Abstract View

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Reversible and Irreversible Finestructure

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ABSTRACT

Various statistics of temperature profiles are examined in an attempt to distinguish irreversible structures due to mixing from reversible distortions induced by internal wave straining. Even if all the low gradient regions were the result of mixing events, an analysis of the profiles shows that such events are rare and most often incomplete. An upper bound on the mixing effectiveness is obtained; it increases as the vertical scale decreases. Taking next the opposite view that internal wave straining is the sole process, an analytic model is developed to calculate the probability density function of temperature gradients. The model considers the straining by a weakly nonlinear Gaussian internal wave field of a linear temperature profile. The nonlinearity of the field is essential to account for the skewness of the probability distributions. Comparisons with data are quite satisfactory at scales larger than ~ 2 m, less so at smaller scales. We conclude that nonlinear effects are important; at scales larger than ~ 2 m straining is dominant with very little mixing, while at smaller scales irreversible structures are more prevalent.