EARTHQUAKE ACTIVITY IN THE YELLOWSTONE REGION

Preliminary Epicenters

April 1 – June 30, 2015

Prepared by the University of Utah Seismograph Stations and funded by
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September 22, 2015

Foreword and Data Explanation

This report contains an epicenter map (Figure 1) and listings of earthquakes (Tables 1 and 2) detected and located in the Yellowstone region (lat. 44° 00′ – 45° 10′ N, long. 109° 45′ – 111° 30′ W). The computer program HYPOINVERSE-2000 (F. W. Klein, 2012, U.S. Geological Survey Open-File Report 02-171 revised) was used to process the earthquake data. This report also includes maps and a table of operating seismograph stations in the University of Utah's Yellowstone seismic network (Figure 2, Table 3).

The earthquake listing in Table 2 is estimated to be systematically complete above magnitude 1.5 within Yellowstone. *These data are preliminary—both the locations and magnitudes in this table are subject to revision.*

The following data are listed for each earthquake in Table 2:

- Date (yymmdd) and origin time in Coordinated Universal Time (UTC). To convert to local time, subtract seven hours for Mountain Standard Time (MST) and six hours for Mountain Daylight Time (MDT). During the report period, local time was MDT.

- Earthquake location coordinates in degrees and minutes of north latitude and west longitude, and depth in kilometers below sea level. Note that prior to October 1, 2012 the earthquake depths in these quarterly reports were computed relative to a datum of 2000 m above sea level.

- "*" indicates poor depth resolution: no recording stations within 10 km or twice the depth.

- MAG, the computed Richter local magnitude (M_L) for each earthquake. "W" indicates that peak amplitude measurements from Wood-Anderson records were used. Otherwise, the estimate is calculated from signal durations and is more correctly identified as coda magnitude (M_C). The notation "--" indicates that a reliable magnitude estimate could not be made.

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

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

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

- RMS, the weighted root-mean-square of the travel-time residuals in seconds:

$$RMS = \left(\frac{\sum_i (W_i R_i)^2}{\sum_i (W_i)^2} \right)^{\frac{1}{2}}$$

where: R_i is the observed minus the computed arrival time for the i-th P or S reading, and 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).

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April 1 – June 30, 2015

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During the three-month period April 1 through June 30, 2015, the University of Utah Seismograph Stations (UUSS) located 220 earthquakes within the Yellowstone region (Figure 1). The total includes 1 earthquake in the magnitude 3 range, and 9 earthquakes in the magnitude 2 range. The largest event to occur during this period was a magnitude 3.0 earthquake on May 18th that was reported felt in the region (see Table 1, a cumulative tabulation of earthquakes during 2015 that were felt in the Yellowstone region). Additional information on earthquakes within the Yellowstone region is available from the University of Utah Seismograph Stations.

Online Information

A complete copy of this report, including maps and the earthquake catalog, is available on the UUSS web site at *http://www.quake.utah.edu/EQCENTER/QUARTERLY/quarterly.htm*.

Note: On October 1, 2012 UUSS began using the ANSS Quake Monitoring System (AQMS) software package for data acquisition and data processing. The primary effect on the data reported herein comes from computing the earthquake locations with a newer version of the computer program HYPOINVERSE-2000 (F. W. Klein, 2012, U.S. Geological Survey Open-File Report 02-171 revised) and a revised and expanded set of velocity models. As implemented at UUSS, this new version of the location program accounts for station elevation differences more accurately and reports focal depths relative to sea level instead of the 2000 m elevation datum used previously.

For earthquakes of magnitude 3 and larger in the Yellowstone region, the U. S. Geological Survey automatically posts a Community Internet Intensity Map (CIIM) on its "Did You Feel It?" web page at http://earthquake.usgs.gov/earthquakes/dyfi/. We encourage anyone who feels an earthquake to report their observations on this interactive web site; felt information is available by zip code on the CIIM site or can be obtained from UUSS directly.

Earthquakes of Magnitude 3.0 or Larger

M_L 3.2	May 18	17:00 MDT	3 mi NE of Lake, WY, YNP

Notable Swarm Seismicity

During the report period, there were three earthquake swarms in the Yellowstone region. For reporting purposes, we use the Mogi definition [Mogi, 1963] of a swarm and require each swarm to have ten or more earthquakes. Note that typically, around 50% of Yellowstone seismicity occurs as swarm seismicity [Farrell et al., 2009].

A. A swarm of 10 earthquakes ($0.0 \leq M \leq 2.1$) occurred about 6 miles NNW of West Yellowstone, MT on May 5th - 9th.
B. A swarm of 11 earthquakes ($-0.1 \leq M \leq 1.2$) occurred about 6 miles ESE of West Yellowstone, MT on May 27th - 30th.
C. A swarm of 16 earthquakes ($-0.1 \leq M \leq 2.4$) occurred about 6 miles SW of West Thumb, YNP on June 14th.

These swarms are labeled in Figure 1.

