HURRICANE FLORENCE

30 August-16 September 2018

PRELIMINARY OPEN-FILE REPORT

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

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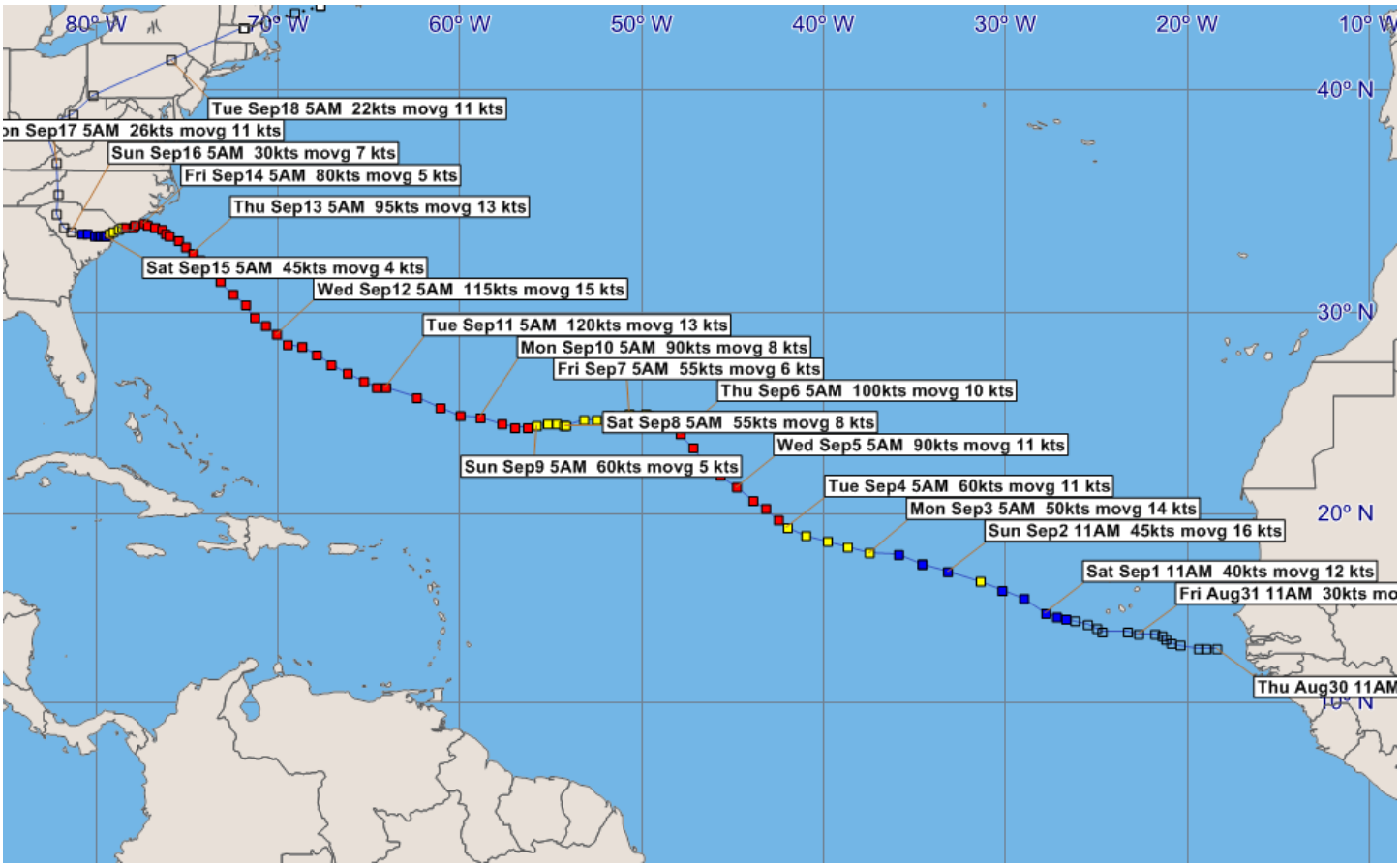

Figure 1. Track and intensity history of Hurricane Florence

On August 30, 2018, the National Hurricane Center (NHC) designated a developing area of low pressure and disturbed weather 100 miles off the west coast of Africa as Potential Tropical Cyclone Six (PTC 6) that would eventually become Hurricane Florence. PTC 6 drifted northwestward and underwent complex periods of intensification and weakening over anomalously warm North Atlantic waters for the next 14 days embedded within the southern reaches of the North Atlantic subtropical ridge.

