

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN23FA257

METEOROLOGY

Specialist's Factual Report

September 22, 2023

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A. ACCIDENT

Location: Beaver Island, Michigan
Date: June 23, 2023
Time: 0844 eastern daylight time
1244 coordinated universal time (UTC)
Airplane: Avid Magnum; Registration: N103DG

B. METEOROLOGY SPECIALIST

Paul Suffern
National Transportation Safety Board
Washington, DC

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's Senior Meteorologist did not travel for this investigation but gathered all data remotely. Data for this investigation were collected from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the Weather Prediction Center (WPC) and the National Center for Environmental Information (NCEI). This Specialist's Factual Report contains the meteorological factors pertinent to the weather surrounding the accident time. All times are eastern daylight time (EDT) and are based upon the 24-hour clock, where local time is -4 hours from UTC. Directions are referenced to true north and distances are in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles. NWS station identifiers use the standard International Civil Aviation Organization 4-letter station identifiers versus the International Air Transport Association 3-letter identifiers, which deletes the initial country code designator "K" for U.S. airports.

The accident site was located at approximate latitude 45.7955° N, longitude 85.6095° W, and impacted the surface of Lake Michigan.

D. FACTUAL INFORMATION

1.0 Synoptic Situation

The synoptic or large-scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction and the WPC, located in College Park, Maryland. These are the base products used in describing synoptic weather features and in the creation of forecasts and warnings for the NWS. Reference to these charts can be found in the Federal Aviation Administration (FAA) "Aviation Weather Handbook", FAA-H-8083-28.¹

1.1 Surface Analysis Chart

The NWS Surface Analysis Chart centered over the Great Lakes Region of the United States for 0800 EDT is provided as figure 1 with the location of the accident site within the black circle. The chart depicted a series of low-pressure systems at 1014- and 1013-hectopascals (hPa) located in western Lake Superior and Minnesota along a stationary frontal system stretched northeast to southwest from Ontario, Canada into South Dakota. A trough² stretched from the Upper Peninsula of Michigan southward through Lake Michigan and into northern Indiana. Troughs can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present.

The station models closest to the accident site depicted air temperatures of 68 degrees Fahrenheit (°F), dew point temperatures of 59°F, overcast cloud cover, and a calm wind.

¹ [FAA-H-8083-28](#)

² Trough - An elongated area of relatively low atmospheric pressure or heights.

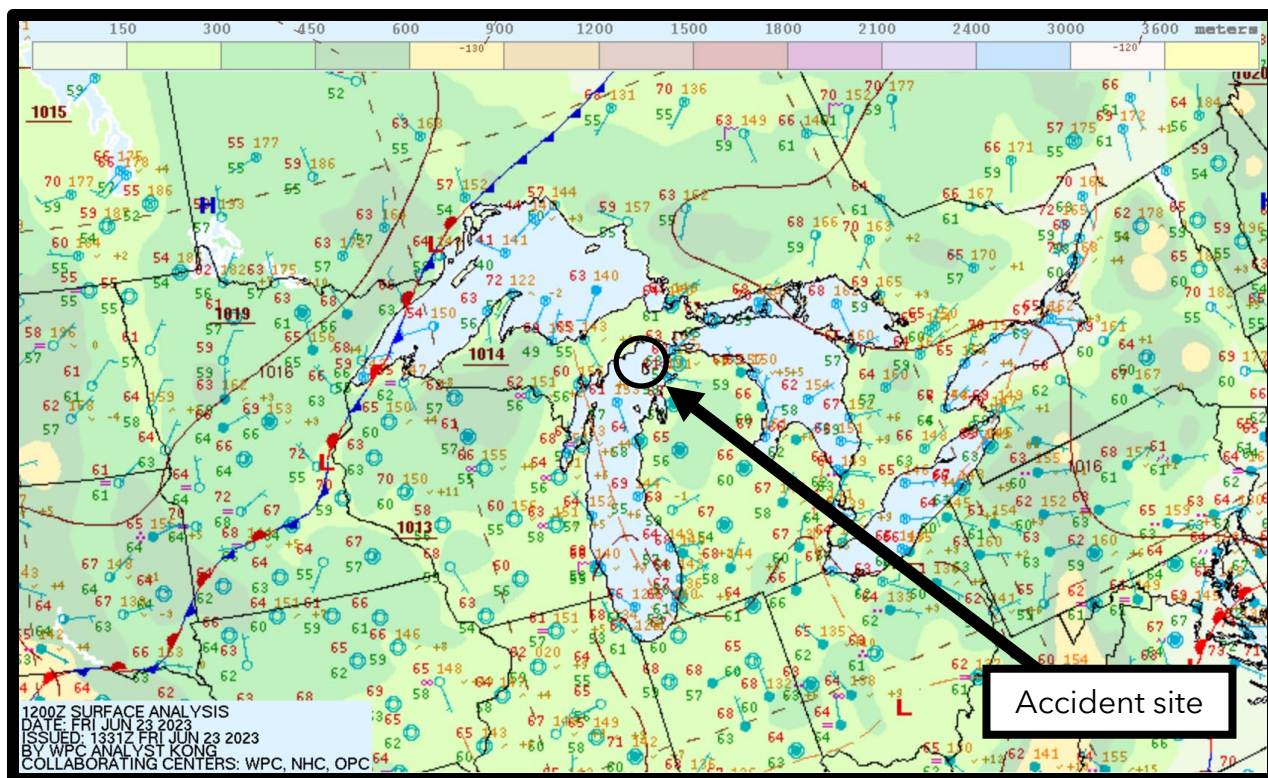


Figure 1. NWS Surface Analysis Chart for 0800 EDT.

1.2 Upper Air Charts

The NWS Storm Prediction Center (SPC) Constant Pressure Charts for 0800 EDT at 925-, 850-, and 700-hPa are presented in figures 2 through 4. The charts indicated that the accident site was located north to northwest of a low- and mid-level low pressure center, which itself was centered over the Ohio Valley. The charts depicted a general northerly to northeasterly wind flow at 5 knots at 925-hPa (figure 2) becoming a northeasterly 20-knot wind by 700-hPa (figure 4) over the area in the vicinity of the accident site.

