

2024 Meteorological Memories

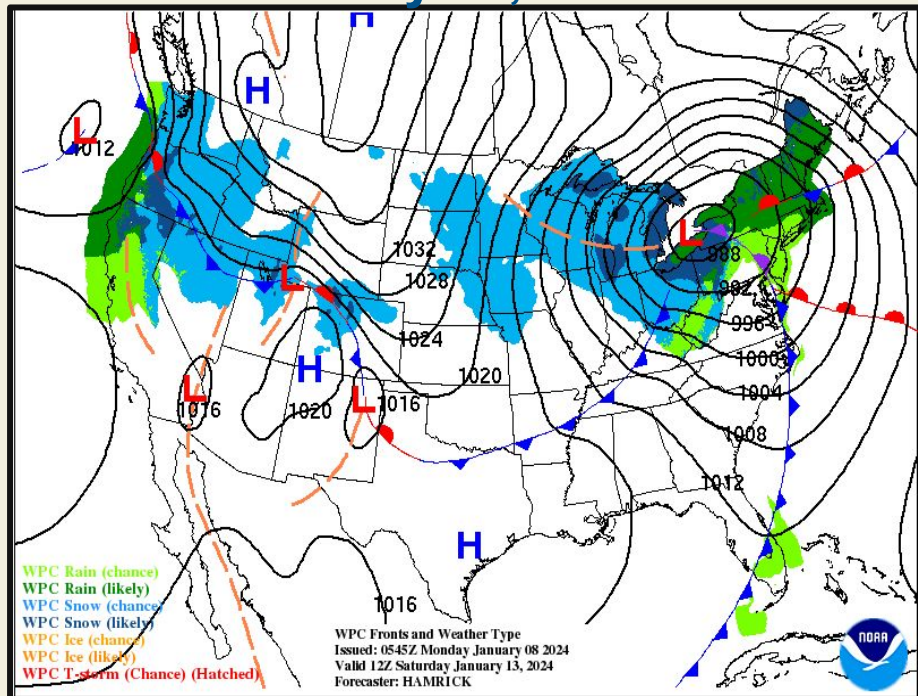
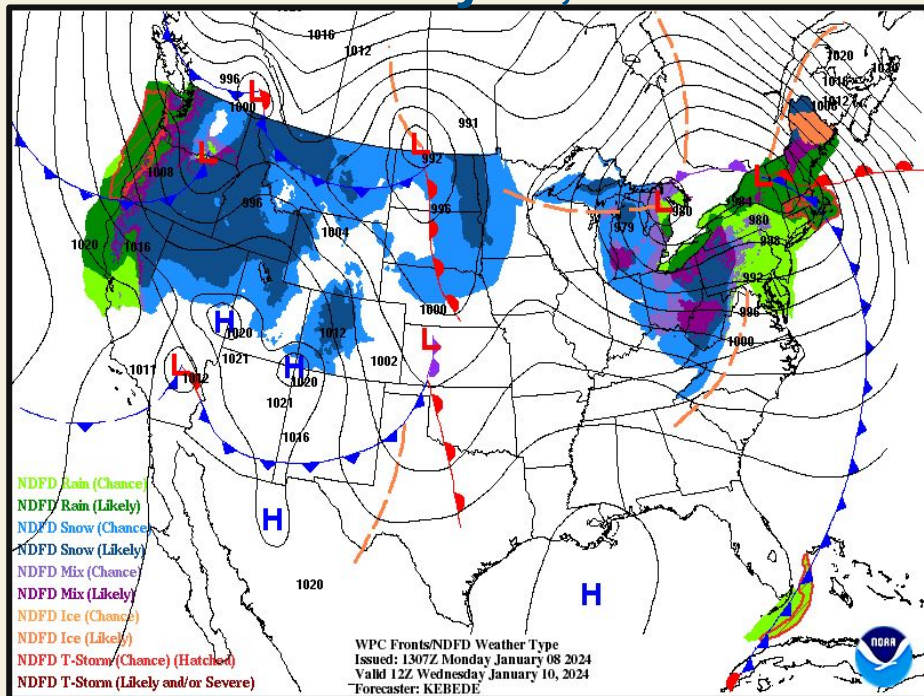
Greg Carbin



Memory #1... January Fury: Back-to-Back Coast-to-Coast Cyclones

January 10, 2024

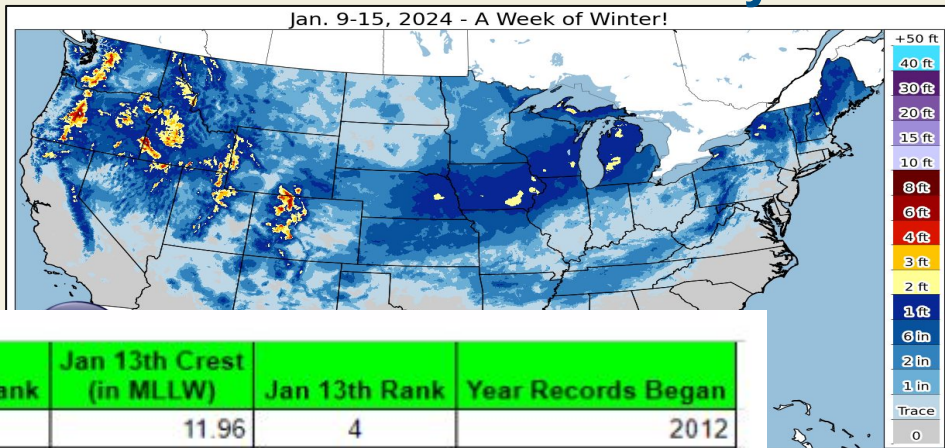
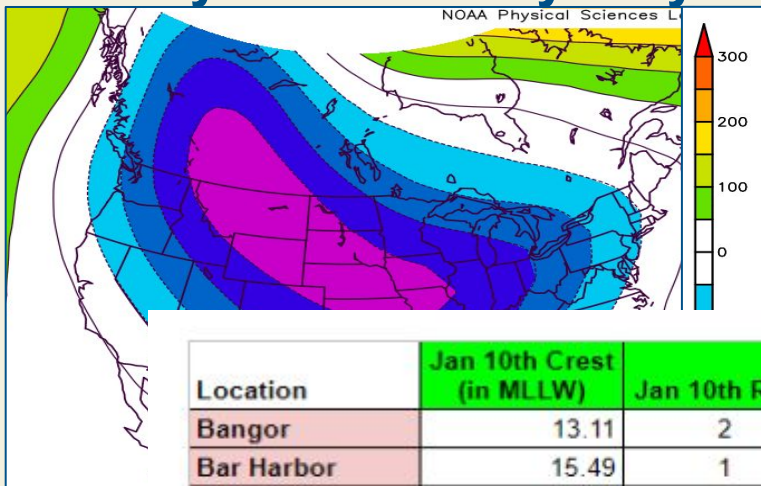
January 13, 2024



[Click for amazing satellite evolution!](https://x.com/NOAASatellites/status/1744799319499186579?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1744799319499186579%7Ctwgr%5Ecfb79167129cde8eca3c1f6c48c57c3a3cea1e4%7Ctwcon%5Es1_c10&ref_url=https%3A%2F%2Fwww.wunderground.com%2Farticle%2Fstorms%2Fwinter%2Fnews%2F2024-01-05-winter-storm-finn-forecast-snow-wind-west-plains-midwest-northeast)

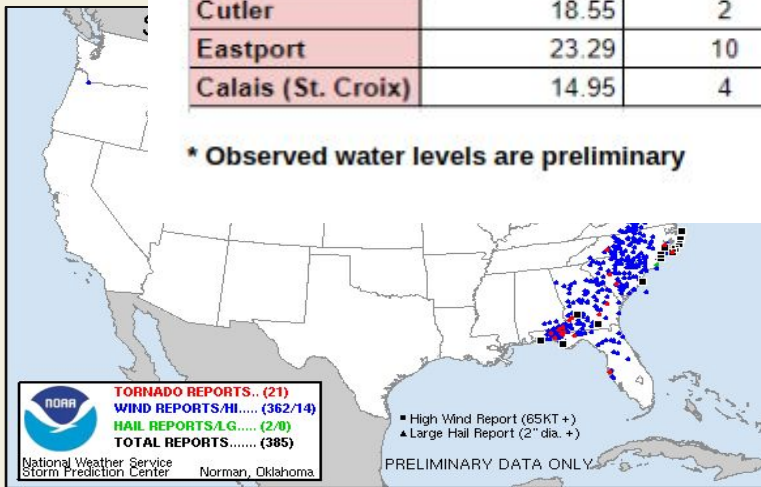
https://x.com/NOAASatellites/status/1744799319499186579?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1744799319499186579%7Ctwgr%5Ecfb79167129cde8eca3c1f6c48c57c3a3cea1e4%7Ctwcon%5Es1_c10&ref_url=https%3A%2F%2Fwww.wunderground.com%2Farticle%2Fstorms%2Fwinter%2Fnews%2F2024-01-05-winter-storm-finn-forecast-snow-wind-west-plains-midwest-northeast

Memory #1... January Fury: Back-to-Back Coast-to-Coast Cyclones



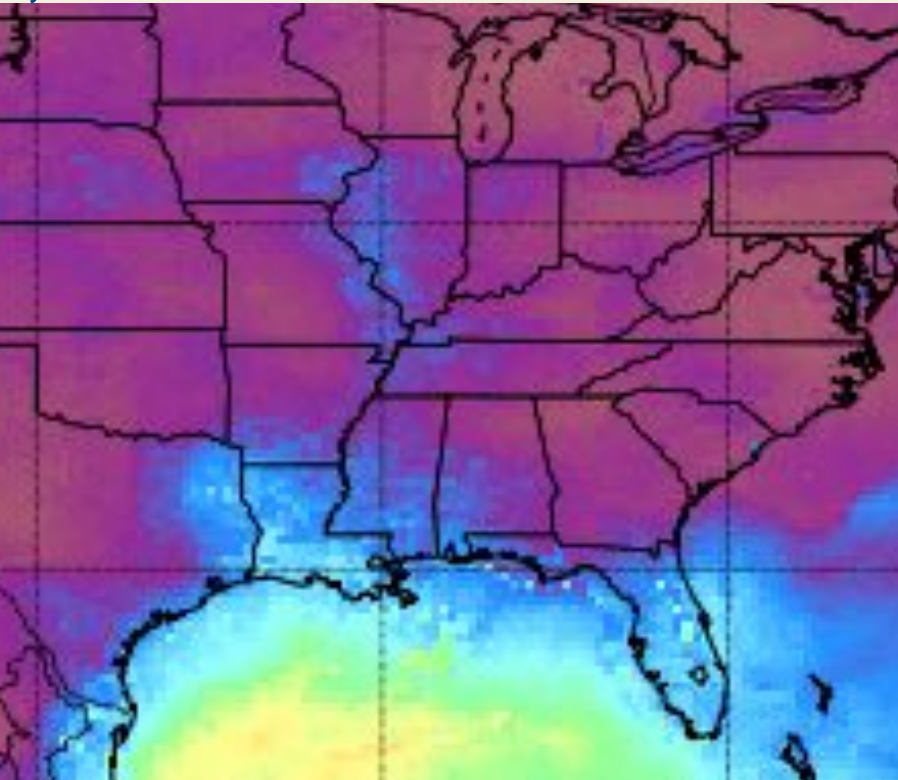
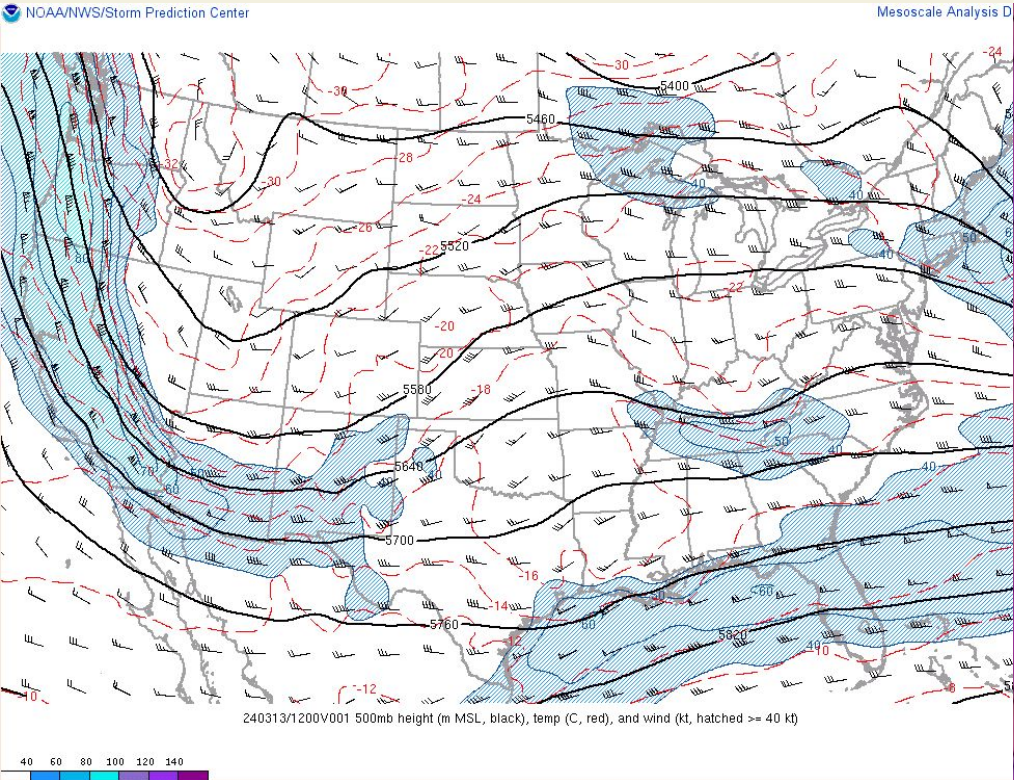
Location	Jan 10th Crest (in MLLW)	Jan 10th Rank	Jan 13th Crest (in MLLW)	Jan 13th Rank	Year Records Began
Bangor	13.11	2	11.96	4	2012
Bar Harbor	15.49	1	15.81	1	1947
Cutler	18.55	2	18.89	1	2010
Eastport	23.29	10	23.92	4	1929
Calais (St. Croix)	14.95	4	15.99	2	2015

