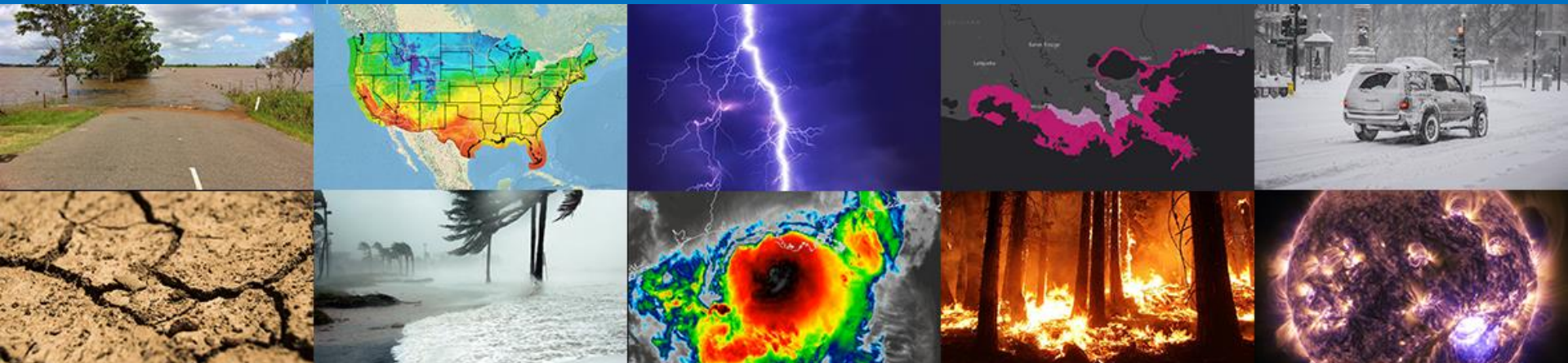
25 Years of CSTAR Operations and Research Collaborations Saves Lives

NATIONAL WEATHER SERVICE

Jeff Waldstreicher

25th Northeast Regional Operational Workshop (NROW) – Albany NY
November 13, 2024



Hurricane Helene PRE

Asheville NC Rainfall

Date	Rainfall
Tuesday September 24	0.21”
Wednesday September 25	4.09”
Thursday September 26	5.78”
Friday September 27	4.11”
Total Rainfall	14.18”

Landfall 1120 pm

1-Day

Rank	Value	Ending Date
1	6.40	1879-10-18
2	5.78	2024-09-26
3	5.38	1918-10-25
4	5.29	2019-04-19
5	5.18	1964-10-04

Period of record: 1869-03-01 to 2024-10-27

2-Days

Rank	Value	Ending Date	Missing Days
1	9.89	2024-09-27	0
2	9.87	2024-09-26	0
3	7.94	1918-10-25	0
4	6.80	1879-10-19	0
5	6.78	1940-08-30	0

