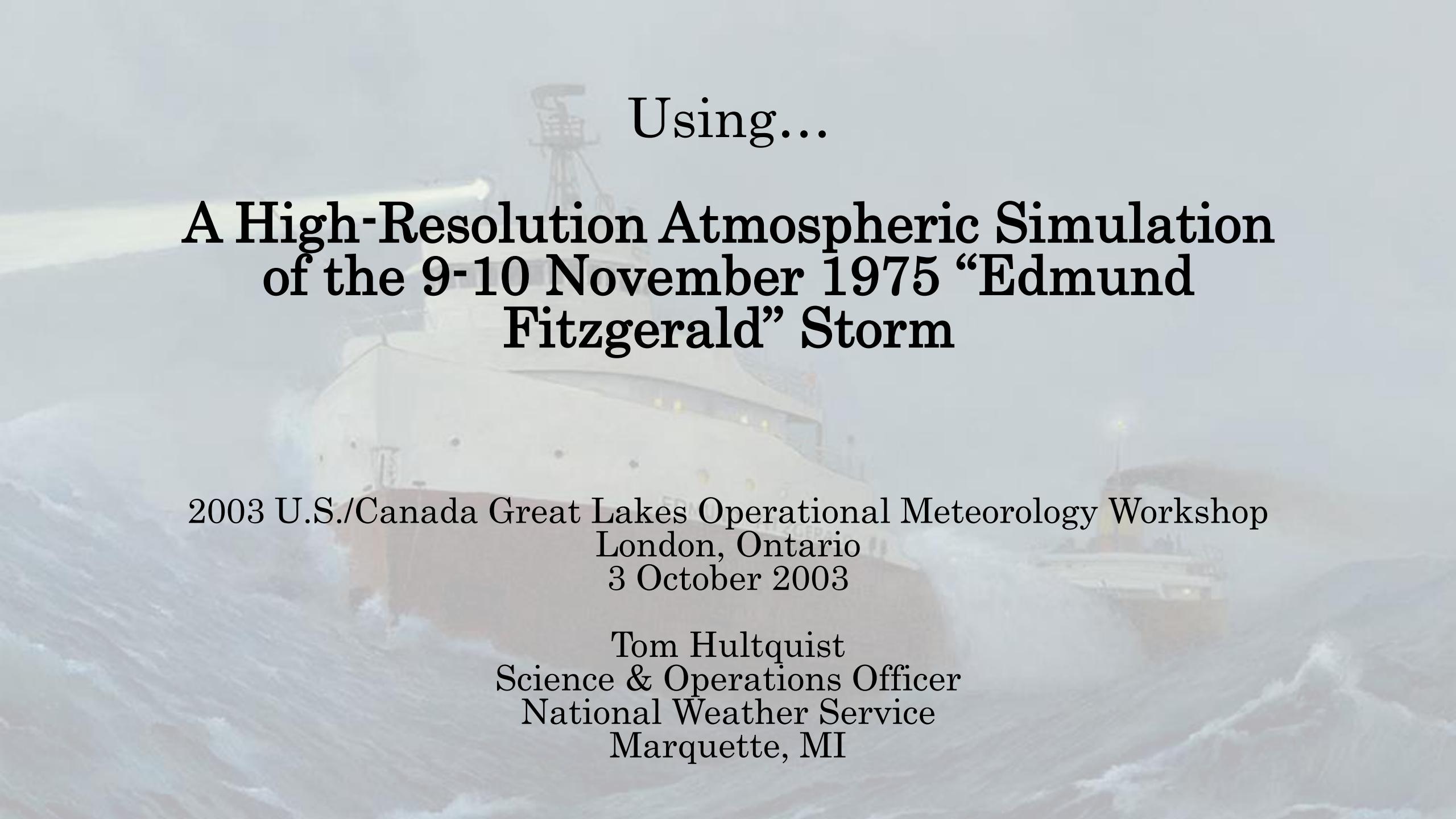


Forecasting the
Witch of November

A POST EVENT RE-ANALYSIS OF 9-10 NOVEMBER 1975

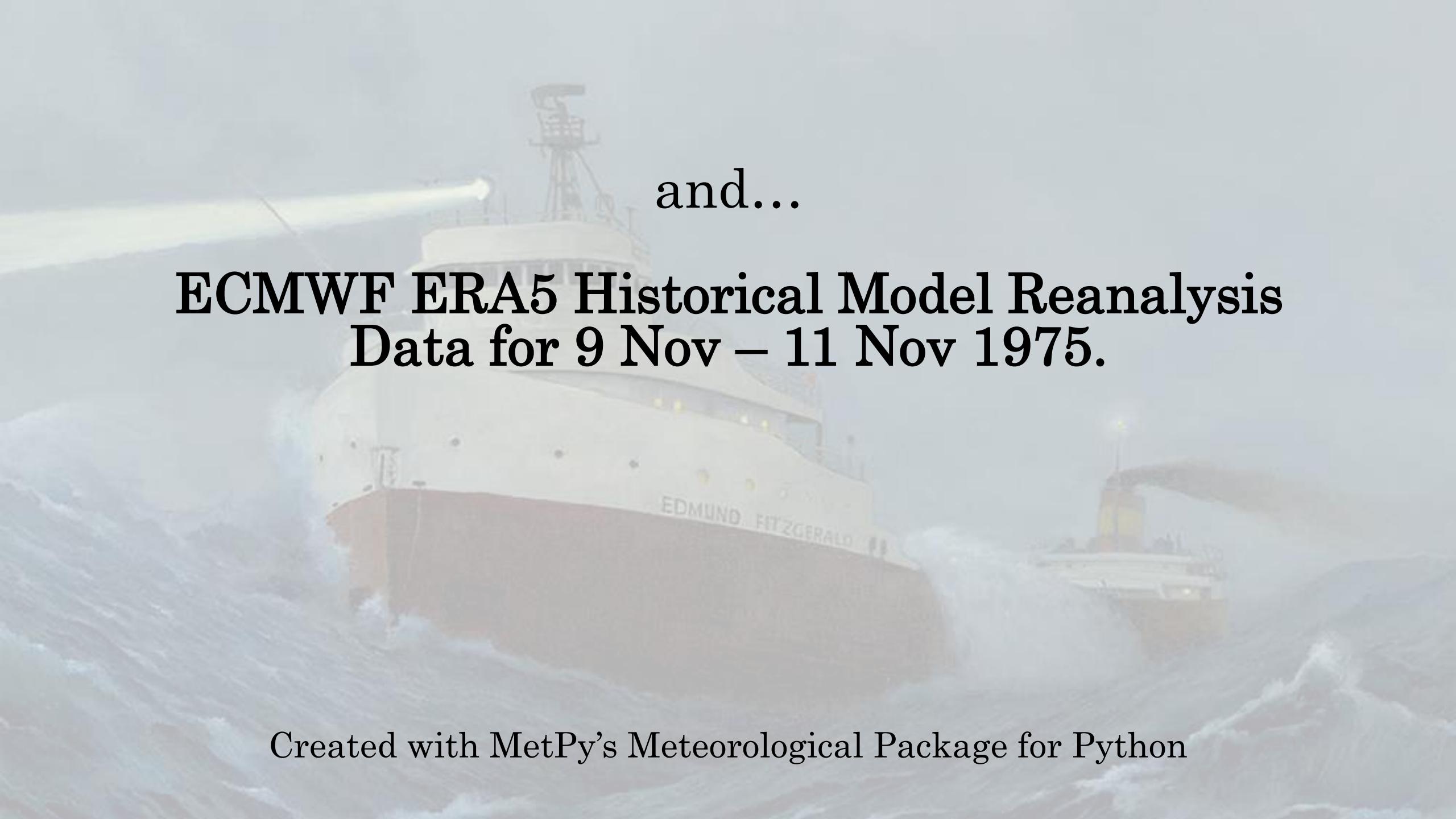


Using...

A High-Resolution Atmospheric Simulation of the 9-10 November 1975 “Edmund Fitzgerald” Storm

2003 U.S./Canada Great Lakes Operational Meteorology Workshop
London, Ontario
3 October 2003

Tom Hultquist
Science & Operations Officer
National Weather Service
Marquette, MI

A large ship, the Edmund Fitzgerald, is shown sailing through a stormy sea. The ship's name is visible on its hull. In the background, another ship is visible. The sky is overcast and grey.

and...

ECMWF ERA5 Historical Model Reanalysis Data for 9 Nov – 11 Nov 1975.

Created with MetPy's Meteorological Package for Python

When the skies of November turn gloomy

- November is known for rough conditions on the Great Lakes.
- More wrecks have occurred in November than any other month
- Over 6000 shipwrecks in the Great Lakes
- Over 30,000 mariners lost

Pride of the American Side

June 7th, 1958

River Rouge, Michigan

728ft bow to stern



Pride of the American Side

Hauled taconite iron ore pellets & coal from Superior, Wisconsin to Toledo, Ohio

Average load was 24-26k tons

Set numerous records for load size



Comin' back from some miss in Wisconsin...

9 Nov 1975

Left Superior Wisconsin at
2:20pm

Headed downbound for Detroit

Load of 26,116 tons of Taconite

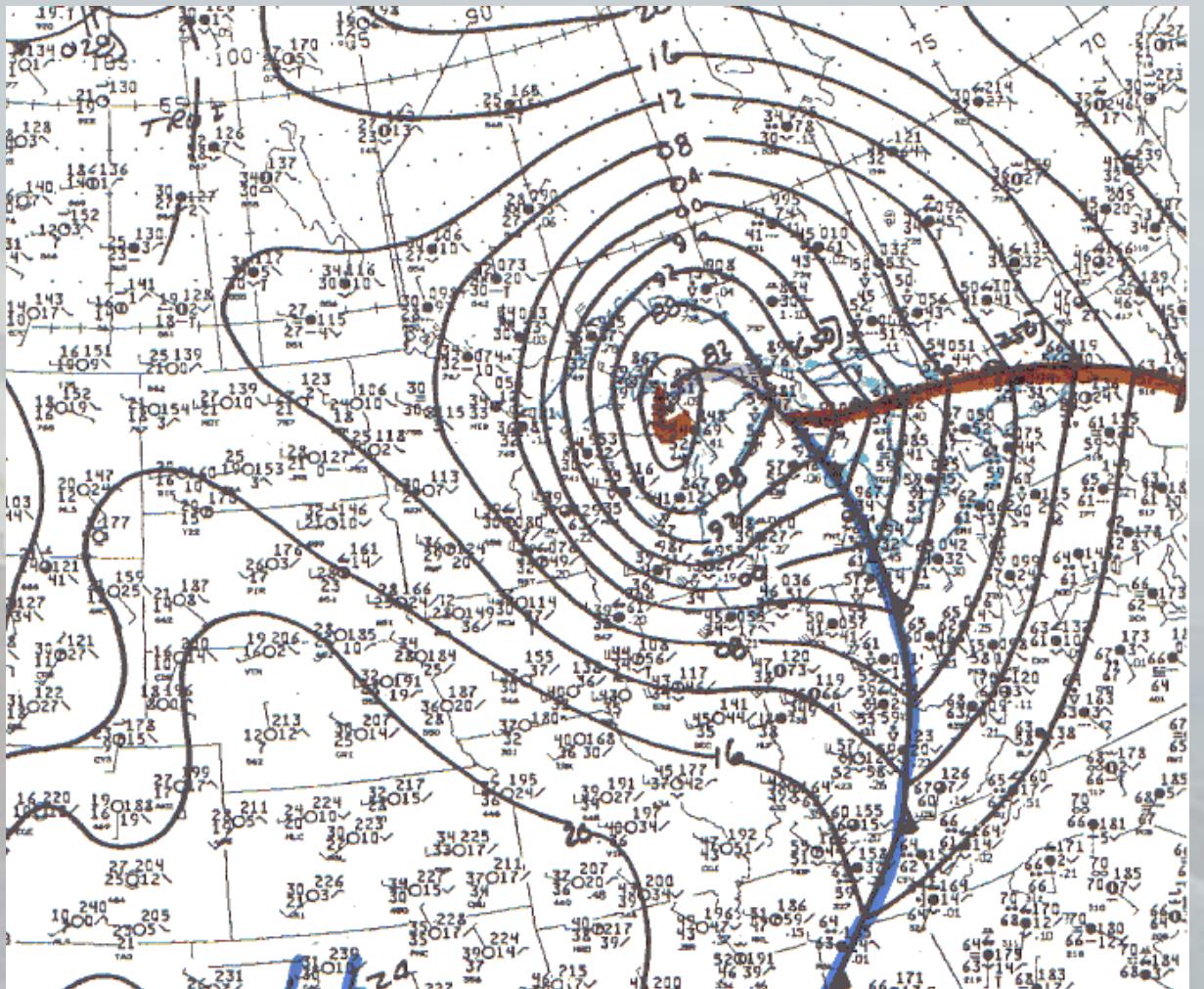
Captain Ernest McSorley
(since 1972)



Could it be the north wind they'd been feesin'?

