



Gulf Stream Note #2

The Gulf Stream Near The Rhumb Line - New England to Bermuda May 29, 2025

An Analysis of Conditions

W. Frank Bohlen (Bohlen@uconn.edu)
Mystic, Connecticut

The dynamic changeable character of the Gulf Stream in the area adjacent to the New England to Bermuda rhumb line, observed over the past few months, continued throughout May. The deep meander in sea surface temperatures (SST) as the main body of the Stream crossed the rhumb line in early May (Fig. 1) was essentially erased by May 20th (Fig. 2) as the meander progressed rapidly to the east. Within the next seven days the next limb of the meander had crossed the rhumb line resulting in flows from the southwest to the northeast on the ascending limb across the line (Fig.3). This evolution in form also served to move the northern limit of the Stream closer to New England.

The altimetry based currents model provides clear indication of the flows associated with these SST patterns. On May 20 the current crossing the rhumb line was nearly linear proceeding from west to east (Fig. 4). By 27 May the advancing meander caused flows across the rhumb line to rotate counterclockwise resulting in main body currents proceeding from the southwest to northeast for a distance of approximately 30nm to the west of the rhumb line(Fig.5). Further to the west across 70° W currents remain nearly east-west.

Comparing the satellite SST image (Fig.3) to the results provided by the GRTOFS model (Fig.6), to gain some confidence in the model, shows reasonable agreement both east and west of the rhumb line. In contrast the results of the Mercator Ocean Model (Fig.7) differ substantially from the satellite image similar to the situation discussed in the May 8 Analysis . Again the reason for this difference is not immediately apparent.

Comparing modeled currents provided by the GRTOFS (Fig.8) to the altimetry based model results (Fig.5) also shows reasonable agreement. Currents in the main body of the Stream crossing the rhumb line at a point approximately 250nm from

Newport, proceed from the southwest to the northeast. Stream width in this area is approximately 50-60nm. To the southeast towards Bermuda flows are affected by two counter rotating features one west of the rhumb line and the other to the east. The eastern counterclockwise rotating feature is a cold core ring and expected to drift progressively to the west. However, a comparison to the May 8 Altimetry, discussed in the first Note, to the May 29 plot (Fig. 5) shows very little movement with the ring stationary near 35° N 69° W. As for the clockwise rotating feature to the east, similar in form to a warm core ring but most likely here simply a turbulent flow feature affected by the main body flows, it too has been nearly stationary over the past three weeks or so. The combined result of these features is an extensive area of adverse current along and adjacent to the rhumb line from the main body of the Stream to well south of 35° N (Fig.5). The situation changes slowly to the south of 34° N as the effects of a cold core ring centered near $33^{\circ} 30'$ N 64° W begin to dominate the flow field. This feature has drifted to the west over the past three weeks slowly closing in on the rhumb line. It warrants careful monitoring.

Monitoring Gulf Stream position, form and associated currents over the past month has provided clear indication of the value of early and careful study. The rapid change in the meander pattern, differing substantially from the expected regular progressive migration to the northeast, similar to a water surface wave under the influence of the wind is to some extent unique. Some of this has been observed previously, favoring the increase rate of formation of warm core rings which have affected inshore water temperatures. What differs in this round is the rates of change resulting in substantial changes in the location of the north wall of the Stream crossing the rhumb line and modifying flow patterns and direction. The possibility that flow features might change substantially in a matter of days is a factor that must be carefully considered when planning Race strategy. What is the potential for this to happen and what is the extent of the possible risk to my plan? These questions are best answered by study extending over several months before the Race and incorporating historic data from previous Races. Such preparation is essential.

