EARTHQUAKE ACTIVITY IN THE YELLOWSTONE REGION

Preliminary Epicenters

October 1 – December 31, 2023

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

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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 through 02:00 (2:00 a.m.) on November 5 and MST thereafter.

- 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).

EARTHQUAKE ACTIVITY IN THE YELLOWSTONE REGION
October 1 – December 31, 2023

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During the three-month period October 1 through December 31, 2023, the University of Utah Seismograph Stations (UUSS) located 321 earthquakes within the Yellowstone region (Figure 1). The total includes 2 earthquakes in the magnitude 3 range, and 16 earthquakes in the magnitude 2 range. The largest event to occur during this period was a magnitude 3.3 earthquake on October 10. One earthquake was 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

M_L 3.3	October 10	05:09 MDT	24.6 mi ESE of Canyon Junction, YNP
M_L 3.0	October 13	02:04 MDT	9.1 mi S of Old Faithful, YNP

Notable Swarm Seismicity

During the report period, there were six 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 14 earthquakes ($-0.3 \leq M \leq 1.4$) occurred about 10.2 mi NE of West Yellowstone, MT from October 2nd – 3rd.
B. A swarm of 42 earthquakes ($-0.8 \leq M \leq 2.4$) occurred about 4.7 mi WNW of Norris Junction, YNP on October 3rd – 5th.
C. A swarm of 21 earthquakes ($0.7 \leq M \leq 2.5$) occurred about 10.2 mi SSW of West Thumb Geyser Basin, YNP on November 6th.
D. A swarm of 22 earthquakes ($0.1 \leq M \leq 1.2$) occurred about 2.9 mi ESE of West Yellowstone, MT from November 19th – 23rd.
E. A swarm of 15 earthquakes ($-0.1 \leq M \leq 1.8$) occurred about 4.5 mi NE of West Yellowstone, MT from December 9th – 12th.
F. A swarm of 13 earthquakes ($0.7 \leq M \leq 2.1$) occurred about 1.9 mi NE of West Thumb Geyser Basin, YNP on December 17th.

These swarms are labeled in Figure 1.

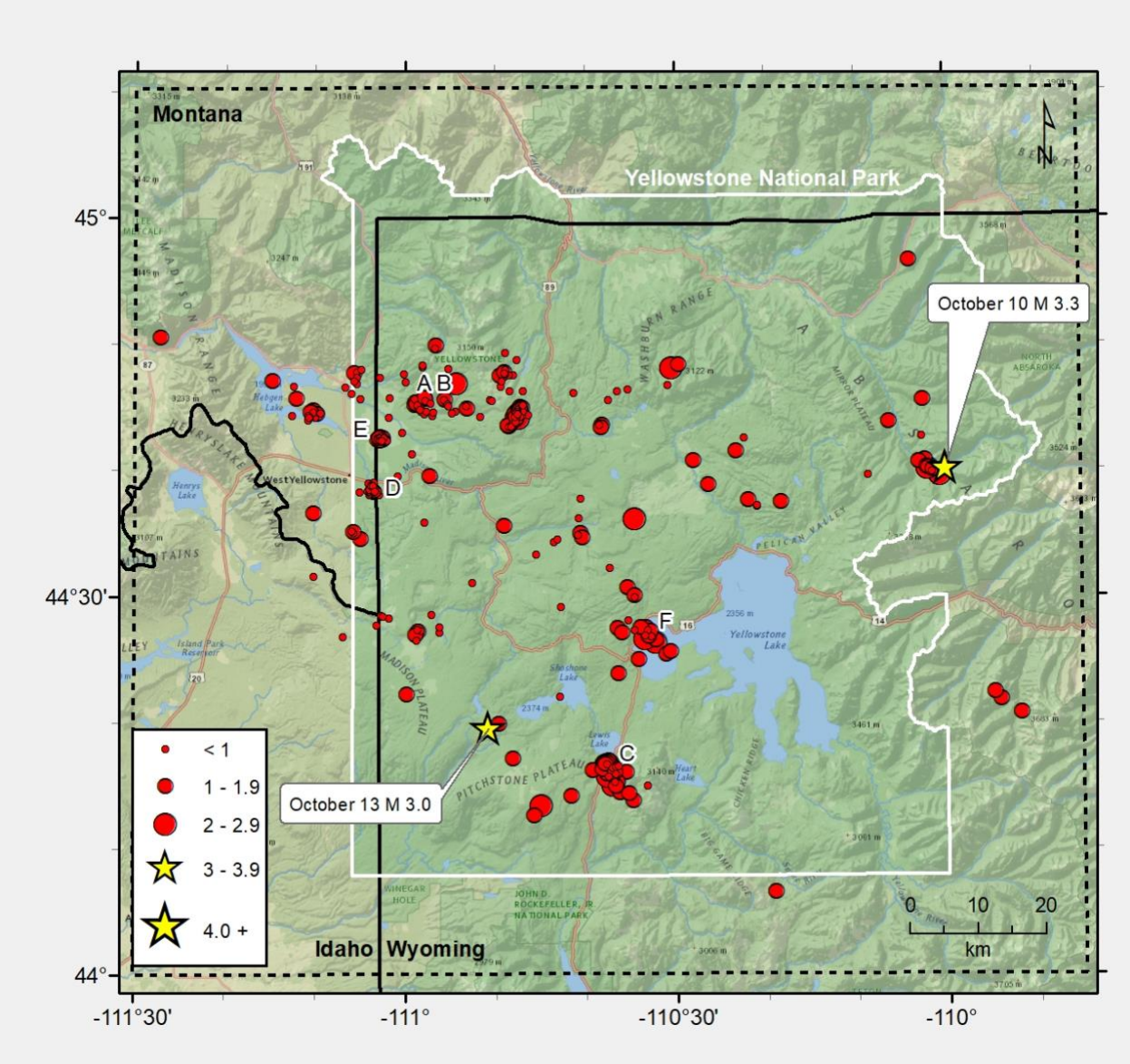

Figure 1. Epicenters of earthquakes located by the University of Utah Seismograph Stations, October 1, 2023, through December 31, 2023. Earthquake swarms (labeled A–F) are discussed in the text.

