Gulf Stream Note #3 June 3, 2021
The Gulf Stream near the Rhumb Line Newport to Bermuda
An Analysis of Conditions

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Clouds continue to limit visible and Infrared satellite views of the Gulf Stream in the vicinity of the Newport to Bermuda rhumb line. Since the view of 22 May (Fig.1) only a single image on 28 May (Fig.2) has been obtained. Comparison shows relatively little change in the structure of the main body of the Stream over this period. The northern inshore edge of the main body of the Stream crosses the rhumb line at a distance of approximately 200nm from Newport with a form affected to some extent by a warm core ring extending north to 40° N. This ring is less well defined in the instantaneous satellite views than in previous views possibly affected by entrainment in the main body of the Stream. The four-day composite (Fig.3) provides a much clearer image but may be biased by the optical averaging process. Despite this possible dispersion the ring can be expected to produce some adverse south to north current along the western edge of the rhumb line in the area 38°30' N to 40° N. Entrainment may in time effectively limit the expected westerly drift of the ring and potentially eliminate it. This process could affect the form of the Stream to be encountered on the Bermuda to Newport leg of the Race.

The satellite altimetry based model of surface currents (Fig.4) shows the region in the vicinity of the Newport Bermuda rhumb line to be affected by a complex pattern of surface currents beginning with the flows associated with the warm core ring sited north of the main body of the Gulf Stream. These primarily affect the area east of the rhumb line but the lead into this area shows northeasterly going flows in the vicinity of 38° 30' N. Speeds might approach 1 knot in the area.

The main body of the Stream crosses the rhumb line at a near right angle near 38°N. On crossing the main body (~ 60nm in width) Flows are affected by a cold core feature centered near 37°N 68° 30'W. This counterclockwise rotating feature has currents in excess of 3 knots particularly along its southern limits where it serves to

divert a regional flow produced by a number of cold and warm core features. This regional flow affects all of the western margin of the Newport Bermuda rhumb line from the southern edge of the cold core ring to Bermuda. In fact, the altimetry shows varying amounts of adverse southeast to northwest flow for both the east and west sides of the rhumb line (Fig.4).

As mentioned in the previous Gulf Stream Note, this complex of currents complicates computer modeling. This fact must be considered when evaluating the results of any optimum routing program such as Expedition. The model most often used in the routing programs is the result of collaborative efforts between NOAA and the U.S. Navy. Examination of the USN HYCOM (similar to NOAA'S RTOFS) shows reasonably good agreement between the satellite IR images of sea surface temperature (SST) (Figs 2 and 3) and the model results (Fig.5). The structure in the vicinity of the warm core ring north of the main body of the Stream is particularly good. Similarly, the associated surface currents (Fig.6) are in close agreement with the altimetry based model (Fig.4). Although hard to read, the image (Fig.6) provides indication of a complex and energetic flow in the region south of the main body of the Stream essentially identical to the altimetry on a spatial scale 1/12 degree or 5 nm. This similarity gives one confidence in the results of the optimum routing schemes employing the USN/NOAA Gulf Stream model.

