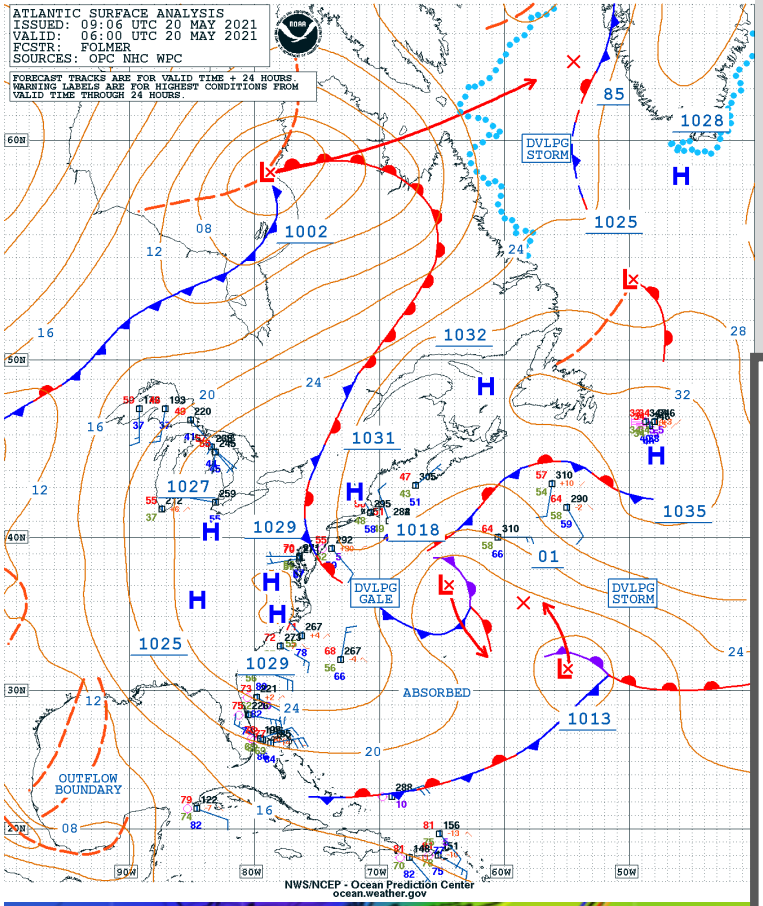

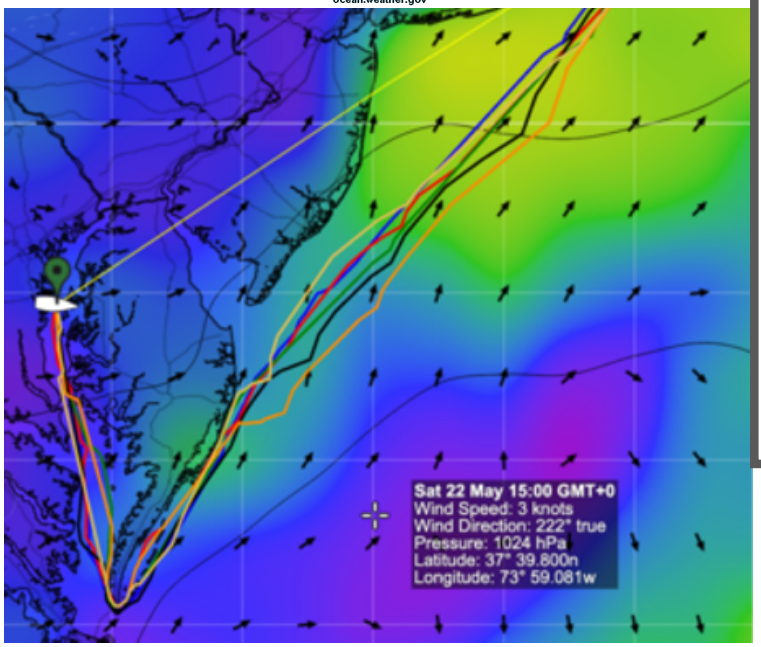

Weather Forecasting Basics

AYC A2N virtual seminar, 22nd May 2021

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- NOAA watches, warnings & sites
- Wind flow around surface Highs & Lows
  - 3 types of Lows to look out for
  - Weather on the ground?
  - Weather chart analysis
- Weather resources

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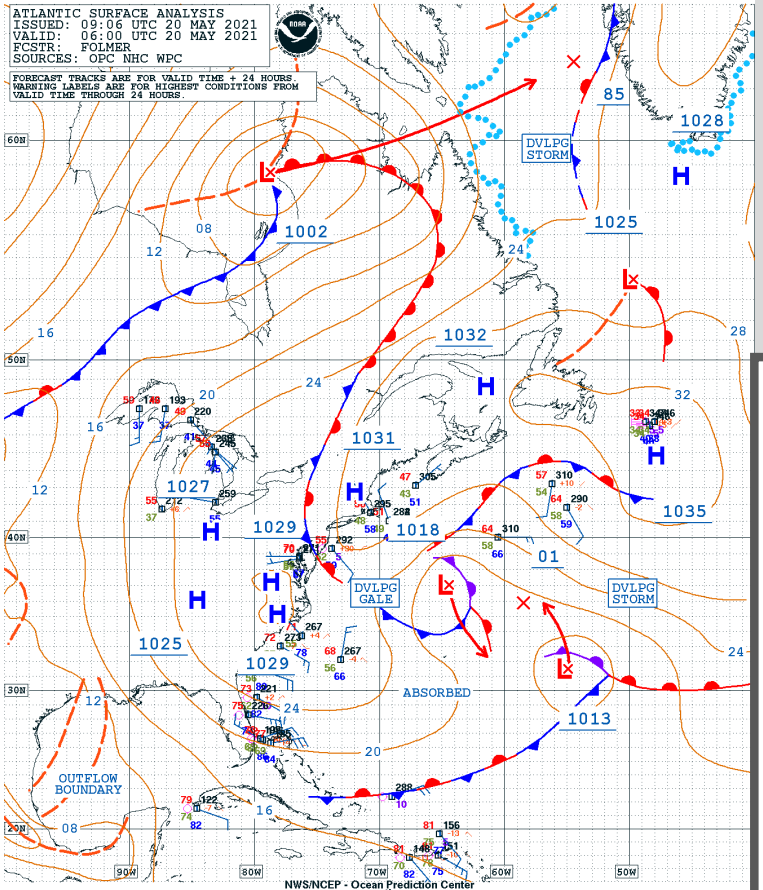
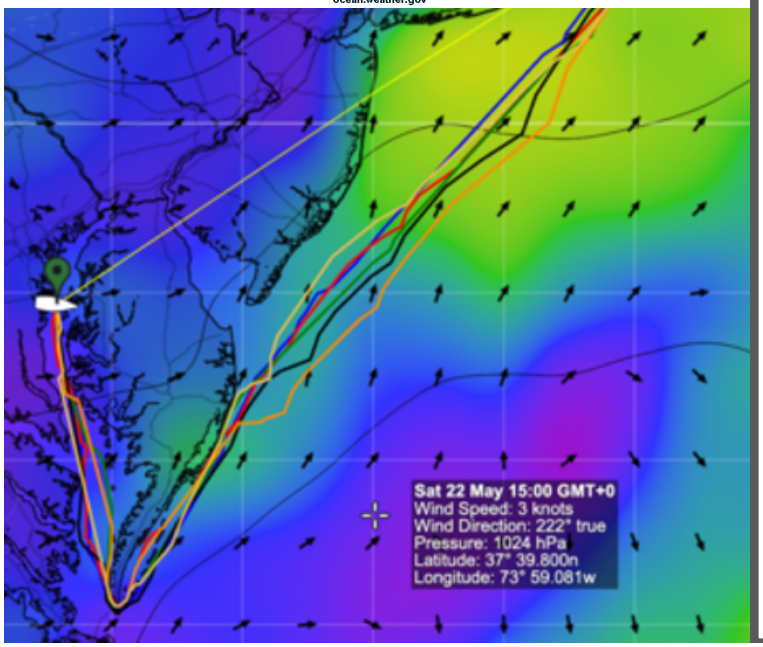




From the NoR:

What resources can I use?

2021 ANNAPOLIS to NEWPORT RACE

Race start dates: June 4 and 5, 2021

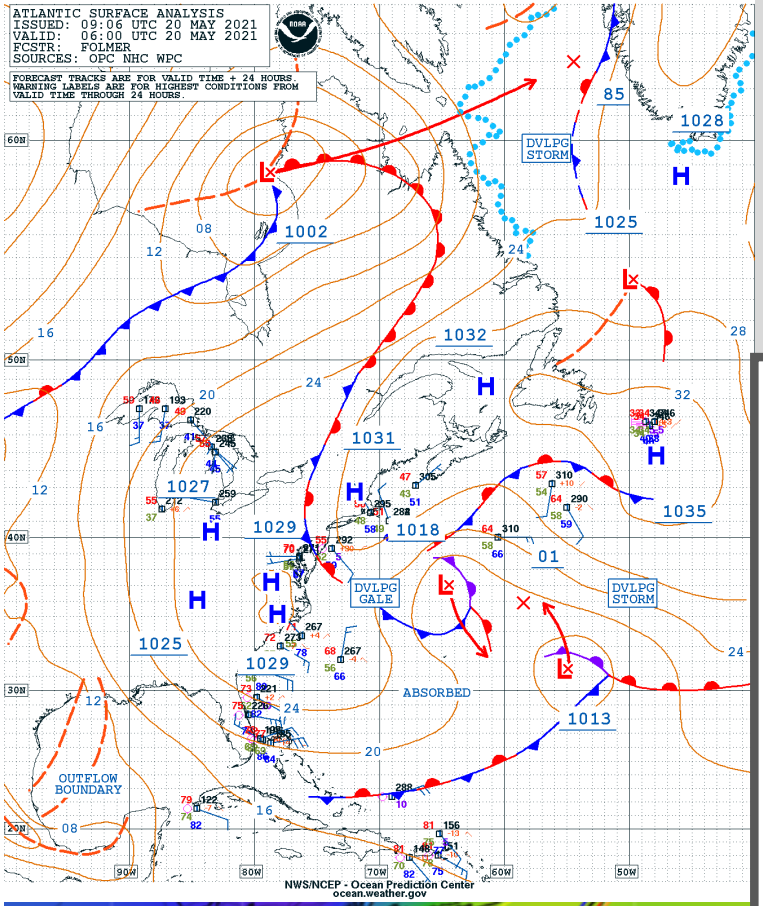
Organizing Authority (OA): Annapolis Yacht Club. Assisted by the US Naval Academy Sailing Squadron, Ida Lewis Yacht Club, and Storm Trysail Club

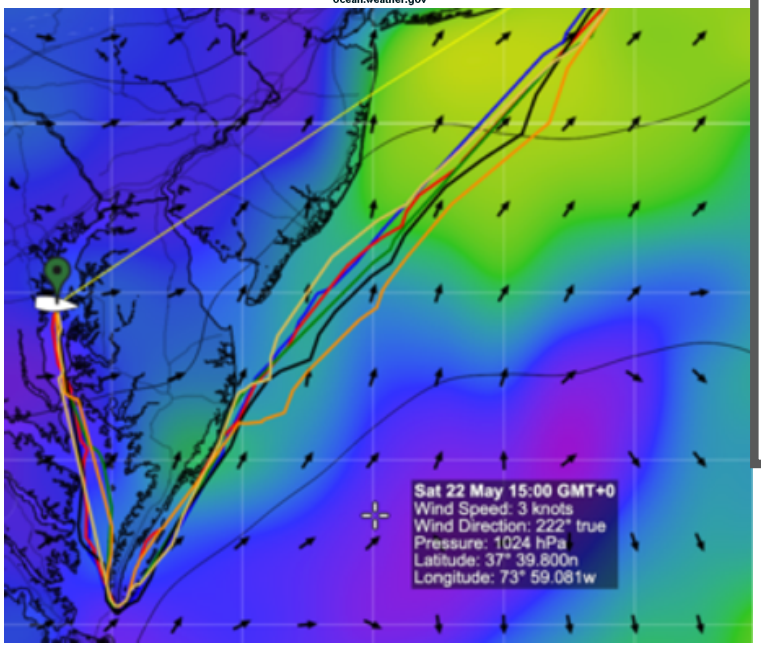
http://www.annapolisnewportrace.com/

NOTICE OF RACE (NoR)

The notation '[DP]' in a rule in this NoR means that the penalty for a breach of that rule may, at the discretion of the protest committee, be less than disqualification. The notation '[NP]' in a rule means that a boat may not protest another boat for breaking that rule. This changes RRS 60.1(a).

1.6 [DP] RRS 41(c) is replaced with: "Help in the form of information freely available to all boats even if that information is only accessible at a cost. However, such 'at a cost' help shall not include private forecast or advice or information customized for a particular boat or group of boats and/or her/their situation. The use of Predict Wind's weather routing tool is expressly permitted."





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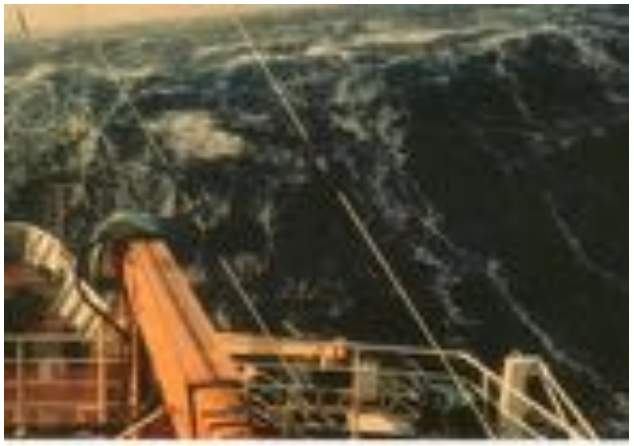
WARNINGS (non-TROPICAL)

BEAUFORT FORCE 8
WIND SPEED: 34-40 KNOTS

SEA: WAVE HEIGHT 5.5-7.5M (18-25FT). MODERATELY HIGH WAVES OF GREATER LENGTH. EDGES OF CREST BEGIN TO BREAK INTO THE SPINDRIFT. FOAM BLOWN IN WELL MARKED STREAKS ALONG WIND DIRECTION.

GALE
WARNING
Force 8,9
34 – 47 knt



BEAUFORT FORCE 9
WIND SPEED: 41-47 KNOTS

SEA: WAVE HEIGHT 7-10M (23-32FT). HIGH WAVES. DENSE STREAKS OF FOAM ALONG DIRECTION OF THE WIND. WAVE CRESTS BEGIN TO TOPPLE, TUMBLE, AND ROLL OVER. SPRAY MAY AFFECT VISIBILITY.

BEAUFORT FORCE 10
WIND SPEED: 48-55 KNOTS

SEA: WAVE HEIGHT 9-12.5M (29-41FT). VERY HIGH WAVES WITH LONG OVERHANGING CRESTS. THE RESULTING FOAM, IN GREAT PATCHES, IS BLOWN IN DENSE WHITE STREAKS ALONG WIND DIRECTION. ON THE WHOLE, SEA SURFACE TAKES A WHITE APPEARANCE. TUMBLING OF THE SEA IS HEAVY AND SHOCK-LIKE. VISIBILITY AFFECTED.

STORM
WARNING
Force 10,11
48 – 63 knt

BEAUFORT FORCE 12
WIND SPEED: 64 KNOTS

SEA: SEA COMPLETELY WHITE WITH DRIVING SPRAY. VISIBILITY VERY SERIOUSLY AFFECTED. THE AIR IS FILLED WITH FOAM AND SPRAY.

HURRICANE FORCE
WARNING
Force 12
> 64 knt

[Beaufort Wind Scale]

[NWS Marine Weather]

WARNINGS (TROPICAL)

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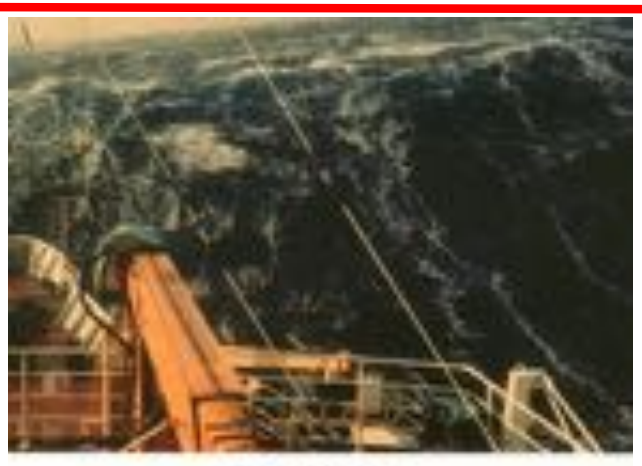
TROPICAL STORM
WARNING
Force 8 – 11
34 – 63 knt



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WARNING
Force 12
> 64 knt

[Beaufort Wind Scale]

[NWS Marine Weather]

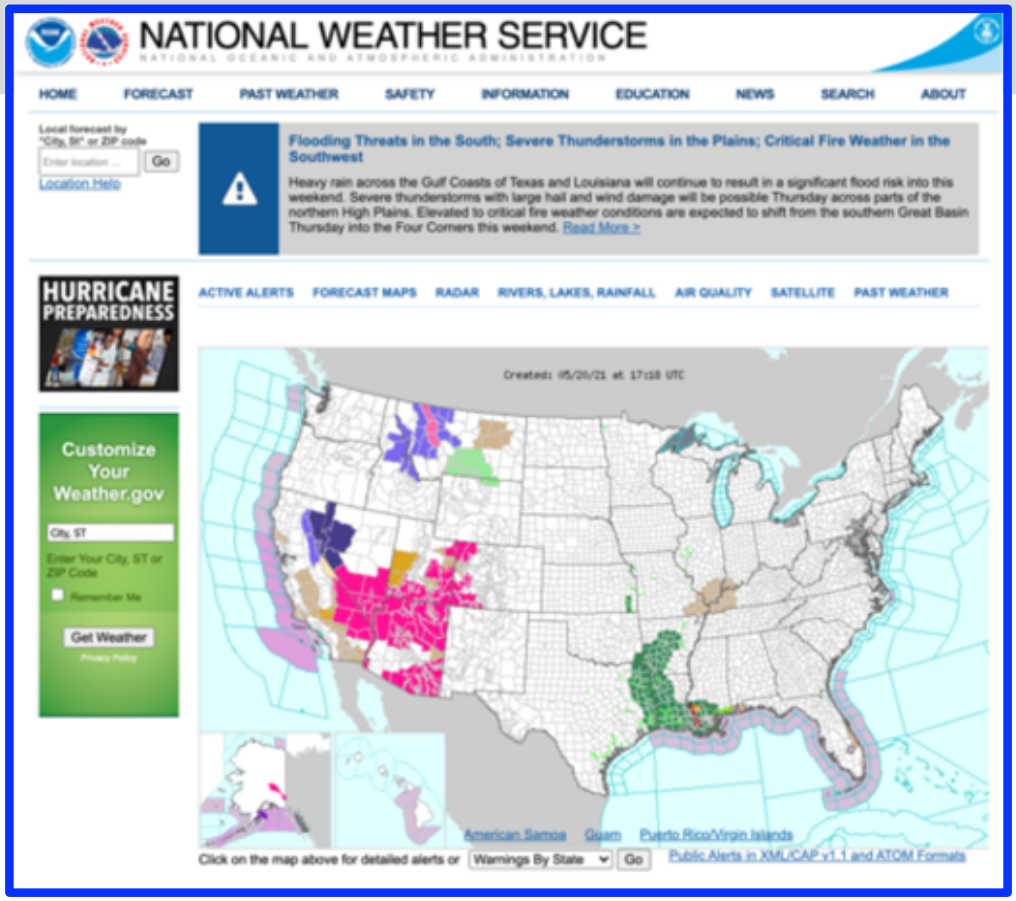
Severe weather on the Chesapeake…..
National Weather Service watches & warnings

Definitions of watches & warnings can be found here:
http://www.weather.gov/lwx/WarningsDefined

- Severe thunderstorm watch → means TS is possible
  - Winds of 58 mph or higher
  - Hail 1 inch in diameter or larger
- ***Severe thunderstorm warning*** → means TS is imminent or occurring

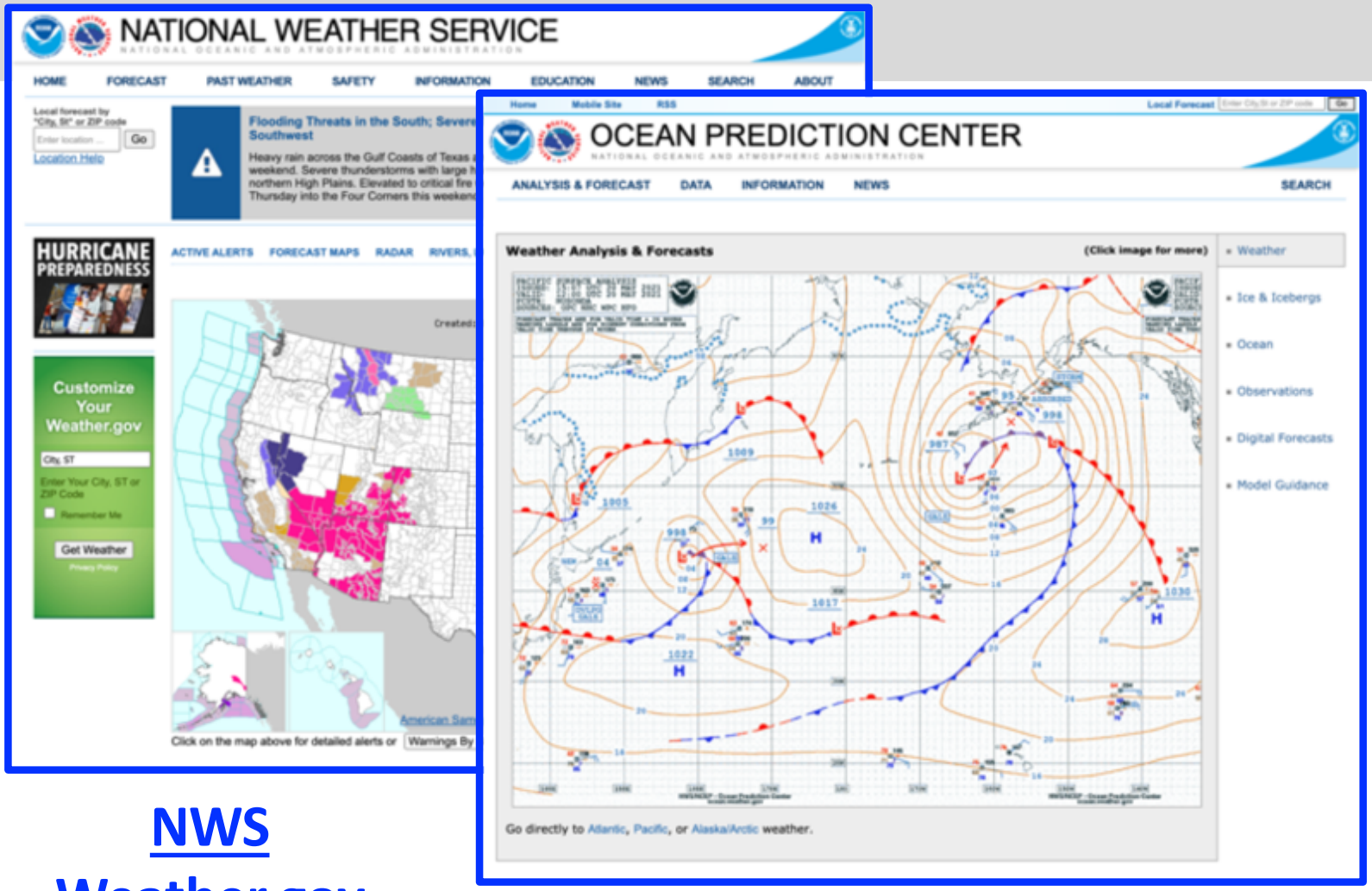
- Tornado watch → means tornado is possible
- ***Tornado warning*** → means tornado is imminent or occurring