Table 1

EARTHQUAKES FELT IN THE YELLOWSTONE REGION
January 1, 2023, to December 31, 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
October 13	02:04 MDT 08:04 UTC	Yellowstone. Felt (III) at Yellowstone National Park.	44º 19.71′	110º 50.92′	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), 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
December 31, 2023

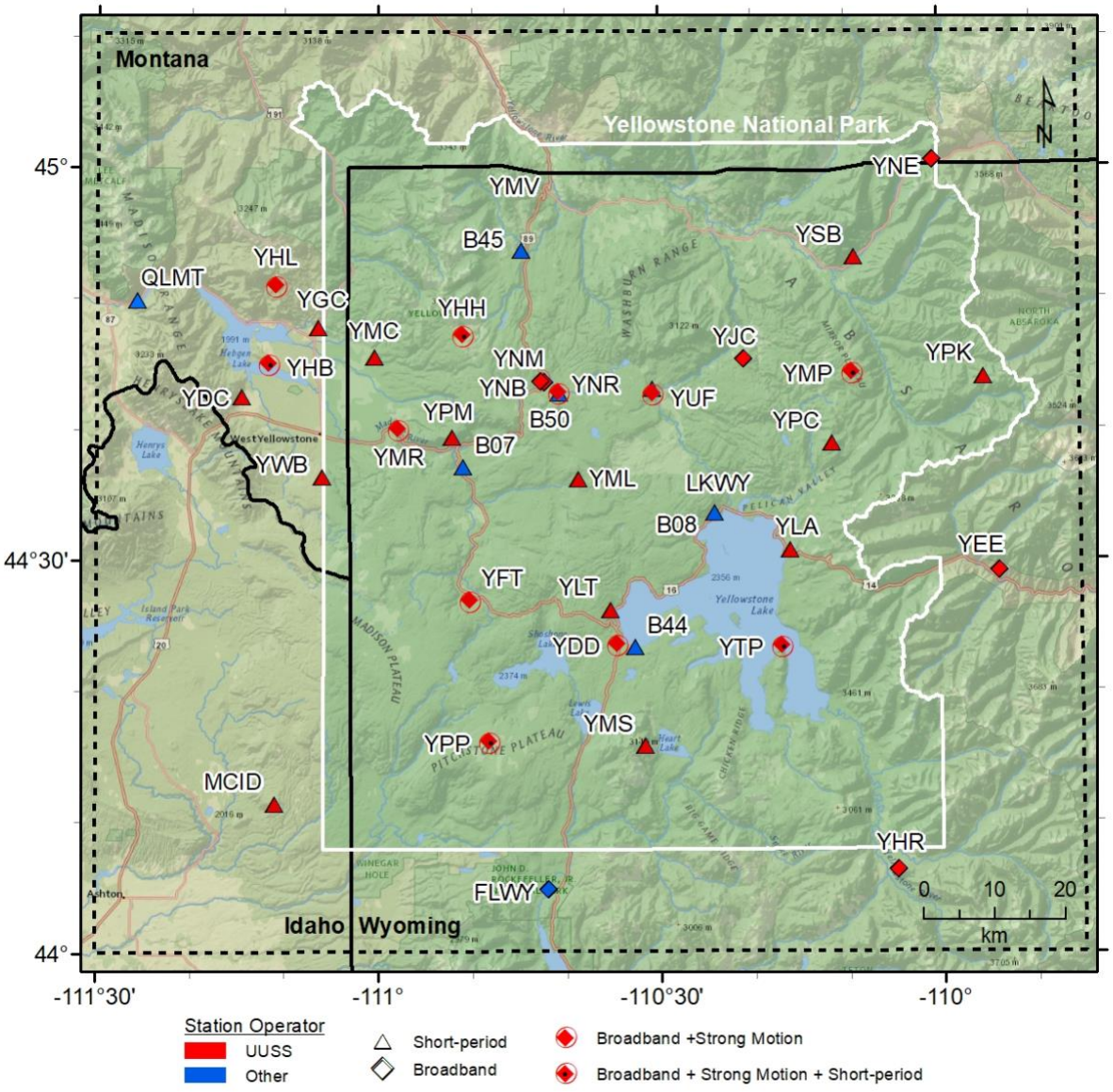

Figure 2. Seismograph stations of the Yellowstone Seismic Network as of December 31, 2023.

