EARTHQUAKE ACTIVITY IN THE YELLOWSTONE REGION

Preliminary Epicenters

April 1 – June 30, 2023

Prepared by the University of Utah Seismograph Stations and funded by
the U.S. Geological Survey (Cooperative Agreement No. G21AC10068)

September 30, 2023

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, 2023

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During the three-month period April 1 through June 30, 2023, the University of Utah Seismograph Stations (UUSS) located 394 earthquakes within the Yellowstone region (Figure 1). The total includes no earthquakes in the magnitude 3 range, and 27 earthquakes in the magnitude 2 range. The largest event to occur during this period was a magnitude 2.8 earthquake on June 17. No earthquakes were reported felt in the region during the report period (see Table 1, a cumulative tabulation of earthquakes that were felt in the Yellowstone region during 2023). 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 *https://quake.utah.edu/earthquake-center/quarterly-seismicity-reports*.

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

None

Notable Swarm Seismicity

During the report period, there were nine 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 earthquakes occur as part of a seismic swarm [Farrell et al., 2009].

A. A swarm of 49 earthquakes ($0.2 \leq M \leq 2.5$) occurred about 9.6 mi SE of Old Faithful, YNP from April 15th – 19th.
B. A swarm of 33 earthquakes ($0.7 \leq M \leq 2.0$) occurred about 2.8 mi NNW of West Thumb Geyser Basin, YNP from April 24th – 26th.
C. A swarm of 19 earthquakes ($0.2 \leq M \leq 2.3$) occurred about 3.4 mi NNW of West Thumb Geyser Basin, YNP on May 5th.
D. A swarm of 26 earthquakes ($0.2 \leq M \leq 2.6$) occurred about 8.4 mi NE of West Yellowstone, MT from May 10th – 16th.
E. A swarm of 13 earthquakes ($0.0 \leq M \leq 2.1$) occurred about 2.8 mi N of West Thumb Geyser Basin, YNP on May 29th.

These swarms are labeled in Figure 1.

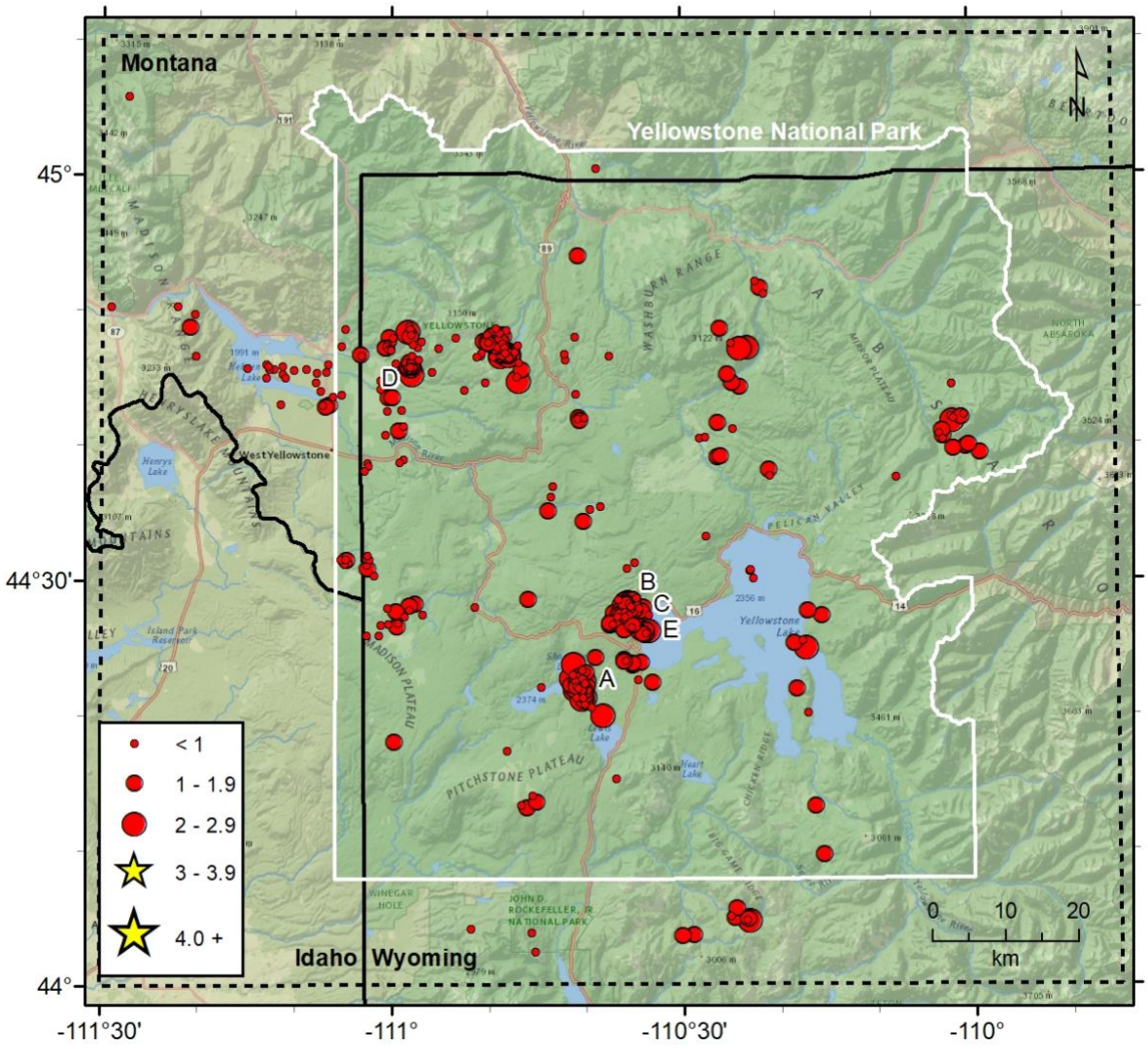

Figure 1. Epicenters of earthquakes located by the University of Utah Seismograph Stations, April 1, 2023, through June 30, 2023. Earthquake swarms (labeled A–E) are discussed in the text.

Table 1

EARTHQUAKES FELT IN THE YELLOWSTONE REGION
January 1, 2023, to June 30, 2023

Date	Time†	Felt Information‡	Latitude	Longitude	Magnitude§
March 29	08:24 MDT 14:24 UTC	Yellowstone. Felt (III) at Yellowstone National Park.	44º 31.52′	110º 21.67′	M_L 3.7

† 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), compiled by the U.S. Geological Survey (USGS); *ShakeMap* indicates the availability of computer-generated maps of ground-shaking (*https://quake.utah.edu*), 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/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, 2023