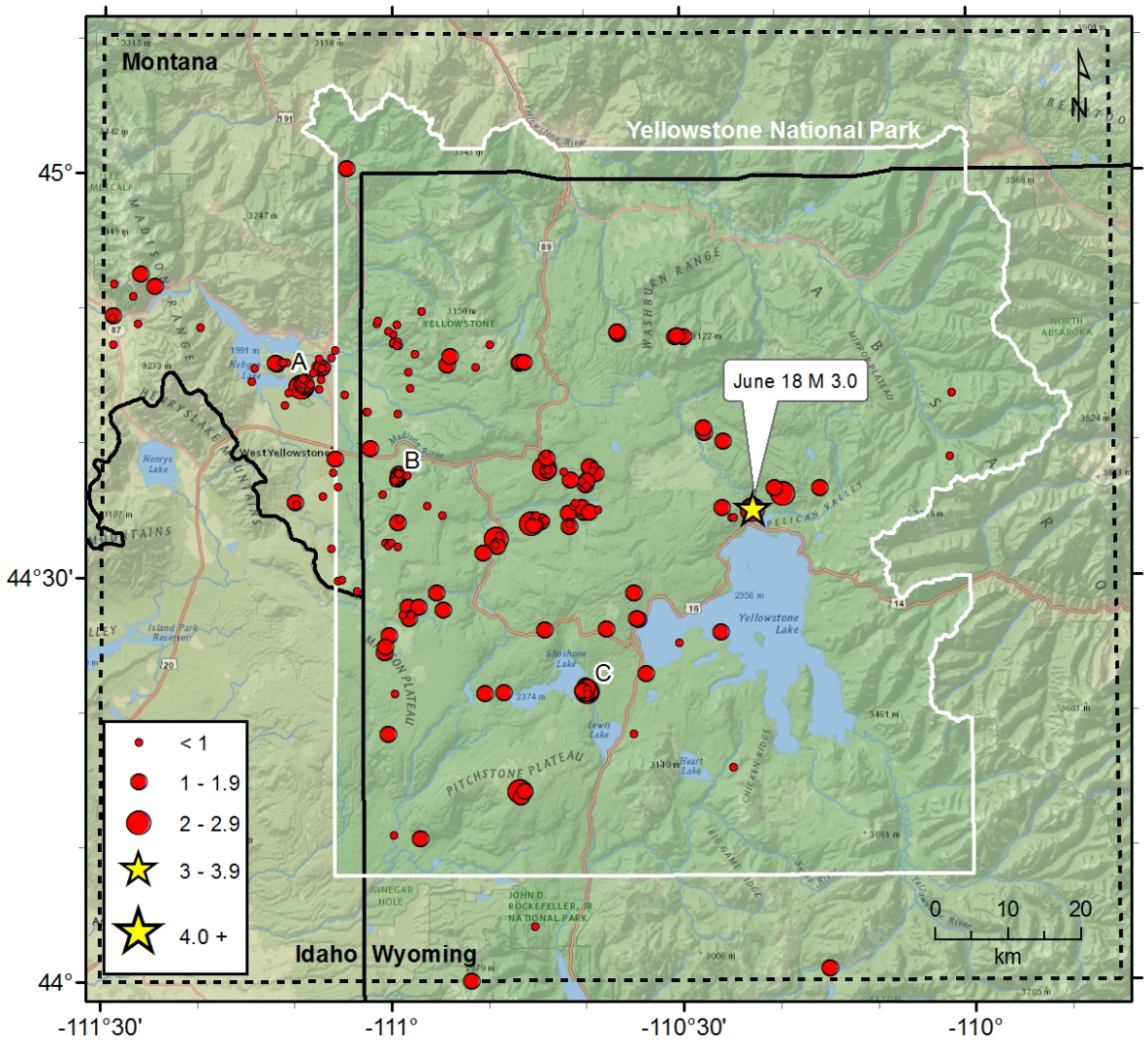

Figure 1. Earthquake epicenters located by the University of Utah Seismograph Stations, April 1, 2015 through June 30, 2015. Earthquakes of magnitude 3.0 and larger are depicted as yellow stars. Earthquake swarms labeled A-C are discussed in the text.

Table 1

EARTHQUAKES FELT IN THE YELLOWSTONE REGION
April 1, 2015 to June 30, 2015

Date	Time†	Felt Information‡	Latitude	Longitude	Magnitude§
May 18	17:00 MDT 23:00 UTC	Yellowstone. Felt (III) at Yellowstone National Park, WY.	44º 35.13′	110º 22.54′	M_L 3.0

† Times are listed both as Local Time—Mountain Standard Time (MST) or Mountain Daylight Time (MDT)—and as Coordinated Universal Time (UTC).
? Indicates on-line reports that appear questionable given the distance from the source
‡ *CIIM* indicates the availability of a Community Internet Intensity Map (http://earthquake.usgs.gov/earthquakes/dyfi/archives.php), compiled by the U.S. Geological Survey (USGS); *ShakeMap* indicates the availability of computer-generated maps of ground-shaking (*http://www.seis.utah.edu/shake/archive*), produced by the University of Utah Seismograph Stations (UUSS). Roman numerals correspond to the Modified Mercalli intensity scale. Unless otherwise indicated, felt information is from the USGS (1) CIIM reports and/or (2) PDE Monthly (or) Weekly Listing Files (http://earthquake.usgs.gov/research/data/pde.php).
§ Richter local magnitude (M_L) or coda magnitude (M_C) determined by UUSS. If labeled "NEIC," data are from the National Earthquake Information Center of the USGS.

