

2023 REPORT ON EARTHQUAKE ACTIVITY IN OHIO



compiled by Jeff L. Fox, Daniel R. Blake, and Jacqueline A. Thompson



**OHIO
GEOLOGICAL
SURVEY**
DEPARTMENT OF NATURAL RESOURCES



OhioSeis

The Ohio Seismic Network 

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Front cover: A seismite (sedimentary rocks deformed by earthquake shock) in Mississippian-age rocks near Portsmouth, Ohio. The curved beds above the geologist's head indicate that a strong shock caused these beds to deform rapidly while they were still liquefied, forming a literal paleoseismogram. Some 350 million years later, seismic activity is still recorded by the Ohio Geological Survey.

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STATE OF OHIO
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL SURVEY
D. Mark Jones, Chief

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PREFACE

The 2023 Report on Earthquake Activity in Ohio continues the efforts of the Ohio Department of Natural Resources (ODNR), Division of Geological Survey's Ohio Seismic Network (OhioSeis) to present a clear and concise representation of all seismicity, natural and anthropogenic, in the state for the calendar year. This report presents the data in tables and figures, with brief discussions of significant earthquakes or seismic swarm activity. The computer program HYPOINVERSE-2000 (Klein, 2014) was used to process earthquake data in SEISAN and AQMS. The earthquake listing in Table 3 is estimated to be systematically complete above magnitude 1.5 M_L within the state for 2023. However, these data are preliminary—both the locations and magnitudes in this table are subject to revision. The catalog may include some anthropogenic seismic events that have not yet been identified.

The Ohio Earthquake Epicenters interactive map is continually updated and is available for viewing at <https://gis.ohiodnr.gov/MapViewer/?config=Earthquakes>. Seismic station lists and locations are current to the calendar year of this report only. Seismic station information can also be found on the interactive map. Station metadata is available from the SAGE Data Management Center (DMC). Station locations contained within this report are not accurate for privacy purposes. Interested scientists can obtain detailed location information for performing earthquake locating from the SAGE DMC.

A complete copy of this report, including maps and earthquake catalog, is available on the ODNR Earthquakes website at ohioseis.ohiodnr.gov.

Jeff Fox
Seismologist

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ABBREVIATIONS USED IN THIS REPORT

Units of Measure

kilometers km
magnitude¹ M_L or M_d
meters m
miles mi

Other

Advanced National Seismic System ANSS
ANSS Quake Management System AQMS
Community Internet Intensity Maps CIIM
Ohio Seismic Network OhioSeis
Seismological Facility for the
Advancement of Geoscience SAGE
Standard for the Exchange of
Earthquake Data SEED
SEISmic ANalysis software SEISAN
United States Geological Survey USGS

¹Richter local magnitude (M_L) or coda magnitude (M_d) determined by OhioSeis.

EARTHQUAKE ACTIVITY IN OHIO

JANUARY 1–DECEMBER 31, 2023

During the period January 1 through December 31, 2023, the Ohio Seismic Network (seismic network code: OH) located 127 earthquakes within Ohio (fig. 1, tables 1 and 3). The total includes 26 earthquakes of magnitude 2.0 M_L or greater, two of which are greater than magnitude 3.0 M_L . During the 2023 calendar year, 13 earthquakes were reported felt by Ohioans. The largest earthquake recorded within Ohio's borders in 2023 was the 4.2- M_L earthquake on August 28 in Lake County. A cumulative tabulation of earthquakes during 2023 that were either felt in the Ohio region or for which a Community Internet Intensity Map (CIIM) was produced, or both, is available in Table 2¹. Additional information on earthquakes within the Ohio region is available from the Ohio Seismic Network online database.

¹ A CIIM summarizes the responses, and an intensity number is assigned to each ZIP code for which a CIIM questionnaire is completed. The intensity values in each ZIP-code area are averaged, and the map is updated as additional data are received. ZIP-code areas for which data have been received are color-coded according to the intensity scale below the map; other areas are gray. A CIIM is automatically made after each widely felt earthquake in the United States. The system can start receiving responses about 3 minutes after the earthquake. Internet users can also enter data for U.S. earthquakes they have experienced in the past.

TABLE 1. Earthquake magnitude statistics for calendar year 2023, all of Ohio.

2023 OHIO EARTHQUAKES SUMMARY	
Earthquakes > M_L 3.00	2
Earthquakes M_L 2.50–3.00	3
Earthquakes M_L 2.00–2.49	21
Earthquakes M_L 1.50–1.99	32
Earthquakes M_L 1.00–1.49	35
Earthquakes M_L < 1.00	34
Total Earthquakes (all magnitudes)	127

