Gulf Stream Note #2 May 23, 2021

The Gulf Stream near the Rhumb Line Newport to Bermuda

An Analysis of Conditions

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On 30 April the main body of the Gulf Stream crossed the Newport-Bermuda rhumb line at a near right angle, west to east, at 38^0 N before turning abruptly to the north to form a prominent hook feature (Fig. 1). Over the next week or so this feature broke away to form a well defined warm core ring. Views of this ring formation process however, were obscured by continuous cloud cover during the first two weeks of May. Views on 14 May show the ring in place centered near 39^0 30'N 68^0 W (Fig.2). The main body of the Stream shows a slight northerly displacement crossing the rhumb line near 38^0 45N at a right angle.

By 18 May the satellite SST (sea surface temperature) image shows that the warm core ring has moved to the west contacting the rhumb line while the boundary of the main body has become slightly more sinuous in form resulting in flows across the rhumb line from the northwest to the southeast (Fig.3). This evolution continued for the next few days resulting in a complex thermal pattern in the vicinity of the rhumb line (Fig.4). The warm core ring has continued its westerly drift and appears to be affecting the rhumb line in the vicinity of 39^0 N. The relationship between these thermal patterns and the currents in the vicinity of the rhumb line is best determined using the altimetry based model results (https://cwcaribbean.aoml.noaa.gov/CURRENTS/index.html) .

The model results dated 24 May, representative of conditions on 22 May (two day delay associated with data processing), show the warm core ring producing southwest to northeast flows of approximately one knot along the rhumb line near 39^0 N (Fig.5). These speeds will likely increase as the ring drifts to the west possibly to a maximum approaching 3 knots within the next two weeks. The main body of the Stream crosses the rhumb line near 38^0N again at a near right angle. Associated with this flow is a southerly limb starting approximately 60nm west of the rhumb line produced by a meander pattern not well indicated in the SST image (Fig.4). This flow at first proceeds due south before turning to the east near 36^0 30'N and then northeast crossing the

rhumb line near 37^0N to ultimately rejoin the northern portion of the main body of the Stream near 38^0N 67^0W. To the south of 37^0N along the rhumb line there is a wide area of southwest to northeast flow in part associated with the southern limb of the main body and in part the result of a large area of clockwise flow centered near 36^0N 66^0W (Fig. 5). Continuing south these flows become progressively more south to north parallel to the rhumb line under the influence of a cold ring located near $33^0$30”N 67^0W. This combination of factors results in an extensive area on and west of the rhumb line of adverse flows for those enroute to Bermuda.

The observations to date indicate that optimum routing to Bermuda must include consideration of the warm core ring north of the main body of the Stream and east of the rhumb line, the structure of the main body, the clockwise feature east of the rhumb line and the cold core ring west of the rhumb line. This represents a challenging combination of features for any computer model of the associated currents. This fact should be kept in mind when evaluating the results produced by routing software such as Expedition. Careful comparisons of a paper based or analog route prepared by an experienced navigator familiar with boat characteristics to that presented by a routing program is recommended. Changes in Stream form and structure should also be carefully monitored over the next 10 days to the start of the Race.

