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1979 Bucaramanga, Columbia Experiment

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PASSCAL Data Report 00-001



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Data Report No. 00-001

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The University of Wisconsin-Madison deployed an array of 12 3-component digital seismographs above the Bucaramanga slab of Colombia for 19 days from late June to the early July 1979 to study details of the Bucaramanga nest based on microseismicity [Schneider, 1984; Schneider et al., 1987] (Figure 1). The Bucaramanga nest positioned at 160 km depth (6.8°N, 73°W) beneath Colombia produces about 8 earthquakes of $m_b \geq 4.7$ per year from a source region having dimensions of 10 km or less [Frolich et al., 1995]. Of the 168 locatable events from the recorded microseismicity ($m_b \leq 4.3$), 142 are from the nest and 19 image a segment of the Bucaramanga slab [Schneider, 1984]. Event data collected by the temporary network from June 20 to July 6, 1979 are being made publicly available through the IRIS DMC as part of a NSF-supported project to archive historic UW-Madison digital seismic datasets collected by the research group of Prof. R. P. Meyer.

Data Collection and Processing

Data were recorded in triggered mode for all stations. Table 1 presents the station coordinates. Table 2 contains the SEG-Y headers set during the UW-to-SEG-Y format conversion process. Clock corrections are incorporated into the SEG-Y data. The data have been assembled in the form of an event volume. Table 3 lists the events based on information from Schneider [1984].

Tape Provided

The data archive consists of one DAT tape with the event-volume data (in PASSCAL SEG-Y 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 100-Hz sampling rates, with a 4-pole Butterworth anti-aliasing filter at 24 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.

Related publications:

- Frolich, C., K. Kadinsky-Cade, and S.D. Davis, A Reexamination of the Bucaramanga, Colombia, Earthquake Nest, *Bull. Seismo. Soc. Am.*, 85, 1622-1634, 1995.
- 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., The Intermediate-Depth Microearthquakes of the Bucaramanga Nest, Colombia, Ph.D. Dissertation - University of Wisconsin-Madison, 233 pp., 1984.
- Schneider, J.F., W.D. Pennington, and R.P. Meyer, Microseismicity and focal mechanisms of the intermediate-depth Bucaramanga nest, Colombia, *J. Geophys. Res.*, 92, 13913-13926, 1987.
- 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.

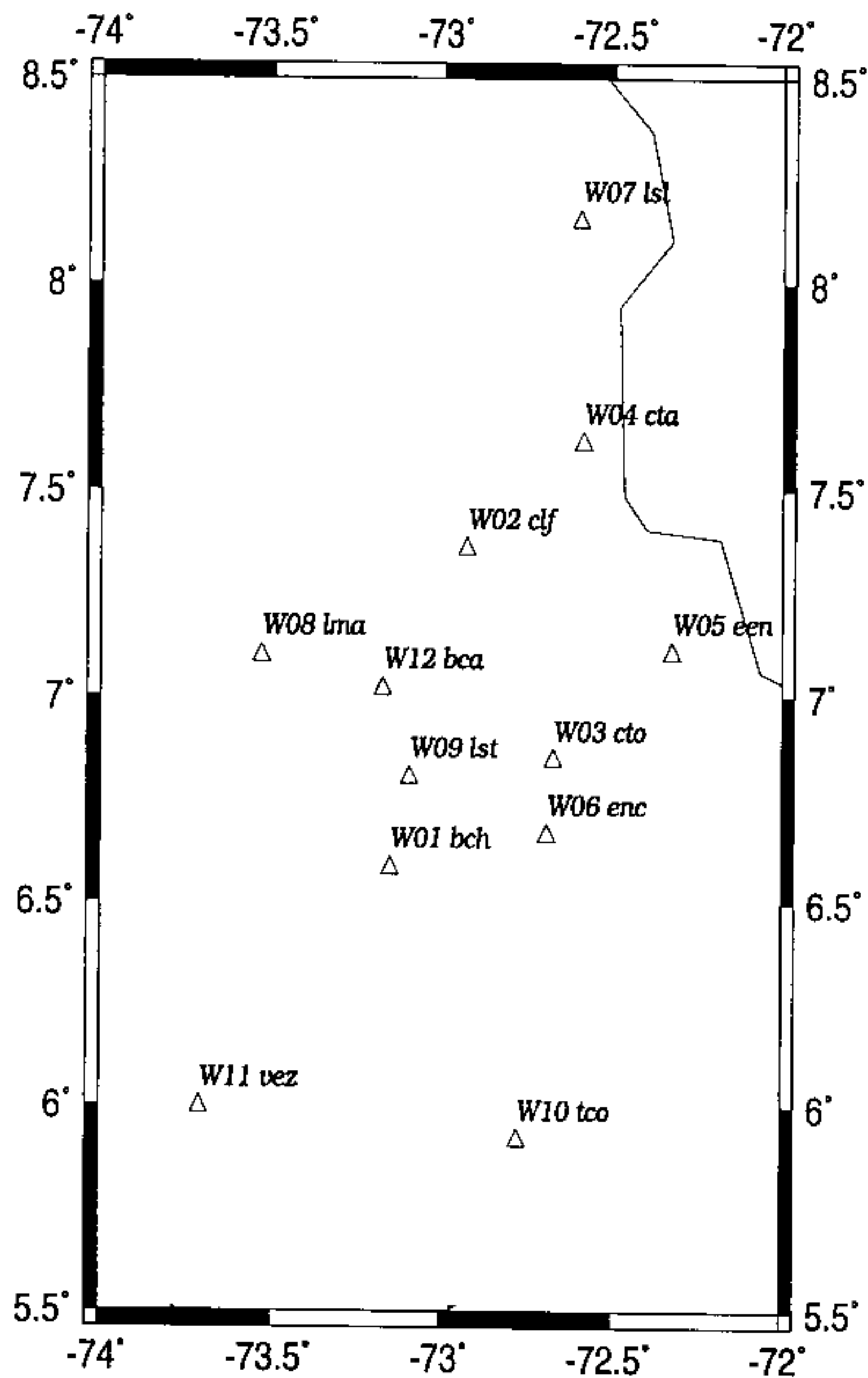


Figure 1. Map of UW station locations for the Bucaramanga, Colombia array, 1979 (triangles). The northeastern border of Colombia with Venezuela is indicated by the solid line. The Bucaramanga nest epicenter occurs just to the west of station W09 (6.8°N, 73.17°W). The array was designed to maximize hypocentral control of events from the nest [Schneider, 1984].