GOES Sea Surface Temperature: May 03 2025 1230 GMT

Courtesy of RUCOOL and U. Delaware ORB Labs, no cloud correction applied

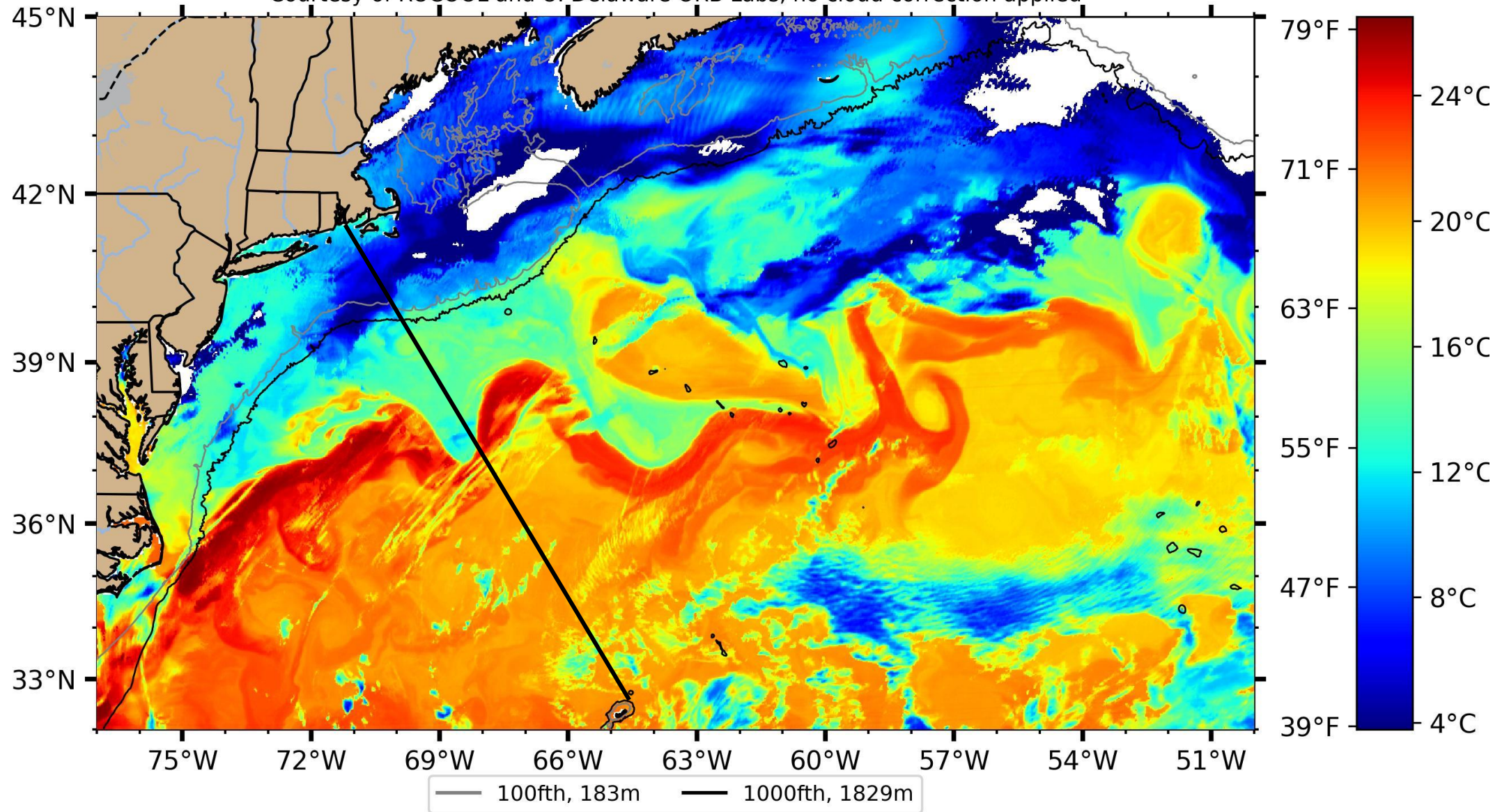


Figure 1 Satellite Image Northwest Atlantic Ocean Sea Surface Temperatures May 3, 2025

