Abstract View

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The Western Boundary Undercurrent off the Bahamas

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ABSTRACT

Two tritium sections through the deep western boundary current east of the Bahamas taken in late 1980 and early 1981 are presented. Tritium from the bomb tests in the late 1950s and early 1960s is used to identify recently formed deep waters in the sections. High concentrations are found in the North Atlantic Deep Water. Low tritium values occur in the Labrador Sea Water found above the core of this deep water. This is consistent with the suggestion by Talley and McCartney that this water mass has not been ventilated at the temperatures observed in these sections since the mid-1950s. Tritium in the sections is correlated with maxima in potential vorticity. This is inconsistent with deep convection as a direct source for the water mass. The potential vorticity maxima may be associated with plume dynamics near the overflow regions or with the dynamics of the deep western boundary current. The sections are south of the section discussed by Jenkins and Rhines where high tritium concentrations were found along the topography on the Blake-Bahama Outer Ridge between 3.5 and 4.5 km depth in late 1977. In the sections farther south a similar maximum is found, but it is at a 0.6°C warmer potential temperature and separated from the topography. Tritium is found at the temperature it appears in the Jenkins and Rhines section. In contrast to their concentrated feature, the tritium in the later sections is spread out into a layer which extends into the ocean interior to the limit of the sections in these temperature ranges. This coupled with dynamic height fields suggests that the boundary current feeds an offshore flow into the ocean interior east of the Bahamas. The change in the temperature where the tritium maximum is found implies variations in the formation and spread of North Atlantic Deep Water on fairly short time scales.

top

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