Weather Sources



[NWS Weather.gov]

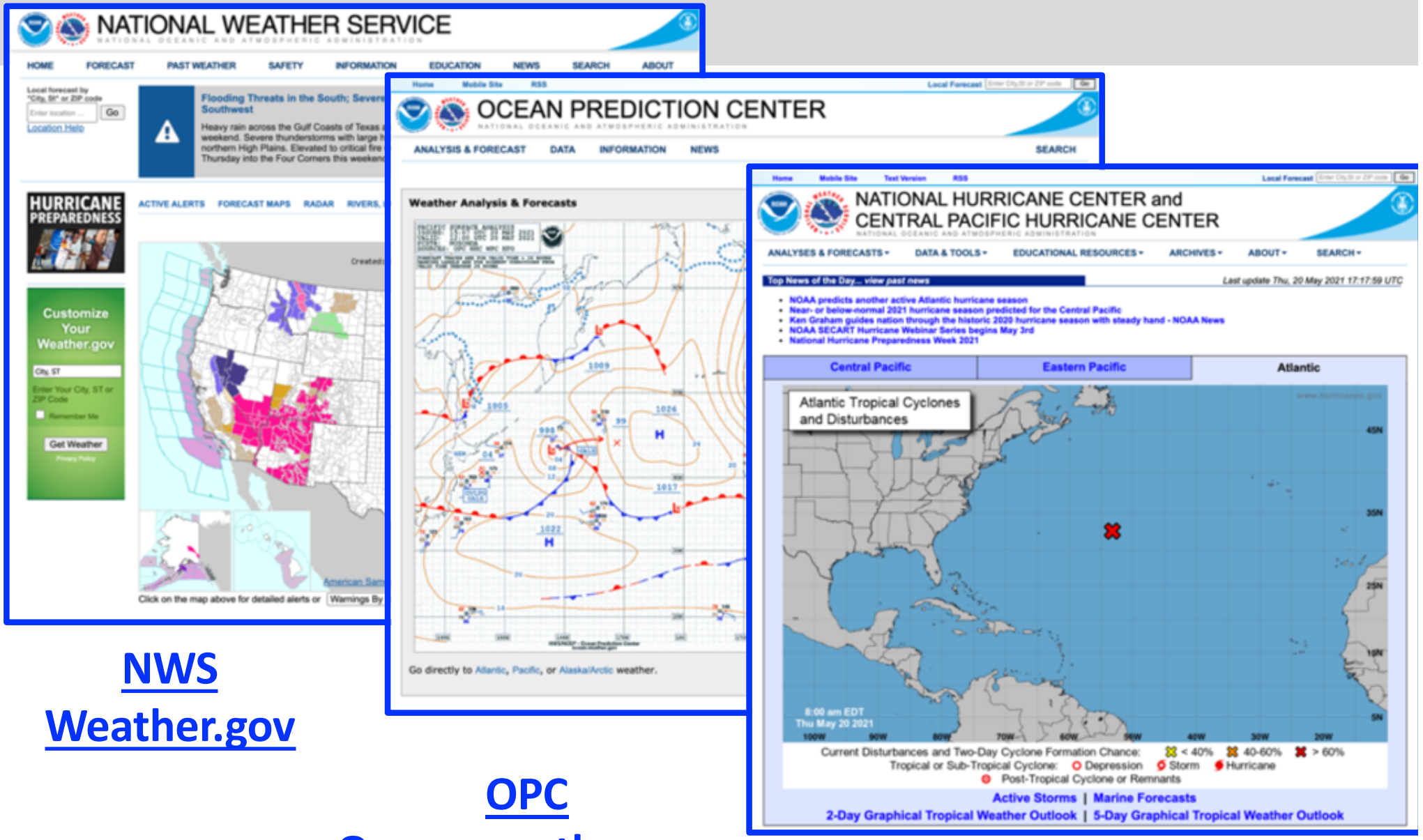
Weather Sources



[NWS Weather.gov]

[OPC Ocean.weather.gov]

Weather Sources

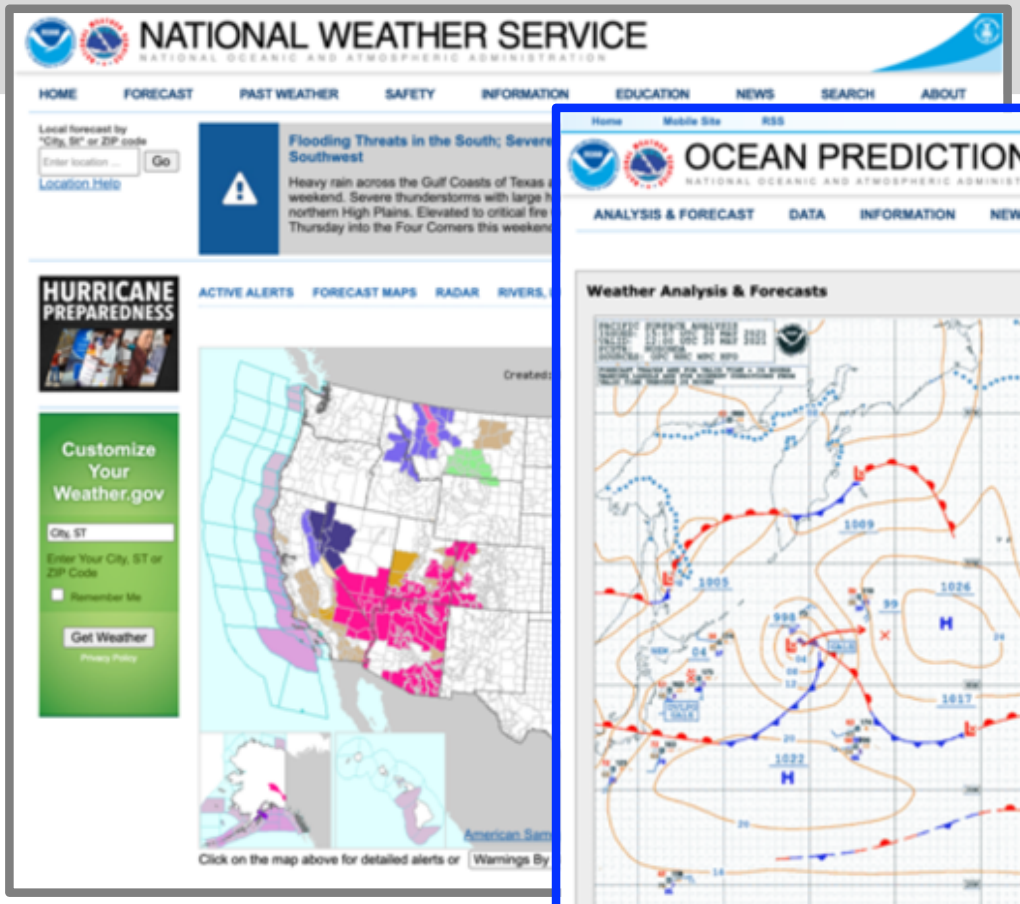


[NWS Weather.gov]

[OPC Ocean.weather.gov]

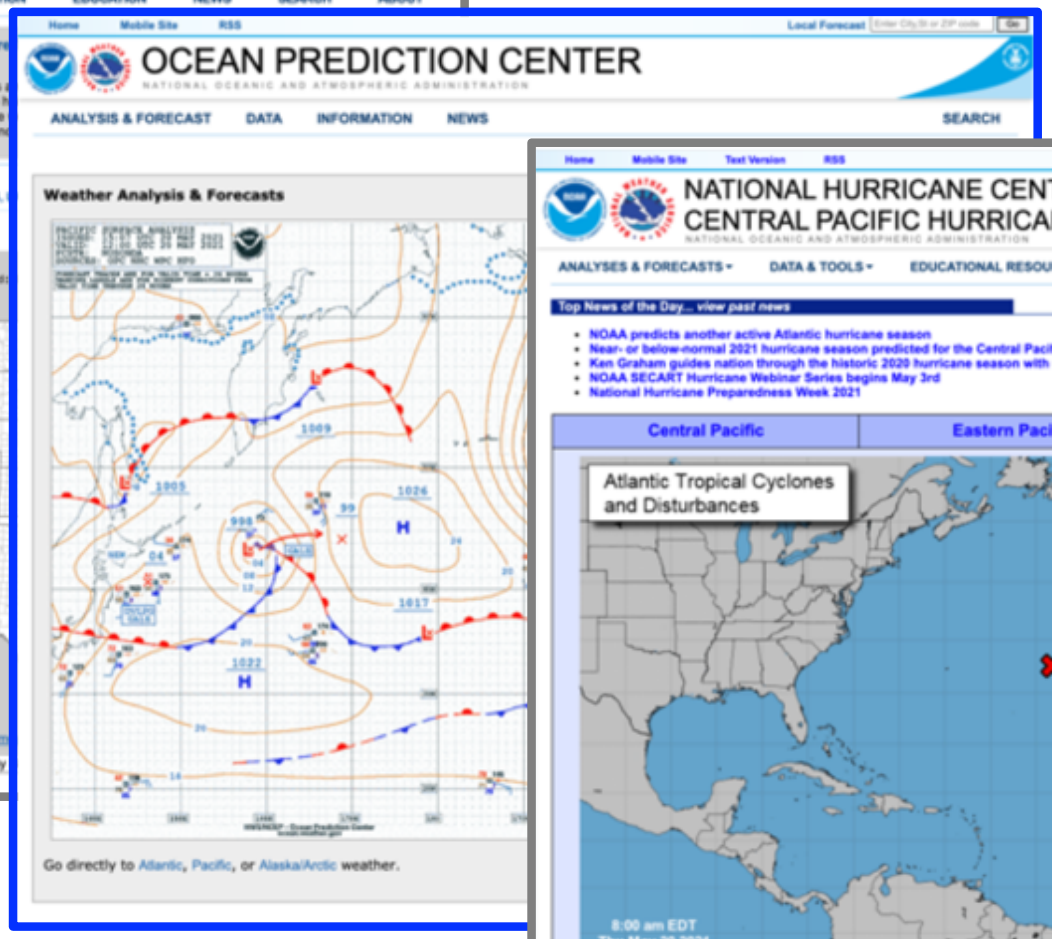
[NHC Hurricanes.gov]

Weather Sources



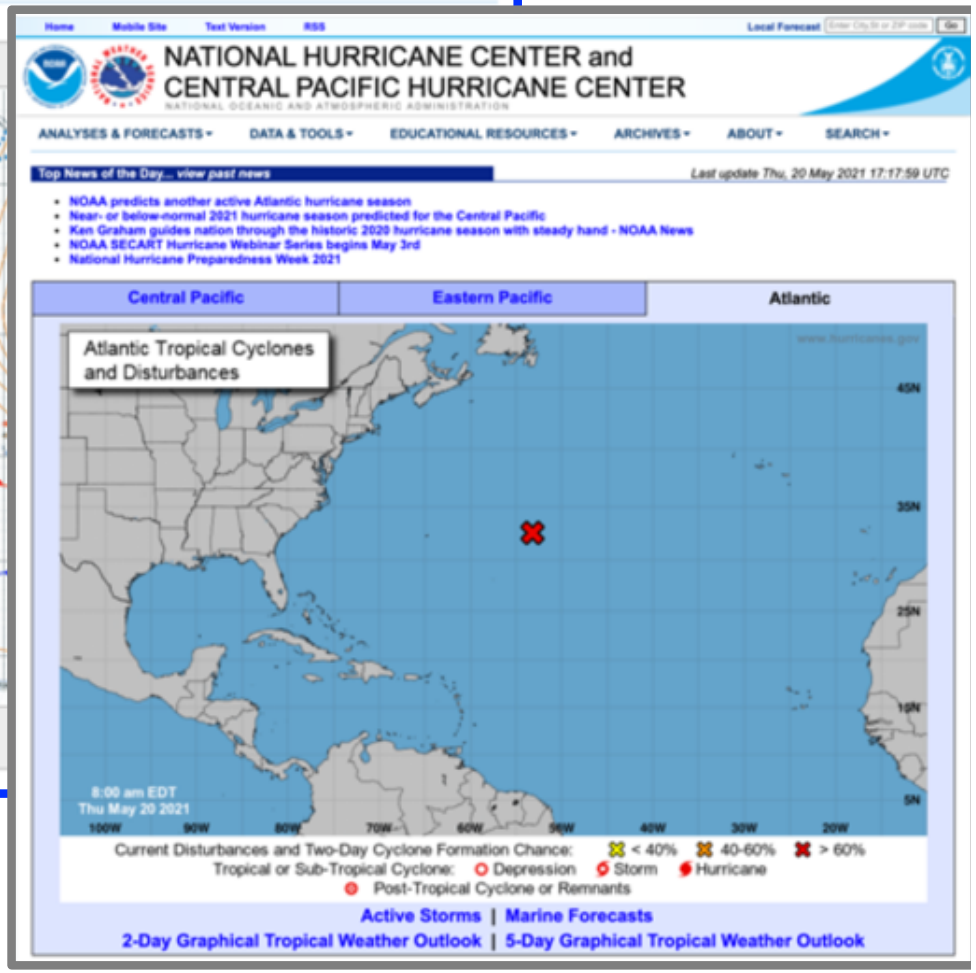
NWS

Weather.gov



OPC

Ocean.weather.gov

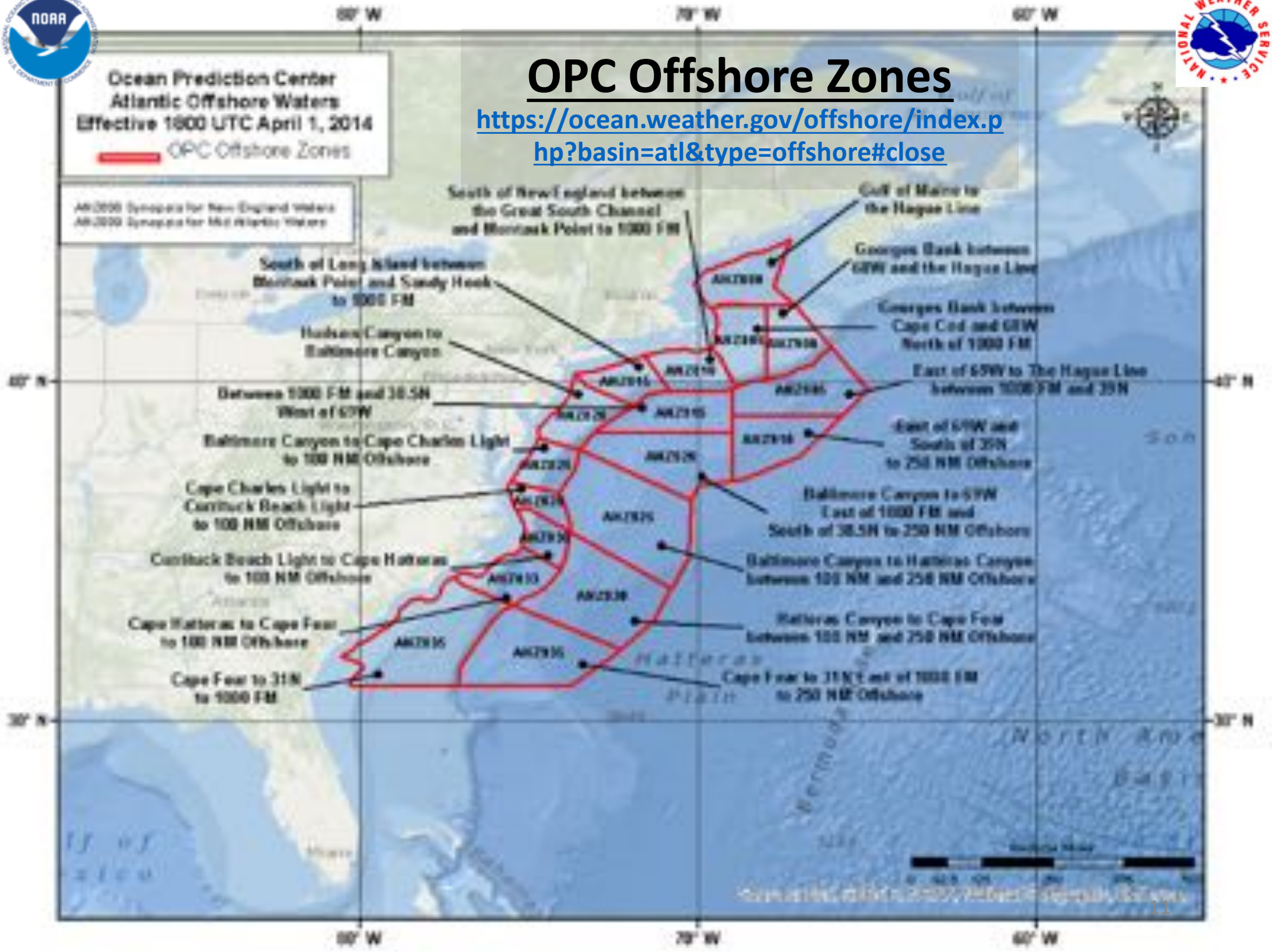


NHC

Hurricanes.gov

OPC Offshore Zones

https://ocean.weather.gov/offshore/index.php?basin=atl&type=offshore#close



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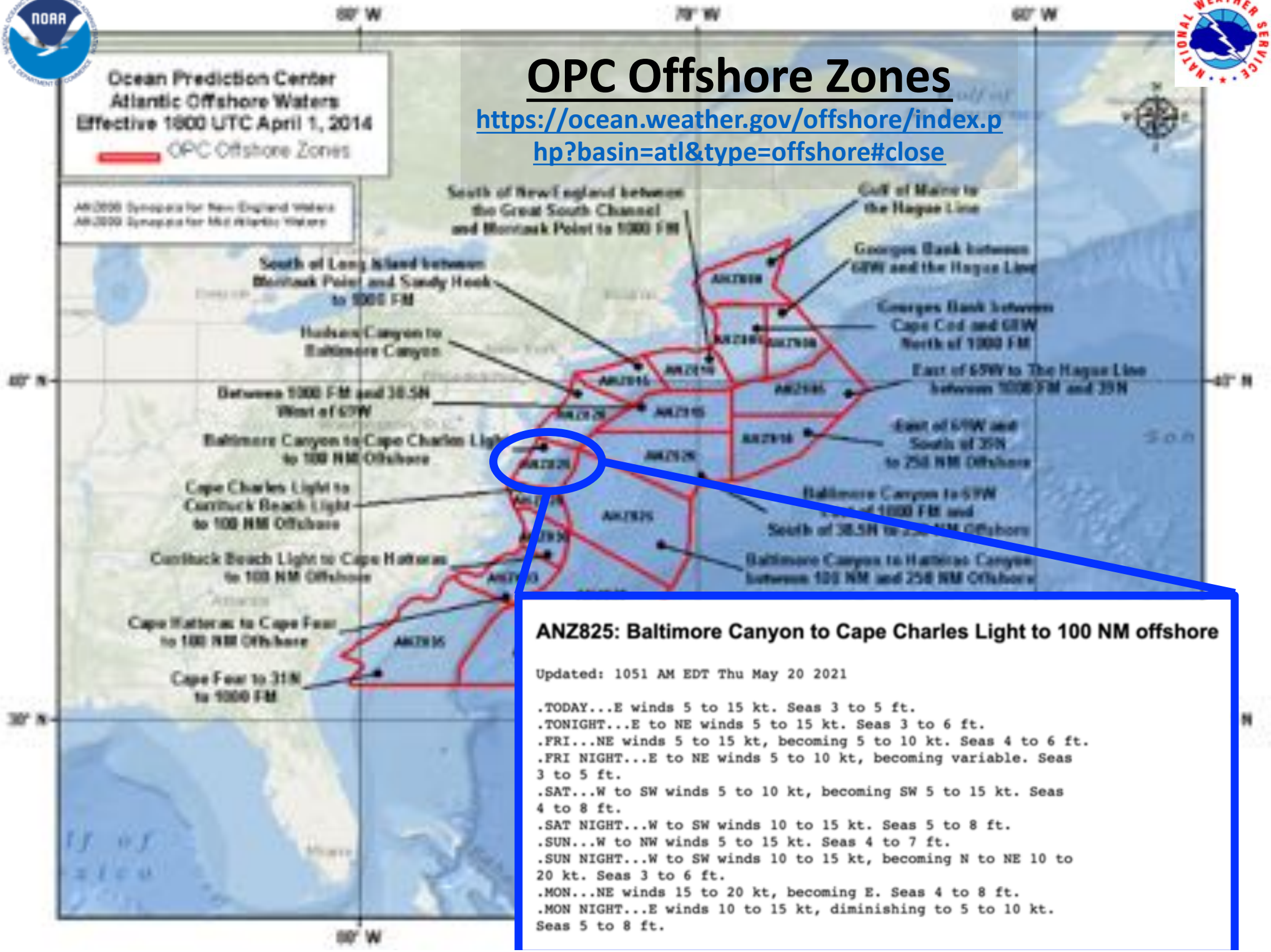
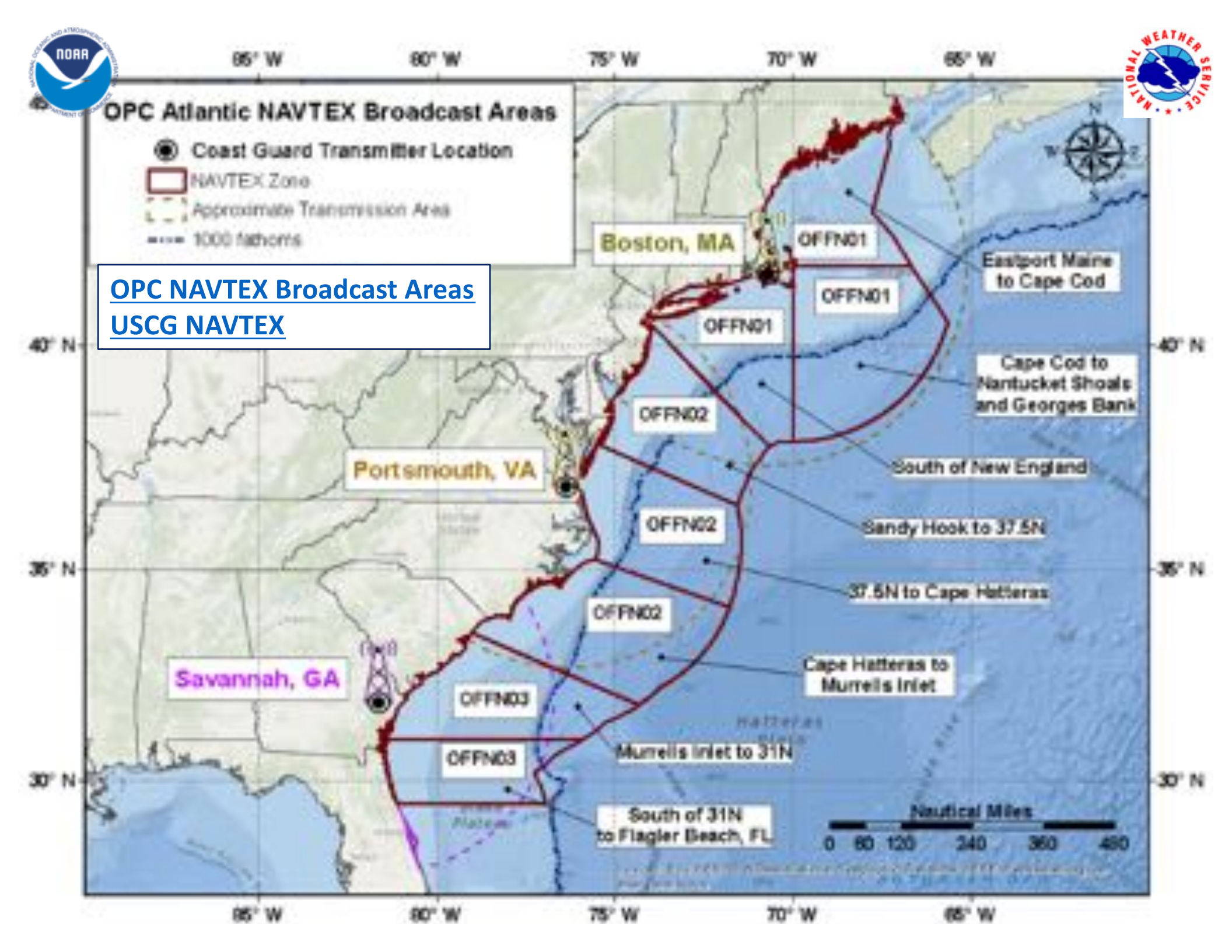
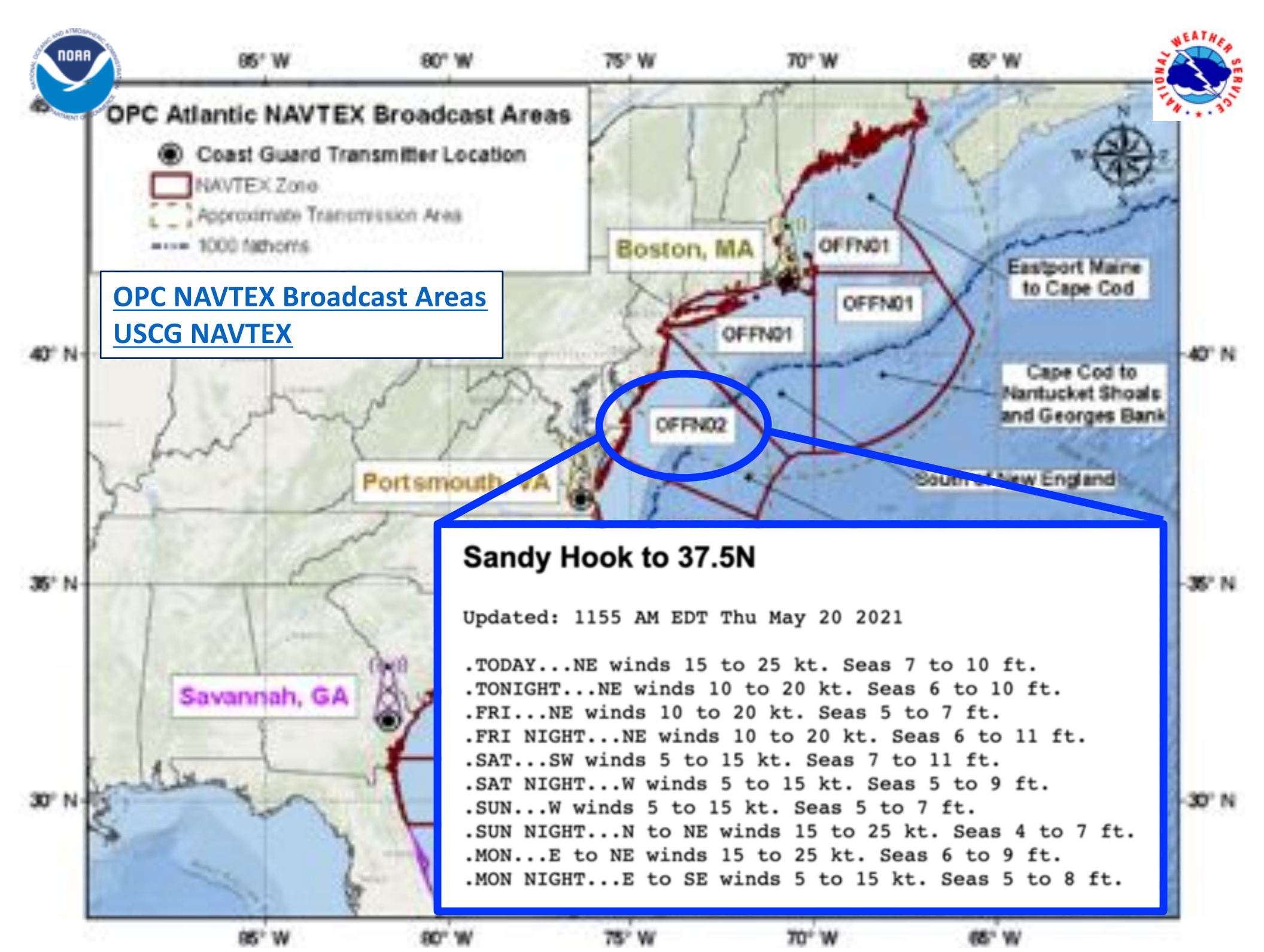


