TROPICAL STORM ANA
6-10 May 2015

OPEN-FILE REPORT

South Carolina Department of Natural Resources
Land, Water and Conservation Division
South Carolina State Climatology Office

Compiled by: Mark Malsick
December 18, 2015

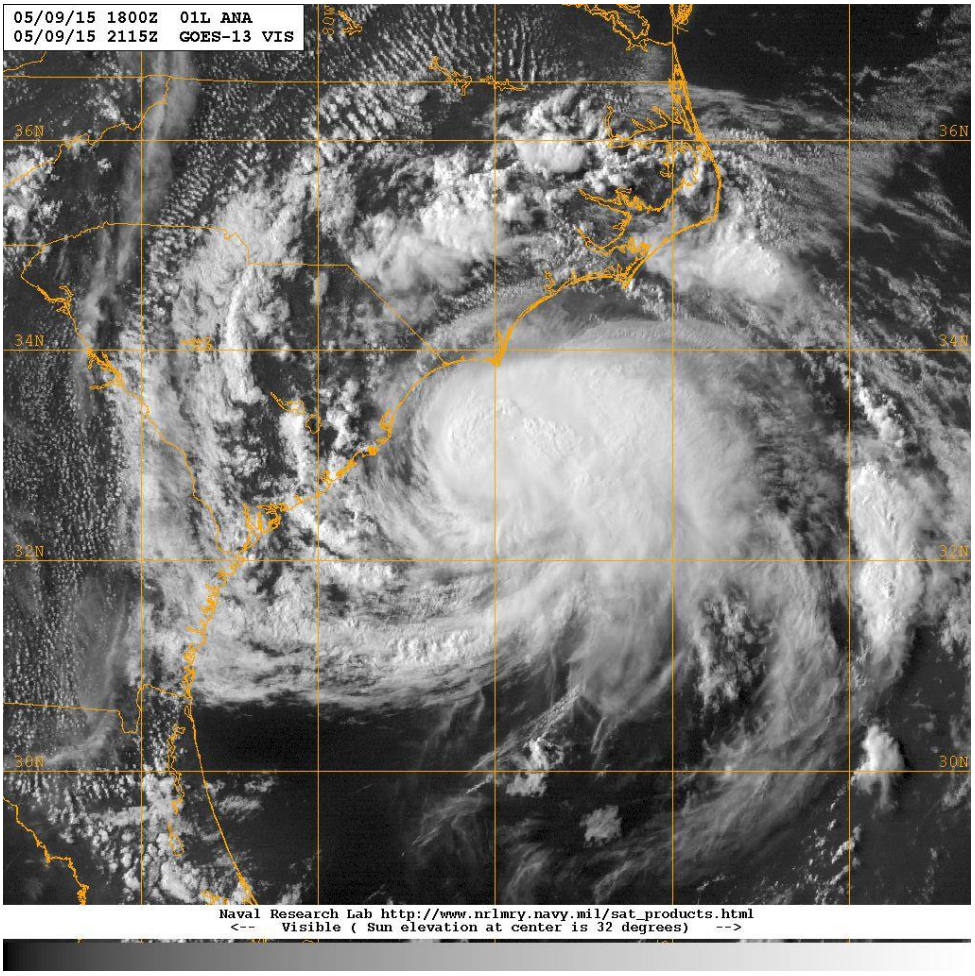

Figure 1. Tropical Storm Ana. The earliest tropical storm to make landfall in South Carolina.

