The Gulf Stream Near The Rhumb Line Newport-Bermuda June 14, 2012
An Analysis of Conditions

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Examination of the sea surface temperatures in the vicinity of the Newport to Bermuda rhumbline for June 11, 2012 (the last day we had reasonably clear conditions) shows the evident thermal boundary of the northern limits of the main body of the Gulf Stream crossing the rhumbline along 38^{o} N (Fig.1). Temperatures at this point increase from approximately 70^{o} F to 82-85^{o} F. Maximum currents approaching five knots can be expected to occur approximately 30nm SE of this point with flows proceeding west to east. To the west of this point Stream associated flows tend to be following a northwest to southeast track due to an evident meander. To the east of the rhumbline crossing the main body of the Stream rotates to the north and east forming the other limb of the meander. This meander can be expected to migrate progressively to the east causing the NW-SE limb to close the rhumbline at rates of approximately 10nm/day. This trend would favor the development of flows that are more rhumbline parallel (from north-northwest to south – southeast) by the start of the Race on the 15th.

To the north of the main body of the Stream, along the New England continental shelf, water temperatures are significantly cooler with the exception of two areas, one near 39^{o} 30' N 71^{o} W and the other straddling the rhumbline just north of the main body between 38 and 39^{o} N 68^{o} 30' W. The first of these features is the remnants of the warm core ring followed over the past few months. It retains sufficient integrity to produce clockwise flows with maxima in the vicinity of 1.5 knots.

The second patch of warmer water is less well defined and difficult to assess using the SST data. It's clear that there will be a component of clockwise flow since the feature is surrounded by colder water. However, there may also be some counterclockwise flows, similar to the classic cold core ring formed by the trapping of colder shelf water in the "elbow" of the feature. Examination of the altimetry for this period (Fig.2) fails to provide clear resolution suggesting that the feature has a relatively small flow signature relative to the effect of the proximate main body of the Stream. It's also interesting to note that the altimetry for the 14th of

June shows an evident easterly migration of the meander and an associated increase in the amount of “north to south” flow affecting the region of the rhumbline.

To the south of the main body of the Stream the SST data (Fig.1) show a number of features in the vicinity of 35^{o} N. Generally the features are poorly defined and may be artifacts associated with the image compositing process. The altimetry data (Fig.2) similarly show a number of counter-rotating features along the rhumbline including two cold core features near 35^{o} N. In this area these features can be expected to drift to the west potentially bringing NW to SE flows to a portion of the rhumbline. Drift rates for cold core feature average approximately 2-3nm/day. Examination of the Navy numerical model for the 13^{th} of June suggests that these flows already are affecting the rhumbline (Fig.3). However, the combination of SST and altimetry based modeling would indicate that this model result may be somewhat premature. This fact should be kept in mind when considering optimum routing in this area.

Reviews of all of the above continue to favor a near rhumbline route to Bermuda with some slight bias to the west to take advantage of the meander in the main body of the Stream. Now we must factor in the expected wind conditions for the period of the Race.