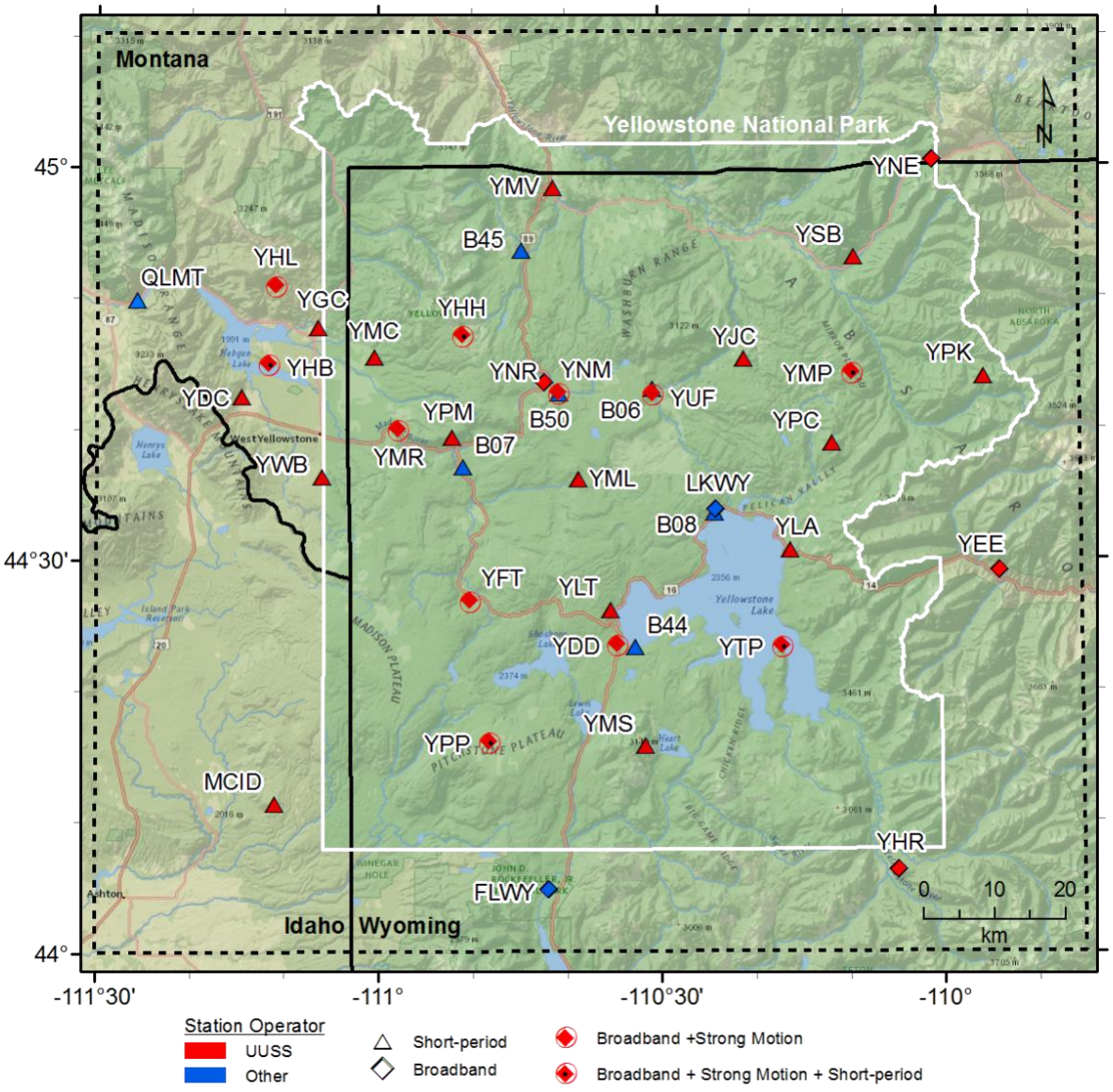

Figure 2. Seismograph stations of the Yellowstone Seismic Network as of June 30, 2023.

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
230401	01:05:58.35	44º24.99’	110º17.24’	7.3	2.0W	22	100	3	0.18
230401	01:06:36.95	44º25.38’	110º18.52’	4.4	1.2	11	108	4	0.15
230401	01:45:26.31	44º25.58’	110º17.59’	5.2	0.8	12	92	4	0.16
230401	06:41:30.59	44º22.51’	110º33.16’	1.8	1.4	11	157	2	0.08
230401	07:44:13.20	44º30.74’	110º23.04’	2.2	0.7	13	75	5	0.12
230401	07:45:33.22	44º30.78’	110º22.99’	2.2	0.6	12	105	5	0.11
230401	12:17:24.66	44º30.15’	110º22.69’	2.9	0.3	8	195	9	0.09
230401	12:55:56.48	44º30.76’	110º22.99’	2.7	0.9	12	104	5	0.12
230401	16:24:59.82	44º47.49’	110º57.81’	6.7	0.1	10	228	5	0.19
230402	05:57:40.20	44º39.38’	109º59.10’	13.6	1.2	13	112	10	0.22
230405	03:39:53.83	44º45.97’	111º13.00’	10.2	0.6	15	178	2	0.16
230405	03:40:12.14	44º45.67’	111º12.70’	10.3	0.2	11	220	2	0.18
230405	03:40:14.25	44º45.04’	111º13.01’	9.0	0.8W	11	269	2	0.17
230405	03:40:26.65	44º45.87’	111º12.82’	8.7	0.0	7	237	2	0.17
230405	05:58:08.12	44º45.38’	111º07.78’	14.1	0.3	11	80	5	0.13
230406	00:50:29.31	44º38.18’	110º20.99’	4.6	1.2	14	90	9	0.09
230406	03:41:54.26	44º48.34’	110º48.86’	5.4	0.1	7	268	3	0.06
230406	15:19:04.97	44º48.35’	110º48.97’	5.6	0.8W	14	192	3	0.12
230407	00:05:51.40	44º48.65’	111º04.81’	9.1	0.4	9	158	8	0.12
230407	17:14:56.19	44º43.58’	111º00.37’	10.5	1.6	22	55	4	0.14
230408	01:03:25.11	44º47.47’	110º49.83’	4.9	1.6W	18	79	2	0.15
230408	12:53:41.33	44º46.07’	110º59.59’	3.9	0.9W	13	136	1	0.14
230408	14:57:38.32	44º31.17’	111º02.68’	17.6	0.5	15	138	11	0.15
230408	15:13:30.45	44º31.62’	111º02.61’	15.9	0.4	9	141	10	0.13
230408	15:16:42.08	44º30.91’	111º02.54’	16.6	1.0W	14	138	11	0.13
230408	15:39:43.47	44º31.87’	111º02.58’	15.5	0.3	9	140	9	0.14
230408	16:40:43.11	44º31.58’	111º02.35’	14.3	0.3	8	143	10	0.09
230408	20:49:37.53	44º23.97’	110º34.32’	1.7	1.6	8	114	1	0.10
230409	12:10:15.13	44º47.22’	110º55.13’	7.8	-0.1	10	159	5	0.10
230409	15:15:47.91	44º25.99’	111º01.34’	17.9	0.4	10	208	20	0.11
230410	12:10:20.32	44º45.59’	111º10.19’	14.0	0.7W	14	110	2	0.16
230410	12:13:40.92	44º45.29’	111º11.34’	18.5	0.3	8	129	1	0.16
230411	08:35:45.80	44º46.67’	110º57.88’	8.7	0.3	9	204	4	0.12
230411	09:07:19.22	44º44.10’	110º52.53’	5.0	-0.2	7	152	6	0.03
230412	04:10:07.63	44º46.62’	110º47.91’	4.0	0.4	12	105	4	0.12
230413	01:55:34.04	44º40.40’	110º02.93’	14.4	0.3	8	92	11	0.15
230414	06:33:55.65	44º45.86’	111º11.38’	12.1	-0.1	15	93	2	0.19
230415	10:38:27.06	44º04.35’	110º51.94’	10.5	0.6	14	105	21	0.14
230415	15:51:07.85	44º22.71’	110º41.31’	1.9	2.3	14	131	9	0.31
230415	15:51:26.04	44º22.81’	110º41.43’	3.8	2.0	10	133	9	0.11
230415	15:52:59.71	44º20.02’	110º38.24’	6.0	2.0W	11	128	8	0.20
230415	15:53:01.62	44º21.96’	110º41.13’	4.1*	2.5W	19	92	11	0.19
230415	15:53:39.97	44º22.29’	110º41.58’	3.8	1.5	14	134	10	0.14
230415	15:55:19.35	44º21.93’	110º41.23’	6.3	1.8W	31	65	9	0.13
230415	15:55:44.27	44º23.21’	110º39.98’	3.6	1.1	17	88	7	0.08