Yellowstone Seismic Network
June 30, 2015

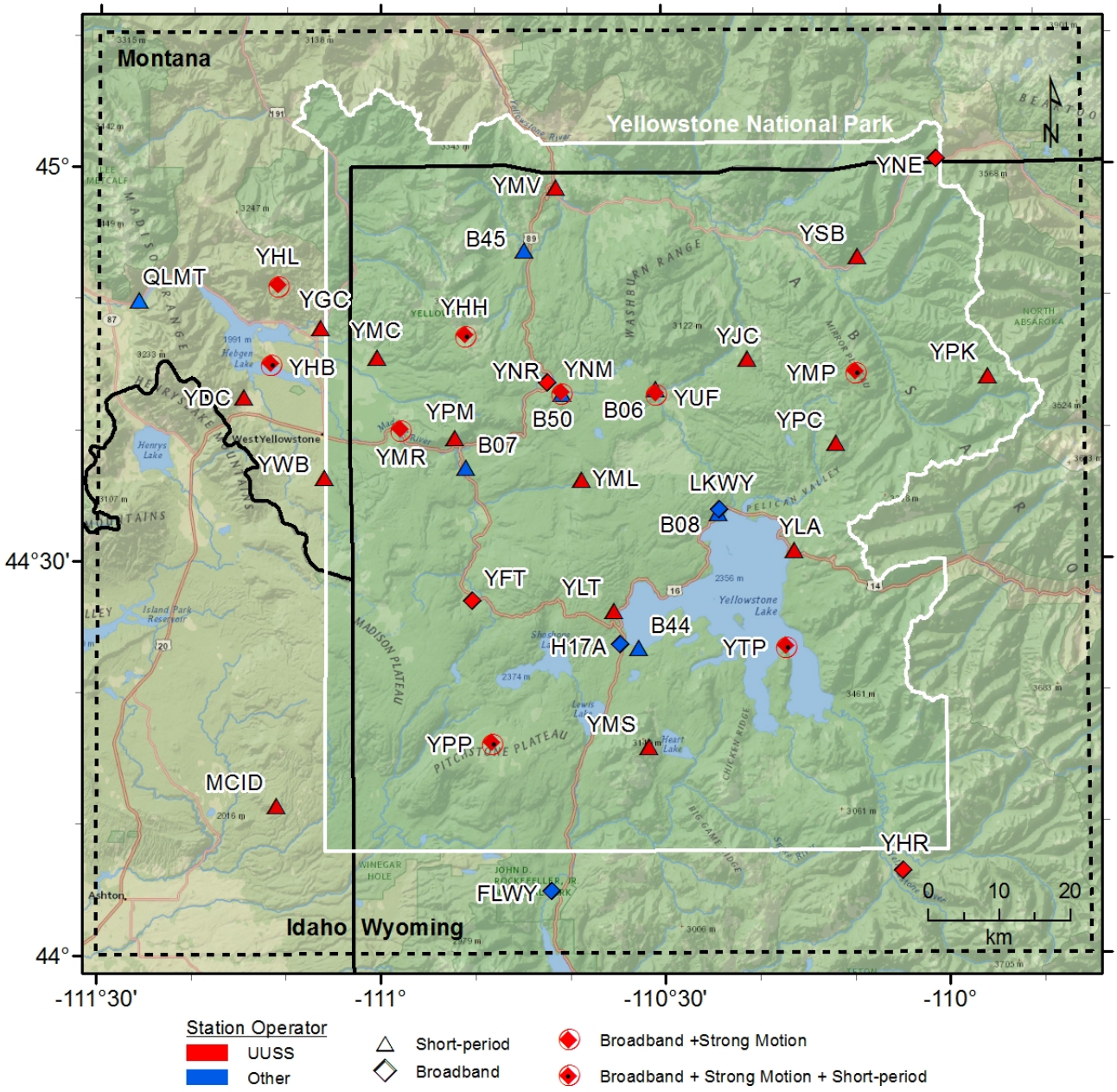

Figure 2

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2015

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
150402	09:03:03.88	45º00.39	111º04.75’	14.6	1.8W	25	86	19	0.18
150402	14:55:46.24	44º33.81’	110º41.65’	8.3	1.0W	16	108	6	0.13
150402	16:50:06.71	44º48.83’	110º59.47’	8.5	0.3	10	178	6	0.15
150402	20:14:53.84	44º32.65’	111º00.12’	12.1	0.3	5	170	14	0.07
150402	20:18:28.73	44º32.65’	111º00.66’	11.0	0.7	8	160	14	0.10
150402	20:19:03.86	44º32.66’	111º00.28’	12.1	0.6	6	172	14	0.07
150402	20:20:26.18	44º32.48’	111º00.42’	10.7	0.5	6	173	15	0.11
150402	20:26:56.41	44º32.41’	110º59.41’	11.2	0.1	8	150	11	0.14
150403	05:54:35.66	44º50.86’	111º26.94’	12.1	0.3	6	285	2	0.04
150403	15:08:41.02	44º00.17’	110º51.78’	10.1	1.7W	26	131	16	0.12
150403	20:39:15.03	44º26.93’	110º34.48’	3.3	1.3W	15	61	2	0.08
150403	20:39:57.59	44º27.00’	110º34.66’	3.8	1.1	5	137	2	0.01
150405	01:01:23.51	44º46.62’	110º57.66’	8.7	0.5	11	145	4	0.12
150407	07:26:55.61	44º42.21’	110º59.38’	7.5	0.6	16	60	4	0.15
150407	17:54:24.74	44º01.03’	110º15.00’	9.9	1.4W	18	160	17	0.16
150408	08:27:02.50	44º47.28’	110º59.46’	5.8	-0.1	14	154	3	0.13
150408	18:58:37.72	44º24.50’	111º00.82’	2.9*	1.3W	9	130	15	0.13
150408	19:00:27.93	44º25.80’	111º00.31’	8.1	1.0W	12	129	14	0.21
150408	19:32:04.30	44º24.94’	111º00.67’	5.3*	0.9	9	151	15	0.12
150409	00:47:22.00	44º40.11’	110º25.62’	3.3	1.3W	11	137	9	0.11
150409	16:42:27.04	44º45.56’	111º07.33’	10.6	-0.3	8	112	6	0.16
150409	20:03:14.18	44º45.59’	111º07.46’	12.0	1.6W	17	62	4	0.14
150409	21:49:55.29	44º45.59’	111º07.30’	11.9	1.0W	14	66	4	0.13
150409	22:55:31.98	44º34.72’	110º54.75’	7.5	0.4	7	182	7	0.10
150410	04:12:37.42	44º45.64’	111º07.35’	10.4	0.2W	11	106	6	0.15
150410	04:25:11.82	44º45.50’	111º07.42’	8.1	0.2W	10	105	6	0.09
150410	09:33:16.19	44º49.37’	111º29.09’	14.2	1.4	14	156	4	0.16
150410	15:51:15.59	44º22.92’	110º33.76’	2.0	1.5W	9	112	2	0.10
150413	17:43:11.23	44º41.07’	110º27.71’	6.6	1.5W	9	111	5	0.15
150414	01:23:35.61	44º14.21’	110º46.81’	7.0	2.2W	18	78	4	0.28
150414	01:28:59.91	44º13.83’	110º46.69’	4.6	1.5	7	95	5	0.32
150415	01:36:00.37	44º36.83’	110º39.82’	4.7	0.4	11	98	2	0.15
150416	13:47:29.74	44º37.19’	110º39.83’	6.7	1.1W	14	60	2	0.16
150416	13:56:14.34	44º49.11’	111º01.47’	6.0	0.5	16	176	7	0.13
150416	13:57:56.25	44º48.93’	111º01.54’	7.5	0.8W	16	174	6	0.14
150417	15:36:05.07	44º47.32’	110º49.87’	4.2	0.6W	12	198	2	0.14
150417	18:41:32.16	44º32.38’	110º49.09’	1.5	1.2W	7	132	9	0.18
150417	18:43:23.03	44º32.93’	110º49.14’	5.8	2.2W	19	69	8	0.23
150417	19:59:20.04	44º33.24’	110º48.86’	4.8	0.9W	15	96	8	0.19
150417	20:56:15.30	44º31.89’	110º50.57’	2.3	1.0	9	117	9	0.18
150418	06:28:20.18	44º36.23’	111º00.97’	9.3	0.6	12	116	7	0.18
150418	20:22:58.76	44º34.65’	110º45.04’	7.8	0.8W	15	85	9	0.18
150418	21:40:39.74	44º34.08’	110º45.56’	4.8	2.0	6	141	9	0.06
150418	21:49:31.62	44º33.90’	110º45.39’	4.7	1.0W	10	98	9	0.06
150418	21:49:54.72	44º34.07’	110º45.18’	4.2	1.0W	9	96	9	0.09

