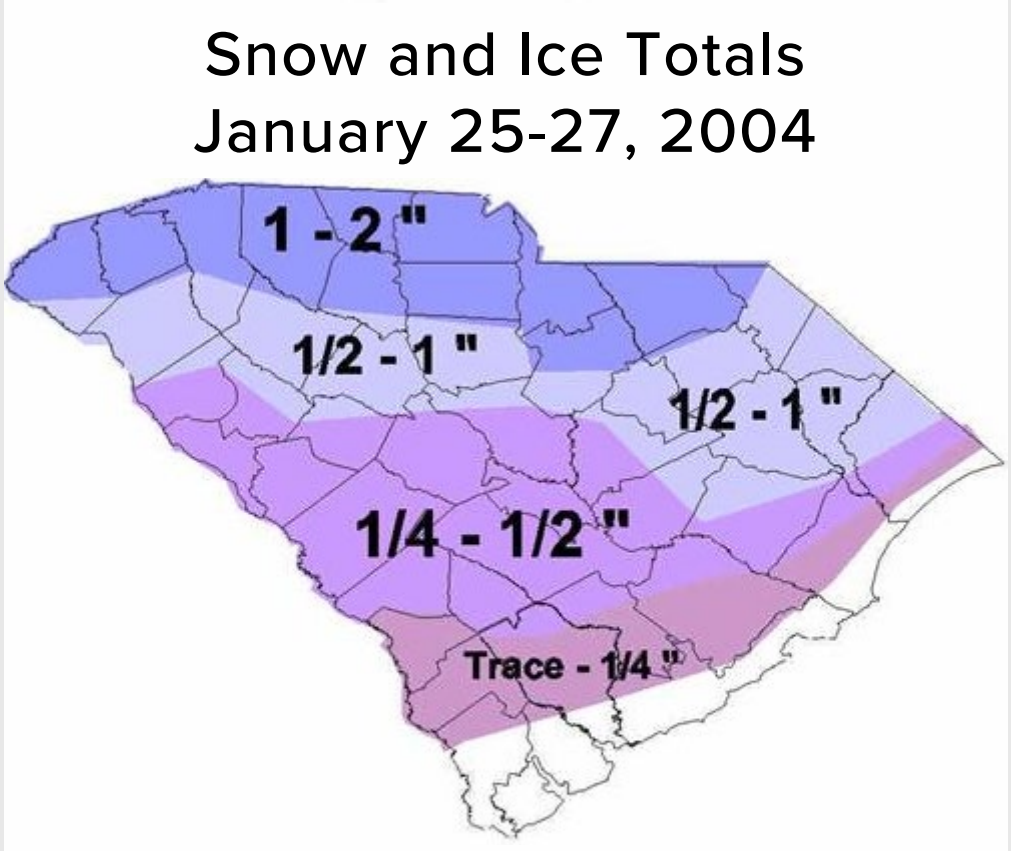
State Climatology Office

Open File Report

# Winter Storm of January 25-27, 2004




Data compiled using Public Information Statements from National Weather Service offices in Columbia, Charleston, Greer and Wilmington, N.C.

Original author: Jason Caldwell in mid-2004

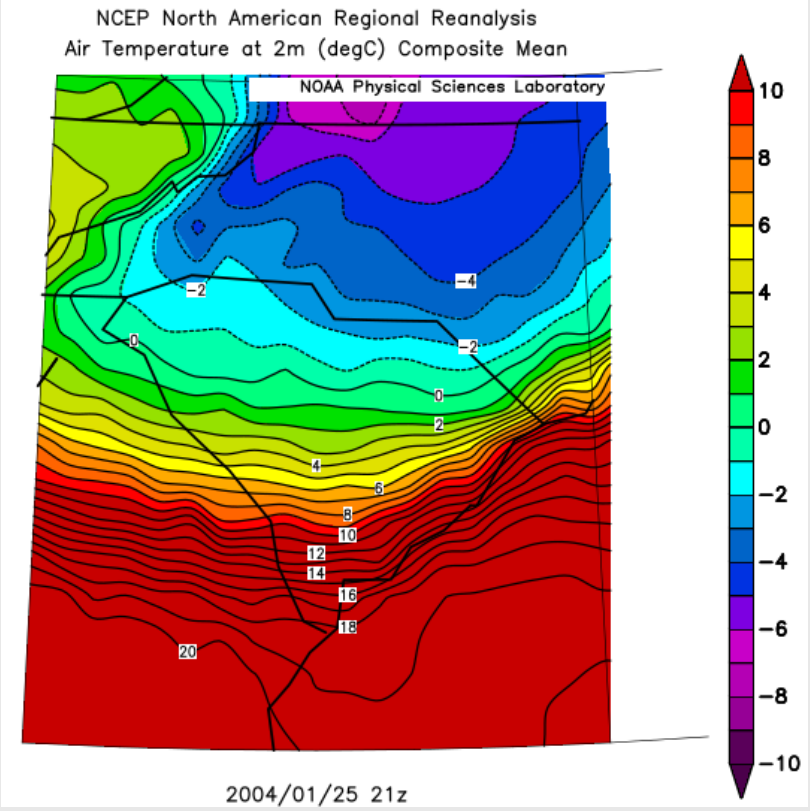
Edited and updated by Frank Strait on January 12, 2023

## Meteorological Synopsis

January 2004 brought below-average temperatures to all of South Carolina, which set the stage for a significant winter storm that affected the state late in the month. The day preceding the storm, however, was one of just a handful of days with above-normal temperature readings during the month over parts of the state. On Saturday, January 24, 2004, high temperatures reached the 60s over most of the state, with locations in Allendale and Sumter Counties reporting a high of 71°F.

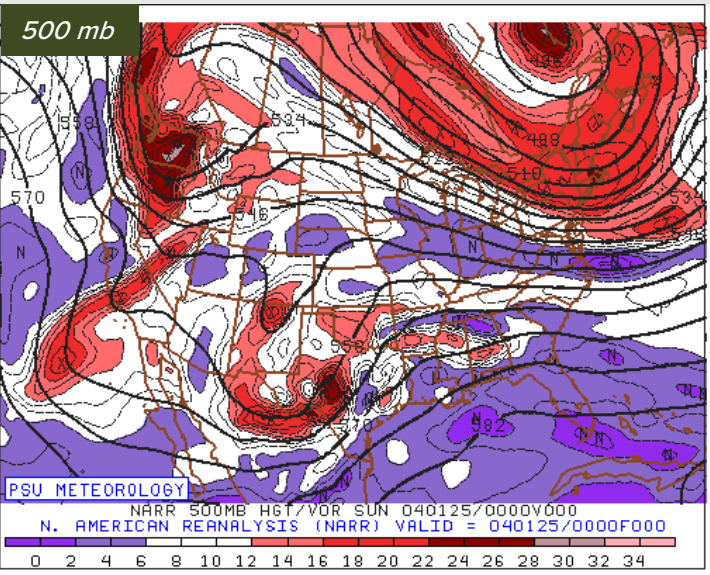
However, a cold front was approaching from the north that day and this cold front moved through the state that night. The polar air mass which moved in behind this cold front brought a turn to colder-than-average temperatures to South Carolina.

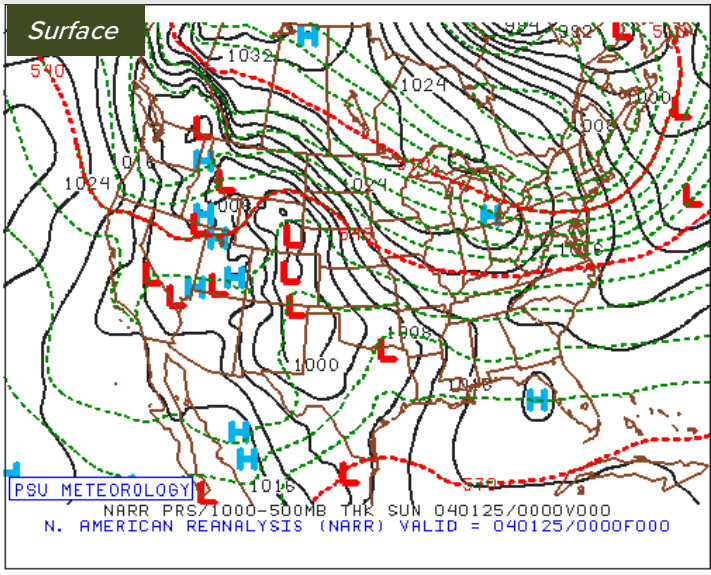
Surface high pressure behind the front became anchored over Pennsylvania, which began a continuous flow of cold air into South Carolina from the northeast. The result was a cold air damming (CAD) situation, which frequently occurs during the winter months east of the Appalachian Mountains and is often associated with winter storms in the Carolinas and Virginia. Despite the unseasonable warmth of January 24, temperatures fell to the 30s and 40s over the state's northern half by daybreak on Sunday, January 25. Temperatures would continue to fall on January 25. As the CAD situation became entrenched over South Carolina and adjacent states, temperatures fell below freezing over the northern part of the state.