Source: <https://rucool.marine.rutgers.edu/>

GOES Sea Surface Temperature: May 20 2025 0930 GMT

Courtesy of RUCOOL and U. Delaware ORB Labs, no cloud correction applied

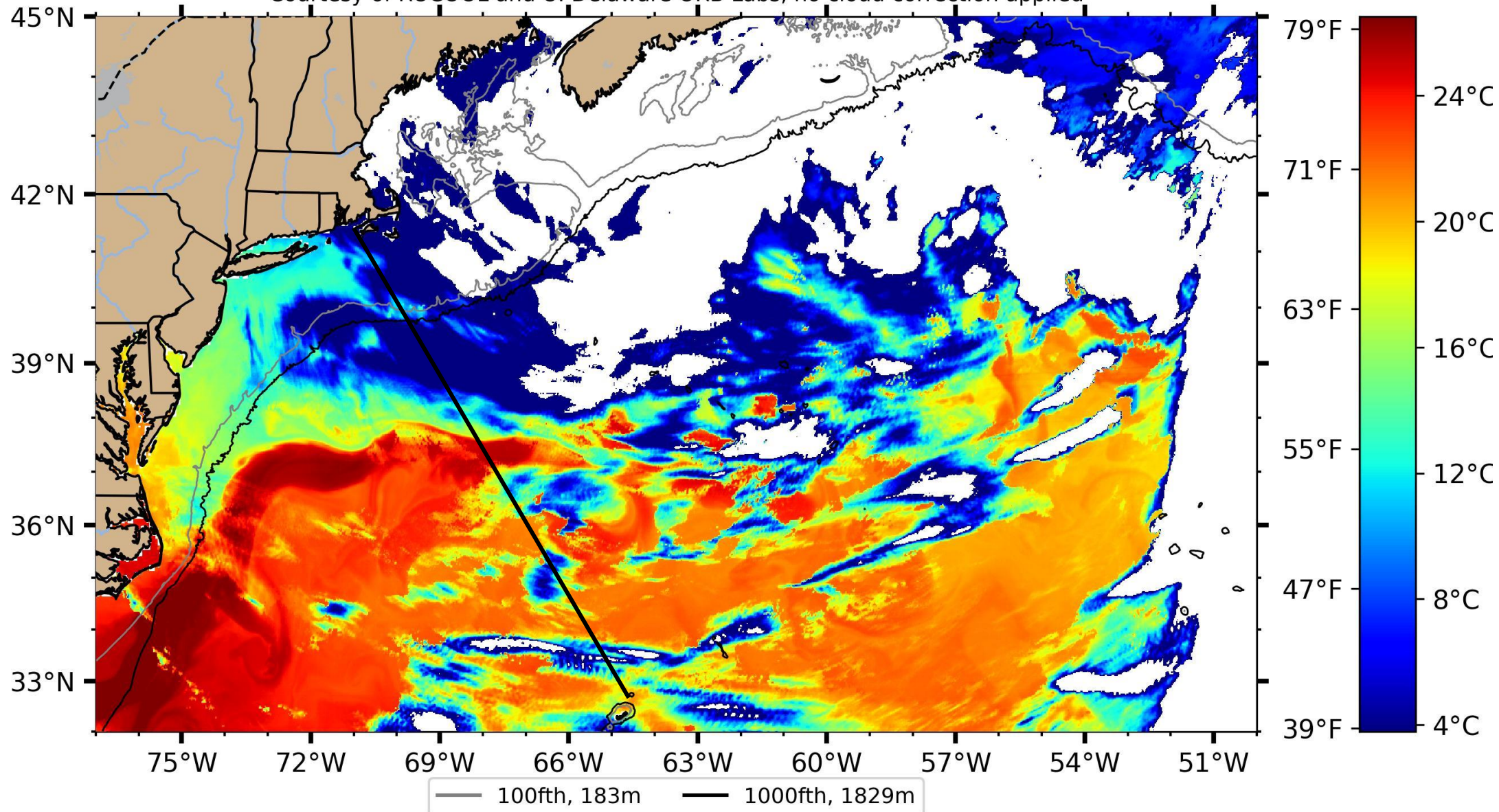


Figure 1 Satellite Image Northwest Atlantic Ocean Sea Surface Temperatures May 20, 2025