Period of record: 1869-03-01 to 2024-10-27

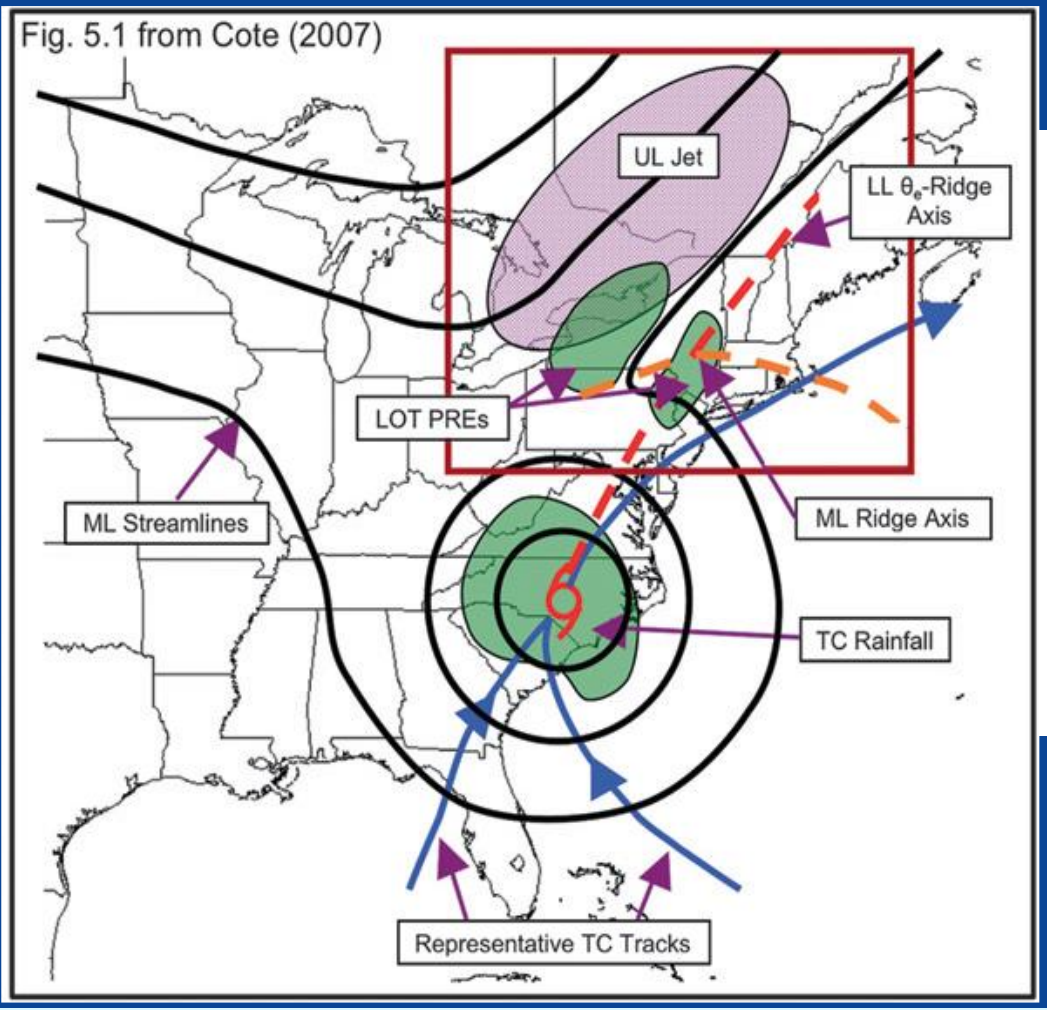
3-Days

Rank	Value	Ending Date	Missing Days
1	13.98	2024-09-27	0
2	10.08	2024-09-26	0
3	9.89	2024-09-28	0
4	8.49	1918-10-26	0
5	7.94	1918-10-25	0

Period of record: 1869-03-01 to 2024-10-27

Predecessor Rainfall Event (PRE) Project

- **2002-2004 –** CSTAR1 Project **- *Distribution of precipitation over the northeast accompanying landfalling and transitioning tropical cyclones*** (**DeLuca**, Bosart, Keyser, Vallee)
- ***2004-2005* –** Follow on CSTAR2 project looking at recent cases led by Vallee (Horwood, Evans, Jurewicz, Cannon) – Discussions at CSTAR meetings and NROW about events 1-2 days ahead of tropical cyclones
- **2005-2007 –** CSTAR2 Project **- *Predecessor rain events in advance of tropical cyclones*** (**Cote**, Bosart, Keyser, Jurewicz)
- **2008-2010** – CSTAR 3 Project - ***Synoptic-Scale Environments and Dynamical Mechanisms Associated with Predecessor Rain EventsAhead of Tropical Cyclones*** (Moore, Bosart, Keyser, Jurewicz)
- **2009-2015 –** Follow on work (refinements, case studies) by Galarneau and Schumacher (funded by CSTAR and NSF)