The NWS issues Gale Warnings for all of Lake Superior at 3:39pm Nov. 9, 1975

The NWS upgrades to Storm Warnings for all of Lake Superior at 2:00am Nov. 10, 1975



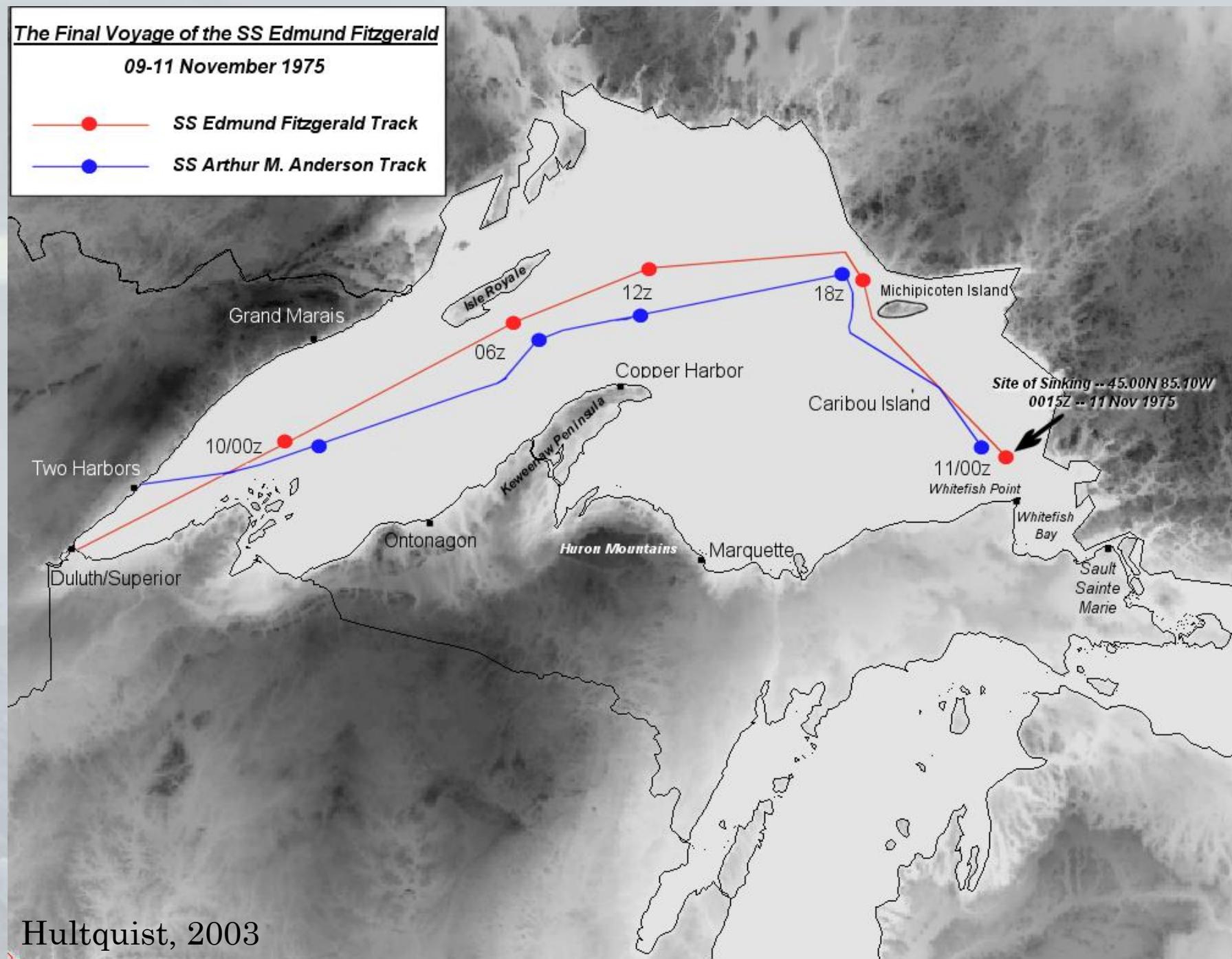
12z 10 Nov 1975 – true sfc analysis (Hultquist, 2003)

The Final Voyage of the SS Edmund Fitzgerald

09-11 November 1975

SS Edmund Fitzgerald Track

SS Arthur M. Anderson Track



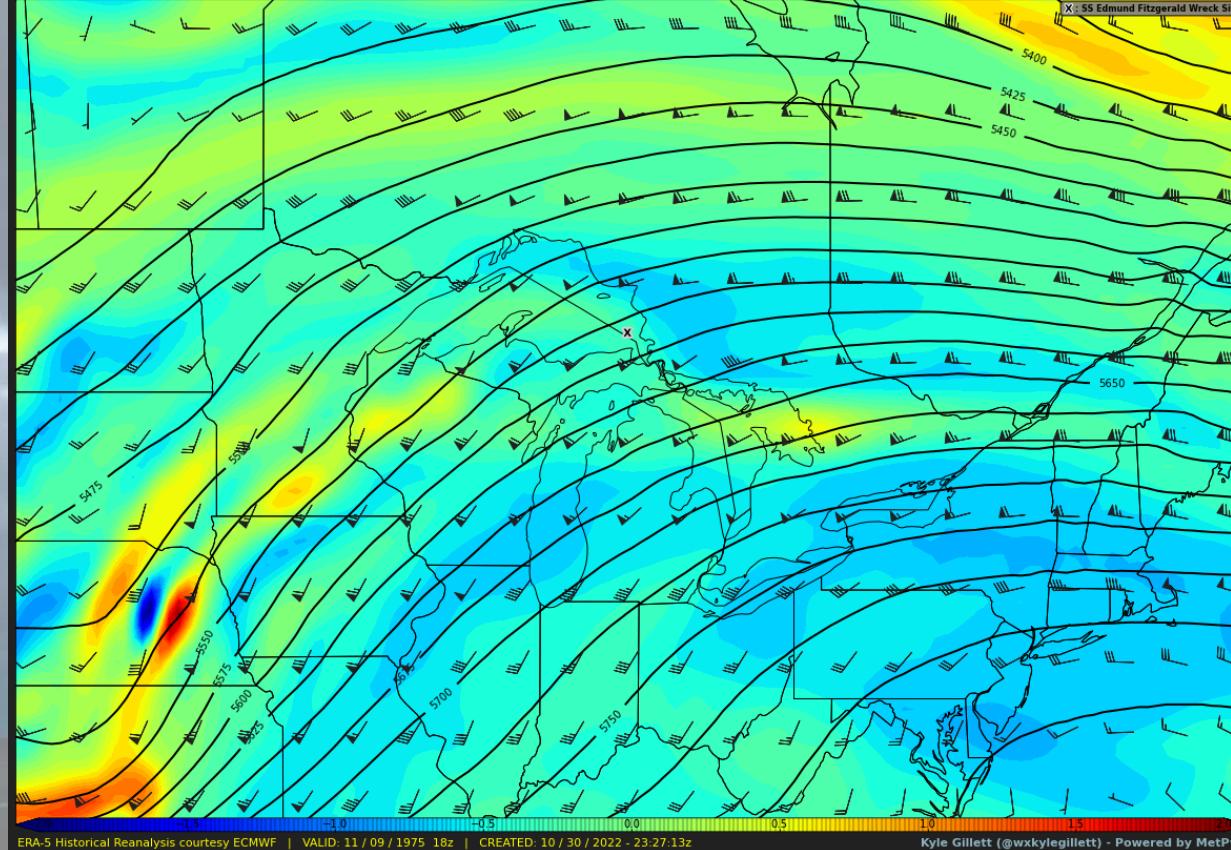
Hultquist, 2003

Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald

ERA-5 Reanalysis | 500 hPa Height (m), Absolute Vorticity (10/s), Wind (kt)

18Z | SUN NOVEMBER 09, 1975

X : SS Edmund Fitzgerald Wreck Site



ERA-5 Historical Reanalysis courtesy ECMWF | VALID: 11 / 09 / 1975 18z | CREATED: 10 / 30 / 2022 - 23:27:13z

