KRSP 90

1990 Kenya Rift International Seismic Project

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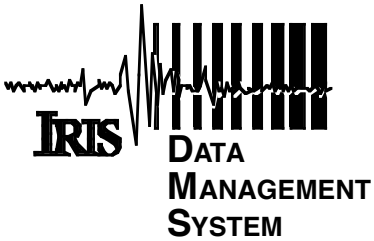
Data Set 03-002



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1990 Kenya Rift International Seismic Project (KRISP 90) Teleseismic Experiment

The Kenya Rift International Seismic Project (KRISP) consisted of a preliminary experiment conducted in 1985 (KRISP85) and a seismic refraction and teleseismic tomography experiment conducted in 1989-1990. The seismic refraction/wide-angle reflection survey was conducted in Jan.-Feb. 1990. The teleseismic segment recorded teleseismic, regional, and local events during a seven-month time span from October 1989 to April 1990. The KRISP90 teleseismic array was centered on Nakuru and positioned over the Kenya dome, an elliptical region of uplift associated with the onset of rifting in the Miocene (Achauer et al., 1994). The KRISP85 and KRISP90 refraction/tomographic experiments were designed to investigate the lithospheric and asthenospheric structure of the Kenya rift in order to delineate the modes and mechanism of continental rifting and interrelating features of crustal structure, development of sedimentary basins, and volcanic features within the rift (Prodehl et al., 1994).

During the KRISP90 teleseismic experiment, 61 stations were deployed from Lake Victoria in the west to just east of Mount Kenya. The average interval between stations gradually increased with distance away from the center of the array. This allowed both a dense array within the rift valley (10-15 km station separation) and an aperture length sufficient to image the upper mantle to 150 km depth (Prodehl et al., 1994; Achauer et al., 1994; and Slack and Davis, 1994). Contributing to the KRISP90 teleseismic array, University of Wisconsin-Madison personnel deployed fourteen 3-component digital seismographs positioned at 19 sites (Figure 1) from December 1989 to April 1990 (Green, 1993).

Event data collected by the UW array are being made publicly available through the IRIS DMC as part of an NSF-supported project to archive historic UW-Madison digital seismic datasets collected by the research group of Prof. R. P. Meyer. During the 4 1/2 months of operation of the UW instrumentation as part of the KRISP90 array, 85 teleseisms identified by the USGS (PDE) were recorded by 5 or more KRISP90 stations (Table 2). An additional 220 local events were recorded by at least 4 UW stations (Table 3).

Data Collection and Processing

The University of Wisconsin instruments, equipped with HS10-1 1Hz natural frequency seismometers, were set to selectively trigger on teleseismic events at 25 samples/sec using a pre-trigger recording time of 80 s. The data have been assembled in the form of day volumes containing events listed in Tables 2 and 3. The UW event data was preserved as SAC files containing station and timing information within the headers.

Tape Provided

The data archive consists of one DAT tape with day-volume data (in SAC format), this report in postscript and RTF formats, and miscellaneous information.

UW Seismic Recorders

The University of Wisconsin-Madison portable digital seismic recorders are wide-dynamic-range instruments (106 dB) designed for recording seismic waves from earthquakes or explosions (Table 4) (Powell, 1983). Data from 1-Hz Hall-Sears HS-10-1 geophones were recorded at 25-Hz sampling rates, with a 4-pole Butterworth anti-aliasing filter at 6.25 Hz. A 13.6 kHz Omega receiver incorporated in each seismograph recorded data from the worldwide Omega navigational network concurrently with seismic signals. A timing-correction process developed for application to the UW seismic recorders provides 1/4 sample rms time error relative to Universal Time (Schneider et al., 1987). Ground motion may be estimated from an average value for voltage sensitivity of 150 V/m/s for the UW Hall-Sears geophones.

Acknowledgments

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Related publications

Achauer, U., A. Glahn, J. Ritter, P. Maguire, R. Meyer, P. Davis, P. Slack, and W. Green, New ideas on the Kenya rift based on the inversion of the combined dataset of the 1985 and 1989/90 seismic tomography experiments, *Tectonophysics*, *236*, 305-329, 1994.