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2015

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
150418	22:05:52.83	44º34.62’	110º45.28’	5.5	0.8	9	97	9	0.16
150419	02:38:46.46	44º38.83’	111º05.90’	4.7	1.0	7	144	5	0.08
150419	06:31:25.78	44º32.49’	110º49.32’	2.1	0.8W	9	102	9	0.13
150419	15:22:47.83	44º18.50’	110º35.02’	6.5	0.6	11	69	7	0.22
150420	03:26:46.35	44º04.23’	110º45.32’	10.1	0.9	15	106	5	0.20
150421	04:21:38.93	44º49.24’	111º29.11’	11.8	0.3	12	118	5	0.07
150421	06:50:05.71	44º44.07’	111º07.58’	10.9	0.6	13	82	6	0.15
150421	09:09:43.92	44º14.21’	110º46.27’	6.3	1.2	10	115	5	0.32
150422	18:33:11.52	44º36.61’	110º20.30’	5.4	1.1	13	86	7	0.11
150423	22:28:10.68	44º10.75’	110º57.04’	36.6	1.2	10	112	16	0.13
150424	16:21:46.73	44º26.24’	110º37.84’	5.5	1.3W	15	80	3	0.13
150427	04:03:45.81	44º36.16’	110º19.46’	5.4	2.2W	18	91	7	0.10
150427	14:59:19.56	44º36.58’	110º15.66’	7.9	1.1	7	176	7	0.04
150428	12:48:02.11	44º37.22’	110º40.29’	4.6	0.9W	17	58	3	0.14
150429	01:57:57.79	44º47.88’	110º29.65’	5.9	1.6W	14	108	9	0.11
150429	10:58:29.87	44º15.94’	110º24.80’	9.5	0.6	13	157	9	0.09
150430	10:10:15.35	44º28.92’	110º55.38’	7.9	1.1W	20	157	8	0.25
150501	04:46:00.95	44º45.65’	110º51.36’	5.2	0.8	11	101	3	0.15
150504	02:32:38.62	44º42.39’	111º02.69’	7.3	0.8W	13	70	7	0.11
150504	10:18:50.26	44º42.36’	111º02.53’	7.5	0.3W	9	79	7	0.12
150504	11:04:40.19	44º34.16’	110º44.52’	7.0	1.2	9	93	9	0.18
150505	03:07:54.36	44º44.55’	111º09.07’	8.3	1.5	18	64	4	0.16
150505	06:31:26.62	44º44.33’	111º09.40’	9.8	1.7W	21	62	3	0.15
150505	12:53:17.53	44º47.39’	110º59.87’	5.5	0.7W	14	155	3	0.15
150505	13:28:10.61	44º47.60’	110º59.40’	5.4	0.2	10	159	4	0.14
150505	13:35:40.36	44º44.65’	111º09.01’	10.7	0.2W	9	123	4	0.17
150505	14:14:06.77	44º47.48’	110º59.91’	5.5	0.4	9	156	4	0.14
150505	17:21:36.43	44º44.18’	111º09.41’	9.3	2.1W	23	64	3	0.13
150505	18:01:48.46	44º44.80’	111º09.32’	11.3	0.1	10	75	3	0.16
150505	18:09:50.79	44º44.31’	111º09.18’	9.3	1.4W	17	62	4	0.15
150505	20:01:03.23	44º44.40’	111º08.47’	5.5	0.0	9	91	5	0.17
150506	17:18:33.98	44º48.60’	111º19.90’	11.9	0.4	10	141	8	0.15
150507	12:27:58.39	44º44.15’	111º09.01’	9.4	1.4W	22	65	4	0.16
150507	14:46:04.71	44º44.06’	111º09.44’	8.6	0.7W	11	66	4	0.13
150508	06:55:26.87	44º34.03’	110º41.58’	4.0	0.4W	14	74	6	0.19
150508	06:55:53.26	44º35.55’	110º41.06’	6.4	0.8W	13	120	4	0.09
150508	06:56:33.88	44º35.35’	110º41.22’	5.8	0.8W	13	121	4	0.11
150508	09:33:41.84	44º34.83’	110º41.68’	2.4	1.5	8	163	5	0.12
150508	09:34:05.02	44º35.23’	110º40.28’	4.9	1.2	16	150	3	0.14
150508	14:26:15.50	44º38.86’	110º02.11’	10.8	0.7	7	173	13	0.20
150509	02:08:00.21	44º36.08’	111º07.21’	5.4	0.6	7	135	2	0.05
150509	08:00:42.60	44º47.30’	110º59.28’	5.8	0.6W	15	154	4	0.18
150509	09:32:18.35	44º44.18’	111º09.50’	10.3	2.0W	25	64	3	0.17
150510	21:48:52.26	44º36.91’	110º39.92’	5.4	1.6W	22	56	2	0.16
150511	13:09:07.58	44º46.38’	111º06.33’	10.8	0.6W	14	86	3	0.14