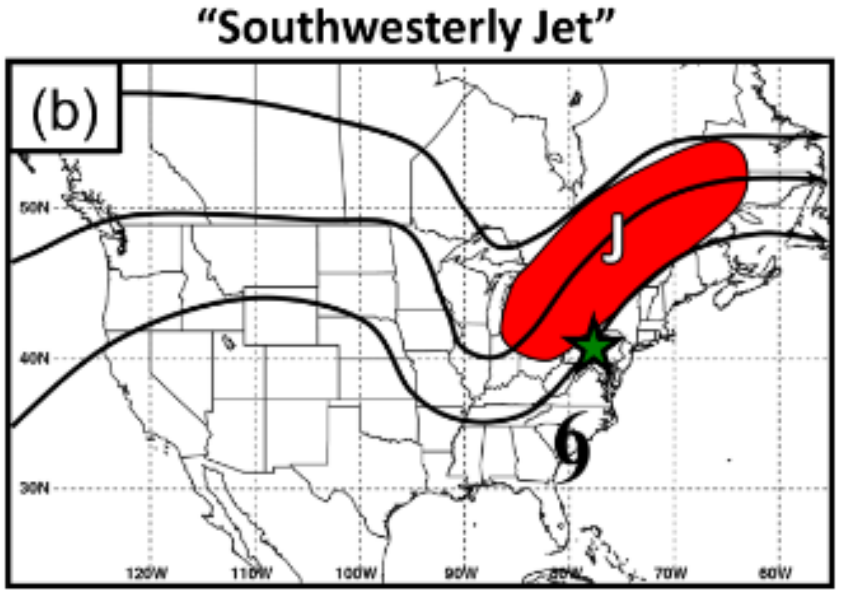
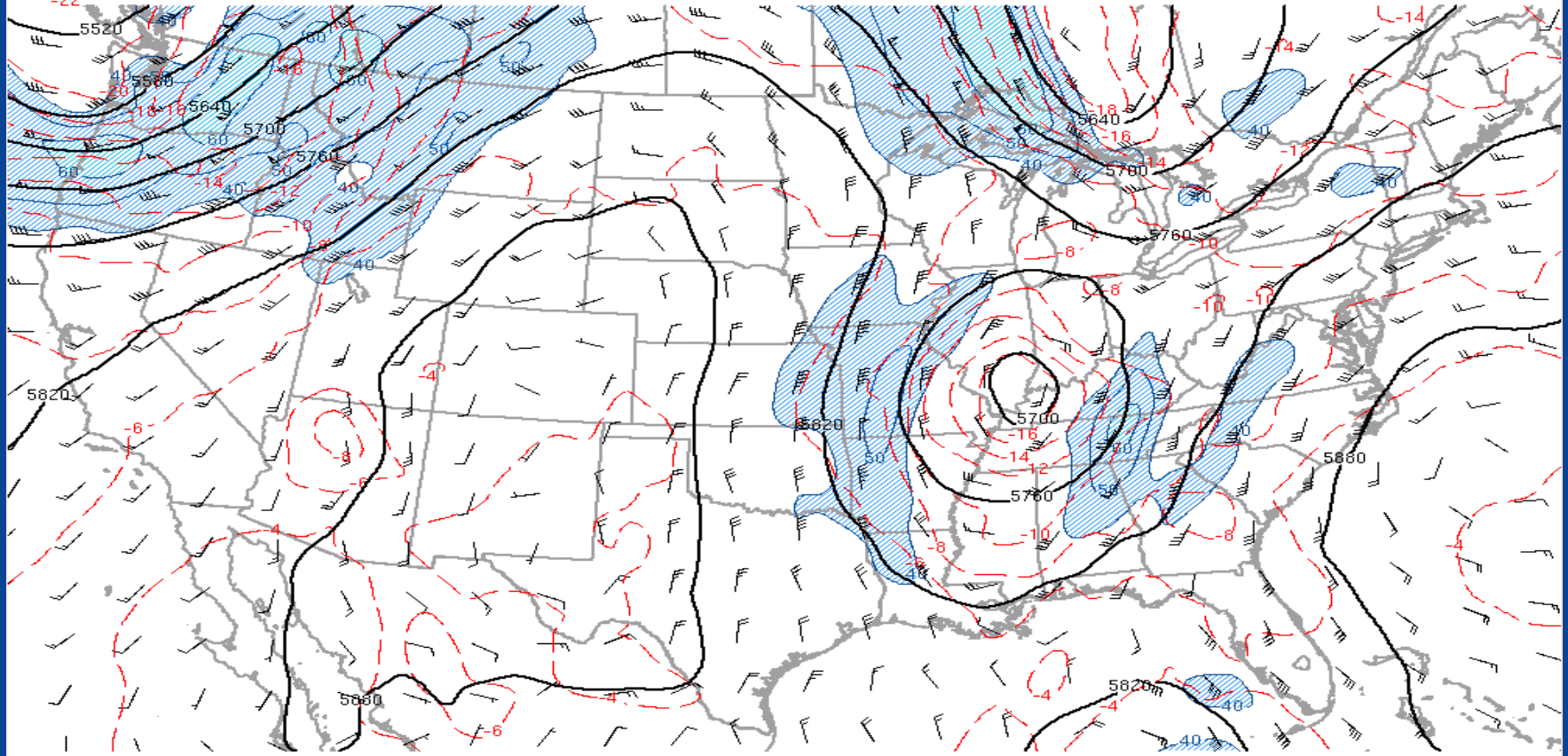