Green, W. Verney., Lithospheric Seismic Structure of the Cenozoic Kenya Rift and the Precambrian Midcontinent Rift from Teleseismic Tomography, Ph.D.. Thesis – University of Wisconsin-Madison*,* 178 pp., 1993

Prodehl, C., J. Mechie, U. Achauer, G.R. Keller, M.A. Khan, W.D. Mooney, S.J. Gaciri, J.D. Obel, The KRISP 90 seismic experiment—a technical review, *Tectonophysics, 236,* 33-60, 1994.

Powell, L.A., Engineering Description of the U.W. Portable Digital Seismograph, Proceedings of the Committee on Controlled Source Seismology (CCSS), Workshop on Portable Digital Seismograph Development, Los Altos, California, 121-122, 1983.

Schneider, J.F., R.C. Aster, L.A. Powell, and R.P. Meyer, Timing of portable seismographs from Omega navigation signals, *Bull. Seismo. Soc. Am.*, *77*, 1457-1478, 1987.

Slack, P., and P. Davis, Attenuation and velocity of P-waves in the mantle beneath the East African Rift, Kenya, *Tectonophysics, 236,* 331-358, 1994.

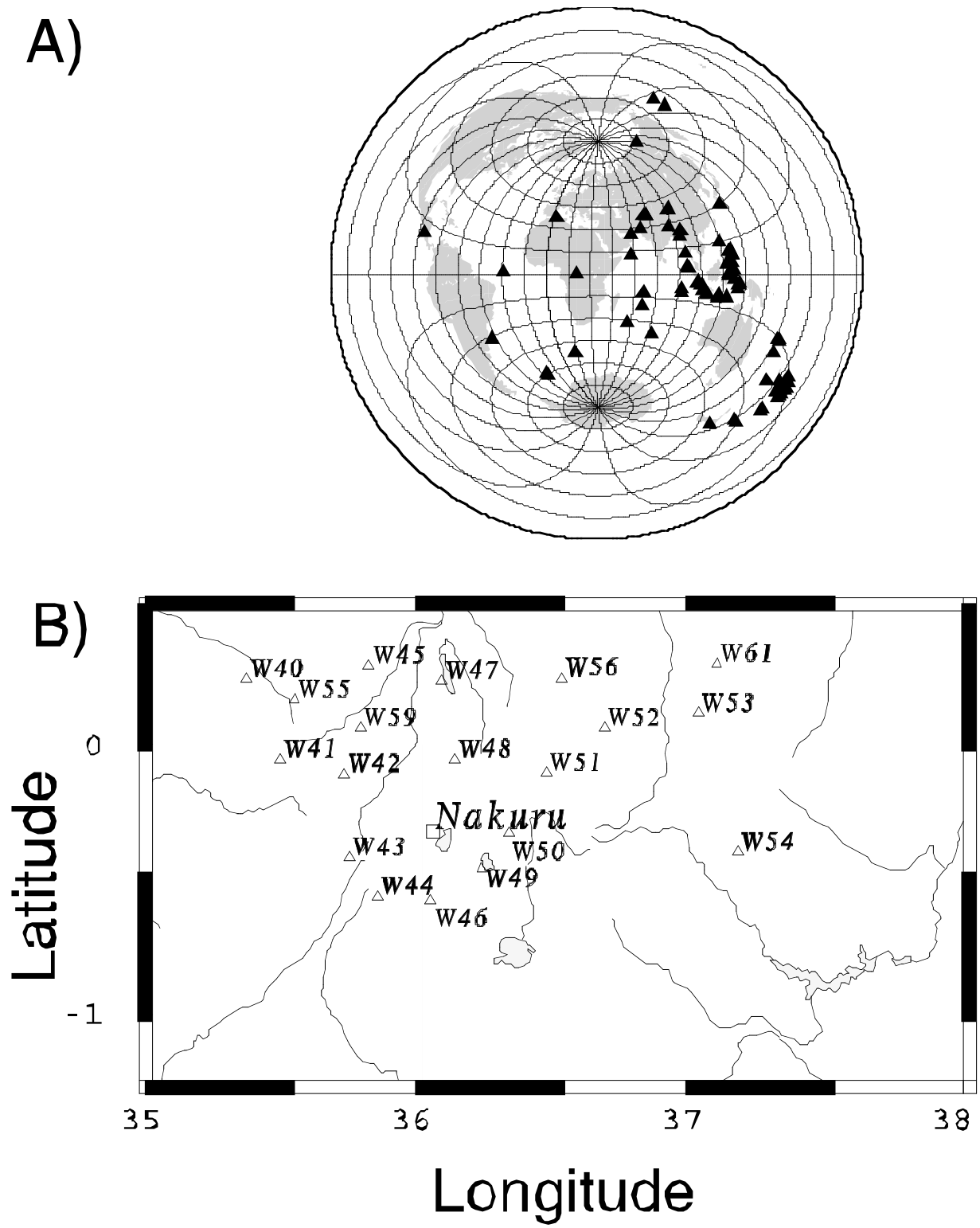

Figure 1. Map of the 19 UW stations (triangle) occupied during the KRISP90 Teleseismic Experiment are displayed in the lower panel. Eighty-five of the teleseismic events recorded by the UW array (triangle) are displayed in the upper panel (see Table 9 of Prodehl et al. 1994).

Table 1. Locations of UW stations deployed in the KRISP90 Teleseismic Experiment.

ID	Latitude	Longitude	Elevation
W40	0.246	35.349	2280
W41	-0.055	35.474	2440
W42	-0.108	35.711	2853
W43	-0.418	35.731	2820
W44	-0.565	35.836	2800
W45	0.295	35.803	1810
W46	-0.576	36.032	2568
W47	0.239	36.072	1160
W48	-0.054	36.121	1750
W49	-0.460	36.220	1790
W50	-0.328	36.319	2570
W51	-0.106	36.458	2560
W52	0.062	36.673	1960
W53	0.117	37.022	1800
W54	-0.400	37.167	1980
W55	0.166	35.526	2590
W56	0.250	36.517	1870
W59	0.062	35.771	1982
W61	0.301	37.0	2160

Table 2. Locations of UW teleseismic events recorded by the KRISP90 Teleseismic Experiment (see Table 9, Prodehl et al., 1994).