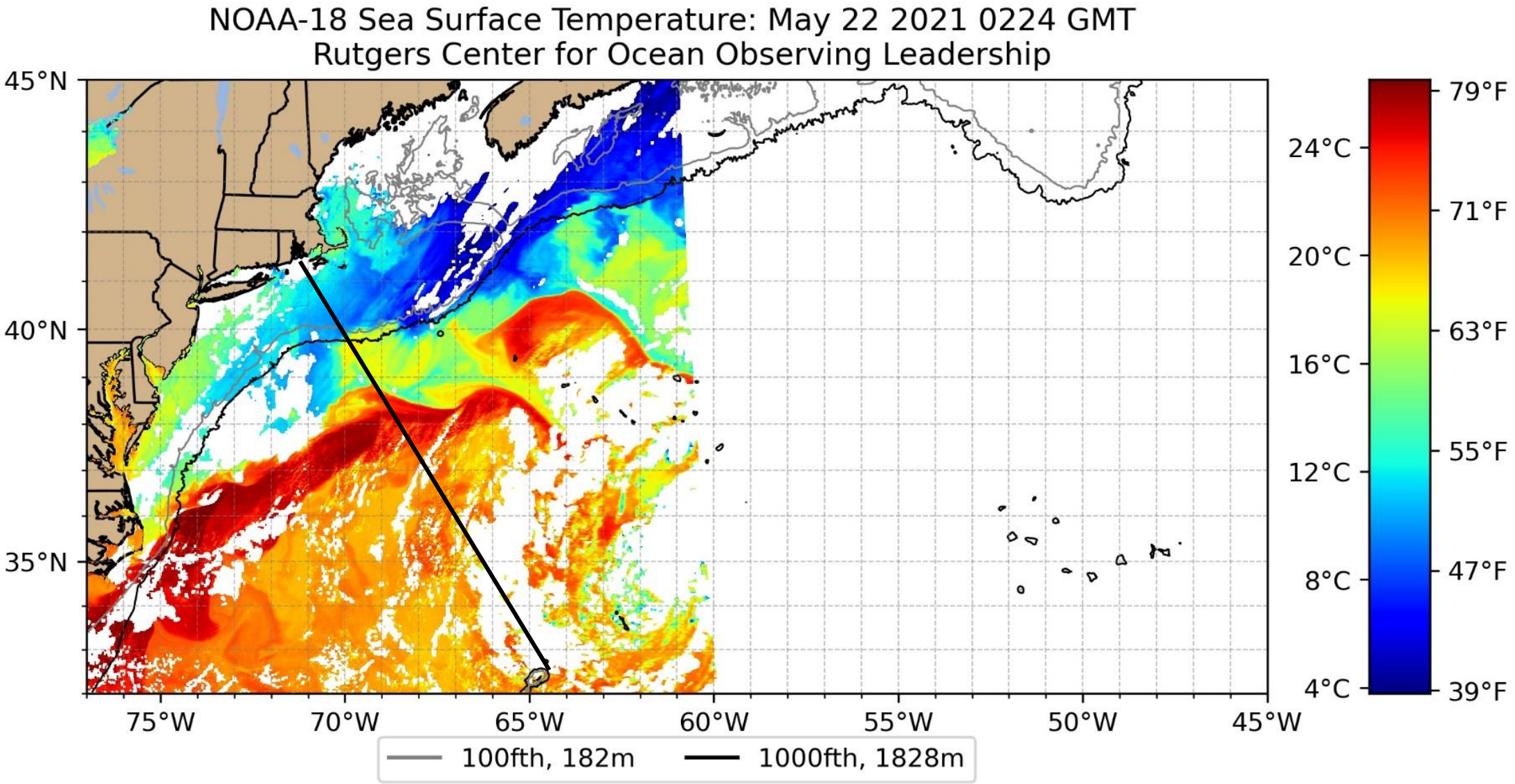

Figure 1 Instantaneous Satellite SST Image 0224 GMT May 22, 2021

Black Line Represents Newport - Bermuda Rhumb Line

https://rucool.marine.rutgers.edu

