Using WFO Tropical Cyclone Products

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NWS Miami/South Florida
Forecast Office (WFO)
Start with Big Picture - NHC

Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.

Tropical Storm Isaac
Wednesday August 22, 2012
11 AM EDT Advisory 6
NWS National Hurricane Center

Current Information:
Center Location 15.8 N 39.3 W
Max Sustained Wind 45 mph
Movement W at 21 mph

Forecast Positions:
• Tropical Cyclone
• Post-Tropical
Sustained Winds: D < 39 mph
S 39-73 mph H 74-110 mph M > 110 mph

Potential Track Area:

Day 1-3

Day 4-5

Watches:

• Hurricane
• Trop. Storm

Warnings:

• Hurricane
• Trop. Storm
The main focus of the National Hurricane Center is on the “big picture”, whereas the WFOs focus on “local impacts.”

When a tropical cyclone threatens land, NHC forecasts the expected:

- Track of the circulation center (direction and forward speed)
- Intensity
- Structure (size)

Based on expected land impacts, NHC coordinates with WFOs for placement of Watches/Warnings (Tropical Storm and/or Hurricane).
Focus on LOCAL potential hazard impacts (evaluated each advisory):

- Winds
- Storm Surge/Storm Tide/Coastal Erosion
- Flooding (land-based and along rivers)
- Tornadoes

For each potential hazard, the following parameters are assessed:

- Most likely onset time period(s)
- Expected duration of significant threat
- Locations of greatest threat
- Severity
- Level of impact to local population and infrastructure
WFO Hurricane Operations

Conceptual Model - WFO Knowledge of Local Impacts

- Threat ‘Potential’ Outlook

- ‘PRE-WATCH’ Period
  - Specific Customer Need – Plan/Prepare

- ‘WATCH/WARNING’ Period
  - Implement

- ‘IMPACT’ Period
  - Last Chance

- Recovery

- Local Warning

- WFO Local Knowledge

- Day 7, Day 5, Day 3, H48, H36, H12, H6, 3, 1

- Radar

- Hurricane Warning

- Hurricane Watch

- Last Chance

- Impact Period
Prior to the issuance of a Tropical Storm/Hurricane ‘Watch and/or Warning’ (i.e. beyond 48-hour until impact), county-specific impacts are not possible, however WFO-scale information can be provided.

During this time period, WFOs provide information on potential hazards via…

• **Hazardous Weather Outlooks and Public Information Statements (typically updated one or more times per day)**
• **Area Forecast Discussions (updated several times per day)**
• **Special Webinar Briefings for Emergency Managers (one or more times per day)**
• **Social Media/Graphicasts/Blog posts/Recorded Briefings (WFO dependent)**
In addition...point & click forecast information from the web provides a general “expression of uncertainty” which indicates the possibility of tropical storm/hurricane conditions for a given area using plain language.
HAZARDOUS WEATHER OUTLOOK FOR SOUTH FLORIDA
NATIONAL WEATHER SERVICE MIAMI FL
904 AM EDT TUE OCT 23 2012

...HIGH RISK OF RIP CURRENTS ATLANTIC BEACHES...
...TROPICAL STORM SANDY MAY AFFECT SOUTH FLORIDA LATE THIS WEEK...

THIS HAZARDOUS WEATHER OUTLOOK IS FOR SOUTH FLORIDA.

.DAY ONE...TODAY AND TONIGHT

RIP CURRENTS: NORTHEAST WINDS OF 20 TO 25 MPH WITH HIGHER GUSTS ALONG THE ATLANTIC COAST WITH FAVORABLE LOW TIDES WILL RESULT IN A HIGH RISK OF RIP CURRENTS AT THE BEACHES.

WIND: A TIGHTENING SURFACE PRESSURE GRADIENT ACROSS THE AREA WILL PRODUCE NORTHEAST WINDS AT 20-25 MPH WITH HIGHER GUSTS POSSIBLE, MAINLY ACROSS THE ATLANTIC WATERS.