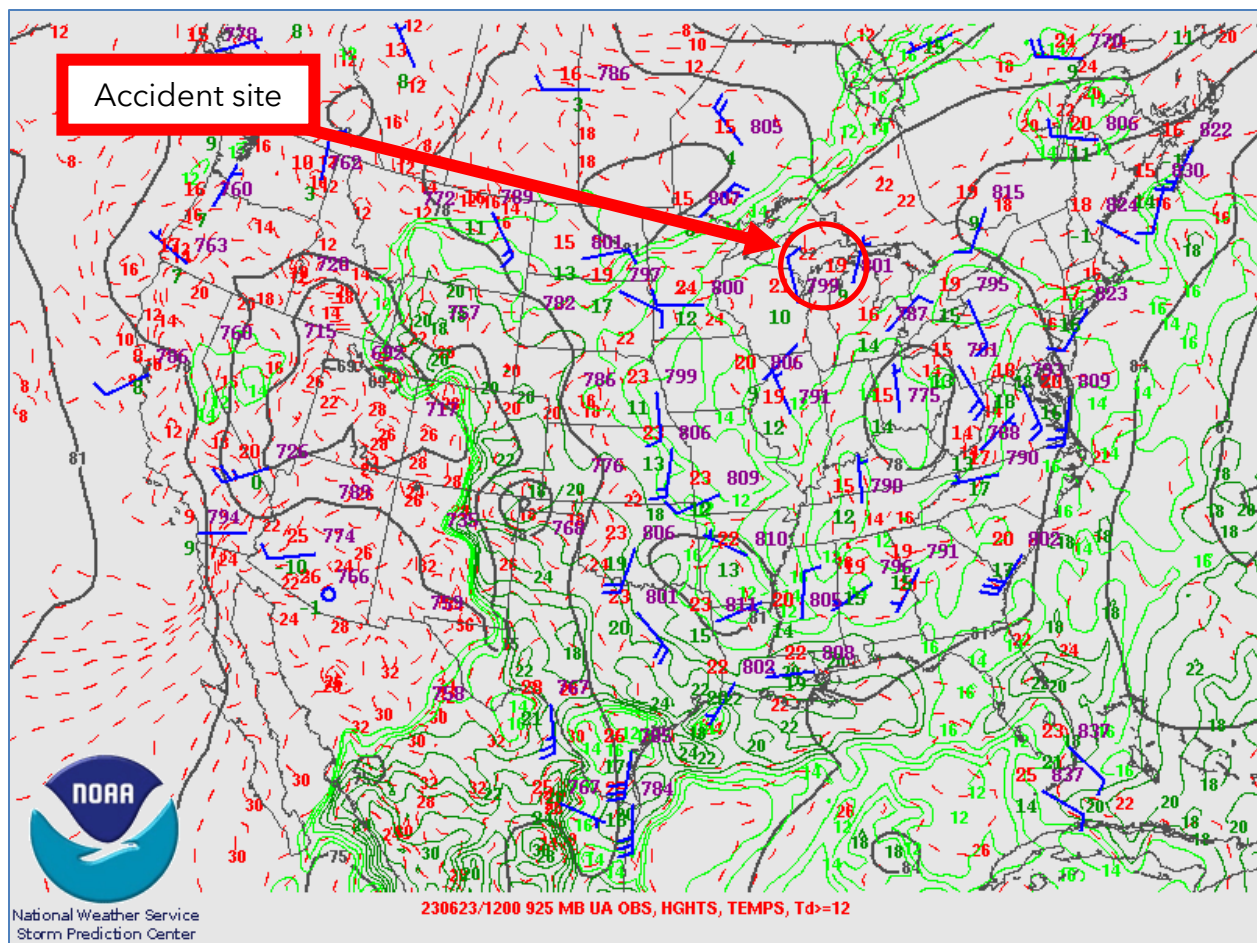


Figure 2. 925-hPa Constant Pressure Chart for 0800 EDT.

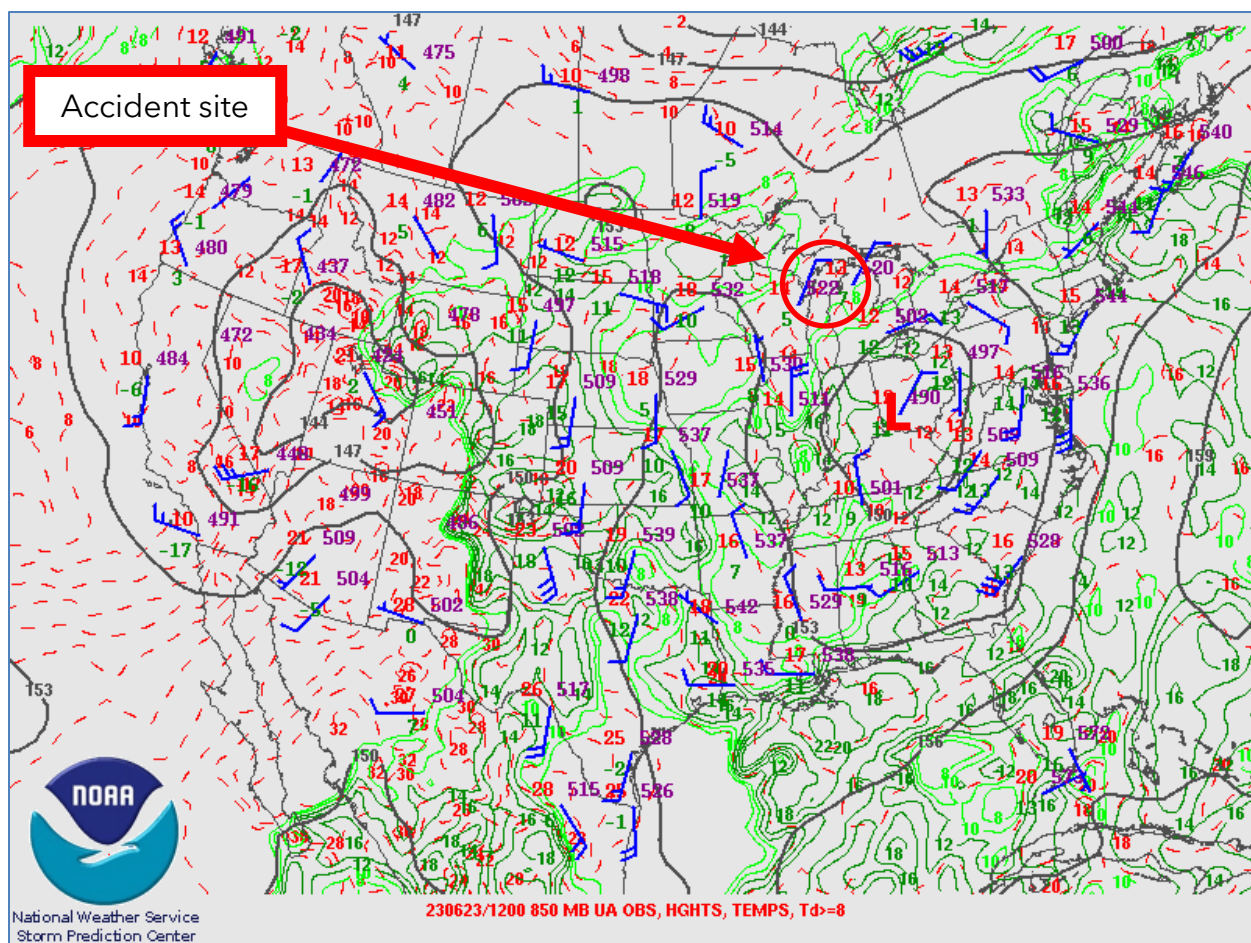


Figure 3. 850-hPa Constant Pressure Chart for 0800 EDT.