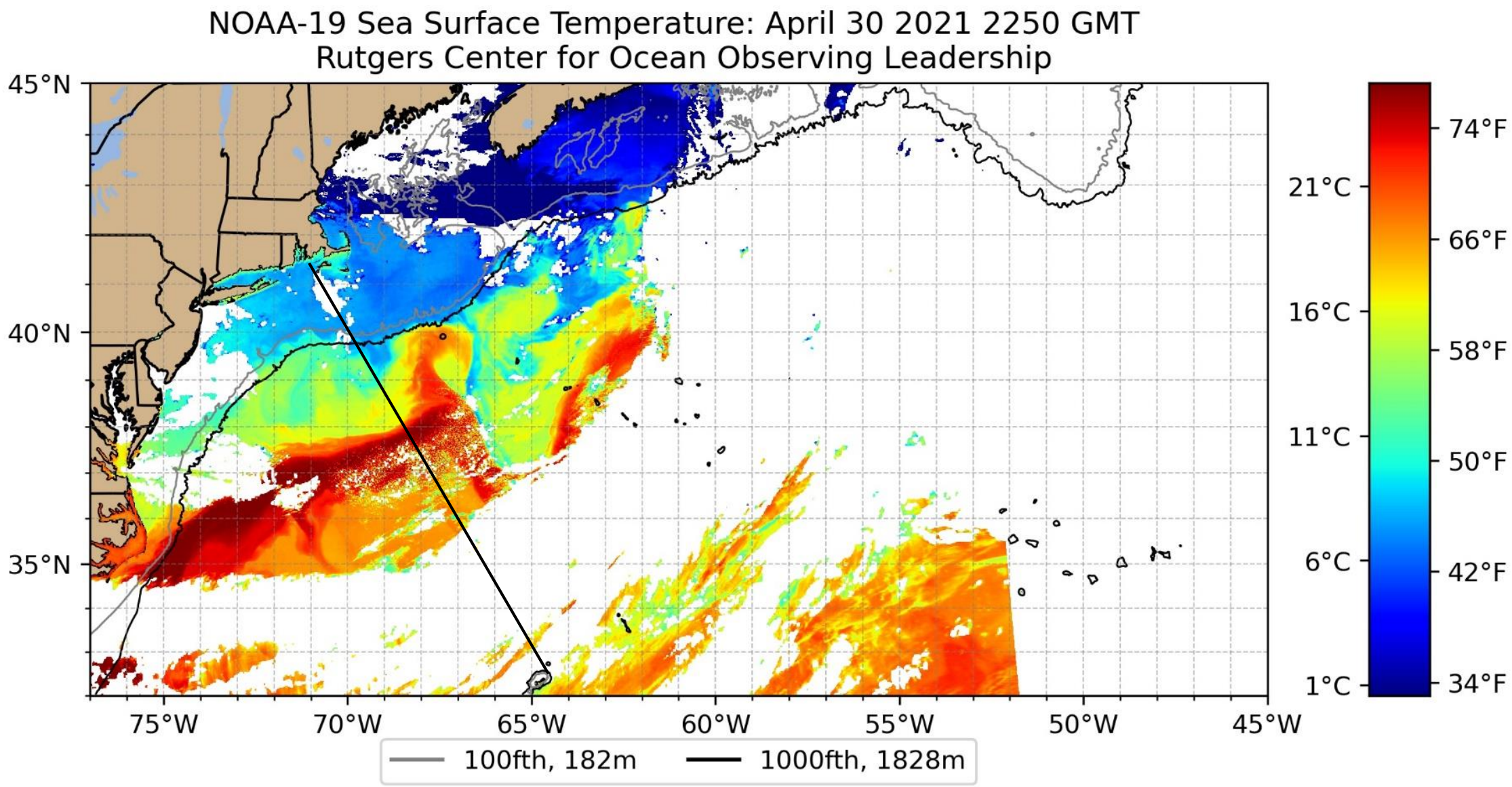

Figure 1 Instantaneous Satellite SST Image 2250 GMT April 30, 2021

Black Line Represents RIS - Bermuda Rhumb Line

https://rucool.marine.rutgers.edu/

