The Gulf Stream Near the Rhumb Line Newport-Bermuda June 19, 2024
An Analysis of Conditions

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In late May - early June (see GS Note #2) the north wall of the Gulf Stream was developing an evident meander with a crest west of the rhumb line (Figs. 1 and 2) Under normal circumstances this would be expected to migrate to the east and potentially provide a band of favorable currents on or near the rhumb line. The concern was that this year we might well not be operating under "normal conditions". Many of the meanders observed earlier in the Spring showed minimal migration and changed form rapidly, on the order of days. Such aberrant behavior, if it persisted, would make for a significant navigational challenge. Fortunately, observations over the past two weeks have shown more normal behavior with the crest of the early June meander migrating progressively to the east (Figs. 3-5) with little indication of deepening. By this morning, the four day composite showed the meander in close contact with the rhumb line. A more detailed one day composite from Rutgers (Fig.6) shows a more inclined intersection with the north wall crossing the rhumb line near 37^0 30'N 68^0 W or at a point approximately 270nm from Newport.

It's important to realize that the core of the current associated with the sea surface temperature patterns is located approximately 30nm in from the north wall. This is shown clearly in the altimetry based circulation (currents) model (Fig.7). This model indicates that maximum current is to be found along a line approximately 25nm to the west of the rhumb line with flows paralleling the line to a counter-clockwise turn near 37^0 20'N followed by the subsequent crossing of the rhumb line. Remember that these model results are approximately 2 days old (time required for data processing). The meander progression observed over the past 20 days or so would suggest that the core of the current might in fact be slightly closer to the rhumb line than indicated in the model.

Proceeding south of 37^0N towards Bermuda, the altimetry based model shows several cold core, counter-clockwise rotating, features two the north of 35^0 N (Fg.7). Both have been drifting slowly to the west (emphasis on slowly). The ring centered near 35^0 45' N 68^0 20'W is producing some adverse northwest going current along the rhumb

line with speeds of approximately 1.5kts. The area affected is relatively small, a factor that should be considered in routing. Further to the south, the ring centered near 34^0N 67^0 W represents a more formidable problem.

The southern ring with a diameter of more than 120nm straddles the rhumb line with maximum northwest going currents approaching 3kts affecting a 40-50nm portion of the line near 34^0 N. To the north and south of this area currents cross the rhumb line at near right angles east to west along the northern edge of the ring and west to east on the south. This ring has shown minimum movement over the past 10 days. Its size, siting and proximity to Bermuda may, depending on wind conditions, make it impossible to completely avoid.

Despite the appearance of relatively “normal” behavior it’s important to keep in mind the aberrant behavior of the past few months. Stream behavior and in particular, the development and evolution of meanders, has deviated significantly from historical patterns over the past ten years or so. The reason(s) are not well understood. For the navigator this means that strategies must take into account the possibility of rapid change- aberrant behavior- when assessing risk. “What if ?” is never to be overlooked.