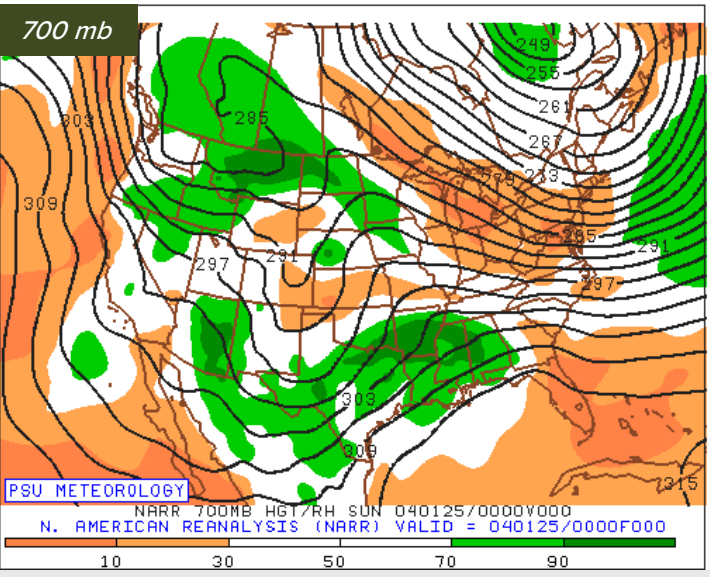


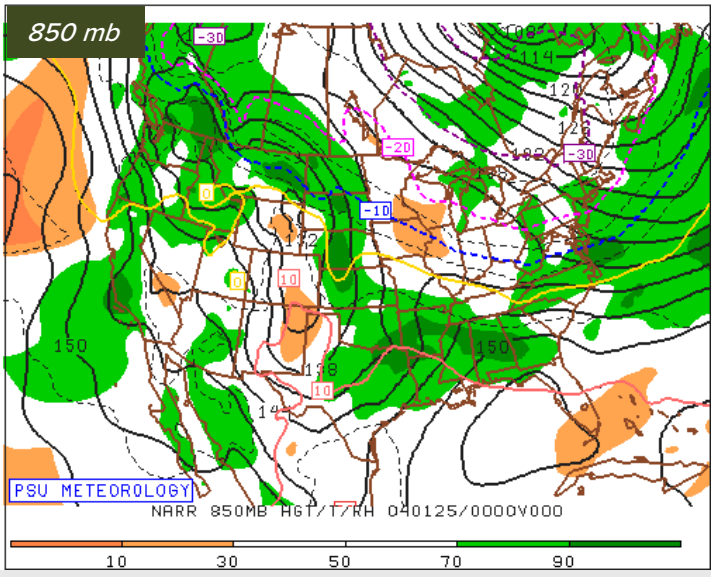

*Temperatures across South Carolina at 4:00 p.m. EST on January 25, 2004, ranged from around -2°C (28.4°F) close to the North Carolina state line to around 18°C (64.4°F) in the southern Lowcountry.*

# Meteorological Synopsis



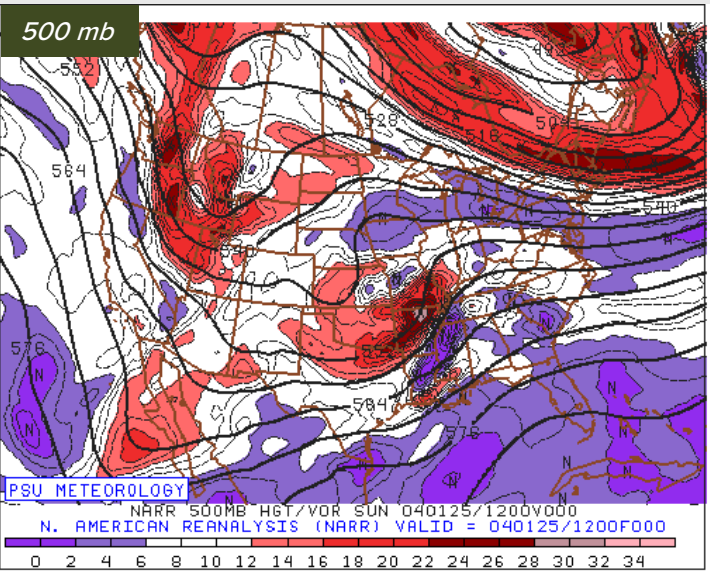



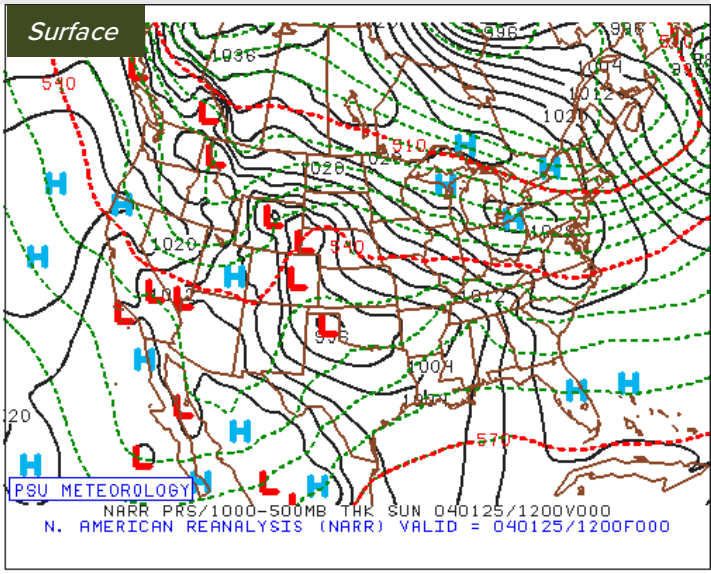

0000 UTC January 25, 2004 (7 p.m. January 24 EST):

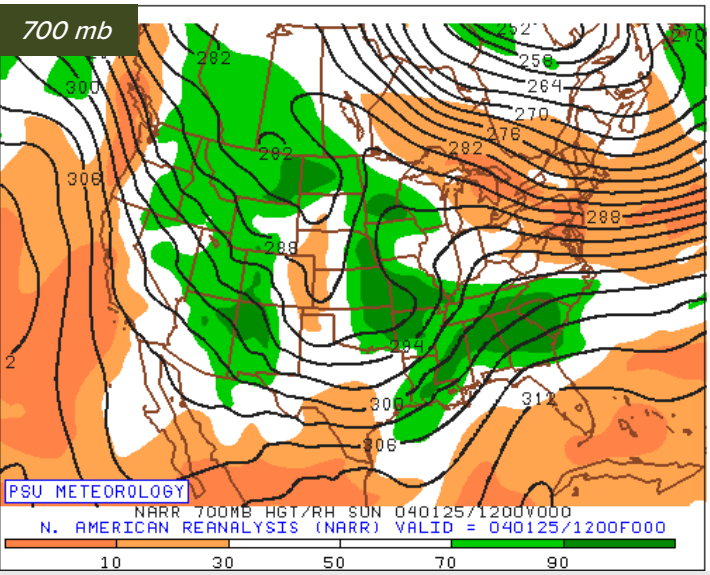
- A surface cold front was moving into South Carolina as high pressure centered near Detroit, Michigan at the time pressed eastward. Temperatures in South Carolina were mostly in the 60s ahead of this front.
- 500 millibar level shortwave features were found over West Texas, the Pacific Northwest and southwest of California, all passing through a broad longwave trough feature over the West.
- A 500 millibar ridge feature was found over the southeastern states.
- Moisture at 850 millibars and 700 millibars associated with the lead shortwave feature was drifting toward South Carolina from the lower Mississippi Valley.

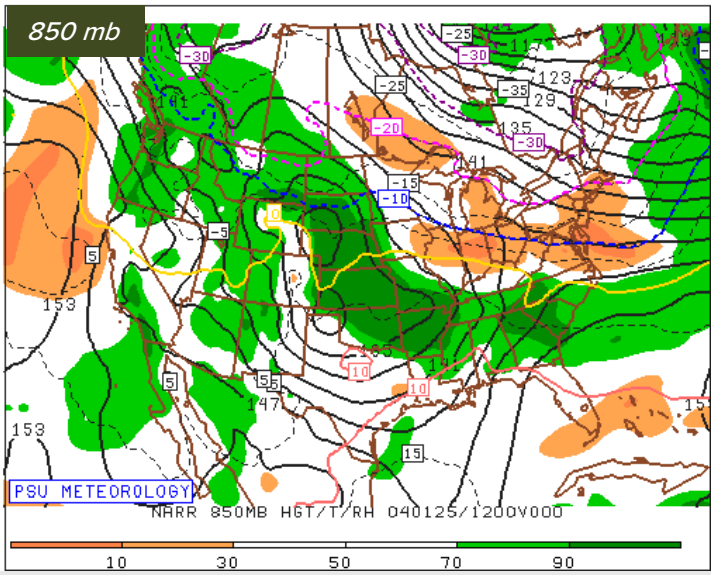
NARR imagery from the Penn State University eWall website

# Meteorological Synopsis



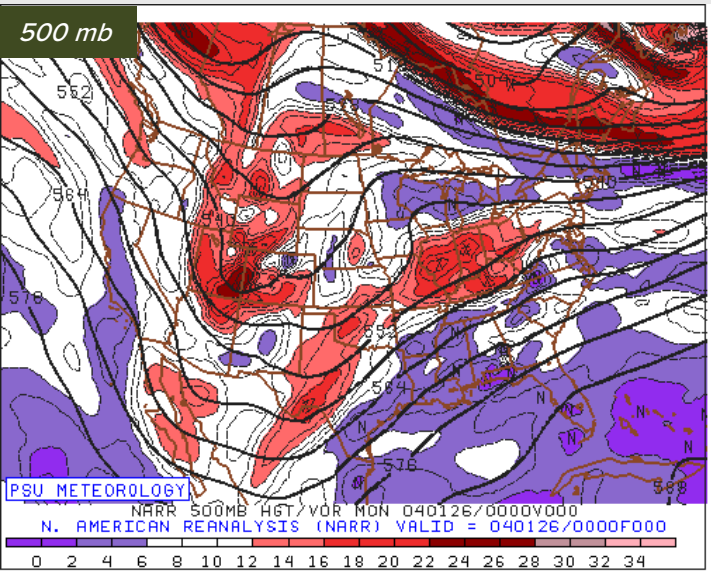



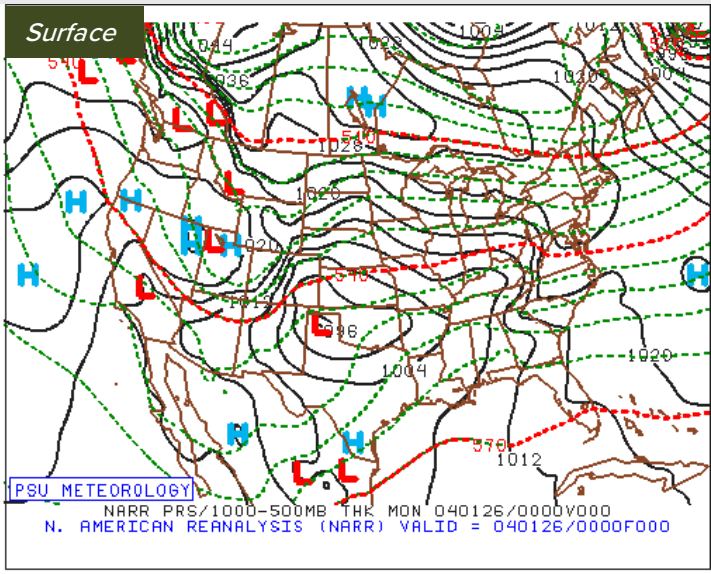

1200 UTC January 25, 2004 (7 a.m. January 25 EST):

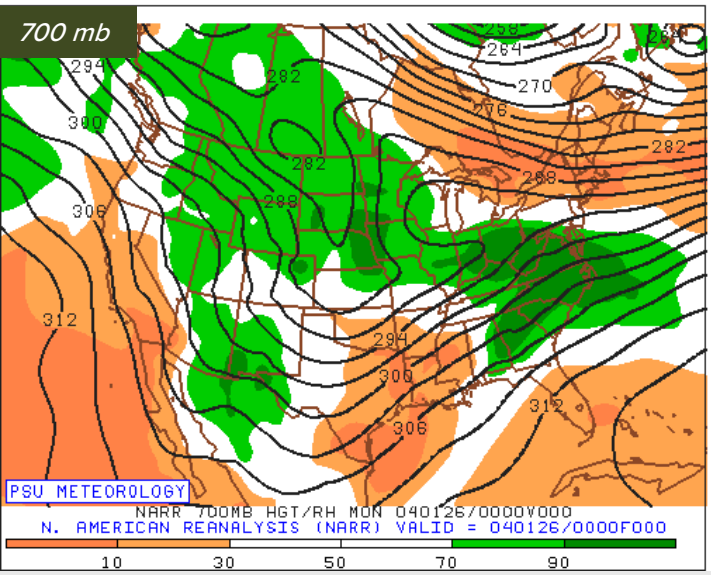
- At the surface, the front had reached the Grand Strand and Lowcountry with CAD evident in the surface isobar pattern. The front would soon become stationary along the South Carolina coast.
- At 500 millibars, the eastward moving shortwave over the Northwest was kicking the one over the southern Plains eastward.
- The shortwave previously southwest of California was crossing Baja California.
- Southwesterly flow over the Southeast at 850 and 700 millibars sent moisture associated with the lead shortwave over the Southern Plains into South Carolina.