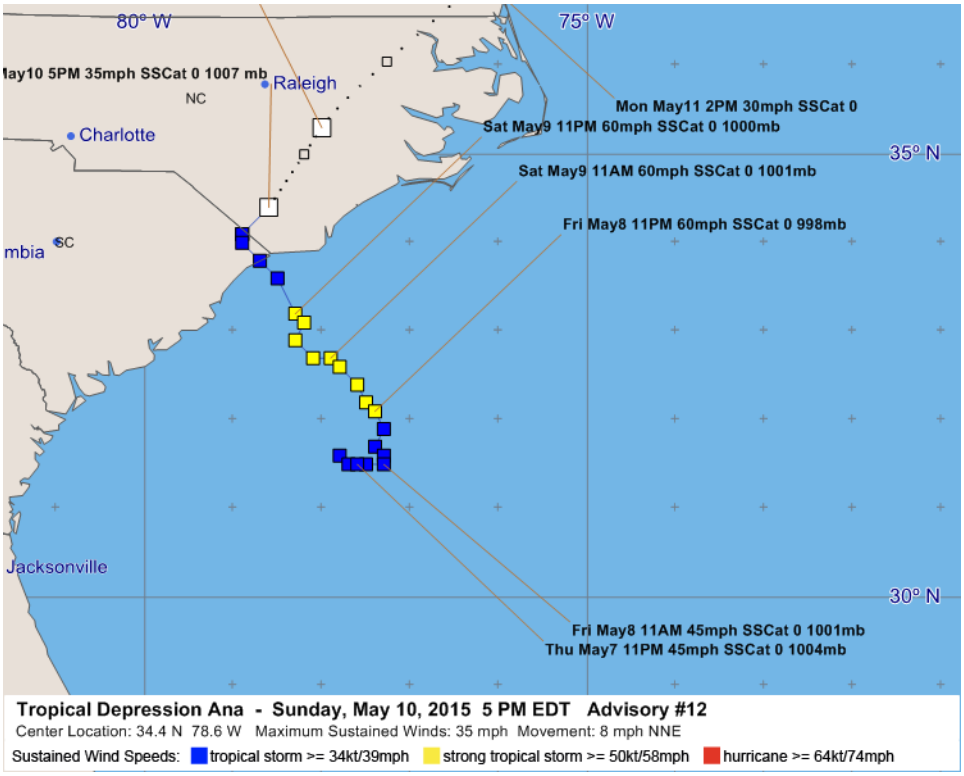

Figure 2. Track and intensity history of Tropical Storm Ana

Event Summary:

Tropical Storm Ana originated from the low-level remnants of a frontal boundary that had pushed southwards over Florida the first week of May (Figs. 3-4). Over the warm waters off the Florida coast, with abundant low-level tropical humidity, and under the diffluent portion of the sub-tropical jet aloft (Figs. 5-6), the frontal remnants strengthened into a closed, low pressure circulation on 6 May that the National Hurricane Center designated Invest 90L.

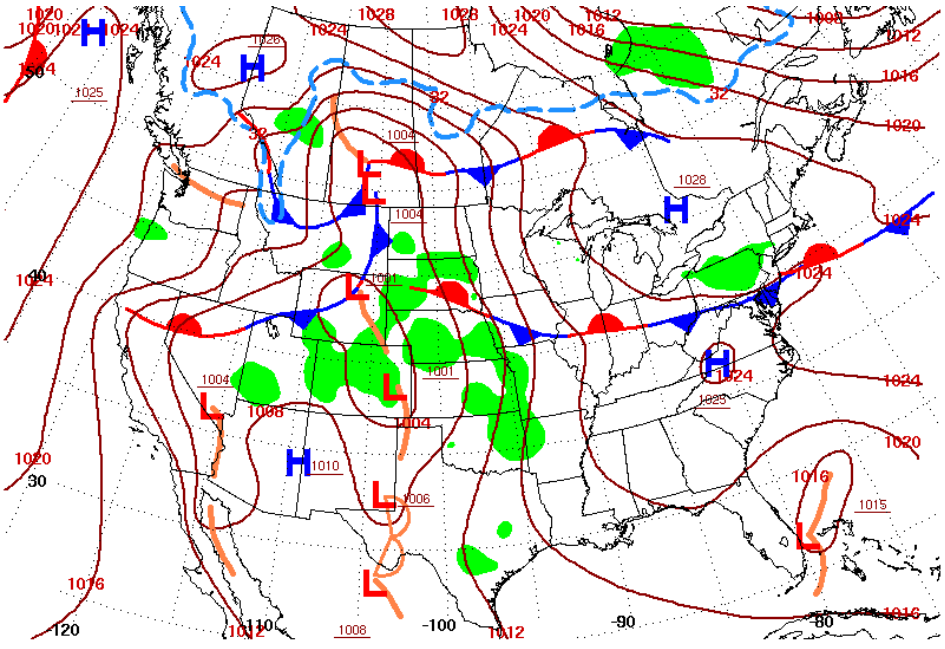

Figure 3. Surface analysis, 0700 EDT 6 May. 1015 mb low off Florida is Invest 90L (NOAA)