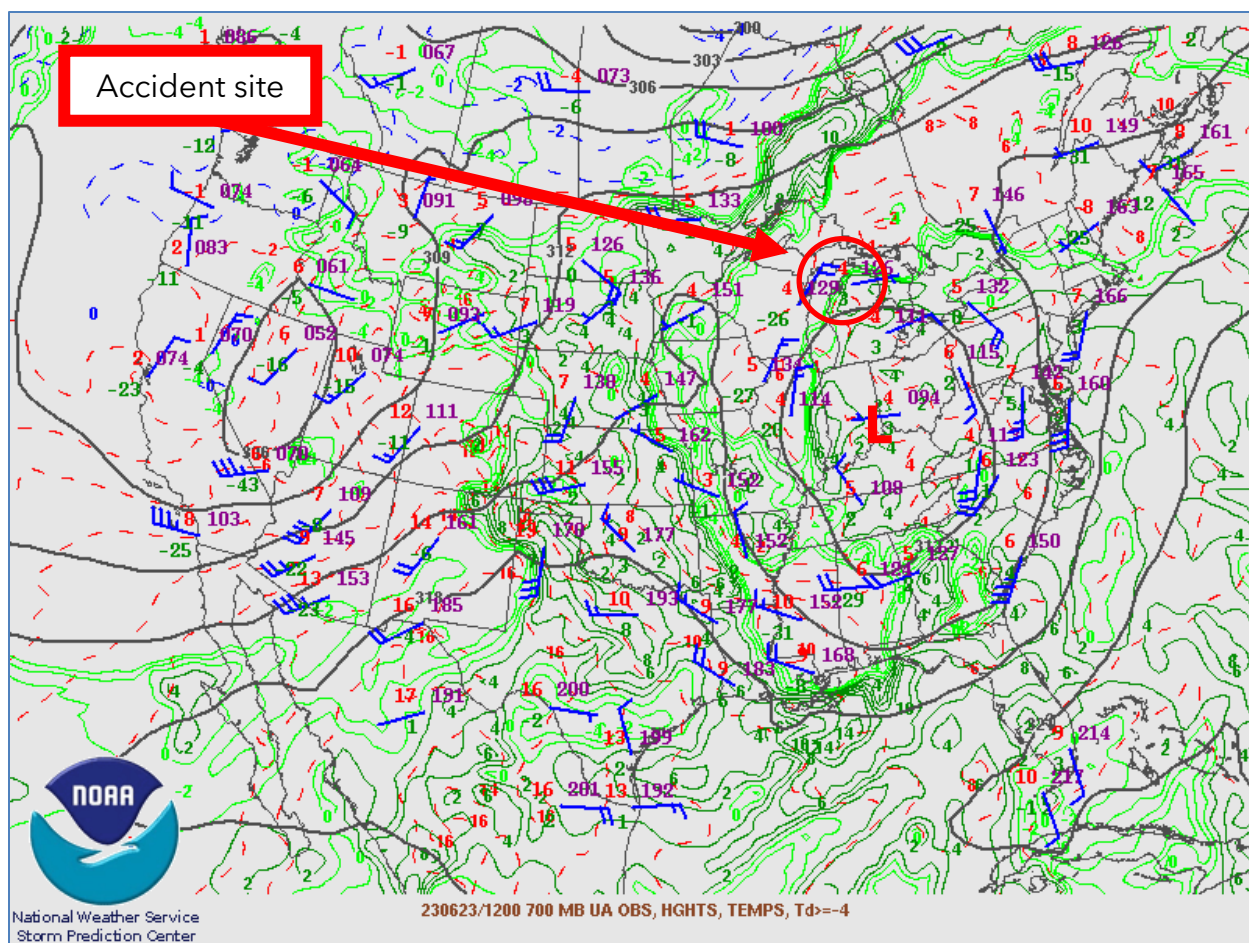


Figure 4. 700-hPa Constant Pressure Chart for 0800 EDT.

2.0 Surface Observations

The area surrounding the accident site was documented using official Aviation Routine Weather Reports (METARs) and Special Reports (SPECIs)³. The following observations were taken from standard code and are provided in plain language. Figure 5 is a local sectional chart with the accident site and the closest weather reporting location marked. A magnetic variation⁴ of 6° west was indicated over the area.

³ Latest criteria for SPECIs can be found in the Federal Meteorological Handbook: [Federal Meteorological Handbook Number 1, Surface Weather Observations and Reports \(icams-portal.gov\)](https://www.federalmeteorologicalhandbook.com/)

⁴ Magnetic variation - The angle (at a particular location) between magnetic north and true north. Latest measurement taken from <https://skyvector.com/>



Figure 5. FAA sectional aeronautical chart of the accident area with the location of the accident site and surface observation site noted.

Beaver Island Airport (KSJX) had the closest official weather station to the accident site. KSJX had an Automated Weather Observing System (AWOS⁵) and its longline⁶ reports were not augmented. The KSJX AWOS was located 6 miles southeast of the accident site (figure 5), at an elevation of 670 ft, and issued the following observations surrounding the accident time:⁷

[0715 EDT] METAR KSJX 231115Z AUTO 0000KT 10SM CLR 17/15
A2999 RMK AO2 T01670146

[0735 EDT] METAR KSJX 231135Z AUTO 0000KT 10SM CLR 18/15
A2999 RMK AO2 T01800151

⁵ AWOS - Automated Weather Observing System is equipped with meteorological instruments to typically observe and report temperature, dewpoint, wind speed and direction, visibility, cloud coverage and ceiling up to 12,000 feet, and altimeter setting. AWOS are maintained by the FAA. Certain AWOS may have different reporting or observational equipment.

⁶ "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases and accessible to the general global public from a large number of vendors. This does not include public accessibility to observations from a reporting station's Very High Frequency (VHF; line-of-site) or telephone broadcast, where applicable. Longline dissemination of weather observations is the primary vehicle through which the weather observations are distributed.

⁷ The bold sections of products in this report are intended to highlight the text that directly reference the weather conditions that affected the accident region around the accident time. The local times in this section next to the METARs are provided for quick reference between UTC and local times.

[0755 EDT] METAR KSJX 231155Z AUTO 00000KT 10SM CLR 20/15
A2999 RMK AO2 T01970153 10197 20130

[0815 EDT] METAR KSJX 231215Z AUTO 26004KT 10SM CLR 23/15
A2999 RMK AO2 T02250145

**[0835 EDT] METAR KSJX 231235Z AUTO 22003KT 10SM CLR 22/14
A2999 RMK AO2 T02220143**

ACCIDENT TIME 0844 EDT

**[0855 EDT] METAR KSJX 231255Z AUTO 26004KT 10SM CLR 22/14
A3000 RMK AO2 T02200142**

[0915 EDT] METAR KSJX 231315Z AUTO 24004KT 10SM CLR 22/14
A3000 RMK AO2 T02200142

The bold type observations decoded in plain language were as follows:

KSJX weather at 0835 EDT, automated, wind from 220° at 3 knots, visibility 10 miles or greater, clear skies below 12,000 ft above ground level (agl), temperature of 22° Celsius (C), dew point temperature of 14°C, and an altimeter setting of 29.99 inches of mercury (inHg). Remarks, automated station with a precipitation discriminator, temperature 22.2°C, dew point temperature 14.3°C.

KSJX weather at 0855 EDT, automated, wind from 260° at 4 knots, visibility 10 miles or greater, clear skies below 12,000 ft agl, temperature of 22°C, dew point temperature of 14°C, and an altimeter setting of 30.00 inHg. Remarks, automated station with a precipitation discriminator, temperature 22.2°C, dew point temperature 14.2°C.

The observations from the KSJX AWOS around the accident time identified VFR⁸ conditions.

⁸ The NWS and the FAA Aeronautical Information Manual (AIM) section 7-1-7 defines the following general flight categories:

- Low Instrument Flight Rules (LIFR*) – ceiling below 500 ft above ground level (agl) and/or visibility less than 1 statute mile.
- Instrument Flight Rules (IFR) – ceiling between 500 to below 1,000 feet agl and/or visibility 1 to less than 3 miles.
- Marginal Visual Flight Rules (MVFR**) – ceiling from 1,000 to 3,000 ft agl and/or visibility 3 to 5 miles.
- Visual Flight Rules (VFR) – ceiling greater 3,000 ft agl and visibility greater than 5 miles.

* By definition, IFR is a ceiling less than 1,000 ft agl and/or visibility less than 3 miles while LIFR is a sub-category of IFR.

**By definition, VFR is a ceiling greater than or equal to 3,000 ft agl and visibility greater than 5 miles

3.0 Upper Air Sounding

A High-Resolution Rapid Refresh (HRRR)⁹ model sounding was created¹⁰ for the approximate accident site coordinates for 0900 EDT. The HRRR sounding was plotted on a standard Skew-T Log P diagram¹¹ from the surface to 700-hPa (or approximately 10,000 ft) using the RAOB¹² software package and is included as figure 6. The sounding depicted an elevation of 577 ft over the grid point with a near surface temperature of 13.5°C, a dew point temperature of 11.4°C, and a relative humidity of 87%. The sounding depicted the lifted condensation level (LCL)¹³ at 896 ft agl (1,473 ft msl) and the convective condensation level (CCL)¹⁴ at 11,043 ft msl. The freezing level was located at 13,218 ft. The precipitable water value at 0.81 inches.

while MVFR is a sub-category of VFR.

⁹ The HRRR is a NOAA real-time three-kilometer resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by three-kilometer grids with three-kilometer radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a one-hour period.

¹⁰ HRRR sounding was created using NOAA Air Resource Laboratory: [READY Archived Meteorology \(noaa.gov\)](https://ready.noaa.gov).

¹¹ Skew T log P diagram - is a standard meteorological plot using temperature and the logarithmic of pressure as coordinates, used to display winds, temperature, dew point, and various indices used to define the vertical structure of the atmosphere.

¹² RAOB - (The complete Rawinsonde Observation program) is an interactive sounding analysis program developed by Esonde Research Services, The Villages, Florida.

¹³ LCL - The height at which a parcel of moist air becomes saturated when it is lifted dry adiabatically.

¹⁴ CCL - The level in the atmosphere to which an air parcel, if heated from below, will rise dry adiabatically, without becoming colder than its environment just before the parcel becomes saturated.

