

*Line W:
Sustained Measurements of the North Atlantic
Meridional Overturning Circulation*

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The global ocean plays a fundamental role in Earth's climate system by exchanging heat, freshwater, carbon, and other substances across the interface between air and sea at some locations and then transporting and releasing them back to the atmosphere in other places. A major agent in this transport process is the Meridional Overturning Circulation (MOC), manifested in the North Atlantic by the flow of warm surface waters (principally within the Gulf Stream) toward the poles and a return flow of colder, denser subsurface waters toward the Equator. The latter is concentrated in a current called the Deep Western Boundary Current (DWBC), which “hugs” the U.S. Eastern Seaboard.

The Line W Program is dedicated to obtaining a ten-year record of changes in transport by the DWBC at a logistically-accessible site southeast of Woods Hole, Massachusetts (Figure 1). Line W is named in memory of Val Worthington, a physical oceanographer at WHOI who devoted a considerable part of his career to measuring and understanding the properties and flows in the Gulf Stream and DWBC. Our research goals include characterizing the nature of the anomalies of water property transport seen at Line W and relating them to fluctuations at other latitudes and ultimately, to variations in air-sea exchange at latitudes where the deep waters are exposed to the atmosphere. We hope that greater accuracy of climate models and improved understanding of the physical processes responsible for MOC variability and its impact on Earth's climate system will result.

Operationally, we are observing the DWBC and Gulf Stream at Line W by utilizing a combination of moored instrumentation and periodic shipboard sampling. Building on a significant archive of historical observations from the region, the modern measurement program was initiated in 2001 with seed funding from The G. Unger Vetlesen Foundation. That support allowed

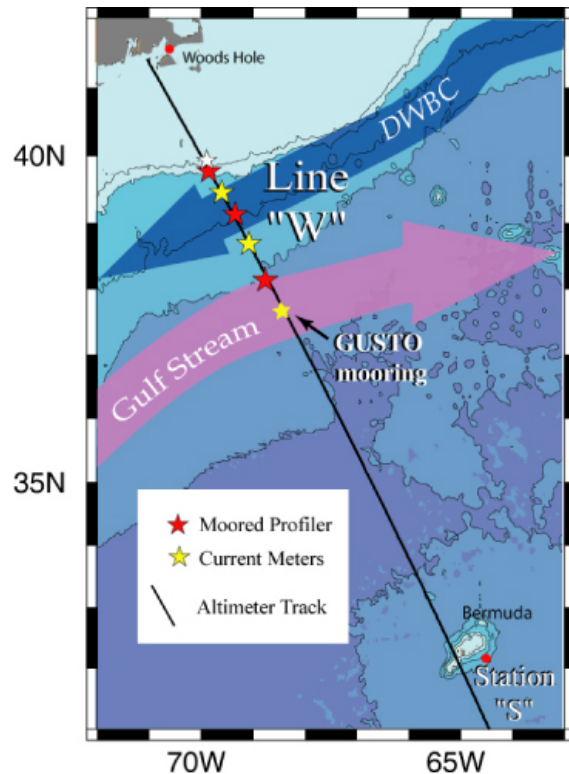


Figure 1: Line W is an array of moorings that monitor changes in the Deep Western Boundary Current (DWBC) and the Gulf Stream. Sensors on the Line W moorings take measurements of water salinity, temperature and velocity along both currents.



us to deploy one mooring for two sequential one-year periods (2001-2002 and 2003-2004) and conduct some shipboard sampling of the DWBC water properties.

In turn, we were able to parlay that seed money into two substantial grants from the National Science Foundation (NSF). The first of these supported an initial four-year sampling effort (Spring 2004-Spring 2008); the second is providing partial funding for six more years of measurements. In these times of tight science funding, we were required to significantly trim our initial funding request to NSF in Principal Investigator (PI) time to analyze the acquired data. Therefore, we are very grateful that the Comer Science and Education Foundation, through WHOI's Ocean and Climate Change Institute, has provided supplemental support for the Line W science team. With this funding, the Line W scientists will be able to oversee the collection, processing and distribution of the basic observations, as well as perform scientific analysis of those data over the next few years.