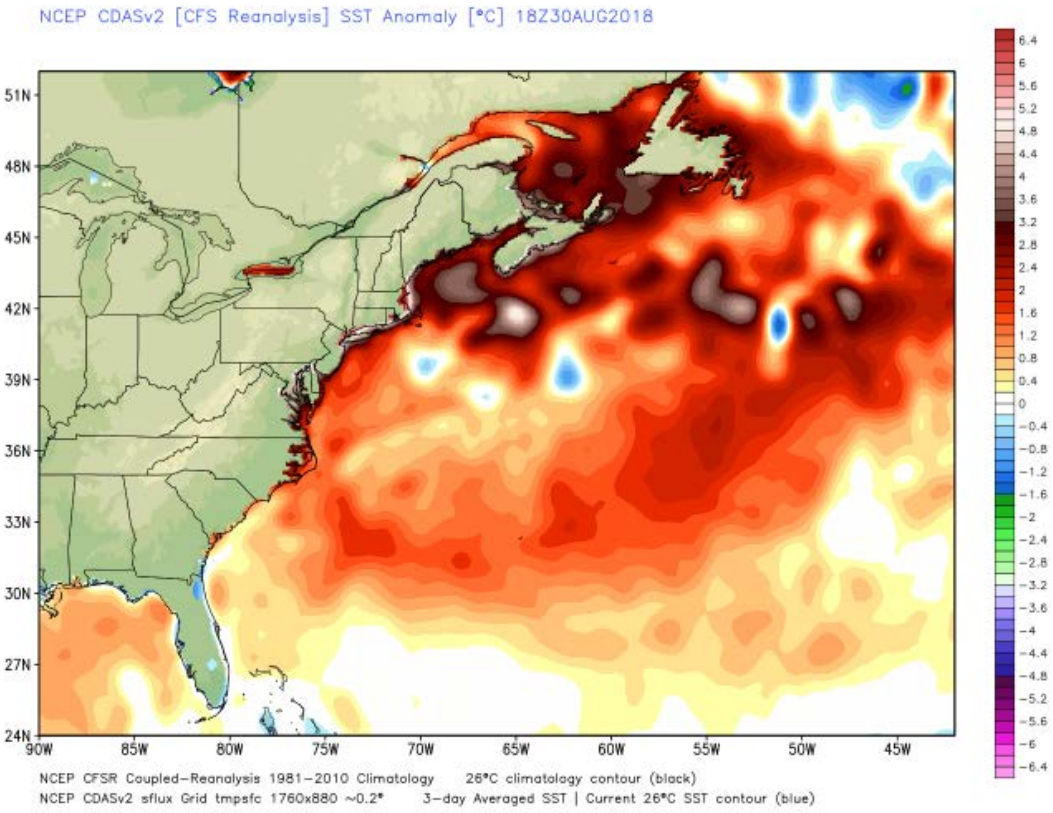

Figure 2. North Atlantic sea surface temperature anomaly 30 August 2018

The National Hurricane Center upgraded PTC 6 to a tropical depression on August 31 after developing a well-defined circulation and cyclonically curved banding in a low shear environment. This low shear environment supported increased strengthening of the convection causing NHC to quickly reclassify the depression as Tropical Storm Florence on the early morning advisory of September 1.

The subtropical ridge kept TS Florence on a steady west-northwest track until the storm, unexpectedly, rapidly intensified into a 130 mph hurricane over the very warm mid-Atlantic surface waters on September 5, despite the southern proximity of the hurricane to an area of strong vertical shear.

The following day, Hurricane Florence encountered an upper level environment with significant southwesterly shear that affected the hurricanes deep convection and forced NHC to downgrade Florence to a 70 mph tropical storm. Florence continued slowly northwestward along the edge of the subtropical ridge at 6-7 mph. By September 9, Florence encountered a dangerously favorable environment of very warm sea surface temperatures above 84° F. degrees, and negligible upper-level shear. Florence rapidly intensified to a 140 mph hurricane by the afternoon of September 10, 1000 miles east-southeast of Charleston. Aircraft reconnaissance data showed the hurricane wind field size doubling in 12 hours.