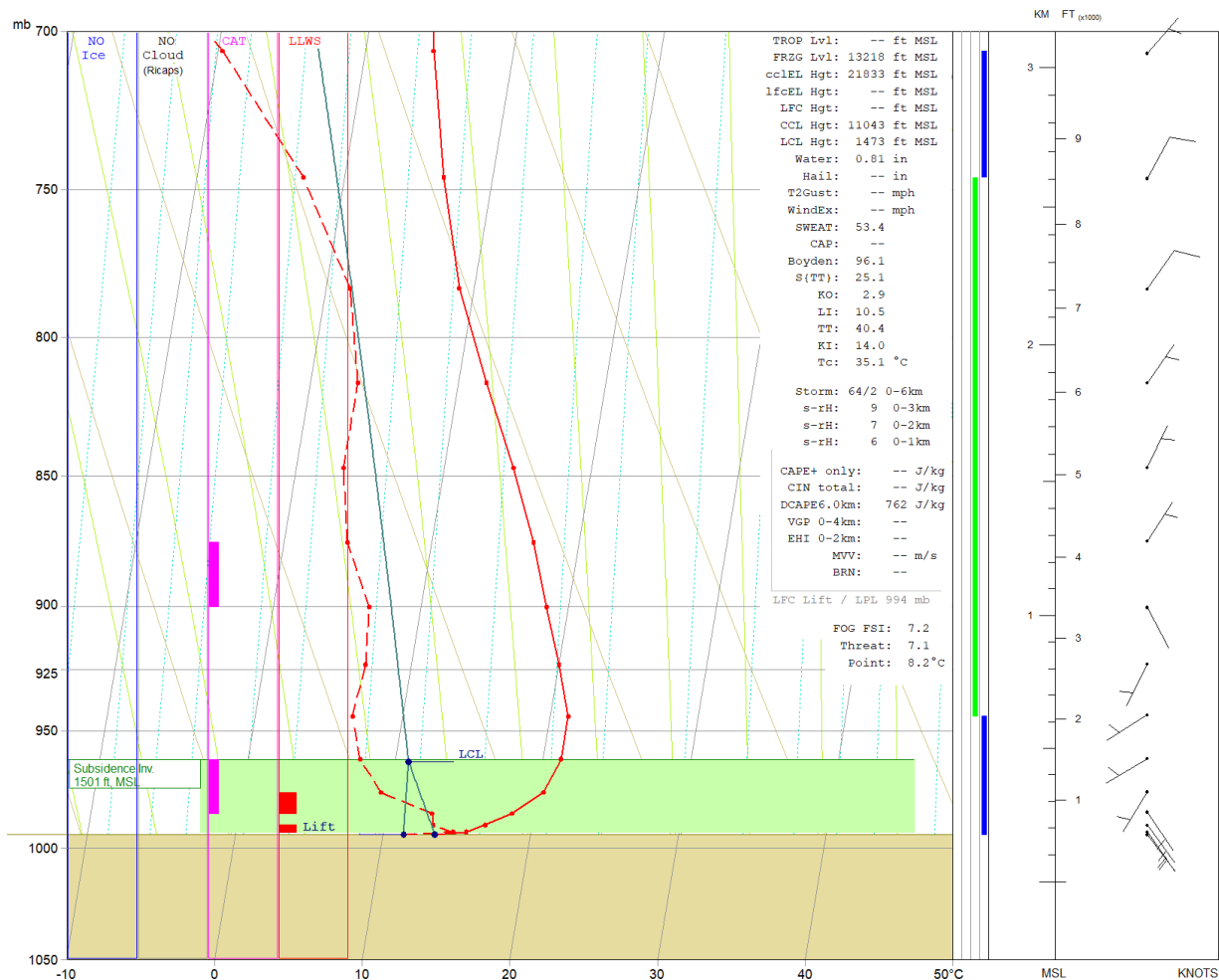


Figure 6. 0900 EDT HRRR sounding.

The 0900 EDT HRRR sounding depicted a surface based inversion¹⁵ due to subsidence through about 1,500 ft (green shaded area) which indicated a stable environment from the surface through 2,000 ft. The RAOB Analysis program did not indicate any clouds or icing conditions below 10,000 ft.

The 0900 EDT HRRR sounding wind profile indicated a near-surface wind from 144° at 4 knots with the wind remaining variable and 10 knots or less through 10,000 ft. RAOB indicated the possibility of light low-level wind shear (LLWS) and light clear air turbulence (CAT) in two layers below 5,000 ft.

¹⁵ Inversion - A departure from the usual decrease of the value of an atmospheric property with increasing altitude; also, the layer through which this departure occurs (the "inversion layer"), or the lowest altitude at which the departure is found (the "base of the inversion").

4.0 Satellite Data

Geostationary Operational Environmental Satellite number 16 (GOES-16) visible and infrared data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System software. Visible and infrared imagery (GOES-16 bands 2 and 13) at wavelengths of 0.64 microns (μm) and 10.3 μm , respectively, were retrieved for the period from 0600 EDT through 1200 EDT and reviewed, and the closest images to the time of the accident were documented.

Figure 7 presents the GOES-16 visible image at 0846 EDT at 2X magnification with the accident site highlighted with a red square. The visible imagery indicated cloud cover and other obscurations above and surrounding the accident site at the accident time with the cloud cover stationary (attachment 1). Figure 8 presents the GOES-16 infrared image at 0846 EDT at 7X magnification with the accident site highlighted with a red square. The lower brightness temperatures (red and yellow colors; higher cloud tops) were located east and south of the accident site at the accident time. The brightness temperature of 280 Kelvin above the accident site would have been near 8,000 ft based on the vertical temperature profile provided by the 0900 EDT HRRR sounding. It should be noted these figures have not been corrected for any parallax error.

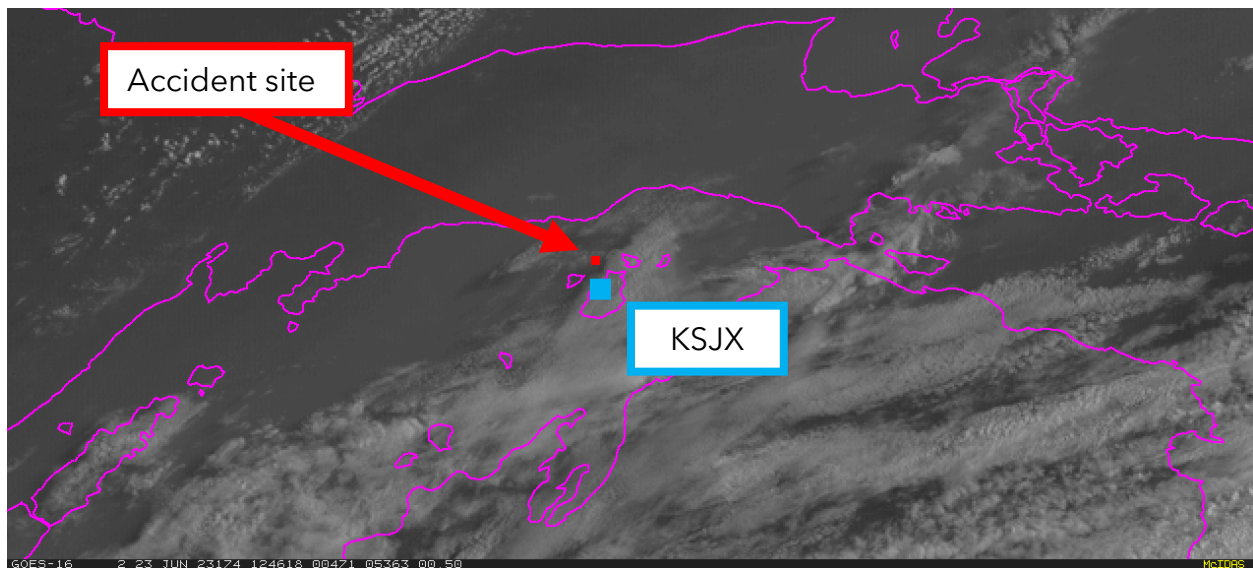


Figure 7. GOES-16 visible image at 0846 EDT.