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230415	16:00:17.68	44º22.34’	110º40.68’	4.8	1.5	14	137	9	0.10
230415	16:00:24.56	44º22.15’	110º40.79’	4.0	0.9	11	138	9	0.09
230415	18:30:48.60	44º22.46’	110º40.96’	5.3	1.0	13	135	9	0.11
230415	18:58:26.58	44º23.06’	110º41.41’	3.9	0.6	15	128	9	0.11
230416	12:57:32.76	44º31.62’	111º05.34’	14.5	0.4	13	162	9	0.15
230416	13:33:27.19	44º20.88’	110º40.07’	4.2	0.9	13	152	9	0.11
230416	13:48:45.03	44º21.09’	110º40.20’	4.4	1.5W	18	101	9	0.11
230416	14:21:34.76	44º39.66’	110º01.87’	10.5	1.3	12	104	12	0.20
230416	14:48:16.91	44º21.23’	110º40.43’	3.8	2.0W	24	99	9	0.14
230416	15:22:55.78	44º31.58’	111º04.80’	14.1	0.3	10	155	9	0.14
230416	17:33:54.94	44º23.86’	110º41.28’	4.3	2.0W	20	75	9	0.12
230416	18:02:21.64	44º31.35’	111º04.48’	13.1	0.9	18	146	9	0.20
230416	18:02:28.84	44º31.53’	111º04.76’	14.5	1.8W	18	147	9	0.22
230416	18:15:02.28	44º20.66’	110º39.46’	2.1	0.8	9	157	9	0.17
230416	18:21:26.05	44º22.21’	110º40.97’	3.7	0.7	10	137	9	0.06
230416	18:25:16.13	44º21.52’	110º40.13’	4.3	1.3W	17	146	8	0.10
230416	18:50:46.76	44º21.88’	110º40.54’	4.2	0.9	13	141	9	0.05
230416	19:00:52.83	44º21.74’	110º40.37’	2.3	0.9	8	172	9	0.09
230416	19:00:57.56	44º21.92’	110º40.36’	2.8	0.7	8	155	8	0.08
230416	22:04:24.96	44º22.19’	110º40.72’	3.8	1.5W	15	138	9	0.12
230417	00:32:35.21	44º22.11’	110º40.48’	4.8	1.2	14	139	8	0.10
230417	00:35:47.15	44º22.60’	110º40.77’	4.3	1.6W	16	135	8	0.10
230417	00:36:37.49	44º21.90’	110º40.14’	4.5	1.2	14	107	8	0.12
230417	00:37:04.25	44º22.26’	110º40.15’	4.7	1.5	12	108	8	0.09
230417	00:42:09.52	44º22.28’	110º40.86’	3.1	1.1	13	137	9	0.14
230417	02:16:02.42	45º05.79’	111º27.44’	11.6*	0.9	13	138	30	0.16
230417	03:14:17.30	44º31.27’	111º04.90’	12.4	0.9W	18	148	10	0.15
230417	04:16:04.75	44º22.04’	110º40.60’	4.0	1.2W	16	140	9	0.12
230417	04:24:42.75	44º21.92’	110º39.83’	2.3	0.9	10	144	8	0.13
230417	04:25:03.69	44º21.89’	110º40.31’	4.0	0.9	11	92	8	0.07
230417	04:27:39.25	44º22.39’	110º40.02’	4.2	0.9	14	88	8	0.09
230417	04:29:22.64	44º22.64’	110º40.66’	3.9	1.0	20	85	8	0.12
230417	04:30:44.26	44º22.65’	110º40.85’	2.0	1.0	22	85	9	0.13
230417	04:31:37.79	44º22.45’	110º40.06’	4.3	0.4	16	138	8	0.10
230417	04:46:56.14	44º22.19’	110º40.95’	4.4	1.0	17	90	9	0.13
230417	04:47:12.68	44º22.61’	110º41.11’	4.1	0.9	10	138	9	0.07
230417	04:47:27.43	44º23.45’	110º40.42’	2.0	0.2	9	129	8	0.09
230417	04:47:40.46	44º23.29’	110º39.96’	2.0	0.2	9	132	7	0.12
230417	05:18:25.87	44º22.74’	110º40.65’	4.2	1.8W	19	85	8	0.10
230417	05:25:58.58	44º22.54’	110º40.20’	4.1	2.0W	19	66	8	0.10
230417	05:27:44.00	44º22.36’	110º40.23’	4.2	0.8	14	139	8	0.10
230417	06:33:20.91	44º22.07’	110º40.82’	4.8	0.6	12	138	9	0.04
230417	06:35:07.63	44º22.25’	110º39.88’	3.6	1.2	10	141	8	0.09
230417	10:50:44.92	44º38.16’	111º02.83’	8.3	0.4	10	141	5	0.19
230417	11:04:19.20	44º22.05’	110º40.26’	2.1	0.9	10	141	8	0.32

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DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
230417	23:05:49.25	44º21.39’	110º40.95’	2.3	0.5	7	174	10	0.06
230417	23:05:54.79	44º21.40’	110º40.26’	2.0	0.5	9	150	9	0.23
230418	04:11:12.03	44º46.02’	111º06.57’	11.0	0.1	18	79	3	0.17
230418	09:32:14.05	44º22.78’	110º40.36’	4.1	0.6	15	85	8	0.12
230418	09:47:15.13	44º22.94’	110º40.77’	4.1	1.3	14	132	8	0.11
230418	09:47:45.17	44º23.00’	110º40.58’	4.3	1.9W	22	82	8	0.10
230418	17:16:42.03	44º38.52’	111º02.48’	9.3	0.5	13	105	6	0.20
230419	17:18:03.34	44º18.07’	110º59.84’	11.2	1.2W	17	116	16	0.17
230419	20:23:12.08	44º33.26’	110º27.58’	4.2	0.6	8	150	5	0.07
230419	23:15:48.02	44º38.67’	111º02.58’	8.8	0.6	14	93	6	0.19
230419	23:39:20.62	44º21.35’	110º40.07’	6.0	2.1W	19	72	9	0.11
230420	08:55:50.88	44º14.18’	110º45.52’	2.4	0.7	9	122	5	0.17
230420	22:37:25.06	44º42.57’	111º00.47’	9.2	-0.1	8	106	6	0.12
230421	23:05:59.67	44º43.78’	110º40.98’	2.9	0.3	12	158	2	0.16
230423	12:45:14.33	44º41.97’	110º01.03’	15.1	1.4	13	94	8	0.15
230423	12:45:24.58	44º41.68’	110º01.90’	12.8	2.1	8	91	10	0.14
230423	13:25:28.10	44º42.18’	110º00.80’	11.8	0.4	11	132	8	0.23
230423	13:41:54.75	44º41.92’	110º01.81’	12.5	0.4	9	140	9	0.17
230423	14:40:33.15	44º42.01’	110º02.12’	11.7	0.9	9	87	10	0.14
230423	18:59:32.76	44º46.62’	111º03.17’	9.7	0.8W	11	136	4	0.12
230423	19:57:40.52	44º44.42’	110º02.00’	5.5	0.2	7	174	9	0.09
230424	07:33:06.00	44º03.85’	110º29.00’	9.1*	1.2	18	147	22	0.14
230424	22:57:39.45	44º27.85’	110º36.39’	4.4	1.3W	23	53	3	0.11
230424	23:35:56.87	44º26.70’	110º35.19’	2.7	1.0	9	117	1	0.08
230424	23:35:59.92	44º27.33’	110º34.86’	3.2	1.5W	10	77	2	0.11
230424	23:36:49.94	44º27.47’	110º36.68’	3.9	1.4W	19	59	3	0.10
230425	00:49:00.97	44º26.75’	110º36.75’	3.7	1.5	10	134	2	0.09
230425	00:49:29.48	44º26.08’	110º34.12’	0.8	1.2	7	238	2	0.03
230425	00:50:02.41	44º26.00’	110º33.94’	0.8	1.9W	11	60	2	0.12
230425	00:50:46.07	44º26.26’	110º33.51’	1.1	2.0W	10	72	2	0.21
230425	00:51:54.62	44º26.80’	110º36.00’	4.3	1.7	14	129	1	0.14
230425	00:52:55.34	44º26.93’	110º34.87’	2.5	1.8	8	233	6	0.08
230425	00:54:22.28	44º27.09’	110º35.56’	2.8	1.9	10	99	2	0.12
230425	00:56:23.25	44º26.59’	110º35.27’	2.7	0.9	13	91	1	0.07
230425	00:58:04.54	44º26.05’	110º33.79’	0.3	1.6	8	62	2	0.05
230425	01:00:13.04	44º26.85’	110º37.56’	3.8	0.9	16	55	3	0.13
230425	01:02:20.37	44º26.37’	110º36.04’	4.9	1.4W	11	90	1	0.16
230425	01:02:40.19	44º27.39’	110º36.15’	4.8	1.5W	16	91	2	0.15
230425	01:04:14.89	44º27.32’	110º36.72’	4.6	0.7	17	63	3	0.10
230425	01:04:40.48	44º27.06’	110º36.87’	4.0	2.0W	17	57	3	0.11
230425	01:05:11.19	44º26.69’	110º37.52’	4.3	1.5W	7	129	3	0.03
230425	01:06:38.66	44º26.12’	110º34.29’	1.0	1.5	6	172	1	0.00
230425	01:06:52.65	44º26.32’	110º33.82’	1.5	1.4	8	121	2	0.07
230425	01:08:22.76	44º27.86’	110º36.46’	4.2	1.4	15	117	3	0.15
230425	01:10:13.88	44º27.73’	110º36.40’	3.0	1.7W	24	53	3	0.13