Kyle Gillett (@wxkylegillett) - Powered by MetPy

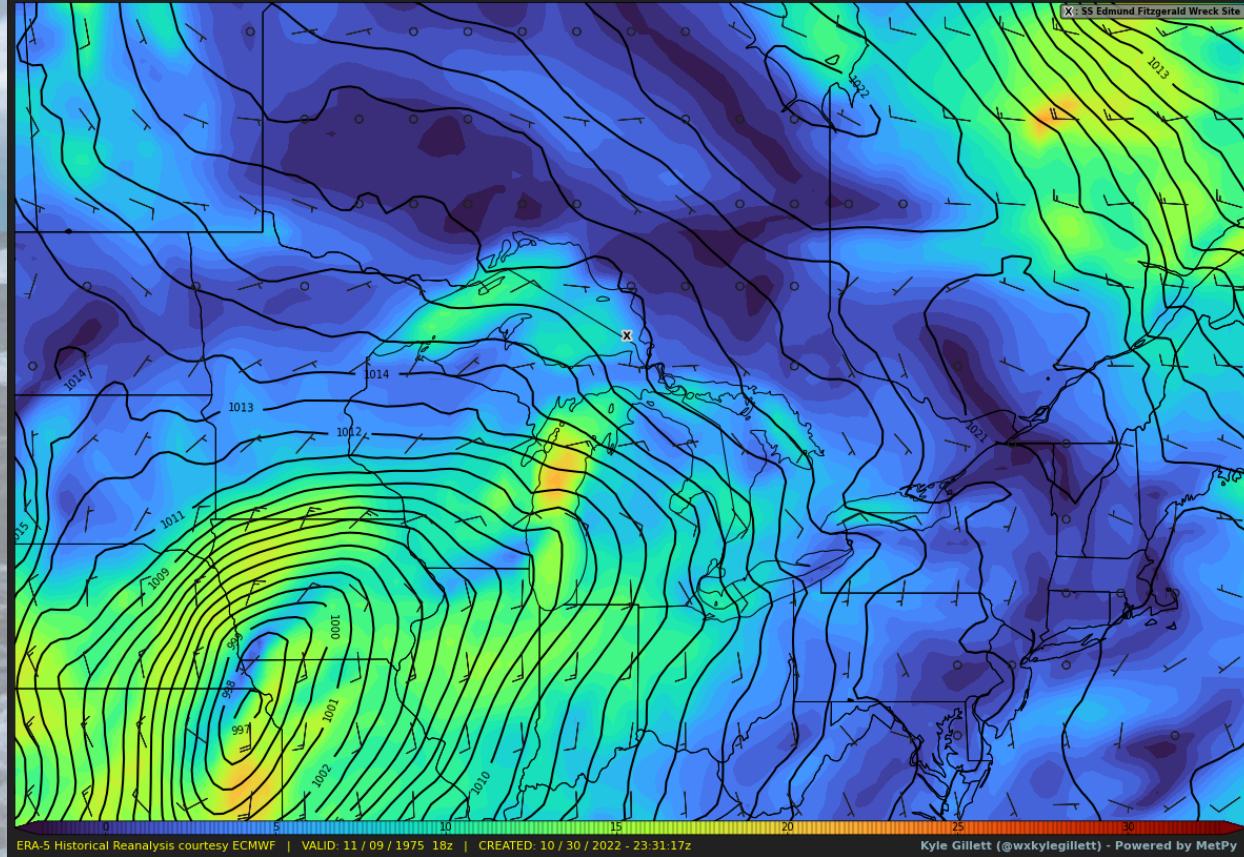
500hPa (left), Sfc (right)
18z 9 Nov 1975 [1pm 11/9]

Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald

ERA-5 Reanalysis | Surface Pressure (hPa), 10m Wind (kt)

18Z | SUN NOVEMBER 09, 1975

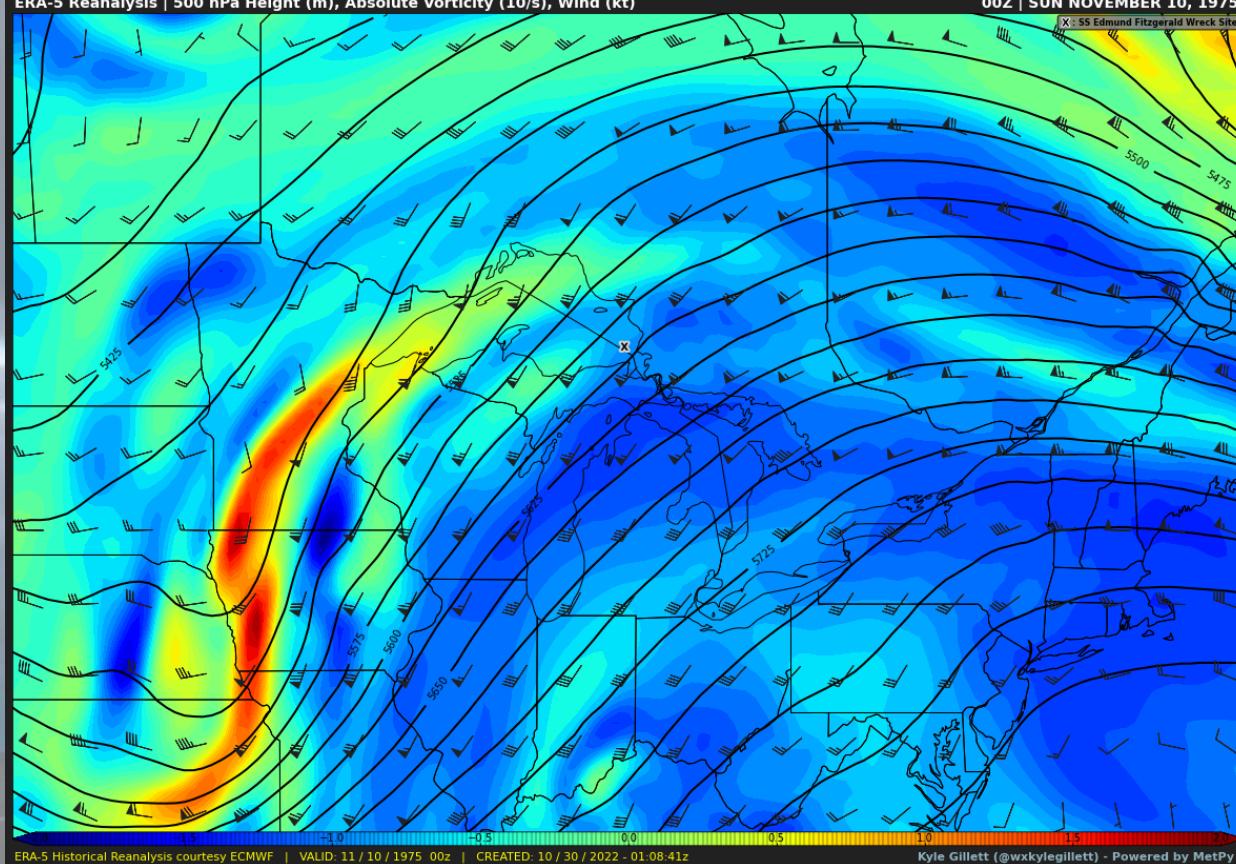
X : SS Edmund Fitzgerald Wreck Site



ERA-5 Historical Reanalysis courtesy ECMWF | VALID: 11 / 09 / 1975 18z | CREATED: 10 / 30 / 2022 - 23:31:17z

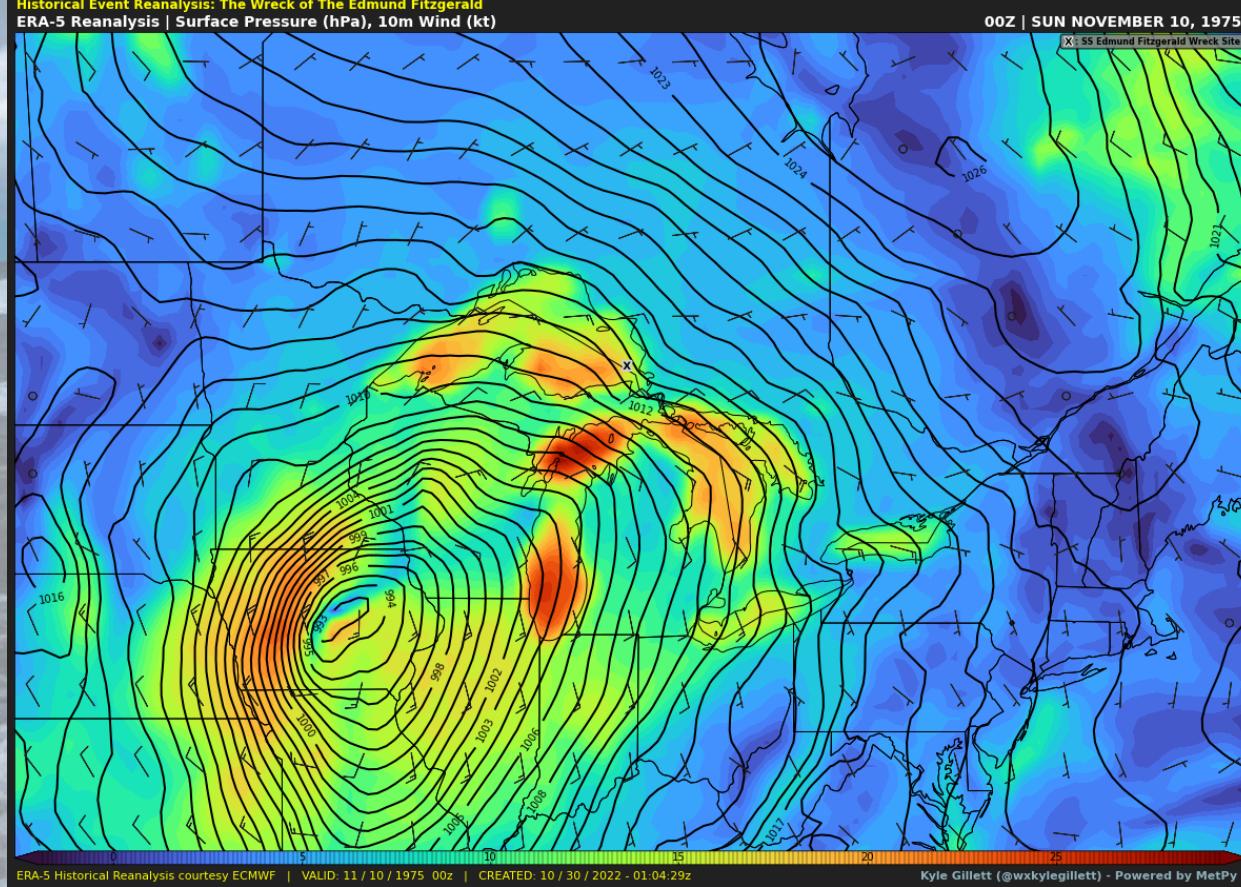
Kyle Gillett (@wxkylegillett) - Powered by MetPy

Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald
ERA-5 Reanalysis | 500 hPa Height (m), Absolute Vorticity (10/s), Wind (kt)



500hPa (left), Sfc (right)
00z 10 Nov 1975 [7pm 11/9]

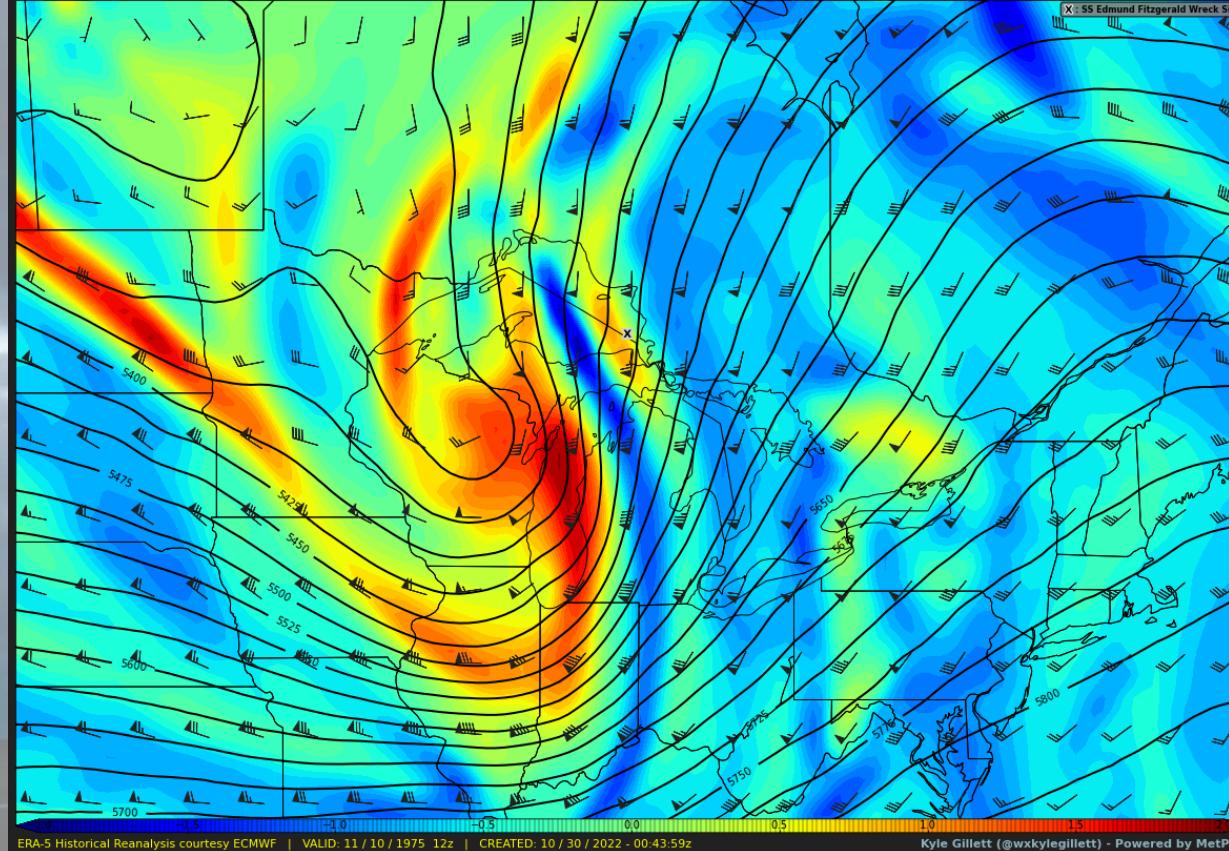
Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald
ERA-5 Reanalysis | Surface Pressure (hPa), 10m Wind (kt)



Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald
ERA-5 Reanalysis | 500 hPa Height (m), Absolute Vorticity (10/s), Wind (kt)

12Z | MON NOVEMBER 10, 1975

X : SS Edmund Fitzgerald Wreck Site



ERA-5 Historical Reanalysis courtesy ECMWF | VALID: 11 / 10 / 1975 12z | CREATED: 10 / 30 / 2022 - 00:43:59z

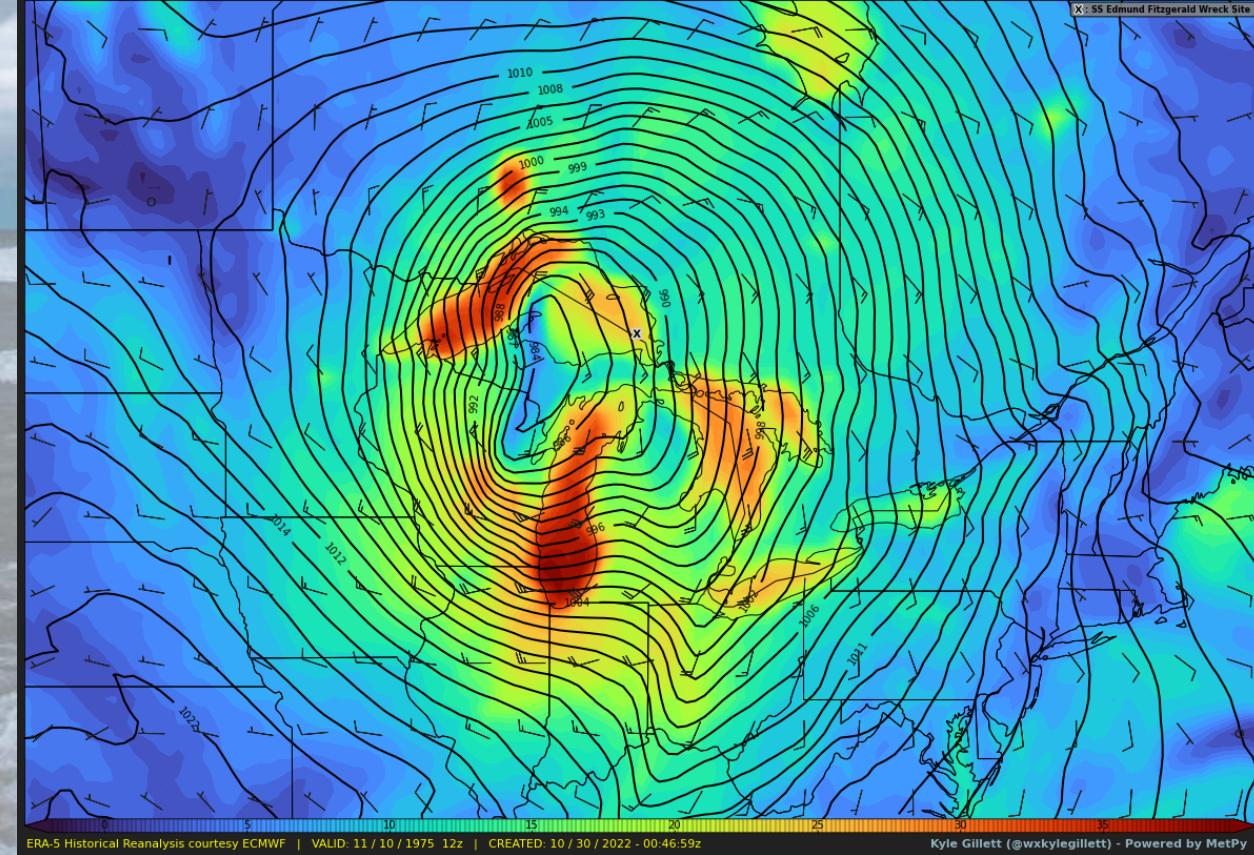
Kyle Gillett (@wxkylegillett) - Powered by MetPy

500hPa (left), Sfc (right)
12z 10 Nov 1975 [7am 11/10]

Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald
ERA-5 Reanalysis | Surface Pressure (hPa), 10m Wind (kt)

12Z | MON NOVEMBER 10, 1975

X : SS Edmund Fitzgerald Wreck Site



ERA-5 Historical Reanalysis courtesy ECMWF | VALID: 11 / 10 / 1975 12z | CREATED: 10 / 30 / 2022 - 00:46:59z

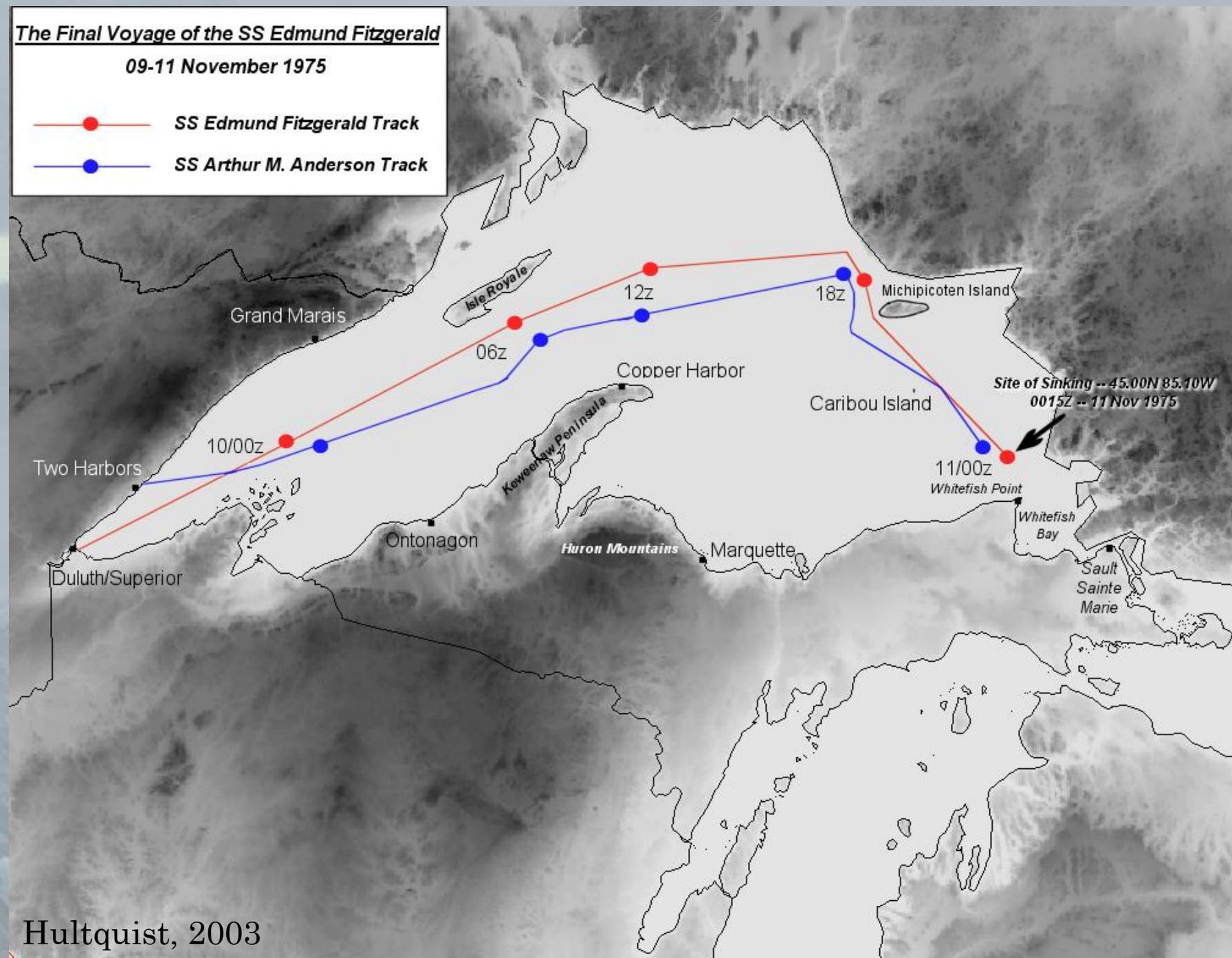
Kyle Gillett (@wxkylegillett) - Powered by MetPy