Source: <https://rucool.marine.rutgers.edu/>

GOES Sea Surface Temperature: May 27 2025 1355 GMT

Courtesy of RUCOOL and U. Delaware ORB Labs, no cloud correction applied

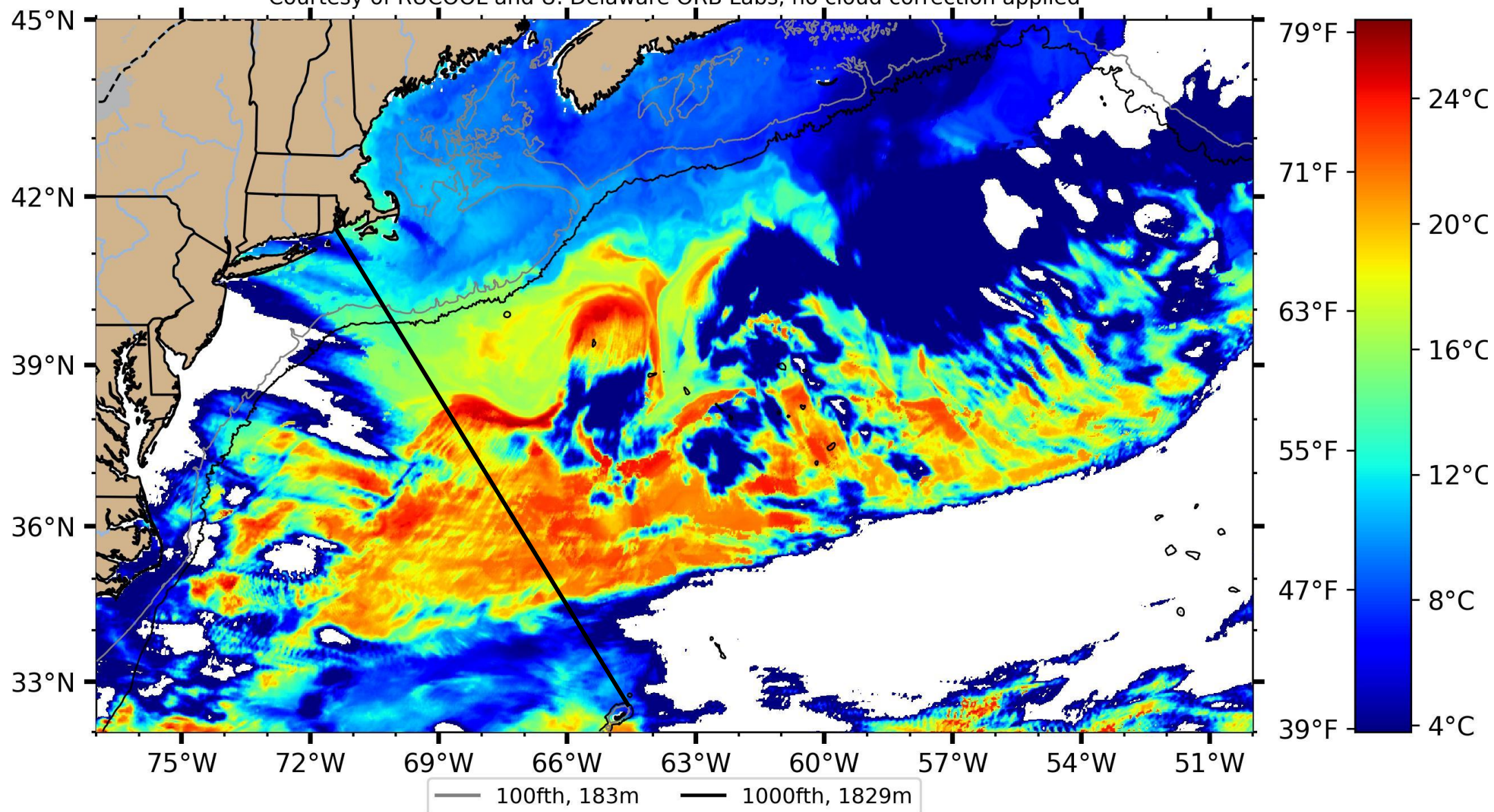


Figure 3 Satellite Image Northwest Atlantic Ocean Sea Surface Temperatures May 27, 2025