Table 1. Locations of UW stations deployed in the Bucaramanga nest experiment 1979.

Bucaramanga, Colombia 1979 (June 20 to July 6, 1979)							
Station Number	Station ID	Latitude (N)		Longitude (W)		Elev (m)	Comment
1	bch	6.000	0.583	73.00	0.154	1400	Barichara
2	clf	7.000	0.358	72.00	0.93	2200	California
3	cto	6.000	0.845	72.00	0.673	3050	El Cerrito
4	cta	7.000	0.614	72.00	0.588	1500	Chinacota
5	een	7.000	0.106	72.00	0.325	2000	El EnCanto
6	enc	6.000	0.662	72.00	0.691	1700	Enciso
7	lsl	8.000	0.155	72.00	0.598	225	La Salina
8	lma	7.000	0.099	73.00	0.531	525	Lisama
9	lst	6.000	0.802	73.00	0.096	1650	Los Santos
10	tco	5.000	0.919	72.00	0.776	2800	Tasco
11	vez	5.000	0.997	73.00	0.708	2300	Velez
12	bca	7.000	0.019	73.00	0.176	750	Bucaramanga

Table 2. Portions of the PASSCAL SEG Y headers used and instrument parameters

Segy Headers set via UW data archiving	Comments (standard usages followed)
lineSeq	UW Instrument event# + channel
reelSeq	UW Instrument event# + channel
event_number	Experiment Event Number
channel_number	standard (1-3:V,N,E)
traceID	standard (1)
elevationScale	standard (1)
coordScale	standard (1)
coordUnits	standard (2 for lat and long)
sampleLength	standard
num_samps*	standard
deltaSample	microseconds
samp_rate	microseconds
gainType	standard
gainConst	Standard: $tr[i]$ (Volts) = $tr[i]*scale_fac/gain$
scale_fac	Scale to volts ($1.9*10^{*-5}$ V/lsb)
year	Trace start time
day	
hour	
minute	
second	
m_secs	
timeBasisCode	standard usage (2 is GMT)
trigyear	trigger time
trigday	
trighour	
trigminute	
trigsecond	
trigmills	
data_form	standard usage (1 is 32-bit)
inst_no	UW instrument number
station_name	Station name (3-letter id)
recLongOrX	receiver longitude*3600
recLatOrY	receiver latitude*3600
sourceLongOrX	source longitude*3600
sourceLatOrY	source latitude*3600
sourceDepth	source depth (m)

Table 3. Events from the Bucaramanga, Colombia 1979 experiment. Over 400 events based on a minimum clustering of four stations are tabled here. The event information (origin time, latitude, longitude and depth) for the 142 nest events (type 1) and 19 slab events (type 2) was culled from Schneider [1984]. Event information of other identified events (type 0) include only the first recorded station time.

id	yr	m	d	h	m	sec	latitude (N)		longitude (W)		depth (km)	type
1	79	06	20	01	08	18.89	0	0.0	0	0.0	0.0	0
2	79	06	20	03	32	17.53	0	0.0	0	0.0	0.0	0
3	79	06	20	04	22	11.78	0	0.0	0	0.0	0.0	0
4	79	06	20	11	21	44.81	0	0.0	0	0.0	0.0	0
5	79	06	20	12	47	21.20	0	0.0	0	0.0	0.0	0
6	79	06	20	23	50	19.14	06	0.823	73	0.170	159.170	1
7	79	06	21	0	0	55.49	0	0.0	0	0.0	0.0	0
8	79	06	21	01	26	52.36	0	0.0	0	0.0	0.0	0
9	79	06	21	02	27	45.92	06	0.810	73	0.173	162.270	1
10	79	06	21	02	37	46.23	06	0.825	73	0.164	160.450	1
11	79	06	21	02	58	31.25	06	0.829	73	0.170	161.960	1
12	79	06	21	05	15	09.01	06	0.805	73	0.168	161.250	1
13	79	06	21	06	14	24.01	06	0.810	73	0.185	162.250	1
14	79	06	21	09	21	30.01	0	0.0	0	0.0	0.0	0
15	79	06	21	10	0	14.76	0	0.0	0	0.0	0.0	0
16	79	06	21	10	18	33.40	0	0.0	0	0.0	0.0	0
17	79	06	21	11	44	23.47	0	0.0	0	0.0	0.0	0
18	79	06	21	12	58	43.87	0	0.0	0	0.0	0.0	0
19	79	06	21	15	10	24.68	0	0.0	0	0.0	0.0	0
20	79	06	21	15	37	16.96	0	0.0	0	0.0	0.0	0
21	79	06	21	16	56	02.21	0	0.0	0	0.0	0.0	0
22	79	06	21	17	01	55.39	0	0.0	0	0.0	0.0	0
23	79	06	21	18	54	32.03	0	0.0	0	0.0	0.0	0
24	79	06	22	0	0	55.51	0	0.0	0	0.0	0.0	0
25	79	06	22	0	08	48.57	0	0.0	0	0.0	0.0	0
26	79	06	22	0	15	11.44	06	0.845	73	0.169	160.090	1
27	79	06	22	0	39	13.53	0	0.0	0	0.0	0.0	0
28	79	06	22	0	51	31.53	0	0.0	0	0.0	0.0	0
29	79	06	22	03	11	24.48	05	0.598	74	0.003	121.460	2
30	79	06	22	03	19	28.99	0	0.0	0	0.0	0.0	0
31	79	06	22	03	35	13.37	0	0.0	0	0.0	0.0	0
32	79	06	22	05	57	55.94	0	0.0	0	0.0	0.0	0
33	79	06	22	06	35	45.24	0	0.0	0	0.0	0.0	0
34	79	06	22	07	16	28.44	0	0.0	0	0.0	0.0	0
35	79	06	22	07	20	44.18	0	0.0	0	0.0	0.0	0
36	79	06	22	07	55	13.77	06	0.494	73	0.640	122.090	2
37	79	06	22	08	01	25.47	0	0.0	0	0.0	0.0	0
38	79	06	22	08	12	47.65	0	0.0	0	0.0	0.0	0
39	79	06	22	10	53	07.67	0	0.0	0	0.0	0.0	0
40	79	06	22	11	08	50.79	06	0.836	73	0.170	160.480	1
41	79	06	22	11	17	0.09	0	0.0	0	0.0	0.0	0
42	79	06	22	13	30	56.50	06	0.812	73	0.169	160.400	1
43	79	06	22	14	07	12.77	0	0.0	0	0.0	0.0	0
44	79	06	22	14	43	36.34	0	0.0	0	0.0	0.0	0
45	79	06	22	15	44	34.68	0	0.0	0	0.0	0.0	0