.DAY TWO THROUGH SEVEN...WEDNESDAY THROUGH MONDAY


Area Forecast Discussion

NATIONAL WEATHER SERVICE MIAMI FL
325 PM EDT FRI MAY 2 2014

.DISCUSSION...
FRONTAL BOUNDARY WILL CONTINUE ACROSS CENTRAL FLORIDA THROUGH SATURDAY. THIS BOUNDARY GENERATED ENOUGH RAINFALL ACROSS THE TAMPA AREA TO CAUSE SIGNIFICANT FLOODING EARLIER TODAY. NOW FOR SOUTH FLORIDA...SHOWERS AND A FEW THUNDERSTORMS ARE EXPECTED THIS AFTERNOON AND EVENING MAINLY ACROSS THE LAKE OKEECHOBEE REGION AS THIS BOUNDARY REMAINS NORTH OF OUR AREA. FORECAST SOUNDINGS SHOW ENOUGH INSTABILITY ACROSS GLADES...HENDRY...AND THE LAKE OKEECHOBEE AREA FOR CONVECTIVE ORGANIZATION TO TAKE PLACE...THEREFORE STRONG SHOWERS AND THUNDERSTORMS CANNOT BE RULED OUT. BY SATURDAY...A LOW PRESSURE ACROSS THE GULF WATERS WILL MOVE ALONG THIS FRONTAL BOUNDARY...WHICH WILL GIVE IT ENOUGH PUSH TO MAKE IT MOVE SOUTH ACROSS SOUTH FLORIDA. THEREFORE...EXPECT AN ACTIVE DAY WEATHERWISE...WITH SHOWERS AND THUNDERSTORMS ON AND OFF DURING THE WHOLE DAY. THERE IS A POTENTIAL FOR LOCALLY HEAVY RAINFALL GIVEN THE APPROACH OF THIS BOUNDARY (FLOOD HISTORY) WITH INCREASING PWATS. WILL CONTINUE TO MONITOR. LATEST MODEL RUNS IN AGREEMENT ABOUT CLEARING BY EARLY SUNDAY AS HIGH PRESSURE BUILDS ACROSS THE PENINSULA.

FOR NEXT WEEK...LONG RANGE MODELS SHOW THE FRONT STALLING OVER THE FLORIDA STRAITS BY EARLY TO MIDDLE OF WEEK AS THE HIGH PRESSURE PREVAILS ACROSS THE FLORIDA PENINSULA. THIS WILL LEAD TO DRIER/PLEASANT WEATHER THROUGH AT LEAST THE END OF THE WORK-WEEK.
Go to weather.gov and select a specific point (City/State or Zip Code)
### Clewiston, FL

**Current Conditions**
- **Temperature:** 63°F (17°C)
- **Humidity:** 94%
- **Wind Speed:** Calm
- **Barometer:** 30.08 in
- **Dewpoint:** 61°F (16°C)
- **Visibility:** 10.00 mi
- **Last Update:** 23 Aug 7:56 am EDT

**Nearest Location:** Okeechobee County Airport (KOBE)
- **Lat:** 27.25°N, **Lon:** -80.85°W, **Elev:** 34 ft

**Weather Forecast**

<table>
<thead>
<tr>
<th>Day</th>
<th>Weather Description</th>
<th>Chance Thunderstorms</th>
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<tr>
<td>Today</td>
<td>30% chance of showers and thunderstorms after noon. Mostly sunny and hot, with a high near 96. Heat index values as high as 104. Northeast wind around 7 mph.</td>
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<td>Tonight</td>
<td>20% chance of showers and thunderstorms before 2am. Partly cloudy, with a low around 72. Northeast wind around 6 mph.</td>
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<td>Friday</td>
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<td>Partly cloudy, with a low around 74. Northeast wind around 7 mph.</td>
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<td>40% chance of showers and thunderstorms. Partly sunny, with a high near 94. Northeast wind 7 to 11 mph.</td>
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<td>Saturday Night</td>
<td>Northeast wind around 8 mph.</td>
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<td>Sunday</td>
<td>Showers and thunderstorms likely. Mostly cloudy, with a high near 88. Windy, with a northeast wind 9 to 15 mph increasing to 24 to 34 mph in the morning. Winds could gust as high as 45 mph. Chance of precipitation is 63%.</td>
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<td>Sunday Night</td>
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<td>Tropical storm conditions possible. Rain likely and possibly a thunderstorm. Cloudy, with a low near 86. Chance of precipitation is 60%.</td>
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**Hazardous Weather Conditions**

