



Diurnal cycle of mixed layer turbulence and stratification in the tropics

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Gliders based microstructure measurements using a MicroRider turbulence package from different locations in the tropical Atlantic are used to investigate the diurnal variability of turbulence and stratification in the mixed layer. The autonomous platform enables us to collect time series of turbulent dissipation rates along with stratification over several weeks in undisturbed waters in the depth range between 2m and 1000m. Microstructure profile time series from the equator, 5° and 8° North in the central and eastern regions show strongly elevated turbulent dissipation rates in the upper mixed layer between 2-10 m depth occurring during day time from about 9am to 5pm. Peak dissipation rates are above $1 \times 10^{-6} \text{W/kg}$ close to the surface and occur at about 14:00 hours local time. Concurrently, strong vertical gradients in temperature develop in the upper 10 meters of the water column indicating the development of stratification due to differential solar heating. On average, the diurnal cycle of temperature in the upper 10m shows an amplitude of 0.4°C. A likely explanation of the enhanced mixing in the upper mixed layer is that wind-induced vertical turbulent momentum transport is strongly inhibited during the diurnal stratified period, leading to large shear in upper few meters of the water column. Strongly enhanced day-time turbulence in the mixed layer is evident in all turbulent dissipation rate time series indicating that the process is not restricted to a specific location or season. Finally, the dataset impressively shows that turbulence in the tropical upper mixed layer peaks during day time rather than at night.