Source: <https://rucool.marine.rutgers.edu/>

MAY-22-2025

CoastWatch NOAA/AOML



Altimeter/GTS Interface

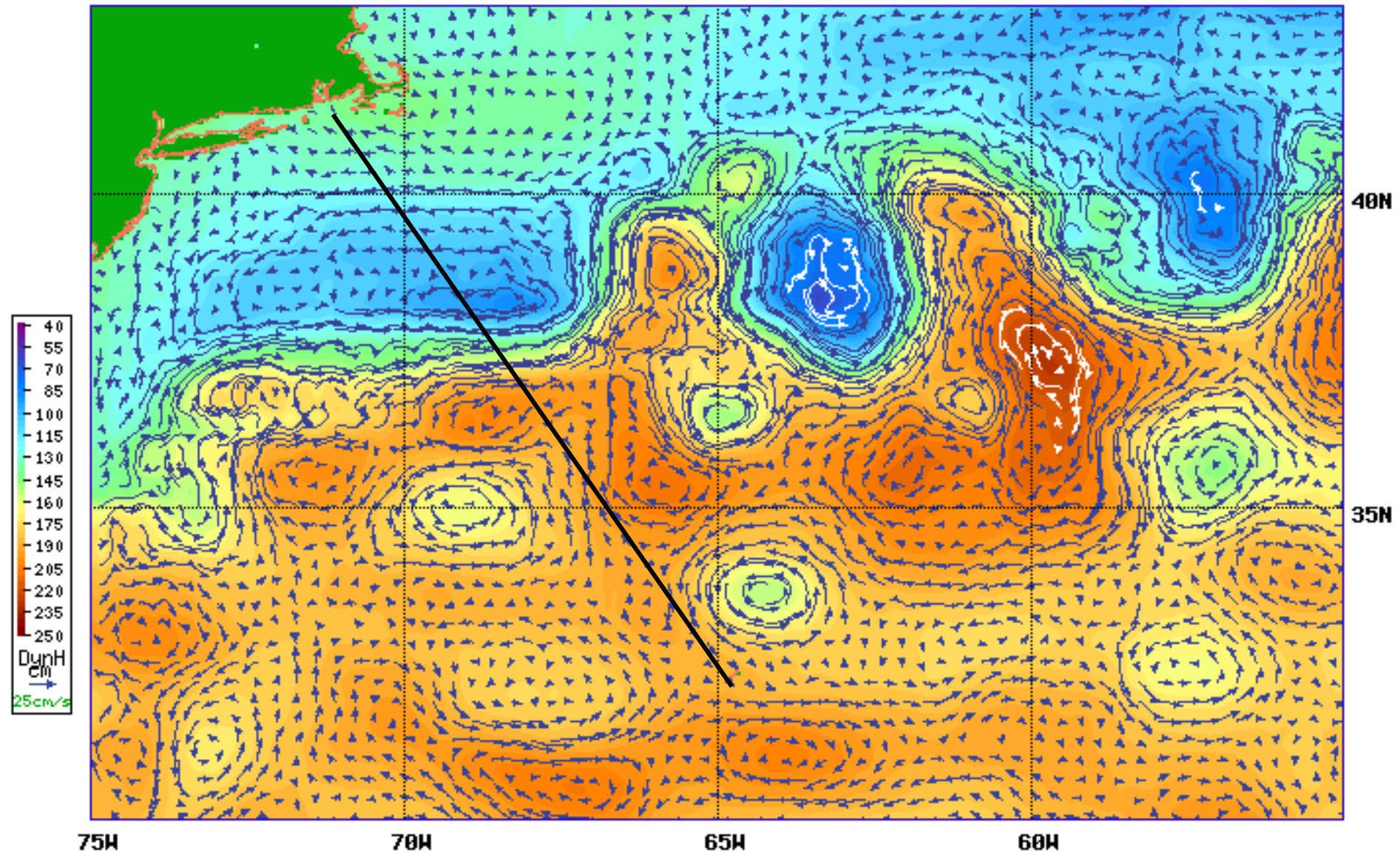


Figure 4 Northwest Atlantic Surface Currents- Altimetry Based Model May 22, 2025