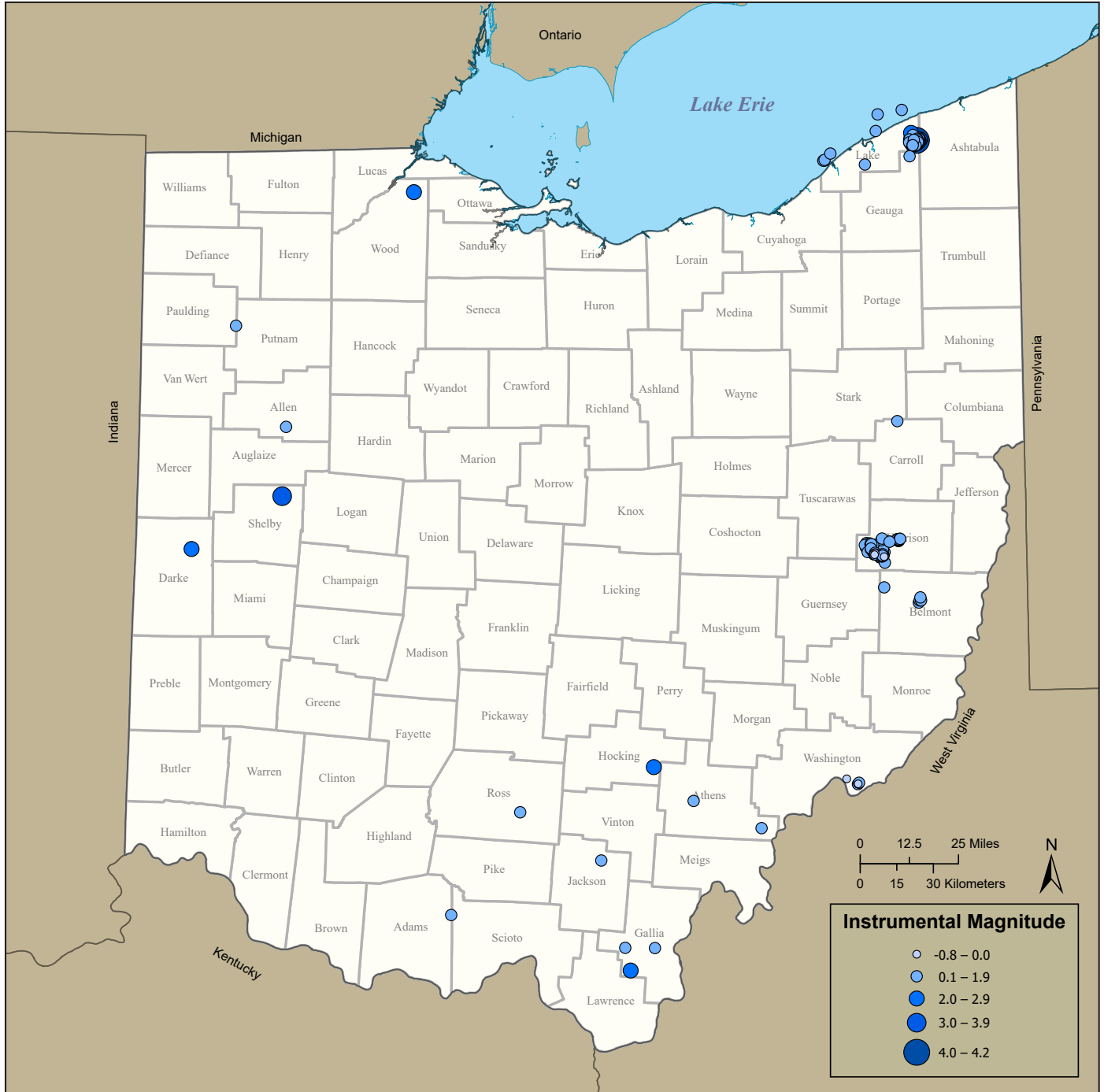


FIGURE 1. Map of earthquake epicenters detected and located by the Ohio Seismic Network seismograph stations, January 1-December 31, 2023.

NOTABLE EARTHQUAKE EVENTS, JANUARY 1–DECEMBER 31, 2023

Two notable earthquakes occurred in 2023 and are worthy of discussion. On August 27 at 10:43 PM local time, a 4.2- M_L earthquake struck eastern Lake County near the town of Madison, just north of Hogback Ridge Metropark along the Grand River (fig. 2). Over 1,360 residents reported feeling this earthquake. The mainshock was followed by a long aftershock sequence that has continued into early 2024 at the time of the publication of this report.

