.86	112-44.96	7.8*	1.6	27	170	22	.27

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	227	1305 50.27	42- 2.49	112-44.51	7.9*	1.5	22	168	21	.19
83	228	404 29.24	39-42.89	110-47.22	1.4*	2.2	13	192	18	.37
83	228	838 54.36	42- 3.18	112-44.97	8.1*	.7	14	237	21	.18
83	302	153 29.68	39-23.85	112-10.13	5.2*	1.1	10	119	48	.40
83	304	703 10.64	39-21.10	111- .76	4.7*	2.3	8	168	39	.55
83	304	2320 30.63	39-59.58	111-57.04	2.5*	.9	12	86	11	.42
83	305	209 8.77	40- .24	111-56.86	7.8	.4	6	166	12	.04
83	305	1115 13.47	37-45.57	112-29.23	7.0*	1.5	9	196	51	.26
83	305	2058 29.14	41-52.88	112-36.53	2.1*	.7	17	143	17	.24
83	306	28 24.20	39-25.78	111- 4.01	4.4*	2.3	8	140	42	.09
83	306	1053 35.65	41- 8.42	111-40.32	8.9*	2.8W	38	122	18	.28
83	306	1516 9.95	37-55.75	112-30.11	1.2*	1.4	12	167	47	.33
83	306	2115 41.46	37-58.11	112-28.00	2.6*	2.3	16	164	48	.27
83	309	709 47.83	41-15.82	111-39.72	9.7*	.7	12	180	19	.32
83	309	2351 44.45	38-36.67	111-31.98	7.0*	1.3	6	104	50	.11
83	311	32 53.80	38-33.24	112-19.59	2.4*	.9	9	117	14	.20
83	312	2251 39.84	39-19.71	111- 8.05	6.6*	1.8	9	160	34	.34
83	313	656 58.12	38-42.81	112-32.23	1.8*	1.1	12	202	38	.42
83	313	658 20.76	38-41.72	112-32.06	1.4	1.2	11	145	8	.53
83	314	631 33.15	37-43.82	113-15.10	2.0*	1.3	7	182	17	.22
83	315	2138 55.83	41-53.70	111-56.38	2.2*	1.2	17	170	17	.25
83	316	1523 26.98	38- 3.22	112- 5.34	2.4*	1.2	7	199	51	.37
83	316	1831 55.46	42-19.51	111-24.45	.4*	2.4	26	111	38	.33
83	317	1932 6.38	39-19.78	111- 7.72	10.0*	1.6	8	121	35	.42
83	318	438 31.76	39-19.25	111- 6.89	.0*	1.6	8	122	36	.26
83	319	2015 35.15	39-18.07	111- 8.04	5.7*	1.7	9	118	34	.26
83	320	1511 10.07	40-30.04	111-21.18	10.4	1.0	16	142	12	.26
83	320	1708 55.44	40-30.12	111-21.80	8.7	.8	11	166	13	.22
83	320	2016 1.54	40-30.39	111-20.99	7.4	1.3	19	145	13	.32
83	320	2041 29.95	40-29.75	111-20.56	1.7*	.8	7	178	11	.13
83	320	2108 29.86	40-30.45	111-19.93	12.1	.9	10	178	12	.22
83	322	1112 35.06	39-32.78	110-25.32	1.6*	3.1	21	239	45	.43
83	322	1512 8.78	41-54.35	111-56.19	2.3*	1.1	15	174	20	.22
83	322	1739 3.76	38-51.09	111-29.28	4.4*	1.9	17	102	39	.38
83	323	1846 46.41	41-17.62	111-44.39	10.2	.9	12	129	15	.23
83	324	209 48.01	38-37.99	111-50.62	1.0*	1.6	14	105	31	.43
83	324	504 34.99	39-19.98	111- 7.07	8.3*	1.7	9	123	36	.25
83	324	1857 18.47	42-11.31	111-24.59	5.3*	1.3	19	116	31	.31
83	326	132 4.58	40-19.59	111-50.53	2.4*	.6	10	104	25	.39
83	327	802 3.25	39- 7.89	111-28.42	.3*	2.0	12	86	15	.45

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	328	1625 46.11	38-10.96	112-35.07	5.2*	1.1	7	168	37	.25
83	329	520 4.73	39- 3.23	113-32.85	5.5*	2.2	18	225	68	.43
83	331	46 8.08	38-14.76	111-53.12	8.5*	2.1	6	276	122	.17
83	331	1239 39.43	39- 6.60	113-27.48	1.3*	1.9	11	267	68	.64
83	331	1406 39.47	42-14.12	112- 6.51	7.0*	1.1	13	132	23	.17
83	331	1416 36.84	42-14.98	112- 7.08	5.3*	2.1	34	111	24	.31
83	331	1527 6.02	42-14.44	112- 6.90	8.5*	.9	15	132	23	.24
83	331	1549 11.79	42-15.52	112- 6.37	3.6*	2.1	22	113	25	.26
83	331	1553 25.41	42-15.21	112- 6.36	4.9*	1.1	14	133	25	.36
83	402	331 24.15	40-29.83	111-19.95	1.5*	.3	10	120	11	.30
83	402	2323 22.39	40-44.26	112-12.40	7.9	.8	16	137	7	.24
83	406	141 16.25	39-17.07	111- 9.26	4.9*	1.8	14	114	33	.42
83	406	2227 55.96	39-18.94	111- 9.15	7.5*	1.5	8	157	33	.16
83	407	1800 28.70	40-29.98	111-20.88	9.9	.6	10	113	12	.20
83	407	2140 51.20	40- .38	111-57.24	8.0	.9	8	151	11	.14
83	407	2233 16.72	40- .56	111-57.20	2.2*	.7	7	173	11	.33
83	407	2236 14.35	40- .25	111-56.91	3.3*	.3	5	166	12	.11
83	407	2251 49.92	40-30.60	111-21.06	4.2*	1.1	19	113	13	.38
83	408	150 8.77	40-29.93	111-20.60	2.0*	.7	11	115	12	.32
83	408	246 17.18	40-30.06	111-20.36	8.7	.6	9	117	12	.13
83	408	425 10.64	40-30.09	111-20.81	5.3*	1.4	18	114	12	.34
83	409	340 53.01	42-27.28	111-36.33	9.3*	1.1	16	186	40	.28
83	409	1000 32.48	40-45.78	111-37.15	11.1	.7	8	111	14	.23
83	409	1016 59.81	40-30.68	111-20.81	10.4	1.2	17	114	13	.30
83	410	534 2.92	41-41.77	111-39.04	12.9	.9	10	136	4	.14
83	411	1808 35.19	40-30.80	111-21.70	9.0	1.6	23	108	12	.30
83	412	1204 59.88	42-26.13	111-10.44	8.4*	1.6	15	121	61	.31
83	413	551 52.55	40-44.02	112-10.58	5.9	1.8	27	84	7	.21
83	413	1436 27.06	41-55.77	111-59.06	1.8*	1.3	14	87	15	.26
83	413	1639 39.52	41-56.08	111-59.06	1.0*	1.4	21	86	15	.27
83	414	50 11.00	39-15.49	111- 6.68	8.0*	1.5	9	136	37	.23
83	414	2250 14.71	39-19.58	111- 7.53	.4*	1.9	15	115	35	.30
83	415	920 53.21	41-42.11	111-43.21	1.8	.9	8	127	4	.22
83	416	1209 33.62	39-20.20	111- 6.88	8.4*	1.6	8	113	36	.09
83	417	2230 48.65	39-12.98	111- 9.83	6.6*	2.2	6	169	34	.48
83	419	926 49.45	41-46.86	112-24.00	1.6*	1.5	17	89	17	.27
83	419	2346 46.24	39-14.40	111- 9.66	4.5*	1.5	8	129	33	.38
83	420	430 33.73	39-15.73	111- 9.40	4.7*	1.5	9	125	33	.36
83	421	338 51.57	39-14.88	111-11.10	1.5*	1.5	7	128	31	.38
83	421	1955 2.25	41-52.77	112-22.07	4.2	.4	12	90	6	.15

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	423	818 22.30	42- 6.14	112-29.33	4.5	.6	15	160	5	.28
83	424	817 43.04	39-18.39	111- 7.24	10.0*	1.6	8	145	35	.19
83	424	1244 2.99	41-46.03	111-40.33	5.3	2.1	32	68	4	.34
83	424	1501 33.42	41-46.58	111-38.85	10.2	1.0	19	146	6	.24
83	424	1833 14.19	40-46.87	111-57.33	2.2*	.9	15	103	20	.32
83	426	238 12.75	38-18.69	112-17.12	5.1*	1.5	10	233	40	.25
83	426	831 54.01	39-16.84	111- 1.01	4.4*	1.6	9	166	36	.43
83	426	933 8.99	39-19.22	111- 8.56	1.9*	1.6	11	159	34	.40
83	429	13 21.90	39-17.80	111- 7.47	5.9*	1.7	8	120	35	.38
83	429	604 43.08	39-20.03	111- 9.07	1.3*	2.1	16	119	33	.56
83	429	2152 6.33	39-22.60	112- 1.55	1.5*	1.9	29	64	21	.31
83	430	1920 16.38	41-22.75	111-40.75	1.3*	2.5	18	96	16	.29
83	430	2039 28.46	41-18.88	111-39.86	12.5	.9	11	129	20	.30
83	503	754 19.26	39-18.73	111- 7.39	4.7*	1.6	12	119	35	.37
83	503	1243 37.66	38-18.29	110-37.97	2.0*	3.0	36	115	59	.25
83	504	157 40.51	39-21.30	111-16.70	13.1	1.8	8	226	22	.31
83	504	401 4.42	39-17.07	111- 8.19	8.9*	1.8	9	122	34	.27
83	505	1533 21.29	42- 9.25	111-52.19	3.9*	1.9	8	310	25	.29
83	505	2131 34.35	41-36.15	112-24.59	7.0	.5	16	125	13	.35
83	505	2348 16.52	39-17.56	111- 7.52	8.7*	1.8	9	120	35	.30
83	506	128 10.28	39-18.32	111- 9.28	7.6*	1.9	9	119	33	.40
83	506	1206 3.36	40-47.06	111-39.69	11.9	.9	19	61	12	.24
83	507	529 42.67	39-11.06	111-10.61	15.1*	1.8	9	139	34	.33
83	507	1148 20.55	38-53.11	111-38.32	5.0*	1.5	15	159	33	.32
83	508	19 44.27	39-14.51	111- 9.75	.8*	1.8	9	129	33	.45
83	508	104 27.82	39-18.92	111- 9.19	.1*	1.9	17	119	33	.54
83	508	132 42.83	39-18.44	111- 6.85	.2*	1.8	14	118	36	.51
83	508	606 7.58	39-34.26	112-14.46	4.9*	1.3	13	75	45	.34
83	509	2140 52.53	38-53.05	111-55.39	7.1*	1.1	5	172	16	.43
83	510	425 2.02	39-19.64	111-10.07	1.3*	2.2	22	120	31	.46
83	510	734 41.67	39-17.77	111- 7.50	5.6*	1.8	8	120	35	.42
83	510	808 53.01	40-40.15	111-30.17	4.8	.9	20	85	8	.34
83	510	2249 35.18	39-19.88	111-22.31	17.5	2.3	9	113	14	.43
83	511	358 21.01	39-17.35	111- 9.41	4.2*	1.9	10	121	32	.21
83	514	307 45.62	41-52.07	112-34.81	1.9*	.9	18	185	18	.23
83	514	1555 58.33	39-17.57	111- 9.68	4.4*	1.9	9	120	32	.22
83	515	755 58.42	37-55.97	112-31.01	1.3*	1.5	10	231	46	.43
83	516	612 11.69	40-18.75	111-51.30	10.2	.8	13	109	18	.26
83	517	2022 17.63	40-41.66	111-52.34	7.4	1.0	11	153	11	.41
83	518	1805 23.21	41-32.70	111-45.87	8.4*	1.1	17	110	17	.14

