Abstract View

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Determination of the Pressure Along a Closed Hydrographic Section. Part I: The Ideal Case

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ABSTRACT

The pressure along a closed hydrographic section can be correctly calculated from density data, in the ideal case of perfectly steady, geostrophic, density-conserving flow; and from dense, error-free data, excluding certain degenerate cues. A corresponding practical method, aimed at an estimate of the pressure from real hydrographic data, has been designed.

The calculation is made by a minimization of the volume enclosed by the surface $B = F(\mathrm{ro},P)$ in the P-ro-B space, where ro is the density. $P = f\mathrm{ro}_z$ the potential vorticity, and $B = B^* + p_0$ the Bernoulli function, split in a known baroclinic part B^* and an unknown pressure p_0, defined at a chosen depth z_0. The minimization is made under free variation of $p_0(s)$, as a function of the tangential coordinate s, the minimum volume is zero under the ideal conditions. Practically, one minimizes a moment rather than the volume, with identical results in the ideal case.

The minimization requires an identification of "corresponding points" (endpoints of the same streamline) from the P-conservation; this may become impractical in the presence of strong noise. In such cases an alternative method based on an integral equation expressing the detailed flux balance of P and B is proposed.