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
230425	01:17:47.07	44º27.87’	110º35.31’	4.6	0.8	12	123	3	0.07
230425	01:18:16.48	44º27.66’	110º37.11’	4.8	1.4	9	112	4	0.07
230425	01:43:02.17	44º26.78’	110º37.18’	4.2	0.9	13	108	3	0.06
230425	01:54:14.24	44º27.35’	110º36.46’	3.8	1.1	15	85	3	0.13
230425	04:49:01.51	44º27.36’	110º35.91’	4.7	--	11	117	2	0.07
230425	04:54:41.35	44º28.58’	110º35.11’	2.9	1.2W	15	88	4	0.17
230425	04:58:42.05	44º27.70’	110º35.90’	4.5	0.9	19	49	3	0.13
230425	05:07:56.30	44º27.45’	110º35.60’	4.3	0.8	11	119	2	0.05
230425	05:08:25.13	44º26.17’	110º33.75’	1.3	0.8	6	120	2	0.06
230425	14:07:08.11	44º48.08’	110º48.48’	4.8	1.0W	21	191	4	0.15
230425	17:53:03.66	44º48.53’	110º48.19’	4.5	0.2	8	218	4	0.07
230425	18:37:46.12	44º48.20’	110º48.65’	4.7	1.4W	19	149	4	0.13
230425	20:12:43.30	44º48.15’	110º49.67’	4.8	1.6W	20	189	2	0.16
230426	01:55:46.62	44º46.58’	110º51.22’	1.9	0.0	10	168	1	0.08
230426	01:55:54.72	44º46.85’	110º50.70’	2.9	0.5	10	208	1	0.11
230426	03:10:56.09	44º47.58’	110º50.03’	4.9	0.9W	16	105	1	0.16
230426	04:50:48.11	44º43.65’	111º06.09’	8.4	0.6W	13	103	8	0.14
230426	10:28:45.45	44º04.01’	110º45.63’	6.9*	0.5	11	119	23	0.12
230426	15:06:28.39	44º36.97’	110º43.41’	4.8	0.8	8	127	6	0.08
230426	15:07:51.32	44º36.20’	110º43.58’	5.0	0.7	9	129	7	0.20
230426	20:55:00.01	44º27.47’	110º36.65’	3.9	1.3	10	192	3	0.06
230426	22:10:45.85	44º47.69’	110º49.54’	4.5	1.0W	19	199	2	0.16
230427	05:04:49.46	44º47.65’	110º50.00’	4.9	0.2	9	106	2	0.12
230427	06:07:27.56	44º41.19’	110º24.69’	4.9	0.8	12	117	8	0.13
230427	23:36:10.89	44º27.38’	110º15.62’	10.6	1.9	22	155	6	0.18
230428	04:01:51.96	44º27.72’	110º17.14’	8.2	1.6	19	94	6	0.12
230428	18:53:11.36	44º48.40’	110º58.27’	8.9	2.2W	30	146	6	0.12
230428	20:30:55.02	44º48.57’	110º58.04’	6.1	0.5	16	178	6	0.14
230428	21:01:32.72	44º46.63’	110º50.81’	2.0	0.6	8	194	1	0.06
230429	17:04:19.33	44º48.18’	110º58.00’	7.7	0.2	15	171	6	0.13
230430	11:32:47.89	44º27.39’	110º58.70’	12.4	0.4	16	121	19	0.12
230430	11:33:26.34	44º26.92’	110º59.42’	12.8	0.4	14	125	20	0.20
230430	17:36:27.57	44º37.61’	110º07.86’	7.6	0.6	10	152	5	0.15
230503	09:55:02.08	44º48.06’	110º58.11’	7.7	1.4W	22	119	6	0.17
230503	10:30:10.38	44º45.01’	111º11.07’	8.2	0.2	16	96	1	0.16
230503	14:41:04.63	44º27.85’	110º58.27’	10.4	--	9	117	11	0.20
230503	14:41:06.93	44º27.99’	111º00.51’	15.7	0.6	15	130	17	0.15
230503	14:55:43.79	44º26.75’	111º01.18’	7.7*	0.5	14	136	19	0.29
230503	20:32:48.89	44º47.30’	110º57.32’	6.4	0.5	10	218	5	0.15
230504	18:30:14.82	44º45.72’	111º15.05’	12.1	0.9	17	124	5	0.18
230504	22:40:59.70	44º47.69’	110º50.55’	4.7	1.7W	15	107	1	0.16
230505	13:33:39.71	44º28.45’	110º35.61’	4.2	1.6W	20	47	4	0.14
230505	13:33:50.05	44º28.20’	110º36.41’	3.2	1.9	12	85	4	0.09
230505	13:34:08.71	44º26.92’	110º36.80’	3.2	0.9	11	65	2	0.17
230505	13:35:00.90	44º28.18’	110º35.76’	4.1	2.1W	25	49	4	0.14