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2015

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
150512	10:45:10.86	44º46.01’	111º11.44’	10.5	0.5W	12	81	2	0.14
150512	10:45:11.07	44º45.99’	111º10.92’	9.0	0.5W	11	93	2	0.07
150512	15:36:27.85	44º45.31’	110º58.30’	5.6	-0.1	8	148	3	0.05
150512	19:35:22.17	44º27.89’	110º57.24’	5.6	1.5W	23	113	10	0.19
150513	00:31:35.40	44º44.43’	111º09.37’	9.6	1.7W	21	61	3	0.14
150513	00:46:09.61	44º44.60’	111º09.22’	9.2	0.5W	14	65	3	0.15
150513	00:49:00.72	44º44.21’	111º09.39’	9.4	0.6W	17	64	4	0.16
150513	06:38:40.90	44º44.40’	111º09.28’	8.1	0.4	15	61	4	0.16
150514	01:40:05.87	44º11.02’	110º59.79’	11.6	0.8	11	115	15	0.16
150515	19:26:23.75	44º25.97’	110º25.94’	2.1	1.0	13	96	10	0.09
150516	12:37:38.73	44º45.25’	111º08.18’	9.6	-0.3	7	98	5	0.12
150517	09:37:47.88	44º27.34’	110º57.99’	4.9	0.6W	13	117	10	0.12
150517	09:43:37.36	44º27.02’	110º58.27’	3.3*	1.1	13	150	11	0.06
150517	09:45:01.47	44º27.31’	110º58.91’	5.5*	0.5	8	218	12	0.18
150518	23:00:51.24	44º35.13’	110º22.54’	4.3	3.0W	38	68	3	0.16
150518	23:10:31.76	44º34.99’	110º22.59’	4.5	2.2W	27	69	3	0.15
150518	23:15:10.56	44º34.44’	110º24.78’	1.8	0.9	9	159	1	0.18
150520	04:17:10.64	44º35.30’	110º22.64’	3.7	0.9	14	101	3	0.13
150520	04:17:39.12	44º35.14’	110º25.78’	1.6	1.0	7	195	3	0.08
150521	17:08:43.13	44º48.10’	110º59.92’	8.8	0.7W	14	166	5	0.16
150522	08:22:58.13	44º37.53’	110º59.26’	9.9	1.0W	19	59	5	0.14
150522	09:17:48.16	44º37.50’	110º59.09’	10.2	0.5	20	59	5	0.16
150522	16:25:43.19	44º37.71’	110º58.85’	9.2	0.2	13	72	5	0.15
150522	16:50:34.61	44º37.44’	110º59.23’	9.6	0.7W	19	60	5	0.18
150523	05:59:15.45	44º37.59’	110º59.31’	9.9	0.8W	19	58	5	0.13
150523	12:10:12.94	44º37.13’	110º59.83’	7.2	0.5	12	63	6	0.15
150524	07:42:00.53	44º37.67’	110º59.26’	9.6	0.9W	20	57	5	0.15
150525	03:04:30.59	44º45.67’	111º06.81’	6.4	0.4W	11	109	7	0.16
150525	06:28:02.68	44º27.63’	110º54.66’	4.5	1.1W	20	102	6	0.23
150525	09:37:31.78	44º44.63’	111º14.58’	13.2	0.7W	17	128	4	0.16
150525	13:21:55.54	44º37.52’	110º59.25’	8.5	0.2	12	73	5	0.13
150526	06:01:17.93	44º34.45’	110º24.60’	2.1	0.8W	10	174	1	0.05
150527	15:39:47.65	44º37.50’	110º59.26’	9.8	0.5	18	59	5	0.15
150527	15:49:49.49	44º37.65’	110º58.43’	8.6	-0.1	12	107	5	0.20
150527	15:50:08.39	44º37.45’	110º58.99’	9.4	0.8W	22	59	5	0.16
150527	22:39:15.68	44º37.30’	110º59.66’	7.7	0.2	9	107	6	0.08
150527	22:49:46.66	44º37.78’	110º59.41’	8.0	0.2	12	103	5	0.18
150528	01:13:11.56	44º21.45’	110º59.75’	16.2	0.7	10	125	16	0.10
150528	14:31:37.62	44º37.40’	110º59.39’	9.5	1.2W	24	60	5	0.16
150528	18:29:25.27	44º37.82’	110º59.26’	9.3	0.1	15	56	5	0.14
150529	06:36:24.83	44º37.70’	110º59.27’	9.6	1.2W	19	57	5	0.14
150529	08:03:00.88	44º37.56’	110º59.36’	8.6	0.6	14	58	5	0.12
150529	08:47:41.71	44º37.89’	110º59.47’	9.2	0.4	18	58	5	0.13
150530	07:28:55.93	44º34.30’	110º44.06’	6.0	0.7W	6	150	8	0.13
150530	18:05:29.46	44º37.64’	110º59.36’	10.0	0.7	13	57	5	0.14

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2015

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
150531	00:27:58.94	44º43.60’	110º01.77’	5.4	0.7	6	193	9	0.10
150531	21:38:56.86	44º21.54’	110º48.47’	5.7	1.6	6	115	10	0.20
150531	21:41:52.69	44º21.45’	110º50.44’	2.3	1.4W	9	123	10	0.09
150602	11:03:49.83	44º34.13’	110º59.40’	13.7	1.7W	31	46	10	0.15
150602	21:46:19.70	44º48.31’	111º00.40’	4.2	0.5W	12	167	5	0.13
150603	07:17:22.05	44º37.66’	110º59.13’	9.2	0.8W	20	58	5	0.16
150603	07:24:31.56	44º34.43’	110º59.24’	13.8	0.1	12	133	11	0.17
150603	12:03:52.99	44º36.78’	111º05.60’	7.3	0.6W	16	95	1	0.15
150604	17:02:10.89	44º39.60’	111º02.27’	5.5	1.1W	14	87	6	0.21
150605	15:45:14.47	44º37.26’	110º41.54’	2.1	1.1	8	157	4	0.20
150605	15:45:23.94	44º37.94’	110º42.14’	2.3	0.8	7	141	6	0.07
150606	05:09:04.91	44º37.50’	110º59.43’	9.8	0.5	18	59	5	0.16
150606	13:50:52.48	44º47.27’	111º28.99’	8.6	0.8	9	154	6	0.10
150607	12:51:55.76	44º35.58’	111º09.99’	10.7	1.0W	19	110	5	0.13
150607	16:50:03.26	44º34.88’	110º39.53’	6.7	1.1W	17	123	3	0.15
150607	16:50:26.06	44º35.12’	110º38.62’	7.1	0.1	8	163	2	0.15
150607	16:52:31.65	44º34.89’	110º40.17’	7.4	1.3W	24	64	3	0.21
150608	02:06:11.10	44º35.48’	111º09.98’	11.4	0.2	13	110	5	0.17
150610	12:16:05.81	44º46.47’	110º53.99’	8.9	1.0W	17	137	4	0.17
150611	02:11:50.78	44º45.81’	110º54.31’	7.5	1.5W	23	102	5	0.21
150611	16:03:50.55	44º29.05’	111º03.64’	9.3	0.3	11	150	14	0.23
150611	16:04:10.06	44º29.94’	111º05.16’	15.1	0.7W	15	150	12	0.20
150611	16:08:56.21	44º29.85’	111º05.61’	14.7	0.7W	13	152	12	0.11
150611	20:44:55.32	44º45.89’	111º11.94’	13.1	1.4W	20	75	2	0.15
150611	21:25:57.45	44º45.98’	111º11.57’	10.5	-0.1	9	153	2	0.12
150612	00:09:03.88	44º45.96’	111º12.14’	12.0	1.0W	13	86	2	0.11
150612	00:41:05.14	44º46.04’	111º11.36’	8.6	-0.1	8	104	2	0.14
150612	01:47:19.43	44º51.76’	111º28.99’	13.9	0.6	7	228	6	0.05
150612	13:03:59.70	44º27.86’	110º58.36’	5.0*	1.6W	17	119	11	0.27
150614	04:30:02.31	44º21.99’	110º39.98’	3.4	1.4W	16	101	8	0.12
150614	05:02:47.61	44º21.48’	110º39.81’	2.5	-0.1	5	164	8	0.07
150614	05:03:12.03	44º21.64’	110º40.27’	2.2	1.0	9	155	8	0.12
150614	05:04:45.10	44º21.94’	110º39.83’	6.3	1.1	14	102	8	0.16
150614	07:03:29.15	44º21.74’	110º39.89’	3.6	1.3W	20	103	8	0.14
150614	07:03:54.90	44º21.66’	110º39.78’	3.8	1.4W	21	103	8	0.13
150614	07:06:25.31	44º21.62’	110º39.86’	4.2	2.4W	22	61	8	0.12
150614	07:09:18.55	44º21.57’	110º39.53’	4.0	1.1W	14	108	8	0.09
150614	07:09:30.85	44º21.44’	110º39.56’	4.3	1.2	13	149	8	0.06
150614	07:15:28.41	44º21.69’	110º39.91’	3.5	1.8W	16	61	8	0.11
150614	07:32:18.85	44º21.59’	110º39.63’	3.5	1.3W	11	103	8	0.10
150614	07:47:26.55	44º21.67’	110º39.75’	1.9	1.4W	12	103	8	0.09
150614	07:54:20.34	44º21.47’	110º39.96’	4.3	1.1	17	103	8	0.08
150614	08:20:52.19	44º21.78’	110º39.77’	2.1	0.6	8	156	8	0.31
150614	08:31:47.97	44º21.57’	110º39.71’	3.3	1.2W	15	103	8	0.14
150614	09:35:24.20	44º21.69’	110º39.88’	3.7	1.5W	15	93	8	0.13

