Velocity structure along Line W based on a decade of shipboard measurements and satellite data

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Regular observations along Line W have provided one component of a long-term AMOC observing system in the Atlantic under the umbrella of the US Climate Variability and Prediction (CLIVAR) program. Line W stretches from the continental shelf south of New England towards Bermuda across the Deep Western Boundary Current (DWBC), which flows equatorward along the continental slope between the 2500 and 4000 m isobaths, and across the vigorously meandering Gulf Stream down-stream of its separation point by Cape Hatteras. The sustained 10-year program along Line W, completed in spring 2014, comprised moorings across the DWBC and repeated shipboard measurements that were collected once or twice per year at 26 regular stations between the 90 m isobath on the Middle Atlantic Bight shelf and the western flank of the Bermuda Rise. Shipboard observations include temperature, salinity, and dissolved oxygen profiles as well as lowered acoustic Doppler current profiler (LADCP) and tracer measurements. Additionally, underway shipboard ADCP (SADCP) measurements spanned each occupation of Line W. Here we use the directly measured velocity data in conjunction with satellite altimetry, to examine the geostrophic and ageostrophic contributions to the flow across Line W. We also examine a feature present in some of the LADCP sections which may suggest a possible intermittent interior pathway. These indicate intensified flow in a layer between 3500 - 4000 m depth approximately 600 - 700 km seaward of the shelf break along Line W. Preliminary results suggest this intensified flow is associated with elevated levels of dissolved oxygen, CFCs and SF6.