The Gulf Stream Near The Rhumb Line Bermuda to Southern New England
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An Analysis of Conditions

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Over the past several weeks the Gulf Stream in the vicinity of the rhumb line between southern New England (SNE) and Bermuda has continued to evolve in a rather predictable way. The meander that affected conditions for the Bermuda 1-2 racers deepened and by the 12th of June, just before the start of the Marion Bermuda Race, crossed the rhumb line at near right angles in the vicinity of 38º N 68º 20' W (Fig.1). To the east of the line and slightly to the north of the crossing point a warm cored feature persisted in close proximity to the northern limits of the main body of the Stream. Over the next four days the meander continued to deepen migrating to the east and extending slightly to the north, west of the rhumb line (Fig.2). The warm core feature also showed some slight easterly movement suggesting that it is being affected by the Gulf Stream currents and subject to some amount of entrainment. If this was not the case the usual or classic warm core feature or ring would tend to drift to the west and across the rhumb line at a rate of 2-3 nm/day. Current conditions appear to favor additional easterly transport of the warm feature limiting its direct affect to areas east of the rhumb line.

Conditions inferred from the composite satellite sea surface temperature image (Fig.2) will make it difficult to avoid an extended period of adverse currents during the return from Bermuda to SNE without some extreme excursions from the rhumb line. The position of the meander on 16 June favors northwest to southeast currents virtually parallel to the rhumb line for at least 90nm from approximately 38º N on to the south.The SST image suggests that these adverse flows may affect an area nearly 60nm in width to the west of the rhumb line. A more detailed image of the currents associated with the main body of the Stream is provided by the NOAA/AOML altimetry based model (Fig.3). The model for the 18th displays excellent consistency with the SST image and provides some hope that conditions to be encountered during the period 20-23 June may not be quite as bleak as first supposed.

The altimetry based model results show little organized flow structure Northwest of Bermuda until north of 35ºN (Fig.3) where a counter-clockwise rotating feature can be observed. Maximum current speeds in this feature may approach 3kts at points approximately 20-30nm west of the rhumb line. To the northwest beyond this feature the main body of the Stream makes its appearance with flows to the southeast rapidly rotating counterclockwise resulting in a near normal crossing of the rhumb line near 37º 20'N 68º 20' W. Adverse currents at this point extend over an area approximately 60nm to the west of the rhumb line. This area narrows to the north in

the vicinity of the “knuckle” of the meander.

The combination of features shown in both the satellite imagery and the altimetry based model favor boat tracks Bermuda to SNE to the west of the rhumb line leaving the main body at a point approximately 50nm west near 38^{o} N 70^{o} W. Although a track Bermuda to this point will not avoid all adverse current it does make maximum use of the counterclockwise rotating cold core feature and much of the main body current field. In addition the easterly set expected on approach to 38^{o} N (see Fig.3) will favor some reduction in the track length to SNE. These factors should be further improved by the expected continuation of the easterly migration of the meander in the main body of the Gulf Stream For Bermuda 1-2 participants conditions favor continuing observation of Gulf Stream structure after the start by daily downloads of the altimetry based model results. For returning cruising boats every effort should be made to acquire additional satellite imagery of SSTs while in Bermuda for use in combination with the altimetry based models.

