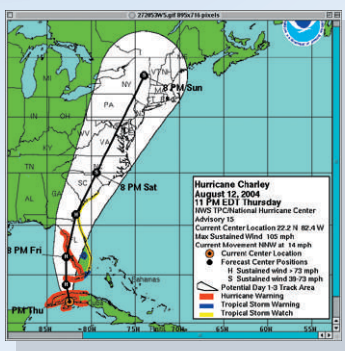
Anatomy of a forecast

As broadcast meteorologists and representatives from the National Weather Service and the National Hurricane Center gathered to debrief Hurricane Charley, one message came up again and again — when evaluating NHC forecasts, focus on the cone instead of the line.

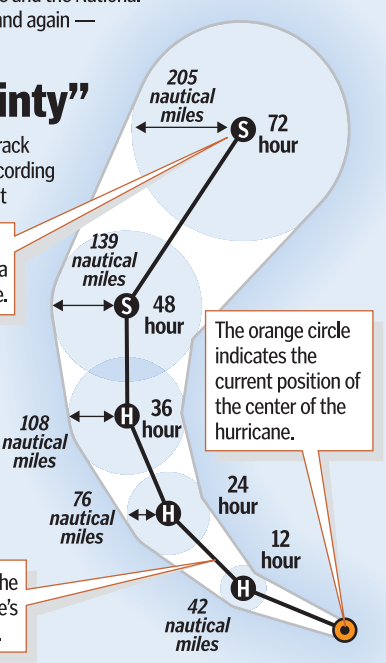
Understanding the "cone of uncertainty"

Predicting the location of a hurricane's center is not an exact science — the average track forecast errors over a 10-year period are used to construct the cone of uncertainty. According to the NHC, the entire path of the center of the storm will remain within the cone about 60 percent to 70 percent of the time.



Coastal warnings and watches

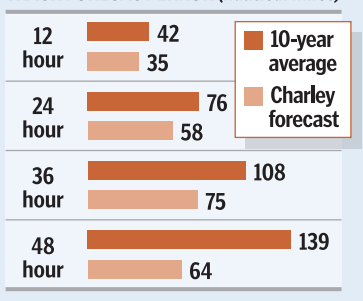
This map from the NHC's Web site shows coastal areas under a hurricane warning or watch, tropical storm warning or watch, the present position of the storm and its predicted path.



How accurate?

The NHC forecast of Charley's path was more accurate than the 10-year average.

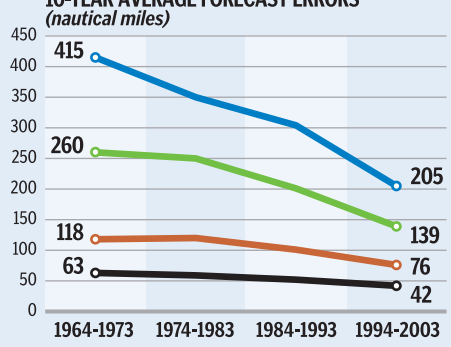
TRACK FORECAST ERROR *(nautical miles)*



Progress

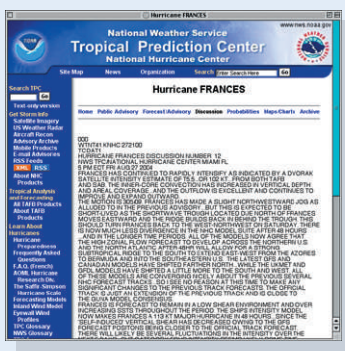
The 10-year average of forecast errors used to construct the NHC's cone has dropped significantly over past decades.

