Suncoast Weather Observer

Winter 2012-2013 Issue 1, Volume 20

Inside This Issue...

WFO Tampa Bay Shines at Great American Teach-In

By: Dan Noah

Public schools throughout the Tampa Bay area welcomed visiting speakers into their classrooms on November 15th and WFO Tampa Bay was one of the over 350 participants. The Tampa Bay office spoke to six different schools and provided 29 separate presentations to 902 students ranging in age from Kindergarten to High School. Forecaster Tyler Fleming was the big winner this year speaking seven times to 430 students at Benito Elementary in New Tampa. Several of the staff members provided the presentations on their day off in order to accommodate as many of the requests as possible. Two of the schools the office could not accommodate have already reserved a spot for the 2013 Teach-In. Pictured above, Tyler Fleming discusses tornadoes and warnings to middle school students.

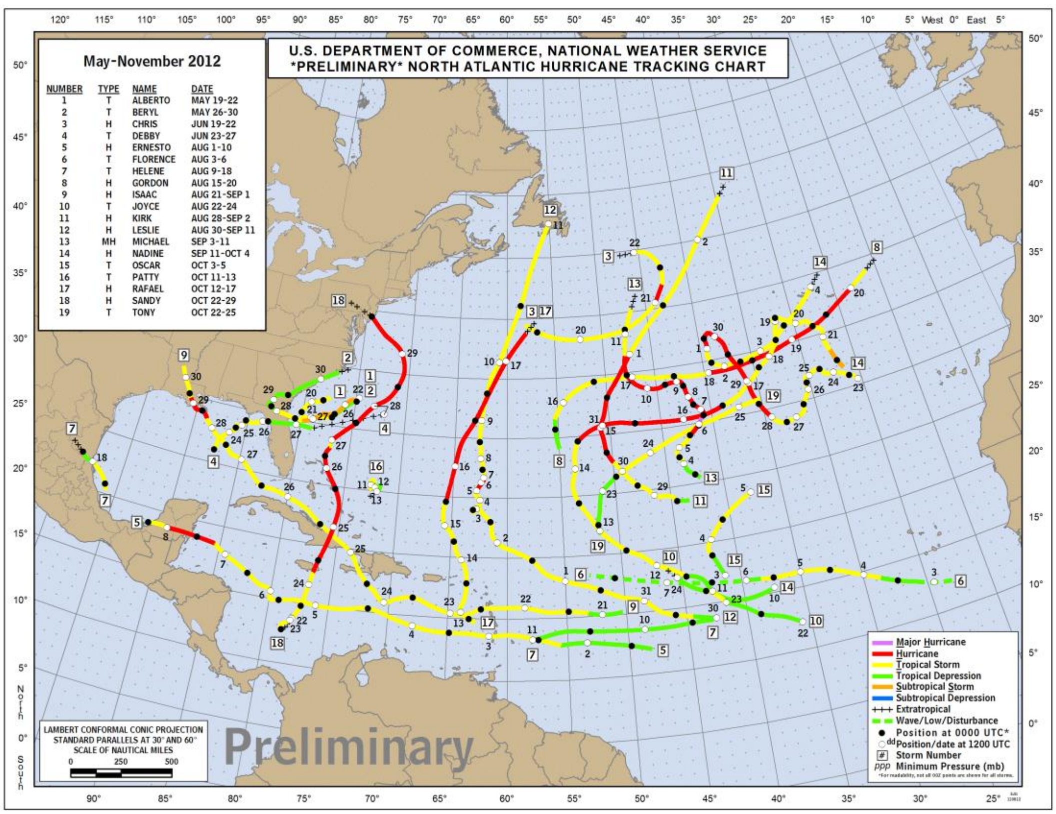
2012 Hurricane Season Review

By: Jennifer Colson

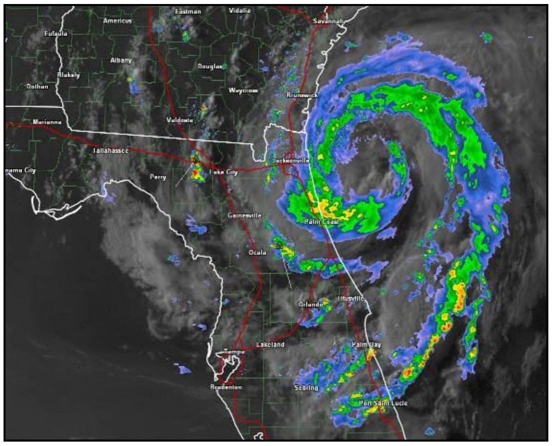
The 2012 hurricane season was another active one. There were a total of 19 tropical storms this season, of which ten became hurricanes, including one major hurricane. An average hurricane season will see 12 named storms and six hurricanes, including three major hurricanes (Category 3 or greater).

This season marks the second consecutive year that the mid-Atlantic and Northeast regions suffered devastating impacts from a named storm, with Sandy this year and Irene last year. This year showed that it doesn't take a major hurricane to ruin lives and impact local economies; each storm, no matter how strong, carries with it a unique set of potentially deadly and destructive threats. This season also marks a record seventh straight year without a major hurricane making landfall in the United States.

A preliminary map of the track of all of the tropical activity for the 2012 season is below. The WFO Tampa Bay Area was impacted by three storms this season, TS Beryl, TS Debby, and Hurricane Isaac. Summaries of the local impacts from these storms are in the next section.



2012 Storms That Impacted the NWS Ruskin Area Reviews



2012 Tropical Storm Beryl

By: Daniel Noah

Tropical Storm Beryl was the second named storm of the year and it occurred before the official start of hurricane season on June 1. That hasn't happened in 108 years. The center of Beryl made landfall near Jacksonville at 12:10 AM EDT on May 28 as a strong tropical storm with winds of 70 mph, then became a tropical depression less than 12 hours later as it curved slowly northward to the Georgia border. Downed trees and power lines knocked out power to 36,000 customers in the Jacksonville area and produced an estimated 90,000 cubic yards of debris. Heavy rains up to 8 inches caused areas of flooding which damaged homes and made travel difficult. Above normal tides up to 2.6 feet damaged sea walls, a handful of vehicles, and at least one condo.

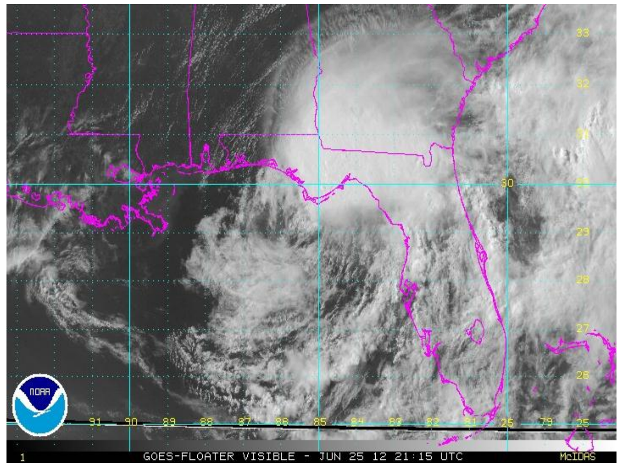
Closer to our area, Beryl created onshore flow in west central Florida leading to isolated areas of heavy rain and tornadoes. One benefit of Beryl was a large area of rain across north Florida that helped to ease the impact of drought in the area.

Large waterspout moved onshore just north of Yankeetown in outer rain band of Beryl. Photo by Yankeetown Fire Department.

An area of 5 to 8 inches of rain south of Lecanto in Citrus County flooded homes, some with 31" of water inside the structure. Photo by Citrus County Emergency Management.