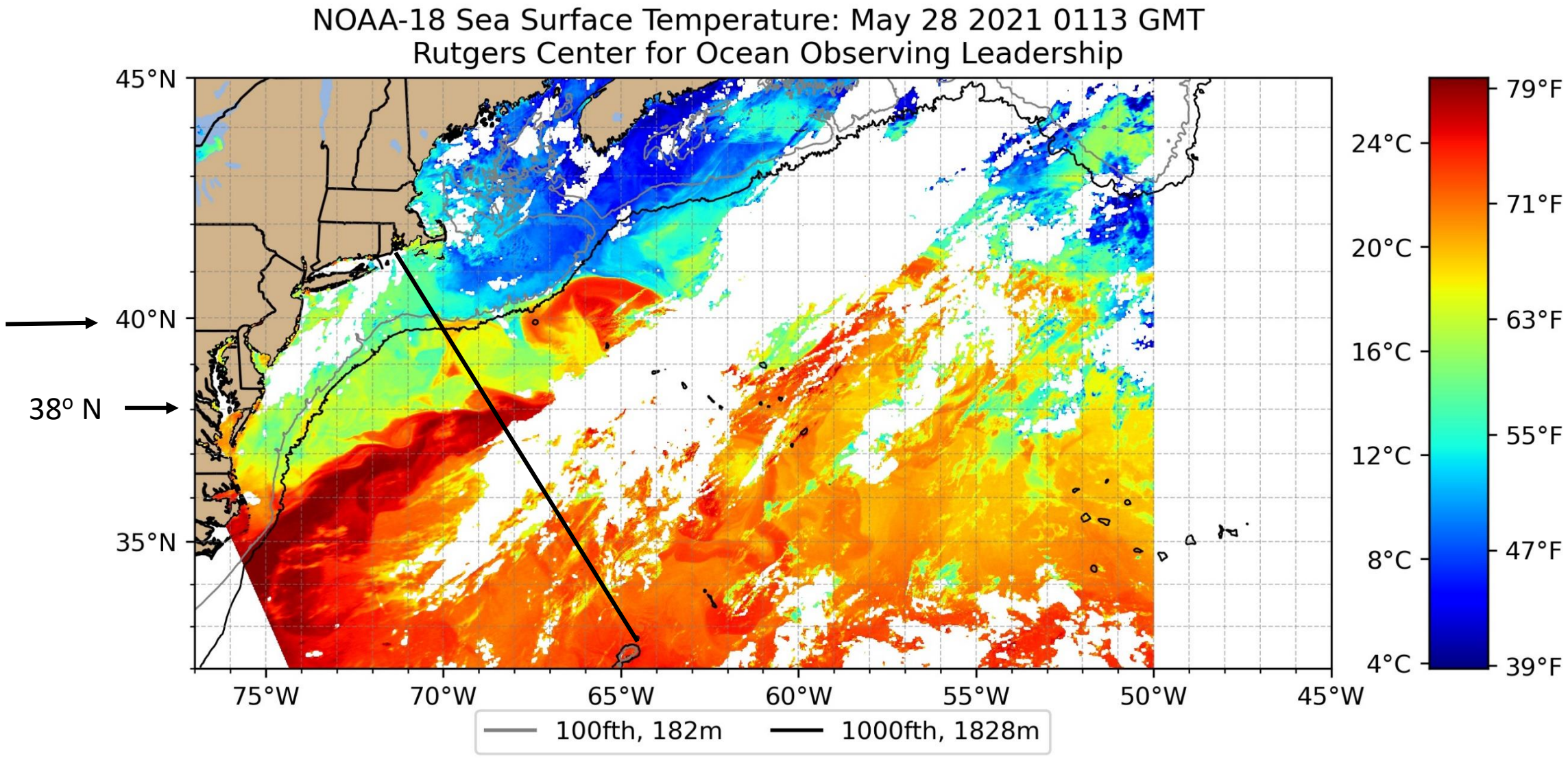

Figure 2 Instantaneous Satellite SST Image 0113 GMT May 28, 2021

Black Line Represents Newport - Bermuda Rhumb Line

https://rucool.marine.rutgers.edu