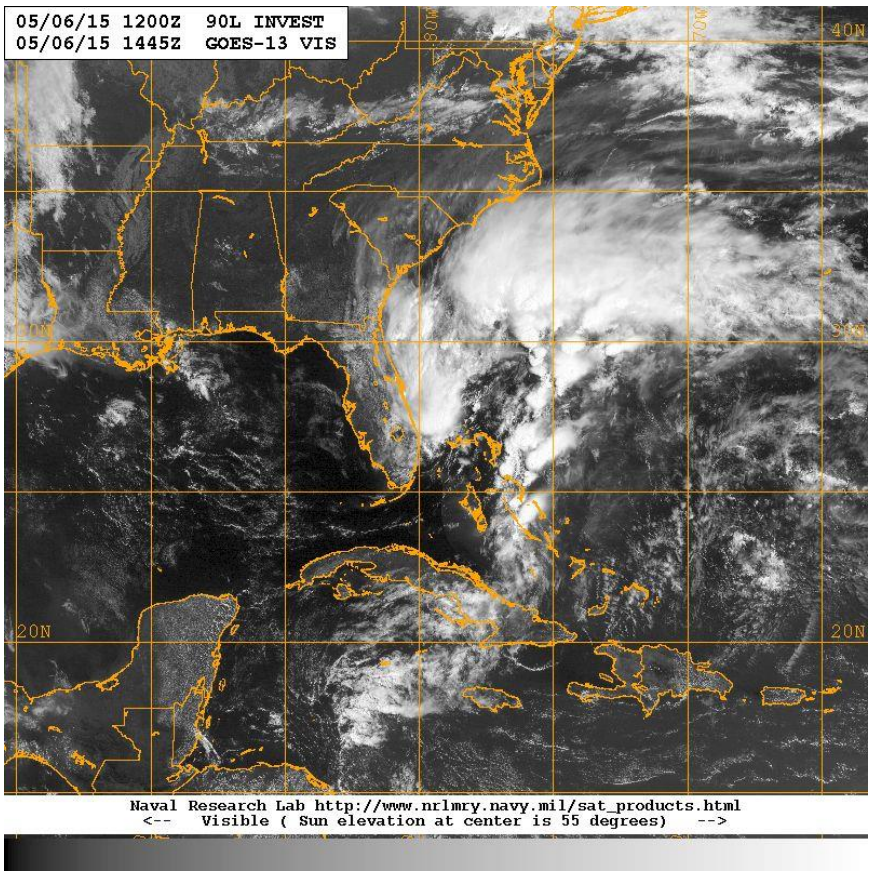

Figure 4. Visual image, Invest 90L, 1045 EDT 6 May (Naval Research Lab, Monterey)

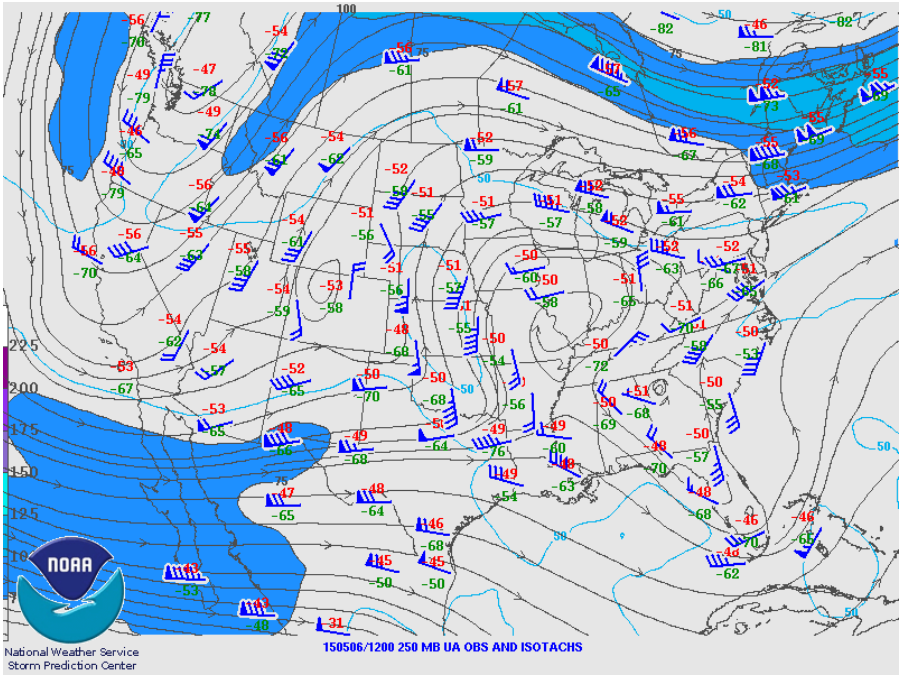

Figure 5. 250 mb winds and streamline analysis, 0700 EDT 6 May (NOAA)