2012 Tropical Storm Debby

By: Jennifer Colson

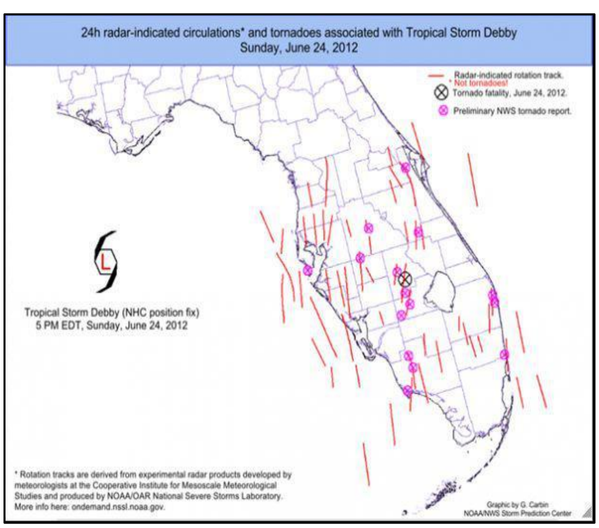


Tropical Storm Debby was the fourth named storm of the year. It was named at 5PM EDT on Saturday, June 23rd and continued through 5 PM EDT Wednesday June 27th, making landfall on Tuesday near Steinhatchee in the Florida Big Bend area before crossing the state and moving into the Atlantic Ocean.

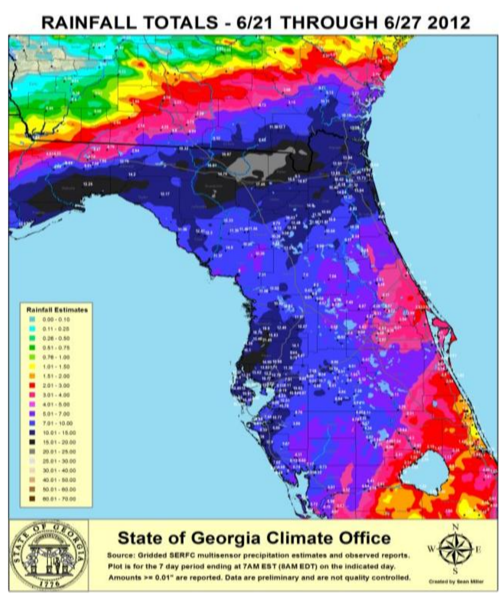
Heavy tropical rains ahead of and with Debby allowed for very high rainfall totals across much of the area and will put numerous locations within the top 5 wettest June's since records began. Rainfall totals reached around 20 inches in some locations around Brooksville and Spring Hill in Hernando County, with a widespread 10-15 inches across much of the greater Tampa Bay and Nature Coast areas. This lead to minor to moderate river flooding across several area rivers and caused numerous homes to be evacuated from the flood waters.

In addition to the river flooding, coastal flooding was a big problem along the west-central Florida coast. Flooding of 3 to 5 feet above ground level for the Nature Coast and 1 to 3 feet above ground level around the greater Tampa Bay area was observed as persistent onshore flow and large southwest swells combined with high tides of around 3 feet. This led to lots of beach erosion and flooding of barrier islands.

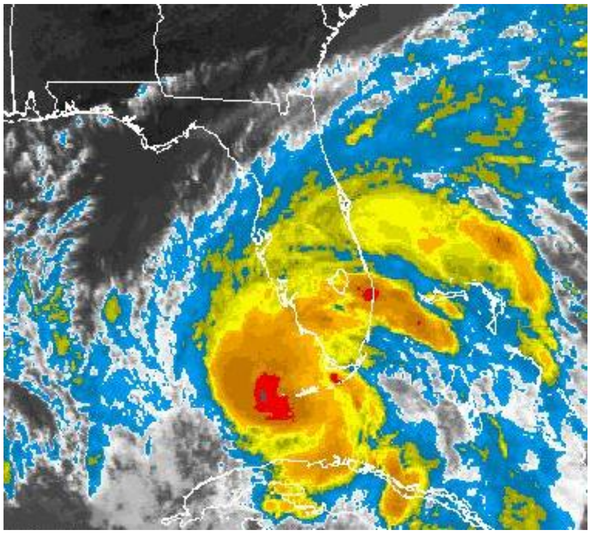
Tornadoes were Debby's final hit, with at least 11 confirmed tornadoes causing a lot of damage across the state and claiming one life in Highlands County. Reports and damage estimates are still being assessed, but monetary damage will likely be in the tens of millions of dollars.



Tornadoes in TS Debby



Rainfall Totals through TS Debby



2012 Hurricane Isaac

By: Tyler Fleming

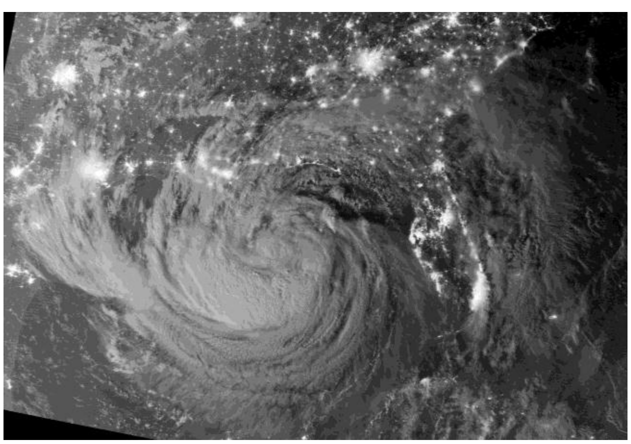
After the deadly and damaging impacts of Tropical Storm Debby over west central and southwest Florida, it was a relief that Hurricane Isaac had much more minimal impacts to our area.

Isaac crossed eastern Cuba as a Tropical Storm on August 25th, 2012 and moved northwest through the Florida Keys before continuing out into the eastern Gulf of Mexico. A Tropical Storm Watch was issued for Pinellas County south through Lee County on the morning of August 25th and was extended north through Levy County that afternoon. Tropical Storm Warnings were issued for the entire area early morning on August 26th. Additionally, Governor Rick Scott declared a state of emergency on August 25th. Isaac stayed off the western Florida coast and eventually made landfall in southeastern Louisiana at Hurricane strength.

The impacts of Isaac over west central and southwest Florida were minimal. One waterspout was spotted over the Tampa Bay on the afternoon of the 27th and moved inland as a brief tornado, with minor damage to 6 residences.

The heaviest rain fell in Highlands County, with over six inches of rain across most of the county, resulting in minor road flooding. The highest storm total rain report for the area was 6.71 inches at the CoCoRaHS station 3.9 miles south-southwest of Sebring. Additional flooding occurred along the Myakka River near Venice, where Ramblers Rest RV Resort sustained minor flooding.

Tropical storm force wind gusts were confined to coastal area, with frequent 34 to 46 knot wind gusts reported along the coast.



Visible Infrared Imaging Radiometer Suite (VIIRS) from the Suomi-NPP Satellite of Tropical Storm Isaac early morning on August 28, 2012. Image source: NASA Earth Observatory.

River flooding at the Ramblers Rest RV Resort during Tropical Storm Isaac. Photograph by Jason Ritter.

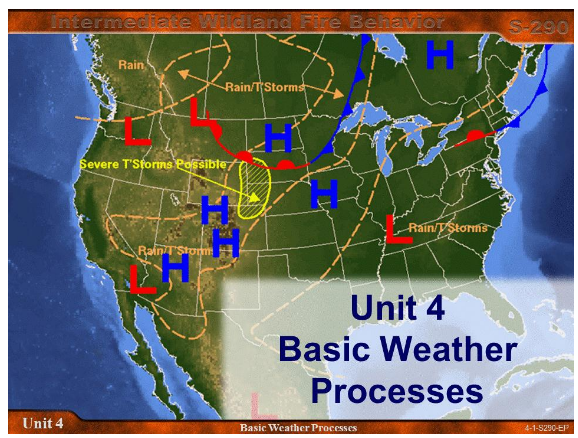
The Expanding Fire Weather Program at NWS Ruskin

By: Jon Jelsema

Meteorologists from the National Weather Service Forecast Office in Ruskin, FL have been busy traveling around west-central and southwest Florida, assisting the Florida Forest Service and Florida Park Service in fire fighter training over the past year. You may wonder what assistance could the NWS provide in the training of fire fighters? Well, fires are driven by 3 key components, known to the firefighting community as the fire triangle. The fire triangle is made up of Fuels, Topography and Weather. The weather plays a critical role in the spread and intensity of both Wildland and Prescribed fires, and as a result, officials from the Florida Forest Service requested the assistance of NWS Ruskin to teach several weather courses across the state over the past year.