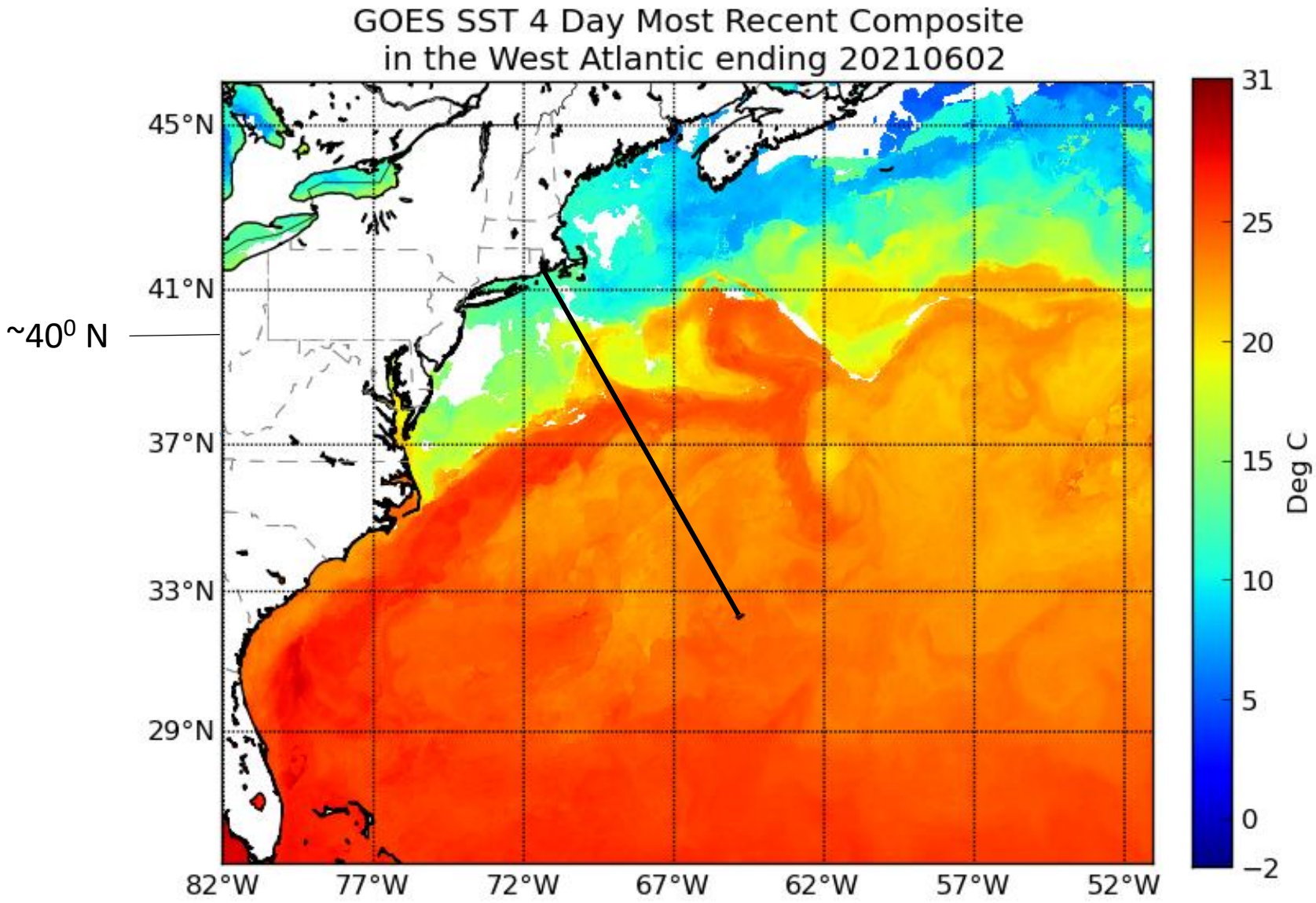

Figure 3 Four day Composite Satellite SST Image June 2, 2021

Black Line Represents Newport - Bermuda Rhumb Line

GOES Satellite-Derived Sea Surface Temperatures (weather.gov)