ANZ825: Baltimore Canyon to Cape Charles Light to 100 NM offshore

Updated: 1051 AM EDT Thu May 20 2021

.TODAY...E winds 5 to 15 kt. Seas 3 to 5 ft.
.TONIGHT...E to NE winds 5 to 15 kt. Seas 3 to 6 ft.
.FRI...NE winds 5 to 15 kt, becoming 5 to 10 kt. Seas 4 to 6 ft.
.FRI NIGHT...E to NE winds 5 to 10 kt, becoming variable. Seas 3 to 5 ft.
.SAT...W to SW winds 5 to 10 kt, becoming SW 5 to 15 kt. Seas 4 to 8 ft.
.SAT NIGHT...W to SW winds 10 to 15 kt. Seas 5 to 8 ft.
.SUN...W to NW winds 5 to 15 kt. Seas 4 to 7 ft.
.SUN NIGHT...W to SW winds 10 to 15 kt, becoming N to NE 10 to 20 kt. Seas 3 to 6 ft.
.MON...NE winds 15 to 20 kt, becoming E. Seas 4 to 8 ft.
.MON NIGHT...E winds 10 to 15 kt, diminishing to 5 to 10 kt. Seas 5 to 8 ft.


OPC Atlantic NAVTEX Broadcast Areas
Coast Guard Transmitter Location
NAVTEX Zone
Approximate Transmission Area
1000 fathoms
OPC NAVTEX Broadcast Areas
USCG NAVTEX
Boston, MA
Portsmouth, VA
Savannah, GA
OFFN01
OFFN01
OFFN01
OFFN02
OFFN02
OFFN02
OFFN03
OFFN03
Eastport Maine to Cape Cod
Cape Cod to Nantucket Shoals and Georges Bank
South of New England
Sandy Hook to 37.5N
37.5N to Cape Hatteras
Cape Hatteras to Murrells Inlet
Murrells Inlet to 31N
South of 31N to Flagler Beach, FL
Nautical Miles
0 60 120 240 360 480
85° W
80° W
75° W
70° W
65° W
40° N
35° N
30° N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Portsmouth, VA
Savannah, GA
Sandy Hook to 37.5N
Updated: 1155 AM EDT Thu May 20 2021
.TODAY...NE winds 15 to 25 kt. Seas 7 to 10 ft.
.TONIGHT...NE winds 10 to 20 kt. Seas 6 to 10 ft.
.FRI...NE winds 10 to 20 kt. Seas 5 to 7 ft.
.FRI NIGHT...NE winds 10 to 20 kt. Seas 6 to 11 ft.
.SAT...SW winds 5 to 15 kt. Seas 7 to 11 ft.
.SAT NIGHT...W winds 5 to 15 kt. Seas 5 to 9 ft.
.SUN...W winds 5 to 15 kt. Seas 5 to 7 ft.
.SUN NIGHT...N to NE winds 15 to 25 kt. Seas 4 to 7 ft.
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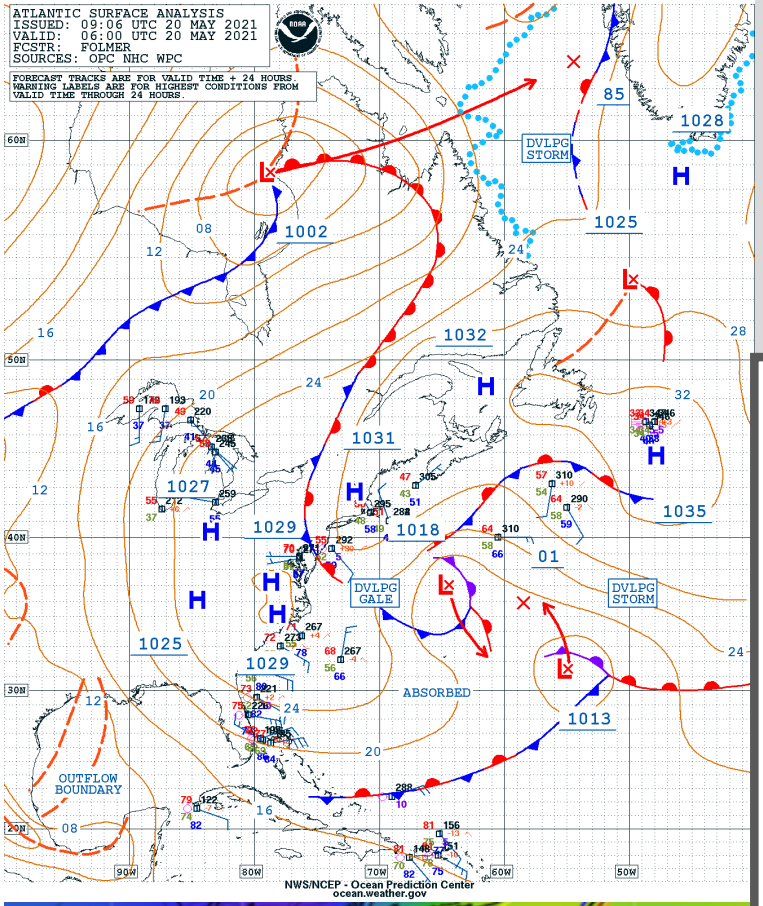

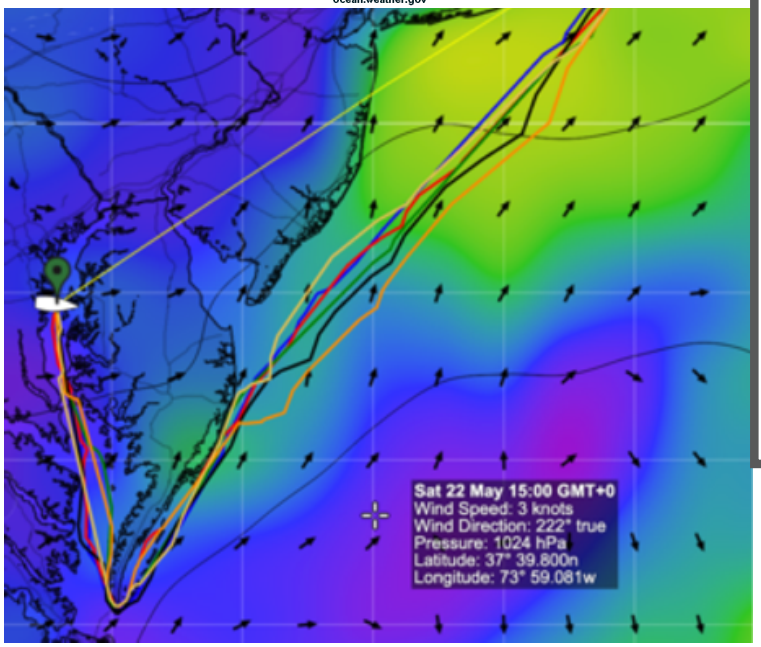

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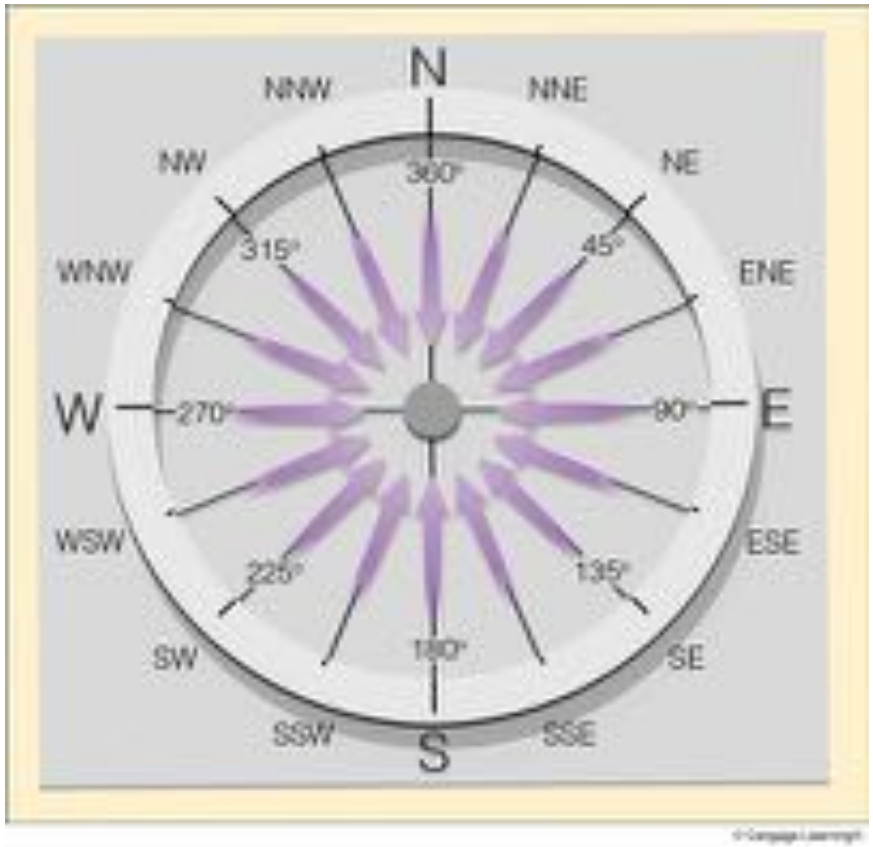
Let's take a step back to remember some basics:

- Wind → horizontal movement of air

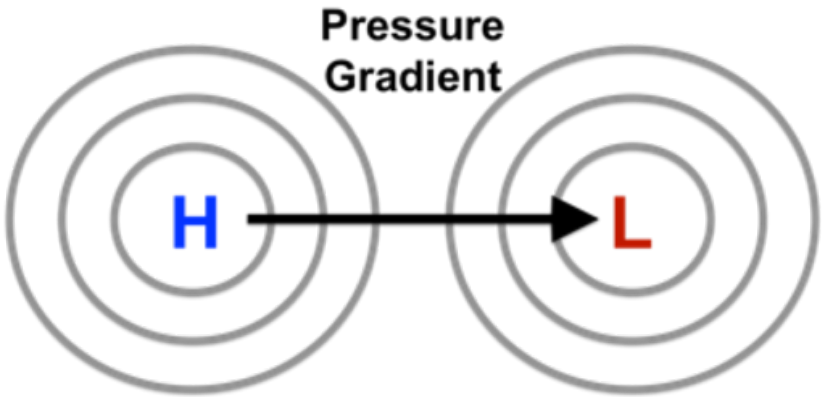
- 'Naming' wind
  - *From source direction*



Figures courtesy of *Meteorology today, 11th edition*, Ahrens, 1th edition, 2016

Let's take a step back to remember some basics:
What makes wind blow?

1. Pressure gradient force is directed from **H** to **L**



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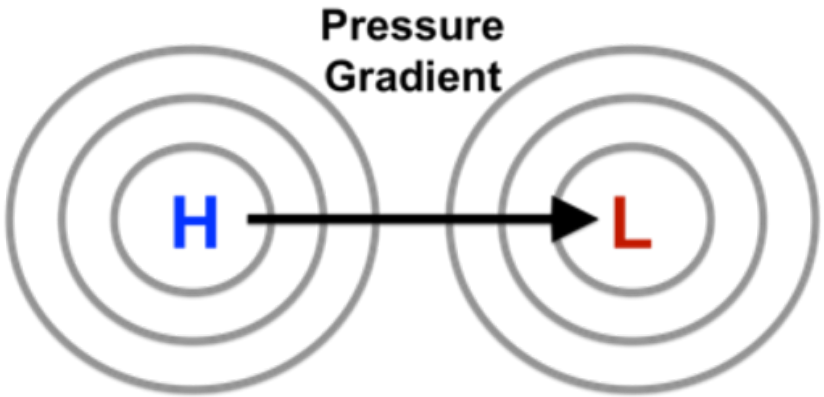
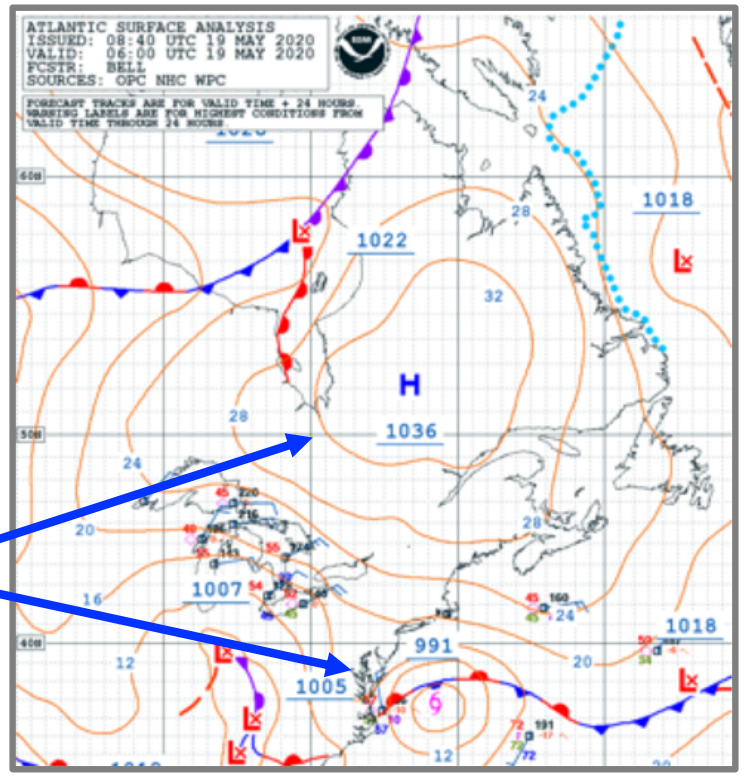


- Increased pressure gradient

➔ increased wind speed

Tightly packed isobars =
➔ stronger pressure gradient
➔ stronger winds



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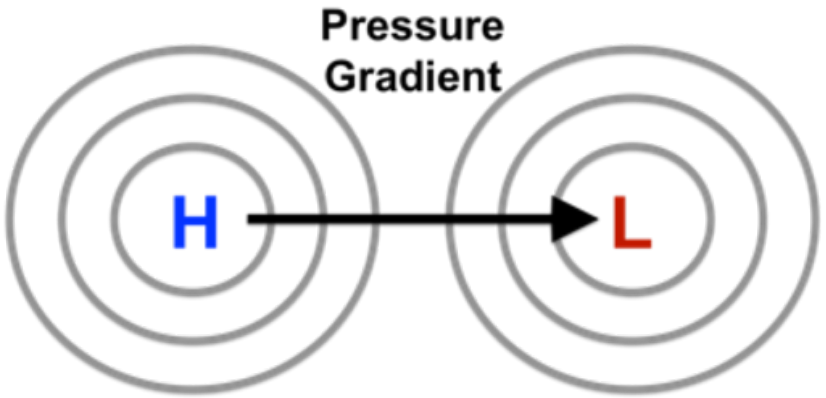
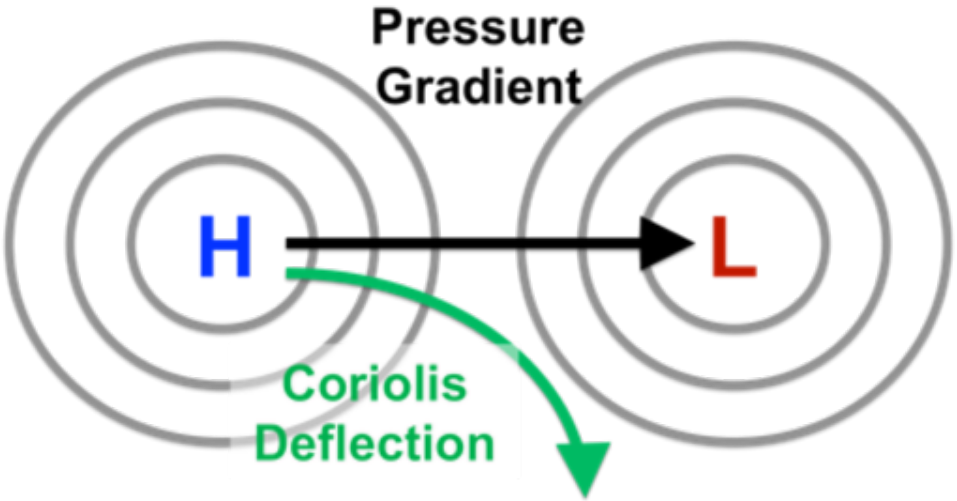


2. Coriolis force, due to Earth's rotation, deflects air to the right of its path of motion



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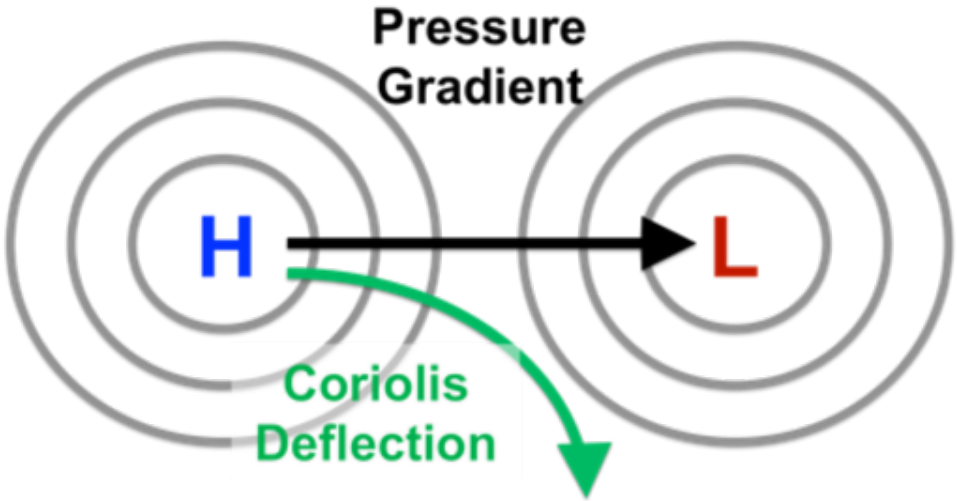
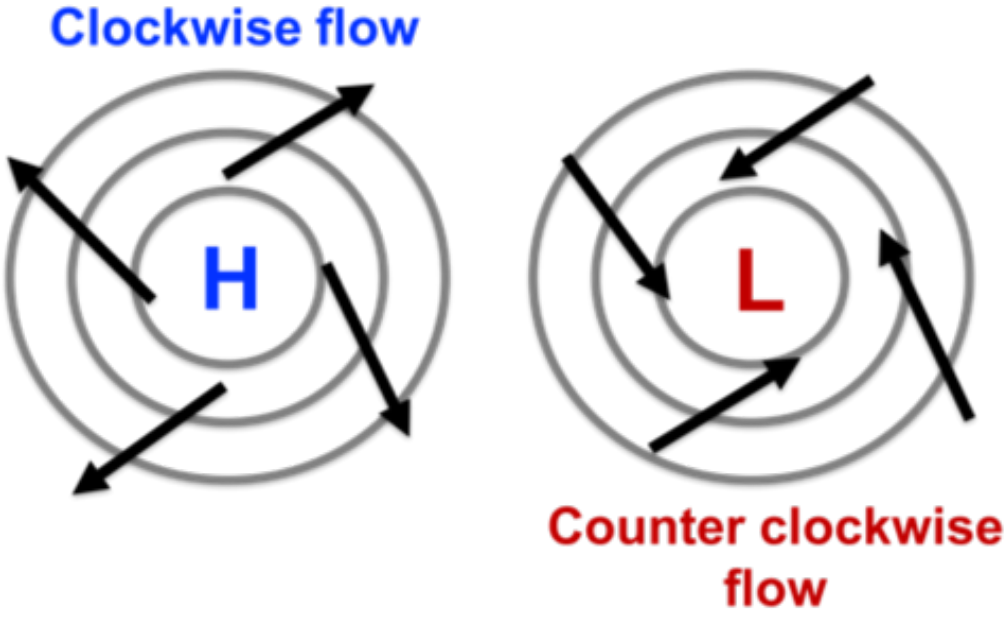


