National Weather Service Marine Forecast Program

Emma Weston and Mark Wool
Meteorologists, NWS Tallahassee, FL

Photo credit: NOAA Photo Library
February 9, 1870: Signal Corps formed by President Grant. (147 years ago)

October 1, 1890: President Benjamin Harrison creates the “U.S. Weather Bureau”. (127 years ago)

1901: Official 3-day forecasts begin for the North Atlantic. (116 years ago)

1970: The Weather Bureau is renamed the National Weather Service. (47 years ago)
Mission

Meteorological support to enhance:

- The protection of life and property
- The efficiency of governmental, recreational, and commercial maritime operations.
• More than 90% of goods imported into US arrive via oceans.

• Maritime commerce worth about $78.6 billion annually.

• About 77 million Americans are involved in recreational boating.

Accurate marine forecasts have a lot of value.

Information from NWS Office of Climate, Water, and Weather Services.
NWS Marine Forecast Areas

Marine Zones:
- Coastal
- Offshore
- High Seas

Areas:
- North Pole
- Greenland
- Japan
- Marshall Islands
- Fiji
- Samoa
- Galapagos

33%
One of 46 NWS offices with local marine responsibility (out of 125)

37% of NWS offices have marine responsibility.
Marine Products We Issue...

Coastal Waters Forecast (CWF)

- Tailored to a wide variety of users. Issued 4x/day. Goes out 5 days.

Area Forecast Discussion (AFD)

- Regularly includes a marine section to describe the reasoning behind the forecast.

Surf Zone Forecast Forecast (SRF)

- Forecasts of surf heights, beach conditions, and rip current risk. Issued once a day in the pre-dawn hours. Goes out 2 days.
Find It On Our Website

weather.gov/tae

Area Forecast Discussion (AFD) and Coastal Waters Forecast (CWF) and Surf Zone Forecast (SRF)
Point-and-Click Map [weather.gov/tae]

Click on a point over the marine areas to get a marine forecast!

Navigate to a Neighboring WFO

Active Hazard Products Across The Area
Hazardous Wx: Winds/Seas

Small Craft Exercise Caution (Headline in CWF)

- Winds of 15-20 knots, and/or seas of 6 feet.

Small Craft Advisory

- 20 to 33 knot winds, and/or seas of at least 7 feet.

Higher End Wind Threat

- Gale Warning: winds of 34 to 47 knots expected.
- Storm Warning: winds of 48 to 63 knots expected.

Tropical Cyclone Watches and Warnings
Storm Force Winds Rare

1993 “Superstorm”

- March 1993 Superstorm is one example.
- Popular Mechanics Article (2009): “200-ft freighter sunk 70 miles off Ft. Myers, FL” AND “Coast Guard rescued 235 people on more than 100 boats”

“Storms,” said Petty Officer Rob Wyman of the Coast Guard, “are violent.”

“The sea conditions were absolutely incredible, unbelievable,” Coast Guard Petty Officer Rob Wyman told the Washington Post. “It looked like a big washing machine. There were huge waves.”

Winds over 50 knots
January 16, 2016 998 mb Gulf Low

- Buoy 42036 (eastern buoy)
  Max gust 41 kts

- Buoy 42039 (western buoy)
  Max gust 47 kts

TONIGHT: Wind Related Hazard Products

- Gale Warning
  Frequent gusts over 48 knots likely
  Strongest winds should remain over the Gulf

- Storm Warning

@NWSTallahassee
Other Hazardous Weather

Special Marine Warning

- Thunderstorms with wind gusts of at least 34 knots, hail of at least \( \frac{3}{4} \) inch in diameter, or waterspouts.

Dense Fog Advisory

- Visibility in fog one nautical mile or less.

High Surf Advisory

- Issued when surf heights are expected to reach 6 feet or higher along the coastline.
Common Weather Patterns That Favor Elevated Winds and Seas
Cold Fronts
Tropical Cyclones

Even a tropical cyclone in western Caribbean can generate swell that will reach Florida Panhandle.

Hurricane Dean
~800 miles S of Panama City

Near Panama City, 8/22/2007
Photo: mrsurfs.com
Easterly Flow Regime

- Ridge of high pressure across the Southeast.
- Typical lower pressures in Caribbean and southern Gulf.
- Increases the pressure gradient in our area.
- Maximizes at night & in a.m.
Local Effects (Sea Breeze)

Figure 5.