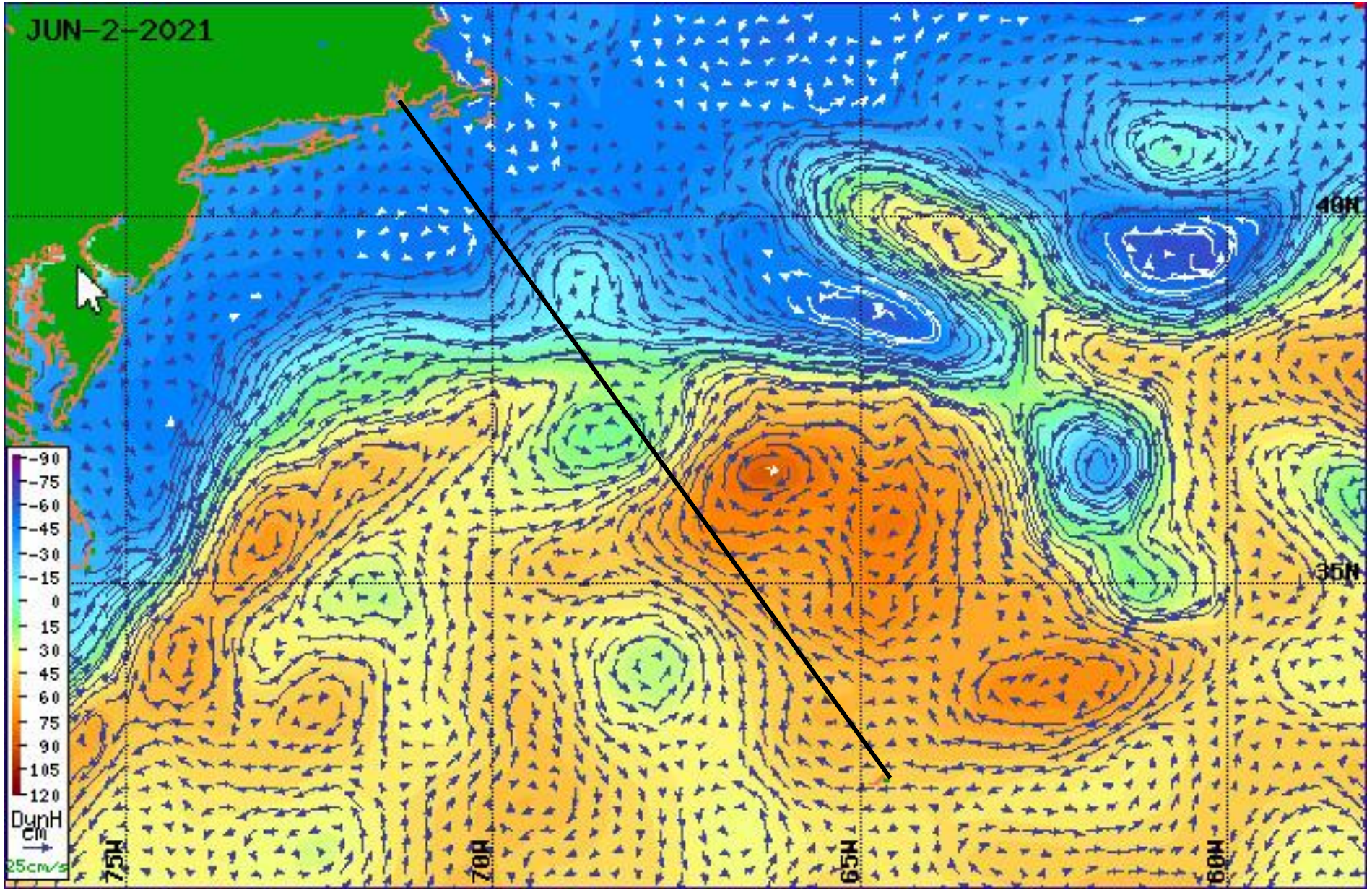

Figure 4 Satellite Altimetry Derived Surface Currents- NW Atlantic Region- June 2, 2021