46	79	06	22	15	55	53.96	06	0.824	73	0.165	160.130	1
47	79	06	22	16	08	38.49	0	0.0	0	0.0	0.0	0
48	79	06	22	16	36	19.61	06	0.789	73	0.215	161.470	1
49	79	06	22	18	09	06.34	0	0.0	0	0.0	0.0	0
50	79	06	22	19	36	46.66	0	0.0	0	0.0	0.0	0
51	79	06	22	20	01	19.56	0	0.0	0	0.0	0.0	0
52	79	06	22	21	52	15.85	06	0.487	74	0.621	48.170	2
53	79	06	22	22	28	20.89	0	0.0	0	0.0	0.0	0
54	79	06	22	23	57	0.06	06	0.821	73	0.175	158.740	1
55	79	06	23	0	0	50.84	0	0.0	0	0.0	0.0	0
56	79	06	23	01	59	07.39	0	0.0	0	0.0	0.0	0
57	79	06	23	02	21	31.95	0	0.0	0	0.0	0.0	0
58	79	06	23	03	13	46.90	0	0.0	0	0.0	0.0	0
59	79	06	23	03	15	43.56	0	0.0	0	0.0	0.0	0
60	79	06	23	04	17	38.10	06	0.815	73	0.176	161.490	1
61	79	06	23	04	32	21.97	0	0.0	0	0.0	0.0	0
62	79	06	23	04	53	49.30	0	0.0	0	0.0	0.0	0
63	79	06	23	05	28	04.33	0	0.0	0	0.0	0.0	0
64	79	06	23	05	31	15.23	06	0.814	73	0.179	161.860	1
65	79	06	23	06	39	54.01	06	0.820	73	0.175	161.030	2
66	79	06	23	08	20	38.59	0	0.0	0	0.0	0.0	0
67	79	06	23	10	43	55.56	06	0.791	73	0.155	160.250	1
68	79	06	23	11	07	56.48	0	0.0	0	0.0	0.0	0
69	79	06	23	16	33	42.12	06	0.839	73	0.164	157.0	1
70	79	06	23	18	54	43.17	0	0.0	0	0.0	0.0	0
71	79	06	23	20	09	29.05	0	0.0	0	0.0	0.0	0
72	79	06	23	21	08	26.45	0	0.0	0	0.0	0.0	0
73	79	06	23	23	13	57.48	06	0.842	73	0.170	162.680	1
74	79	06	24	0	0	55.42	0	0.0	0	0.0	0.0	0
75	79	06	24	0	07	35.37	06	0.797	73	0.158	160.460	1
76	79	06	24	01	08	26.96	0	0.0	0	0.0	0.0	0
77	79	06	24	01	44	37.65	06	0.789	73	0.152	158.890	1
78	79	06	24	02	15	30.85	0	0.0	0	0.0	0.0	0
79	79	06	24	02	30	40.48	06	0.858	73	0.166	161.230	1
80	79	06	24	03	0	22.17	0	0.0	0	0.0	0.0	0
81	79	06	24	03	44	24.51	06	0.778	73	0.153	160.090	1
82	79	06	24	04	43	04.94	0	0.0	0	0.0	0.0	0
83	79	06	24	05	08	14.35	0	0.0	0	0.0	0.0	0
84	79	06	24	05	26	18.77	0	0.0	0	0.0	0.0	0
85	79	06	24	05	44	51.56	0	0.0	0	0.0	0.0	0
86	79	06	24	13	06	12.12	0	0.0	0	0.0	0.0	0
87	79	06	24	13	40	10.23	06	0.813	73	0.160	162.260	1
88	79	06	24	17	08	27.97	0	0.0	0	0.0	0.0	0
89	79	06	24	18	05	37.55	0	0.0	0	0.0	0.0	0
90	79	06	24	18	07	08.49	06	0.821	73	0.170	161.140	1
91	79	06	24	19	30	19.56	0	0.0	0	0.0	0.0	0
92	79	06	24	19	43	56.85	0	0.0	0	0.0	0.0	0
93	79	06	24	22	04	06.65	0	0.0	0	0.0	0.0	0
94	79	06	24	23	49	39.15	0	0.0	0	0.0	0.0	0
95	79	06	25	0	0	01.07	0	0.0	0	0.0	0.0	0
96	79	06	25	0	0	55.40	0	0.0	0	0.0	0.0	0
97	79	06	25	0	33	10.65	0	0.0	0	0.0	0.0	0
98	79	06	25	0	37	50.44	06	0.820	73	0.147	162.780	1
99	79	06	25	0	39	34.99	06	0.813	73	0.176	161.650	1