Table 2. Earthquakes in the Yellowstone Region: October 1–December 31, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
231001	11:57:30.30	44º27.18’	110º36.04’	3.5	1.4W	14	78	2	0.09
231002	05:46:09.66	44º44.76’	110º54.46’	7.8	0.4	18	95	7	0.15
231002	10:51:43.83	44º49.77’	110º56.78’	6.4	0.7W	14	98	9	0.13
231002	11:02:18.98	44º49.94’	110º56.67’	6.3	1.0W	14	99	9	0.13
231002	21:04:05.72	44º45.46’	110º58.87’	9.3	1.2W	16	99	2	0.13
231002	21:52:30.08	44º44.78’	110º57.76’	5.3	0.2	10	129	4	0.17
231002	21:52:54.31	44º44.69’	110º56.99’	2.3	-0.3	8	128	5	0.09
231002	22:03:15.26	44º44.78’	110º58.30’	7.7	0.6	11	126	3	0.19
231002	22:03:23.20	44º44.40’	110º57.07’	2.1	-0.3	6	133	5	0.06
231002	22:03:40.98	44º44.55’	110º57.96’	8.1	0.4	11	119	4	0.17
231002	22:05:34.42	44º45.29’	110º58.77’	8.4	1.2W	18	99	2	0.19
231002	22:06:02.88	44º44.92’	110º58.47’	8.3	-0.1	15	120	3	0.19
231002	22:14:35.82	44º45.25’	110º58.73’	9.5	0.2	14	125	2	0.11
231002	22:17:26.54	44º45.33’	110º58.76’	10.3	1.4W	13	126	2	0.13
231002	22:19:38.61	44º45.22’	110º59.02’	9.9	1.3W	15	98	2	0.14
231002	22:50:35.16	44º47.67’	111º00.22’	8.2	0.1	12	159	4	0.21
231002	22:50:56.46	44º47.10’	111º00.00’	8.6	0.7W	16	81	3	0.17
231002	23:39:57.11	44º45.16’	110º58.74’	8.7	0.7W	15	123	2	0.18
231003	01:49:12.49	44º45.73’	110º59.02’	9.9	0.4	11	131	2	0.08
231003	10:54:15.81	44º44.55’	110º47.30’	4.9	0.3	12	153	7	0.16
231003	11:14:08.14	44º44.42’	110º47.47’	2.0	0.0	9	148	7	0.09
231003	13:56:33.28	44º44.63’	110º47.61’	2.3	0.1	7	151	7	0.14
231003	13:56:41.89	44º44.38’	110º47.07’	2.4	0.5	9	151	8	0.11
231003	14:38:46.49	44º44.86’	110º47.31’	6.6	1.0W	14	146	7	0.18
231003	18:21:55.29	44º44.71’	110º47.68’	6.0	1.9W	21	69	7	0.18
231003	18:22:03.29	44º44.09’	110º47.80’	5.6	1.4	10	137	7	0.22
231003	18:25:33.55	44º45.07’	110º47.25’	7.2	1.1W	13	164	6	0.17
231003	18:25:39.58	44º44.71’	110º47.34’	2.8	1.0	6	155	7	0.13
231003	18:25:43.02	44º44.30’	110º47.78’	2.2	1.0	6	168	7	0.20
231003	18:27:53.43	44º44.81’	110º47.48’	5.0	1.3W	15	133	7	0.14
231003	18:28:06.77	44º44.81’	110º47.37’	4.9	1.5W	13	145	7	0.13
231003	18:28:55.52	44º45.04’	110º47.23’	7.9	1.3W	17	150	7	0.17
231003	18:30:16.48	44º44.81’	110º47.50’	5.3	0.9W	10	156	7	0.08
231004	02:09:29.59	44º44.86’	110º47.35’	6.3	1.2W	15	159	7	0.17
231004	03:03:24.72	44º47.11’	111º05.68’	10.2	-0.3	10	125	2	0.16
231004	03:04:09.86	44º44.52’	110º47.70’	2.1	-0.5	9	147	7	0.10
231004	03:05:55.37	44º44.77’	110º47.55’	5.0	0.6W	13	154	7	0.13
231004	03:07:05.78	44º44.18’	110º47.51’	6.9	2.0W	23	55	7	0.20
231004	03:14:12.13	44º45.01’	110º47.03’	7.9	1.0W	15	165	7	0.17
231004	03:17:57.13	44º44.55’	110º47.69’	2.3	0.6W	10	148	7	0.11
231004	03:18:34.57	44º44.57’	110º47.71’	2.2	-0.2	9	148	7	0.12
231004	03:26:21.98	44º44.71’	110º47.54’	6.1	0.2	11	153	7	0.17
231004	03:26:26.24	44º44.06’	110º47.42’	4.5	0.5	9	141	8	0.23
231004	03:39:10.65	44º44.46’	110º47.71’	2.1	0.6W	10	146	7	0.11
231004	03:39:38.82	44º44.35’	110º47.87’	2.5	-0.8	9	142	7	0.13