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	518	1839 53.37	41-32.72	111-45.84	6.1*	1.2	19	52	17	.20
83	519	408 55.71	40-46.86	111-52.02	3.8	.9	14	78	4	.29
83	520	20 11.55	39-17.04	111- 9.53	9.6*	1.8	8	138	32	.23
83	520	107 40.09	39-18.09	111- 7.58	6.3*	1.8	11	118	35	.41
83	521	609 51.13	39-18.57	111- 9.37	.5*	1.7	14	117	32	.45
83	522	248 35.90	39-38.99	112- 8.29	3.4*	1.5	12	179	34	.23
83	522	2146 27.06	39-17.35	111- 9.96	.0*	1.9	9	121	32	.22
83	523	29 46.26	41-32.94	111-45.81	10.6	.5	13	80	17	.15
83	523	1255 7.70	41-46.18	112-25.82	3.8*	.8	16	113	19	.23
83	523	1304 32.22	41-46.51	112-26.48	3.0*	.6	8	213	19	.23
83	523	1315 14.38	41-46.34	112-26.25	2.3*	.7	13	116	19	.16
83	523	1325 5.77	41-46.55	112-26.14	2.4*	1.0	15	117	19	.14
83	523	1842 46.94	39-18.44	111-58.38	3.2*	1.4	10	96	31	.25
83	524	911 39.55	38-35.03	112-37.04	4.9	.9	6	208	7	.14
83	524	2036 6.61	41-37.17	112- 2.72	1.9	1.2	19	67	7	.31
83	524	2038 49.75	41-36.93	112- 3.00	1.4	1.4	19	66	7	.33
83	525	44 26.32	41-37.22	112- 2.84	1.5	1.4	17	67	7	.14
83	525	447 47.76	41-37.50	112- 3.02	1.4	1.0	14	69	7	.16
83	526	150 35.28	39-18.05	111-10.21	5.4*	1.8	10	119	31	.21
83	526	1850 22.26	38-31.97	112-17.15	2.2	1.3	8	131	9	.51
83	527	746 1.06	42-25.05	111- 4.11	5.2*	1.4	16	128	67	.41
83	527	2116 44.04	40-19.70	111-51.55	2.2*	1.0	12	102	24	.28
83	528	23 40.97	40-19.95	111-51.36	10.4*	.8	11	101	24	.30
83	528	815 3.59	38-31.77	112-17.07	1.1	1.3	13	131	9	.49
83	528	817 30.45	38-32.04	112-16.94	1.6	1.5	14	130	9	.41
83	528	1220 18.55	39-18.72	111- 7.60	5.0*	1.8	12	119	35	.33
83	529	122 1.35	39-19.42	111- 7.35	.3*	2.0	23	115	35	.38
83	529	237 50.89	38- 7.98	112-10.51	10.1*	1.5	9	247	42	.16
83	530	751 30.86	42-18.71	111-31.02	4.8*	1.3	13	296	30	.35
83	601	428 9.12	37-45.51	112-23.82	.6*	1.8	11	218	59	.29
83	601	2048 56.77	39-18.55	111- 8.17	.0*	1.6	12	118	45	.30
83	602	331 50.81	41-37.45	112- 3.45	2.3	1.1	15	69	8	.28
83	602	528 8.66	41-36.55	112- 2.30	1.5	.9	12	143	6	.22
83	602	850 4.34	41-37.18	112- 2.75	1.4	1.0	13	67	7	.24
83	603	1849 51.90	41-37.17	112- 2.69	6.2	1.3	16	67	7	.25
83	603	1855 33.34	41-36.83	112- 2.73	5.2	1.0	15	65	7	.34
83	603	2110 30.70	41-36.95	112- 2.84	7.1	1.3	25	66	7	.27
83	604	1720 42.70	38-46.90	111-33.03	.0*	1.9	14	179	45	.28
83	605	850 6.36	39-54.88	111-57.21	2.3*	.5	5	193	11	.04
83	605	1727 27.83	37-46.91	113-16.61	1.7*	1.4	11	151	14	.43

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	606	1632 8.97	39-34.05	112-14.06	.4#	1.5	14	103	45	.31
83	608	1802 19.92	41-12.96	112-25.17	.0#	1.0	16	168	19	.31
83	609	1350 20.73	39-50.92	111-59.11	.3#	1.0	14	77	14	.33
83	609	1521 22.42	39-51.83	111-58.50	2.0#	.7	7	242	13	.22
83	609	1558 12.97	39-50.94	111-59.19	1.6#	2.1	27	62	14	.39
83	609	1600 43.60	39-53.45	111-57.97	2.2#	.8	6	184	11	.23
83	609	1609 2.51	39-51.90	111-58.63	5.8#	1.0	12	79	13	.14
83	609	1612 30.86	39-51.12	111-59.58	.1#	.9	10	78	13	.26
83	609	1657 15.00	39-51.23	111-58.75	5.9#	2.9W	23	49	13	.35
83	609	1700 22.58	39-49.33	111-59.77	2.9#	.3	6	270	16	.47
83	609	1701 49.54	39-51.40	111-58.03	2.4#	.8	6	245	14	.16
83	609	1703 58.33	39-51.02	111-57.87	1.5#	2.1	14	135	14	.23
83	609	1706 5.60	39-53.22	111-58.60	6.3	1.3	27	48	11	.32
83	609	1708 .35	39-50.36	111-58.92	2.7#	1.2	18	87	15	.11
83	609	1722 49.15	39-50.00	111-59.35	3.0#	.5	6	263	15	.50
83	609	1836 15.39	39-49.82	111-59.50	3.0#	.3	6	264	15	.46
83	609	1930 25.64	39-51.00	111-57.90	2.2#	.8	7	249	14	.28
83	609	2243 34.33	39-20.79	111- 7.82	.2#	2.1	17	173	47	.47
83	610	2336 27.22	40- 3.58	111-19.43	7.0#	1.2	5	255	43	.38
83	614	1159 28.53	39-18.87	111- 6.13	4.4#	1.8	11	99	44	.50
83	614	1559 17.57	39-17.94	111- 9.30	.4#	1.8	15	116	44	.39
83	615	755 39.41	38-58.59	111-39.46	10.8#	1.3	17	83	23	.38
83	615	1247 14.68	39-18.72	111-10.36	1.2#	2.0	17	91	43	.36
83	616	1119 21.37	39-18.91	111- 7.70	6.4#	1.8	10	97	46	.49
83	616	1201 31.92	41-56.01	112-37.60	2.2#	.8	11	219	21	.19
83	616	1845 43.30	38-56.18	111-23.47	.4#	2.4	18	106	35	.38
83	616	2119 6.63	39-17.22	111- 9.34	1.5#	1.6	12	114	43	.52
83	617	1351 48.33	39-19.70	111- 6.25	4.9#	1.8	13	101	45	.39
83	617	1957 11.61	39-18.51	111- 8.63	1.4#	1.6	14	110	45	.44
83	618	1317 46.39	39-18.78	111- 6.71	1.5#	1.7	11	121	45	.22
83	620	103 31.48	41-50.56	112-29.78	4.7#	1.5	24	95	17	.29
83	620	122 33.80	41-50.28	112-29.80	2.3#	.6	12	159	17	.23
83	620	1530 44.52	39-11.88	111-48.78	8.9	1.4	12	80	14	.38
83	620	2100 6.09	41-42.14	111-38.97	11.0	.6	11	169	4	.15
83	620	2115 48.78	41-43.39	111-41.47	7.9	.7	9	164	0	.11
83	620	2154 52.55	41-41.36	111-42.59	1.7	1.6	23	91	4	.47
83	621	2124 28.71	41-50.18	112- 7.81	7.4#	.6	5	233	21	.43
83	621	2145 19.98	39-19.84	111- 7.18	.1#	1.9	16	99	46	.35
83	623	1646 .34	39-19.24	111- 6.61	.7#	1.8	19	100	45	.41
83	625	230 26.93	39-17.33	111- 4.08	9.2#	1.6	9	120	40	.47