ID	Name	m:d:yr	hr:mn:sc	Latitude	Longitude	Depth	Directory	# Sta
1	Banda	12/06/89	5:19:46.1	-6.222	-130.459	97	W340	5
2	Iran	12/07/89	12:59:32.6	25.943	-59.002	10	W341	7
3	Burma	12/08/89	0:04:25.3	21.218	-93.800	47	W342	7
4	Philipines	12/08/89	10:23:11.3	10.071	-126.513	33	W342	7
5	Minahasa	12/09/89	20:38:8.5	0.184	-123.456	154	W343	11
6	Tonga	12/11/89	17:28:48.2	-17.210	172.230	33	W345	7
7	Banda	12/12/89	8:33:55.5	-4.705	-130.869	72	W346	7
8	Philipines	12/15/89	18:43:46.0	8.393	-126.778	33	W349	14
9	Philipines	12/16/89	0:33:36.4	8.442	-127.066	33	W350	7
10	Philipines	12/16/89	0:53:45.7	8.427	-126.950	33	W350	8
11	W. Irian	12/16/89	2:40:48.3	-3.619	-131.223	33	W350	5
12	S. India	12/17/89	3:12:15.6	-8.546	-92.209	10	W351	12
13	C. Atlantic	12/18/89	7:13:2.5	1.017	29.013	18	W352	10
14	Philipines	12/20/89	0:8:25.6	8.130	-126.879	64	W354	12
15	Philipines	12/20/89	8:35:20.6	8.203	-126.935	42	W354	10
16	Sumatera	12/21/89	8:8:6.2	3.176	-96.420	33	W355	5
17	S.Sandwich	12/25/89	14:50:57.1	-59.478	25.735	33	W359	5
18	Halmahera	12/25/89	19:50:19.1	1.687	-127.178	105	W359	9
19	Molucca	12/27/89	4:19:45.1	0.959	-126.159	78	W361	5
20	Sumatera	12/27/89	19:24:11.9	-4.780	-103.320	90	W361	7
21	Sumatera	12/27/89	20:1:4.0	-4.428	-102.963	57	W361	8
22	Tonga	12/29/89	14:36:48.9	-18.662	175.525	274	W363	8
23	Philipines	01/02/90	1:25:6.8	8.326	-127.443	42	W002	5
24	Ceram	01/02/90	21:38:18.4	-2.587	-127.744	33	W002	10
25	Somoa	01/04/90	5:32:25.4	-15.046	172.904	83	W004	10
26	Java	01/05/90	10:10:21.4	-8.750	-106.527	27	W005	6
27	Arabia	01/05/90	11:59:54.3	12.395	-57.892	10	W005	7
28	S. India	01/06/90	21:44:55.6	-10.674	-93.019	10	W006	10
29	At.-Ind. Oc.	01/07/90	20:53:29.0	-32.196	-57.437	10	W007	10
30	Tonga	01/08/90	4:17:39.4	-17.670	172.530	33	W008	6
31	Tibet	01/09/90	2:29:21.2	28.110	-88.129	33	W009	8
32	Fox Isl.	01/09/90	4:58:38.8	52.018	169.363	33	W009	5
33	Burma	01/09/90	18:51:28.9	24.748	-95.277	118	W009	9
34	Burma	01/10/90	6:37:54.5	24.538	-94.681	85	W010	6
35	Sw. Africa	01/10/90	10:6:1.4	-52.206	-13.558	10	W010	5
36	Adaman	01/10/90	11:53:21.2	11.603	-95.187	33	W010	6
37	Timor	01/10/90	16:11:45.6	-10.287	-123.677	39	W010	10
38	Taluad	01/12/90	15:28:15.0	4.976	-126.464	66	W012	5
39	Tonga	01/13/90	17:2:9.6	-18.320	175.920	313	W013	9
40	Sumba	01/13/90	20:3:41.5	-10.217	-117.784	35	W013	7
41	Qinghan	01/14/90	3:3:19.0	37.767	-91.894	17	W014	11
42	Kermadec	01/18/90	12:45:26.0	-29.999	177.706	26	W018	5