Black Line shows Newport-Bermuda Rhumb Line

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

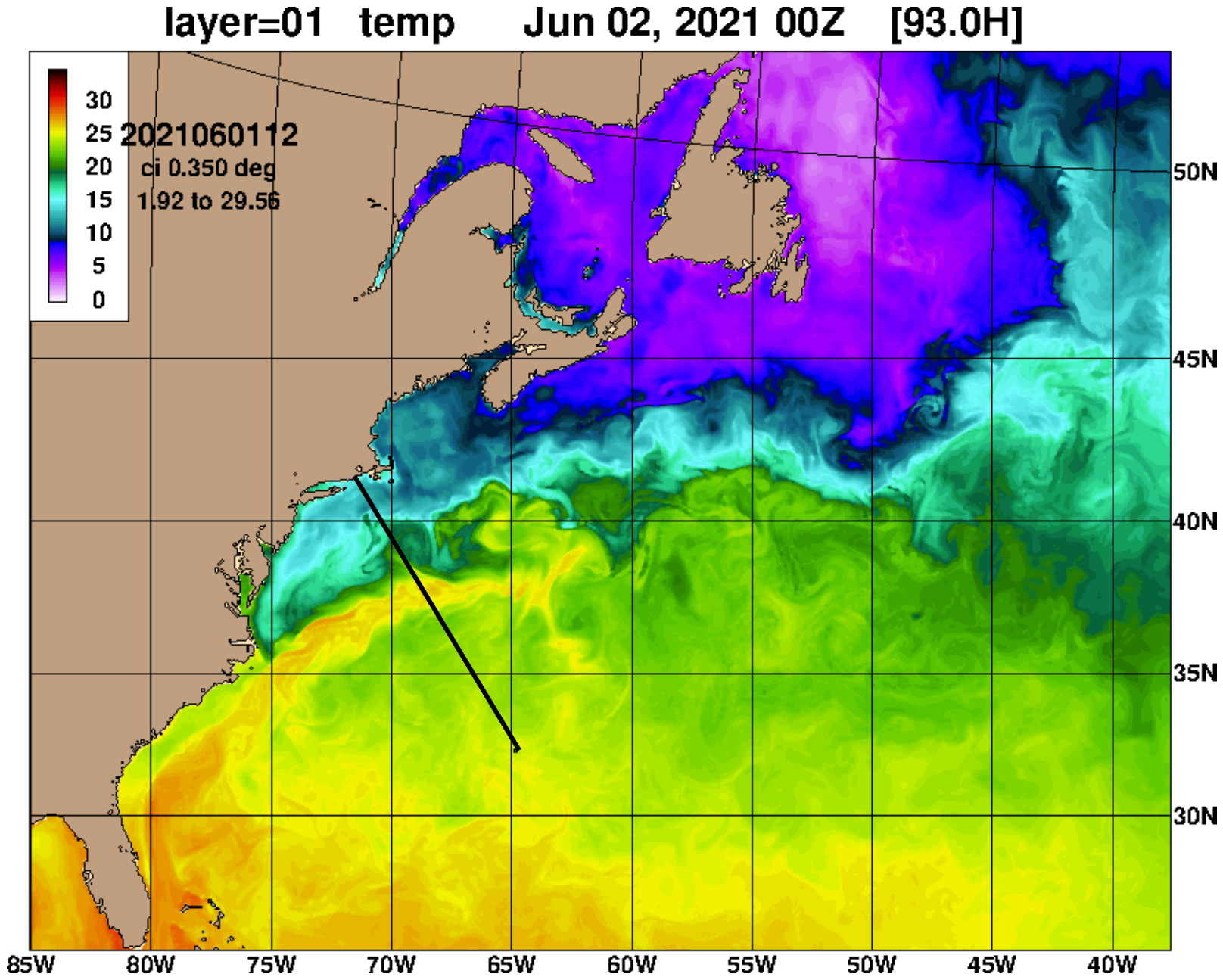

Figure 5 USN HYCOM Model of SST –Northwest Atlantic June 2, 2021

Global HYCOM+CICE 1/12 degree page (navy.mil)