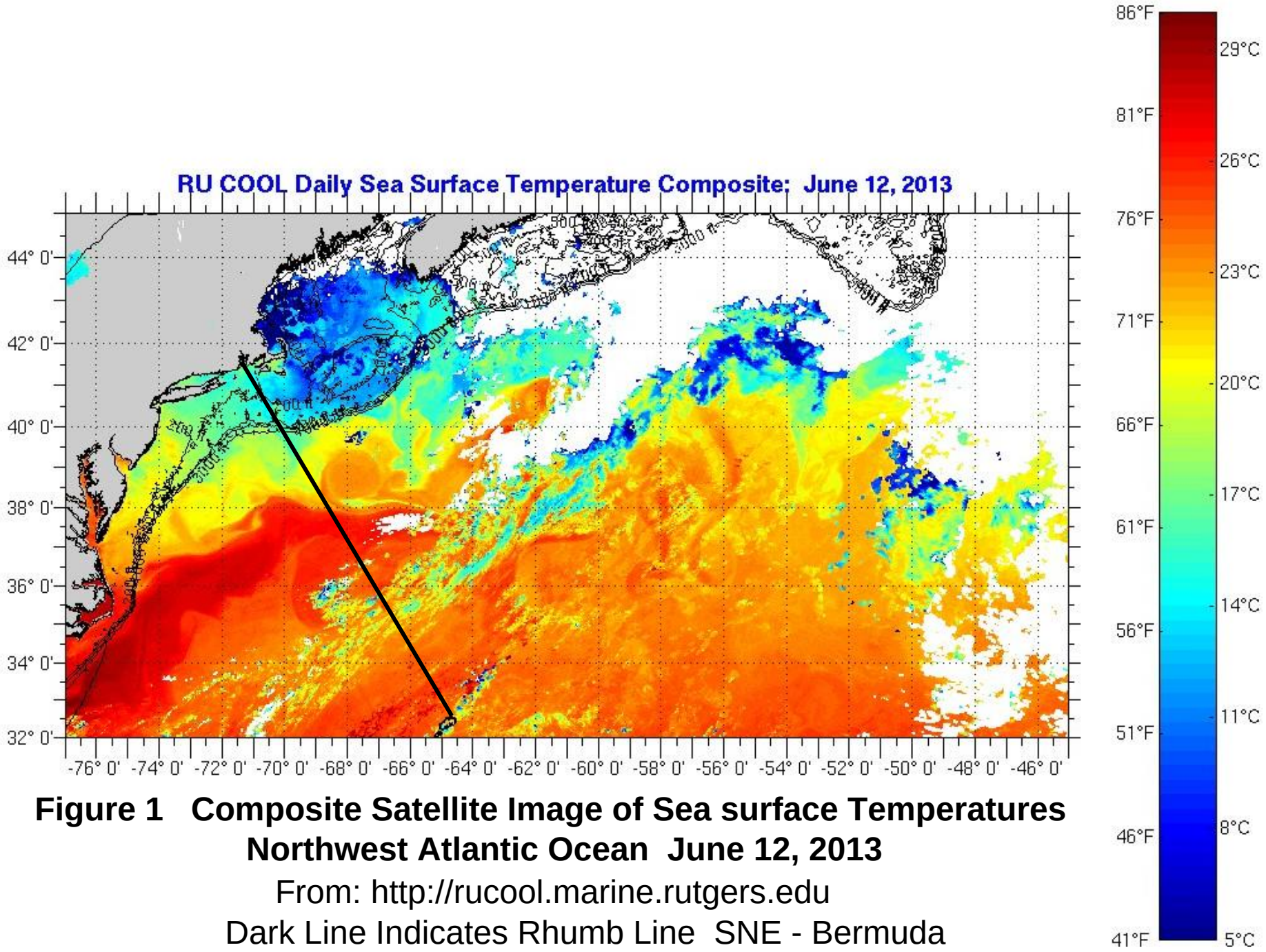

Figure 1 Composite Satellite Image of Sea surface Temperatures Northwest Atlantic Ocean June 12, 2013