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231004	04:09:39.78	44º44.74’	110º47.23’	6.4	1.2W	19	72	7	0.19
231004	04:21:49.73	44º44.25’	110º47.67’	7.7	2.4W	25	46	7	0.19
231004	04:26:16.89	44º44.52’	110º47.70’	2.3	0.4	9	147	7	0.12
231004	04:27:24.85	44º44.91’	110º47.40’	7.4	0.5	10	159	7	0.21
231004	04:28:57.15	44º44.59’	110º47.83’	4.8	1.7W	17	78	7	0.13
231004	04:35:35.93	44º44.87’	110º47.55’	6.0	0.3	8	156	6	0.06
231004	04:36:23.27	44º45.15’	110º47.36’	7.7	0.9W	10	165	6	0.12
231004	04:39:43.70	44º44.56’	110º47.59’	2.1	--	8	149	7	0.12
231004	04:42:27.40	44º45.00’	110º47.32’	7.9	0.9W	11	161	6	0.14
231004	04:47:56.80	44º44.57’	110º47.79’	2.4	-0.6	7	148	7	0.09
231004	04:48:23.96	44º44.61’	110º47.38’	5.4	0.6W	10	152	7	0.16
231004	04:48:49.63	44º44.40’	110º47.60’	2.5	-0.1	9	146	7	0.16
231004	04:49:07.13	44º44.28’	110º47.71’	2.4	-0.3	8	143	7	0.15
231004	05:25:27.03	44º44.75’	110º47.02’	8.1	0.3W	8	160	7	0.15
231004	06:42:24.16	44º06.63’	110º19.21’	8.6*	1.0	15	198	24	0.16
231004	07:17:19.10	44º45.23’	110º47.00’	8.2	0.1	9	171	7	0.21
231004	17:06:12.08	44º47.41’	111º05.44’	10.9	0.2	9	137	1	0.13
231004	17:51:58.65	44º47.87’	111º05.44’	10.8	0.5	13	144	1	0.13
231004	21:57:46.61	44º47.79’	111º05.72’	11.2	1.2W	10	140	1	0.10
231004	21:58:23.87	44º46.62’	111º06.74’	9.7	0.6	12	79	2	0.16
231005	01:02:06.04	44º48.04’	111º04.97’	10.4	0.0	12	148	2	0.13
231005	01:44:32.41	44º44.51’	110º47.44’	2.0	0.4	10	150	7	0.11
231005	06:10:23.89	44º45.02’	110º46.83’	5.0	0.5W	7	167	7	0.04
231005	17:35:09.36	44º39.97’	110º01.46’	12.3	1.0	8	182	11	0.23
231005	22:00:39.62	44º40.84’	110º28.06’	5.2	1.2W	10	109	5	0.17
231007	14:10:18.63	44º29.27’	110º42.80’	2.0*	0.6	10	96	11	0.29
231007	17:41:26.68	44º47.59’	110º48.07’	3.4	0.6	8	228	4	0.10
231010	00:08:58.47	44º46.36’	110º46.97’	10.5	--	9	128	11	0.15
231010	01:18:34.52	44º46.74’	110º49.45’	6.3	0.6	17	95	2	0.16
231010	01:20:59.67	44º47.53’	110º48.95’	6.2	0.3	13	205	3	0.13
231010	08:09:57.78	44º27.00’	110º58.89’	3.8*	1.0	12	243	12	0.12
231010	08:11:02.69	44º27.33’	110º58.61’	4.6*	1.2	10	184	11	0.15
231010	08:41:33.63	44º27.41’	110º58.30’	6.5	0.7	13	119	11	0.19
231010	09:28:29.24	44º27.63’	110º56.31’	8.3	0.4	12	117	8	0.17
231010	10:46:31.44	44º40.15’	110º01.97’	13.1	1.2	10	101	11	0.17
231010	11:09:19.11	44º40.22’	110º00.08’	13.2	3.3W	28	115	9	0.25
231010	11:52:56.09	44º40.07’	110º02.05’	12.3	2.0	12	100	11	0.20
231010	12:42:02.40	44º40.23’	110º02.14’	12.4	1.3	13	99	11	0.20
231010	14:51:43.52	44º28.66’	110º57.13’	6.6	0.7	10	110	10	0.10
231010	18:41:15.71	44º27.43’	110º58.74’	4.6*	0.6	12	121	11	0.15
231011	02:52:19.08	44º46.91’	111º05.39’	7.9	0.5	15	126	2	0.14
231013	08:04:26.07	44º19.71’	110º50.92’	5.8	3.0W	23	90	7	0.21
231013	15:51:59.70	44º39.61’	110º08.64’	4.6	0.5	5	147	4	0.06
231015	21:31:29.17	44º47.45’	111º02.84’	5.4	0.4	13	148	5	0.17
231016	10:51:02.67	44º47.63’	110º48.51’	4.5	0.2	10	230	3	0.13

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DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
231016	16:41:33.82	44º45.69’	110º55.63’	9.8	1.2W	14	126	6	0.15
231016	19:08:34.09	44º19.98’	110º49.70’	1.9	1.3	11	103	7	0.30
231016	21:59:34.66	44º14.26’	110º41.74’	9.3	0.9	6	186	9	0.08
231017	21:42:16.26	44º39.60’	110º57.37’	6.4	1.5W	15	56	1	0.18
231018	03:06:48.62	44º36.63’	111º10.26’	9.4	1.8W	17	171	6	0.18
231018	16:19:13.10	44º44.42’	111º10.87’	14.1	0.3	17	117	2	0.17
231018	22:16:31.27	44º44.07’	111º10.83’	13.3	0.3	11	170	2	0.17
231020	15:11:17.77	44º40.67’	110º03.08’	13.1	1.5	10	91	11	0.16
231021	01:48:36.11	44º37.23’	110º21.01’	5.9*	0.7	7	127	13	0.18
231021	11:34:56.39	44º26.92’	111º06.92’	15.5	0.5	10	159	18	0.20
231022	03:21:08.60	44º35.68’	110º49.11’	8.4	1.2W	17	61	8	0.17
231023	14:43:03.84	44º31.69’	111º10.24’	14.6	0.6	15	174	10	0.19
231023	18:26:58.43	44º47.53’	110º49.49’	4.6	1.6W	22	82	2	0.19
231024	00:09:52.28	44º37.52’	110º18.39’	2.0	1.2	6	127	9	0.11
231024	03:12:07.59	44º36.19’	110º34.63’	5.2	2.2W	23	66	5	0.12
231026	08:29:59.74	44º35.98’	110º57.97’	7.7	0.6	7	127	8	0.10
231027	00:51:51.93	44º42.70’	110º02.72’	9.2	0.6	8	162	9	0.12
231030	22:50:39.80	44º48.26’	110º58.10’	7.2	0.9	15	89	6	0.12
231031	01:30:21.14	44º30.80’	110º35.40’	2.3*	1.9W	11	106	11	0.22
231031	02:50:37.35	44º30.18’	110º34.66’	4.3	1.3W	15	62	7	0.11
231031	05:10:59.26	44º30.03’	110º34.65’	5.1	0.4	8	117	7	0.04
231031	15:08:58.40	44º45.54’	110º02.54’	2.3	1.0	7	118	9	0.05
231031	19:57:30.57	44º37.81’	110º40.60’	2.2	0.8	7	146	4	0.07
231101	00:43:45.55	44º39.83’	110º01.63’	14.2	0.8	7	180	11	0.04
231101	02:22:28.97	44º39.55’	110º00.67’	10.7	2.1W	25	106	11	0.24
231101	13:54:06.24	44º35.08’	110º40.58’	6.9	1.4W	18	61	3	0.13
231101	13:54:32.36	44º32.32’	110º37.41’	8.7	0.9	11	141	8	0.18
231101	13:54:59.71	44º34.75’	110º40.42’	6.1	1.1W	16	71	4	0.21
231101	13:58:14.29	44º34.95’	110º40.88’	6.1	0.8	11	87	4	0.14
231103	05:48:30.37	44º23.94’	110º36.49’	4.6	1.7W	18	57	3	0.18
231104	11:43:13.20	44º44.35’	110º47.32’	3.2	-0.2	7	147	7	0.09
231104	16:27:53.42	44º46.38’	110º48.47’	2.6	0.1	8	185	4	0.10
231106	08:58:36.02	44º16.48’	110º38.04’	9.9	1.2	12	92	9	0.22
231106	09:05:07.19	44º16.42’	110º38.14’	11.1	1.2	16	80	9	0.20
231106	09:05:22.73	44º16.66’	110º36.51’	5.3*	0.7	6	188	13	0.01
231106	09:09:19.96	44º16.33’	110º37.36’	7.5	1.8W	16	94	8	0.24
231106	09:15:31.87	44º16.48’	110º37.38’	10.2	1.2	10	92	8	0.26
231106	09:20:12.06	44º16.83’	110º37.76’	11.1	0.8	10	76	8	0.17
231106	09:21:00.09	44º16.74’	110º37.58’	4.4	2.5W	24	95	8	0.12
231106	09:24:17.50	44º16.81’	110º37.95’	5.5	1.1W	11	92	9	0.10
231106	09:25:06.43	44º16.73’	110º37.37’	6.1	1.7W	14	94	8	0.12
231106	09:29:45.54	44º16.76’	110º38.20’	4.1	1.6W	13	92	9	0.09
231106	09:30:58.62	44º16.24’	110º37.51’	7.3	1.6W	16	95	8	0.20
231106	09:34:12.01	44º15.13’	110º33.25’	12.3	--	7	167	22	0.09
231106	09:48:55.96	44º16.71’	110º37.89’	6.2	2.0W	16	95	8	0.12