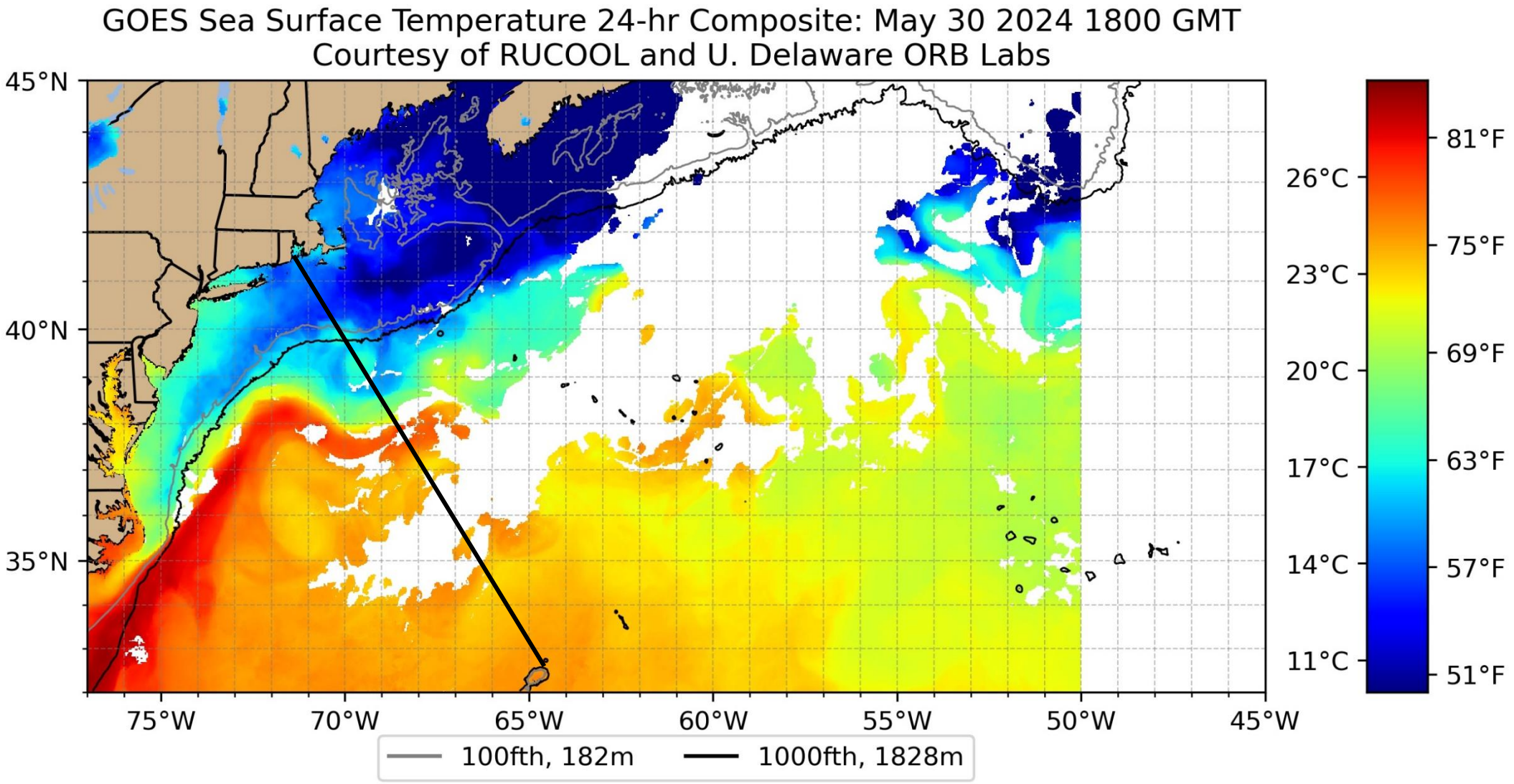

Figure 1 Gulf Stream Sea Surface Temperatures May 30, 2024

Black Line Represents Newport to Bermuda Rhumb Line