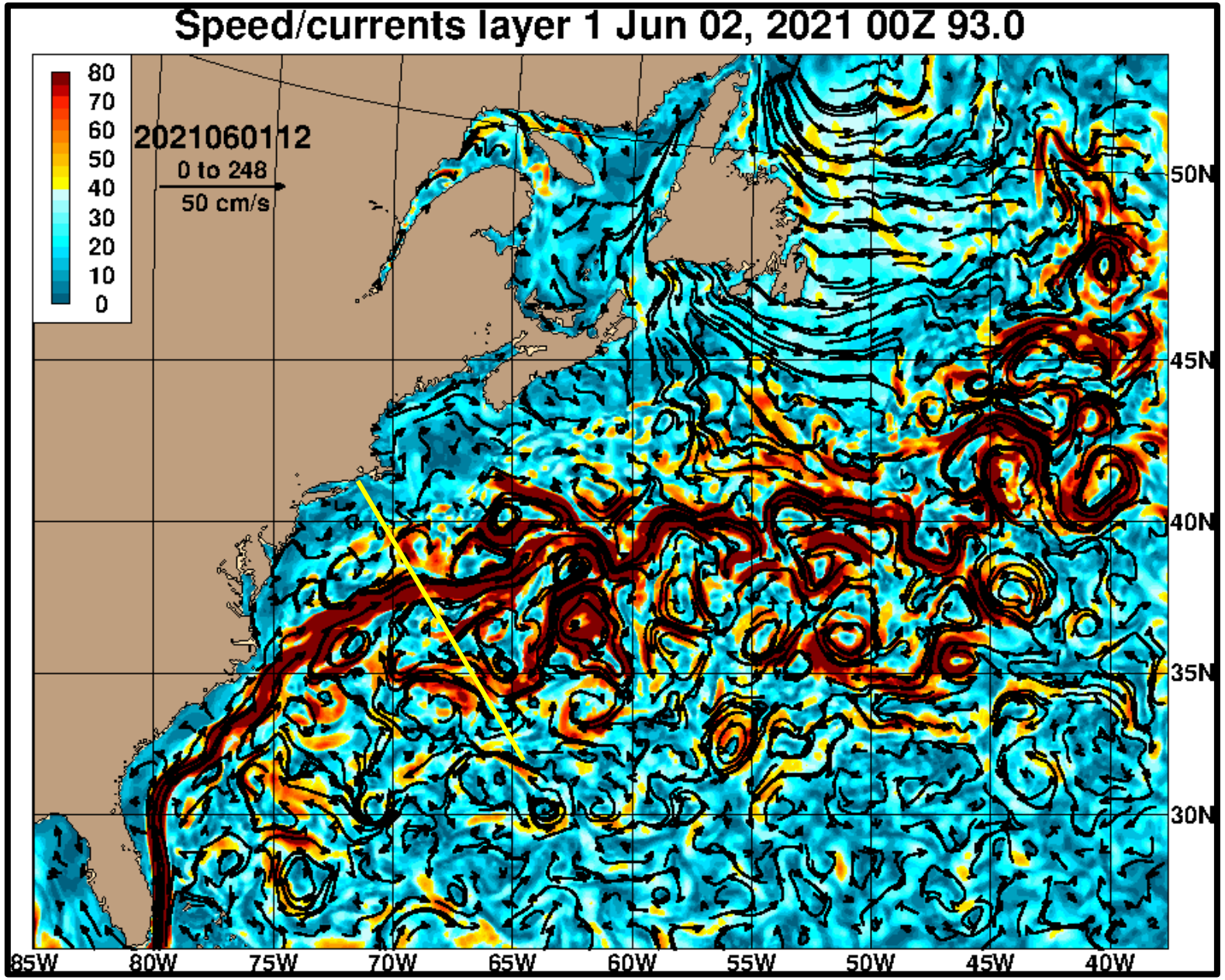

Figure 6 USN HYCOM Model of Surface Currents Northwest Atlantic June 2, 2021

Global HYCOM+CICE 1/12 degree page (navy.mil)