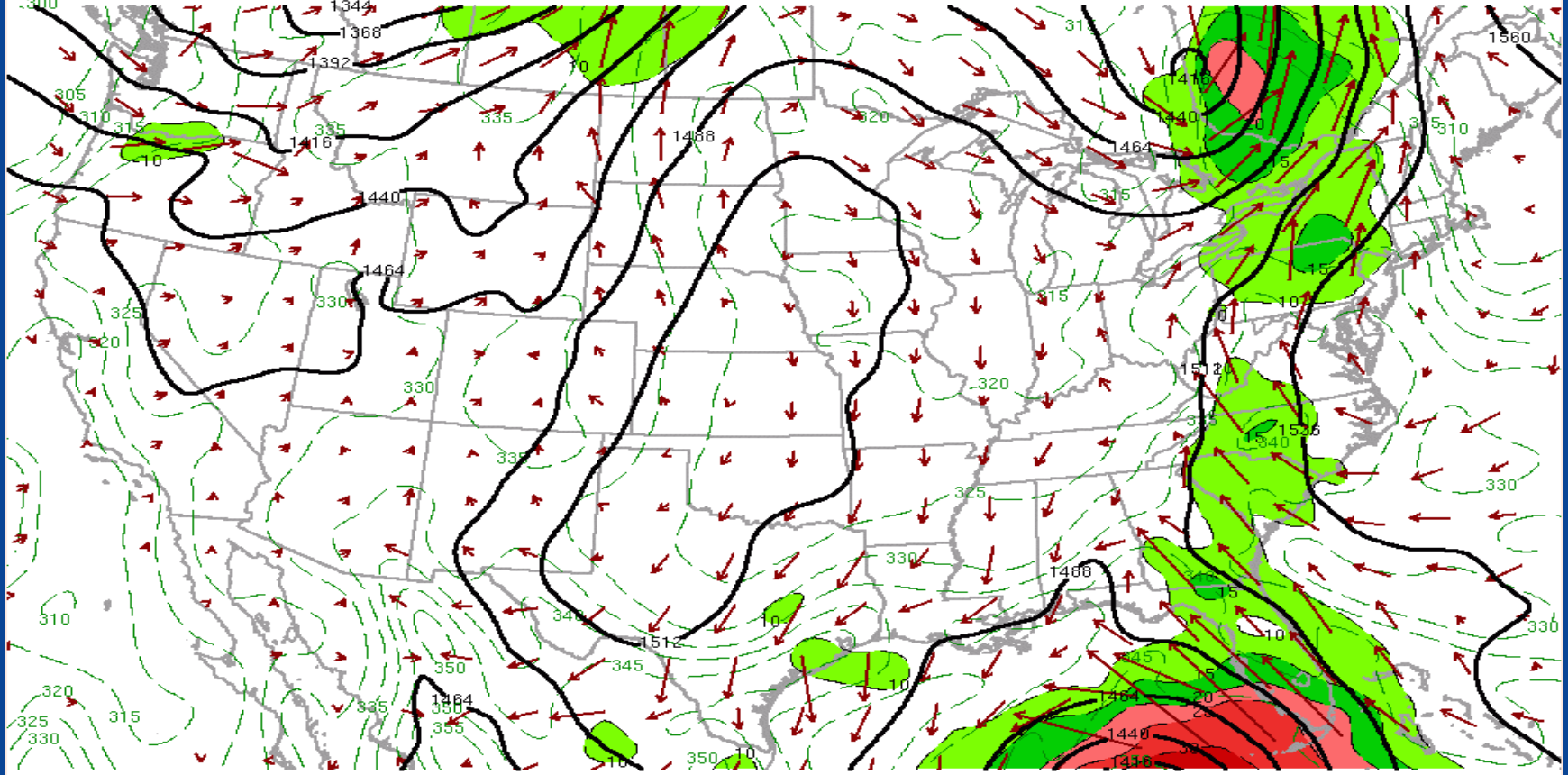