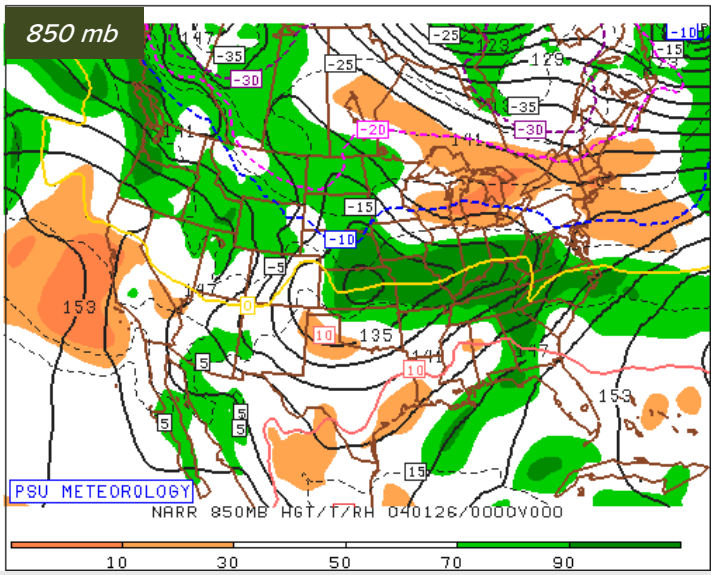
NARR imagery from the Penn State University eWall website

# Meteorological Synopsis




0000 UTC January 26, 2004 (7 p.m. January 25 EST):

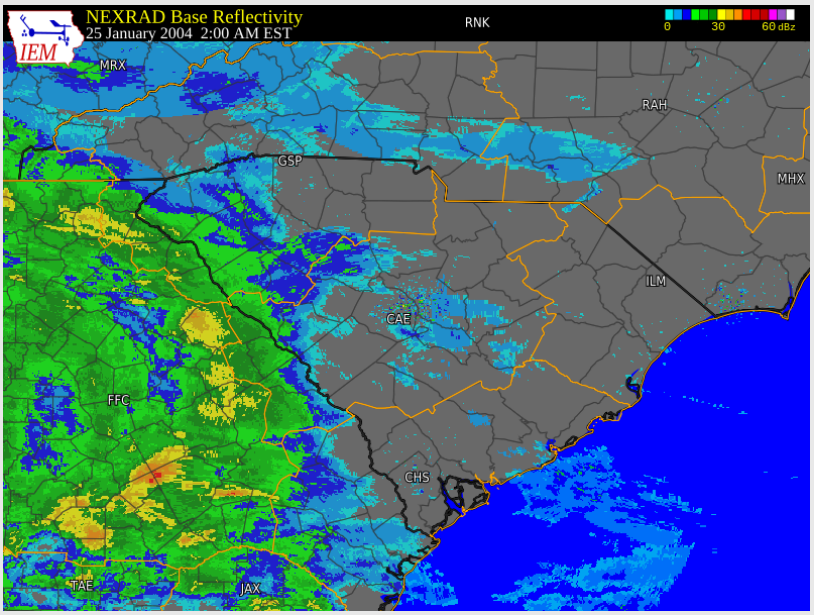
- CAD was entrenched over the Carolinas, indicated by ridging in the surface isobars. A stationary front was near South Carolina's coast, extending west through Georgia and Alabama.
- The leading 500 millibar shortwave was over the Midwest and the shortwave previously over Baja California had reached the southern Plains States. The shortwave from the Northwest had reached the Four Corners and was kicking the southern Plains shortwave northeastward.
- Moist southwesterly flow continued at 850 millibars and 700 millibars over the Southeast, with high relative humidity at those levels over most of South Carolina causing precipitation.

NARR imagery from the Penn State University eWall website

## Meteorological Synopsis

The broad upper-level trough over the western part of the nation at the event's start would make slow eastward progress as the storm unfolded. Three different shortwave features would follow the jet stream around this upper trough to generate the precipitation for this winter storm. An upper-level ridge was found over the southeastern United States at the start of the event, which would grow to cover much of the East Coast of the United States during the storm. This upper-level ridge would force the shortwave features to pass by to the north of South Carolina. By the time the event ended, the upper ridge would flatten and shift eastward over the Atlantic Ocean.

Shortwave features following the jet stream path around the upper trough would send three separate waves of moisture into South Carolina. The first of these would begin to spread precipitation over the state during the early morning hours of Sunday, January 25. Initially, it was too warm for anything but rain to fall in South Carolina. However, after the rain began, cooling by evaporation occurred, lowering temperatures. Also, progressively colder air continued to flow into the state from the northeast.

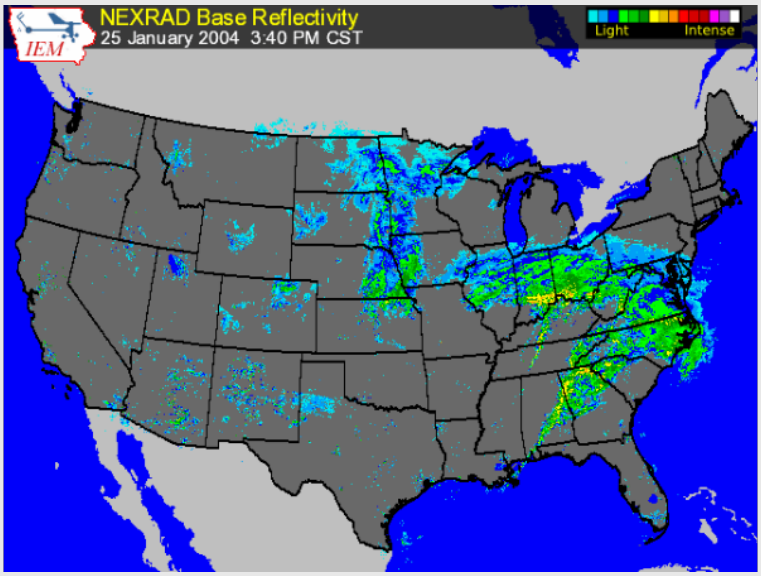



*Composite weather radar imagery showing precipitation arriving in South Carolina at 2:00 a.m. EST on January 25, 2004.*

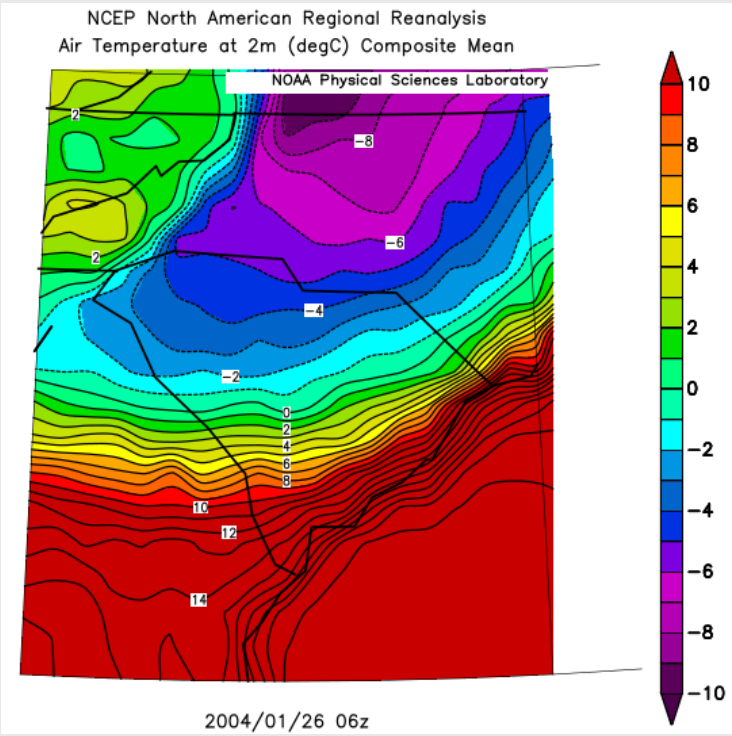
The first wave of precipitation, occurring along a warm front associated with the lead upper-level shortwave feature, was enhanced as the southwesterly flow of moisture was forced to rise over the denser cold air building into areas east and southeast of the Appalachians. This first wave of precipitation largely side-stepped the Lowcountry but was moderate to heavy over the rest of the state. Over most of South Carolina, this first wave of precipitation fell as rain which turned to freezing rain in areas close to the North Carolina state line as temperatures dropped below freezing in those areas.

## Meteorological Synopsis

The first wave of precipitation lifted north of the state by midafternoon on January 25. However, by then, the second wave of precipitation along an approaching cold front, also associated with the lead upper-level shortwave feature pushing into South Carolina from the west. Over most of the Upstate, this second wave of precipitation arrived before the first ended and would have been indistinguishable from the first wave.