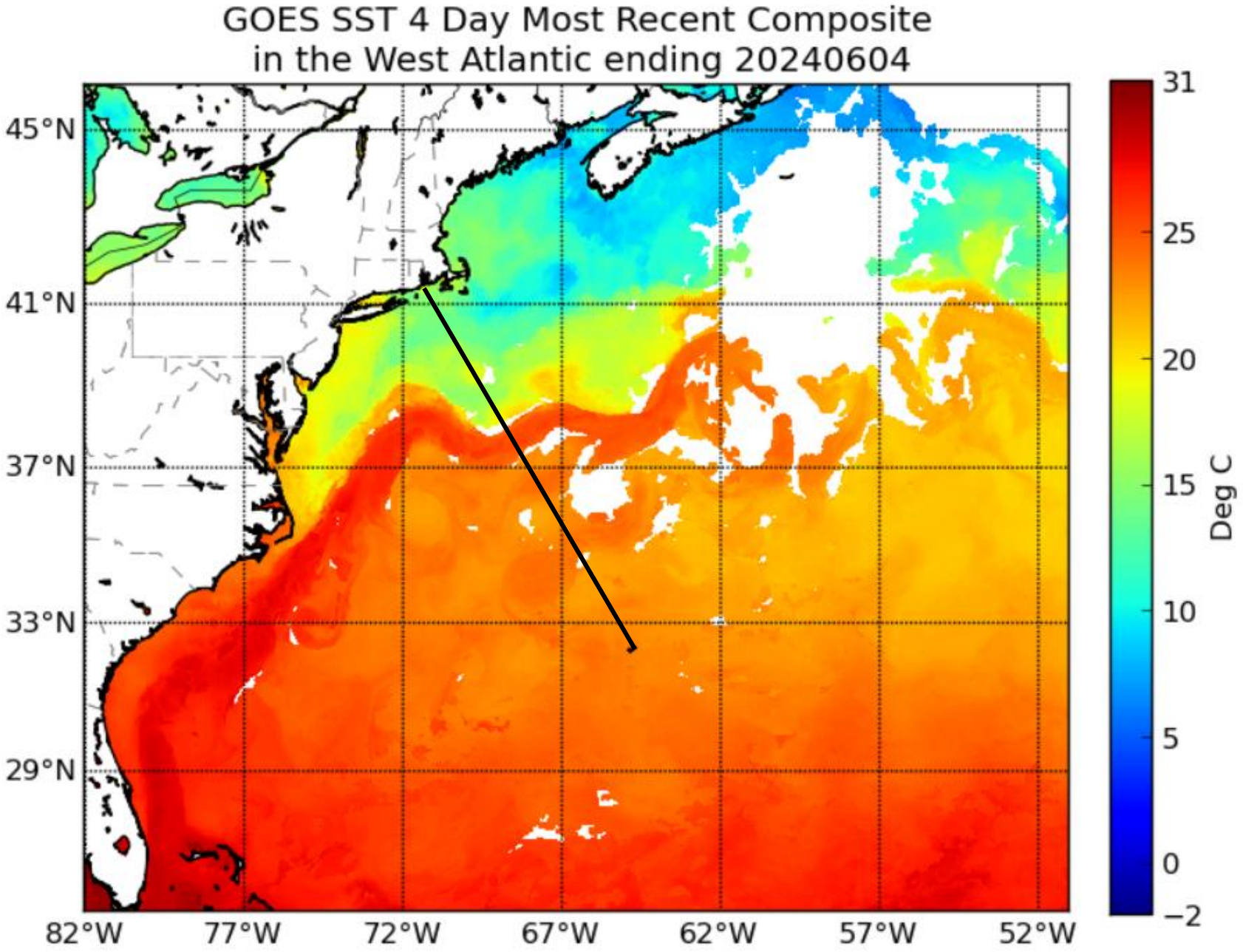

Figure 2 Ocean Prediction Center Gulf Stream 4-Day Composite SST Image 6/04/24
Black Line Represents The Newport To Bermuda Rhumb Line