43	Sumatera	01/22/90	17:26:12.1	3.848	-96.103	51	W022	6
44	Philipines	01/24/90	19:33:31.0	14.582	-119.455	23	W024	8
45	Sunda	01/28/90	3:58:47.1	-5.960	-105.640	83	W028	5
46	Fiji	02/02/90	18:34:46.7	-17.936	178.378	576	W033	8
47	Java	02/04/90	7:58:14.0	-10.243	-110.311	47	W035	7
48	Afghanistan	02/05/90	5:16:45.1	37.069	-71.273	102	W036	7
49	Philipines	02/08/90	7:15:32.3	9.691	-124.708	31	W039	7
50	Philipines	02/08/90	7:39:50.8	9.658	-124.841	33	W039	5
51	Philipines	02/08/90	7:47:0.1	9.726	-124.643	34	W039	10
52	Algeria	02/09/90	9:31:47.8	36.747	-2.426	12	W040	7
53	S. Atlantic	02/12/90	23:56:36.6	-31.152	48.311	30	W043	0
54	Minahasa	02/15/90	0:27:13.1	-0.432	-123.669	232	W046	8
55	Ryukyu	02/17/90	2:28:0.2	29.500	-130.796	50	W048	0
56	NewZealand	02/19/90	5:34:37.4	-40.300	-176.045	23	W050	6
57	Vanuatu	02/19/90	6:48:13.2	-15.411	-166.297	36	W050	6
58	Tonga	02/19/90	16:46:33.2	-16.240	173.950	33	W050	7
59	M. Ind.Rise	02/22/90	16:51:50.4	-11.508	-66.343	10	W053	6
60	Tonga	02/24/90	19:13:15.4	-15.280	175.453	33	W055	6
61	Fiji	03/03/90	12:16:26.9	-22.041	-175.156	33	W062	7
62	Tonga	03/03/90	21:26:24.0	-22.210	174.160	33	W062	5
63	Vanuatu	03/04/90	17:21:46.1	-15.357	-167.820	33	W063	5
64	Pakistan	03/04/90	19:46:22.1	28.872	-66.349	28	W063	5
65	Vanuatu	03/05/90	16:38:15.0	-18.134	-167.949	33	W064	5
66	Kashmir	03/05/90	20:47:3.5	36.850	-73.009	33	W064	5
67	Afghanistan	03/05/90	23:4:23.7	36.743	-72.974	33	W064	5
68	Sumba	03/06/90	13:30:59.1	-11.298	-117.488	33	W065	5
69	Kashmir	03/06/90	18:7:6.1	36.882	-73.104	33	W065	5
70	Kashmir	03/06/90	21:39:51.3	36.865	-73.088	33	W065	5
71	MascareneI	03/07/90	18:22:3.4	-17.331	-66.639	10	W066	0
72	M. Ind.Rise	03/11/90	0:55:31.0	-37.203	-78.165	10	W070	7
73	Andreanoff	03/12/90	14:41:21.9	51.391	174.967	33	W071	7
74	Laptev Sea	03/13/90	0:32:58.9	73.314	-134.955	16	W072	6
75	Somoa	03/13/90	1:04:50.2	-16.716	172.390	33	W072	10
76	Celebes	03/14/90	3:44:49.1	4.578	-122.617	640	W073	7