Senior Forecaster Jon Jelsema, and Emergency Response Meteorologists Todd Barron and Rick Davis, all members of the fire weather team at the NWS office in Ruskin, FL, have assisted in fire weather training and sharing of new products developed to support our core fire partners over the past year. The Meteorologists assisted with the instruction of two S-290 Intermediate Wildland Fire Behavior Courses, one in Bradenton, FL and another in Brooksville, FL, one Fire Dispatcher Training Session in Brooksville, FL, two Fire Weather Review Training Sessions, one in Bradenton, FL and another in Sarasota, FL, and finally one Interagency Prescribed Fire Course in Sarasota, FL.

Wildland Fire Behavior is influenced by 3 key factors known as the Fire Triangle: Fuels, Weather, and Topography.



The first of 4 units taught by NWS Ruskin during the S290 Intermediate Wildland Fire Behavior Course was Basic Weather Processes.

In addition to the training sessions, seven Meteorologists from NWS Ruskin took Familiarization Trips to observe the importance of routine daily weather forecasts for prescribed burn operations. These trips allowed forecasters to see how weather impacted fire spread and intensity as well as how our partners in the firefighting community utilize our forecasts to make strategic decisions on mitigating the impacts of prescribed fires on the public.

Emergency Response Meteorologists Mike Gittinger and Rick Davis, Journeyman Forecaster Tyler Fleming, and Senior Forecaster Paul Close observing the Valroy Road prescribed burn on June 19th, 2012.

Senior Forecasters Bryan Mroczka and Jon Jelsema taking a weather obsertion to compare with forecasted weather conditions at a prescribed fire on May 22nd, 2012 in Myakka River State Park.

The NWS in Ruskin, FL will continue to partner with the firefighting agencies of west-central and southwest Florida in the future, working to ensure that fire fighters are given a solid understanding of the weather, so they remain as safe as possible while protecting the public from the dangers of Wildland fires.

These photos show why weather is such an important instructional component for developing an understanding of wildland and prescribed fire behavior. In some cases, such as the one's pictured above, extreme fire behavior results from sudden changes in the weather.

Incident Meteorologist Assists at the Sheep Herder Hill Wildfire

By: Rick Davis

Incident Meteorologist Rick Davis was dispatched to East-Central Wyoming on Casper Mountain during mid-September to provide weather and decision support services to numerous city, state and national agencies involved in fighting the Sheep Herder Hill Wildfire. The fire, which at its peak was over 15,000 square acres and threatening hundreds of structures and homes, began on September 8th or 9th, and was finally contained by September 17th.

The wildfire was burning in steep and complex terrain from about 5,000 to 8,000 feet elevation with numerous fuel types including grasses, shrubs, and timber such as ponderosa pines and aspen trees. Rick provided numerous specific area weather and smoke forecasts each day, as well as gave several daily weather briefings for those within the incident and other area partners and media. Some pictures of the fire and weather support are below.

2012 Climate Summary

By: Paul Close

SPECIAL FEATURE: 20th Anniversary of the 1993 March Storm of the Century

Storm Overview

By: Charlie Paxton

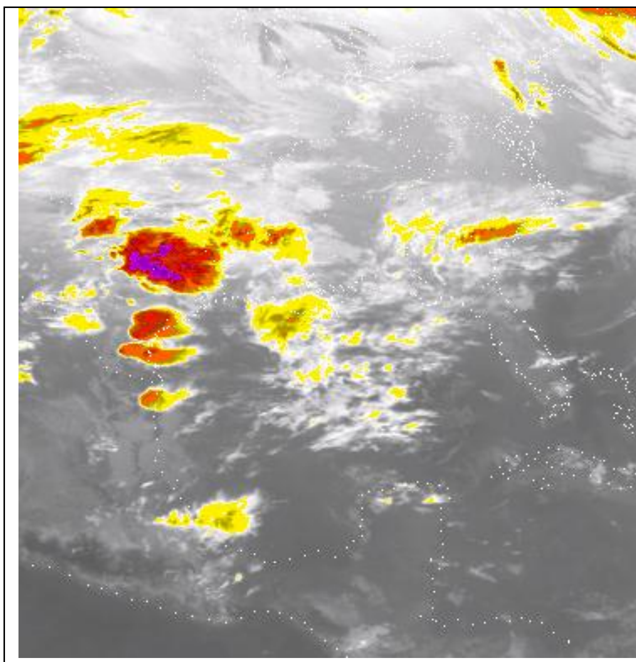
The March 1993 "Storm of the Century" struck the gulf coast of Florida late on Friday March 12, 1993 and continued slamming Florida and states to the north on Saturday. Why was it called the Storm of the Century? To Florida residents, it was an unnamed March hurricane creating wind gusts over 90 mph, tornadoes, and a devastatingly deadly storm surge. But it was much larger than a hurricane. To residents farther north it was called "The Blizzard of the Century" A blizzard like few had seen that dropped temperatures, dumped snow, broke trees, and knocked out power over a wide swath from Georgia to Maine. The Superstorm produced over $2 billion in property damage across portions of 22 eastern U.S. states. Most of the property damage occurred in Florida. Advanced warnings saved lives with less than 100 direct casualties – half of whom were on vessels in seas estimated as high as 65 feet. Another 118 people perished from indirect causes with many dying during the post storm cleanup.

Five days in advance, computer models indicated intense cyclogenesis of a low pressure system over the Gulf of Mexico as it rocketed from coastal Texas to Florida then up the eastern seaboard. It was initially difficult to believe that a weak low pressure area could deepen to much lower pressures in such short a period of time. Some forecasters used the term "meteorological bomb"! As the week went on, the numerical forecast models continued showing the same unbelievable development. It was happening though. Upstream, the upper flow produced a series of troughs successively flowing into the primary trough. The arctic, polar and subtropical jet streams were merging and a deep flow of tropical moisture over the Gulf was coming north from the Caribbean Sea. These merging factors set the timer for the impending explosion.

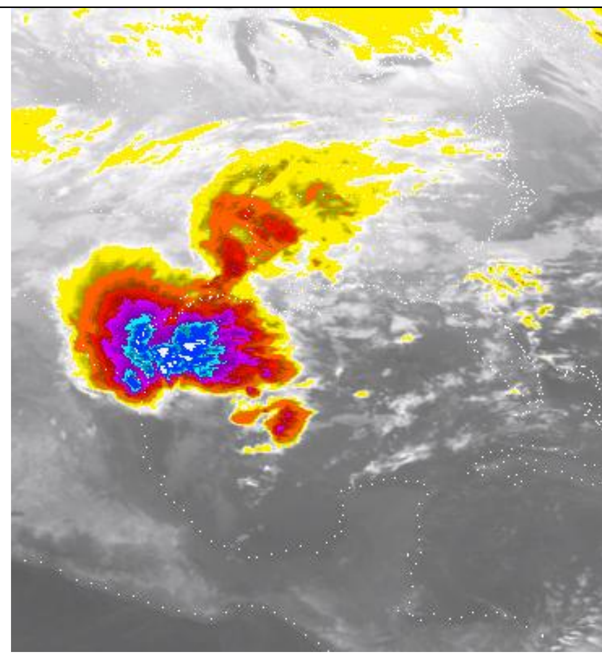
The winds howled as the storm moved north with the strongest recorded wind gusts at these locations:

- 144 mph Mount Washington, NH
- 110 mph Franklin County, FL
- 109 mph Dry Tortugas, FL
- 101 mph Flattop Mountain, NC