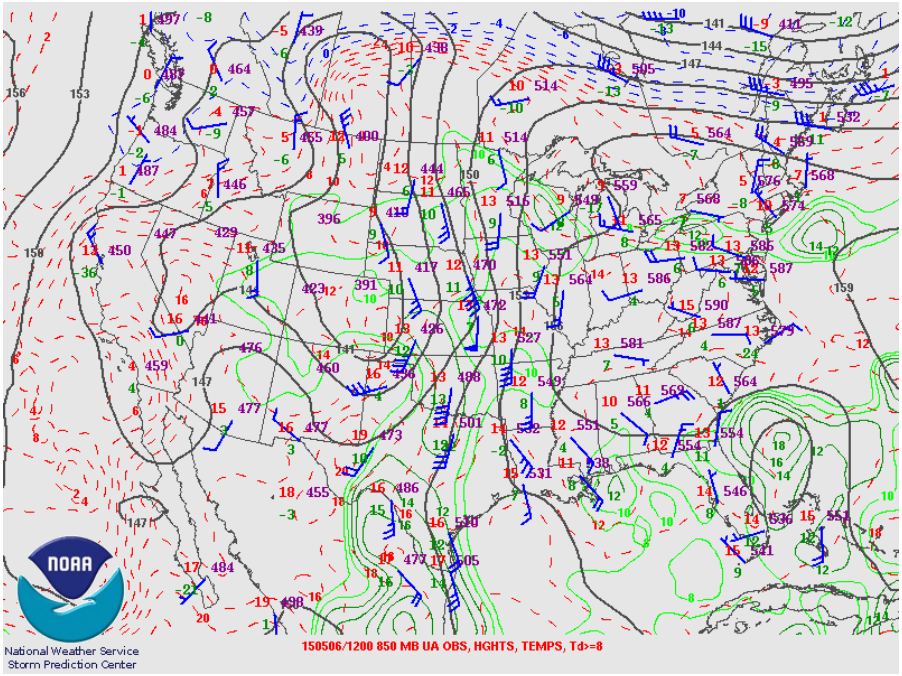

Figure 6. 850 mb heights, temperatures and dewpoints, 0700 EDT, 6 May (NOAA)

This feature drifted north and deepened, becoming a 40 knot subtropical storm early on 8 May, 145 miles southeast of Charleston. Slow strengthening of Ana continued in the vicinity of the Gulf Stream as the storm did a slow turn to the northwest. The National Hurricane Center reclassified Ana as a tropical storm in the 9 May 0500 advisory, based upon the development of eyewall convection near the center of circulation, warming of the upper levels above the center of the storm and the development of weak anti-cyclonic outflow aloft.

Over the warm Gulf Stream waters, Tropical Storm Ana reached its peak intensity with a strongest sustained wind speed of 50 knots (57.5 mph), and a minimum central pressure 998 millibars; both values were estimated by aircraft reconnaissance. As the storm continued northwest towards the South Carolina coast, the storm encountered cooler 20^{o}C shelf waters and 20 knots of wind shear that weakened Ana's intensity. In addition to the shear and cool shelf waters along the coast, Ana's track took the storm into dry air in place over the Mid-Atlantic States and the subsequent dry air entrainment also weakened the storm further prior to landfall (Figure 7).

The National Hurricane Center issued a tropical storm watch for the beaches from Edisto Beach to the Surf City NC early on 8 May (Figure 8.) as Ana approached the coast. That watch was upgraded after midnight 8 May to a Tropical Storm Warning for the coast from the South Santee River to Surf City NC before Tropical Storm Ana made landfall (Figs. 9-10.). Tropical Storm Ana is the earliest known tropical storm to make landfall on the South Carolina coast according to National Hurricane Center records.