Table 2. Earthquakes in the Yellowstone Region: October 1–December 31, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
231106	10:23:29.15	44º16.59’	110º36.79’	10.9	0.8	11	78	7	0.19
231106	12:01:56.98	44º17.05’	110º37.59’	13.6	1.2	10	73	8	0.13
231106	12:26:20.36	44º16.89’	110º38.12’	10.1	1.1	13	76	9	0.20
231106	13:16:18.86	44º16.03’	110º37.71’	8.6	1.8W	17	86	8	0.22
231106	14:41:11.13	44º16.00’	110º37.77’	6.9	1.3	12	86	8	0.14
231106	14:42:02.62	44º15.95’	110º37.46’	7.4	2.5W	26	87	8	0.22
231106	14:46:58.35	44º15.83’	110º37.68’	7.6	2.1W	21	89	8	0.21
231106	14:49:09.38	44º15.77’	110º36.97’	9.3	2.4W	25	91	7	0.23
231106	15:01:54.50	44º16.23’	110º37.06’	11.3	1.3	13	84	7	0.22
231109	06:32:20.44	44º45.74’	111º05.03’	10.1	0.2	14	106	4	0.14
231109	12:11:40.14	44º40.78’	110º02.35’	12.6	1.5	11	155	11	0.22
231109	19:23:31.99	44º46.18’	111º06.00’	7.4	0.8	16	92	3	0.16
231110	14:41:48.62	44º17.27’	110º48.13’	3.2	1.4	11	86	2	0.04
231111	05:16:07.63	44º48.14’	110º30.49’	7.5	2.8W	26	76	10	0.17
231111	10:10:08.46	44º43.90’	110º47.73’	8.3	-0.4	7	134	8	0.08
231111	10:10:17.58	44º43.67’	110º48.27’	9.1	0.6	10	125	8	0.14
231111	10:39:27.94	44º43.80’	110º47.72’	9.9	0.8	10	132	8	0.14
231111	10:40:32.36	44º43.52’	110º48.53’	8.9	0.7W	17	70	8	0.18
231111	11:49:44.42	44º43.52’	110º48.27’	9.0	0.6	15	89	7	0.16
231111	12:07:00.94	44º43.60’	110º48.47’	8.7	1.2W	20	71	8	0.18
231111	12:11:04.51	44º34.62’	110º43.20’	10.4	0.5	8	152	7	0.12
231111	12:19:10.88	44º43.62’	110º48.63’	9.3	1.0W	17	70	8	0.14
231111	13:09:43.67	44º43.58’	110º48.55’	9.3	1.1W	15	70	8	0.14
231112	12:22:11.52	44º16.29’	110º39.38’	11.0	1.7W	13	122	12	0.24
231112	12:23:13.66	44º16.37’	110º37.49’	5.7	1.2	11	99	8	0.21
231112	12:57:14.46	44º15.09’	110º37.13’	6.7	2.4W	21	100	7	0.19
231112	13:03:20.60	44º16.38’	110º38.28’	3.7	1.1	11	98	9	0.15
231112	13:08:38.02	44º15.79’	110º37.59’	10.9	0.9	13	89	8	0.27
231114	09:27:40.82	44º36.28’	110º40.85’	6.8	0.4	10	88	3	0.11
231114	12:27:23.55	44º33.41’	110º45.54’	12.0	0.6W	11	100	11	0.13
231115	09:19:34.20	44º45.65’	110º50.63’	5.1	0.4	13	84	3	0.17
231115	15:49:51.57	44º43.08’	111º00.44’	7.1	0.5W	15	73	5	0.19
231116	11:37:42.65	44º37.20’	110º21.04’	5.9*	0.9	9	92	13	0.13
231116	16:35:41.48	44º43.81’	110º06.35’	11.9	1.0	8	88	4	0.11
231117	19:13:17.09	44º44.41’	111º12.61’	12.3	0.3	14	192	2	0.17
231118	10:38:22.58	44º47.70’	110º48.95’	3.8	0.4	10	233	3	0.12
231118	14:29:08.52	44º45.60’	110º50.42’	5.8	0.3	10	125	3	0.12
231118	17:34:34.39	44º43.63’	110º38.18’	6.7	1.6W	16	125	4	0.17
231118	17:34:47.47	44º43.65’	110º38.52’	6.1	0.6	8	149	5	0.14
231118	17:44:26.77	44º43.46’	110º38.34’	5.3	1.1W	15	147	3	0.16
231119	02:15:26.61	44º17.03’	110º37.78’	5.9	1.3W	12	90	8	0.10
231119	07:44:12.54	44º46.82’	110º30.91’	2.0	0.9	14	133	7	0.23
231119	10:12:21.73	44º47.68’	110º48.98’	4.6	0.2	8	232	3	0.13
231119	12:36:56.99	44º38.47’	111º03.65’	10.8	0.9	11	159	5	0.15
231119	12:53:07.14	44º39.63’	111º00.90’	9.3	0.8W	7	254	4	0.06