* Observed water levels are preliminary

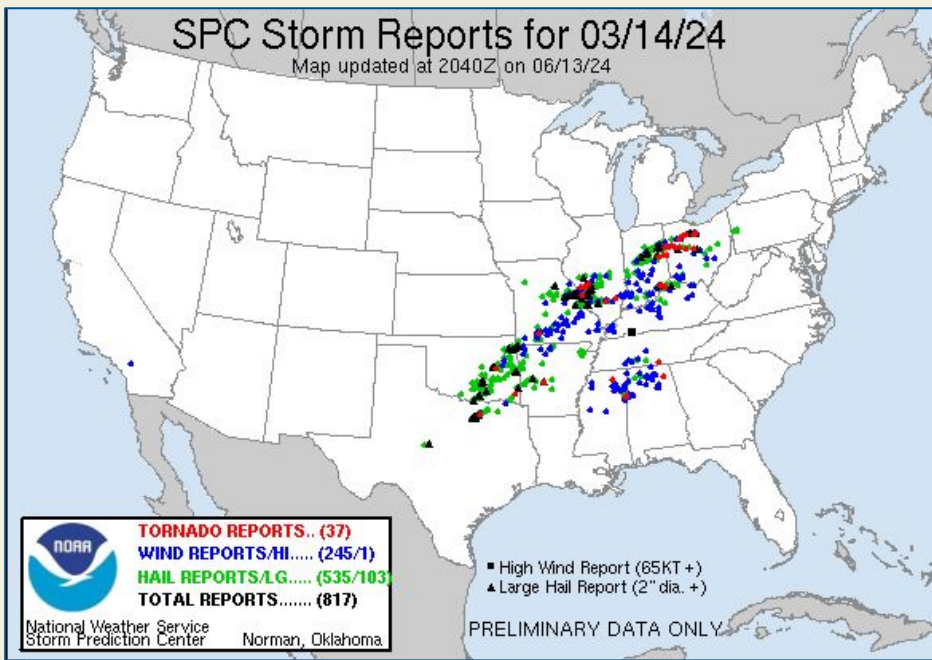


Memory #2... March Madness: Tornadoes & Severe Storms in the Heartland

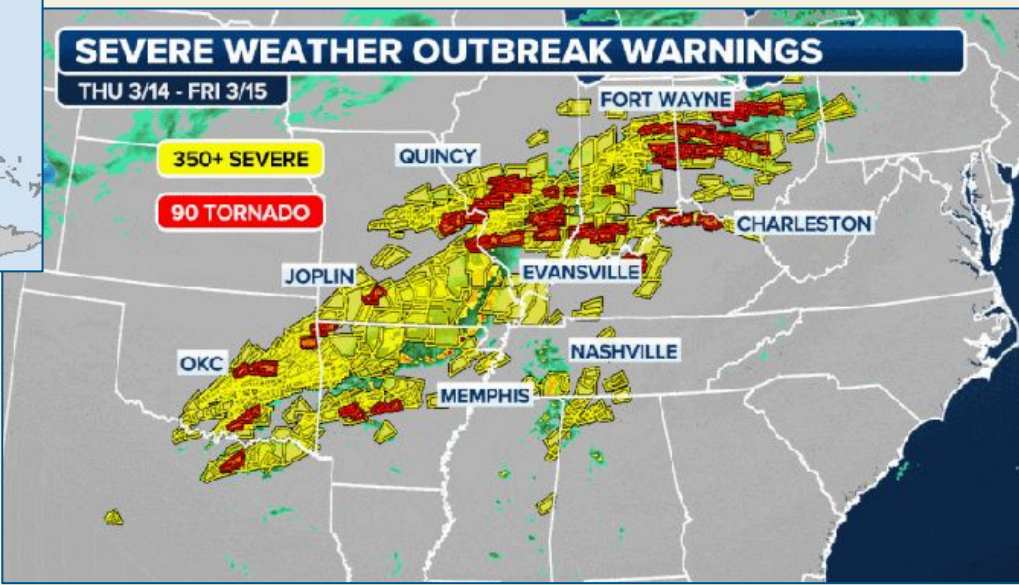
March 13-15, 2024



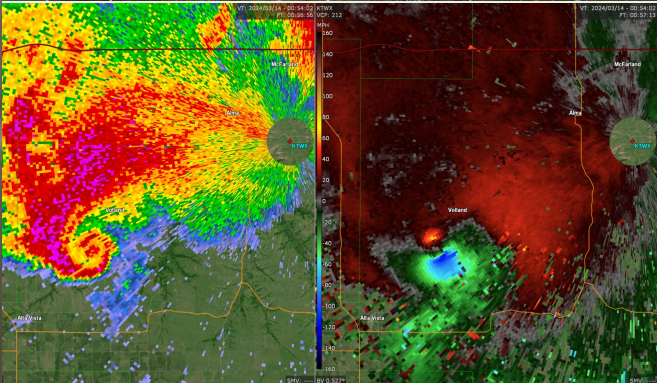
Memory #2... March Madness: Tornadoes & Severe Storms in the Heartland



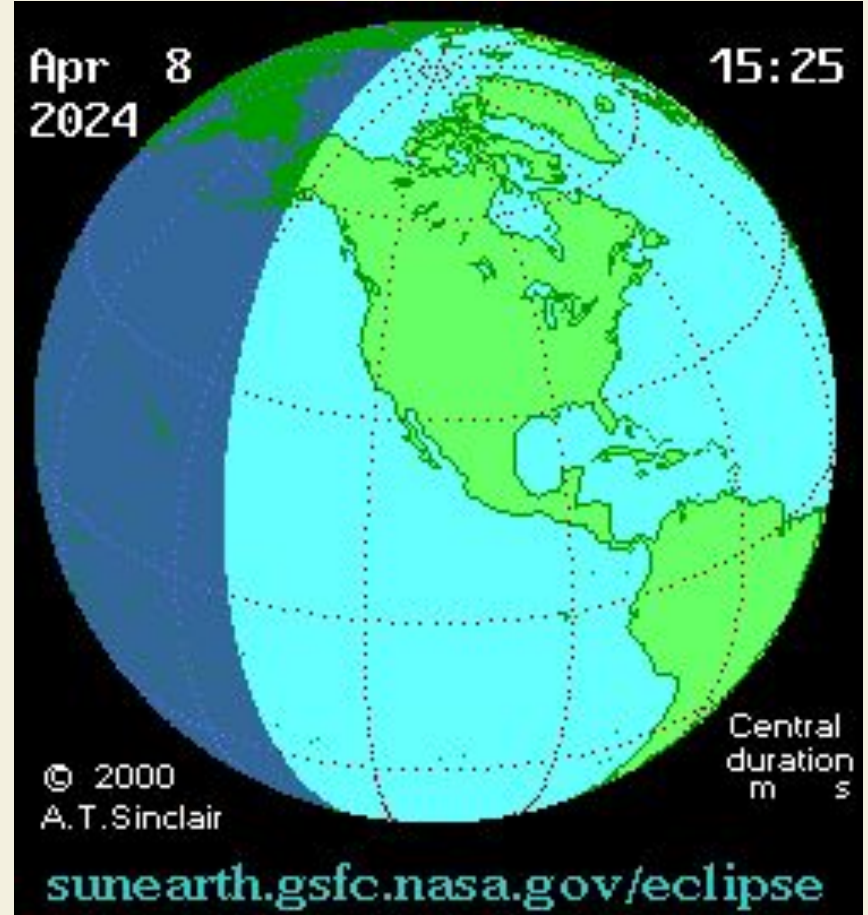
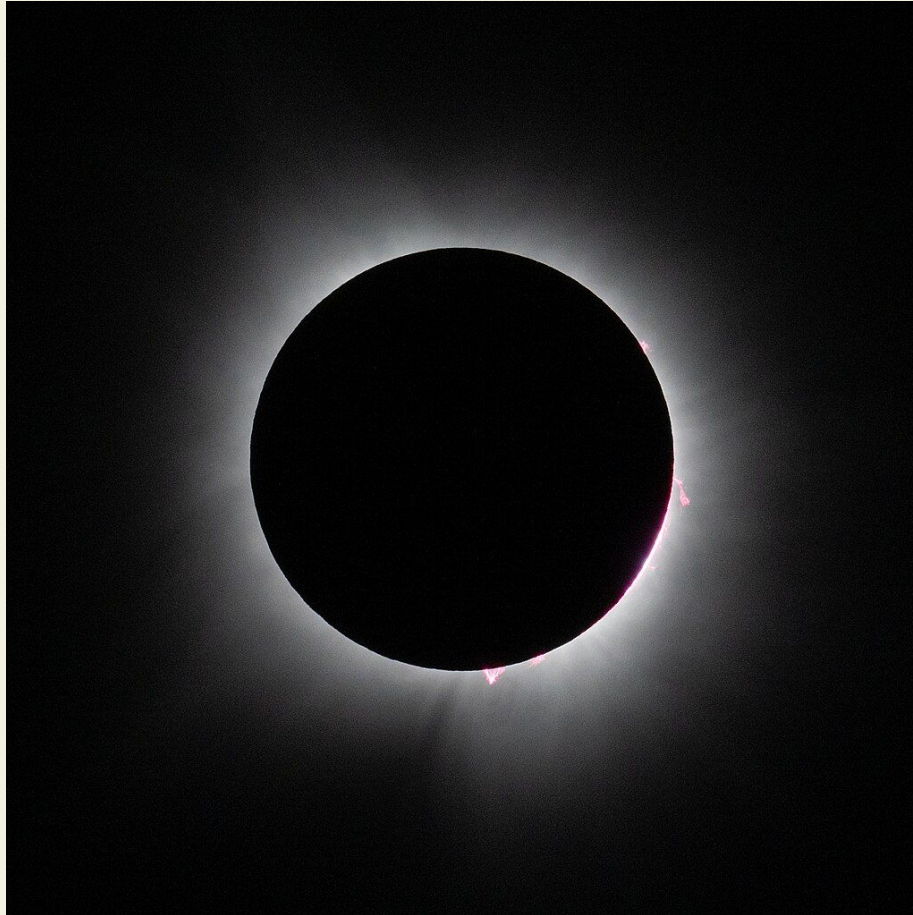
March 13-15, 2024



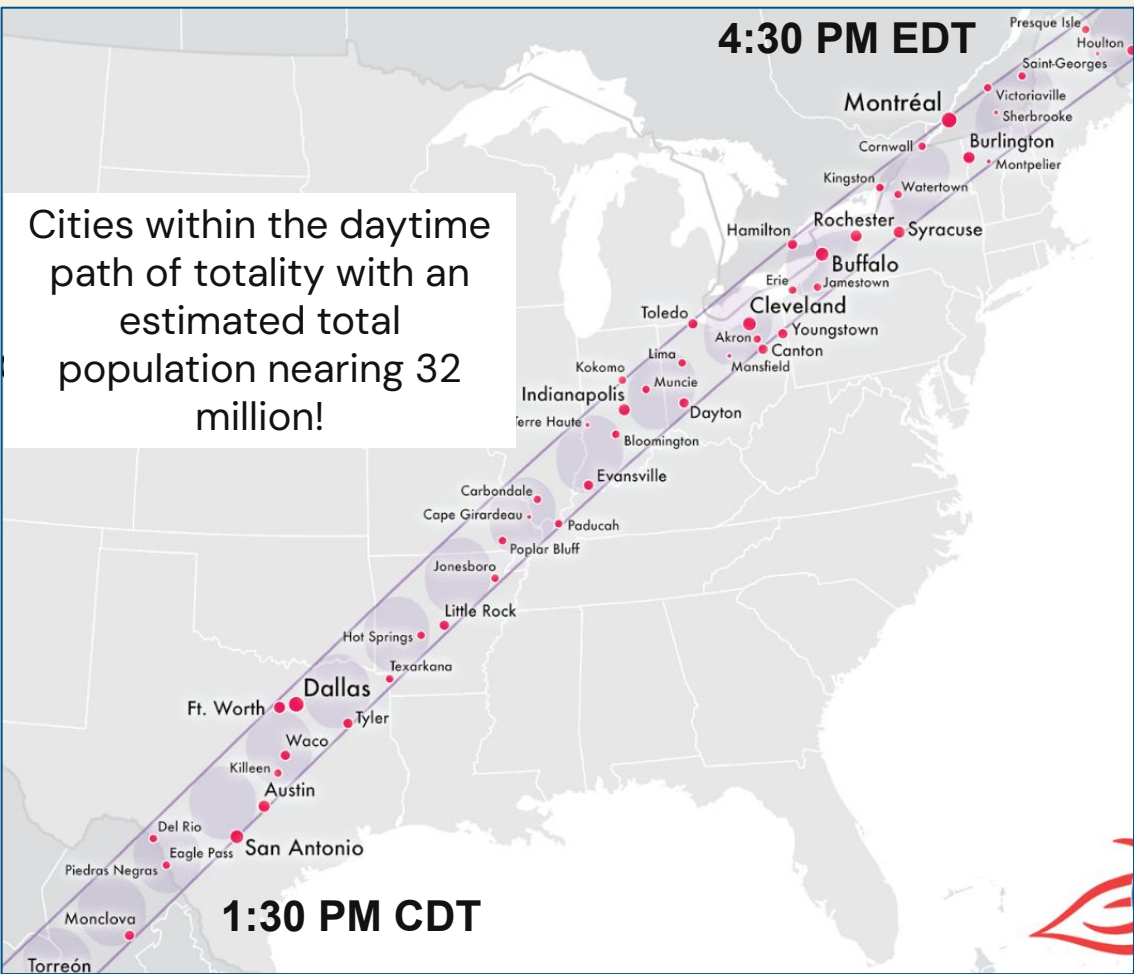
Memory #2... March Madness: Tornadoes & Severe Storms in the Heartland



Memory #3... The Great North American Eclipse of April 8, 2024



Memory #3... The Great North American Eclipse of April 8, 2024



Given the path of totality, time of year, and relative rarity (next one over CONUS is 20 years away).

AND

...Over 31 million in population along path of totality (and many more within <8 hour driving distance)...

The cloud cover forecast for the late morning to afternoon of April 8 became of **increasing interest to millions!**

The NWS WPC became the national forecast center for this event, issuing specialized Key Messages in the week leading up to the Eclipse!