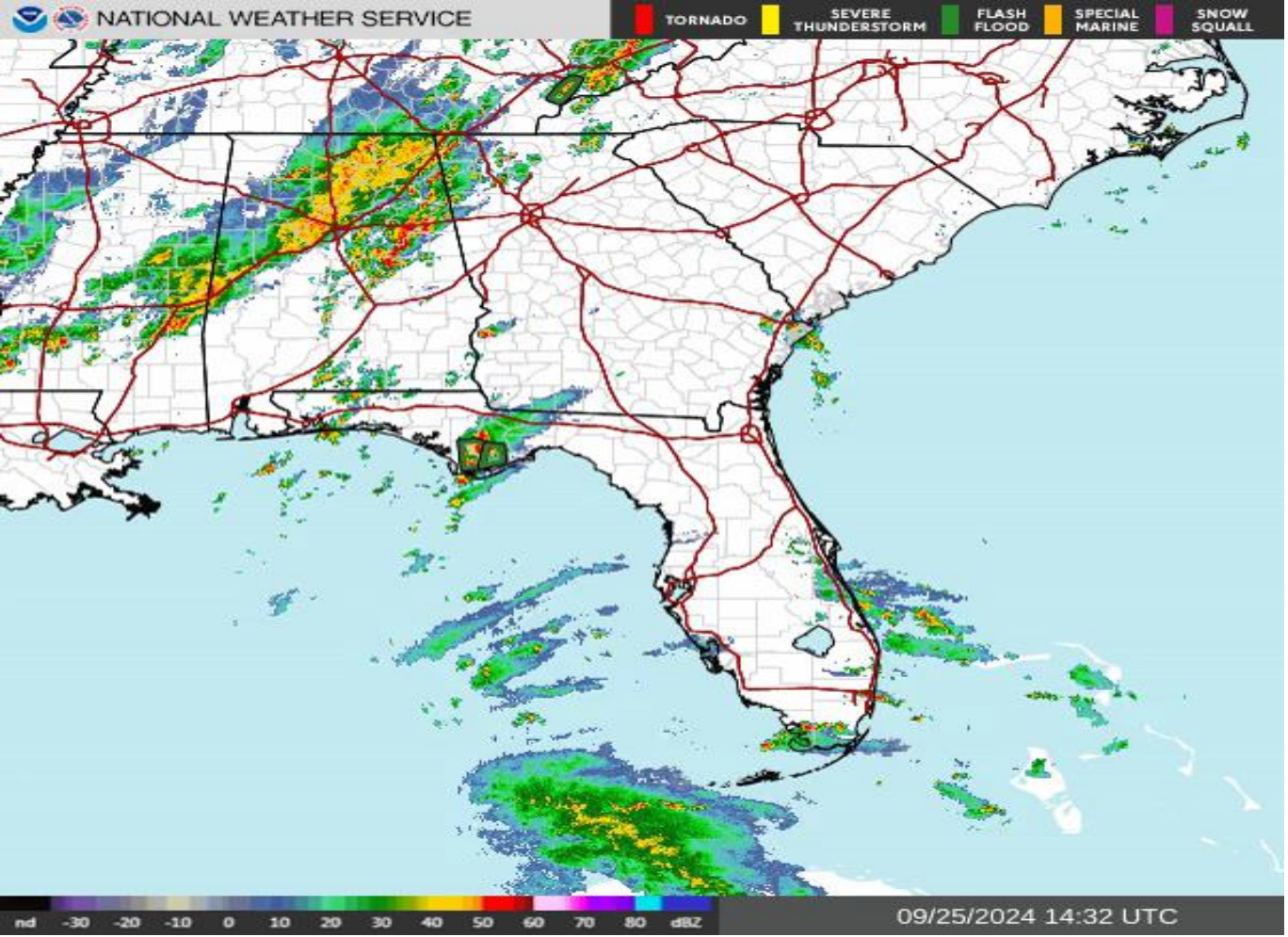
Figure 2.1b (Moore 2010)