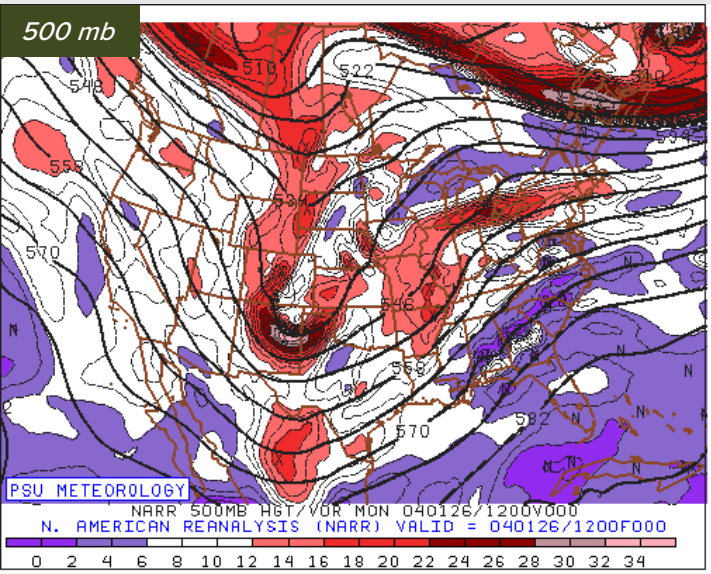

*Composite weather radar imagery showing precipitation coverage at 3:40 p.m. EST on January 25, 2004.*

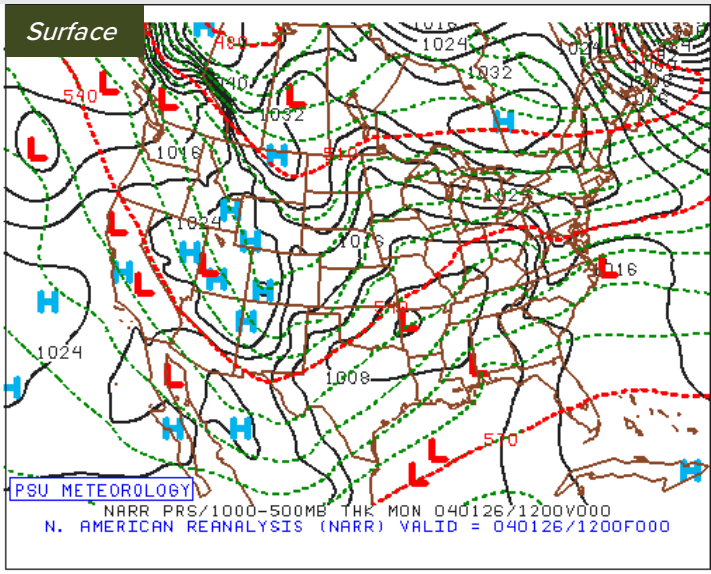


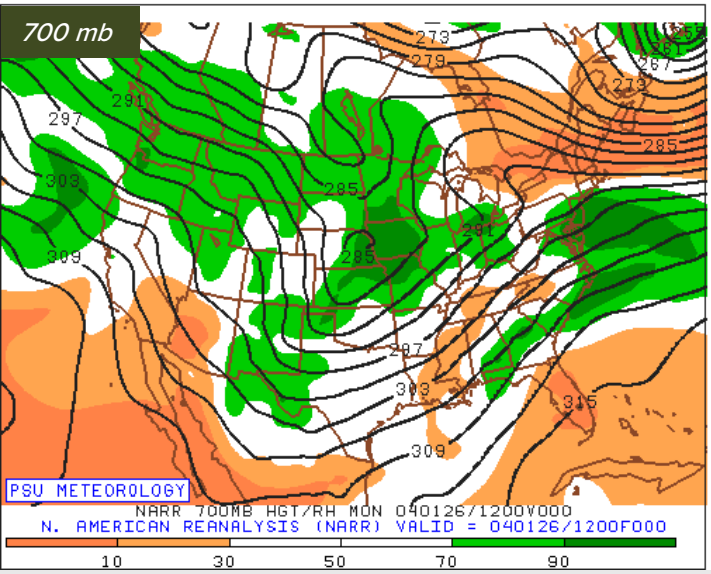

*Temperatures across South Carolina at 1:00 a.m. EST on January 26, 2021, ranged from around -5°C (23.0°F) close to the North Carolina state line to around 16°C (60.8°F) in the coastal areas of the Lowcountry.*

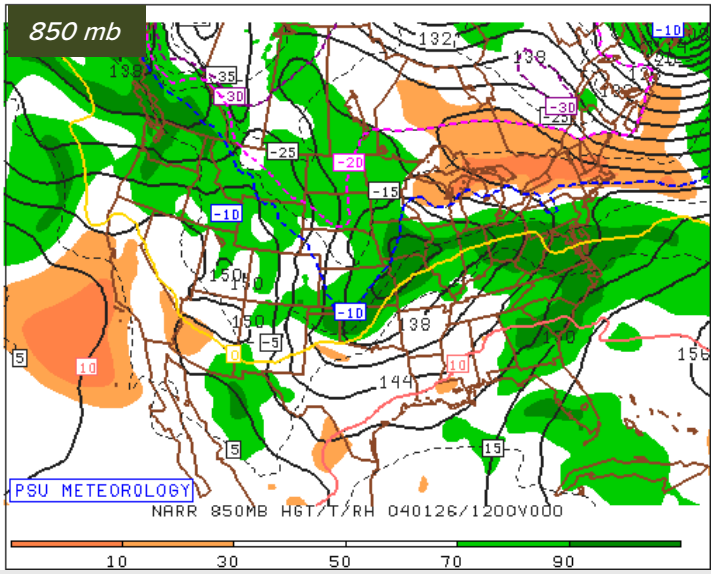
However, surface temperatures and temperatures aloft continued to drop as cold air flowed into the state from the northeast. As a result, freezing rain mixed with or turned to sleet and snow over the Upstate, while the Midlands and northern Pee Dee regions saw rain turn to freezing rain mixed with sleet. The proportion of sleet and snow was greatest along and north of Interstate 85, and in York and Lancaster Counties. It accumulated about one inch in these areas, with less reported over the rest of the Upstate and northern Midlands. These areas saw impactful ice accretions as well. However, precipitation was generally light as the cold front became stationary over South Carolina.

# Meteorological Synopsis



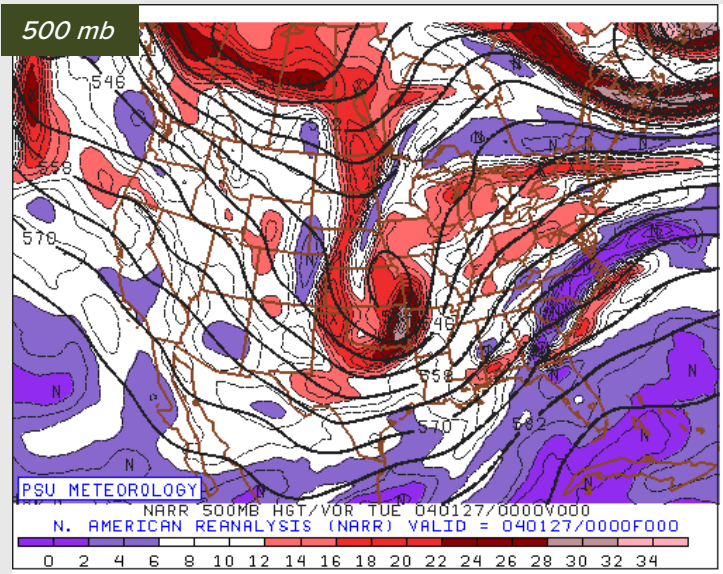



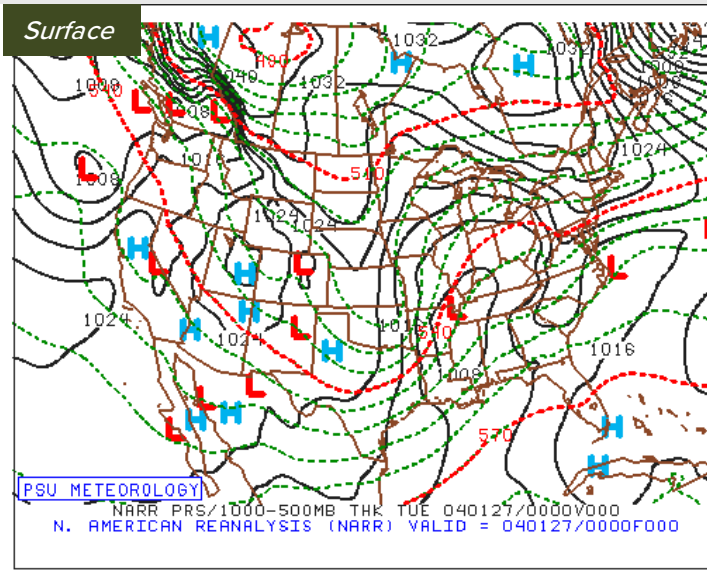

1200 UTC January 26, 2004 (7 a.m. January 26 EDT):

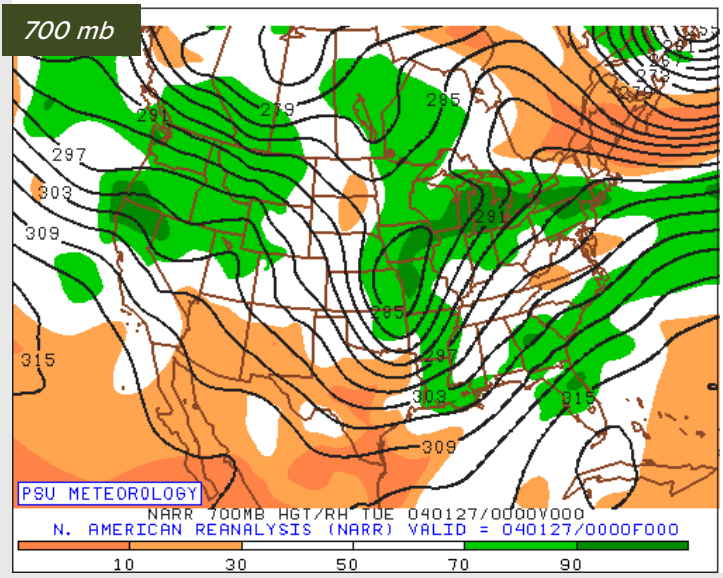
- CAD is still present over the Carolinas, evident in the surface isobar pattern indicating ridging from high pressure to the north.
- The 500 millibar shortwave previously over the Southern Plains was moving northeastward through the mid-Mississippi Valley, while the lead shortwave was over the eastern Great Lakes region. The third shortwave in the series was moving eastward over Colorado and New Mexico.
- Ample moisture continues to stream into South Carolina from the southwest at the 700 and 850 millibar levels.