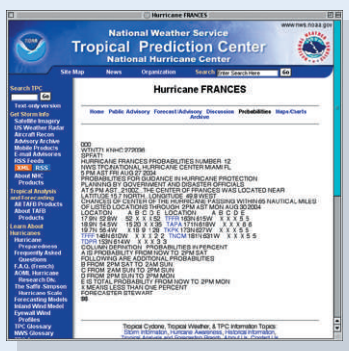
10-YEAR AVERAGE FORECAST ERRORS *(nautical miles)*

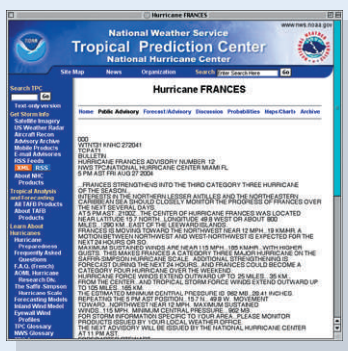


Other NHC storm forecast products

Along with the chart shown above, here are some of the NHC's other forecast products available on its web site.



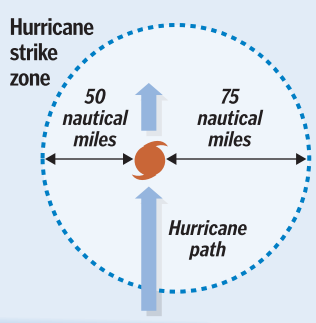




Discussion

The Tropical Cyclone Discussion explains the reasoning for the analysis and forecast of a tropical or subtropical cyclone. It includes a table of the forecast track and intensity.

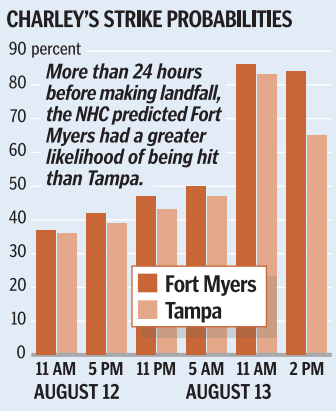
Discussions, as well as strike probabilities and public advisories, are issued every six hours and may be issued at any time if there are significant changes in the storm.



Strike probabilities

This table shows the likelihood of a hurricane or tropical storm's strike zone hitting specified points such as cities. Probabilities are shown for the time periods 0-24, 24-36, 36-48, and 48-72 hours from the time the table is released.

CHARLEY'S STRIKE PROBABILITIES



Public advisory

This advisory contains a list of all current watches and warnings on a tropical or subtropical cyclone.

It also shows the storm's current position in latitude and longitude coordinates and distance from a selected land point, as well as the current motion.

Maximum sustained winds in miles per hour and the estimated or measured minimum central pressure in millibars and inches are also shown.

The advisory may also include information on potential storm tides, rainfall or tornadoes associated with the storm.

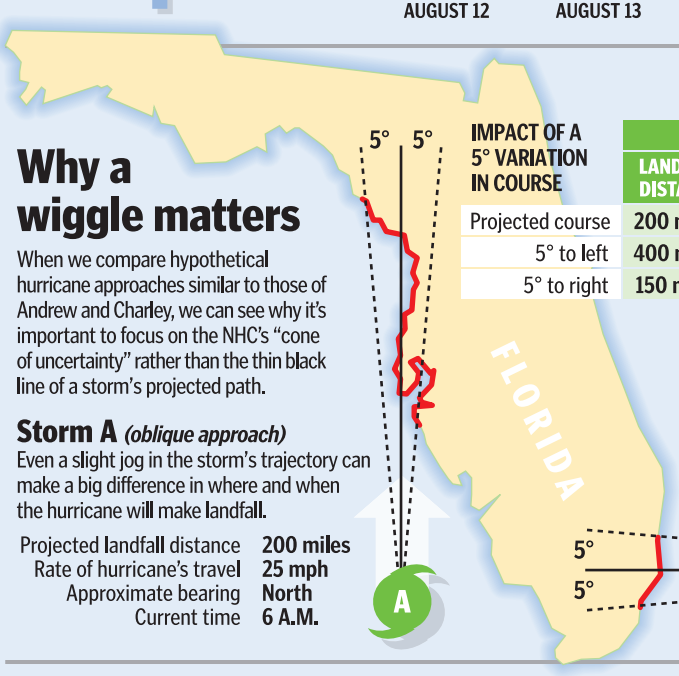
Why a wiggle matters

When we compare hypothetical hurricane approaches similar to those of Andrew and Charley, we can see why it's important to focus on the NHC's "cone of uncertainty" rather than the thin black line of a storm's projected path.