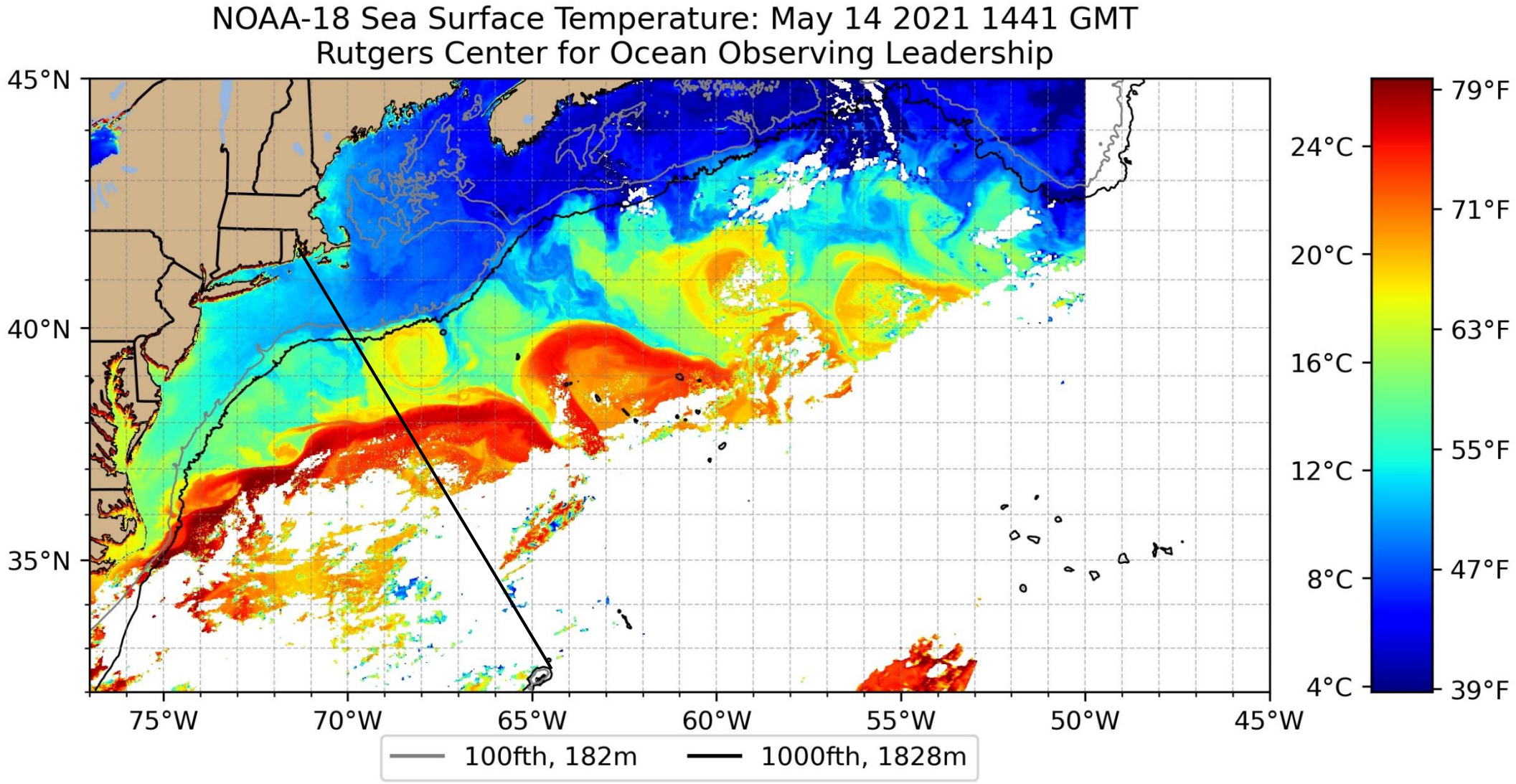

Figure 2 Instantaneous Satellite SST Image 1441 GMT May 14, 2021

Black Line Represents Newport - Bermuda Rhumb Line

https://rucool.marine.rutgers.edu/