Memory #3... The Great North American Eclipse of April 8, 2024

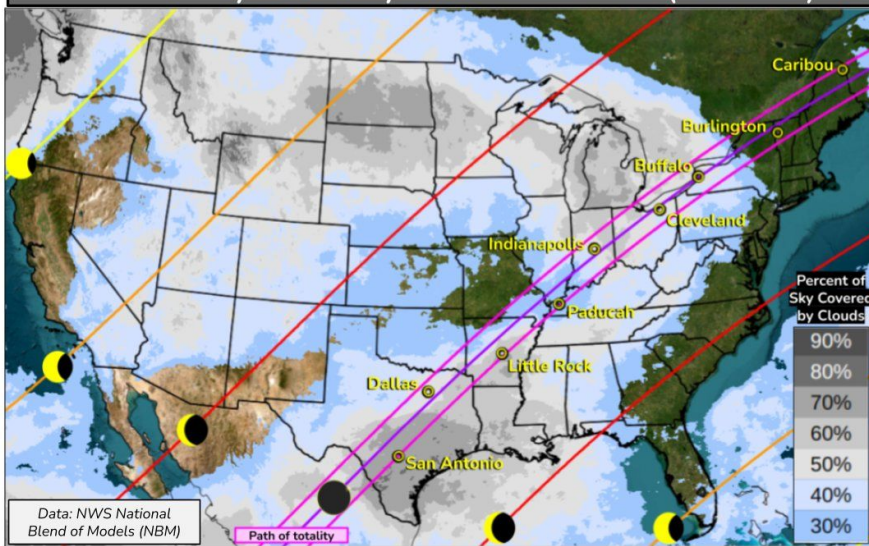


Key Messages for 2024 Total Solar Eclipse

Updated April 1, 2024
12:00 PM EDT

A total solar eclipse will occur Monday, April 8th. Know the forecast before you go at [weather.gov](https://www.weather.gov)

Percent of Sky Covered by Clouds at 2 PM EDT (1 PM CDT)



Expect forecast to change

Next Update: Tuesday by 2 PM EDT

“Totality or bust, check the forecast and adjust!”

Forecast Tips for the Eclipse:

Gray shaded areas on the map represent areas where cloud cover is more likely to occur during the total solar eclipse next Monday, with grayish-blue and light blue shading corresponding to more uncertainty.

Unshaded areas with the map background visible are more likely to have clearer skies. Please note that some clouds cannot be completely ruled out in these areas yet.

Best Chances for Clear Viewing

Clear skies in the path of totality are **most likely in northern New England and Upstate New York**. However, there is still uncertainty and some clouds cannot be ruled out yet.

Clouds May Impede Viewing Here

Cloud cover in the path of totality is **most likely in Texas, southeast Oklahoma, and central Arkansas**, and is possible farther northeast into the Ohio Valley and eastern Great Lakes.

Significant Weather Hazards

At this time, specifics about hazardous weather are uncertain. However, rain and thunderstorms do appear possible in and near the path of totality in Texas, southeast Oklahoma, and Arkansas.



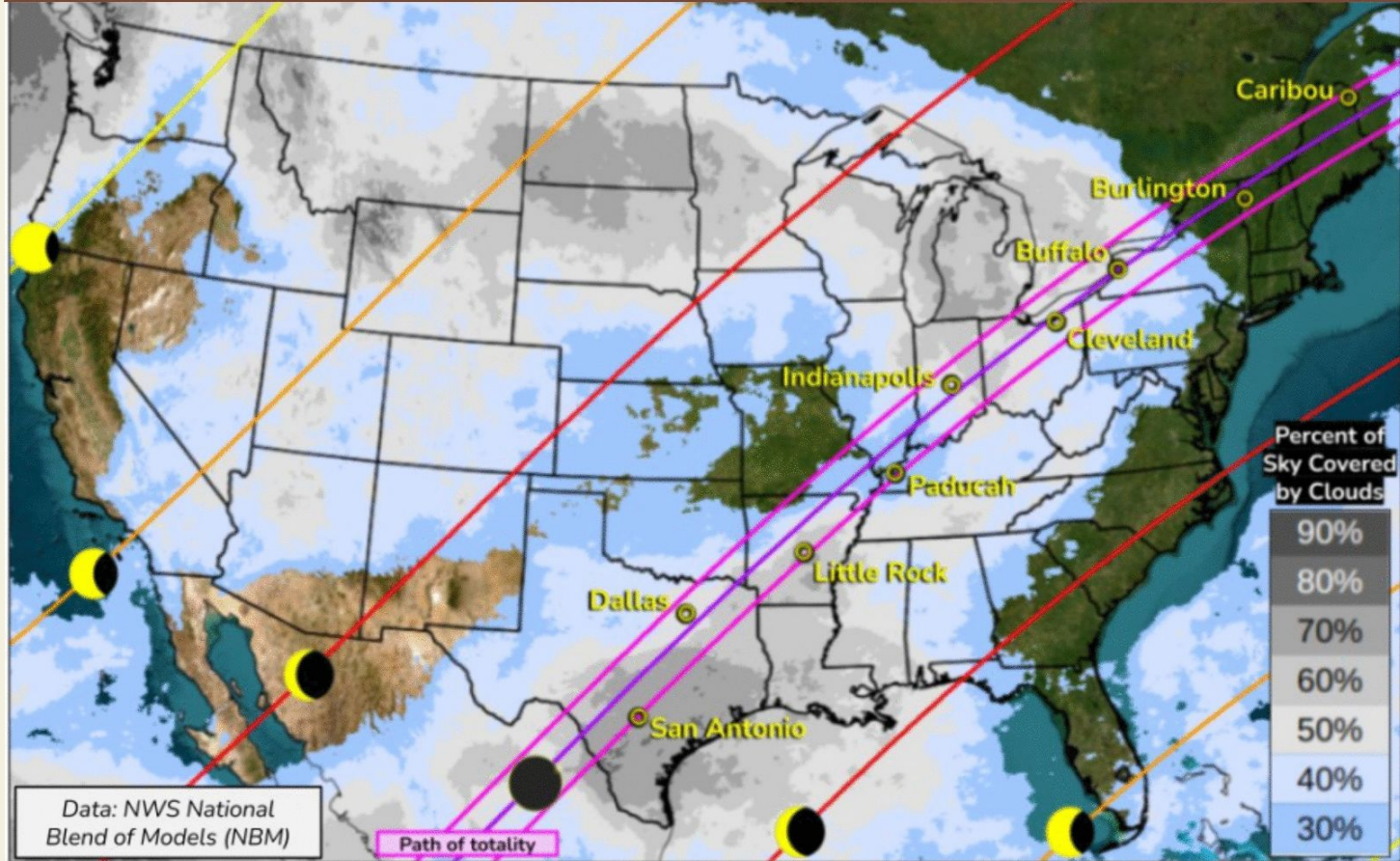
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

For more information go to:
www.wpc.ncep.noaa.gov and www.weather.gov

Weather Prediction Center
College Park, MD

Memory #3... The Great North American Eclipse of April 8, 2024

144 hour (6-day) forecast valid for afternoon of April 8, 2024



Memories #4 & #5... An Active Springtime Severe Weather Regime!



Highest SPC Day 1 Convective (Categorical) Outlook for Contiguous US

Valid 01 Apr 2024 - 31 May 2024. Days since: ENH -2, HIGH 25, MDT 5, MRGL 32, SLGT 0, TSTM 56. Total Days: ENH 29, HIGH 1, MDT 9, MRGL 7, SLGT 16, TSTM 1

April 2024

May 2024

SUN	MON	TUE	WED	THU	FRI	SAT
	1 MDT	2 MDT	3 SLGT	4 MRGL	5 TSTM	6 SLGT
7 SLGT	8 ENH	9 ENH	10 MDT	11 ENH	12 MRGL	13 MRGL
14 ENH	15 ENH	16 ENH	17 SLGT	18 ENH	19 MRGL	20 SLGT
21 MRGL	22 MRGL	23 SLGT	24 SLGT	25 ENH	26 ENH	27 MDT
28 ENH	29 MRGL	30 ENH				

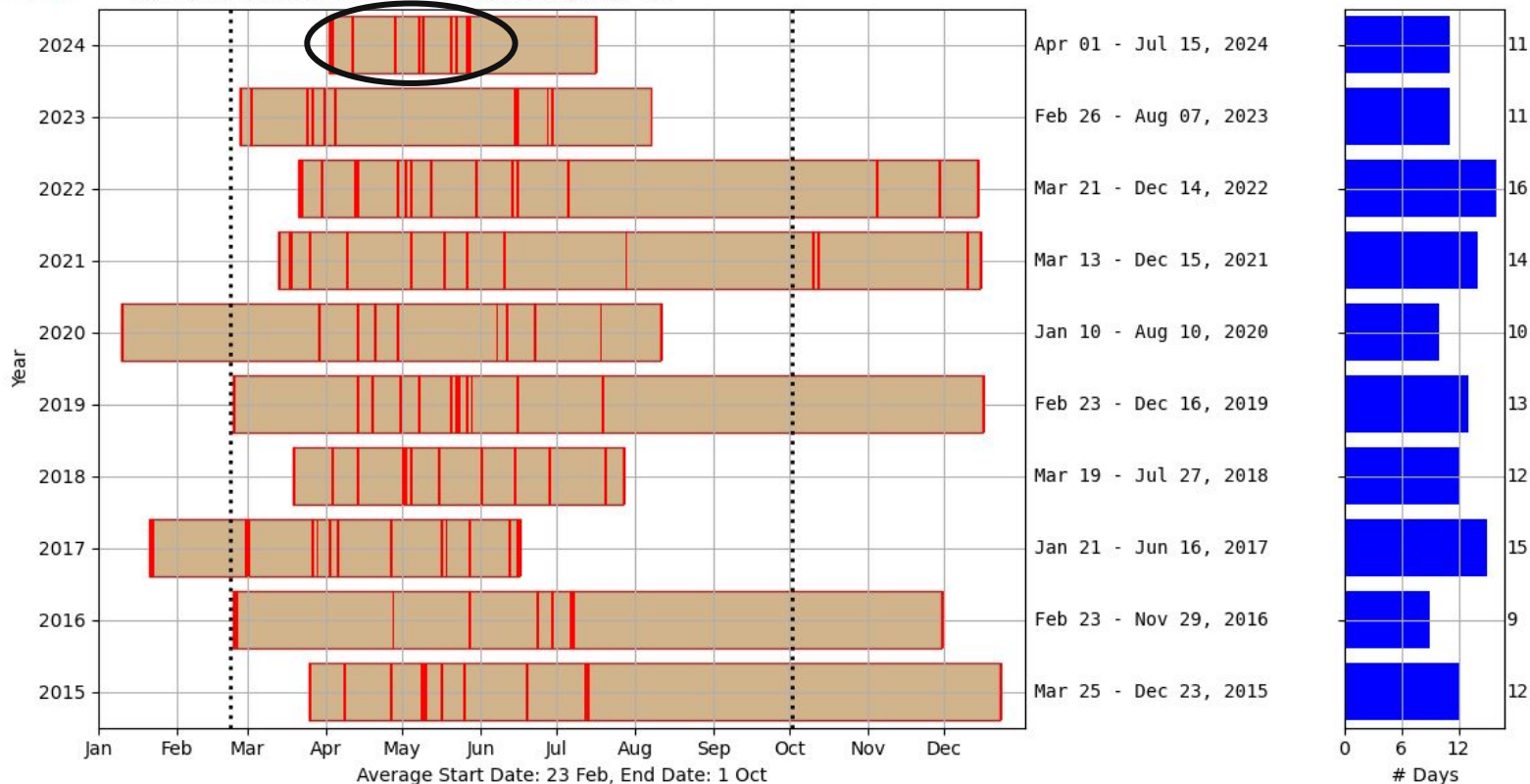
SUN	MON	TUE	WED	THU	FRI	SAT
			1 ENH	2 ENH	3 ENH	4 ENH
5 SLGT	6 HIGH	7 ENH	8 MDT	9 ENH	10 ENH	11 SLGT
12 SLGT	13 ENH	14 SLGT	15 ENH	16 ENH	17 SLGT	18 SLGT
19 MDT	20 ENH	21 MDT	22 ENH	23 ENH	24 ENH	25 MDT
26 MDT	27 SLGT	28 ENH	29 SLGT	30 ENH	31 SLGT	

Memories #4 & #5... An Active Springtime Severe Weather Regime!



SPC Day 1 Categorical Moderate Risk Outlook

Based on Unofficial IEM Archives, Contiguous US



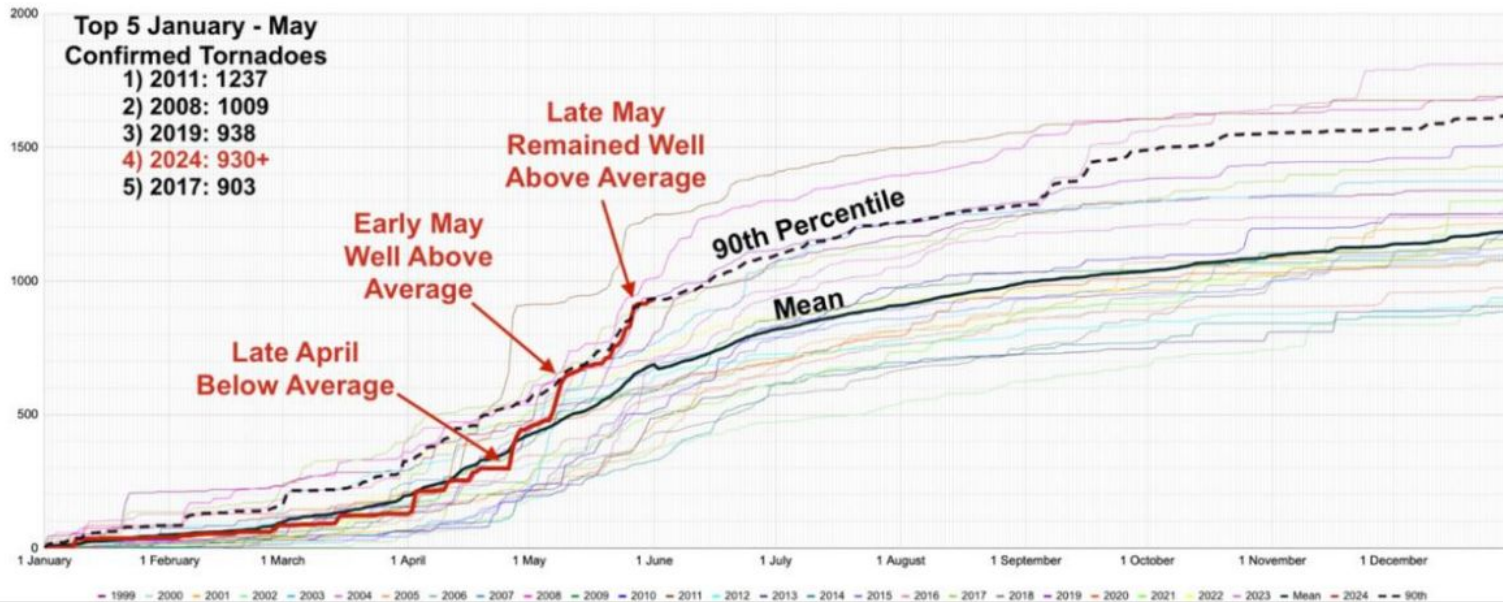
Memories #4 & #5... An Active Springtime Severe Weather Regime!