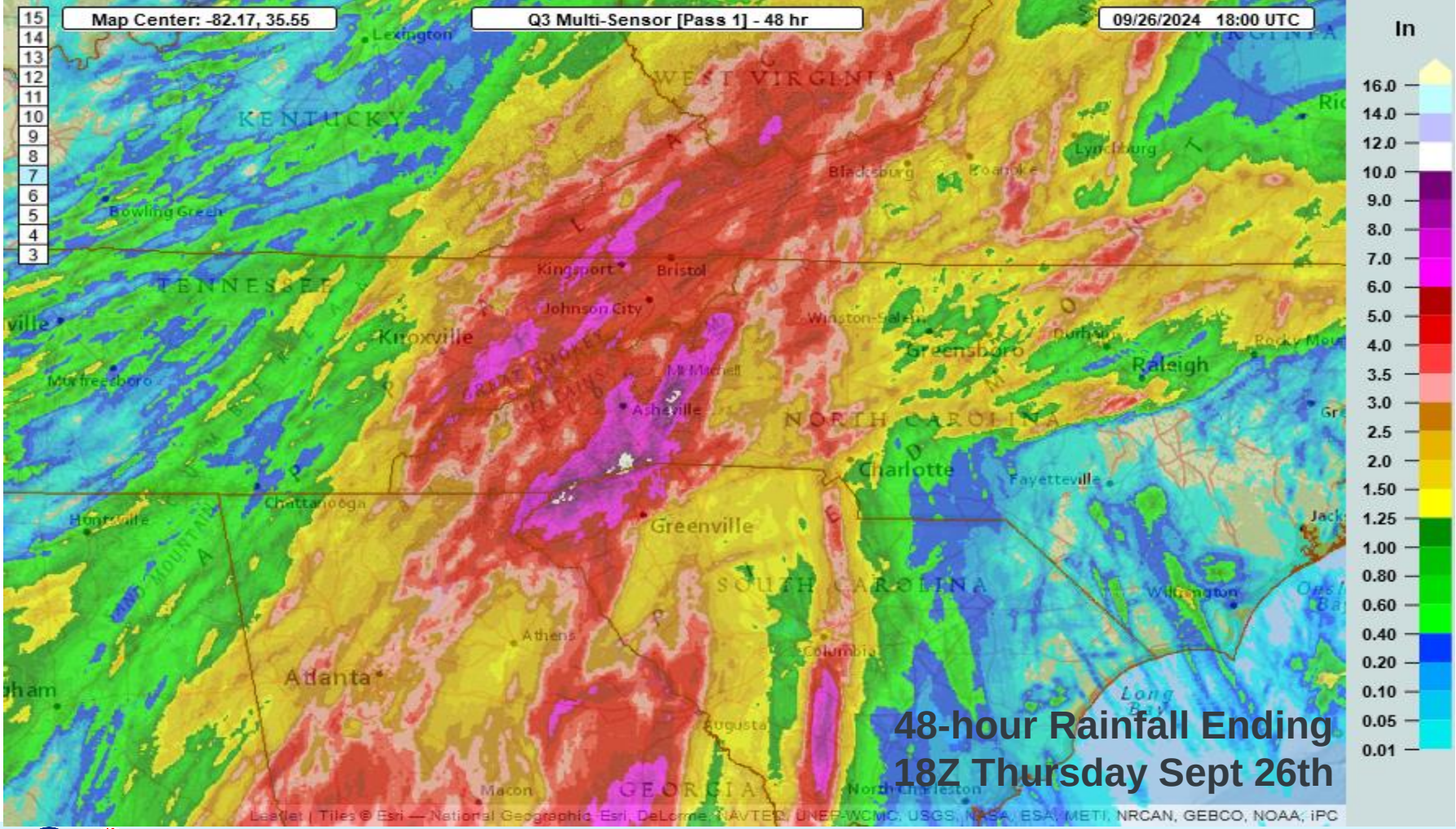
500 mb – 00 UTC Thursday September 26, 2024