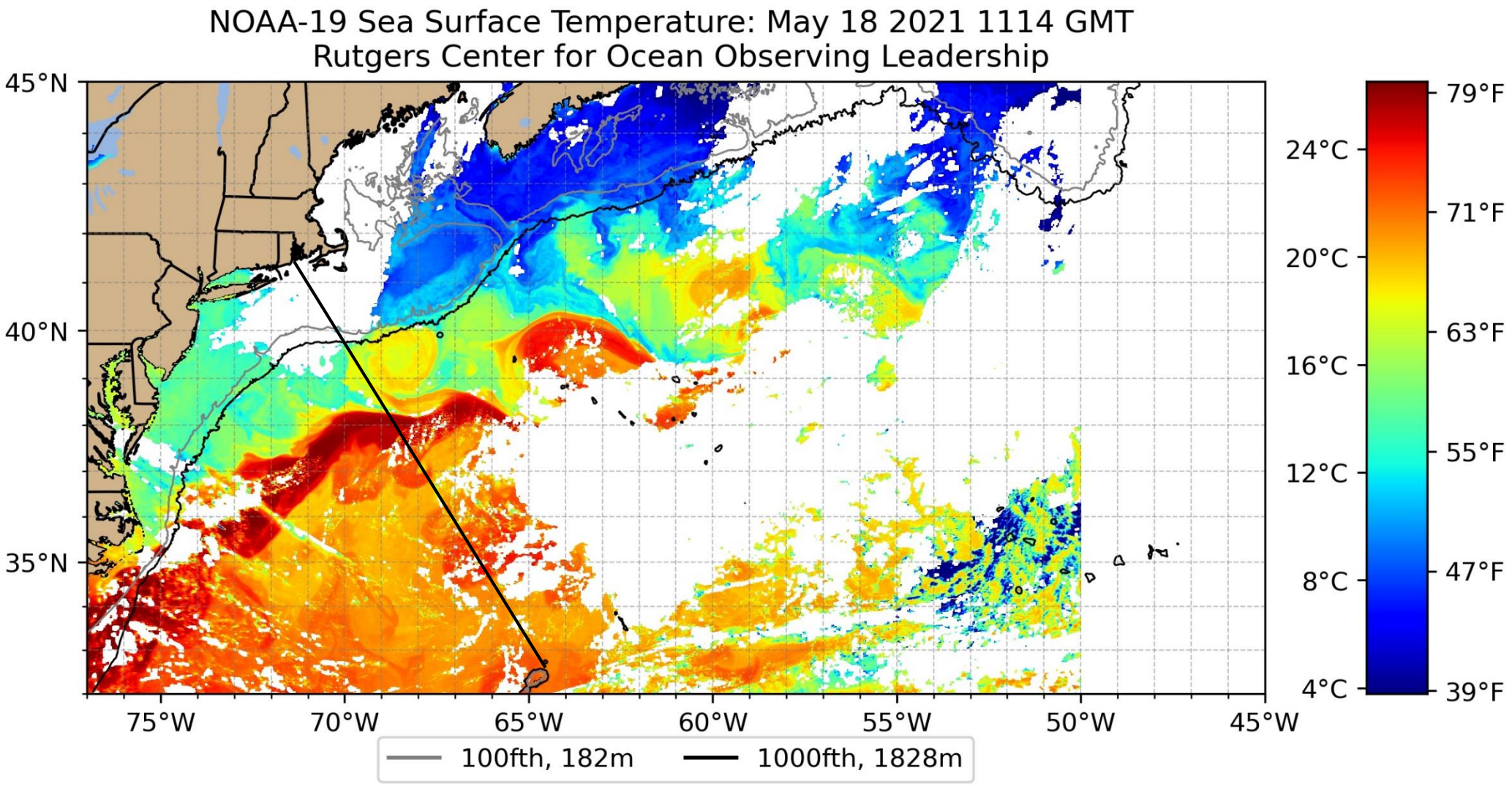

Figure 3 Instantaneous Satellite SST Image 1114 GMT May 18, 2021

Black Line Represents Newport - Bermuda Rhumb Line

https://rucool.marine.rutgers.edu