930+ Tornadoes through May 31, 2024

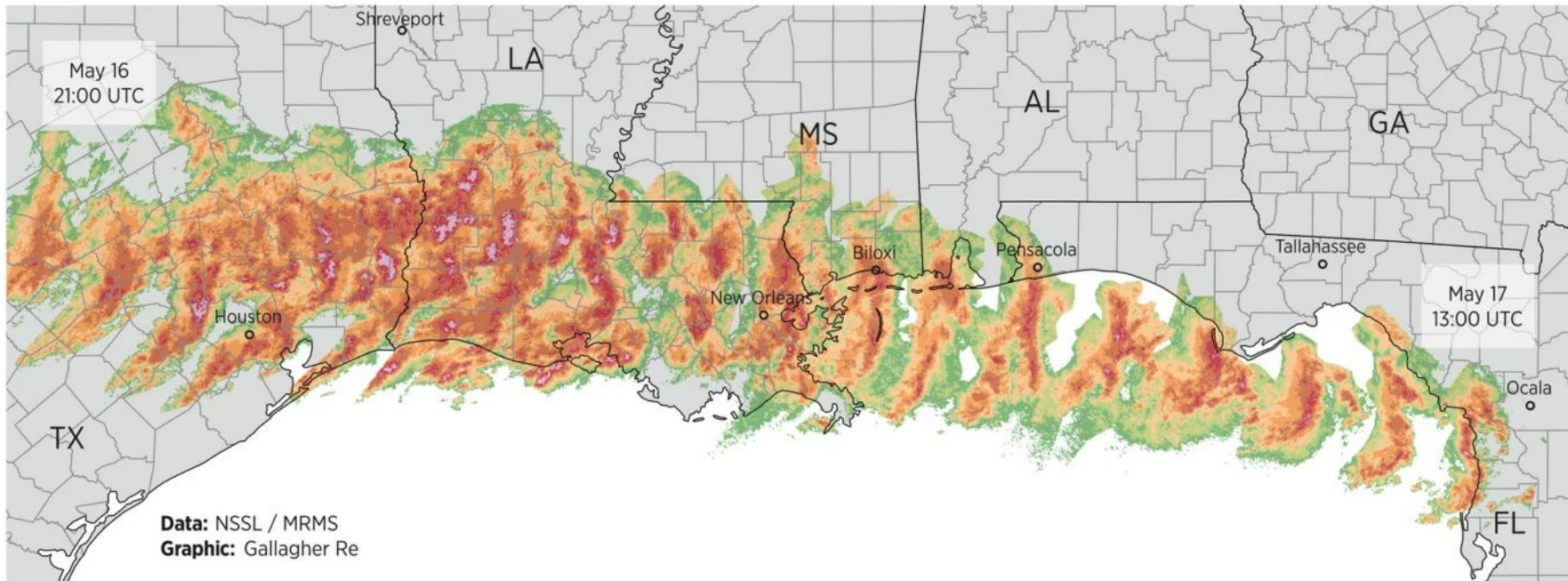


United States Annual Counts of Confirmed Tornadoes (1999 - 2024)

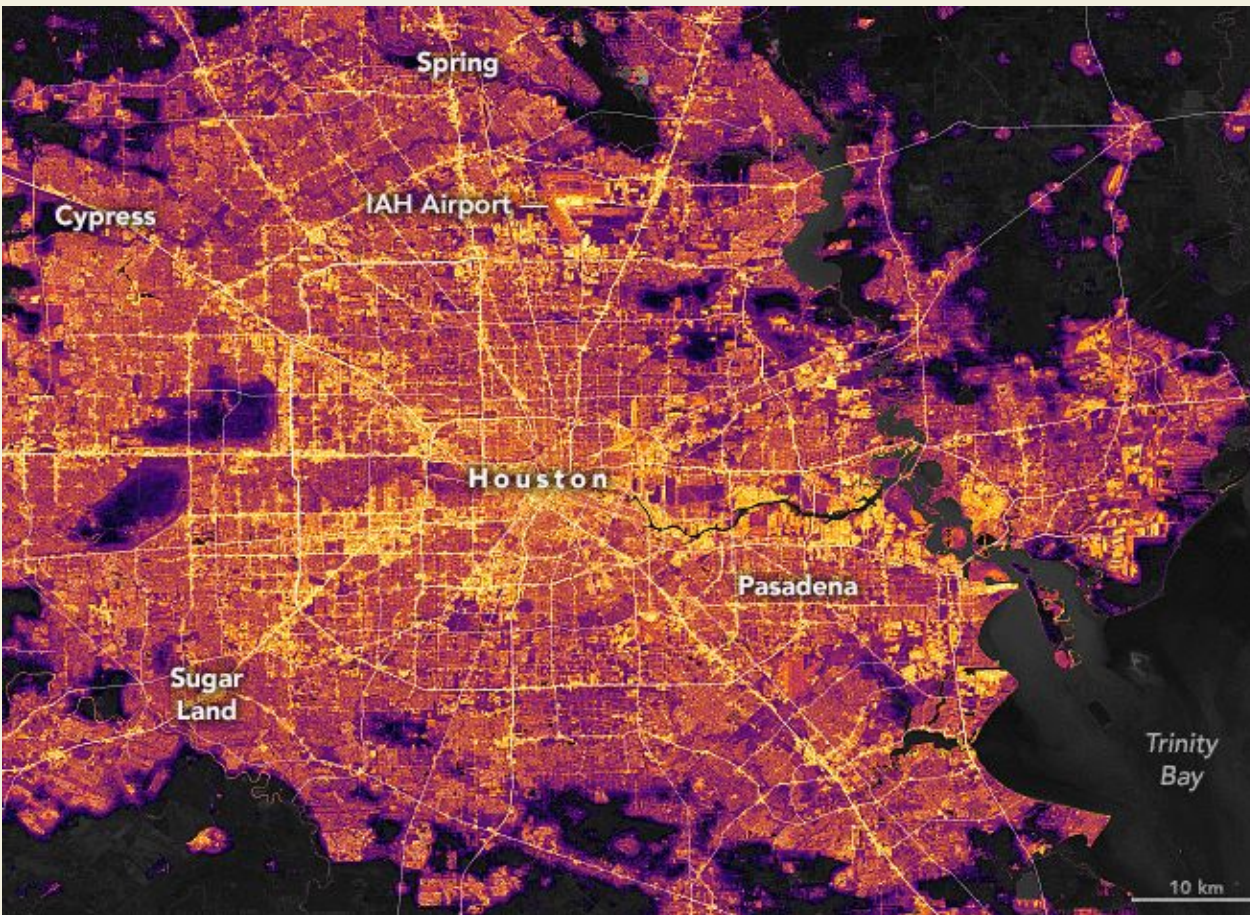


Memories #4 & #5... An Active Springtime Severe Weather Regime!

Hourly Composite Radar Reflectivity: May 16 (21:00 UTC) to May 17 (13:00 UTC) 35 dBz or greater



Memories #4 & #5... An Active Springtime Severe Weather Regime!

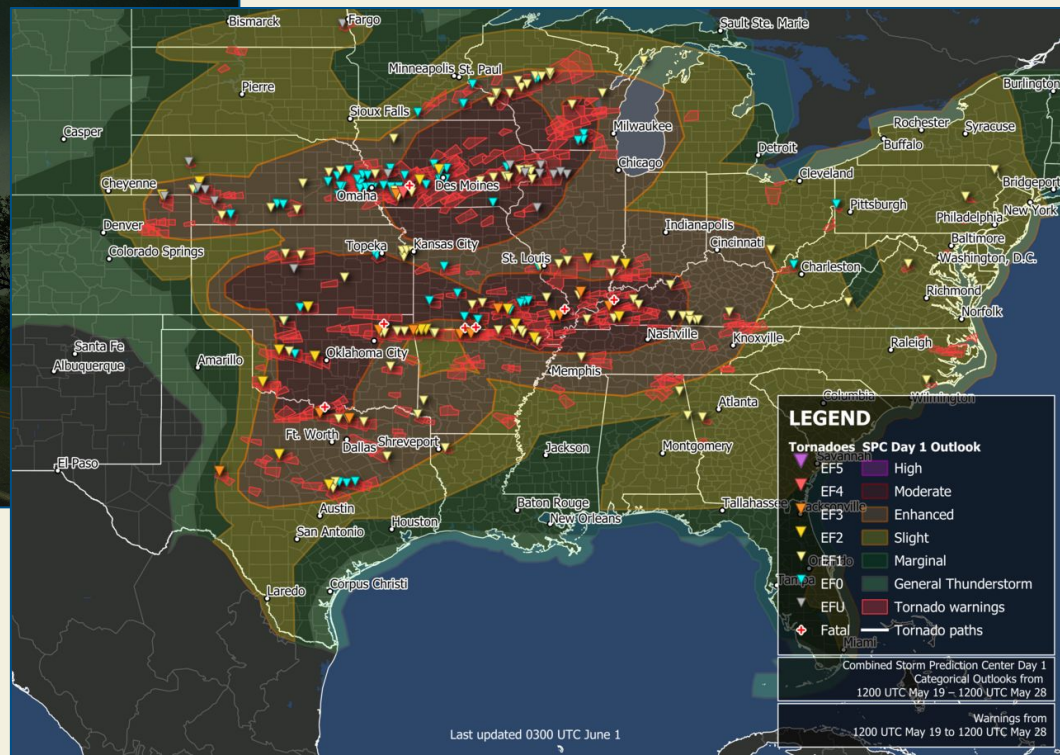


Wind damage in Houston.
Source: NWS DAT

Memories #4 & #5... An Active Springtime Severe Weather Regime!

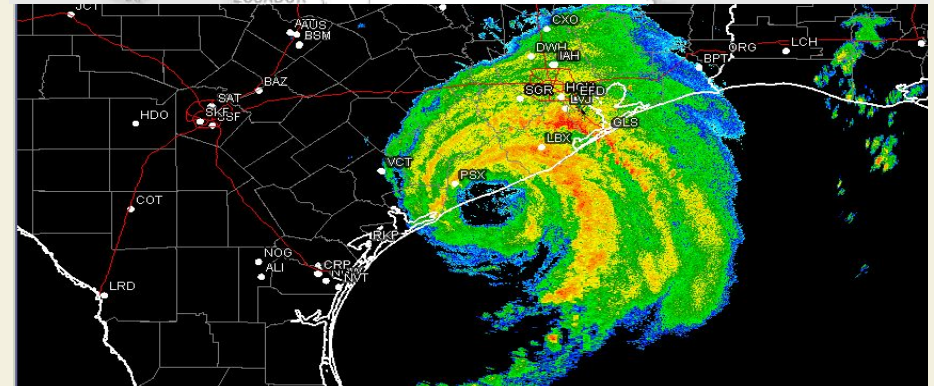
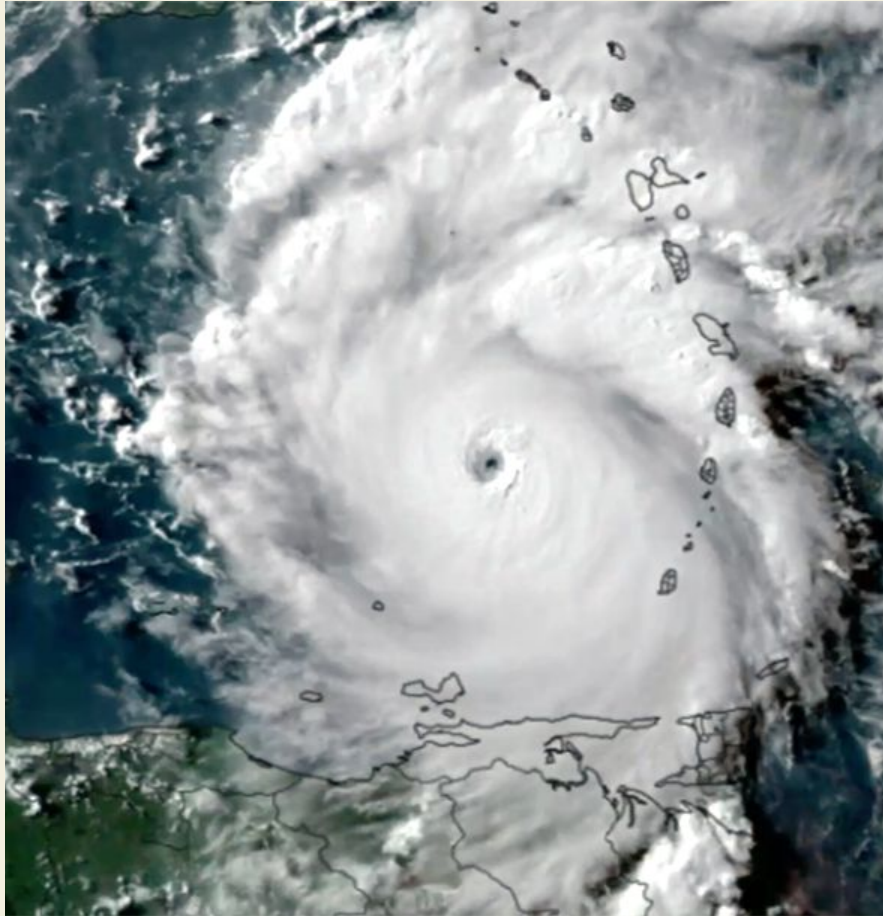


May 2024 ends with an incredibly active period for severe weather across a broad swath of the central United States.



During the second half of May, dozens are killed and property losses are estimated at over \$10 billion!

Memory #6... Hurricane Beryl a CAT 5 in July?!



Memory #6... Hurricane Beryl a CAT 5 in July?!