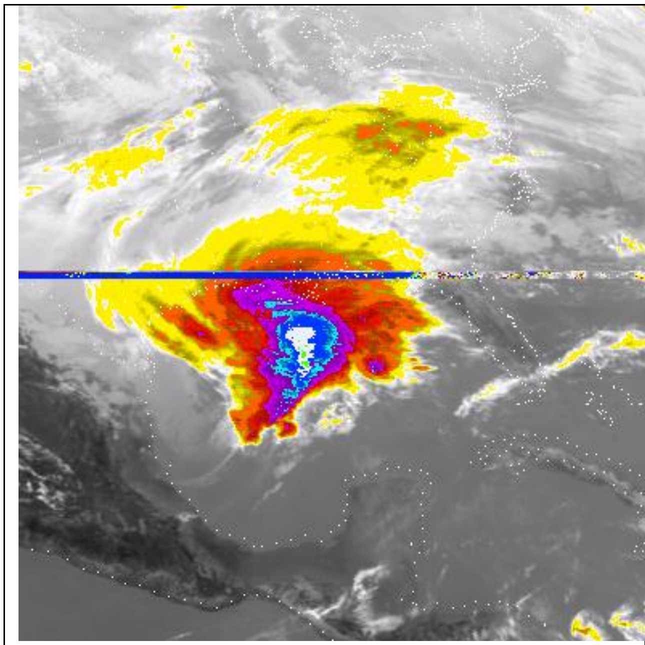
The fast moving squall line produced 59,000 cloud to ground lightning flashes with the highest flash density just south of Tampa and as it moved onshore along Florida's gulf coast. The Superstorm created an unprecedented storm surge up to 12 feet in Taylor County well north of Tampa Bay in the Florida panhandle. The surge drowned 13 people. The following series of images shows the evolution of the storm from a tattered collection of clouds over Texas to a huge storm menacing the eastern U.S. within a day.



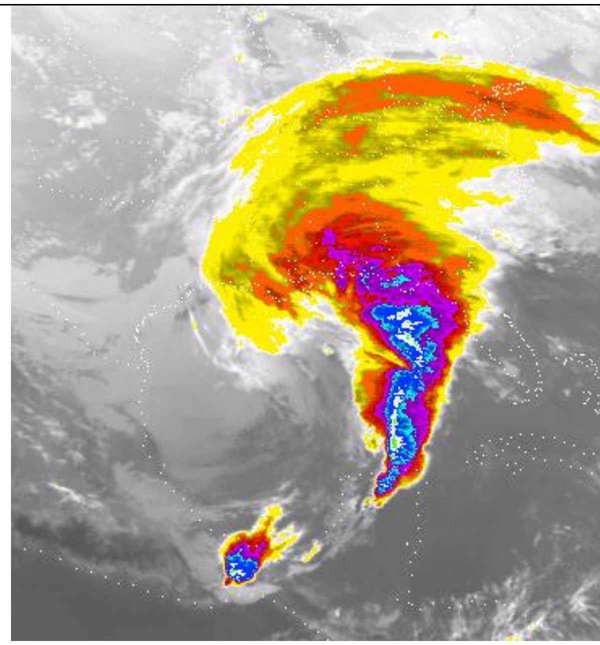
Infrared satellite 9 pm EST 11 March 1993



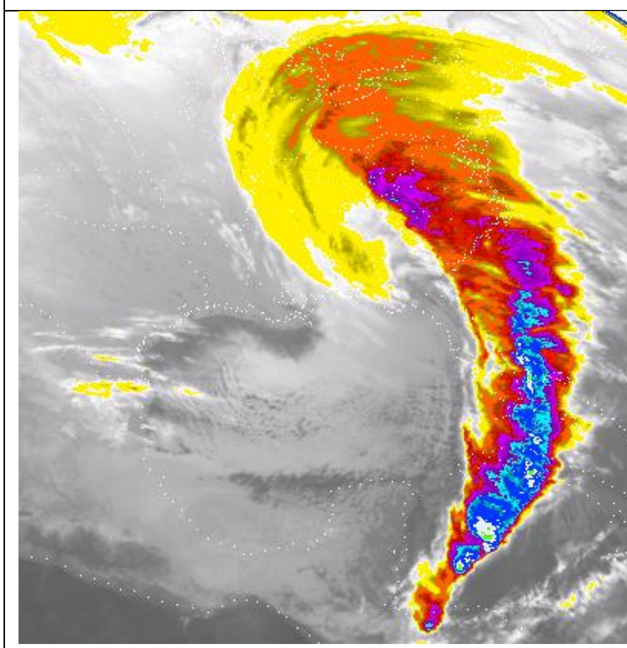
Infrared satellite 7 am EST 12 March 1993



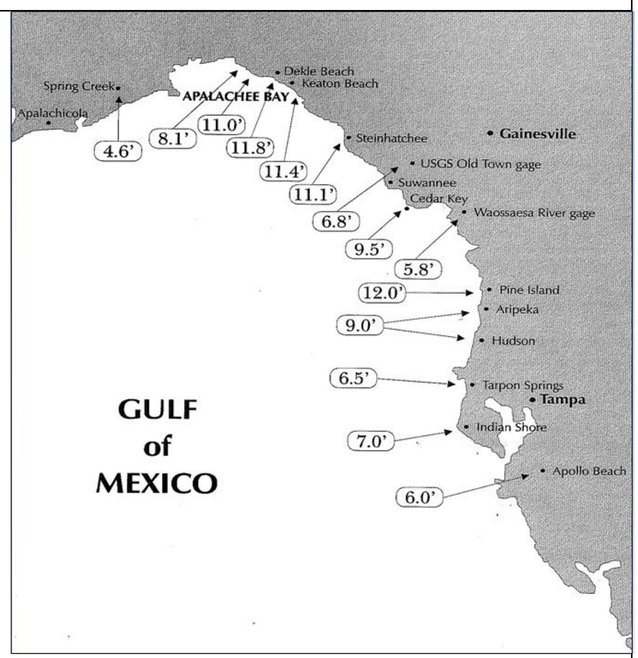
Infrared satellite 2 pm EST 12 March 1993



Infrared satellite 8 pm EST 12 March 1993



Infrared satellite 5 am EST 13 March 1993



Maximum storm surge heights

Numerous tornadoes struck the state including an F2 near Chiefland in Levy County causing 3 deaths. Other tornadoes struck these locations:

- Other F2 tornadoes struck along a 30 mile track in Lake County causing 1 death and another occurred near Ocala in Marion County
- F1 tornadoes struck near: La Crosse in Alachua County causing 1 death, near Crystal River in Citrus County and another in Jacksonville.
- F0 tornadoes struck near: Treasure Island in Pinellas County, New Port Richey in Pasco County, Tampa, Bartow in Polk County, and Jacksonville

The storm dumped a 10 to over 20 inch swath of snow from northern Alabama and Georgia north to New York and Maine, bringing the eastern third of the country to a standstill. The deepest snow amounts fell in these areas during the storm:

54” in Snowshoe, WV	43” in Syracuse, NY	42” in Tobyhanna, PA	35” in Lincoln, NH
33” in Boone, NC	30” in Gatlinburg, TN	25.2” in Pittsburgh, PA	23” in Chattanooga, TN
22” in London, KY	20.1” in Worcester, MA	17” in Birmingham, AL	16.2” in Atlanta, GA

Charlie Paxton was the forecaster on duty during the day on Friday March 12, 1993 and came back that evening to issue warnings for the event. He recalls working the storm that night:

> *“When I arrived, the office satellite imagery showed the squall line racing east at 70 mph! Our team issued 26 warnings and lead time ranged from 30 minutes to over two hours! I upgraded wording in all of the warnings to indicate winds of over 90 mph! Standard warnings usually indicate wind gusts over 55 mph. Of the 6 tornadoes in our area...lead times were all over 20 minutes with the longest lead time of 48 minutes. Remember, we were using the old WSR-57 Radar. We didn’t have Doppler. We had a processor attached to the radar called RADAP and I had written software to make calculations on the severity of cells and that really helped. “*
>
> *“We used an XT PC to send products through our main communication system called AFOS. We communicated with the Melbourne WSR-88D operator who helped identify tornadic circulations within range of their radar. We used the NAWAS line to communicate with the county Emergency Operations Centers. We also received a number of reports from the local media. We had an 800 number available to the public. Our phone didn’t stop ringing. People were shocked at the intensity of the storm and provided us with many accounts of damage.”*

In an official NOAA Service assessment these words were written about the performance of the Ruskin weather office:

> Review of the verification statistics shows clearly that excellent warning services were provided by WSO Tampa. Of the 26 severe weather warnings issued, 22 verified. **Of the 45 reported events, 43, or 95 percent, occurred with either a Severe Thunderstorm or Tornado Warning in effect prior to the event. These results are exceptional for any NWS office.**

Looking at the Storm through the Models: Then and Now

By: Bryan Mroczka

Then: Early 90s Numerical Weather Prediction of the Superstorm

20 years ago this March, the state of Florida was impacted by one of the most intense and dynamic non-tropical system of modern times, the Superstorm of March 12-14, 1993. This memorable storm impacted a wide swath of the Eastern United States, but struck the Sunshine State particularly hard with almost all forms of hazardous weather.

In this section we will take a look back at the success of the numerical weather prediction models in early detection of this historic storm, and how today's advancements in numerical weather prediction would have further improved the long range forecast and threat assessment for our section of the country.

Up to 5 days ahead of time, long term agreement within the various computer models began to indicate the potential for a significant winter storm over the eastern United States by the coming weekend. The increasing confidence in this storm within the forecast community can be seen in the subjective surface forecast charts for days 4 and 5 seen in Figure 1. The consensus at that time indicated a deepening area of low pressure travelling along the eastern seaboard.

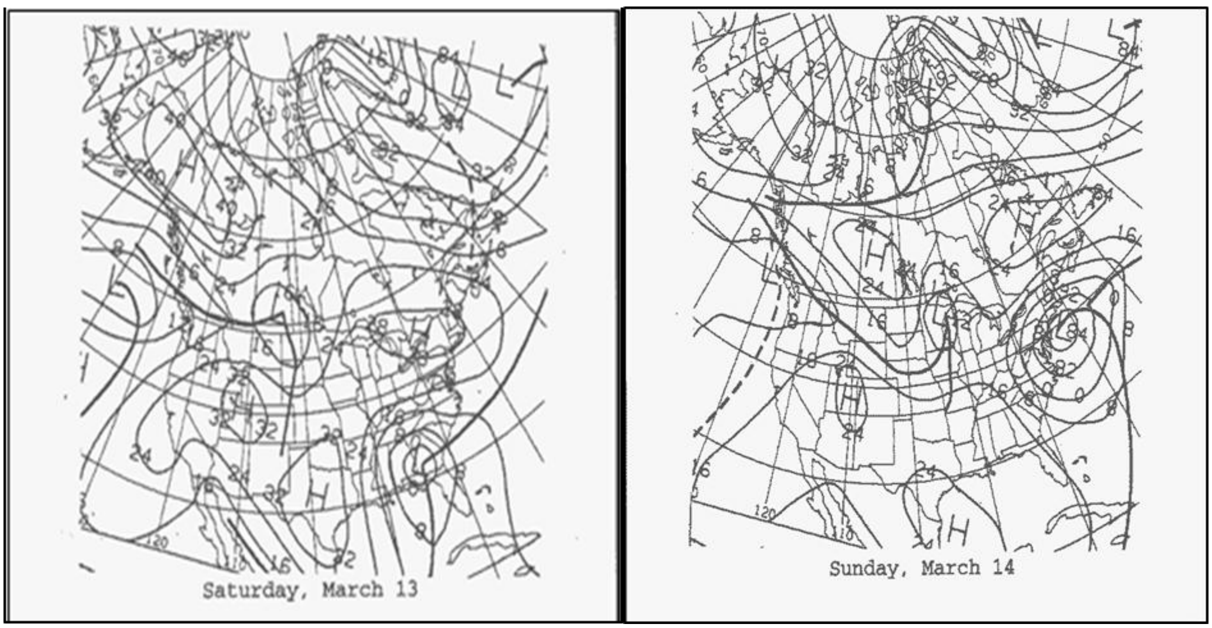


Fig 1. Subjective Surface Forecast Charts from NMC for day 4 (Saturday) and day 5 Sunday.

Confidence in a potentially very significant storm continued to increase into the medium range forecast period. The 500mb and surface pressure forecasts from the MRF (Figure 2), UKMET and ECMWF (Figure 3) all show a significant upper level trough over the eastern United States and intense area of low pressure near the Mid-Atlantic coast by Sunday morning.

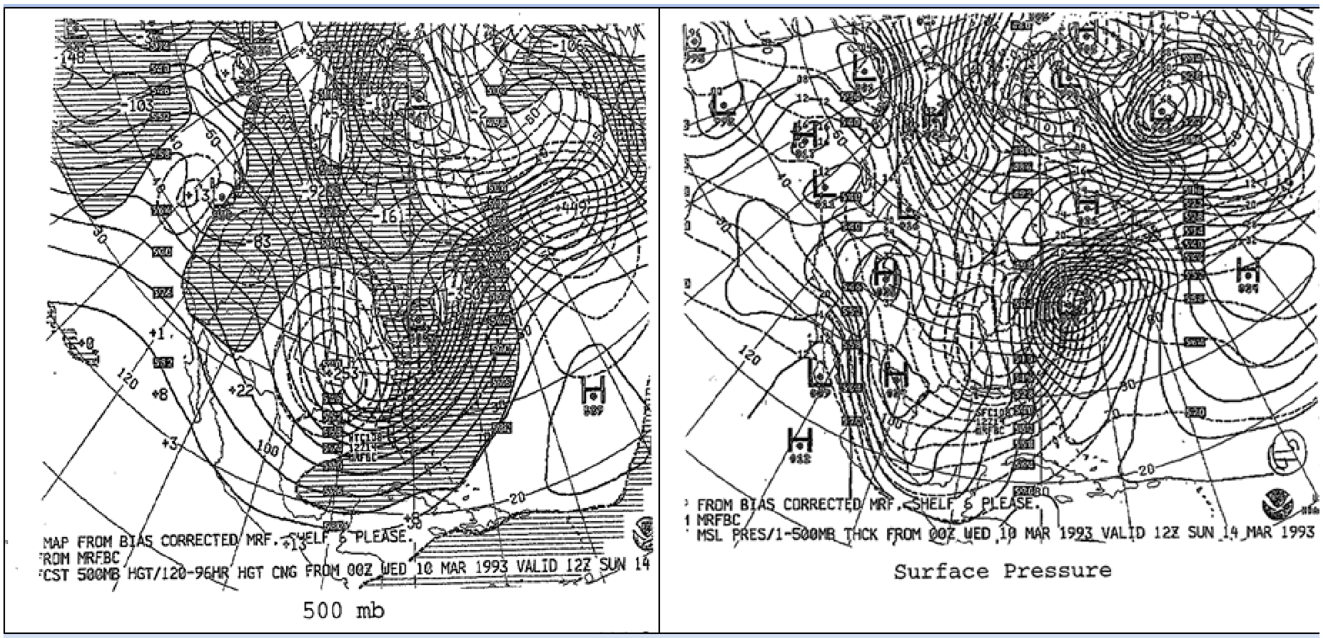


Fig 2. MRF Forecasts Valid at 700 AM EST, Sunday, March 14, 1993.

The model consensus during the medium range period was indicating that although low pressure would develop over the northern Gulf of Mexico, the most significant deepening of the cyclone was not to commence until the system turned north and moved along the Eastern Seaboard. In reality, the rapid cyclogenesis and deepening would begin over the northern Gulf and continued up the Eastern Seaboard. This earlier explosive development subjected a larger portion of the Eastern United States to unprecedented hazards.