Pressure Gradient Force at the surface moves air from over water towards land.
Tools That We Use For The Marine Forecast
Marine Observations
http://www.ndbc.noaa.gov/maps/Florida.shtml

Dial-a-Buoy: 888-701-8992 and then punch in the ID [example: 42039]
We Also Consider...

SCATTEROMETRY

SHIP REPORTS
AWIPS Workstation

Computer model forecast data

Graphical Forecast Editor
Graphical Forecast Editor

We can load model data and then manipulate it graphically.

Editing is sort of like a “fancy coloring book”

We produce grids of wave height, swell, wave period, and surf height.
Global Wave Models

Primarily used by NWS:

**NOAA WAVEWATCH III®**

Other wave models do exist, including this one from Environment Canada.
Mesoscale Models (WRF)

WRF–ARW 4KM MSLP and 10 meter Winds (mph)
Hour 36 (06Z20JAN2012)
Nearshore Wave Prediction System

Generates waves by wind stress, propagation, shoaling, refraction, bottom friction, and breaking.

Produces forecasts of...
- significant wave height
- primary swell height and direction
- primary period

Surf heights are then calculated and used to assess rip current risk
• Under the forecast menu, click Local models
• On Local Models page, click on NWPS image
Nearshore Wave Prediction System

polar.ncep.noaa.gov/nwps/nwpsloop.php?site=tae
Wave Generation Basics
Some Definitions

Wind Waves

- Short period (4-8 seconds) waves generated from the action of the wind on the local water surface.

Swell

- Wind generated waves that have traveled out of their source region. Swells are characterized as having smoother, more uniform crests, and longer periods (8+ seconds) than wind waves.

Seas

- The combination of wind waves and swell.

Fetch

- An area of uniform wind speed and direction over a water body. Also, the distance over water that a fetch of wind travels.
Rayleigh Distribution

What we forecast

<table>
<thead>
<tr>
<th>Description</th>
<th>Percentage of $H_s$</th>
<th>If $H_s = 5$ feet</th>
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<tbody>
<tr>
<td>Mean wave height</td>
<td>64%</td>
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<tr>
<td>Significant wave height</td>
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<td>5 feet</td>
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<tr>
<td>Highest 10% of waves</td>
<td>127%</td>
<td>6.4 feet</td>
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<tr>
<td>Highest 1% of waves</td>
<td>167%</td>
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<tr>
<td>Theoretical maximum</td>
<td>~190%</td>
<td>9.5 feet</td>
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Think of the ‘Wave Spectrum’

- Mariners should prepare for a range of wave heights, rather than focusing on the one value in the forecast.
- For a 5-second period, highest 1% wave will occur on average every 10 mins.
...SMALL CRAFT ADVISORY IN EFFECT FROM 10 PM EST THIS EVENING THROUGH FRIDAY AFTERNOON...

.TONIGHT...NORTH WIND 5 TO 10 KNOTS INCREASING TO AROUND 20 KNOTS. SEAS 2 TO 3 FEET BUILDING TO 5 TO 6 FEET OCCASIONALLY UP TO 8 FEET. DOMINANT PERIOD 4 SECONDS. PROTECTED WATERS SMOOTH INCREASING TO CHOPPY.

.FRIDAY...NORTHEAST WIND AROUND 20 KNOTS BECOMING 5 TO 10 KNOTS. SEAS 4 TO 6 FEET OCCASIONALLY UP TO 8 FEET. DOMINANT PERIOD 4 SECONDS. PROTECTED WATERS CHOPPY BECOMING SMOOTH.

.FRIDAY NIGHT...EAST WIND AROUND 10 KNOTS BECOMING SOUTHWEST AFTER MIDNIGHT. SEAS 1 TO 2 FEET. DOMINANT PERIOD 4 SECONDS. PROTECTED WATERS SMOOTH.

.SATURDAY...WEST WIND 10 TO 15 KNOTS INCREASING TO AROUND 20 KNOTS IN THE AFTERNOON. SEAS 3 TO 4 FEET OCCASIONALLY UP TO 5 FEET. DOMINANT PERIOD 3 SECONDS. PROTECTED WATERS A LIGHT TO MODERATE CHOP INCREASING TO CHOPPY IN THE AFTERNOON. A SLIGHT CHANCE OF RAIN IN THE AFTERNOON.