Pressure gradient + **Coriolis** = wind direction around a surface **High** & **Low** pressure



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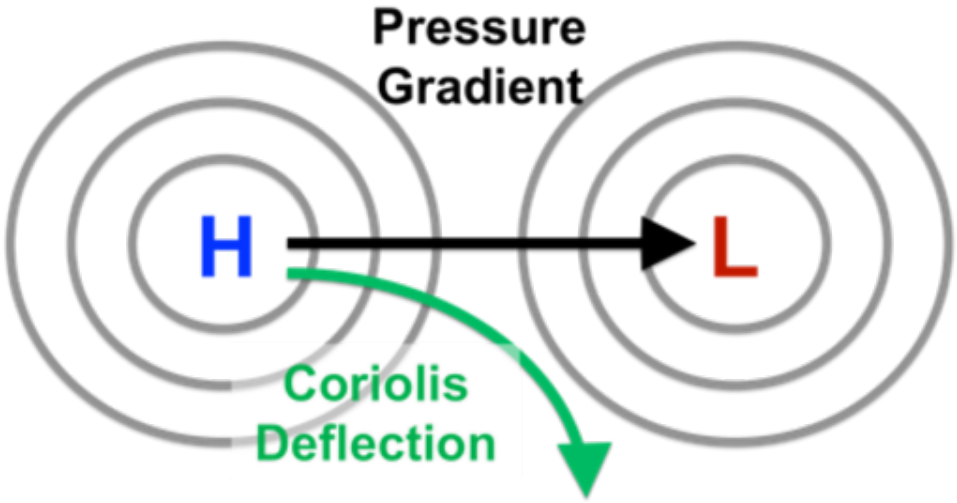
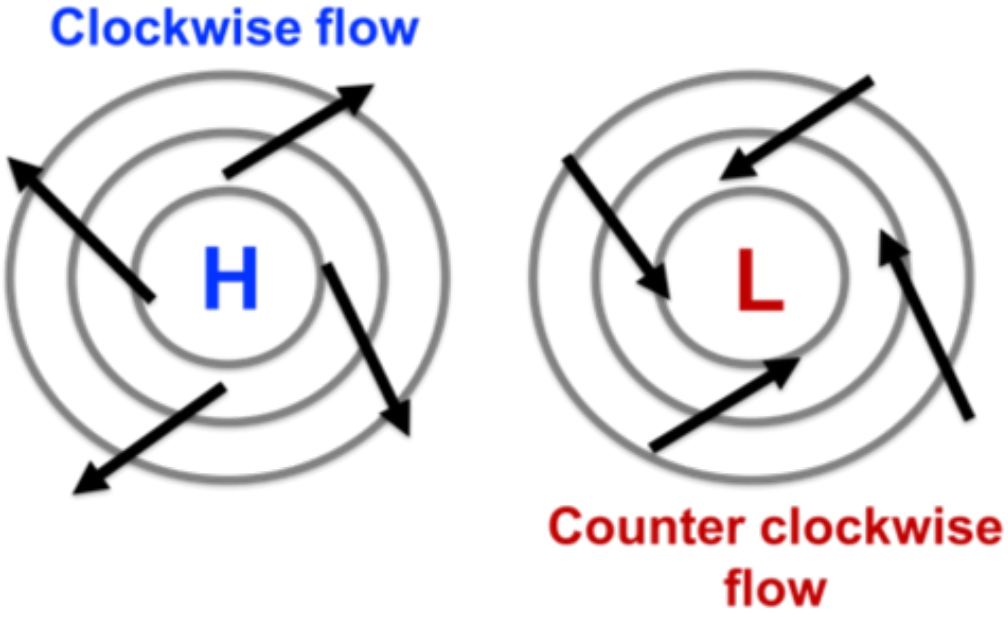
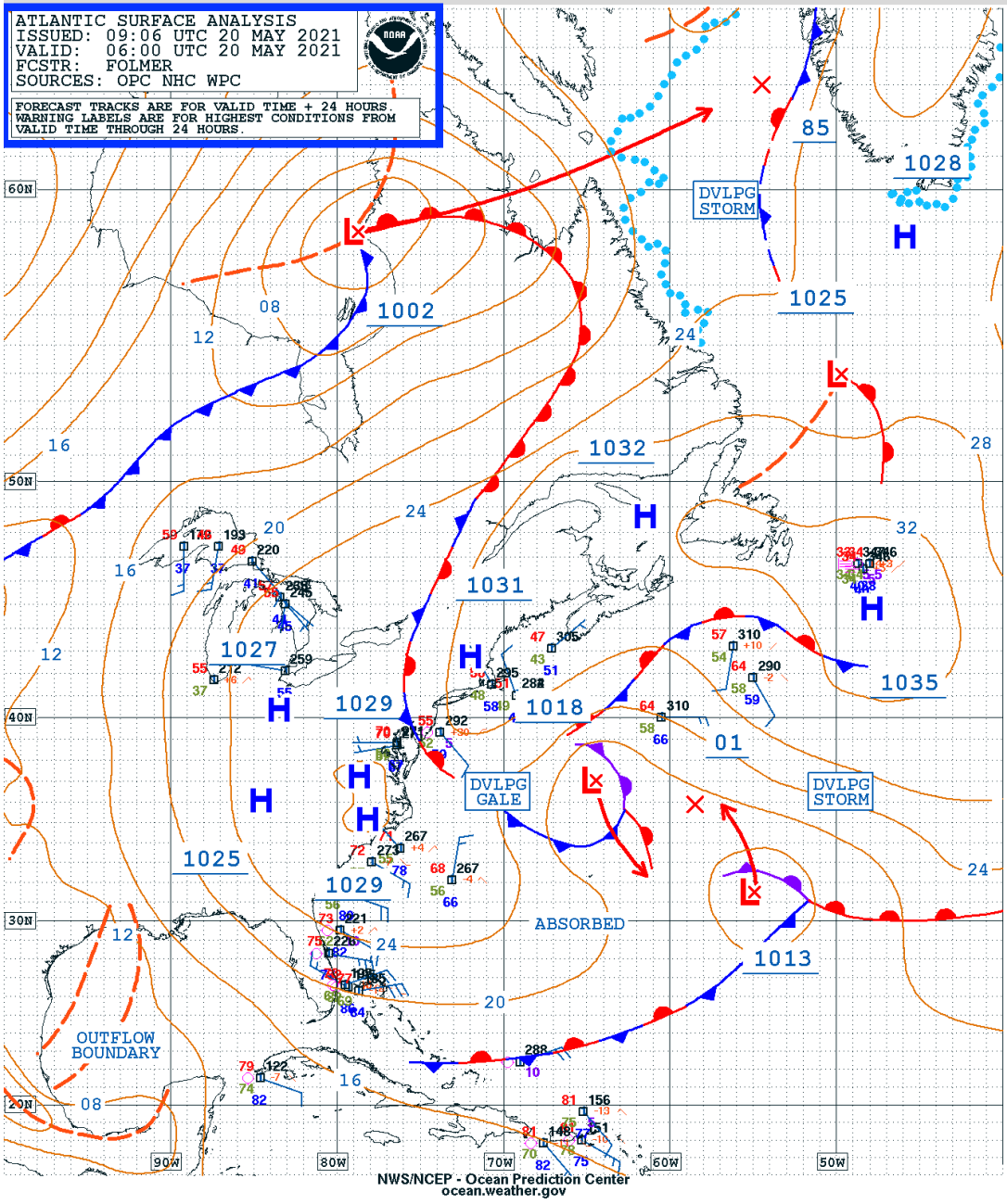


In the Northern Hemisphere:

- Cyclonic flow → counter clockwise
- Anticyclonic flow → clockwise



Let's take a look at some Highs & Lows on a surface weather chart…..



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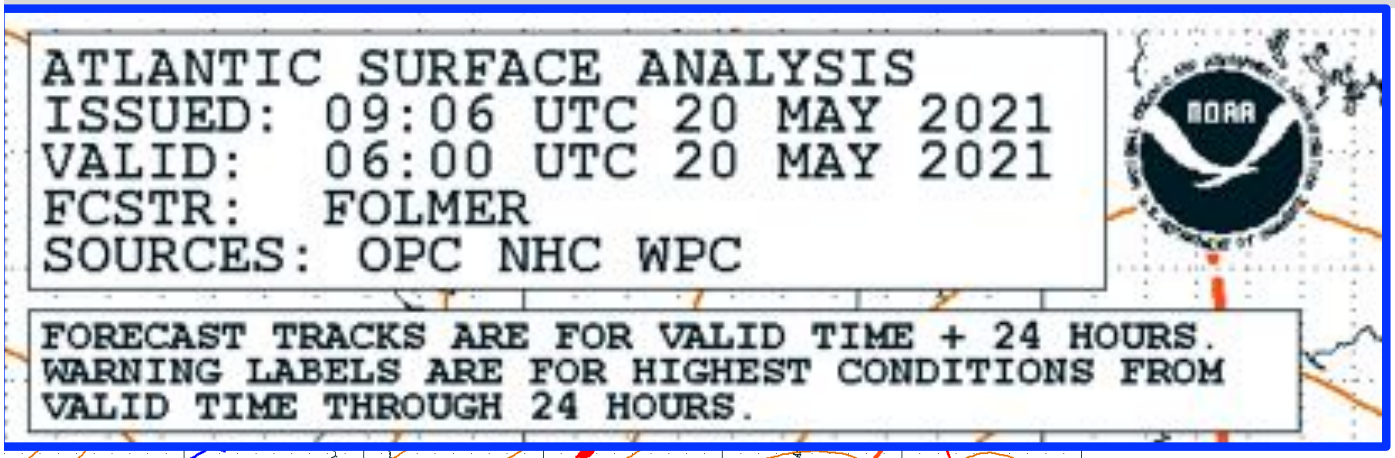
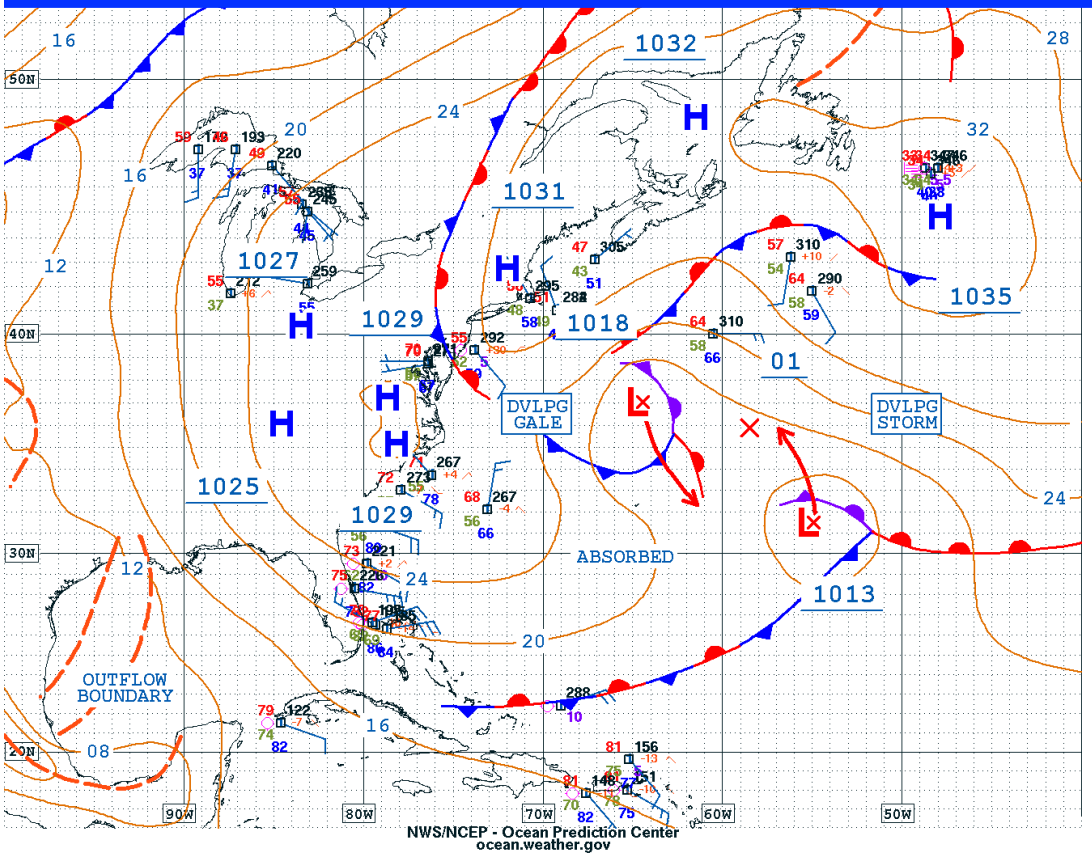
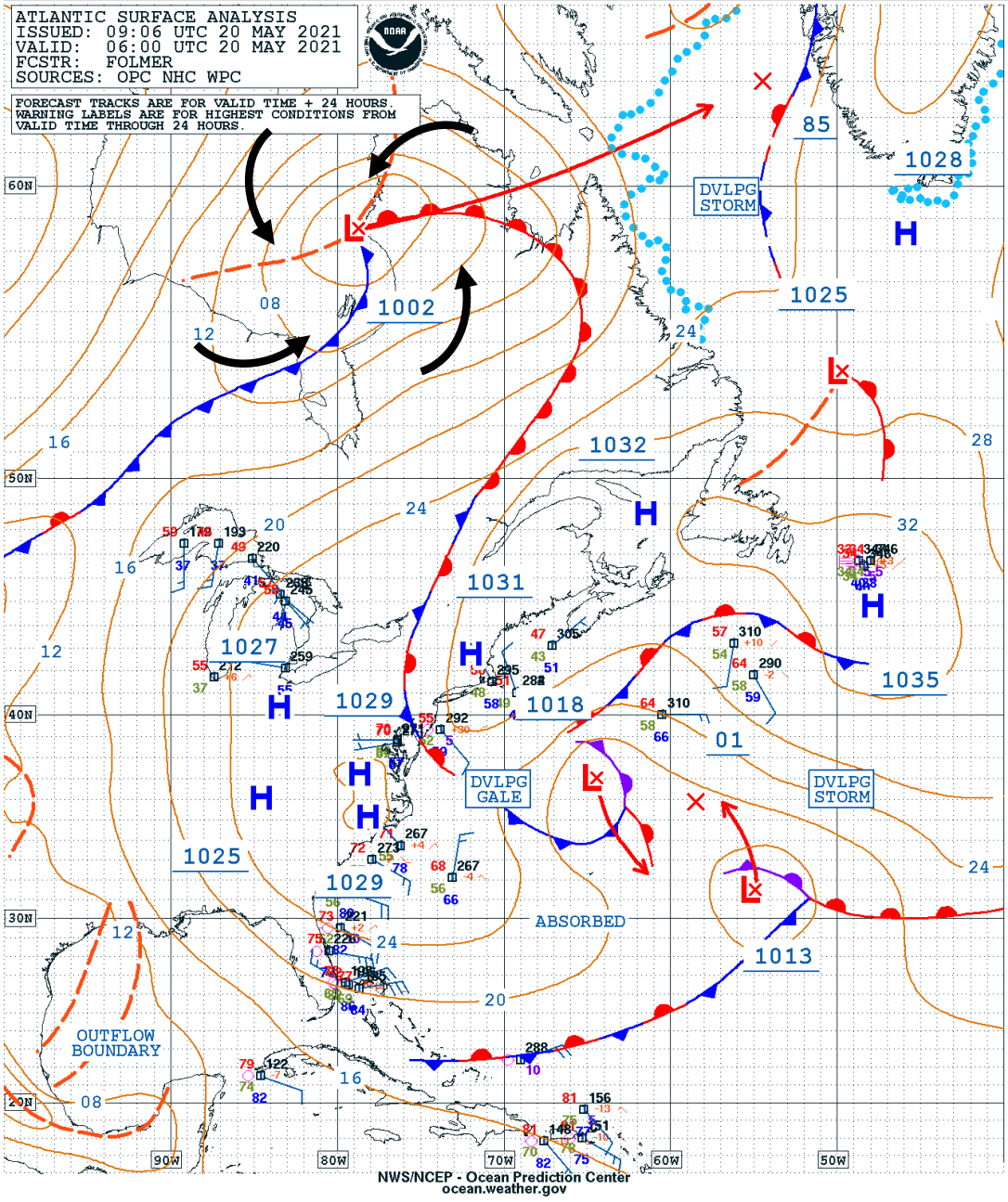




Surface map

- **"ISSUED"**
  → time analysis was released
- **"VALID"**
  → Time conditions apply
- UTC/GMT/Zulu time

Let's take a look at some Highs & Lows on a surface weather chart…..

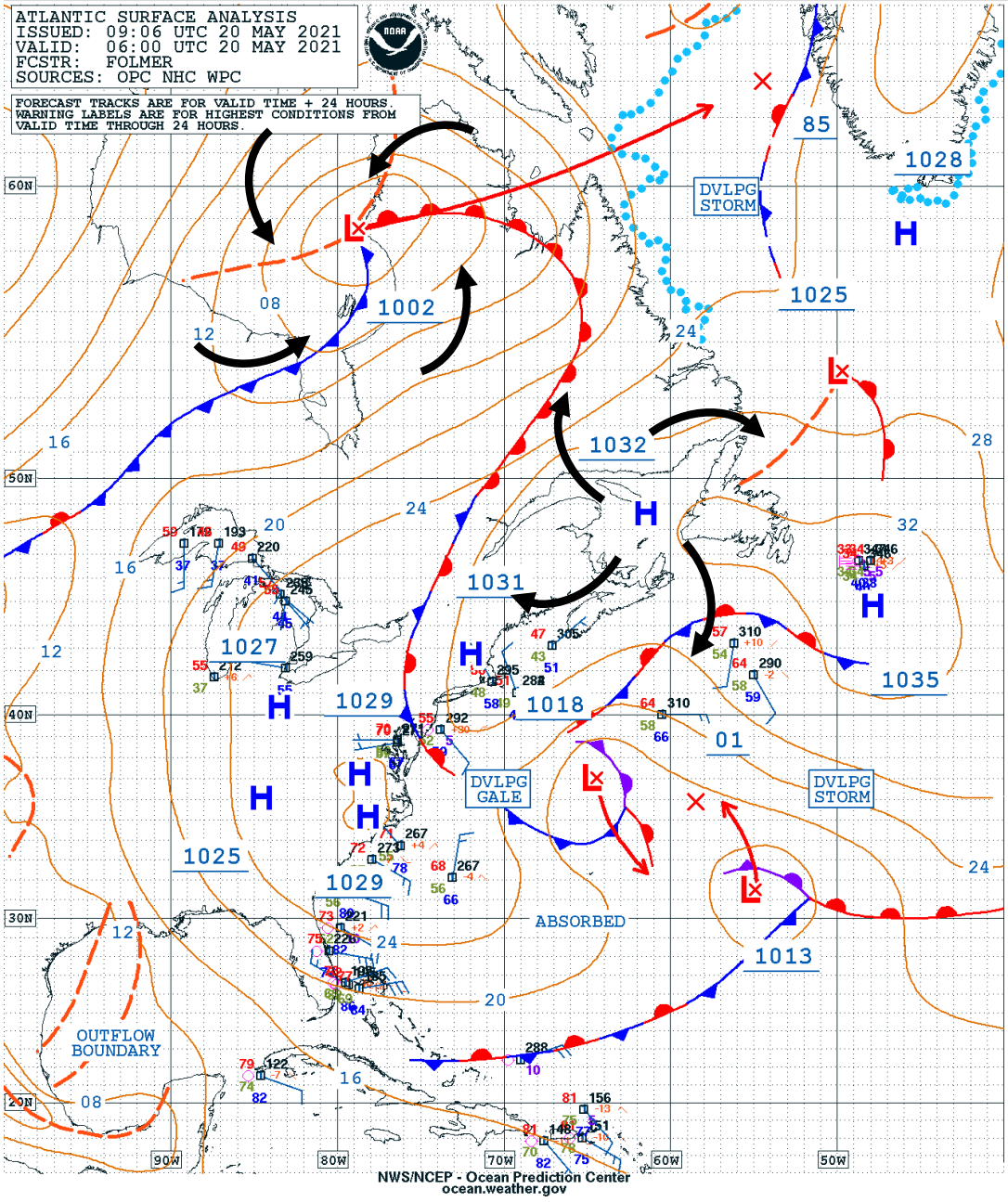


Q → *High or low pressure in comparison to what?*

mean sea level pressure: 1013 mb

Q → *What is the direction of wind flow around this Low?*

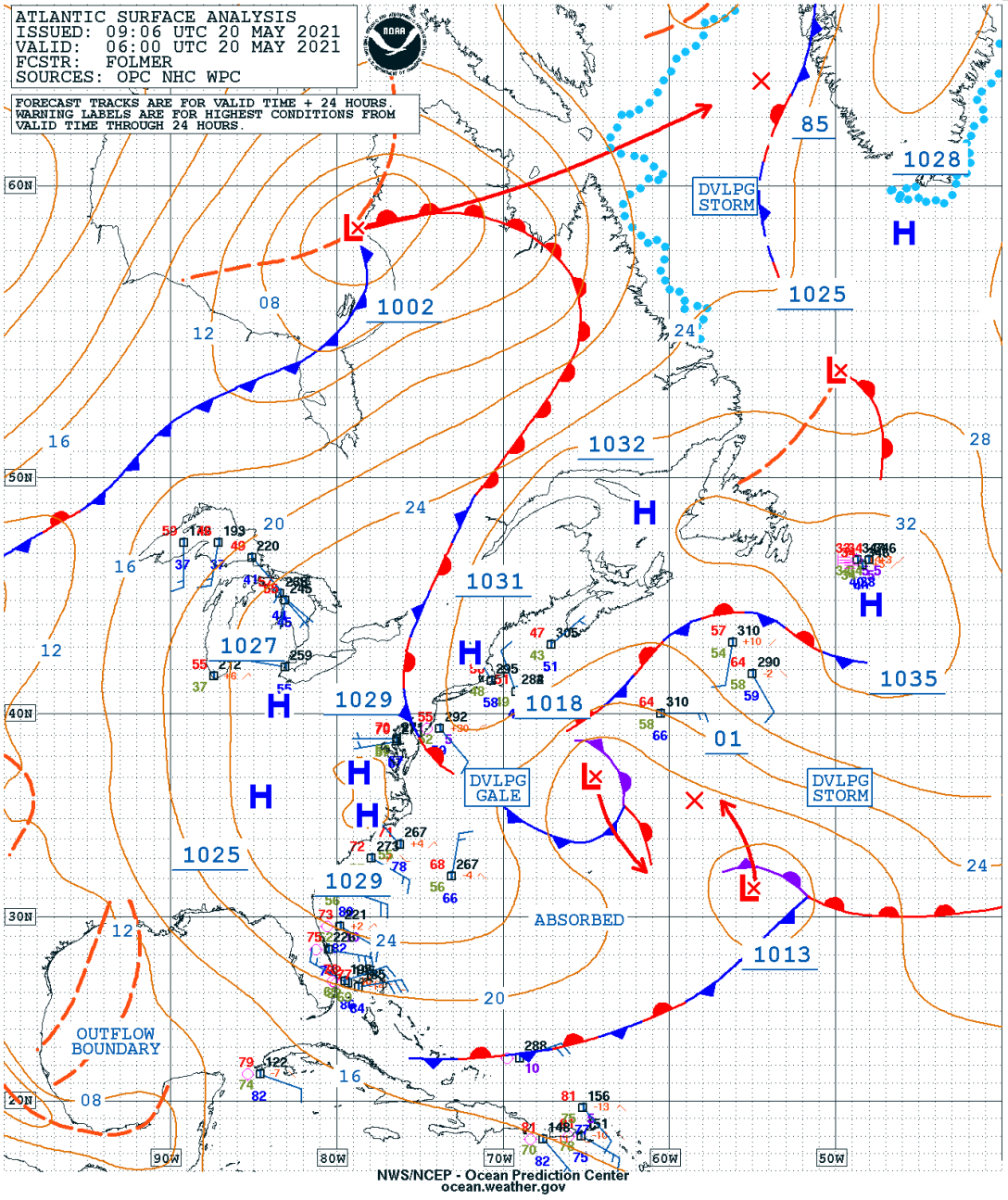
Let's take a look at some Highs & Lows on a surface weather chart…..