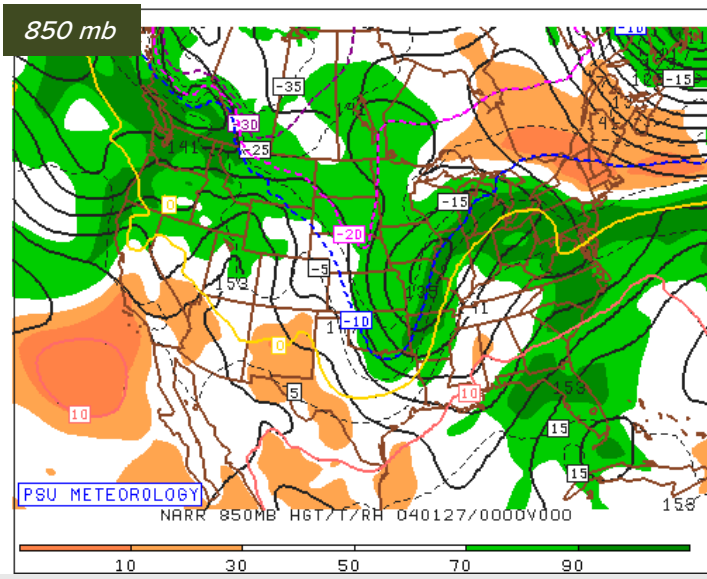
NARR imagery from the Penn State University eWall website

# Meteorological Synopsis



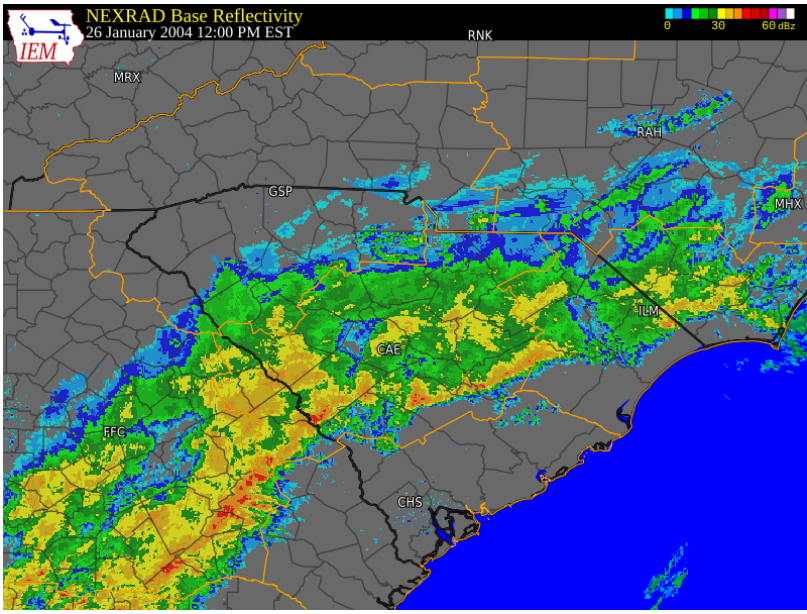

0000 UTC January 27, 2004 (7 p.m. January 26 EDT):

- CAD is still present over the Carolinas
- The 500 millibar shortwave over the southern Plains supported a surface low pressure center over the middle Mississippi Valley and a trailing cold front through the lower Mississippi Valley.
- Moisture was less plentiful at this point at the 700 and 850 millibar levels.

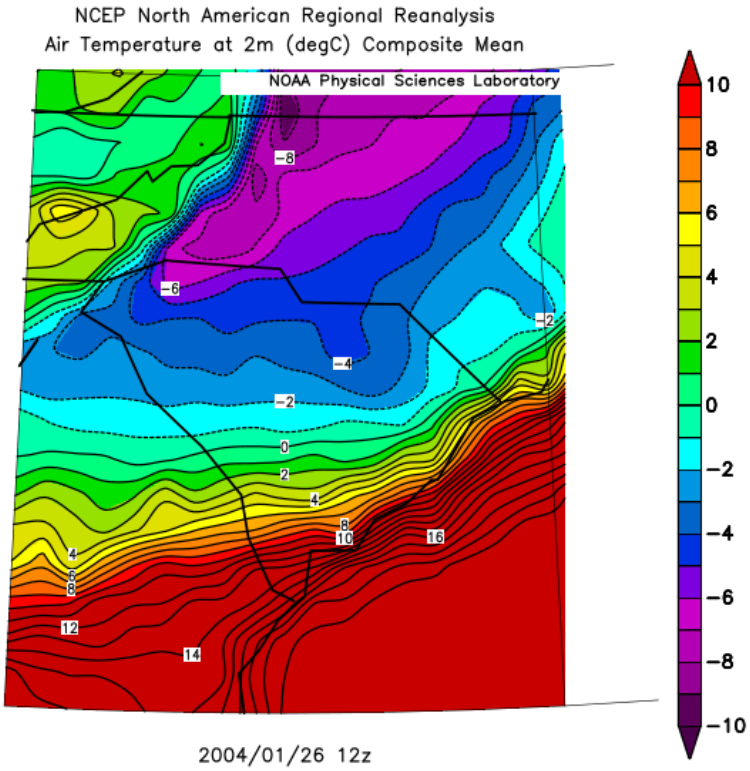
NARR imagery from the Penn State University eWall website

## Meteorological Synopsis

As the morning hours of Monday, January 26 passed, the second shortwave's approach caused the precipitation along the front to retreat to the west and north. The shortwave also enhanced the precipitation, causing it to become heavy again over the Central Savannah River Area, Midlands, Catawba River Area, and northern Pee Dee region. This occurred despite an outbreak of severe thunderstorms along and near the eastern Gulf Coast region.




*Composite weather radar imagery showing precipitation coverage at noon EST on January 26, 2004.*

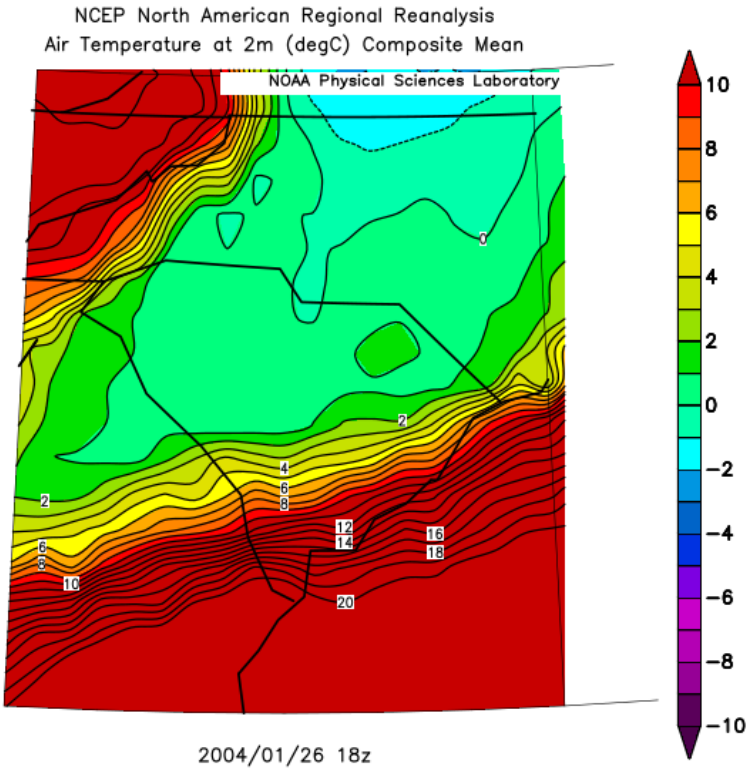



*Temperatures across South Carolina at 7:00 a.m. EST on January 26, 2021, ranged from around -6°C (21.2°F) close to the North Carolina state line to around 12°C (53.6°F) in the coastal Lowcountry.*

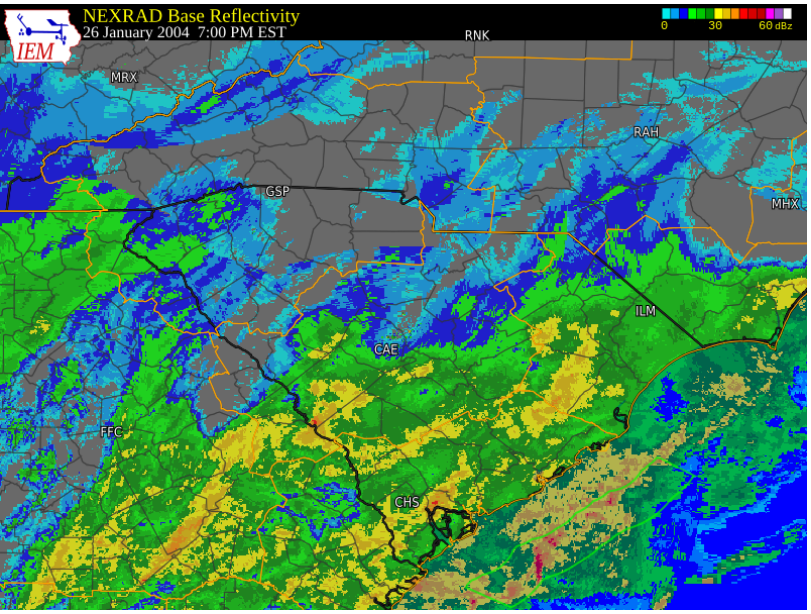
Often such thunderstorm outbreaks consume the moisture flowing into a storm and results in lighter precipitation falling farther north in the Carolinas. Temperatures were well below freezing across the Upstate, over most of the Midlands, and the northern Pee Dee region as the day began but rose to near freezing over this area during the afternoon. Little in the way of additional ice accretion occurred after midday in South Carolina as temperatures were above freezing in most places, and little or no precipitation was occurring in the area at or below freezing.

# Meteorological Synopsis

Precipitation continued along the coastal areas through the afternoon of January 26. During this time, the third in the series of upper shortwave features was approaching South Carolina. This approaching shortwave began to generate heavier and more widespread precipitation again later in the day, especially during the evening. Parts of the Upstate saw temperatures fall back to or below freezing that night and during the early morning hours of Tuesday, January 27, as did some areas to the east along the Catawba River, along with a few spots over the northern Midlands. Those areas saw more freezing rain and additional ice accretion during this time.