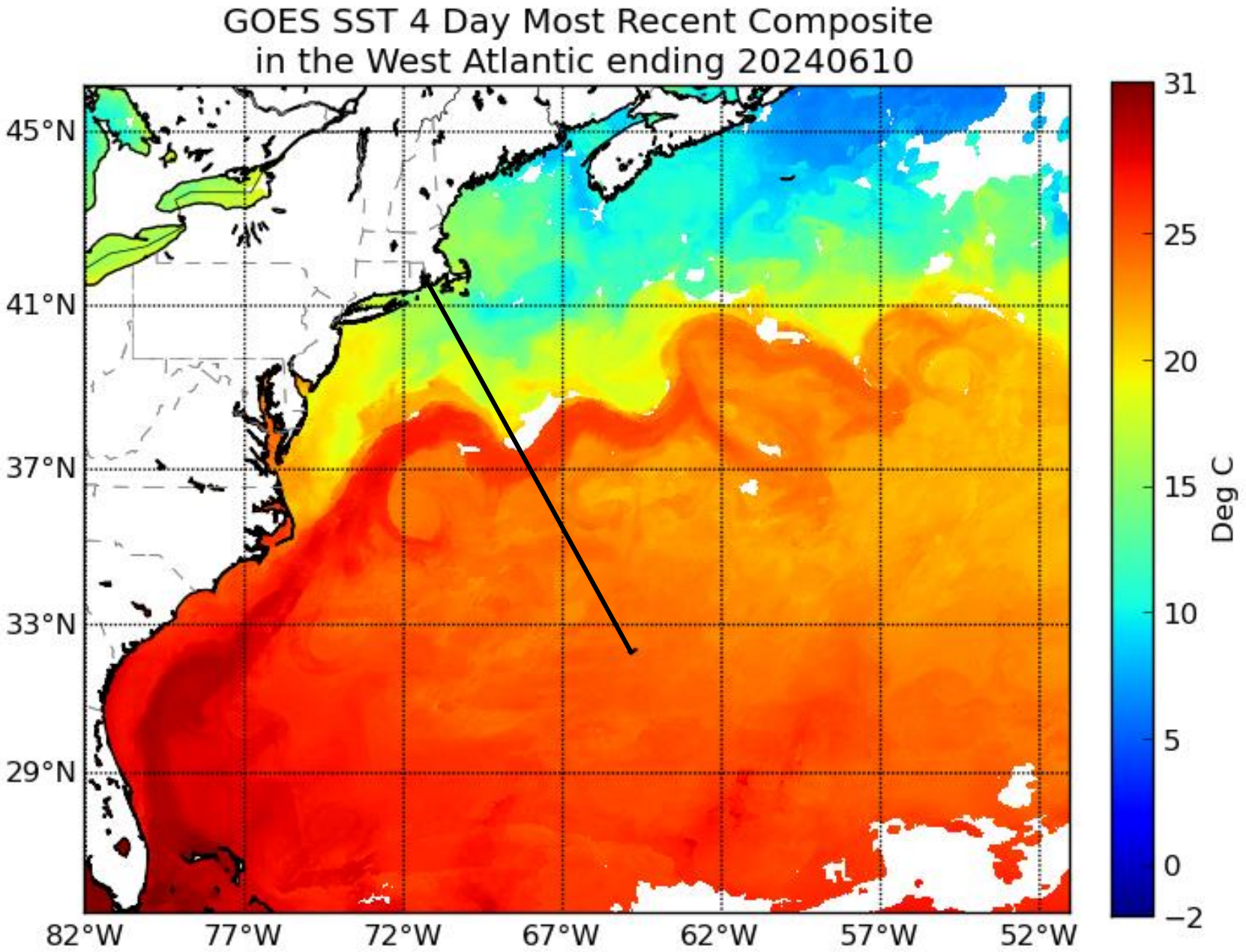

Figure 3 Ocean Prediction Center Gulf Stream 4-Day Composite SST Image 6/10/24
Black Line Represents The Newport To Bermuda Rhumb Line