What about around the High pressure system?

- clear, settled weather
- Wind strength dependent on pressure gradient

3 types of Low pressure systems:



1. Mid-latitude Lows:

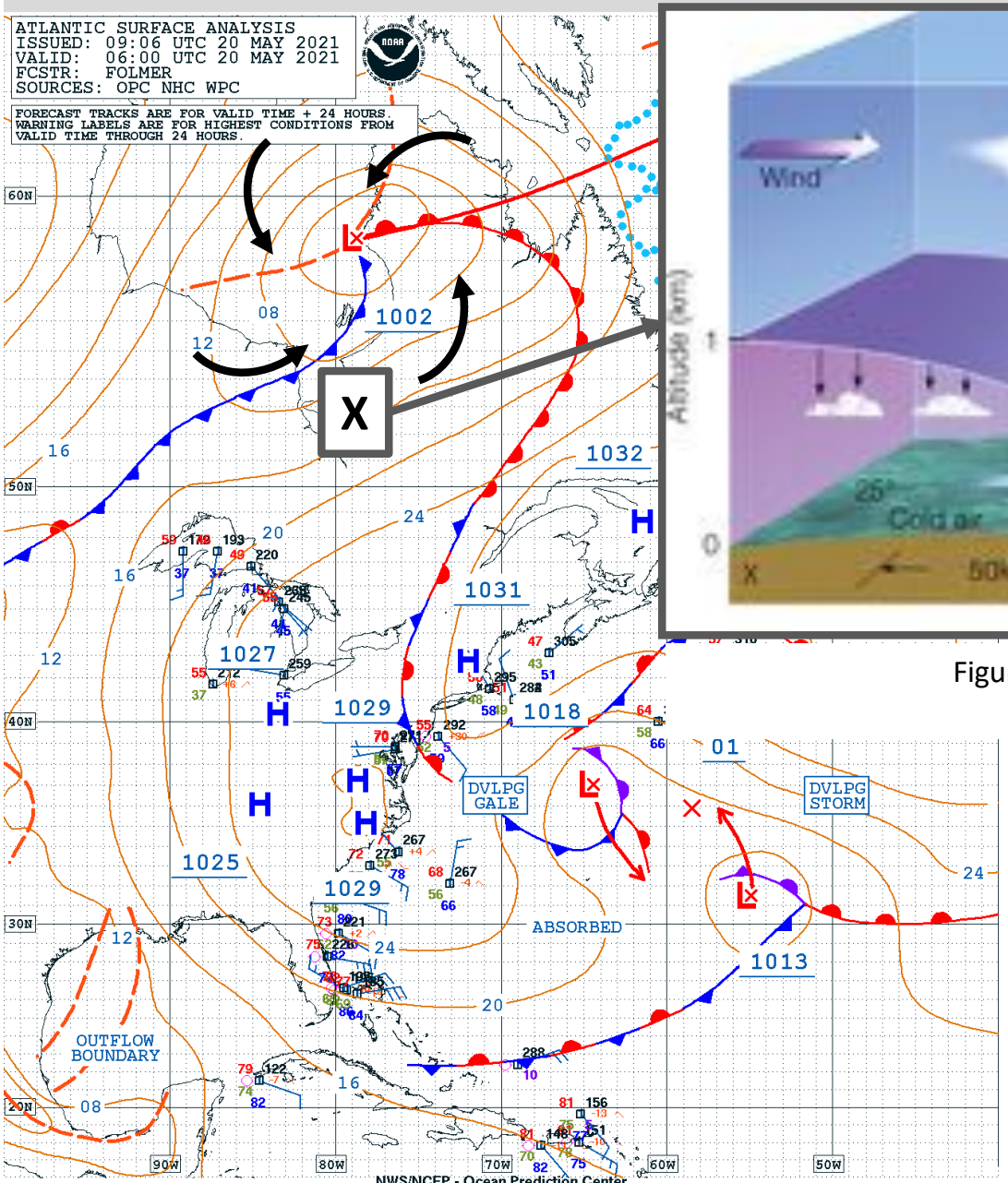
- most common between 30-60 N/S
- move (in general) from W→ E
- associated with ***fronts***
  - *boundary between air mass of different characteristics*

Types of fronts include:

- Cold fronts
- Warm fronts
- Stationary fronts
- Occluded fronts

3 types of Low pressure systems:

1. Mid-latitude Low – cold front passage



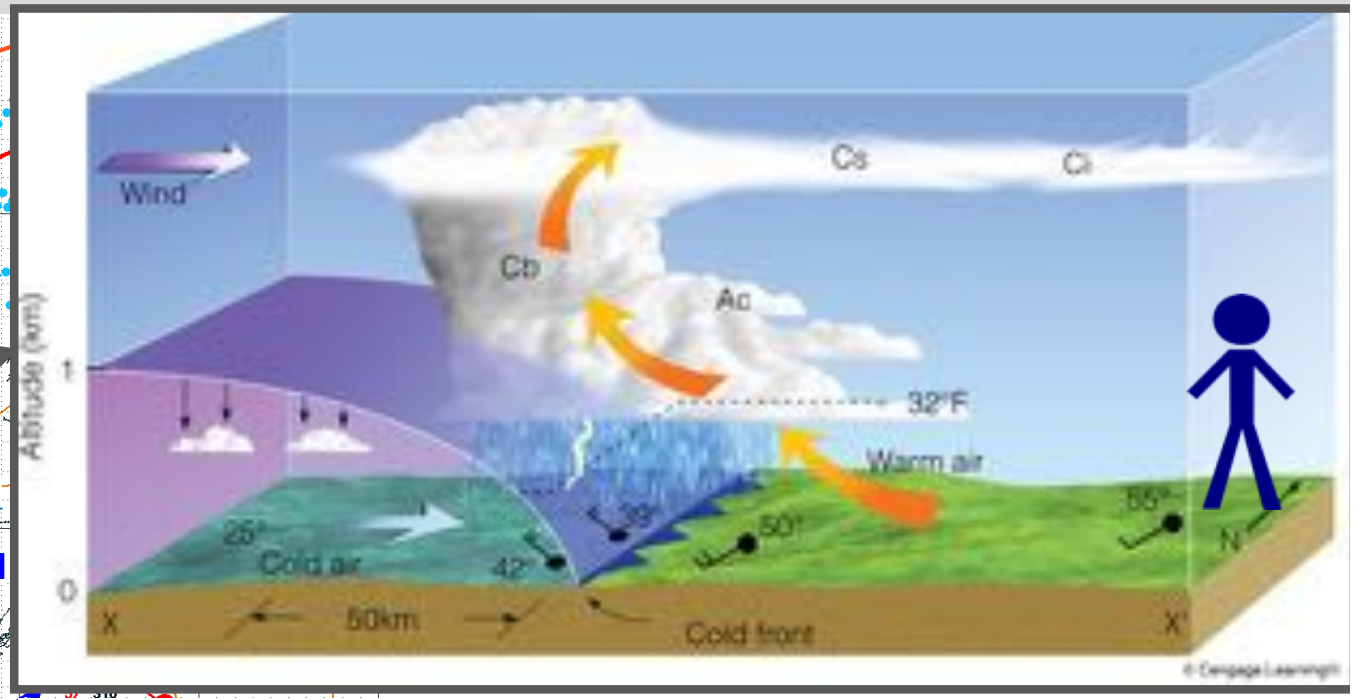
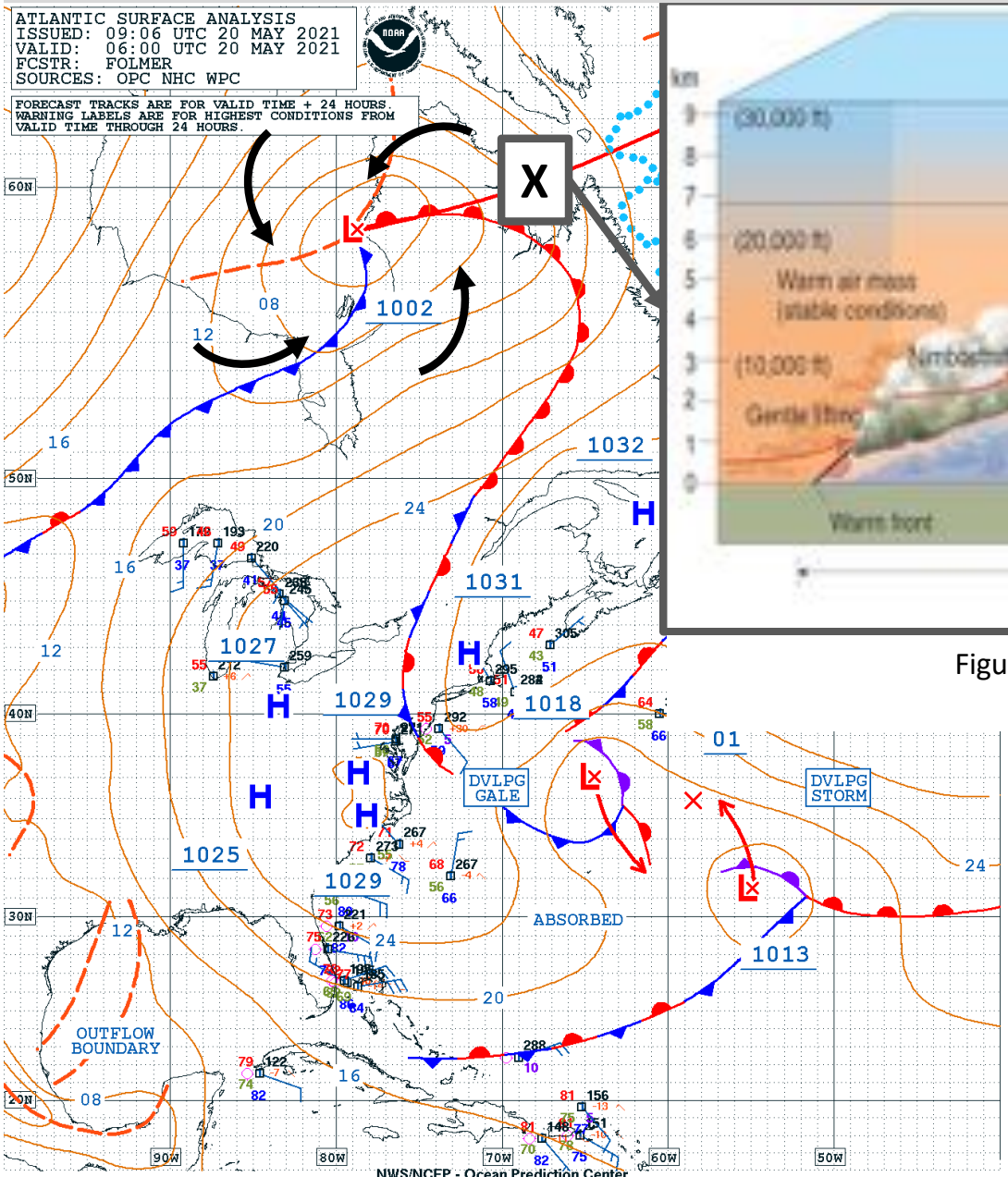


Figure courtesy of *Meteorology today, 11th edition*, Ahrens, 1th edition, 2016

3 types of Low pressure systems:

1. Mid-latitude Low – warm front passage



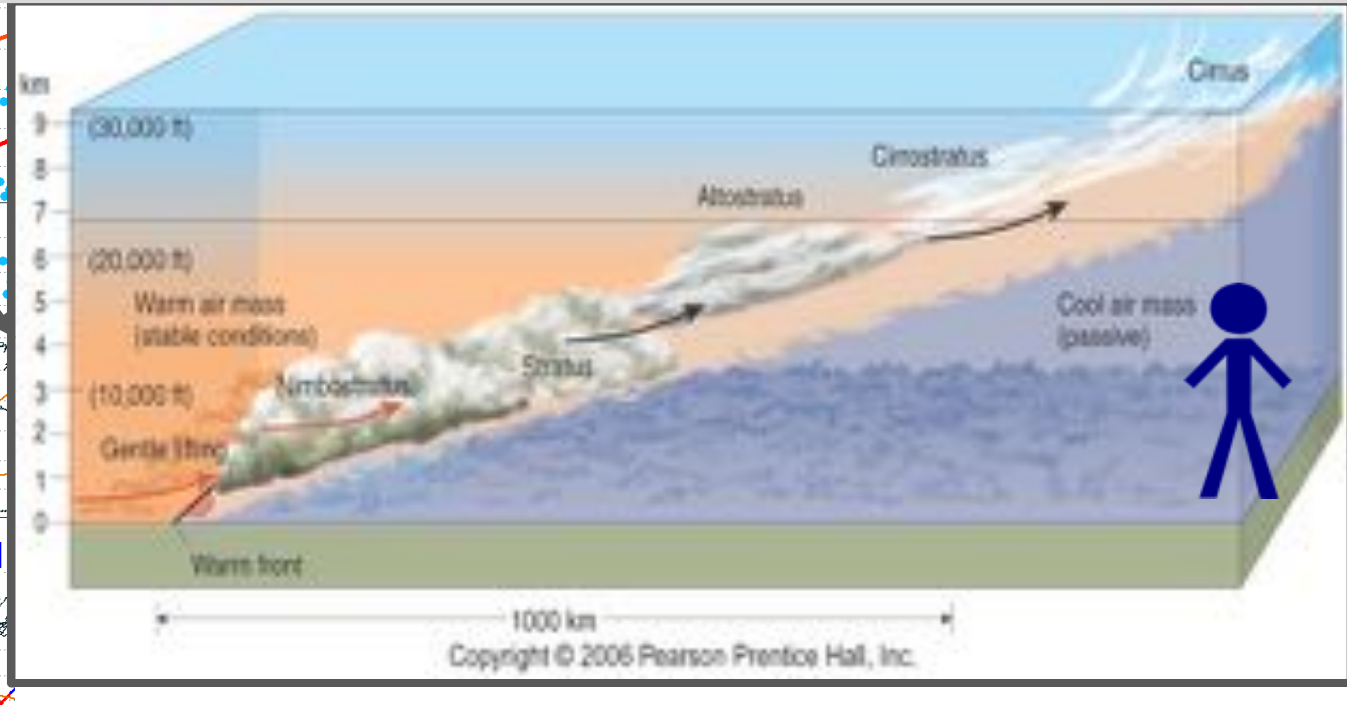
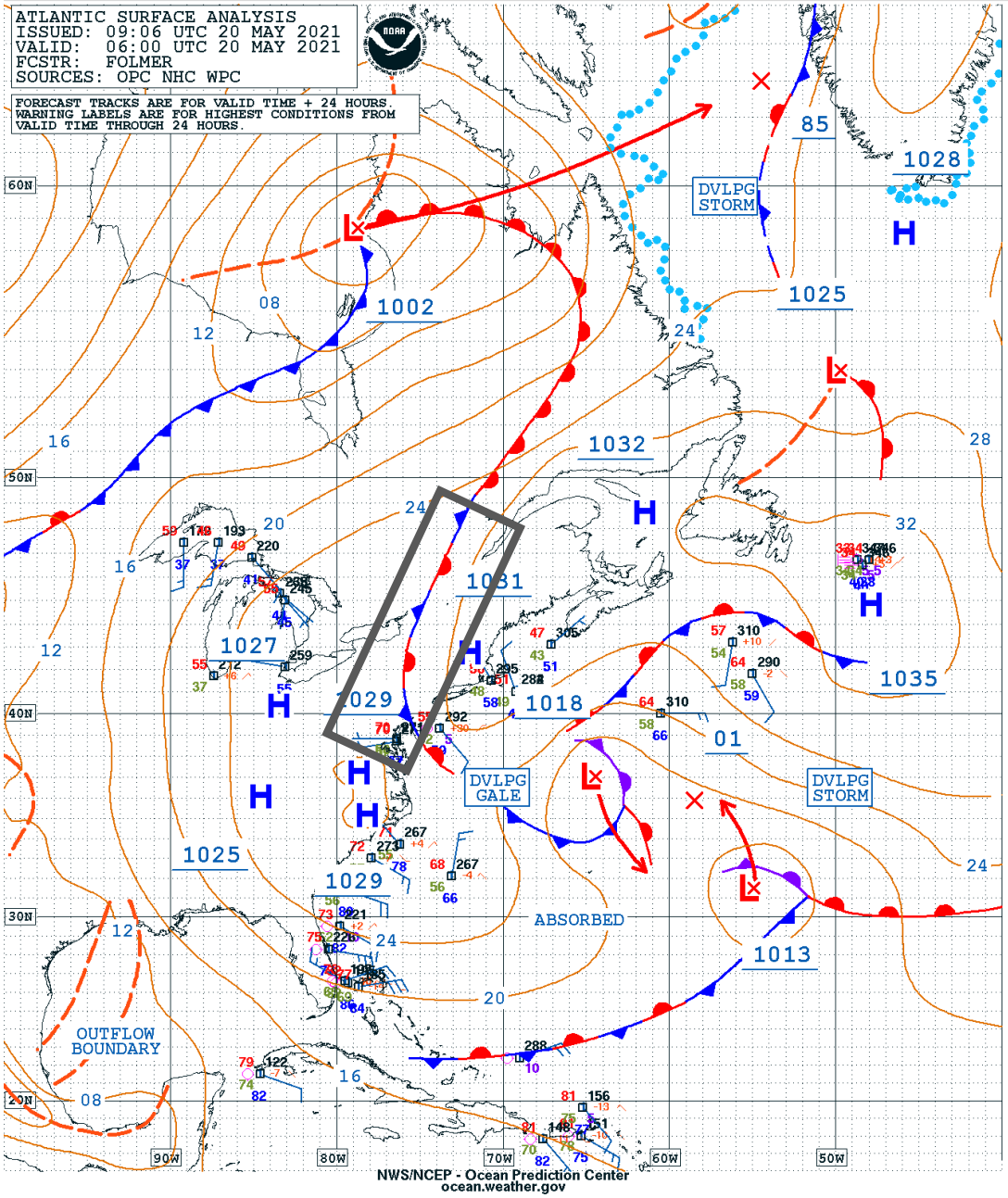
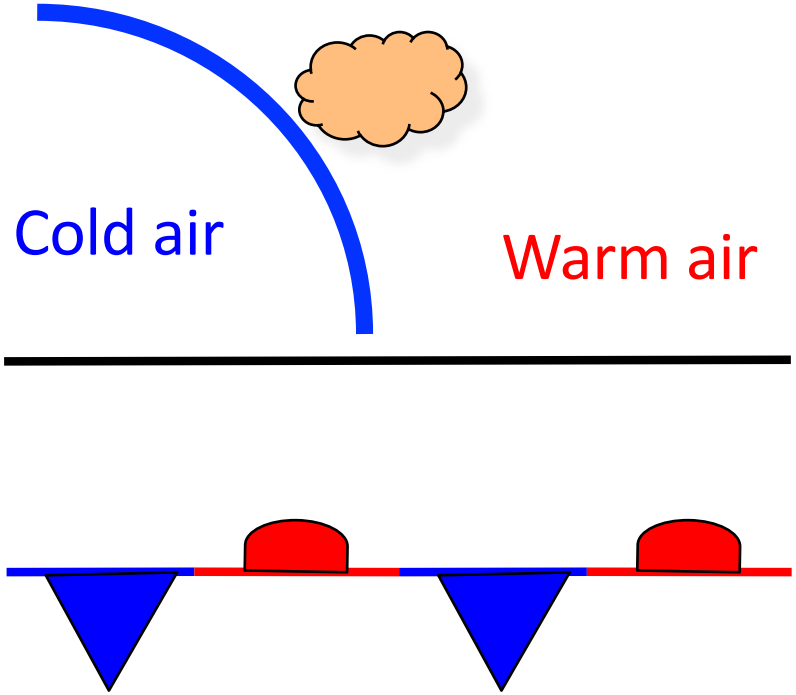


Figure courtesy of *Meteorology today, 11th edition*, Ahrens, 1th edition, 2016

3 types of Low pressure systems:

1. Mid-latitude Low – stationary front

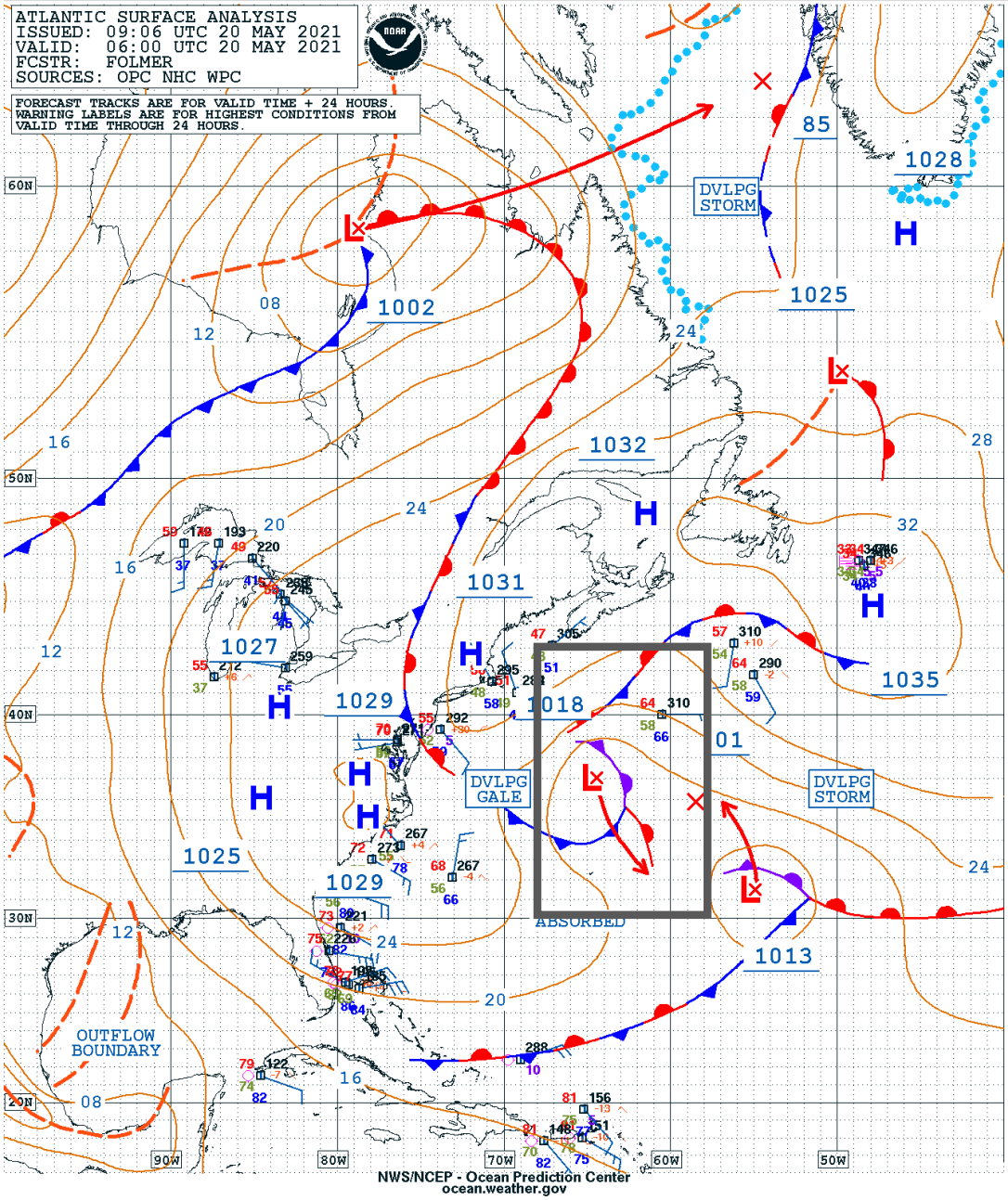


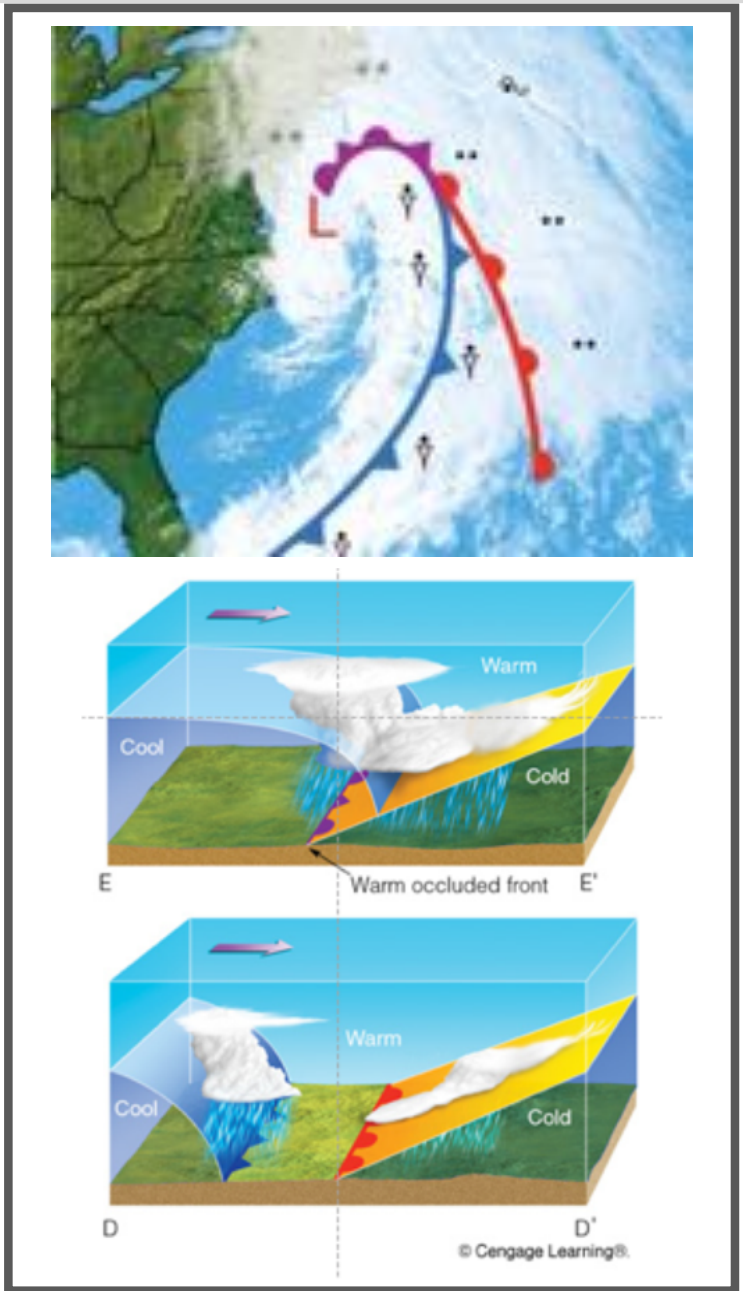


- Symbology always points away from air type
- Clouds will vary
- Precipitation intensity will vary

3 types of Low pressure systems:

1. Mid-latitude Low – occluded front





3 types of Low pressure systems:
2. *Cut-off Lows*

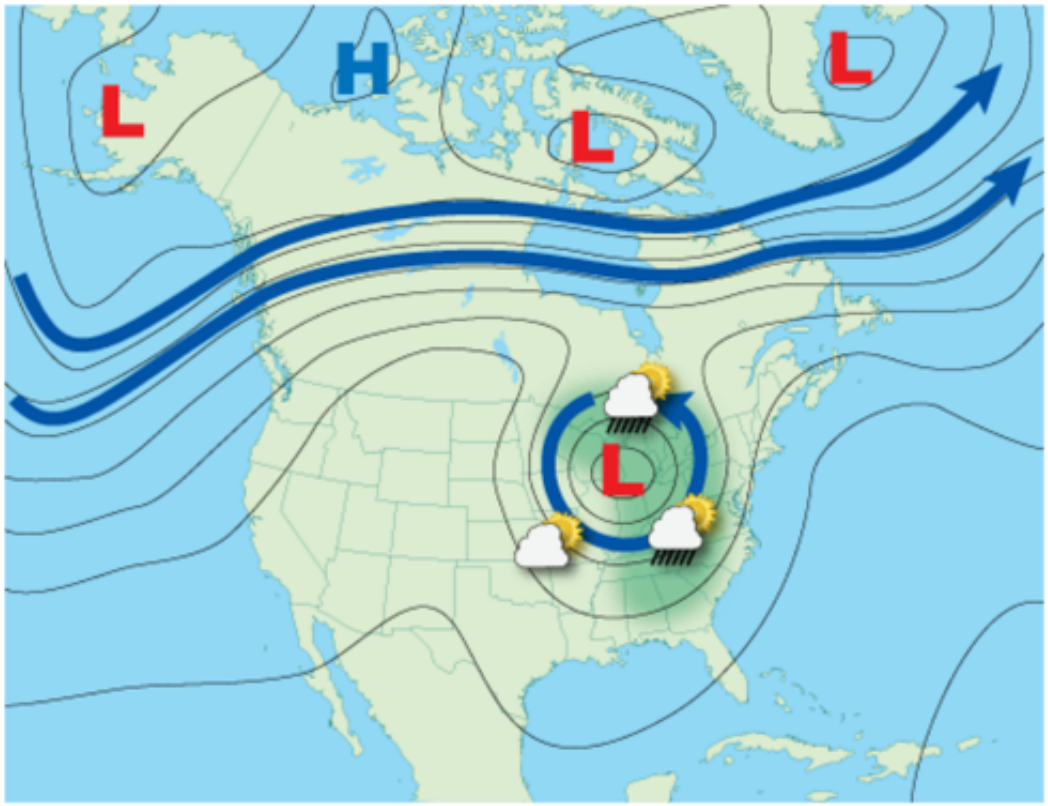


Image source: https://www.weather.gov/jetstream/basic, accessed 03/29/19

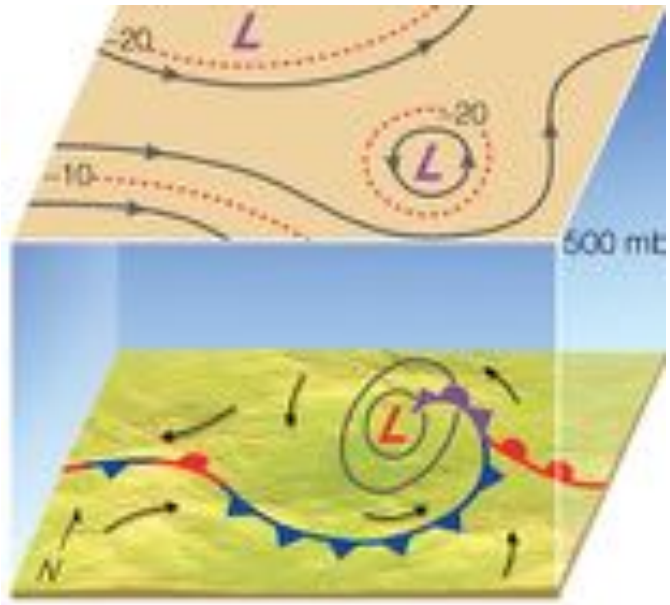
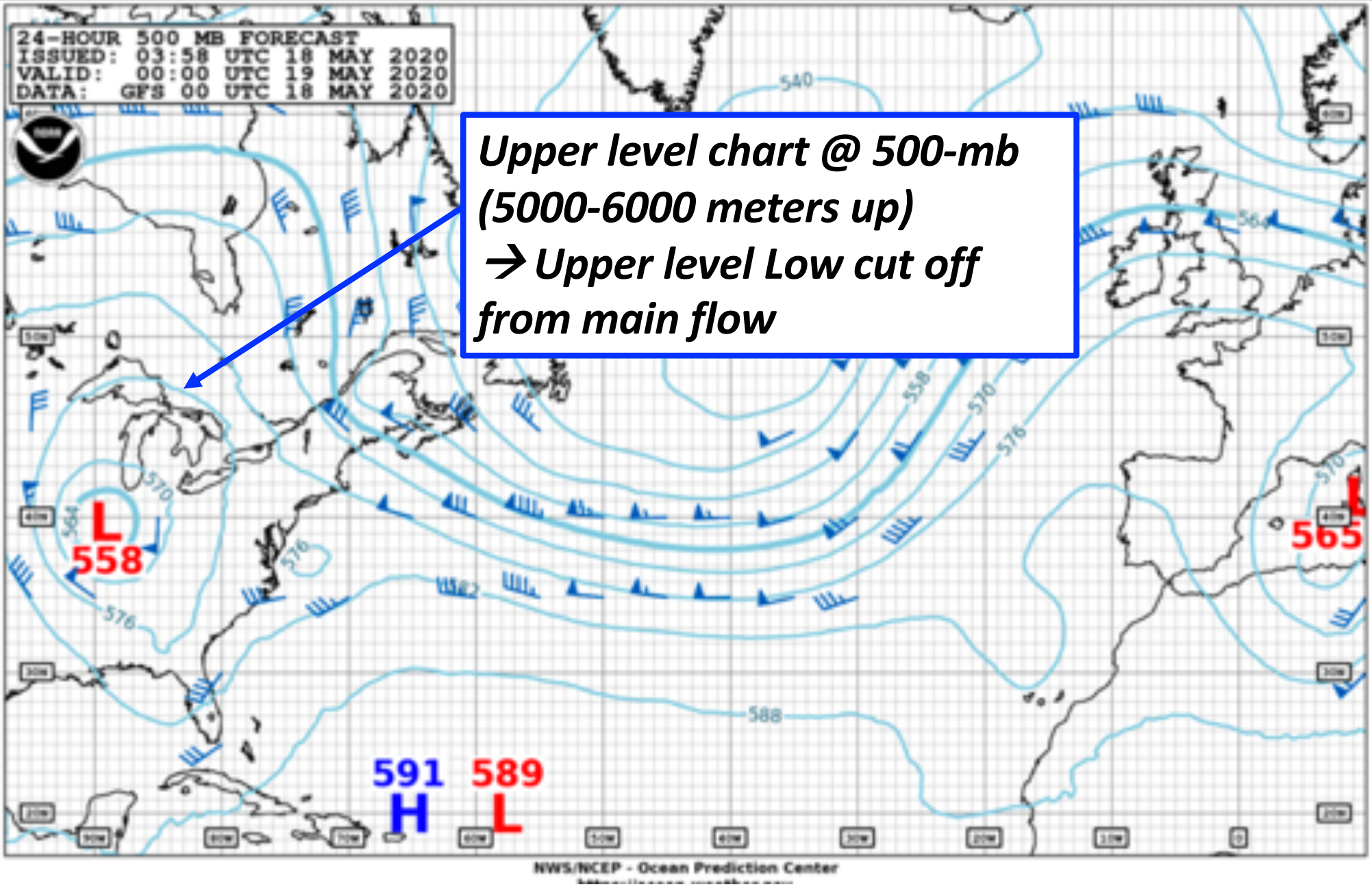


Figure courtesy of *Meteorology today, 11th edition*, Ahrens, 1th edition, 2016

- *"Cut-off low, weatherman's woe"* → move very slowly & can drift for many days
- Challenging to forecast
- Unsettled weather in east and northward quadrants of the low

3 types of Low pressure systems:

2. *Cut-off Lows*



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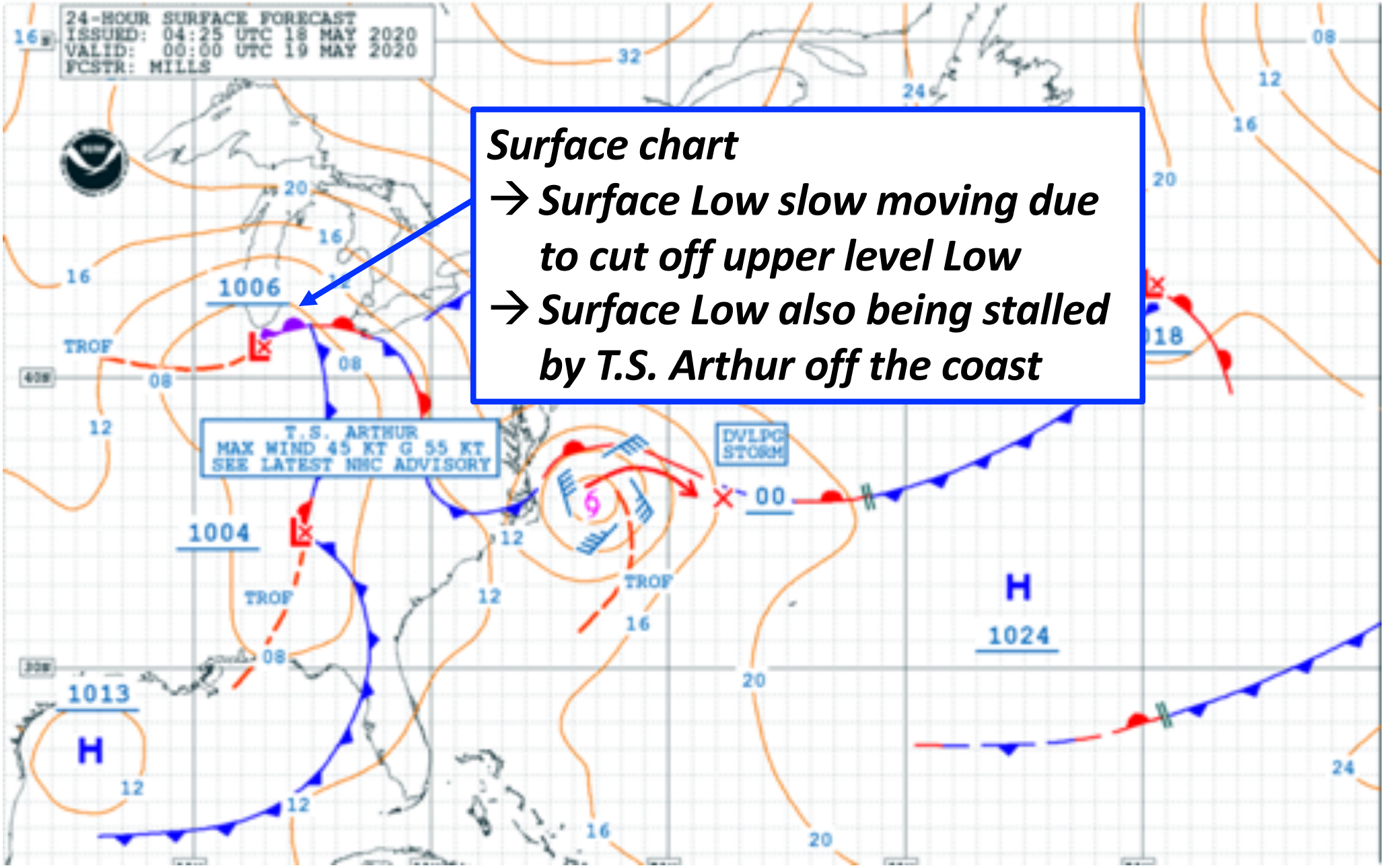


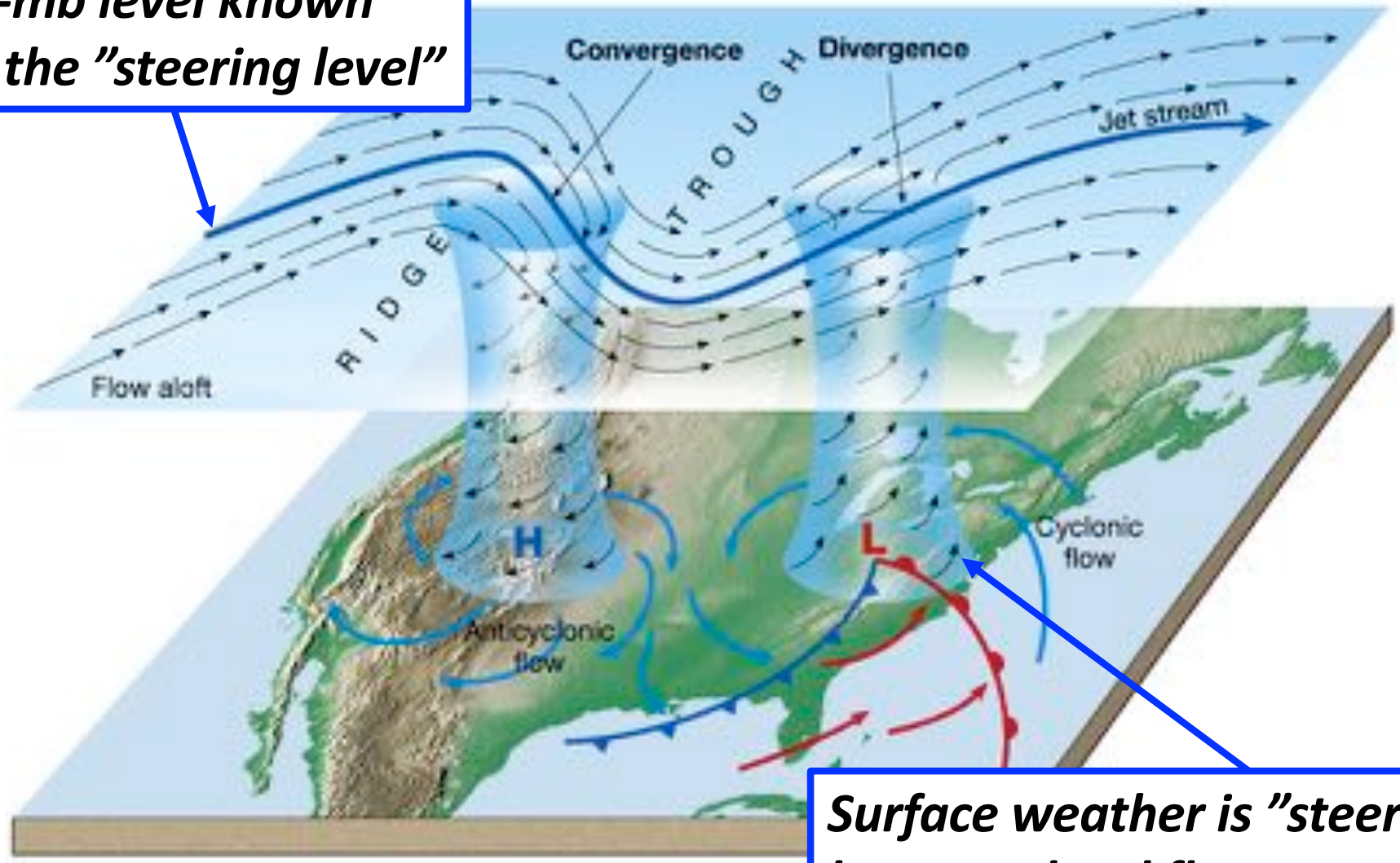
Surface chart

→ Surface Low slow moving due to cut off upper level Low

→ Surface Low also being stalled by T.S. Arthur off the coast

3 types of Low pressure systems:
500mb Chart vs. Surface chart

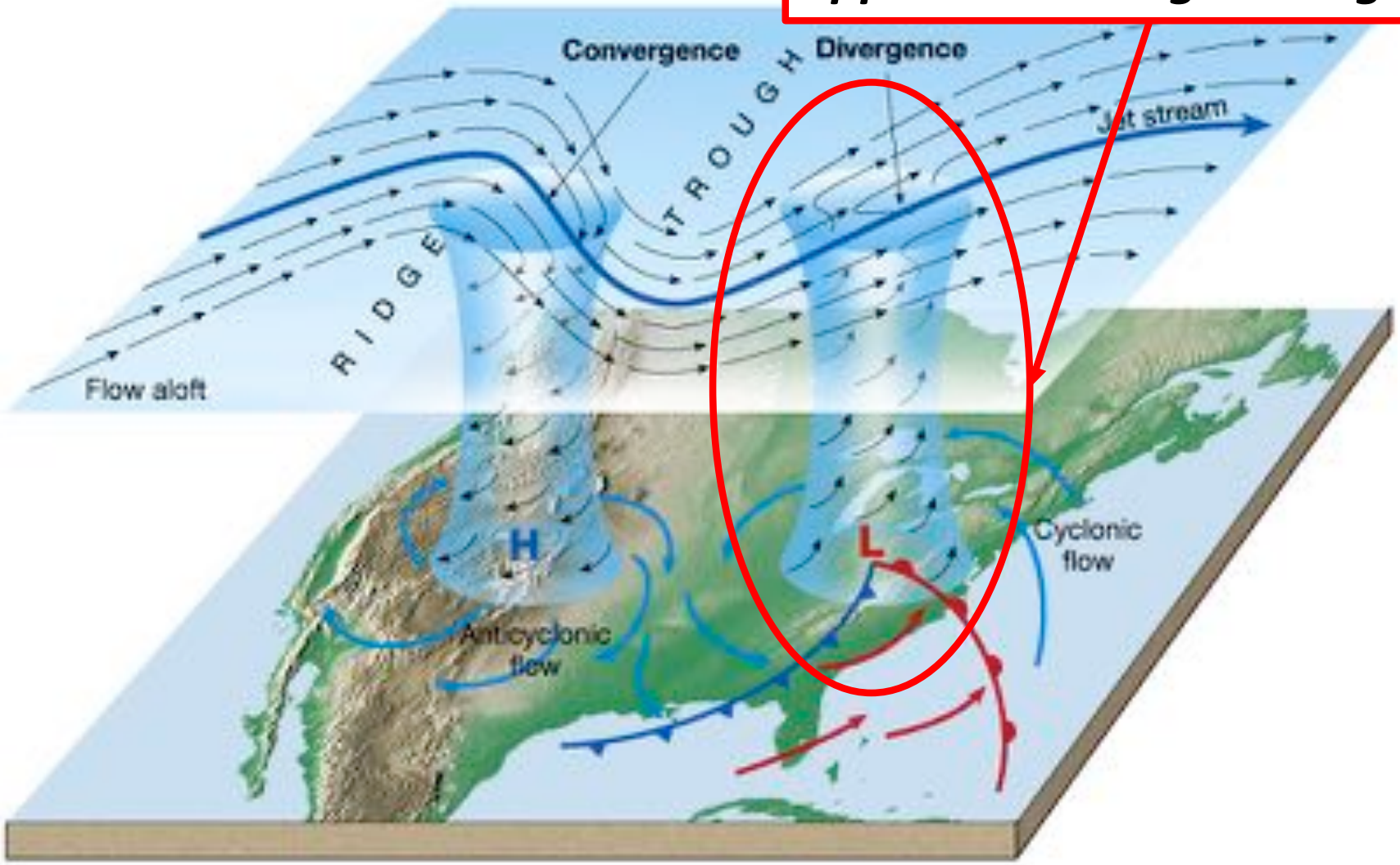
500-mb level known has the "steering level"