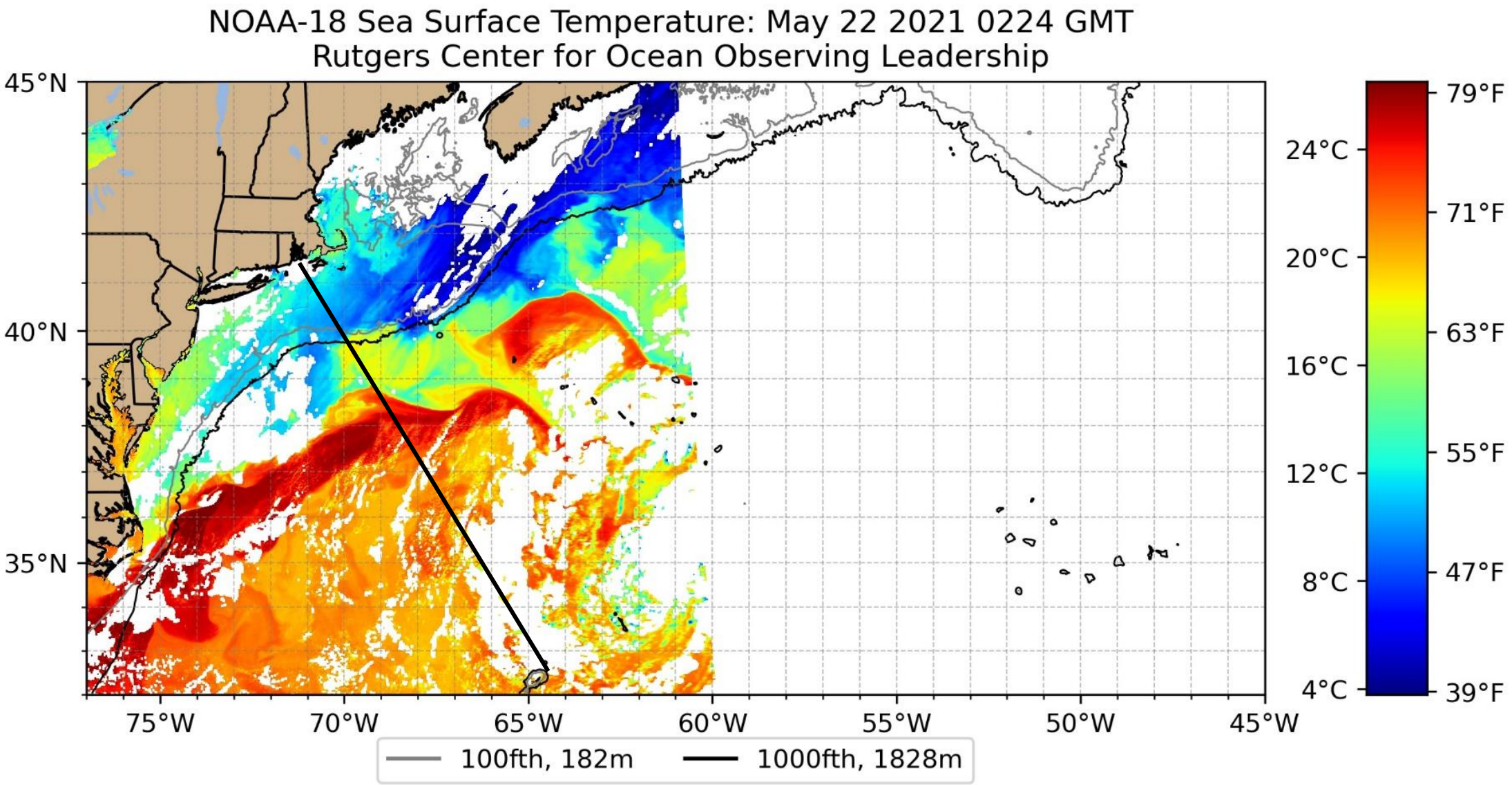

Figure 4 Instantaneous Satellite SST Image 0224 GMT May 22, 2021

Black Line Represents Newport - Bermuda Rhumb Line

https://rucool.marine.rutgers.edu

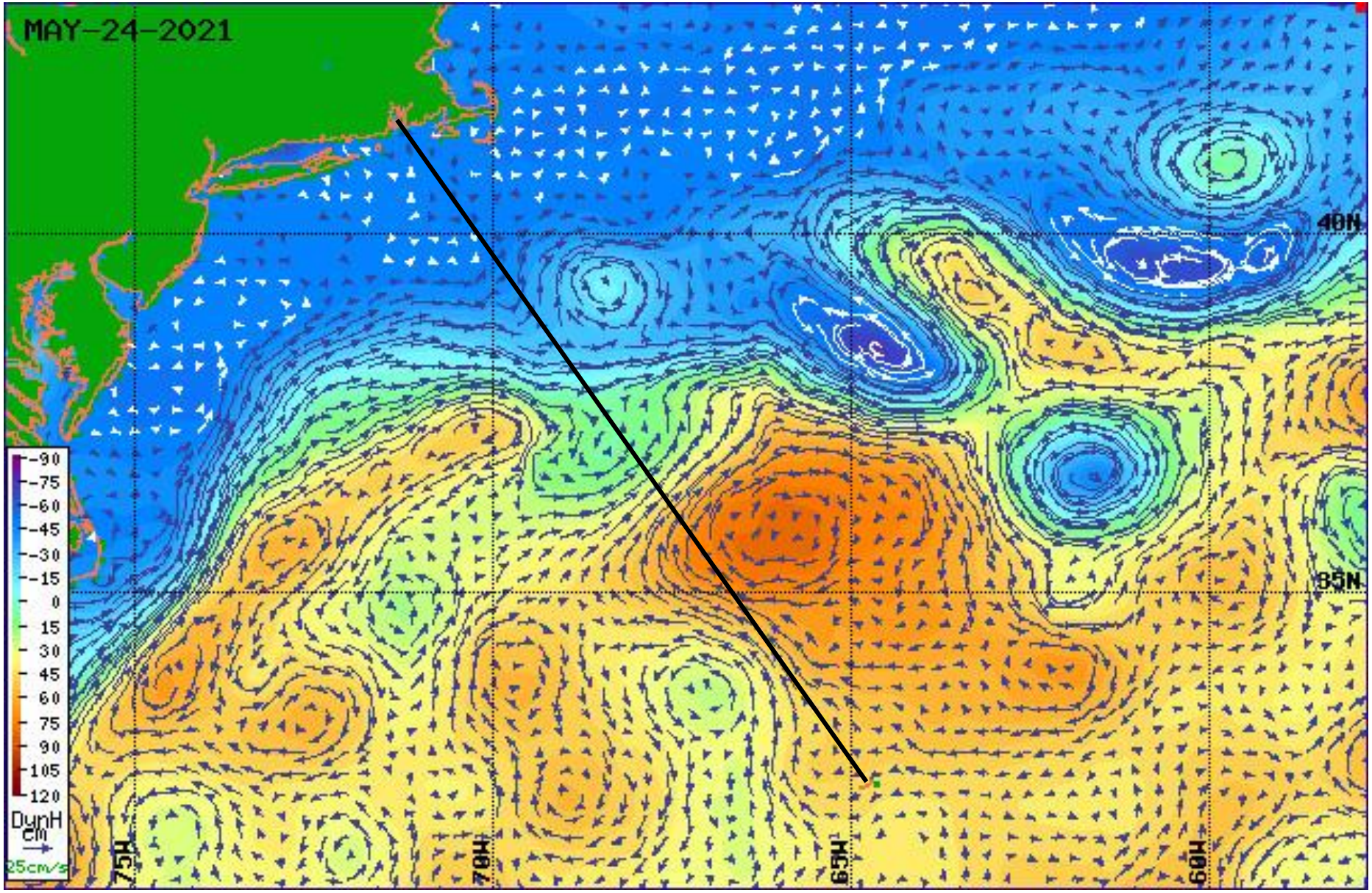

Figure 5 Satellite Altimetry Derived Surface Currents- NW Atlantic Region- May 24, 2021

Black Line shows Newport-Bermuda Rhumb Line

https://cwcaribbean.aoml.noaa.gov/CURRENTS/index.html