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
230505	13:35:41.17	44º27.84’	110º35.78’	3.9	1.8W	14	68	3	0.14
230505	13:36:10.34	44º28.35’	110º35.83’	4.5	2.3W	19	52	4	0.09
230505	13:37:13.36	44º27.98’	110º34.52’	4.4	0.2	11	143	3	0.17
230505	13:38:23.93	44º28.11’	110º35.26’	4.0	1.8W	14	125	3	0.12
230505	13:39:16.03	44º28.15’	110º34.70’	2.5	0.4	9	149	4	0.09
230505	13:41:28.82	44º28.19’	110º35.58’	3.8	1.8W	16	47	4	0.07
230505	13:51:43.41	44º28.00’	110º36.12’	6.1	1.8W	19	94	3	0.11
230505	13:57:53.31	44º28.64’	110º36.64’	4.5	0.8	16	74	5	0.15
230505	14:01:09.31	44º28.11’	110º35.37’	3.3	0.8	11	126	4	0.16
230505	14:01:14.07	44º28.75’	110º34.77’	2.1	0.6	9	228	5	0.16
230505	14:05:52.56	44º27.81’	110º35.00’	5.1	1.0	16	68	3	0.13
230505	14:08:50.51	44º27.70’	110º35.11’	5.0	0.9	13	77	3	0.16
230505	14:12:00.45	44º28.34’	110º35.58’	3.4	0.7	12	127	4	0.09
230505	14:19:48.02	44º28.30’	110º35.72’	4.3	1.1	12	50	4	0.07
230505	14:24:16.18	44º48.49’	110º49.50’	4.9	0.7W	9	211	3	0.07
230505	14:29:46.90	44º28.40’	110º35.69’	3.7	2.0W	22	46	4	0.13
230506	16:55:58.54	44º45.48’	111º06.79’	10.5	0.3	14	78	4	0.15
230506	19:24:40.56	44º48.74’	111º20.89’	11.4	1.4W	18	95	14	0.17
230506	19:56:27.85	44º46.69’	111º03.23’	10.1	1.0W	14	136	4	0.12
230507	02:39:48.02	44º47.67’	110º56.92’	6.1	0.3	11	166	6	0.09
230507	06:04:09.92	44º37.75’	110º20.87’	4.9	0.3	8	96	9	0.07
230507	08:36:13.68	44º43.08’	111º11.58’	5.2	0.3	10	208	4	0.13
230507	12:45:38.07	44º48.62’	110º25.98’	9.5	1.2W	15	103	9	0.15
230508	04:27:52.13	44º48.63’	110º58.16’	7.5	0.2	11	179	6	0.09
230509	11:28:25.52	44º47.94’	110º48.91’	5.7	0.3	11	208	3	0.10
230509	18:09:47.72	44º39.95’	110º00.30’	15.2	1.0	8	169	10	0.07
230509	18:39:28.25	44º45.67’	111º12.23’	9.7	0.6	12	162	1	0.16
230509	23:29:39.31	44º24.13’	110º35.92’	2.2	0.7	11	92	2	0.12
230510	00:32:31.30	44º54.02’	110º40.69’	15.9	1.6W	25	131	18	0.24
230510	08:26:15.49	44º48.67’	110º49.28’	5.4	0.1	10	214	3	0.07
230510	11:12:54.94	44º27.22’	110º36.07’	6.4	0.8	6	151	2	0.07
230510	15:42:42.27	44º43.54’	110º59.98’	10.7	1.0W	15	69	4	0.13
230511	14:16:05.35	44º39.11’	110º26.32’	4.8	1.9W	21	69	9	0.16
230511	14:39:22.60	44º47.69’	110º50.15’	4.9	1.4W	19	110	1	0.16
230511	16:00:53.05	44º47.56’	110º50.02’	4.4	1.0W	16	108	1	0.13
230511	20:05:38.82	44º45.85’	110º58.15’	5.1	0.5	14	134	3	0.17
230511	21:34:57.93	44º45.58’	110º58.06’	6.0	1.5W	17	108	3	0.16
230511	22:25:27.64	44º45.45’	110º58.10’	6.2	2.4W	27	100	3	0.13
230511	22:33:39.11	44º45.80’	110º57.75’	4.9	0.5	12	132	3	0.14
230511	22:35:10.57	44º46.08’	110º58.05’	5.7	0.9W	13	137	3	0.13
230511	22:37:49.80	44º46.19’	110º58.07’	5.2	0.4	12	139	3	0.14
230512	01:58:36.48	44º46.03’	110º57.98’	5.2	0.4	14	136	3	0.15
230512	07:18:44.35	44º45.88’	110º58.01’	5.0	0.4	14	133	3	0.18
230512	11:03:42.63	44º45.88’	110º57.89’	4.9	0.9W	16	133	3	0.17
230512	14:30:10.99	44º46.04’	110º57.95’	5.3	0.6	13	136	3	0.14

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
230512	22:09:31.98	44º45.82’	110º58.12’	3.6	--	11	133	3	0.17
230512	22:09:34.63	44º45.82’	110º57.83’	3.6	1.4	13	132	3	0.15
230512	22:09:46.50	44º45.90’	110º58.17’	4.4	0.4	14	134	3	0.16
230513	06:00:15.41	44º45.27’	110º57.96’	5.6	2.1W	24	99	3	0.13
230513	06:54:05.14	44º45.80’	110º58.03’	5.2	0.9W	14	133	3	0.16
230513	14:01:22.22	44º45.78’	110º57.81’	5.1	0.3	13	132	3	0.12
230513	18:45:38.57	44º45.61’	110º58.09’	6.7	2.6W	25	108	3	0.13
230513	18:55:26.21	44º46.17’	110º58.13’	5.4	0.6	11	138	3	0.15
230513	23:30:42.07	44º46.13’	110º58.10’	5.1	0.9W	13	150	3	0.16
230514	00:18:34.89	44º42.61’	110º59.06’	6.2	0.3	11	124	5	0.11
230514	01:10:20.32	44º26.60’	110º59.49’	8.4	1.4W	15	126	12	0.19
230514	07:15:07.97	44º45.84’	110º58.00’	5.5	0.9W	13	133	3	0.10
230514	08:39:33.50	44º46.64’	110º37.45’	3.3	--	10	162	8	0.07
230514	09:53:42.96	44º40.62’	110º27.59’	2.2	0.5	13	115	6	0.18
230514	10:12:34.03	44º45.63’	110º58.42’	5.9	1.6W	17	108	3	0.14
230514	19:14:43.21	44º47.33’	111º05.24’	8.5	0.4	11	137	2	0.19
230515	13:59:07.74	44º42.97’	111º06.48’	9.8	1.4W	18	81	8	0.15
230515	14:01:00.47	44º42.98’	111º07.22’	9.8	0.9W	12	118	7	0.15
230516	05:03:41.57	44º45.80’	110º58.30’	4.8	0.3	12	132	3	0.13
230516	06:41:05.30	44º42.88’	111º06.88’	8.6	1.3W	19	117	8	0.18
230516	07:15:52.95	44º47.78’	110º49.79’	4.7	0.4	14	108	2	0.16
230516	10:32:35.99	44º45.83’	110º58.11’	5.2	0.2	13	133	3	0.17
230516	10:33:13.38	44º46.14’	110º58.22’	5.4	1.0W	13	138	3	0.11
230516	13:35:59.46	44º49.71’	111º20.44’	7.9	0.4	10	190	13	0.18
230516	16:22:34.71	44º45.68’	110º58.27’	5.1	0.4	12	131	3	0.14
230518	07:57:02.73	44º15.41’	110º36.96’	6.0	0.4	9	131	7	0.11
230518	18:10:39.19	44º45.84’	110º58.35’	5.0	1.1W	18	133	3	0.18
230519	03:41:47.94	44º22.00’	110º18.28’	7.3	1.2	7	211	3	0.05
230519	10:25:20.82	44º39.76’	110º00.56’	15.7	1.5	10	107	10	0.09
230520	00:19:22.13	44º44.05’	111º07.39’	13.7	0.3	12	103	6	0.15
230520	07:13:31.64	44º30.40’	111º01.84’	15.1	0.3	14	134	12	0.10
230520	08:04:54.47	44º02.59’	110º45.30’	8.1*	0.3	11	122	23	0.18
230521	03:40:07.69	44º31.38’	110º34.95’	3.1	0.4	8	126	10	0.05
230521	06:20:42.85	44º46.13’	110º58.58’	4.4	0.7W	13	137	3	0.13
230521	09:20:25.79	44º46.66’	110º48.78’	4.9	1.9W	22	90	3	0.21
230521	11:35:27.05	44º47.53’	110º48.51’	5.3	0.2	10	206	3	0.11
230521	12:14:58.82	44º47.01’	110º48.49’	3.6	0.4	10	207	3	0.11
230521	16:24:14.68	44º46.67’	110º48.52’	3.4	0.4	10	194	4	0.09
230521	19:51:39.91	44º46.64’	110º48.24’	2.4	0.5	8	195	4	0.13
230521	22:36:26.37	44º50.29’	111º22.20’	14.3	0.9	10	179	15	0.14
230522	09:44:37.98	44º47.84’	110º48.21’	5.4	0.6W	9	210	4	0.07
230522	13:33:48.04	44º46.58’	110º48.76’	4.7	2.3W	26	88	3	0.20
230522	13:52:57.77	44º46.72’	110º48.79’	4.5	1.2W	15	99	3	0.17
230522	15:23:52.21	44º46.83’	110º48.26’	2.9	-0.5	7	202	4	0.06
230522	22:35:29.48	44º46.53’	110º48.17’	3.3	0.5	13	193	4	0.11