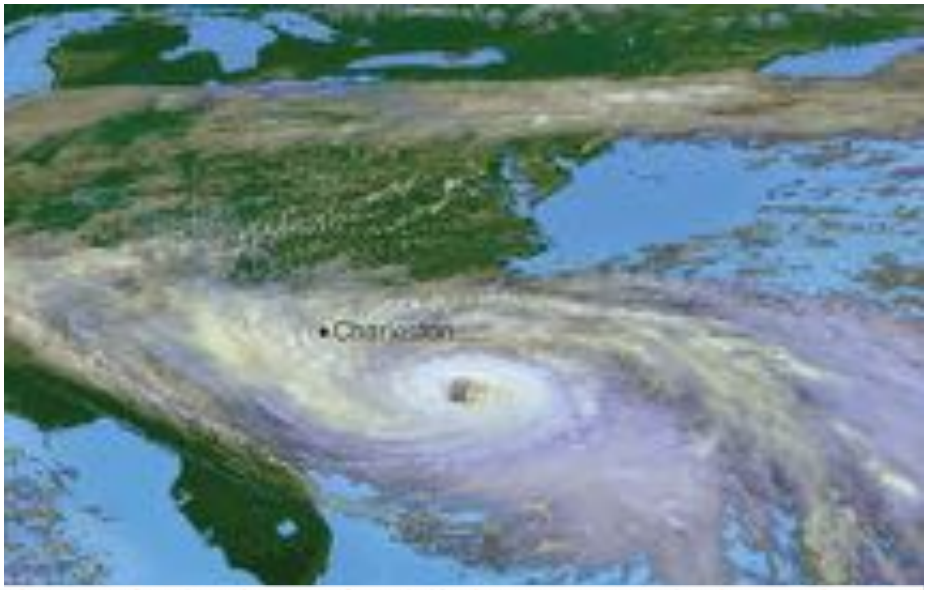
Surface weather is "steered" by upper level flow

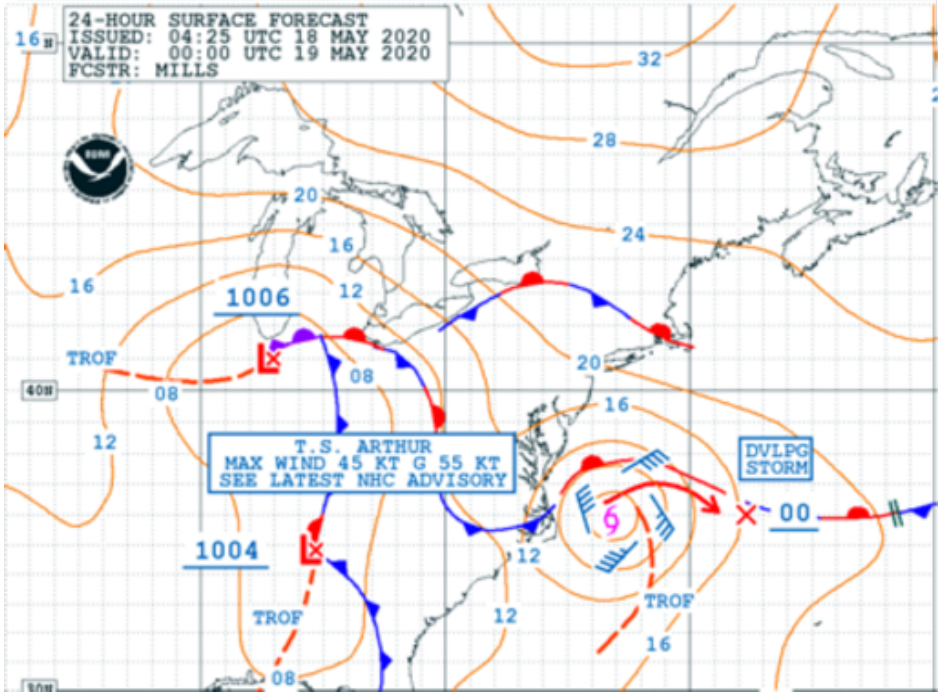
3 types of Low pressure syst
500mb Chart vs. Surface cha

Ideal placement for a surface low pressure to strengthen & develop → located between a upper level trough & ridge



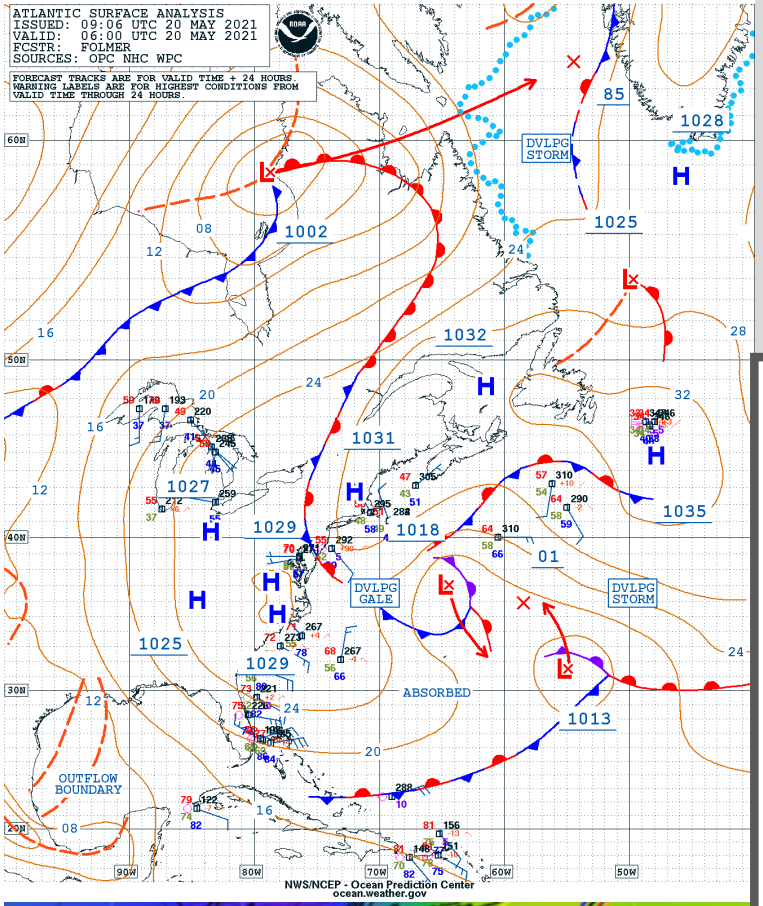
3 types of Low pressure systems:
3. *Tropical Lows – cyclones/hurricanes*

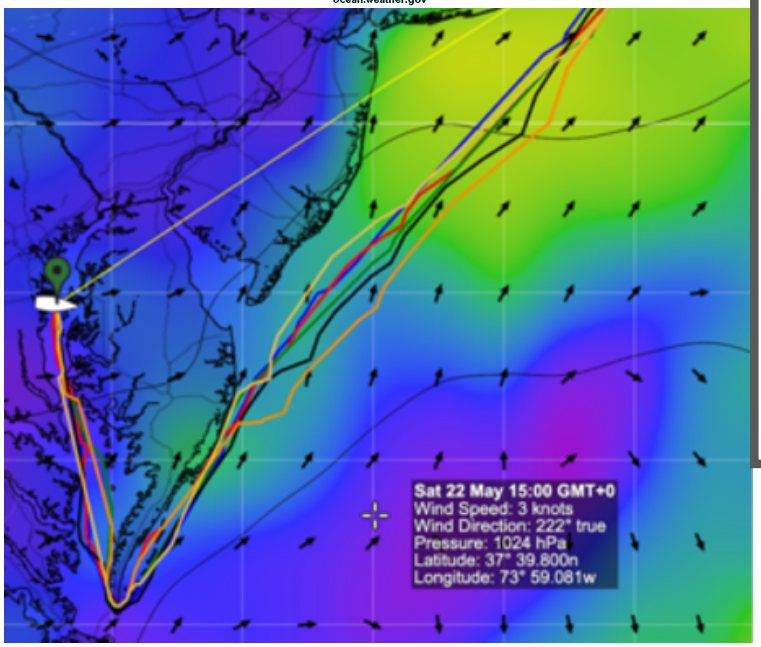




- Storms fueled by warm tropical waters
- Hurricanes are really tropical cyclones
- Atlantic hurricane season is June 1st – Nov 30th

→ Tropical storm: sustained winds 34-63 knts
→ Hurricane: sustained winds > 64 knts





Weather Forecasting Basics

AYC A2N virtual seminar, 22nd May 2021

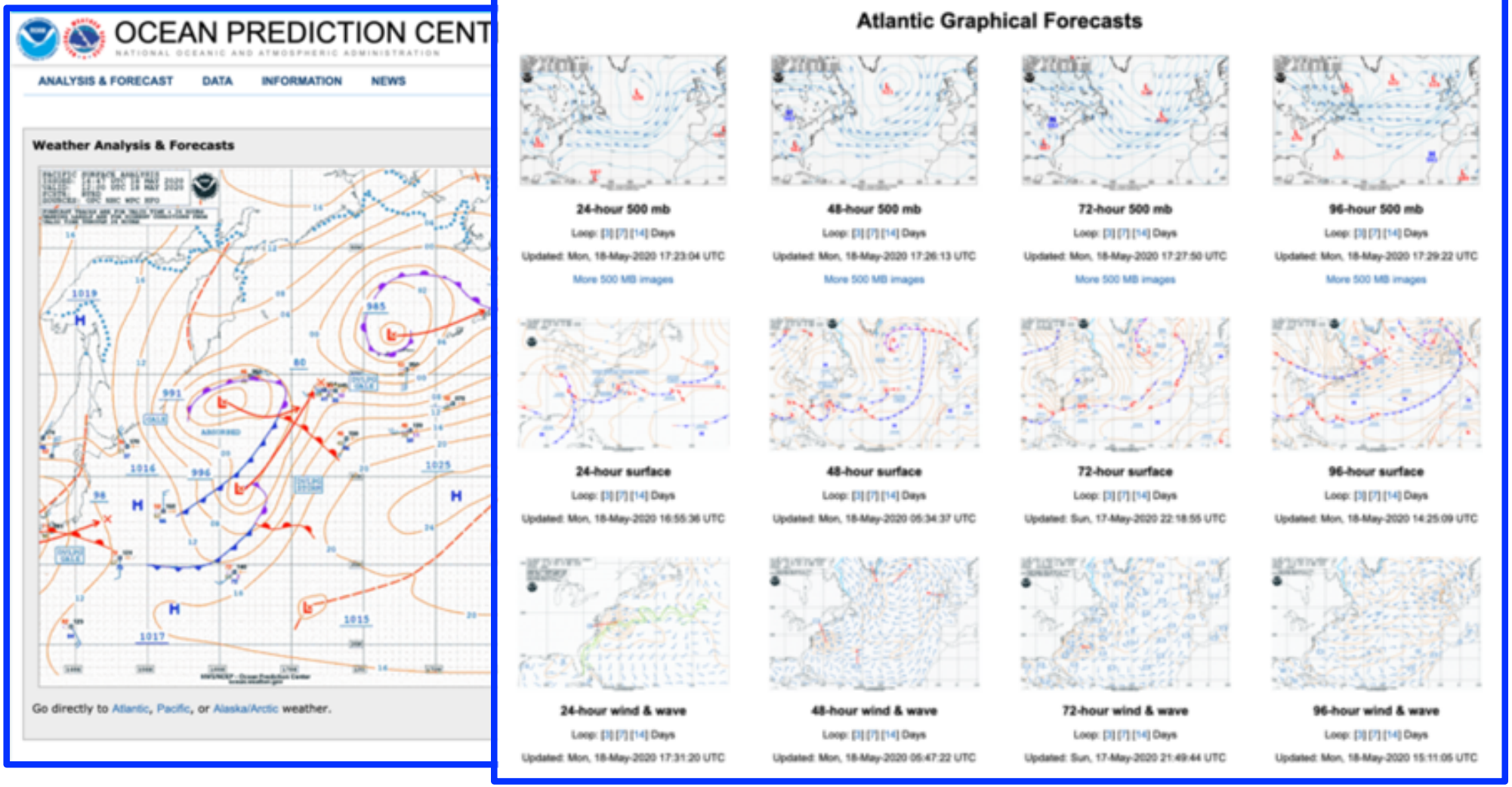
Session goals:

- ✓ NOAA watches, warnings & sites
- ✓ Wind flow around surface Highs & Lows
  - 3 types of Lows to look out for
  - Weather on the ground?
  - **Weather chart analysis**
- ■ Weather resources

Dr. Gina Henderson
Oceanography Dept., USNA
ghenders@usna.edu

NOAA Ocean Prediction Center charts:

- NOAA Ocean prediction center website: https://ocean.weather.gov/



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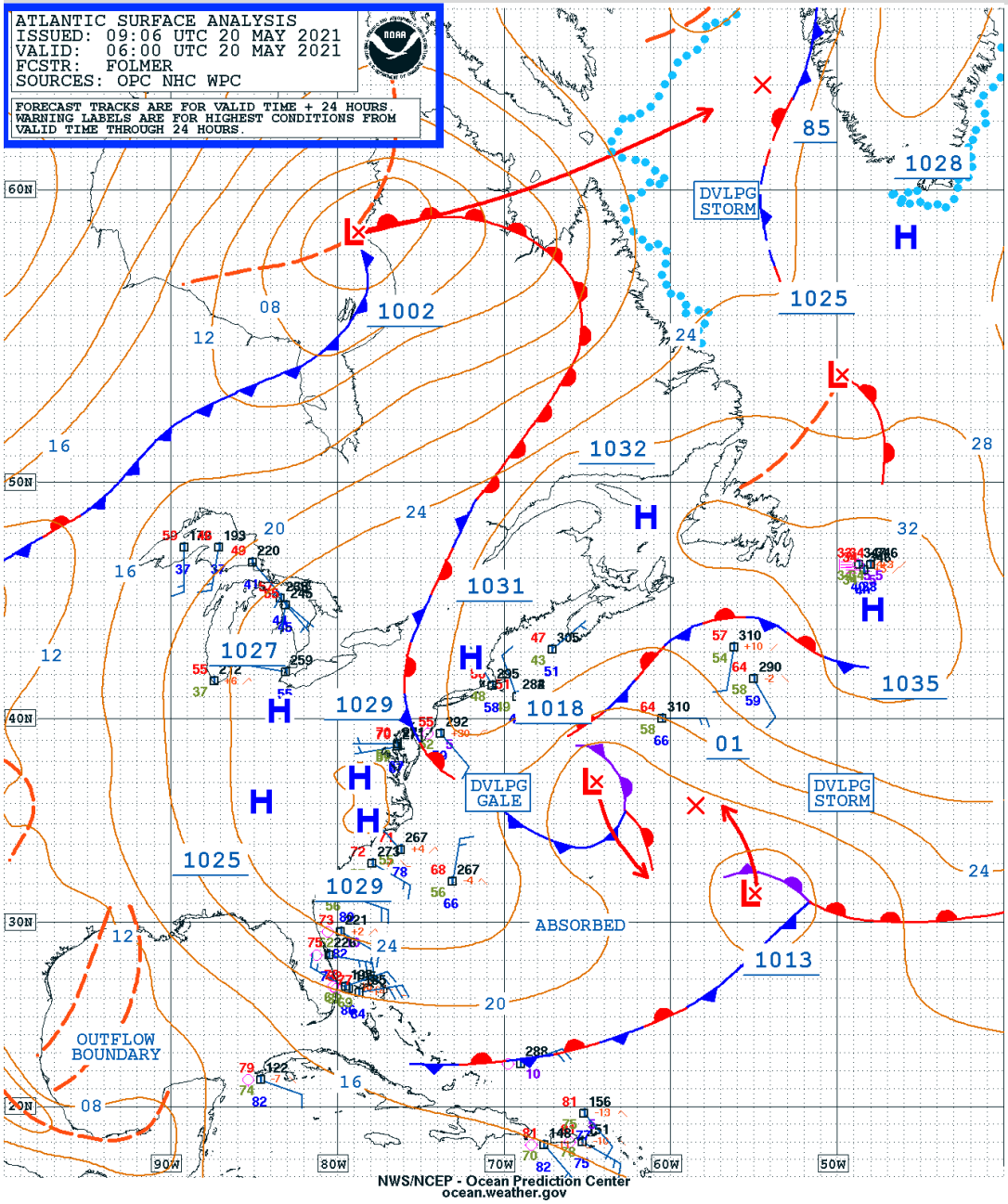

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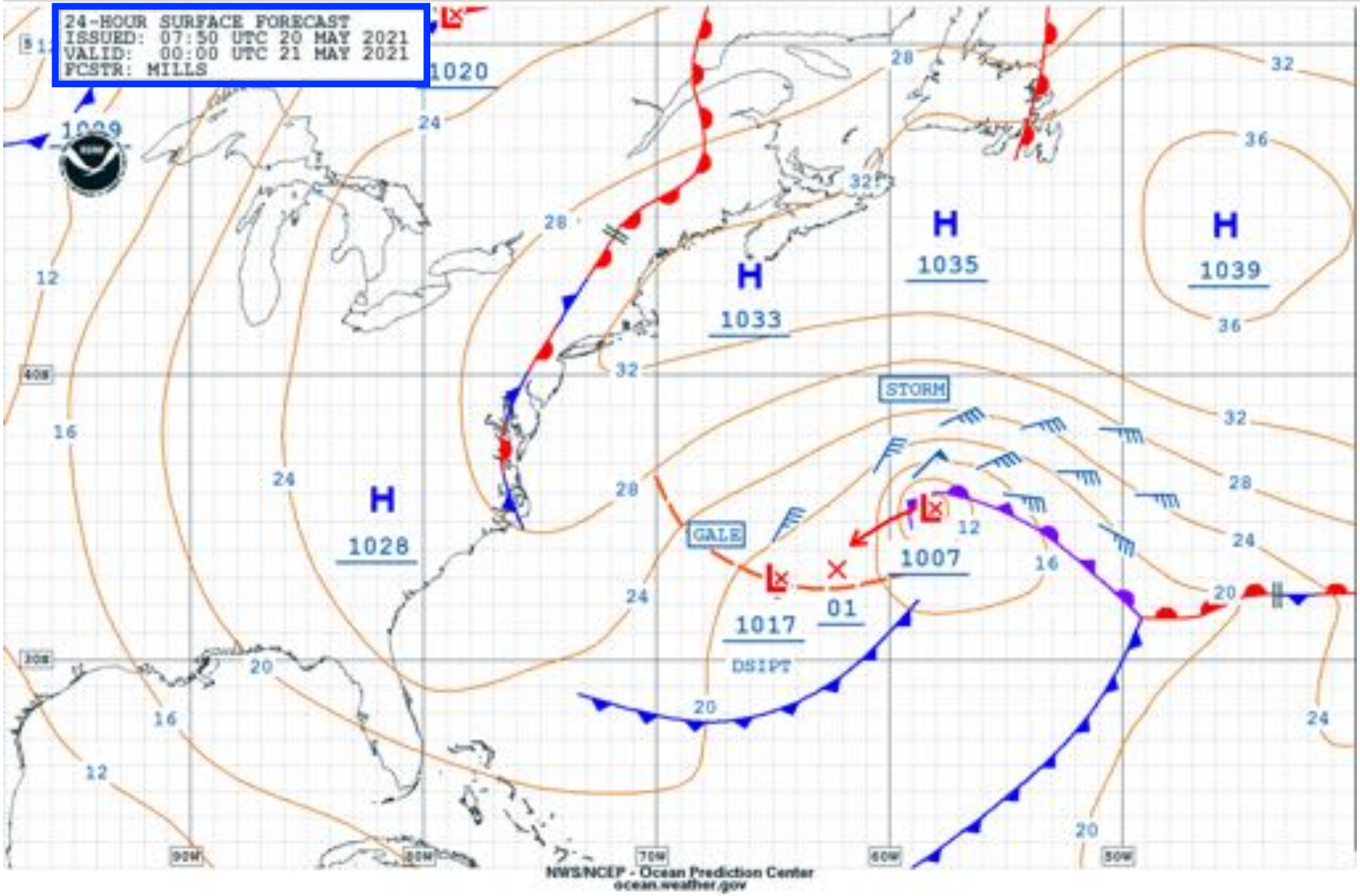