From: http://rucool.marine.rutgers.edu

Dark Line Indicates Rhumb Line SNE - Bermuda

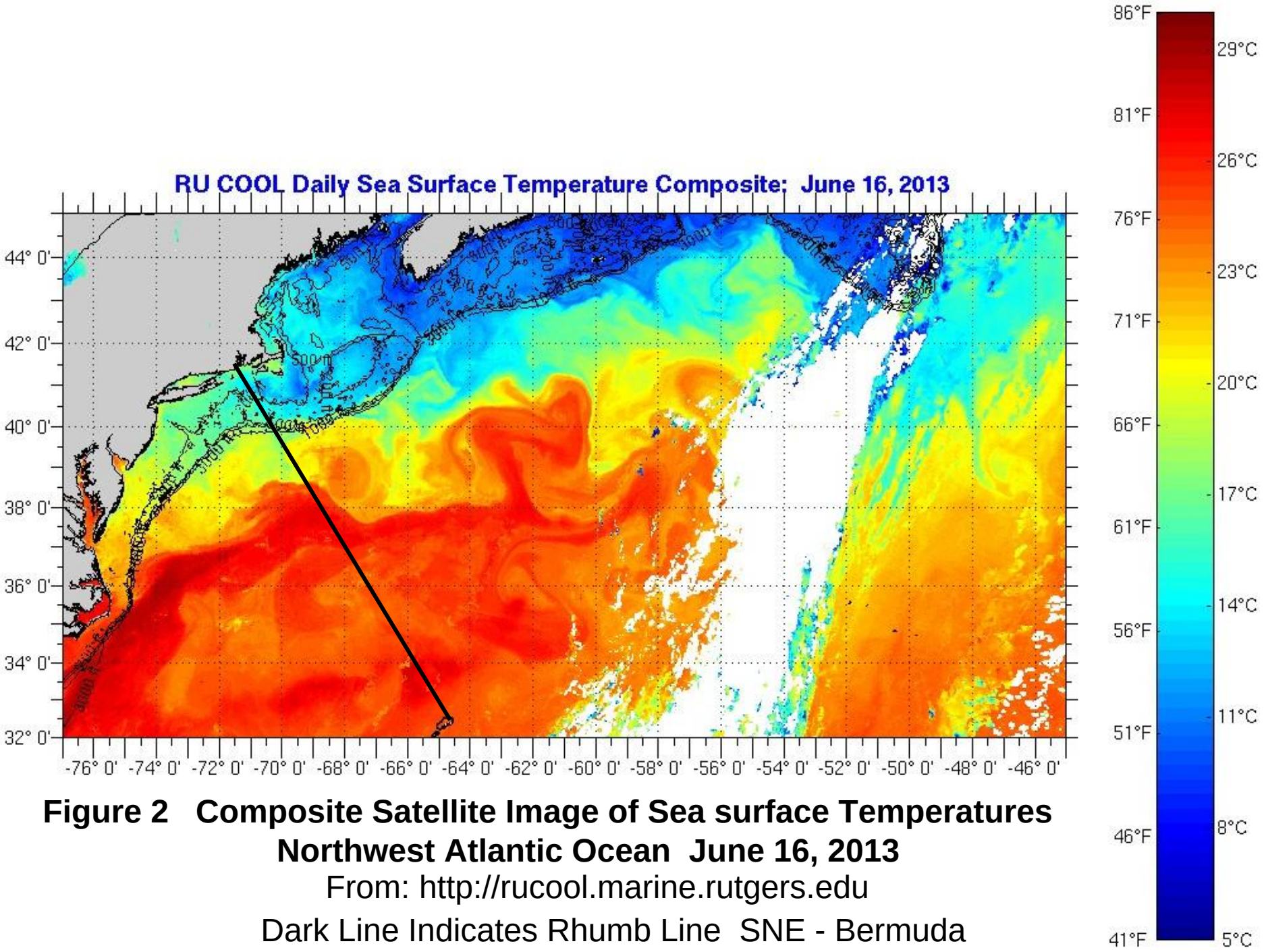

Figure 2 Composite Satellite Image of Sea surface Temperatures Northwest Atlantic Ocean June 16, 2013