During the 1 to 2 day forecast period, the shorter term model guidance all were remarkably forecasting the record-breaking low pressures to be later observed by the mature cyclone over the Mid-Atlantic States. However, the model solutions of rapid deepening on Saturday along the Eastern Seaboard, as opposed to over the Northern Gulf of Mexico, continued to be a theme.

During Friday, as the cyclone began to develop over the Western Gulf of Mexico, computer models finally began to forecast an earlier and more rapid deepening over the Gulf of Mexico during the following 12 hours. However, even at this close range, limitations in early numerical weather prediction under-forecast the actual explosive deepening that was to occur Friday Night over the North-Central and Northeast Gulf of Mexico.

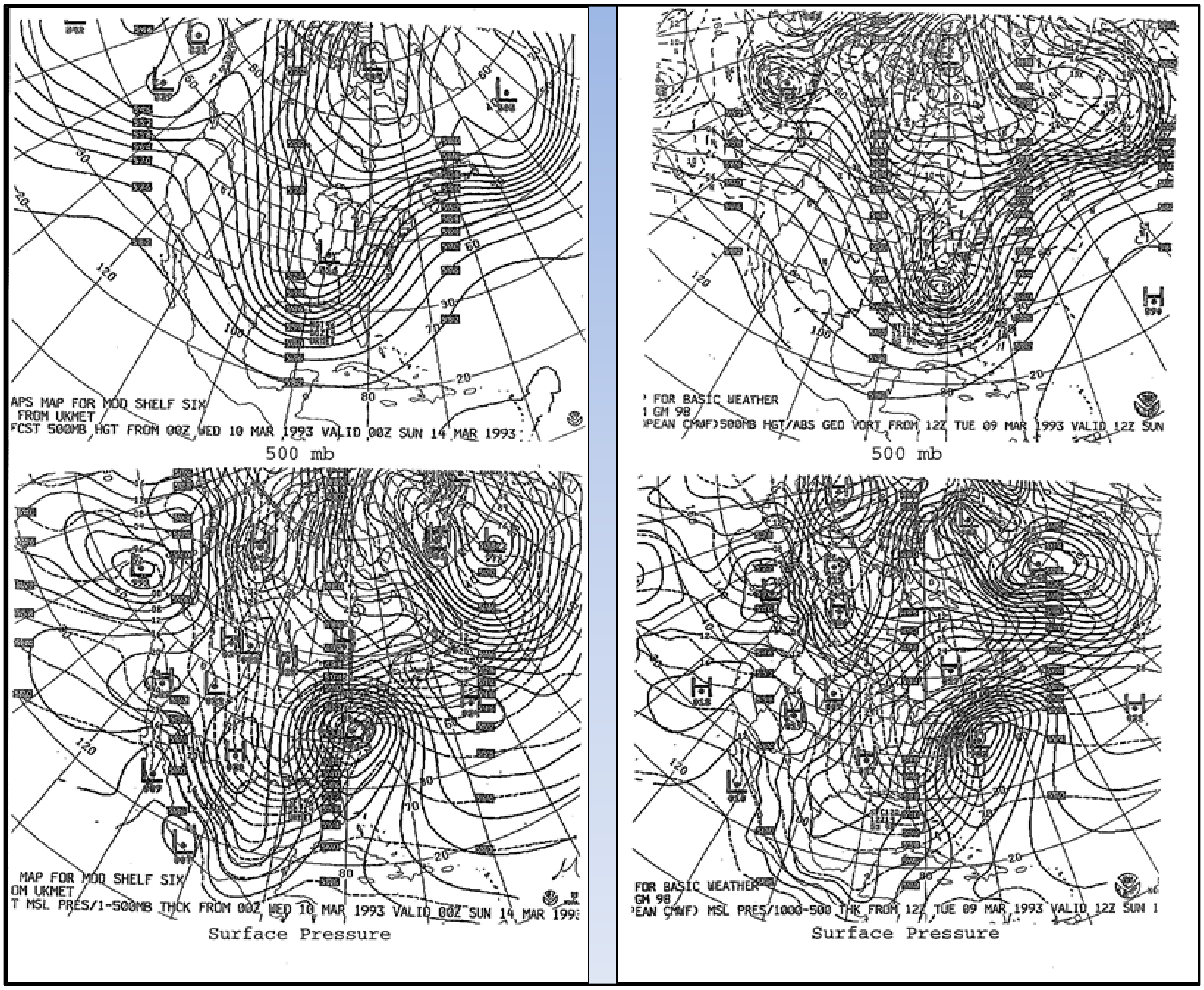


Fig 3. UKMET Forecast (left) Valid 7 PM EST Saturday, March 13, 1993, and ECMWF Forecast (right) Valid 7 AM EST Sunday, March 14, 1993.

Between 1 PM on Friday March 12th, and 7 AM Saturday March 13th, observed surface pressure falls of 26mb occurred as the cyclone passed over the Northern Gulf of Mexico. By definition, this explosive deepening, according to the survey report issued by NOAA, resulted in a nearly unprecedented extratropical "Gulf of Mexico Bomb". The meteorological definition of a "bomb" is a cyclone which deepens by 24 millibars in 24 hours or less.

A surface cyclone exhibiting these types of pressure falls indicates a very energetic upper level parent system. These upper level characteristics along with the resulting surface wind fields would prove this extratropical cyclone was to be unlike any other seen over the Northeast Gulf and Florida Peninsula during modern times.

Now: Today's Numerical Weather Prediction of the 1993 Superstorm

In March of 1993, during the days leading up to the Superstorm, there was certainly confidence in a significant extra-tropical storm impacting the entire Eastern Seaboard. However, as discussed in the previous section, some of the details that were under-forecast, or at the time simply un-resolvable by the coarse nature of these early computer models, proved very important to the eventual hazards and impacts to our portion of the country.

Today, due to a combination of advanced computing power, more robust observational data for initial conditions, model temporal and spatial resolution, and complex visualization methods, a more accurate and advanced threat assessment from a similar storm could be achieved. In this section we will look at how the surface features of the Superstorm of 1993 would be handled by some of today's more sophisticated numerical weather prediction models.

The following section is based on a simulation of the March 1993 Superstorm using the Weather Research and Forecasting (WRF) model, with initial conditions provided by the Climate Forecast System Reanalysis (CFSR) at 1 PM EST, Thursday March 11th, 1993.

Figure 4 shows the simulated progression of the surface pressure and wind pattern from Thursday evening of March 11th, through Saturday morning of March 13th. The model simulation correctly forecast the unusually rapid cyclogenesis across the Northeast Gulf of Mexico and the resulting powerful wind fields the accompanied the storms passage.

Figure 5 shows the progression of lowest surface pressure during the model simulation. Tracking the central low during an 18 hour period between Friday morning and late Friday night yields a pressure fall of around 25mb.

Although surface winds were high, winds just above the surface were even more extreme. It is these higher momentum winds that can periodically find their way to the surface within thunderstorms and other processes. Today's sophisticated forecast models and systems for visualizing the output help forecasters better understand these environments above our heads. Figure 6 shows an hourly snapshot of the 850mb wind forecast valid late in the evening on March 12th. The wind field ahead of the low is truly impressive, with a wide swath of southerly flow at 90-100+ knots. Understanding and knowledge of this type of extreme environment ahead of time would allow forecasters and emergency management to plan for potential high end severe thunderstorm winds.