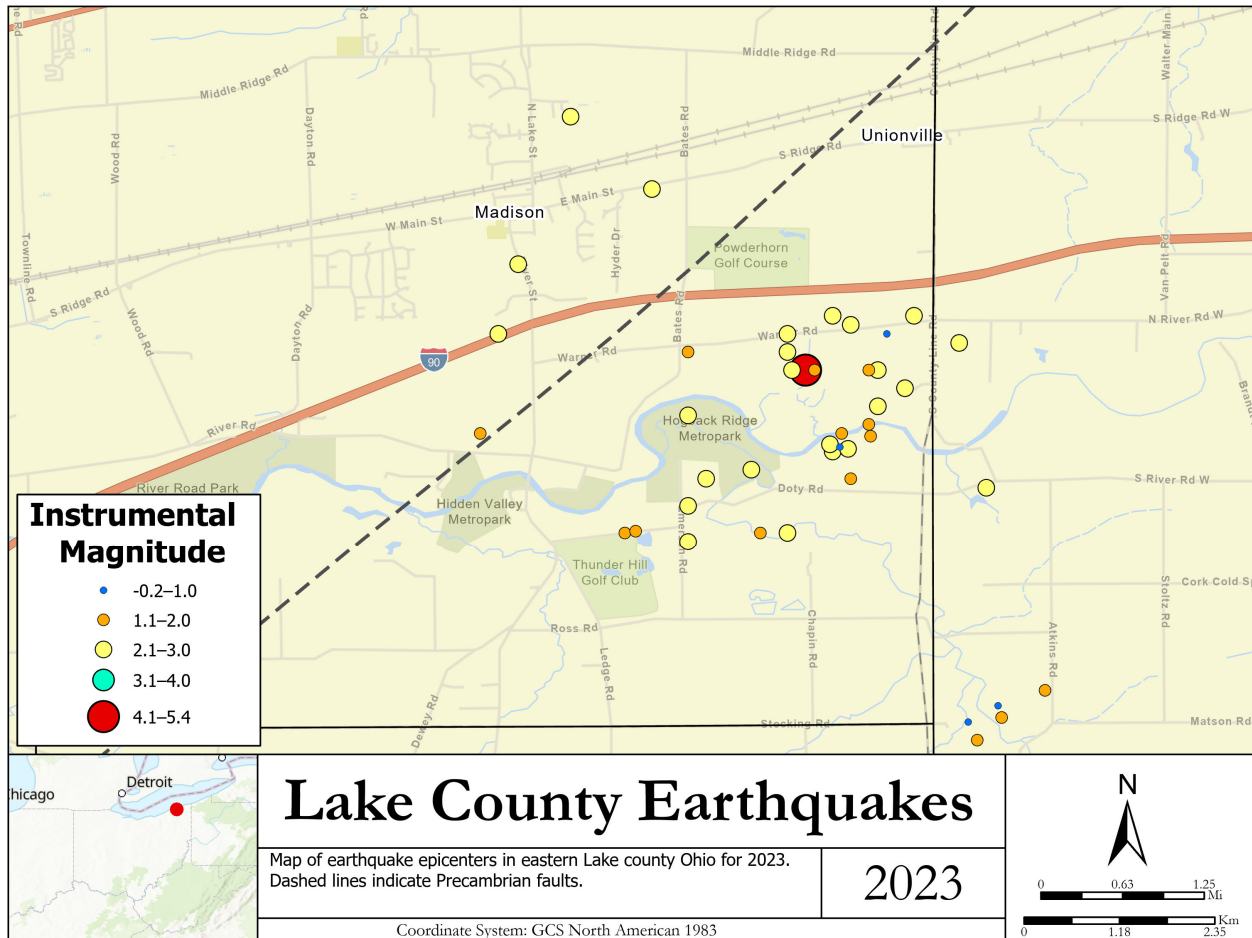


FIGURE 2. Map of showing earthquake locations (the 4.2- M_L event and subsequent aftershocks) in eastern Lake County, Ohio, near Hogback Ridge Metropark during 2023. Dashed line is the Akron Magnetic Boundary (Baranoski, 2013).

The next earthquake of note in 2023 occurred on December 9 in Shelby County within the Anna Seismic Zone. At approximately 12:27 AM, a 3.1- M_L earthquake struck approximately 3 miles due west of downtown Jackson Center off State Route 274 (fig. 3). No subsequent aftershocks from this earthquake have been detected at the time of the publication of this report. Over 350 residents reported feeling this earthquake.

