

Labrador Sea Water property changes along the path of the Deep Western Boundary Current

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Observations of the DWBC at Line W, on the continental slope about 39°N, from 1995 to 2014 reveal water mass changes that are consistent with changes upstream in the Labrador Sea. This is most evident in the deep Labrador Sea Water (dLSW) water mass that was actively renewed by intense winter convection in the early 1990s. The intense deep convection period resulted in a cold, fresh, and thick anomaly in the dLSW density range. The arrival of this cold-fresh-thick anomaly is evident 3-7 years later in shipboard measurements at Line W. Further, the transition from cold-fresh to warm-salty properties in the dLSW range and thinning of the dLSW layer is measured by the Line W moored array from 2004-2014 with statistical confidence. Additional datasets along the path of the DWBC provide further evidence for equatorward advection of the cold-fresh-thick anomaly and indicate that stirring between the boundary and the interior increases south of the Flemish Cap. The consistency of the data with realistic advective and mixing time scales is assessed using the Waugh and Hall (2005) model framework. The data are found to be consistent with a mean transit time of approximately 5 years, with a leading order role for both advection by the DWBC and mixing between it and interior waters.