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	625	2207 36.07	41-35.29	111-41.36	4.9*	1.4	20	131	15	.21
83	626	438 5.21	37-52.53	113-16.96	5.6*	1.4	9	135	16	.20
83	626	1719 9.58	41-38.65	112- 1.49	4.2	1.0	16	69	6	.23
83	627	157 24.46	41-12.14	112-24.27	2.5*	1.0	12	197	21	.28
83	628	1514 44.57	41-37.63	112- 2.26	.1	1.2	15	95	6	.20
83	628	2157 37.93	41-49.72	110-20.45	6.7*	1.6	10	291	118	.45
83	628	2331 29.67	39-19.77	111- 7.99	.6*	2.6	25	97	46	.40
83	628	2340 54.66	39-19.83	111- 8.04	.1*	2.3	21	97	46	.39
83	629	731 .70	39-19.58	111- 7.01	2.8*	1.6	14	122	46	.35
83	629	1932 7.10	41-51.38	112-46.12	2.2	1.0	11	246	8	.30
83	630	438 14.24	41-59.85	111-29.92	3.5*	1.2	13	238	26	.21
83	702	226 46.72	41-55.37	111-28.11	6.9*	1.3	17	229	27	.41
83	703	1654 54.44	41-51.34	112-14.73	2.2*	.4	8	79	10	.50
83	706	206 9.51	42-10.29	111-36.27	12.2	.8	12	199	15	.26
83	706	1927 18.09	41-58.76	112-45.54	8.7*	1.0	11	201	22	.13
83	707	215 17.21	39-18.92	111- 7.20	1.7*	2.0	16	98	46	.32
83	708	431 59.80	41-35.36	112-53.44	3.5*	1.3	14	228	23	.24
83	708	808 45.96	41-45.77	112-21.50	2.5*	.6	10	120	18	.39
83	708	1822 41.94	39-29.91	111-41.63	1.9*	.7	12	157	11	.28
83	708	1828 8.58	39-29.65	111-41.65	3.6*	.9	9	176	11	.42
83	711	955 17.65	38- 5.74	112- 4.67	9.3*	1.4	9	191	47	.18
83	712	253 45.59	38-26.99	112-13.62	1.6	1.0	12	133	8	.24
83	712	529 9.16	39-23.43	111-21.21	14.5*	1.2	11	145	34	.29
83	712	1603 47.82	37-46.98	112-35.28	7.1*	1.6	11	204	50	.20
83	712	2209 40.30	37-48.39	112-34.00	.1*	1.5	10	201	50	.24
83	712	2340 56.05	41- 4.63	111- 6.58	.8*	1.3	13	223	45	.22
83	714	318 7.49	41-34.89	111-41.99	3.4*	1.0	14	125	16	.32
83	714	2218 2.58	39-44.55	111-48.30	.1*	1.5	7	163	16	.38
83	716	1853 30.55	41-25.60	113-10.48	3.3*	1.8	26	233	51	.24
83	717	1602 9.22	41-46.47	112-21.23	9.6	1.0	16	96	17	.19
83	718	221 47.39	37-59.83	113-39.21	.3*	1.3	7	256	29	.38
83	718	1454 39.08	41-50.37	112-36.37	2.9*	.9	13	177	15	.17
83	718	1558 24.76	42-18.62	111-31.68	14.1*	1.0	10	208	30	.23
83	719	1358 16.91	39-29.93	111-52.29	2.9	1.8	13	103	3	.52
83	720	15 33.72	40-36.86	111-29.93	.3	1.5	14	80	4	.40
83	722	642 38.96	39-18.44	111-55.18	1.7*	1.1	11	135	22	.37
83	722	1838 1.46	41-39.06	112- 1.40	1.3	1.3	30	44	7	.33
83	723	156 17.33	41-53.69	112-21.63	1.6	.9	10	147	4	.34
83	727	1432 42.76	40-39.82	111-25.18	15.3	.6	9	153	7	.10
83	727	1524 35.27	38-43.17	112-26.97	1.5*	1.1	8	158	13	.32

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	728	402 5.26	39-33.44	111-53.31	11.4	.9	13	146	9	.27
83	729	1952 44.38	39-14.57	111-11.63	.8*	1.6	8	128	39	.33
83	729	2049 31.42	39-18.53	111- 7.08	.8*	2.2	13	117	45	.33
83	730	40 13.70	40-49.36	111-53.74	.1	.4	12	123	8	.18
83	731	1745 23.50	41-40.27	111-41.55	9.1	1.1	13	142	6	.16
83	731	2204 37.86	41-31.20	112- 8.70	10.5	.4	12	90	11	.11
83	731	2245 18.43	41-48.26	112-24.57	2.5*	.5	10	121	15	.31
83	801	1422 55.21	41-43.56	111-41.98	6.3	1.0	12	125	1	.18
83	801	1452 46.18	41-42.21	111-43.64	1.8	.7	8	144	4	.27
83	801	1604 33.44	40-40.59	111-40.98	1.9*	.8	11	105	13	.25
83	802	50 33.83	39-51.09	111-57.52	1.2*	1.0	7	247	14	.14
83	802	620 16.46	41-42.77	112- 2.43	3.1	.6	14	84	1	.17
83	803	431 7.37	41-59.80	111- 9.45	1.6*	1.3	13	143	52	.23
83	803	954 21.15	41-59.23	112-29.39	1.6*	.9	12	215	15	.29
83	803	1420 10.89	38-12.22	112-47.51	3.9*	1.5	7	174	21	.35
83	803	1422 5.47	41-31.31	111-53.70	5.6	1.3	12	145	11	.13
83	804	1658 9.78	39-58.66	111-52.93	3.4*	.1	5	121	11	.05
83	804	1750 59.38	37-31.48	110-27.12	.0*	2.7	21	138	40	.22
83	805	617 10.16	39-59.51	111-52.85	2.9*	.3	6	125	10	.19
83	805	1205 30.92	37-32.22	110-26.62	1.4*	2.3	21	136	39	.44
83	806	313 38.26	39-19.25	111- 7.86	.0*	2.1	14	116	46	.45
83	806	1210 10.57	42- 4.38	111-40.68	12.3	.8	10	241	9	.32
83	806	2309 24.24	40- .00	111-50.57	7.6	.9	7	134	8	.26
83	807	148 5.49	39-59.70	111-52.54	3.5	.5	6	127	9	.10
83	807	446 14.85	37-46.26	112-34.46	1.5*	1.5	8	235	44	.39
83	807	828 14.64	41-44.65	111-41.90	7.9	.7	8	185	1	.23
83	807	2223 27.92	41-22.52	111-22.95	.2*	1.6	28	127	14	.37
83	809	1916 55.83	42- .81	112-33.72	1.4*	.8	11	165	21	.31
83	810	2126 11.50	42- .85	112-31.25	2.2*	.9	13	159	18	.42
83	810	2132 22.22	42- .49	112-31.46	2.5*	.7	11	226	18	.21
83	810	2140 41.05	41-58.49	112-28.32	8.2	.9	8	208	13	.15
83	811	40 8.96	41-47.10	112-24.21	3.0*	.5	10	113	17	.15
83	811	558 14.84	41-59.71	112-29.93	5.3*	.7	13	154	16	.33
83	811	1142 48.36	39-59.50	111-53.00	2.5*	.4	6	128	10	.21
83	811	1653 58.59	37-47.06	112-35.24	1.3*	1.4	10	247	50	.30
83	812	116 8.73	42- 2.91	111-41.77	7.1	1.1	17	173	10	.25
83	812	151 8.62	39-59.27	111-53.27	2.5*	.5	6	126	10	.23
83	812	1043 22.09	41-59.77	112-31.14	2.3*	.9	9	222	17	.14
83	812	2243 33.43	40-15.23	111-34.20	.2*	.9	8	149	18	.29
83	813	1941 3.08	41-18.83	111-37.68	1.1*	2.1	31	154	19	.33

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	813	2053 55.90	42- 1.00	112-45.58	5.9*	1.0	10	202	26	.26
83	814	719 23.63	39- 7.83	111-27.09	.2*	1.5	11	86	17	.31
83	815	2338 .41	39-18.09	111- 6.63	4.6*	1.8	12	119	44	.42
83	818	151 13.83	41-55.89	112-18.90	4.4	1.0	17	120	0	.24
83	819	153 4.38	38-40.39	111-30.11	2.6*	1.3	9	191	58	.32
83	820	48 52.84	39-20.71	111- 7.83	6.6*	1.5	11	99	47	.36
83	821	1304 50.16	39-17.35	111- 9.92	6.7*	1.6	9	138	42	.39
83	821	2129 1.86	39-18.70	111- 9.90	3.2*	1.7	10	117	43	.43
83	822	621 29.97	38-39.12	112-33.02	.5	1.3	10	162	3	.37
83	825	2036 6.34	41-53.56	112-36.76	3.9*	.6	8	148	18	.20
83	826	1145 33.74	42- 1.48	112-31.87	1.4*	1.2	19	147	13	.30
83	826	1151 37.81	42- .51	112-32.06	1.3*	.9	15	145	15	.30
83	827	714 4.70	39-18.36	111- 7.99	1.9*	1.8	12	118	46	.42
83	827	2144 41.65	42- 4.25	111-41.53	12.7	1.5	20	189	9	.23
83	827	2309 59.09	41-53.64	112-37.26	2.9*	.8	10	150	18	.21
83	828	1303 16.81	41-28.07	113- 4.20	7.2*	1.1	10	311	42	.17
83	828	2316 23.62	39-18.53	111-55.63	.3*	2.2	21	108	22	.41
83	828	2322 6.36	39-18.47	111-54.85	.6*	1.2	7	148	27	.37
83	828	2326 20.34	39-18.39	111-54.23	.8*	1.4	10	133	21	.38
83	829	1253 11.45	41- 4.99	111-25.60	9.8*	3.0W	12	165	50	.24
83	830	20 40.20	39-28.75	111-57.25	.0*	.6	9	157	11	.41
83	830	1135 20.92	39-19.52	111-53.49	1.0*	1.5	12	144	19	.34
83	830	1200 7.66	39-18.93	111-56.22	1.2*	1.3	10	152	21	.38
83	831	603 52.18	42- 5.34	112-19.29	1.3*	1.9	24	81	17	.20
83	831	658 31.07	42- 6.97	112-19.04	2.1*	.9	13	200	16	.26
83	831	1215 13.08	42- 7.10	112-18.59	2.3*	.9	13	110	17	.21
83	901	856 47.84	39-19.36	111- 7.87	6.2*	1.4	8	120	47	.39
83	901	1702 49.75	39-29.06	111-56.20	5.6	1.3	9	205	9	.17
83	903	1818 29.55	39-27.10	111-57.71	.3*	1.1	14	92	12	.36
83	903	2207 57.78	39-27.63	111-57.53	.6*	1.2	12	92	11	.35
83	905	152 1.99	39-24.00	111-59.48	.4*	1.1	7	233	17	.34
83	905	1908 1.93	42- 6.31	112-18.91	1.9*	1.0	14	146	17	.18
83	906	323 26.15	41-38.74	112- 1.81	1.3	1.7	14	51	7	.22
83	906	841 49.93	42- 4.82	112-18.71	4.2*	.9	6	287	16	.23
83	907	1101 33.27	41-42.71	112- 2.86	.5	.5	10	85	1	.38
83	907	1317 20.14	38-30.20	112- .67	3.2*	1.3	12	120	14	.42
83	908	58 46.59	42- 5.82	112-18.09	4.1*	.8	9	145	16	.23
83	908	1353 13.11	42- 5.96	112-18.66	3.7*	1.3	22	145	17	.36
83	909	325 3.78	39-43.19	110-34.61	4.3*	1.6	10	221	35	.40
83	909	956 24.13	42-26.58	111-29.32	7.0*	1.0	12	178	57	.42