The Final Voyage of the SS Edmund Fitzgerald

09-11 November 1975

—●— **SS Edmund Fitzgerald Track**

—●— **SS Arthur M. Anderson Track**



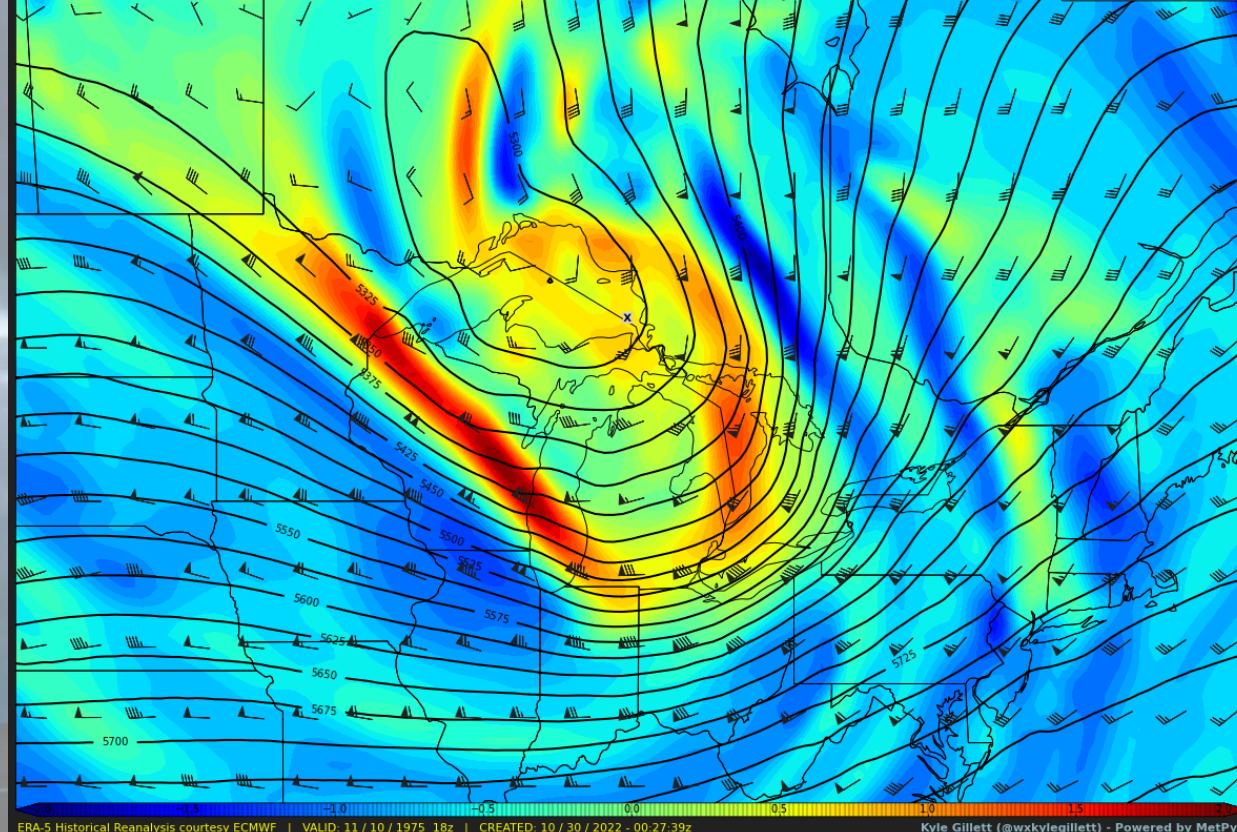
Hultquist, 2003

Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald

ERA-5 Reanalysis | 500 hPa Height (m), Absolute Vorticity (10/s), Wind (kt)

18Z | MON NOVEMBER 10, 1975

X: SS Edmund Fitzgerald Wreck Site



ERA-5 Historical Reanalysis courtesy ECMWF | VALID: 11 / 10 / 1975 18z | CREATED: 10 / 30 / 2022 - 00:27:39z

Kyle Gillett (@wxkylegillett) - Powered by MetPy

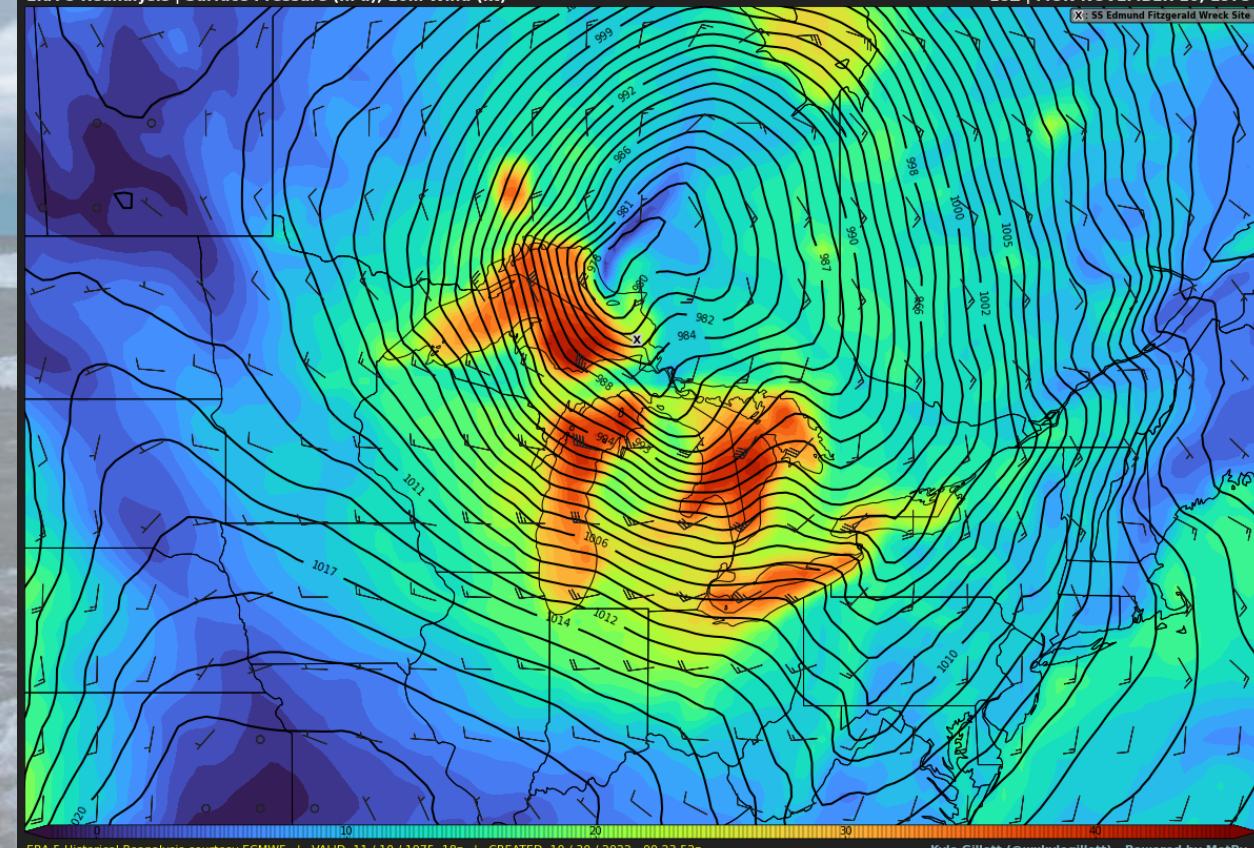
500hPa (left), Sfc (right)
18z 10 Nov 1975 [1pm 11/10]

Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald

ERA-5 Reanalysis | Surface Pressure (hPa), 10m Wind (kt)

18Z | MON NOVEMBER 10, 1975

X: SS Edmund Fitzgerald Wreck Site



ERA-5 Historical Reanalysis courtesy ECMWF | VALID: 11 / 10 / 1975 18z | CREATED: 10 / 30 / 2022 - 00:23:52z

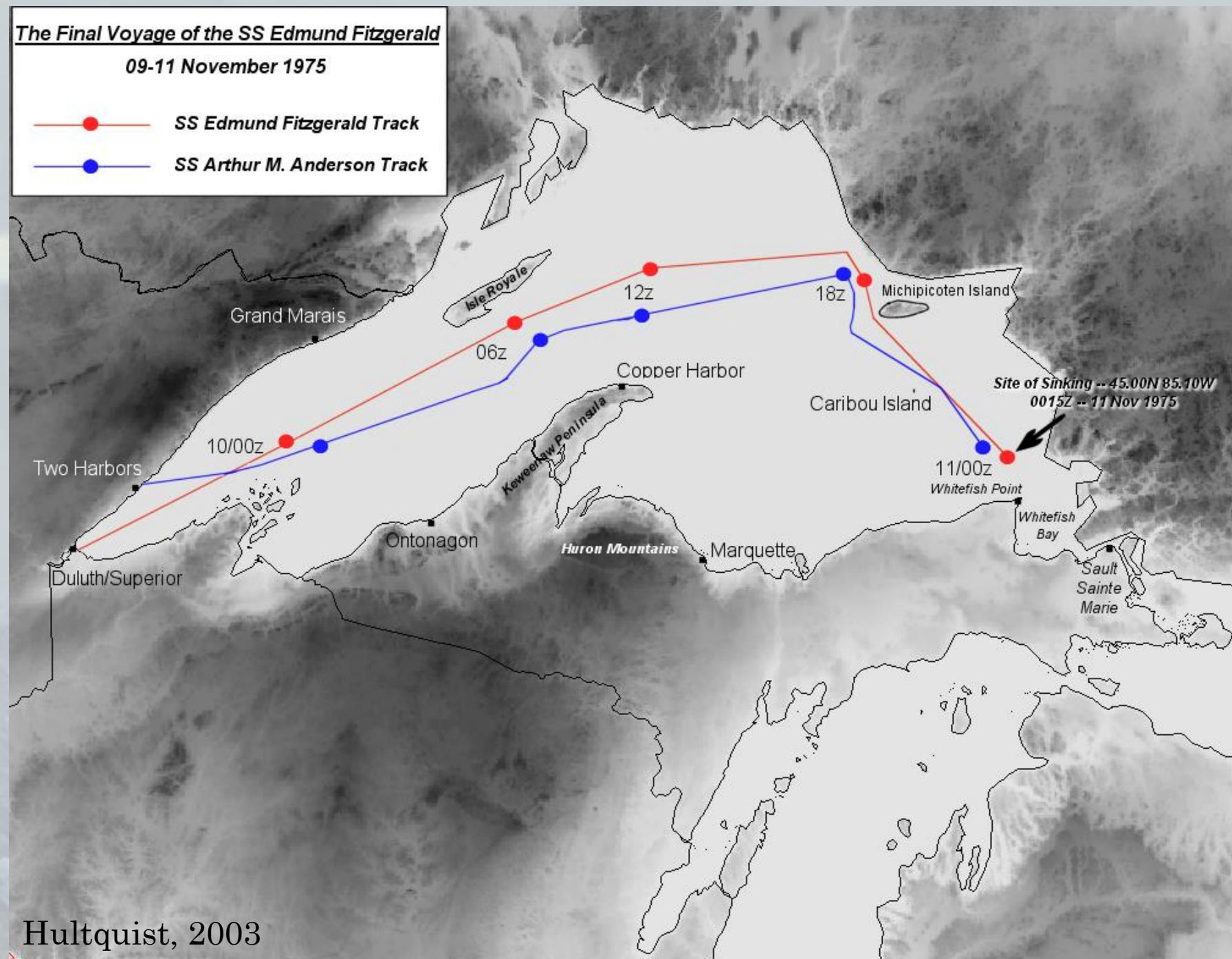
Kyle Gillett (@wxkylegillett) - Powered by MetPy