.SATURDAY NIGHT...WEST WIND AROUND 20 KNOTS BECOMING NORTHWEST 10 TO 15 KNOTS AFTER MIDNIGHT...THEN BECOMING NORTH 5 TO 10 KNOTS LATE. SEAS 4 TO 5 FEET OCCASIONALLY UP TO 6 FEET. DOMINANT PERIOD 4 SECONDS. PROTECTED WATERS CHOPPY BECOMING A LIGHT TO MODERATE CHOP AFTER MIDNIGHT...THEN BECOMING SMOOTH LATE. A CHANCE OF RAIN AFTER MIDNIGHT.

.SUNDAY...NORHEAST WIND AROUND 10 KNOTS BECOMING SOUTH IN THE LATE MORNING AND AFTERNOON. SEAS 2 TO 3 FEET. PROTECTED WATERS SMOOTH. A CHANCE OF RAIN.

New Parameters Added:

• Dominant wave period
• Height of the highest 1/10 of the waves (occasional wording)
When the water depth is less than half the wavelength, the incoming waves begin to interact with the ocean floor. This slows the wave, but waves behind it continue at same rate. This shortens the wavelength.
**WAVES BEGIN TO BREAK**

- **10s period**
  - At 22m / 74ft

- **8s period**
  - At 14m / 47ft

### Period vs Depth Table

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<tr>
<th>Period</th>
<th>Depth (m)</th>
<th>Depth (ft)</th>
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<tr>
<td>2 sec</td>
<td>1 m</td>
<td>3 ft</td>
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<td>4 sec</td>
<td>3.6 m</td>
<td>12 ft</td>
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<tr>
<td>6 sec</td>
<td>8 m</td>
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<td>8 sec</td>
<td>14 m</td>
<td>47 ft</td>
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<td>10 sec</td>
<td>22 m</td>
<td>74 ft</td>
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National Data Buoy Center
Weather/Ocean Observing Platforms

111 Buoys

- Wind speed / direction
- Air temp / humidity
- Barometric pressure
- Ocean temperature
- Wave height, period, direction
- Ocean currents
- Salinity

Coastal-Marine Automated Network (C-MAN) Stations
- On Lighthouses, offshore structures, fishing piers, beaches
www.ndbc.noaa.gov

Dial-A-Buoy
888-701-8992
Northern Gulf Stations

Stations:
- PCBF1
- PACF1
- SGOF1
- 42039
- APCF1/AXPF1
- SHPF1
- CDRF1
- 42036
- KTNF1
Current Observations at a Glance

Station PCBFI
NOS
Location: 30°21.03'N 86°28.97'W
Date: Sat, 24 Jan 2015 17:54:00 UTC
Winds: NW (320°) at 6.0 kt gusting to 9.9 kt
Atmospheric Pressure: 99.04 in
Air Temperature: 51.5°F
Water Temperature: 59.9°F

Select a region:
- Atlantic (Tropical)
- Atlantic West
- Australia
- Bay of Bengal
- Caribbean Sea
- Central America
- Chile
- Europe
- Gulf of Alaska
- Gulf of Mexico (West)
- Gulf of Mexico (East/Florida)
- Nova Scotia
- Pacific (North)
- Pacific (West)
- USA-Alaska
- USA-Hawaii
- USA-Great Lakes (East)
- USA-Lake Superior
- USA-Northeast
- USA-Northwest
- USA-Southeast
- USA-Southwest
- World
Station 42039 (LLNR 141) - PENSACOLA - 115NM ESE of Pensacola, FL

Ownership and maintenance by National Data Buoy Center
3-meter discus buoy
ARES payload
28.739 N 86.006 W (28°44'22" N 86°0'23" W)

Site elevation: sea level
Air temp: 74°F
Air temp height: 4 m above site elevation
Anemometer height: 5 m above site elevation
Barometer elevation: sea level
Sea temp depth: 0.6 m below site elevation
Water depth: 274.3 m
Watch circle radius: 533 yards

Latest NWS Marine Forecast 1 and Latest NWS Marine Forecast 2

Important Notice to Mariners
Search And Rescue (SAR) Data
Meteorological Observations from Nearby Stations and Ships