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83	909	1701 47.42	38- 4.46	112-20.28	8.6*	1.6	7	148	63	.07
83	910	946 4.24	41-35.20	111-44.11	5.0*	.9	18	70	18	.25
83	910	1856 10.32	42-18.33	111-42.50	1.9*	.9	10	263	21	.34
83	910	1903 42.21	41-38.05	112-53.64	9.4*	.9	17	234	18	.23
83	911	629 57.27	41-40.78	112-48.98	6.6	1.6	16	214	11	.16
83	912	715 49.87	39-38.07	111-56.45	4.5*	1.6	13	90	31	.26
83	912	844 57.34	41-29.02	112- 5.50	6.3	.7	11	99	11	.11
83	912	1126 6.07	39-38.48	111-57.87	4.1*	1.2	10	123	31	.22
83	914	1416 29.83	41-34.06	111-42.77	2.4*	.0	10	111	18	.31
83	914	1610 49.76	39-18.44	111- 8.03	.6*	1.8	10	118	46	.52
83	915	1135 31.52	42- 7.59	112-18.56	1.1*	1.5	28	148	18	.35
83	916	615 20.47	41-28.70	111-53.98	1.8	1.3	14	83	8	.34
83	916	944 16.49	41-42.01	112-47.54	2.6	1.3	20	205	8	.16
83	916	2041 4.84	42- 5.92	112-19.11	2.0*	1.0	15	146	17	.38
83	917	2007 15.21	38- 5.14	113-22.66	9.8*	1.5	6	146	33	.21
83	918	203 50.47	41-18.45	111-36.76	1.9*	.4	7	215	19	.08
83	918	802 10.07	41-27.29	112- 3.80	1.6	1.4	26	45	8	.24
83	918	833 14.18	42- 6.60	112-19.45	1.6*	1.4	18	148	18	.19
83	922	1526 11.29	40-14.79	111-21.82	3.1*	.7	11	197	20	.34
83	922	1620 11.00	39-18.97	111-10.21	1.4*	1.9	10	91	43	.51
83	922	2147 52.13	40-15.21	111-22.82	3.4*	1.9	25	118	20	.29
83	923	1912 38.34	39-49.01	111-59.30	7.0*	.8	6	271	17	.07
83	924	150 1.05	39-19.75	111- 8.43	2.1*	2.0	10	121	46	.30
83	924	1657 46.33	40-42.57	108-45.83	7.6*	3.9W	20	190	213	.63
83	924	2220 26.60	41-58.72	112-27.36	1.4*	1.1	23	145	12	.30
83	925	1133 3.43	41-59.91	112- 9.38	.1	1.0	14	122	4	.38
83	925	1208 33.41	40-30.93	110-49.76	1.6*	1.6	19	184	37	.43
83	926	2220 18.74	41-19.58	111-40.53	12.7	.6	13	136	22	.28
83	928	2211 1.03	41-38.78	111-28.98	1.3	.7	10	164	4	.23
83	928	2324 1.07	41- 7.55	110-52.28	.2*	1.6	10	242	73	.45
83	929	843 23.37	39-20.51	111- 7.32	.1*	2.1	11	124	47	.32
83	929	1634 42.91	38-31.11	112- .00	12.9	1.0	9	123	15	.30
83	929	2039 3.12	40-28.29	111-58.19	6.5	1.3	22	66	10	.30
83	930	1513 48.19	39-18.39	111- 7.72	4.9*	1.9	11	118	46	.38
83	1001	123 23.40	41-47.21	112-23.30	1.1*	1.0	18	103	16	.22
83	1001	127 56.99	41-47.88	112-23.43	8.1	.8	17	113	15	.22
83	1001	232 21.15	41-47.15	112-23.51	2.2*	.7	12	110	16	.20
83	1001	625 38.26	39-32.09	111-22.85	2.7*	1.6	10	123	45	.31
83	1001	725 9.38	41-47.07	112-23.08	1.6*	.7	17	102	16	.31
83	1001	1152 7.61	41- 5.14	110-39.67	.2*	1.7	17	277	85	.28

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	1002	1333 29.49	39-59.29	111-47.64	1.4*	1.1	12	142	10	.30
83	1002	2317 10.75	41-53.09	111-44.06	8.1	1.1	18	86	9	.19
83	1003	531 9.29	39-19.83	111- 7.30	.6*	2.0	16	99	46	.28
83	1003	632 33.33	39-16.90	111-10.31	11.4*	1.7	9	113	42	.22
83	1005	334 17.15	42- 8.77	112-30.83	4.8*	.9	13	172	28	.25
83	1005	802 25.68	39-58.62	111-55.14	6.7	1.0	10	128	13	.16
83	1005	853 3.10	39-58.86	111-55.11	7.1	1.2	8	125	12	.08
83	1005	1026 19.45	42- 5.04	111-39.69	10.4	.6	12	181	10	.22
83	1005	1413 13.39	39-58.95	111-54.70	5.9*	.6	6	134	12	.19
83	1005	1917 37.36	39-59.04	111-55.01	7.9	.2	6	137	12	.17
83	1005	2120 42.38	39-58.56	111-55.13	4.1*	.7	6	131	13	.06
83	1006	8 31.18	39-58.95	111-55.09	8.9	.7	8	125	12	.14
83	1006	804 37.18	39-55.38	111-58.66	8.8	1.1	11	191	9	.20
83	1006	1909 7.96	41- 7.30	110-50.59	.6*	1.7	8	230	75	.39
83	1006	2120 14.98	42- 5.11	111-39.20	8.6	.9	12	183	11	.24
83	1008	1157 53.83	40-44.88	111-59.56	5.5*	4.3W	30	66	15	.33
83	1008	1215 46.54	40-44.68	111-57.78	12.1	.5	11	167	13	.34
83	1008	1321 53.45	40-43.54	111-58.74	10.5	.4	16	67	15	.22
83	1008	1606 39.07	41-58.38	112-33.21	1.4*	1.1	16	158	19	.28
83	1009	1204 45.65	37-51.86	112-56.26	.0*	1.2	9	93	23	.57
83	1009	1918 2.50	42- 3.17	112-27.89	2.2*	.8	8	234	18	.28
83	1011	1023 1.57	40-44.39	111-59.57	1.6*	.9	34	67	16	.34
83	1011	1101 58.17	40-43.91	111-59.43	10.5	2.5	22	100	16	.18
83	1012	1908 6.26	41-40.95	111-57.74	2.2	1.0	15	97	7	.24
83	1012	2121 13.07	42- 4.62	111-40.61	9.9	.6	8	172	9	.31
83	1013	2112 3.66	37-52.57	113- 6.28	.1*	2.2	13	109	22	.43
83	1013	2121 4.41	37-56.62	113- 8.83	.2*	1.6	9	128	22	.35
83	1014	1928 22.43	38-16.06	112-45.22	4.8*	1.1	7	166	27	.17
83	1015	1520 49.37	39-19.08	111- 8.03	6.5*	2.2	13	96	46	.53
83	1016	158 56.39	39-16.89	111- 7.19	6.9*	1.8	8	115	44	.51
83	1016	215 12.29	40-44.37	111-59.74	1.5*	1.7	30	49	16	.32
83	1016	540 52.03	40-44.08	111-59.81	6.0*	.6	12	65	16	.28
83	1016	630 43.68	40-44.05	111-59.56	4.2*	.8	13	65	16	.24
83	1017	2004 38.49	41-47.49	112-23.40	2.2*	1.2	20	82	16	.24
83	1017	2316 21.45	41-48.77	111-36.91	11.3	.6	10	139	12	.09
83	1019	1850 59.61	41- 7.12	110-55.15	.7*	1.3	13	223	55	.48
83	1020	737 30.73	39-18.88	111- 5.23	9.4*	1.7	14	102	43	.53
83	1020	2029 30.94	42- 4.05	110-12.98	5.1*	1.8	17	311	85	.45
83	1021	435 6.35	39-20.02	111- 6.56	3.0*	1.9	9	101	45	.40
83	1021	810 9.32	39-17.89	111- 7.09	.6*	1.8	14	96	45	.49