Debris and floodwaters from Hurricane Beryl cover the main roadway in Surfside Beach, Tex., on Monday. (Adrees Latif/Reuters)

Tornado Watch

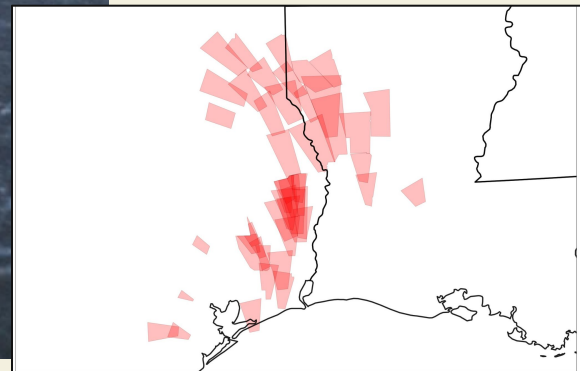
Valid Until
10:00 PM CDT Monday
July 8, 2024

Threat Information

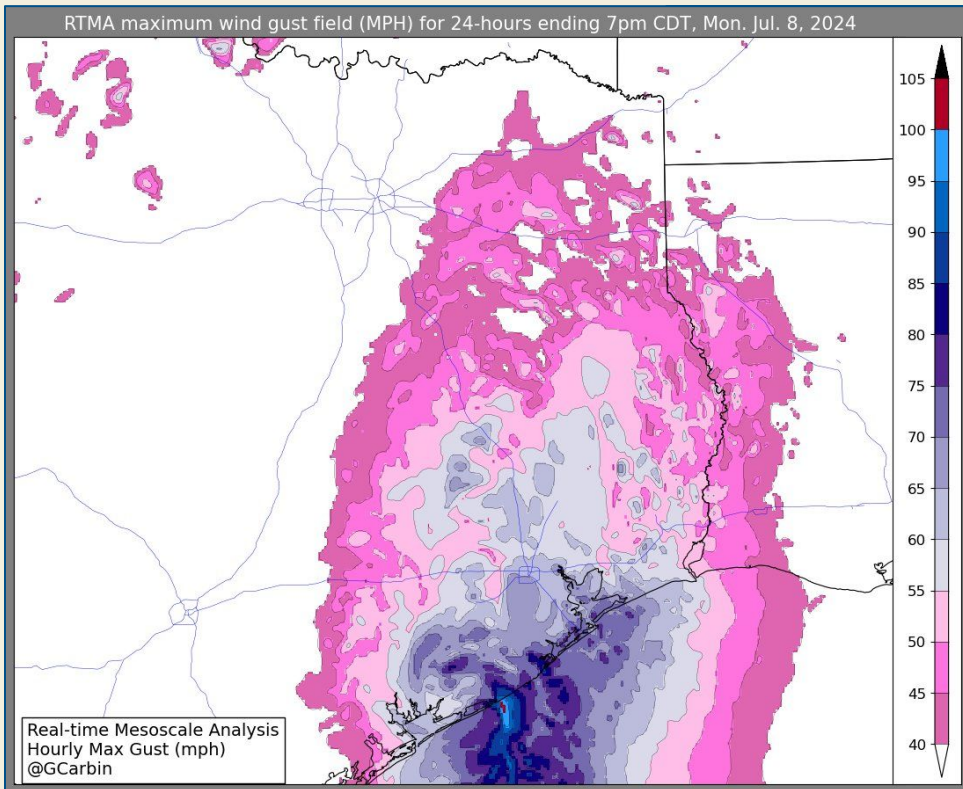
- TORNADOES**
Several Tornadoes Likely
- HAIL**
No Hail Expected
- WIND**
Isolated Gusts
Up To 70 MPH Possible

Potential Exposure

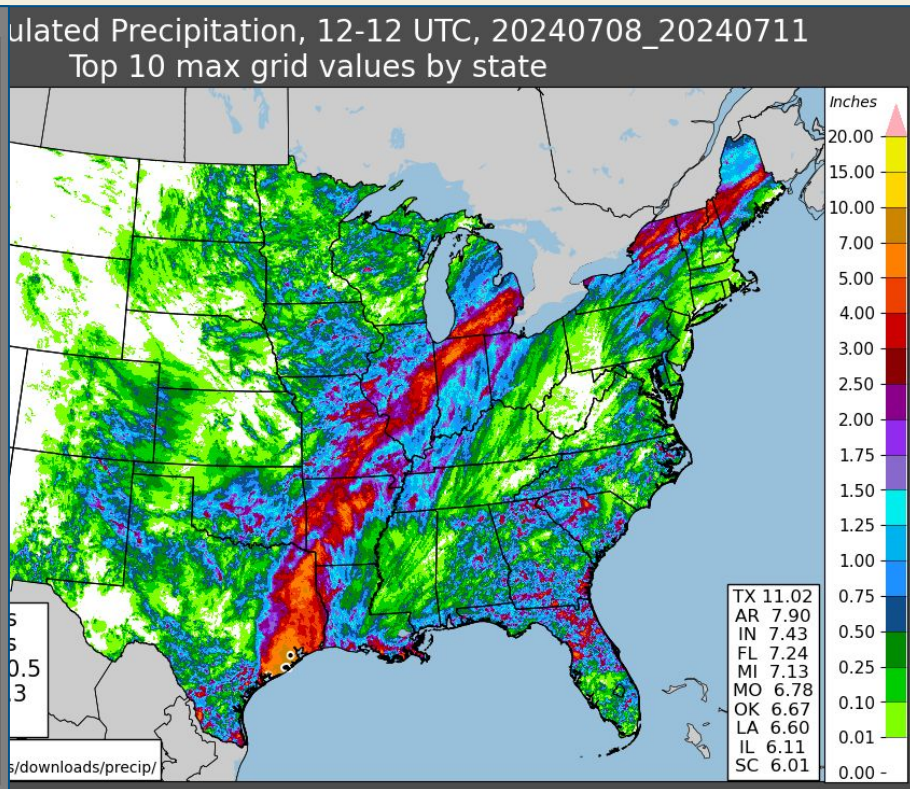
- Population: 3,595,335
- Schools: 1434
- Hospitals: 159



Memory #6... Hurricane Beryl a CAT 5 in July?!

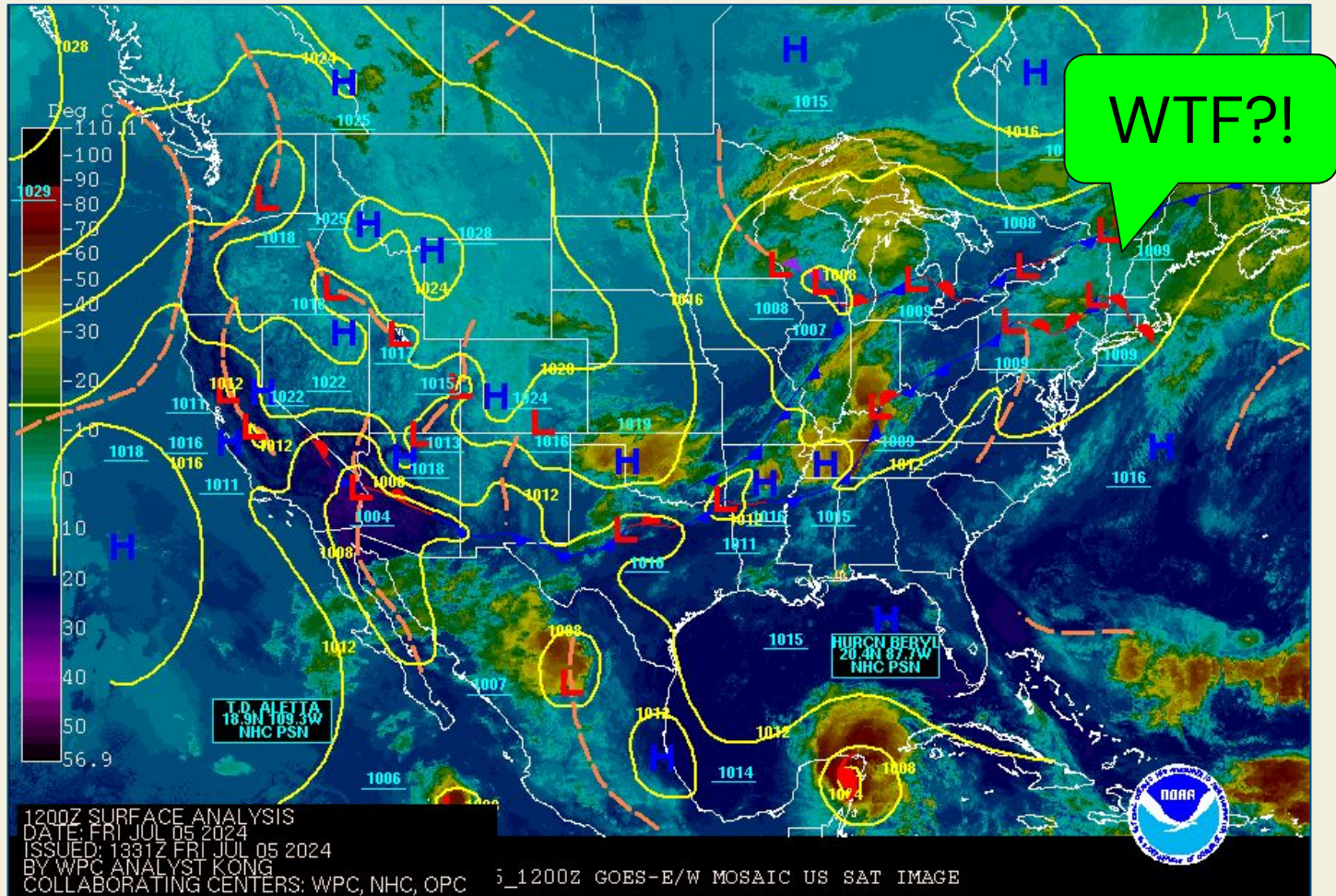


Hurricane force winds move inland across the Texas Gulf Coast on July 8

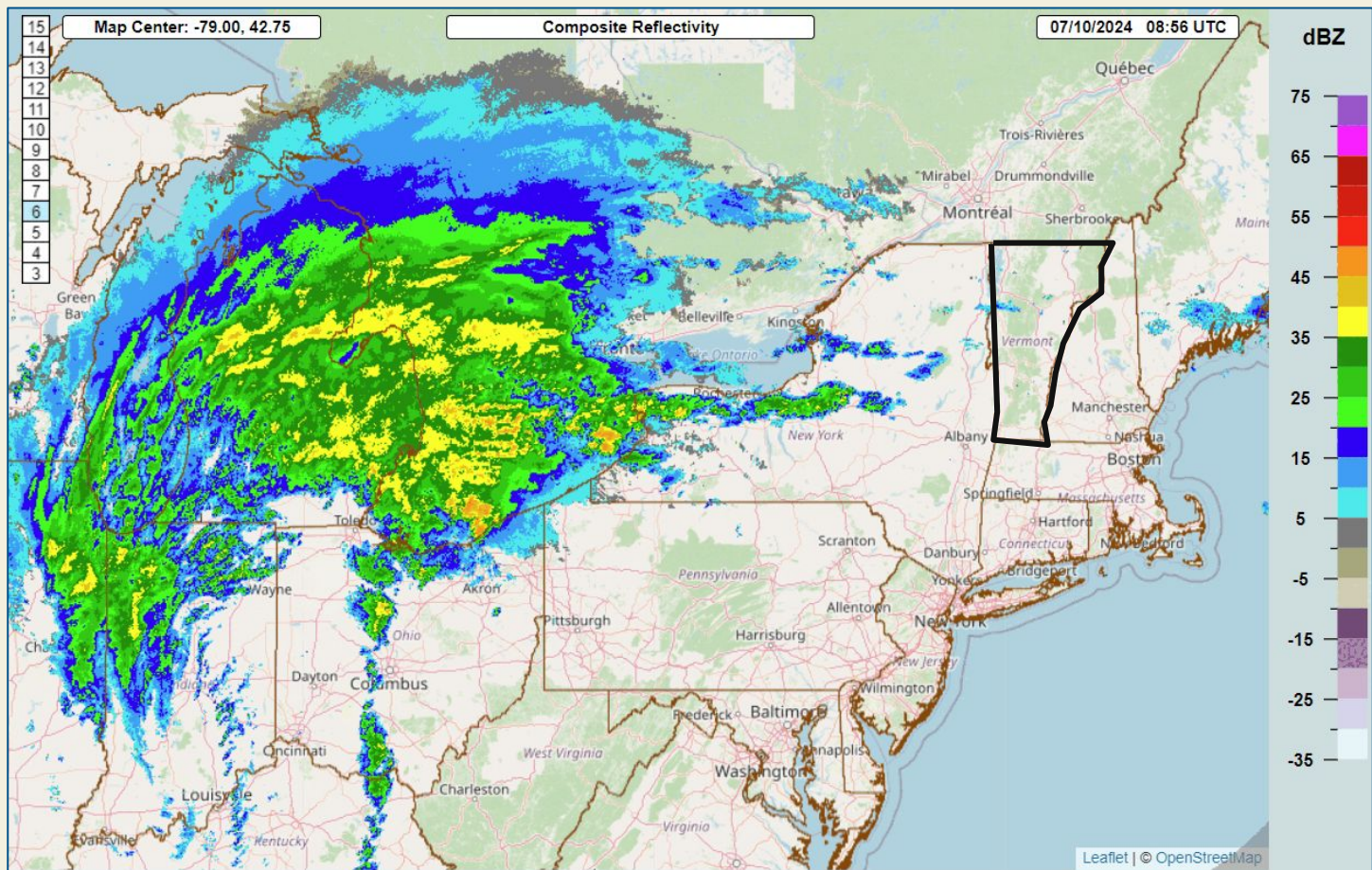


Rainfall swath associated with Beryl from July 8-10. (Red = 3 inches +)