Wind Speed at 42039
Image Credits: NOAA/NOS/NESSC

Significant Wave Height at 42039
Image Credits: NOAA/NOS/NESSC

Conditions at 42039 as of
(11:50 am CST)
1750 GMT on 01/24/2015:

Unit of Measure: English
Time Zone: Station Local Time

Wind Direction (WDIR):
NW (310 deg true)

Wind Speed (WSPD):
21.4 kts

Wind Gust (GUST):
25.3 kts

Wave Height (WVHT):
8.0 ft

Dominant Wave Period (DPD):
8 sec
### Continuous Winds

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<tr>
<th>TIME (CST)</th>
<th>WDIR</th>
<th>WSPD</th>
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<tr>
<td>10:50 am</td>
<td>WNW (297 deg)</td>
<td>2.9 kts</td>
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<td>10:40 am</td>
<td>WNW (286 deg)</td>
<td>2.7 kts</td>
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<td>10:30 am</td>
<td>NW (322 deg)</td>
<td>2.9 kts</td>
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<tr>
<td>10:20 am</td>
<td>NW (321 deg)</td>
<td>4.1 kts</td>
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<tr>
<td>10:10 am</td>
<td>WNW (302 deg)</td>
<td>4.1 kts</td>
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<tr>
<td>10:00 am</td>
<td>NW (308 deg)</td>
<td>4.1 kts</td>
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### Supplemental Measurements

**Highest 1-minute Wind Speed**

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<th>WSPD</th>
<th>WDIR</th>
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<tbody>
<tr>
<td>10:50 am</td>
<td>5.8 kts</td>
<td>NW (310 deg true)</td>
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### Peak gust during the measurement hour

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<tr>
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<td>NW (310 deg)</td>
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### Previous observations

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<th>WSPD</th>
<th>GST HT</th>
<th>TEMP</th>
<th>PRES</th>
<th>PTDY</th>
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</table>
Wave observations

Detailed Wave Summary
for 42039 as of (11:00 am CST)
1700 GMT on 02/17/2016:

These wave data are displayed in rounded times.

Unit of Measure: | English | Time Zone: Station Local Time

Click on the graph icon in the table below to see a time series plot of the last five days of that observation.

| Significant Wave Height (WHT): | 3.0 ft |
| Swell Height (SwH): | 2.6 ft |
| Swell Period (SwP): | 4.5 sec |
| Swell Direction (SwD): | WNW |
| Wind Wave Height (WWH): | 1.3 ft |
| Wind Wave Period (WWP): | 3.6 sec |
| Wind Wave Direction (WWD): | WNW |
| Wave Steepness (STEEPNESS): | VERY_STEEP |
| Average Wave Period (APD): | 4.5 sec |

Previous observations

<table>
<thead>
<tr>
<th>MM DD</th>
<th>TIME (CST)</th>
<th>WHT</th>
<th>SwH</th>
<th>SwP</th>
<th>SwD</th>
<th>WWH</th>
<th>WWP</th>
<th>WWDD</th>
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<th>APD</th>
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<td>SSW</td>
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<td>1.6</td>
<td>7.7</td>
<td>S</td>
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<tr>
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<td>1.6</td>
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Additional Information

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<th>Time</th>
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<th>Wind Speed</th>
<th>Sea State</th>
<th>Description</th>
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<td>02 16 12:00 pm</td>
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<td>W</td>
<td>6.2</td>
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</tbody>
</table>

Plot of wave energy versus frequency (and period)

**Description of Measurements**
Links which are specific to this station are listed below:

- Real Time Data in tabular form for the last forty-five days.
- Historical Data & Climatic Summaries for quality controlled data for the current month, previous months, and previous years.
- The weekly status report and the weekly maintenance report also provide valuable station information.

Note that the payload types and the station locations occasionally change. Please refer to the NDBC data inventory for the data history of each station.