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yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	1021	1250 6.63	40-29.99	111-21.06	5.6*	1.3	26	111	12	.33
83	1022	56 58.14	39-14.88	111- 8.93	1.2*	1.8	11	109	43	.46
83	1022	1317 16.29	40-43.86	111-59.24	3.9*	.9	21	53	16	.25
83	1023	16 17.86	41-12.50	112-24.42	1.2*	.7	23	138	20	.27
83	1023	2111 37.60	39-19.37	111- 7.20	2.2*	2.0	14	99	46	.39
83	1025	359 51.63	41-31.41	112- 9.90	2.2*	.8	9	89	10	.34
83	1026	219 14.48	39-14.63	111-57.77	1.7*	1.7	15	110	28	.46
83	1027	1039 45.38	41-47.65	112-21.89	1.3*	.8	15	112	15	.13
83	1027	1305 47.37	39-21.16	111-50.77	.3*	2.0	27	88	15	.39
83	1029	1300 59.34	41-55.97	112-34.56	2.3*	.9	15	146	20	.19
83	1029	1758 52.53	38- 2.89	112-30.76	1.1*	2.0	13	123	42	.54
83	1029	1858 49.04	38- 1.44	112-31.56	.0*	2.0	13	125	42	.48
83	1030	1416 9.71	41-20.64	111-41.78	3.3*	1.6	29	110	20	.26
83	1030	1500 36.46	41-19.73	111-41.72	2.5*	.9	9	181	21	.15
83	1030	1759 7.77	41-41.37	111-32.42	31.4	1.1	7	107	1	.58
83	1030	1801 26.07	41-47.89	111-38.57	9.2	1.1	19	119	14	.17
83	1101	234 20.32	42- 6.53	112-19.14	1.2*	2.1	24	87	17	.26
83	1101	754 .75	42- 6.41	112-19.38	2.3*	1.6	11	192	16	.28
83	1102	412 43.85	41-40.29	112- 6.49	17.9	1.0	8	177	8	.41
83	1102	2030 .61	38-52.28	111-53.56	.9*	2.3	8	114	19	.64
83	1103	519 14.02	39-16.86	111- 6.77	8.2*	1.7	10	95	44	.48
83	1103	747 52.04	41-27.85	112-25.98	1.8	.4	10	204	8	.45
83	1104	2243 33.83	40-44.43	111-58.36	5.5*	1.0	10	64	14	.21
83	1105	506 23.54	39-17.51	111- 6.98	1.0*	1.9	11	118	44	.45
83	1105	817 51.42	40-45.51	111-59.27	2.2*	1.0	14	85	15	.44
83	1107	2127 8.65	40-52.75	111-39.01	6.9	1.5	24	77	9	.24
83	1110	1106 52.38	38-14.69	112-34.75	4.5*	1.0	7	156	39	.25
83	1110	1223 29.89	40-42.34	111-25.23	10.1	1.1	16	150	11	.26
83	1111	57 36.32	41-31.12	111-44.46	3.0*	.7	10	90	20	.35
83	1116	111 29.95	38-12.84	112-44.88	3.3*	1.5	9	143	24	.42
83	1116	2345 25.24	38-13.44	112-45.71	.0*	2.0	9	140	24	.49
83	1117	1900 29.58	40-32.15	111-32.49	10.2	.6	7	128	10	.52
83	1117	1955 6.07	40-43.74	111-50.66	3.8	.8	9	199	6	.14
83	1118	1902 10.54	39-58.49	111-27.59	2.2*	1.4	10	233	29	.30
83	1119	330 59.89	42- .34	112-29.86	1.0*	1.7	22	229	16	.27
83	1119	350 46.93	42- .33	112-29.96	4.8*	3.8W	18	229	16	.24
83	1120	957 36.90	40-43.86	111-59.84	1.4*	1.0	16	65	16	.33
83	1120	1727 29.94	38-12.03	112-37.10	.1*	1.5	7	155	34	.40
83	1121	2057 39.17	41-27.02	112-26.70	6.3	.6	6	215	7	.06
83	1122	1522 52.11	41-27.65	112-26.14	1.6	.3	9	184	8	.28

Utah Region Earthquakes: 1981-1983

yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	1123	1408 11.01	37-35.76	112-19.46	7.0*	1.5	6	199	81	.18
83	1127	256 51.51	41-27.85	112-25.71	4.4	1.2	10	201	8	.13
83	1128	32 25.12	41-50.81	112-46.16	6.8	1.3	14	172	7	.24
83	1128	55 47.11	41-51.09	112-47.57	7.8	1.1	10	225	8	.19
83	1128	211 24.26	41-51.44	112-47.35	7.8	.9	10	222	8	.24
83	1129	400 46.90	39-22.21	111- 7.49	17.9*	2.0	6	101	44	.24
83	1129	1102 45.05	40-42.44	111-24.64	8.4	1.8	25	152	12	.39
83	1129	1710 39.61	41-27.94	112-24.71	.0	1.8	26	132	8	.23
83	1129	2024 57.27	41-26.54	112-26.46	9.4	.8	7	216	6	.12
83	1129	2132 3.07	41-27.15	112-24.65	.7	1.5	16	143	6	.35
83	1130	553 20.72	41-27.66	112-25.93	2.3	.6	9	204	8	.13
83	1130	856 34.64	41-27.88	112-24.58	.2	1.3	12	188	8	.31
83	1130	1856 27.53	41-27.54	112-24.80	1.8	1.0	13	192	7	.21
83	1201	843 6.64	41-27.55	112-26.03	2.6	1.3	13	189	7	.37
83	1201	1415 27.60	41-28.03	112-26.83	2.5	.4	6	212	9	.13
83	1202	307 14.66	41-27.82	112-23.69	.3	1.5	21	124	8	.45
83	1202	1400 53.75	39-23.40	111-45.24	.2*	1.5	7	147	24	.48
83	1203	42 47.33	41-13.89	112-54.07	7.3*	1.3	18	193	44	.35
83	1204	352 21.88	41-26.97	112-23.82	1.8	.7	10	190	6	.19
83	1204	1432 6.01	41-48.05	112-50.44	4.2	.9	9	253	5	.24
83	1205	552 6.74	41- 1.50	110-53.53	.8*	1.6	12	220	47	.25
83	1205	1936 41.94	38-50.84	111-29.18	1.5*	1.4	8	102	39	.26
83	1206	18 11.00	40-19.73	112-11.97	1.3*	1.8	15	110	15	.31
83	1206	1702 37.07	38-50.23	112- 3.76	.6*	1.7	8	141	14	.47
83	1206	1706 18.85	38-50.69	112- 4.18	.6*	1.8	10	143	13	.47
83	1206	1731 37.78	38-51.19	112- 8.55	2.2*	1.4	5	177	13	.13
83	1207	2128 17.09	39-25.45	111- 2.44	3.1*	1.9	8	121	37	.39
83	1208	1805 37.91	42-23.11	111-34.68	9.5*	1.4	17	164	55	.28
83	1209	858 40.72	38-34.62	112-33.93	.2*	3.6W	26	94	34	.27
83	1209	1142 48.04	38-36.84	112-28.10	9.7*	2.0	9	109	95	.30
83	1209	1724 9.54	39-17.67	111-59.51	2.8*	2.3	30	95	26	.24
83	1209	2017 35.61	41-14.94	112-24.54	.8*	.9	15	158	15	.33
83	1210	2035 18.29	39-26.45	111-58.21	5.7*	1.8	16	130	13	.28
83	1210	2350 54.93	38-34.13	112-33.30	1.5*	2.2	12	112	33	.57
83	1211	740 45.69	42-21.10	111-34.16	5.6*	3.6W	20	98	58	.33
83	1213	1356 45.02	40-48.79	111-47.65	8.2	1.5	25	80	3	.23
83	1214	728 50.57	41-47.29	112-20.86	5.6*	.8	13	110	15	.15
83	1215	200 49.39	37-34.53	110-30.59	3.0*	2.8	20	193	45	.22
83	1215	1137 13.24	41-38.56	111-40.72	11.7	.3	7	138	11	.10
83	1215	1932 49.82	39-18.27	111- 6.43	7.4*	1.8	9	114	44	.33

Utah Region Earthquakes: 1981-1983

yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	1216	455 34.83	39-18.07	111- 9.57	3.2*	1.8	13	110	43	.55
83	1216	1159 58.36	38-31.88	112-33.67	.0*	2.0	8	136	33	.48
83	1217	2226 24.32	41-15.35	112-23.60	1.3*	1.1	18	159	15	.36
83	1218	2155 36.83	38-36.39	112-34.01	2.8	1.6	6	159	2	.09
83	1220	1841 57.64	41-27.46	112-25.19	1.7	1.0	12	196	7	.12
83	1222	108 25.93	39-18.41	111- 8.01	.9*	2.0	10	118	46	.47
83	1222	714 7.56	41-36.15	111-43.79	2.9*	1.4	10	164	19	.39
83	1222	745 39.85	41-34.30	111-44.87	3.0*	1.1	8	175	18	.34
83	1222	753 14.26	41-34.60	111-44.55	3.0*	1.0	8	179	18	.35
83	1222	756 17.93	41-35.56	111-44.10	3.0*	1.0	7	186	18	.40
83	1222	809 23.67	41-35.43	111-43.85	3.0*	.8	6	186	19	.48
83	1222	817 32.86	41-33.51	111-46.61	1.9*	2.0	21	81	16	.31
83	1222	832 21.30	41-34.75	111-44.82	11.9	1.2	11	155	18	.12
83	1222	1025 23.12	41-34.12	111-45.73	12.3	1.1	8	171	17	.22
83	1222	1505 6.24	41-35.79	111-43.73	2.5*	1.2	10	163	19	.40
83	1222	1647 40.28	41-34.43	111-44.29	3.0*	1.0	8	178	18	.41
83	1222	1729 4.39	41-34.18	111-45.69	13.9	.8	5	171	17	.01
83	1222	2044 56.89	41-34.85	111-45.15	10.6	.6	5	178	17	.04
83	1223	34 59.92	41-35.96	111-43.70	3.0*	.8	9	190	19	.46
83	1223	408 26.08	41-36.67	111-44.11	7.8*	.9	9	194	18	.36
83	1223	508 52.91	41-34.84	111-45.59	11.7	.9	7	177	16	.05
83	1223	749 4.16	41-36.44	111-44.13	3.0*	1.1	7	192	18	.42
83	1223	954 32.85	41-34.22	111-45.45	11.2	.8	7	173	17	.07
83	1223	1825 23.60	41-35.32	111-44.99	9.7	.8	7	182	17	.07
83	1223	1948 20.43	38-24.89	112- 9.61	2.2*	1.5	7	138	11	.25
83	1224	1648 42.09	39-18.59	111- 6.48	4.7*	1.7	9	99	44	.43
83	1225	512 11.30	41-35.68	111-43.89	12.3	1.1	9	230	19	.10
83	1226	142 32.12	41-35.67	111-45.44	1.8*	1.6	14	194	16	.24
83	1226	144 45.12	41-38.06	111-47.30	2.0*	1.2	6	221	14	.27
83	1226	145 13.80	41-35.67	111-45.76	.7*	1.8	19	165	16	.43
83	1226	149 26.63	41-35.85	111-49.80	13.5	1.1	8	213	10	.18
83	1226	157 .15	41-36.04	111-43.35	3.3*	1.3	10	232	19	.21
83	1226	239 5.29	41-34.55	111-50.40	11.8	1.7	14	186	10	.52
83	1226	243 54.47	41-35.59	111-46.60	2.9*	1.0	9	222	15	.43
83	1226	307 59.98	41-34.93	111-42.01	3.8*	1.2	9	235	21	.24
83	1227	1410 23.87	38-17.63	112-37.35	1.6*	1.5	10	106	36	.23
83	1228	304 41.78	39-21.50	111-14.49	6.5*	1.7	15	111	39	.51
83	1230	258 14.68	39-21.23	111-15.47	1.5*	2.3	12	141	38	.41
83	1230	1412 46.36	39- 9.92	112- 7.67	18.8	1.5	5	208	22	.06
83	1230	2000 13.23	40-14.81	112-11.98	1.4*	1.7	12	103	23	.23