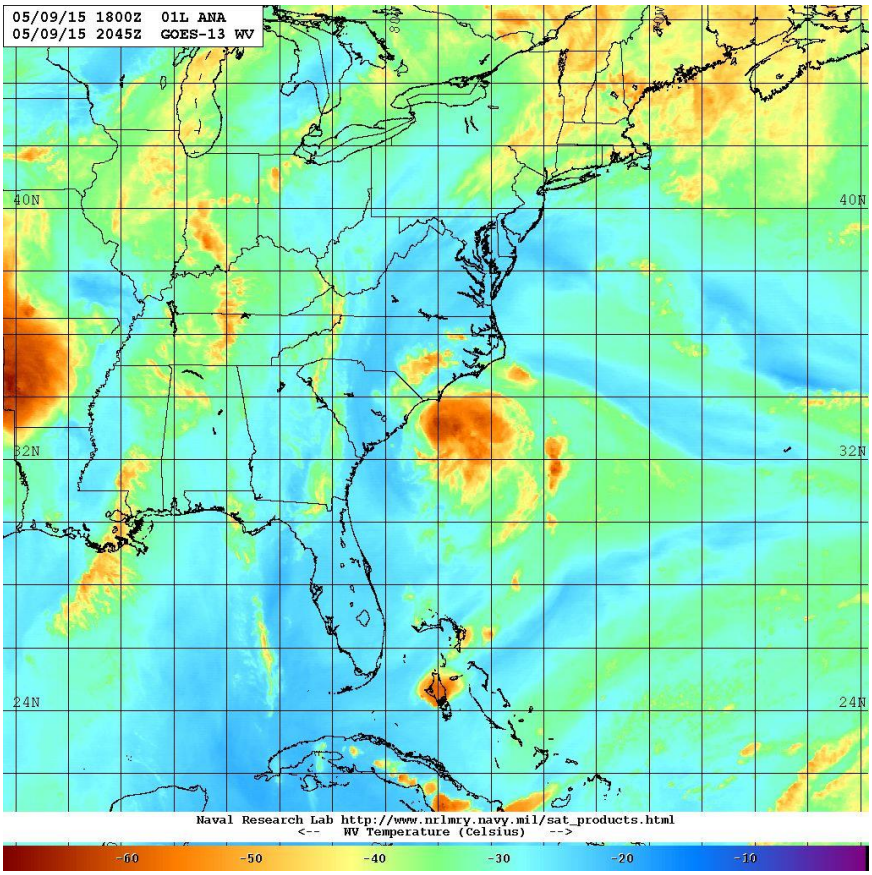

Figure 7. Water vapor image 1645 EDT 9 May showing dry air entrencehed over the Mid_atlantic States prior to TS Ana's landfall. (NRL-Monterey)

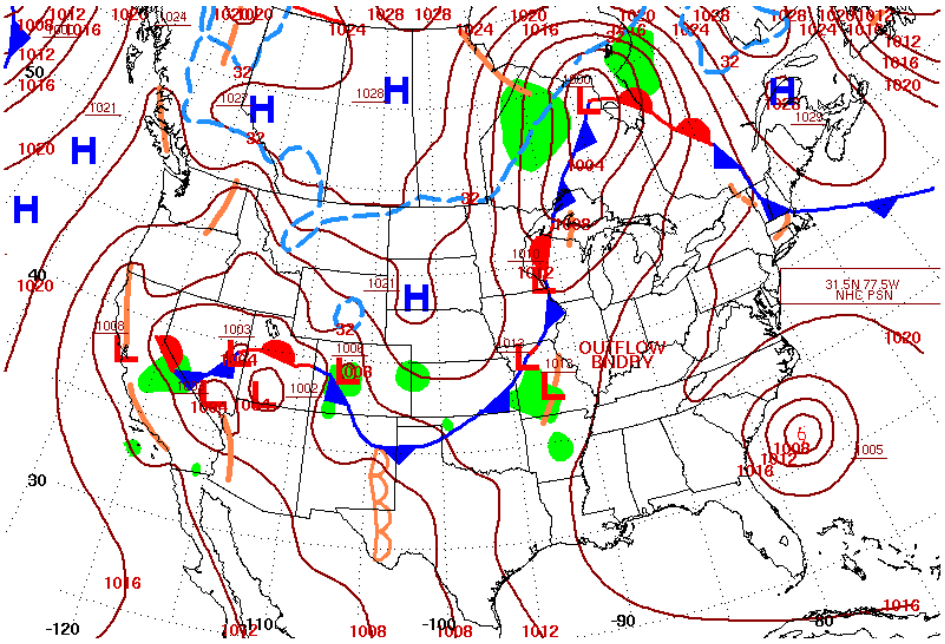

Figure 8. Surface analysis, 0700 EDT 8 May (NOAA)