The Final Voyage of the SS Edmund Fitzgerald

09-11 November 1975

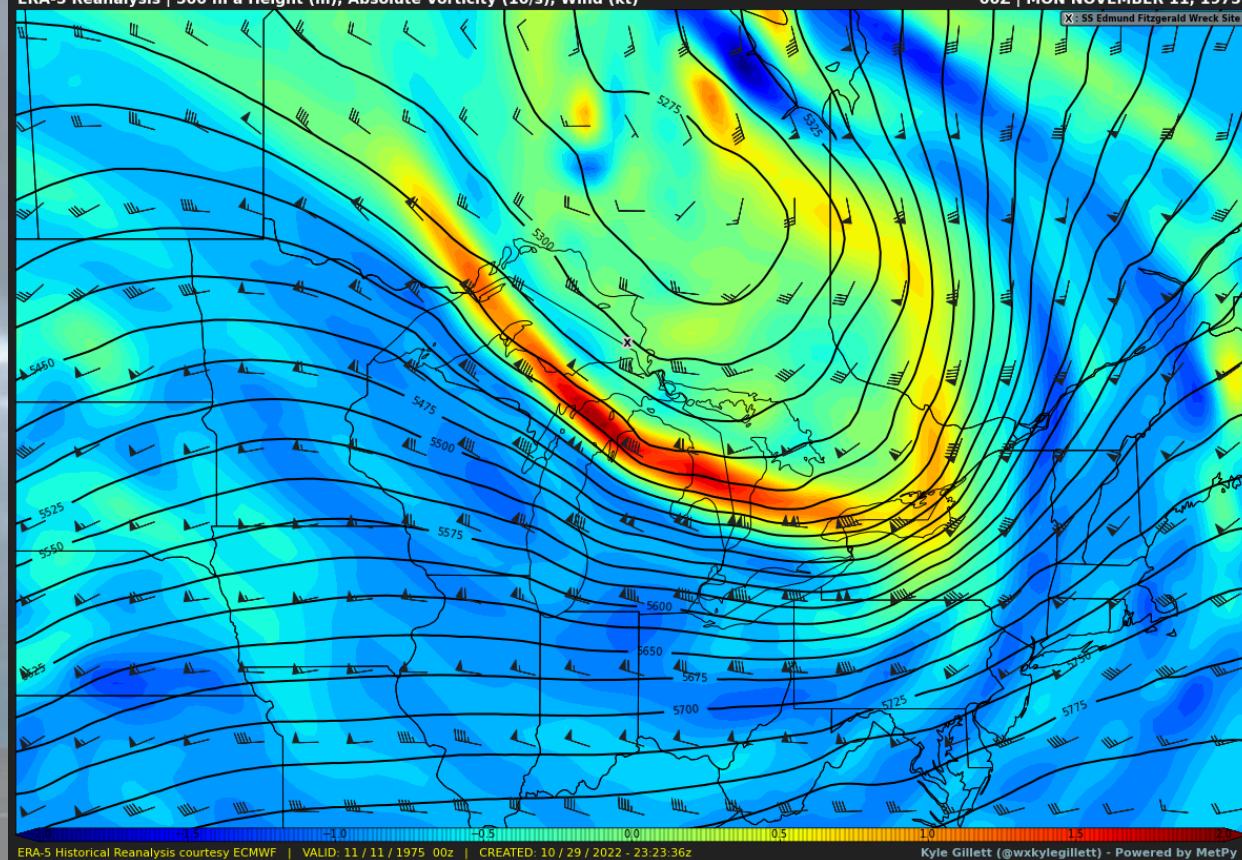
SS Edmund Fitzgerald Track

SS Arthur M. Anderson Track



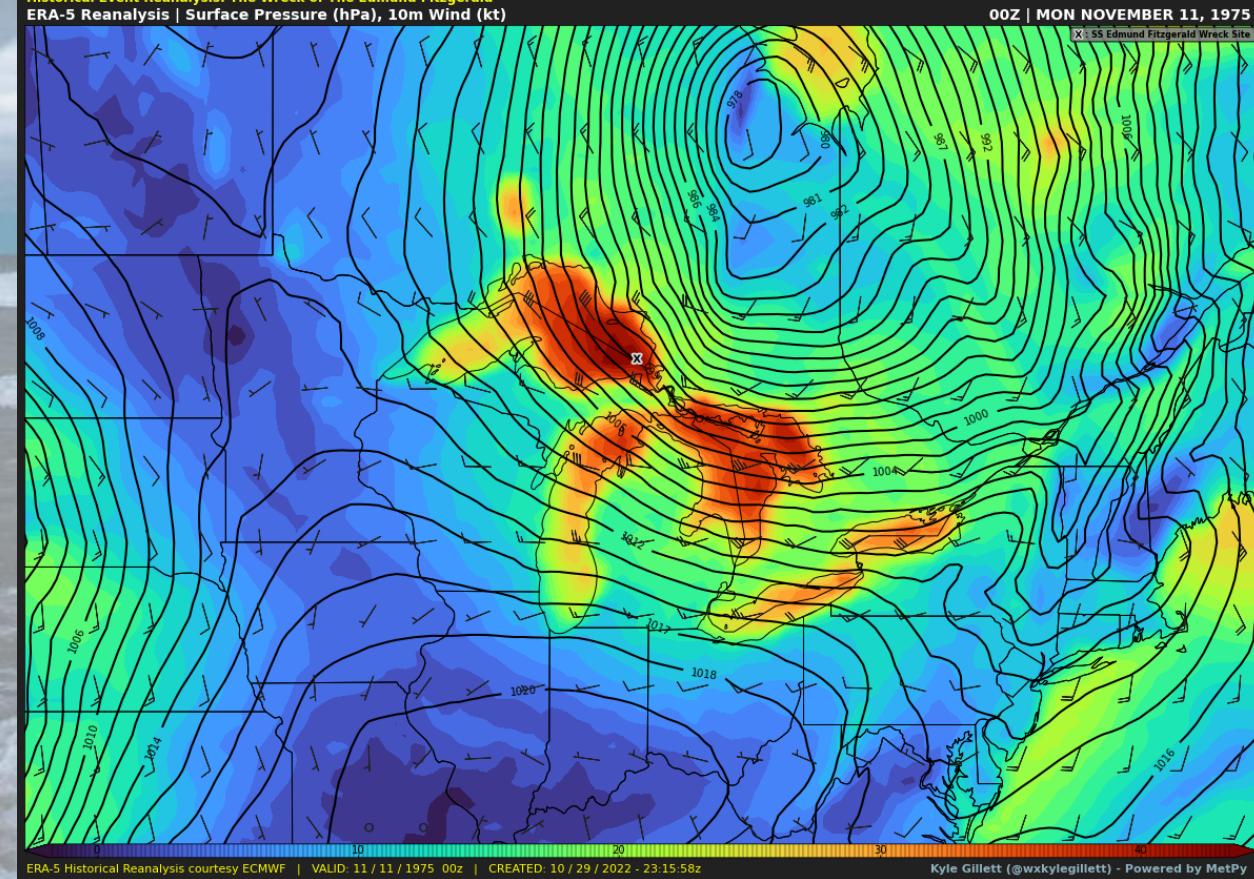
Hultquist, 2003

Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald
ERA-5 Reanalysis | 500 hPa Height (m), Absolute Vorticity (10/s), Wind (kt)



500hPa (left), Sfc (right)
00z 11 Nov 1975 [7pm 11/10]

Historical Event Reanalysis: The Wreck of The Edmund Fitzgerald
ERA-5 Reanalysis | Surface Pressure (hPa), 10m Wind (kt)