- **Hazardous Weather Outlook**

**7-Day Forecast**

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When a Tropical Storm/Hurricane Watch and/or Warning is in effect (i.e. 48-hours or less until impact), the ability to forecast more accurate county-specific impacts increase.

During this time period, WFOs provide information on potential hazards via…

• **Tropical Cyclone Potential Impact Graphics** (available 30-45 minutes after NHC advisory).
• **Hurricane Local Statements** (routinely updated every 6-hours, one hour after NHC advisory)
• **Area Forecast Discussions** (updated several times per day)
• **Special Webinar Briefings for Emergency Managers** (two or more times per day)
• **Social Media/Graphicasts/Blog posts/Recorded Briefings** (WFO dependent)
In addition...point & click forecast information from the web provides a general “expression of uncertainty” which indicates the possibility of tropical storm/hurricane conditions for a given area using plain language.
URGENT - IMMEDIATE BROADCAST REQUESTED
HURRICANE SANDY LOCAL STATEMENT
NATIONAL WEATHER SERVICE MELBOURNE FL
600 AM EDT FRI OCT 26 2012

...TROPICAL STORM WARNING REMAINS IN EFFECT...

...WINDS...
AS SANDY MOVES CLOSER...SUSTAINED HIGH WINDS WILL INCREASE TODAY AND TONIGHT. THE TIMING FOR THE STRONGEST WINDS WILL BEGIN THIS MORNING ALONG THE TREASURE COAST..BY LATE MORNING ACROSS BREvard COUNTY AND DURING THE AFTERNOON ALONG THE VOLUSIA COUNTY COAST. MAXIMUM SUSTAINED WINDS DURING THAT TIME ARE FORECAST TO BE IN THE 30 TO 35 MPH RANGE WITH GUSTS OF 40 TO 50 MPH. WIND GUSTS COULD BRIEFLY REACH 50 TO 60 MPH IN HEAVIER RAIN SQUALLS THAT MOVE ONSHORE TODAY AND TONIGHT. LOOSE ITEMS SUCH AS GARBAGE CANS AND OUTDOOR FURNITURE...SHOULD HAVE BEEN MOVED INDOORS...AS THEY WILL BE BLOWN AROUND.

...STORM SURGE AND STORM TIDE...
LARGE AND BATTERING WAVES WITH BREAKERS UP TO 8 FEET TODAY THROUGH EARLY SATURDAY MORNING WILL CAUSE MODERATE BEACH EROSION AND POSSIBLY SOME EROSION OF DUNES DURING THE MULTIPLE HIGH TIDE CYCLES TODAY THROUGH SATURDAY.

A MAXIMUM STORM SURGE IN THE 1 TO 3 FOOT RANGE COULD RESULT IN MINOR COASTAL FLOODING IN A FEW VULNERABLE SPOTS SUCH AS BATHTUB REEF BEACH IN MARTIN COUNTY.

THE SURF WILL BE EXTREMELY DANGEROUS TODAY THROUGH SATURDAY. BEACH GOERS SHOULD REMAIN OUT OF THE POUNDING SURF. THE LARGE SURF CAN KNOCK YOU DOWN AND MAKE YOU SUSCEPTIBLE TO THE SEAWARD PULL OF RIP CURRENTS.

...INLAND FLOODING...
SHOWERS AND OCCASIONAL RAIN SQUALLS WILL CONTINUE TO MOVE ONSHORE TODAY. COVERAGE OF RAINFALL ALONG THE COASTAL COUNTIES IS EXPECTED TO INCREASE INTO THIS AFTERNOON WITH OCCASIONAL HEAVIER DOWNPOURS.