Utah Region Earthquakes: 1981-1983

yr	date	orig time	lat-n	long-w	depth	mag	no	gap	dmn	rms
83	1230	2056 14.32	38- 6.78	112-27.19	6.9*	1.5	5	139	47	.04
83	1230	2257 32.04	38- 6.62	112-27.50	2.6*	1.6	6	139	47	.14
83	1231	1307 26.61	41-46.97	112-23.73	2.4*	1.2	20	88	17	.21
83	1231	1836 3.92	41-46.72	112-22.96	3.0*	.9	11	100	17	.25

number of earthquakes = 1843

* indicates poor depth control
W indicates Wood-Anderson data used for magnitude calculation

LISTING OF FELT EARTHQUAKES WITHIN THE UUSS NETWORK:
JANUARY 1981 TO DECEMBER, 1983#
(Times are UTC)

1981

January 16, 1981 10:26:29.77 Near Kanarraville, south of Cedar City, Utah.
37N26.87, 113W06.61 Magnitude 3.4 (M_L)
Felt (IV) at Kanarraville, New Harmony, Glendale, Cedar City, and Rockville. Also felt at Tropic and Virgin, Utah.

January 16, 1981 14:50:45.92 Near Kanarraville, south of Cedar City, Utah.
37N27.10, 113W05.77 Magnitude 3.3 (M_L)
Felt (IV) at Glendale, New Harmony, and Virgin. Also felt at Cedar City, Kanarraville, Rockville, and Tropic, Utah.

February 01, 1981 02:21:47.67 Near Kanarraville, south of Cedar City, Utah.
37N33.82, 113W15.83 Magnitude 3.6 (M_L)
Felt at Kanarraville and Cedar City, Utah.

February 20, 1981 09:13:01.19 Near Lindon north of Provo, Utah.
40N19.33, 111W44.11 Magnitude 3.9 (M_L)
Felt (VI) at Orem, (V) at Provo, and (IV) at American Fork, Lehi, Payson, Pleasant Grove, Santaquin, Springville, and Salt Lake City, Utah. Also felt at Draper and Riverton, Utah. Slight damage.

April 05, 1981 05:40:39.69 5 miles northwest of Kanarraville and south of Cedar City, Utah.
37N35.49, 113W17.87 Magnitude 4.6 (M_L)
Felt (V) at Cedar City, Kanarraville, New Harmony, and Springdale, Utah. Felt in Beaver, Garfield, Iron, Kane, and Washington Counties, Utah. Also felt at Colorado City, Arizona.

April 11, 1981 08:08:02.32 Hansel Valley, Utah northwest of Great Salt Lake.
41N51.53, 112W40.58 Magnitude 3.1 (M_L)
Felt (IV) at Snowville, Utah. Also felt at Stone, Idaho.

#Note: Many of the comments describing the Modified Mercalli intensity (Roman numerals), extent of the felt area, and related effects were taken directly from the monthly U.S. Geological Survey National Earthquake Information Serivce (NEIS) publication, "Preliminary Determination of Epicenters." Locations and magnitudes are from UUSS data files or from NEIS data where noted.

May 14, 1981 05:11:04.34 Near Hiawatha, Utah.
39N28.86, 111W04.72 Magnitude 3.5 (M_L)
Felt at Orem, Hiawatha, Goshen, Elsinore, and Sigurd, Utah.

May 27, 1981 05:46:15.9 Near Soda Springs, Idaho.
42N35.4, 111W43.8#(NEIS) Magnitude 3.1 (M_L) (NEIS)
Felt (IV) at Grace, Idaho.

September 21, 1981 08:01:33.51 Near East Carbon, Utah.
39N35.48, 110W25.47 Magnitude 3.2 (M_L)
Felt (III) at East Carbon and Sunnyside, Utah.

September 22, 1981 05:03:59.43 Near East Carbon, Utah.
39N35.35, 110W23.61 Magnitude 3.0 (M_L)
Felt in East Carbon, Utah.

September 30, 1981 04:17:31.98 Southeast of Soda Springs, Idaho.
42N32.56, 111W12.02# Magnitude 3.8 (M_L)
Felt (IV) at Bern and Dingle, (III) at Geneva, Ovid, Paris, and Thatcher, Idaho. Also felt at Georgetown and Montpelier, Idaho.

December 9, 1981 08:15:04.52 Southeast of Soda Springs, Idaho.
42N38.19, 111W26.48# Magnitude 4.1 (M_L)
Felt (V) at Conda and Soda Springs, (IV) at Paris and (III) at Lava Hot Springs, Idaho.

December 9, 1981 08:43:32.09 Near Soda Springs, Idaho.
42N39.01, 111W28.12# Magnitude 3.2 (M_L)
Felt in Soda Springs, Idaho.

December 15, 1981 14:17:58.79 Near Grover, Wyoming.
42N53.06, 110W56.06# Magnitude 2.4 (M_L)
Felt in Grover, Wyoming

December 15, 1981 15:36:20.54 Near Grover, Wyoming.
42N53.09, 110W55.72# Magnitude 2.3 (M_L)
Felt in Grover, Wyoming.

December 17, 1981 10:47:43.36 4 miles east of Orem, Utah at the mouth of Provo Canyon.
40N19.48, 111W37.89 Magnitude 2.0 (M_L)
Felt at Orem, Utah.

1982

January 7, 1982 16:21:45.41 Near Colorado City, Arizona.
36N56.99, 112W53.10 Magnitude 2.6 (M_L)
Felt at Colorado City, Arizona.

January 28, 1982 08:00:40.38 Near Montpelier, Idaho.
42N23.32, 111W30.70 Magnitude 3.2 (M_L)
Felt (III) at Georgetown, Idaho.

March 1, 1982 10:43:07.09 Star Valley, Wyoming.
42N59.00, 111W04.58* Magnitude 2.9 (M_L)
(Lower Star Valley) Felt (IV) at Etna, Freedom, and Thayne, Wyoming.

March 5, 1982 05:50:22.92 Southeast of Cedar City, Utah.
37N22.03, 112W36.67 Magnitude 3.3 (M_L)
Felt at Fredonia, Glendale, and Kanab, Utah.

May 24, 1982 12:13:26.56 Near Richfield, Utah.
38N42.50, 112W02.19 Magnitude 4.0 (M_L)
Slight damage. Felt (VI) at Annabella and Glenwood, (V) at Elsinore, Koosharem and Monroe, (IV) at Aurora and Richfield. Also felt at Manti, Sigurd, Greenwich, and Cedar City, Utah.

August 23, 1982 04:58:22.97 Near Cedar City, Utah.
37N34.32, 113W12.09 Magnitude 3.3 (M_L)
Felt in Cedar City, Utah.

August 29, 1982 12:07:54.32 Near Emigration Canyon, east of Salt Lake City, Utah.
40N52.73, 111W40.04 Magnitude 2.7 (M_L)
Felt on East Bench, Salt Lake City, Utah.

Note: A large number of small earthquakes were reported felt by local residents in the Soda Springs area of southeastern Idaho during September-November 1982. These earthquakes were part of an earthquake swarm including a magnitude 4.7 event on October 14, 1982. Only the most significant felt events of this swarm are listed here.

October 7, 1982 09:26:03.29 Near Star Valley, Wyoming.
43N00.34, 111W04.71* Magnitude 2.7 (M_L)
Felt (III) at Freedom, Wyoming, and (II) at Thayne, Wyoming.

October 8, 1982 09:53:30.99 Near Soda Springs, Idaho.
42N37.71, 111W27.65* Magnitude 3.5 (M_L)
Felt (IV) at Georgetown, Idaho.

October 8, 1982 10:06:57.83 Near Soda Springs, Idaho.
42N37.82, 111W27.35* Magnitude 3.8 (M_L)
Felt (V) at Conda and (IV) at Soda Springs, Idaho.

October 8, 1982 16:04:08.15 Near Soda Springs, Idaho.
42N38.05, 111W27.79* Magnitude 3.2 (M_L)
Felt in the Soda Springs, Idaho area.

