

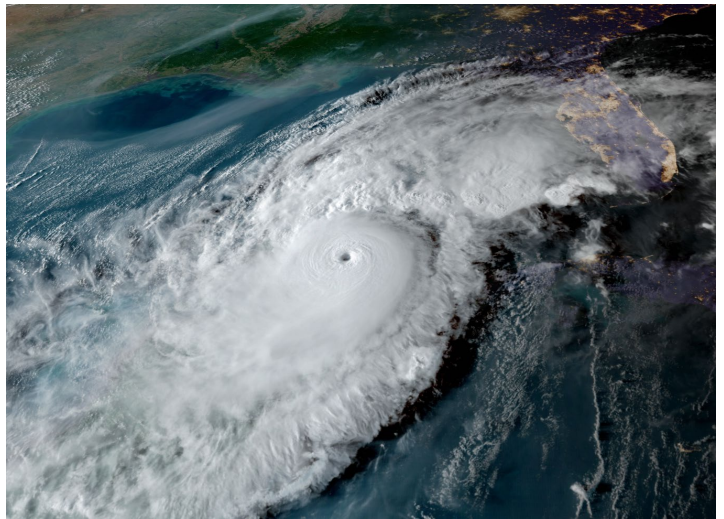
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Hurricane Milton Report #1 October 11, 2024

Hurricane Milton made landfall on Wednesday night, October 9, 2024 near Sarasota, Florida, as a Category 3 storm. Milton’s landfall marks the second major hurricane landfall in Florida in less than two weeks, the third hurricane to make landfall in Florida in 2024, and the 10th major hurricane landfall along the US Gulf Coast since 2017. While Milton weakened prior to landfall from Category 5 status, the storm still caused significant impacts across the state of Florida. This post event report will address Milton’s place in history, assess initial impacts immediately following the storm, and detail where Milton overperformed, underperformed, or surprised relative to forecasts.

Milton’s Superlatives

- **Strength:** At its peak intensity, Hurricane Milton was a Category 5 hurricane on the Saffir-Simpson scale, packing winds of 180 mph and a central pressure of 897 millibars. Milton was the strongest storm of 2024 and ranks in or near the top five strongest in both low central pressure and highest windspeed for Atlantic hurricanes.
- **2024 a Record Year:** Milton’s landfall ties 2024 with five other years for the most landfalling storms in Florida in one year (3). Only 2004 and 2005 had the same amount of Gulf Coast hurricane landfalls in one year (5), which ranks second trailing only 1886 (six landfalls).
- **Observations:** Upon landfall, a wind gust of 105 mph was measured in the Egmont Channel, just southwest of St. Petersburg. Gusts of 102 and 101 mph were reported at the Bradenton Airport and St. Petersburg Airport, respectively. Over 18 inches of rain fell in St. Petersburg, with more than 9 inches falling in a 3-hour period. Tampa recorded a 24-hour total of 11.23 inches on Wednesday, October 9, shattering not just its single day record for October, but rather its record for the entire month of October. Many rainfall totals place the return period at 1 in 1,000 years.
- **Societal Impacts:** Over 3.5 million customers were left without power by Thursday morning, with Hardee and Highlands counties having nearly 100% of customers impacted. At least 16 fatalities have been reported as of Friday morning, October 11, with at least 6 coming from Milton’s tornadic activity.



Satellite image of Hurricane Milton at its peak strength on October 8, 2024. Source: NOAA / CIRA.



Heavy structural damage has been observed in St. Petersburg in Pinellas counties. Seen above is damage to the roof of Tropicana Field (Source: Duke Energy), and seen left a crane collapse in downtown St. Petersburg (Source: City of St. Pete).