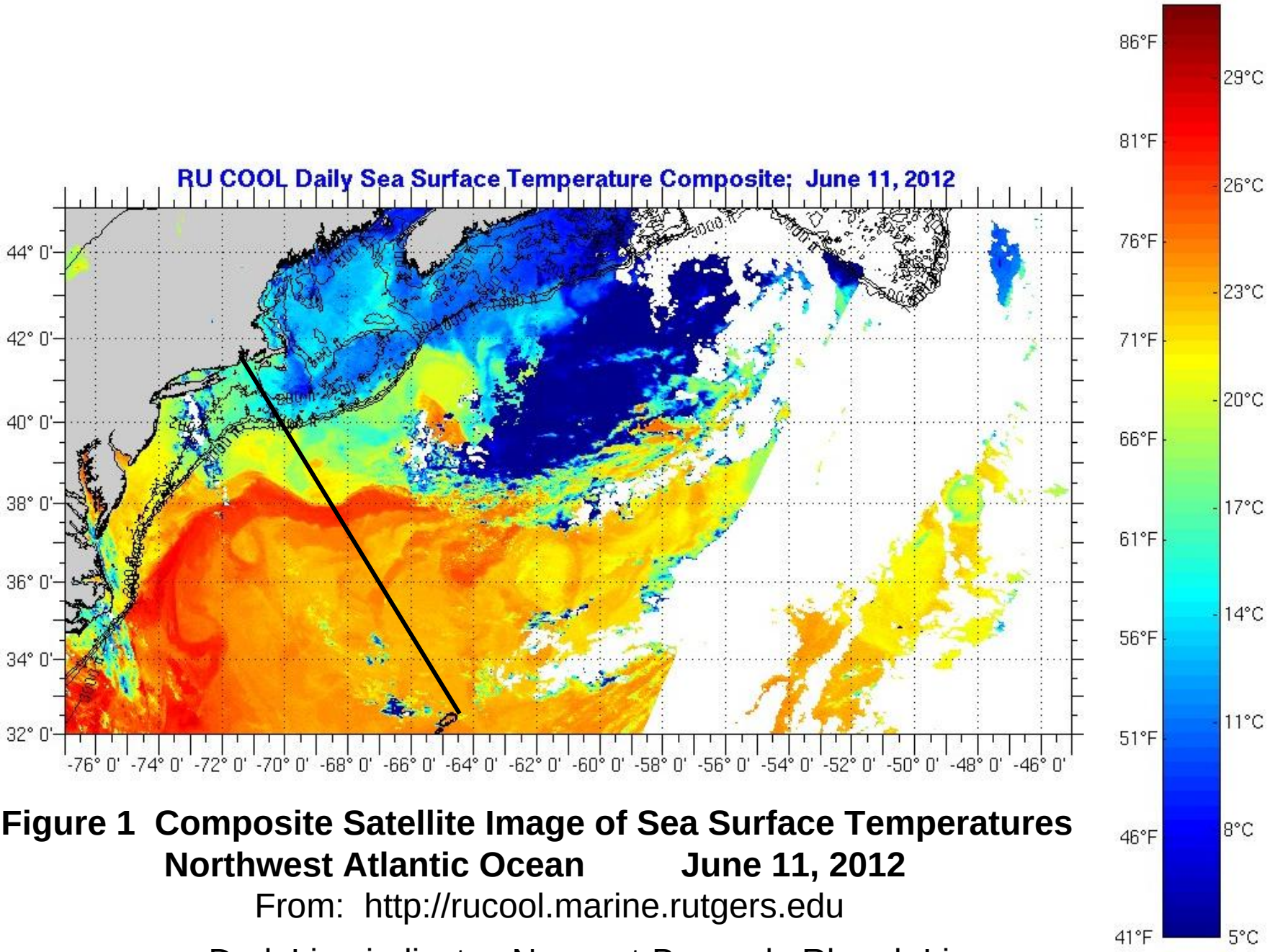

Figure 1 Composite Satellite Image of Sea Surface Temperatures Northwest Atlantic Ocean June 11, 2012