Black Line Represents The New England to Bermuda Rhumb Line

<http://tinyurl.com/y93ku8m8>

MAY-29-2025

CoastWatch NOAA/AOML



Altimeter/GTS Interface

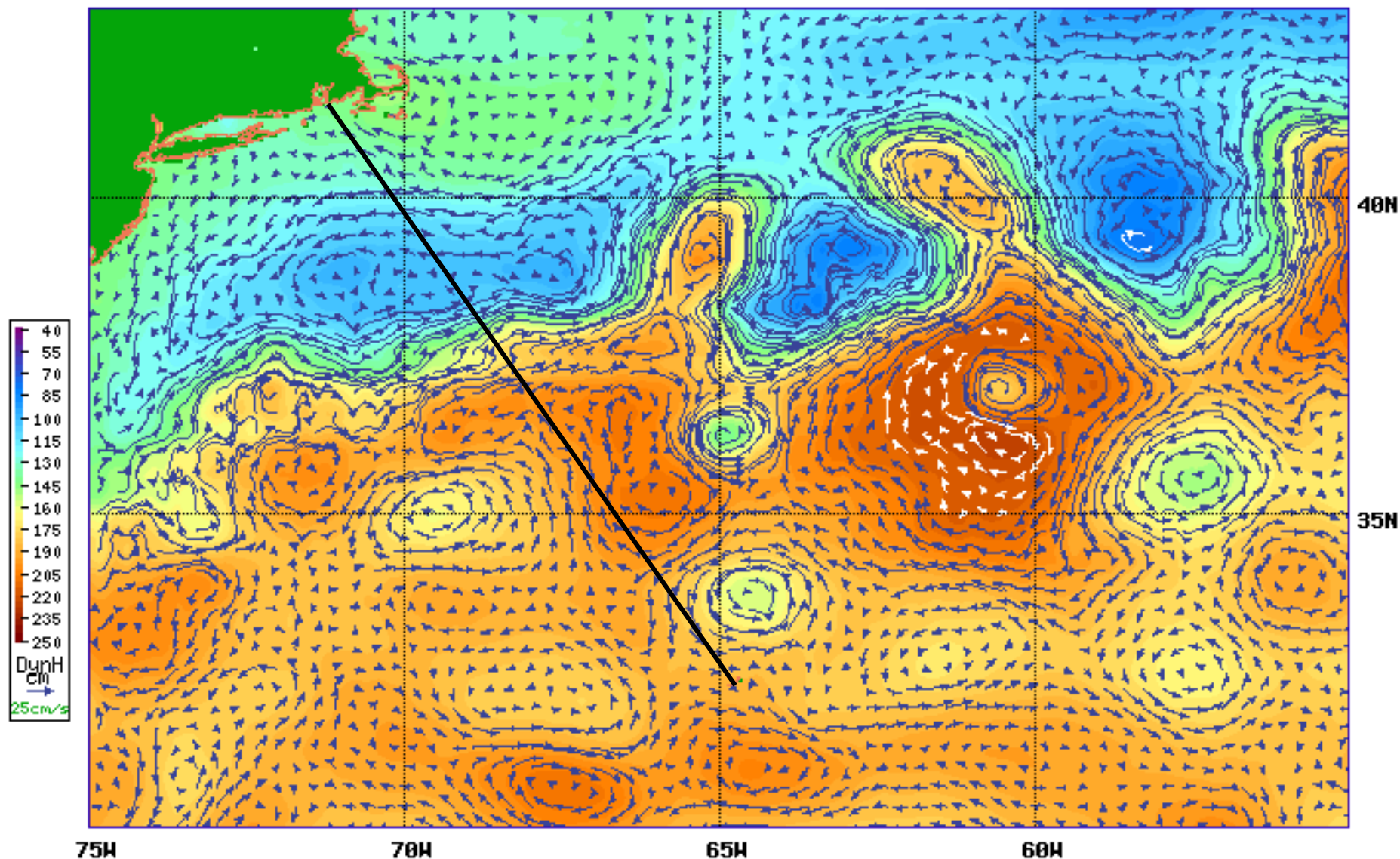
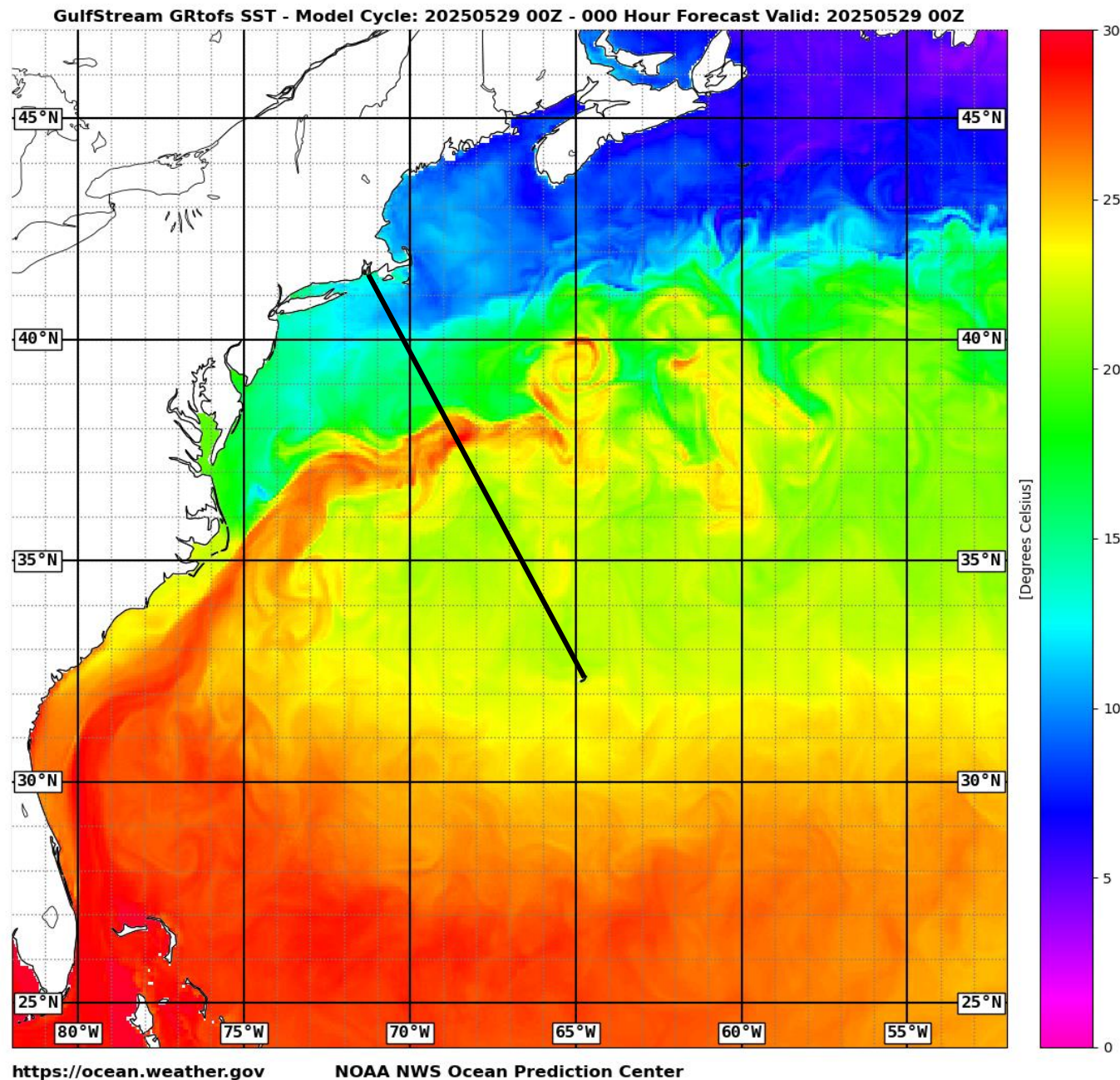