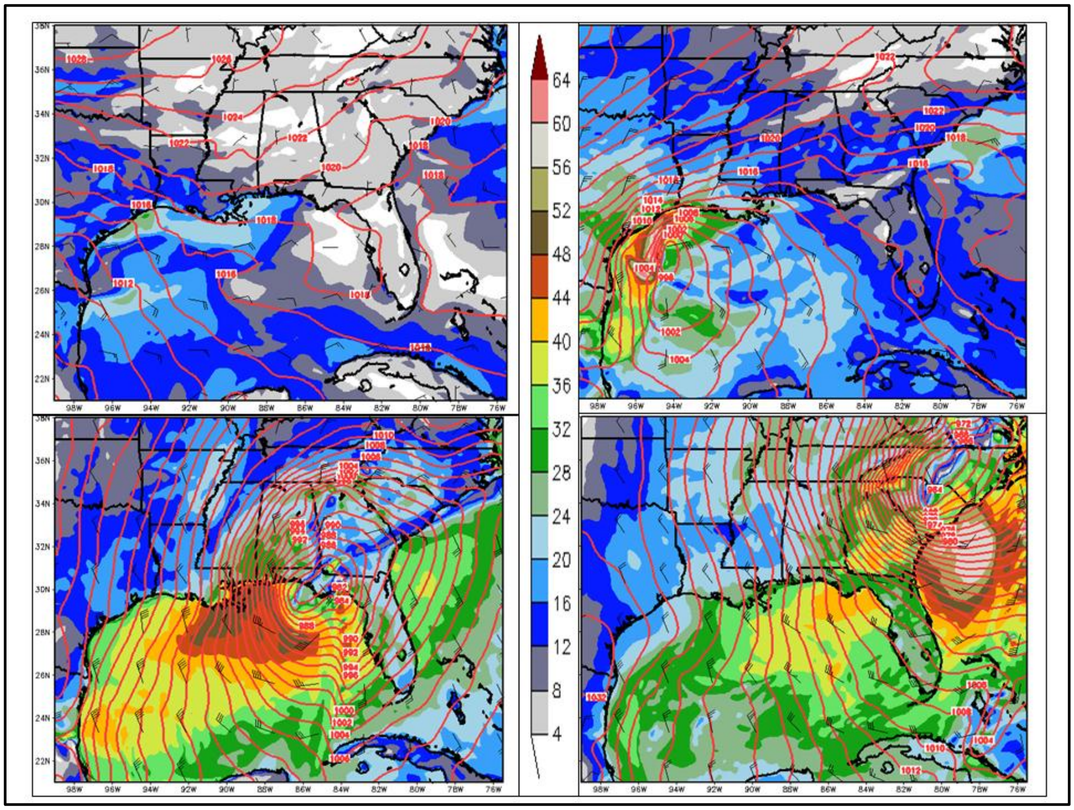


Fig 4. Surface pressure and wind (shaded) forecast by WRF-ARW simulation for Thursday evening (top left), Friday morning (top right), Friday evening (bottom left), Saturday morning (bottom right).

One of the more significant advancements in numerical weather prediction since the time of the 1993 Superstorm, is the beginning of explicit convection models. In plain terms, this means that some models used by forecasters now can model individual thunderstorms or squall line features down to the storm-scale. Modeling storms at this scale allows a wealth of new information to be unlocked from the environment, including simulating actual wind gusts produced by the storms, rotation potential within storms, and even how the model is forecasting the radar reflectivity to appear at a future time.

The prediction and visualization of these types of forecast fields aid forecasters in their confidence, not only in timing of convective activity (thunderstorms), but also the potential type of thunderstorms and severity to anticipate.

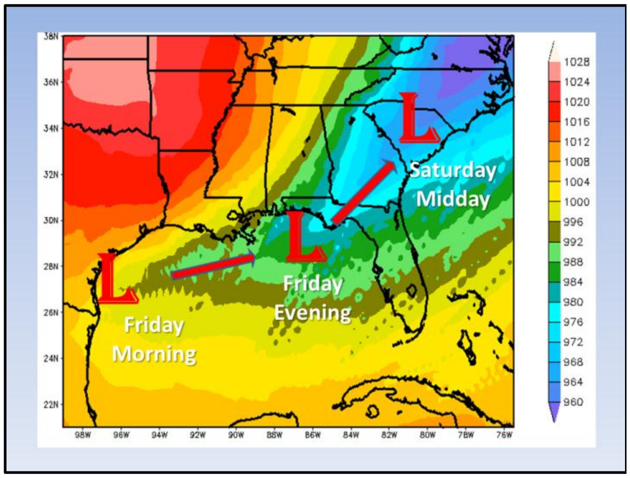


Fig 5. Lowest mean sea level pressure (MSLP) during the model simulation.

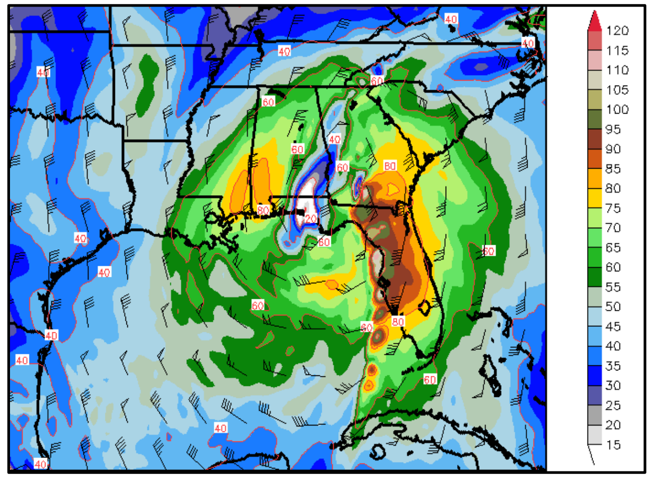


Fig 6. 850mb Wind Fields Late Friday Night

Figure 7 shows a comparison between a snapshot of the model simulated radar reflectivity forecast for the Superstorm squall line Friday Night of March 12th into the 13th, compared to the actual radar image from the Weather Service Radar in Melbourne, FL at the same time. Keep in mind, the actual squall line does extend down into the Southeast Gulf of Mexico as forecast by the model, however, those locations are simply too distant for the radar to detect the storms occupying that region.

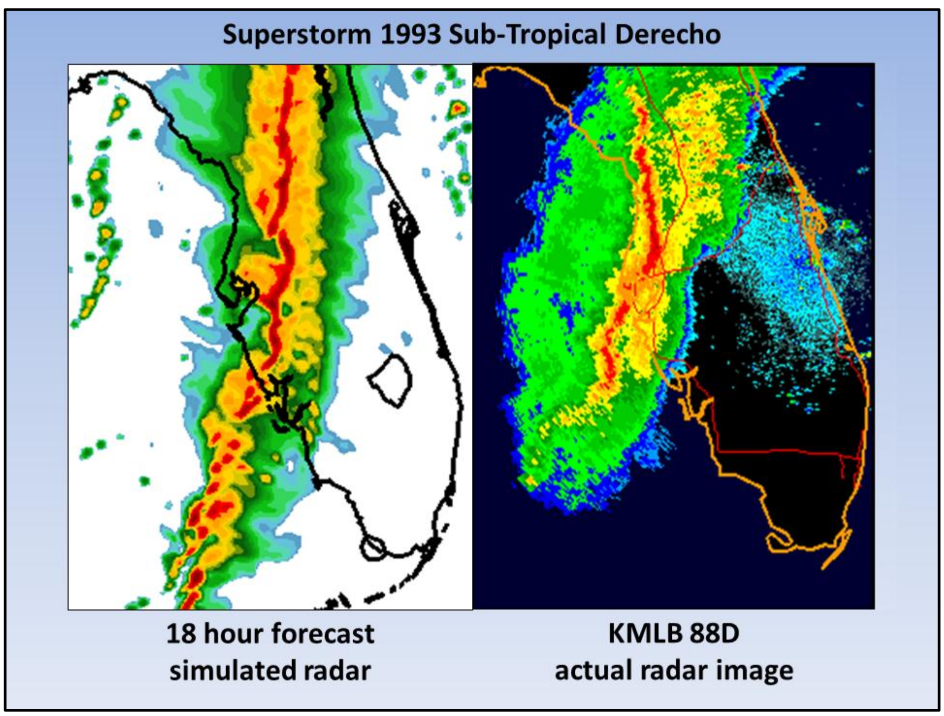


Fig 7. Simulated model radar forecast (left) compared to actual WSR-88D radar image

Figure 8 show several snapshots of the forecast squall line as it approaches and progresses across the Florida Peninsula. The vigorous nature of the simulated convection combined with the forecast wind fields would suggest a high potential for severe thunderstorm wind gusts associated with the squall line passage.