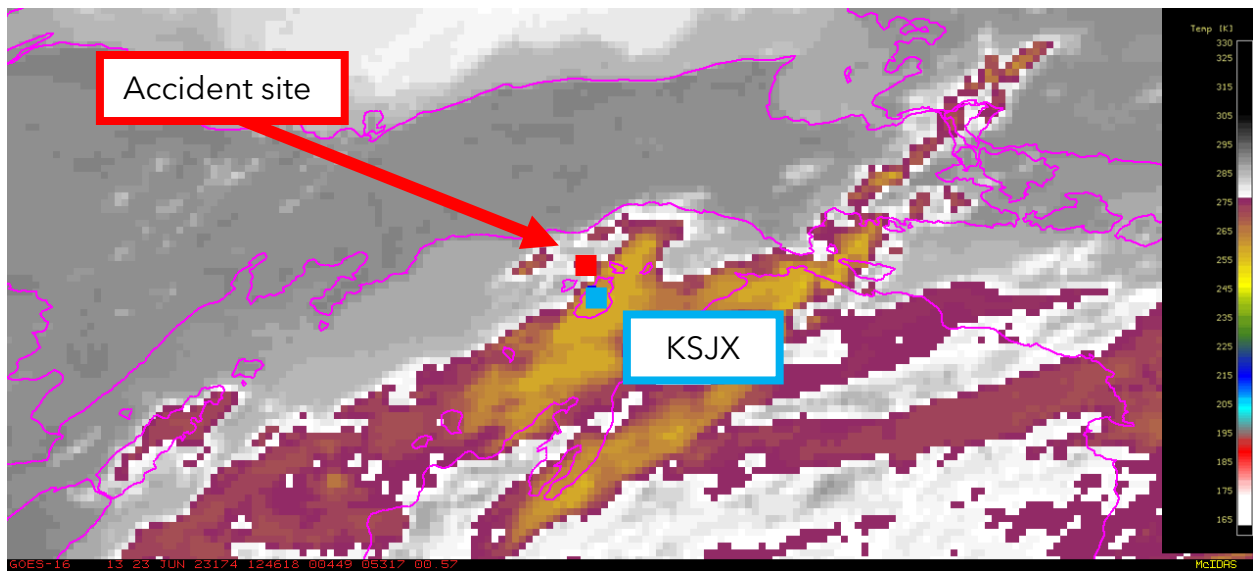


Figure 8. GOES-16 infrared image at 0846 EDT.

5.0 National Radar Imagery

A regional view of the NWS National Reflectivity Mosaic is included as figure 9 for 0845 EDT with the approximate location of the accident site marked by a red circle. The image depicted no echoes above the accident site.

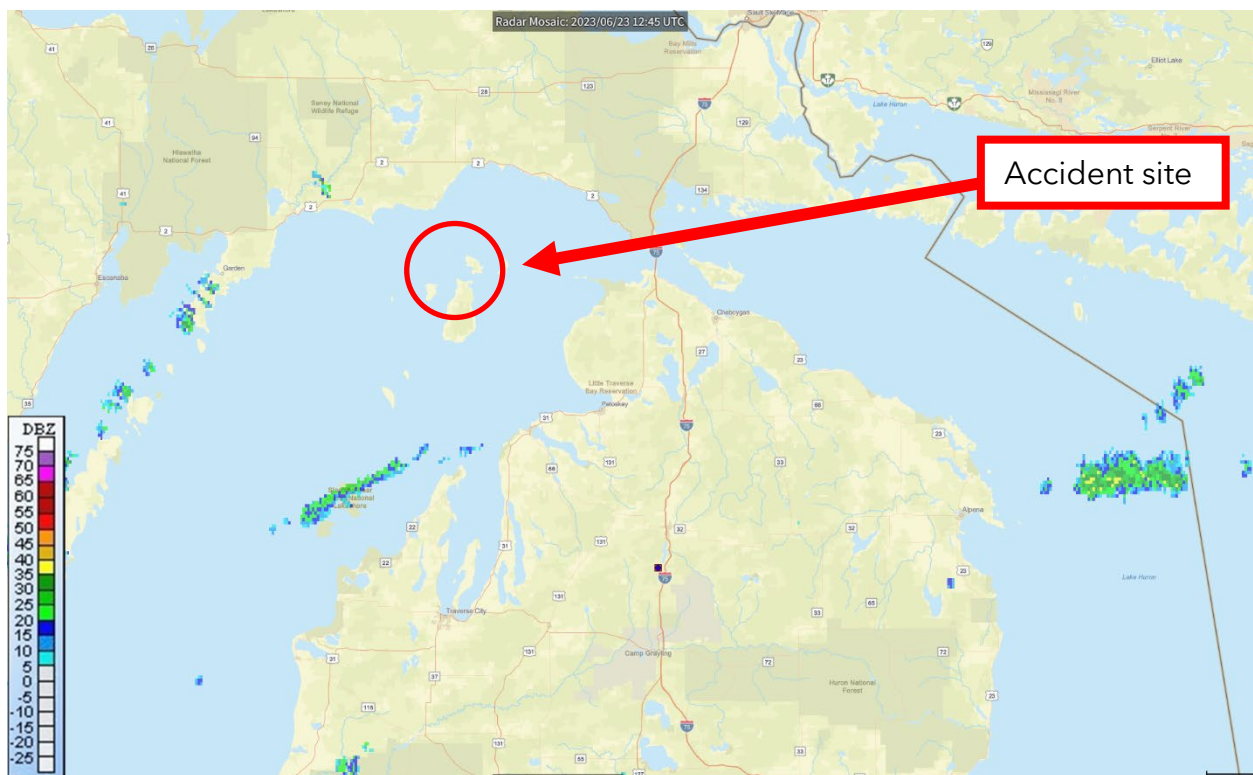


Figure 9. National Reflectivity Mosaic for 0845 EDT.

6.0 Pilot Reports

The longline-disseminated pilot reports¹⁶ (PIREPs) distributed into the national airspace system (NAS) within 2 hours before and after the accident time and within 100 miles of the accident site at altitudes below 18,000 ft are shown here:

GLR UA /OV KBFA/TM 1250/FL066/TP C172/SK OVC075/WX HZ066-TOP070/WV
03017KT/RM DURD

7.0 Significant Meteorological Information

There were no convective or non-convective Significant Meteorological Information (SIGMET) advisories valid for the accident site at the accident time.

8.0 Center Weather Service Advisories

The Minneapolis (ZMP) Air Route Traffic Control Center (ARTCC) Center Weather Service Unit (CWSU) was responsible for the accident region. There was no Center Weather Advisory (CWA) valid for the accident site at the accident time.

9.0 Airmen's Meteorological Information

There were no NWS Aviation Weather Center (AWC) text Airmen's Meteorological Information (AIRMET) advisories valid for the accident site for below 12,000 ft.

10.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) products issued by the AWC before the accident flight and valid at 0800 and 1100 EDT are shown in attachment 2. The GFA surface forecasts applicable to the accident site that were valid before the accident flight's departure indicated VFR conditions for the accident site with a south wind of 5 knots. LIFR surface visibilities and fog were indicated for portions of Lake Michigan west and south of the accident site. The GFA cloud forecast applicable to the accident site indicated clear skies to few clouds. There were no Graphical AIRMET¹⁷ (G-AIRMET) valid for the accident site at 0800 or 1100 EDT. The only

¹⁶ Only PIREPs with the World Meteorological Organization headers UBWI** and UBMI** were considered. These do not include pilot reports only broadcast via radio.

¹⁷ Graphical AIRMETs (G-AIRMETs), found on the Aviation Weather Center webpage at <http://aviationweather.gov>, are graphical forecasts of en-route weather hazards valid at discrete

human-generated information reflected in the two GFA products were the G-AIRMETs.

11.0 Terminal Aerodrome Forecast

There were no airports with an NWS Terminal Aerodrome Forecast¹⁸ (TAF) within 30 miles of the accident site.

12.0 National Weather Service Area Forecast Discussion

The NWS weather forecast office in Gaylord, Michigan, (WFO APX) was responsible for the public forecast in the region of the accident site. WFO APX issued the following Area Forecast Discussion (AFD) at 0637 EDT, the AFD issued closest to the accident time with an aviation section:

FXUS63 KAPX 231037
AFDAPX

Area Forecast Discussion
National Weather Service Gaylord MI
637 AM EDT Fri Jun 23 2023

.NEAR TERM...(Today through Tonight)
Issued at 301 AM EDT Fri Jun 23 2023

High Impact Weather Potential: None.