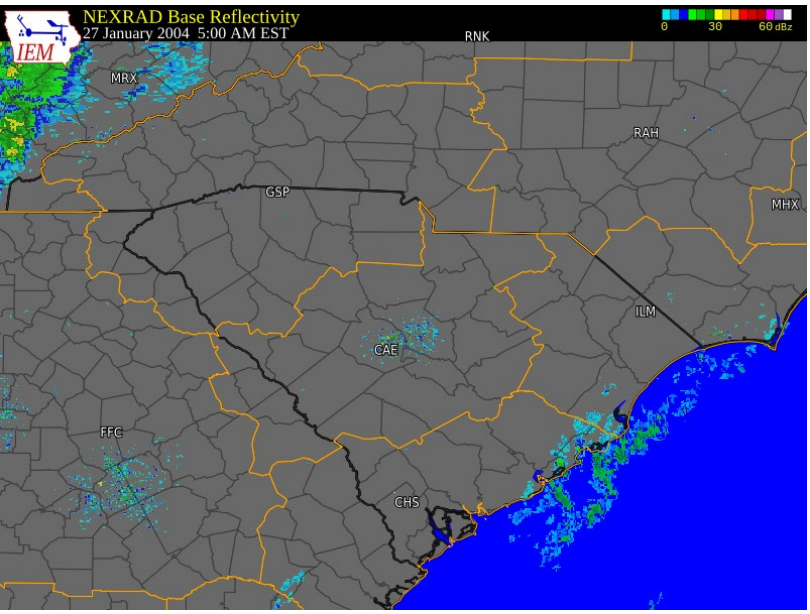

*Temperatures across South Carolina at 1:00 p.m. EST on January 26, 2021, ranged from around 0°C (32.0°F) close to the North Carolina state line to around 20°C (68.0°F) in the coastal Lowcountry.*




*Composite weather radar imagery showing precipitation at 7 p.m. EST on January 26, 2004.*

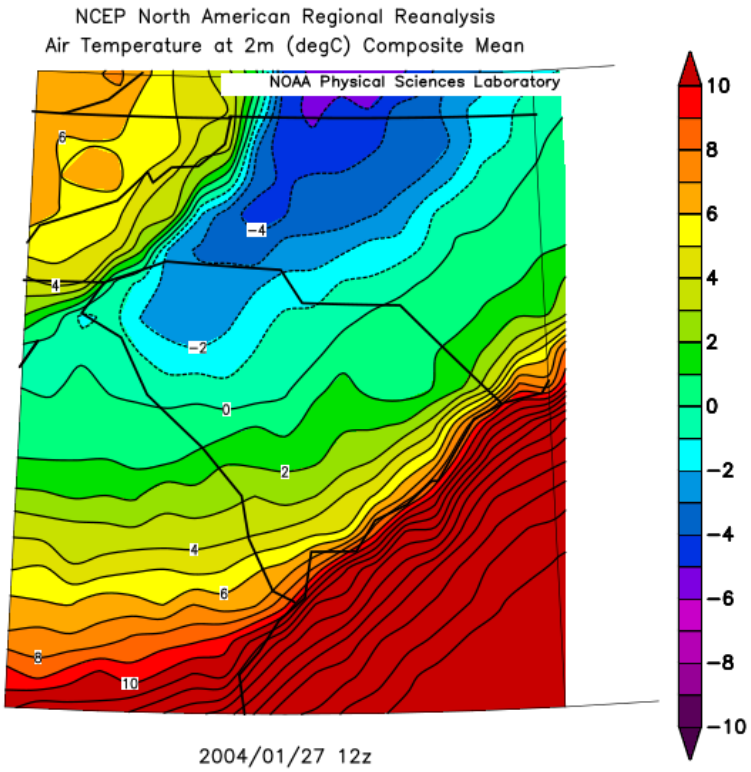
Precipitation would finally move out of the state just after 5:00 a.m. on January 27. However, the locally dense fog lingered over much of the state, with temperatures still below freezing over much of the Upstate, Midlands, and Pee Dee regions. The freezing fog led to a small additional ice accretion and kept roads slippery.

## Meteorological Synopsis



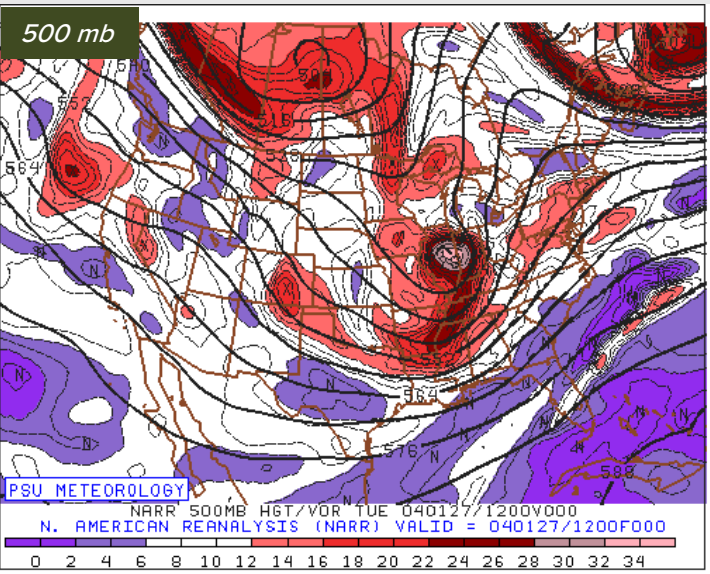

*Composite weather radar imagery showing precipitation coverage across South Carolina at 5 a.m. EST on January 27, 2004.*

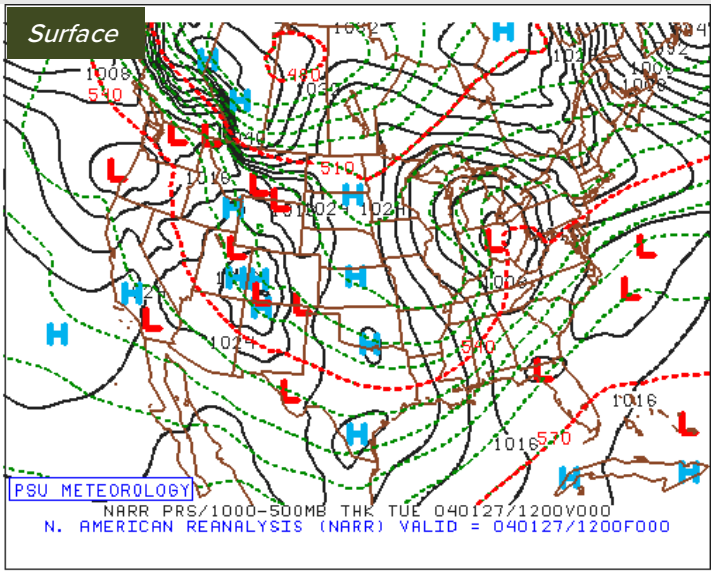
Low clouds, fog, and spotty drizzle would hold on across South Carolina for much of January 27 as the air mass over the state remained stagnant. This slowed the melting of the ice accretions. It would not be until the afternoon, when a cold front associated with the third upper shortwave feature would move through the state, that the sky would clear. This cold front did not have much moisture associated with it, and precipitation with this front passed by to the west and north of South Carolina.

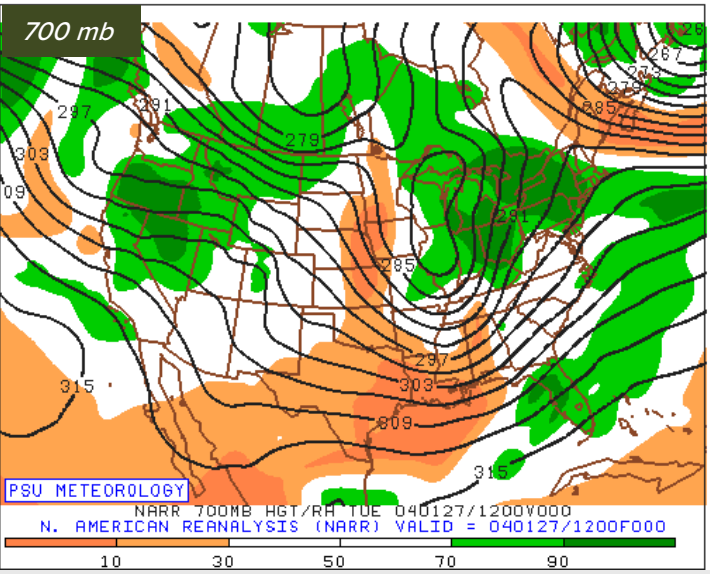


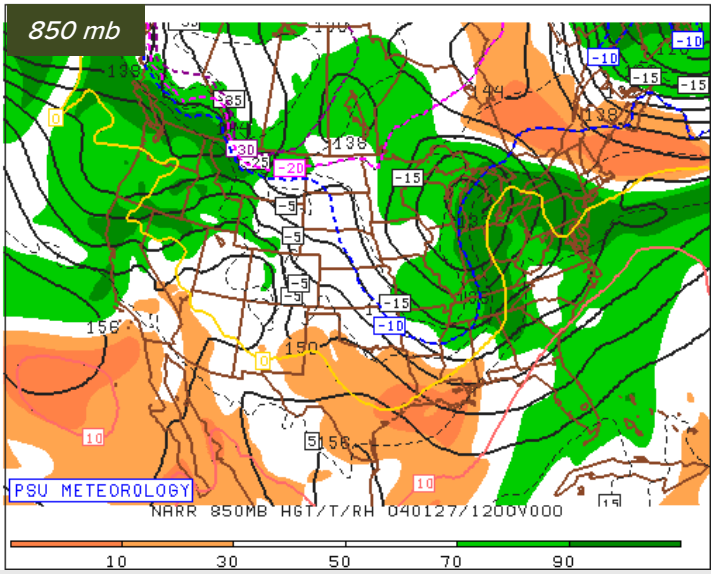

*Temperatures across South Carolina at 7:00 a.m. EST on January 27, 2021, ranged from around -3°C (26.6°F) close to the North Carolina state line to around 10°C (50.0°F) in the coastal Lowcountry.*

