Determination of Atlantic Circulation on Isopycnal Surfaces from Hydrographic Data

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A simple steady-state theory of the geostrophic velocity field on the isopycnal surface predicts the existence of current spirals associated with the Jacobian of the potential vorticity (q) and the pressure (p) fields on that surface, J(q, p). The rotation of the horizontal velocity on the isopycnal surface with density is proportional to J(q, p). Thus, vertical velocity spiral exists when the Jacobian J(q, p) is non-zero, that is, the q-isoline intersects with the p-isoline (isobaric line). A technique is devised for computing the absolute velocity from observed density data alone. We use a climatological T, S data for the Atlantic Ocean from the National Ocean Data Center (NODC) to show the benefit of using this method to invert the ocean circulation. The difference of circulations between z-level and isopycnal level will also be discussed.

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