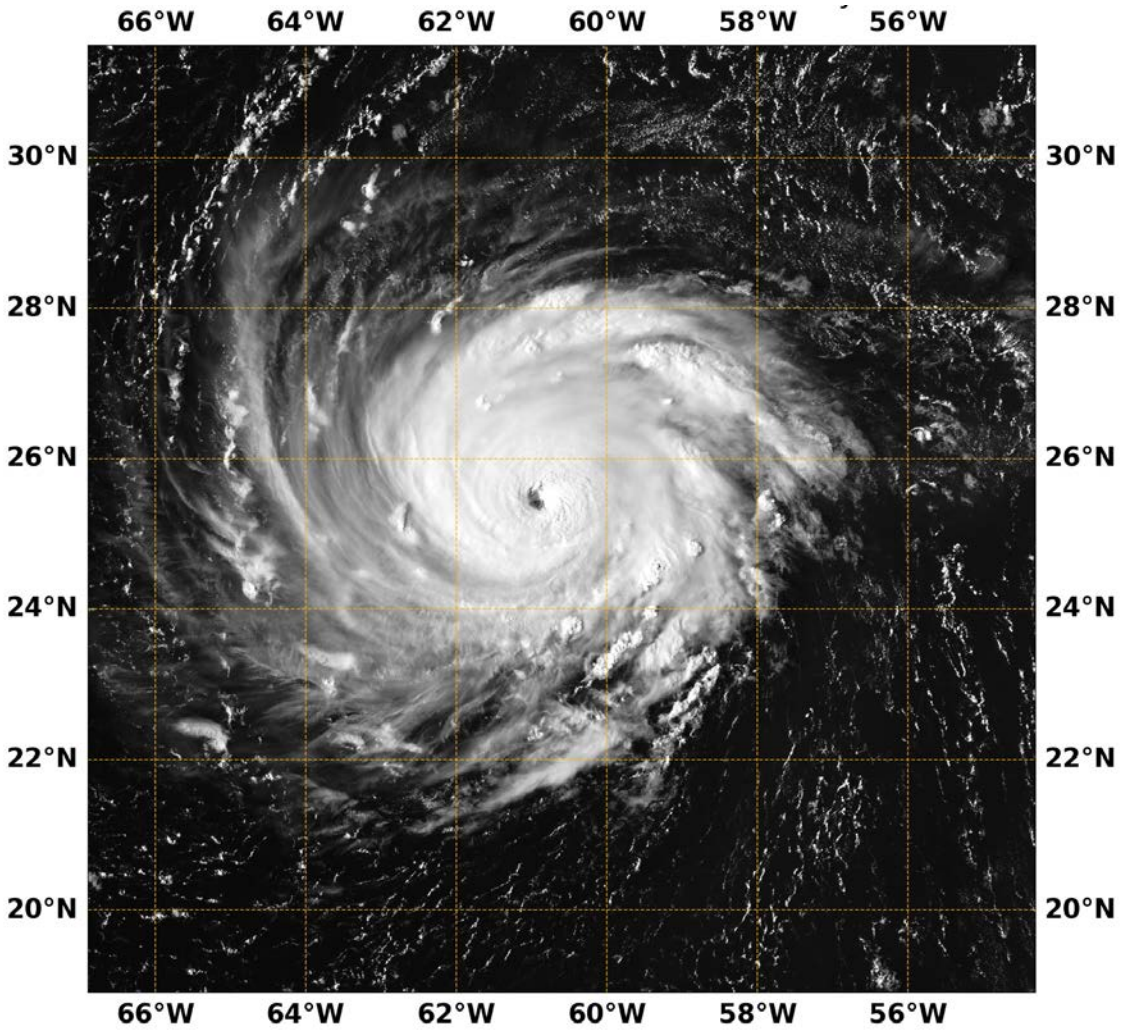

Figure 3. Hurricane Florence at maximum intensity: 140 mph 4 PM, 10 September. (Naval Research Laboratory, Monterey)

Florence accelerated to 17 mph on September 11 and continued on its steady, northwesterly track around the southwest periphery of the Atlantic ridge. Despite a forecast for strengthening, satellite imagery and data from reconnaissance aircraft showed significant structural changes to Florence's eyewall complex early on September 12 suggesting the hurricane weakened slightly to 130 mph after undergoing an eyewall replacement cycle and experiencing southerly shear.

Florence's intensity was lowered to 105 mph when the hurricane was centered 450 miles east-southeast of Charleston late on September 12. An upper level ridge of high pressure north of Florence kept Florence on a northwesterly course towards North Carolina at 16 mph. Extending out 190 miles from Florence's center, tropical storm force winds began upwelling of cooler shelf waters off the southern North Carolina coast. The ridge of upper level high pressure weakened and shifted northeast of Florence on September 13. Florence slowed to 6 mph and turned slowly to a more westerly course over cooler, upwelled shelf waters. Dry air entrainment weakened the eyewall complex. Aircraft reconnaissance data and coastal radar images supported an intensity downgrade to 85 knots (97 mph) on NHC's 5 PM advisory. Despite light, low level shear and proximity to the deep warm waters of the Gulf Stream, Florence's intensity changed little overnight. At 5 AM on Friday, September 14, Hurricane Florence was within 20 miles of the North Carolina coast with 90 mph winds. At 715 AM, Florence made landfall near Wrightsville Beach with estimated maximum sustained winds of 90 mph and a central pressure of 958 mb. Maximum sustained winds of 64 mph with a gust to 105 mph were recorded at the National Weather Service Office in Wilmington.