RAINFALL TOTALS THROUGH TONIGHT ARE EXPECTED TO BE BETWEEN 1 AND 3 INCHES OVER THE COASTAL COUNTIES...WITH ISOLATED AMOUNTS OF 3 TO 6 INCHES. IT APPEARS THE BEST CHANCE FOR THESE HIGHER RAINFALL TOTALS WILL BE OVER THE TREASURE COAST COUNTIES OF MARTIN SAINT LUCIE AND INDIAN RIVER...WHERE THE WATER TABLE IS STILL LIKELY A LITTLE HIGHER THAN NORMAL DUE TO RAINFALL FROM TROPICAL STORM ISAAC IN LATE AUGUST.
With tropical cyclones, it’s all about impacts.

To maximize public safety, WFOs provide guidance to help initiate disaster plans based on *potential impacts* (i.e. realistic threats - not overly-pessimistic or overly-optimistic threats).
Potential Impact Graphics

Experimental
TROPICAL CYCLONE IMPACTS - DECISION SUPPORT

Combined Hazards Threat Graphic for
Graphic for THIS IS A TEST
Graphic last updated 20-Jul-2012 1:37 PM EDT

Be Sure to Refresh your Browser

Tropical Cyclone Hazards Potential Impacts
Specific to South Florida

Storm: THIS IS A TEST.

Issued: July 20, 2012
Impact Graphics Imported into Google Earth

Coastal Flood/Surge Example:

Impact levels superimposed on Google Earth map.
Clicking on a point on the map brings up the potential impact description for that particular location (in this example, South Beach).
Potential Impact Graphics

WFO “Potential Impact Graphics” take into account probabilistic forecasts (i.e. range of possibilities) as well as deterministic forecasts (most likely scenarios). Both probabilistic and deterministic forecasts are based on the NHC forecast track – so in addition to input from computer models and historical data, the human forecaster element is also accounted for in the final product.
Potential Impact Graphics

Example: A major hurricane approximately 36-hours from projected landfall (Hurricane Warning issued).

“Perfect Forecast Impacts”

Deterministic-only assessment

“Potential Impacts”

Includes probabilistic assessment

To support key decisions and promote appropriate protective actions, the “Potential Impact” graphic would be best to follow (as it incorporates both deterministic and probabilistic scenarios).
WFO radar meteorologists analyze individual rainbands for wind, surge, flooding and tornado threats on a county to sub-county scale as landfall or closest point of approach is approached.
‘IMPACT’ Period
WFO Operations

Radar operators continually diagnose individual rainbands and embedded cells, and will...

• Issue warnings for damaging winds and tornadoes associated with:
  ➢ Outer rainbands
  ➢ Intermediate rainbands

• Issue ‘Extreme Wind Warnings’ associated with:
  ➢ Inner core (eyewall)

• Issue frequent updates on short-term impacts associated with significant hazards
  ➢ Winds
  ➢ Surge
  ➢ Flooding
  ➢ Tornadoes
Extreme Wind Warnings

• Issuance criteria:

- Issued for county or sub-county scale areas
- Category 3; sustained winds of 115 mph or greater (rare issuances)
- Issued 1-hour prior to onset
- Valid for 2-hours or less
- Not re-issued for same area, but detailed follow-up information will be issued by WFO
Extreme Wind Warnings

- First used during Hurricane Charley (2004)
- Expanded to entire NWS (2007)
- Issued by WFO’s for imminent onset of destructive/life-threatening winds

- Follow tornado safety advice (outside of surge and flood zones)
- Last opportunity to take life-saving actions
- For the public, shelter managers, first-responders…
Extreme Wind Warnings

- Provide a powerful tool for WFOs to issue an EAS-activated warning just prior to the onset of destructive winds.
- Do not negate, minimize or supersede long-fused Hurricane Warnings. Instead, they complement long-fused Hurricane Warnings by providing critical short-fused information.
EWW Example
Hurricane Charley
Major Wind Event
2004
Thank You...

Questions?

Photo: Andy Tingler – WFO Miami