October 10, 1982 15:16:27.06 Near Soda Springs, Idaho.
42N38.27, 111W27.26* Magnitude 2.3 (M_L)
Felt at Lakey Ranch, 6 miles SE of Soda Springs, Idaho.

October 11, 1982 03:07:04.86 Near Soda Springs, Idaho.
42N38.55, 111W28.37* Magnitude 2.6 (M_L)
Felt at Lakey Ranch, 6 miles SE of Soda Springs, Idaho.

October 13, 1982 21:24:42.68 Near Soda Springs, Idaho.
42N36.58, 111W24.86* Magnitude 1.9 (M_L)
Felt at Lakey Ranch, 6 miles SE of Soda Springs, Idaho.

October 14, 1982 04:08:20.67 Near Soda Springs, Idaho.
42N36.32, 111W26.61* Magnitude 1.7 (M_L)
Felt at Lakey Ranch, 6 miles SE of Soda Springs, Idaho.

October 14, 1982 04:10:23.19 Near Soda Springs, Idaho.
42N36.04, 111W25.24* Magnitude 4.7 (M_L)
Felt (V) at Conda, Georgetown, Soda Springs, Geneva, and Montpelier, Idaho. Felt (IV) at Bloomington, Clifton, Lava Hot Springs, Dingle, Nounan, Grace, Ovid, Paris, Pocatello, Thatcher, and Wayan, Idaho.

October 14, 1982 06:28:45.95 Near Soda Springs, Idaho.
42N35.31, 111W23.56* Magnitude 3.9 (M_L)
Felt.

October 14, 1982 07:32:59.99 Near Soda Springs, Idaho.
42N36.65, 111W25.03* Magnitude 3.3 (M_L)
Felt.

October 14, 1982 10:40:15.11 Near Soda Springs, Idaho.
42N35.07, 111W23.84* Magnitude 3.6 (M_L)
Felt.

October 14, 1982 10:56:30.03 Near Soda Springs, Idaho.
42N34.34, 111W24.45* Magnitude 3.6 (M_L)
Felt.

October 14, 1982 11:03:53.97 Near Soda Springs, Idaho.
42N35.28, 111W24.96* Magnitude 3.6 (M_L)
Felt.

October 14, 1982 11:09:29.04 Near Soda Springs, Idaho.
42N36.44, 111W27.34* Magnitude 4.1 (M_L)
Felt.

October 14, 1982 12:21:42.03 Near Soda Springs, Idaho.
42N35.03, 111W23.77* Magnitude 3.4 (M_L)
Felt.

October 14, 1982 12:56:51.26 Near Soda Springs, Idaho.
42N34.97, 111W25.23* Magnitude 3.2 (M_L)
Felt.

October 14, 1982 23:44:53.43 Near Soda Springs, Idaho.
42N36.21, 111W24.92* Magnitude 3.5 (M_L)
Felt.

October 15, 1982 02:51:16.79 Near Soda Springs, Idaho.
42N36.62, 111W24.71* Magnitude 3.3 (M_L)
Felt.

October 16, 1982 01:36:50.67 Near Soda Springs, Idaho.
42N36.92, 111W25.96* Magnitude 2.9 (M_L)
Felt.

October 16, 1982 03:49:11.14 Near Soda Springs, Idaho.
42N37.76, 111W26.17* Magnitude 1.7 (M_L)
Felt at Lakey Ranch 6 miles SE of Soda Springs, Idaho.

October 16, 1982 22:26:16.73 Near Soda Springs, Idaho.
42N35.28, 111W24.65* Magnitude 2.1 (M_L)
Felt at Soda Springs, Idaho.

October 16, 1982 23:02:14.32 Near Soda Springs, Idaho.
42N35.88, 111W24.49* Magnitude 1.5 (M_L)
Felt.

October 17, 1982 00:15:35.39 Near Soda Springs, Idaho.
42N35.94, 111W24.62* Magnitude 2.8 (M_L)
Felt at Soda Springs, Idaho.

October 17, 1982 19:28:34.48 Near Soda Springs, Idaho.
42N36.37, 111W25.67* Magnitude 2.6 (M_L)
Felt.

October 28, 1982 03:33:51.38 Near Soda Springs, Idaho.
42N36.79, 111W27.07* Magnitude 2.3 (M_L)
Felt.

October 28, 1982 05:00:07.51 Near Soda Springs, Idaho.
42N37.65, 111W25.46* Magnitude 1.6 (M_L)
Felt.

November 5, 1982 22:22:50.72 Near Soda Springs, Idaho.
42N36.37, 111W27.56* Magnitude 2.3 (M_L)
Felt.

November 5, 1982 22:28:44.55 Near Soda Springs, Idaho.
42N36.65, 111W26.27* Magnitude 2.3 (M_L)
Felt.

November 6, 1982 11:45:53.26 Near Soda Springs, Idaho.
42N36.01, 111W25.05* Magnitude 2.3 (M_L)
Felt.

December 24, 1982 15:11:21.09 Near Samaria, Idaho.
42N08.57, 112W29.43 Magnitude 3.3 (M_L)
Felt (II) at Malad City, (III) at Holbrook and Stone, Idaho, and Snowville, Utah.

1983

January 22, 1983 11:44:48.66 Goshen Valley, southwest of Provo, Utah.
39N56.92, 111W56.73 Magnitude 2.6 (M_L)
Felt within Goshen Valley, Utah.

February 8, 1983 10:54:54.1 Near Palisades Reservoir, Idaho.
43N18.48, 111W09.24*(NEIS) Magnitude 4.1 (M_L)
Felt (V) at Palisades, Idaho. Felt (IV) at Etna and Teton Village, Wyoming. Also felt (IV) at Swan Valley and Victor, Idaho.

March 6, 1983 10:53:35.65 Near Mountain Green, southeast of Ogden, Utah.
41N08.42, 111W40.32 Magnitude 2.8 (M_L)
Felt at Mountain Green, Ogden, Morgan, Croydon, Taggart, Peterson, Round Valley, Milton, and Enterprise, Utah.

March 22, 1983 11:12:35.06 East of Price, Utah near Sunnyside.
39N32.78, 110W25.32 Magnitude 3.1 (M_L)
Felt near local mine, - roadway caved in.

April 13, 1983 05:51:52.55 Northwest of Magna, Utah.
40N44.02, 112W10.58 Magnitude 1.8 (M_L)
Felt by a few residents in Magna, Utah.

May 3, 1983 12:43:37.66 Near Hanksville, Utah.
38N18.29, 110W37.97 Magnitude 3.0 (M_L)
Felt at Hanksville, Utah.

June 9, 1983 16:57:15.00 Near Mona, Utah.
39N51.23, 111W58.75 Magnitude 2.9 (M_L)
Felt at Mona, Utah.

August 29, 1983 12:53:11.45 East of Croydon in Morgan Canyon, Utah.
41N04.99, 111W25.60 Magnitude 3.0 (M_L)
Felt at Croydon and Taggart, Utah. Also felt at Ogden, Utah.

October 8, 1983 11:57:53:83 Approximately 2 miles south of Salt Lake City Airport, Salt Lake City, Utah.
40N44.88, 111W59.56 Magnitude 4.3 (M_L)
Slight damage. Felt (VI) at West Valley City, (V) at Bountiful, Magna, Salt Lake City, and Woods Cross, Utah. Felt as far north as Ogden and as far south as northern Utah County.

October 11, 1983 11:01:58.17 Approximately 2 miles south of the Salt Lake City Airport, west of Salt Lake City, Utah.
40N43.91, 111W59.43 Magnitude 2.5 (M_L)
Felt by numerous residents within the Salt Lake Valley.

October 28, 1983 14:06:06.69 Borah Peak, Idaho Earthquake, near Challis and Mackay, Idaho.
43N57.88, 113W54.30* Magnitude 7.3 (M_s) (NEIS)
Two people were killed, two were injured and considerable damage at Challis. One person injured and extensive damage at Mackay. Total damage from the earthquake estimated at 2.5 million dollars. Fault scarp extending for more than 35 kilometers with vertical displacement up to 2.5 meters observed between Mackay and Challis. The earthquake was felt in Idaho, Washington, Montana, Oregon, Nevada, Wyoming, Utah, and parts of Canada.

Note: A large number of Borah Peak, Idaho aftershocks were felt in the vicinity of Mackay and Challis during October 28-December 31, 1983. Only the three largest aftershocks are listed here.

October 28, 1983 19:51:25.02 Near Mackay, Idaho.
44N03.64, 113W53.35* Magnitude 5.8 (M_L)
Felt in Challis-Mackay, Idaho area.

October 29, 1983 23:29:12.53 Near Mackay, Idaho.
44N11.59, 114W00.62* Magnitude 5.8 (M_L)
Felt in the Challis-Mackay, Idaho area.

October 29, 1983 23:39:06.25 Near Mackay, Idaho.
44N13.45, 114W01.83* Magnitude 5.4 (M_L)
Felt in Challis-Mackay, Idaho area.

November 2, 1983 20:03:59.49 Near Jackson, Wyoming.
43N26.59, 110W56.26* Magnitude 3.5 (NEIS)
Felt in Jackson, Wyoming.

November 19, 1983 03:50:46.93 Pocatello Valley, Idaho near the Idaho-Utah border.
42N00.33, 112W29.96 Magnitude 3.8 (M_L)
Felt (V) at Park Valley and Snowville, Utah. Felt (IV) at Chubbuck, Idaho, and Portage, Utah. Also felt at Stone, Malad City, and Weston, Idaho.

December 9, 1983 08:58:40.72 Near Cove Fort, Utah in southwestern Utah.
38N34.62, 112W33.93 Magnitude 3.6 (M_L)
Felt (III) at Elsinore, Greenville, and Junction, Utah.

December 11, 1983 07:40:45.69 Near Montpelier, Idaho.
42N21.10, 111W34.16 Magnitude 3.6 (M_L)
Felt (III) at Montpelier, Idaho.