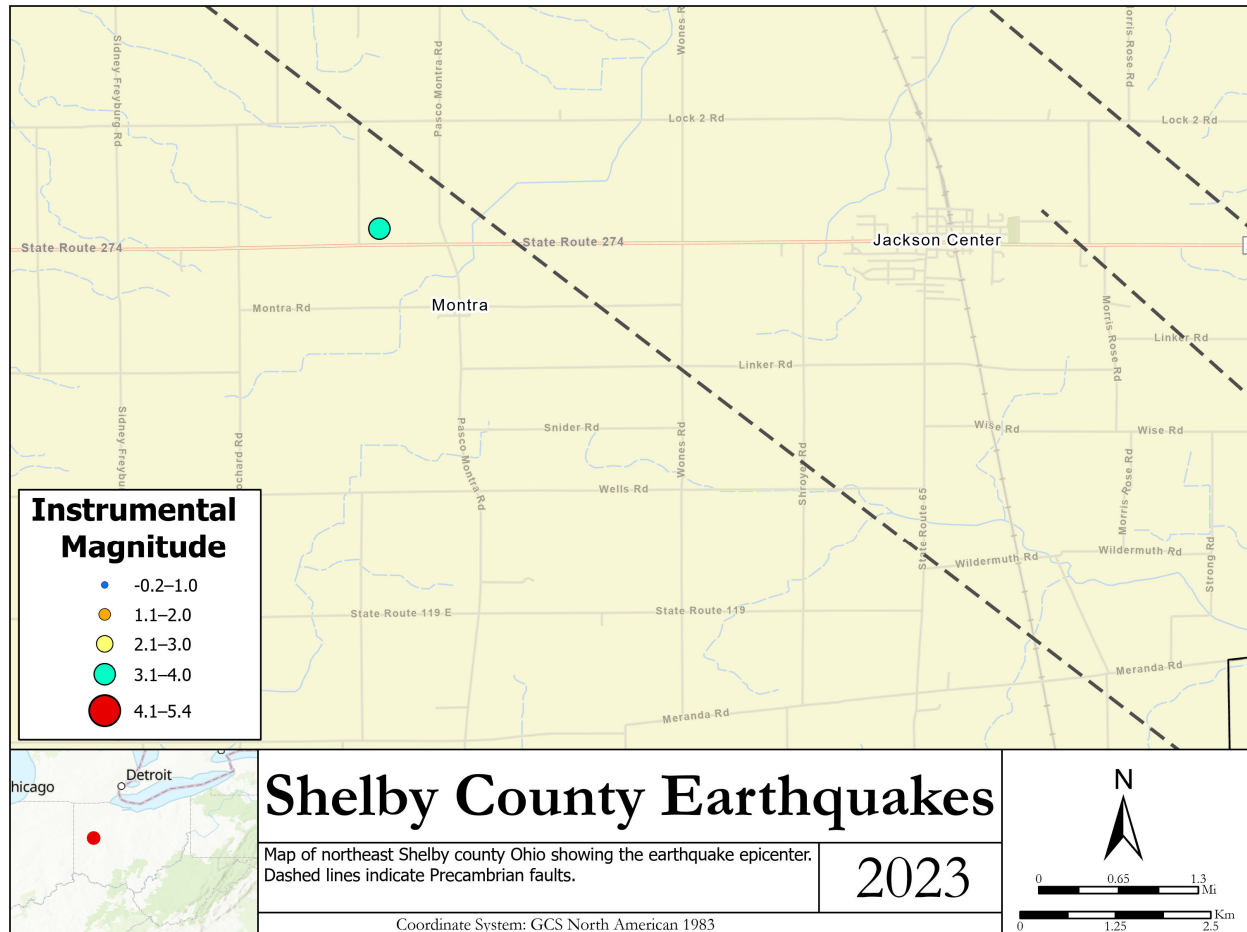


FIGURE 3. Map showing the earthquake location of the 3.1- M_L event near the town of Jackson Center in eastern Shelby County, Ohio, in 2023. Dashed lines are interpreted faults within the Anna Seismic Zone (Baranoski, 2013).

FELT EARTHQUAKE EVENTS, JANUARY 1–DECEMBER 31, 2023

For earthquakes M_L 3.0 and larger in the Ohio region, the U.S. Geological Survey (USGS) automatically posts a Community Internet Intensity Map (CIIM) on its “Did You Feel It?” web page at earthquake.usgs.gov/earthquakes/dyfi. Earthquakes of smaller magnitude that are felt and those reported by regional seismic networks will also be posted to the USGS CIIM pages. We encourage anyone who feels an earthquake to report their observations on this interactive website. Felt information is available by zip code on the CIIM site or can be obtained directly from OhioSeis.

TABLE 2. Earthquakes felt and/or generating a Shakemap in the Ohio region, January 1–December 31, 2023.

DATE	TIME ¹	FELT INFORMATION ²	LATITUDE	LONGITUDE	MAGNITUDE (M_L) ³
Mar 20	18:54 EST 22:54 UTC	USGS ShakeMap. CIIM. Felt (II) at Gallipolis, Bidwell, and Huntington, OH.	38.705	-82.399	2.3
May 20	20:17 (May 19 EST) 00:17 UTC	USGS ShakeMap. CIIM. Felt (III) at Perrysburg, Northwood, and Oregon, OH, and (II) at Toledo and Bowling Green, OH.	41.569	-83.485	2.9
Aug 24	08:43 EST 12:43 UTC	USGS ShakeMap. CIIM. Felt (III) at Madison and Ashtabula, OH, and (II) at Geneva, OH.	41.745	-81.014	2.4
Aug 28	22:43 (Aug 27 EST) 02:43 UTC	USGS ShakeMap. CIIM. Felt (IV) at Madison, Geneva, and Perry, OH, (III) at Painesville, Mentor, and Ashtabula, OH, and (II) at Willoughby, OH.	41.754	-81.017	4.2
Aug 28	23:02 (Aug 27 EST) 03:02 UTC	USGS ShakeMap. CIIM. Felt (IV) at Geneva, OH, and (III) at Mentor and Willoughby, OH.	41.749	-81.030	2.5
Sep 1	12:33 EST 16:33 UTC	USGS ShakeMap. CIIM. Felt (III) at Madison and Mogadore, OH, and (II) at Elyria and Geneva, OH.	41.758	-81.019	2.2
Sep 1	12:53 EST 16:53 UTC	USGS ShakeMap. CIIM. Felt (II) at Geneva and Madison, OH.	41.760	-81.005	2.0
Sep 1	13:16 EST 17:16 UTC	USGS ShakeMap. CIIM. Felt (III) at Geneva, OH, and (II) at Madison, OH.	41.757	-81.000	2.3
Sep 21	15:13 EST 19:13 UTC	USGS ShakeMap. CIIM. Felt (III) at Madison, OH, and (II) at Geneva and Willoughby, OH.	41.782	-81.043	2.1
Sep 22	16:58 EST 20:58 UTC	USGS ShakeMap. CIIM. Felt (II) at Geneva and Madison, OH.	41.743	-81.023	2.3
Sep 28	22:27 (Sep 27 EST) 02:27 UTC	USGS ShakeMap. CIIM. Felt (III) at Geneva and Madison, OH.	41.748	-81.010	1.7
Dec 1	08:58 EST 13:58 UTC	USGS ShakeMap. CIIM. Felt (III) at Madison and Geneva, OH, and (II) at Thompson and Austinburg, OH.	41.745	-81.014	2.4
Dec 9	00:27 EST 05:27 UTC	USGS ShakeMap. CIIM. Felt (IV) at Maplewood, OH, (III) at Jackson Center, Anna, and Sidney, OH.	40.441	-84.105	3.1