Pattern Synopsis/Forecast:

Mid/upper level low...with attendant weak surface reflection...working their collective way slowly north into the lower Ohio River Valley early this morning. Overhead ridge axis has weakened as a result, giving way to broad, weak troughing across the northern Great Lakes. Still another dry night across the Northwoods, although weak retrograding mid level impulse is bringing some mid level clouds...especially to parts of northern lower Michigan. Seasonably mild conditions persist, with temperatures still mostly in the 60s.

times no more than 3 hours apart for a period of up to 12 hours into the future (for example, 00, 03, 06, 09, and 12 hours). G-AIRMETs are snap shots at discrete time intervals as defined above. The text AIRMET is the result of the production of the G-AIRMET but provided in a time smear for a 6hr valid period.

¹⁸ According to NWS Instruction 10-813: "An NWS TAF consists of the expected meteorological conditions significant to aviation at an airport for a specified time period. For the U.S., this is the area within five (5) statute miles (SM) of the center of an airport's runway complex."

www.nws.noaa.gov/directives/sym/pd01008013curr.pdf

Ohio Valley low pressure will continue to work slowly north, reaching vicinity Lake Erie by early Saturday morning. Cyclonic flow within broader mid level trough will begin to pinwheel a bit of Atlantic moisture back west into the region today...bringing a bit more cloud cover and even the potential for a few showers.

Primary Forecast Concerns/Challenges:

Cloud/temperature trends and addressing shower potential.

Details:

Atlantic moisture plume will continue to rotate back northwest today north of that approaching Ohio Valley low. This will result in thickening clouds, especially across the southeast half of northern lower Michigan. While forcing is most certainly lacking, just enough hints of enhanced lower level convergence across parts of north central and northeast lower Michigan to perhaps drive the development of a few light showers this afternoon. Not entirely sold on this idea given lack of deeper forcing above surface convergence axes and ongoing prolonged stretch of very dry weather, but a token low end shower mention is most definitely warranted. Again, would like to stress that most of the area will remain dry. A smidge cooler today with those increasing clouds, with highs mostly in the lower and middle 80s (warmest across eastern upper Michigan where skies should remain mostly sunny...albeit a bit hazy from elevated smoke).

Moisture thins out with time tonight as ridging begins to reintroduce itself. Expect partly cloudy to mostly clear skies. Could see some patchy fog in places, but that should be more the exception than the rule. Another night with widespread lows in the 50s expected.

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.SHORT TERM...(Saturday through Sunday)

Issued at 301 AM EDT Fri Jun 23 2023

High Impact Weather Potential: Minimal. Perhaps a few thunderstorms Sunday?

Pattern Synopsis/Forecast:

Ridging expected to dominate our weather to start the weekend as eastern Lakes low pressure moves off into New England. Main story is arrival of a fairly respectable shortwave during the day Sunday. Overwhelming support in now nearly the full deterministic and ensemble suite for this wave. Couple this with decent moisture profiles and strong upper jet core punching into the central Plains, and at least theoretically the stage is set for the arrival of some much needed rains Sunday into early next week.

Primary Forecast Concerns/Challenges:

Cloud/temperature trends and addressing those Sunday shower chances.

Details:

Should be a dry and mild start to the weekend. Could see a decent cumulus field develop Saturday afternoon, but warm mid levels should negate enough depth to those clouds to produce showers. Highs Saturday expected to be well up into the 80s. Thinking Saturday night remains dry, with increasing showers chances arriving on Sunday as that earlier mentioned shortwave trough approaches from the northern Plains. Still have some trepidation on guidance derived categorical pops by Sunday afternoon, with at least some hints initial surge of deeper moisture will remain off to our west and south...eventually pivoting into our region Sunday night into Monday. Subtle cooling through the mid levels argues for the development of at least some instability, with enough updraft through the ice-producing levels to support at least some thunder potential. Current trends support best severe potential remaining off to our south, but definitely something to monitor in the coming days. Highs Sunday will be highly predicated by cloud and shower trends. Current forecast highs in the lower/middle 80s definitely subject to change as those shower/cloud trends become better established.

.LONG TERM...(Sunday night through Thursday)
Issued at 301 AM EDT Fri Jun 23 2023

High Impact Weather Potential...Minimal.

A shortwave through begins to dig through the region this Sunday night and linger over the Great Lakes state into Tuesday. This pattern supports cyclogenesis, leading to rainfall across the CWA for the first half of the forecast period. There is some discrepancy amongst guidance as to the exact timing and low pressure track as it passes Michigan, but precipitation can definitely be expected early next week. The largest amount of uncertainty is the QPF amounts, where the best convergence will organize, and what areas will see organized precipitation versus scattered showers through the first half of the week.

As the trough begins to lift Wednesday, zonal midlevel flow will occupy the area keeping temperatures below normal for late June. A jet maxima accompanying the aforementioned zonal flow will progress to the midwest this Thursday, potentially bringing another round of precipitation to northern Michigan. POPs will remain low in the forecast because this system formation relies on the placement of the jet max and associated upper level divergence. Location of this jet max will be critical in determining if another round of showers will hit northern Michigan and aid in ending this very dry spell for the region.

&&

**.AVIATION...(For the 12Z TAFS through 12Z Saturday morning)
Issued at 636 AM EDT Fri Jun 23 2023**

**VFR conditions will continue through the period under passing
mid/high level clouds and some relatively high based cumulus.
Light winds with local lake breeze development this afternoon.**

&&

.MARINE...

Issued at 301 AM EDT Fri Jun 23 2023

Limited winds/waves expected through Saturday across our nearshore waters. Southeast winds expected to increase on Sunday as low pressure approaches the region, although current trends continue to support sub-advisory conditions. Signals are increasing for more significant winds early next week, when marine headlines will likely be needed. Dry and mild weather through Saturday, with increasing shower chances (possible thunder?) Sunday through Monday.

&&

.APX WATCHES/WARNINGS/ADVISORIES...

MI...NONE.

LH...NONE.

LM...NONE.

LS...NONE.

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13.0 Winds and Temperature Aloft Forecast

The NWS Winds and Temperature Aloft forecast valid for the closest points to the accident site are included below:

```
FBUS31 KWNO 230759
FD1US1
DATA BASED ON 230600Z
VALID 231200Z FOR USE 0800-1500Z. TEMPS NEG ABV 24000

FT 3000 6000 9000 12000 18000 24000 30000 34000 39000
MQT 3013 3407+15 3607+06 9900+02 9900-10 3408-22 361837 352446 011456
SSM 9900 0605+12 0908+05 9900+02 9900-10 2210-21 241736 231847 221857
TVC 9900 0511+11 1008+07 1108+01 1806-11 2605-20 230736 220847 210958
```

The bulletin issued at 0359 EDT was for use between 0400 EDT and 1100 EDT.

14.0 Pilot Weather Information

Title 14 CFR 91.103 states that “Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight.” FAA AC 91-92 “Pilot’s Guide to a Preflight Planning” (dated March 15, 2021) provided pilot guidance on preflight self-briefings, including planning, weather interpretation, and risk identification/mitigation skills. The AC further stated in part:

Pilots adopting these guidelines will be better prepared to interpret and utilize real-time weather information before departure and en route, in the cockpit, via technology like Automatic Dependent Surveillance-Broadcast (ADS-B) and via third-party providers.¹⁹

A search of archived information indicated that the accident pilot did not request weather information from Leidos Flight Service. The accident pilot did have an account through ForeFlight (attachment 5) and entered routes into the app in the days prior to the accident and on the accident day, however, no weather imagery or briefing information was requested or received. For more information please see attachment 5. It is unknown what weather information, if any, the accident pilot checked or received before or during the accident flight.

¹⁹ https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-92.pdf. The AC also listed multiple online FAA resources for aviation flight planning services for adverse weather.