Table 2. Earthquakes in the Yellowstone Region: October 1–December 31, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
231119	13:03:38.34	44º38.40’	111º03.08’	10.5	0.5	12	149	5	0.13
231119	13:23:20.03	44º38.37’	111º03.85’	11.0	0.7	13	102	5	0.11
231119	13:29:43.25	44º38.40’	111º04.19’	11.7	0.7	13	107	5	0.12
231119	13:37:30.62	44º38.41’	111º04.01’	11.0	0.6	14	105	5	0.14
231119	13:37:53.02	44º38.85’	111º03.69’	7.4	0.2	9	129	6	0.08
231119	13:43:34.18	44º38.70’	111º03.86’	10.5	0.4	8	165	5	0.15
231119	13:55:07.68	44º38.31’	111º03.92’	10.6	0.6	14	103	5	0.12
231119	14:53:25.63	44º38.17’	111º04.06’	11.3	0.9	13	103	4	0.12
231119	15:12:40.00	44º38.45’	111º03.63’	11.6	0.6	12	158	5	0.16
231119	15:36:58.22	44º38.89’	111º03.85’	10.8	0.2	11	168	6	0.15
231120	10:52:12.43	44º46.92’	110º54.34’	7.6	2.2W	23	82	4	0.19
231120	16:01:10.07	44º38.55’	111º04.03’	11.8	0.2	12	106	5	0.15
231120	18:16:59.02	44º38.90’	111º03.74’	11.4	0.6	12	166	6	0.17
231121	12:19:36.85	44º12.73’	110º45.87’	1.8	1.4	11	75	7	0.18
231121	14:44:05.52	44º22.32’	110º59.90’	11.5	1.0	10	126	16	0.14
231121	15:20:14.14	44º28.40’	111º01.85’	12.8	0.7	14	138	16	0.20
231121	15:27:19.49	44º28.61’	111º02.77’	13.2	0.8	16	140	15	0.20
231121	18:26:08.30	44º48.03’	110º48.91’	3.5	0.2	11	118	3	0.08
231121	19:29:44.92	44º27.84’	111º03.25’	14.5	0.4	9	148	16	0.19
231121	23:27:51.65	44º28.48’	111º02.53’	10.0	0.6	14	143	15	0.18
231122	04:49:46.65	44º44.28’	111º01.83’	9.7	0.6	14	81	3	0.13
231122	05:01:44.21	44º39.10’	111º03.51’	9.6	0.4	8	165	6	0.12
231122	06:59:12.08	44º38.65’	111º03.69’	10.6	0.3	14	102	5	0.15
231122	06:59:30.03	44º38.39’	111º03.14’	10.8	0.9W	17	92	5	0.17
231122	07:50:40.37	44º38.47’	111º03.74’	11.3	0.6	16	102	5	0.16
231122	11:07:23.31	44º22.19’	110º42.90’	2.8*	0.3	7	139	11	0.07
231122	11:07:45.80	44º38.32’	111º03.54’	11.9	1.2W	19	96	5	0.19
231122	11:11:40.22	44º38.45’	111º03.44’	11.4	0.1	13	97	5	0.14
231122	11:12:05.90	44º38.63’	111º03.58’	11.1	0.8W	17	100	5	0.14
231122	22:15:04.90	44º16.91’	110º37.80’	4.2	1.1	11	92	8	0.09
231123	06:02:01.51	44º38.93’	110º26.45’	4.7	1.4W	7	125	9	0.08
231123	09:51:15.29	44º20.71’	109º51.88’	14.5	1.4	12	220	16	0.13
231123	15:52:39.73	44º38.64’	111º03.49’	11.8	0.4	10	158	5	0.10
231123	18:04:04.37	44º48.84’	110º47.63’	2.1	0.3	8	249	5	0.16
231124	12:32:10.84	44º34.60’	111º04.99’	4.9	1.3	13	145	4	0.16
231125	10:22:42.59	44º44.56’	111º09.88’	11.5	1.1W	19	108	3	0.18
231125	11:32:15.99	44º31.21’	110º52.63’	4.8	0.8W	11	94	8	0.12
231125	18:27:08.60	44º21.76’	109º54.10’	10.5	1.8	16	244	14	0.17
231126	11:55:38.53	44º22.35’	109º54.82’	10.9	1.0	14	238	13	0.16
231126	15:16:13.12	44º28.15’	110º35.34’	3.7	0.7	11	123	4	0.08
231126	23:10:28.39	44º47.78’	110º49.00’	4.5	0.3	9	234	3	0.09
231127	08:37:37.08	44º47.74’	110º49.01’	3.8	0.1	9	234	3	0.08
231127	10:37:53.50	44º45.81’	110º57.96’	7.0	1.0W	14	103	3	0.15
231129	13:31:34.65	44º38.45’	111º03.67’	11.5	1.0W	16	100	5	0.13
231129	13:41:29.52	44º38.11’	111º02.93’	10.4	0.5	13	141	5	0.13