Figure 5 Northwest Atlantic Surface Currents- Altimetry Based Model May 29, 2025

Black Line Represents The New England to Bermuda Rhumb Line

<http://tinyurl.com/y93ku8m8>



<https://ocean.weather.gov>

NOAA NWS Ocean Prediction Center

Figure 6 Modelled Sea Surface Temperature - May 29, 2025
[Global RTOFS High Resolution Oceanic Model](#)

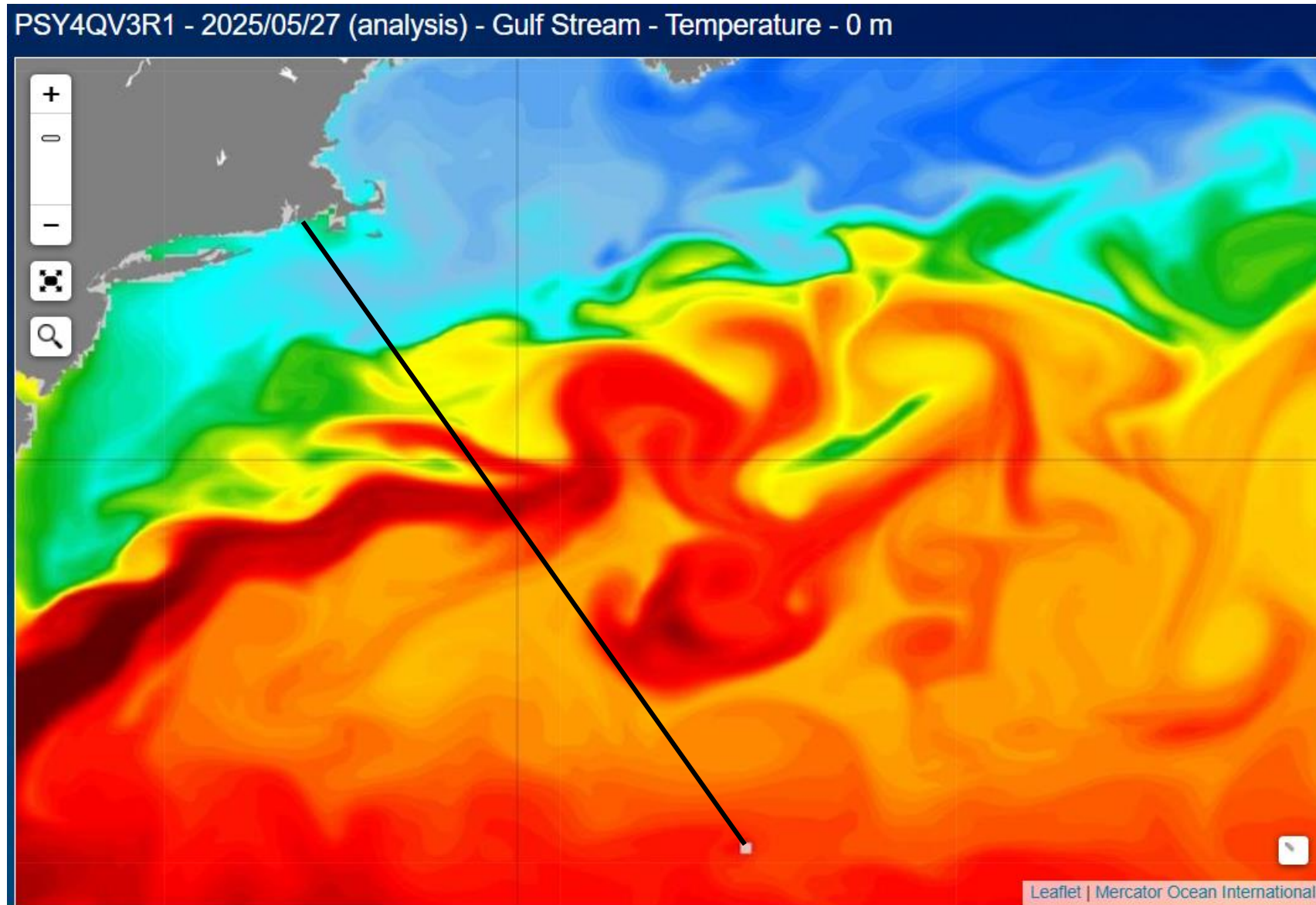


Figure 7 Gulf Stream SST Mercator Ocean Model May 27, 2025
[Daily Global Physical Bulletin at 1/12° - Ocean Forecasts - Mercator Ocean](#)