15.0 HRRR Smoke Numerical Model

HRRR-Smoke²⁰ model data surrounding the accident time was retrieved. The HRRR-Smoke was initialized at 0900 EDT and produced smoke information for 0900 EDT which is included in figures 10, 11, 12, and 13. The imagery indicated between 12 and 60 $\mu\text{g}/\text{m}^3$ concentration of fine particulate matter (fire smoke) near the surface of the accident site through 6,000 ft agl with the surface visibilities below a mile across the majority of Lake Michigan and northern portions of Lake Huron. For more information on HRRR-Smoke please see attachment 3.

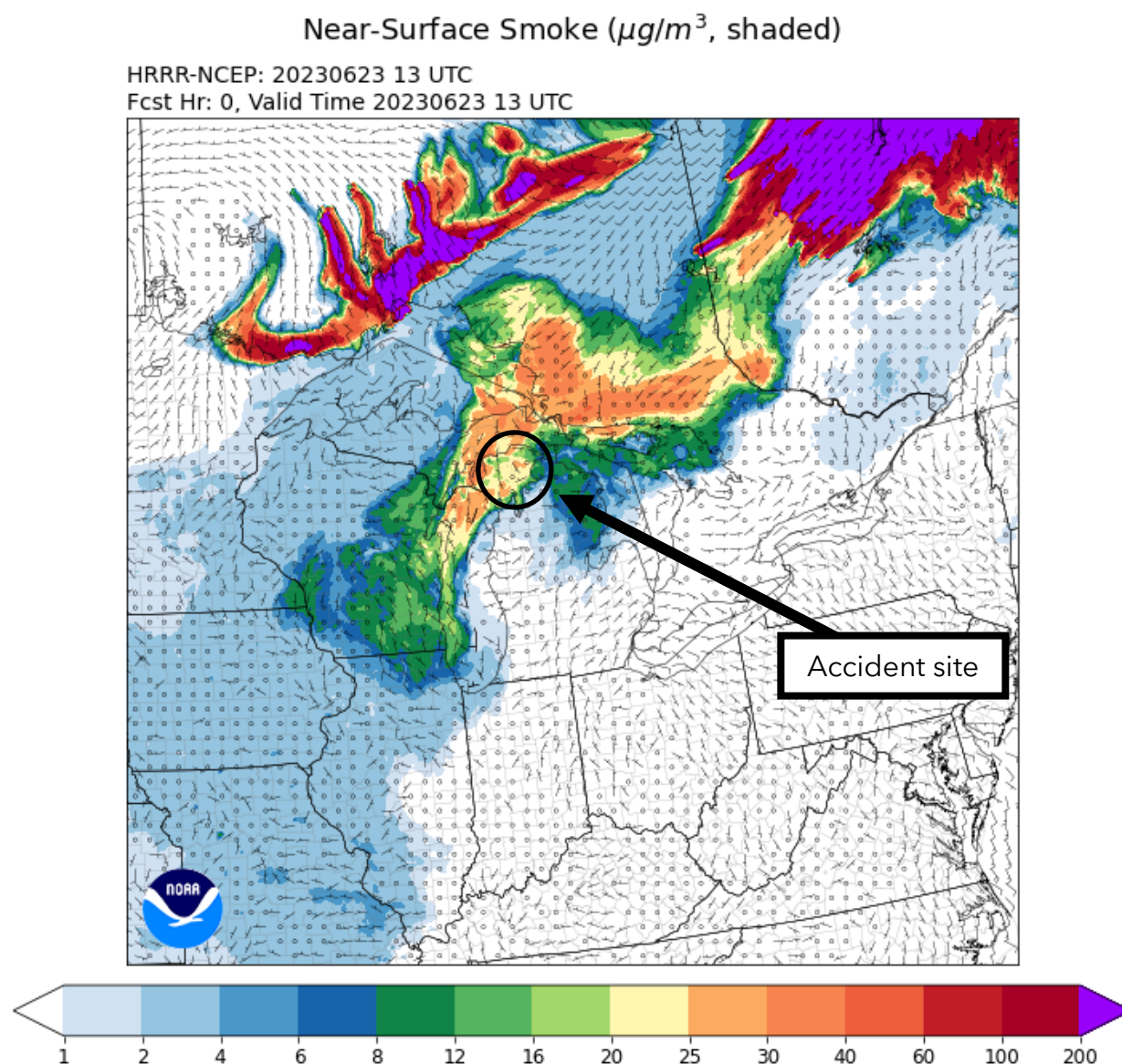


Figure 10. 0900 EDT Near-Surface Smoke image from HRRR-Smoke.

²⁰ <https://rapidrefresh.noaa.gov/hrrr/HRRRsmoke/> and [HRRR-Smoke VIIRS Activefire user guide.pdf \(noaa.gov\)](#)

1000ft AGL Smoke ($\mu\text{g}/\text{m}^3$, shaded)

HRRR-NCEP: 20230623 13 UTC

Fcst Hr: 0, Valid Time 20230623 13 UTC

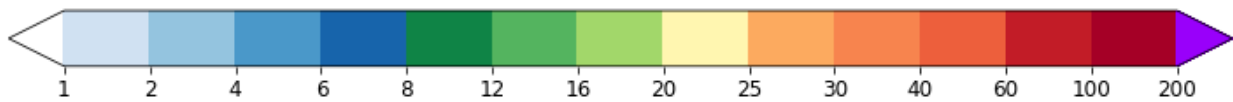
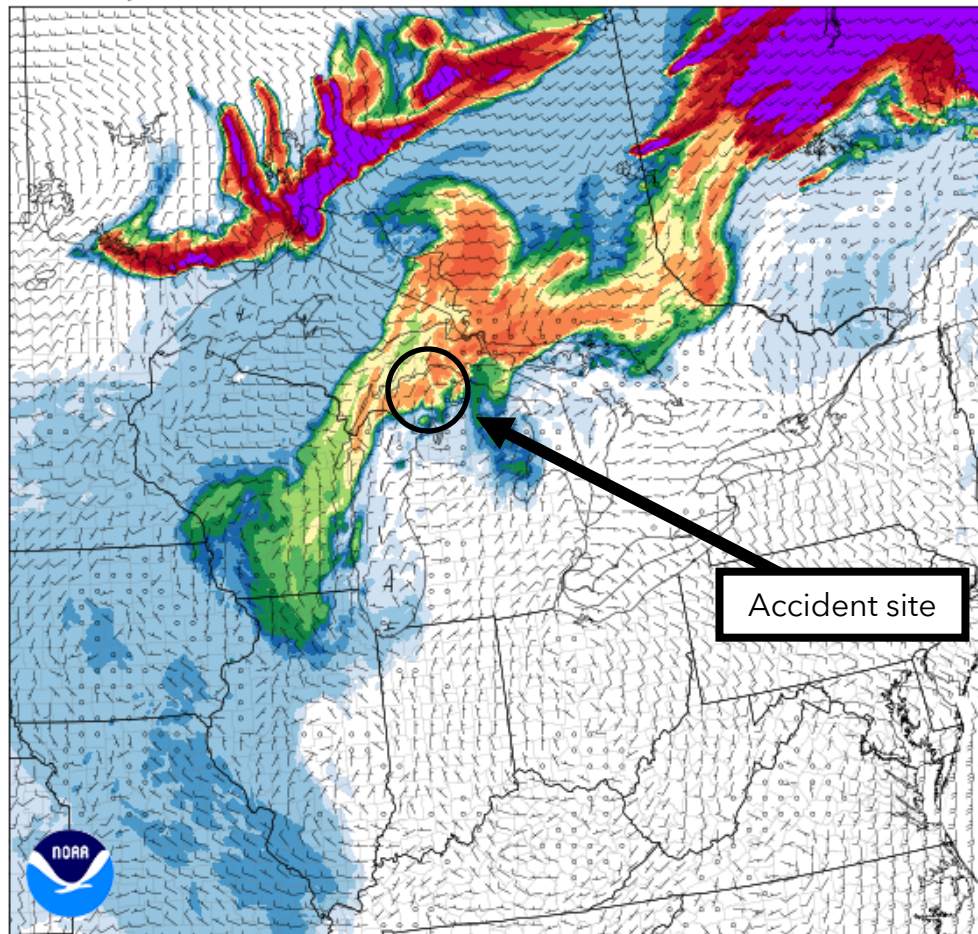


Figure 11. 0900 EDT 1,000 ft agl Smoke image from HRRR-Smoke.