100	79	06	25	01	19	47.19	0	0.0	0	0.0	0.0	0
101	79	06	25	01	51	01.06	0	0.0	0	0.0	0.0	0
102	79	06	25	02	24	09.23	06	0.812	73	0.166	161.220	1
103	79	06	25	04	52	41.24	0	0.0	0	0.0	0.0	0
104	79	06	25	05	21	15.60	06	0.825	73	0.171	159.690	1
105	79	06	25	05	48	05.86	0	0.0	0	0.0	0.0	0
106	79	06	25	06	27	45.75	06	0.820	73	0.170	159.660	1
107	79	06	25	06	43	44.67	06	0.811	73	0.174	162.190	1
108	79	06	25	07	56	24.86	06	0.898	73	0.198	162.170	1
109	79	06	25	08	35	40.97	0	0.0	0	0.0	0.0	0
110	79	06	25	10	24	07.16	0	0.0	0	0.0	0.0	0
111	79	06	25	11	11	50.23	06	0.790	73	0.155	159.580	1
112	79	06	25	11	14	30.25	0	0.0	0	0.0	0.0	0
113	79	06	25	12	48	10.37	06	0.809	73	0.165	161.740	1
114	79	06	25	14	55	23.82	06	0.833	73	0.173	158.420	1
115	79	06	25	15	32	52.81	06	0.838	73	0.171	159.570	1
116	79	06	25	16	28	58.23	06	0.842	73	0.483	127.190	2
117	79	06	25	17	06	55.18	06	0.515	73	0.125	186.300	2
118	79	06	25	17	27	23.64	0	0.0	0	0.0	0.0	0
119	79	06	25	18	01	51.46	0	0.0	0	0.0	0.0	0
120	79	06	25	20	01	57.75	0	0.0	0	0.0	0.0	0
121	79	06	25	20	22	39.67	06	0.824	73	0.166	159.780	1
122	79	06	25	20	46	36.72	0	0.0	0	0.0	0.0	0
123	79	06	25	21	41	30.59	06	0.811	73	0.173	160.270	1
124	79	06	25	22	37	59.38	06	0.801	73	0.164	159.650	1
125	79	06	25	23	44	22.27	0	0.0	0	0.0	0.0	0
126	79	06	26	0	0	55.38	0	0.0	0	0.0	0.0	0
127	79	06	26	0	03	08.62	07	0.602	73	0.770	170.020	2
128	79	06	26	01	13	18.92	0	0.0	0	0.0	0.0	0
129	79	06	26	02	36	32.14	0	0.0	0	0.0	0.0	0
130	79	06	26	03	23	19.37	0	0.0	0	0.0	0.0	0
131	79	06	26	04	15	02.06	0	0.0	0	0.0	0.0	0
132	79	06	26	05	43	49.53	0	0.0	0	0.0	0.0	0
133	79	06	26	05	46	02.06	0	0.0	0	0.0	0.0	0
134	79	06	26	06	21	49.59	06	0.811	73	0.163	160.410	1
135	79	06	26	07	51	19.76	06	0.810	73	0.162	162.760	1
136	79	06	26	08	10	26.23	0	0.0	0	0.0	0.0	0
137	79	06	26	09	36	46.50	0	0.0	0	0.0	0.0	0
138	79	06	26	16	02	50.83	0	0.0	0	0.0	0.0	0
139	79	06	26	16	22	58.15	06	0.811	73	0.172	158.520	1
140	79	06	26	17	19	05.98	06	0.819	73	0.172	160.240	1
141	79	06	26	18	26	13.56	0	0.0	0	0.0	0.0	0
142	79	06	26	19	20	03.54	0	0.0	0	0.0	0.0	0
143	79	06	26	19	51	01.47	0	0.0	0	0.0	0.0	0
144	79	06	26	21	10	46.62	06	0.819	73	0.179	161.250	1
145	79	06	27	0	0	55.27	0	0.0	0	0.0	0.0	0
146	79	06	27	01	21	24.80	0	0.0	0	0.0	0.0	0
147	79	06	27	01	22	38.87	0	0.0	0	0.0	0.0	0
148	79	06	27	01	42	26.49	0	0.0	0	0.0	0.0	0
149	79	06	27	01	44	09.19	0	0.0	0	0.0	0.0	0
150	79	06	27	02	13	28.00	0	0.0	0	0.0	0.0	0
151	79	06	27	02	17	28.88	06	0.819	73	0.172	160.470	1
152	79	06	27	03	13	51.76	0	0.0	0	0.0	0.0	0
153	79	06	27	03	31	27.35	0	0.0	0	0.0	0.0	0