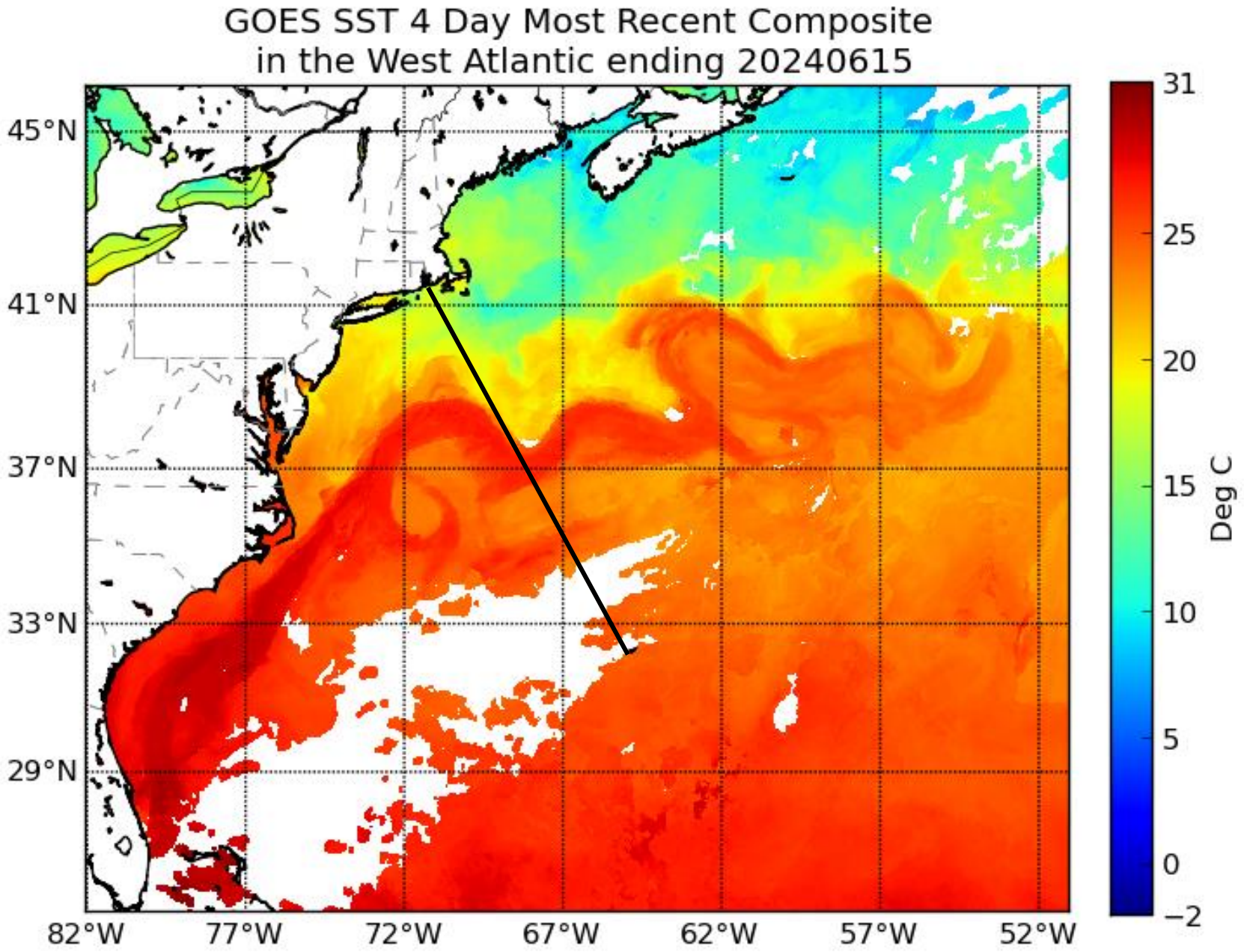

Figure 4 Ocean Prediction Center Gulf Stream 4-Day Composite SST Image 6/15/24
Black Line Represents The Newport To Bermuda Rhumb Line