¹Times are listed both as Local Time—Eastern Standard Time (EST) or Eastern Daylight Time (DST)—and as Coordinated Universal Time (UTC).
²CIIM is Community Internet Intensity Map (earthquake.usgs.gov/earthquakes/dyfi), compiled by the U.S. Geological Survey (USGS); ShakeMap indicates the availability of computer-generated maps of ground shaking (earthquake.usgs.gov/earthquakes/search/), produced by the OhioSeis Seismograph Stations (OH). Roman numerals correspond to the Modified Mercalli intensity scale (see fig. A-11). Unless otherwise indicated, felt information is from the USGS (1) CIIM reports and/or (2) PDE Monthly (or) Weekly Listing Files (earthquake.usgs.gov/data/comcat/catalog/us/).
³Richter local magnitude (M_L) or coda magnitude (M_c) determined by OhioSeis.

A catalog of all recorded earthquakes in Ohio for 2023 can be found in Table 3. Earthquakes are listed in chronological order.

TABLE 3. Catalog of all earthquakes in Ohio in 2023¹.

Year	Month	Day	Hour ²	Minute	Second	Latitude	Longitude	Depth ³ (km)	Mag (M _L)
2023	January	1	0	3	55.07	40.284	-81.132	5.0	0.7
2023	January	1	1	4	39.05	40.287	-81.129	5.0	1.3
2023	January	1	2	54	54.37	40.286	-81.138	5.0	1.3
2023	January	1	3	12	26.27	40.285	-81.132	5.0	1.0
2023	January	1	3	34	55.30	40.284	-81.134	5.0	1.0
2023	January	1	4	26	30.15	40.286	-81.138	5.0	1.3
2023	January	1	5	29	1.98	40.286	-81.137	5.0	1.1
2023	January	1	6	7	24.50	40.284	-81.135	5.0	1.6
2023	January	1	7	30	30.40	40.283	-81.137	5.0	1.3
2023	January	1	10	14	38.12	40.283	-81.136	5.0	1.3
2023	January	1	11	34	40.31	40.283	-81.132	5.0	1.2
2023	January	1	12	4	28.90	40.280	-81.137	5.0	1.6
2023	January	1	13	54	40.79	40.286	-81.132	5.0	1.5
2023	January	1	15	11	45.94	40.283	-81.132	5.0	1.4
2023	January	1	16	48	20.83	40.287	-81.127	5.0	0.6
2023	January	2	0	39	50.27	40.240	-84.536	2.4	2.2
2023	January	2	11	12	37.11	40.285	-81.140	5.0	1.0
2023	January	2	21	36	28.20	40.279	-81.134	5.0	1.4
2023	January	9	12	36	20.23	40.229	-81.216	3.7	1.2
2023	January	23	13	20	52.25	41.791	-81.217	2.3	2.0
2023	January	26	16	4	56.89	40.219	-81.224	5.0	1.6
2023	January	27	16	0	29.42	40.200	-81.202	5.0	1.2
2023	January	28	4	52	49.83	40.225	-81.210	2.7	1.8
2023	February	4	9	49	0.74	39.328	-82.126	7.7	2.0
2023	February	4	22	48	47.93	40.277	-81.178	5.0	0.3
2023	February	10	5	14	1.39	40.278	-81.179	5.0	1.1
2023	February	28	0	46	14.37	41.710	-81.441	5.6	1.1
2023	March	15	19	20	37.31	40.697	-84.092	7.0	1.4
2023	March	20	22	54	27.03	38.703	-82.426	8.0	2.3
2023	April	7	13	7	10.71	40.225	-81.216	3.2	1.8
2023	April	8	13	26	54.80	40.245	-81.217	7.0	1.9
2023	April	8	13	48	24.73	40.248	-81.210	5.0	1.5
2023	April	8	22	58	25.06	38.786	-82.311	25.0	0.9