154	79	06	27	04	11	20.01	06	0.778	73	0.166	159.400	1
155	79	06	27	04	27	35.30	06	0.817	73	0.180	161.180	1
156	79	06	27	05	25	18.02	06	0.798	73	0.162	161.370	1
157	79	06	27	06	08	30.21	06	0.812	73	0.168	158.970	1
158	79	06	27	06	53	40.28	0	0.0	0	0.0	0.0	0
159	79	06	27	07	14	44.59	06	0.257	73	0.806	0.310	2
160	79	06	27	08	0	50.69	06	0.824	73	0.171	161.780	1
161	79	06	27	08	46	16.01	0	0.0	0	0.0	0.0	0
162	79	06	27	09	14	42.22	0	0.0	0	0.0	0.0	0
163	79	06	27	09	39	11.20	0	0.0	0	0.0	0.0	0
164	79	06	27	09	49	33.36	06	0.802	73	0.162	160.980	1
165	79	06	27	09	52	07.31	0	0.0	0	0.0	0.0	0
166	79	06	27	10	07	02.11	06	0.814	73	0.181	159.920	1
167	79	06	27	11	17	41.19	0	0.0	0	0.0	0.0	0
168	79	06	27	11	31	22.53	06	0.788	73	0.155	159.200	1
169	79	06	27	12	05	18.29	0	0.0	0	0.0	0.0	0
170	79	06	27	12	26	38.11	0	0.0	0	0.0	0.0	0
171	79	06	27	13	19	26.82	06	0.808	73	0.155	161.960	1
172	79	06	27	13	32	14.42	0	0.0	0	0.0	0.0	0
173	79	06	27	19	44	18.99	0	0.0	0	0.0	0.0	0
174	79	06	27	20	49	16.06	06	0.795	73	0.158	160.510	1
175	79	06	27	21	17	31.31	0	0.0	0	0.0	0.0	0
176	79	06	27	21	53	14.43	0	0.0	0	0.0	0.0	0
177	79	06	27	23	57	59.19	0	0.0	0	0.0	0.0	0
178	79	06	28	0	0	30.29	0	0.0	0	0.0	0.0	0
179	79	06	28	0	42	30.86	06	0.807	73	0.164	159.930	1
180	79	06	28	03	35	42.10	0	0.0	0	0.0	0.0	0
181	79	06	28	03	42	37.98	06	0.797	73	0.160	159.760	1
182	79	06	28	04	34	52.84	0	0.0	0	0.0	0.0	0
183	79	06	28	05	55	43.51	06	0.814	73	0.214	162.840	1
184	79	06	28	06	37	35.29	0	0.0	0	0.0	0.0	0
185	79	06	28	07	11	03.22	06	0.808	73	0.182	160.120	1
186	79	06	28	07	37	45.10	06	0.798	73	0.165	160.100	1
187	79	06	28	11	04	56.04	06	0.813	73	0.173	160.700	1
188	79	06	28	11	12	04.92	0	0.0	0	0.0	0.0	0
189	79	06	28	12	34	21.79	0	0.0	0	0.0	0.0	0
190	79	06	28	17	04	29.81	0	0.0	0	0.0	0.0	0
191	79	06	28	20	32	40.46	06	0.782	73	0.151	158.390	1
192	79	06	28	22	23	46.60	06	0.819	73	0.173	161.440	1
193	79	06	28	22	38	18.60	0	0.0	0	0.0	0.0	0
194	79	06	28	23	18	23.44	06	0.805	73	0.165	161.290	1
195	79	06	28	23	32	13.44	0	0.0	0	0.0	0.0	0
196	79	06	28	23	47	35.09	0	0.0	0	0.0	0.0	0
197	79	06	29	0	0	55.09	0	0.0	0	0.0	0.0	0
198	79	06	29	02	36	18.14	06	0.821	73	0.177	160.690	1
199	79	06	29	03	37	03.05	0	0.0	0	0.0	0.0	0
200	79	06	29	03	58	52.97	08	0.157	74	0.877	84.200	2
201	79	06	29	04	21	29.91	0	0.0	0	0.0	0.0	0
202	79	06	29	04	35	30.17	0	0.0	0	0.0	0.0	0
203	79	06	29	05	57	30.99	07	0.978	72	0.465	1.970	2
204	79	06	29	06	50	25.26	06	0.813	73	0.166	160.570	1
205	79	06	29	07	14	51.67	06	0.830	73	0.154	0.0	1
206	79	06	29	08	06	05.33	0	0.0	0	0.0	0.0	0
207	79	06	29	08	27	26.36	0	0.0	0	0.0	0.0	0

208	79	06	29	08	51	39.74	06	0.636	73	0.511	7.830	2
209	79	06	29	09	09	45.53	0	0.0	0	0.0	0.0	0
210	79	06	29	09	26	23.31	06	0.813	73	0.177	161.400	0
211	79	06	29	10	15	36.17	0	0.0	0	0.0	0.0	0
212	79	06	29	10	31	16.71	06	0.810	73	0.172	160.950	1
213	79	06	29	12	04	22.34	0	0.0	0	0.0	0.0	0
214	79	06	29	12	33	40.17	0	0.0	0	0.0	0.0	0
215	79	06	29	12	56	22.32	06	0.824	73	0.170	160.720	1
216	79	06	29	14	11	54.34	06	0.778	73	0.157	159.730	1
217	79	06	29	16	49	23.77	06	0.795	73	0.161	159.940	1
218	79	06	29	17	42	57.77	06	0.788	73	0.138	160.430	1
219	79	06	29	18	22	24.98	0	0.0	0	0.0	0.0	0
220	79	06	29	19	32	56.66	0	0.0	0	0.0	0.0	0
221	79	06	29	22	15	30.54	0	0.0	0	0.0	0.0	0
222	79	06	30	0	0	36.95	0	0.0	0	0.0	0.0	0
223	79	06	30	0	14	09.77	0	0.0	0	0.0	0.0	0
224	79	06	30	0	25	19.21	06	0.809	73	0.174	163.410	1
225	79	06	30	01	03	43.40	0	0.0	0	0.0	0.0	0
226	79	06	30	01	09	44.90	06	0.816	73	0.149	159.290	1
227	79	06	30	01	22	29.33	0	0.0	0	0.0	0.0	0
228	79	06	30	01	33	27.89	06	0.804	73	0.161	161.990	1
229	79	06	30	01	37	55.02	0	0.0	0	0.0	0.0	0
230	79	06	30	01	50	48.89	0	0.0	0	0.0	0.0	0
231	79	06	30	04	41	21.85	06	0.825	73	0.163	160.100	1
232	79	06	30	05	32	05.39	06	0.799	73	0.161	162.160	1
233	79	06	30	05	58	54.07	0	0.0	0	0.0	0.0	0
234	79	06	30	06	25	27.82	0	0.0	0	0.0	0.0	0
235	79	06	30	06	51	36.57	0	0.0	0	0.0	0.0	0
236	79	06	30	06	53	52.02	06	0.805	73	0.175	162.390	1
237	79	06	30	06	59	12.59	0	0.0	0	0.0	0.0	0
238	79	06	30	07	22	01.47	0	0.0	0	0.0	0.0	0
239	79	06	30	08	02	02.01	06	0.820	73	0.162	160.410	1
240	79	06	30	08	23	54.53	06	0.803	73	0.171	161.140	1
241	79	06	30	08	35	04.68	0	0.0	0	0.0	0.0	0
242	79	06	30	10	08	22.74	0	0.0	0	0.0	0.0	0
243	79	06	30	10	36	26.35	06	0.851	73	0.153	161.370	1
244	79	06	30	11	41	20.77	0	0.0	0	0.0	0.0	0
245	79	06	30	12	17	05.79	06	0.821	73	0.181	161.370	1
246	79	06	30	12	50	40.81	06	0.808	73	0.170	161.180	1
247	79	06	30	13	35	42.41	06	0.820	73	0.189	160.670	1
248	79	06	30	15	27	48.60	0	0.0	0	0.0	0.0	0
249	79	06	30	18	02	40.74	06	0.819	73	0.173	161.660	1
250	79	06	30	21	13	47.20	06	0.800	73	0.160	159.720	1
251	79	06	30	22	14	54.73	06	0.820	73	0.171	161.450	1
252	79	06	30	22	39	14.51	06	0.815	73	0.169	161.160	1
253	79	06	30	23	11	38.17	0	0.0	0	0.0	0.0	0
254	79	07	01	0	0	32.67	0	0.0	0	0.0	0.0	0
255	79	07	01	02	34	37.44	06	0.862	73	0.184	159.020	1
256	79	07	01	03	06	20.30	0	0.0	0	0.0	0.0	0
257	79	07	01	03	53	44.64	0	0.0	0	0.0	0.0	0
258	79	07	01	04	29	58.36	06	0.817	73	0.172	161.020	1
259	79	07	01	05	13	11.59	06	0.807	73	0.160	162.730	1
260	79	07	01	05	22	57.34	06	0.809	73	0.172	161.980	1
261	79	07	01	06	18	19.63	0	0.0	0	0.0	0.0	0