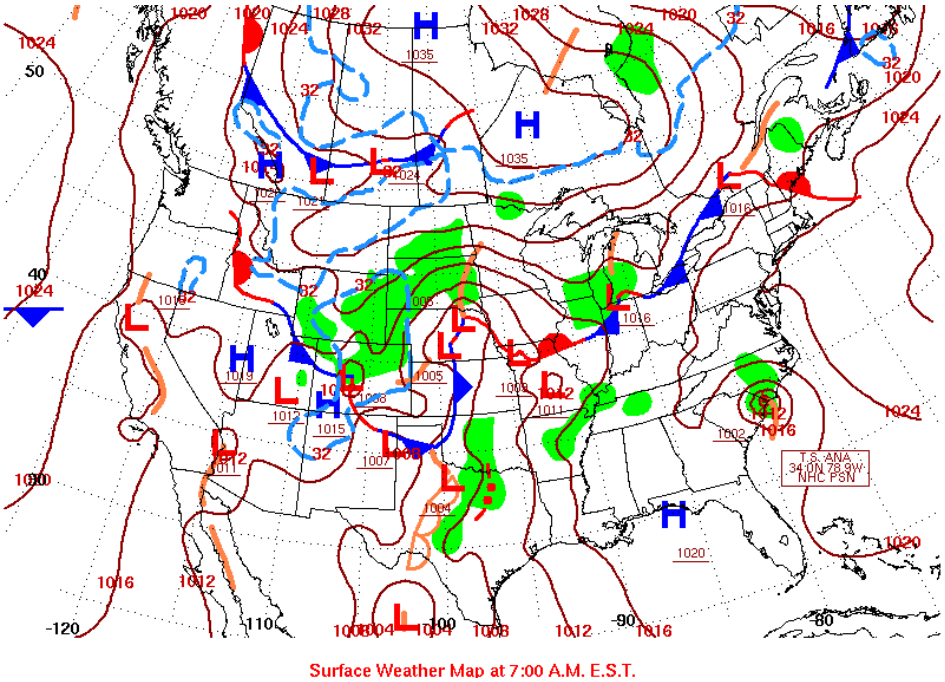

Figure 9. Surface analysis at TS Ana landfall, 0700 EDT 10 May (NOAA)

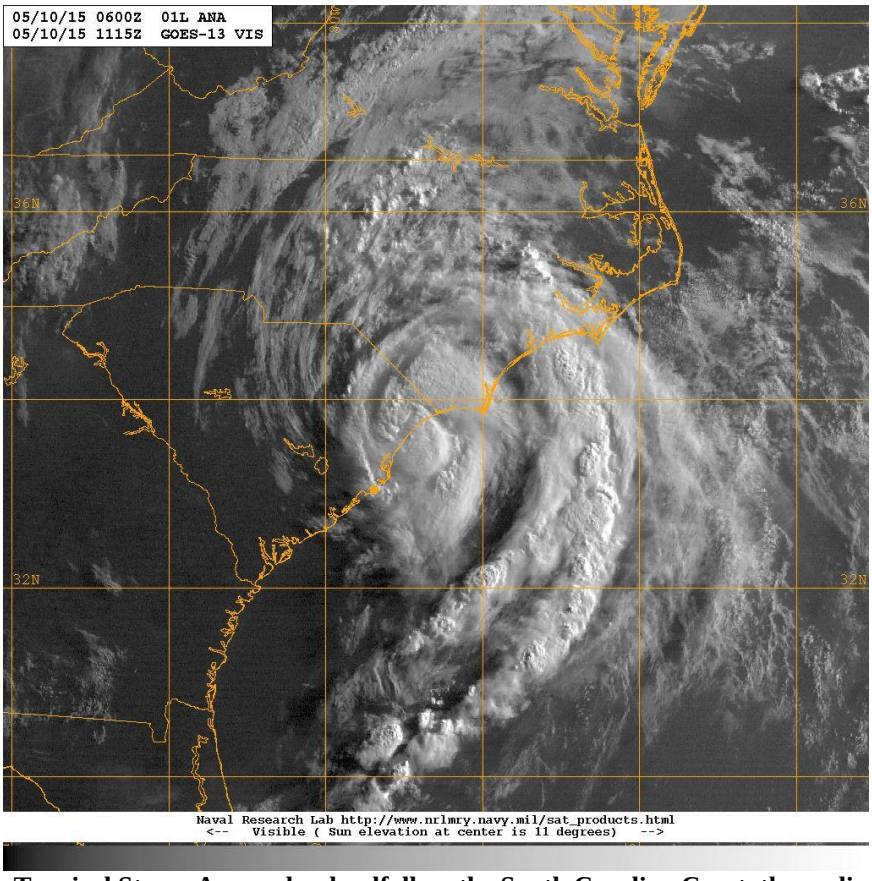

Figure 10. Tropical Storm Ana makes landfall on the South Carolina Coast, the earliest tropical storm landfall in South Carolina climate history. (NRL-Monterey)