# Meteorological Synopsis



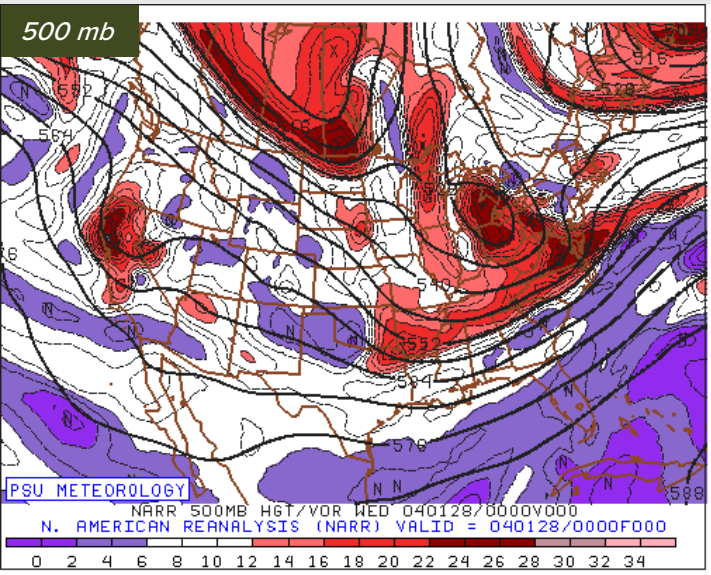



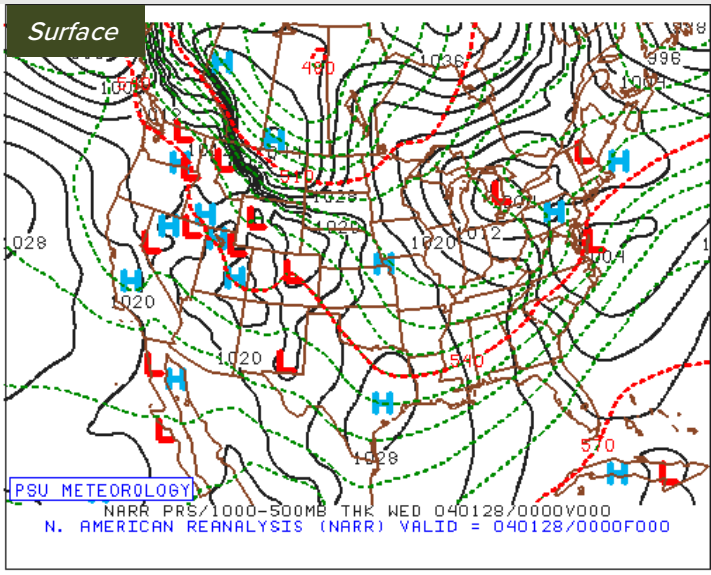

1200 UTC January 27, 2004 (7 a.m. January 27 EDT):

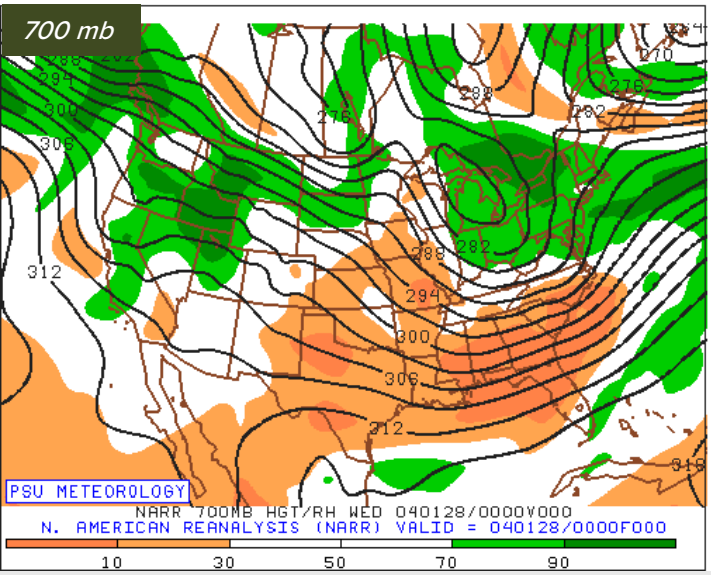
- CAD was still weakly present near the surface over the Carolinas.
- The third 500 millibar shortwave in the series was over the mid-Mississippi Valley, moving east, supporting a surface storm over Ohio and a cold front trailing it to the Florida Panhandle.
- The upper ridge along the East Coast was starting to shift eastward over the Atlantic.
- By this point, steady precipitation had ended across South Carolina, but moisture remained at the 850 millibar level and below, resulting in locally dense fog and spotty drizzle.
- Little moisture was present along the approaching cold front at 700 millibars and 850 millibars.

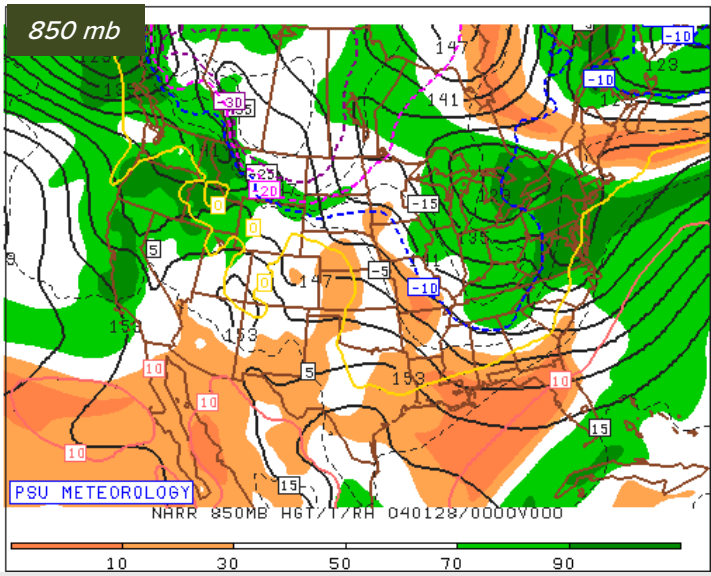
NARR imagery from the Penn State University eWall website

# Meteorological Synopsis



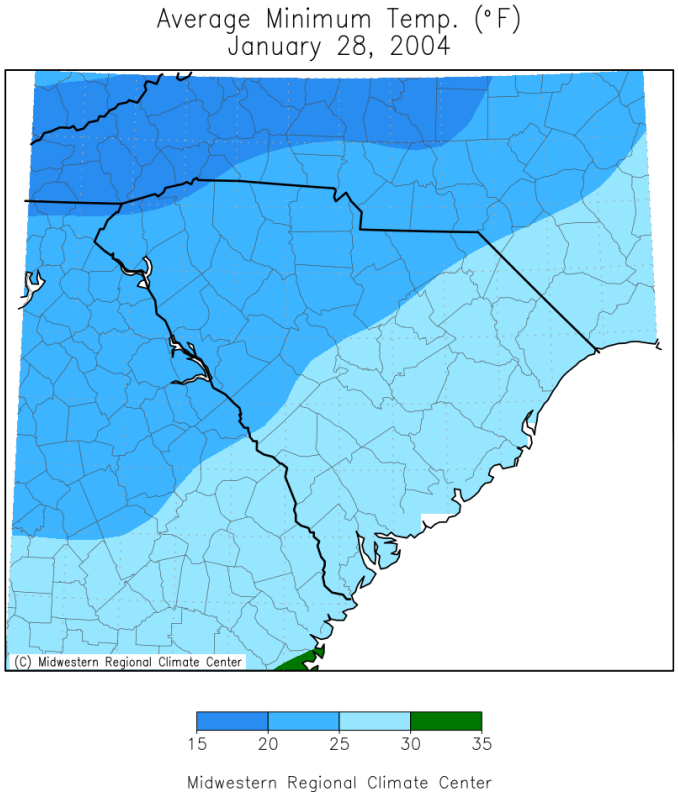

0000 UTC January 28, 2004 (7 p.m. January 27 EDT):

- The storm previously centered over Ohio had tracked to southern Ontario, Canada. The storm was in the process of jumping to the East Coast in Miller B storm fashion, with a coastal low pressure taking shape near Ocean City, Maryland.
- Northwesterly winds from the surface to at least the 850 millibar level were driving cold and dry polar air into South Carolina, causing the sky over the state to clear.

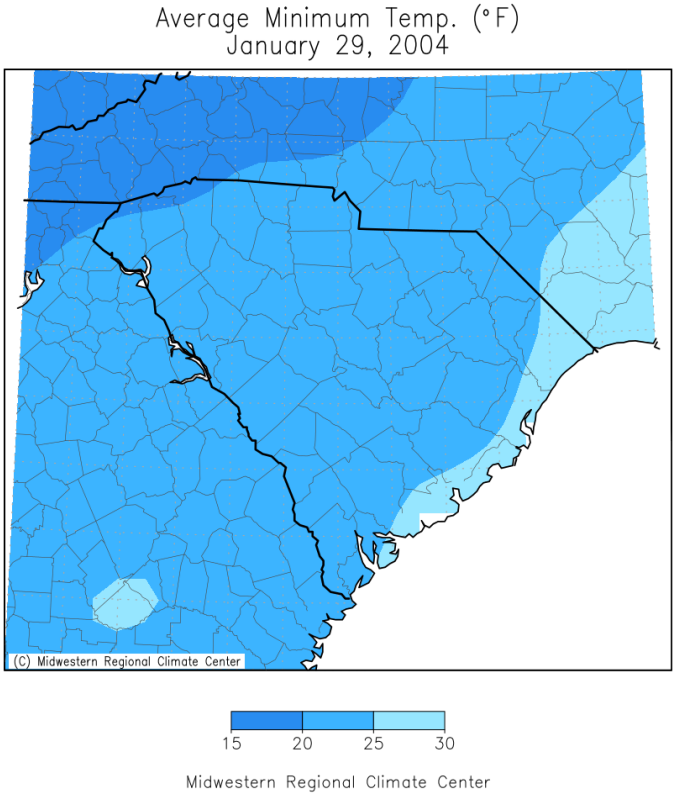
NARR imagery from the Penn State University eWall website

# Meteorological Synopsis

Fresh cold air arriving behind the front would also slow melting on January 28. Temperatures fell below freezing over most of the state that morning, with lows in the teens and 20s across the Upstate. The result was refreezing of melted ice, and the ice was slow to melt during the day on January 28, with highs only in the 30s and 40s across the state. Outside of the Upstate, it was warm enough to fully melt the ice on Wednesday, January 28. However, enough ice lingered in the Upstate for another frigid morning to result in refreezing and icy patches on roads and sidewalks on Thursday, January 29.