Year	Month	Day	Hour ²	Minute	Second	Latitude	Longitude	Depth ³ (km)	Mag (M _L)
2023	April	8	22	58	29.06	38.787	-82.451	2.5	0.8
2023	April	8	23	17	29.80	40.228	-81.209	1.8	1.3
2023	April	9	5	54	36.43	40.223	-81.215	2.4	0.5
2023	April	11	22	32	31.60	40.222	-81.205	3.3	0.0
2023	April	28	21	59	17.64	40.109	-81.207	6.7	0.6
2023	May	15	0	1	2.70	39.390	-81.340	2.9	0.5
2023	May	20	0	17	36.25	41.569	-83.483	1.6	2.9
2023	May	22	16	15	52.11	39.109	-82.564	7.8	1.0
2023	June	10	15	4	42.00	39.385	-81.345	3.1	0.8
2023	June	10	15	4	56.00	40.226	-81.213	2.4	0.1
2023	June	26	20	38	24.19	41.687	-81.470	5.7	1.3
2023	July	2	10	10	12.26	40.721	-81.132	10.6	1.5
2023	July	5	3	28	22.91	40.248	-81.219	6.7	1.5
2023	July	10	9	55	33.90	39.286	-82.949	5.0	1.4
2023	August	1	12	24	8.86	39.453	-82.315	6.7	2.1
2023	August	2	11	14	42.83	38.906	-83.272	27.4	1.8
2023	August	13	20	16	5.97	40.231	-81.213	3.7	0.3
2023	August	22	7	48	50.65	40.272	-81.275	6.7	1.2
2023	August	22	17	52	39.07	40.269	-81.270	9.7	1.1
2023	August	23	0	13	46.35	41.754	-81.019	2.4	2.0
2023	August	24	12	43	52.31	41.745	-81.014	4.0	2.4
2023	August	24	12	48	39.49	41.739	-81.030	2.4	2.1
2023	August	24	17	27	27.70	41.759	-81.012	1.5	2.1
2023	August	26	6	48	56.89	41.735	-81.030	2.4	2.0
2023	August	26	10	32	45.37	41.747	-81.053	1.6	1.8
2023	August	28	2	43	25.72	41.754	-81.017	2.3	4.2
2023	August	28	2	57	27.67	41.736	-81.019	2.5	1.9
2023	August	28	3	2	12.77	41.749	-81.030	1.3	2.5
2023	August	28	3	21	11.32	41.774	-81.034	10.0	1.9
2023	August	28	4	7	8.92	41.867	-81.087	7.5	0.8
2023	August	28	14	49	22.64	41.760	-81.014	1.3	1.9
2023	August	28	23	34	43.96	40.231	-81.254	1.4	1.5
2023	August	29	1	19	39.39	41.756	-81.030	1.7	1.7
2023	August	29	3	28	7.93	40.269	-81.266	5.0	1.0
2023	August	29	4	39	30.47	40.241	-81.259	1.7	1.0
2023	August	30	0	8	26.25	41.750	-81.009	3.1	1.9
2023	September	1	1	45	33.79	40.252	-81.272	2.0	2.0

Year	Month	Day	Hour ²	Minute	Second	Latitude	Longitude	Depth ³ (km)	Mag (M _L)
2023	September	1	1	55	0.23	40.240	-81.254	1.7	1.8
2023	September	1	2	5	1.64	40.264	-81.258	6.7	1.3
2023	September	1	14	53	32.34	40.267	-81.257	3.7	1.2
2023	September	1	16	33	12.82	41.758	-81.019	6.4	2.2
2023	September	1	16	53	40.31	41.760	-81.005	4.3	2.0
2023	September	1	17	16	38.81	41.757	-81.000	2.3	2.3
2023	September	3	2	1	16.40	40.245	-81.264	2.5	1.3
2023	September	3	11	39	54.89	41.756	-81.019	2.0	2.0
2023	September	4	15	59	55.90	40.239	-81.203	5.0	1.8
2023	September	5	17	6	17.81	40.273	-81.290	2.5	1.8
2023	September	5	23	21	17.33	40.289	-81.214	1.0	1.1
2023	September	6	1	21	51.27	40.236	-81.255	1.8	0.9
2023	September	6	2	58	6.73	40.251	-81.269	2.3	1.1
2023	September	6	7	2	15.53	40.256	-81.292	2.3	1.5
2023	September	6	7	2	20.38	40.224	-81.228	5.0	1.5
2023	September	6	7	5	5.48	40.266	-81.297	2.5	1.2
2023	September	6	13	38	12.14	40.253	-81.268	2.4	0.8
2023	September	6	13	39	5.55	40.283	-81.218	1.7	1.3
2023	September	9	16	57	3.00	40.230	-81.251	1.1	-0.4
2023	September	10	11	6	32.27	40.240	-81.284	2.5	1.2
2023	September	10	19	15	20.68	40.230	-81.247	1.4	0.7
2023	September	12	0	58	13.60	40.237	-81.248	2.0	0.3
2023	September	14	3	27	11.30	40.252	-81.250	3.5	1.0
2023	September	14	5	49	10.10	40.231	-81.248	1.1	0.3
2023	September	15	19	9	33.40	40.236	-81.248	3.0	0.0
2023	September	18	9	31	56.98	41.752	-81.006	10.0	2.2
2023	September	19	10	29	21.70	40.224	-81.216	1.4	0.3
2023	September	21	19	13	0.02	41.782	-81.043	11.0	2.1
2023	September	21	21	28	54.64	41.754	-81.009	3.0	2.2
2023	September	22	0	18	38.11	41.668	-81.272	3.1	1.5
2023	September	22	20	58	45.01	41.743	-81.023	3.6	2.3
2023	September	26	1	38	55.20	unknown*	unknown*	unknown*	
2023	September	28	2	27	34.66	41.748	-81.010	2.9	1.7
2023	September	29	9	20	26.94	41.754	-81.016	3.8	1.8
2023	October	1	4	17	49.52	41.066	-84.344	5.0	1.9
2023	October	2	8	29	52.40	40.226	-81.208	3.3	0.7
2023	October	3	23	37	6.63	41.754	-81.010	2.5	1.8