77	Vanuatu	03/15/90	4:56:34.5	-15.151	-167.249	131	W074	9
78	MascareneI	03/18/90	23:19:29.0	-20.448	-66.761	20	W077	5
79	Kermadec	03/21/90	16:46:6.6	-31.118	179.210	153	W080	5
80	Tonga	03/24/90	17:20:18.4	-16.255	173.018	33	W083	5
81	Nicaragua	04/03/90	22:57:0.6	11.397	86.388	53	W093	7
82	Somoa	04/06/90	06:09:1.8	-15.451	172.005	33	W096	6
83	S.Sandwich	04/06/90	07:52:1.0	-60.508	25.486	33	W096	5
84	Tonga	04/06/90	14:31:45.9	-21.781	174.159	33	W096	5
85	Java	04/10/90	22:44:43.0	-10.572	-109.572	33	W100	6

Table 3. Listing of local earthquakes recorded by UW stations during the KRISP90 Teleseismic Experiment. The earliest trigger time per event is listed.

Evt	yr/mo/dy	hr:min:sec	Directory	#sta
1	89/12/05	18:01:48	W339	5
2	89/12/06	06:43:53	W340	4
3	89/12/07	00:26:16	W341	4
4	89/12/08	11:50:19	W342	6
5	89/12/09	23:55:15	W343	11
6	89/12/10	01:27:05	W344	4
7	89/12/10	01:27:05	W344	8
8	89/12/10	20:56:06	W344	4
9	89/12/11	02:00:28	W345	10
10	89/12/12	09:57:03	W346	8
11	89/12/13	13:48:31	W347	7
12	89/12/13	18:53:02	W347	7
13	89/12/14	14:28:04	W348	11
14	89/12/14	18:14:39	W348	6
15	89/12/14	18:32:57	W348	7
16	89/12/14	19:17:41	W348	10
17	89/12/14	22:05:12	W348	5
18	89/12/15	02:53:41	W349	6
19	89/12/15	10:47:17	W349	12
20	89/12/15	17:27:19	W349	5
21	89/12/18	16:29:55	W352	4
22	89/12/18	19:31:23	W352	4
23	89/12/18	19:47:01	W352	5
24	89/12/20	08:33:08	W354	4
25	89/12/21	23:39:26	W355	5
26	89/12/23	03:59:56	W357	10
27	89/12/24	00:44:54	W358	6
28	89/12/24	17:35:35	W358	8
29	89/12/28	03:58:31	W362	8
30	89/12/29	13:31:33	W363	8
31	89/12/31	17:14:08	W365	5
32	89/12/31	22:34:03	W365	8
33	90/01/01	04:07:55	W01	6
34	90/01/03	02:38:55	W03	7
35	90/01/03	12:09:20	W03	6
36	90/01/05	17:02:01	W05	4
37	90/01/08	13:42:02	W08	6
38	90/01/09	04:11:37	W09	4
39	90/01/09	20:41:49	W09	8
40	90/01/10	21:13:15	W10	6
41	90/01/12	17:51:15	W12	8
42	90/01/12	22:13:54	W12	6
43	90/01/13	17:07:26	W13	9
44	90/01/15	08:43:58	W15	6