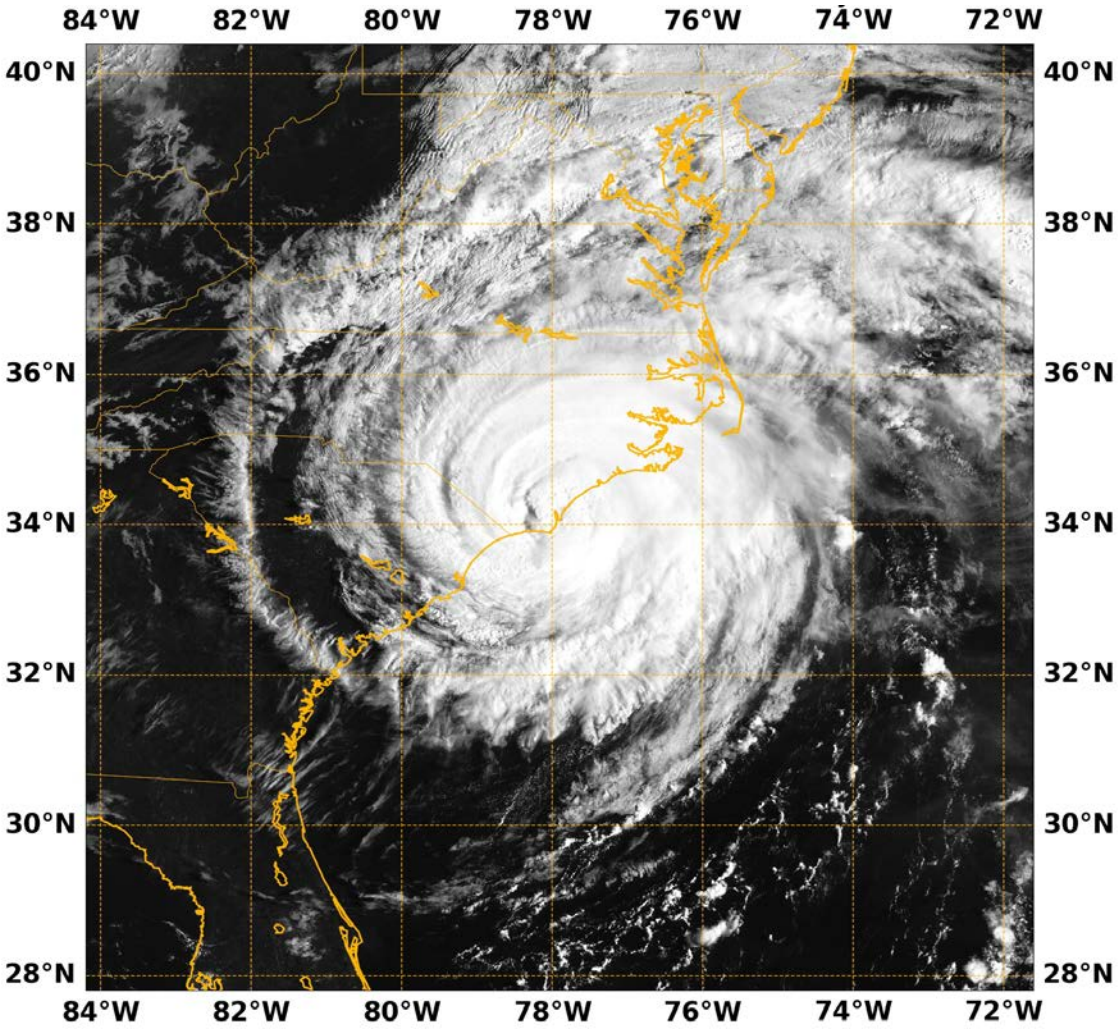

Figure 4. Hurricane Florence at landfall 7:15 AM, 14 September. (Naval Research Laboratory, Monterey)

A mid-level blocking ridge across the Upper Midwest, weak steering and frictional surface effects slowed Florence to a 3 mph crawl across the southern inland coast of North Carolina as it rapidly weakened Florence to a tropical storm before crossing into South Carolina's Horry County at 5 PM with 38 mph winds gusting to 61 mph. The storms slow forward speed and wind field expansion due to the frictional effects kept a strong surface inflow channel locked over eastern North Carolina and the Pee Dee region of South Carolina for the next 48 hours resulting in rainfall totals ranging from 5 to 35 inches.

Florence crept slowly westward over South Carolina and continued to rapidly weaken during the day of September 15 decaying to a tropical depression overnight. The remnant circulation of Florence recurved and accelerated to the north-northeast away from the State on September 16 with the assistance of a deep, upper trough west of the State.

ACKNOWLEDGEMENTS:

- The National Data Buoy Center
- The National Hurricane Center
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- The Naval Research Laboratory-Monterey