Tropical Storm Ana made landfall southwest of North Myrtle Beach at 0600 EDT 10 May. A peak wind gust of 49.5 mph was recorded at North Myrtle Beach Airport; however, sustained winds remained below 30 mph at North Myrtle Beach and briefly just above 30 mph at the Myrtle Beach Airport (Figs. 11-12). Ana produced a 2.5 foot storm surge at Oyster Landing and at the Springmaid Pier. The highest rainfall total attributed to Tropical Storm Ana occurred at Kinston North Carolina where a National Weather Service Cooperative observing site reported 6.87 inches. Tables 1 through 3 show the South Carolina rainfall, onshore and offshore winds, and wave heights caused by Tropical Storm Ana.

South Carolina Effects:

Due to the weakened intensity of Tropical Storm Ana, coastal and inland effects were minimal. Tropical Storm Ana flooded numerous roads and low-lying areas along the Horry County coast. Wave action prior to and during landfall produced notable beach erosion in Cherry Grove.

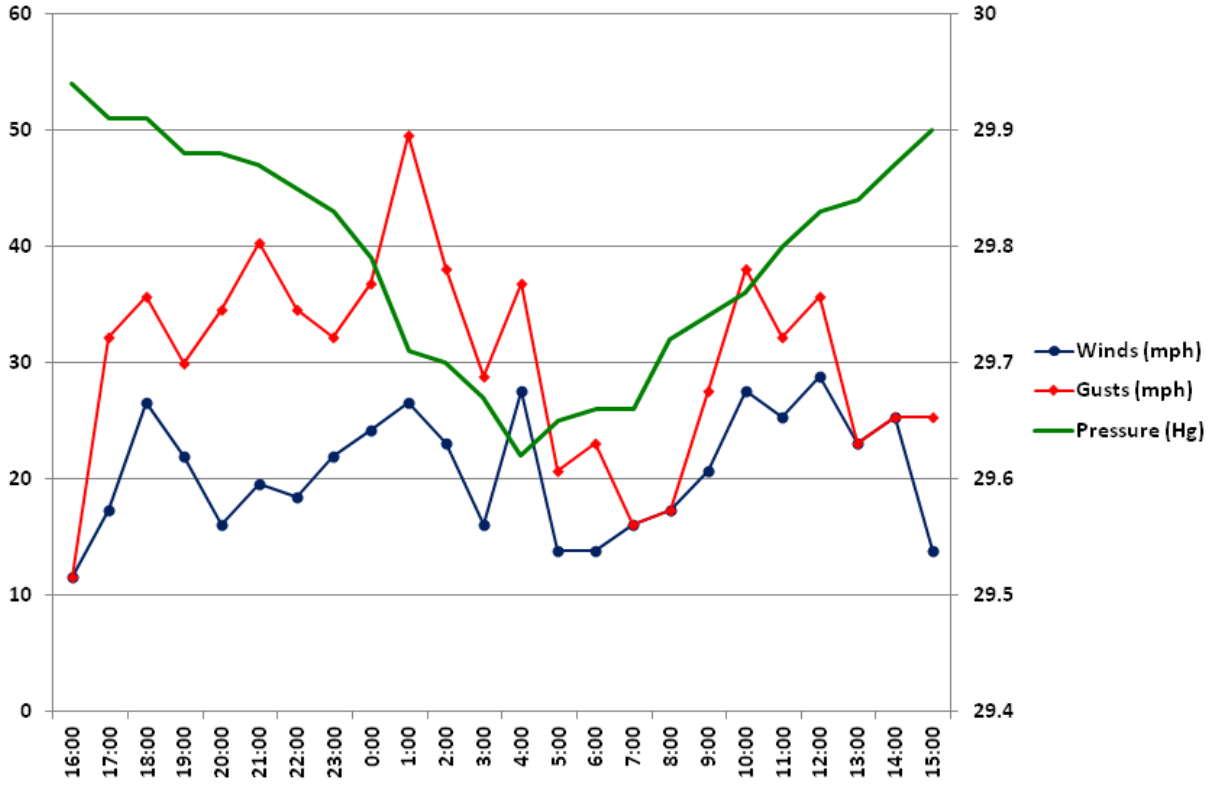

Figure 11. North Myrtle Beach Airport (KCRE) 24 hour period of observtions of sustained winds, gust and barometric pressure beginning 1600 9 May.