Table 2. Earthquakes in the Yellowstone Region: October 1–December 31, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
231129	13:50:40.23	44º38.57’	111º03.84’	11.2	0.5	11	163	5	0.13
231129	17:48:42.67	44º47.16’	111º14.79’	1.8	1.9	10	219	6	0.18
231129	22:01:51.95	44º46.31’	110º36.55’	2.1	0.4	14	178	8	0.20
231130	03:20:40.95	44º38.25’	111º03.28’	10.6	0.4	12	148	5	0.18
231130	04:18:05.16	44º39.06’	111º04.15’	11.0	0.6	10	175	6	0.14
231130	07:42:57.48	44º38.47’	111º03.72’	11.2	0.6	12	159	5	0.13
231130	11:12:52.68	44º45.39’	110º57.26’	4.6	0.1	10	151	4	0.10
231201	01:59:44.41	44º46.22’	110º41.36’	2.7*	0.8	9	174	13	0.08
231201	22:11:00.31	44º38.34’	111º05.08’	14.3	0.4	8	184	4	0.11
231202	01:40:00.86	44º56.61’	110º04.01’	19.0	1.2	12	117	9	0.11
231202	11:06:35.43	44º44.97’	110º53.24’	7.1	1.0W	18	96	5	0.14
231202	11:46:40.96	44º45.18’	110º53.28’	5.8	0.3	10	122	5	0.10
231202	21:28:35.43	44º48.15’	110º55.22’	6.4	--	9	180	6	0.09
231203	08:04:10.09	44º46.49’	110º35.30’	3.2	0.7	7	278	10	0.06
231203	08:06:54.44	44º45.61’	110º37.48’	4.7	0.7	12	170	7	0.10
231205	07:13:40.54	44º49.36’	110º48.95’	4.9	0.0	7	252	5	0.12
231205	13:51:05.99	44º44.60’	110º54.84’	4.9	-0.1	7	121	7	0.04
231205	14:10:12.67	44º45.16’	110º55.22’	9.8	0.0	7	137	7	0.09
231205	14:17:03.42	44º45.37’	110º55.47’	10.3	0.9	10	144	6	0.11
231205	14:19:00.74	44º45.30’	110º55.39’	8.5	0.1	9	142	7	0.11
231205	14:43:11.32	44º45.67’	110º55.71’	9.9	0.8W	12	126	6	0.11
231205	14:50:44.62	44º47.14’	110º49.30’	4.9	0.2	7	206	2	0.04
231207	01:49:55.37	44º45.59’	110º57.79’	6.1	0.3	14	101	3	0.18
231209	02:22:37.16	44º42.56’	111º02.17’	9.9	0.6	13	178	6	0.15
231209	19:39:30.95	44º27.59’	110º36.49’	3.9	1.7W	11	115	8	0.10
231209	20:26:35.53	44º37.70’	110º22.04’	0.8*	1.0	9	85	14	0.14
231211	01:10:59.93	44º42.45’	111º02.84’	10.5	1.5W	22	92	7	0.17
231211	01:11:07.46	44º42.53’	111º02.52’	10.0	1.8W	20	88	6	0.20
231211	01:12:11.06	44º42.68’	111º02.83’	11.0	1.4W	16	91	6	0.12
231211	01:15:57.27	44º42.62’	111º02.47’	11.2	0.2	11	88	6	0.11
231211	01:16:06.29	44º42.41’	111º02.81’	9.2	0.5	10	92	7	0.13
231211	06:59:47.64	44º42.49’	111º03.16’	11.1	1.7W	19	94	7	0.14
231211	07:00:55.47	44º42.57’	111º03.03’	8.8	0.7W	13	92	7	0.16
231211	07:01:17.72	44º42.62’	111º02.98’	9.8	1.2	16	101	6	0.18
231211	07:03:08.83	44º42.62’	111º03.13’	10.1	0.7W	15	93	7	0.13
231211	07:05:11.82	44º42.40’	111º02.63’	8.7	-0.1	10	90	7	0.09
231211	07:05:35.39	44º42.64’	111º02.87’	10.0	0.6	15	91	6	0.12
231211	07:06:15.19	44º42.67’	111º02.91’	10.3	0.8W	16	91	6	0.14
231211	08:07:34.60	44º42.81’	111º02.77’	10.7	0.6W	12	90	8	0.12
231212	01:28:03.76	44º13.50’	110º45.04’	4.2	2.0W	13	94	7	0.14
231212	10:24:40.08	44º42.43’	111º02.06’	9.8	0.4	10	175	6	0.07
231213	01:27:00.11	44º50.52’	111º27.28’	11.9	1.6W	20	188	21	0.17
231214	10:36:22.41	44º47.82’	110º49.03’	5.0	1.5W	18	83	3	0.15
231214	12:01:20.68	44º42.64’	111º02.58’	11.1	1.3W	17	89	6	0.14
231215	22:03:51.76	44º46.72’	111º12.45’	4.9	0.0	11	210	3	0.15