262	79	07	01	07	01	05.49	0	0.0	0	0.0	0.0	0
263	79	07	01	08	01	40.90	0	0.0	0	0.0	0.0	0
264	79	07	01	08	18	24.97	0	0.0	0	0.0	0.0	0
265	79	07	01	08	34	56.09	0	0.0	0	0.0	0.0	0
266	79	07	01	08	45	46.97	0	0.0	0	0.0	0.0	0
267	79	07	01	09	02	57.34	06	0.807	73	0.162	161.770	1
268	79	07	01	09	04	58.32	05	0.839	73	0.633	138.830	2
269	79	07	01	10	34	34.72	06	0.806	73	0.150	161.940	1
270	79	07	01	12	04	12.43	0	0.0	0	0.0	0.0	0
271	79	07	01	12	15	04.51	06	0.814	73	0.165	162.210	1
272	79	07	01	14	35	37.78	06	0.803	73	0.156	162.480	2
273	79	07	01	14	40	58.44	06	0.817	73	0.184	160.810	1
274	79	07	01	16	28	10.17	0	0.0	0	0.0	0.0	0
275	79	07	01	16	54	02.15	06	0.822	73	0.185	160.290	1
276	79	07	01	17	52	28.92	06	0.795	73	0.147	159.840	1
277	79	07	01	19	52	35.42	06	0.603	73	0.573	13.330	2
278	79	07	01	20	23	10.94	0	0.0	0	0.0	0.0	0
279	79	07	01	20	31	52.62	0	0.0	0	0.0	0.0	0
280	79	07	01	20	36	42.08	0	0.0	0	0.0	0.0	0
281	79	07	01	20	39	33.59	0	0.0	0	0.0	0.0	0
282	79	07	01	20	48	07.90	0	0.0	0	0.0	0.0	0
283	79	07	01	21	13	16.98	0	0.0	0	0.0	0.0	0
284	79	07	01	22	08	10.78	0	0.0	0	0.0	0.0	0
285	79	07	01	22	34	58.61	06	0.782	73	0.146	158.420	1
286	79	07	01	23	42	11.92	06	0.817	73	0.176	160.740	1
287	79	07	02	0	0	54.78	0	0.0	0	0.0	0.0	0
288	79	07	02	0	31	42.43	0	0.0	0	0.0	0.0	0
289	79	07	02	02	54	23.77	06	0.811	73	0.170	162.210	1
290	79	07	02	04	15	36.65	0	0.0	0	0.0	0.0	0
291	79	07	02	04	34	43.38	06	0.919	73	0.232	158.290	1
292	79	07	02	05	40	43.25	0	0.0	0	0.0	0.0	0
293	79	07	02	05	52	32.01	0	0.0	0	0.0	0.0	0
294	79	07	02	06	03	54.62	0	0.0	0	0.0	0.0	0
295	79	07	02	06	17	44.23	0	0.0	0	0.0	0.0	0
296	79	07	02	06	20	23.60	0	0.0	0	0.0	0.0	0
297	79	07	02	06	37	46.27	06	0.810	73	0.169	162.530	1
298	79	07	02	07	14	29.75	0	0.0	0	0.0	0.0	0
299	79	07	02	07	47	08.24	0	0.0	0	0.0	0.0	0
300	79	07	02	08	14	43.70	06	0.791	73	0.152	157.650	1
301	79	07	02	08	30	38.75	0	0.0	0	0.0	0.0	0
302	79	07	02	08	54	53.15	06	0.825	73	0.167	160.790	1
303	79	07	02	09	12	57.66	06	0.809	73	0.175	160.020	1
304	79	07	02	09	14	38.47	06	0.822	73	0.168	159.890	1
305	79	07	02	10	08	17.02	0	0.0	0	0.0	0.0	0
306	79	07	02	10	09	47.54	0	0.0	0	0.0	0.0	0
307	79	07	02	10	13	18.54	06	0.845	73	0.173	158.200	1
308	79	07	02	10	19	33.77	0	0.0	0	0.0	0.0	0
309	79	07	02	11	16	26.75	0	0.0	0	0.0	0.0	0
310	79	07	02	11	35	47.12	06	0.188	73	0.328	2.570	2
311	79	07	02	12	11	16.09	0	0.0	0	0.0	0.0	0
312	79	07	02	15	28	08.63	0	0.0	0	0.0	0.0	0
313	79	07	02	15	40	35.46	06	0.810	73	0.155	161.460	1
314	79	07	02	15	50	44.50	06	0.883	73	0.386	137.170	2
315	79	07	02	17	03	01.91	0	0.0	0	0.0	0.0	0