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2015

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
150614	15:29:41.01	44º46.95'	111º05.95'	8.6	0.7W	14	129	8	0.16
150616	16:19:03.43	44º35.39'	110º56.38'	12.8	0.4	15	139	8	0.15
150617	02:19:43.94	44º49.79'	110º56.98'	4.6	0.3	15	234	9	0.18
150617	12:02:57.97	44º52.48'	111º26.17'	10.0	1.4	13	287	5	0.15
150617	12:39:12.89	44º51.61'	111º24.75'	9.0	1.4W	22	148	4	0.16
150619	03:46:33.36	44º43.64'	111º04.98'	10.1	0.4W	14	157	7	0.16
150620	01:32:08.18	44º18.45'	111º00.41'	11.9	1.5	10	132	17	0.19
150620	03:40:31.78	44º38.36'	110º39.05'	1.6	0.6	9	119	4	0.26
150620	03:40:38.65	44º37.69'	110º39.16'	4.7	1.6	12	114	3	0.29
150620	03:41:00.72	44º37.76'	110º38.88'	2.8	1.5	11	118	3	0.33
150620	03:43:36.27	44º38.30'	110º39.03'	1.8	--	11	118	4	0.27
150620	03:43:40.67	44º38.12'	110º39.38'	1.8	1.9W	9	187	3	0.26
150620	03:43:48.92	44º37.97'	110º39.19'	1.7	--	9	183	3	0.26
150620	05:52:57.75	44º38.24'	110º39.50'	2.0	1.2W	7	109	4	0.25
150620	22:32:37.76	44º44.14'	110º58.09'	2.4	0.3	8	134	4	0.05
150620	23:33:10.68	44º48.11'	110º36.46'	2.1*	1.8W	10	234	11	0.12
150621	01:30:46.40	44º44.72'	111º07.39'	12.9	0.3	9	190	9	0.14
150621	22:40:41.55	44º38.10'	110º44.18'	8.0	2.5W	26	62	8	0.17
150621	22:41:14.41	44º37.99'	110º44.12'	7.5	0.9	19	111	8	0.14
150621	22:48:15.26	44º39.27'	110º44.03'	2.2	0.8W	14	120	8	0.23
150621	23:04:51.48	44º38.90'	110º43.95'	2.3	1.0	8	128	8	0.28
150621	23:40:42.53	44º38.00'	110º43.81'	6.7	1.1	9	147	8	0.08
150621	23:41:05.53	44º38.05'	110º43.89'	2.3	0.4	7	146	8	0.07
150623	00:22:04.10	44º48.20'	110º36.63'	2.7*	1.7W	8	234	11	0.07
150623	00:43:16.27	44º26.20'	110º44.17'	9.2	1.0	10	88	14	0.28
150623	11:37:41.63	44º45.96'	110º46.78'	4.2	1.5W	11	108	6	0.08
150623	11:47:19.20	44º46.01'	110º46.25'	2.2	1.0W	9	197	7	0.14
150623	11:55:44.89	44º46.01'	110º46.64'	4.9	1.3W	13	110	6	0.16
150624	03:13:39.25	44º37.87'	111º06.06'	6.4	0.3	10	121	3	0.14
150625	09:22:22.88	44º40.72'	110º27.56'	4.6	1.7W	11	114	6	0.15
150625	09:23:30.69	44º47.92'	110º30.37'	3.4	1.4W	13	95	9	0.19
150625	13:48:05.29	44º47.82'	110º30.61'	5.1	1.9W	13	150	9	0.23
150626	04:03:26.03	44º48.86'	111º26.44'	12.7	0.5	6	142	2	0.02
150626	13:27:56.82	44º32.22'	111º06.27'	16.4	0.7	10	172	8	0.13
150626	18:23:04.35	44º43.77'	111º10.72'	6.0	0.8	8	91	3	0.07
150629	01:26:57.22	44º42.82'	111º11.18'	6.0	0.4	7	159	4	0.04
150629	11:10:31.48	44º28.88'	110º34.94'	5.4	1.2W	15	119	5	0.14
150629	15:34:13.58	44º45.61'	111º14.28'	12.4	0.4	7	146	6	0.11
150629	16:57:37.28	44º46.27'	111º07.63'	12.6	0.1	9	211	10	0.16
150629	17:10:23.57	44º25.19'	110º30.25'	3.9	0.5	13	87	5	0.11

number of earthquakes = 220
* indicates poor depth control
W indicates Wood-Anderson data used for magnitude calculation

Table 3
UNIVERSITY OF UTAH YELLOWSTONE SEISMIC NETWORK
Operating Seismograph Stations
June 30, 2015