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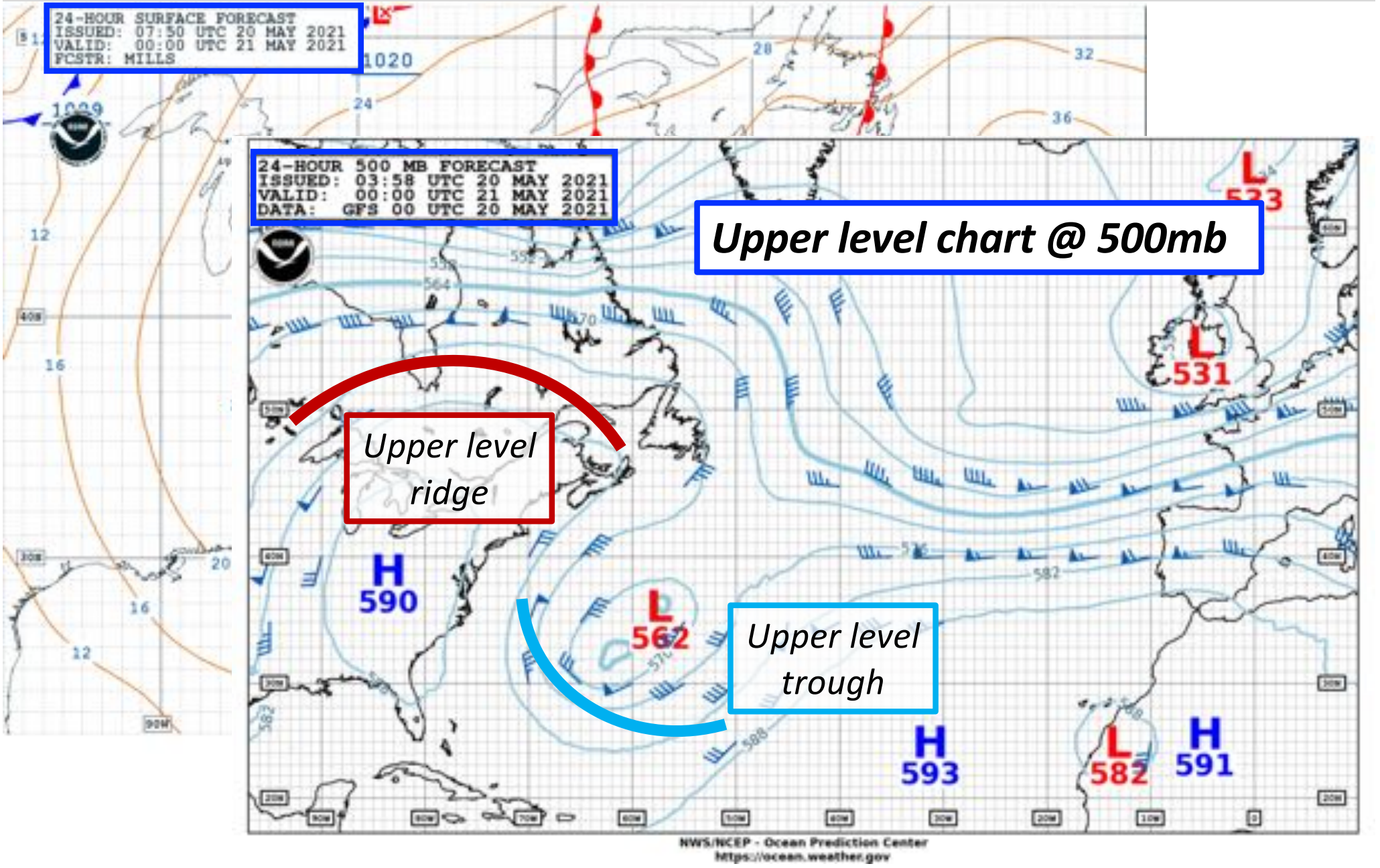
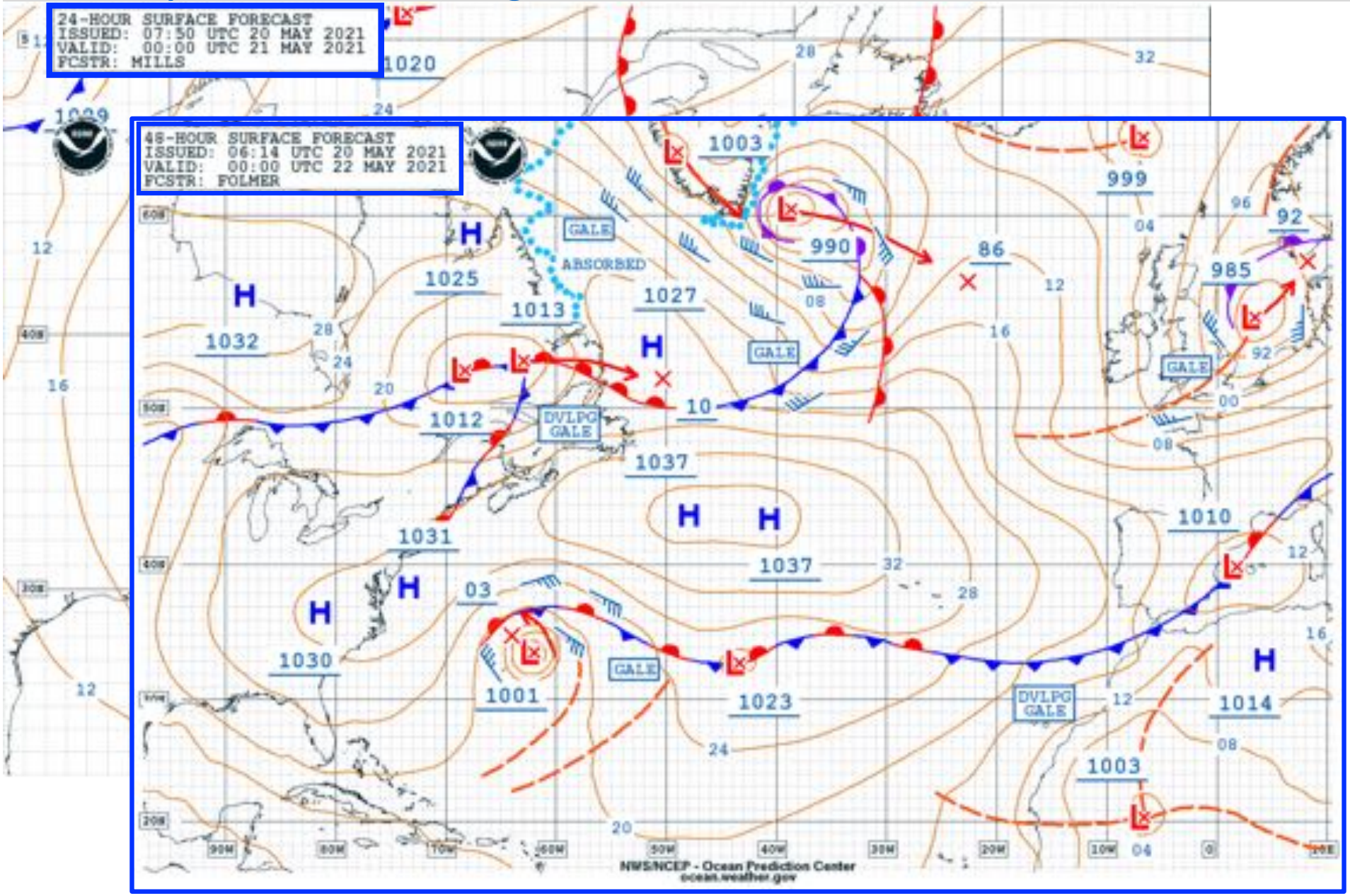
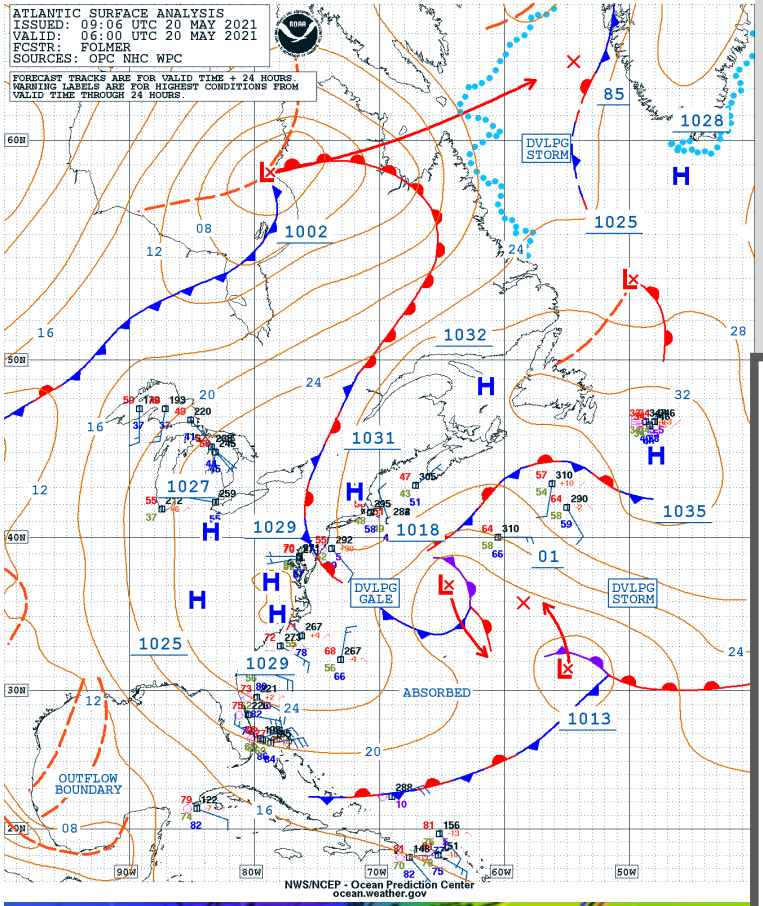


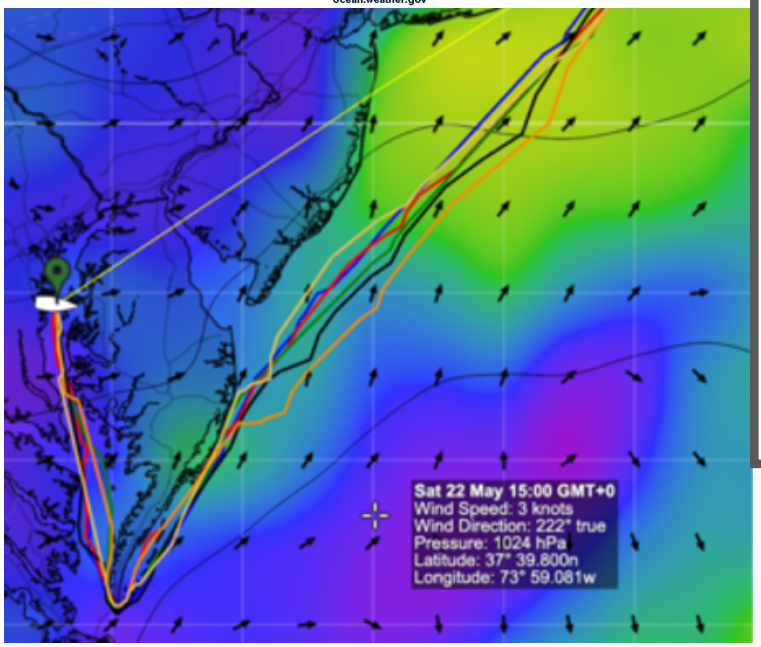
NOAA Ocean Prediction Center charts:

24hr, 48hr, 72hr, 96hr forecast charts available for all OPC products

https://ocean.weather.gov/







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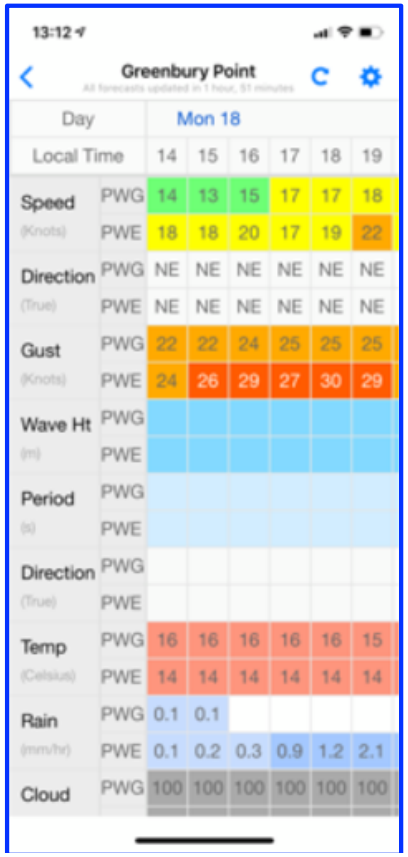
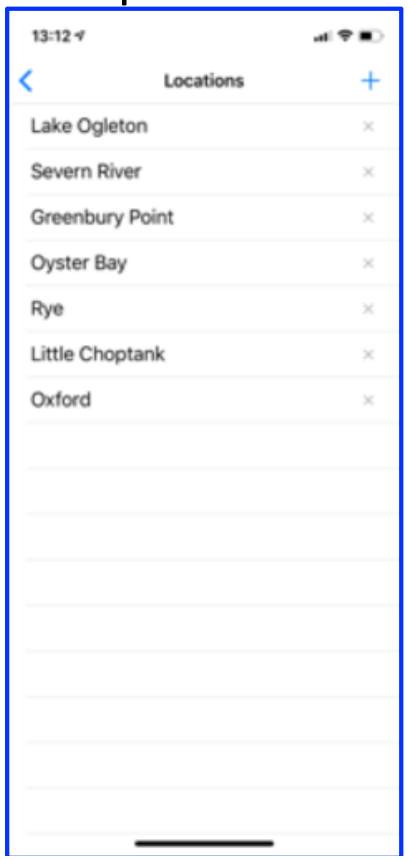
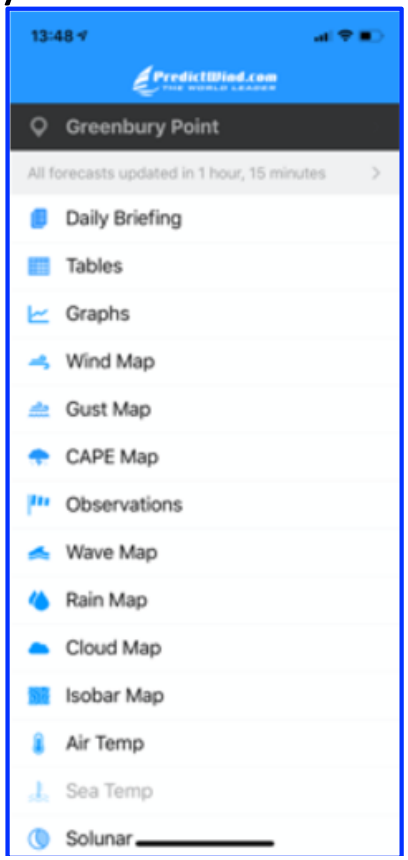
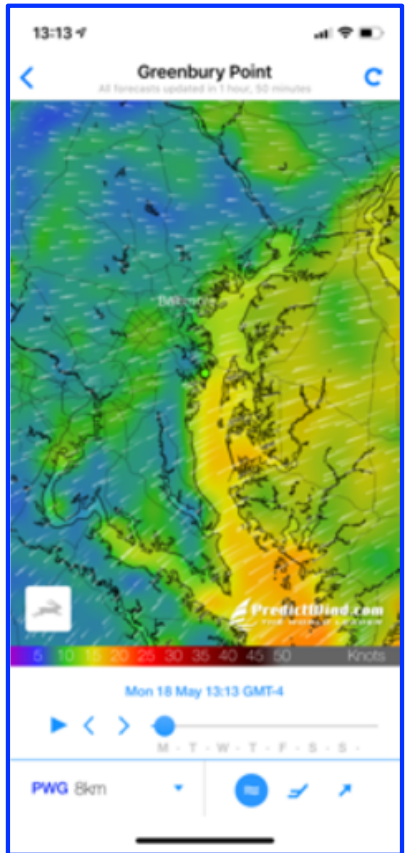
Some favorite weather resources…..

- National weather service website: https://www.weather.gov/
- NOAA Ocean prediction center website: https://ocean.weather.gov/
- Predict wind app & website: http://www.predictwind.com/
  - Premium version has a fee, free version is pretty good
  - Can load multiple locations as your favorites









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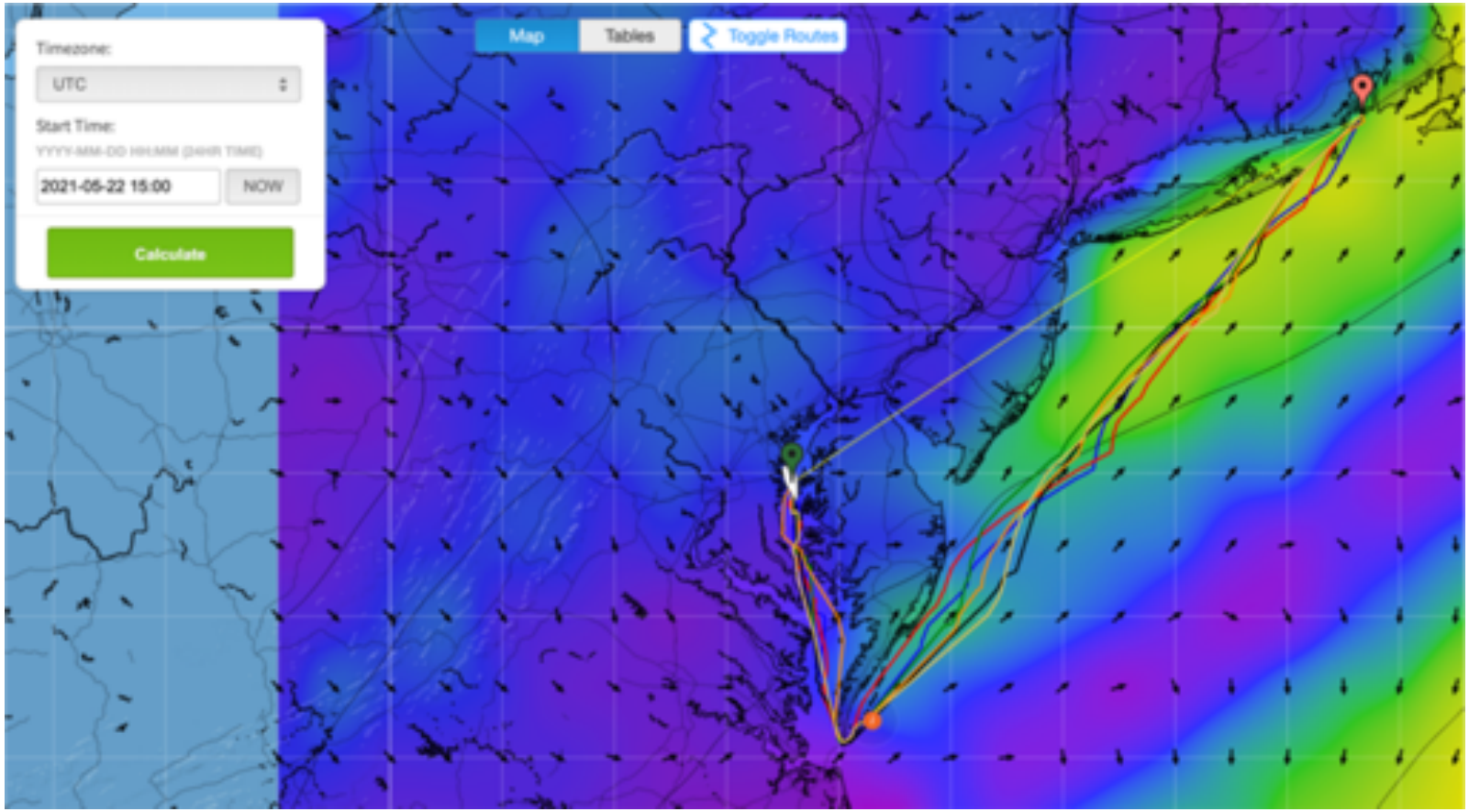
  - Weather routing in premium version
  - Instruction video: https://help.predictwind.com/en/articles/2884532-how-to-use-weather-routing-on-the-website



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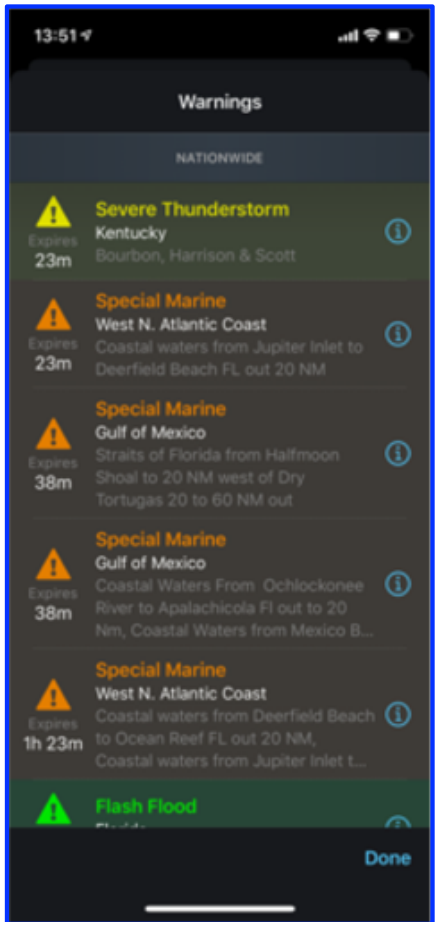
- Sailflow app & website: https://www.sailflow.com/
- Windy app & website: https://www.windy.com/

Some favorite weather resources…..

Radar apps

- Radarscope app: https://www.radarscope.app/
  - Has 1-time fee
  - Great for real time radar



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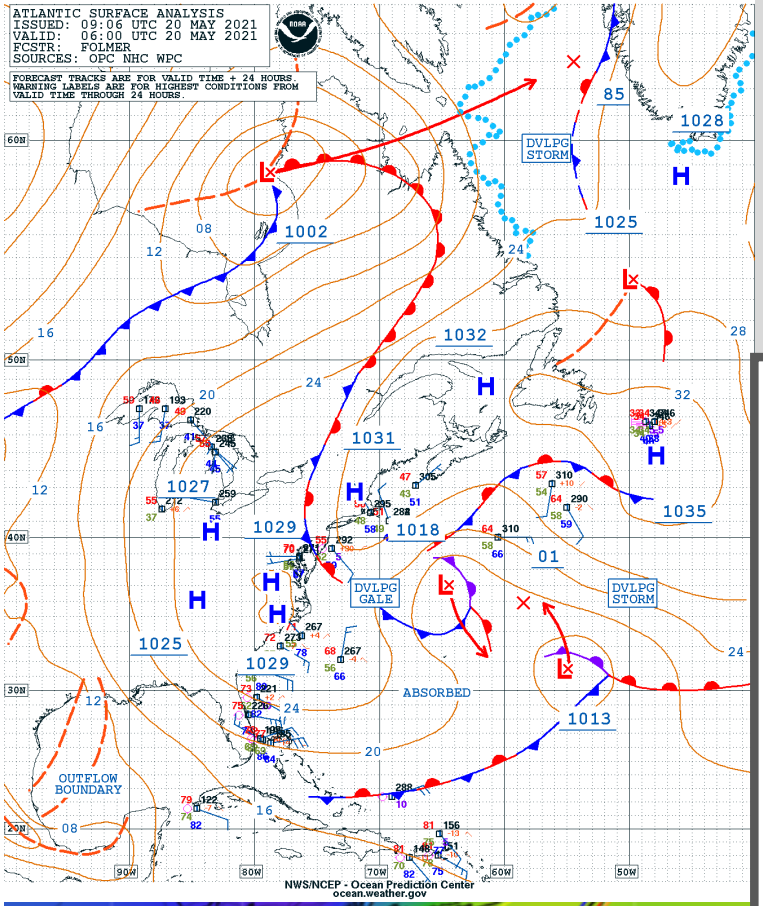
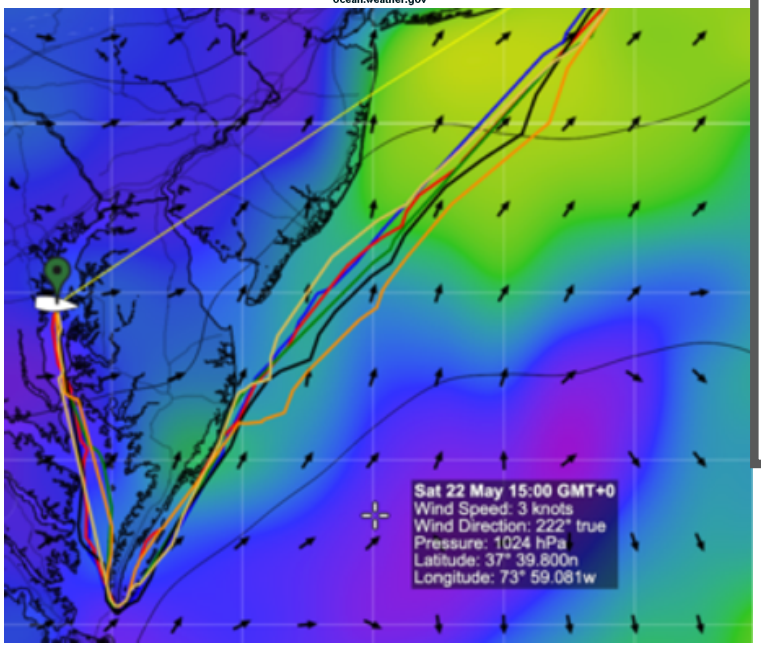
  - Great for real time radar
- NOAA weather radar app





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