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
230523	03:43:28.17	44º47.15’	110º48.47’	4.1	0.7W	9	212	3	0.11
230523	03:50:54.88	44º47.26’	110º48.31’	4.1	-0.3	7	216	4	0.06
230523	12:03:07.32	44º46.93’	110º48.93’	5.0	1.1W	16	100	3	0.18
230523	17:23:44.47	44º47.24’	110º49.07’	5.3	0.4	9	212	3	0.15
230523	20:22:37.99	44º13.45’	110º46.68’	1.9	0.9	12	91	6	0.19
230524	03:32:04.77	44º46.33’	110º57.25’	7.7	0.9W	17	114	4	0.17
230524	03:32:15.59	44º45.44’	110º55.81’	2.1	0.1	8	148	6	0.05
230524	05:04:07.47	44º46.04’	110º58.21’	5.7	0.8W	14	137	3	0.13
230524	15:56:52.59	44º44.70’	110º50.36’	3.5	-0.4	6	172	5	0.09
230524	21:55:16.67	44º45.11’	110º47.07’	2.3	0.4	10	104	7	0.10
230525	10:58:41.37	44º47.88’	110º48.40’	5.6	0.4	11	210	4	0.08
230525	18:03:20.35	44º17.45’	110º48.13’	3.3	0.9	7	156	2	0.06
230525	21:33:47.48	44º47.39’	110º46.95’	2.2	0.6	16	105	5	0.14
230526	02:20:21.04	44º46.63’	110º47.99’	7.1	2.3W	25	90	4	0.20
230526	05:40:15.88	44º46.70’	110º47.87’	7.7	2.8W	30	93	4	0.19
230526	06:58:00.81	44º46.79’	110º48.07’	4.8	1.1W	16	107	4	0.21
230526	11:06:04.13	44º24.17’	110º36.06’	3.7	1.4W	20	116	2	0.13
230526	11:07:23.22	44º24.02’	110º36.06’	3.8	1.1W	18	52	2	0.20
230526	12:41:33.08	44º46.61’	110º47.95’	4.9	1.3W	23	90	4	0.22
230526	14:20:41.59	44º46.52’	110º47.83’	2.6	0.3	12	196	4	0.16
230526	14:52:52.37	44º46.63’	110º47.53’	2.1	0.6	12	201	5	0.16
230527	10:52:45.33	44º40.55’	110º02.95’	13.1	1.2	10	92	11	0.17
230527	12:19:49.45	44º13.69’	110º45.13’	1.9	1.1	15	93	6	0.14
230527	12:38:53.55	45º00.46’	110º38.82’	12.6	0.6	12	201	15	0.15
230528	03:03:15.55	44º43.75’	111º05.26’	11.5	0.3	16	98	7	0.13
230528	08:09:52.68	44º46.59’	110º49.49’	3.2	0.2	12	177	2	0.11
230528	15:05:05.72	44º46.66’	110º48.00’	5.1	1.0W	14	107	4	0.21
230529	05:42:58.18	44º44.19’	111º01.15’	10.7	0.3	8	176	3	0.05
230529	17:57:27.30	44º47.38’	110º48.30’	3.7	0.6	6	221	4	0.05
230529	22:22:36.48	44º28.06’	110º34.05’	3.3	1.7	6	188	4	0.13
230529	22:22:55.33	44º28.03’	110º35.76’	3.6	1.5	10	121	3	0.13
230529	22:23:29.45	44º26.22’	110º34.49’	1.8	1.2	7	118	1	0.01
230529	22:27:45.55	44º27.69’	110º36.12’	5.1	1.5	11	130	3	0.11
230529	22:29:41.06	44º27.70’	110º35.35’	4.6	1.3	13	72	3	0.07
230529	22:34:05.01	44º28.63’	110º35.59’	0.9	1.3	9	128	4	0.26
230529	22:36:34.27	44º27.76’	110º34.29’	1.8	1.4	10	206	3	0.16
230529	22:37:12.02	44º28.14’	110º35.36’	2.6	0.0	8	237	4	0.29
230529	22:37:35.27	44º27.49’	110º33.52’	1.8	0.6	7	182	3	0.07
230529	22:38:23.11	44º27.87’	110º35.85’	4.8	1.6	10	144	3	0.05
230529	22:40:00.05	44º28.14’	110º35.44’	3.7	1.2	9	123	4	0.10
230529	22:52:37.11	44º28.13’	110º35.73’	3.6	2.1W	22	47	4	0.14
230529	23:12:29.48	44º28.26’	110º35.84’	3.8	1.1	8	122	4	0.03
230530	03:26:50.45	44º47.34’	110º49.26’	4.9	1.0	14	103	2	0.12
230530	03:33:36.79	44º48.39’	110º49.10’	5.3	0.7	8	241	3	0.09
230530	21:43:17.67	44º44.60’	110º24.79’	-0.9	1.1	7	186	5	0.10