UURSN Code	Location	SEED Station	SEED Channel	No. of Channels	Network Code	Latitude	Longitude	Elevation (meters)	Sensor	Digitizer	Telemetry	Sponsor
B206*	Canyon206bwy2008, Yellowstone, WY	B206	EH[ZEN]	3	PB	44° 46.66′	110° 30.70′	2400	IESE-S2	Q330	Digital	PBO
B207*	Madisn207bwy2007, Yellowstone, WY	B207	EH[ZEN]	3	PB	44° 37.14′	110° 50.91′	2182	IESE-S2	Q330	Digital	PBO
B208*	Lakejn208bwy2008, Yellowstone, WY	B208	EH[ZEN]	3	PB	44° 33.61′	110° 24.09′	2406	IESE-S2	Q330	Digital	PBO
B944*	Grantt944bwy2008, Yellowstone, WY	B944	EH[ZEN]	3	PB	44° 23.38′	110° 32.63′	2365	IESE-S2	Q330	Digital	PBO
B945*	Panthr944swy2008, Yellowstone, WY	B945	EH[ZEN]	3	PB	44° 53.64′	110° 44.65′	2249	IESE-S2	Q330	Digital	PBO
B950*	Norris950bwy2013, Yellowstone, WY	B950	EH[ZEN]	3	PB	44° 42.77′	110° 40.71′	2328	IESE-S2	Q330	Digital	PBO
FLWY*	Flagg Ranch, WY	FLWY	BH[ZEN]	3	IW	44° 04.96′	110° 41.96′	2078	3ESP	RT-130	Digital	ANSS
H17A*	Grant Junction, Yellowstone, WY	H17A	BH[ZEN]	3	TA	44° 24.00′	110° 34.80′	2400	STS-2	Q330	Digital	ES
IMW	Indian Meadows, WY	IMW	BH[ZEN]	3	IW	43° 53.58′	110° 56.58′	2670	3ESP	RT-130	Digital	ANSS
LKWY*	Lake, WY	LKWY	BH[ZEN]	3	US	44° 33.91′	110° 24.00′	2424	STS-2	Q330	Digital	USGS
LOHW*	National Elk Refuge, WY	LOHW	BH[ZEN]	3	IW	43° 36.76′	110° 36.30′	2245	3ESP	RT-130	Digital	ANSS
MCID	Moose Creek, ID	MCID	EHZ	1	WY	44° 11.45′	111° 11.03′	2137	L4C	PSN	Analog	USGS
QLMT*	Earthquake Lake, MT	QLMT	EHZ	1	MB	44° 49.84′	111° 25.80′	2064	L4C	-	Analog	MBMT
REDW*	Red-Top Meadows, WY	REDW	BH[ZEN]	3	IW	43° 21.74′	110° 51.18′	2322	3ESP	RT-130	Digital	ANSS
RRI2*	Red Ridge, ID	RRI2	BH[ZEN]	3	IW	43° 20.84′	111° 19.20′	2547	3ESP	RT-130	Digital	ANSS
TPMT*	Teepe Creek, MT	TPMT	EHZ	1	MB	44° 43.79′	111° 39.94′	2518	L4C	-	Analog	MBMT
YDC	Denny Creek, MT	YDC	EHZ	1	WY	44° 42.51′	111° 14.60′	2025	L4C	PSN	Analog	USGS
YFT	Old Faithful (YNP), WY	YFT	HH[ZEN]	3	WY	44° 27.05′	110° 50.24′	2292	Trillium 120	72A-07	Digital	USGS
			EN[ZEN]	3					Titan			
			EHZ	1					L4C	None	None	
YGC	Grayling Creek, MT	YGC	EHZ	1	WY	44° 47.77′	111° 06.45′	2075	L4C	PSN	Analog	USGS
YHB	Horse Butte, MT	YHB	EHZ	1	WY	44° 45.07′	111° 11.71′	2157	L4C	PSN	Analog	USGS
			HH[ZEN]	3					40T	ANSS-130	Digital	
			EN[ZEN]	3					Titan			
YHH	Holmes Hill (YNP), WY	YHH	EHZ	1	WY	44° 47.30′	110° 51.03′	2717	S13	PSN	Analog	USGS
			HH[ZEN]	3					Trillium 120	Q330	Digital	
			EN[ZEN]	3					Titan			
YHL	Hebgen Lake, MT	YHL	HH[ZEN]	3	WY	44° 51.05′	111° 10.98′	2691	Trillium 120	Q330	Digital	USGS
			EN[ZEN]	3					Titan			

UURSN Code	Location	SEED Station	SEED Channel	No. of Channels	Network Code	Latitude	Longitude	Elevation (meters)	Sensor	Digitizer	Telemetry	Sponsor
YHR	Hawk's Rest, WY	YHR	HH[ZEN]	3	WY	44° 06.36′	110° 04.90′	2976	Trillium 120	Q330	Digital	USGS
YJC	Joseph′s Coat (YNP), WY	YJC	EH[ZEN]	3	WY	44° 45.33′	110° 20.95′	2684	S13	PSN	Analog	USGS
YLA	Lake Butte (YNP), WY	YLA	EHZ	1	WY	44° 30.76′	110° 16.12′	2580	L4C	PSN	Analog	USGS
YLT	Little Thumb Creek (YNP), WY	YLT	EHZ	1	WY	44° 26.25′	110° 35.28′	2439	L4C	PSN	Analog	USGS
YMC	Maple Creek (YNP), WY	YMC	EH[ZEN]	3	WY	44° 45.53′	111° 00.41′	2073	S13	PSN	Analog	USGS
YML	Mary Lake (YNP), WY	YML	EH[ZEN]	3	WY	44° 36.20′	110° 38.63′	2653	L4C	PSN	Analog	USGS
YMP	Mirror Plateau (YNP), WY	YMP	EHZ	1	WY	44° 44.38′	110° 09.40′	2774	S13	PSN	Analog	USGS
			HH[ZEN]	3					Trillium 120	Q330	Digital	
			EN[ZEN]	3					Titan			
YMR	Madison River (YNP), WY	YMR	HH[ZEN]	3	WY	44° 40.12′	110° 57.90′	2149	Trillium 120	Q330	Digital	USGS
			EN[ZEN]	3					Titan			
YMS	Mount Sheridan (YNP), WY	YMS	EHZ	1	WY	44° 15.84′	110° 31.67′	3106	L4C	PSN	Analog	USGS
YMV	Mammoth Vault (YNP), WY	YMV	EHZ	1	WY	44° 58.42′	110° 41.33′	1829	L4C	PSN	Analog	USGS
YNE	Northeast Entrance (YNP), WY	YNE	HH[ZEN]	3	WY	45° 00.46′	110° 00.48′	2343	Compact	Taurus	Digital	USGS
YNM	Norris Museum (YNP), WY	YNM	HH[ZEN]	3	WY	44° 43.59′	110° 42.22′	2311	Trillium 240	Q330	Digital	USGS
YNR	Norris Junction (YNP), WY	YNR	HH[ZEN]	3	WY	44° 42.93′	110° 40.75′	2336	Trillium 120	RT-130	Digital	USGS
			EN[ZEN]	3					Titan			
YPC	Pelican Cone (YNP), WY	YPC	EHZ	1	WY	44° 38.88′	110° 11.55′	2932	L4C	PSN	Analog	USGS
YPK	Parker Peak (YNP), WY	YPK	EH[ZEN]	3	WY	44° 43.91′	109° 55.32′	2897	L4C	PSN	Analog	USGS
YPM	Purple Mountain (YNP), WY	YPM	EHZ	1	WY	44° 39.43′	110° 52.12′	2582	L4C	PSN	Analog	USGS
YPP	Pitchstone Plateau (YNP), WY	YPP	EHZ	1	WY	44° 16.26′	110° 48.27′	2707	S13	PSN	Analog	USGS
			HH[ZEN]	3					Trillium 120	Q330	Digital	
			EN[ZEN]	3					Titan			
YSB	Soda Butte (YNP), WY	YSB	EHZ	1	WY	44° 53.04′	110° 09.06′	2072	L4C	PSN	Analog	USGS
YTP	The Promontory (YNP), WY	YTP	EHZ	1	WY	44° 23.51′	110° 17.10′	2384	L4	PSN	Analog	USGS
			HH[ZEN]	3					Trillium 120	Q330	Digital	
			EN[ZEN]	3					Titan			
YUF	Upper Falls (YNP), WY	YUF	HH[ZEN]	3	WY	44° 42.76′	110° 30.71′	2394	3ESP	ANSS-130	Digital	USGS
			EN[ZEN]	3					Titan			
YWB	West Boundary (YNP), WY	YWB	EHZ	1	WY	44° 36.35′	111° 06.05′	2310	L4C	PSN	Analog	USGS