45	90/01/15	11:44:59	W15	4
46	90/01/16	01:58:12	W16	8
47	90/01/16	11:08:06	W16	5
48	90/01/17	10:22:14	W17	4
49	90/01/18	05:58:02	W18	5
50	90/01/29	05:59:45	W29	5
51	90/01/29	12:02:18	W29	7
52	90/01/30	14:09:50	W30	10
53	90/01/30	18:14:38	W30	5
54	90/01/30	20:52:04	W30	5
55	90/01/30	20:52:15	W30	8
56	90/01/30	23:09:47	W30	7
57	90/01/31	00:12:25	W31	8
58	90/01/31	01:47:16	W31	7
59	90/01/31	10:52:01	W31	8
60	90/02/01	11:08:59	W32	8
61	90/02/03	02:09:00	W34	5
62	90/02/03	16:01:51	W34	6
63	90/02/04	04:30:03	W35	6
64	90/02/04	07:19:04	W35	4
65	90/02/04	17:12:16	W35	4
66	90/02/04	21:50:13	W35	4
67	90/02/05	20:53:40	W36	5
68	90/02/06	00:17:26	W37	5
69	90/02/06	20:33:30	W37	5
70	90/02/07	04:00:45	W38	5
71	90/02/09	15:41:34	W40	9
72	90/02/12	20:19:12	W43	6
73	90/02/13	08:40:53	W44	4
74	90/02/13	13:46:53	W44	5
75	90/02/14	12:14:05	W45	10
76	90/02/14	19:02:51	W45	5
77	90/02/16	08:47:17	W47	4
78	90/02/17	15:36:53	W48	6
79	90/02/18	02:22:25	W49	5
80	90/02/22	01:53:05	W53	7
81	90/02/25	00:04:40	W56	5
82	90/02/26	01:57:18	W57	6
83	90/02/26	11:37:44	W57	5
84	90/03/04	00:42:30	W63	4
85	90/03/07	11:15:07	W66	5
86	90/03/09	13:40:10	W68	4
87	90/03/10	22:41:38	W69	5
88	90/03/13	15:15:47	W72	6
89	90/03/13	23:46:52	W72	7
90	90/03/13	23:59:10	W72	5
91	90/03/14	00:52:59	W73	6
92	90/03/14	01:24:30	W73	5