Year	Month	Day	Hour ²	Minute	Second	Latitude	Longitude	Depth ³ (km)	Mag (M _L)
2023	October	6	7	36	24.84	41.736	-81.037	2.3	1.5
2023	October	11	5	55	16.98	41.852	-81.206	2.4	2.0
2023	October	11	12	56	2.65	41.742	-81.028	2.5	2.1
2023	October	12	21	55	6.30	39.386	-81.344	3.1	-0.8
2023	October	14	4	12	9.36	41.736	-81.036	7.0	1.2
2023	October	22	10	24	54.50	39.405	-81.398	2.7	-0.2
2023	October	28	1	40	49.21	41.758	-81.051	1.8	1.9
2023	November	5	6	3	7.70	41.736	-81.022	2.8	1.7
2023	November	17	3	0	12.33	40.059	-81.038	6.6	0.9
2023	November	17	12	40	31.39	40.051	-81.042	8.0	1.0
2023	November	17	18	30	44.53	40.059	-81.031	6.5	0.6
2023	November	18	1	41	47.29	40.070	-81.034	3.9	0.6
2023	November	21	9	48	50.34	41.684	-81.472	4.9	1.9
2023	November	21	11	9	46.12	41.684	-81.476	4.8	1.9
2023	December	1	13	58	2.59	41.746	-81.014	2.9	2.4
2023	December	9	5	27	26.57	40.441	-84.105	7.0	3.1
2023	December	18	3	1	22.04	41.696	-81.052	3.3	1.3
2023	December	18	11	46	10.42	39.226	-81.798	6.7	1.0
2023	December	27	2	31	0.90	39.222	-81.781	6.0	-0.9
2023	December	27	2	47	44.01	39.226	-81.805	2.8	0.7

¹ Earthquakes listed in chronological order.

² UTC: Coordinated Universal Time. All earthquake origin times are given in UTC time by hour. UTC is similar to GMT (Greenwich Mean Time). To convert to local time, subtract 5 hours for Eastern Standard Time (EST) and 4 hours for Daylight Saving Time (DST).

³ Earthquake depth listed in km below datum.

* Earthquakes with "unknown*" in the Latitude, Longitude, and Depth boxes were too small to locate reliably; however, data indicate these earthquakes did originate within Ohio.

ACKNOWLEDGMENTS

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Network Maintenance Performed and Installations Completed

In 2023, the OhioSeis team had another very busy summer and installed four new seismic stations and upgraded three other stations with new vaults and seismometers. There were also other station upgrades and vault replacements done at the shallow surface-vault sites. Routine annual maintenance of all 29 sites was also completed during the summer.

OhioSeis had the help of several Ohio Geological Survey interns in 2023. The ODNR Division of Mineral Resource Management (MRM) assisted by drilling 6 of the 7 new boreholes. In all, three new sites were drilled and installed in northeastern Ohio in Lorain, Lake, and Ashtabula Counties. In Lake County, station CHOH (Chagrin River Park, OH) was installed (fig. A-2). Station RBOH (Red Brook Park, OH) was installed in Ashtabula County (fig. A-3) and station CROH (Carlisle Reservation, OH) was installed in Lorain County (fig. A-4). Station M53A was upgraded from a Transportable Array-style vault to a new borehole vault (fig. A-5).



FIGURE A-2. Photos taken at OhioSeis station CHOH at Chagrin River Park in Lake County, Ohio. Left: Drilling at the site prior to installation. Right: Installation of seismic station equipment.



FIGURE A-3. Photos taken at OhioSeis station RBOH at Red Brook Metro Park in Ashtabula County, Ohio. Left: Installation of the site. Right: Checking seismic data produced at the newly installed station.



FIGURE A-4. Photos taken at OhioSeis station CROH at Carlisle Reservation in Lorain County, Ohio. Left: Intern and staff assembling power control system. Center: Using the downhole camera for aligning the seismometer at the bottom of the hole. Right: The operational station.



FIGURE A-5. Photo showing Instrument installation and checks at M53A in Trumbull County.

In north central Ohio, station KDOH (located in Killdeer Plains Wildlife Area just south of the town of Upper Sandusky in Wyandot County) was upgraded to a borehole-style vault from a surface vault (fig. A-6).



FIGURE A-6. Photos taken at OhioSeis station KDOH at Killdeer Plains Wildlife Area in Wyandot County, Ohio. Left: Drilling borehole for the station. Right: Finished station.