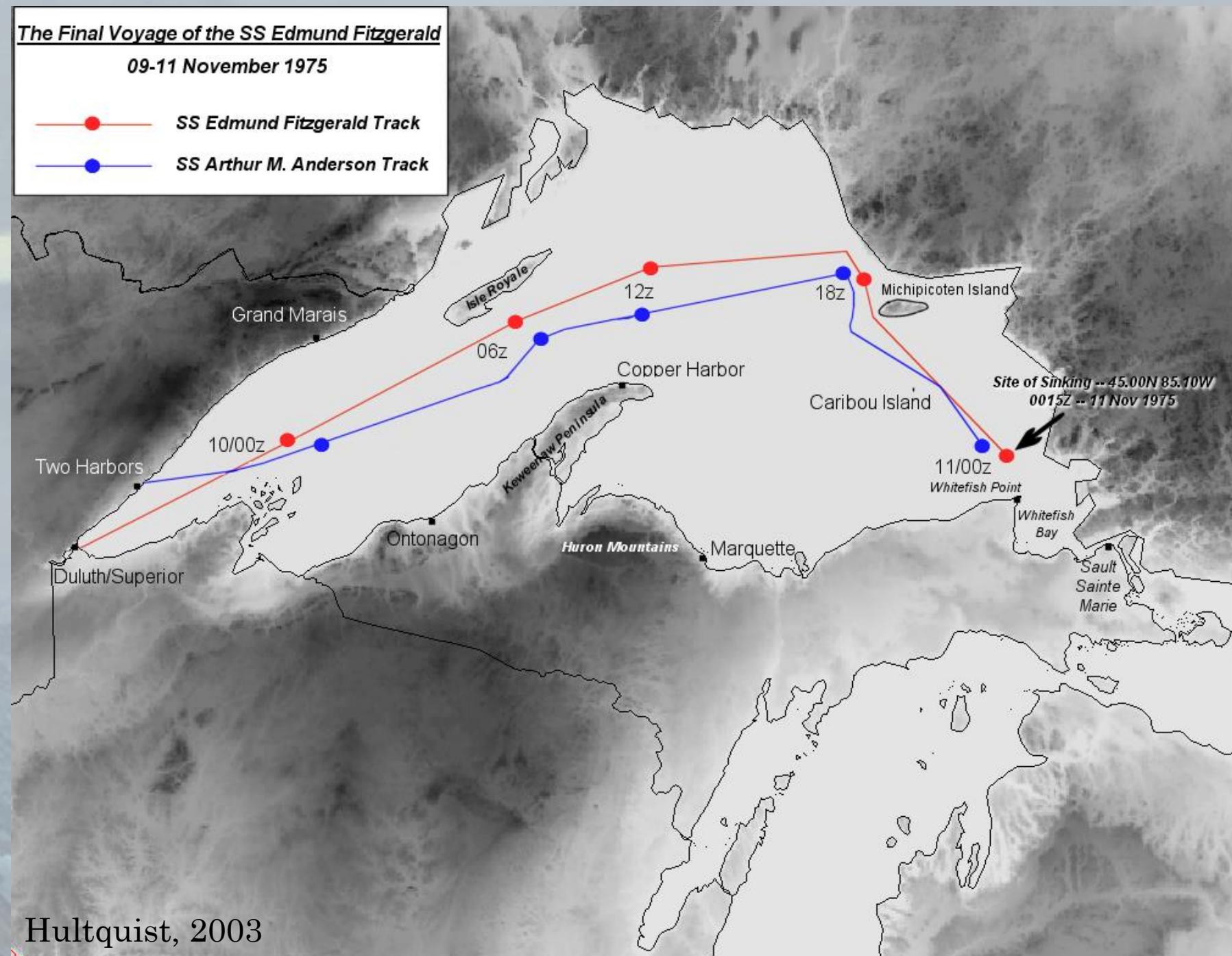


The Final Voyage of the SS Edmund Fitzgerald

09-11 November 1975

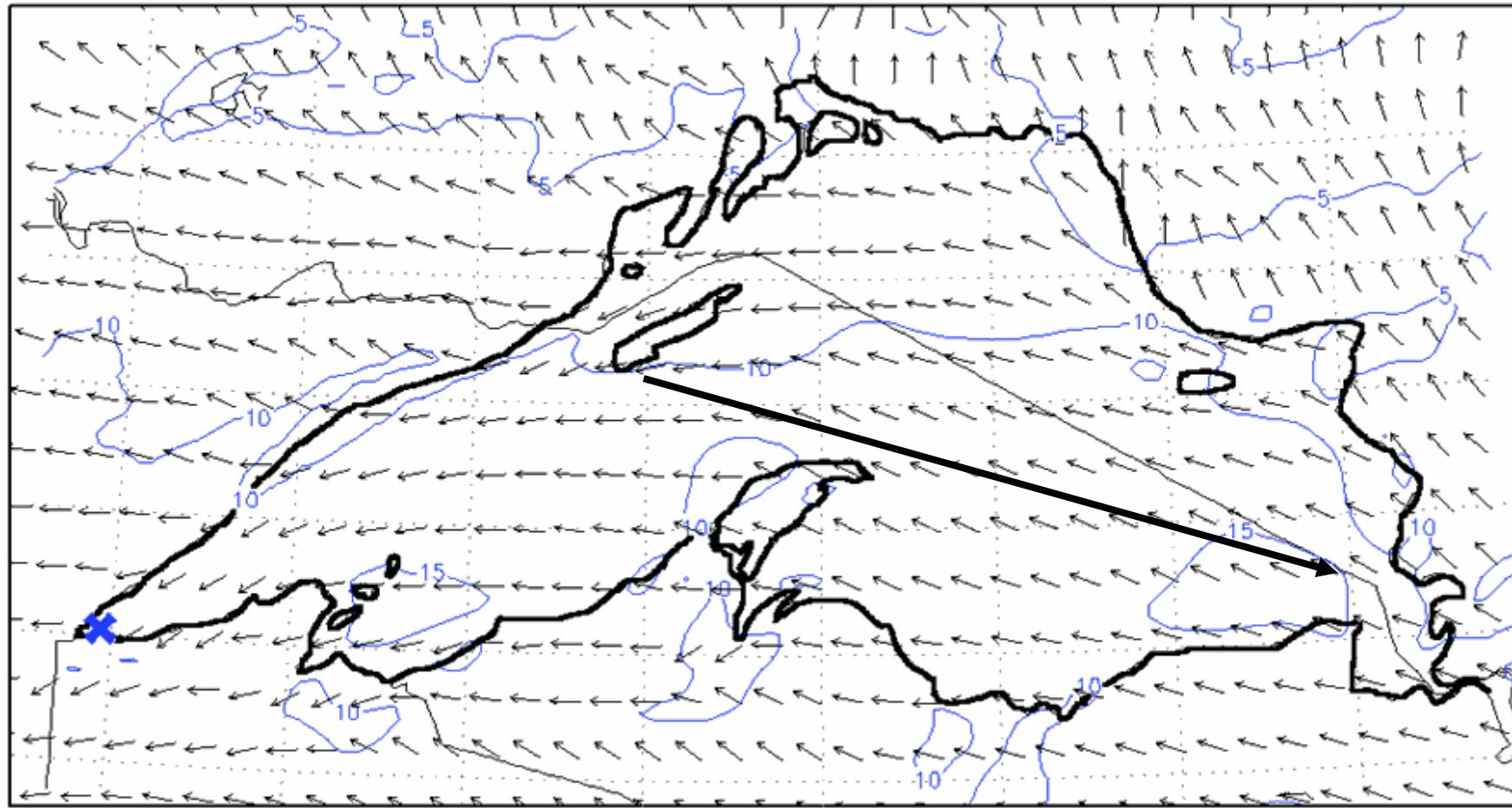
—●— **SS Edmund Fitzgerald Track**

—●— **SS Arthur M. Anderson Track**

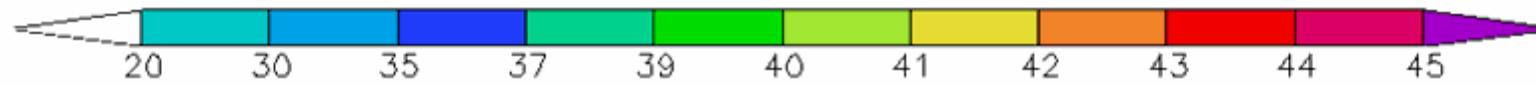


Hultquist, 2003

1 PM EST, November 9, 1975

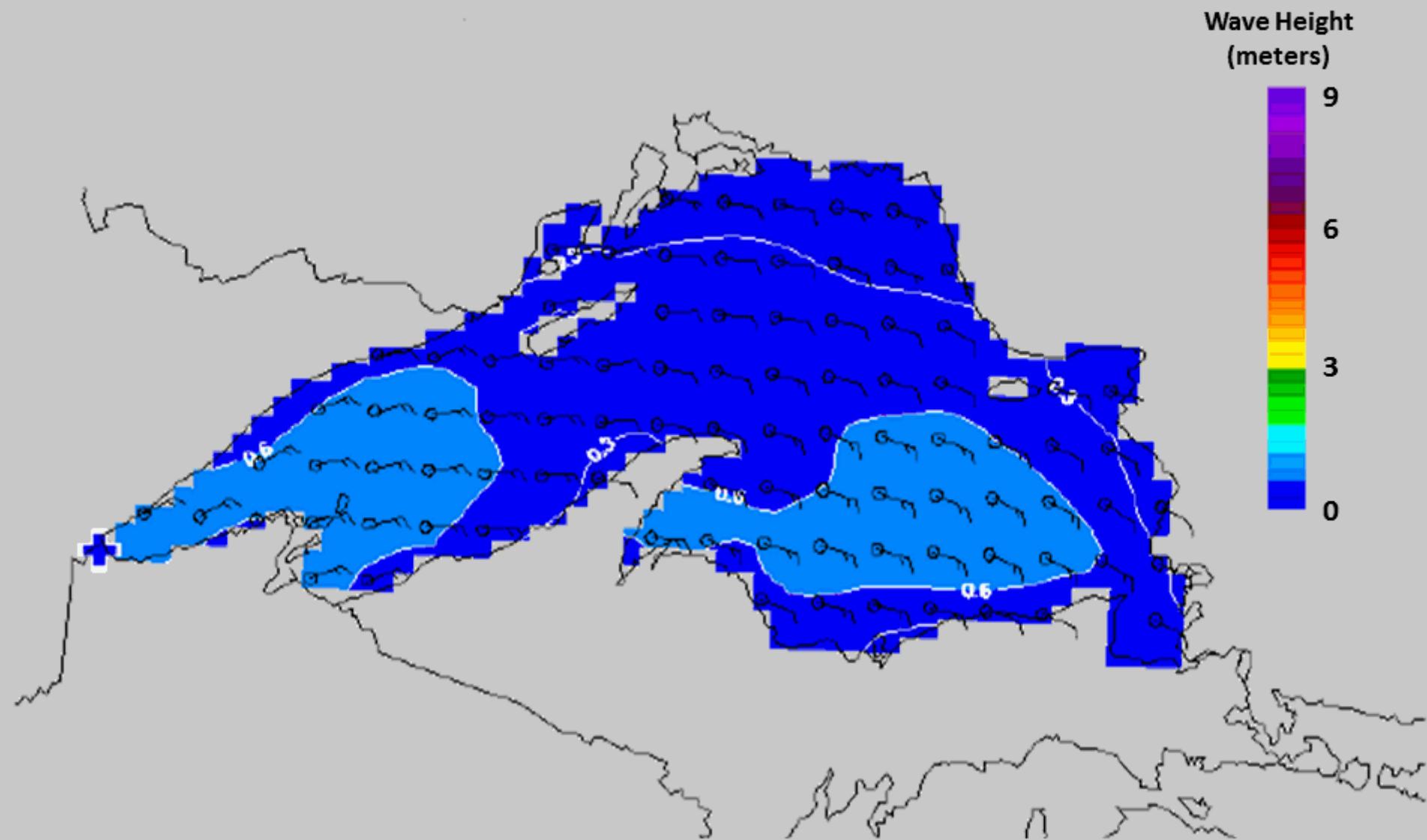


50 Meter Wind Speed (Knots) & Wind Direction



(Hultquist, 2003)

1 PM EST, November 9, 1975



(Hultquist, 2003)

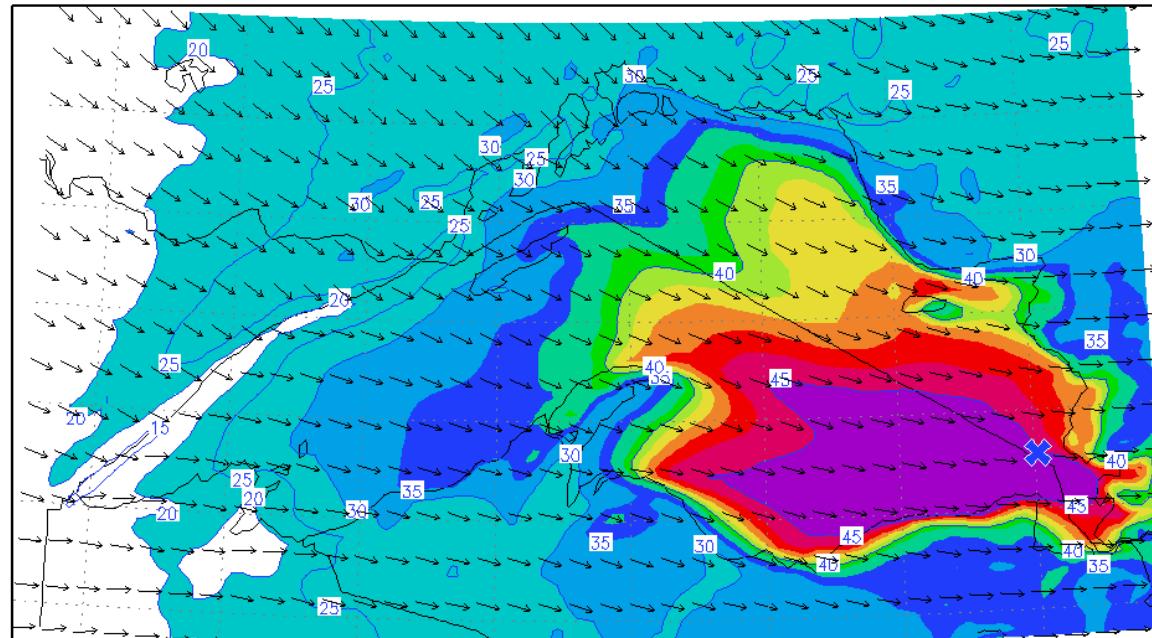
Wave height in color (meters) and wind field

45-55kt (51-63mph)

[many reports suggested 60-80 mph winds]

Final Voyage of the Edmund Fitzgerald
November 9–11 1975

50m Wind Speed (kt) & Wind Direction -- 00Z11NOV1975



(Hultquist, 2003)

7-10m (22-32ft)