From: http://rucool.marine.rutgers.edu

Dark Line Indicates Rhumb Line SNE - Bermuda

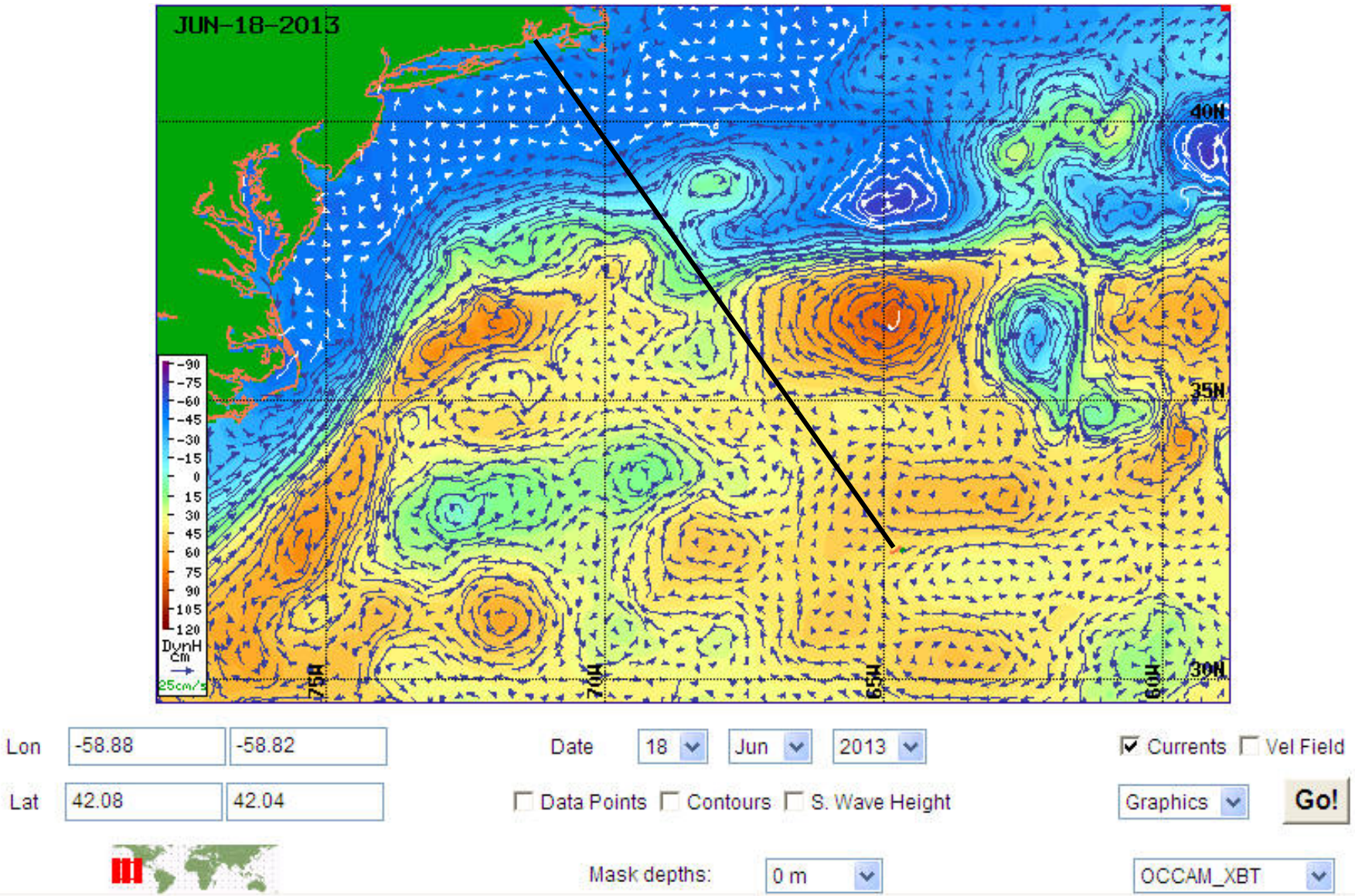

Figure 3 Modeled Current Speeds and Directions Near SNE-Bermuda Rhumbline Based on NOAA/AOML Altimetry Data

http://www.aoml.noaa.gov/phod/dataphod/work/trinanes/INTERFACE/index.html

Dark Line indicates Rhumb Line