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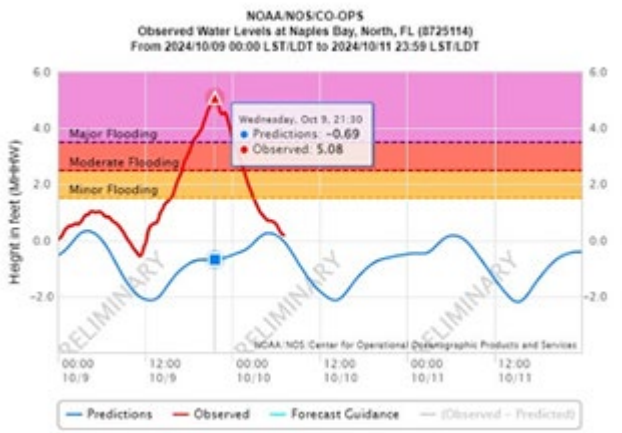
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Underperformance Relative to Forecast

Storm Surge

Initial forecasts for Hurricane Milton anticipated a significant storm surge threat for Tampa Bay and surrounding areas. While Milton did produce significant localized storm surge, with the highest in North Naples Bay, the storm surge impact in Tampa Bay fell short of initial expectations due to several factors:

- **Landfall Location:** Milton ultimately made landfall south of Tampa Bay, sparing the most densely populated areas from impacts. Hurricane Ian, for example, followed a more direct path into Florida’s southwestern coast, resulting in more severe storm surge impacts.
- **Storm Angle and Wind Direction:** The location and angle at which Milton crossed the Florida peninsula reduced the funneling effect that often amplifies storm surge. Instead of pushing water into the bay, winds pulled water away, mitigating the potential for significant coastal flooding.
- **Hurricane Size:** Generally, larger storms with broader wind fields push more water and create higher surges. Hurricane Milton was relatively moderate in size for its intensity, compared to Hurricane Helene which ranked in the top 90% for hurricanes its size.
- **Tidal Timing:** Milton’s peak surge coincided with a low tide in some areas, such as Venice. Had the surge coincided with high tide, the impacts would likely have been far worse.



Tidal Gauge Plot at Naples Bay, North, FL (8725114).
Source: NOAA.



Onset of storm surge flooding early Wednesday evening, October 9 along Gulf Shore Drive in Naples, which experienced some of the worst storm surge in Hurricane Milton. Source: Naples Police Department.



Downed trees in The Villages, roughly 50 miles northwest of Orlando. Source: Guy Carpenter.

Central Florida Wind Damage

Initially expected to rival the inland impacts of Hurricane Charley of 2004, arguably the most severe hurricane to hit the Orlando region, Hurricane Milton’s weakening prior to landfall and additional weakening as it traversed across Central Florida minimized overall impacts throughout the Orlando metropolitan region. While widespread power outages, flash flooding, and downed trees have been reported throughout the region, Orlando was largely spared from extreme wind conditions. The Orlando International Airport recorded a wind gust to 86 mph, compared to 106 mph from Charley.

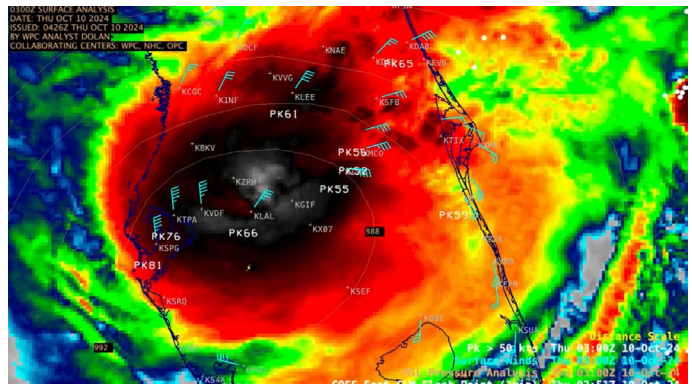
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Overperformance Relative to Forecast