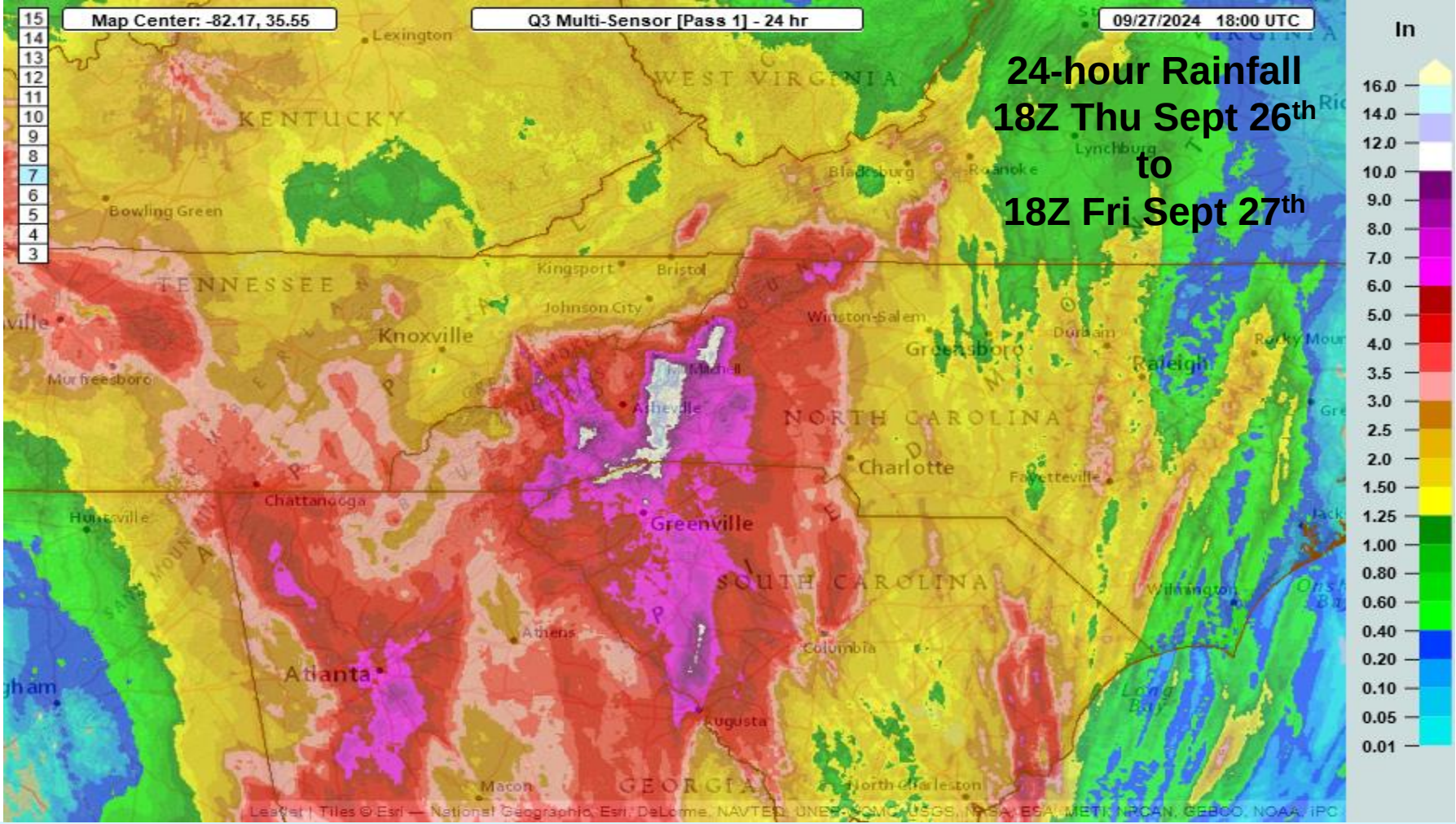


850 mb – 00 UTC Thursday September 26, 2024



48 hour Radar Loop
1432 UTC Wed Sept 25th
To
1402 UTC Fri Sept 27th


Map Center: -82.17, 35.55
Q3 Multi-Sensor [Pass 1] - 48 hr
09/26/2024 18:00 UTC
In
16.0
14.0
12.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.5
3.0
2.5
2.0
1.50
1.25
1.00
0.80
0.60
0.40
0.20
0.10
0.05
0.01
48-hour Rainfall Ending
18Z Thursday Sept 26th
Leaflet | Tiles © Esri — National Geographic, Esri, DeLorme, NAVTEQ, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, iPC


Map Center: -82.17, 35.55
Q3 Multi-Sensor [Pass 1] - 24 hr
09/27/2024 18:00 UTC
24-hour Rainfall
18Z Thu Sept 26th
to
18Z Fri Sept 27th
In
16.0
14.0
12.0
10.0
9.0
8.0
7.0
6.0
5.0
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KENTUCKY
WEST VIRGINIA
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
Lexington
Bowling Green
Blacksburg
Roanoke
Lynchburg
Kingsport
Bristol
Johnson City
Knoxville
Winston-Salem
Greensboro
Raleigh
Murfreesboro
Asheville
Charlotte
Fayetteville
Chattanooga
Greenville
Atlanta
Athens
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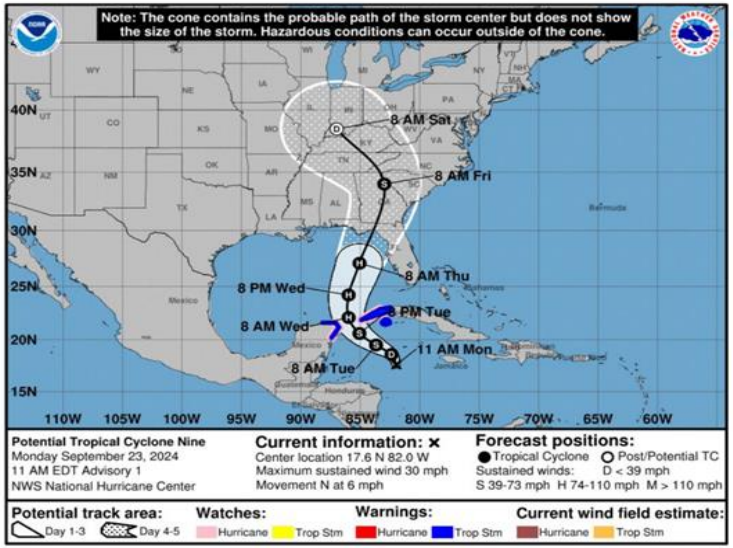
Potential Tropical Cyclone 9

September 23, 2024
11:59 AM

For the western Carolinas and northeast Georgia

OVERVIEW

- Potential Tropical Cyclone 9 is currently developing over the Gulf of Mexico, and is forecast to move near the western Carolinas and northeast Georgia late this week.
- Impacts remain unclear, but heavy rainfall and windy conditions are a possibility.



TIMING	▪ Rainfall will likely begin by Thursday night, with the strongest impacts likely during the day Friday. ▪ Confidence on timing is only moderate, and may change with future briefings.
HAZARDS & IMPACTS	▪ Heavy rainfall is possible, especially over the western part of the forecast area. ▪ Gusty winds may also be a concern. Tropical-storm force winds look unlikely, but not impossible, at this time. ▪ Exact numbers for rainfall or wind gusts are difficult to pin down this far out.
NWS ALERTS	▪ None
FORECAST CHALLENGES	▪ With over 72 hours between now and the event onset, there's still significant question over what direction the system will track, which severely reduces confidence in the wind and rainfall forecasts. ▪ The possibility of preceding rainfall on Tuesday and Wednesday makes it even more difficult to determine how much any heavy rain associated with PTC 9 will affect the area.
POST-EVENT OUTLOOK	▪ The system is expected to lift north by Saturday, resulting in drying and quieter conditions.
NEXT BRIEFING	▪ By 6 PM Monday, September 23rd.

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

National Weather Service
Greenville-Spartanburg, SC

GSP AFD – 330 pm Tue Sept 24th

On Wed, the **synoptic pattern comes together to produce a Predecessor Rain Event (PRE)**. This pattern is looking more defined on the current model runs and has shifted east from previous solns into our wrn FA areas.