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
230531	07:29:02.59	44º47.20’	110º23.22’	5.5	2.3W	14	139	5	0.18
230601	11:27:37.79	44º46.65’	111º20.30’	11.8	0.4	9	247	12	0.13
230601	18:46:14.28	44º47.12’	110º23.93’	5.0	2.0W	18	140	5	0.20
230601	22:59:35.47	44º44.32’	110º23.99’	1.3	1.5	8	160	4	0.09
230602	02:51:30.45	44º38.97’	110º58.83’	9.3	0.5	14	91	2	0.15
230602	03:52:13.13	44º28.33’	110º57.65’	5.4	1.5W	17	114	10	0.21
230602	03:52:54.47	44º28.16’	110º58.23’	7.6	1.5W	20	69	11	0.21
230602	03:54:07.57	44º27.73’	110º59.65’	16.6	1.4W	9	189	18	0.12
230602	04:12:06.14	44º46.13’	110º46.90’	5.1	0.6W	12	115	6	0.09
230602	07:03:01.29	44º38.81’	110º59.17’	9.1	0.5	12	93	3	0.15
230602	08:02:16.23	44º47.51’	110º24.85’	1.1	0.9	7	216	7	0.08
230602	08:13:13.55	44º45.26’	110º25.24’	0.8	1.0	10	177	6	0.11
230602	16:37:49.86	44º13.24’	110º46.14’	1.8	1.2	11	105	6	0.14
230603	12:54:05.88	44º25.97’	111º02.66’	15.0	0.6	11	214	20	0.20
230603	12:54:17.44	44º26.84’	111º00.37’	14.7	0.8	8	197	19	0.21
230604	03:45:11.25	44º48.86’	110º58.19’	7.4	0.5	12	182	7	0.09
230606	04:00:49.10	44º35.20’	110º43.85’	8.2	1.0W	16	65	7	0.15
230606	20:12:58.46	44º44.73’	110º46.89’	8.2	2.2W	18	89	7	0.19
230607	15:01:49.70	44º20.23’	110º17.07’	11.5	0.3	15	187	6	0.22
230607	15:48:45.24	44º22.19’	110º44.60’	2.0*	0.5	8	122	12	0.29
230608	05:47:50.64	44º41.63’	110º26.27’	8.1	1.3W	18	101	6	0.15
230608	05:48:41.67	44º40.51’	110º28.19’	5.6	0.5	16	92	5	0.21
230609	09:38:33.12	44º52.07’	110º22.38’	5.8*	0.6	15	152	20	0.16
230609	22:51:10.62	44º24.31’	110º39.03’	4.6	1.3	9	141	6	0.10
230610	06:42:42.71	44º05.23’	110º25.14’	6.7*	0.7	15	179	35	0.19
230610	17:54:49.20	44º47.98’	110º53.38’	7.1	0.7W	13	188	3	0.09
230611	15:25:12.97	44º39.16’	110º26.00’	2.4	1.1	9	136	9	0.20
230611	19:58:54.95	44º50.25’	111º29.18’	13.9	0.6	8	216	5	0.11
230612	04:45:57.80	44º47.99’	110º59.92’	6.9	0.6W	12	164	5	0.09
230612	05:18:14.31	44º46.95’	110º47.28’	2.0	0.4W	11	212	5	0.13
230612	16:49:10.86	44º48.02’	111º00.26’	6.5	1.1	10	205	5	0.10
230613	13:20:24.72	44º51.57’	110º21.81’	12.5	1.9W	29	122	12	0.18
230613	21:46:17.03	44º47.67’	110º59.93’	6.3	0.8	17	159	4	0.16
230613	22:11:04.87	44º51.17’	110º21.45’	5.4*	0.9	10	138	20	0.13
230613	22:39:05.93	44º28.09’	110º51.47’	13.9	0.7	10	171	3	0.25
230613	22:41:37.00	44º27.56’	110º56.89’	18.5	0.9W	8	173	19	0.28
230614	17:29:12.96	44º42.01’	110º40.76’	6.6	0.8	10	81	1	0.04
230615	08:23:16.03	44º42.03’	110º40.63’	6.4	1.6W	19	80	1	0.13
230616	10:53:57.11	44º42.04’	110º40.06’	7.6	0.6	11	111	2	0.10
230616	12:58:30.18	44º09.72’	110º15.55’	7.0*	1.2	13	167	24	0.12
230616	14:58:52.52	44º47.19’	111º00.65’	9.6	1.0W	15	122	3	0.12
230616	16:37:39.12	44º47.27’	111º00.34’	9.6	0.8W	12	152	3	0.10
230616	16:46:00.96	44º47.13’	111º00.39’	8.7	0.4	9	247	3	0.13
230616	17:01:38.30	44º47.18’	111º00.63’	10.6	1.4W	18	122	3	0.11
230616	17:03:15.98	44º47.49’	111º00.47’	10.0	0.6W	11	197	4	0.09

Table 2. Earthquakes in the Yellowstone Region: April 1–June 30, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
230616	17:25:32.50	44º47.10’	111º00.06’	9.0	0.3	7	246	3	0.07
230616	17:29:43.32	44º47.31’	111º00.50’	9.4	0.8W	14	153	3	0.11
230616	17:30:39.26	44º47.35’	111º00.59’	9.0	0.5	12	153	3	0.09
230616	17:32:58.53	44º47.12’	111º00.07’	8.7	0.4	7	246	3	0.07
230617	06:52:15.43	44º04.98’	110º23.41’	8.9*	1.0	18	158	23	0.18
230617	13:51:12.55	44º48.03’	110º41.00’	2.3	0.8	8	266	9	0.10
230617	14:28:18.98	44º46.36’	110º42.00’	2.3	0.2	7	246	7	0.13
230617	17:45:56.63	44º05.09’	110º24.82’	7.5*	1.5	11	181	35	0.20
230617	17:58:21.91	44º04.87’	110º23.18’	6.9*	2.8W	22	116	23	0.17
230617	18:31:05.11	44º05.76’	110º24.57’	15.5*	1.3	12	181	34	0.18
230617	22:18:11.25	44º41.83’	110º40.60’	6.2	1.1	13	83	2	0.07
230617	23:20:22.44	44º46.76’	110º42.09’	2.3	0.2	7	251	7	0.16
230618	09:41:33.10	44º04.90’	110º23.51’	3.9*	0.6	11	186	36	0.13
230620	12:55:38.64	44º35.52’	110º38.41’	7.8	0.6W	9	175	2	0.11
230620	12:57:22.22	44º34.42’	110º40.21’	5.0	1.0	11	105	4	0.09
230620	13:00:00.50	44º35.28’	110º39.56’	6.6	0.5	9	101	2	0.17
230621	11:12:31.46	44º13.29’	110º16.38’	7.7*	1.1	16	87	19	0.21
230621	12:32:23.46	44º45.65’	111º08.85’	8.6	0.2	9	90	4	0.11
230622	07:09:16.35	44º30.95’	110º35.73’	5.6	--	11	89	9	0.14
230624	14:04:13.63	44º28.66’	110º45.96’	4.7	1.2W	14	67	6	0.17
230624	19:27:45.71	44º44.85’	111º01.19’	5.9	0.8W	17	87	2	0.15
230625	03:58:27.85	44º22.72’	110º34.59’	3.2	0.8	11	147	3	0.22
230625	03:59:15.97	44º23.76’	110º35.14’	1.6	1.7W	10	187	1	0.06
230625	04:00:40.64	44º23.88’	110º35.16’	2.0	1.4W	12	121	1	0.07
230625	13:14:54.78	44º41.11’	110º59.29’	6.9	1.1W	18	68	3	0.18
230625	15:43:54.48	44º41.48’	110º58.86’	5.3	0.5	13	93	3	0.20
230626	13:51:41.75	44º44.66’	111º07.91’	9.4	0.0	10	95	5	0.20
230626	15:42:04.75	44º46.82’	110º49.05’	5.1	1.3W	15	99	3	0.18
230626	17:11:51.41	44º40.82’	111º00.71’	7.0	0.4	11	141	4	0.18
230627	04:57:44.98	44º45.60’	110º46.61’	8.1	1.1W	10	183	7	0.09
230627	19:26:15.54	44º40.99’	110º03.06’	10.8	1.1	9	88	10	0.15
230627	19:54:08.63	44º40.81’	110º03.36’	12.5	0.8	7	162	10	0.17
230629	20:48:06.83	44º48.21’	110º50.17’	5.9	0.6	13	114	2	0.15
230630	05:54:06.14	44º03.74’	110º30.16’	10.3*	1.1	15	109	22	0.16

number of earthquakes = 394
* 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, 2023