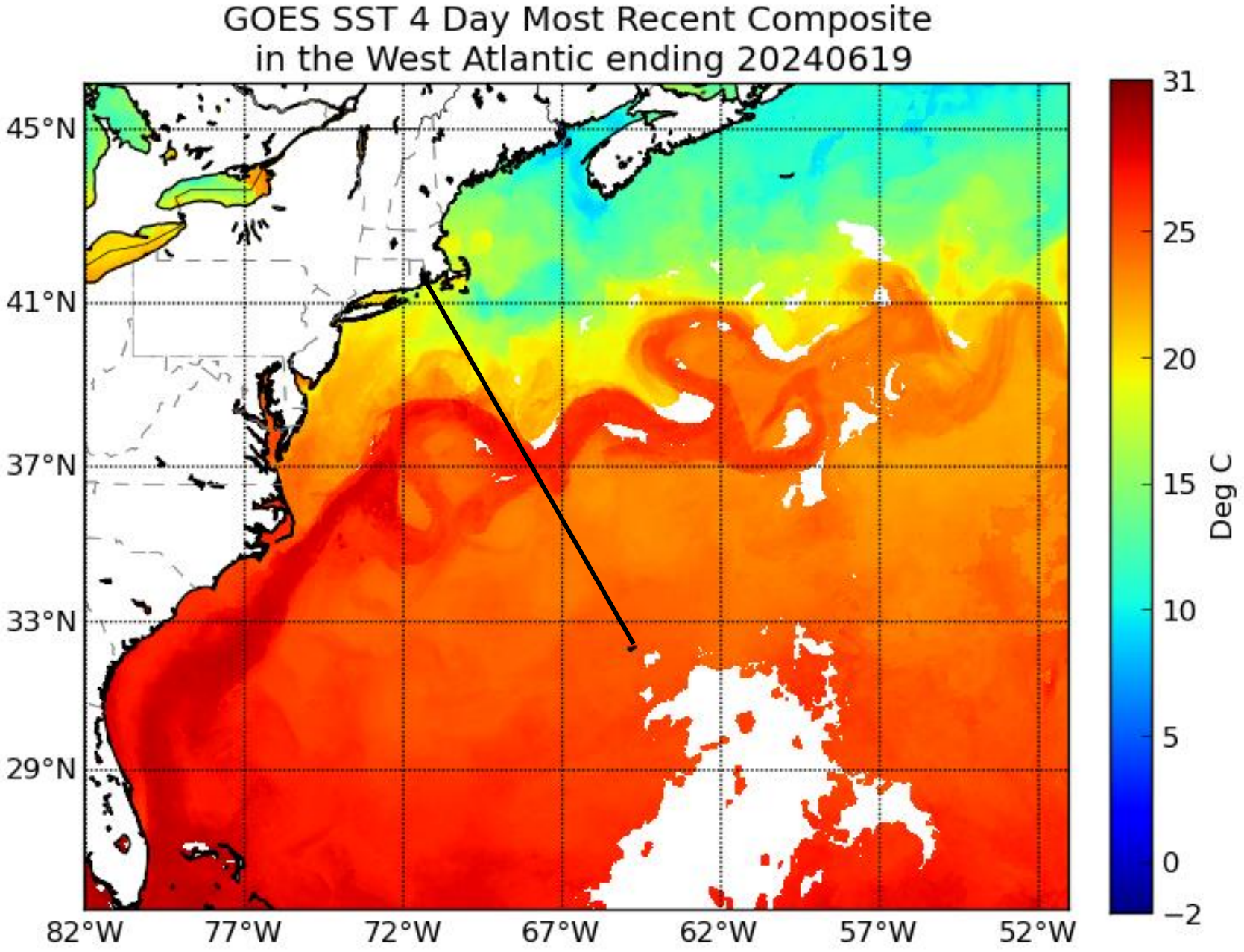

Figure 5 Ocean Prediction Center Gulf Stream 4-Day Composite SST Image 6/19/24
Black Line Represents The Newport To Bermuda Rhumb Line