Memory #7... A Year to the Day - Vermont Again Awash in a July 11 Flood



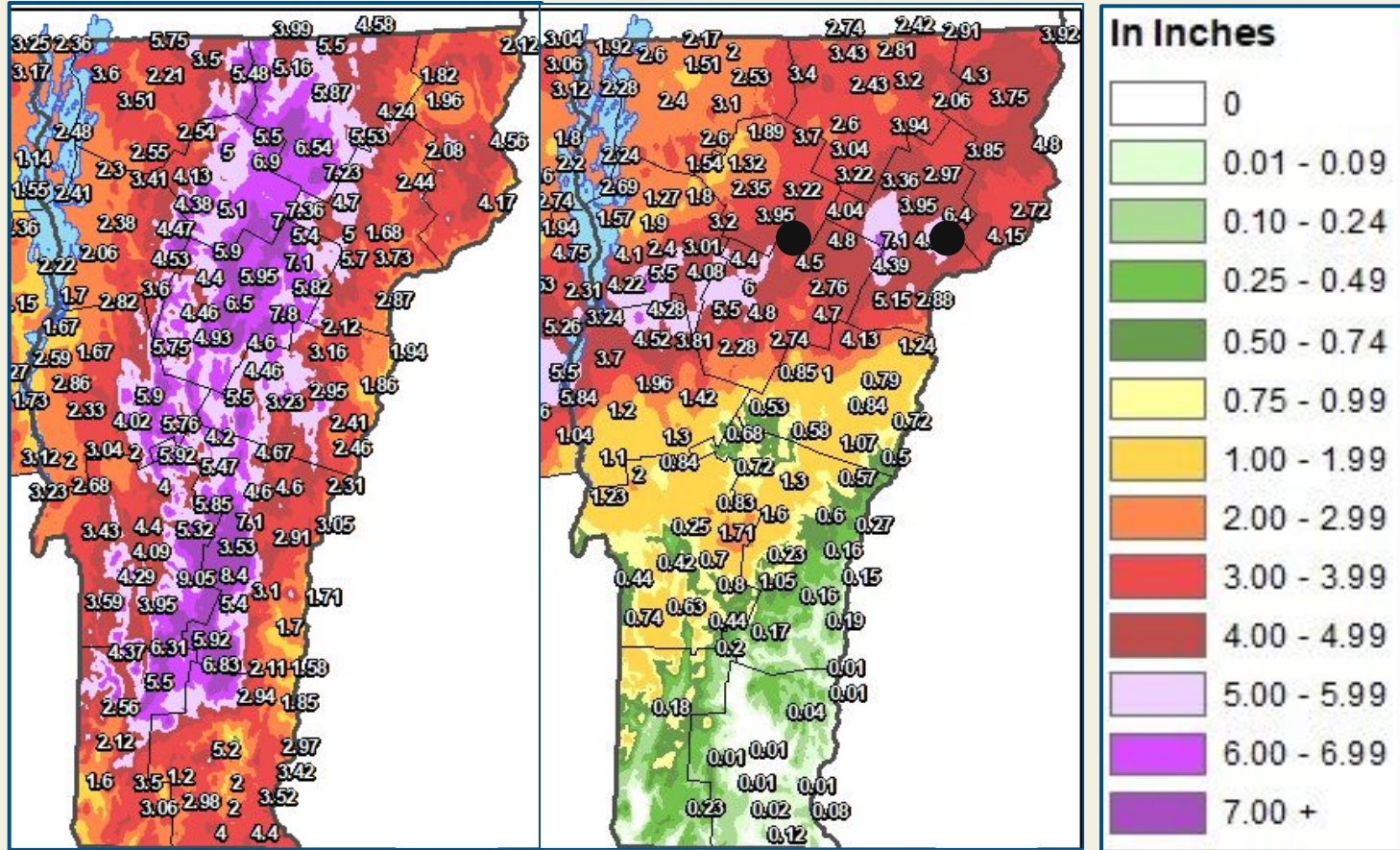
Memory #7... A Year to the Day - Vermont Again Awash in a July 11 Flood



Memory #7... A Year to the Day - Vermont Again Awash in a July 11 Flood

July 9-11, 2023

July 9-11, 2024



Memory #7... A Year to the Day - Vermont Again Awash in a July 11 Flood

Barnet, VT



Plainfield, VT



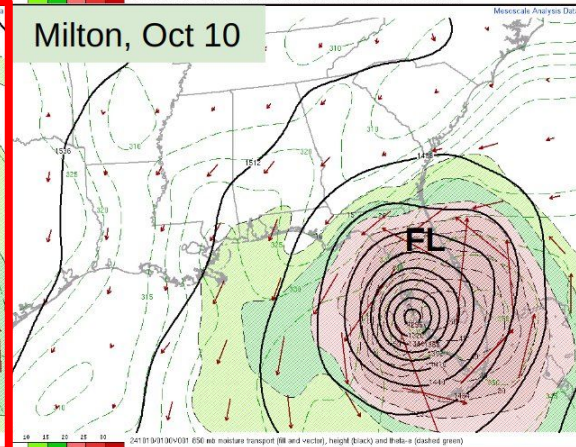
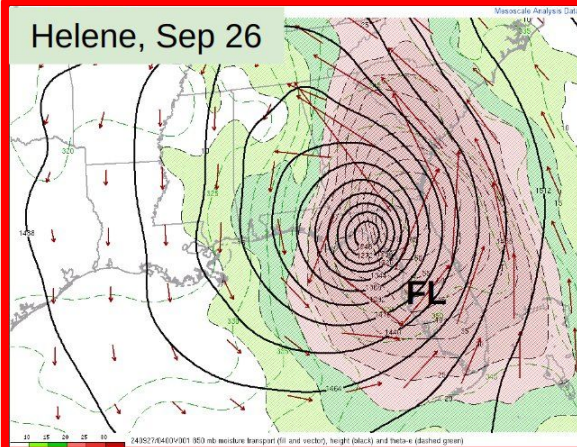
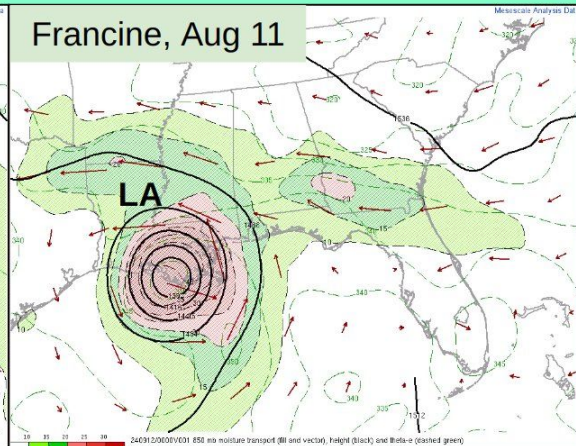
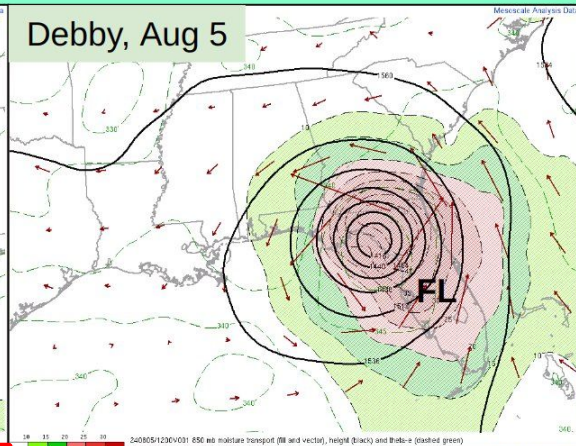
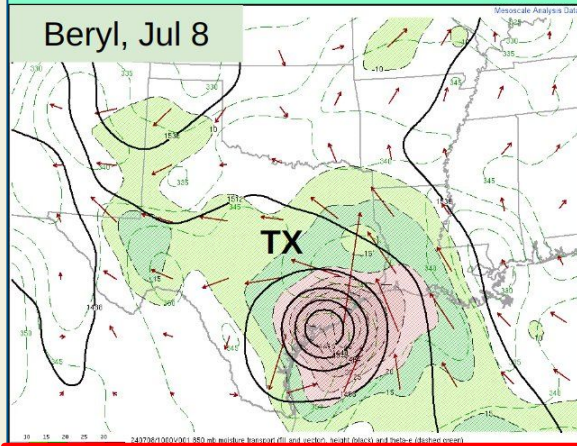
From NWS Burlington, VT...”By the morning of July 11, Vermont Emergency Management had received nearly 700 reports of damage related to flooding with numerous roads and bridges impacted, and numerous swift water rescues. The secondary impact from this event was the scattered supercell thunderstorms, which produced wind damage, large hail, and frequent cloud to ground lightning. In conclusion, the weather events of July 10th and 11th will go down as one of the most impactful in our region in 2024, while also coincidentally marking the 1-year anniversary of the Great Flood of 2023.”

Memory #7... A Year to the Day - Vermont Again Awash in a July 11 Flood



Memory #8... Hurricane Helene: A Monster Storm's Deadly Path

2024 Gulf Coast tropical cyclone landfalls, 850 hPa level w/ moisture transport (fill and vectors)



Max Event Rainfall Totals

Beryl, ~17" (TX)

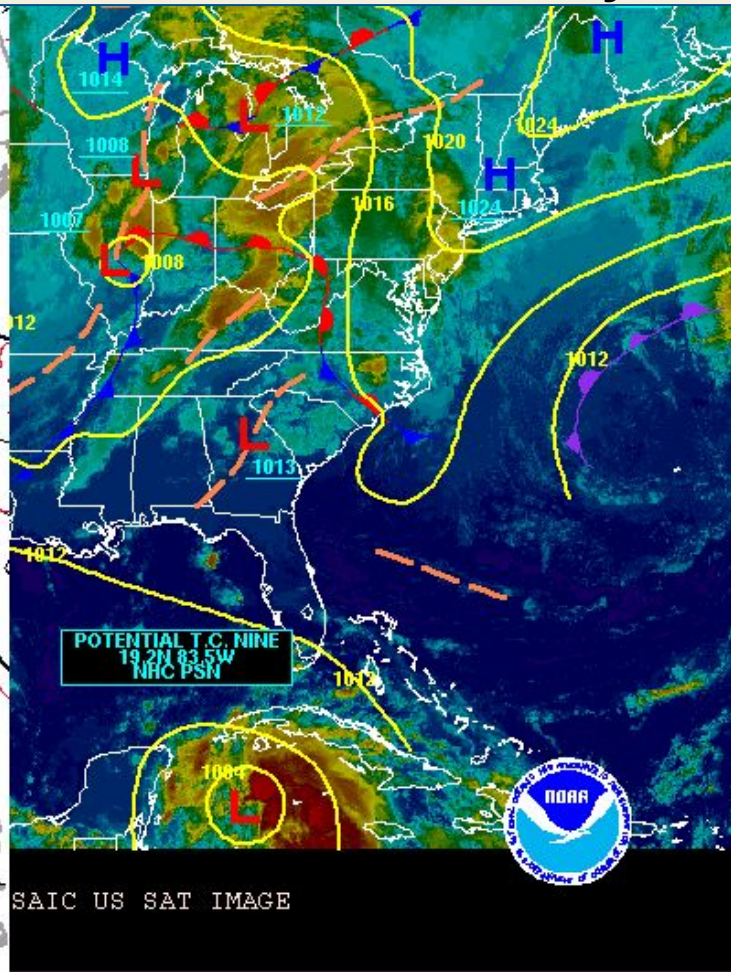
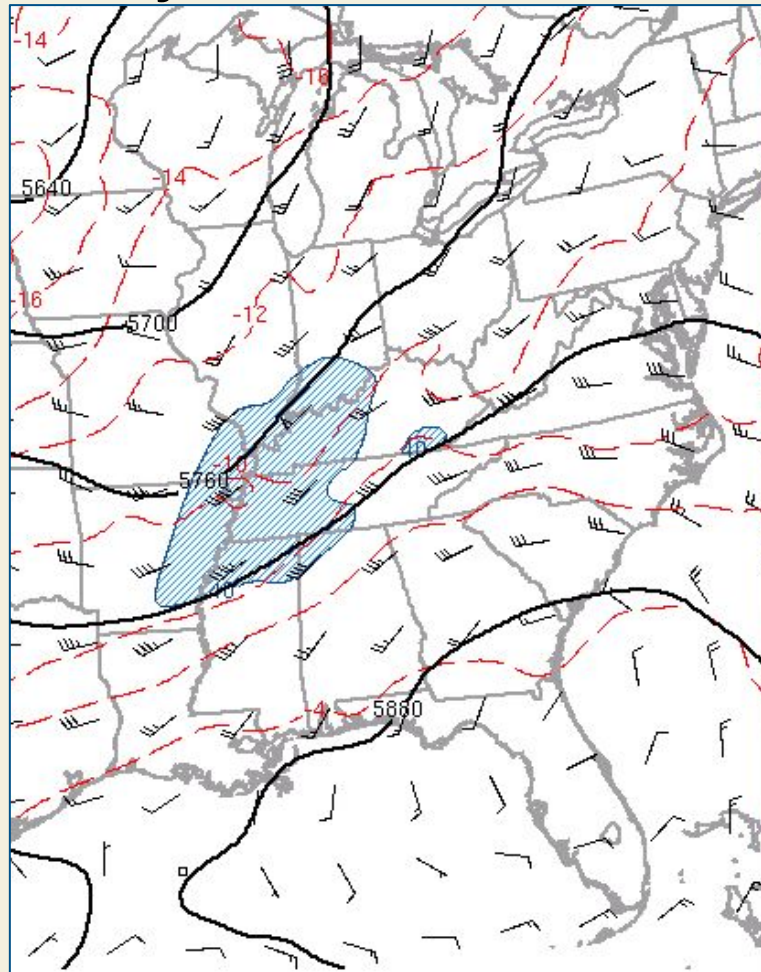
Debby, ~19" (FL)

Francine, ~9" (LA)

Helene, ~30" (NC)

Milton, ~19" (FL)

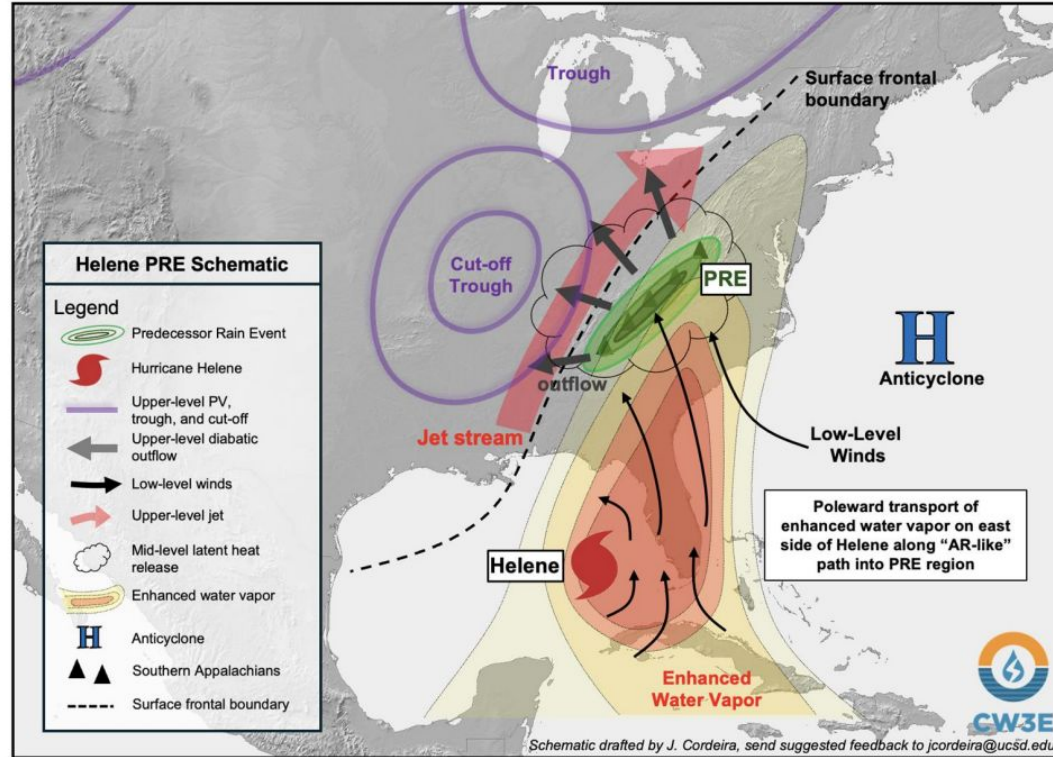
Memory #8... Hurricane Helene: A Monster Storm's Deadly Path