Figure 9 shows a snapshot image (left) of the wind gusts being produced within the model associated with the squall line as it arrives at the Florida west coast, and (right) the highest wind gusts through the entire model run. This particular model output certainly suggested the potential for a high end severe thunderstorm event, with virtually all of Florida West Coast in a threat for hurricane force wind gusts. Figure 10 is an analysis of the observed convective wind gusts seen with the squall line passage. Much of the region realized the modern day forecast of high end damaging wind gust potential. Areas in the orange to blue colors represent observed wind gusts within the squall line of at least hurricane force.

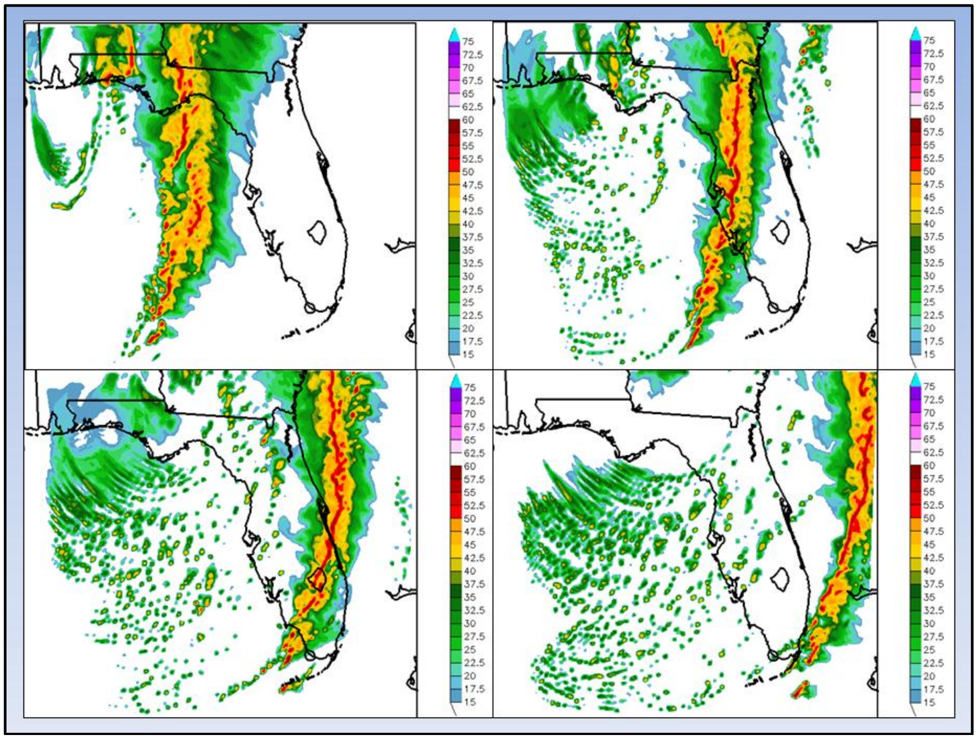


Fig 8. Simulated model radar forecast progression across the Florida Peninsula.

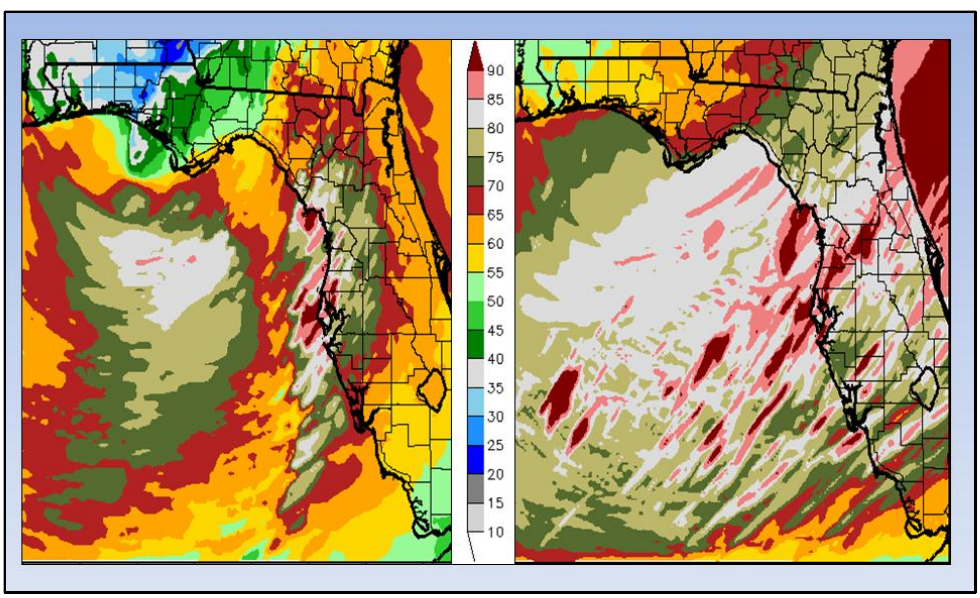


Fig 9. Hourly snapshot of forecast wind gusts as squall line arrives at Florida west coast and wind gust forecast through entire model simulation (right)

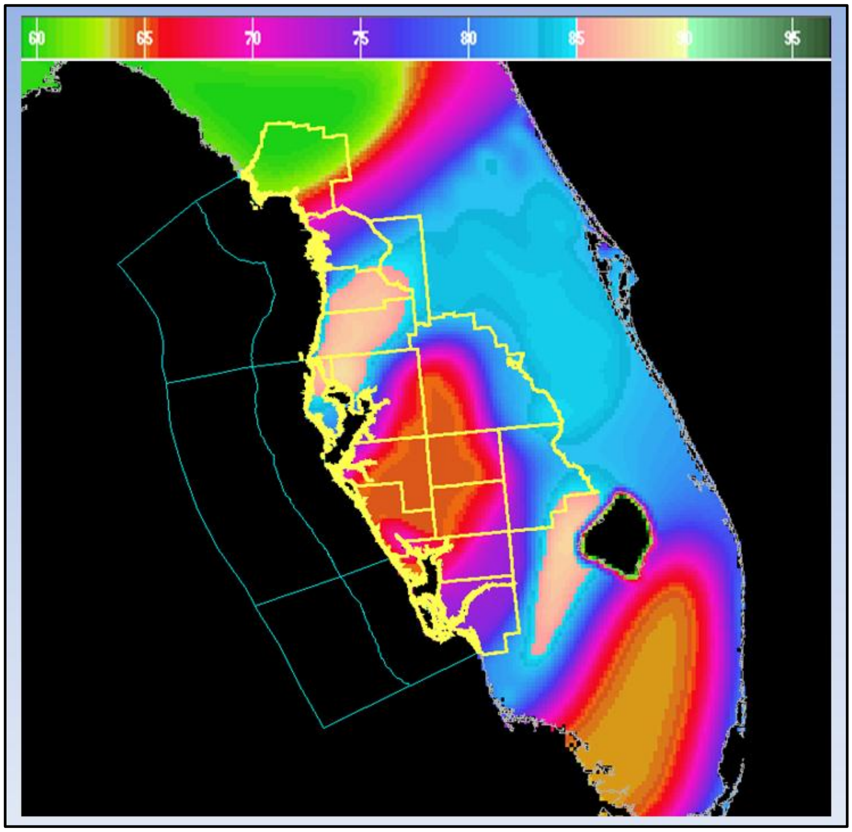


Fig 10. Analysis of observed convective wind gusts during squall line passage.

Thank You to all!

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