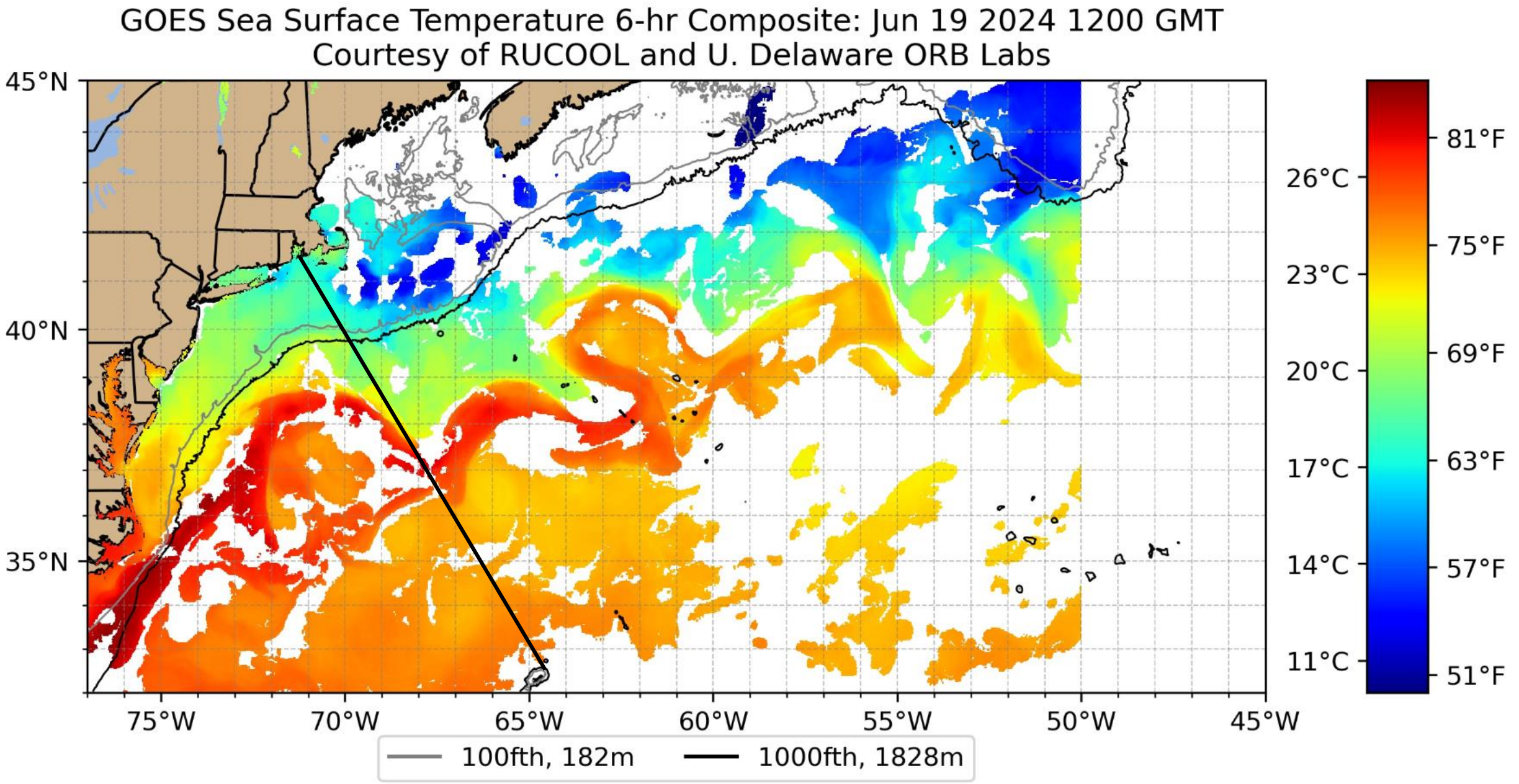

Figure 6 Gulf Stream Sea Surface Temperatures June 19, 2024

Black Line Represents the Newport Bermuda Rhumb Line