316	79	07	02	19	23	47.82	06	0.834	73	0.179	159.290	1
317	79	07	02	19	33	33.90	06	0.821	73	0.175	160.800	1
318	79	07	02	19	42	52.61	06	0.812	73	0.178	162.140	1
319	79	07	02	20	45	28.30	06	0.815	73	0.180	161.180	1
320	79	07	02	21	23	31.50	06	0.827	73	0.159	162.930	1
321	79	07	02	22	54	48.83	0	0.0	0	0.0	0.0	0
322	79	07	02	23	20	08.42	06	0.825	73	0.165	161.380	1
323	79	07	02	23	57	27.11	06	0.800	73	0.166	159.660	1
324	79	07	03	0	0	54.66	0	0.0	0	0.0	0.0	0
325	79	07	03	0	31	44.92	0	0.0	0	0.0	0.0	0
326	79	07	03	0	41	29.50	06	0.800	73	0.157	160.160	1
327	79	07	03	01	43	34.39	07	0.973	73	0.595	113.940	2
328	79	07	03	01	50	02.00	06	0.802	73	0.156	158.700	1
329	79	07	03	02	22	28.27	0	0.0	0	0.0	0.0	0
330	79	07	03	03	05	43.11	0	0.0	0	0.0	0.0	0
331	79	07	03	03	13	10.65	0	0.0	0	0.0	0.0	0
332	79	07	03	04	42	13.90	06	0.572	73	0.223	179.120	2
333	79	07	03	04	49	57.14	06	0.472	73	0.187	178.120	2
334	79	07	03	06	30	20.79	06	0.818	73	0.171	160.800	1
335	79	07	03	07	24	39.37	0	0.0	0	0.0	0.0	0
336	79	07	03	08	04	19.74	0	0.0	0	0.0	0.0	0
337	79	07	03	09	07	24.19	06	0.872	73	0.386	135.900	2
338	79	07	03	09	37	27.79	06	0.854	73	0.178	160.610	1
339	79	07	03	09	50	42.25	06	0.807	73	0.171	160.490	1
340	79	07	03	10	04	39.61	0	0.0	0	0.0	0.0	0
341	79	07	03	11	36	37.83	06	0.209	73	0.951	105.250	2
342	79	07	03	14	08	41.23	0	0.0	0	0.0	0.0	0
343	79	07	03	16	21	27.83	06	0.791	73	0.159	161.140	1
344	79	07	03	16	32	28.11	06	0.801	73	0.548	123.750	2
345	79	07	03	18	02	49.28	06	0.315	73	0.648	131.170	2
346	79	07	03	19	02	39.04	0	0.0	0	0.0	0.0	0
347	79	07	04	0	0	54.55	0	0.0	0	0.0	0.0	0
348	79	07	04	0	06	08.95	0	0.0	0	0.0	0.0	0
349	79	07	04	0	51	15.67	0	0.0	0	0.0	0.0	0
350	79	07	04	0	58	52.22	0	0.0	0	0.0	0.0	0
351	79	07	04	01	40	33.28	06	0.858	73	0.182	159.390	1
352	79	07	04	01	55	57.55	0	0.0	0	0.0	0.0	0
353	79	07	04	02	44	57.34	06	0.522	73	0.604	124.210	2
354	79	07	04	03	38	41.81	0	0.0	0	0.0	0.0	0
355	79	07	04	04	10	59.64	06	0.819	73	0.163	160.400	1
356	79	07	04	05	50	16.75	06	0.803	73	0.162	159.830	1
357	79	07	04	09	31	21.76	0	0.0	0	0.0	0.0	0
358	79	07	04	10	44	0.61	0	0.0	0	0.0	0.0	0
359	79	07	04	11	40	47.14	06	0.787	73	0.164	160.450	1
360	79	07	04	14	28	40.77	06	0.809	73	0.164	160.540	1
361	79	07	04	15	15	27.79	0	0.0	0	0.0	0.0	0
362	79	07	04	15	30	21.17	0	0.0	0	0.0	0.0	0
363	79	07	04	15	43	40.67	0	0.0	0	0.0	0.0	0
364	79	07	04	16	40	22.95	06	0.811	73	0.179	161.580	1
365	79	07	04	17	47	57.63	06	0.852	73	0.179	161.690	1
366	79	07	04	18	03	23.03	0	0.0	0	0.0	0.0	0
367	79	07	04	18	40	45.72	06	0.837	73	0.180	160.040	1
368	79	07	04	20	07	09.79	06	0.817	73	0.168	160.580	1
369	79	07	04	20	33	10.15	0	0.0	0	0.0	0.0	0

