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Absolute Geostrophic Velocity Determination from Historical Hydrographic Data in the Western North Atlantic

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ABSTRACT

Beta-spiral calculations are presented using averaged western North Atlantic hydrographic data from the period 1914–73. Profiles of long-term mean geostrophic flow relative to ISM db along 70°W from 26 to 32°N are shown. Absolute reference velocities at 1500 db are obtained using two beta-spiral methods and data from three depth ranges. Results indicate a dependence of the reference velocity on the depth range used in the calculation. Northeastward reference velocities are found from upper and middle thermocline data while near-zero velocities are obtained using data from the lower thermocline and below. Evidence that mesoscale variability plays an important role in the vorticity dynamics of the upper kilometer of the western North Atlantic is discussed. It is concluded that only the velocities derived from beta-spiral analyses at the deeper levels are valid in terms of the model assumptions. The resulting absolute velocity profiles are compared with field observations, the geophysical inverse method results of Wunsch (1978), and the Worthington (1976) circulation pattern.

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