SEED Station	Location	SEED Channel	No. of Channels	Network Code	Latitude	Longitude	Elevation (meters)	Sensor	Digitizer	Telemetry	Sponsor
B206*	Canyon206bwy2008, Yellowstone, WY	EH[ZEN]	3	PB	44° 46.66′	110° 30.70′	2400	IESE-S2	Q330	Digital	PBO
B207*	Madisn207bwy2007, Yellowstone, WY	EH[ZEN]	3	PB	44° 37.14′	110° 50.91′	2182	IESE-S2	Q330	Digital	PBO
B208*	Lakejn208bwy2008, Yellowstone, WY	EH[ZEN]	3	PB	44° 33.61′	110° 24.09′	2406	IESE-S2	Q330	Digital	PBO
B944*	Grantt944bwy2008, Yellowstone, WY	EH[ZEN]	3	PB	44° 23.38′	110° 32.63′	2365	IESE-S2	Q330	Digital	PBO
B945*	Panthr944swy2008, Yellowstone, WY	EH[ZEN]	3	PB	44° 53.64′	110° 44.65′	2249	IESE-S2	Q330	Digital	PBO
B950*	Norris950bwy2013, Yellowstone, WY	EH[ZEN]	3	PB	44° 42.77′	110° 40.71′	2328	IESE-S2	Q330	Digital	PBO
FLWY*	Flagg Ranch, WY	BH[ZEN]	3	IW	44° 04.96′	110° 41.96′	2078	3ESP	RT-130	Digital	ANSS
IMW*	Indian Meadows, WY	BH[ZEN]	3	IW	43° 53.58′	110° 56.58′	2670	3ESP	RT-130	Digital	ANSS
LKWY*	Lake, WY	BH[ZEN]	3	US	44° 33.91′	110° 24.00′	2424	STS-2	Q330	Digital	USGS
LOHW*	National Elk Refuge, WY	BH[ZEN]	3	IW	43° 36.76′	110° 36.30′	2245	3ESP	RT-130	Digital	ANSS
MCID	Moose Creek, ID	EHZ	1	WY	44° 11.45′	111° 11.03′	2137	L4C	PSN	Analog	USGS
MOOW*	Moose Ponds, WY	BH[ZEN]	3	IW	43° 44.92′	110° 44.69′	2128	3ESP	RT-130	Digital	ANSS
QLMT*	Earthquake Lake, MT	EHZ	1	MB	44° 49.84′	111° 25.80′	2064	L4C	-	Analog	MBMT
REDW*	Red-Top Meadows, WY	BH[ZEN]	3	IW	43° 21.74′	110° 51.18′	2322	3ESP	RT-130	Digital	ANSS
SNOW*	Snow King Mountain, WY	BH[ZEN]	3	IW	43° 27.75′	110° 45.31′	2390	3ESP	RT-130	Digital	ANSS
TPAW*	Teton Pass, WY	BH[ZEN]	3	IW	43° 29.41′	110° 57.04′	2512	3ESP	RT-130	Digital	ANSS
TPMT*	Teepe Creek, MT	EHZ	1	MB	44° 43.79′	111° 39.94′	2518	L4C	-	Analog	MBMT
YDC	Denny Creek, MT	EHZ	1	WY	44° 42.51′	111° 14.60′	2025	L4C	PSN	Analog	USGS
YDD	Grant Junction, Yellowstone, WY	HH[ZEN]	3	WY	44° 24.00′	110° 34.80′	2400	STS-2	Q330	Digital	NSF
		EN[ZEN]	3					Episensor			
YEE	East Entrance (YNP), WY	HH[ZEN]	3	WY	44° 29.12′	109° 53.81′	2270	Compact PH	Centaur	Digital	USGS
YFT	Old Faithful (YNP), WY	HH[ZEN]	3	WY	44° 27.05′	110° 50.24′	2292	Compact	Centaur	Digital	USGS
		EN[ZEN]	3					Titan			
YGC	Grayling Creek, MT	EHZ	1	WY	44° 47.77′	111° 06.45′	2075	L4C	PSN	Analog	USGS
YHB	Horse Butte, MT	EHZ	1	WY	44° 45.07′	111° 11.71′	2157	L4C	PSN	Analog	USGS
		HH[ZEN]	3					Compact	Centaur	Digital	
		EN[ZEN]	3					Titan			
YHH	Holmes Hill (YNP), WY	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			

SEED Station	Location	SEED Channel	No. of Channels	Network Code	Latitude	Longitude	Elevation (meters)	Sensor	Digitizer	Telemetry	Sponsor
YHL	Hebgen Lake, MT	HH[ZEN]	3	WY	44° 51.05′	111° 10.98′	2691	Trillium 120	Q330	Digital	USGS
		EN[ZEN]	3					Titan			
YHR	Hawk's Rest, WY	HH[ZEN]	3	WY	44° 06.36′	110° 04.90′	2976	Trillium 120	Q330	Digital	USGS
YJC	Joseph′s Coat (YNP), WY	EH[ZEN]	3	WY	44° 45.33′	110° 20.95′	2684	S13	PSN	Analog	USGS
YLA	Lake Butte (YNP), WY	EHZ	1	WY	44° 30.76′	110° 16.12′	2580	L4C	PSN	Analog	USGS
YLT	Little Thumb Creek (YNP), WY	EHZ	1	WY	44° 26.25′	110° 35.28′	2439	L4C	PSN	Analog	USGS
YMC	Maple Creek (YNP), WY	EH[ZEN]	3	WY	44° 45.53′	111° 00.41′	2073	S13	PSN	Analog	USGS
YML	Mary Lake (YNP), WY	EH[ZEN]	3	WY	44° 36.20′	110° 38.63′	2653	S13	PSN	Analog	USGS
YMP	Mirror Plateau (YNP), WY	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	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	EHZ	1	WY	44° 15.84′	110° 31.67′	3106	L4C	PSN	Analog	USGS
YMV	Mammoth Vault (YNP), WY	EHZ	1	WY	44° 58.42′	110° 41.33′	1829	L4C	PSN	Analog	USGS
YNE	Northeast Entrance (YNP), WY	HH[ZEN]	3	WY	45° 00.46′	110° 00.48′	2343	Compact	Centaur	Digital	USGS
YNM	Norris Museum (YNP), WY	HH[ZEN]	3	WY	44° 43.59′	110° 42.22′	2311	Trillium 240	Q330	Digital	USGS
YNR	Norris Junction (YNP), WY	HH[ZEN]	3	WY	44° 42.93′	110° 40.75′	2336	Trillium 120	Q330	Digital	USGS
		EN[ZEN]	3					Titan			
YPC	Pelican Cone (YNP), WY	EHZ	1	WY	44° 38.88′	110° 11.55′	2932	L4C	PSN	Analog	USGS
YPK	Parker Peak (YNP), WY	EH[ZEN]	3	WY	44° 43.91′	109° 55.32′	2897	L4C	PSN	Analog	USGS
YPM	Purple Mountain (YNP), WY	EHZ	1	WY	44° 39.43′	110° 52.12′	2582	L4C	PSN	Analog	USGS
YPP	Pitchstone Plateau (YNP), WY	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	EHZ	1	WY	44° 53.04′	110° 09.06′	2072	L4C	PSN	Analog	USGS
YTP	The Promontory (YNP), WY	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	HH[ZEN]	3	WY	44° 42.76′	110° 30.71′	2394	Trillium 120	Centaur	Digital	USGS
		EN[ZEN]	3					Titan			
YWB	West Boundary (YNP), WY	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: 150 data channels from 46 stations were being recorded at the end of this report period

EXPLANATION OF TABLE

UURSN Code: Station code formerly used in routine processing. Owing to software limitations, the station code may not be the same 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
Compact PH	Nanometrics Compact Posthole 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)
Centaur	Nanometrics Centaur (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
NSF	National Science Foundation

Network Changes During April 1–June 30, 2023

None