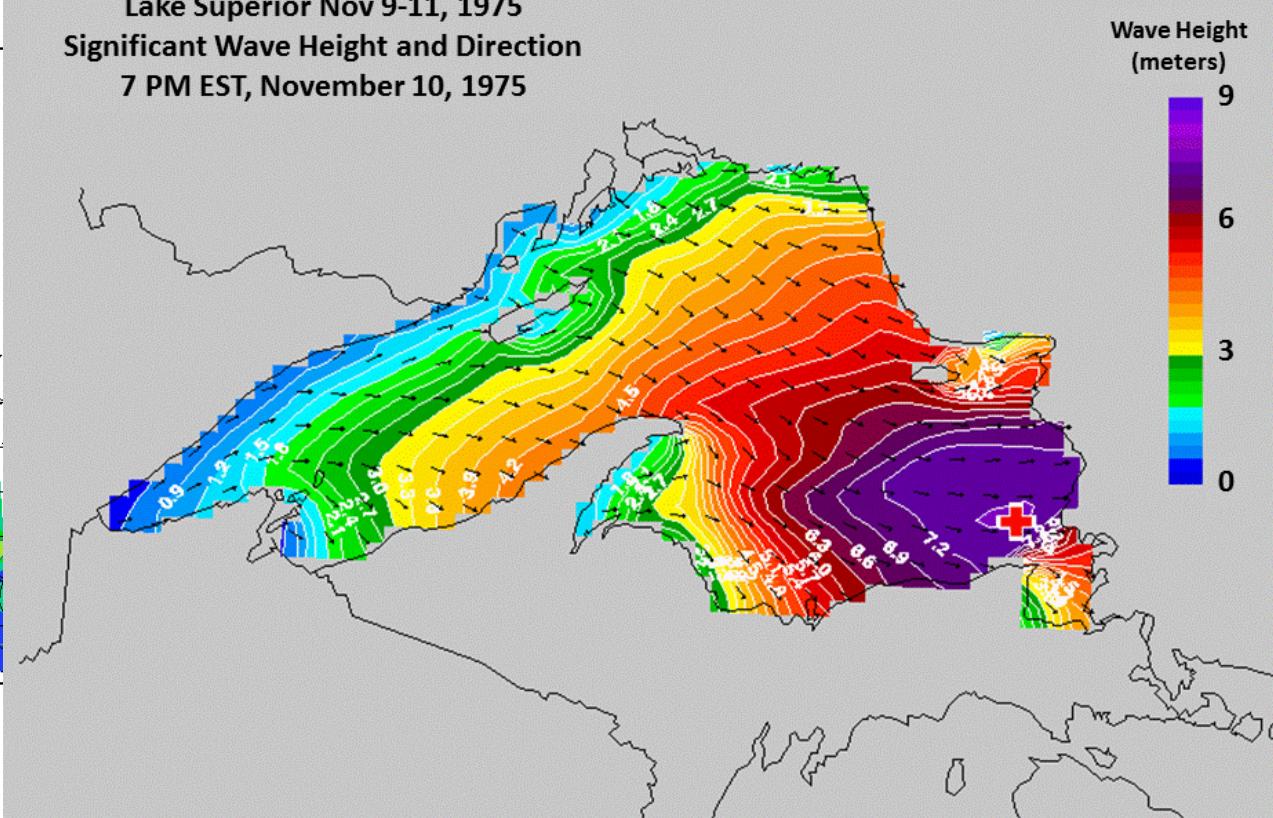
[reports from the Anderson suggest 30-35ft waves]

Last Voyage of the Edmund Fitzgerald

Lake Superior Nov 9-11, 1975

Significant Wave Height and Direction

7 PM EST, November 10, 1975



1km grid spacing nest 50m
wind speed

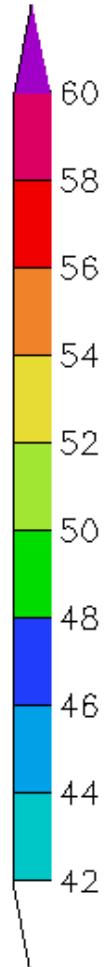
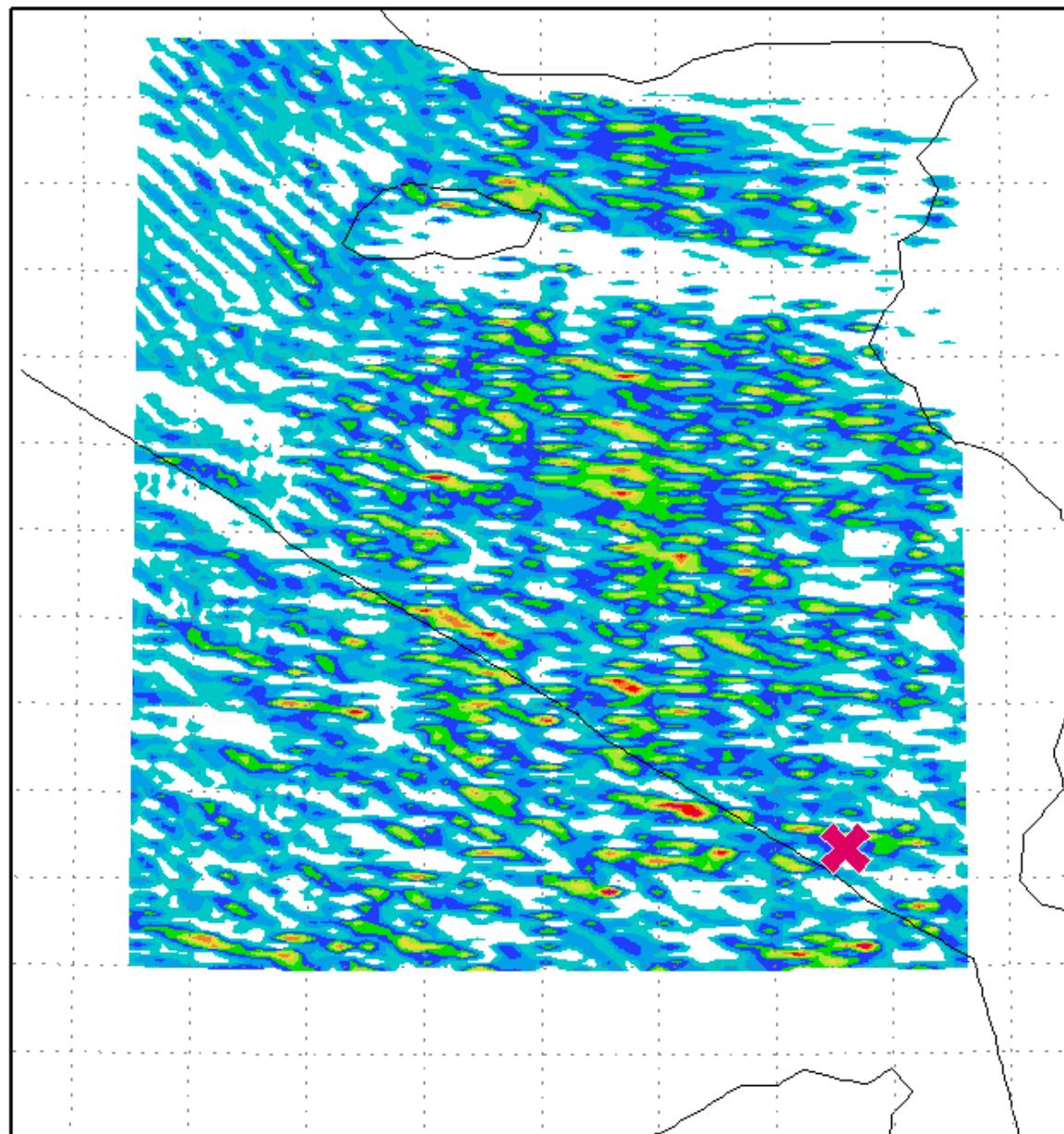
Model indicates localized
55-65kt pockets

(Up to 75mph!)

Likely associated with
horizontal roll convection
cells and snow squalls.

(Hultquist, 2003)

Final Voyage of the Edmund Fitzgerald
November 9–11 1975



T'was the witch of November come steasin'

The Fitzgerald rounded Caribou Island shortly after 3pm

Captain Cooper of the SS Arthur M. Anderson reports the Fitzgerald is too close to 'Six Fathom Shoals' near the island

At 3:30pm Cpt. McSorley radios Cpt. Cooper "water coming in"

At 4:10pm the Fitz loses both radars

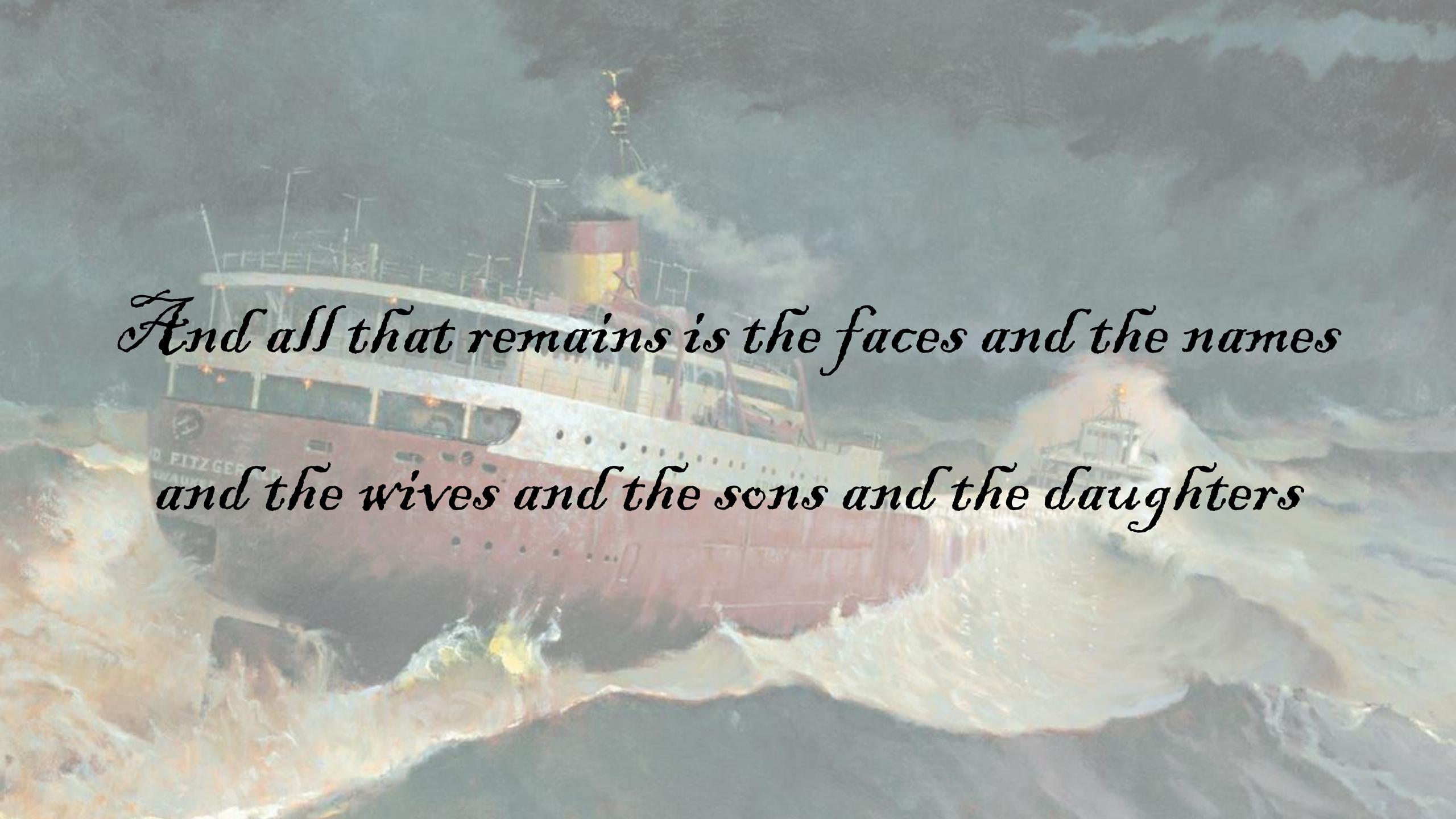
At 7:10pm "we are holding our own"

When the waves turn the minutes to hours. . .

By 7:15pm a heavy snow squall causes the Anderson to lose sight of the Fitzgerald (lost on radar at 7:20pm – typical in a heavy squall)

The squall ends by 7:30pm. Anderson attempts to spot the Fitz, her lights are no where to be found.

Shortly before 8pm the Anderson calls the Coast Guard.



*And all that remains is the faces and the names
and the wives and the sons and the daughters*