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U.S. Dept. of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Data Buoy Center
Bldg. 3205
Stennis Space Center, MS 39529
Contact Us
Page last modified: October 20, 2015
How to get warnings

To receive marine weather statements and special marine warnings:
Turn VHF to WX channel
Panama City: WX1 (162.550 MHz)

Wireless Emergency Alerts
- Most smartphones set up, make sure under settings
- Will alarm for tornado and flash flood warnings

<table>
<thead>
<tr>
<th>NOAA Weather Radio Frequencies</th>
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<tbody>
<tr>
<td>162.400 MHz (WX2)</td>
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<tr>
<td>162.425 MHz (WX4)</td>
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<td>162.450 MHz (WX5)</td>
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<td>162.525 MHz (WX7)</td>
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<td>162.550 MHz (WX1)</td>
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Why we need reports:

- Very few marine observations
- Only 2 buoys in area that report wave heights
Why we need reports:

• Storms can form very quickly, especially in summer
• The further storm is from radar, harder it is to see lower levels of storm
• Waterspouts form in these lower levels, spin up quickly and can be hard to detect on radar
Sending Marine Reports

- Call a forecaster at (850)942-8833 option 9
- Marine Report Form (internet)
- mPING (app)
- Social media (Twitter and Facebook)
Storm Report Form

- Found on marine website: http://www.weather.gov/tae/marine
**Marine Report Form**

2. Event Type (Select all that apply)
- Flood
- Hail
- High Wind Speed
- Tornado/Funnel Cloud
- Wind Damage
- Winter Precipitation
- Snow
- Freezing Rain/Icing
- Heavy Rain

3. Additional Details
Provide any additional information that you feel is pertinent to your submission (500 characters maximum).

You may also pass along additional information by e-mailing them to the National Weather Service Tallahassee, Florida separately. (WFO TAE)

4. Contact Information

**VOLUNTARY and WILL NOT** be distributed.

- Your Name:
- Spotter Id (if assigned):
- E-mail address:
- Phone number:

Observer Profile:
- General Public

**NOTE:** If you have any questions about reporting weather and/or using this reporting form, please contact the TAE Webmaster.
mPING

- Free app created by the National Severe Storms Lab
- Available in the Apple App store and Google Play
- http://mping.nssl.noaa.gov/
<table>
<thead>
<tr>
<th>Report Types</th>
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<td>None</td>
</tr>
<tr>
<td>Rain/Snow</td>
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<tr>
<td>Hail</td>
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<td>Wind Damage</td>
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<td>Tornado</td>
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<td>Flood</td>
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<tr>
<td>Mudslide</td>
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<tr>
<td>Reduced Visibility</td>
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mPING

The mPING Project
Meteorological Phenomena Identification Near the Ground

Report Type

Rain

Successfully Submitted
Thank you for your report, it has been submitted!

OK

Submit Report

View Reports
Receiving Reports

When reports are sent using the marine report form or the mPING app forecasters are alerted immediately on their workstations.
NWS Tallahassee is active on Facebook and Twitter. The best way to send reports is to tweet @NWSTallahassee or use the #TLHspotter hashtag.

#TLHspotter

Be Sure To Include
What, When, and Where
...and photos if you have them

On Twitter, you can use the hashtag, or simply mention us in your tweet: @NWSTallahassee

On Facebook, it is best to post directly to our page, but you can add the hashtag too. If you are posting on your own account and using the hashtag, the privacy must be set to “public” for us to be able to see it.

You can also submit a storm report using our electronic form!

Get the latest weather info on the go at mobile.weather.gov

NWS Tallahassee
weather.gov/tallahassee
@NWSTallahassee
www.facebook.com/NWSTallahassee
Things to include in reports

- Location
- Time
- Type of weather
- Magnitude (wave height, wind speed estimate)
- Duration
- Direction of storms or waterspouts
Thanks!

Ground truth from boaters like you helps us to continue to improve our forecasts and warnings.

Help us keep everyone safe by being our eyes and ears on the water!
Thanks For Your Attention!

NWS Tallahassee:  [www.weather.gov/tae](http://www.weather.gov/tae)
NWPS:  [polar.ncep.noaa.gov/nwps.nwpsloop.php?site=tae](http://polar.ncep.noaa.gov/nwps.nwpsloop.php?site=tae)
COMET:  [http://deved.meted.ucar.edu/marine/mod2_wlc_gen/print.htm](http://deved.meted.ucar.edu/marine/mod2_wlc_gen/print.htm)

NWS Tallahassee -  850-942-8833  (answered 24/7; press 9 to ring through)
Dial-A-Buoy -  888-701-8992  (Buoy ID: ex: 42039)
NWR (recording) -  850-942-8851

Marine Focal Point  emma.weston@noaa.gov
Warning Coordination Met.  mark.wool@noaa.gov