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Distribution and Circulation of Labrador Sea Water

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ABSTRACT

Labrador Sea Water is the final product of the cyclonic circulation of Subpolar Mode Water in the open northern North Atlantic (McCartney and Talley, 1982). The temperature and salinity of the convectively formed Subpolar Mode Water decrease from 14.7°C, 36.08‰ to 3.4°C, 34.88‰ on account of the cumulative effects of excess precipitation and cooling. The coldest Mode Water is Labrador Sea Water, which spreads at mid-depths and is found throughout the North Atlantic Ocean north of 40°N and along its western boundary to 18°N.

A vertical minimum in potential vorticity is used as the primary tracer for Labrador Sea Water. Labrador Sea Water is advected in three main directions out of the Labrador Sea: 1) northeastward into the Irminger Sea, 2) southeastward across the Atlantic beneath the North Atlantic current, and 3) southward past Newfoundland with the Labrador Current and thence westward into the Slope Water region, crossing under the Gulf Stream off Cape Hatteras.

The Labrador Sea Water core is nearly coincident with an isopycnal which also intersects the lower part of the Mediterranean Water, whose high salinity and high potential vorticity balance the low salinity and low potential vorticity of the Labrador Sea Water. Nearly isopycnal mixing between them produces the upper part of the North Atlantic Deep Water.

A 27-year data set from the Labrador Sea at Ocean Weather Station *Bravo* shows decade-long changes in the temperature, salinity, density and formation rate of Labrador Sea Water, indicating that Labrador Sea Water property distributions away from the Labrador Sea are in part due to changes in the source.

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