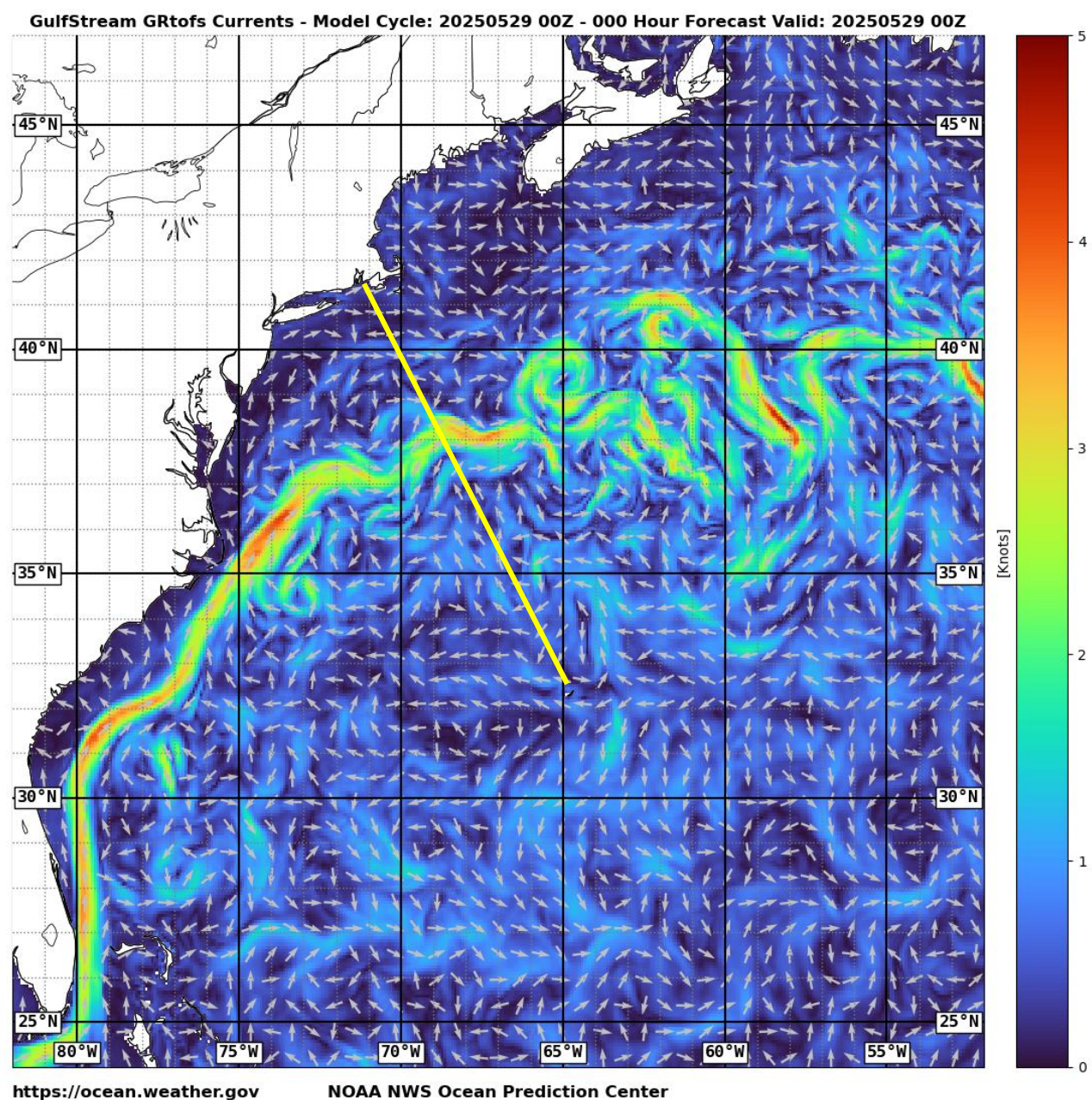


Figure 8 GRTOFS Gulf Stream Currents Model May 29, 2025

[GRtofs GulfStream currents f000.png \(1100×1100\)](#)