Wed Night through Friday **Night…Signals point toward a Predecessor Rainfall Event (PRE) that may already be underway at 00Z Thursday** across parts of northeast GA, southwest NC, and the western Upstate. Although Helene will still be well to the south at that time, a plume of deep tropical moisture lifting northward to the east of a large upper low over the mid-MS Valley region, combined with deep layer forcing, is expected to result in a high probability of showers. **Rainfall efficiency should be high**. Although parts of southwest NC and northeast GA have been dry recently, the antecedent conditions may not matter much. **The ingredients will be in place for a good chance of significant rainfall more than 24 hours before Helene arrives.**

3:30 pm Tue Sept 24 Webinar

Pre-Helene Rainfall

Tropical Storm Helene

Note: The forecast will change between now and Wednesday night

- A predecessor rain event will occur ahead of Helene.
- Distinct region of heavy rainfall that develops 24-36 hours in advance of the main rain shield associated with Tropical Systems.
- Flash flood concern will be greatest along the Blue Ridge Escarpment and Great Smokies prior to Helene, with 4-6+" possible. Significant mainstem flooding can't be ruled out.

Last updated: 9/24/2024 3:30 PM EDT

National Weather Service - Greenville-Spartanburg, SC

Helene Rainfall

Tropical Storm Helene

Note:The forecast will change between now and Wednesday night

- The main rain shield associated with Helene will move into the area Thursday night through Friday afternoon.
- Widespread 3-6+" of rainfall with locally higher amounts. This rainfall on top of previous rainfall will lead to considerable flash flood impacts, with catastrophic impacts possible.
- Vulnerable areas need to prepare for the worst case scenario. Areas that normally do not flood may flood.

Last updated: 9/24/2024 3:30 PM EDT

National Weather Service - Greenville-Spartanburg, SC

Storm Total

Tropical Storm Helene

Note: The forecast will change between now and Wednesday night

- The combination between the predecessor event and Helene will cause numerous instances of significant and damaging flash flooding across the western Carolinas and northeast Georgia.
- Significant flooding of larger streams and mainstem rivers is likely with flooding in some areas persisting into Saturday. Major flooding is possible.
- Several landslides may occur across the mountains.

Last updated: 9/24/2024 3:30 PM EDT

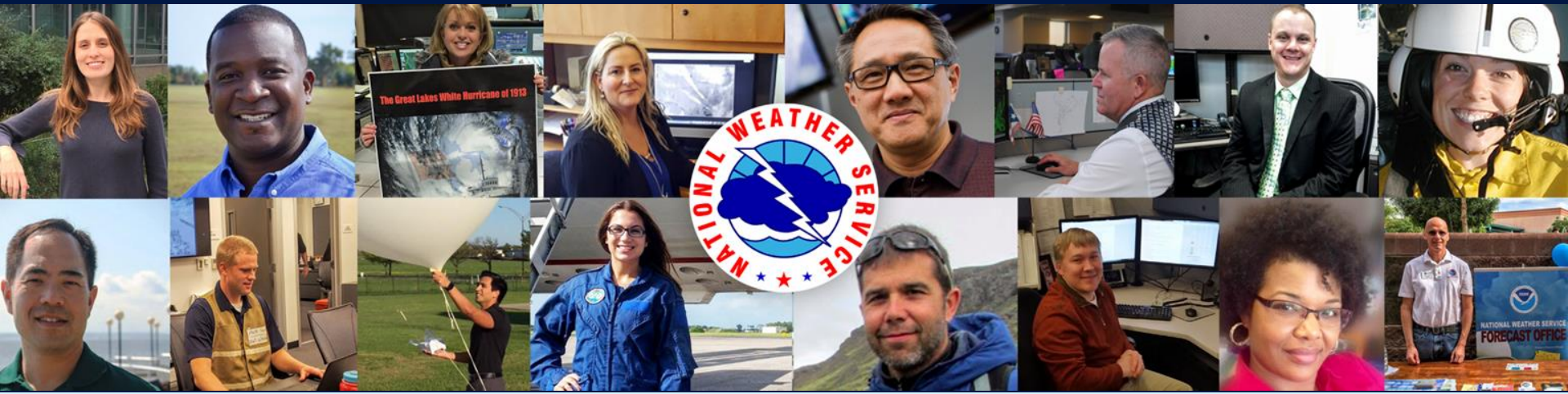
National Weather Service - Greenville-Spartanburg, SC

Messaging Continued to Ramp Up

- **WPC ERO Moderate Risk for PRE and Helene – upgraded to High Risk**
- **Comparisons made to 1916 extreme flood event across Southern Appalachians**
  - Need to assess effectiveness – no one alive for this event
  - EM feedback indicated this was effective to convey seriousness
- **Strong messaging about threat of major landslides**
- **Numerous Flash Flood Emergencies issued**

Despite the significant loss of life – early recognition and messaging of the PRE exacerbating the direct impacts from Helene likely saved hundreds of lives and aided post-event recovery

Thank you!


The Great Lakes White Hurricane of 1913
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FORECAST OFFICE