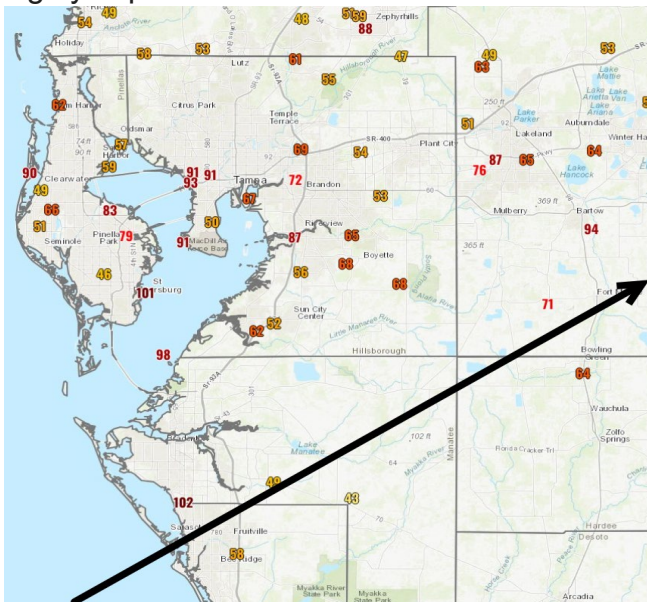
Left of Track – Peak Wind Gusts & Excessive Rainfall

A landfalling hurricane south of Tampa Bay moving inland at 15 mph would usually create the highest winds and rainfall to the right of the landfall location, over Manatee and Sarasota counties. However, the most prolific corridor of peak winds in excess of 90 mph and record setting precipitation was observed over St. Petersburg and Tampa northeast to Lakeland.

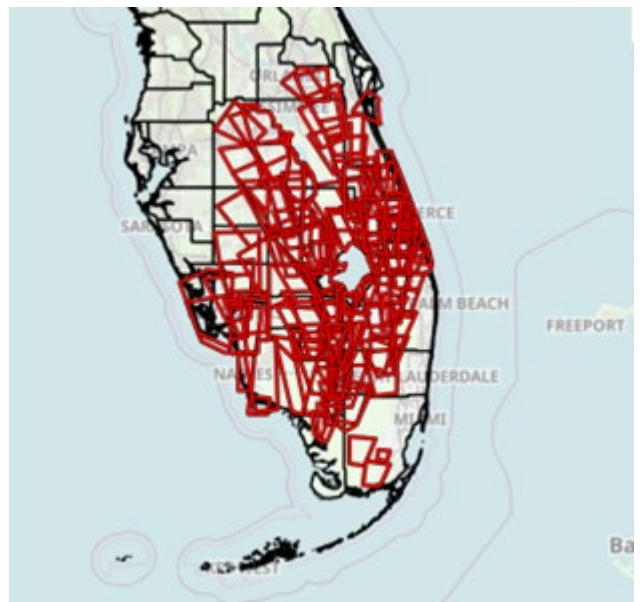


Milton inland with a majority of peak wind gusts occurring to left of the track. Source: University of Wisconsin.

Milton interacted with a frontal system and the jet stream over the southeastern US, resulting in the start of Milton's transition into a mid-latitude storm system. It is highly unusual for a Florida hurricane to commence this transition so far south. As a result, vendor tracks of Milton will likely be insufficient in capturing the magnitude of impacts due to this unique outcome and highly impactful hazards to the left of the landfall track.



Peak wind gusts relative to the track of Milton. Source: National Weather Service.



Tornado Warnings Issued by the NWS as of 10/9 6 PM. Source: NWS Miami.

Tornado Outbreak

A prolific tornado outbreak associated with the outer bands of Hurricane Milton occurred across central and southern Florida on Wednesday, October 9 as the storm tracked towards the Gulf Coast. A total of 126 tornado warnings were issued, the highest number on record for a single day for the state of Florida and second highest of any state behind Alabama in the 2011 Tuscaloosa outbreak. At least 19 tornadoes have been confirmed as of Wednesday night, and more are anticipated as survey teams assess damage for EF ratings and track adjustments. Heavy damage has been reported in St. Lucie and Palm Beach counties. Of note, many homes fared well in the face of tornadic winds as a result of Florida's building requirements, suffering only roof and cosmetic damage, not structural damage. It is not uncommon for hurricanes to spawn tornadoes; Hurricane Beryl earlier this year produced over 60 tornadoes across much of the US, and Hurricanes Frances, Beulah, and Ivan all produced over 100. It is likely that damage from Milton's tornado outbreak will contribute to overall insured loss and is not contemplated in hurricane catastrophe models.