93	90/03/14	02:27:29	W73	8
94	90/03/14	02:28:15	W73	7
95	90/03/14	03:08:44	W73	6
96	90/03/14	03:14:12	W73	5
97	90/03/14	08:24:13	W73	6
98	90/03/14	11:02:46	W73	9
99	90/03/14	13:44:31	W73	4
100	90/03/14	19:58:14	W73	8
101	90/03/14	20:45:53	W73	8
102	90/03/15	01:26:31	W74	9
103	90/03/15	02:22:32	W74	7
104	90/03/15	05:43:32	W74	6
105	90/03/16	03:26:42	W75	6
106	90/03/16	04:44:03	W75	7
107	90/03/16	10:45:17	W75	7
108	90/03/16	13:22:01	W75	8
109	90/03/16	16:57:33	W75	8
110	90/03/16	17:45:01	W75	6
111	90/03/16	19:15:44	W75	5
112	90/03/17	02:26:27	W76	4
113	90/03/17	09:11:18	W76	6
114	90/03/17	16:08:33	W76	4
115	90/03/17	17:39:52	W76	5
116	90/03/18	13:00:21	W77	6
117	90/03/21	03:55:42	W80	4
118	90/03/21	05:53:54	W80	4
119	90/03/23	11:40:11	W82	5
120	90/03/24	19:37:10	W83	5
121	90/03/31	05:54:48	W90	5
122	90/03/31	17:33:05	W90	5
123	90/04/02	02:53:51	W92	5
124	90/04/02	14:55:45	W92	5
125	90/04/03	02:43:10	W93	5
126	90/04/04	01:37:05	W94	7
127	90/04/04	22:53:38	W94	7
128	90/04/05	01:29:30	W95	5
129	90/04/05	17:55:38	W95	6
130	90/04/05	18:36:19	W95	4
131	90/04/06	00:45:56	W96	6
132	90/04/06	01:06:15	W96	6
133	90/04/06	10:16:14	W96	4
134	90/04/06	13:13:11	W96	5
135	90/04/07	01:39:03	W97	6
136	90/04/07	06:07:23	W97	4
137	90/04/09	00:02:57	W99	4
138	90/04/09	20:40:48	W99	7
139	90/04/10	08:22:18	W100	5

Table 4. General specifications, University of Wisconsin-Madison digital 3-component recorders

DATA STORAGE:	5" reel 1/4" tape, 1800 feet		or	SCSI 3-1/2" disk
CAPACITY:	20 Mbyte			210 Mbyte
FORMAT:	4-track; 3-channel + error correction			multi-stream packet
DYNAMIC RANGE:	106 dB	Noise = 0.25 □V P-P		Clipping = 0.05 V P-P
CALIBRATION:	Random binary sequence and step current applied to seismometer coils through a bridge (at programmed start times)			
PASSBAND:	Low end: 2 poles at 0.09 Hz High end: 4-pole Butterworth at (0.25 * sample rate)			
SAMPLE RATE:	25, 50, 100, 200, 400 samples/second			
PRE-EVENT DELAY:	512, 1024, 2048 samples/channel			
MODES:	Programmed and/or multiple-mode triggered			
PROGRAMMING:	Time (ddd – hr:mn:sc), repeat interval and count for run, calibrate, trigger arm and disarm (24 entries)			
RUN TIMES:	Programmable to 1000 minutes in 1 sec steps with optional programmed limits on total recording time for each mode			
TRIGGER HARDWARE:	STA/delayed LTA ratio; broadband or teleseismic filtered			
TRIGGER SOFTWARE:	Three frequency band Walsh transform filter to discriminate teleseismic, regional, and noise; with independent run times			
STATUS REVIEW:	Omega signal, time, configuration, schedules, number of events recorded and time used for each mode, times of last 500 events, seismometer period and damping			
TIMING INTERNAL:	1 mHz TCXO, +/- 1 x 10^{-6} over temperature range			
EXTERNAL:	13.6 kHz Omega VLF phase recorded with seismic data; worldwide coverage (except Antarctica and central Greenland) Post-processing time corrections: +/- 1 x 10^{-8} oscillator error; 1/4 sample RMS time error relative to U.T.			
POWER:	12.5 V DC +/- 20% 40 ma average current waiting for trigger 400 ma average current recording to tape 50 ma average current recording to disk			
DIMENSIONS:	56 x 33 x 40 cm			
WEIGHT:	22 kg			
TEMPERATURE:	0 deg to 50 deg C normal range (tape operates to 0 deg C) -20 deg to 70 dec C reduced spec. (disk operates to –20 deg C) -40 deg to 80 deg C storage			