Table 2. Earthquakes in the Yellowstone Region: October 1–December 31, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
231216	07:03:23.58	44º45.72’	110º57.79’	7.3	1.5W	21	75	3	0.15
231216	15:29:46.58	44º44.62’	111º09.51’	5.4	0.1	11	123	3	0.14
231217	02:35:12.23	44º44.24’	111º10.74’	8.1	--	11	162	2	0.12
231217	02:35:12.78	44º44.62’	111º10.32’	9.1	1.4W	17	112	2	0.18
231217	03:06:09.95	44º44.58’	111º09.55’	5.7	0.2	12	124	3	0.16
231217	03:13:03.10	44º44.23’	111º10.63’	7.7	0.1	10	159	2	0.13
231217	03:13:21.65	44º27.60’	110º33.97’	2.0	1.1	9	160	7	0.20
231217	03:18:00.24	44º25.73’	110º30.65’	1.1	1.0	7	130	6	0.10
231217	03:18:06.74	44º26.63’	110º32.32’	2.1	1.9W	9	125	6	0.18
231217	03:19:13.47	44º25.53’	110º31.13’	2.1	1.4	9	122	6	0.20
231217	03:19:29.86	44º26.40’	110º32.30’	1.4	2.1W	9	128	6	0.07
231217	03:22:01.07	44º26.70’	110º33.46’	2.0	2.0W	12	125	6	0.22
231217	03:25:08.74	44º26.99’	110º33.52’	4.9	0.7	8	151	6	0.09
231217	03:27:02.32	44º26.88’	110º32.84’	2.0	0.9	11	125	6	0.22
231217	03:29:00.99	44º27.59’	110º33.44’	2.3	1.6W	8	102	7	0.06
231217	04:29:21.15	44º26.88’	110º33.07’	4.5	1.6W	9	100	6	0.07
231217	04:31:38.21	44º25.07’	110º34.16’	6.1	1.7W	8	96	3	0.16
231217	04:36:09.55	44º27.43’	110º34.67’	5.6	0.9	10	168	7	0.10
231217	07:20:55.61	44º44.64’	111º10.27’	8.3	0.4	13	111	2	0.16
231217	12:51:07.87	44º44.64’	111º10.55’	9.3	1.0W	14	115	2	0.16
231217	13:07:27.09	44º44.84’	111º10.23’	9.2	1.1W	14	100	2	0.18
231217	18:05:59.02	44º27.35’	110º32.93’	2.0	1.1	9	103	7	0.05
231217	18:07:03.64	44º27.37’	110º33.22’	3.2	0.8	7	102	7	0.04
231218	19:29:10.08	44º27.22’	110º56.29’	7.5	0.6	11	186	8	0.25
231218	20:00:21.84	44º26.61’	110º58.78’	9.5	0.7	11	125	11	0.19
231219	17:25:37.15	44º41.35’	110º59.34’	6.3	0.6	12	96	3	0.16
231219	18:57:27.42	44º38.85’	111º03.85’	11.0	0.2	10	105	5	0.16
231219	22:49:48.16	44º44.48’	110º46.36’	6.4	0.9	13	155	6	0.18
231221	00:44:28.15	44º45.70’	111º12.12’	9.3	1.0	13	190	1	0.22
231221	14:56:16.28	44º48.39’	110º58.11’	6.7	0.6	17	146	6	0.13
231223	12:35:51.46	44º45.80’	111º01.75’	5.1	0.3	10	129	2	0.14
231223	21:55:30.05	44º44.31’	110º51.76’	8.4	0.3	8	90	6	0.07
231225	23:38:09.48	44º41.54’	110º23.37’	2.5*	1.0	8	238	22	0.14
231226	23:46:59.37	44º48.39’	110º29.73’	5.5	1.1	15	155	10	0.09
231229	03:57:57.64	44º35.27’	111º05.96’	9.1	0.1	11	168	2	0.11
231229	03:58:14.25	44º35.13’	111º05.76’	8.4	0.9	11	162	2	0.11
231229	09:38:37.69	44º35.17’	111º05.82’	9.1	1.2W	17	148	2	0.15
231229	13:12:59.99	44º15.05’	110º36.77’	7.1	1.1	10	102	7	0.15
231229	13:45:33.67	44º42.60’	110º22.47’	1.7*	0.8	8	281	24	0.08
231229	14:18:51.53	44º15.42’	110º36.96’	6.7	0.9	10	96	7	0.09
231230	00:21:23.51	44º16.56’	110º37.17’	3.9	1.6	12	159	7	0.09
231230	00:45:53.61	44º44.26’	111º10.05’	12.2	0.5	14	121	3	0.15
231230	03:34:57.62	44º13.91’	110º34.86’	0.3	1.7	12	130	6	0.16
231230	03:35:12.12	44º14.47’	110º35.35’	2.7	1.4	8	131	6	0.11
231230	03:35:22.55	44º16.16’	110º35.63’	7.5	1.3	7	164	5	0.14

Table 2. Earthquakes in the Yellowstone Region: October 1–December 31, 2023

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
231230	03:35:38.57	44º16.50’	110º37.24’	4.0	0.9	6	160	8	0.12
231230	03:35:53.61	44º16.06’	110º36.84’	5.3	0.9	7	167	7	0.07
231230	03:36:09.72	44º16.17’	110º36.90’	5.3	0.9	6	177	7	0.05
231230	03:37:02.74	44º14.54’	110º36.29’	6.5	1.9	15	111	7	0.20
231230	03:37:23.62	44º15.38’	110º36.61’	5.9	1.3	6	195	7	0.12
231231	12:39:40.48	44º34.42’	110º43.60’	12.4	0.6	9	151	8	0.12

number of earthquakes = 321
* indicates poor depth control
W indicates Wood-Anderson data used for magnitude calculation

Table 3
UNIVERSITY OF UTAH YELLOWSTONE SEISMIC NETWORK
Operating Seismograph Stations
December 31, 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	HH[ZEN]	3	WY	44° 45.33′	110° 20.95′	2684	Trillium 120	Centaur	Digital	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	HH[ZEN]	3	WY	44° 58.42′	110° 41.33′	1829	Trillium 120	Centaur	Digital	USGS
YNB	Norris Basin (YNP), WY	HH[ZEN]	6	WY	44° 43.64′	110° 42.67′	2307	Trillium 120	Centaur	Digital	USGS
		HDF[1,2,3]						InfraBSU			
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	Centaur	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

SEED Station	Location	SEED Channel	No. of Channels	Network Code	Latitude	Longitude	Elevation (meters)	Sensor	Digitizer	Telemetry	Sponsor
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: 160 data channels from 47 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 October 1–December 31, 2023

None