* Station operated by another agency and recorded as part of the Yellowstone Seismic Network
Network Statistics: 139 data channels from 43 stations were being recorded at the end of this report period

EXPLANATION OF TABLE

UURSN Code: Station code formerly used in routine processing. Due to processing software limitations, the station code may not be the station code used by the original operator. For multi-component stations, the vertical, east-west, and north-south high gain (low gain) components are identified by an appended Z(V), E(L), and N(M), respectively, in UUSS phase files.

Location: General description of station location. YNP = Yellowstone National Park.

SEED Station: The SEED (Standard for the Exchange of Earthquake Data) station code used by the original operator.

SEED Channel: The SEED format uses three letters to name seismic channels. See <<http://www.iris.edu/manuals/SEEDManual_V2.4.pdf>> for information about the SEED channel naming convention. Relevant sections are reproduced below. In the SEED convention, each letter describes one aspect of the instrumentation and its digitization. The first letter specifies the general sampling rate and the response band of the instrument. Band codes used in this table include:

Band Code	Band Type	Sample Rate	Corner Period
E	Extremely short period	≥ 80 Hertz	< 10 seconds
H	High broadband	≥ 80 Hertz	≥ 10 seconds
B	Broadband	≥ 10 to < 80 Hertz	≥10 seconds
S	Short period	≥ 10 to < 80 Hertz	< 10 seconds

The second letter specifies the family to which the sensor belongs. Sensor families used in this table are:

Instrument Code	Description
H	High gain seismometer
L	Low gain seismometer
N	Accelerometer

The third letter specifies the physical configuration of the members of a multiple axis instrument package. Channel orientations used in this table are:

Z E N Traditional (Vertical, East-West, North-South)

Number of Channels: Total number of waveform channels recorded.

Network Code: The FDSN (Federation of Digital Seismographic Networks) registered network code. See <<http://www.iris.edu/dms/nodes/dmc/services/network_codes>> for information about registered seismograph network codes. Network codes referenced in this table:

Network Code	Network name; Network operator or responsible organization
IE	Idaho National Laboratory Seismic Network
IU	IRIS/USGS Network; USGS Albuquerque Seismological Laboratory
IW	Intermountain West Network, U.S. Geological Survey

MB	Montana Regional Seismic Network; Montana Bureau of Mines and Geology
PB	Plate Boundary Observatory
UU	University of Utah Regional Network; University of Utah
US	US National Network; USGS National Earthquake Information Center
WY	Yellowstone Wyoming Seismic Network; University of Utah

Latitude, Longitude: Sensor location in degrees and decimal minutes; North latitude, West longitude.

Elevation: Sensor altitude in meters above sea level.

Sensor	**Description**
L4, L4C	Mark Products L4 or L4C short-period seismometer
S13, 18300	Geotech S13 or 18300 short-period seismometer
Ranger	Kinemetrics Ranger short-period seismometer
40T	Guralp CMG-40T broadband seismometer
3T	Guralp CMG-3T broadband seismometer
3ESP	Guralp CMG-3ESP broadband seismometer
STS-2	Streckheisen STS-2 broadband seismometer
FBA23	Kinemetrics FBA-23 accelerometer
EpiSensor	Kinemetrics EpiSensor accelerometer
Applied Mems	Applied Mems accelerometer
PA-23	Geotech PA-23 accelerometer
Compact	Nanometrics Compact broadband seismometer
Trillium 120	Nanometrics Trillium 120 broadband seismometer
Trillium 240	Nanometrics Trillium 240 broadband seismometer
Titan	Nanometrics Titan accelerometer
Observer	Refraction Technology (REF TEK) Model 151 Observer broadband seismometer
IESE-S2	Institute of Earth Science and Engineering S-2 model borehole seismometer

Digitizer	**Description**
K2	Kinemetrics Altus Series K2 (19-bit resolution field digitizer)
Etna	Kinemetrics Altus Series Etna (18-bit resolution field digitizer)
72A-07	Refraction Technology (REF TEK) model 72A-07 (24-bit field digitizer)
72A-08	Refraction Technology (REF TEK) model 72A-08 (24-bit field digitizer)
ANSS-130	Refraction Technology (REF TEK) model 130-ANSS/02 (24-bit resolution field digitizer)
RT-130	Refraction Technology (REF TEK) model RT-130 (24-bit resolution field digitizer)
Q330	Quanterra, Inc Q330 digitizer (24-bit resolution field digitizer)
SMART-24	Geotech SMART-24 digitizer (24-bit resolution field digitizer)
PSN	PSN-ADC-SERIAL version III (16-bit resolution field digitizer)
Basalt	Kinemetrics Basalt (24-bit resolution field digitizer)
Taurus	Nanometrics Taurus (24-bit resolution field digitizer)

Telemetry	**Description**
Analog	Data transmission is analog along part of the transmission pathway

Digital	Data are converted to digital form at the station site
None	On-site recording system

Sponsor (or Operator for stations marked by * in preceding columns)

USGS	U.S. Geological Survey
Utah	State of Utah
ANSS	Advanced National Seismic System
INL	Idaho National Laboratory
MBMT	Montana Bureau of Mines and Geology
PBO	Plate Boundary Observatory
ES	EarthScope

NETWORK CHANGES DURING APRIL 1-JUNE 30, 2015

None