6000ft AGL Smoke ($\mu\text{g}/\text{m}^3$, shaded)

HRRR-NCEP: 20230623 13 UTC

Fcst Hr: 0, Valid Time 20230623 13 UTC

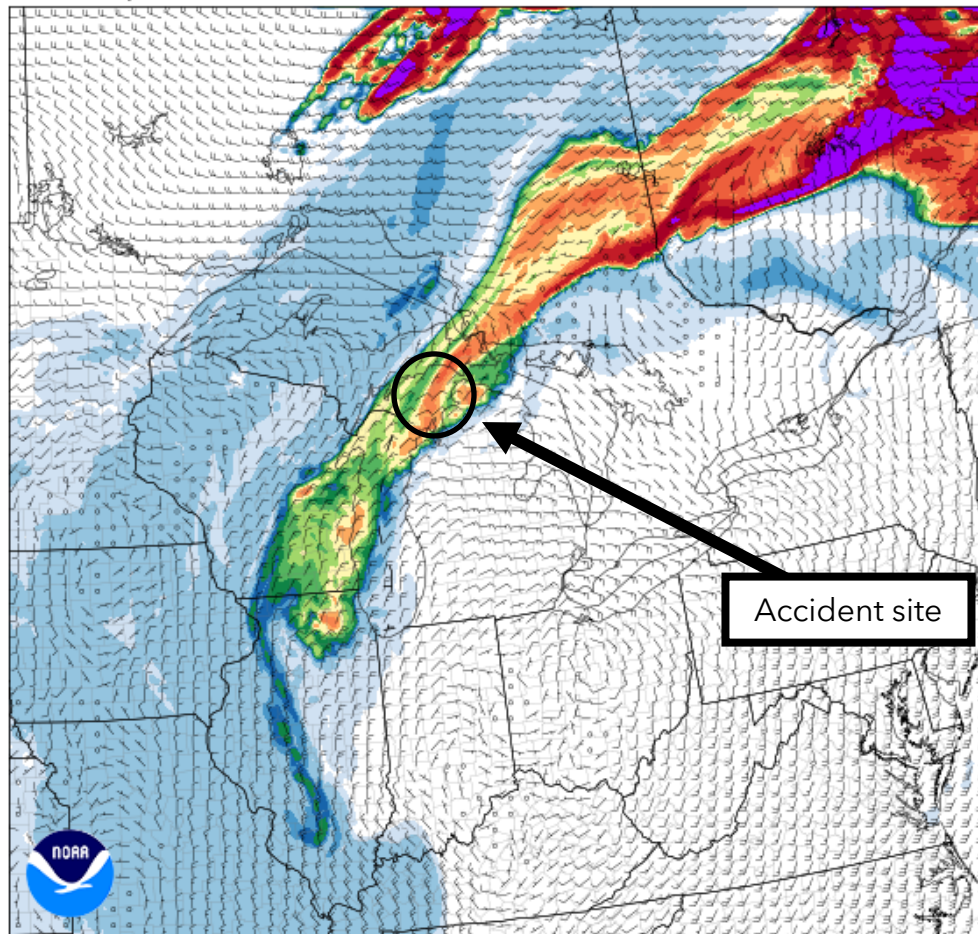


Figure 12. 0900 EDT 6,000 ft agl Smoke image from HRRR-Smoke.

Vertically Integrated Smoke (mg/m^2 , shaded)

HRRR-NCEP: 20230623 13 UTC

Fcst Hr: 0, Valid Time 20230623 13 UTC

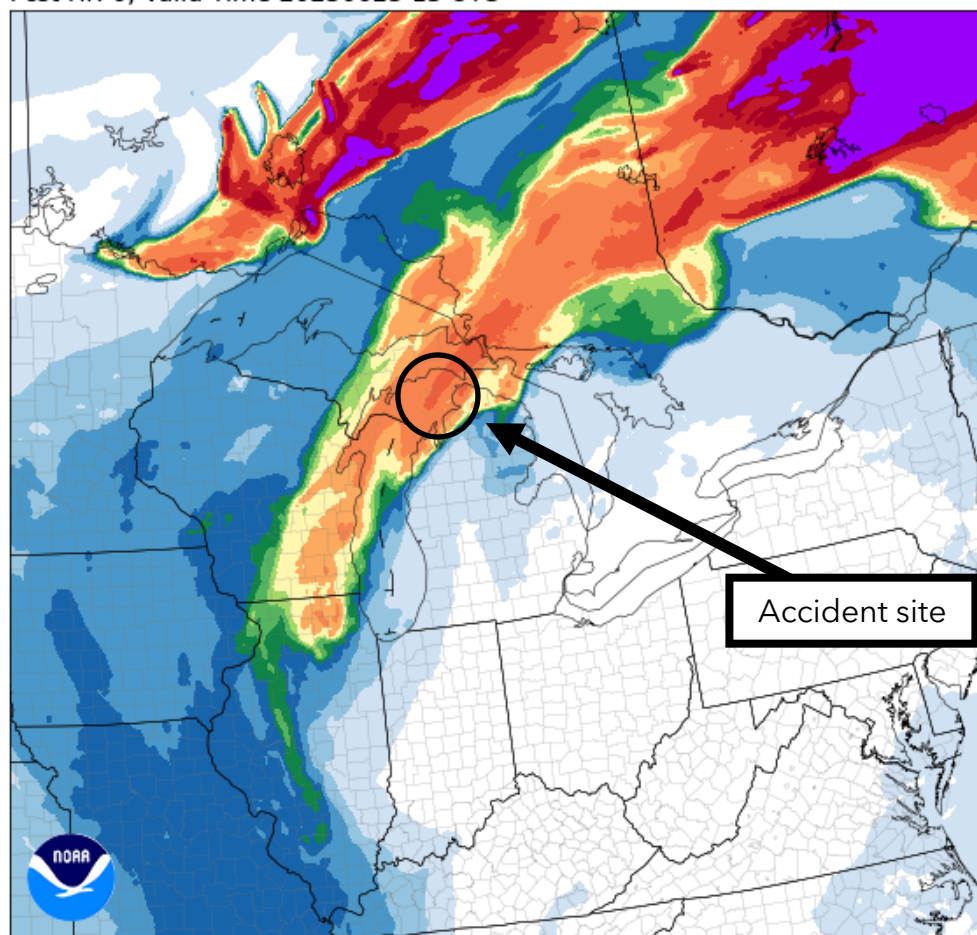


Figure 13. 0900 EDT Vertically Integrated Smoke²¹ image from HRRR-Smoke.

²¹ Vertically Integrated Smoke -Simulated total smoke mass within vertical columns over each model grid cell. Columns extend to ~25 kilometers above the ground. This product displays the total smoke load that includes smoke in the boundary layer as well as aloft, illustrating the integral amount of smoke throughout the atmosphere.

16.0 Witness Information

The first United States Coast Guard asset on scene (between 0900 and 1000 EDT) stated that the smoke and haze combined with light winds and calm seas made it difficult to discern where sky and water met with no discernable horizon. They stated they logged a total of 1 hour of instrument meteorological conditions (IMC) to account for the conditions requiring instruments during the overwater transit portions of the flight. For more information please see attachment 4.

17.0 Astronomical Data

The astronomical data obtained for the accident site on June 23, 2023, indicated the following:

SUN

Begin civil twilight 0515 EDT

Sunrise 0552 EDT

Accident time 0844 EDT²²

Sun transit 1344 EDT

Sunset 2137 EDT

End civil twilight 2215 EDT

At the time of the accident the Sun was had an altitude of 26.70° and azimuth of 83.01°.

E. LIST OF ATTACHMENTS

Attachment 1 - GOES-16 Visible imagery animation from 0711 to 0931 EDT

Attachment 2 - GFA information valid at the accident time

Attachment 3 - Additional HRRR smoke imagery

Attachment 4 - Witness information

Attachment 5 - ForeFlight information

Submitted by:

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Senior Meteorologist

²² Inserted accident time for reference and context.