December 20, 1983 22:52:10.08 Near Jackson, Wyoming.
43N19.76, 110W45.42* Magnitude 4.5 (M_B) (NEIS)
Felt (IV) at Jackson, Kelly, and Moose, Wyoming. Felt in the Teton and Lincoln counties. Also felt in the Palisades Reservoir area of eastern Idaho.

December 22, 1983 18:56:02.61 Near Jackson, Wyoming.
43N20.37, 110W42.81* Magnitude 3.4 (M_L) (NEIS)
Felt (III) at Jackson, Teton Village, and Etna, Wyoming.

December 27, 1983 12:21:29.2 Near Challis, Idaho.
44N17.82, 114W04.74*(NEIS) Magnitude 4.4 (M_B) (NEIS)
Within the aftershock zone of the October 28, 1983 Borah Peak, Idaho earthquake. Felt near Challis, Idaho

*Indicates earthquake is outside the Utah region (36.75-42.50 N Lat, 108.75-114.25 W Long)

APPENDIX A

ABSTRACTS OF UNIVERSITY OF UTAH THESES INVOLVING SEISMOLOGICAL RESEARCH AND/OR EARTHQUAKE-RELATED STUDIES: JANUARY 1, 1981 TO DECEMBER 31, 1983

Upper Crustal Structure of the Salt Lake Valley and the Wasatch Fault From Seismic Modeling

(M.S. Thesis, December 1981)

Author: William McClellan Bashore, Jr.

Support: U.S. Geological Survey

Supervisor: Robert B. Smith

ABSTRACT

Two unreversed refraction profiles were recorded parallel and perpendicular to the Late Cenozoic structures in the Salt Lake Valley using large quarry blast sources. Three-component seismic data were modeled, principally using P-arrivals, utilizing an asymptotic ray tracing algorithm (McMechan and Mooney, 1980) for travel-times and synthetic seismograms in laterally inhomogeneous media. Gravity data were also used as an additional constraint to the seismic models. The algorithm was compared against other modeling techniques and resolution tests were designed to enhance confidence levels for fault dip determination. Modeling the line that crosses the Wasatch fault, suggests an asymmetrical eastward-deepening basin bounded on the east by a segmented normal fault that flattens in dip with depth. A narrow ($\sim$3 km) lateral velocity gradient zone, east of the mapped fault, is necessary to satisfy the arrivals. Average fault dips to 4 km depth, from 25 to 40 could be fit to the observed data (average station spacing, $\sim$2 km). Differing from other models of northern Utah, a high velocity (6.25 km/sec) laterally inhomogeneous layer at 5.1 to 7.0 km depth was necessary to fit arrivals east of the fault. These models are not sufficient to interpret the Wasatch fault as being listric; however, they do suggest that it has a significantly smaller dip with depth than is seen at the surface.

Simultaneous Inversion for Lateral Velocity Variations and Hypocenters in the Yellowstone Region Using Earthquake and Refraction Data.

(M.S. Thesis, December 1981)

Author: Harley Mitchel Benz

Support: National Science Foundation

Supervisor: Robert B. Smith

ABSTRACT

A data set of 422 P-wave arrival times from 30 earthquakes and 6 refraction sources recorded in the Yellowstone region were

simultaneously inverted for three-dimensional upper-crustal P-wave velocity structure and hypocenter locations. Only P-wave arrival-times off the crystalline basement, the Pg refractor, were utilized from the refraction sources. The velocity inversion used a two layer block model. The velocity of the surface layer was fixed and the inversion was performed on the second layer using a block size of 18.5 km x 20.2 km. The inversion utilized an iterative technique incorporating the Method of Separation of Parameters.

Results show a correlation between the computed velocity model and observed gravity data. High velocities along the northern boundary of the Park correlate with gravity highs associated with near-surface basement. The caldera region showed an average velocity of 5.75 km/sec with prominent low velocity zones of 4.94 km/sec and 5.18 km/sec in the northeast and southwest portions of the caldera, respectively. The 4.94 km/sec LVZ is situated over the northeast rim of the caldera and coincides with a -55 mgal gravity low and the Parks largest area of hydrothermal activity. The results also show a systematic migration of epicenters radially toward the caldera by an average of 1.23 km relative to HYPO71 starting locations.

The Lateral Inverse Q-Structure of the Upper Crust in Yellowstone National Park from Seismic Refraction Data.

(M.S. Thesis, December 1981)

Author: Steven Ralph Clawson

Support: National Science Foundation

Supervisor: Robert B. Smith

ABSTRACT

The spectral ratio technique was adapted to model the lateral variation in δQ^{-1} in the Yellowstone region using seismic refraction data. The attenuation measurements were based on changes in the frequency content of the wavelets from the crystalline basement that were recorded from large-scale refraction experiments conducted in Yellowstone National Park in 1978 and 1980. A maximum entropy spectral estimate provided the best estimates of the power spectra for the short time series. Differential attenuation, δt^*, measurements were then calculated from a least squares fit to the spectral ratio. This technique requires the determination of small changes in δt^*, which also contain possible errors that were reduced by: (1) averaging over three power spectra from three stations outside the anomalous area to use as a reference spectrum, (2) averaging δt^* values that do not add significant information to the inversion and were thought to be error prone, and (4) weighting the individual datum in the inversion. Using these methods, the differential attenuation data set had an acceptable signal to error ratio of 4.0.

The differential attenuation data set was then inverted using a modified ridge regression estimator to give a δQ^{-1}-model for the surface and crystalline basement layers in Yellowstone National Park. High attenuation occurs in the near-surface, ($Q < 27$), within the Yellowstone caldera, while low attenuation occurs on the crystalline basement, ($Q > 200$), probably corresponding to a cooling granitic batholith with a shallow vapor-liquid mixture near the surface. An anomalous area beneath Hot Springs Basin, in the northeast corner of the caldera, showed high attenuation, ($Q = 40$), and a 30 percent velocity reduction in the crystalline layer. This zone is postulated to be due to a partial melt at depth. The western and southwestern caldera also showed high attenuation in the crystalline layer that are postulated to be caused by a fracture zone.

Microearthquake Studies Across the Basin and Range-Colorado Plateau Transition Zone in Central Utah

(M.S. Thesis, June 1982)

Author: Mary Eileen McKee

Support: National Science Foundation; State of Utah; U.S. Geological Survey

Supervisor: Walter J. Arabasz

ABSTRACT

Earthquake studies of the Basin and Range-Colorado Plateau transition in central Utah were recently initiated by the University of Utah, motivated by increasing interest in the geodynamics of the transition zone. A 10-week microearthquake field study (12 instruments, 36 sites, 700 km^2, 400 hypocenters) was carried out during the summer of 1979 between 39°-40°N and 110°30'-112°30'W. Results from this study, together with fixed-network data and the results of a 1980 aftershock study (following a shock of M4.4 on May 24, 1980 at 39.9°N, 112.0°W), provide new information for: (1) resolution of crustal seismicity in central Utah, (2) observation of the characteristics of the clustered seismic activity in the vicinity of coal mining operations in the eastern Wasatch Plateau, and the diffuse epicentral patterns in the eastern Basin and Range province, and (3) mapping of changes in stress orientation from fault plane solutions. Key sets of microearthquake data were processed with a joint-hypocenter-determination program in an attempt to delineate trends in the hypocenters that could be correlated with local structures.

Diffuse seismicity and normal faulting focal mechanisms with ENE-ESE-trending T-axes characterize the Basin and Range structural region west of the Wasatch Plateau. Scattered microearthquakes occur throughout the western and central parts of the Wasatch Plateau itself, which is broken by a series of en echelon N-S trending

Cenozoic grabens. Along the eastern boundary of the Wasatch Plateau, intense, very shallow (<4km) microseismicity is associated with extensive underground coal mining. In the East Mountain area, south of Huntington Canyon, more than 300 events per day ($M_L > 2.0$) were detected. A significant finding was the discrimination of earthquakes 6-16 km beneath this same area. A composite fault-plane solution for 8 of these events has oblique nodal planes with a near-horizontal P-axis trending N25°E--spatially identifying a transition from Basin and Range extension to horizontal compression thought to be typical of the inner core of the Colorado Plateau.

Seismicity and Correlation with Fine Structure in the Sevier Valley Area of the Basin and Range-Colorado Plateau Transition, South-Central Utah

(M.S. Thesis, June 1983)

Author: Dale Richard Julander

Support: National Science Foundation

Supervisor: Walter J. Arabasz

ABSTRACT

A program of systematic microearthquake studies focusing on the Basin and Range-Colorado Plateau transition in central and SW Utah was begun by the University of Utah in 1979. This thesis synthesizes results of recent work carried out between 38° and 39°N lat including: (1) a 7-wk field study during summer 1981 (13 portable seismographs, 33 sites, 5-15 km station spacing, 156 hypocenters) along the Sevier River Valley and its flanking highlands, between about Richfield and Circleville; and (2) an 8-day aftershock study (10 portable seismographs, Δ = 0-20 km, 249 hypocenters) following a shock of local magnitude 4.0 on May 24, 1982, that occurred close to Richfield-directly within the 1981 study area. Upper-crustal structure was specially investigated to improve hypocentral accuracy. This included use of nearby quarry blasts as refraction sources and analysis of local earthquake data for multilayering using both the minimum-apparent-velocity method and a simultaneous velocity-hypocenter inversion technique. To unravel the association of seismicity with complex geologic structure, high-quality earthquake locations were processed with a JHD program to achieve maximum spatial precision, and focal mechanisms (both single-event and composite) were determined using both P-wave first motions and SV/P amplitude inversion. Important results include: (1) generally diffuse seismicity (depth = 0-13 km) with locally intense clustering and spatially discontinuous seismicity above and below depths of 5-6 km that may be a result of low-angle detachment faulting; (2) a predominance of seismic slip on moderately-dipping to high-angle fractures; (3) common focal mechanisms with large components of strike-slip (with no

indication of change in mechanism with depth down to at least 10 km) that suggest either a transitional stress state between the Basin and Range and Colorado Plateau provinces or block-interior deformation not directly correlative with a regional stress field.

APPENDIX B

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NOTE

For further information or assistance regarding earthquake data in the Utah region, contact:

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