*Low temperatures across South Carolina on January 28, 2004, ranged from around 15°F in the mountains to around 32°F along the coast.*

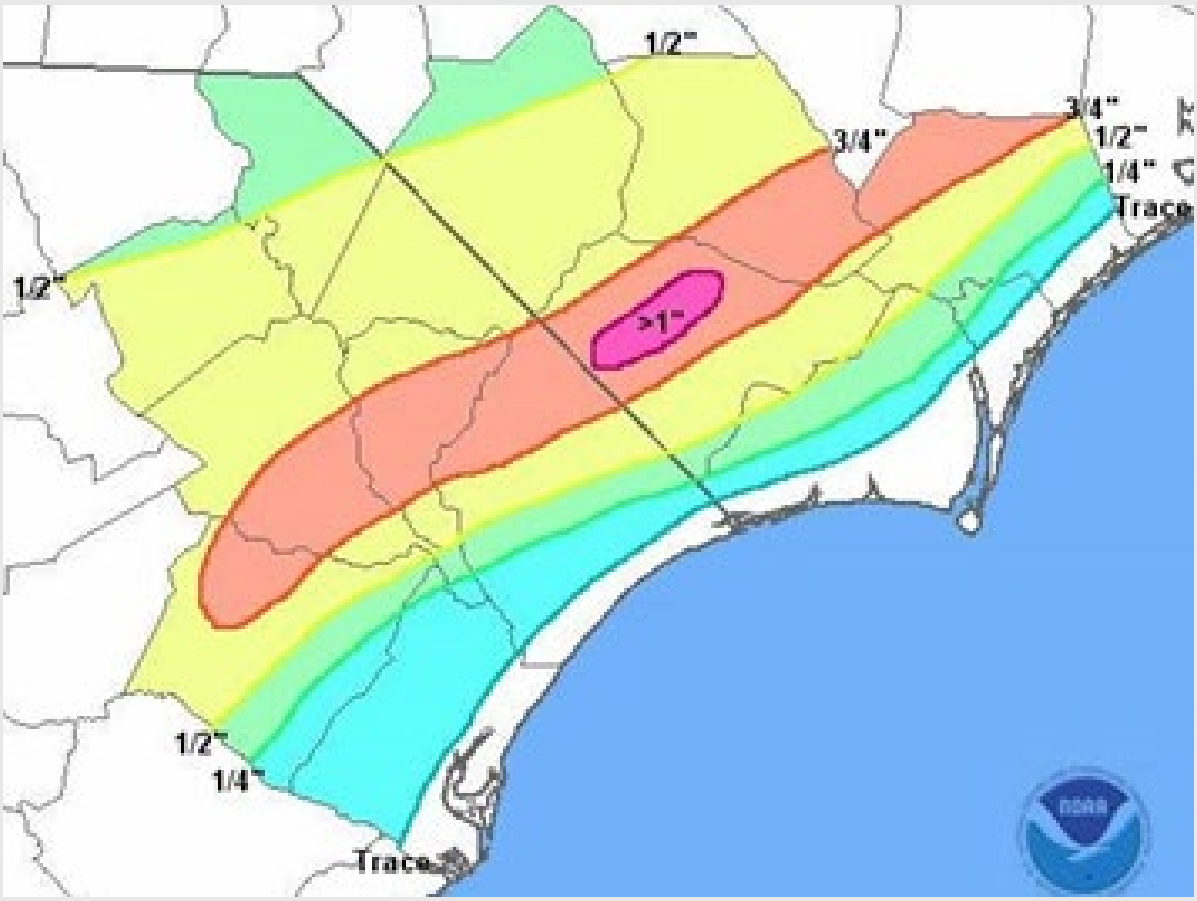



*Low temperatures across South Carolina on January 29, 2004, ranged from around 15°F in the mountains to around 30°F along the coast.*

## Meteorological Synopsis

### Snow and Sleet Accumulation Reports
### January 25-27, 2004

| Station | Snow/Sleet | Station | Snow/Sleet |
|---|---|---|---|
| Caesars Head | 1.7 | Winthrop University | 1.1 |
| Walhalla | 1.0 | Greenville | 1.0 |
| Greenville-Spartanburg Int'l Airport | 1.0 | Hunts Bridge | 1.0 |
| Fort Mill 4 NW | 0.9 | Great Falls | 0.8 |
| Santuck | 0.7 | Table Rock | 0.7 |
| Chester 1 SE | 0.6 | Sandy Springs 2 NE | 0.5 |
| Gaffney 6 E | 0.5 | Chesterfield 3 E | 0.1 |
| Columbia Metropolitan Airport | Trace | | |




*A plot of ice accretion across the Pee Dee region of South Carolina and adjacent areas of North Carolina from the January 25-27, 2004, winter storm. The map was generated in 2004 by the Wilmington, NC, National Weather Service office.*

## Effects on South Carolina

At one time, every county in the state, except Jasper, Beaufort, and coastal Colleton Counties, was under either a Winter Weather Advisory or Winter Storm Warning.

State forestry officials reported the most tree damage since Hurricane Hugo in 1989. The South Carolina Forestry Commission estimated that $95 million in timber damage occurred in the state, with more than half of the damage in Clarendon, Orangeburg and Calhoun Counties.

Over 200,000 people were reported without power by the South Carolina Emergency Management Division at 7 p.m. on Monday, January 26. Around 50,000 electric customers were still without power on Thursday, January 29. and a few areas remained without power for an entire week.

Tree damage from the storm compounded travel problems. Trees or large branches downed by the storm blocked roadways in some areas. In some cases, road crews could not clear these blockages until after the ice melted.

Schools were closed in the Upstate and Midlands as late as Thursday, January 29. Power outages kept certain schools closed until Monday, February 2.

Unofficial reports attribute seven deaths in South Carolina due to the event. At least 57 deaths were blamed on the snow, ice, and cold from Kansas to the East Coast.

Governor Mark Sanford issued an Executive Order declaring a State of Emergency for 37 of South Carolina's counties on Tuesday, January 27. The order directed the South Carolina National Guard into action to assist the Emergency Management Division in storm response. The governor also requested a disaster declaration from the federal government, which President George W. Bush issued on February 13, 2004, covering 17 of South Carolina's counties in the Upstate, Midlands, and Pee Dee regions. The federal government awarded about $16.2 million in disaster aid.

The Department of Public Safety reported that they responded to 1,881 traffic incidents during January 25-27.

Government agencies reported $28 million in losses, and power company SCE & G reported $15 million in expenses to repair storm damage, according to reports from The State newspaper.

Other storm effects include the delay or cancellation of flights at most of the state's airports and other major airports in adjacent states, such as Charlotte Douglas International Airport. There were also widespread cable television outages around Columbia and the delay of the public debut of new animals at Riverbanks Zoo, according to news reports from The State newspaper.

## For additional information:

National Weather Service products issued during the storm and observations from civilian and military airports during the storm can be found at the Iowa State University's Iowa Environmental Mesonet website.

*South Carolina Winter Weather Database: Winter Storm of January 24-26, 2004*. (2021, November 1). The South Carolina Winter Weather Database. *https://scdnr.maps.arcgis.com/apps/opsdashboard/index.html#/617c9914b64f4ef1937e39f2c1c52a40?p1=156&event=156*

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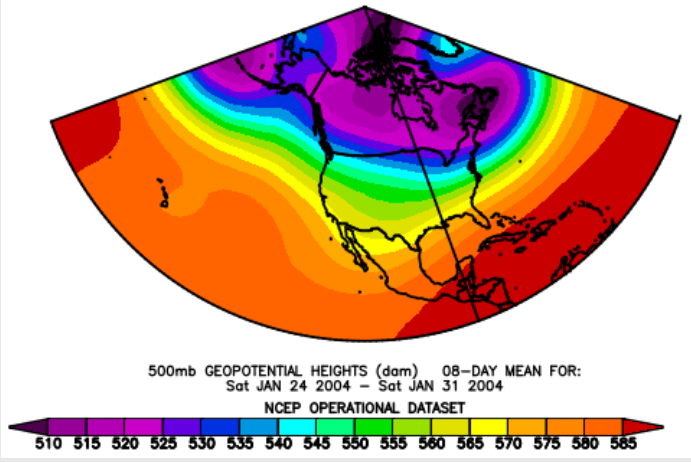
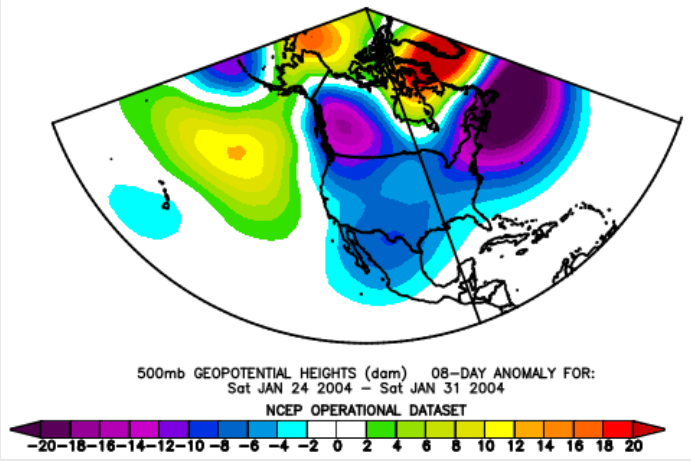
## Appendix 1: Storm Photographs

# Appendix 2: Teleconnection States

The upper-level weather pattern over and around North America and the Northern Hemisphere's major teleconnection indices around the time of this storm were not ideal for a winter storm in South Carolina. The East Pacific Oscillation (EPO) was in a positive phase, which favors warmer-than-average temperatures over the southeastern United States during winter. A weak upper ridge was over the Southeast and a trough covered the West, indicative of the Pacific-North American pattern (PNA) in its negative phase, unfavorable for a winter storm in South Carolina. El Niño-Southern Oscillation was in a neutral state at the time.

However, other teleconnections were favorable. The Arctic Oscillation (AO) was strongly negative, favoring frequent invasions of arctic air into the Northern Hemisphere midlatitudes. Also, the North Atlantic Oscillation (NAO) was strongly negative at the time. This favors colder and stormy weather over the eastern part of North America in general during winter. Finally, the Madden-Julian Oscillation was firmly in Phase 2 in late January 2004, favorable for cold air to reach South Carolina.




500-millibar mean heights (top) and mean height anomaly (bottom) for January 24-31, 2004.

- Positive height anomalies near the North Pole indicate a negative AO.
- The EPO was weakly positive, which masked by positive height anomalies over Alaska and around the North Pole associated with the strongly negative AO. Ordinarily, a positive EPO would produce a trough over Alaska and negative height anomalies.
- An upper trough, negative anomalies over western North America, and a weak upper ridge over the Southeast indicate a negative PNA.
- An upper ridge near Greenland and positive height anomalies in that area, along with negative anomalies directly south, indicate a negative NAO.