Abstract View

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The Energetics of Overturning Structures: Implications for the Theory of Fossil Turbulence

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ABSTRACT

A large number of oceanic and freshwater microstructure observations are analyzed to determine the energetic state of the turbulence. The total available energy and a time scale for dissipating the total energy are estimated. It is found that the time scale for dissipating the total energy in overturns is usually much shorter than the time scale for gravitational collapse found in laboratory studies. This implies that the energy being dissipated in an overturn could not be supplied fast enough to support the dissipation if gravitational collapse were the only source supplying the energy. Two criteria used in Gibson's theory of fossil turbulence for establishing the state of overturns are compared: a length wale (or available potential energy) criterion suggested by Gibson and tested in the laboratory by Stillinger and Gibson's "activity parameter" criterion. It is found that most overturns are "active" according to the available potential-energy criterion, but "fossil" according to the activity parameter criterion. A modification of the activity parameter is suggested to achieve agreement.