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

Dark Line indicates Newport-Bermuda Rhumb Line

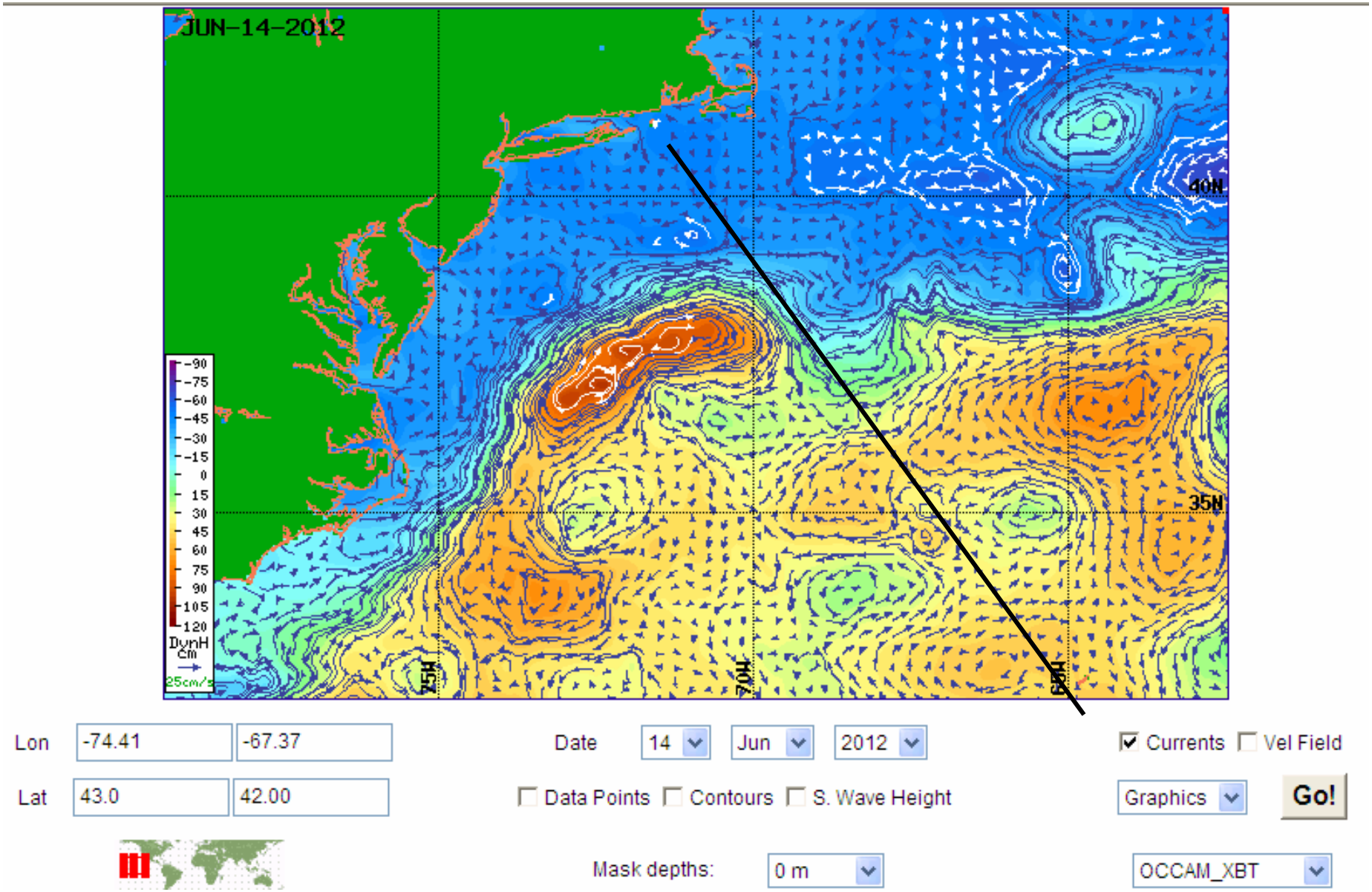

Figure 2 Altimetry Based Model Results Showing currents and Sea Surface Heights in The Vicinity of The Newport-Bermuda Rhumb Line

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

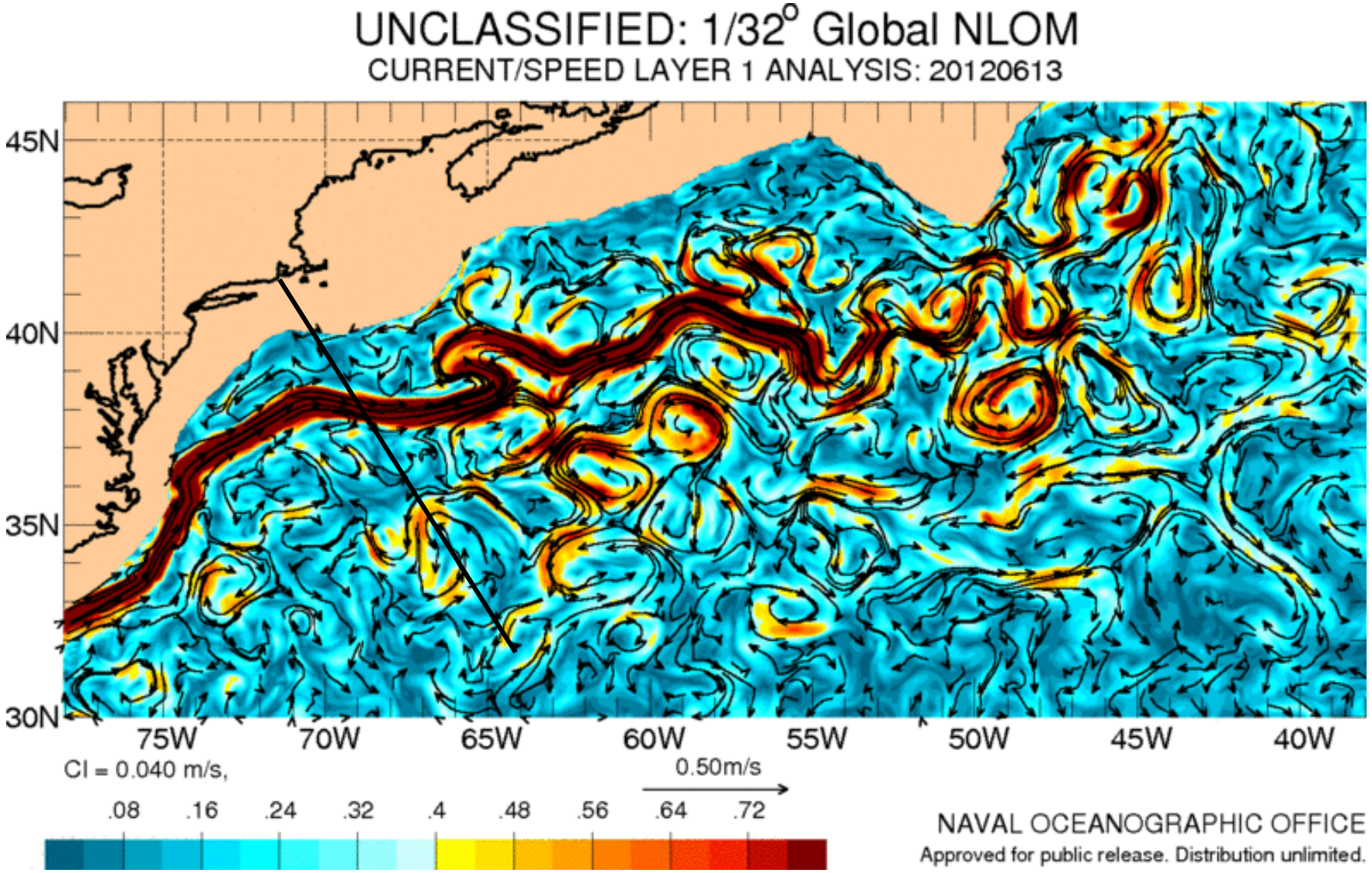

Figure 3 USN Numerical Model of Surface Currents – Northwest Atlantic

http://www7320.nrlssc.navy.mil/global_nlom32/gfs.html