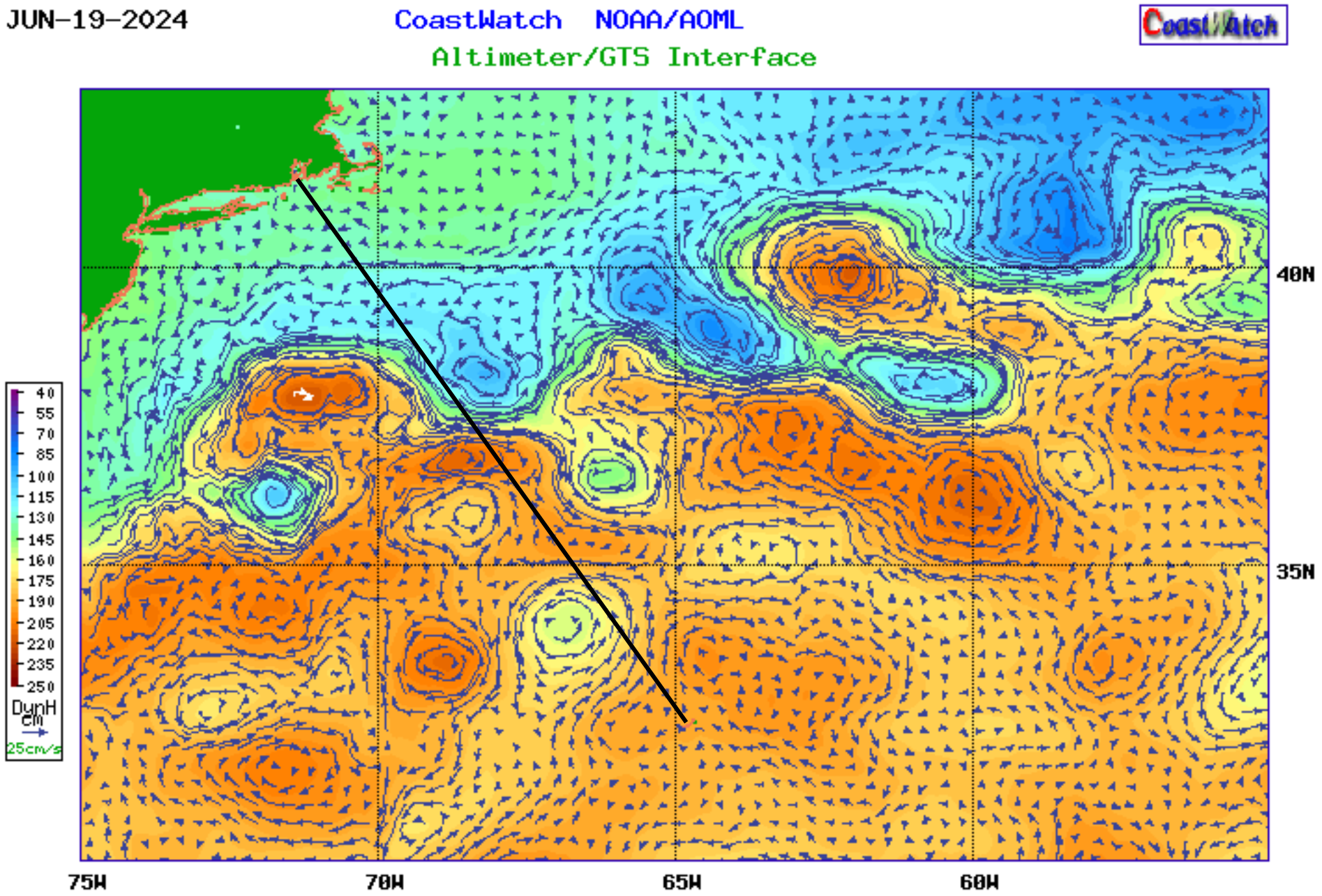

Figure 7 Northwest Atlantic Surface Currents- Altimetry Based Model June 19, 2024
Black Line Represents The Newport to Bermuda Rhumb Line