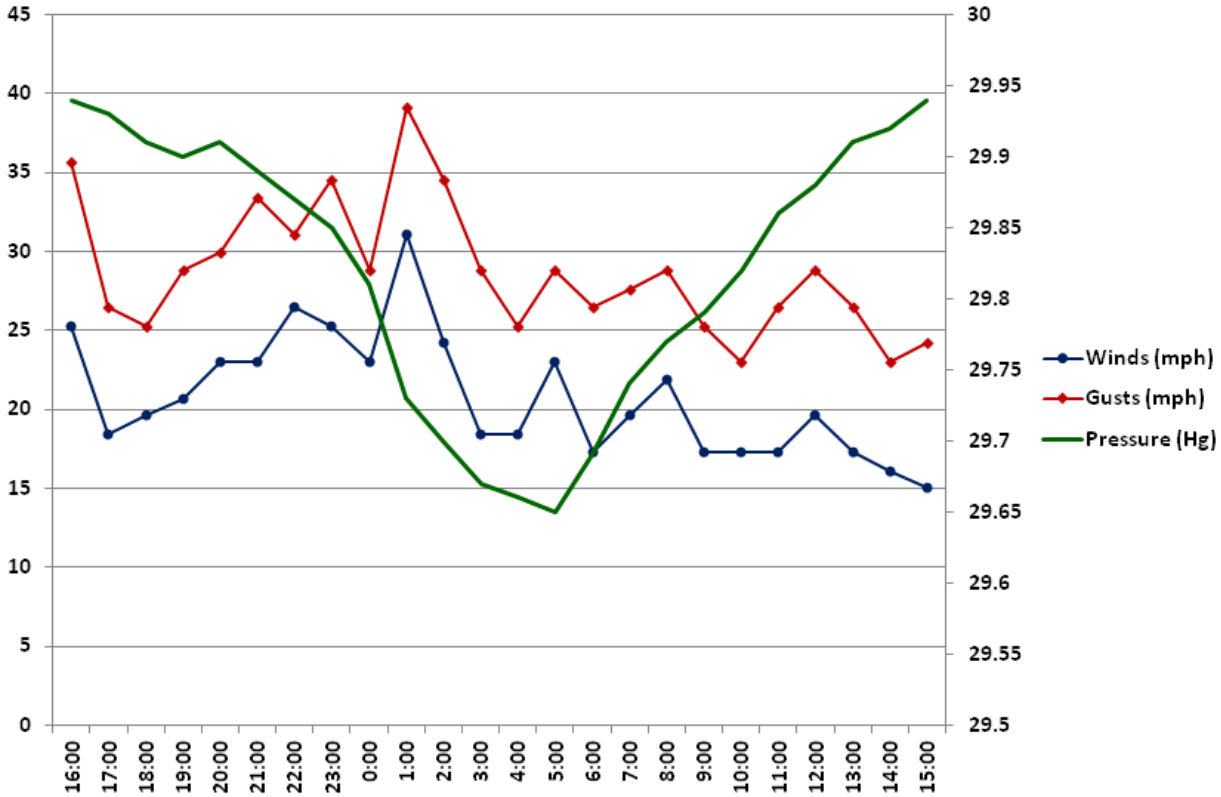

Figure 12. Myrtle Beach International airport (KWYR) 24 hour observation of sustained wind, gusts and barometric pressure beginning 1600 EDT 9 May.

Table 1: Rainfall totals (inches):

Barnwell	0.07	Charleston AFB	0.16
Conway	5.08	Florence	0.02
Georgetown	3.90	Hilton Head	0.01
Moncks Corner	0.04	Mount Pleasant	0.9
North Myrtle Beach	6.16	Orangeburg	0.23

Table 2: Sustained Wind/Gust (mph):

Beaufort	18/28	Charleston AFB	23/36
Georgetown	20/28	North Inlet	27/44
North Myrtle Beach	28/49.5	Myrtle Beach	31/39
Springmaid Pier	22/43		

Table 3: Offshore Sustained Wind/Gust (mph)/ Wave Height (ft):

Edisto Buoy	38/47/12.7
Frying Pan Shoals	46/61.5/16.2
Grays Reef Buoy	29.5/36/7

ACKNOWLEDGEMENTS:

- NOAA Storm Prediction Center
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- The National Hurricane Center
- National Weather Service Office, Charleston, South Carolina
- National Weather Service Office, Wilmington, North Carolina
- The Naval Research Laboratory-Monterey