SAIC US SAT IMAGE

Memory #8... Hurricane Helene: A Monster Storm's Deadly Path

CW3E Event Summary: Helene Predecessor Rain Event

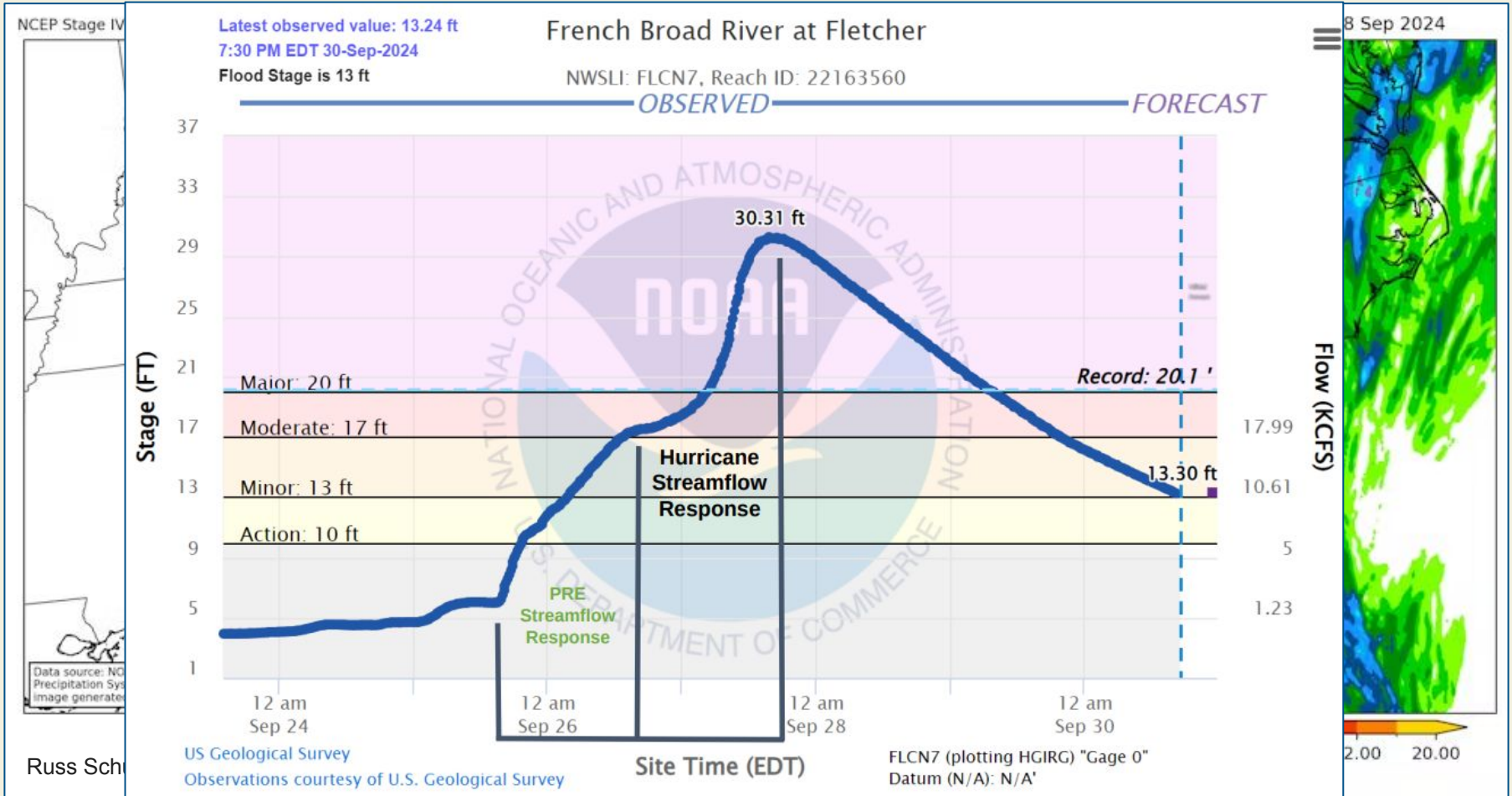


A schematic interpretation of the meteorological ingredients leading to extreme precipitation and catastrophic flooding over the Southern Appalachians with a predecessor rain event ("PRE") and Hurricane Helene are shown at left.

These ingredients include the "AR-like" poleward transport of enhanced water vapor on the east side of Helene prior to landfall, the interaction of this moisture with terrain, and a favorable synoptic set-up (e.g., upstream cut-off trough, surface frontal boundary, upper-level jet, and western North Atlantic anticyclone).

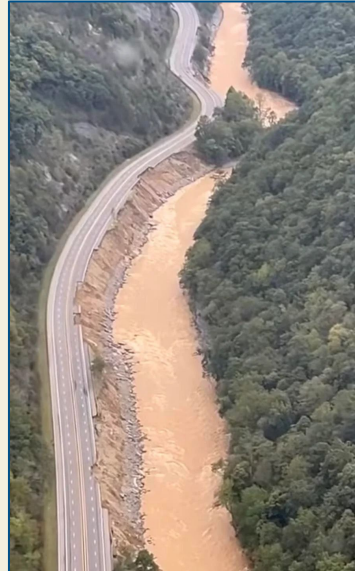
Schematic drafted by J. Cordeira and feedback is always welcome to improve the quality of the analysis. Contact: jcordeira@ucsd.edu

Memory #8... Hurricane Helene: A Monster Storm's Deadly Path



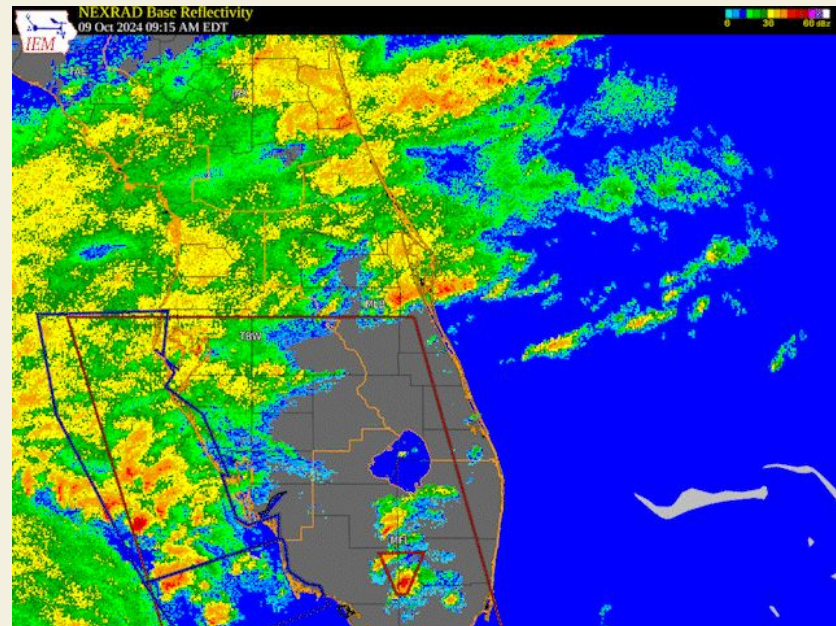
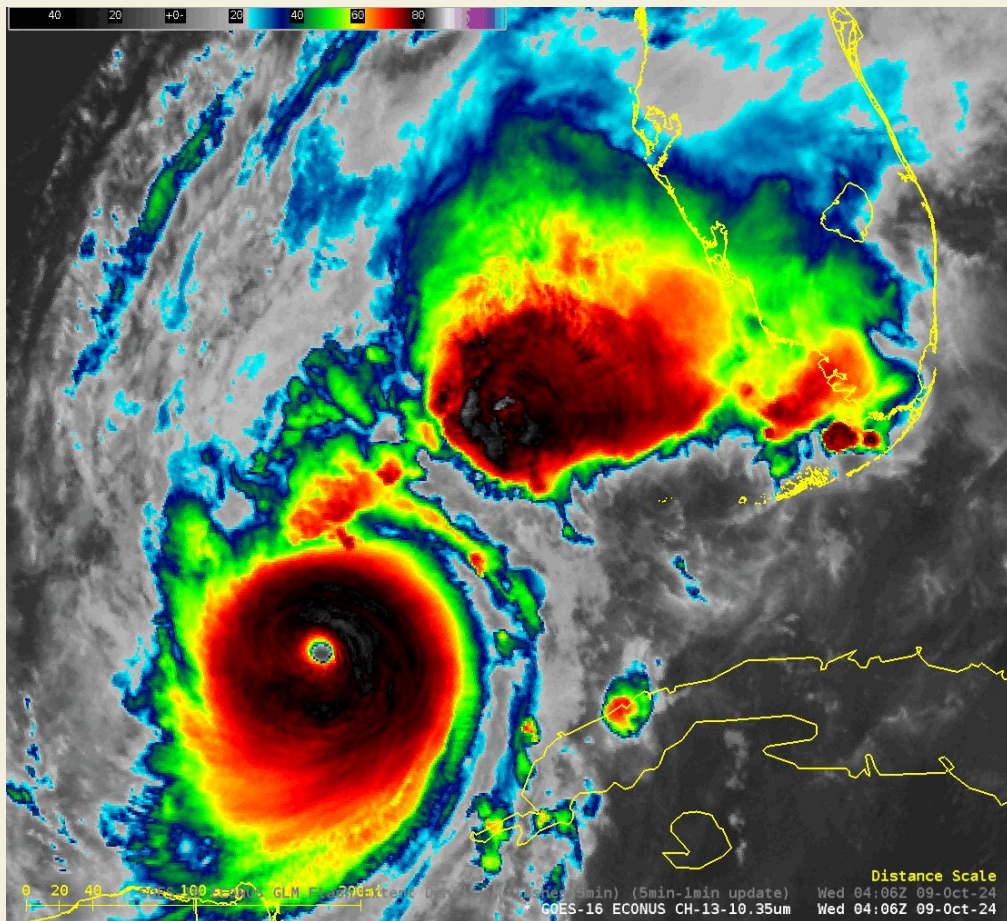
Memory #8... Hurricane Helene: A Monster Storm's Deadly Path

On I-40, looking down at U.S. 74.



Jonathan Drake / Reuters

Memory #9... Hurricane Milton: Florida Under Siege



- Tampa Bay near worst case but exceptional track forecast NHC!
- Record rapid intensification to CAT 5 and sub-900 mb pres.
- Tornado Outbreak well before landfall
- Surge in wake of Helene
- Extreme Rainfall swath across FL
- River flooding again
- Similar to Ian's extreme rainfall (a bit further south)

Memory #9... Hurricane Milton: Florida Under Siege

And under pressure!

> STRONGEST HURRICANES

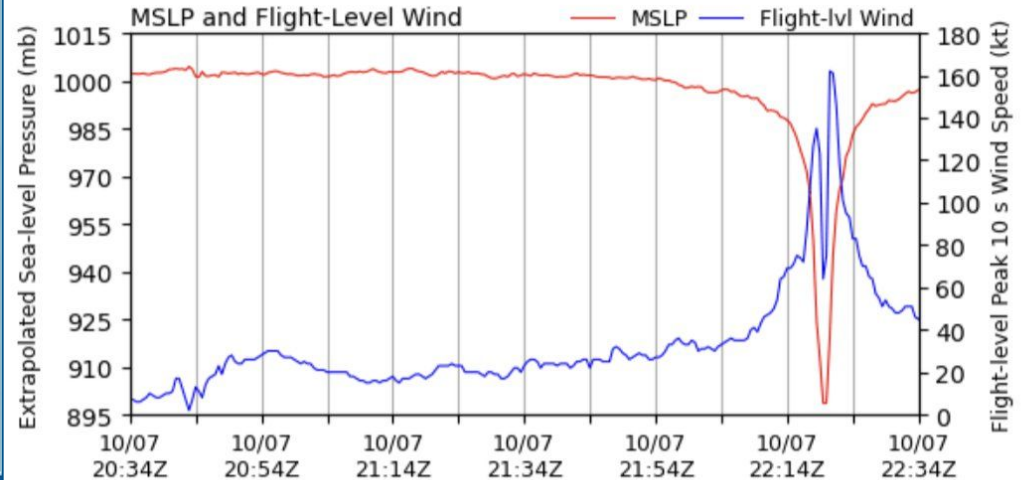
» BY LOWEST PRESSURE IN THE ATLANTIC BASIN

1. Hurricane Wilma 882 mb 2005
2. Hurricane Gilbert 888mb 1988
3. Labor Day Hurricane 892mb 1935
4. Hurricane Rita 895mb 2005
5. Hurricane Milton 897mb 2024
6. Hurricane Allen 899mb 1980
7. Hurricane Camille 900mb 1969
8. Hurricane Katrina 902mb 2005
9. Hurricane Mitch 905mb 1998
- Hurricane Dean 905mb 2007