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National Hurricane Center (NHC) Forecast Skill

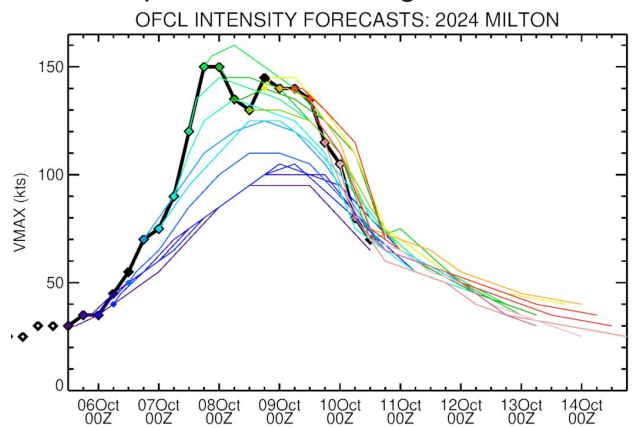
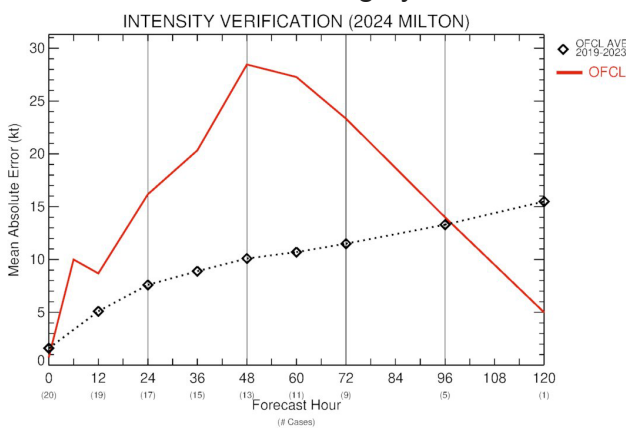
Milton was a challenging storm to forecast from both a track and intensity perspective. A week before landfall, almost all model guidance was still unclear on whether a tropical system would even develop in the Gulf of Mexico, let alone one of the strongest Category 5 hurricanes ever recorded in the North Atlantic. The lack of historical analogs, the small size of Milton, and the competing thermodynamical and dynamical elements all contributed to outsized forecast uncertainty.

Track Forecasts

When NHC initiated advisories on October 5, the center of the forecast cone depicted future-Milton making landfall just south of Tampa Bay. Four days later, Hurricane Milton came ashore only 12 miles south of the center of the October 5 cone. Although only 1 forecast, it is representative of an overall exceptional track forecast performance for NHC, especially for longer lead times (72-120 hours). The ever increasing accuracy of NHC forecasts helps to minimize evacuations and help best position recovery assets.

Intensity Forecasts

Milton achieved hurricane status at 5 p.m. EDT on October 6 and was forecasted to reach a Category 4 storm with maximum sustained winds of 145 mph in 48 hours. Such rapid strengthening being explicitly forecast by the NHC is rare, yet this forecast was unable to keep up with Milton's historic intensification. Only a few hurricane models forecasted Milton achieving its near record intensity, challenging NHC to explicitly forecast Milton's peak. Despite troubles with rendering Milton's peak intensity, landfall intensity at category 3 strength was well forecast throughout Milton's lifetime, availing the worst case stronger hurricane scenarios to largely be discarded in formulated pre-event loss ranges.



NHC intensity forecast errors for Hurricane Milton as of 9 AM, October 10. *Source: Brian McNoldy, University of Miami.*

NHC official intensity forecasts for Hurricane Milton from October 6-10 with Best Track intensity (black bolded line) *Source: Brian McNoldy, University of Miami.*

A second post event report on Hurricane Milton will be issued the week of October 14, 2024.

About Guy Carpenter

Guy Carpenter, a business of Marsh McLennan (NYSE: MMC), is a leading global risk advisory and reinsurance specialist and broker. Marsh McLennan is a global leader in risk, strategy and people, advising clients in 130 countries across four businesses: Marsh, Guy Carpenter, Mercer and Oliver Wyman. With annual revenue of \$23 billion and more than 85,000 colleagues, Marsh McLennan helps build the confidence to thrive through the power of perspective. For more information, visit guycarp.com, or follow on LinkedIn and X.

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