Storm A *(oblique approach)*

Even a slight jog in the storm's trajectory can make a big difference in where and when the hurricane will make landfall.

Projected landfall distance	200 miles
Rate of hurricane's travel	25 mph
Approximate bearing	North
Current time	6 A.M.



IMPACT OF A 5° VARIATION IN COURSE

	STORM A		STORM B	
	LANDFALL DISTANCE	LANDFALL TIME	LANDFALL DISTANCE	LANDFALL TIME
Projected course	200 miles	2 p.m.	200 miles	2 p.m.
5° to left	400 miles	10 p.m.	205 miles	2:12 p.m.
5° to right	150 miles	12 noon	210 miles	2:24 p.m.

Storm B *(perpendicular approach)*

Last-minute surprises are less frequent when storms approach land at a right angle.

Projected landfall distance	200 miles
Rate of hurricane's travel	25 mph
Approximate bearing	West
Current time	6 A.M.

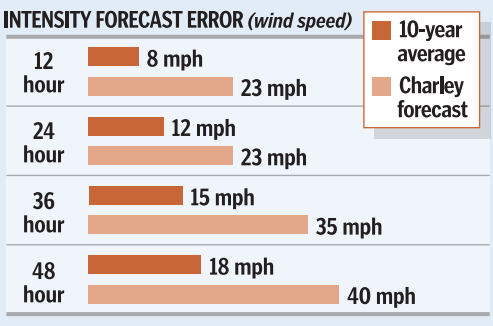
NOTE: Drawing not to scale.

Predicting storm intensity

Room for improvement

While the NHC says their prediction of Hurricane Charley's path was significantly more accurate than its 10-year average. Predicting the storm's wind speeds left much to be desired.

INTENSITY FORECAST ERROR *(wind speed)*



Hurricane-force winds blow trees and debris on Fort Myers Beach.

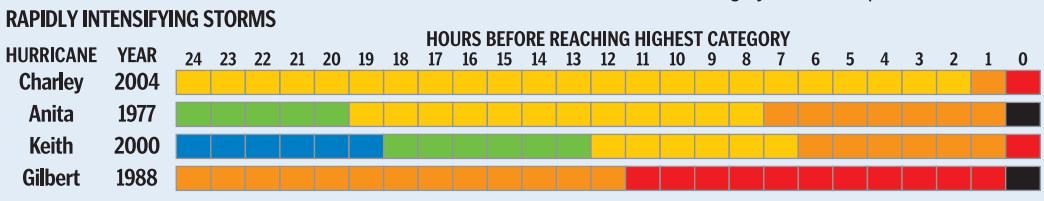
MARC BEAUDIN/THE NEWS-PRESS

Rapid intensification

When a hurricane's force changes from a Category 2 to a Category 4 within a few hours, people in its path take notice. The problem is if, as in the case of Hurricane Charley, this rapid intensification takes place just as the storm is making landfall, there may not be time to leave the area safely. That's why developing the technology to predict rapid intensification of hurricanes has been one of the NHC's top priorities in recent years.

FORCE	WIND SPEED	STORM SURGE
Tropical storm	Under 74 mph	Under 4 ft
Category 1	74-95 mph	4-5 ft
Category 2	96-110 mph	6-8 ft
Category 3	111-130 mph	9-12 ft
Category 4	131-155 mph	13-18 ft
Category 5	155 mph+	18 ft+

RAPIDLY INTENSIFYING STORMS



SOURCES: NHC; NOAA; WEATHER UNDERGROUND; RESEARCH BY THE NEWS-PRESS

MICHAEL DONLAN/THE NEWS-PRESS

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