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How Does Labrador Sea Water Enter the Deep Western Boundary Current?

Jaime B. Palter and M. Susan Lozier

Division of Earth and Ocean Science, Nicholas School of the Environment and Earth Science, Duke University, Durham, North Carolina

Kara L. Lavender

Woods Hole Oceanographic Institution, Woods Hole, Massachusetts

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ABSTRACT

Labrador Sea Water (LSW), a dense water mass formed by convection in the subpolar North Atlantic, is an important constituent of the meridional overturning circulation. Understanding how the water mass enters the deep western boundary current (DWBC), one of the primary pathways by which it exits the subpolar gyre, can shed light on the continuity between climate conditions in the formation region and their downstream signal. Using the trajectories of (profiling) autonomous Lagrangian circulation explorer [(P) ALACE] floats, operating between 1996 and 2002, three processes are evaluated for their role in the entry of Labrador Sea Water in the DWBC: 1) LSW is formed directly in the DWBC, 2) eddies flux LSW laterally from the interior Labrador Sea to the DWBC, and 3) a horizontally divergent mean flow advects LSW from the interior to the DWBC. A comparison of the heat flux associated with each of these three mechanisms suggests that all three contribute to the transformation of the boundary current as it transits the Labrador Sea. The formation of LSW directly in the DWBC and the eddy heat flux between the interior Labrador Sea and the DWBC may play leading roles in setting the interannual variability of the exported water mass.

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