370	79	07	04	22	20	34.87	06	0.800	73	0.155	160.080	1
371	79	07	04	22	27	48.80	0	0.0	0	0.0	0.0	0
372	79	07	04	23	44	10.76	0	0.0	0	0.0	0.0	0
373	79	07	05	0	0	54.46	0	0.0	0	0.0	0.0	0
374	79	07	05	0	08	50.46	06	0.827	73	0.159	161.040	1
375	79	07	05	02	41	28.09	0	0.0	0	0.0	0.0	0
376	79	07	05	05	33	33.90	0	0.0	0	0.0	0.0	0
377	79	07	05	05	58	05.90	0	0.0	0	0.0	0.0	0
378	79	07	05	06	22	27.60	0	0.0	0	0.0	0.0	0
379	79	07	05	07	0	58.72	0	0.0	0	0.0	0.0	0
380	79	07	05	09	23	40.06	0	0.0	0	0.0	0.0	0
381	79	07	05	11	47	08.90	0	0.0	0	0.0	0.0	0
382	79	07	05	12	25	45.66	0	0.0	0	0.0	0.0	0
383	79	07	05	12	50	17.56	06	0.811	73	0.179	161.840	1
384	79	07	05	14	59	55.26	0	0.0	0	0.0	0.0	0
385	79	07	05	15	22	07.32	05	0.722	73	0.447	166.190	2
386	79	07	05	20	18	41.28	0	0.0	0	0.0	0.0	0
387	79	07	05	20	38	59.37	0	0.0	0	0.0	0.0	0
388	79	07	05	21	08	39.78	0	0.0	0	0.0	0.0	0
389	79	07	05	21	22	13.59	0	0.0	0	0.0	0.0	0
390	79	07	05	22	27	10.29	0	0.0	0	0.0	0.0	0
391	79	07	05	23	03	49.55	0	0.0	0	0.0	0.0	0
392	79	07	06	0	0	54.36	0	0.0	0	0.0	0.0	0
393	79	07	06	0	55	20.95	0	0.0	0	0.0	0.0	0
394	79	07	06	02	08	31.25	0	0.0	0	0.0	0.0	0
395	79	07	06	02	25	46.90	0	0.0	0	0.0	0.0	0
396	79	07	06	02	37	36.49	0	0.0	0	0.0	0.0	0
397	79	07	06	03	06	22.67	06	0.806	73	0.146	159.600	1
398	79	07	06	04	42	34.18	0	0.0	0	0.0	0.0	0
399	79	07	06	04	50	11.33	0	0.0	0	0.0	0.0	0
400	79	07	06	04	55	04.84	0	0.0	0	0.0	0.0	0
401	79	07	06	06	25	41.51	0	0.0	0	0.0	0.0	0
402	79	07	06	08	39	55.79	06	0.838	73	0.172	159.980	1
403	79	07	06	08	43	39.30	0	0.0	0	0.0	0.0	0
404	79	07	06	09	03	44.28	0	0.0	0	0.0	0.0	0
405	79	07	06	10	51	33.28	0	0.0	0	0.0	0.0	0
406	79	07	06	12	58	13.02	0	0.0	0	0.0	0.0	0
407	79	07	06	13	37	50.63	06	0.819	73	0.171	160.950	1
408	79	07	06	14	12	36.25	0	0.0	0	0.0	0.0	0
409	79	07	06	14	51	37.15	06	0.820	73	0.173	160.680	1
410	79	07	06	14	59	54.91	0	0.0	0	0.0	0.0	0
411	79	07	06	16	39	57.58	0	0.0	0	0.0	0.0	0
412	79	07	06	19	40	32.78	0	0.0	0	0.0	0.0	0
413	79	07	06	21	10	0.53	06	0.822	73	0.167	160.640	1
414	79	07	06	22	49	12.34	0	0.0	0	0.0	0.0	0
415	79	07	06	23	22	22.73	0	0.0	0	0.0	0.0	0
416	79	07	07	0	0	54.86	0	0.0	0	0.0	0.0	0
417	79	07	07	0	29	30.77	0	0.0	0	0.0	0.0	0
418	79	07	07	01	42	0.86	0	0.0	0	0.0	0.0	0
419	79	07	07	03	32	14.56	0	0.0	0	0.0	0.0	0
420	79	07	07	05	32	22.10	0	0.0	0	0.0	0.0	0
421	79	07	07	06	14	44.34	0	0.0	0	0.0	0.0	0
422	79	07	07	07	01	14.70	0	0.0	0	0.0	0.0	0
423	79	07	07	07	22	29.85	0	0.0	0	0.0	0.0	0

424	79	07	07	09	05	25.20	0	0.0	0	0.0	0.0	0
425	79	07	07	09	37	12.37	0	0.0	0	0.0	0.0	0
426	79	07	07	14	19	03.05	0	0.0	0	0.0	0.0	0
427	79	07	07	14	59	54.82	0	0.0	0	0.0	0.0	0
428	79	07	07	16	02	16.40	0	0.0	0	0.0	0.0	0
429	79	07	07	17	25	0.39	0	0.0	0	0.0	0.0	0
430	79	07	07	18	40	38.70	0	0.0	0	0.0	0.0	0
431	79	07	07	19	05	16.56	0	0.0	0	0.0	0.0	0
432	79	07	07	21	52	03.84	0	0.0	0	0.0	0.0	0
433	79	07	07	23	39	26.27	0	0.0	0	0.0	0.0	0
434	79	07	08	0	0	54.78	0	0.0	0	0.0	0.0	0
435	79	07	08	0	48	47.68	0	0.0	0	0.0	0.0	0
436	79	07	08	02	16	20.55	0	0.0	0	0.0	0.0	0
437	79	07	08	02	47	20.29	0	0.0	0	0.0	0.0	0
438	79	07	08	03	31	56.55	0	0.0	0	0.0	0.0	0
439	79	07	08	03	38	49.04	0	0.0	0	0.0	0.0	0
440	79	07	08	06	33	27.88	0	0.0	0	0.0	0.0	0
441	79	07	08	07	11	16.47	0	0.0	0	0.0	0.0	0
442	79	07	08	10	0	45.05	0	0.0	0	0.0	0.0	0
443	79	07	08	10	11	36.05	0	0.0	0	0.0	0.0	0
444	79	07	08	10	38	22.17	0	0.0	0	0.0	0.0	0
445	79	07	08	11	29	36.49	0	0.0	0	0.0	0.0	0
446	79	07	08	12	25	55.38	0	0.0	0	0.0	0.0	0
447	79	07	08	14	37	08.29	0	0.0	0	0.0	0.0	0
448	79	07	08	14	59	54.72	0	0.0	0	0.0	0.0	0
449	79	07	08	23	58	32.45	0	0.0	0	0.0	0.0	0
450	79	07	09	0	0	54.72	0	0.0	0	0.0	0.0	0
451	79	07	09	0	47	26.44	0	0.0	0	0.0	0.0	0
452	79	07	09	01	46	10.85	0	0.0	0	0.0	0.0	0
453	79	07	09	05	40	07.85	0	0.0	0	0.0	0.0	0
454	79	07	09	07	35	20.86	0	0.0	0	0.0	0.0	0
455	79	07	09	08	41	21.95	0	0.0	0	0.0	0.0	0
456	79	07	09	14	59	54.64	0	0.0	0	0.0	0.0	0
457	79	07	09	20	23	38.14	0	0.0	0	0.0	0.0	0
458	79	07	09	21	25	38.55	0	0.0	0	0.0	0.0	0
459	79	07	09	22	55	08.22	0	0.0	0	0.0	0.0	0
460	79	07	10	0	0	54.60	0	0.0	0	0.0	0.0	0
461	79	07	10	11	56	23.13	0	0.0	0	0.0	0.0	0
462	79	07	10	19	27	46.63	0	0.0	0	0.0	0.0	0
463	79	07	11	0	0	54.51	0	0.0	0	0.0	0.0	0
464	79	07	11	10	37	45.75	0	0.0	0	0.0	0.0	0

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 μ 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