



Abstract View

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The Subpolar Mode Water of the North Atlantic Ocean

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ABSTRACT

The warm waters of the subtropical and subpolar basins of the North Atlantic have tight regional temperature-salinity relationships, and are conventionally called the regional “Central Waters.” A volumetric census of the temperature-salinity characteristics of the North Atlantic by Wright and Worthington (1970) shows that waters characterized by certain segments of the T - S relationships have large volumes compared to those of other segments: volumetric “Mode Waters.” Such Mode Waters appear as layers with increased vertical separation between isopycnals-pycnostads. The present study reports on the existence of pycnostads in the central and eastern North Atlantic. These Subpolar Mode Waters are formed by deep winter convection in the subpolar North Atlantic, and participate in the upper water circulation of the northern North Atlantic. The seasonal outcropping of the pycnostads occurs within and adjacent to the North Atlantic Current, the Irminger Current, the East and West Greenland Currents, and the Labrador Current. The warmer pycnostads ($10^{\circ}\text{C} \lesssim T \lesssim 15^{\circ}\text{C}$) recirculate in an anticyclonic subtropical gyre east and south of the North Atlantic Current, causing volumetric modes in the central and eastern subtropical North Atlantic. A branch of the North Atlantic Current carries somewhat heavier and cooler ($8^{\circ}\text{C} \lesssim T \lesssim 10^{\circ}\text{C}$) pycnostads northward past Ireland. The bulk of the current turns westward, but one branch continues northward, providing a warm core to the Norwegian Current (8°C). Within the main westward flow the density continues to increase and temperature to decrease. Southeast of Iceland pycnostad temperatures are near 8°C . Following the cyclonic circulation around the Irminger Sea west of the Reykjanes Ridge the temperature drops to less than 5°C . The cyclonic flow around the Labrador Sea gives a final pycnostad temperature below 3.5°C . The last, coldest, densest pycnostad is the Labrador Sea Water which influences lower latitudes via the southward flowing, Deep Western Boundary Current along the western boundary, and via eastward flow at mid-depth in the North Atlantic Current (Talley and McCartney, 1982).

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