Abstract View

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Convectively Driven Turbulent Mixing in the Upper Ocean

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ABSTRACT

Two experiments were performed to study the characteristics of turbulence in convective mixed layers in the upper Ocean. In the first, a diurnal convective mixed layer developed in the Bahamas under the influence of the cycle of daytime solar heating and nighttime evaporative cooling. The mixed layer reached as deep as 100 m each night and restratified each day. In the second, the mixed layer of a warm-core Gulf Stream ring deepened from less than 50 m to more than 150 m in a little more than a day, when subjected to rapid cooling during a cold air outbreak. Although individual profiles of ϵ, the rate of viscous dissipation of turbulent kinetic energy, had considerable spatial and temporal variability, the mean dissipation profiles were similar to those in convecting atmospheric boundary layers. The $\bar{\epsilon}$ is established by the surface buoyancy flux, J_b^0; $\bar{\epsilon}/J_b^0$ = 0.61 and 0.72 in the Bahamas and ring data, respectively, compared with 0.64 in convecting atmospheric mixed layers. The mean profiles decrease gradually, no more than a factor of 3, through the mixed layer and drop abruptly, by 1 to 2 decades, at the mixed layer base.