In southwestern Ohio, station SLSO (located in Stonelick State Park northeast of Cincinnati in Clermont County) was upgraded to a borehole vault (fig. A-7) and station SLOH (located in Shawnee Lookout, a park west of Cincinnati near the Ohio-Indiana border in Hamilton County) was the last new station to be installed in 2023 and was drilled by ODOT (fig. A-8).

Finally, station SROH (located in Shade River State Forest southeast of Athens along the Ohio River) received a new surface style vault and the 3T seismometer was replaced by a 6TD instrument (fig. A-9).

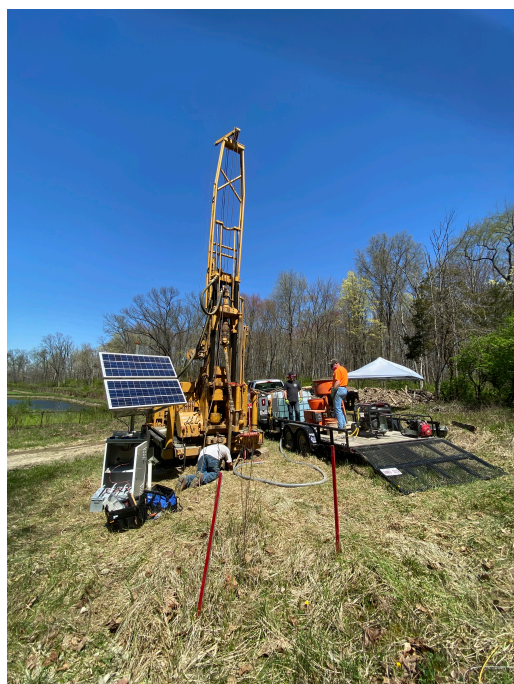


FIGURE A-7. Photo showing drilling the borehole at station SLSO (Stonelick State Park) in Clermont County, Ohio.



FIGURE A-8. Photo showing the installation of station SLOH (Shawnee Lookout Park) in Hamilton County, Ohio.



FIGURE A-9. Photos of field work being performed at two OhioSeis stations in 2023. Left: OhioSeis intern installing seismometer in new vault at station SROH (Shade River State Forest) in Meigs County, Ohio. Right: OhioSeis intern performing maintenance at station SSF2 (Shawnee State Forest) in Scioto County, Ohio.

TABLE A-1. Ohio Seismic Network operating seismograph stations as of December 31, 2023.

Station Code	Station Name	Latitude	Longitude	Start	End
BCOH	Blue Creek Metropark	41.5	-83.8	6/14/19	
BGOH	Bowling Green State University Firelands Campus	41.4	-82.6	9/25/19	
BSPO	Barkcamp State Park	40.0	-81.0	4/30/18	
CHOH	Chagrin River Park	41.7	-81.4	8/30/23	
CHWO	Cooper Hollow State Nature Preserve	38.9	-82.5	6/8/18	
CPOH	Chapparral Prarie State Nature Preserve	38.8	-83.6	8/26/19	
CROH	Carlisle Reservation	41.3	-82.2	8/8/23	
DSFO	Dean State Forest	38.7	-82.6	10/19/21	
FOXO	Fox Lake Wildlife Area	39.3	-82.2	10/27/21	
HINO	Hinckley Reservation	41.2	-81.7	6/9/21	
KDOH	Killdeer Plains Wildlife Area	40.7	-83.4	8/8/19	
KIOH	Kelleys Island State Park	41.6	-82.7	7/28/21	
KLOH	Kiser Lake State Park	40.2	-84.0	7/9/19	
KLSO	Kiser Lake State Park	40.2	-84.0	6/1/16	7/9/19
LEBO	Lake Erie Bluffs Metropark	41.8	-81.2	8/24/16	
LLSO	Lake La Su An Wildlife Area	41.7	-84.6	11/3/21	
M53A	Farmdale	41.4	-80.7	10/16/15	
MFOH	Malabar Farms State Park	40.7	-82.4	7/2/19	
MWLO	Mercer Wildlife Area	40.5	-84.6	5/9/18	
O53A	Freeport	40.2	-81.2	12/13/12	
P51A	Williamsport	39.5	-83.1	9/28/18	
P52A	Corning	39.6	-82.1	7/24/12	8/11/22
RBOH	Red Brook Metropark	41.9	-80.8	8/29/23	
SLOH	Shawnee Lookout	39.1	-84.8	10/3/23	
SLSO	Stonelick State Park	39.2	-84.1	7/6/18	
SROH	Shade River State Forest	39.1	-81.8	8/26/19	
SSF2	Shawnee State Forest	38.7	-83.1	10/21/20	
SSFO	Shawnee State Forest	38.7	-83.2	1/5/16	10/28/20
SSPO	Sycamore State Park	39.8	-84.3	6/28/19	
SVWO	Spring Valley Wildlife Area	39.6	-84.0	9/1/21	
VLOH	Vernon A. Luthman Tecumseh Wildlife Area	40.3	-84.2	7/24/19	
WODO	Wallace H. O'Dowd Wildlife Area	39.5	-82.1	10/20/21	



FIGURE A-12. Map of OhioSeis and other seismic station locations in Ohio and adjacent states for 2023.

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

FIGURE A-11. The Modified Mercalli Intensity Scale for earthquake shaking.

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