Recon Aircraft Observations

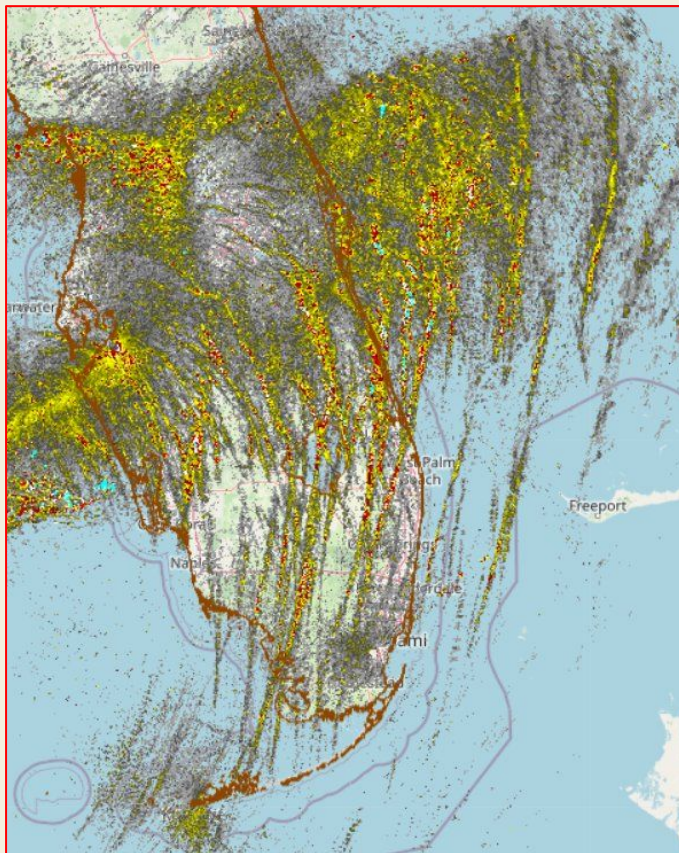
Mission ID: NOAA2-1014A-MILTON

Levi Cowan - tropicaltidbits.com



Memory #9... Hurricane Milton: Florida Under Siege

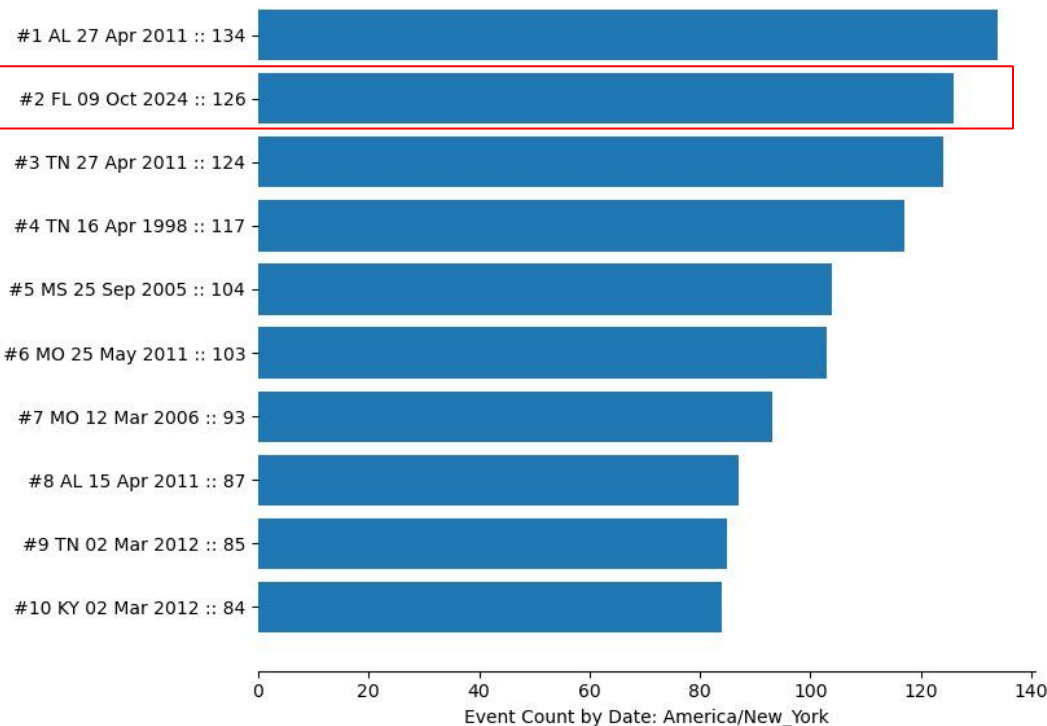
Rotation Tracks Summary Product



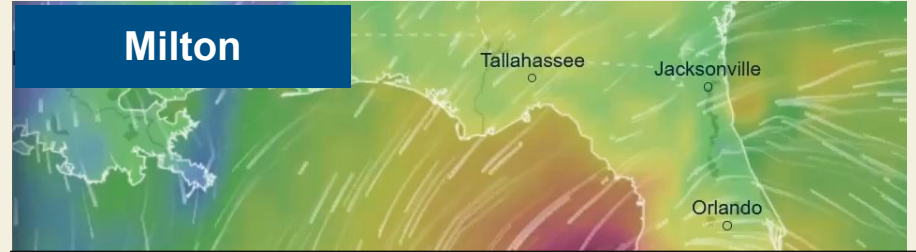
NWS Tornado Warnings by Day in Florida

NWS Issued by State

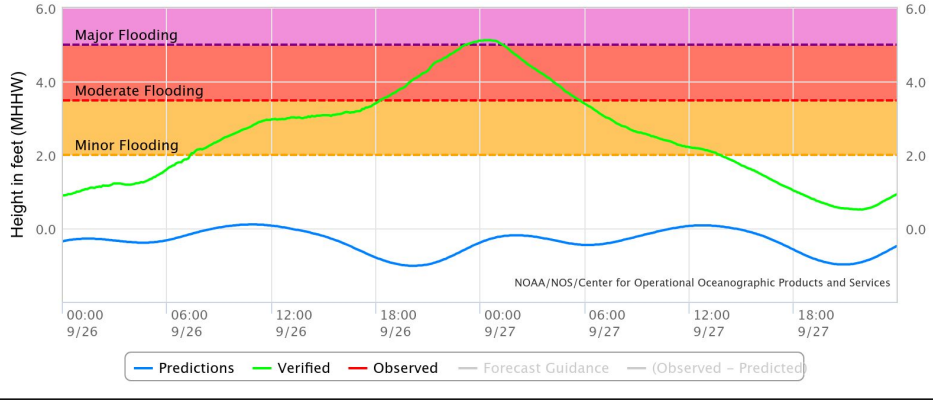
Tornado Warning (TO.W) Events by Calendar Date [31 Jan 1986-09 Oct 2024]



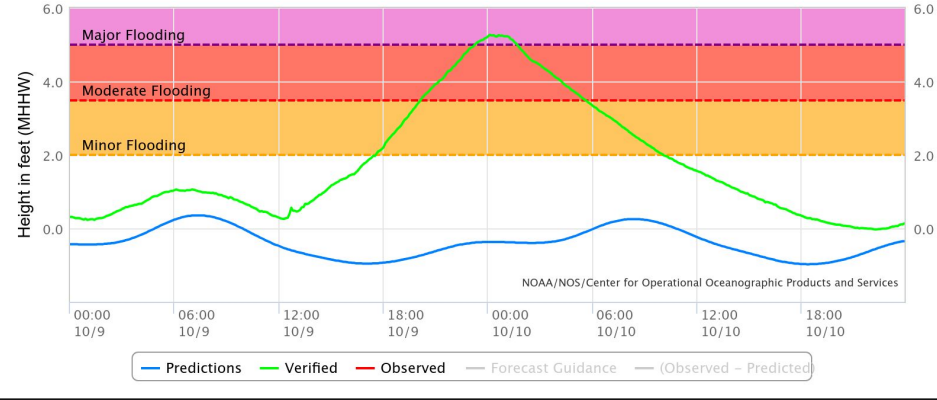
Memory #9... Hurricane Milton: Florida Under Siege



NOAA/NOS/CO-OPS
Observed Water Levels at 8725520, Fort Myers FL
From 2024/09/26 00:00 LST/LDT to 2024/09/27 23:59 LST/LDT

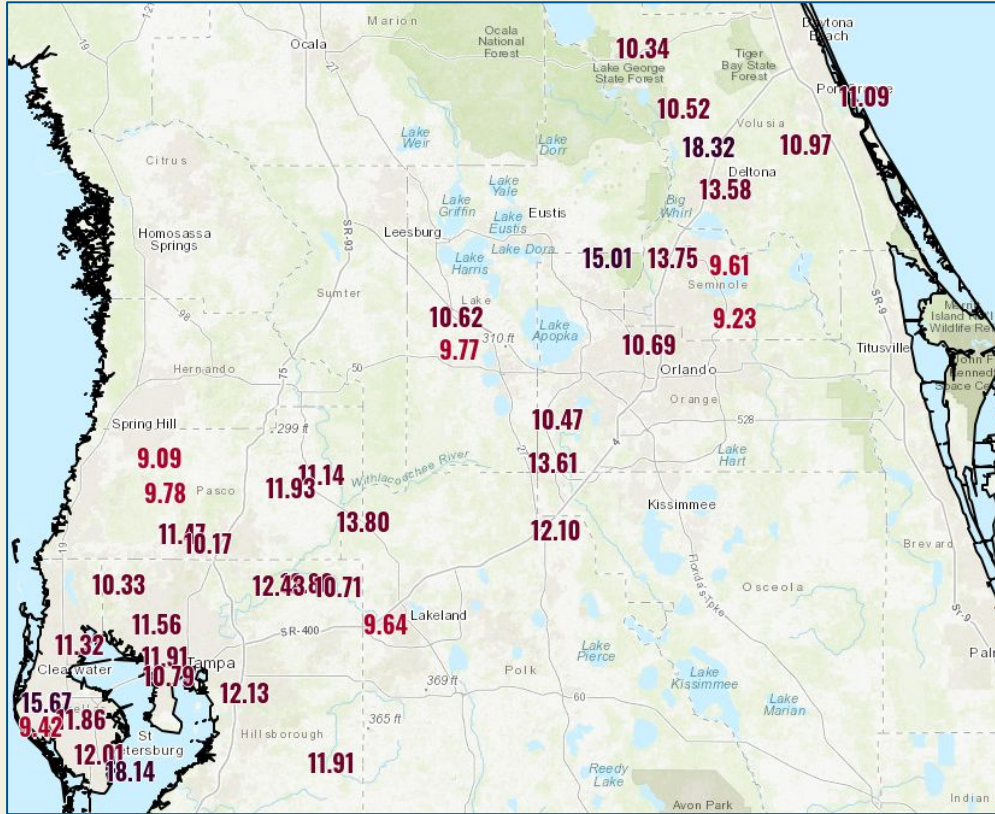


NOAA/NOS/CO-OPS
Observed Water Levels at 8725520, Fort Myers FL
From 2024/10/09 00:00 LST/LDT to 2024/10/10 23:59 LST/LDT



Memory #9... Hurricane Milton: Florida Under Siege

24 hour rainfall observations > 9 inches



10-inch or more 24 hour rainfall



Memory #9... Hurricane Milton: Florida Under Siege

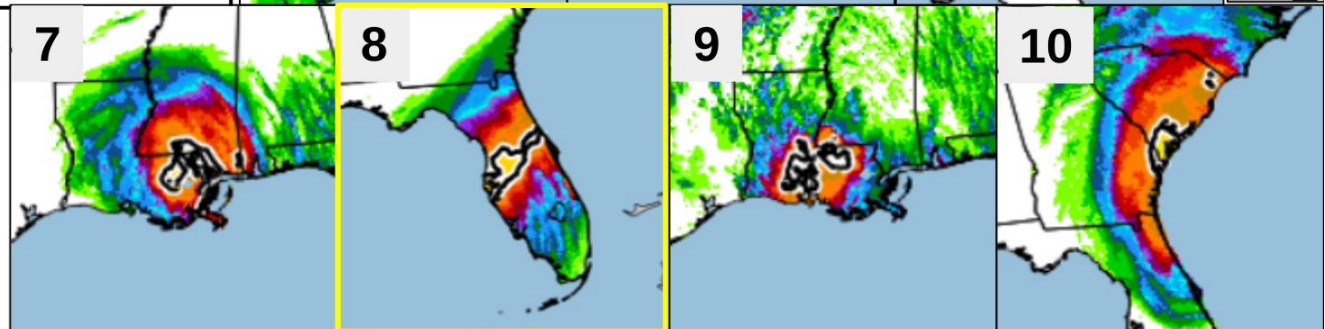
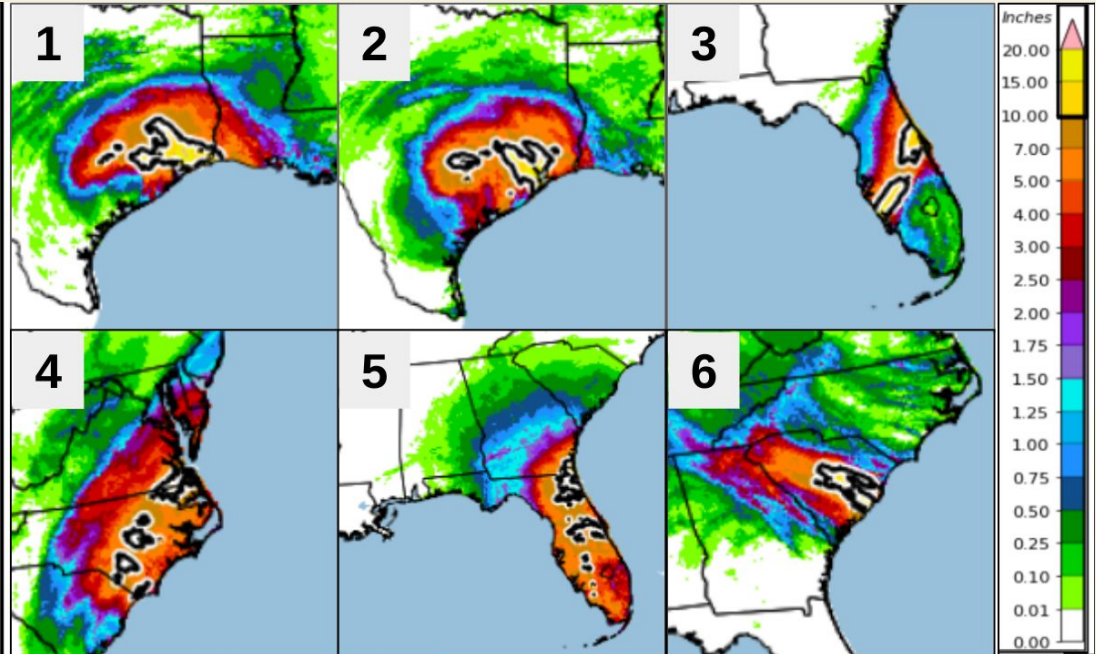
Ten Most Prolific CONUS Tropical Cyclone Rainfall Days Since 2005*

Rank	Storm	Day	24h Ending Date	Area (km ²)
1.	Harvey	Day 3	08/28/2017	14,768
2.	Harvey	Day 2	08/27/2017	11,370
3.	Ian		09/29/2022	9,149
4.	Matthew	Day 2	10/09/2016	9,033
5.	Irma		09/11/2017	8,768
6.	Joaquin		10/04/2015	8,271
7.	Isaac		08/30/2012	8,122
8.	Milton		10/10/2024	8,105
9.	No Name (LA)		08/13/2016	7,525
10.	Matthew	Day 1	10/08/2016	6,597

* Ranked according to the areal coverage of 10 or more inches of estimated 24h rainfall, 8am-8am EDT, for dates shown. (Day 1 = landfall date).

NWS Data:

<https://water.noaa.gov/resources/downloads/precip>



Updated Oct. 14, 2024
@GCarbin

Memory #10... Seasons, Solar, and Snow! A Return to Vermont

